DUE DILIGENCE GEOTECHNICAL REPORT

Segale Site
Southwest of I-5 and State Route 432
Kelso, Washington

For
Trammell Crow Company
October 25, 2021

Project: TrammellCr-104-01

NV5

October 25, 2021

Trammell Crow Company
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Attention: John Varin

Due Diligence Geotechnical Report
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NV5 is pleased to submit this due diligence geotechnical report for the Segale Site in Kelso, Washington. The site is located southwest of the intersection of Interstate 5 (I-5) and State Route 432, between I-5 and the Burlington Northern Santa Fe Railway tracks. Our services for this project were conducted in accordance with our proposal dated September 13, 2021.

We appreciate the opportunity to be of service to you. Please contact us if you have questions regarding this report.

Sincerely,

NV5

Nick Paveglio, P.E.
Principal Engineer

cc: Kirk Olsen, Trammell Crow Company (via email only)

NNP:kt
Attachments
One copy submitted (via email only)
Document ID: TrammellCr-104-01-102521-geor.docx

EXECUTIVE SUMMARY

The primary geotechnical considerations for the project are summarized as follows:

- Between 3 and 7 inches of liquefaction-induced settlement is possible at the ground surface of the site during a seismic event. Differential settlement at the ground surface is expected to be approximately one-half of the total settlement over a 50-foot span. Provided the buildings are single-story, concrete structures with column spacing of 50 feet and a seismic Risk Category of I/II, specialized foundation systems will not be required to support the buildings from a seismic perspective, provided the owner is willing to accept the risk of building damage after a seismic event.

- Liquefaction-induced lateral spreading is possible toward the sloughs on the eastern and western margins of the site. To meet the design tolerances for lateral spreading in Tables 12.12-2 of ASCE 7-16 and avoid needing specialized foundation systems, the buildings should be located at least 75 and 50 feet from the top of the slopes of the western and eastern sloughs, respectively. If development requires buildings to be constructed within 75 and 50 feet of the tops of the slough slopes, specialized foundations or buttresses will be required.

- The native fine-grained soil below the dredge sand fill at the site is compressible and fill and floor slab loads can induce significant settlement. Where the combination of fill and floor slab loading exceeds 125 psf over the existing condition, a surcharge is recommended.

- Spread foundations supporting column loads up to 300 kips can be used to support the proposed buildings, provided (1) buildings are located at least 75 and 50 feet from the western and eastern sloughs, respectively, or buttresses are installed between the buildings and the tops of the slough slopes, (2) subgrades are prepared as described in the "Settlement Considerations" section (a surcharge may be required), and (3) the owner is willing the accept the risk of building damage after a seismic event.

- Buildings with column loads more than 300 kips should be supported on conventional spread footings on soil improvements or deep foundations.

- The near-surface soil at the site consists of sand fill with low fines content. The sand fill is capable of supporting some construction loading; however, it will likely not support large equipment and areas with heavy traffic, particularly in the wet season, and granular haul roads and staging areas may be necessary.

- Infiltration systems may be possible in the dredge sand fill above the seasonal high groundwater. We recommend the seasonal high groundwater elevation at the site be taken as 18 feet. Additional testing in planned infiltration locations is recommended to confirm the feasibility of infiltration systems once development plan progress.

- Development was in the conceptual stages at the time this report was prepared. We recommend that NV5 be involved in development as it progresses and revise geotechnical recommendations, if necessary.

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ACRONYMS AND ABBREVIATIONS

ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
BGS	below ground surface
CDSM	cement deep soil mix
CPT	cone penetration test
CSZ	Cascadia subduction zone
FOS	factor of safety
g	gravitational acceleration (32.2 feet/second^2)
H:V	horizontal to vertical
IBC	International Building Code
km	kilometers
MCE	maximum considered earthquake
M_w	moment magnitude
NA	not applicable
OSHA	Occupational Safety and Health Administration
pcf	pounds per cubic foot
pci	pounds per cubic inch
PGA	peak ground acceleration
psf	pounds per square foot
SPT	standard penetration test
USGS	U.S. Geological Survey
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

This report presents the results of our due diligence geotechnical engineering evaluation for the Segale site at in Kelso, Washington. The approximately 119-acre site is located southwest of the intersection of Interstate 5 (I-5) and State Route 432, between I-5 and the Burlington Northern Santa Fe Railway tracks. The site is shown relative to surrounding features on Figure 1. Figure 2 shows the existing conditions at the site. Acronyms and abbreviations used herein are defined above, immediately following the Table of Contents.

2.0 BACKGROUND

Based on a review of available information, the site was a low-lying wetland area with a network of sloughs prior to the 1980s. In the 1980s, a majority of the site was filled with approximately 25 to 30 feet of dredge sand fill. The site remained relatively unchanged until 2011 when the southbound on-ramp to I-5 at the northern boundary of the site and the extension of Talley Way through the site were constructed.

3.0 PROJECT UNDERSTANDING

Development will be in the northern, elevated portion of the site. Specific development was not known at the time of this report; however, we anticipate it may consist of one or two large warehouse- or distribution-type buildings with associated infrastructure.

Based on correspondence with Trammell Crow Company, the buildings will likely be Risk Category I/II structures with a fundamental period of less than 0.5 second and column spacing of at least 50 feet. Based on Table 12.12-3 of ASCE 7-16, the maximum tolerable differential seismic settlement of these types of structures is 4.5 inches. The upper limit on lateral spreading for buildings to be constructed on conventional spread footings in Table 12.13-2 of ASCE-7-16 is 18 inches.

4.0 PURPOSE AND SCOPE

The purpose of our services was to provide preliminary geotechnical engineering recommendations for design and construction of the future development. The specific scope of our services is summarized as follows:

- Reviewed available, published geology information and our in-house files for geotechnical information near the site.
- Reviewed previous geotechnical reports and information provided by the seller.
- Coordinated and managed the field explorations, including utility locates and scheduling subcontractors and NV5 field staff.
- Conducted the following explorations at the site:
  - Three drilled borings to depths between 61.5 and 91.5 feet BGS
  - Advanced two CPTs to depths between approximately 80 and 96 feet BGS
- Maintained continuous logs of the borings and collected samples at representative intervals.

- Completed laboratory testing that included the following:
  - Seventeen moisture content determinations in general accordance with ASTM D2216
  - Eleven particle-size analyses in general accordance with ASTM D1140
  - Five Atterberg limits tests in general accordance with ASTM D2436
  - One consolidation test in general accordance with ASTM D2435
- Prepared this due diligence report summarizing our findings, conclusions, and recommendations, including information related to the following:
  - Subsurface soil and groundwater conditions
  - Liquefaction and lateral spreading potential
  - Settlement considerations
  - Recommendations for site preparation, grading and drainage, stripping depths, fill type for imported material, compaction criteria, trench excavation and backfill, use of on-site soil, and wet/dry weather earthwork
  - Foundation alternatives for support of the buildings
  - Recommendations for preparing floor slab subgrade
  - Recommendations for the management of identified groundwater conditions that may affect the performance of structures or pavement
  - Code-based seismic design parameters in accordance with ASCE 7-16 (we have assumed the fundamental period of the structure will be less than 0.5 second and that a site-specific seismic hazard analysis will not be required per Section 20.3.1 of ASCE 7-16).

5.0 SITE CONDITIONS

5.1 GEOLOGIC CONDITIONS

The near-surface geologic unit is mapped as quaternary-aged alluvium deposited by the Columbia and Cowlitz rivers. The alluvium consists of silt, sand, and gravel (Schuster, 2002). The alluvium is underlain by tertiary or andesite rock of the Oligocene-Eocene-aged Goble Volcanics. The dredge sand fill placed in the 1980s is not shown on geologic maps.

5.2 SURFACE CONDITIONS

The irregularly shaped, approximately 119-acre site is bordered by the southbound on-ramp to I-5 to the north, a slough and I-5 to the east, marshland to the south, and a slough and the Burlington Northern Santa Fe Railway to the west. The site undeveloped with the exception of Talley Way, which was constructed in 2011. The majority of the site is flat and open with the exception of two sand stockpiles in the northern and central portions of the site. Current topography at the site is shown on Figure 2. Vegetation at the site consists of grass and brush and the ground surface is generally covered by sand. The extreme southern portion of the site is approximately 15 feet lower than the rest of the site and consists of a mixture of wetland and forested areas.

5.3 SUBSURFACE CONDITIONS

5.3.1 General

Subsurface conditions at the site were previously explored by Kleinfelder and GeoEngineers between 2001 and 2012. Explorations consisted of three drilled borings to depths of up to 31.5 feet BGS and six CPTs to depths between approximately 26 and 78 feet BGS. In addition,

WSDOT completed several borings near the northern and eastern portions of the site as part of the SR-432/Talley Way improvement project in the late 2000s and Hanson completed borings north and west of the site as park of railway improvements.

NV5 supplemented the previous investigations by completing three drilled borings (B-1 through B-3) to depths between 61.5 and 91.5 feet BGS and two CPTs (CPT-1 and CPT-2) to depths between approximately 80 and 96 feet BGS. Locations of all explorations are shown on Figure 2. Logs of the NV5 borings and laboratory testing results are presented in Appendix A. Logs of the NV5 CPTs are presented in Appendix B. Logs and laboratory testing from the previous explorations at the site are presented in Appendix C.

Subsurface conditions at the site generally consist of 26 to 30 feet of sand fill underlain by native silt and clay with occasional interbedded zone of silty sand that extends to depths of approximately 75 to 90 feet BGS. Medium dense to dense sand is below the silt and clay and extends the maximum depth explored of approximately 96 feet BGS. A detailed description of the subsurface soil is discussed below.

5.3.2 Soil Conditions

5.3.2.1 Dredge Sand Fill

Dredge sand fill placed in the 1980s is present below the ground surface at the site. The sand is gray and loose to dense with density generally decreasing with depth. The sand has variable proportions of silt with silt content typically increasing with depth. The sand is moist to wet and extends approximately 26 to 30 feet BGS. Figure 2 shows the depths of the dredge fill at the site.

5.3.2.2 Native Fine-Grained Soil

Beneath the fill is native fine-grained soil consisting of clay and silt with interbedded layers of silty sand and trace organics. The clay and silt are generally very soft to medium stiff and gray. Clay is generally more prevalent in the eastern portion of the site and silt is more common in the western portion of the site. The fine-grained soil extends to depths between approximately 75 and 90 feet BGS.

The interbedded silty sand layers within the fine-grained soil are medium dense and typically in the western portion of the site. The interbedded silty sand is medium dense, wet, and up to 10 feet in thickness.

Laboratory testing indicates the silt and clay have low to high plasticity with moisture contents that ranged from 41 to 70 percent at the time of exploration. Consolidation testing indicates the clay and silt have moderate to high compressibility.

5.3.2.3 Sand

Underlying the fine-grained soil is medium dense to dense, silty sand. The sand is gray and wet with trace organics. The sand extends to the maximum depth explored of approximately 96 feet BGS in the explorations.

5.3.2.4 Bedrock

Based on explorations and mapping by WSDOT, bedrock consisting of tertiary or andesite is present below the sand. WSDOT mapping indicates bedrock is likely present between 90 and 110 feet BGS in the eastern portion of the site and more than 150 feet BGS in the western portion of the site.

5.3.3 Groundwater

Mud rotary drilling methods prevented the direct measurement of groundwater in the drilled borings; however, increased moisture of soil samples was observed between depths of 15 and 20 feet BGS. Pore water dissipation testing in the CPTs indicated groundwater was present at a depth of 19 feet BGS. Piezometer readings just north of the site by WSDOT as part of the SR-432/Talley Way improvement project indicate groundwater generally fluctuates between 12 and 20 feet BGS during the year.

We anticipate that groundwater levels will fluctuate with the levels of the nearby Cowlitz and Columbia rivers. Perched water may be present above the static groundwater, particularly in the wet season.

5.4 INFILTRATION TESTING

Infiltration testing was completed in boring B-2 at a depth of 5 feet BGS to preliminarily evaluate infiltration potential at the site. Infiltration testing was completed using the single ring, falling head test method in general accordance with the procedure outlined in the Western Washington Stormwater Manual. Testing was completed until consistent rates were achieved. The unfactored infiltration rate is presented in Table 1.

Table 1. Infiltration Testing Results

Exploration	Depth (feet BGS)	Infiltration Rate[1] (inches per hour)	Soil Type
B-2	5	>100	Sand with silt (dredge sand fill)

1. unfactored field rate

Recommendations for the use of the test results are provided in the "Infiltration Systems" section.

5.5 SEISMIC HAZARDS

5.5.1 Seismic Setting

5.5.1.1 Earthquake Source Zones

Three scenario earthquakes are possible with the local seismic setting. Two of the possible earthquake sources are associated with the CSZ, and the third event is a shallow, local crustal earthquake that could occur in the North American Plate. The three earthquake scenarios are discussed below.

5.5.1.2 Regional Events

The CSZ is the region where the Juan de Fuca Plate is being subducted beneath the North American Plate. This subduction is occurring in the coastal region between Vancouver Island and northern California. Evidence has accumulated suggesting that this subduction zone has generated eight great earthquakes in the last 4,000 years, with the most recent event occurring approximately 300 years ago (Weaver and Shedlock, 1991). The fault trace is mapped approximately 50 to 120 km off the Washington Coast.

Two types of subduction zone earthquakes are possible and considered in this study:

1. An interface event earthquake on the seismogenic part of the interface between the Juan de Fuca Plate and the North American Plate on the CSZ. This source is capable of generating earthquakes with a moment magnitude of 9.0.
2. A deep intraplate earthquake on the seismogenic part of the subducting Juan de Fuca Plate. These events typically occur at depths of between 30 and 60 km. This source is capable of generating an event with a moment magnitude of up to 8.0.

5.5.1.3 Local Events

An earthquake could occur on a local fault within the North American Plate. The closest local mapped faults are more than 50 km from the site and the potential for local crustal faulting is low.

5.5.1.4 Earthquake Source Contribution

We anticipate the fundamental period of structures constructed at the site will be between 0.2 and 0.5 second. Based on deaggregation by USGS, a majority of the site hazard is from the CSZ interface event (approximately 65 to 75 percent). The remainder of the hazard is from the crustal background seismicity (20 to 25 percent) and the CSZ intraplate events (10 to 5 percent).

5.5.2 Liquefaction

Liquefaction is caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles to near zero. Granular soil, which relies on interparticle friction for strength, is susceptible to liquefaction until the excess pore pressures can dissipate. In general, loose, saturated sand soil with low silt and clay content is most susceptible to liquefaction. Silty soil with low plasticity is also susceptible to liquefaction or strain softening under relatively higher levels of ground shaking. We completed a liquefaction analysis to evaluate the possible magnitude of liquefaction settlement of the soft silt and loose sand layers encountered in the explorations.

We performed liquefaction analysis using the information from explorations and the results of laboratory testing. Triggering was completed in accordance with Boulanger and Idriss (2014). Groundwater was assumed at 12 feet BGS in analysis. Evaluation was completed for the CSZ interface event using Mw = 9.0 and PGA = 0.25 g. Due to the distance of mapped crustal faults (more than 50 km) from the site, the risk of a crustal event is low and was not considered in analysis.

Analysis indicates total seismic settlement at the ground surface as a result of liquefaction will range between 3 and 7 inches. Liquefaction settlement will be greater in the western portion of the site where silt and interbedded layers of silty sand are more prevalent. The eastern portion of the site contains more clay, which is generally not susceptible to liquefaction due its plasticity content and limited to no interbedded silty sand layers. Differential settlement is expected to be one-half of the total settlement over a 50-foot span (1.5 to 3.5 inches).

According to ASCE 7-16, seismic differential settlement must be less than the values determined in Table 12.12-3 or soil improvements or deep foundations are required to support buildings. Settlement tolerances in Table 12.12-3 are based on the type, column spacing, and risk category of structures. Based on our experience, warehouse- or distribution-type buildings are typically Risk Category I or II. Table 2 shows the maximum tolerable seismic settlement limits for various structure types and column spacing for Risk Category I/II structures. As shown in the table, the allowable seismic settlement increases with column spacing and decreases with multi-story structures. We should be contacted to provide additional information if the structures are Type III or IV.

Table 2. ASCE 7-16 Allowable Seismic Differential Settlement for Risk Category I or II Structures

Structure Type	Column Spacing (feet)					
	25	30	35	40	45	50
Single-Story Structure with Concrete or Masonry Walls	2.2	2.7	3.1	3.6	4.0	4.5
Other Single-Story Structures	4.5	5.4	6.3	7.2	8.1	9.0
Multi-Story Structures with Concrete or Masonry Walls	1.5	1.8	2.1	2.4	2.7	3.0
Other Multi Multi-Story Structures	3.0	3.6	4.2	4.8	5.4	6.0

Assuming a single-story, concrete building with column spacing of at least 50 feet (and a Risk Category of I/II) as anticipated, the predicted differential settlement (1.5 to 3.5 inches) is less that the maximum allowable limit in Table 12.12-3 of ASCE 7-16 of 4.5 inches. Accordingly, buildings with column spacing of 50 feet can be supported on conventional spread footings and soil improvements or deep foundations are not required, provided the owner is willing to accept the potential for building damage after a seismic event (damage potential to be provided by project structural engineer).

Table 2 should be used to determine the maximum allowable differential settlement if column spacing is less than 50 feet. In general, if the tolerable limit in Table 2 is less than 3.5 inches, soil improvements or deep foundations will be required. Because liquefaction settlement is expected to be lower in the eastern portion of the site, additional explorations and analysis in

specific building locations could reduce differential settlement below 3.5 inches and eliminate the need for soil improvements or deep foundations for more closely spaced columns.

Per Section 12.13.9 of ASCE 7-16, foundation ties will be likely be required for the buildings because anticipated differential settlement is greater than one-quarter of the tolerances in Table 12.12-3 of ASCE 7-16.

5.5.3 Lateral Spreading

5.5.3.1 General

Lateral spreading is a liquefaction-related seismic hazard that occurs on gently sloping or flat sites underlain by liquefiable sediment adjacent to an open face, such as a riverbank. Liquefied soil adjacent to an open face can flow toward the open face, resulting in lateral ground displacement.

The site is away from Columbia and Cowlitz rivers; however, there are sloughs along the eastern and western site margins that are approximately 20 feet lower than the site and lateral spreading is possible. Lateral spreading of buildings toward the slough must be less than limits in Table 12.12.-2 of ASCE 7-16 or the buildings will need to be supported on deep foundations or a buttress will need to be installed between the buildings and the slough to prevent lateral spreading. For Risk Category I/II structures that are anticipated at the site, the maximum horizontal ground displacement at the footings is 18 inches.

5.5.3.2 Analysis

Lateral spreading toward the sloughs was evaluated using limit equilibrium analysis and empirical equations. Limit equilibrium analyses was performed using the SLOPE/W application by GeoStudio. A critical cross section where the slope to the slough was steepest was evaluated.

Static strength parameters were based on CPT and boring correlations and the results of laboratory testing. Post-liquefaction residual strength parameters were applied to the layers of potentially liquefiable sands based on correlations by Olson and Stark (2002), Kramer and Wang (2015), and Idriss and Boulanger (2007).

Limit equilibrium analysis was completed to determine the allowable distance from the crest of the sloughs to structures to meet the requirements of Table 12.12.-3 of ASCE 7-16. We considered the following conditions:

1. Pseudo static. Based on static, drained strength of all soil. The horizontal pseudo static coefficient (k_h) was taken as one-half of the PGA of the CSZ interface event of 0.125 g. Due to the proximity of known crustal faults from the site, a crustal analysis was not performed. The results of the pseudo static analysis provided values for FOS against sliding.

2. Cyclically Softened Soil Condition. This is to evaluate the potential for long duration shaking, particularly associated with a subduction event. The intent of this analysis was to estimate K_y values for critical slip surfaces for weaker shaking that occurs after strong shaking when soils may have residual strength. A reduced PGA of 0.09 g was assigned

for the crustal and CSZ scenarios. This corresponds to the PGA at the time of strength loss when $R_u > 0.8$ in the sandy soil from the liquefaction analysis described above.

3. Post-Seismic Stability. The intent of the analysis was to evaluate the potential for flow failure after seismic loading ($k_h = 0$). Shaking is complete and residual/softened soil parameters exist due to cyclic deformation and liquefaction.

Circular and block failure geometries were used to generate potential slip surfaces for all analyses. Only the critical failure type (lowest FOS or K_y) is shown in the results presented in Appendix D (circular failure controlled in all cases). Newmark sliding block analyses was performed on slip for the "cyclically softened soil" conditions. Displacement was estimated using simplified methods presented by Bray and Travasarou (2007) and Bray et al. (2018). An $M_w = 9.0$ was used in analysis. A summary of the results is provided in Tables 3 and 4.

Table 3. Western Slough Lateral Spreading Results

Condition	Distance from Top of Slope (feet)	Soil Strength Conditions	PGA Used in Analysis (g)	Calculated K_y (g)	Calculated FOS	Calculated Lateral Movement (inches)
Pseudo Static	75	Drained	0.125	NA	1.62	NA
Cyclically Softened	75	Residual	0.09	0.02	NA	18
Post-Seismic Stability	75	Residual	0	0	1.17	NA

Table 4. Eastern Slough Lateral Spreading Results

Condition	Distance from Top of Slope (feet)	Soil Strength Conditions	PGA Used in Analysis (g)	Calculated K_y (g)	Calculated FOS	Calculated Lateral Movement (inches)
Pseudo Static	50	Drained	0.125	NA	1.56	NA
Cyclically Softened	50	Residual	0.09	0.02	NA	18
Post-Seismic Stability	50	Residual	0	0	1.11	NA

Analysis indicates the buildings should be a minimum of 75 and 50 feet from the crests of the western and eastern sloughs to meet design tolerances for spread footings. The eastern slough

setback is less than the western slough setback because the slope leading to the base of the slough is steeper. The buildings will be required to have foundation ties due to the liquefaction and lateral spreading potential.

Limit equilibrium FOSes against sliding greater than 1.1 were calculated for pseudo static and post-seismic stability conditions meeting standard of care for seismic conditions. This indicates that slope failure will not occur beneath the buildings during the design-level earthquake (pseudo static) and flow failure is not anticipated after shaking (post-seismic stability).

If the buildings need to be closer to the slopes or there is a desire to reduce the magnitude of lateral spreading, buttresses can be installed between the buildings and the sloughs. Buttresses are typically designed and constructed by design-build contractors. Based on the subsurface conditions adjacent to the open face, stone columns or CDSM columns that extend to depths of approximately 40 to 50 feet BGS would be required. Stone column buttresses typically consist of three to four rows of 36- to 42-inch-diameter columns installed in a triangular pattern with center-to-center spacings between 7 and 9 feet. CDSM column buttresses typically consist of one or two rows of overlapping columns with diameters between 6 and 8 feet.

6.0 DESIGN

6.1 SETTLEMENT CONSIDERATIONS

6.1.1 General

Grading plans had not been developed at the time of this report. Based on correspondence with the design team, maximum floor slab loading will be up to 500 psf. The near-surface soil generally consists up to 30 feet of dredge sand fill underlain by soft, moderate to highly compressible clay and silt that are prone to settlement under structural and/or fill loads. Based on laboratory testing and analysis, a net increase in pressure of 125 psf above the existing condition from the combination of fill and floor slab loading will result in settlement that exceeds typical static foundation settlement tolerances of 1 inch total and 0.5 inch differential over a 50-foot span.

Where the combination of fill and floor slab loading exceeds 125 psf above the existing condition, we recommend building footprints be surcharged. The net increase in load should be calculated assuming a new fill density of 120 pcf and an in-place soil density of 110 pcf. For example, if floor slab loading is 500 psf and new fills of 3 feet are planned, the net pressure increase is 860 psf (500 psf + 3 [feet] x 120 pcf = 860 psf). Alternatively, if the floor slab loading is 500 psf and a 4-foot cut is planned, the net pressure increase is 20 psf (500 psf – 4 [feet] x 110 pcf = 20 psf).

6.1.2 Surcharge

We recommend a surcharge of 200 psf above the anticipated floor slab loading. The pressure should be calculated from finished subgrade and the unit weight of the surcharge should be assumed to be 100 pcf. For example, if the floor slab loading is 500 psf, a surcharge pressure of 700 psf is required above finished subgrade (500 psf floor load + 200 psf surcharge = 700 psf). The resulting surcharge height will be 7 feet above finished subgrade (700 psf/100 pcf = 7 feet).

The actual surcharge duration should be evaluated based on the results of settlement plate monitoring as described in the following section. The surcharge should extend laterally at least 5 feet beyond surcharge area in building footprints. The surcharge embankment side slopes should be inclined no steeper than 1H:1V.

Surcharging can be accomplished in stages (rolling surcharge) if there is not enough material available to cover all of the building footprints or if the buildings are constructed in multiple phases. If multiple surcharge stages occur over a single building footprint, we recommend that successive surcharge areas overlap by at least 20 feet. Recommendations for surcharge heights and duration will not change for a rolling surcharge, provided the building areas and loads do not change.

All fill placed below finished soil subgrade elevation should be placed and compacted as structural fill. Surcharge material placed above finished subgrade does not need to be compacted as structural fill, provided the total unit weight of the material is at least 100 pcf.

Due to the presence of clay, fill-induced consolidation could be longer than normal. Actual completion of fill-induced settlement will vary based on fill thickness; however, settlement will generally be complete within 14 to 20 weeks of placing fill to final grade. Settlement plates should be installed to monitor settlement and determine when it is appropriate to remove the surcharge.

It is important to note that surcharging reduces static settlement as a result of fill and floor slab loading only and the buildings will still be subject to the seismic settlements predicted in the "Seismic Hazards" section.

6.1.3 Settlement Monitoring

Settlement plates should be installed to determine the surcharge duration. A typical settlement plate detail is shown on Figure 3. For preliminary planning purposes, we recommend settlement monitoring points be installed at a rate of one per 20,000 square feet surcharge constructed.

For ease in handling, the casing and rod portions of the settlement plate are usually installed in 5-foot sections. As filling progresses, couplings are used to install additional sections. Continuity in the monitoring data is maintained by reading and recording the top of the measurement rod immediately prior to and following the addition of new sections. Care must be taken during fill construction not to bend or break the rods.

The settlement monitoring points should be surveyed twice weekly. The settlement monitoring points should be monitored using survey equipment with accuracy of 1/100th of a foot and referenced to a stationary datum established at least 500 feet from fill placement. The survey data should be supplied to NV5 within three days of the survey.

6.2 FOUNDATION SUPPORT

6.2.1 General

Based on discussion with Trammell Crow Company, we anticipate the buildings at the site will be single-story, concrete structures with minimum column spacing of 50 feet and a Risk Category of

I/II. Maximum column loads for these types of structures are typically less than 300 kips and static foundation design tolerances are typically 1 inch total and 0.5 inch differential between adjacent footings.

As described in the "Seismic Hazards" section, portions of the dredge sand fill and native soil below groundwater are liquefiable during a seismic event. Seismic settlement ranges from approximately 3 inches in the eastern portion of the site up to 7 inches in the western portion of the site. Differential seismic settlement over a distance of approximately 50 feet is expected to be 1.5 to 3.5 inches.

Assuming a single-story, concrete building with a Risk Category of I/II and column spacing of 50 feet, the anticipated seismic differential settlement at the site is less than the allowable limits in Table 12.12-3 of ASCE 7-16 and buildings with column loads less than 300 kips can be supported on conventional spread footings.

If column loads exceed 300 kips, a reduction in the seismic settlement beneath building footings is desired, or column spacing changes and the differential settlements in Table 12.12-3 of ASCE 7-16 are exceeded, soil improvements or deep foundations will be required to support the buildings.

In addition to seismic settlement, the extreme eastern and western portions of the site are subject to liquefaction-induced lateral spreading toward the sloughs. Per Table 12.13-2 of ASCE 7-16, the maximum lateral spreading movement for conventional spread footings is 18 inches. As described in the "Lateral Spreading" section, analysis indicates buildings should be a minimum of 75 and 50 feet from the tops of the western and eastern sloughs to meet the 18-inch lateral movement design tolerances for spread footings. If the buildings need to be closer than 75 and 50 feet, respectively, deep foundations or a buttress will need to be installed to mitigate spreading.

A discussion of foundation alternatives for supporting structures at the site is presented in the sections below.

6.2.2 Conventional Spread Footings

Conventional spread footings can be used to support building column loads up to 300 kips, provided the following:

- Subgrades are prepared as described in the "Settlement Considerations" section.
- The predicted seismic differential settlement is less than values described in Table 12.12-3 of ASCE 7-16.
- Lateral spreading at the footings is less than 18 inches as described in Table 12.12-2 of ASCE 7-16.
- The owner is willing to accept the potential for building damage in a seismic event.

Footings should be proportioned on a maximum allowable bearing pressure of 3,000 psf. This value is a net bearing pressure; the weight of the footing and overlying backfill can be ignored in calculating footing sizes. The recommended allowable bearing pressure applies to the total of

dead plus long-term live loads and can be increased by 50 percent for short-term loads resulting from wind or seismic forces. Continuous wall and isolated spread footings should be at least 18 and 24 inches wide, respectively. The bottom of exterior footings should be at least 18 inches below the lowest adjacent exterior grade. The bottom of interior footings should be established at least 12 inches below the base of the slab.

Provided the subgrade is prepared as described in the "Settlement Considerations" section and total static post-construction settlement is expected to be less than 1 inch, differential settlement will be less than 0.5 inch over a 50-foot span. Potential seismic settlements are described in "Seismic Hazards" section.

Lateral loads on building and retaining wall footings can be resisted by passive earth pressure on the sides of the structures and by friction on the base of footings. The allowable passive earth pressure for footings confined by the on-site soil or planned structural fill is 300 pcf. Adjacent floor slabs, pavement, or the upper 12-inch depth of adjacent, unpaved areas should not be considered when calculating passive resistance.

An allowable coefficient of friction equal to 0.35 can be used for footings bearing on sand fill.

All footing subgrades should be evaluated by a representative of NV5 to confirm suitable bearing conditions. Localized over-excavation of footing subgrades may be required to penetrate soft, loose, or deleterious materials.

6.2.3 Soil Improvements

6.2.3.1 General

Soil improvements consisting of deep dynamic compaction, stone columns, aggregate piers, and CDSM columns could be used to support the buildings if column loads exceed 300 kips. Deep dynamic compaction, stone columns, and aggregate piers can likely only be used to support column loads up to 500 to 1,000 kips (this will vary with soil improvement type), and CDSM columns extending into the medium dense to dense sand beginning approximately 75 to 90 feet BGS will likely be required if loading is more than 1,000 kips.

Deep dynamic compaction, stone columns, and CDSM columns can also be used to reduce or limit liquefaction settlement at the site. If required, stone columns and CDSM columns can be used to create a buttress to reduce lateral spreading toward the sloughs in the eastern and western portions of the site.

Soil improvement systems are typically designed by a specialty design-build contractor to adhere to design criteria established by the design team. Soil improvements may be used in combination with surcharging described in the "Settlement Considerations" section to meet typical building static settlement tolerances.

6.2.3.2 Deep Dynamic Compaction

Dynamic compaction is a soil improvement technique for predominately granular soil in which a large weight is dropped from specific heights. The energy from the impact of the weight densifies the soil below the ground surface. Dynamic compaction is typically designed and concreted by a

specialty contractor and completed in a grid pattern with weights of 6 to 25 tons and drop heights up to 80 feet. The process generally includes 7 to 15 higher energy drops at each location in the grid pattern as well as ironing passes to compact loose soil around the grid caused from impact. Ironing passes do not require the same number of drops as the high energy drops. Deep dynamic compaction can typically achieve improvement to depths of 25 feet BGS. After dynamic compaction is complete, the buildings can be supported on conventional spread footings bearing directly on the improved soil.

Deep dynamic compaction at the site will densify the dredge sand fill, provide higher bearing capacities, and reduce seismic settlement. Based on our experience, spread footings supported on soil improved with deep dynamic compaction can typically be sized using an allowable bearing pressure of up to 4,000 psf. Provided a minimum SPT N-value in the improvement zone of 25 to 30 blows, we anticipate total seismic settlement in the western and eastern portions of the site can be reduced to 2 to 4 inches and 1 inch to 2 inches, respectively. Verification of the densification should be determined by post-construction SPT testing.

Prior to the start of production dynamic compaction, test areas should be completed with varying combinations of drop heights, spacing, and number of drops to determine the appropriate combination for production. Dynamic compaction should extend a minimum distance of 20 feet beyond the footprint of the building. Dynamic compaction will result in craters from compaction of the soil. After completion of dynamic compaction, craters should be leveled or filled with material and compacted as structural fill. This is typically completed by the earthwork contractor and is not part of the specialty contractor's scope of work.

Because dynamic compaction does not densify the compressible soil below the dredge sand fill, surcharging will likely be required in combination with deep dynamic compaction to meet typical static design tolerances for the buildings.

6.2.3.3 Stone Columns

Conventional spread footing bearing on stone columns can be used to support buildings with column loads greater than 300 kips and likely up to 800 kips. Stone columns are constructed by inserting a vibrating probe into the subsurface soil to the desired depth. As the probe is extracted, the void is backfilled with crushed rock aggregate. Stone columns reinforce and densify the surrounding soil matrix, reducing the potential for liquefaction to occur. Cement can be mixed into the crushed rock for stone columns for added strength and stiffness to resist lateral loads.

Stone columns can be used to increase bearing capacity of the existing soil and reduce seismic settlement. Stone column ground improvement systems are designed by specialty design-build contractors. Based on our experience, spread footings supported on stone column ground improvement can typically be sized using an allowable bearing pressure of up to 4,000 to 5,000 psf. Testing in the immediate vicinity of the site suggests a single 36- to 42-inch-diameter stone column installed to a depth of approximately 30 feet BGS can achieve an allowable axial capacity of approximately 100 kips.

The magnitude of liquefaction mitigation from stone columns will depend on the depth of installation. If stone columns are installed to the base of the dredge sand fill (approximately 30 feet BGS), we anticipate total seismic settlement in the western portion of the site can be reduced to less than 3 inches. If stone columns are installed to a depth of 30 feet BGS in the eastern portion of the site, we anticipate total seismic settlement will be less than 1 inch. Differential seismic settlement is expected to be one-half the total settlement over a distance of 50 feet. We anticipate total seismic settlement can be reduced to less than 2 inches in the western portion of the site if stone columns extend to depths of approximately 50 feet BGS. Stone columns used to reduce seismic settlement will likely need to extend 10 to 20 feet beyond the edges of footings.

If stone columns are installed beneath footings only, surcharging will likely be required to limit static settlement from fill and slab loading. Alternatively, static settlement from the combination of foundation, fill, and floor slab loading could be limited to design tolerances if stone columns are installed beneath entire building footprints. We anticipate stone columns will need to be installed to depths of at least 40 feet BGS beneath the entire building footprints to limit static settlement to typical design tolerances discussed in this report.

NV5 should be allowed to review the final design and proposed installation methods by the specialty contractor. A representative of our firm should observe the installation of test columns and quality control testing. We should be present during installation of production columns to confirm that soil conditions are as anticipated. We should also review the data obtained during installation to confirm that the expected design bearing pressure and settlement criteria can be achieved. We recommend that a test program be implemented at the start of construction to verify that the selected stone column size and spacing will be adequate or to evaluate other possible configurations.

6.2.3.4 Aggregate Piers

Aggregate piers are a ground improvement system that consists of installing compacted aggregate piers that reinforce and improve the soil. Aggregate piers can be used to support moderate loading generally up to 800 to 1,000 kips. In general, aggregate pier foundations consist of 2- to 3-foot-diameter drilled holes backfilled with compacted crushed rock. The crushed rock is placed in the hole in lifts and compacted. Piers are typically arranged in a grid pattern to provide uniform support for foundations. After installation of the aggregate piers, buildings are supported on conventional spread footings bearing directly on the piers.

Aggregate piers are used to increase bearing pressures of soil but do not reduce liquefaction. Accordingly, buildings constructed on aggregate piers will be subject to the seismic settlements discussed in the “Seismic Considerations” section. In addition, buildings supported on aggregate piers will not densify soft soil below the dredge sand fill, and surcharging may be required in combination with aggregate piers to meet typical static design tolerances for buildings.

Aggregate pier foundations are typically proprietary systems designed and constructed by specialty contractors. The allowable bearing pressure for shallow foundations supported on rammed aggregate piers is typically 4,000 to 6,000 psf. This value can typically be increased by

one-third when considering transient loads, such as wind and seismic forces. A specialty contractor should be contacted to provide the actual allowable bearing pressures and aggregate pier configurations if they are being considered for this project.

If aggregate piers are used for this project, we recommend that NV5 be allowed to review the final design and proposed installation methods. A representative of our firm should observe test pier installation and load testing and review the data obtained to confirm that the expected design bearing pressure and settlement criteria can be achieved. We should also be present during installation of production piers to confirm that soil conditions are as anticipated.

6.2.3.5 CDSM Columns

Conventional spread footings bearing on CDSM columns can be used to support moderate to heavy building column loading. CDSM columns improve weak soil by mechanically mixing it with cement slurry. CDSM columns are installed using a drill installed with radial mixing paddles located near the bottom of the drill rods used to mix cement slurry into the subsurface soil. Slurry is pumped through the drill rods as the drill bit advances and the soil and slurry are mixed together as the drill bit advances and is withdrawn. The process constructs individual CDSM column elements to increase bearing capacity and decrease settlement. CDSM columns typically vary in diameter between 48 and 72 inches. Spoils generated during installation can be used on site as structural fill or hauled off site. A 12- to 24-inch-thick layer of compacted angular crushed rock is typically placed between the top of the CDSM columns and the bottom of the foundations to distribute foundation loads to the CDSM columns and to provide a working surface for constructing the foundations.

CDSM columns can mitigate liquefaction if installed in a lattice pattern; however, due to the cost associated with a lattice system, it is more likely that CDSM columns would be installed beneath footings and extend into the medium dense to dense sand beginning approximately 75 to 90 feet BGS. Liquefaction settlement, as described in the “Seismic Considerations” section would still occur, but the CDSM columns would be designed to incorporate the downdrag effects as a result of the seismic settlement.

If CDSM columns are installed beneath foundations only, floor slabs will be subject to the static settlement from fill and floor loads as described in the “Settlement Considerations” section and surcharging may be needed to control slab settlement. In addition, floor slabs would be subject to the seismic settlement as described in the “Seismic Considerations” section.

CDSM columns can be used to structurally support floor slab and mitigate both static and seismic settlement if they are installed beneath the entire slab in a grid pattern and extend to medium dense to dense sand.

CDSM column ground improvement systems are designed by a design-build contractor. Based on our experience, foundations supported on CDSM columns can typically be sized using an allowable bearing pressure of at least 4,000 to 6,000 psf. This can typically be increased by one-third when considering transient loads, such as wind and seismic forces.

If CDSM column ground improvement is designed by a specialty contractor, we recommend that NV5 be allowed to review the final design and proposed installation methods. A representative of our firm should observe the installation of test columns and quality control testing. We should be present during installation of production columns to confirm that soil conditions are as anticipated. We should also review the data obtained during installation to confirm that the expected design bearing pressure and settlement criteria can be achieved.

6.2.4 Deep Foundations

Deep foundations consisting of driven piles and drilled shafts that extend into the medium dense to dense sand below 75 to 90 feet BGS can also be used to support moderate to heavily loaded columns greater than 300 kips. Based on our experience, deep foundations are significantly more expensive than soil improvements, and we anticipate they will not be considered for the project. NV5 can be contacted to provide more detailed recommendations for deep foundations, if necessary.

6.3 SEISMIC DESIGN CRITERIA

Buildings at the site will likely be designed in accordance with the 2018 IBC 2018 and ASCE 7-16. Due to the potential for liquefaction, the seismic site class at the site is F. ASCE 7-16 Section 20.3.1 requires a site-specific ground motion analysis be completed for structures with a fundamental period greater than 0.5 second that are located within a Site Class F. If structures have a fundamental period of less than 0.5 second, seismic design parameters can be determined using the pre-liquefaction class.

Based on experience, most single-story, warehouse- or distribution-type buildings are concrete structures with fundamental periods less than 0.5 second and seismic design parameters can be in accordance with the pre-liquefaction site classification. Multi-story buildings over three stories in height could have fundamental periods greater than 0.5 second and may require a site-specific seismic hazard evaluation.

Based on shear wave velocity testing in CPTs at the site, a pre-liquefaction seismic site class of E is appropriate. A site class of E can be used for design, provided Exception 3 in ASCE 7-16 Section 11.4.8 is met. If the exception is not met, a site-specific seismic analysis will be required. Seismic design parameters in accordance with ASCE 7-16 Site Class E (and Exception 3 of Section 11.4.8) are presented in Table 5. The pre-liquefaction site class of E is applicable for seismic design parameters only, and additional requirements for buildings on Site Class F soil should be incorporated into the design of the building (i.e., foundation ties). A site-specific seismic evaluation was not included in our due diligence scope of services; however, building-specific site-specific hazard evaluations and could potentially reduce the design parameters in Table 5.

Table 5. Seismic Design Parameters

Seismic Design Parameter	Short Period (T_s = 0.2 second)	1 Second Period (T_1 = 1.0 second)
MCE Spectral Acceleration	S_s = 0.877 g	S_1 = 0.423 g
Site Class	F*	
Site Coefficient	F_a = 1.300	F_v = 4.0
Adjusted Spectral Acceleration	S_{MS} = 1.140 g	S_{M1} = 1.692 g
Design Spectral Response Acceleration Parameters	S_{DS} = 0.760 g	S_{D1} = 1.128 g

* Seismic design parameters in accordance with a seismic site class of E per Exception 3 in ASCE 7-16 Section 11.4.8.

6.4 FLOOR SLABS

Floor slab subgrades should be prepared in accordance with the "Site Preparation" and "Settlement Considerations" sections. Adherence to these sections will limit static settlement to design tolerances; however, floor slabs will be subject to the seismic settlements described in the "Seismic Hazards" section, unless the subgrade soils are improved or the floor slab is structurally supported by deep foundations.

A modulus of reaction of 125 pci can be used for slabs on grade constructed on subgrade prepared as recommended. A minimum 6-inch-thick layer of imported granular material should be placed and compacted over the prepared subgrade to assist as a capillary break. The floor slab base rock should be compacted crushed rock or crushed gravel. The imported granular material should be placed in one lift and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557. Floor slab base rock contaminated with excessive fines (greater than 5 percent by dry weight passing the U.S. Standard No. 200 sieve) should be replaced.

Flooring manufacturers often require vapor barriers to protect flooring and flooring adhesives. Many flooring manufacturers will warrant their product only if a vapor barrier is installed according to their recommendations. Selection and design of an appropriate vapor barrier, if needed, should be based on discussions among members of the design team. We can provide additional information to assist you with your decision.

All slab subgrade should be evaluated by the geotechnical engineer to confirm suitable bearing conditions. Observations should also confirm that loose or soft material, organic material, unsuitable fill, prior topsoil zones, and softened subgrade have been removed and replaced with structural fill.

6.5 DRAINAGE

6.5.1 Temporary

During work at the site, the contractor should be made responsible for temporary drainage of surface water as necessary to prevent standing water and/or erosion at the working surface. During rough and finished grading of the site, the contractor should keep all pads and subgrade free of ponding water.

6.5.2 Surface

The ground surface around the finished building pads should be sloped away from the edge of the pad at a minimum 2 percent gradient for a distance of at least 5 feet. Roof drainage from the buildings should be directed into solid, smooth-wall drainage pipes that carry the collected water to the storm drain system. Trapped planter areas should not be created adjacent to pavement and structures without providing means for positive drainage (e.g., swales or catch basins).

Surface and subsurface drainage systems should not be tied to one another, unless special provisions are taken to prevent backflow of surface water into the subsurface drainage system.

6.5.3 Subsurface

Based on the depths to groundwater, perimeter footing drains will not be required, unless footings are more than 10 feet below current grades. If installed, drains should consist of a filter fabric-wrapped, drain rock-filled trench that extends at least 12 inches below the lowest adjacent grade (i.e., slab subgrade elevation). A perforated pipe should be placed at the base to collect water that gathers in the drain rock. Discharge for footing drains should not be tied directly into the stormwater drainage system, unless mechanisms are installed to prevent backflow.

6.5.4 Infiltration Systems

Infiltration testing was completed in boring B-2 to evaluate the potential for infiltration systems at the site. The test was completed in the dredge sand fill consisting of sand with silt. Based on the measured rate, on-site infiltration systems may be viable in the dredge sand fill, provided a minimum separation of 5 feet is maintained between the base of the systems and the seasonal high groundwater. Based on observations of groundwater during explorations and monitoring data by WSDOT, we recommend the seasonal high groundwater be taken as elevation 18 feet. It should be noted that during flooding events on the Columbia and Cowlitz rivers, groundwater could be present above the base of the infiltration systems. We recommend additional infiltration testing be completed for specific infiltration system as development progresses.

6.6 PERMANENT SLOPES

Permanent cut and fill slopes should not exceed 2H:1V. Slopes that will be mowed should not exceed 3H:1V. Access roads and pavement should be located at least 5 feet from the top of cut and fill slopes. The setback should be increased to 10 feet for buildings. The slopes should be planted with appropriate vegetation to provide protection against erosion as soon as possible after grading. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 TRAFFICABILITY

The near-surface soil at the site consists of sand fill with low fines content. The sand fill is capable of supporting some construction loading; however, it will likely not support large equipment and areas with heavy traffic, particularly in the wet season, and granular haul roads and staging areas may be necessary.

Based on our experience, between 12 and 18 inches of imported granular material is generally required in staging areas and between 18 and 24 inches in haul roads areas. Stabilization material may be used as a substitute, provided the top 4 inches of material consists of imported granular material. The actual thickness will depend on the contractor's means and methods and, accordingly, should be the contractor's responsibility.

As an alternative to thickened crushed rock sections, haul roads and utility work zones may be constructed using cement-amended subgrade overlain by a crushed rock wearing surface. NV5 can provide recommendations for cement amendment as development progresses.

7.2 EXCAVATION

7.2.1 General

We anticipate static groundwater will generally be more than 12 feet BGS. During high water or flood events on the Columbia and Cowlitz rivers, groundwater could be at shallower depths. Perched groundwater could also be present at shallow depths and particularly in the wet season.

The sand fill that extends approximately 30 feet BGS is prone to caving at all depths. Open excavation techniques will likely be needed to excavate trenches at the site. The walls of the excavations can be cut at a slope of 1H:1V, provided groundwater seepage is not present. Excavations should be flattened to 1½H:1V or 2H:1V if excessive sloughing or raveling occurs. If groundwater is present, caving, raveling, and "running" conditions could occur. In lieu of large and open cuts, approved temporary shoring may be used for excavation support. A wide variety of shoring and dewatering systems are available. Consequently, we recommend that the contractor be responsible for selecting the appropriate shoring and dewatering systems.

If shoring is used, we recommend that the type and design of the shoring system be the responsibility of the contractor, who is in the best position to choose a system that fits the overall plan of operation. All excavations should be made in accordance with applicable OSHA and state regulations.

7.2.2 Dewatering

Dewatering may be required for excavations at the site, particularly during the wet season. If encountered, pumping from a sump located within the trench may be effective in dewatering localized sections of trench. However, this method is unlikely to prove effective in dewatering long sections of trench or large excavations. In addition, the sidewalls of trench excavations will need to be flattened or shored if seepage is encountered.

Where groundwater seepage into shored excavations occurs, we recommend placing at least 1 foot to 2 feet of stabilization material at the base of the excavations.

We note that these recommendations are for guidance only. Dewatering of excavations is the sole responsibility of the contractor, as the contractor is in the best position to select these systems based on their means and methods.

8.0 LIMITATIONS

We have prepared this due diligence report for use by Trammell Crow Company and members of the design and construction team for the proposed development. This report should be considered preliminary and can be used for estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions and are not applicable to other sites.

Soil explorations indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect soil strata or water level variations that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, re-evaluation will be necessary.

The site development plans and design details were not finalized at the time this report was prepared. When the design has been finalized and if there are changes in the site grades or location, configuration, design loads, or type of construction, the conclusions and recommendations presented may not be applicable. If design changes are made, we should be retained to review our conclusions and recommendations and to provide a written evaluation or modification.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in this report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

♦ ♦ ♦

We appreciate the opportunity to be of service to you. Please call if you have questions concerning this report or if we can provide additional services.

Sincerely,

NV5

Nick Paveglio, P.E.
Principal Engineer

Signed 10/25/2021

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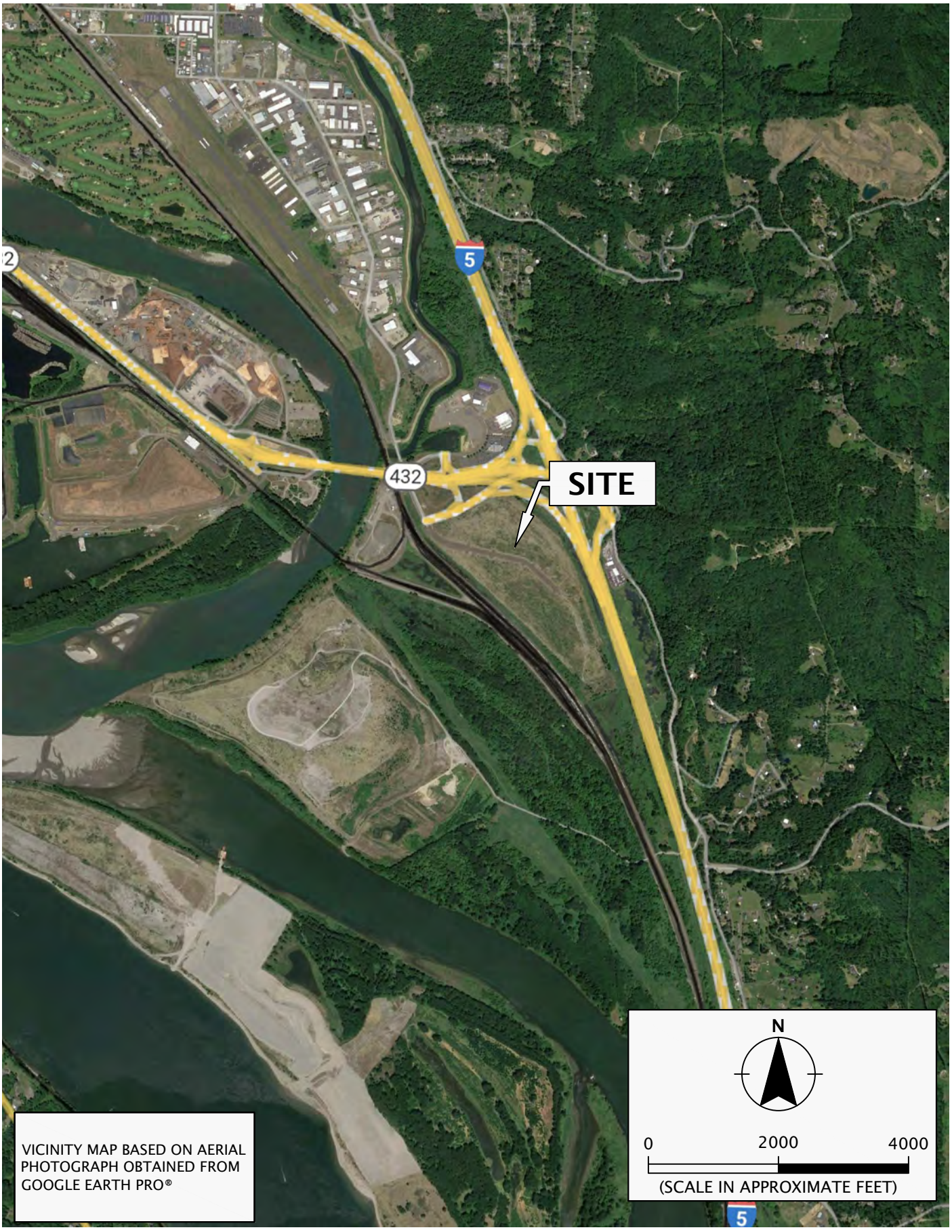
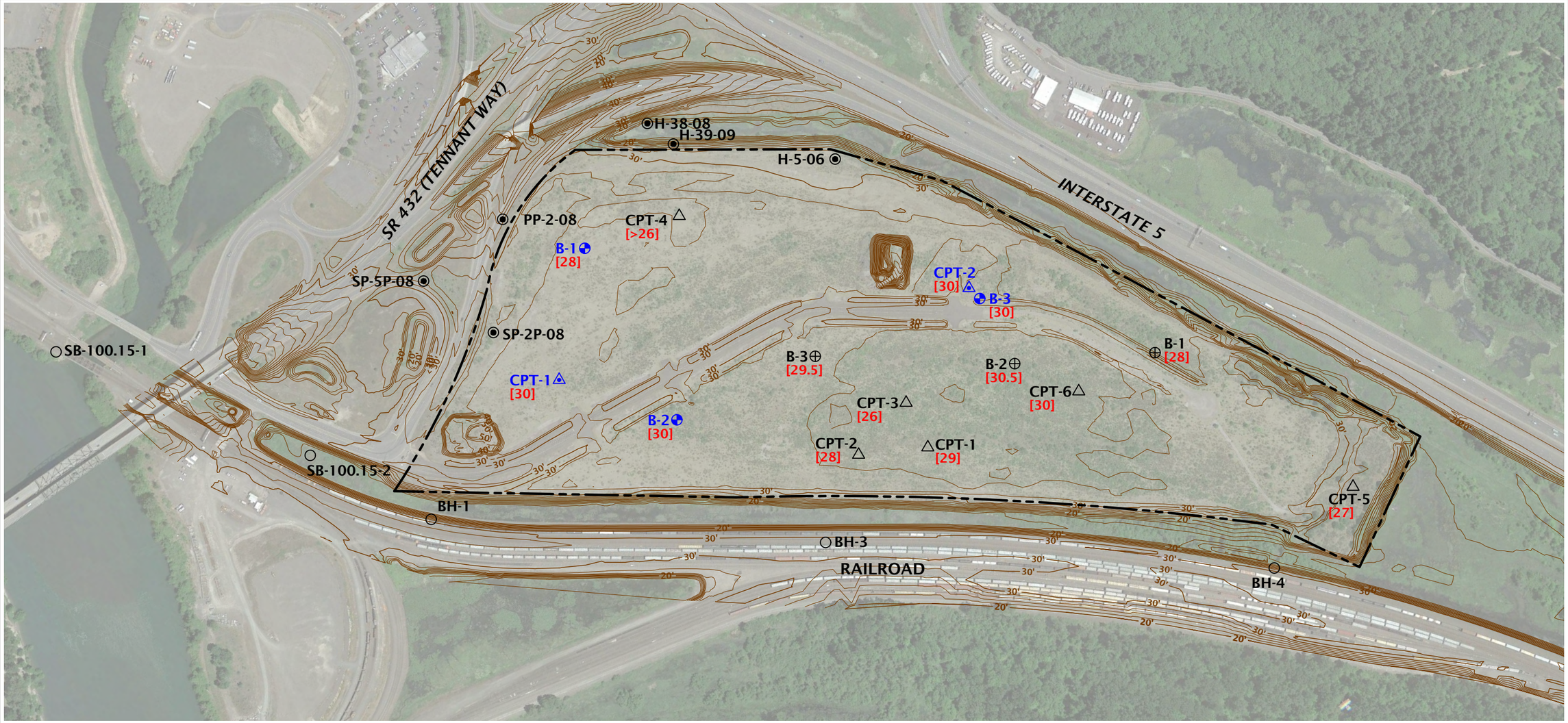
FIGURES



NV5	TRAMMELLCR-104-01	**VICINITY MAP**	
	OCTOBER 2021	SEGALE SITE KELSO, WA	**FIGURE 1**



LEGEND:

- SITE DEVELOPMENT BOUNDARY
- NV5 BORING
- NV5 CPT
- GEOENGINEERS CPT
- KLEINFELDER BORING
- WSDOT BORING
- HANSON BORING
- [28] OBSERVED DEPTH OF SAND FILL (FEET BGS)
- EXISTING TOPOGRAPHY (2-FOOT INTERVALS; 10-FOOT INDEX CONTOURS)

N

0 400 800

(SCALE IN FEET)

SITE PLAN BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®
OCTOBER 4, 2021

SITE PLAN

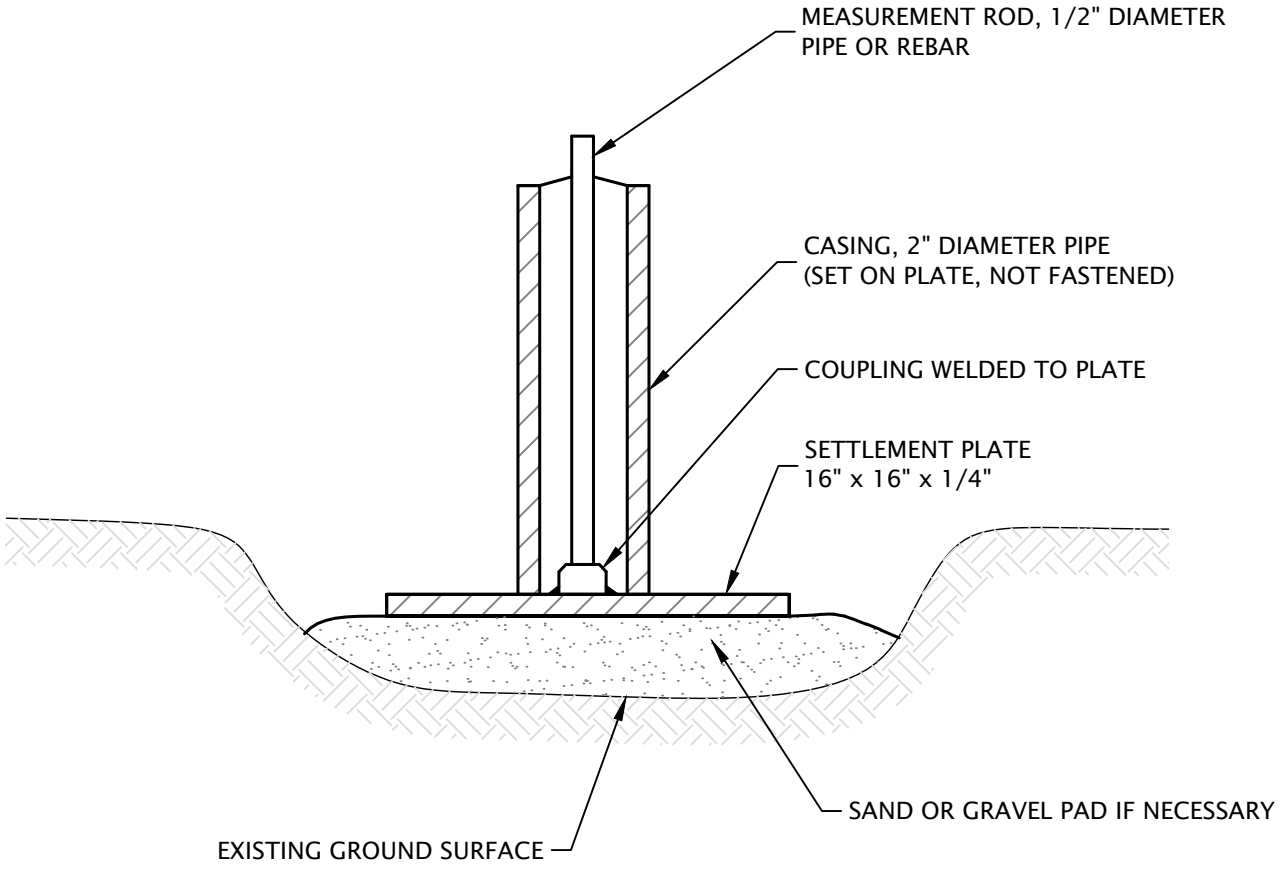
FIGURE 2

SEGALE SITE
KELSO, WA

TRAMMELLCR-104-01

OCTOBER 2021

NV5



NOT TO SCALE

NOTES:

1. INSTALL MARKERS ON FIRM GROUND OR ON SAND OR GRAVEL PADS IF NEEDED FOR STABILITY. TAKE INITIAL READING ON TOP OF ROD AND AT ADJACENT GROUND LEVEL PRIOR TO PLACING ANY FILL.
2. FOR EASE IN HANDLING, ROD AND CASING ARE USUALLY INSTALLED IN 5-FOOT SECTIONS. AS FILL PROGRESSES, COUPLINGS ARE USED TO INSTALL ADDITIONAL LENGTHS. CONTINUITY IS MAINTAINED BY READING THE TOP OF THE MEASUREMENT ROD, THEN IMMEDIATELY ADDING THE NEW SECTION AND READING THE TOP OF THE ADDED ROD. BOTH READINGS ARE RECORDED.
3. RECORD THE ELEVATION OF THE TOP OF THE MEASUREMENT ROD IN EACH MARKER AT THE RECOMMENDED TIME INTERVALS. EACH TIME, NOTE THE ELEVATION OF THE ADJACENT FILL SURFACE.
4. READ THE MARKER TO THE NEAREST 0.01 FOOT, OR 0.005 FOOT IF POSSIBLE. NOTE THE FILL ELEVATION TO THE NEAREST 0.1 FOOT.
5. THE ELEVATIONS SHOULD BE REFERENCED TO A TEMPORARY BENCHMARK LOCATED ON STABLE GROUND AT LEAST 500 FEET FROM THE EMBANKMENT.

NV5	TRAMMELLCR-104-01	**SETTLEMENT PLATE DETAIL**	
	OCTOBER 2021	SEGALE SITE KELSO, WA	**FIGURE 3**

APPENDIX A

APPENDIX A

FIELD EXPLORATIONS

We supplemented the existing explorations at the site by drilling three borings (B-1 through B-3) to depths between 61.5 and 91.5 feet BGS and advancing two CPTs (CPT-1 and CPT-2) to depths between approximately 80 and 96 feet BGS. Drilling services were completed by Western States Soil Conservation, Inc. on September 22 and 23, 2021 using mud rotary drilling techniques. The boring logs are presented in this appendix. A description of the CPTs is presented in Appendix B.

The locations of the explorations are shown on Figure 2 and were determined in the field by pacing and taping from existing site features. This information should be considered accurate only to the degree implied by the methods used.

Member of our geology staff observed the explorations. We collected representative samples of the various soils encountered in the borings for geotechnical laboratory testing.

SOIL SAMPLING

Samples were collected from the boring using a 1½-inch-inside diameter (SPT) split-spoon sampler in general accordance with ASTM D1586. The split-spoon sampler was driven into the soil with a 140-pound hammer free falling 30 inches. The sampler was driven a total distance of 18 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the boring logs, unless otherwise noted. Higher quality, relatively undisturbed samples were collected using a standard Shelby tube in general accordance with ASTM D1587. Sampling methods and intervals are shown on the exploration logs.

The average efficiency of the automatic SPT hammer used by the Western States Soil Conservation, Inc. was 85 percent. The calibration testing results are presented at the end of this appendix.

SOIL CLASSIFICATION

The soil samples were classified in accordance with the "Exploration Key" (Table A-1) and "Soil Classification System" (Table A-2), which are presented in this appendix. The exploration logs indicate the depths at which the soils or their characteristics change, although the change actually could be gradual. If the change occurred between sample locations, the depth was interpreted. Classifications are shown on the exploration logs.

LABORATORY TESTING

CLASSIFICATION

The soil samples were classified in the laboratory to confirm field classifications. The laboratory classifications are shown on the exploration logs if those classifications differed from the field classifications.

ATTERBERG LIMITS TESTING

The plastic limit and liquid limit (Atterberg limits) of select soil samples were determined in accordance with ASTM D4318. The Atterberg limits and the plasticity index were completed to aid in the classification of the soil and evaluation of liquefaction susceptibility. The test results are presented in this appendix.

CONSOLIDATION TESTING

One-dimensional consolidation testing was completed on a relatively undisturbed soil sample in general accordance with ASTM D2435. The test results are presented in this appendix.

PARTICLE-SIZE ANALYSIS

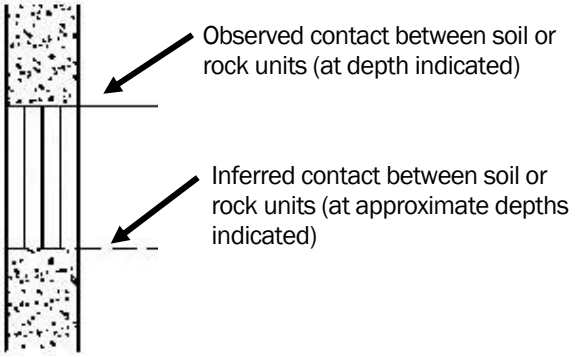
We completed particle-size analysis on select soil samples in order to determine the distribution of soil particle sizes. The testing consisted of percent fines determination (percent passing the U.S. Standard No. 200 sieve) analyses completed in general accordance with ASTM D1140 (P200). The test results are presented in this appendix.

MOISTURE CONTENT

We tested the natural moisture content of select soil samples in general accordance with ASTM D2216. The test results are presented in this appendix.

SYMBOL	SAMPLING DESCRIPTION
	Location of sample collected in general accordance with ASTM D1586 using Standard Penetration Test (SPT) with recovery
	Location of sample collected using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D1587 with recovery
	Location of sample collected using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample collected using Dames & Moore sampler and 140-pound hammer or pushed with recovery
	Location of sample collected using 3-inch-outside diameter California split-spoon sampler and 140-pound hammer with recovery
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	P	Pushed Sample
CBR	California Bearing Ratio	PP	Pocket Penetrometer
CON	Consolidation	P200	Percent Passing U.S. Standard No. 200 Sieve
DD	Dry Density		
DS	Direct Shear	RES	Resilient Modulus
HYD	Hydrometer Gradation	SIEV	Sieve Gradation
MC	Moisture Content	TOR	Torvane
MD	Moisture-Density Relationship	UC	Unconfined Compressive Strength
NP	Non-Plastic	VS	Vane Shear
OC	Organic Content	kPa	Kilopascal

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
		MS	Moderate Sheen
ppm	Parts per Million	HS	Heavy Sheen

RELATIVE DENSITY - COARSE-GRAINED SOIL

Relative Density	Standard Penetration Test (SPT) Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)
Very loose	0 – 4	0 – 11	0 – 4
Loose	4 – 10	11 – 26	4 – 10
Medium dense	10 – 30	26 – 74	10 – 30
Dense	30 – 50	74 – 120	30 – 47
Very dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOIL

Consistency	Standard Penetration Test (SPT) Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)	Unconfined Compressive Strength (tsf)
Very soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 – 4	3 – 6	2 – 5	0.25 – 0.50
Medium stiff	4 – 8	6 – 12	5 – 9	0.50 – 1.0
Stiff	8 – 15	12 – 25	9 – 19	1.0 – 2.0
Very stiff	15 – 30	25 – 65	19 – 31	2.0 – 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

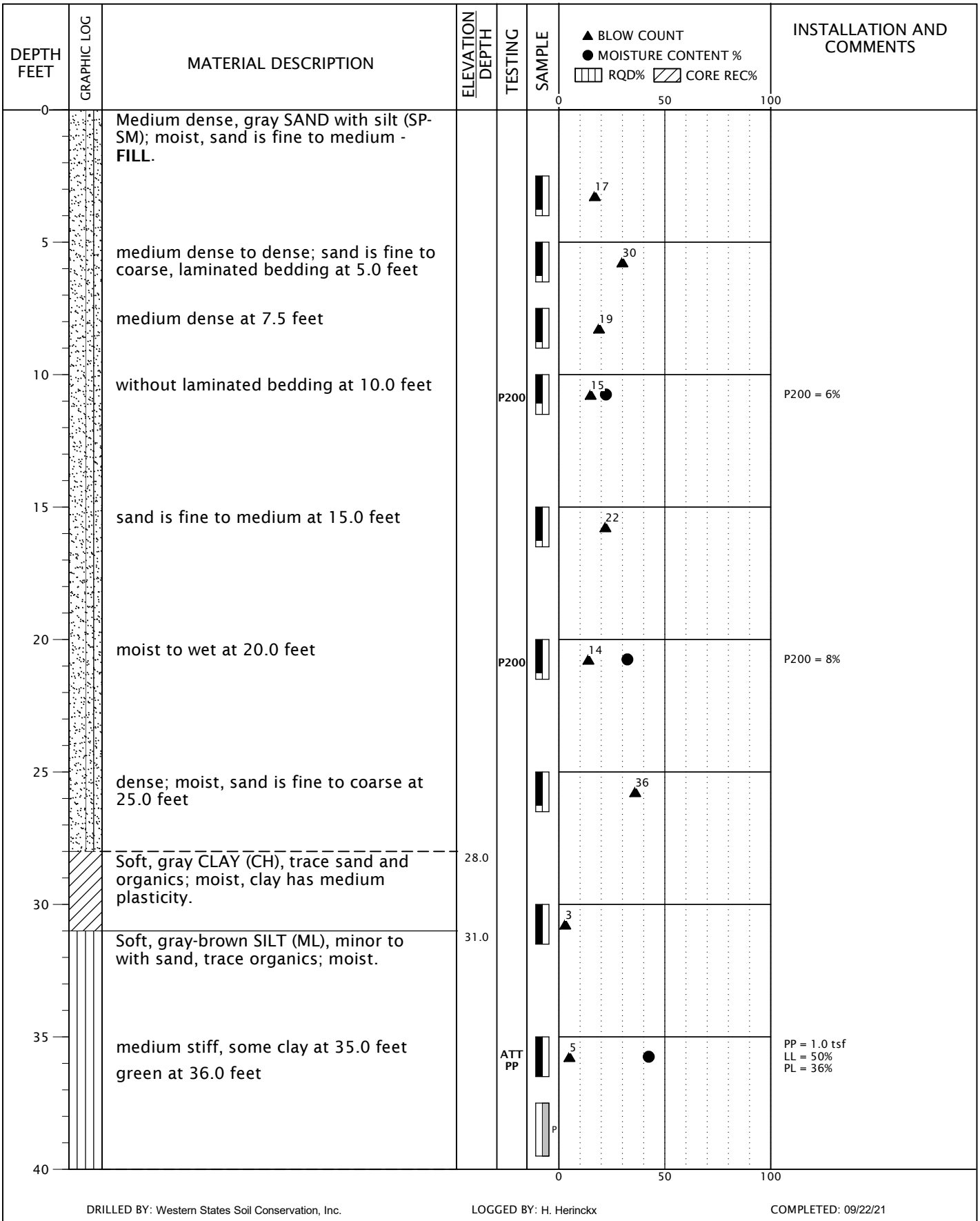
PRIMARY SOIL DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOIL (more than 50% retained on No. 200 sieve)	GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (< 5% fines)	GW or GP	GRAVEL
		GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)	GW-GM or GP-GM	GRAVEL with silt
			GW-GC or GP-GC	GRAVEL with clay
		GRAVEL WITH FINES (> 12% fines)	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND (50% or more of coarse fraction passing No. 4 sieve)	CLEAN SAND (<5% fines)	SW or SP	SAND
		SAND WITH FINES (≥ 5% and ≤ 12% fines)	SW-SM or SP-SM	SAND with silt
			SW-SC or SP-SC	SAND with clay
		SAND WITH FINES (> 12% fines)	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOIL (50% or more passing No. 200 sieve)	SILT AND CLAY	Liquid limit less than 50	ML	SILT
			CL	CLAY
			CL-ML	silty CLAY
			OL	ORGANIC SILT or ORGANIC CLAY
		Liquid limit 50 or greater	MH	SILT
			CH	CLAY
			OH	ORGANIC SILT or ORGANIC CLAY
HIGHLY ORGANIC SOIL			PT	PEAT

MOISTURE CLASSIFICATION		ADDITIONAL CONSTITUENTS					
		Secondary granular components or other materials such as organics, man-made debris, etc.					
			Silt and Clay In:			Sand and Gravel In:	
Term	Field Test	Percent	Fine-Grained Soil	Coarse-Grained Soil	Percent	Fine-Grained Soil	Coarse-Grained Soil
dry	very low moisture, dry to touch						
moist	damp, without visible moisture	< 5	trace	trace	< 5	trace	trace
		5 – 12	minor	with	5 – 15	minor	minor
wet	visible free water, usually saturated	> 12	some	silty/clayey	15 – 30	with	with
					> 30	sandy/gravelly	Indicate %

NV5

SOIL CLASSIFICATION SYSTEM

TABLE A-2



DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: H. Herinckx COMPLETED: 09/22/21

BORING METHOD: mud rotary (see document text) BORING BIT DIAMETER: 3 7/8 inches

BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT

NV5	TRAMMELLCR-104-01	**BORING B-1**
	OCTOBER 2021	SEGALE SITE KELSO, WA
		FIGURE A-1

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	INSTALLATION AND COMMENTS
40	Very soft to soft, green with gray mottled and black streaked CLAY (CL), trace sand and debris (wood); moist.	40.0		2	
	Medium stiff, gray, sandy SILT (ML), trace debris (fibrous wood); wet, silt is non-plastic, rapid dilatancy.	43.0			
45			PP	6	PP = 0.5 tsf
50	medium stiff to stiff, some clay; laminated bedding at 50.0 feet		P200 PP	8	P200 = 64% PP = 0.5 tsf
55	soft, minor to with sand; without to slow dilatancy at 55.0 feet			3	
60	very soft at 60.0 feet		PP	0	PP = 0.5 tsf
	Very soft, gray CLAY (CL), trace sand; moist.	63.0			
65			PP	1	PP = 1.25 tsf
70	very soft to soft, minor sand, trace debris (fibrous wood); moist to wet, stratified bedding of pink-gray CLAY, interbedded with gray, sandy SILT (approximately 2 inches thick) at 70.0 feet		PP	2	PP = 0.75 tsf
	Very stiff, gray, sandy SILT (ML), some clay, trace debris (fibrous wood); wet, rapid dilatancy, interbedded with SILT, minor sand (approximately 2 inches thick).	73.0			
75			PP	18	PP = 0.5 tsf
80					

SAMPLE: ▲ BLOW COUNT, ● MOISTURE CONTENT %, RQD%, CORE REC%; 0 50 100

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: H. Herinckx COMPLETED: 09/22/21

BORING METHOD: mud rotary (see document text) BORING BIT DIAMETER: 3 7/8 inches

N|V|5

TRAMMELLCR-104-01

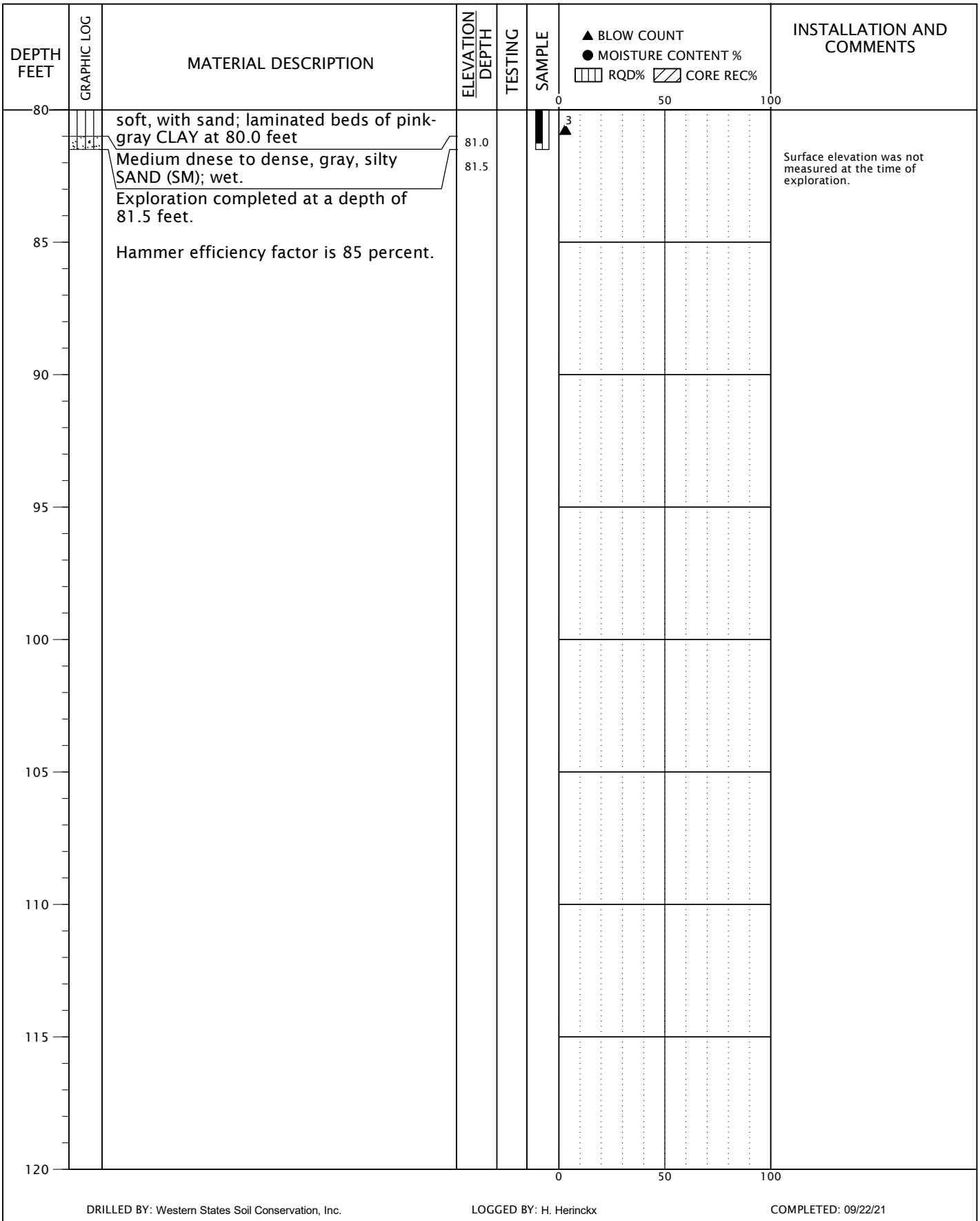
BORING B-1
(continued)

OCTOBER 2021

SEGALE SITE
KELSO, WA

FIGURE A-1

BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT



DRILLED BY: Western States Soil Conservation, Inc.

LOGGED BY: H. Herinckx

COMPLETED: 09/22/21

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 3 7/8 inches

NV5

TRAMMELLCR-104-01

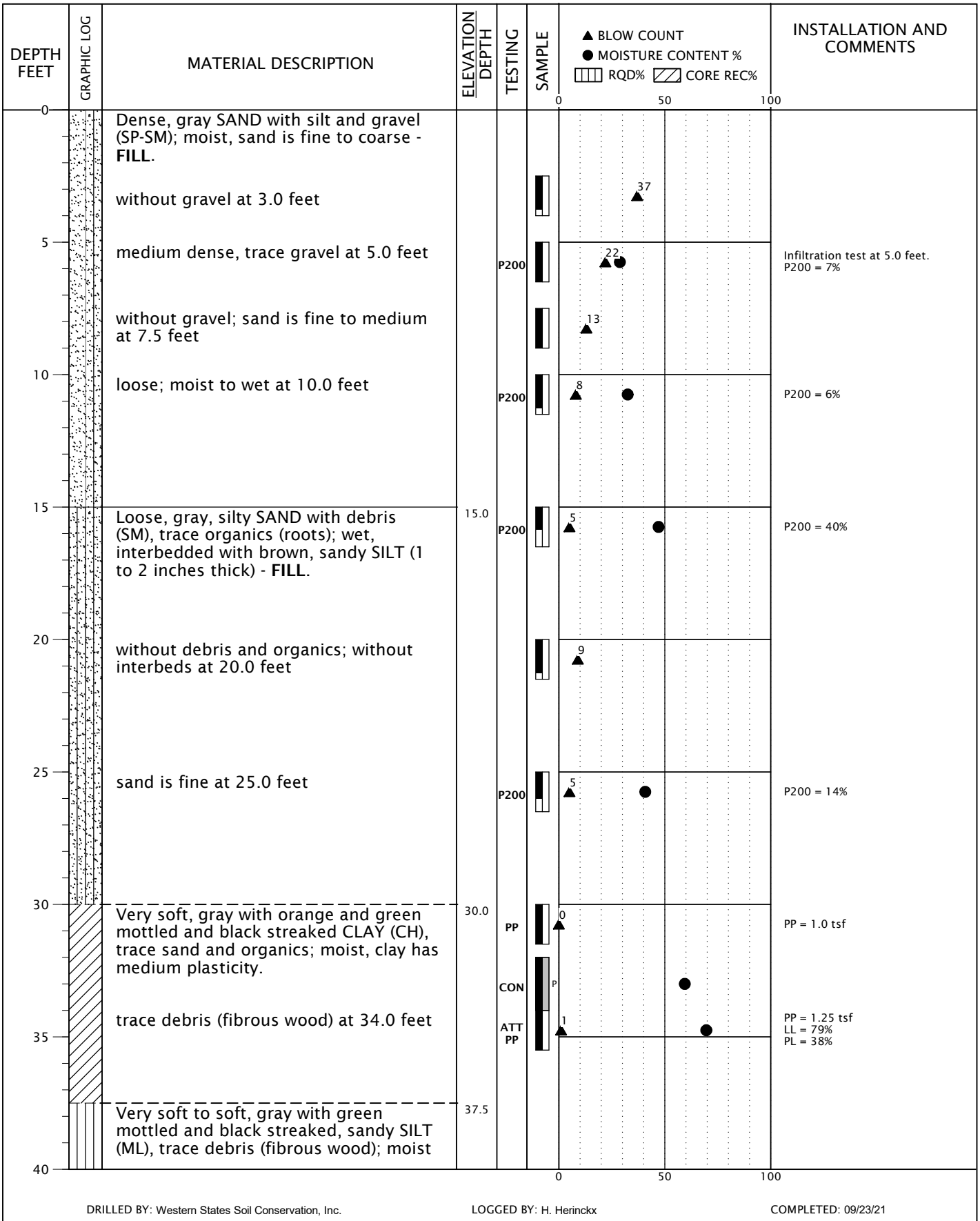
BORING B-1
(continued)

OCTOBER 2021

SEGALE SITE
KELSO, WA

FIGURE A-1

BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT



DRILLED BY: Western States Soil Conservation, Inc.

LOGGED BY: H. Herinckx

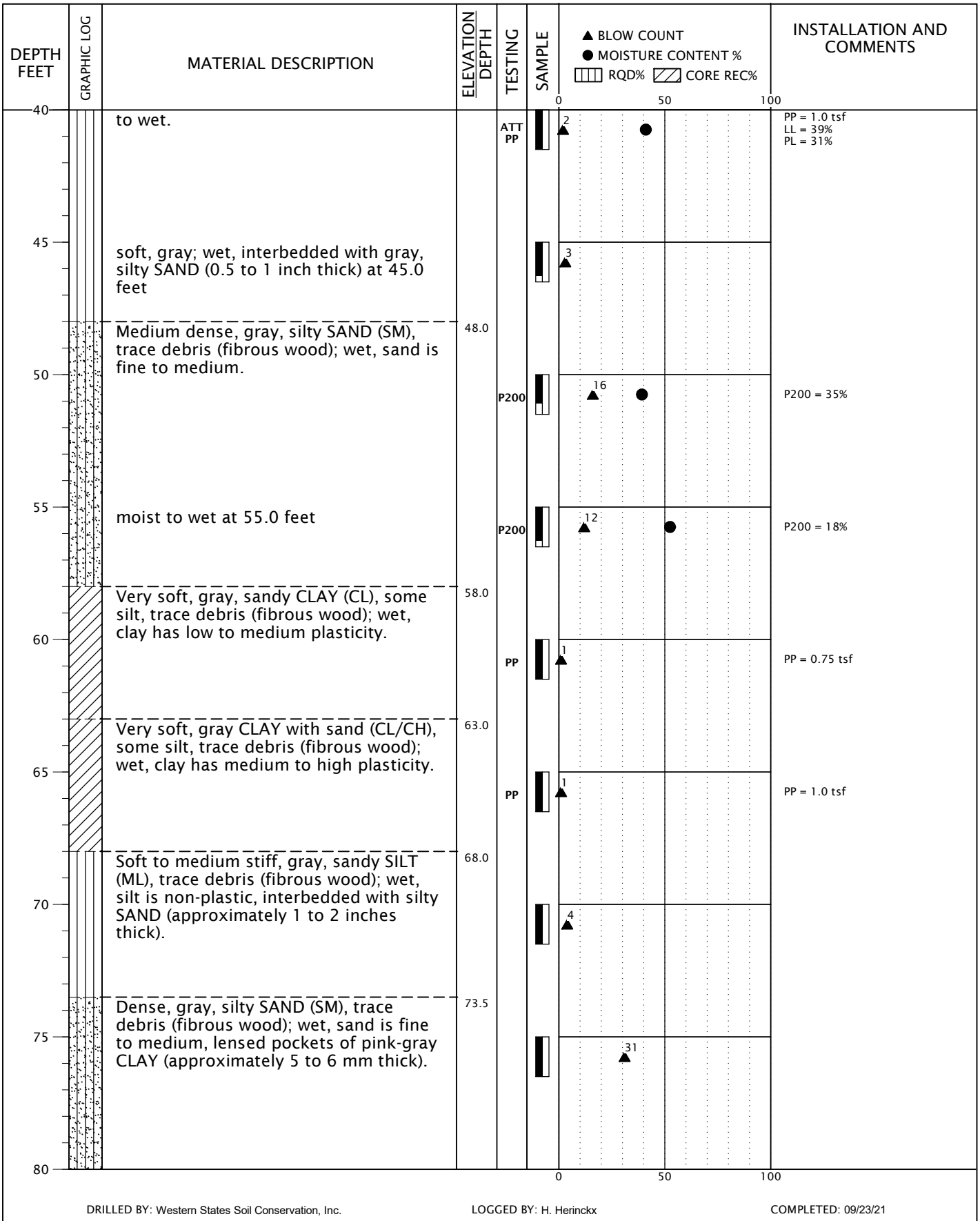
COMPLETED: 09/23/21

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 3 7/8 inches

N|V|5	TRAMMELLCR-104-01	**BORING B-2**
	OCTOBER 2021	SEGALE SITE KELSO, WA
		FIGURE A-2

BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT



DRILLED BY: Western States Soil Conservation, Inc.

LOGGED BY: H. Herinckx

COMPLETED: 09/23/21

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 3 7/8 inches

NV5

TRAMMELLCR-104-01

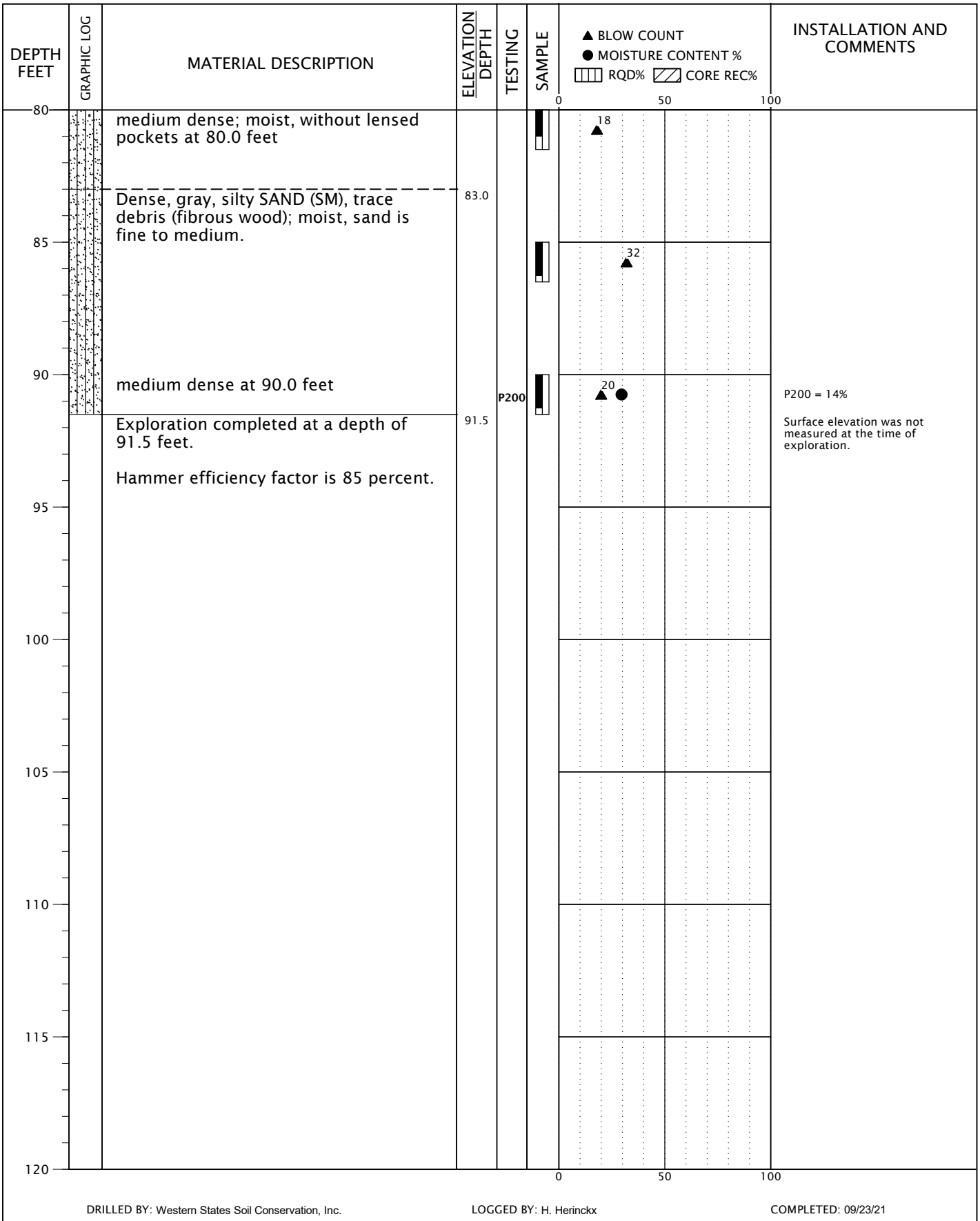
BORING B-2
(continued)

OCTOBER 2021

SEGALE SITE
KELSO, WA

FIGURE A-2

BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT



DRILLED BY: Western States Soil Conservation, Inc.

LOGGED BY: H. Herinckx

COMPLETED: 09/23/21

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 3 7/8 inches

N|V|5

TRAMMELLCR-104-01

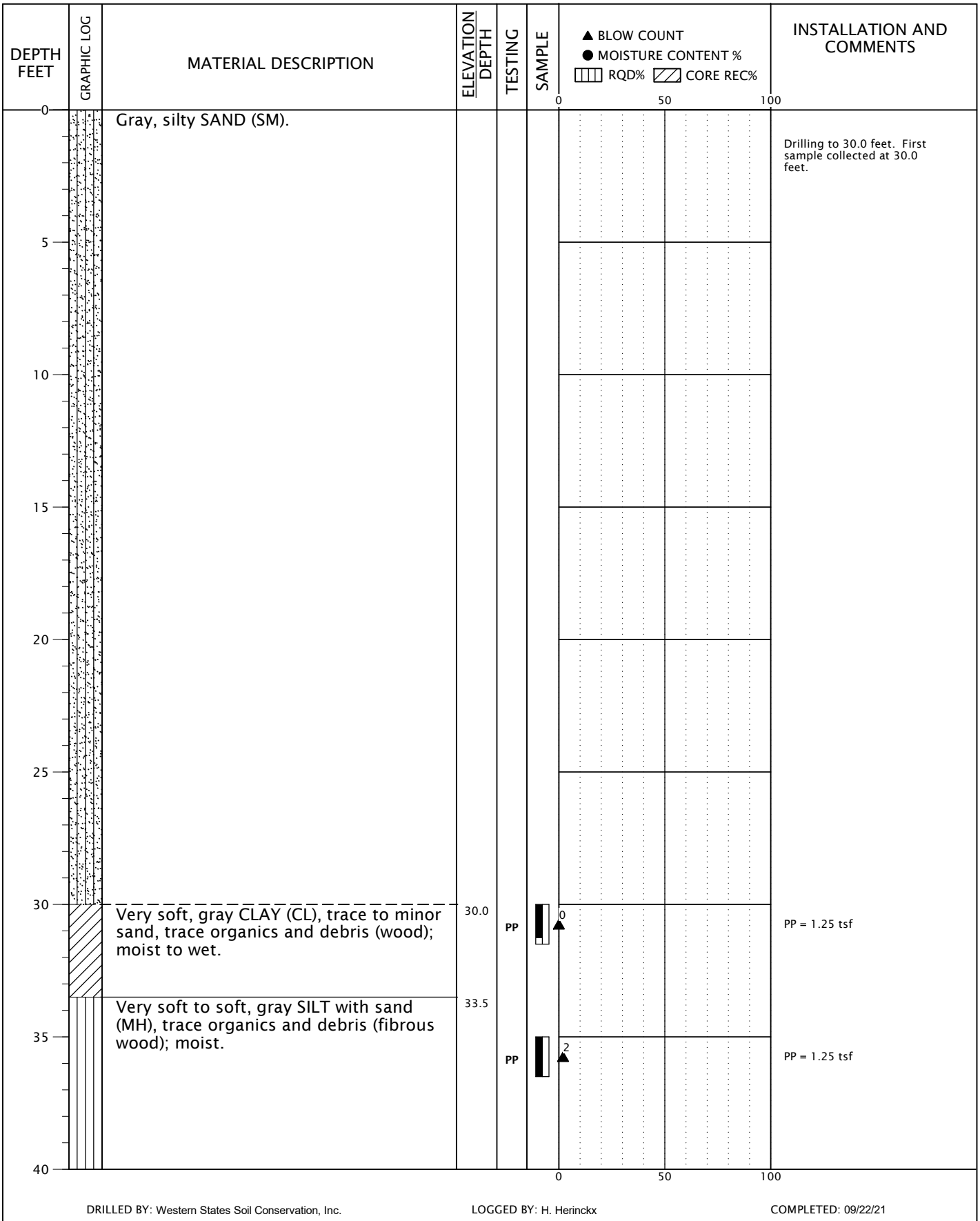
BORING B-2
(continued)

OCTOBER 2021

SEGALE SITE
KELSO, WA

FIGURE A-2

BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT


DEPTH FEET
GRAPHIC LOG
MATERIAL DESCRIPTION
ELEVATION DEPTH
TESTING
SAMPLE
▲ BLOW COUNT
● MOISTURE CONTENT %
RQD% CORE REC%
0
50
100
INSTALLATION AND COMMENTS
Gray, silty SAND (SM).
Drilling to 30.0 feet. First sample collected at 30.0 feet.
0
5
10
15
20
25
30
35
40
Very soft, gray CLAY (CL), trace to minor sand, trace organics and debris (wood); moist to wet.
30.0
PP
0
PP = 1.25 tsf
Very soft to soft, gray SILT with sand (MH), trace organics and debris (fibrous wood); moist.
33.5
PP
2
PP = 1.25 tsf
0
50
100
DRILLED BY: Western States Soil Conservation, Inc.
LOGGED BY: H. Herinckx
COMPLETED: 09/22/21
BORING METHOD: mud rotary (see document text)
BORING BIT DIAMETER: 3 7/8 inches
N V 5
TRAMMELLCR-104-01
BORING B-3
OCTOBER 2021
SEGALE SITE
KELSO, WA
FIGURE A-3
BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	INSTALLATION AND COMMENTS
40	soft, trace to minor sand; interbedded with gray CLAY (approximately 2 inches thick) at 40.0 feet		ATT PP	3	PP = 0.75 tsf LL = 71% PL = 47%
45	medium stiff, with sand at 45.0 feet		P200 PP	5	P200 = 61% PP = 0.5 tsf
50	Very soft, gray SILT with sand (ML); moist to wet.	50.0	ATT PP	0	PP = 0.5 tsf LL = 42% PL = 33%
55	very soft to soft, sandy; rapid dilatancy at 55.0 feet		PP	2	PP = 0.5 tsf
60	very soft, with sand; without to slow dilatancy at 60.0 feet			0	
	Exploration completed at a depth of 61.5 feet. Hammer efficiency factor is 85 percent.	61.5			Surface elevation was not measured at the time of exploration.
65					
70					
75					
80					

▲ BLOW COUNT
● MOISTURE CONTENT %
RQD% CORE REC%
0 50 100

DRILLED BY: Western States Soil Conservation, Inc.

LOGGED BY: H. Herinckx

COMPLETED: 09/22/21

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 3 7/8 inches

N|V|5

TRAMMELLCR-104-01

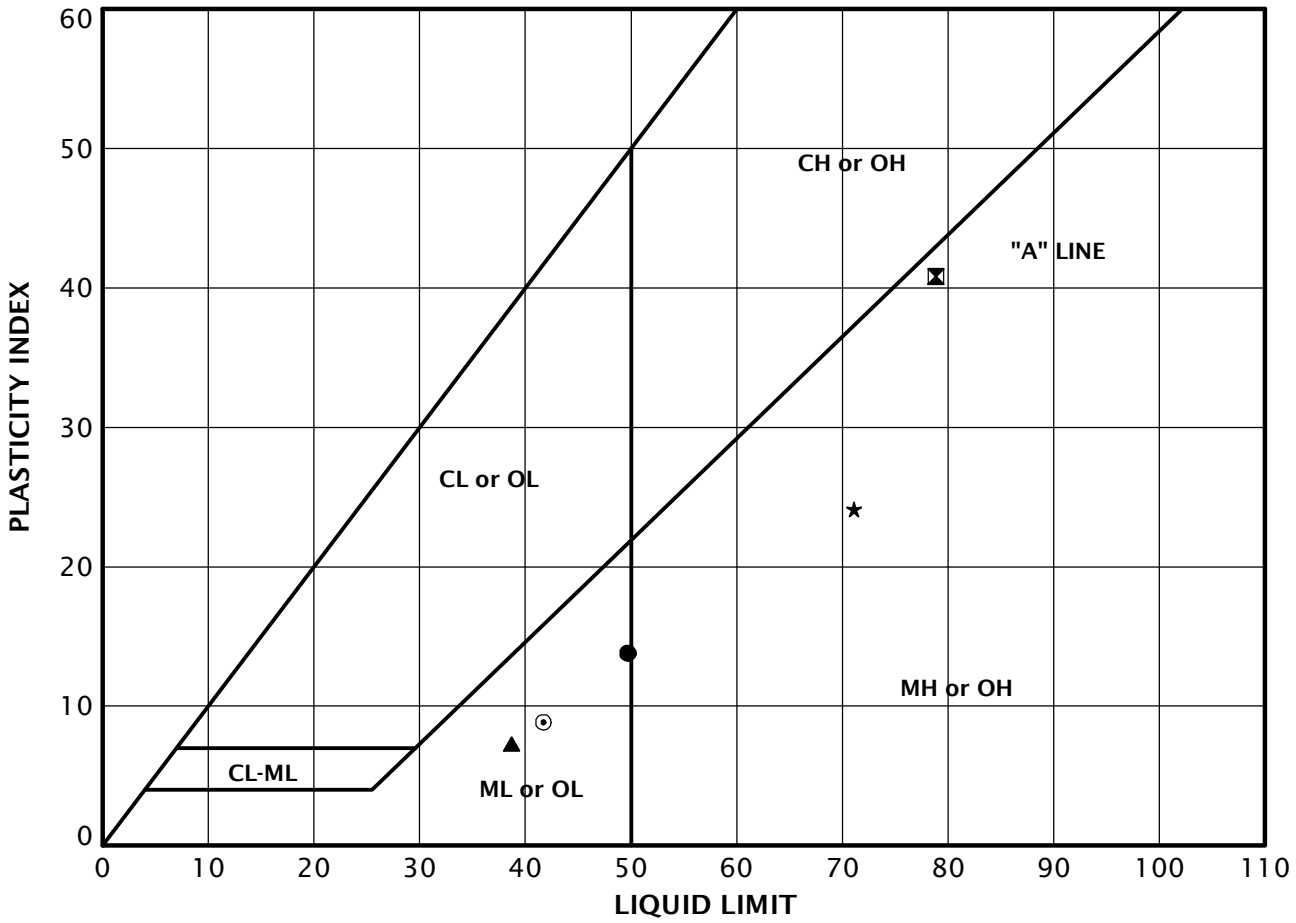
BORING B-3
(continued)

OCTOBER 2021

SEGALE SITE
KELSO, WA

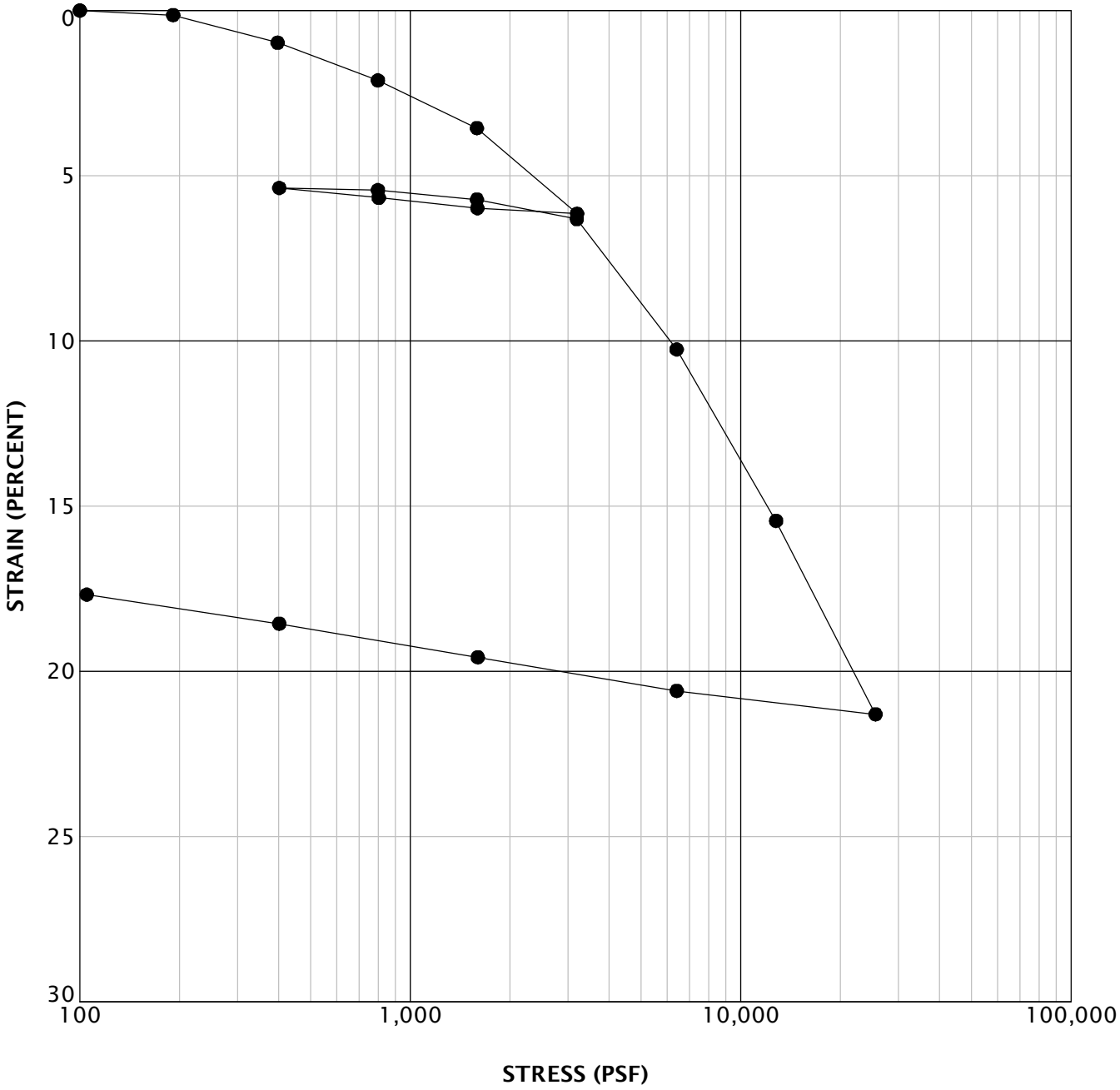
FIGURE A-3

BORING LOG - NV5 - 1 PER PAGE TRAMMELLCR-104-01-B1_3.GPJ GDI_NV5.GDT PRINT DATE: 10/25/21:KT



KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
●	B-1	35.0	42	50	36	14
⊠	B-2	34.0	70	79	38	41
▲	B-2	40.0	41	39	31	8
★	B-3	40.0	53	71	47	24
⊙	B-3	50.0	48	42	33	9

NV5	TRAMMELLCR-104-01	**ATTERBERG LIMITS TEST RESULTS**
	OCTOBER 2021	SEGALE SITE KELSO, WA — **FIGURE A-4**



KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)
●	B-2	32.0	59	64

N|V|5	TRAMMELLCR-104-01	**CONSOLIDATION TEST RESULTS**	
	OCTOBER 2021	SEGALE SITE KELSO, WA	**FIGURE A-5**

CONSOL_STRAIN_100K TRAMMELLCR-104-01-B1_3.GPJ GEODESIGN.GDT PRINT DATE: 10/15/21:SN

SAMPLE INFORMATION			MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
B-1	10.0		22				6			
B-1	20.0		32				8			
B-1	35.0		42					50	36	14
B-1	50.0		42				64			
B-2	5.0		29				7			
B-2	10.0		32				6			
B-2	15.0		47				40			
B-2	25.0		41				14			
B-2	32.0		59	64						
B-2	34.0		70					79	38	41
B-2	40.0		41					39	31	8
B-2	50.0		39				35			
B-2	55.0		52				18			
B-2	90.0		30				14			
B-3	40.0		53					71	47	24
B-3	45.0		44				61			
B-3	50.0		48					42	33	9

Pile Dynamics, Inc.
SPT Analyzer Results

RIG#7
PDA-S Ver. 2017.22 - Printed: 1/4/2019

Summary of SPT Test Results

Project: WSSC-8-04, Test Date: 12/27/2018

EMX: Maximum Energy — ETR: Energy Transfer Ratio - Rated

Start Depth ft	Final Depth ft	**N Value**	**N60 Value**	Average EMX ft-lb	Average ETR %
25.00	26.50	**0**	**0**	0.00	0.0
30.00	31.50	**0**	**0**	0.00	0.0
35.00	36.50	**0**	**0**	0.00	0.0
40.00	41.50	**31**	**43**	297.64	85.0
			Overall Average Values:	297.64	85.0
			Standard Deviation:	3.78	1.1
			Overall Maximum Value:	303.37	86.7
			Overall Minimum Value:	289.04	82.6

APPENDIX B

APPENDIX B

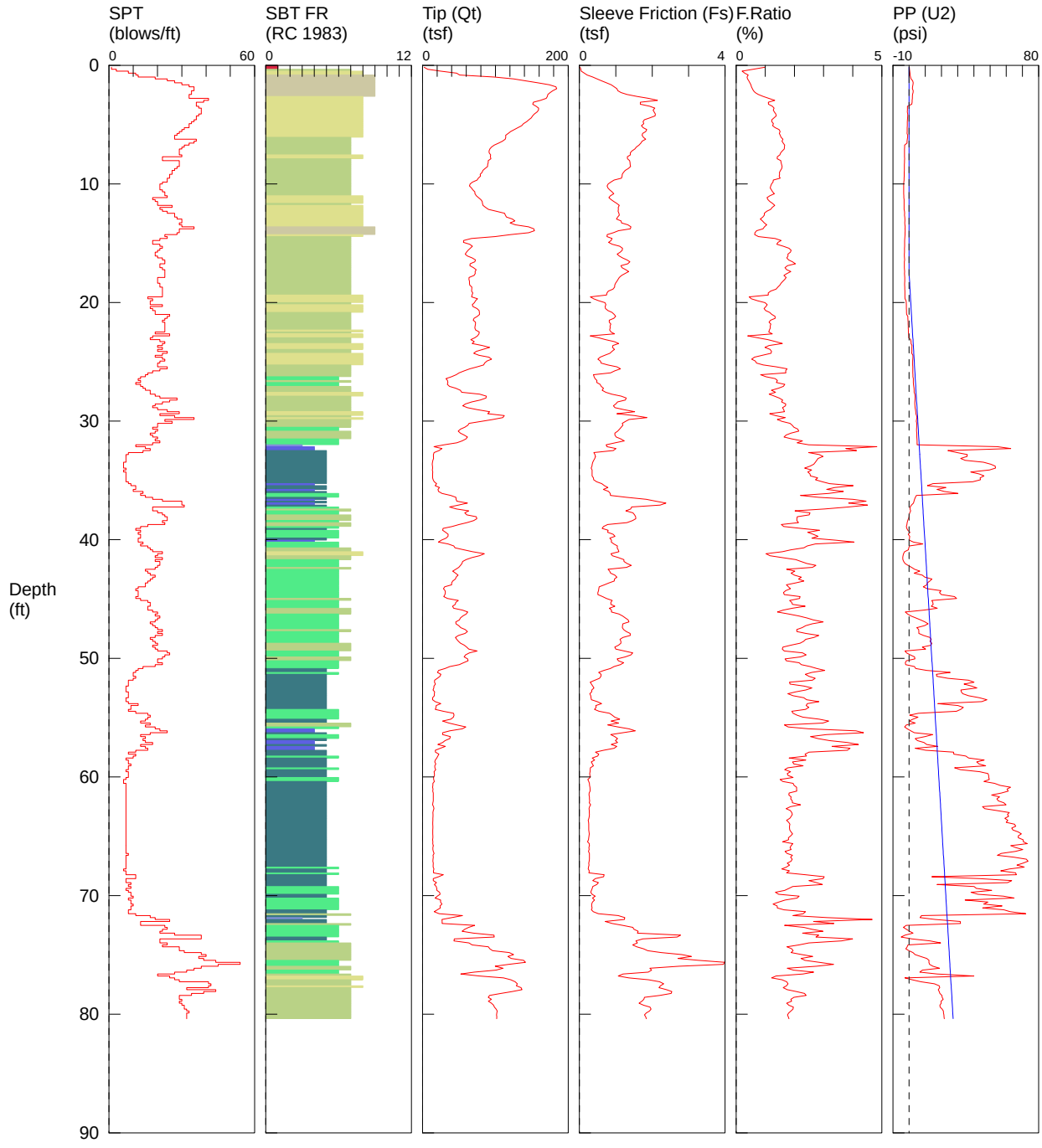
CONE PENETRATION TESTING

Our subsurface exploration program included two CPTs (CPT-1 and CPT-2) to depths between approximately 80 and 96 feet BGS. Figure 2 shows the locations of the CPTs relative to existing site features. The CPTs were performed in general accordance with ASTM D5778 by Oregon Geotechnical Explorations of Keizer, Oregon. The CPT results are presented in this appendix.

The CPT is an in situ test that provides characterizes subsurface stratigraphy. The testing includes advancing a 35.6-millimeter-diameter cone equipped with a load cell and a friction sleeve through the soil profile. The cone is advanced at a rate of approximately 2 centimeters per second. Tip resistance, sleeve friction, and pore pressure are typically recorded at 0.1-meter intervals. Seismic shear wave velocity testing was completed in one of the CPTs at 3-foot intervals.

NV5 / CPT-1 / 3001 Talley Way Kelso

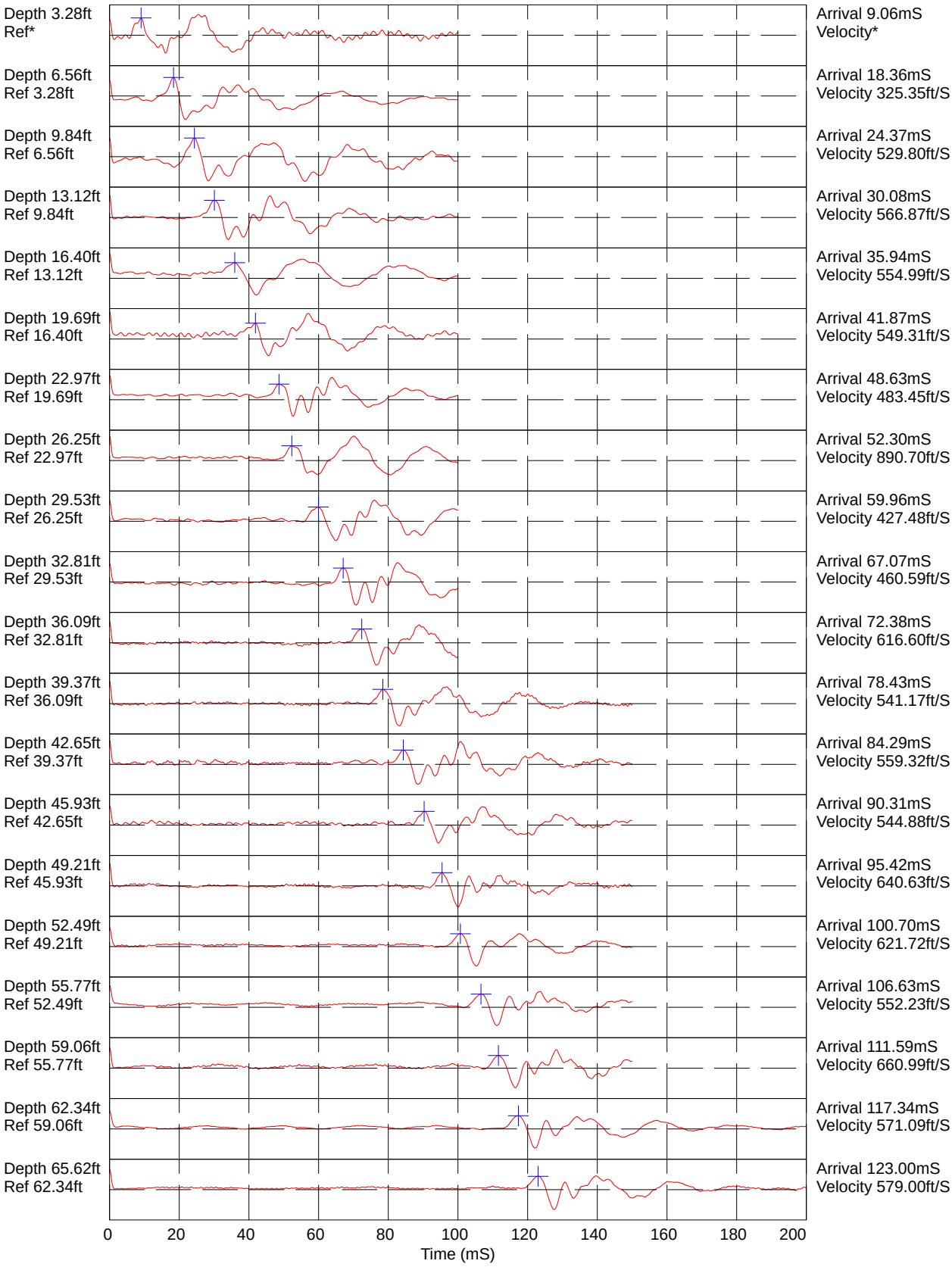
OPERATOR: OGE DMM
CONE ID: DDG1532
HOLE NUMBER: CPT-1
TEST DATE: 9/28/2021 8:22:22 AM
TOTAL DEPTH: 80.381 ft



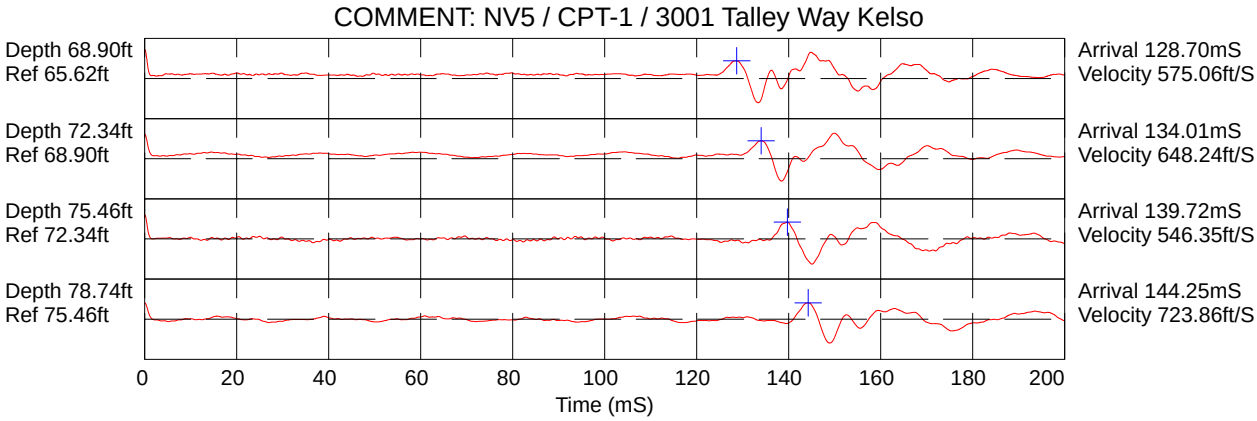
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: NV5 / CPT-1 / 3001 Talley Way Kelso



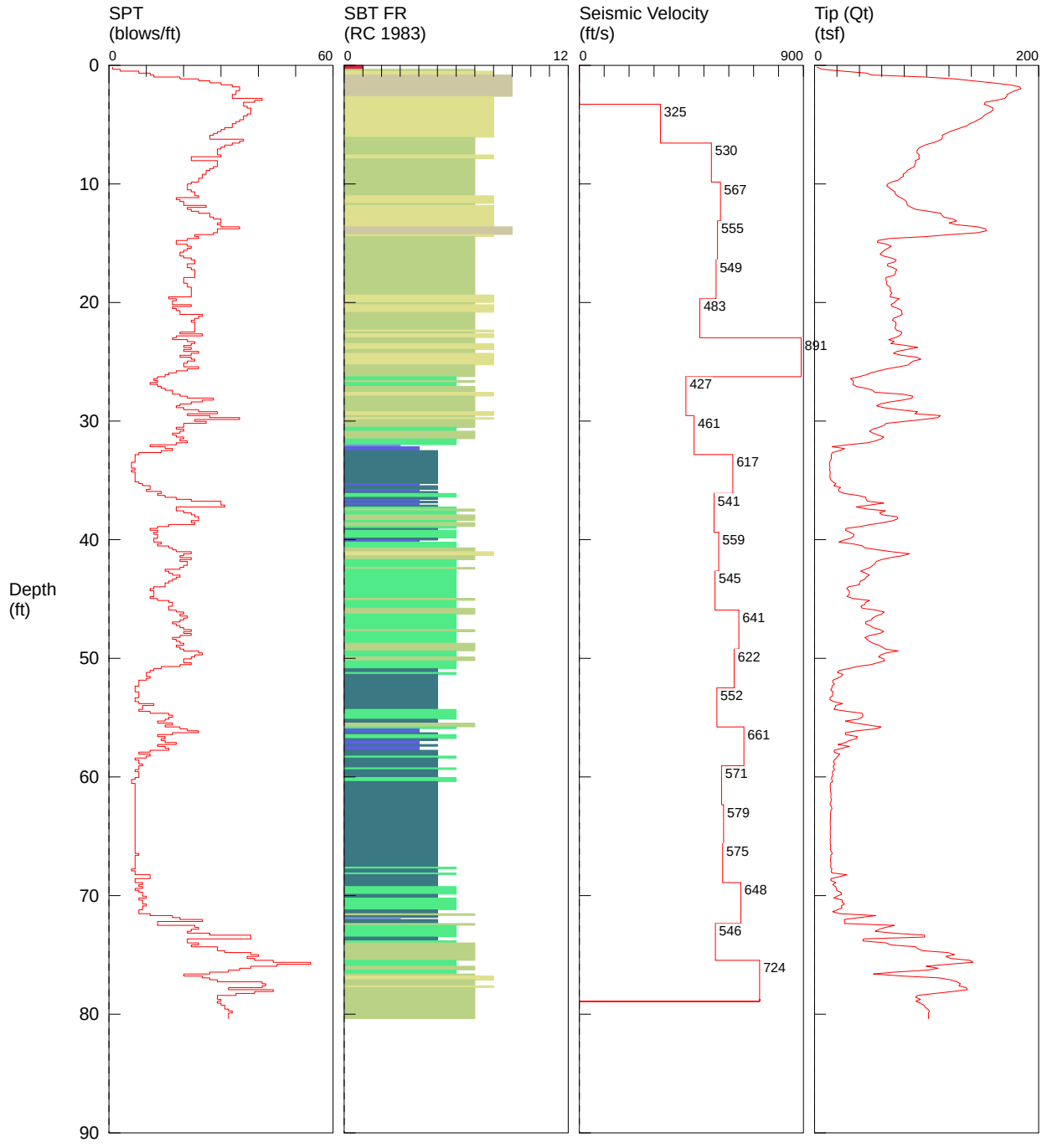
Hammer to Rod String Distance (ft): 1.97
* = Not Determined



Hammer to Rod String Distance (ft): 1.97
* = Not Determined

NV5 / CPT-1 / 3001 Talley Way Kelso

OPERATOR: OGE DMM
CONE ID: DDG1532
HOLE NUMBER: CPT-1
TEST DATE: 9/28/2021 8:22:22 AM
TOTAL DEPTH: 80.381 ft

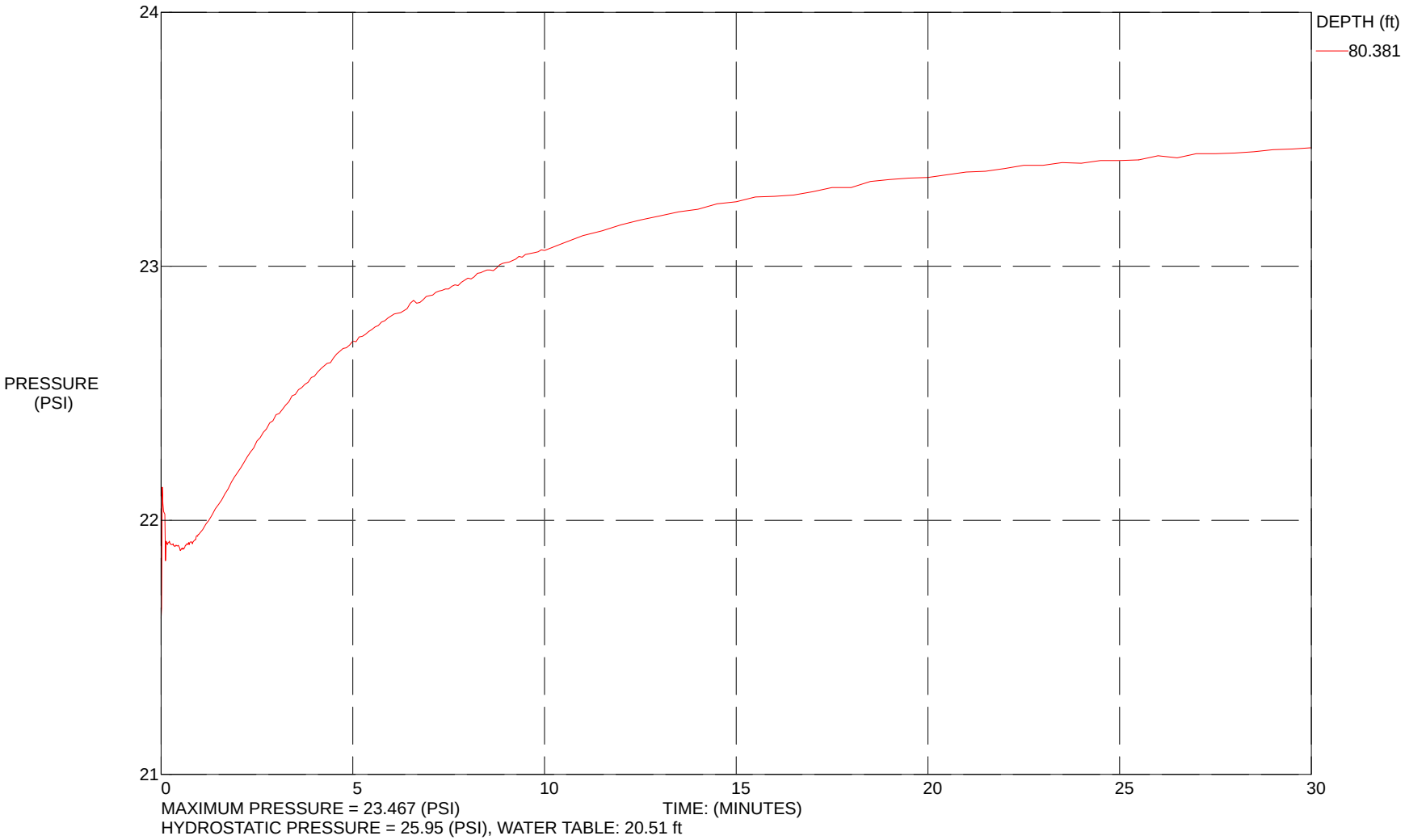


1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: NV5 / CPT-1 / 3001 Talley Way Kelso

TEST DATE: 9/28/2021 8:22:22 AM



NV5 / CPT-1 / 3001 Talley Way Kelso

OPERATOR: OGE DMM
CONE ID: DDG1532
HOLE NUMBER: CPT-1
TEST DATE: 9/28/2021 8:22:22 AM
TOTAL DEPTH: 80.381 ft

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
0.164	2.16	0.0212	0.982	0.056	1	1	sensitive fine grained
0.328	6.86	0.0400	0.584	0.125	3	1	sensitive fine grained
0.492	24.89	0.0501	0.201	0.303	8	7	silty sand to sandy silt
0.656	46.64	0.1362	0.292	0.487	11	8	sand to silty sand
0.820	50.93	0.2106	0.413	0.567	12	8	sand to silty sand
0.984	98.45	0.3646	0.370	0.838	19	9	sand
1.148	125.20	0.4843	0.387	1.192	24	9	sand
1.312	141.01	0.6056	0.429	2.177	27	9	sand
1.476	158.21	0.7409	0.468	2.481	30	9	sand
1.640	174.29	0.8740	0.501	2.273	33	9	sand
1.804	183.01	0.9538	0.521	2.076	35	9	sand
1.969	184.20	1.0262	0.557	1.980	35	9	sand
2.133	178.76	1.0547	0.590	2.483	34	9	sand
2.297	175.16	1.1448	0.654	2.414	34	9	sand
2.461	171.94	1.3081	0.761	2.103	33	9	sand
2.625	171.32	1.5873	0.927	1.988	33	9	sand
2.789	169.78	1.8937	1.115	2.020	41	8	sand to silty sand
2.953	161.89	2.1436	1.324	1.821	39	8	sand to silty sand
3.117	152.22	1.6753	1.101	1.783	36	8	sand to silty sand
3.281	151.26	1.6746	1.107	1.541	36	8	sand to silty sand
3.445	155.79	1.9330	1.241	-1.083	37	8	sand to silty sand
3.609	159.36	2.0695	1.299	-1.086	38	8	sand to silty sand
3.773	158.98	2.0233	1.273	-1.102	38	8	sand to silty sand
3.937	157.05	2.0519	1.307	-1.139	38	8	sand to silty sand
4.101	153.38	2.0872	1.361	-0.956	37	8	sand to silty sand
4.265	151.07	2.0755	1.374	-0.958	36	8	sand to silty sand
4.429	149.31	1.9337	1.295	-1.030	36	8	sand to silty sand
4.593	145.93	1.7857	1.224	-1.121	35	8	sand to silty sand
4.757	142.93	1.7472	1.222	-1.163	34	8	sand to silty sand
4.921	138.54	1.7694	1.277	-1.137	33	8	sand to silty sand
5.085	136.18	1.7019	1.250	-1.152	33	8	sand to silty sand
5.249	130.77	1.7518	1.340	-1.206	31	8	sand to silty sand
5.413	126.02	1.8494	1.468	-1.200	30	8	sand to silty sand
5.577	120.81	1.8183	1.505	-1.235	29	8	sand to silty sand
5.741	117.44	1.7366	1.479	-1.371	28	8	sand to silty sand
5.906	113.90	1.7210	1.511	-0.966	27	8	sand to silty sand
6.070	114.25	1.7561	1.537	-1.011	27	8	sand to silty sand
6.234	113.50	1.8210	1.604	-1.137	36	7	silty sand to sandy silt
6.398	109.59	1.7217	1.571	-1.272	35	7	silty sand to sandy silt
6.562	104.43	1.6877	1.616	-1.395	33	7	silty sand to sandy silt
6.726	98.36	1.6378	1.665	-2.789	31	7	silty sand to sandy silt
6.890	94.55	1.5652	1.655	-2.851	30	7	silty sand to sandy silt
7.054	92.36	1.5213	1.647	-2.872	29	7	silty sand to sandy silt
7.218	91.30	1.4425	1.580	-2.888	29	7	silty sand to sandy silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
7.382	91.35	1.3953	1.527	-2.912	29	7	silty sand to sandy silt
7.546	93.39	1.4006	1.500	-2.877	30	7	silty sand to sandy silt
7.710	93.06	1.3144	1.412	-2.861	22	8	sand to silty sand
7.874	93.66	1.3194	1.409	-2.840	22	8	sand to silty sand
8.038	89.97	1.3762	1.530	-2.872	29	7	silty sand to sandy silt
8.202	90.05	1.3893	1.543	-2.888	29	7	silty sand to sandy silt
8.366	89.41	1.3914	1.556	-2.928	29	7	silty sand to sandy silt
8.530	89.09	1.4038	1.576	-2.984	28	7	silty sand to sandy silt
8.694	85.78	1.3407	1.563	-2.997	27	7	silty sand to sandy silt
8.858	82.76	1.2588	1.521	-3.032	26	7	silty sand to sandy silt
9.022	81.55	1.2092	1.483	-3.093	26	7	silty sand to sandy silt
9.186	78.92	1.1753	1.489	-3.117	25	7	silty sand to sandy silt
9.350	79.40	1.1715	1.475	-3.125	25	7	silty sand to sandy silt
9.514	76.51	1.1524	1.506	-3.138	24	7	silty sand to sandy silt
9.678	74.79	0.9513	1.272	-3.162	24	7	silty sand to sandy silt
9.843	68.50	0.8629	1.260	-3.271	22	7	silty sand to sandy silt
10.007	65.28	0.7914	1.212	-3.449	21	7	silty sand to sandy silt
10.171	64.27	0.7616	1.185	-3.460	21	7	silty sand to sandy silt
10.335	67.02	0.7814	1.166	-3.431	21	7	silty sand to sandy silt
10.499	68.92	0.8322	1.207	-3.383	22	7	silty sand to sandy silt
10.663	71.68	0.8967	1.251	-3.370	23	7	silty sand to sandy silt
10.827	71.94	0.9434	1.311	-3.378	23	7	silty sand to sandy silt
10.991	73.74	0.8528	1.157	-3.327	24	7	silty sand to sandy silt
11.155	76.64	0.8107	1.058	-3.316	18	8	sand to silty sand
11.319	79.97	0.8704	1.088	-3.199	19	8	sand to silty sand
11.483	81.89	0.9441	1.153	-3.165	20	8	sand to silty sand
11.647	82.22	1.0234	1.245	-3.173	20	8	sand to silty sand
11.811	82.98	1.0966	1.321	-3.170	26	7	silty sand to sandy silt
11.975	86.39	1.0663	1.234	-3.141	21	8	sand to silty sand
12.139	90.50	1.0698	1.182	-3.138	22	8	sand to silty sand
12.303	101.31	1.0624	1.049	-2.925	24	8	sand to silty sand
12.467	112.60	1.0817	0.961	-2.813	27	8	sand to silty sand
12.631	113.70	1.0940	0.962	-2.867	27	8	sand to silty sand
12.795	115.19	1.0533	0.914	-2.760	28	8	sand to silty sand
12.959	123.38	1.0193	0.826	-2.694	30	8	sand to silty sand
13.123	126.70	1.1427	0.902	-2.707	30	8	sand to silty sand
13.287	120.03	1.1594	0.966	-2.760	29	8	sand to silty sand
13.451	127.36	1.3307	1.045	-2.654	30	8	sand to silty sand
13.615	145.58	1.4127	0.970	-2.462	35	8	sand to silty sand
13.780	152.57	1.3956	0.915	-2.531	29	9	sand
13.944	153.51	1.0745	0.700	-2.489	29	9	sand
14.108	145.65	0.9313	0.639	-2.579	28	9	sand
14.272	121.03	0.7648	0.632	-2.632	23	9	sand
14.436	99.35	0.7565	0.761	-2.718	24	8	sand to silty sand
14.600	67.14	0.8949	1.333	-2.734	21	7	silty sand to sandy silt
14.764	56.47	0.8697	1.540	-2.811	18	7	silty sand to sandy silt
14.928	55.93	0.8015	1.433	-2.848	18	7	silty sand to sandy silt
15.092	64.61	0.8994	1.392	-2.856	21	7	silty sand to sandy silt
15.256	68.41	1.1083	1.620	-2.853	22	7	silty sand to sandy silt
15.420	65.46	1.1845	1.809	-2.859	21	7	silty sand to sandy silt
15.584	62.42	1.1770	1.886	-2.867	20	7	silty sand to sandy silt
15.748	60.26	1.1221	1.862	-2.861	19	7	silty sand to sandy silt
15.912	58.47	1.0379	1.775	-2.960	19	7	silty sand to sandy silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
16.076	61.44	1.0939	1.780	-2.941	20	7	silty sand to sandy silt
16.240	68.16	1.1835	1.736	-2.869	22	7	silty sand to sandy silt
16.404	72.76	1.3080	1.798	-2.845	23	7	silty sand to sandy silt
16.568	71.82	1.3868	1.931	-2.949	23	7	silty sand to sandy silt
16.732	65.39	1.3286	2.032	-2.989	21	7	silty sand to sandy silt
16.896	64.86	1.1403	1.758	-2.992	21	7	silty sand to sandy silt
17.060	69.98	1.1694	1.671	-2.957	22	7	silty sand to sandy silt
17.224	73.53	1.2734	1.732	-2.901	23	7	silty sand to sandy silt
17.388	72.05	1.3520	1.877	-2.856	23	7	silty sand to sandy silt
17.552	72.17	1.2522	1.735	-2.869	23	7	silty sand to sandy silt
17.717	70.53	1.1551	1.638	-2.843	23	7	silty sand to sandy silt
17.881	63.85	1.0941	1.714	-2.787	20	7	silty sand to sandy silt
18.045	63.65	1.0614	1.668	-2.787	20	7	silty sand to sandy silt
18.209	64.22	1.0275	1.600	-2.776	20	7	silty sand to sandy silt
18.373	64.25	0.9914	1.543	-2.792	21	7	silty sand to sandy silt
18.537	64.71	0.9692	1.498	-2.800	21	7	silty sand to sandy silt
18.701	67.61	0.9667	1.430	-2.731	22	7	silty sand to sandy silt
18.865	67.48	0.9231	1.368	-2.744	22	7	silty sand to sandy silt
19.029	67.39	0.7955	1.180	-2.667	22	7	silty sand to sandy silt
19.193	69.07	0.7573	1.096	-2.686	22	7	silty sand to sandy silt
19.357	67.74	0.7447	1.099	-2.694	22	7	silty sand to sandy silt
19.521	67.39	0.3005	0.446	-2.696	16	8	sand to silty sand
19.685	75.51	0.3902	0.517	-2.600	18	8	sand to silty sand
19.849	72.67	0.5321	0.732	-1.916	17	8	sand to silty sand
20.013	71.22	0.7024	0.986	-1.860	17	8	sand to silty sand
20.177	68.24	0.7280	1.067	-1.794	22	7	silty sand to sandy silt
20.341	69.17	0.7068	1.022	-1.765	17	8	sand to silty sand
20.505	74.63	0.7139	0.957	-1.717	18	8	sand to silty sand
20.669	77.59	0.7828	1.009	-1.677	19	8	sand to silty sand
20.833	77.86	0.8969	1.152	-1.618	19	8	sand to silty sand
20.997	78.25	0.9571	1.223	-1.546	25	7	silty sand to sandy silt
21.161	75.09	0.9983	1.329	-0.804	24	7	silty sand to sandy silt
21.325	70.53	0.9447	1.340	-0.804	23	7	silty sand to sandy silt
21.490	69.47	0.8200	1.180	-0.751	22	7	silty sand to sandy silt
21.654	72.52	0.8184	1.129	-0.692	23	7	silty sand to sandy silt
21.818	72.71	0.8647	1.189	-0.684	23	7	silty sand to sandy silt
21.982	72.16	0.8415	1.166	-0.647	23	7	silty sand to sandy silt
22.146	71.72	0.8427	1.175	-0.588	23	7	silty sand to sandy silt
22.310	72.85	0.8299	1.139	-0.548	23	7	silty sand to sandy silt
22.474	77.72	0.8669	1.115	-0.458	19	8	sand to silty sand
22.638	77.49	0.9638	1.244	-0.383	25	7	silty sand to sandy silt
22.802	75.53	0.2987	0.395	-0.317	18	8	sand to silty sand
22.966	71.72	0.5285	0.737	-0.311	17	8	sand to silty sand
23.130	66.06	0.7166	1.085	0.926	21	7	silty sand to sandy silt
23.294	70.97	0.9601	1.353	1.166	23	7	silty sand to sandy silt
23.458	67.98	1.0778	1.585	1.147	22	7	silty sand to sandy silt
23.622	81.87	0.9211	1.125	1.754	20	8	sand to silty sand
23.786	91.93	0.9081	0.988	1.698	22	8	sand to silty sand
23.950	82.80	0.9625	1.162	1.674	20	8	sand to silty sand
24.114	73.67	0.8932	1.212	1.645	24	7	silty sand to sandy silt
24.278	70.27	0.8374	1.192	1.626	22	7	silty sand to sandy silt
24.442	77.47	0.6938	0.896	2.281	19	8	sand to silty sand
24.606	91.02	0.5688	0.625	2.286	22	8	sand to silty sand

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
24.770	94.77	0.5050	0.533	2.183	23	8	sand to silty sand
24.934	88.19	0.5782	0.656	2.164	21	8	sand to silty sand
25.098	85.19	0.5939	0.697	2.132	20	8	sand to silty sand
25.262	83.86	0.7777	0.927	2.172	20	8	sand to silty sand
25.427	75.01	1.0291	1.372	2.217	24	7	silty sand to sandy silt
25.591	64.74	1.1301	1.746	2.238	21	7	silty sand to sandy silt
25.755	57.18	0.9685	1.694	2.193	18	7	silty sand to sandy silt
25.919	50.23	0.8571	1.706	2.222	16	7	silty sand to sandy silt
26.083	46.18	0.3864	0.837	2.268	15	7	silty sand to sandy silt
26.247	39.68	0.4048	1.020	2.318	13	7	silty sand to sandy silt
26.411	32.07	0.4289	1.337	2.550	12	6	sandy silt to clayey silt
26.575	34.15	0.4829	1.414	2.566	13	6	sandy silt to clayey silt
26.739	34.62	0.4774	1.379	2.590	11	7	silty sand to sandy silt
26.903	34.04	0.5676	1.667	2.627	13	6	sandy silt to clayey silt
27.067	37.00	0.5986	1.618	2.845	14	6	sandy silt to clayey silt
27.231	45.55	0.6588	1.446	3.000	15	7	silty sand to sandy silt
27.395	51.78	0.6246	1.206	3.050	17	7	silty sand to sandy silt
27.559	53.70	0.7247	1.350	3.056	17	7	silty sand to sandy silt
27.723	78.39	0.8875	1.132	3.476	19	8	sand to silty sand
27.887	87.56	1.1510	1.315	3.591	21	8	sand to silty sand
28.051	86.99	1.2839	1.476	3.585	28	7	silty sand to sandy silt
28.215	79.00	1.2592	1.594	3.535	25	7	silty sand to sandy silt
28.379	67.42	1.0487	1.555	3.431	22	7	silty sand to sandy silt
28.543	58.82	1.0008	1.701	3.463	19	7	silty sand to sandy silt
28.707	55.27	0.9337	1.689	3.495	18	7	silty sand to sandy silt
28.871	61.49	0.9777	1.590	3.657	20	7	silty sand to sandy silt
29.035	75.29	1.2277	1.631	3.859	24	7	silty sand to sandy silt
29.199	91.92	1.5187	1.652	4.110	29	7	silty sand to sandy silt
29.364	89.55	1.0300	1.150	4.171	21	8	sand to silty sand
29.528	112.28	1.5139	1.348	4.530	27	8	sand to silty sand
29.692	110.17	1.8540	1.683	4.743	35	7	silty sand to sandy silt
29.856	96.64	1.3644	1.412	4.538	23	8	sand to silty sand
30.020	80.78	1.2654	1.566	4.389	26	7	silty sand to sandy silt
30.184	63.87	1.1793	1.846	4.695	20	7	silty sand to sandy silt
30.348	62.04	1.1925	1.922	4.629	20	7	silty sand to sandy silt
30.512	57.92	1.1479	1.982	4.607	18	7	silty sand to sandy silt
30.676	51.98	1.1008	2.118	4.567	20	6	sandy silt to clayey silt
30.840	48.96	1.0512	2.147	4.565	19	6	sandy silt to clayey silt
31.004	51.90	0.9742	1.877	4.682	17	7	silty sand to sandy silt
31.168	56.87	0.9742	1.713	4.679	18	7	silty sand to sandy silt
31.332	61.49	1.0084	1.640	4.719	20	7	silty sand to sandy silt
31.496	59.55	1.1361	1.908	4.754	19	7	silty sand to sandy silt
31.660	54.19	1.2330	2.275	4.863	21	6	sandy silt to clayey silt
31.824	47.12	0.9856	2.092	4.913	18	6	sandy silt to clayey silt
31.988	29.64	0.7375	2.488	4.937	11	6	sandy silt to clayey silt
32.152	15.65	0.7565	4.833	54.495	15	3	clay
32.316	26.61	1.0016	3.763	62.727	17	4	silty clay to clay
32.480	22.53	0.9301	4.128	23.971	14	4	silty clay to clay
32.644	15.87	0.3944	2.485	29.579	8	5	clayey silt to silty clay
32.808	14.91	0.4249	2.850	35.887	7	5	clayey silt to silty clay
32.972	14.84	0.4425	2.981	35.711	7	5	clayey silt to silty clay
33.136	15.01	0.4217	2.810	31.780	7	5	clayey silt to silty clay
33.301	14.17	0.3915	2.763	34.578	7	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
33.465	13.43	0.3652	2.720	45.903	6	5	clayey silt to silty clay
33.629	13.20	0.3514	2.661	50.492	6	5	clayey silt to silty clay
33.793	13.56	0.3444	2.540	53.129	6	5	clayey silt to silty clay
33.957	13.72	0.3225	2.351	53.387	7	5	clayey silt to silty clay
34.121	13.36	0.3459	2.588	49.624	6	5	clayey silt to silty clay
34.285	14.03	0.3455	2.463	38.003	7	5	clayey silt to silty clay
34.449	13.74	0.3485	2.536	43.454	7	5	clayey silt to silty clay
34.613	13.65	0.3473	2.544	46.182	7	5	clayey silt to silty clay
34.777	13.73	0.3839	2.796	43.797	7	5	clayey silt to silty clay
34.941	14.44	0.3929	2.722	44.053	7	5	clayey silt to silty clay
35.105	16.02	0.4739	2.957	39.254	8	5	clayey silt to silty clay
35.269	19.17	0.6143	3.205	14.671	9	5	clayey silt to silty clay
35.433	17.14	0.6881	4.013	11.280	11	4	silty clay to clay
35.597	23.11	0.7808	3.379	22.691	11	5	clayey silt to silty clay
35.761	21.12	0.6550	3.101	17.181	10	5	clayey silt to silty clay
35.925	21.76	0.7997	3.676	21.530	14	4	silty clay to clay
36.089	26.49	0.8424	3.180	30.074	13	5	clayey silt to silty clay
36.253	38.72	0.8533	2.204	4.511	15	6	sandy silt to clayey silt
36.417	45.78	1.2946	2.828	3.774	18	6	sandy silt to clayey silt
36.581	45.86	1.8398	4.012	3.306	22	5	clayey silt to silty clay
36.745	47.06	2.0995	4.461	2.989	30	4	silty clay to clay
36.909	61.67	2.3784	3.857	2.656	30	5	clayey silt to silty clay
37.073	49.17	2.2176	4.510	1.373	31	4	silty clay to clay
37.238	37.12	1.4321	3.858	0.647	18	5	clayey silt to silty clay
37.402	46.47	1.4087	3.032	0.506	18	6	sandy silt to clayey silt
37.566	63.23	1.2756	2.017	0.902	20	7	silty sand to sandy silt
37.730	58.03	1.4717	2.536	0.293	22	6	sandy silt to clayey silt
37.894	60.52	1.5152	2.504	0.027	23	6	sandy silt to clayey silt
38.058	73.71	1.5470	2.099	-0.136	24	7	silty sand to sandy silt
38.222	74.32	1.5487	2.084	-0.572	24	7	silty sand to sandy silt
38.386	70.02	1.4581	2.082	-0.889	22	7	silty sand to sandy silt
38.550	60.92	1.3037	2.140	-1.227	23	6	sandy silt to clayey silt
38.714	50.18	0.7772	1.549	-1.408	16	7	silty sand to sandy silt
38.878	40.52	0.6611	1.631	-1.698	13	7	silty sand to sandy silt
39.042	28.04	0.6238	2.225	-1.499	11	6	sandy silt to clayey silt
39.206	27.65	0.7910	2.861	-0.822	13	5	clayey silt to silty clay
39.370	31.67	0.7769	2.453	0.474	12	6	sandy silt to clayey silt
39.534	35.06	0.9257	2.640	-0.636	13	6	sandy silt to clayey silt
39.698	34.83	0.9791	2.811	0.341	13	6	sandy silt to clayey silt
39.862	32.17	0.8351	2.596	0.154	12	6	sandy silt to clayey silt
40.026	25.82	0.8805	3.411	0.109	12	5	clayey silt to silty clay
40.190	21.66	0.8750	4.040	2.529	14	4	silty clay to clay
40.354	34.74	0.9442	2.718	8.416	13	6	sandy silt to clayey silt
40.518	42.73	1.0420	2.439	0.165	16	6	sandy silt to clayey silt
40.682	44.55	1.0357	2.325	-0.290	17	6	sandy silt to clayey silt
40.846	56.73	1.0641	1.876	-0.476	18	7	silty sand to sandy silt
41.011	68.61	1.0853	1.582	-2.800	22	7	silty sand to sandy silt
41.175	84.77	0.8672	1.023	-3.508	20	8	sand to silty sand
41.339	78.20	0.9058	1.158	-3.758	19	8	sand to silty sand
41.503	67.69	1.0693	1.580	-3.998	22	7	silty sand to sandy silt
41.667	59.77	1.2209	2.043	-3.921	19	7	silty sand to sandy silt
41.831	54.98	1.2235	2.225	-3.455	21	6	sandy silt to clayey silt
41.995	54.06	1.3094	2.422	-2.624	21	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
42.159	51.96	1.4222	2.737	-0.735	20	6	sandy silt to clayey silt
42.323	49.52	1.2946	2.615	1.475	19	6	sandy silt to clayey silt
42.487	45.48	0.7860	1.728	3.292	15	7	silty sand to sandy silt
42.651	41.29	0.8314	2.013	6.537	16	6	sandy silt to clayey silt
42.815	45.32	0.8556	1.888	3.013	17	6	sandy silt to clayey silt
42.979	48.76	0.9765	2.003	8.051	19	6	sandy silt to clayey silt
43.143	46.01	1.0283	2.235	9.651	18	6	sandy silt to clayey silt
43.307	45.08	0.9629	2.136	14.104	17	6	sandy silt to clayey silt
43.471	41.27	0.9568	2.318	12.744	16	6	sandy silt to clayey silt
43.635	39.88	0.8138	2.040	11.158	15	6	sandy silt to clayey silt
43.799	39.83	0.6856	1.721	10.915	15	6	sandy silt to clayey silt
43.963	30.22	0.5427	1.796	8.674	12	6	sandy silt to clayey silt
44.127	28.72	0.5336	1.858	11.134	11	6	sandy silt to clayey silt
44.291	30.85	0.5233	1.696	19.624	12	6	sandy silt to clayey silt
44.455	31.26	0.5073	1.623	18.701	12	6	sandy silt to clayey silt
44.619	30.69	0.5057	1.648	19.912	12	6	sandy silt to clayey silt
44.783	28.92	0.6339	2.192	27.945	11	6	sandy silt to clayey silt
44.948	34.19	0.7437	2.175	29.350	13	6	sandy silt to clayey silt
45.112	49.05	0.8985	1.832	13.926	16	7	silty sand to sandy silt
45.276	45.52	0.8663	1.903	14.567	17	6	sandy silt to clayey silt
45.440	44.71	0.8647	1.934	14.759	17	6	sandy silt to clayey silt
45.604	41.15	0.9731	2.365	13.689	16	6	sandy silt to clayey silt
45.768	42.69	0.8221	1.926	17.434	16	6	sandy silt to clayey silt
45.932	54.83	0.8829	1.610	8.999	18	7	silty sand to sandy silt
46.096	62.03	0.8779	1.415	-2.385	20	7	silty sand to sandy silt
46.260	60.00	1.0818	1.803	-1.033	19	7	silty sand to sandy silt
46.424	55.08	1.1866	2.154	1.113	21	6	sandy silt to clayey silt
46.588	51.79	1.2628	2.438	4.192	20	6	sandy silt to clayey silt
46.752	50.52	1.3365	2.646	7.035	19	6	sandy silt to clayey silt
46.916	45.56	1.3598	2.985	9.763	17	6	sandy silt to clayey silt
47.080	45.71	1.1934	2.611	11.695	18	6	sandy silt to clayey silt
47.244	49.65	1.1840	2.385	9.385	19	6	sandy silt to clayey silt
47.408	52.25	1.1818	2.262	4.698	20	6	sandy silt to clayey silt
47.572	58.37	1.2121	2.077	5.898	22	6	sandy silt to clayey silt
47.736	61.70	1.2838	2.081	5.927	20	7	silty sand to sandy silt
47.900	58.35	1.3932	2.387	5.962	22	6	sandy silt to clayey silt
48.064	49.26	1.3961	2.834	8.834	19	6	sandy silt to clayey silt
48.228	44.95	1.1975	2.664	12.874	17	6	sandy silt to clayey silt
48.392	46.72	1.1136	2.384	13.668	18	6	sandy silt to clayey silt
48.556	49.24	1.1379	2.311	12.840	19	6	sandy silt to clayey silt
48.720	51.97	1.1395	2.193	14.006	20	6	sandy silt to clayey silt
48.885	57.42	1.0738	1.870	13.479	18	7	silty sand to sandy silt
49.049	60.43	0.9687	1.603	8.094	19	7	silty sand to sandy silt
49.213	63.31	1.0011	1.581	10.183	20	7	silty sand to sandy silt
49.377	74.63	1.2298	1.648	-2.563	24	7	silty sand to sandy silt
49.541	64.19	1.4640	2.281	-1.618	25	6	sandy silt to clayey silt
49.705	59.08	1.4174	2.399	0.655	23	6	sandy silt to clayey silt
49.869	57.05	1.2617	2.212	3.300	22	6	sandy silt to clayey silt
50.033	61.81	1.0360	1.676	3.495	20	7	silty sand to sandy silt
50.197	62.42	1.0715	1.717	-1.815	20	7	silty sand to sandy silt
50.361	56.13	1.2116	2.159	-2.411	22	6	sandy silt to clayey silt
50.525	50.37	1.1265	2.236	-2.188	19	6	sandy silt to clayey silt
50.689	37.48	0.9502	2.535	3.175	14	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
50.853	30.67	0.8500	2.772	4.075	12	6	sandy silt to clayey silt
51.017	22.14	0.6731	3.040	10.862	11	5	clayey silt to silty clay
51.181	20.33	0.5269	2.592	25.342	10	5	clayey silt to silty clay
51.345	25.08	0.5956	2.375	16.760	10	6	sandy silt to clayey silt
51.509	23.70	0.5911	2.494	17.069	11	5	clayey silt to silty clay
51.673	20.25	0.5489	2.711	23.923	10	5	clayey silt to silty clay
51.837	16.34	0.4273	2.615	36.571	8	5	clayey silt to silty clay
52.001	16.25	0.2972	1.828	40.098	8	5	clayey silt to silty clay
52.165	17.70	0.3274	1.849	33.856	8	5	clayey silt to silty clay
52.329	15.66	0.3654	2.333	38.575	7	5	clayey silt to silty clay
52.493	15.33	0.3985	2.600	41.830	7	5	clayey silt to silty clay
52.657	14.27	0.3407	2.388	31.964	7	5	clayey silt to silty clay
52.822	16.45	0.3365	2.045	32.259	8	5	clayey silt to silty clay
52.986	16.09	0.2854	1.774	33.114	8	5	clayey silt to silty clay
53.150	16.06	0.3138	1.955	36.675	8	5	clayey silt to silty clay
53.314	13.76	0.3199	2.325	43.364	7	5	clayey silt to silty clay
53.478	13.71	0.3314	2.418	48.035	7	5	clayey silt to silty clay
53.642	17.13	0.4864	2.839	44.769	8	5	clayey silt to silty clay
53.806	24.99	0.6100	2.441	17.780	12	5	clayey silt to silty clay
53.970	18.73	0.4496	2.401	29.997	9	5	clayey silt to silty clay
54.134	18.30	0.4563	2.494	33.444	9	5	clayey silt to silty clay
54.298	17.41	0.4138	2.377	31.738	8	5	clayey silt to silty clay
54.462	28.38	0.5411	1.907	29.209	11	6	sandy silt to clayey silt
54.626	42.48	0.8294	1.952	5.637	16	6	sandy silt to clayey silt
54.790	43.26	0.9021	2.085	0.242	17	6	sandy silt to clayey silt
54.954	42.26	0.9680	2.291	5.440	16	6	sandy silt to clayey silt
55.118	38.77	1.1061	2.853	2.310	15	6	sandy silt to clayey silt
55.282	27.49	0.8726	3.174	-0.051	13	5	clayey silt to silty clay
55.446	36.20	1.0775	2.976	3.702	17	5	clayey silt to silty clay
55.610	47.10	0.7778	1.651	-1.709	15	7	silty sand to sandy silt
55.774	59.39	1.0591	1.783	-2.837	19	7	silty sand to sandy silt
55.938	54.49	1.3576	2.491	-1.192	21	6	sandy silt to clayey silt
56.102	37.31	1.5336	4.110	0.948	24	4	silty clay to clay
56.266	27.40	1.1977	4.371	3.103	17	4	silty clay to clay
56.430	27.67	0.8575	3.100	14.482	13	5	clayey silt to silty clay
56.594	38.04	0.9699	2.550	9.718	15	6	sandy silt to clayey silt
56.759	37.32	1.0484	2.810	3.732	14	6	sandy silt to clayey silt
56.923	30.79	0.9868	3.205	5.081	15	5	clayey silt to silty clay
57.087	27.46	1.0475	3.814	9.095	18	4	silty clay to clay
57.251	20.85	0.8742	4.194	10.862	13	4	silty clay to clay
57.415	31.15	1.0254	3.292	17.615	15	5	clayey silt to silty clay
57.579	24.45	0.9558	3.910	3.705	16	4	silty clay to clay
57.743	17.41	0.6644	3.817	10.210	11	4	silty clay to clay
57.907	17.57	0.4393	2.500	27.391	8	5	clayey silt to silty clay
58.071	22.44	0.5301	2.362	27.575	11	5	clayey silt to silty clay
58.235	20.80	0.5019	2.413	34.945	10	5	clayey silt to silty clay
58.399	19.45	0.3533	1.816	36.717	7	6	sandy silt to clayey silt
58.563	17.50	0.4180	2.389	46.414	8	5	clayey silt to silty clay
58.727	16.72	0.3241	1.938	41.729	8	5	clayey silt to silty clay
58.891	18.06	0.3571	1.977	43.169	9	5	clayey silt to silty clay
59.055	16.70	0.3844	2.302	47.268	8	5	clayey silt to silty clay
59.219	16.94	0.3005	1.773	28.083	8	5	clayey silt to silty clay
59.383	17.93	0.2982	1.663	31.722	7	6	sandy silt to clayey silt

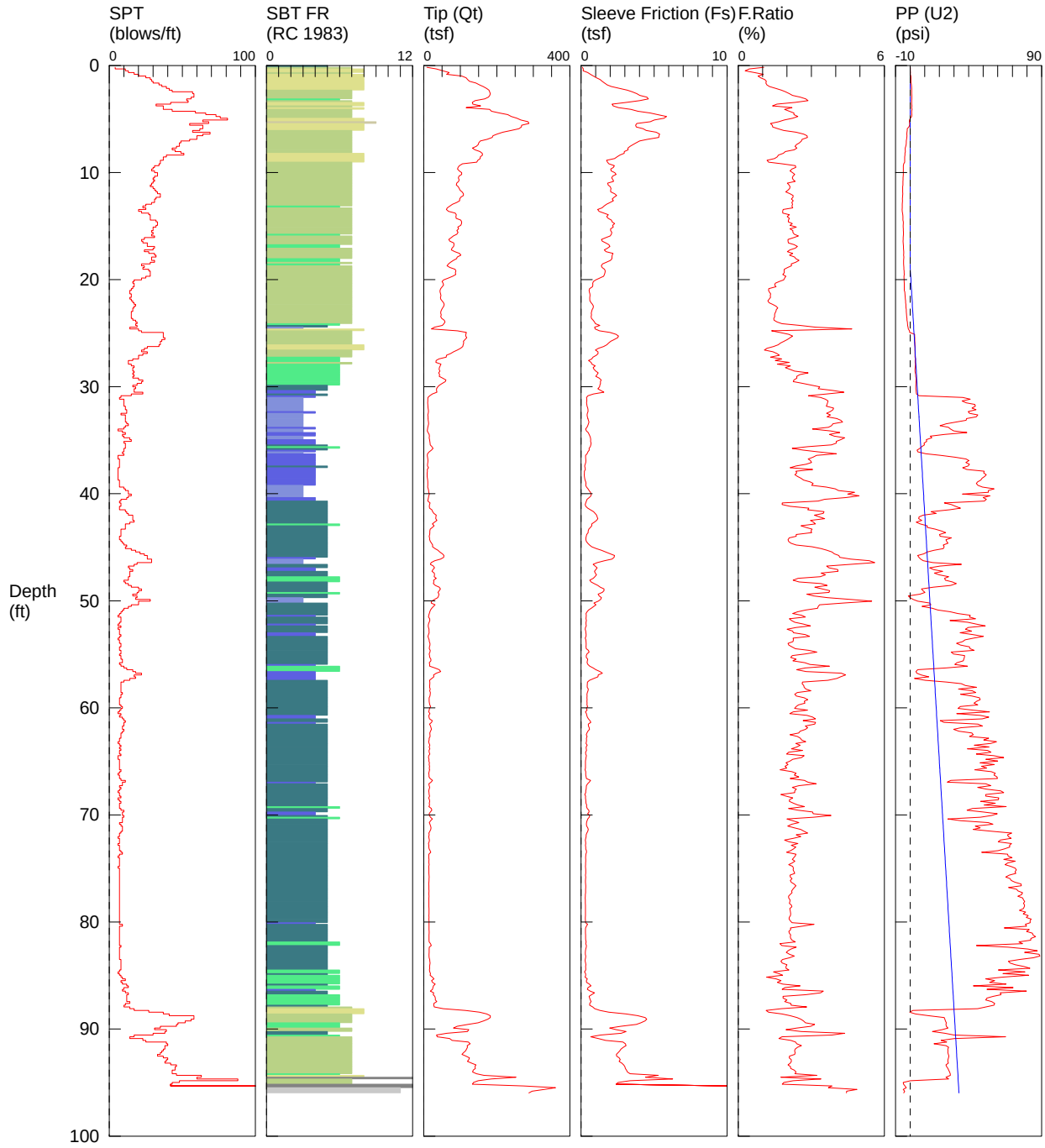
Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
59.547	15.81	0.2952	1.868	43.563	8	5	clayey silt to silty clay
59.711	16.10	0.2823	1.754	48.690	8	5	clayey silt to silty clay
59.875	16.22	0.2887	1.780	49.052	8	5	clayey silt to silty clay
60.039	15.11	0.2951	1.954	49.150	7	5	clayey silt to silty clay
60.203	15.21	0.2292	1.507	49.509	6	6	sandy silt to clayey silt
60.367	16.07	0.2573	1.601	46.206	6	6	sandy silt to clayey silt
60.532	14.08	0.2749	1.953	52.735	7	5	clayey silt to silty clay
60.696	14.08	0.2796	1.986	56.092	7	5	clayey silt to silty clay
60.860	13.82	0.2868	2.076	62.581	7	5	clayey silt to silty clay
61.024	14.21	0.2950	2.076	60.465	7	5	clayey silt to silty clay
61.188	14.00	0.2910	2.078	61.151	7	5	clayey silt to silty clay
61.352	14.62	0.2654	1.816	57.021	7	5	clayey silt to silty clay
61.516	14.61	0.2637	1.805	50.909	7	5	clayey silt to silty clay
61.680	14.50	0.2736	1.887	55.786	7	5	clayey silt to silty clay
61.844	14.75	0.2760	1.872	54.162	7	5	clayey silt to silty clay
62.008	14.73	0.2833	1.924	55.184	7	5	clayey silt to silty clay
62.172	14.10	0.2712	1.923	58.492	7	5	clayey silt to silty clay
62.336	13.88	0.3063	2.207	59.823	7	5	clayey silt to silty clay
62.500	15.06	0.2805	1.862	45.251	7	5	clayey silt to silty clay
62.664	15.41	0.2641	1.713	46.755	7	5	clayey silt to silty clay
62.828	14.56	0.2702	1.855	54.119	7	5	clayey silt to silty clay
62.992	14.17	0.2708	1.911	61.827	7	5	clayey silt to silty clay
63.156	14.31	0.2757	1.926	60.656	7	5	clayey silt to silty clay
63.320	14.25	0.2696	1.892	61.455	7	5	clayey silt to silty clay
63.484	14.15	0.2596	1.835	59.102	7	5	clayey silt to silty clay
63.648	14.07	0.2433	1.729	60.917	7	5	clayey silt to silty clay
63.812	13.97	0.2519	1.804	59.900	7	5	clayey silt to silty clay
63.976	14.00	0.2582	1.844	65.112	7	5	clayey silt to silty clay
64.140	14.04	0.2566	1.827	65.873	7	5	clayey silt to silty clay
64.304	14.11	0.2583	1.830	63.334	7	5	clayey silt to silty clay
64.469	13.99	0.2568	1.835	64.132	7	5	clayey silt to silty clay
64.633	13.95	0.2631	1.887	67.417	7	5	clayey silt to silty clay
64.797	13.92	0.2694	1.936	69.301	7	5	clayey silt to silty clay
64.961	14.07	0.2636	1.873	67.337	7	5	clayey silt to silty clay
65.125	14.12	0.2535	1.795	67.358	7	5	clayey silt to silty clay
65.289	13.82	0.2485	1.798	70.385	7	5	clayey silt to silty clay
65.453	14.08	0.2249	1.597	70.518	7	5	clayey silt to silty clay
65.617	13.90	0.2700	1.942	72.927	7	5	clayey silt to silty clay
65.781	14.59	0.2746	1.882	62.916	7	5	clayey silt to silty clay
65.945	14.18	0.2618	1.847	65.724	7	5	clayey silt to silty clay
66.109	14.11	0.2658	1.884	70.166	7	5	clayey silt to silty clay
66.273	14.75	0.2479	1.680	65.596	7	5	clayey silt to silty clay
66.437	15.83	0.2765	1.747	56.848	8	5	clayey silt to silty clay
66.601	14.33	0.2771	1.934	54.489	7	5	clayey silt to silty clay
66.765	14.62	0.2733	1.868	64.609	7	5	clayey silt to silty clay
66.929	14.19	0.2723	1.919	72.362	7	5	clayey silt to silty clay
67.093	14.12	0.2665	1.888	73.438	7	5	clayey silt to silty clay
67.257	14.64	0.2564	1.752	70.177	7	5	clayey silt to silty clay
67.421	14.43	0.2639	1.829	66.613	7	5	clayey silt to silty clay
67.585	14.38	0.2474	1.720	71.074	7	5	clayey silt to silty clay
67.749	15.44	0.2422	1.568	61.945	6	6	sandy silt to clayey silt
67.913	14.83	0.2706	1.824	56.531	7	5	clayey silt to silty clay
68.077	15.11	0.2615	1.731	65.727	7	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
68.241	28.58	0.6779	2.372	66.254	11	6	sandy silt to clayey silt
68.406	22.03	0.6652	3.020	13.963	11	5	clayey silt to silty clay
68.570	14.63	0.4364	2.983	43.475	7	5	clayey silt to silty clay
68.734	14.57	0.3640	2.498	63.387	7	5	clayey silt to silty clay
68.898	18.97	0.5222	2.754	60.755	9	5	clayey silt to silty clay
69.062	16.12	0.4776	2.962	17.181	8	5	clayey silt to silty clay
69.226	18.74	0.3636	1.941	40.018	9	5	clayey silt to silty clay
69.390	19.43	0.3517	1.810	41.487	7	6	sandy silt to clayey silt
69.554	19.69	0.3274	1.662	51.013	8	6	sandy silt to clayey silt
69.718	23.33	0.3137	1.345	38.181	9	6	sandy silt to clayey silt
69.882	24.05	0.3500	1.455	42.461	9	6	sandy silt to clayey silt
70.046	20.05	0.4336	2.163	58.160	10	5	clayey silt to silty clay
70.210	17.12	0.3585	2.095	64.846	8	5	clayey silt to silty clay
70.374	24.75	0.4156	1.679	34.522	9	6	sandy silt to clayey silt
70.538	24.47	0.3574	1.461	48.620	9	6	sandy silt to clayey silt
70.702	26.64	0.3368	1.264	46.118	10	6	sandy silt to clayey silt
70.866	23.97	0.3372	1.407	57.372	9	6	sandy silt to clayey silt
71.030	24.46	0.3453	1.412	45.347	9	6	sandy silt to clayey silt
71.194	20.16	0.3312	1.643	58.538	8	6	sandy silt to clayey silt
71.358	16.00	0.3806	2.379	62.378	8	5	clayey silt to silty clay
71.522	22.73	0.5225	2.299	72.070	11	5	clayey silt to silty clay
71.686	54.68	1.0648	1.947	7.588	17	7	silty sand to sandy silt
71.850	40.01	1.2462	3.115	6.702	19	5	clayey silt to silty clay
72.014	26.50	1.2371	4.668	16.130	25	3	clay
72.178	26.77	0.7100	2.652	31.543	13	5	clayey silt to silty clay
72.343	26.77	0.8974	3.352	31.695	13	5	clayey silt to silty clay
72.507	71.44	1.1859	1.660	-1.879	23	7	silty sand to sandy silt
72.671	63.23	1.4662	2.319	-3.569	24	6	sandy silt to clayey silt
72.835	57.76	1.4974	2.593	-1.735	22	6	sandy silt to clayey silt
72.999	54.11	1.6131	2.981	0.197	21	6	sandy silt to clayey silt
73.163	69.97	1.5922	2.276	2.457	27	6	sandy silt to clayey silt
73.327	98.02	2.7792	2.835	-2.632	38	6	sandy silt to clayey silt
73.491	98.31	2.6872	2.733	-4.943	38	6	sandy silt to clayey silt
73.655	43.53	1.7390	3.995	1.661	21	5	clayey silt to silty clay
73.819	42.96	1.5529	3.615	12.917	21	5	clayey silt to silty clay
73.983	63.71	1.5911	2.497	19.451	24	6	sandy silt to clayey silt
74.147	68.10	1.4646	2.151	-0.727	22	7	silty sand to sandy silt
74.311	90.30	1.5729	1.742	-1.203	29	7	silty sand to sandy silt
74.475	92.28	1.7597	1.907	-2.052	29	7	silty sand to sandy silt
74.639	96.19	1.8764	1.951	-0.200	31	7	silty sand to sandy silt
74.803	119.09	2.2435	1.884	2.257	38	7	silty sand to sandy silt
74.967	124.85	2.8088	2.250	3.641	40	7	silty sand to sandy silt
75.131	117.24	3.0778	2.625	7.043	37	7	silty sand to sandy silt
75.295	121.68	2.7081	2.226	10.852	39	7	silty sand to sandy silt
75.459	138.65	3.2701	2.359	12.193	44	7	silty sand to sandy silt
75.623	141.31	4.0388	2.858	12.182	54	6	sandy silt to clayey silt
75.787	118.23	3.9550	3.345	12.560	45	6	sandy silt to clayey silt
75.951	99.65	2.7425	2.752	14.650	38	6	sandy silt to clayey silt
76.115	110.28	1.9343	1.754	18.701	35	7	silty sand to sandy silt
76.280	100.92	1.9831	1.965	8.166	32	7	silty sand to sandy silt
76.444	71.07	1.8897	2.659	6.553	27	6	sandy silt to clayey silt
76.608	52.41	1.1989	2.287	17.333	20	6	sandy silt to clayey silt
76.772	78.07	1.0657	1.365	39.989	25	7	silty sand to sandy silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
76.936	111.11	1.3567	1.221	-2.686	27	8	sand to silty sand
77.100	120.94	1.9001	1.571	1.794	29	8	sand to silty sand
77.264	127.08	2.2019	1.733	7.242	41	7	silty sand to sandy silt
77.428	130.11	2.3133	1.778	15.552	42	7	silty sand to sandy silt
77.592	128.86	2.2281	1.729	18.549	41	7	silty sand to sandy silt
77.756	135.25	2.1848	1.615	18.863	32	8	sand to silty sand
77.920	136.53	2.3929	1.753	17.977	44	7	silty sand to sandy silt
78.084	123.01	2.5371	2.063	18.483	39	7	silty sand to sandy silt
78.248	107.55	2.5186	2.342	19.002	34	7	silty sand to sandy silt
78.412	91.92	2.2059	2.400	20.194	29	7	silty sand to sandy silt
78.576	90.17	1.7875	1.982	20.399	29	7	silty sand to sandy silt
78.740	94.49	1.7701	1.873	21.022	30	7	silty sand to sandy silt
78.904	90.40	1.7187	1.901	19.664	29	7	silty sand to sandy silt
79.068	94.51	1.6365	1.732	19.808	30	7	silty sand to sandy silt
79.232	97.39	1.7603	1.808	19.017	31	7	silty sand to sandy silt
79.396	98.65	1.9371	1.964	19.100	31	7	silty sand to sandy silt
79.560	100.90	1.9669	1.949	20.340	32	7	silty sand to sandy silt
79.724	102.49	1.9261	1.879	21.134	33	7	silty sand to sandy silt
79.888	101.78	1.8354	1.803	21.184	32	7	silty sand to sandy silt
80.052	101.52	1.7883	1.762	21.450	32	7	silty sand to sandy silt
80.217	101.78	1.8205	1.789	21.554	32	7	silty sand to sandy silt
80.381	101.73	1.8405	1.809	21.661	32	7	silty sand to sandy silt

NV5 / CPT-2 / 3001 Talley Way Kelso

OPERATOR: OGE DMM
CONE ID: DDG1532
HOLE NUMBER: CPT-2
TEST DATE: 9/28/2021 10:24:35 AM
TOTAL DEPTH: 95.965 ft

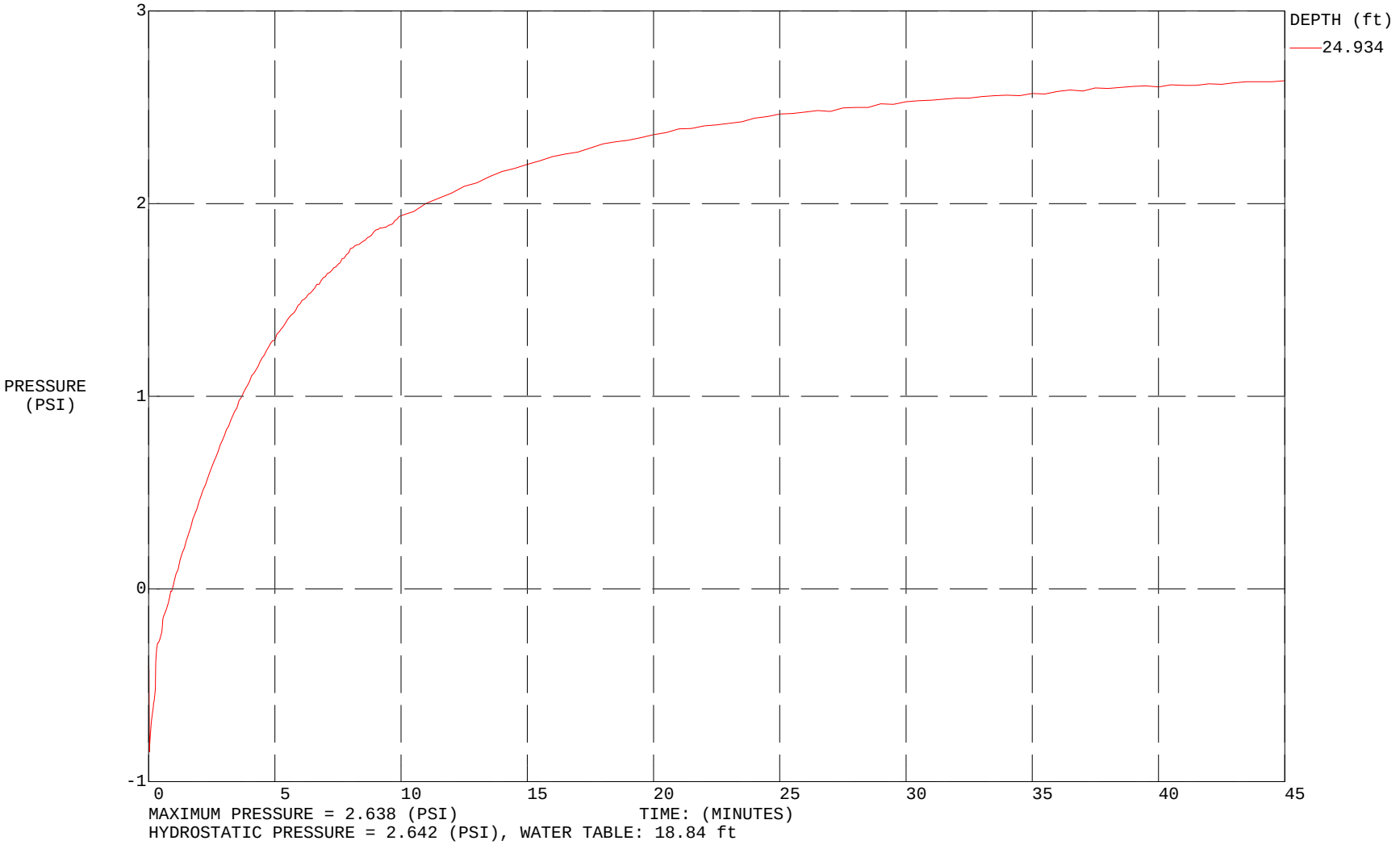


1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: NV5 / CPT-2 / 3001 Talley Way Kelso

TEST DATE: 9/28/2021 10:24:35 AM



NV5 / CPT-2 / 3001 Talley Way Kelso

OPERATOR: OGE DMM
CONE ID: DDG1532
HOLE NUMBER: CPT-2
TEST DATE: 9/28/2021 10:24:35 AM
TOTAL DEPTH: 95.965 ft

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
0.164	8.35	0.0872	1.044	0.011	4	5	clayey silt to silty clay
0.328	34.18	0.1542	0.451	0.093	11	7	silty sand to sandy silt
0.492	52.24	0.1476	0.282	0.130	13	8	sand to silty sand
0.656	69.40	0.4585	0.661	0.162	17	8	sand to silty sand
0.820	62.28	0.6421	1.031	0.109	20	7	silty sand to sandy silt
0.984	103.85	0.8416	0.810	0.429	25	8	sand to silty sand
1.148	115.56	1.0555	0.913	0.514	28	8	sand to silty sand
1.312	119.87	1.3019	1.086	0.564	29	8	sand to silty sand
1.476	125.30	1.4406	1.150	0.591	30	8	sand to silty sand
1.640	142.68	1.6103	1.129	0.697	34	8	sand to silty sand
1.804	152.31	1.7874	1.174	0.788	36	8	sand to silty sand
1.969	162.49	2.0818	1.281	0.868	39	8	sand to silty sand
2.133	171.74	2.6390	1.537	0.932	41	8	sand to silty sand
2.297	178.15	3.1584	1.773	0.993	43	8	sand to silty sand
2.461	179.98	3.4865	1.937	1.059	57	7	silty sand to sandy silt
2.625	182.17	3.8217	2.098	1.062	58	7	silty sand to sandy silt
2.789	180.62	4.0162	2.224	1.123	58	7	silty sand to sandy silt
2.953	176.85	4.4982	2.544	1.086	56	7	silty sand to sandy silt
3.117	166.44	4.6095	2.769	1.147	53	7	silty sand to sandy silt
3.281	140.34	4.0141	2.860	1.030	54	6	sandy silt to clayey silt
3.445	132.91	3.1035	2.335	1.030	42	7	silty sand to sandy silt
3.609	134.39	2.1273	1.583	1.046	32	8	sand to silty sand
3.773	155.62	2.1904	1.408	1.200	37	8	sand to silty sand
3.937	115.67	2.5562	2.210	1.011	37	7	silty sand to sandy silt
4.101	180.08	3.4124	1.895	1.240	43	8	sand to silty sand
4.265	185.13	3.8852	2.099	0.956	59	7	silty sand to sandy silt
4.429	206.97	4.7281	2.284	0.964	66	7	silty sand to sandy silt
4.593	229.81	5.2469	2.283	1.102	73	7	silty sand to sandy silt
4.757	239.54	5.8542	2.444	1.030	76	7	silty sand to sandy silt
4.921	254.90	5.6715	2.225	0.019	81	7	silty sand to sandy silt
5.085	265.62	5.0116	1.887	-0.514	64	8	sand to silty sand
5.249	285.48	4.7395	1.660	-0.604	68	8	sand to silty sand
5.413	287.69	3.8082	1.324	-0.431	55	9	sand
5.577	267.80	3.7378	1.396	-0.421	64	8	sand to silty sand
5.741	267.27	3.7811	1.415	-0.926	64	8	sand to silty sand
5.906	260.48	4.2449	1.630	-2.057	62	8	sand to silty sand
6.070	239.07	4.4575	1.865	-2.049	57	8	sand to silty sand
6.234	216.35	5.1350	2.374	-2.273	69	7	silty sand to sandy silt
6.398	200.39	5.3748	2.682	-2.300	64	7	silty sand to sandy silt
6.562	189.24	5.3389	2.821	-2.244	60	7	silty sand to sandy silt
6.726	187.09	5.3124	2.839	-2.294	60	7	silty sand to sandy silt
6.890	173.38	4.5373	2.617	-2.510	55	7	silty sand to sandy silt
7.054	154.81	4.0109	2.591	-2.632	49	7	silty sand to sandy silt
7.218	150.32	3.7754	2.512	-2.640	48	7	silty sand to sandy silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
7.382	148.84	3.5572	2.390	-2.757	48	7	silty sand to sandy silt
7.546	143.85	3.3475	2.327	-2.989	46	7	silty sand to sandy silt
7.710	133.28	3.2053	2.405	-3.396	43	7	silty sand to sandy silt
7.874	140.10	3.2183	2.297	-3.380	45	7	silty sand to sandy silt
8.038	153.73	2.9631	1.928	-3.348	49	7	silty sand to sandy silt
8.202	160.00	2.9507	1.844	-3.615	51	7	silty sand to sandy silt
8.366	160.87	2.6508	1.648	-3.521	39	8	sand to silty sand
8.530	154.25	2.4562	1.592	-3.788	37	8	sand to silty sand
8.694	154.35	2.3019	1.491	-3.777	37	8	sand to silty sand
8.858	147.87	1.7399	1.177	-3.777	35	8	sand to silty sand
9.022	144.83	1.8087	1.249	-3.785	35	8	sand to silty sand
9.186	105.95	1.8996	1.793	-4.434	34	7	silty sand to sandy silt
9.350	97.09	2.2775	2.346	-4.677	31	7	silty sand to sandy silt
9.514	93.79	2.2126	2.359	-4.679	30	7	silty sand to sandy silt
9.678	92.24	2.0285	2.199	-4.735	29	7	silty sand to sandy silt
9.843	96.98	2.0587	2.123	-4.695	31	7	silty sand to sandy silt
10.007	103.54	2.3081	2.229	-4.698	33	7	silty sand to sandy silt
10.171	103.66	2.4041	2.319	-4.711	33	7	silty sand to sandy silt
10.335	96.32	2.1635	2.246	-4.772	31	7	silty sand to sandy silt
10.499	94.46	2.0952	2.218	-4.844	30	7	silty sand to sandy silt
10.663	96.69	2.1822	2.257	-4.828	31	7	silty sand to sandy silt
10.827	95.09	2.2202	2.335	-4.908	30	7	silty sand to sandy silt
10.991	90.17	1.8142	2.012	-4.996	29	7	silty sand to sandy silt
11.155	88.95	1.8550	2.085	-4.959	28	7	silty sand to sandy silt
11.319	94.16	1.9964	2.120	-5.132	30	7	silty sand to sandy silt
11.483	96.94	2.0441	2.109	-5.137	31	7	silty sand to sandy silt
11.647	99.21	2.0183	2.034	-5.164	32	7	silty sand to sandy silt
11.811	104.45	2.0332	1.947	-5.185	33	7	silty sand to sandy silt
11.975	108.63	2.3033	2.120	-5.129	35	7	silty sand to sandy silt
12.139	108.19	2.4353	2.251	-5.190	35	7	silty sand to sandy silt
12.303	100.77	2.2625	2.245	-5.278	32	7	silty sand to sandy silt
12.467	98.04	2.1344	2.177	-5.291	31	7	silty sand to sandy silt
12.631	98.28	2.2180	2.257	-5.275	31	7	silty sand to sandy silt
12.795	90.26	1.9824	2.196	-5.315	29	7	silty sand to sandy silt
12.959	78.51	1.7476	2.226	-5.422	25	7	silty sand to sandy silt
13.123	71.70	1.5779	2.201	-5.472	23	7	silty sand to sandy silt
13.287	64.41	1.4366	2.230	-5.491	25	6	sandy silt to clayey silt
13.451	61.54	1.1323	1.840	-5.526	20	7	silty sand to sandy silt
13.615	67.42	1.2284	1.822	-5.478	22	7	silty sand to sandy silt
13.780	85.89	1.5679	1.825	-5.219	27	7	silty sand to sandy silt
13.944	88.94	1.8653	2.097	-5.062	28	7	silty sand to sandy silt
14.108	87.63	1.7575	2.006	-5.015	28	7	silty sand to sandy silt
14.272	88.53	1.8561	2.097	-5.001	28	7	silty sand to sandy silt
14.436	101.07	2.0807	2.059	-4.919	32	7	silty sand to sandy silt
14.600	103.62	2.1277	2.053	-4.700	33	7	silty sand to sandy silt
14.764	103.44	2.2961	2.220	-4.719	33	7	silty sand to sandy silt
14.928	101.28	2.1535	2.126	-4.759	32	7	silty sand to sandy silt
15.092	92.85	2.2116	2.382	-4.810	30	7	silty sand to sandy silt
15.256	95.11	2.0205	2.124	-4.743	30	7	silty sand to sandy silt
15.420	90.38	2.0260	2.242	-4.679	29	7	silty sand to sandy silt
15.584	93.87	2.1034	2.241	-4.613	30	7	silty sand to sandy silt
15.748	90.55	2.0806	2.298	-4.639	29	7	silty sand to sandy silt
15.912	80.70	1.9919	2.468	-4.671	31	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
16.076	75.04	1.7121	2.281	-4.775	24	7	silty sand to sandy silt
16.240	68.37	1.3982	2.045	-4.751	22	7	silty sand to sandy silt
16.404	71.09	1.4503	2.040	-4.831	23	7	silty sand to sandy silt
16.568	81.78	1.6835	2.059	-4.772	26	7	silty sand to sandy silt
16.732	82.82	1.9010	2.295	-4.692	26	7	silty sand to sandy silt
16.896	81.48	1.9812	2.432	-4.607	31	6	sandy silt to clayey silt
17.060	77.38	1.8082	2.337	-4.653	30	6	sandy silt to clayey silt
17.224	75.11	1.5910	2.118	-4.583	24	7	silty sand to sandy silt
17.388	84.89	1.7102	2.015	-4.434	27	7	silty sand to sandy silt
17.552	97.84	2.1819	2.230	-4.402	31	7	silty sand to sandy silt
17.717	101.52	2.1331	2.101	-4.450	32	7	silty sand to sandy silt
17.881	91.34	2.1101	2.310	-4.360	29	7	silty sand to sandy silt
18.045	89.54	2.1125	2.359	-4.397	29	7	silty sand to sandy silt
18.209	80.55	2.0078	2.493	-4.448	31	6	sandy silt to clayey silt
18.373	73.11	1.7218	2.355	-4.474	28	6	sandy silt to clayey silt
18.537	67.44	1.4659	2.174	-4.445	22	7	silty sand to sandy silt
18.701	63.51	1.3882	2.186	-4.392	24	6	sandy silt to clayey silt
18.865	71.34	1.4450	2.025	-4.346	23	7	silty sand to sandy silt
19.029	85.44	1.6121	1.887	-4.352	27	7	silty sand to sandy silt
19.193	87.71	1.6507	1.882	-4.147	28	7	silty sand to sandy silt
19.357	86.60	1.6343	1.887	-4.142	28	7	silty sand to sandy silt
19.521	87.45	1.5985	1.828	-4.128	28	7	silty sand to sandy silt
19.685	78.96	1.5409	1.951	-4.221	25	7	silty sand to sandy silt
19.849	67.59	1.2866	1.903	-4.219	22	7	silty sand to sandy silt
20.013	54.29	1.0128	1.866	-4.189	17	7	silty sand to sandy silt
20.177	49.96	0.8424	1.686	-4.205	16	7	silty sand to sandy silt
20.341	52.77	0.8005	1.517	-4.102	17	7	silty sand to sandy silt
20.505	53.88	0.8056	1.495	-4.070	17	7	silty sand to sandy silt
20.669	50.29	0.7798	1.550	-4.059	16	7	silty sand to sandy silt
20.833	46.33	0.5808	1.254	-4.032	15	7	silty sand to sandy silt
20.997	44.47	0.5518	1.241	-4.032	14	7	silty sand to sandy silt
21.161	44.62	0.5681	1.273	-3.700	14	7	silty sand to sandy silt
21.325	45.61	0.6060	1.329	-3.609	15	7	silty sand to sandy silt
21.490	46.86	0.6140	1.310	-3.505	15	7	silty sand to sandy silt
21.654	45.30	0.5978	1.320	-3.436	14	7	silty sand to sandy silt
21.818	46.33	0.5882	1.270	-3.311	15	7	silty sand to sandy silt
21.982	49.93	0.6044	1.210	-3.186	16	7	silty sand to sandy silt
22.146	54.06	0.6824	1.262	-3.064	17	7	silty sand to sandy silt
22.310	55.85	0.7860	1.407	-2.970	18	7	silty sand to sandy silt
22.474	54.53	0.8410	1.542	-2.922	17	7	silty sand to sandy silt
22.638	51.10	0.8271	1.619	-2.869	16	7	silty sand to sandy silt
22.802	48.88	0.7628	1.561	-2.723	16	7	silty sand to sandy silt
22.966	46.70	0.7195	1.541	-2.646	15	7	silty sand to sandy silt
23.130	46.45	0.6980	1.503	-2.595	15	7	silty sand to sandy silt
23.294	47.75	0.7101	1.487	-2.513	15	7	silty sand to sandy silt
23.458	46.24	0.6915	1.496	-2.419	15	7	silty sand to sandy silt
23.622	49.04	0.7138	1.456	-2.289	16	7	silty sand to sandy silt
23.786	55.92	0.8207	1.468	-2.151	18	7	silty sand to sandy silt
23.950	57.97	0.9213	1.589	-1.962	19	7	silty sand to sandy silt
24.114	55.05	0.9848	1.789	-1.837	18	7	silty sand to sandy silt
24.278	50.49	1.2789	2.533	-1.751	19	6	sandy silt to clayey silt
24.442	29.22	0.9260	3.169	-1.496	14	5	clayey silt to silty clay
24.606	20.76	0.9684	4.664	-1.310	20	3	clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
24.770	91.94	1.2580	1.368	-0.522	22	8	sand to silty sand
24.934	116.62	1.9798	1.698	-0.399	37	7	silty sand to sandy silt
25.098	115.02	2.3827	2.072	3.045	37	7	silty sand to sandy silt
25.262	114.86	2.5594	2.228	3.069	37	7	silty sand to sandy silt
25.427	117.70	2.5058	2.129	3.077	38	7	silty sand to sandy silt
25.591	112.77	2.2707	2.014	3.098	36	7	silty sand to sandy silt
25.755	108.71	2.0334	1.870	3.133	35	7	silty sand to sandy silt
25.919	109.06	1.8861	1.729	3.159	35	7	silty sand to sandy silt
26.083	107.65	1.7647	1.639	3.207	34	7	silty sand to sandy silt
26.247	106.70	1.5394	1.443	3.322	26	8	sand to silty sand
26.411	100.75	1.1870	1.178	3.300	24	8	sand to silty sand
26.575	91.82	0.9788	1.066	3.311	22	8	sand to silty sand
26.739	81.48	1.1578	1.421	3.330	26	7	silty sand to sandy silt
26.903	73.49	1.1619	1.581	3.340	23	7	silty sand to sandy silt
27.067	62.08	1.0449	1.683	3.245	20	7	silty sand to sandy silt
27.231	61.47	0.8110	1.319	3.250	20	7	silty sand to sandy silt
27.395	41.44	0.7361	1.776	3.668	16	6	sandy silt to clayey silt
27.559	33.83	0.5140	1.519	3.420	13	6	sandy silt to clayey silt
27.723	33.09	0.6896	2.084	3.386	13	6	sandy silt to clayey silt
27.887	46.80	0.7476	1.597	3.583	15	7	silty sand to sandy silt
28.051	44.76	0.9587	2.142	3.495	17	6	sandy silt to clayey silt
28.215	42.58	0.8235	1.934	3.457	16	6	sandy silt to clayey silt
28.379	41.70	0.8869	2.127	3.370	16	6	sandy silt to clayey silt
28.543	43.88	1.0129	2.308	3.372	17	6	sandy silt to clayey silt
28.707	40.95	1.1749	2.869	3.527	16	6	sandy silt to clayey silt
28.871	43.12	1.0891	2.526	3.750	17	6	sandy silt to clayey silt
29.035	42.39	1.0154	2.395	3.726	16	6	sandy silt to clayey silt
29.199	51.43	1.2387	2.409	4.030	20	6	sandy silt to clayey silt
29.364	60.31	1.3771	2.283	4.035	23	6	sandy silt to clayey silt
29.528	58.57	1.3193	2.252	3.963	22	6	sandy silt to clayey silt
29.692	50.50	1.3323	2.638	3.945	19	6	sandy silt to clayey silt
29.856	42.51	1.2833	3.019	3.894	16	6	sandy silt to clayey silt
30.020	37.89	1.2678	3.346	3.886	18	5	clayey silt to silty clay
30.184	34.82	1.1447	3.287	3.905	17	5	clayey silt to silty clay
30.348	34.79	1.3513	3.884	4.030	17	5	clayey silt to silty clay
30.512	36.03	1.5628	4.338	4.144	23	4	silty clay to clay
30.676	23.38	0.8499	3.635	4.309	15	4	silty clay to clay
30.840	16.45	0.4735	2.879	6.053	8	5	clayey silt to silty clay
31.004	11.24	0.3794	3.376	35.988	7	4	silty clay to clay
31.168	10.85	0.3877	3.573	41.136	10	3	clay
31.332	10.59	0.3902	3.686	35.546	10	3	clay
31.496	10.34	0.3786	3.661	38.352	10	3	clay
31.660	10.75	0.3915	3.642	44.255	10	3	clay
31.824	11.47	0.4142	3.612	44.612	11	3	clay
31.988	11.80	0.4617	3.911	42.339	11	3	clay
32.152	12.30	0.4786	3.892	45.094	12	3	clay
32.316	12.64	0.4776	3.779	39.802	12	3	clay
32.480	11.90	0.4318	3.628	40.534	8	4	silty clay to clay
32.644	11.03	0.4169	3.779	46.273	11	3	clay
32.808	11.68	0.4259	3.647	45.280	11	3	clay
32.972	11.56	0.4673	4.044	38.615	11	3	clay
33.136	11.89	0.5002	4.208	38.328	11	3	clay
33.301	12.44	0.5331	4.285	31.368	12	3	clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
33.465	13.06	0.5073	3.884	24.644	13	3	clay
33.629	11.85	0.4536	3.829	20.420	11	3	clay
33.793	10.85	0.4021	3.705	26.143	10	3	clay
33.957	10.10	0.3075	3.044	27.572	6	4	silty clay to clay
34.121	9.57	0.3615	3.779	29.779	9	3	clay
34.285	11.54	0.4809	4.168	38.863	11	3	clay
34.449	14.55	0.5446	3.743	23.675	9	4	silty clay to clay
34.613	15.34	0.6040	3.938	13.777	10	4	silty clay to clay
34.777	14.63	0.6386	4.365	14.852	14	3	clay
34.941	15.63	0.6578	4.209	11.046	15	3	clay
35.105	16.30	0.6550	4.019	11.355	10	4	silty clay to clay
35.269	17.06	0.6863	4.022	9.460	11	4	silty clay to clay
35.433	17.54	0.6707	3.823	9.742	11	4	silty clay to clay
35.597	22.01	0.6313	2.869	7.932	11	5	clayey silt to silty clay
35.761	25.11	0.5558	2.214	6.604	10	6	sandy silt to clayey silt
35.925	20.94	0.5575	2.663	4.703	10	5	clayey silt to silty clay
36.089	14.32	0.4712	3.291	5.294	9	4	silty clay to clay
36.253	10.02	0.4036	4.029	10.591	10	3	clay
36.417	9.58	0.3079	3.214	20.929	6	4	silty clay to clay
36.581	10.08	0.3085	3.060	30.894	6	4	silty clay to clay
36.745	11.18	0.3211	2.873	38.330	7	4	silty clay to clay
36.909	11.21	0.3319	2.961	40.196	7	4	silty clay to clay
37.073	10.72	0.3219	3.003	38.096	7	4	silty clay to clay
37.238	10.27	0.2861	2.787	40.651	7	4	silty clay to clay
37.402	10.23	0.2428	2.373	39.667	7	4	silty clay to clay
37.566	12.58	0.2680	2.131	36.015	6	5	clayey silt to silty clay
37.730	9.48	0.2891	3.049	38.754	6	4	silty clay to clay
37.894	9.69	0.2294	2.367	50.665	6	4	silty clay to clay
38.058	9.32	0.2236	2.398	50.356	6	4	silty clay to clay
38.222	9.31	0.2164	2.325	52.003	6	4	silty clay to clay
38.386	9.31	0.2268	2.436	50.973	6	4	silty clay to clay
38.550	9.68	0.2488	2.571	49.179	6	4	silty clay to clay
38.714	10.41	0.2792	2.681	48.245	7	4	silty clay to clay
38.878	10.83	0.3190	2.947	46.222	7	4	silty clay to clay
39.042	10.97	0.3374	3.074	45.285	7	4	silty clay to clay
39.206	10.77	0.3245	3.014	46.401	7	4	silty clay to clay
39.370	10.42	0.3768	3.617	49.525	10	3	clay
39.534	11.94	0.4749	3.978	57.398	11	3	clay
39.698	13.16	0.5416	4.117	53.497	13	3	clay
39.862	13.41	0.6399	4.773	53.544	13	3	clay
40.026	15.48	0.6949	4.489	35.797	15	3	clay
40.190	13.63	0.6759	4.960	54.551	13	3	clay
40.354	12.63	0.5585	4.422	49.967	12	3	clay
40.518	11.79	0.4178	3.544	52.182	8	4	silty clay to clay
40.682	10.99	0.3610	3.284	50.827	7	4	silty clay to clay
40.846	17.23	0.3107	1.803	23.345	8	5	clayey silt to silty clay
41.011	15.74	0.2836	1.801	28.187	8	5	clayey silt to silty clay
41.175	14.95	0.3175	2.124	31.019	7	5	clayey silt to silty clay
41.339	15.64	0.4529	2.895	34.426	7	5	clayey silt to silty clay
41.503	22.19	0.6328	2.852	26.883	11	5	clayey silt to silty clay
41.667	24.21	0.8519	3.519	14.312	12	5	clayey silt to silty clay
41.831	27.47	0.9585	3.489	17.753	13	5	clayey silt to silty clay
41.995	34.09	1.0663	3.128	8.895	16	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
42.159	33.16	1.1040	3.329	6.087	16	5	clayey silt to silty clay
42.323	32.50	1.1526	3.546	5.794	16	5	clayey silt to silty clay
42.487	36.03	1.0682	2.964	7.926	17	5	clayey silt to silty clay
42.651	29.44	0.9070	3.081	4.107	14	5	clayey silt to silty clay
42.815	23.32	0.7384	3.167	6.816	11	5	clayey silt to silty clay
42.979	28.11	0.7250	2.579	11.671	11	6	sandy silt to clayey silt
43.143	23.20	0.6433	2.773	11.591	11	5	clayey silt to silty clay
43.307	17.50	0.5299	3.029	17.168	8	5	clayey silt to silty clay
43.471	16.25	0.4854	2.988	21.440	8	5	clayey silt to silty clay
43.635	16.14	0.4863	3.013	24.248	8	5	clayey silt to silty clay
43.799	16.07	0.3822	2.379	20.072	8	5	clayey silt to silty clay
43.963	14.69	0.3495	2.378	20.524	7	5	clayey silt to silty clay
44.127	15.60	0.3260	2.089	28.115	7	5	clayey silt to silty clay
44.291	15.99	0.3266	2.043	24.463	8	5	clayey silt to silty clay
44.455	17.88	0.3706	2.073	25.051	9	5	clayey silt to silty clay
44.619	21.01	0.4543	2.162	25.794	10	5	clayey silt to silty clay
44.783	24.17	0.5736	2.373	22.573	12	5	clayey silt to silty clay
44.948	23.93	0.7238	3.025	23.311	11	5	clayey silt to silty clay
45.112	30.70	1.0459	3.407	22.696	15	5	clayey silt to silty clay
45.276	38.20	1.3884	3.635	16.494	18	5	clayey silt to silty clay
45.440	43.61	1.6769	3.845	11.725	21	5	clayey silt to silty clay
45.604	50.79	2.0032	3.944	9.329	24	5	clayey silt to silty clay
45.768	55.33	2.2834	4.127	5.212	26	5	clayey silt to silty clay
45.932	54.40	2.2658	4.165	5.954	26	5	clayey silt to silty clay
46.096	45.90	2.1174	4.613	7.165	29	4	silty clay to clay
46.260	30.00	1.6140	5.379	8.909	29	3	clay
46.424	19.88	1.1141	5.605	15.507	19	3	clay
46.588	17.80	0.8206	4.611	34.993	17	3	clay
46.752	26.44	0.9590	3.628	20.404	13	5	clayey silt to silty clay
46.916	29.44	1.0966	3.725	13.287	14	5	clayey silt to silty clay
47.080	24.89	1.0160	4.082	15.989	16	4	silty clay to clay
47.244	22.40	0.9177	4.097	22.265	14	4	silty clay to clay
47.408	28.63	0.9742	3.403	16.502	14	5	clayey silt to silty clay
47.572	29.30	1.0481	3.576	19.899	14	5	clayey silt to silty clay
47.736	28.12	0.9468	3.367	26.289	13	5	clayey silt to silty clay
47.900	34.13	0.8390	2.458	23.526	13	6	sandy silt to clayey silt
48.064	26.68	0.6006	2.251	24.139	10	6	sandy silt to clayey silt
48.228	27.65	0.6894	2.494	28.892	11	6	sandy silt to clayey silt
48.392	26.13	0.8876	3.397	31.546	13	5	clayey silt to silty clay
48.556	31.52	1.1509	3.651	27.641	15	5	clayey silt to silty clay
48.720	41.90	1.3147	3.138	15.871	20	5	clayey silt to silty clay
48.885	45.49	1.5694	3.450	7.729	22	5	clayey silt to silty clay
49.049	41.93	1.5720	3.749	8.685	20	5	clayey silt to silty clay
49.213	38.92	1.4494	3.724	10.130	19	5	clayey silt to silty clay
49.377	41.41	1.1667	2.817	6.737	16	6	sandy silt to clayey silt
49.541	40.29	1.2445	3.089	-1.307	19	5	clayey silt to silty clay
49.705	38.17	1.3980	3.662	-0.122	18	5	clayey silt to silty clay
49.869	29.15	1.3396	4.596	2.065	28	3	clay
50.033	21.40	1.1730	5.482	5.084	20	3	clay
50.197	20.37	0.8795	4.318	13.300	20	3	clay
50.361	30.63	1.0219	3.337	14.125	15	5	clayey silt to silty clay
50.525	26.45	0.8685	3.284	8.062	13	5	clayey silt to silty clay
50.689	21.46	0.6990	3.257	15.121	10	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
50.853	18.51	0.5115	2.764	19.015	9	5	clayey silt to silty clay
51.017	16.59	0.4044	2.437	27.394	8	5	clayey silt to silty clay
51.181	15.08	0.3366	2.233	32.597	7	5	clayey silt to silty clay
51.345	13.47	0.3505	2.601	41.144	6	5	clayey silt to silty clay
51.509	12.64	0.3479	2.752	40.617	8	4	silty clay to clay
51.673	16.05	0.3365	2.096	44.753	8	5	clayey silt to silty clay
51.837	16.61	0.3627	2.184	27.269	8	5	clayey silt to silty clay
52.001	14.54	0.3363	2.312	39.376	7	5	clayey silt to silty clay
52.165	12.63	0.3360	2.660	44.902	6	5	clayey silt to silty clay
52.329	11.83	0.3506	2.963	51.407	8	4	silty clay to clay
52.493	12.65	0.2995	2.368	39.664	6	5	clayey silt to silty clay
52.657	14.00	0.2802	2.001	37.851	7	5	clayey silt to silty clay
52.822	13.96	0.3115	2.231	42.107	7	5	clayey silt to silty clay
52.986	14.49	0.3277	2.261	34.141	7	5	clayey silt to silty clay
53.150	12.47	0.3430	2.751	43.007	8	4	silty clay to clay
53.314	11.45	0.3352	2.928	50.031	7	4	silty clay to clay
53.478	12.54	0.2823	2.251	43.425	6	5	clayey silt to silty clay
53.642	14.70	0.3320	2.259	37.561	7	5	clayey silt to silty clay
53.806	15.06	0.3379	2.244	35.852	7	5	clayey silt to silty clay
53.970	16.93	0.3454	2.040	31.706	8	5	clayey silt to silty clay
54.134	16.73	0.3470	2.074	34.514	8	5	clayey silt to silty clay
54.298	15.21	0.3345	2.198	40.614	7	5	clayey silt to silty clay
54.462	15.01	0.3514	2.341	41.091	7	5	clayey silt to silty clay
54.626	17.50	0.5060	2.892	43.731	8	5	clayey silt to silty clay
54.790	17.00	0.5477	3.221	28.011	8	5	clayey silt to silty clay
54.954	14.48	0.3970	2.741	29.627	7	5	clayey silt to silty clay
55.118	15.74	0.3490	2.217	37.266	8	5	clayey silt to silty clay
55.282	16.32	0.3514	2.153	37.119	8	5	clayey silt to silty clay
55.446	19.23	0.4557	2.370	36.736	9	5	clayey silt to silty clay
55.610	19.34	0.4331	2.240	36.305	9	5	clayey silt to silty clay
55.774	14.95	0.4082	2.731	32.009	7	5	clayey silt to silty clay
55.938	16.03	0.4710	2.939	30.598	8	5	clayey silt to silty clay
56.102	16.04	0.5999	3.741	39.145	10	4	silty clay to clay
56.266	30.10	0.8277	2.750	24.415	12	6	sandy silt to clayey silt
56.430	42.17	1.0096	2.394	5.129	16	6	sandy silt to clayey silt
56.594	46.47	1.2931	2.783	3.929	18	6	sandy silt to clayey silt
56.759	34.48	1.4596	4.233	4.525	22	4	silty clay to clay
56.923	26.63	1.1730	4.405	7.498	17	4	silty clay to clay
57.087	27.58	1.1586	4.201	12.699	18	4	silty clay to clay
57.251	21.71	0.8790	4.049	2.960	14	4	silty clay to clay
57.415	15.66	0.5767	3.683	10.325	10	4	silty clay to clay
57.579	16.49	0.4349	2.638	24.849	8	5	clayey silt to silty clay
57.743	16.46	0.4307	2.616	34.939	8	5	clayey silt to silty clay
57.907	15.83	0.4253	2.686	37.889	8	5	clayey silt to silty clay
58.071	15.74	0.4256	2.703	45.392	8	5	clayey silt to silty clay
58.235	17.63	0.4892	2.776	33.031	8	5	clayey silt to silty clay
58.399	15.84	0.4720	2.979	42.493	8	5	clayey silt to silty clay
58.563	17.82	0.4310	2.418	44.923	9	5	clayey silt to silty clay
58.727	17.37	0.4018	2.313	34.474	8	5	clayey silt to silty clay
58.891	16.92	0.4031	2.383	42.198	8	5	clayey silt to silty clay
59.055	14.79	0.4002	2.706	47.332	7	5	clayey silt to silty clay
59.219	14.52	0.4144	2.854	48.011	7	5	clayey silt to silty clay
59.383	14.73	0.3989	2.708	45.525	7	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
59.547	15.27	0.4179	2.737	43.683	7	5	clayey silt to silty clay
59.711	16.17	0.3994	2.470	46.281	8	5	clayey silt to silty clay
59.875	18.61	0.4425	2.377	34.287	9	5	clayey silt to silty clay
60.039	15.77	0.3642	2.310	32.704	8	5	clayey silt to silty clay
60.203	14.36	0.4087	2.845	42.837	7	5	clayey silt to silty clay
60.367	13.35	0.3002	2.249	54.292	6	5	clayey silt to silty clay
60.532	16.91	0.3569	2.111	31.817	8	5	clayey silt to silty clay
60.696	13.77	0.3883	2.820	48.000	7	5	clayey silt to silty clay
60.860	14.06	0.4295	3.055	53.792	9	4	silty clay to clay
61.024	15.70	0.4972	3.167	49.339	10	4	silty clay to clay
61.188	22.89	0.6084	2.658	20.633	11	5	clayey silt to silty clay
61.352	21.03	0.6672	3.172	23.164	10	5	clayey silt to silty clay
61.516	15.61	0.4896	3.136	46.345	10	4	silty clay to clay
61.680	18.26	0.5028	2.753	49.416	9	5	clayey silt to silty clay
61.844	19.56	0.5570	2.848	34.684	9	5	clayey silt to silty clay
62.008	20.75	0.5725	2.759	29.709	10	5	clayey silt to silty clay
62.172	18.34	0.4644	2.533	33.422	9	5	clayey silt to silty clay
62.336	16.18	0.4014	2.481	42.211	8	5	clayey silt to silty clay
62.500	16.77	0.3564	2.125	43.137	8	5	clayey silt to silty clay
62.664	17.06	0.4143	2.429	40.726	8	5	clayey silt to silty clay
62.828	14.27	0.3639	2.550	53.739	7	5	clayey silt to silty clay
62.992	14.40	0.3742	2.599	50.353	7	5	clayey silt to silty clay
63.156	13.06	0.3619	2.772	59.105	6	5	clayey silt to silty clay
63.320	14.45	0.3412	2.362	55.128	7	5	clayey silt to silty clay
63.484	16.51	0.4189	2.537	43.941	8	5	clayey silt to silty clay
63.648	14.43	0.3475	2.408	53.880	7	5	clayey silt to silty clay
63.812	16.32	0.3557	2.179	39.219	8	5	clayey silt to silty clay
63.976	14.11	0.3720	2.636	52.930	7	5	clayey silt to silty clay
64.140	14.74	0.3046	2.067	55.243	7	5	clayey silt to silty clay
64.304	16.20	0.3212	1.983	45.283	8	5	clayey silt to silty clay
64.469	13.36	0.3607	2.701	57.108	6	5	clayey silt to silty clay
64.633	13.03	0.3375	2.590	64.090	6	5	clayey silt to silty clay
64.797	14.16	0.3159	2.230	51.833	7	5	clayey silt to silty clay
64.961	13.95	0.2966	2.127	59.845	7	5	clayey silt to silty clay
65.125	15.43	0.3027	1.961	47.809	7	5	clayey silt to silty clay
65.289	14.54	0.2965	2.039	57.590	7	5	clayey silt to silty clay
65.453	15.65	0.3004	1.920	48.777	7	5	clayey silt to silty clay
65.617	15.09	0.3002	1.989	52.325	7	5	clayey silt to silty clay
65.781	15.76	0.2709	1.719	44.261	8	5	clayey silt to silty clay
65.945	14.78	0.3251	2.200	55.551	7	5	clayey silt to silty clay
66.109	13.51	0.3200	2.369	58.277	6	5	clayey silt to silty clay
66.273	14.07	0.3239	2.302	57.343	7	5	clayey silt to silty clay
66.437	14.05	0.3481	2.478	59.432	7	5	clayey silt to silty clay
66.601	17.04	0.3631	2.131	59.719	8	5	clayey silt to silty clay
66.765	23.97	0.6503	2.713	27.812	11	5	clayey silt to silty clay
66.929	19.54	0.5581	2.856	25.453	9	5	clayey silt to silty clay
67.093	13.90	0.4448	3.200	51.700	9	4	silty clay to clay
67.257	14.37	0.3583	2.493	55.195	7	5	clayey silt to silty clay
67.421	15.97	0.3542	2.217	46.212	8	5	clayey silt to silty clay
67.585	14.40	0.3431	2.383	52.171	7	5	clayey silt to silty clay
67.749	13.46	0.3114	2.314	62.027	6	5	clayey silt to silty clay
67.913	14.04	0.3257	2.320	63.991	7	5	clayey silt to silty clay
68.077	14.65	0.2563	1.749	51.745	7	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
68.241	15.69	0.3077	1.960	51.727	8	5	clayey silt to silty clay
68.406	13.39	0.2991	2.233	60.608	6	5	clayey silt to silty clay
68.570	15.48	0.3253	2.101	60.435	7	5	clayey silt to silty clay
68.734	15.89	0.3334	2.099	48.218	8	5	clayey silt to silty clay
68.898	14.94	0.3388	2.268	58.295	7	5	clayey silt to silty clay
69.062	15.64	0.3817	2.441	50.630	7	5	clayey silt to silty clay
69.226	13.81	0.3757	2.721	65.772	7	5	clayey silt to silty clay
69.390	20.46	0.4217	2.061	42.589	8	6	sandy silt to clayey silt
69.554	21.64	0.5329	2.462	38.911	10	5	clayey silt to silty clay
69.718	17.81	0.5428	3.049	49.901	9	5	clayey silt to silty clay
69.882	14.53	0.4466	3.074	59.618	9	4	silty clay to clay
70.046	15.45	0.5887	3.810	55.762	10	4	silty clay to clay
70.210	18.15	0.5624	3.099	48.115	9	5	clayey silt to silty clay
70.374	23.24	0.4638	1.995	25.743	9	6	sandy silt to clayey silt
70.538	18.73	0.4175	2.229	34.812	9	5	clayey silt to silty clay
70.702	15.17	0.3775	2.488	53.345	7	5	clayey silt to silty clay
70.866	16.84	0.3704	2.199	56.629	8	5	clayey silt to silty clay
71.030	18.86	0.3827	2.030	44.497	9	5	clayey silt to silty clay
71.194	19.71	0.4538	2.303	47.987	9	5	clayey silt to silty clay
71.358	19.06	0.4884	2.562	43.172	9	5	clayey silt to silty clay
71.522	16.61	0.4490	2.702	56.336	8	5	clayey silt to silty clay
71.686	13.83	0.3941	2.849	69.474	7	5	clayey silt to silty clay
71.850	14.47	0.3440	2.378	66.594	7	5	clayey silt to silty clay
72.014	13.57	0.3477	2.563	67.233	6	5	clayey silt to silty clay
72.178	14.07	0.3184	2.262	69.027	7	5	clayey silt to silty clay
72.343	15.47	0.2932	1.896	61.790	7	5	clayey silt to silty clay
72.507	14.65	0.3063	2.091	60.270	7	5	clayey silt to silty clay
72.671	12.85	0.3143	2.446	69.379	6	5	clayey silt to silty clay
72.835	13.73	0.2984	2.173	68.000	7	5	clayey silt to silty clay
72.999	13.63	0.3216	2.359	68.245	7	5	clayey silt to silty clay
73.163	14.33	0.3250	2.268	64.385	7	5	clayey silt to silty clay
73.327	17.24	0.3698	2.145	60.191	8	5	clayey silt to silty clay
73.491	18.88	0.3753	1.987	48.998	9	5	clayey silt to silty clay
73.655	13.81	0.3265	2.364	66.666	7	5	clayey silt to silty clay
73.819	13.56	0.3167	2.335	66.986	6	5	clayey silt to silty clay
73.983	13.60	0.3096	2.276	69.770	7	5	clayey silt to silty clay
74.147	14.07	0.3121	2.218	64.098	7	5	clayey silt to silty clay
74.311	13.90	0.3232	2.325	71.936	7	5	clayey silt to silty clay
74.475	13.94	0.3093	2.219	66.831	7	5	clayey silt to silty clay
74.639	14.71	0.3045	2.070	64.971	7	5	clayey silt to silty clay
74.803	13.47	0.3004	2.230	68.881	6	5	clayey silt to silty clay
74.967	13.69	0.3099	2.264	71.854	7	5	clayey silt to silty clay
75.131	13.82	0.3110	2.251	72.650	7	5	clayey silt to silty clay
75.295	13.86	0.3177	2.291	71.723	7	5	clayey silt to silty clay
75.459	13.67	0.3169	2.318	72.266	7	5	clayey silt to silty clay
75.623	14.19	0.3014	2.125	67.827	7	5	clayey silt to silty clay
75.787	14.62	0.3123	2.136	65.373	7	5	clayey silt to silty clay
75.951	14.01	0.3094	2.208	68.399	7	5	clayey silt to silty clay
76.115	14.01	0.2991	2.134	69.238	7	5	clayey silt to silty clay
76.280	13.69	0.2972	2.172	71.734	7	5	clayey silt to silty clay
76.444	13.58	0.3104	2.285	75.870	7	5	clayey silt to silty clay
76.608	13.75	0.3250	2.364	76.123	7	5	clayey silt to silty clay
76.772	13.83	0.3181	2.300	67.409	7	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
76.936	13.75	0.3082	2.242	72.801	7	5	clayey silt to silty clay
77.100	13.98	0.3063	2.191	73.863	7	5	clayey silt to silty clay
77.264	13.88	0.3064	2.208	76.898	7	5	clayey silt to silty clay
77.428	13.85	0.2937	2.121	76.254	7	5	clayey silt to silty clay
77.592	14.02	0.2890	2.061	73.629	7	5	clayey silt to silty clay
77.756	13.72	0.2832	2.064	77.007	7	5	clayey silt to silty clay
77.920	13.75	0.2920	2.123	77.539	7	5	clayey silt to silty clay
78.084	13.85	0.2928	2.114	78.439	7	5	clayey silt to silty clay
78.248	13.95	0.2930	2.100	77.595	7	5	clayey silt to silty clay
78.412	13.71	0.2992	2.182	78.242	7	5	clayey silt to silty clay
78.576	13.77	0.3028	2.199	78.122	7	5	clayey silt to silty clay
78.740	14.05	0.2966	2.111	77.510	7	5	clayey silt to silty clay
78.904	14.12	0.3005	2.128	74.795	7	5	clayey silt to silty clay
79.068	14.12	0.3020	2.140	79.067	7	5	clayey silt to silty clay
79.232	14.06	0.3019	2.147	77.348	7	5	clayey silt to silty clay
79.396	13.89	0.2974	2.141	80.770	7	5	clayey silt to silty clay
79.560	13.96	0.2914	2.087	79.466	7	5	clayey silt to silty clay
79.724	13.94	0.2908	2.086	82.801	7	5	clayey silt to silty clay
79.888	14.01	0.2995	2.137	82.104	7	5	clayey silt to silty clay
80.052	14.04	0.3102	2.209	82.184	7	5	clayey silt to silty clay
80.217	14.19	0.4412	3.110	78.878	9	4	silty clay to clay
80.381	14.17	0.3715	2.621	79.719	7	5	clayey silt to silty clay
80.545	14.19	0.3035	2.139	64.423	7	5	clayey silt to silty clay
80.709	14.02	0.3021	2.155	81.524	7	5	clayey silt to silty clay
80.873	14.42	0.2989	2.073	79.759	7	5	clayey silt to silty clay
81.037	14.35	0.3003	2.093	83.637	7	5	clayey silt to silty clay
81.201	14.22	0.3060	2.151	84.076	7	5	clayey silt to silty clay
81.365	14.18	0.3030	2.137	85.852	7	5	clayey silt to silty clay
81.529	14.22	0.3066	2.156	82.668	7	5	clayey silt to silty clay
81.693	14.17	0.3132	2.210	82.580	7	5	clayey silt to silty clay
81.857	14.87	0.3486	2.345	74.398	7	5	clayey silt to silty clay
82.021	18.20	0.3109	1.709	76.924	7	6	sandy silt to clayey silt
82.185	20.57	0.3674	1.786	45.405	8	6	sandy silt to clayey silt
82.349	14.95	0.3555	2.378	66.935	7	5	clayey silt to silty clay
82.513	14.50	0.3138	2.164	80.494	7	5	clayey silt to silty clay
82.677	14.57	0.2979	2.045	86.977	7	5	clayey silt to silty clay
82.841	14.62	0.2878	1.968	78.282	7	5	clayey silt to silty clay
83.005	14.01	0.2947	2.103	88.271	7	5	clayey silt to silty clay
83.169	14.20	0.3258	2.295	88.742	7	5	clayey silt to silty clay
83.333	14.64	0.3076	2.101	84.356	7	5	clayey silt to silty clay
83.497	15.80	0.2865	1.813	74.832	8	5	clayey silt to silty clay
83.661	16.30	0.2851	1.750	67.326	8	5	clayey silt to silty clay
83.825	17.03	0.3069	1.803	68.410	8	5	clayey silt to silty clay
83.990	16.70	0.3335	1.997	71.958	8	5	clayey silt to silty clay
84.154	15.77	0.3095	1.962	77.914	8	5	clayey silt to silty clay
84.318	16.08	0.3142	1.954	81.926	8	5	clayey silt to silty clay
84.482	15.45	0.3213	2.079	60.313	7	5	clayey silt to silty clay
84.646	16.40	0.2373	1.447	78.559	6	6	sandy silt to clayey silt
84.810	18.25	0.3041	1.667	63.432	7	6	sandy silt to clayey silt
84.974	17.28	0.3140	1.817	80.991	8	5	clayey silt to silty clay
85.138	23.34	0.2720	1.165	63.387	9	6	sandy silt to clayey silt
85.302	27.97	0.4331	1.549	51.750	11	6	sandy silt to clayey silt
85.466	21.08	0.3692	1.752	57.870	8	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
85.630	23.53	0.3779	1.606	54.415	9	6	sandy silt to clayey silt
85.794	31.05	0.5667	1.825	65.610	12	6	sandy silt to clayey silt
85.958	26.50	0.6715	2.534	43.223	13	5	clayey silt to silty clay
86.122	24.95	0.4772	1.913	70.534	10	6	sandy silt to clayey silt
86.286	23.90	0.4303	1.801	52.597	9	6	sandy silt to clayey silt
86.450	17.87	0.6238	3.491	79.533	11	4	silty clay to clay
86.614	27.03	0.9130	3.378	61.652	13	5	clayey silt to silty clay
86.778	25.73	0.7095	2.758	62.275	12	5	clayey silt to silty clay
86.942	30.17	0.5543	1.837	56.853	12	6	sandy silt to clayey silt
87.106	31.73	0.5827	1.836	52.533	12	6	sandy silt to clayey silt
87.270	31.58	0.6312	1.999	51.700	12	6	sandy silt to clayey silt
87.434	35.73	0.6798	1.903	55.719	14	6	sandy silt to clayey silt
87.598	27.59	0.5957	2.159	57.848	11	6	sandy silt to clayey silt
87.762	26.85	0.5815	2.166	57.327	10	6	sandy silt to clayey silt
87.927	28.43	0.7977	2.806	51.804	14	5	clayey silt to silty clay
88.091	53.40	0.9379	1.756	46.201	17	7	silty sand to sandy silt
88.255	113.50	1.2947	1.141	1.826	27	8	sand to silty sand
88.419	152.65	1.8988	1.244	-0.367	37	8	sand to silty sand
88.583	172.09	3.0756	1.787	3.612	41	8	sand to silty sand
88.747	181.87	3.8766	2.131	12.526	58	7	silty sand to sandy silt
88.911	181.87	4.3886	2.413	23.303	58	7	silty sand to sandy silt
89.075	175.36	4.4949	2.563	23.771	56	7	silty sand to sandy silt
89.239	163.73	4.3818	2.676	24.157	52	7	silty sand to sandy silt
89.403	148.37	4.0947	2.760	24.753	47	7	silty sand to sandy silt
89.567	120.75	3.7859	3.135	24.530	46	6	sandy silt to clayey silt
89.731	91.22	2.7100	2.971	24.775	35	6	sandy silt to clayey silt
89.895	81.22	1.9528	2.404	25.898	31	6	sandy silt to clayey silt
90.059	123.06	2.4081	1.957	21.897	39	7	silty sand to sandy silt
90.223	119.56	3.0840	2.580	15.137	38	7	silty sand to sandy silt
90.387	62.86	2.7451	4.367	23.800	30	5	clayey silt to silty clay
90.551	34.90	1.3430	3.848	30.026	17	5	clayey silt to silty clay
90.715	36.90	0.6602	1.789	65.280	14	6	sandy silt to clayey silt
90.879	70.63	1.1760	1.665	30.481	23	7	silty sand to sandy silt
91.043	77.69	1.6780	2.160	21.160	25	7	silty sand to sandy silt
91.207	122.03	2.8676	2.350	25.067	39	7	silty sand to sandy silt
91.371	126.69	3.0375	2.397	16.324	40	7	silty sand to sandy silt
91.535	118.63	3.0728	2.590	24.500	38	7	silty sand to sandy silt
91.699	119.34	2.9025	2.432	26.292	38	7	silty sand to sandy silt
91.864	116.99	2.7267	2.331	25.736	37	7	silty sand to sandy silt
92.028	114.34	2.6424	2.311	25.810	36	7	silty sand to sandy silt
92.192	109.26	2.5471	2.331	25.709	35	7	silty sand to sandy silt
92.356	104.35	2.4144	2.314	26.116	33	7	silty sand to sandy silt
92.520	115.42	2.4289	2.105	26.518	37	7	silty sand to sandy silt
92.684	124.88	2.6079	2.088	26.231	40	7	silty sand to sandy silt
92.848	123.32	2.6805	2.174	25.842	39	7	silty sand to sandy silt
93.012	119.40	2.5989	2.177	25.773	38	7	silty sand to sandy silt
93.176	130.27	2.7834	2.137	26.087	42	7	silty sand to sandy silt
93.340	142.70	2.9120	2.041	24.455	46	7	silty sand to sandy silt
93.504	140.28	2.9992	2.138	24.910	45	7	silty sand to sandy silt
93.668	141.12	3.0406	2.155	25.791	45	7	silty sand to sandy silt
93.832	135.37	3.1072	2.295	26.286	43	7	silty sand to sandy silt
93.996	133.57	3.1702	2.374	27.000	43	7	silty sand to sandy silt
94.160	144.18	3.3517	2.325	27.418	46	7	silty sand to sandy silt

Depth ft	Tip (Qt) (tsf)	Sleeve Friction (Fs) (tsf)	F.Ratio (%)	PP (U2) (psi)	SPT (blows/ft)	Zone	Soil Behavior Type UBC-1983
94.324	164.26	5.2914	3.221	27.474	63	6	sandy silt to clayey silt
94.488	252.60	4.4181	1.749	24.447	60	8	sand to silty sand
94.652	184.81	6.2759	3.396	26.276	88	12	sand to clayey sand (*)
94.816	149.03	3.3596	2.254	0.298	48	7	silty sand to sandy silt
94.980	135.91	2.5361	1.866	-4.780	43	7	silty sand to sandy silt
95.144	133.09	2.3979	1.802	-4.501	42	7	silty sand to sandy silt
95.308	273.33	10.5105	3.845	-3.521	131	12	sand to clayey sand (*)
95.472	360.60	13.3268	3.696	-2.696	173	12	sand to clayey sand (*)
95.636	329.81	16.0670	4.872	-4.823	316	11	very stiff fine grained (*)
95.801	296.58	13.1934	4.449	-3.758	284	11	very stiff fine grained (*)
95.965	287.82	12.7933	4.445	-4.365	276	11	very stiff fine grained (*)

APPENDIX C

APPENDIX C

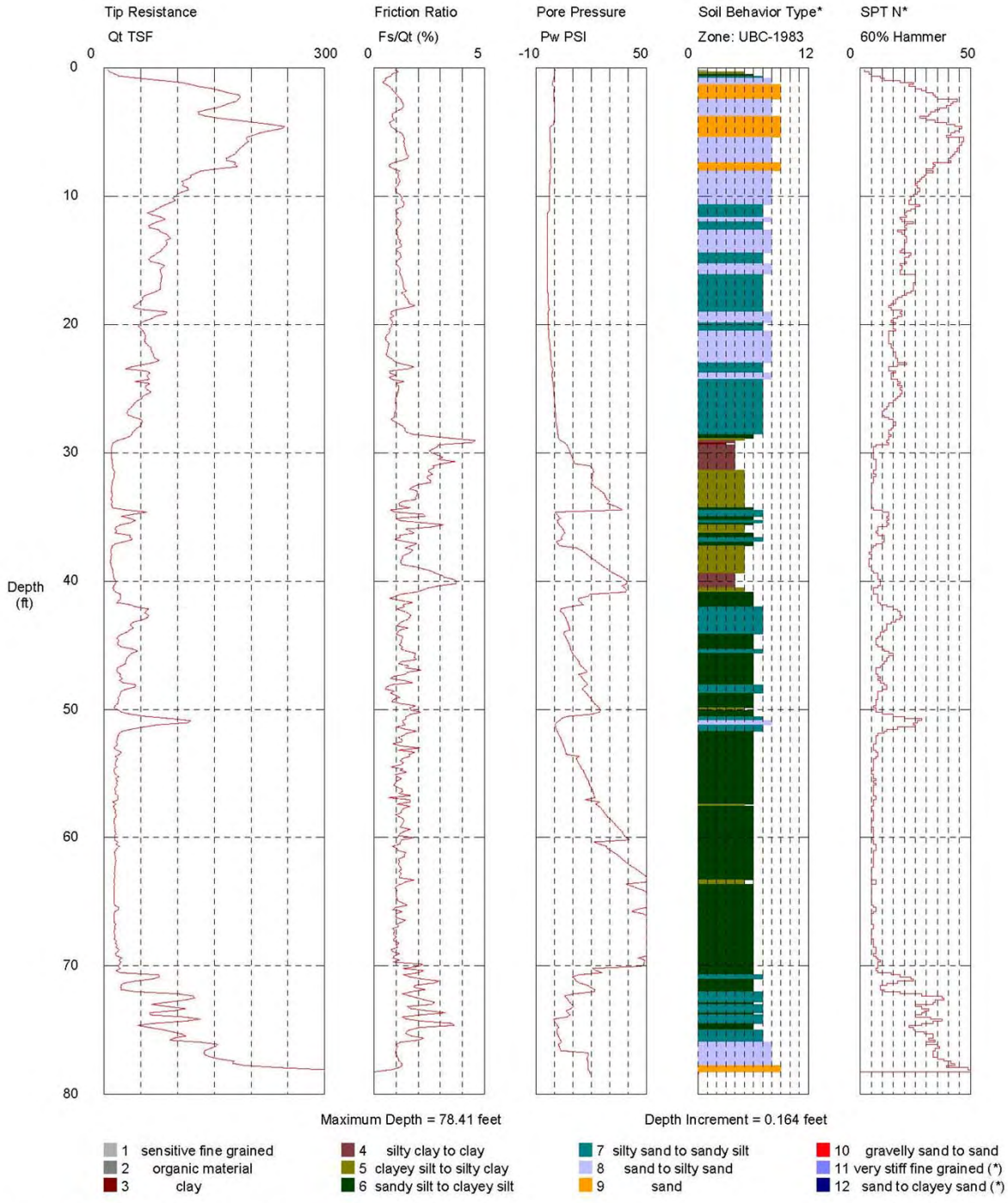
PREVIOUS EXPLORATIONS

This appendix includes exploration logs and laboratory testing result for explorations completed at or near the site by Kleinfelder, GeoEngineers, Hanson, and WSDOT. The locations of the explorations are shown on Figure 2.

GeoEngineers

Operator: Brown
Sounding: CPT-01
Cone Used: DPG1186

CPT Date/Time: 12/7/2011 2:11:44 PM
Location: Kelso Village
Job Number: 0291-041-01



*Soil behavior type and SPT based on data from UBC-1983

CPT-1

Kelso Village
Kelso, Washington

GeoEngineers

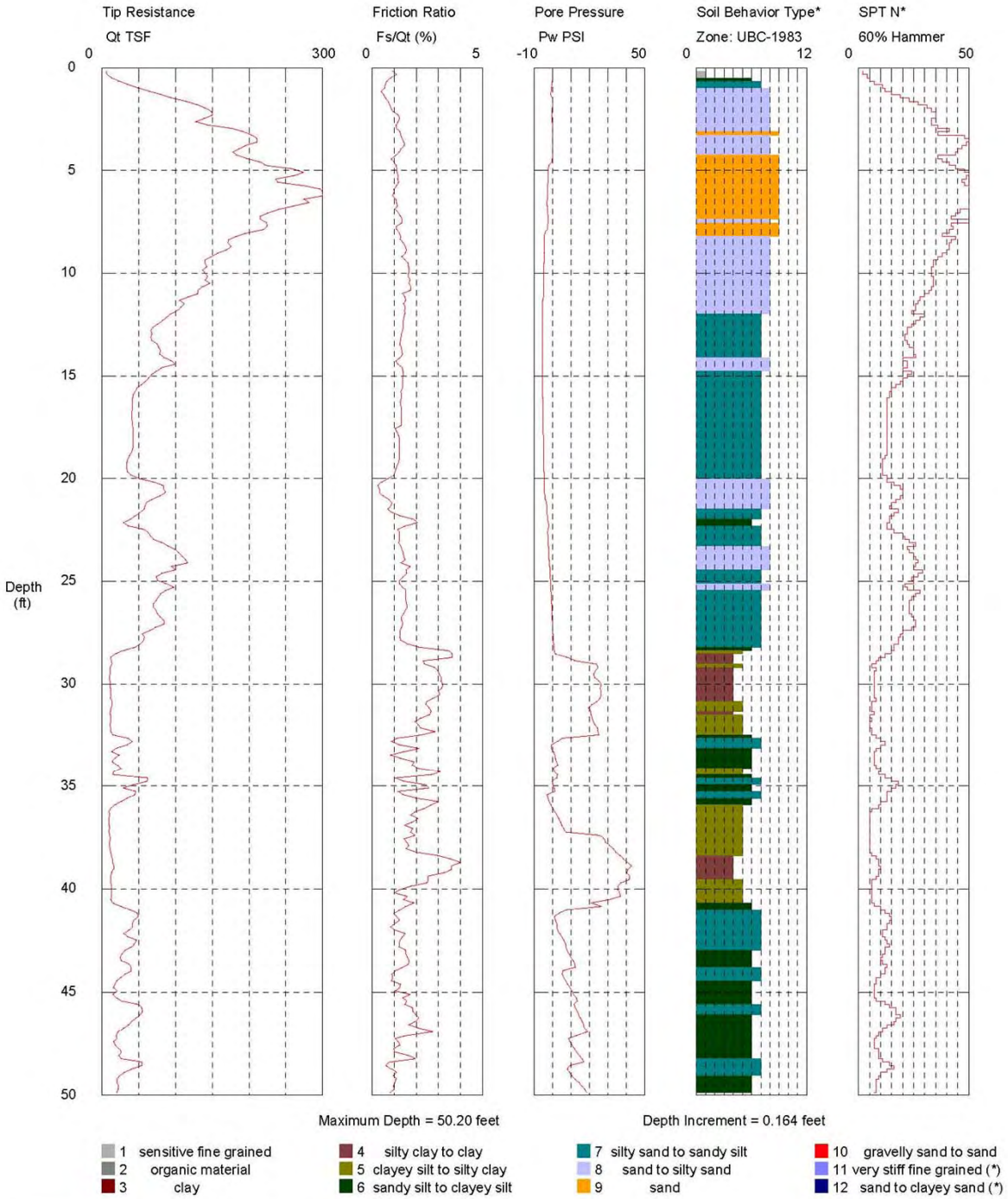
Figure A-1

0291-041-01

GeoEngineers

Operator: Brown
Sounding: CPT-02
Cone Used: DPG1186

CPT Date/Time: 12/8/2011 9:32:04 AM
Location: Kelso Village
Job Number: 0291-041-01



*Soil behavior type and SPT based on data from UBC-1983

CPT-2

Kelso Village
Kelso, Washington

GeoEngineers

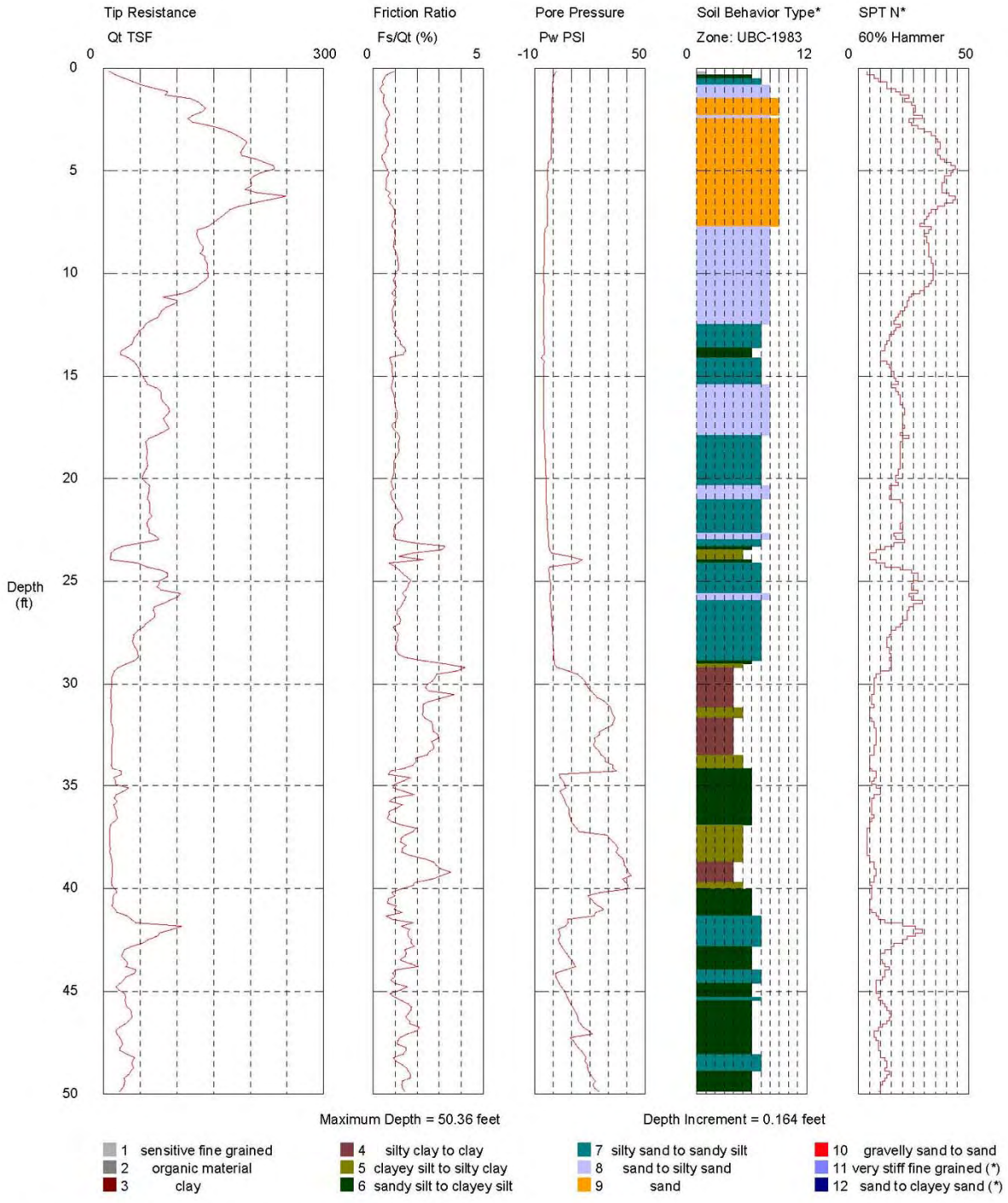
Figure A-2

0291-041-01

GeoEngineers

Operator: Brown
Sounding: CPT-03
Cone Used: DPG1186

CPT Date/Time: 12/7/2011 1:15:06 PM
Location: Kelso Village
Job Number: 0291-041-01



*Soil behavior type and SPT based on data from UBC-1983

CPT-3

Kelso Village
Kelso, Washington

GeoEngineers

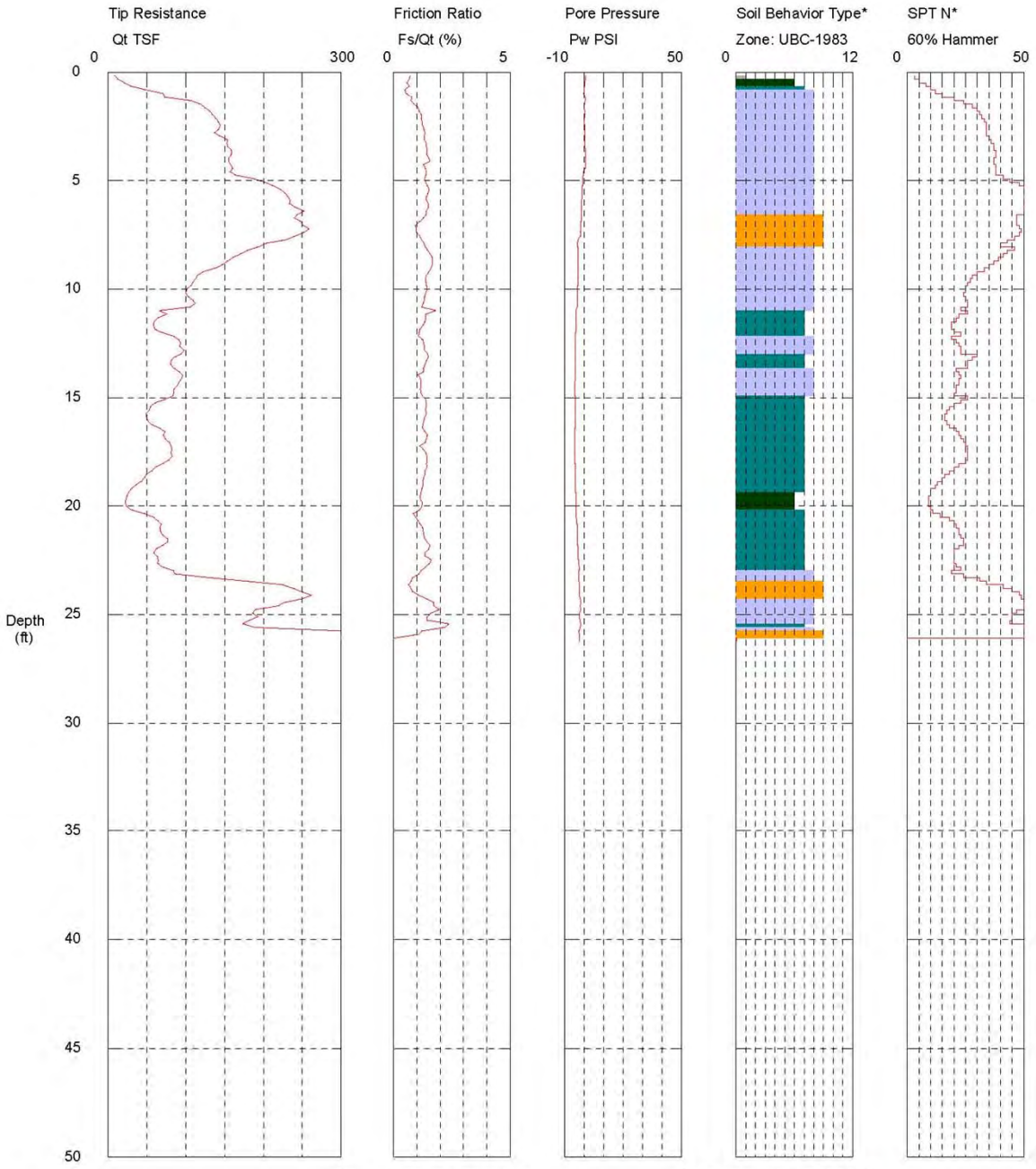
Figure A-3

0291-041-01

GeoEngineers

Operator: Brown
Sounding: CPT-04
Cone Used: DPG1186

CPT Date/Time: 12/8/2011 10:12:24 AM
Location: Kelso Village
Job Number: 0291-041-01



*Soil behavior type and SPT based on data from UBC-1983

CPT-4

Kelso Village
Kelso, Washington

GeoEngineers

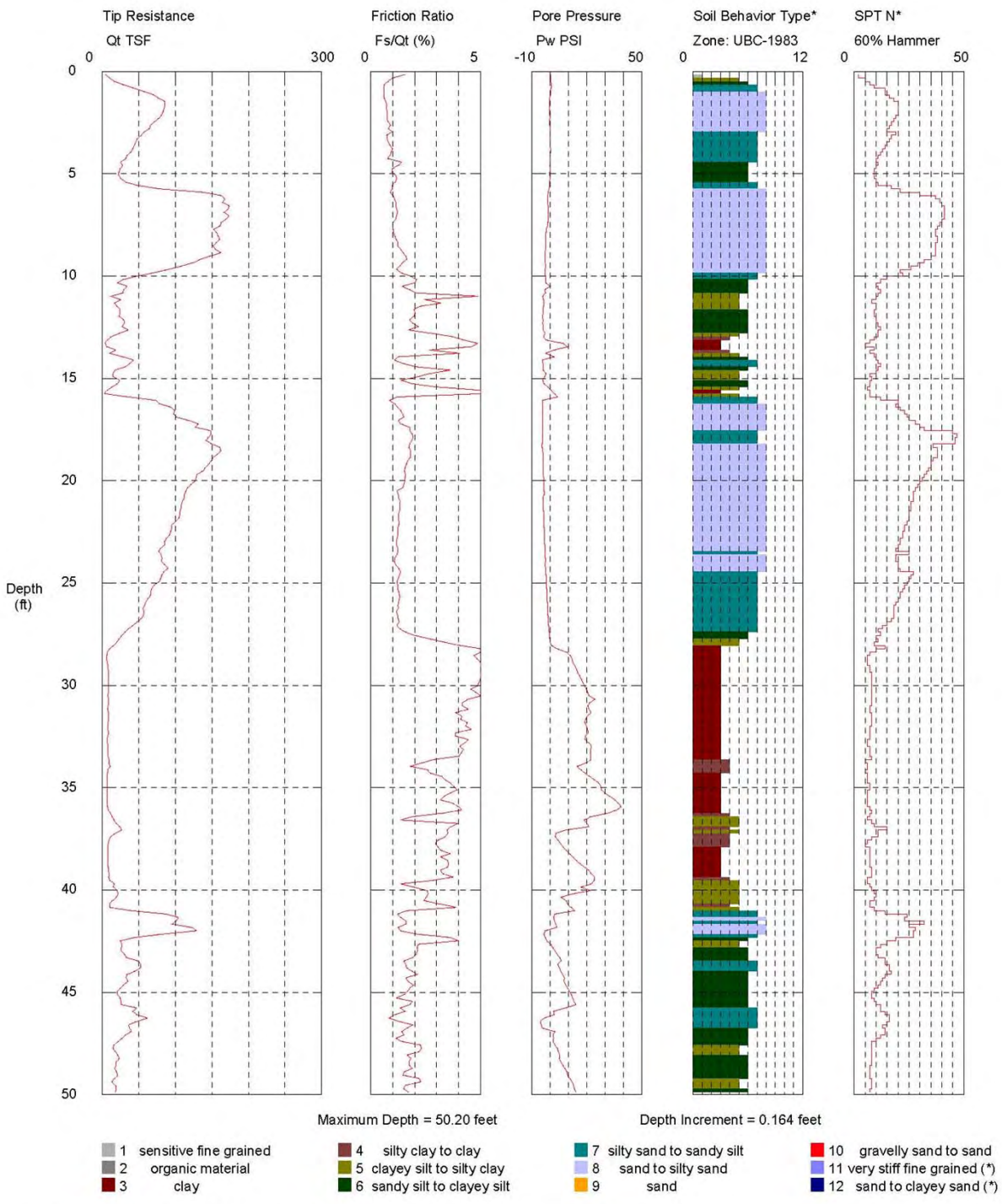
Figure A-4

0291-041-01

GeoEngineers

Operator: Brown
Sounding: CPT-05
Cone Used: DPG1186

CPT Date/Time: 12/8/2011 8:39:55 AM
Location: Kelso Village
Job Number: 0291-041-01



*Soil behavior type and SPT based on data from UBC-1983

CPT-5

Kelso Village
Kelso, Washington

GeoEngineers

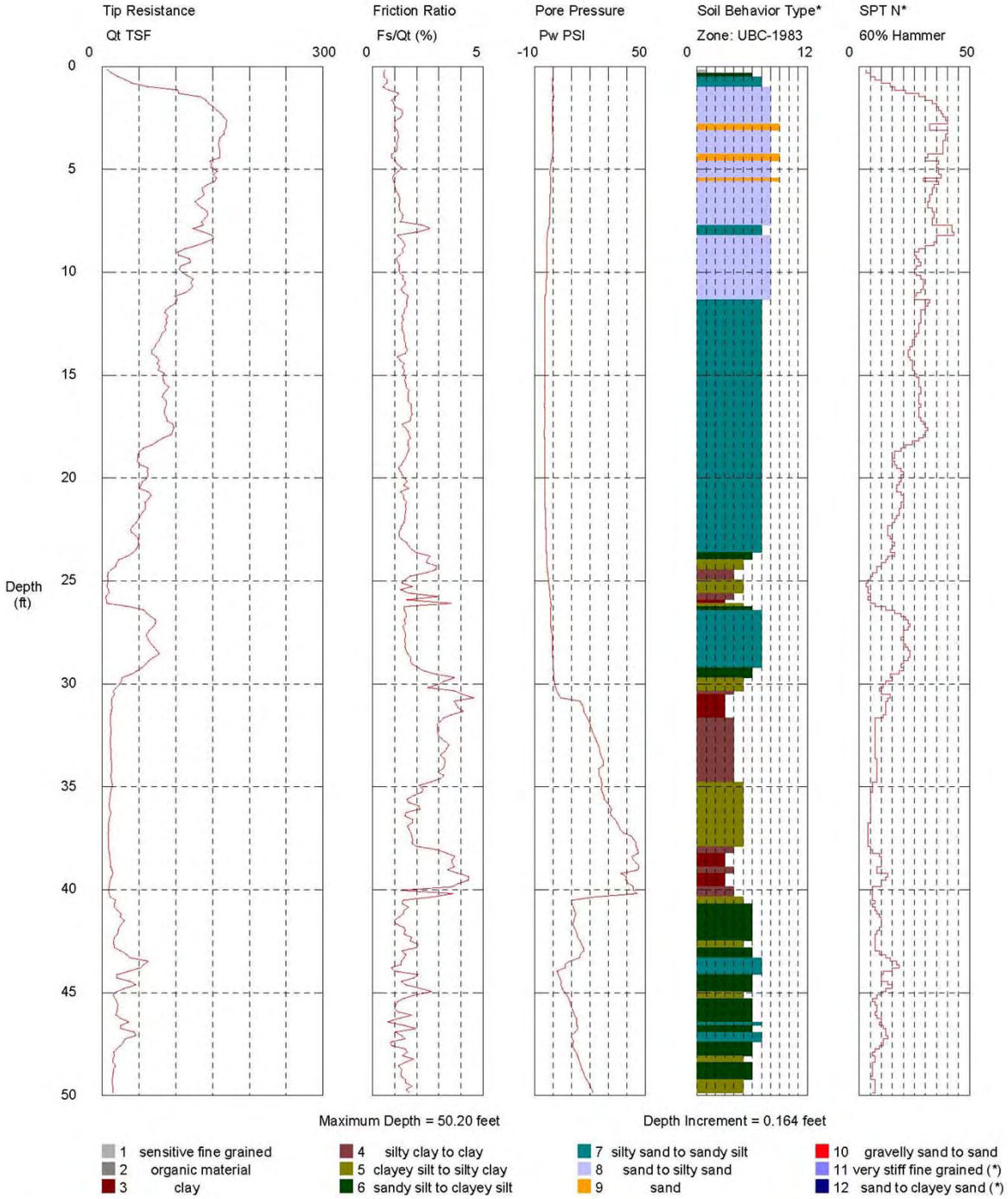
Figure A-5

0291-041-01

GeoEngineers

Operator: Brown
Sounding: CPT-06
Cone Used: DPG1186

CPT Date/Time: 12/7/2011 3:28:04 PM
Location: Kelso Village
Job Number: 0291-041-01



*Soil behavior type and SPT based on data from UBC-1983

CPT-6

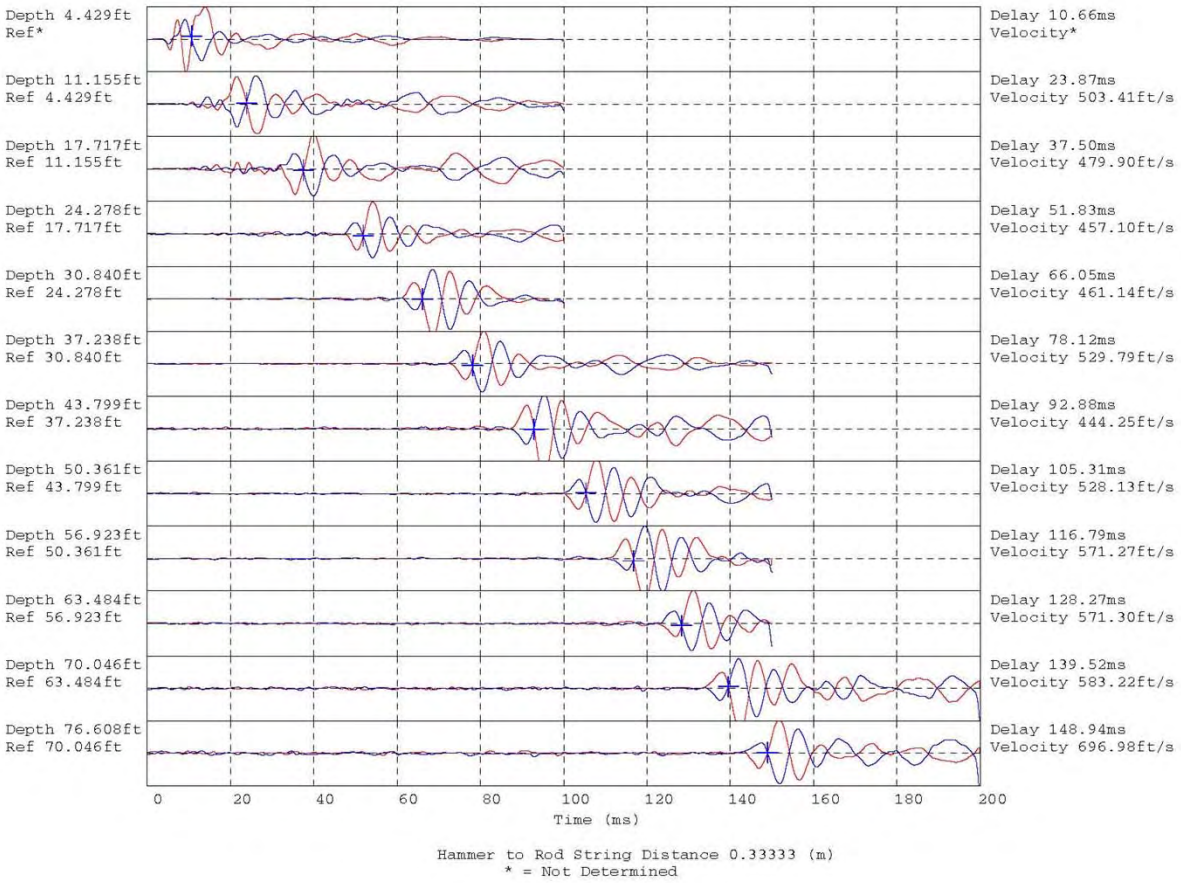
Kelso Village
Kelso, Washington

GeoEngineers

Figure A-6

0291-041-01

Shear Wave Velocity Plot
CPT-01 Kelso Village



Hammer to Rod String Distance 0.33333 (m)
* = Not Determined

In Situ Engineering

CPT-1 Seismic	
Kelso Village Kelso, Washington	
GeoEngineers	Figure A-7

0291-041-01

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	TESTING PROGRAM: LABORATORY: MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	OTHER TESTS	FIELD: PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	U.S.C.S. SYMBOL	SOIL DESCRIPTION
														Surface: fine to medium sand/brush
0									1 5 7		1	SP		SAND (SP): brown, dry to moist, medium dense, fine to medium sand, trace coarse sand, fine gravel, and silt. (FILL)
5									5 7 8		2			- Trace organics.
									5 7 10		3			
10									3 5 5		4			- Grades to fine to coarse sand, 1/4 inch of seam gray silt in tip, some fine to coarse gravel.
15									6 7 8		5	SP-SM		SAND WITH SILT (SP-SM): gray, moist to wet, fine to medium sand, trace coarse sand and fine gravel.
20														

DATE DRILLED: 9-18-06 | SURFACE ELEVATION (feet): 16.0 | DRILLING METHOD: HSA

LOGGED BY: S. Flowers | TOTAL DEPTH (feet): 31.5 | DRILLER: Holocene

REVIEWED BY: Kevin Roth | DIAMETER OF BORING (in): 8 | CASING SIZE: N/A

KLEINFELDER

GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 75737

Kelso Retail Development
I-5 and SR 432
Kelso, Washington

BORING LOG
B-1

Appendix
A - a

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

BY: _____ APPROV: _____

2002 STAN. INPUT/ALL OUTPUT 75737.GPJ 2000REV.GDT 10/5/06

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	TESTING PROGRAM: LABORATORY: MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	OTHER TESTS	FIELD: PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	U.S.C.S. SYMBOL	SOIL DESCRIPTION
20									3 3 13		6		SP-SM	SAND WITH SILT (SP-SM): gray, moist to wet, fine to medium sand, trace coarse sand and fine gravel.
25									4 5 15		7			
30									0 0 4		8		ML	CLAYEY SILT (ML): gray, wet, soft, low plasticity, fine to medium sand. (ALLUVUIM)
31.5														Boring terminated at 31.5 feet bgs. Groundwater seepage was observed, but depth was not determined due to drilling methods. Boring backfilled with bentonite chips and cuttings.

* SAMPLER TYPE: Cal. (3"OD) Split Spoon; SPT (2" OD) Split Spoon; Core Sample; Shelby Tube; Grab; No Recovery

**HAMMER WEIGHT: 300 lbs (30" Drop); 140 lbs (30" Drop)

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

BY: _____ APPROV: _____

2002 STAN. INPUT/ALL OUTPUT 75737.GPJ 2000REV.GDT 10/5/06

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 75737

Kelso Retail Development
I-5 and SR 432
Kelso, Washington

BORING LOG
B-1

Appendix
A - b

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	TESTING PROGRAM: LABORATORY: MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	FIELD: OTHER TESTS	PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	U.S.C.S. SYMBOL	SOIL DESCRIPTION
														Surface: fine to medium sand/brush
0									3 5 7		1	SP		SAND (SP): brown, moist, medium dense, fine to medium sand, trace coarse sand, fine gravel, and silt and organics. (FILL)
5									3 5 7		2			
									7 10 12		3			
10									7 9 12		4			
15									5 5 5		5			
20														

DATE DRILLED: 9-18-06 | SURFACE ELEVATION (feet): 16.0 | DRILLING METHOD: HSA

LOGGED BY: S. Flowers | TOTAL DEPTH (feet): 31.5 | DRILLER: Holocene

REVIEWED BY: Kevin Roth | DIAMETER OF BORING (in): 8 | CASING SIZE: N/A

KLEINFELDER

GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 75737

Kelso Retail Development
I-5 and SR 432
Kelso, Washington

BORING LOG
B-2

Appendix
A - a

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

APPROV: _____

BY: _____

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	TESTING PROGRAM: LABORATORY: MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	OTHER TESTS	FIELD: PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	U.S.C.S. SYMBOL	SOIL DESCRIPTION
20		▽							3 5 7		6	SP		SAND (SP): brown, moist, medium dense, fine to medium sand, trace coarse sand, fine gravel, and silt and organics. - Grades wet.
25									4 5 5		7	SP-SM		SAND WITH SILT (SP-SM): dark gray, wet, fine to medium sand, trace coarse sand.
30									0 1 3		8	CL		CLAY (CL): gray, wet, soft, low plasticity, 0.5 tsf with pocket penetrometer. (ALLUVIUM)
31.5														Boring terminated at 31.5 feet bgs. Groundwater seepage was encountered at 21 feet bgs during drilling. Boring backfilled with bentonite chips and cuttings.

* SAMPLER TYPE: Cal. (3"OD) Split Spoon; SPT (2" OD) Split Spoon; Core Sample; Shelby Tube; Grab; No Recovery

**HAMMER WEIGHT: 300 lbs (30" Drop); 140 lbs (30" Drop)

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

BY: _____ APPROV: _____

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 75737

Kelso Retail Development
I-5 and SR 432
Kelso, Washington

BORING LOG
B-2

Appendix
A - b

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	TESTING PROGRAM: LABORATORY: MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	OTHER TESTS	FIELD: PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	U.S.C.S. SYMBOL	SOIL DESCRIPTION
														Surface: fine to medium sand/brush
0												SP		SAND (SP): brown, moist, medium dense, fine to medium sand, trace to some coarse sand, trace fine gravel and organics. (FILL)
5									4 5 6		1			
10									6 4 4		2			- Grades loose, trace coarse sand.
15									2 2 3		3			
20												SP-SM		

DATE DRILLED: 9-18-06 | SURFACE ELEVATION (feet): 20.0 | DRILLING METHOD: HSA

LOGGED BY: S. Flowers | TOTAL DEPTH (feet): 31.5 | DRILLER: Holocene

REVIEWED BY: Kevin Roth | DIAMETER OF BORING (in): 8 | CASING SIZE: N/A

KLEINFELDER

GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NUMBER: 75737

Kelso Retail Development
I-5 and SR 432
Kelso, Washington

BORING LOG
B-3

Appendix
A - a

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

BY: _____ APPROV: _____

2002 STAN. INPUT/ALL OUTPUT 75737.GPJ 2000REV.GDT 10/5/06

DEPTH (feet)	WELL/PIEZO CONSTRUCTION	WATER LEVEL	TESTING PROGRAM: LABORATORY: MOISTURE CONTENT(%)	PLASTIC LIMIT(%)	LIQUID LIMIT(%)	% PASSING No. 200 SIEVE	OTHER TESTS	FIELD: PID (ppm)	BLOWS/6 in** (uncorrected)	SAMPLER *	SAMPLE NUMBER	U.S.C.S. NAME	U.S.C.S. SYMBOL	SOIL DESCRIPTION
20									1 2 5		4	SP-SM		SAND WITH SILT (SP-SM): gray, wet, loose, fine to medium sand, trace coarse sand.
25									0 0 0		5ab	CL		SANDY CLAY (CL): gray, wet, very soft, fine sand, low plasticity, organics.
30									2 2		6ab	SM		SILTY SAND (SM): brown, wet, very loose, trace silt.
31.5									2			CL		CLAY (CL): brown, wet, soft, laminated. (ALLUVIUM) Boring terminated at 31.5 feet bgs. Groundwater seepage was encountered at 20 feet bgs during drilling. Boring backfilled with bentonite chips and cuttings.

* SAMPLER TYPE — Cal. (3"OD) Split Spoon; SPT (2" OD) Split Spoon; Core Sample; Shelby Tube; Grab; No Recovery

**HAMMER WEIGHT — 300 lbs (30" Drop); 140 lbs (30" Drop)

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

APPROV: _____ BY: _____

2002 STAN. INPUT/ALL OUTPUT 75737.GPJ 2000REV.GDT 10/5/06

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

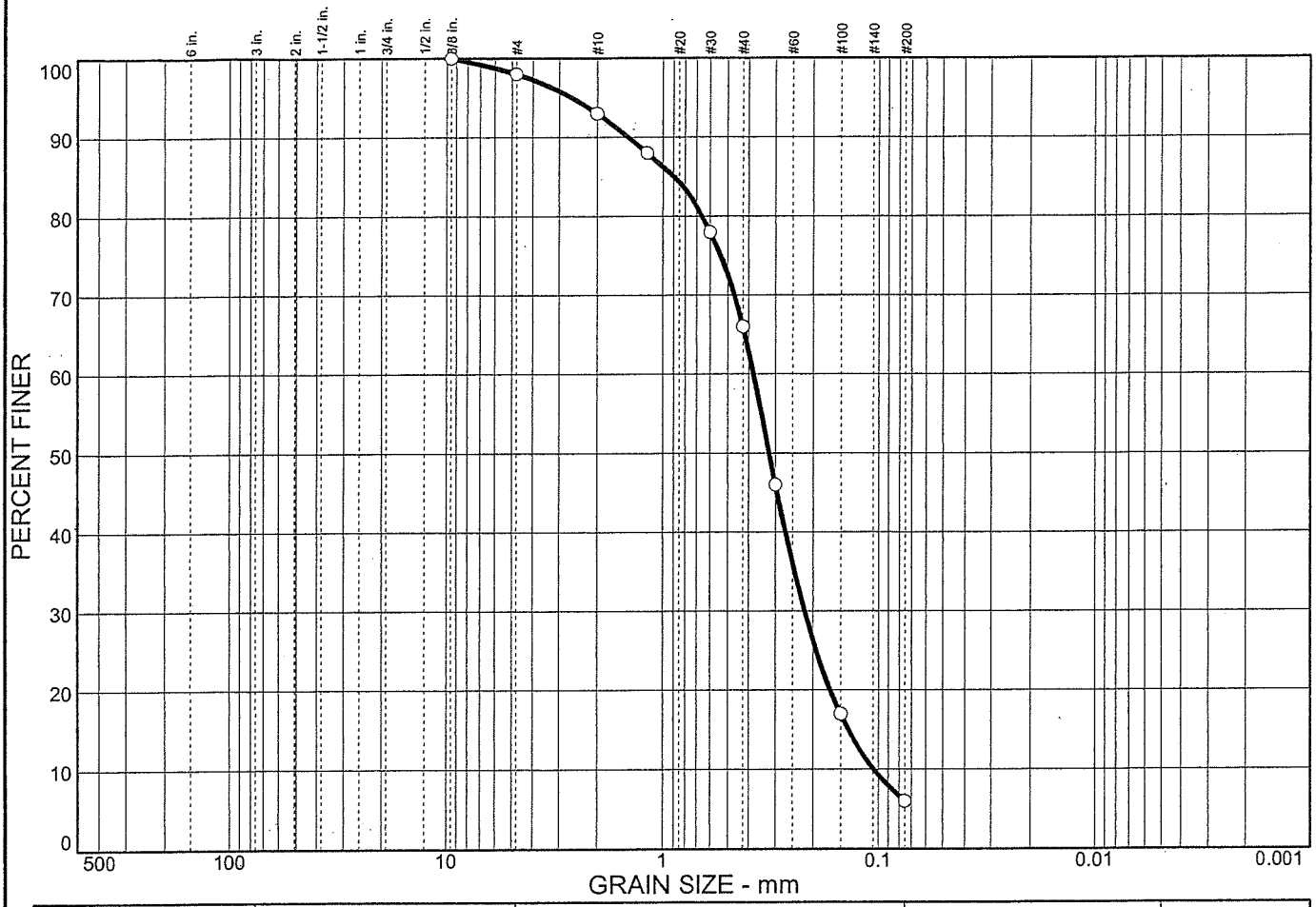
PROJECT NUMBER: 75737

Kelso Retail Development
I-5 and SR 432
Kelso, Washington

BORING LOG
B-3

Appendix
A - b

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	2	92	6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100		
#4	98		
#10	93		
#16	88		
#30	78		
#40	66		
#50	46		
#100	17		
#200	6.0		

* (no specification provided)

Soil Description

Poorly graded sand with silt
Moisture Content: 6.0%

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.895 D_{60}= 0.380 D_{50}= 0.321
D_{30}= 0.218 D_{15}= 0.138 D_{10}= 0.105
C_u= 3.62 C_c= 1.20

Classification

USCS= SP-SM AASHTO=

Remarks

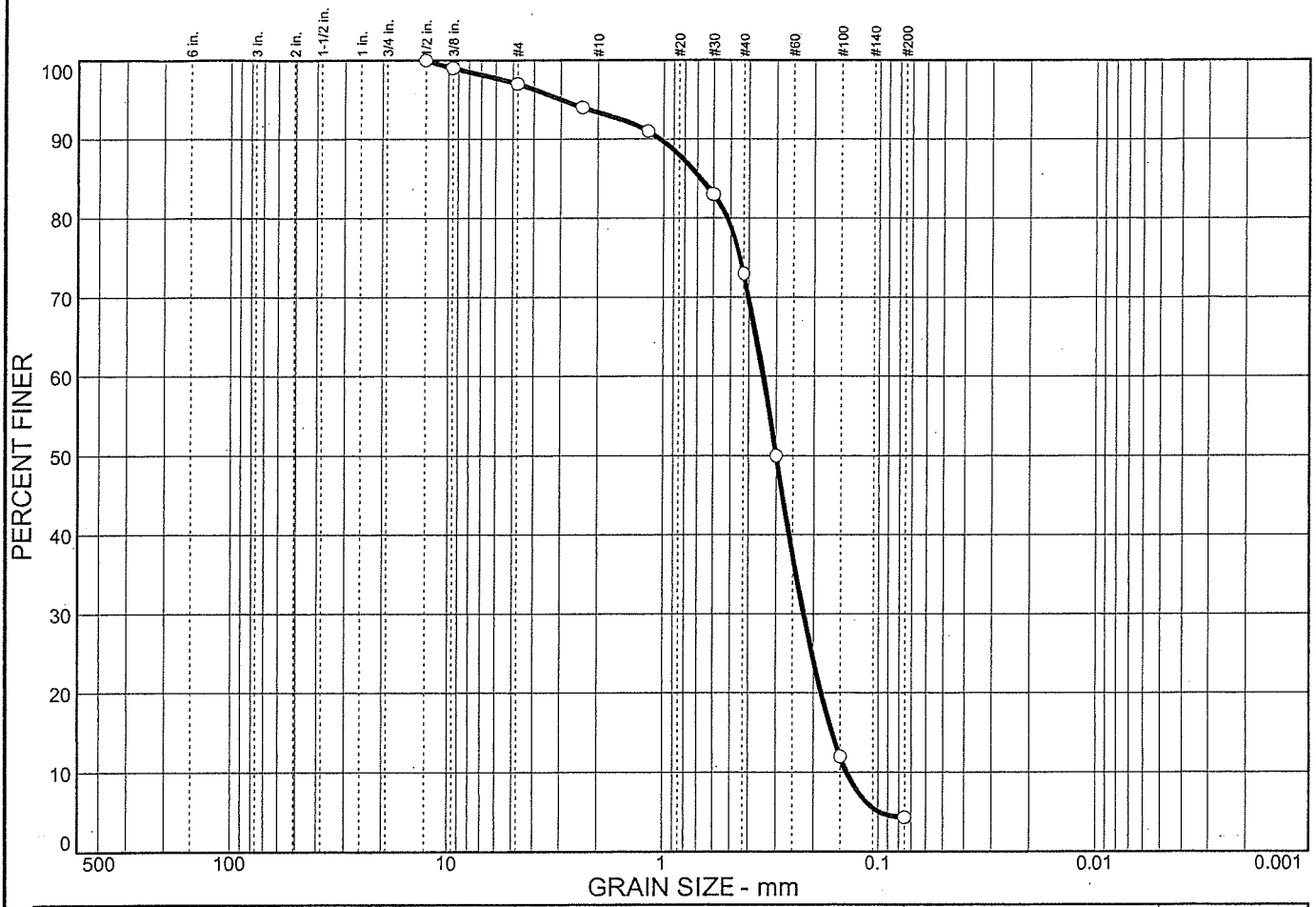
Tested By: B. Kochanski
Checked By: J. Revard, CET

Sample No.: 7510 **Source of Sample:** B-1 **Date:** 10/5/06
Location: **Elev./Depth:** 5"

KLEINFELDER, INC.

Client:
Project: Kelso Retail Development
Project No: 75737

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	3	93	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100		
3/8 in.	99		
#4	97		
#8	94		
#16	91		
#30	83		
#40	73		
#50	50		
#100	12		
#200	4.3		

* (no specification provided)

Soil Description

Poorly graded sand
Moisture Content: 5.4%

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.678 D_{60}= 0.344 D_{50}= 0.300
D_{30}= 0.222 D_{15}= 0.163 D_{10}= 0.140
C_u= 2.47 C_c= 1.02

Classification

USCS= SP AASHTO=

Remarks

Tested By: B. Kochanski
Checked By: J. Revard, CET

Sample No.: 7470 **Source of Sample:** B-2 **Date:** 10/5/06
Location: **Elev./Depth:** 7.5"

KLEINFELDER, INC.

Client:
Project: Kelso Retail Development
Project No: 75737

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-26386

HOLE No. H-5-06

Job No. XL-2963 SR 5 Elevation 29.0 ft

Sheet 1 of 3

Project I-5 / SR-432 Talley Way Interchange

Driller Danny Henderson Lic# 2742 T

Site Address SR-432 and I-5

Inspector Brian Hilts

Start May 17, 2006 Completion May 18, 2006 Well ID#

Equipment CME 850 w/ autohammer

Station R 29+41.80 Offset 222.96ft Rt. Hole Dia (inches) 4"ODx62'

Method Wet Rotary

Northing 290248.00 Easting 1037044.00 Collected by

Datum

County Cowlitz Subsection NE-SW Section 12 Range 2 WWM Township 7 N

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 3 4 (7)		D-1		Poorly graded SAND, loose, very dark gray, moist, homogeneous, HCl reaction not tested. Length Recovered 0.9 ft, Length Retained 0.9 ft		
5	25.0									
				3 4 4 (8)		D-2	GS MC	SP-SM, M.C. = 27% Poorly graded SAND with silt, loose, dark gray, moist, homogeneous, HCl reaction not tested. Length Recovered 1.0 ft, Length Retained 1.0 ft		
10	20.0									
				3 4 5 (9)		D-3		Poorly graded SAND with trace gravel, loose, dark gray, moist, homogeneous, HCl reaction not tested. Length Recovered 1.0 ft, Length Retained 1.0 ft 05/18/2006	▽	
15	15.0									
				9 12 15 (27)		D-4		Well graded SAND with trace gravel, dense, dark gray, wet, homogeneous, HCl reaction not tested. Length Recovered 1.1 ft, Length Retained 1.1 ft		
20	10.0									

SOILA XL-2963(TA-3023 OLD)(TA-2322 OLD)I-5 SR-432 TALLEY WAY INTERCHANGE.GPJ SOIL.GDT 9/3/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-26386

HOLE No. H-5-06

Job No. XL-2963 SR 5 Elevation 29.0 ft

Sheet 2 of 3

Project I-5 / SR-432 Talley Way Interchange

Driller Danny Henderson Lic# 2742 T

Depth (ft)	Elevation (ft)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		1 1 2 (3)		D-5	MC	M.C. = 85% SILT with some dark brown organics, very loose, dark gray, moist, homogeneous, HCl reaction not tested. Length Recovered 1.5 ft, Length Retained 1.5 ft *Note: A moisture can was obtained at the sample depth.*		
25	5							
				S-6		SILT, very loose, dark greenish gray, moist, homogeneous, HCl reaction not tested. Length Recovered 2.0 ft, Length Retained 2.0 ft		
30	0	3 2 3 (5)		D-7	GS MC AL	ML, M.C. = 40%, PI = NA Sandy SILT with silt lenses, loose, dark greenish gray, wet, stratified, HCl reaction not tested. Length Recovered 1.2 ft, Length Retained 1.2 ft		
		1 2 2 (4)		D-8		Silty SAND, very loose, dark gray, wet, homogeneous, HCl reaction not tested. Length Recovered 1.2 ft, Length Retained 1.2 ft		
35	-5							
		2 2 2 (4)		D-9		Sandy SILT, very loose, dark gray, wet, homogeneous, HCl reaction not tested. Length Recovered 1.1 ft, Length Retained 1.1 ft *Note: The morning of 05/18/06 the water table inside the casing was measured at 16.4 ft.*		
40	-10							
		1 2 1 (3)		D-10	GS MC	ML, M.C. = 43% SILT with sand, very loose, dark gray, wet, homogeneous, HCl reaction not tested. Length Recovered 1.3 ft, Length Retained 1.3 ft *Note: From 44 ft to 44.1 ft wood debris observed.*		
45	-15							

Field SPT (N) ◆ Moisture Content ✚ RQD ▨ 20 40 60 80

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-26386

HOLE No. H-5-06

Job No. XL-2963 SR 5 Elevation 29.0 ft

Sheet 3 of 3

Project I-5 / SR-432 Talley Way Interchange

Driller Danny Henderson Lic# 2742 T

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				1 2 1 (3)		D-11	MC	M.C. = 53% Sandy SILT with silty sand lenses, very loose, dark gray, wet, stratified, HCl reaction not tested. Length Recovered 1.3 ft, Length Retained 1.3 ft *Note: Moisture tin obtained at sample depth.*		
50	-20									
				1 1 2 (3)		D-12		SILT with lenses of silt, sandy silt and silty sand with some wood debris, very loose, dark gray, wet, stratified, HCl reaction not tested. Length Recovered 1.5 ft, Length Retained 1.5 ft		
55	-25									
				1 2 1 (3)		D-13		Sandy SILT, very loose, dark gray, wet, homogeneous, HCl reaction not tested. Length Recovered 1.5 ft, Length Retained 1.5 ft *Note: The hole stayed open to 58 ft after the casing was removed.*		
60	-30							End of test hole boring at 59.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. *Note: The water table was observed at 15 ft.*		
65	-35									
70	-40									

SOILA XL-2963(TA-3023 OLD)(TA-2322 OLD)I-5 SR-432 TALLEY WAY INTERCHANGE.GPJ SOIL.GDT 9/3/09

Job No. **XL-2963** Date **August 10, 2009**

Hole No. **H-5-06** Sheet **1** of **1**

Project **I-5 / SR-432 Talley Way Interchange**

Laboratory Summary

Washington State Department of Transportation

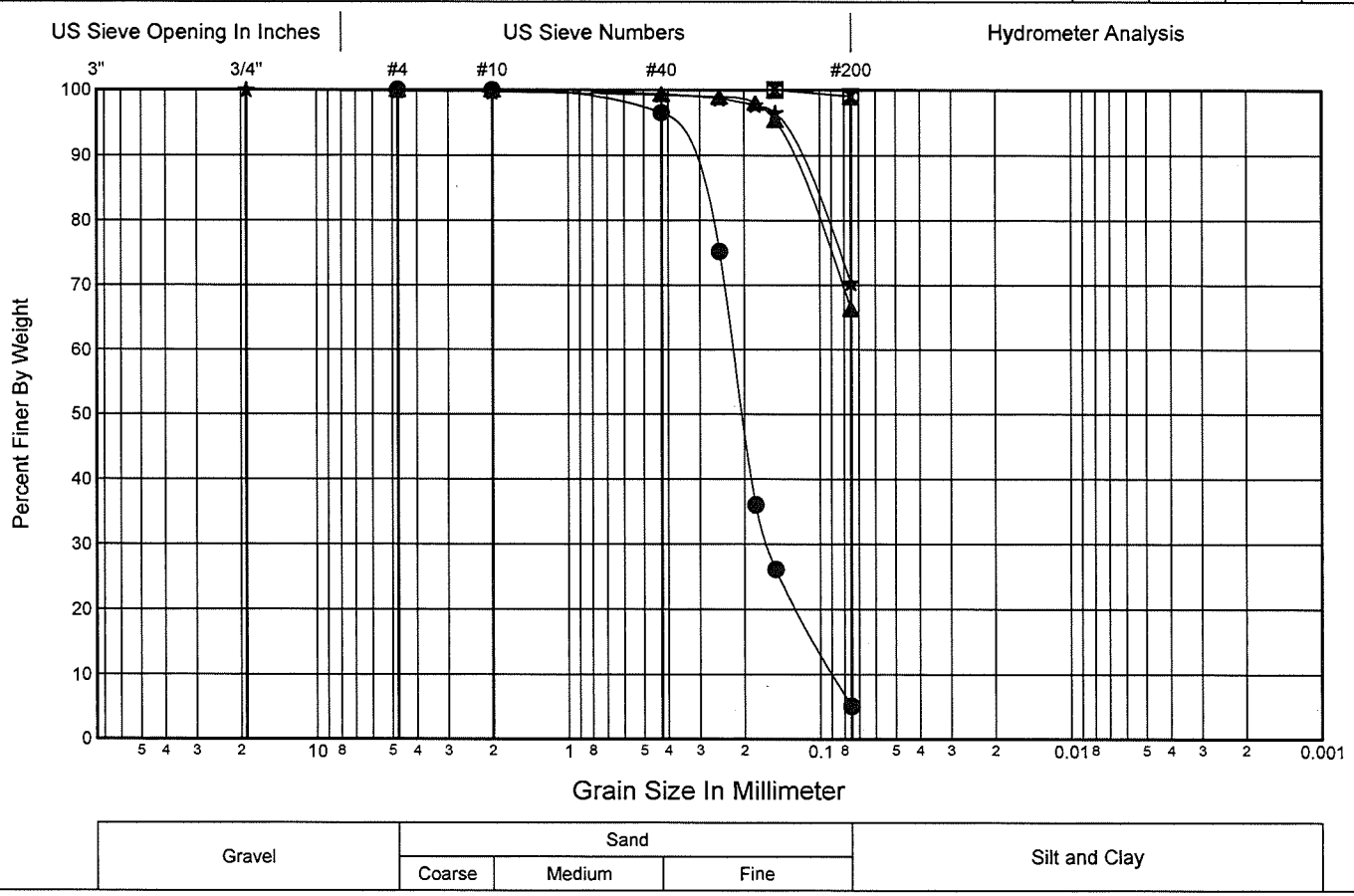
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	8.0	2.44	D-2	SP-SM	See Boring Log	POORLY GRADED SAND with SILT	27			
⊠	23.0	7.01	D-5		See Boring Log	Moisture Content only	85			
▲	30.0	9.14	D-7	ML	See Boring Log	SANDY SILT	40			
★	43.0	13.11	D-10	ML	See Boring Log	SILT with SAND	43			
⊙	48.0	14.63	D-11		See Boring Log	Moisture Content only	53			

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	94.9	5.1	1.3	2.5
⊠	0.0	1.0	99.0		
▲	0.0	33.7	66.3		
★	0.2	29.5	70.3		
⊙	0.0	1.0	99.0		

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.220	0.20	0.16	0.12	0.088
⊠					
▲					
★					
⊙					



Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-38-08

Sheet 1 of 7

Job No. XL-2963 SR 5 Elevation 21.7 ft

Project I-5/SR 432 Talley Way Interchange Driller Shepherd, Robert Lic# 2710

Site Address Vic SR432 and I-5 Inspector Brian Hilts

Start April 1, 2008 Completion April 3, 2008 Well ID# Equipment CME 55 with Autohammer

Station AL 115+36.54 Offset 260.37ft Rt. Hole Dia (inches) 6 Method Wet Rotary

Northing 2921005.27 Easting 1036401.82 Collected by HQ Geotech Division Datum State Plane South

County Cowlitz Subsection SE1/4 of NW1/4 Section 12 Range 2WWM Township 7

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
	20.0									
5			◆	7 14 18 (32)		D-1		Silty GRAVEL with sand, sub-angular, dense, grayish brown, moist, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft.		
	15.0									
10			◆	10 14 10 (24)		D-2		Silty GRAVEL with sand, sub-angular, medium dense, grayish brown, wet, homogenous, HCl not tested. Length Recovered:0.3 ft. Length Retained:0.3 ft.		
	10.0									
			◆	4 6 6 (12)		D-3		Silty GRAVEL with sand, sub-angular, medium dense, grayish green, moist, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft.		
15	5.0									
			◆	0 0		D-4		SILT with gravel, organic soil and peat, very loose, dark gray, moist, homogenous, HCl not tested.		
20										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-38-08

Job No. XL-2963 SR 5 Elevation 21.7 ft

Sheet 2 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Shepherd, Robert Lic# 2710

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				2 (2)				Length Recovered:0.8 ft. Length Retained:0.8 ft.		
	0									
				0 0 2 (2)		D-5	GS MC AL	SILT with some organic lenss, very loose, dark gray mottled with greenish gray, moist, laminated, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
25										
	-5									
						S-6		Sandy SILT with a trace of organics, dark gray, homogenous.		
30										
				1 1 2 (3)		D-7		Sandy SILT with a trace of organics, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-10									
				4 2 3 (5)		D-8		Sandy SILT, loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft.		
35										
	-15									
				2 1 1 (2)		D-9	GS MC AL	ML, MC=39%, PI=NA SILT, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
40										
	-20					S-10	GS MC AL CN	MC=37%(POST TEST MC:) ML, MC=42%, PI=NA SILT, dark gray, homogenous.		
				2 2		D-11	GS MC	ML, MC=44%, LL=34 Sandy SILT with organic lenss, very loose, dark gray,		
45										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-38-08

Job No. XL-2963 SR 5 Elevation 21.7 ft

Sheet 3 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Shepherd, Robert Lic# 2710

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				1 (3)			AL	wet, stratified, laminated, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-25									
50				1 1 1 (2)		D-12		Sandy SILT, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-30									
55				0 0 1 (1)		D-13		Sandy SILT with trace organics, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-35									
60				0 0 1 (1)		D-14		Sandy SILT, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-40									
65				0 0 2 (2)		D-15	GS MC AL	ML, MC=56%, LL=40 SILT, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-45									
70						S-16		Sandy SILT, dark gray, homogenous.		

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-38-08

Job No. XL-2963 SR 5 Elevation 21.7 ft

Sheet 4 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Shepherd, Robert Lic# 2710

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				0 1 2 (3)		D-17	GS MC AL	ML, MC=55%, LL=38 SILT, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
75	-50			0 0 2 (2)		D-18		SILT, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
80	-55			1 1 2 (3)		D-19	GS MC AL	ML, MC=59%, LL=37 SILT, very loose, dark gray, wet, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
85	-60			2 3 2 (5)		D-20		SILT with sand, loose, dark gray, wet, homogenous, HCl not tested. Length Recovered:0.9 ft. Length Retained:0.9 ft.		
90	-65			2 5 6 (11)		D-21		SILT with sand, medium dense, dark gray, wet, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
95	-70					S-22		SILT with trace fine sand, dark gray, homogenous.		

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-38-08

Job No. XL-2963 SR 5 Elevation 21.7 ft

Sheet 5 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Shepherd, Robert Lic# 2710

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				0 0 0 (0)		D-23	GS MC AL	ML, MC=48%, LL=28 SILT with sand, very loose, dark gray, wet, stratified, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft. *Note: The bottom 0.3 feet of sample was silt with a trace of brown organics.*		
	-75									
				0 2 2 (4)		D-24		SILT with sand, very loose, dark gray, moist, homogenous, HCl not tested, with a trace of brown organics. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
100										
	-80									
				0 2 2 (4)		D-25		SILT with some brown organics, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
105										
	-85									
						S-26		SILT, dark gray, homogenous.		
110										
				0 2 2 (4)		D-27	GS MC AL	ML, MC=45%, LL=39 SILT with one gravel, very loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-90									
115										
	-95									
				0 3		D-28		SILT, loose, dark gray, moist, homogenous, HCl not tested, (moisture tin obtained).		
120										

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-38-08

Job No. XL-2963 SR 5 Elevation 21.7 ft

Sheet 6 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Shepherd, Robert Lic# 2710

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 (6)				Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-100									
				0 2 3 (5)		D-29		SILT with trace brown organics, loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
125										
	-105									
						S-30		SILT, dark gray, homogenous.		
130										
				5 4 5 (9)		D-31		SILT with some brown organics, loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-110									
				0 6 7 (13)		D-32	GS MC AL	ML, MC=36%, PI=NA SILT with sand, medium dense, dark greenish gray, wet, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
135										
	-115									
				9 11 13 (24)		D-33		Sandy SILT with gravel, medium dense, dark greenish gray, wet, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
140										
	-120									
				8 10		D-34	GS MC	ML, MC=34% Sandy SILT stratified with silty sand, dense, dark		
145										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-38-08

Job No. XL-2963 SR 5 Elevation 21.7 ft

Sheet 7 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Shepherd, Robert Lic# 2710

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				17 (27)				greenish gray, wet, stratified, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. *Note: At 146 feet the soil became denser demonstrated by drilling.*		
	-125									
				>> 50/3" (REF)		D-35		Sandy SILT, very dense, dark gray, dry, homogenous, HCl not tested. Length Recovered:0.3 ft. Length Retained:0.3 ft.		
150										
	-130									
				>> 28 50/4" (REF)		D-36	GS MC AL	ML, MC=20%, PI=9 Sandy SILT, very dense, dark grayish brown, dry, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft.		
155										
	-135									
				>> 50/3" (REF)		D-37		Poorly graded SAND, very dense, dark gray, moist, homogenous, HCl not tested. Length Recovered:0.3 ft. Length Retained:0.3 ft.		
160										
	-140									
				>> 50/3" (REF)		D-38		Poorly graded SAND, very dense, gray, moist. Length Recovered:0.3 ft. Length Retained:0.3 ft.		
165								The implied accuracy of the borehole location information displayed on this boring log is typically sub-meter in (X,Y) when collected by the HQ Geotech Division and sub-centimeter in (X,Y,Z) when collected by the Region Survey Crew.		
	-145							End of test hole boring at 164.3 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
170										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-39-09

Job No. XL-2963 SR 5 Elevation 36.5 ft

Sheet 1 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Cooper, Richard Lic# 2964T

Site Address Vic SR432 and I-5

Inspector Harvey, Thomas #2599

Start May 12, 2009 Completion May 13, 2009 Well ID# Equipment CME 45 (9C4-8) - AH

Station AL 115+57.83 Offset 331.64ft Rt. Hole Dia (inches) 6 Method Wet Rotary

Northing 290915.82 Easting 1036429.80 Collected by HQ Geotech Division Datum State Plane South

County Cowlitz Subsection SE1/4 of NW1/4 Section 12 Range 2WWM Township 7

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								5/13/2005	▽	
	35.0			1 1 1 (2)		D-1		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft.		
5				1 2 1 (3)		D-2		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	30.0			1 2 2 (4)		D-3		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
10				2 2 1 (3)		D-4		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
	25.0			3 2 3 (5)		D-5		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
15				3 3 3 (6)		D-6		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
	20.0			2 2 1 (3)		D-7		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
20										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-39-09

Job No. XL-2963 SR 5 Elevation 36.5 ft

Sheet 2 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Cooper, Richard Lic# 2964T

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				1 2 1 (3)		D-8		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
25	15			2 2 2 (4)		D-9		Silty SAND, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
30	10			1 2 2 (4)		D-10		Silty SAND, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
35	5			2 2 2 (4)		D-11		Silty SAND, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
40	0			1 2 1 (3)		D-12		Silty SAND, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
45	-5									

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-39-09

Job No. XL-2963 SR 5 Elevation 36.5 ft

Sheet 3 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Cooper, Richard Lic# 2964T

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				1 1 2 (3)		D-13		Silty SAND, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft.		
	-10									
50				2 1 1 (2)		D-14		Silty SAND, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-15									
55				2 1 1 (2)		D-15		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-20									
60				2 2 2 (4)		D-16		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-25									
65				1 2 2 (4)		D-17		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-30									
70										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-39-09

Job No. XL-2963 SR 5 Elevation 36.5 ft

Sheet 4 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Cooper, Richard Lic# 2964T

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				2 2 3 (5)		D-18		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
75	-35			3 4 5 (9)		D-19		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
80	-40			7 11 17 (28)		D-20		Poorly graded SAND, dense, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
85	-45			3 2 3 (5)		D-21		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
90	-50			3 4 3 (7)		D-22		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
95	-55									

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-39-09

Job No. XL-2963 SR 5 Elevation 36.5 ft

Sheet 5 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Cooper, Richard Lic# 2964T

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
	-60			2 3 3 (6)		D-23		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
100	-65			4 4 4 (8)		D-24		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
105	-70			2 2 2 (4)		D-25		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
110	-75			2 3 3 (6)		D-26		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
115	-80			2 2 2 (4)		D-27		Sandy SILT, very loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
120										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-39-09

Job No. XL-2963 SR 5 Elevation 36.5 ft

Sheet 6 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Cooper, Richard Lic# 2964T

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 3 4 (7)		D-28		Sandy SILT, loose, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft. *Note: 8-inch piece of wood observed.*		
	-85									
125				4 4 13 (17)		D-29		Sandy SILT, medium dense, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-90									
130				11 14 19 (33)		D-30		Sandy SILT, dense, gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
	-95									
135				14 19 24 (43)		D-31		SILTSTONE, dense, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	-100									
140										
	-105									
145										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32521

HOLE No. H-39-09

Job No. XL-2963 SR 5 Elevation 36.5 ft

Sheet 7 of 7

Project I-5/SR 432 Talley Way Interchange

Driller Cooper, Richard Lic# 2964T

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
	-110							The implied accuracy of the borehole location information displayed on this boring log is typically sub-meter in (X,Y) when collected by the HQ Geotech Division and sub-centimeter in (X,Y,Z) when collected by the Region Survey Crew.		
150	-115							End of test hole boring at 141.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
155	-120							Bail/Recharge test: Hole Diameter: 6 in. Depth of boring during bail test: 136.5 ft Depth of casing during bail test: 130 ft Bailed bore hole water level to 15 ft Observed recharge after 10 minutes was 0.6 ft		
160	-125									
165	-130									
170										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-32523

HOLE No. PP-2-08

Job No. XL-2963 SR 5 Elevation 32.3 ft

Sheet 1 of 1

Project I-5/SR 432 Talley Way Interchange

Driller Henderson, Danny Lic# 2742

Site Address Vic SR432 and I-5

Inspector Vince Johnson

Start March 7, 2008 Completion March 7, 2008 Well ID#

Equipment CME 55 with Autohammer

Station 104+80.27 Offset 489.71ft Rt. Hole Dia (inches) 4

Method Wet Rotary

Northing 290607.53 Easting 1035301.45 Collected by HQ Geotech Division

Datum State Plane South

County Cowlitz Subsection SW1/4 of NW1/4 Section 12 Range 2WWM Township 7

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 5 8 8 (13)		D-1		Poorly graded SAND with silt, medium dense, dark gray, moist, homogenous, HCl not tested. Length Recovered:2 ft. Length Retained:2 ft.		
	30.0									
				4 7 7 7 (14)		D-2		Poorly graded SAND with silt, medium dense, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
5										
				3 3 4 4 (7)		D-3	GS MC	SP-SM, MC=22% Poorly graded SAND with silt, loose, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft.		
	25.0									
				3 4 6 7 (10)		D-4		Poorly graded SAND with silt and trace gravel, medium dense, dark grayish brown, moist, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
10										
				6 5 6 7 (11)		D-5		Poorly graded SAND with silt and trace gravel, medium dense, dark grayish brown, wet, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
	20.0									
				5 7 5 6 (12)		D-6		Poorly graded SAND with silt and trace gravel, medium dense, dark gray, wet, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft.		
15										
	15.0							End of test hole boring at 16 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal The implied accuracy of the borehole location information displayed on this boring log is typically sub-meter in (X,Y) when collected by the HQ Geotech Division and sub-centimeter in (X,Y,Z) when collected by the Region Survey Crew.		
20										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Job No. **XL-2963** Date **August 10, 2009**

Hole No. **PP-2-08** Sheet **1** of **1**

Project **I-5/SR 432 Talley Way Interchange**

Laboratory Summary

Washington State Department of Transportation

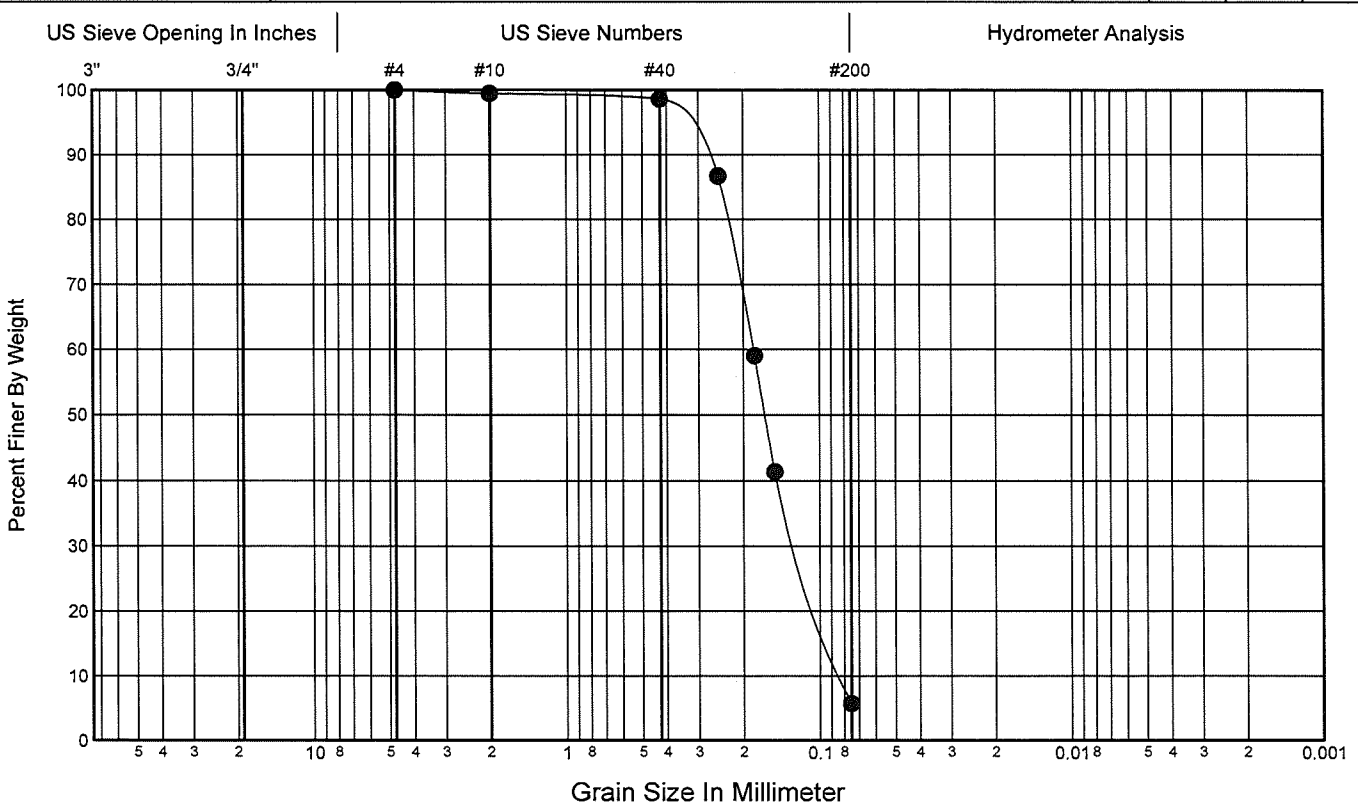
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	**7.0**	**2.13**	**D-3**	**SP-SM**	**See Boring Log**	**POORLY GRADED SAND with SILT**	**22**			

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	**0.0**	**94.3**	**5.7**	**1.0**	**2.2**

GRADATION VALUES

	D60	D50	D30	D20	D10
●	**0.182**	**0.16**	**0.12**	**0.10**	**0.082**



Washington State Department of Transportation

LOG OF TEST BORING

Start Card R-72688

HOLE No. SP-2p-08

Sheet 1 of 2

Job No. XL-2963 SR 5 Elevation 27.9 ft

Project I-5/SR 432 Talley Way Interchange

Driller Henderson, Danny Lic# 2742

Site Address Vic SR432 and I-5

Inspector Vince Johnson

Start March 5, 2008 Completion March 5, 2008 Well ID# APJ-534

Equipment CME 55 with Autohammer

Station 107+02.36 Offset 226.78ft Lt. Hole Dia (inches) 4

Method Wet Rotary

Northing 291330.86 Easting 1035503.52 Collected by HQ Geotech Division

Datum State Plane South

County Cowlitz Subsection SW1/4 of NW1/4 Section 12 Range 2WWM Township 7

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				1 1 2 2 (3)		D-1		Poorly graded SAND with organics (hair roots), very loose, dark brown, moist, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft.		
	25.0									
5				4 11 12 14 (23)		D-2		Well graded SAND with silt and trace gravels, medium dense, dark brown, moist, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft.		
	20.0			7 9 9 9 (18)		D-3	GS MC	SW-SM, MC=18% Well graded SAND with silt, medium dense, dark brown, moist, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft.		
10				6 8 8 8 (16)		D-4		Well graded SAND with silt and trace gravels, medium dense, dark brown, wet, stratified, HCl not tested. Length Recovered:2 ft. Length Retained:2 ft. 3/5/2008	▽	
	15.0			1 3 3 3 (6)		D-5		Silty SAND, loose, dark brown, wet, stratified, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft. *NOTE: Metal fragment in sample.*		
15				2 2 2 2 (4)		D-6		SILT with sand, trace gravels and organics, very loose, dark gray, wet, stratified, HCl not tested, upper 0.2 well graded sand. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
	10.0							The implied accuracy of the borehole location information displayed on this boring log is typically sub-meter in (X,Y) when collected by the HQ Geotech Division and sub-centimeter in (X,Y,Z) when collected by the Region Survey Crew.		
20										

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card R-72688

HOLE No. SP-2p-08

Job No. XL-2963 SR 5 Elevation 27.9 ft

Sheet 2 of 2

Project I-5/SR 432 Talley Way Interchange

Driller Henderson, Danny Lic# 2742

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
0	27.9							Water level before bailing: 2.1ft Bailed bore hole water level to 12.7ft Recharge after 1 minutes :12ft Recharge after 5 minutes :11.1ft Recharge after 10 minutes :10.6ft		
5	22.9									
10	17.9									
15	12.9									
20	7.9									
25	2.9									
30	-2.1							End of test hole boring at 16 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
35	-7.1									
40	-12.1									
45	-17.1									

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card R-72688

HOLE No. SP-5p-08

Sheet 1 of 2

Job No. XL-2963 SR 5 Elevation 34.7 ft

Project I-5/SR 432 Talley Way Interchange Driller Henderson, Danny Lic# 2742

Site Address Vic of Talley Way and SR432 Inspector Vince Johnson

Start March 7, 2008 Completion March 7, 2008 Well ID# APJ-537 Equipment CME 55 with Autohammer

Station 107+01.97 Offset 184.48ft Rt. Hole Dia (inches) 4 Method Wet Rotary

Northing 290925.20 Easting 1035556.44 Collected by HQ Geotech Division Datum State Plane South

County Cowlitz Subsection SW1/4 of NW1/4 Section 12 Range 2WWM Township 7

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 4 4 4 (8)		D-1	GS MC	SP, MC=7% Poorly graded SAND, loose, grayish brown, moist, homogenous, HCl not tested. Length Recovered:1.8 ft. Length Retained:1.8 ft.		
									3/7/2008	
5	30.0			3 2 2 1 (4)		D-2		Poorly graded SAND, very loose, dark gray, wet, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
				2 6 12 12 (18)		D-3		Poorly graded SAND, medium dense, dark gray, wet, stratified, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
10	25.0			9 13 14 16 (27)		D-4		Poorly graded SAND, dense, dark gray, wet, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
				9 13 14 15 (27)		D-5		Poorly graded SAND, dense, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft.		
				7 15 16 15 (31)		D-6		Poorly graded SAND, dense, dark gray, moist, homogenous, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft.		
15	20.0			8 11 14 14 (25)		D-7		Poorly graded SAND, dense, dark grayish brown, wet, laminated, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
20	15.0			6 10		D-8	GS MC	SM, MC=27% Silty SAND, medium dense, dark gray, wet, laminated,		

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card R-72688

HOLE No. SP-5p-08

Job No. XL-2963 SR 5 Elevation 34.7 ft

Sheet 2 of 2

Project I-5/SR 432 Talley Way Interchange

Driller Henderson, Danny Lic# 2742

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				10 9 (20)				HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
								The implied accuracy of the borehole location information displayed on this boring log is typically sub-meter in (X,Y) when collected by the HQ Geotech Division and sub-centimeter in (X,Y,Z) when collected by the Region Survey Crew.		
25	10							End of test hole boring at 21 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
30	5									
35	0									
40	-5									
45	-10									

SOILA XL-2963 I-5_SR432 TALLEY WAY I_C WITH CONE.GPJ SOIL.GDT 8/13/09

Job No. **XL-2963** Date **August 10, 2009**

Hole No. **SP-5p-08** Sheet **1** of **1**

Project **I-5/SR 432 Talley Way Interchange**

Laboratory Summary

Washington State Department of Transportation

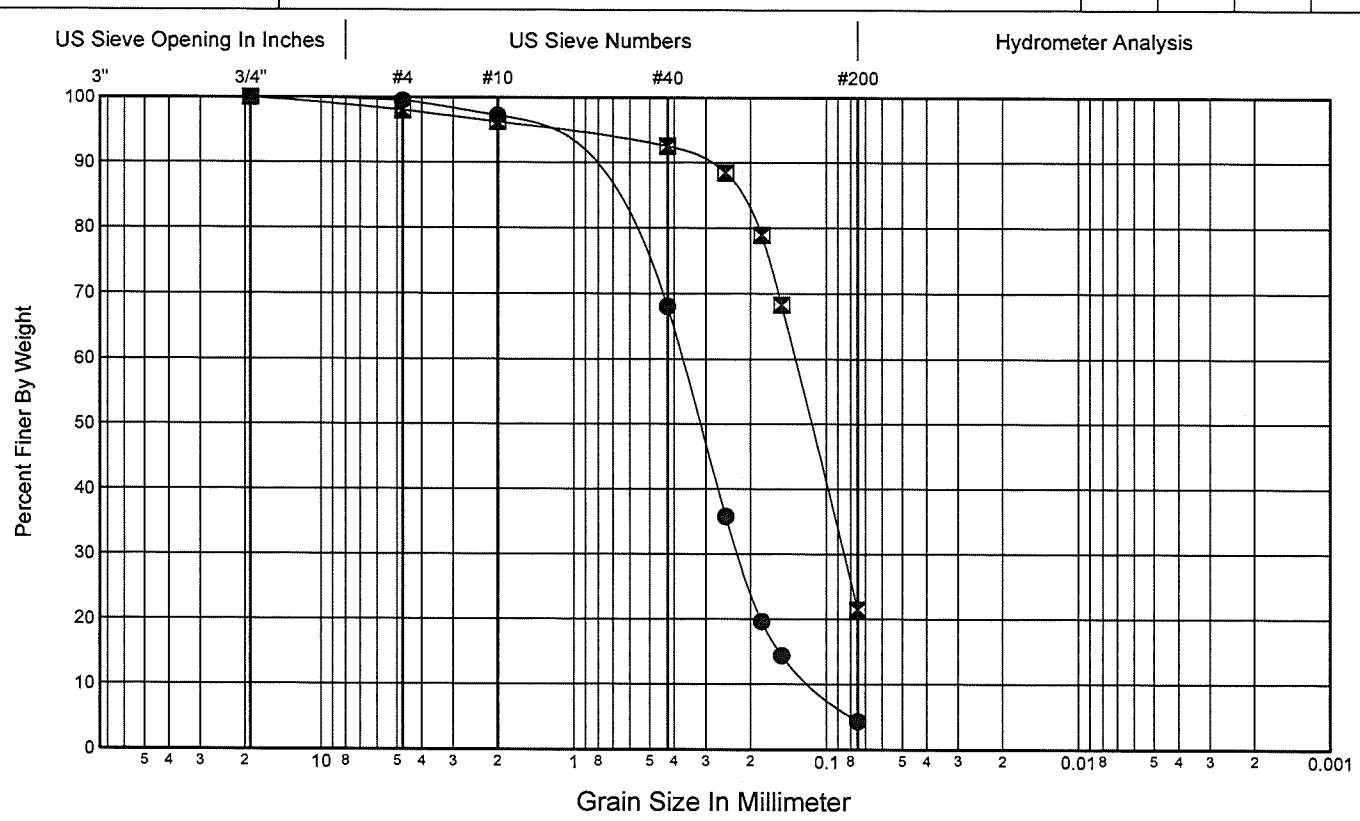
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	0.0	0.00	D-1	SP	See Boring Log	POORLY GRADED SAND	7			
⊠	19.0	5.79	D-8	SM	See Boring Log	SILTY SAND	27			

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.5	95.2	4.3	1.2	3.4
⊠	2.0	76.5	21.5		

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.372	0.32	0.22	0.18	0.111
⊠	0.133	0.11	0.09		



Project No. 12R0076	**LOG OF BOREHOLE NO. SB-100.15-1**	Sheet 1 of 4

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

37' RR North of Inside Face of RR North of Concrete Backwall.
87' RR East of Main 2 Track Centerline.

Surface Elev.: **28.4 ft**

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft³)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
0.5 Brown fine SAND with gravel, loose. (FILL) 27.9									
Brown fine SAND, trace silt, very loose. (FILL)									
2									
4									
6		1 1 1 N=2	1	SS	18/18 100%	32			
8									
9.0 19.4									
Brown very fine sandy SILT, some very fine sand seams, trace clay, very soft.									
10		0 0 2 N=2	2	SS	18/18 100%	45			
12									
13.0 15.4									
Brownish-gray SILT, trace organics, some oxidation, very soft to soft.									
14									
16		0 0 0 N=0	3	SS	18/18 100%	53		0.66 BSh 0.05	
18									
20			4-4	SH	24/24 100%				
22.0 6.4									
Grayish-brown SILT, trace to some organics, firm.									
22		1 1 2 N=3	5	SS	18/18 100%	96		P 0.75	
24									
26		0 2 2 N=4	6	SS	18/18 100%	75		0.85 Sh 0.05	
28.0 0.4									
Gray SILT, trace organics.									
28									
30									

Continued Next Page

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/24/12	FINISHED	9/24/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. SB-100.15-1	Sheet 2 of 4

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

37' RR North of Inside Face of RR North of Concrete Backwall.
87' RR East of Main 2 Track Centerline.

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	NUMBER	TYPE	RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	DRY DENSITY (lb/ft³)	Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Gray SILT, trace organics. *(continued)*							
		0 0 1 N=1	7	SS	18/18 100%	51		0.43 Sh	
32									
34									
35.0		-6.6							
		Interbedded grayish-brown fine SAND, trace to some silt, medium dense and grayish-brown SILT, firm.							
		3 6 11 N=17	8	SS	18/18 100%	29			
36									
38									
40		10 9 3 N=12	9	SS	6/18 33%	31			
42									
44									
46		12 7 4 N=11	10	SS	9/18 50%	34			
47.0		-18.6							
		Grayish-brown silty very fine SAND and very fine sandy SILT, loose, soft.							
48									
50		0 0 0 N=0	11	SS	14/18 78%	53			
52.0		-23.6							
		Interbedded very fine SAND, trace to some silt and very fine sandy silt and very fine sandy SILT, loose to medium-dense.							
52									
54									
56		5 2 5 N=7	12	SS	18/18 100%	38			
58									
60									

Continued Next Page

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/24/12	FINISHED	9/24/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. SB-100.15-1	Sheet 3 of 4

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

37' RR North of Inside Face of RR North of Concrete Backwall.
87' RR East of Main 2 Track Centerline.

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft³)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Interbedded very fine SAND, trace to some silt and very fine sandy silt and very fine sandy SILT, loose to medium-dense. *(continued)* - very fine sand, trace silt over very fine sandy silt.							
62		5 2 3 N=5	13	SS	18/18 100%	59			
64									
66		9 6 9 N=15	14	SS	18/18 100%	37			
68.0		- very fine sand, trace silt. -39.6							
68		Dark gray fine SAND, medium-dense to dense, micaceous.							
70		14 16 15 N=31	15	SS	18/18 100%	32			
72									
74									
76		9 11 13 N=24	16	SS	18/18 100%	30			
78									
80		11 12 17 N=29	17	SS	18/18 100%	34			
82									
84									
86		11 14 16 N=30	18	SS	18/18 100%	26			
88									
90									

Continued Next Page

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/24/12	FINISHED	9/24/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. SB-100.15-1	Sheet 4 of 4

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

37' RR North of Inside Face of RR North of Concrete Backwall.
87' RR East of Main 2 Track Centerline.

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft^3)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Dark gray fine SAND, medium-dense to dense, micaceous. *(continued)*							
		10 11 10 N=21	19	SS	18/18 100%	30			
92									
94									
96									
98									
100		7 8 11 N=19	20	SS	18/18 100%	29			
101.5		- organic seam at 101.0'. -73.1 E.O.B.							

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/24/12	FINISHED	9/24/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076

LOG OF BOREHOLE NO. SB-100.15-2

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

20.8' RR South of Centerline of Roadway.
75' RR East of Main 2 Track Centerline.

Surface Elev.: **27.5 ft**

DEPTH (ft)	GRAPHIC LOG	BLOWS/6in N - VALUE RQD	NUMBER	TYPE	RECOVERED (in) LTH SMPLD (in)	MOISTURE, %	DRY DENSITY (lb/ft³)	Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		SAMPLES				TESTS			
0		Gravelly SAND. (roadway shoulder) (FILL)							
2.0 / 25.5		Brown fine SAND, trace silt, moist, loose to medium-dense. (FILL)							
6		5 7 7 N=14	1	SS	18/18 100%	08			
10		3 3 4 N=7	2	SS	12/18 67%	21			
16		5 5 7 N=12	3	SS	18/18 100%	25			
20		5 5 5 N=10	4	SS	2/18 11%	20			
		- brown steel bolt, debris.							
23.0 / 4.5		Gray silty CLAY, very soft to soft, some stiff silt seams, trace organics.							
26		0 0 0 N=0	5 6-1	SS SH	0/18 0% 10/24 42%	71	56.2		
30		0	7	SS	18/18	53		0.58	

Continued Next Page

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/26/12	FINISHED	9/27/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. SB-100.15-2	Sheet 2 of 5

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

20.8' RR South of Centerline of Roadway.
75' RR East of Main 2 Track Centerline.

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft³)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Gray silty CLAY, very soft to soft, some stiff silt seams, trace organics. *(continued)* - alternating very stiff and soft layers. 2 1 N=3			100%			Sh	
32									
34			8-1	SH	9/24 38%				
		- in gray silt, hit sand, bent tube.							
36.5	-9.0	8 11 14 N=25	9	SS	18/18 100%	27			
		Gray fine SAND, medium-dense.							
38									
40		11 8 8 N=16	10	SS	18/18 100%	28			
42									
44									
45.5	-18.0	18 6 3 N=9	11	SS	18/18 100%	25			
		Grayish-brown silty very fine sandy SILT, and silty very fine SAND, loose to medium-dense.							
46									
48									
50		5 1 2 N=3	12	SS	14/18 78%	51		0.58 BSh	
52									
54									
		- very sandy silt.							
56		2 4 3 N=7	13	SS	14/18 78%	37			
58									
60									

Continued Next Page

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/26/12	FINISHED	9/27/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. SB-100.15-2	Sheet 3 of 5

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

20.8' RR South of Centerline of Roadway.
75' RR East of Main 2 Track Centerline.

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft³)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Grayish-brown silty very fine sandy SILT, and silty very fine SAND, loose to medium-dense. *(continued)*							
62		2 0 2 N=2	14	SS	18/18 100%	56		P 0.5	
63.0		-35.5							
		Brownish-gray very fine SAND, trace to some silt, dense.							
64									
66		12 14 17 N=31	15	SS	18/18 100%	37			
68.0		-40.5							
		Dark gray fine SAND, medium-dense to dense.							
68									
70		12 14 14 N=28	16	SS	18/18 100%	28			
72									
74									
76		15 14 13 N=27	17	SS	18/18 100%	22			
78									
80		13 11 12 N=23	18	SS	18/18 100%	22			
82									
84									
86									
88									
90									

Continued Next Page

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/26/12	FINISHED	9/27/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. SB-100.15-2	Sheet 4 of 5

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

20.8' RR South of Centerline of Roadway.
75' RR East of Main 2 Track Centerline.

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft^3)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Dark gray fine SAND, medium-dense to dense. *(continued)*							
92		15 17 17 N=34	19	SS	18/18 100%	23			
94									
96									
98									
100		15 15 17 N=32	20	SS	18/18 100%	24			
102									
104									
106									
108									
110									
112									
114									
116									
118									
120									

Continued Next Page

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/26/12	FINISHED	9/27/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. SB-100.15-2	Sheet 5 of 5

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KBM Task 6**

20.8' RR South of Centerline of Roadway.
75' RR East of Main 2 Track Centerline.

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft^3)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Dark gray fine SAND, medium-dense to dense. *(continued)*							
		13 13 13 N=26	21	SS	18/18 100%	26			
122									
124									
126									
128									
130									
132									
134									
136									
138									
140		15 16 16 N=32	22	SS	18/18 100%	23			
141.5 -114.0		E.O.B.							

WATER LEVEL OBSERVATIONS	
WL	NE

HANSON

STARTED	9/26/12	FINISHED	9/27/12
DRILL CO.	Geodyne Inc.	DRILL RIG	
DRILLER	Raymundo Dimas	ASS'T DRILLER	
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076

LOG OF BOREHOLE NO. BH-1

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KMB Task 6**

Milepost 100.4
26.5 ft RR East of Existing Main 2 Track Centerline

Surface Elev.: **21.7 ft**

				SAMPLES				TESTS			
		GRAPHIC LOG	DEPTH (ft)	BLOWS/6in N - VALUE RQD	NUMBER	TYPE	RECOVERED (in) LTH SMPLD (in)	MOISTURE, %	DRY DENSITY (lb/ft³)	Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
	BALLAST (Fill).										
2.0		19.7	2								
	Dark brown fine SAND, trace gravel, very loose.			1 2 2 N=4	1	SS	2/18 11%				
4.5		17.2	4								
	Brownish-gray SILT, trace to some clay, trace organics, firm, with oxidation spots.			1 2 1 N=3	2	SS	18/18 100%			P 1	
8.0		13.7	6								
	Dark brown CLAYEY SILT and SILTY CLAY,			2 2 2 N=4	3	SS	18/18 100%			P 1.5	
9.0	trace organics, firm to stiff.	12.7	8								
	Brownish-gray SILT, trace to some clay, trace organics, trace very fine sand, firm.			2 2 2 N=4	4	SS	18/18 100%				
10.5		11.2	10								
11.0	Dark brown SILT, trace to some clay, trace organics.	10.7									
	Gray to bluish/greenish-gray CLAYEY SILT, trace organics, soft. ▽		12		5	SH	10/10 100%	48		2.00 TV	LL = 66 PL = 41
15.5		6.2	14								
	Bluish-gray very fine SANDY SILT, trace organics, soft.			1 2 1 N=3	6	SS	18/18 100%				
17.0		4.7	16								
	Gray very fine SANDY SILT, with oxidation spots, very loose.			2 1 1 N=2	7	SS	18/18 100%	39			P200 = 90.7%
19.5		2.2	18								
	Light gray SILTY CLAY, ashy, soft to firm.			1 1 2 N=3	8	SS	18/18 100%			P 0.75	
21.5		0.2	20								
	Gray very fine SANDY SILT, loose.		22								
23.0		-1.3									
	Gary SILT, trace very fine sand, trace clay, trace organics, soft to firm.		24								

Continued Next Page

WATER LEVEL OBSERVATIONS		
WL	▽ 14.0	DD

HANSON

STARTED	6/13/13	FINISHED	6/13/13
DRILL CO.	Geologic Drill Explorations Inc.	DRILL RIG	
DRILLER	Ritch Gibson	ASS'T DRILLER	Blaine
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. BH-1	Sheet 2 of 2

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KMB Task 6**

Milepost 100.4
26.5 ft RR East of Existing Main 2 Track Centerline

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft^3)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
25.5 -3.8									
Light gray SILT, trace clay, trace very fine sand, soft to firm.		1 2 2 N=4	9	SS	18/18 100%			P 0.75	
26									
28.0 -6.3									
Light gray SILTY very fine SAND, some ash, medium dense.									
28									
		4 6 10 N=16	10	SS	18/18 100%				
30									
31.5 -9.8									
E.O.B.									

WATER LEVEL OBSERVATIONS		
WL	▽ 14.0	DD

HANSON

STARTED	6/13/13	FINISHED	6/13/13
DRILL CO.	Geologic Drill Explorations Inc.	DRILL RIG	
DRILLER	Ritch Gibson	ASS'T DRILLER	Blaine
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076

LOG OF BOREHOLE NO. BH-3

Sheet 1 of 2

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KMB Task 6**

Milepost 100.7
31 ft RR East of Existing Main 2 Track Centerline

Surface Elev.: **14.8 ft**

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft³)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
Brown CLAYEY SILT, trace organics, with oxidation spots, firm to stiff.									
3.5 / 11.3		2 1 2 N=3	1	SS	18/18 100%			P 1	
4.0 / 10.8 Gray SILTY CLAY and CLAYEY SILT, trace to some very fine sand, very soft to soft. ▽									
Gray SILT, some very fine sand, with oxidation spots.			2	SH	18/18 100%	33		0.75 TV	P200 = 64.4%
7.7 / 7.1									
Gray to grayish-brown SILT, some very fine sand, some oxidation spots, very loose.		3 2 2 N=4	3	SS	18/18 100%				
9.0 / 5.8									
Gray very fine SANDY SILT and SILTY very fine SAND, very loose.		1 2 1 N=3	4	SS	18/18 100%	40			P200 = 95.0%
			5	SH	24/24 100%				
15.0 / -0.2									
15.5 / -0.7 Dark gray to gray CLAYEY SILT, trace very fine sand, trace organics, very soft.		1 1 1 N=2	6	SS	18/18 100%	55			LL = 46 PL = 36
16.5 / -1.7 Gray SILT, trace clay, trace very fine sand, very soft.									
Brown SILT, trace organics, firm to stiff.			7	SH	16/16 100%	84			P200 = 96.1%
		2 2 2 N=4	8	SS	18/18 100%				
23.0 / -8.2									
Gray SILTY very fine SAND and SANDY SILT, slightly cohesive, loose.									

Continued Next Page

WATER LEVEL OBSERVATIONS		
WL	▽ 4.5	DD

HANSON

STARTED	6/13/13	FINISHED	6/13/13
DRILL CO.	Geologic Drill Explorations Inc.	DRILL RIG	
DRILLER	Ritch Gibson	ASS'T DRILLER	Blaine
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. BH-3	Sheet 2 of 2

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KMB Task 6**

Milepost 100.7
31 ft RR East of Existing Main 2 Track Centerline

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft^3)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Gray SILTY very fine SAND and SANDY SILT, slightly cohesive, loose. *(continued)*							
26		4 3 4 N=7	9	SS	18/18 100%				
28									
30		1 2 2 N=4	10	SS	18/18 100%				
31.5 -16.7		E.O.B.							

WATER LEVEL OBSERVATIONS		
WL	▽ 4.5	DD

HANSON

STARTED	6/13/13	FINISHED	6/13/13
DRILL CO.	Geologic Drill Explorations Inc.	DRILL RIG	
DRILLER	Ritch Gibson	ASS'T DRILLER	Blaine
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076

LOG OF BOREHOLE NO. BH-4

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KMB Task 6**

Milepost 101.0
39 ft RR East of Existing Main 2 Track Centerline

Surface Elev.: **16.4 ft**

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft³)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
Gray very fine to fine SAND, very loose. ▽									
2		2 3 3 N=6	1	SS	18/18 100%				
4									
6		2 2 1 N=3	2	SS	18/18 100%				
8.5 / 7.9		1 2 2 N=4	3	SS	18/18 100%				
Blueish-gray SILTY very fine SAND and SANDY SILT, very loose.									
10		1 2 2 N=4	4	SS	18/18 100%				
12.0 / 4.4									
Bluish-gray SILT, some very fine sand, trace wood pieces, very loose/soft.									
12		2 1 2 N=3	5	SS	18/18 100%	44			P200 = 81.1%
14									
16.0 / 0.4		1 1 1 N=2	6	SS	18/18 100%			P 0.5	
16									
17.0 / -0.6									
Gray SILT, trace very fine sand, very loose/soft.									
18.0 / -1.6									
18		1 2 1 N=3	7	SS	18/18 100%			P 0.5	
18.5 / -2.1 Wood.									
Grayish-brown SILT, some clay, soft.									
19.5 / -3.1									
Light gray SILT, with ash, high plasticity, firm.									
20		2 2 2 N=4	8	SS	18/18 100%	51		P 0.75	LL = 53 PL = 33
21.5 / -5.1									
Brownish-gray SILTY very fine SAND, loose to medium dense.									
22									
24									

Continued Next Page

WATER LEVEL OBSERVATIONS		
WL	▽ 2.0	DD

HANSON

STARTED	6/11/13	FINISHED	6/11/13
DRILL CO.	Geologic Drill Explorations Inc.	DRILL RIG	
DRILLER	Ritch Gibson	ASS'T DRILLER	Blaine
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

Project No. 12R0076	LOG OF BOREHOLE NO. BH-4	Sheet 2 of 2

CLIENT: **BNSF**

ARCHITECT/ENGINEER: **Hanson Professional Services Inc.**

SITE: **Kelso, Washington**

PROJECT: **KMB Task 6**

Milepost 101.0
39 ft RR East of Existing Main 2 Track Centerline

(continued)

DEPTH (ft)	GRAPHIC LOG	SAMPLES: BLOWS/6in N - VALUE RQD	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERED (in) LTH SMPLD (in)	TESTS: MOISTURE, %	TESTS: DRY DENSITY (lb/ft^3)	TESTS: Qu (tsf) FAILURE TYPE	ADDITIONAL DATA/ REMARKS
		Brownish-gray SILTY very fine SAND, loose to medium dense. *(continued)*							
26		2 5 4 N=9	9	SS	18/18 100%	37			P200 = 49.5%
28									
30		2 2 3 N=5	10	SS	18/18 100%				
32									
34									
36		2 3 6 N=9	11	SS	18/18 100%				
37.0		-20.6							
		Gray SILT, trace to some very fine sand.							
38									
40		1 3 2 N=5	12	SS	18/18 100%				
41.5		-25.1							
		E.O.B.							

WATER LEVEL OBSERVATIONS		
WL	▽ 2.0	DD

HANSON

STARTED	6/11/13	FINISHED	6/11/13
DRILL CO.	Geologic Drill Explorations Inc.	DRILL RIG	
DRILLER	Ritch Gibson	ASS'T DRILLER	Blaine
LOGGED BY	Michael Buckley	APPROVED	Michael Buckley

APPENDIX D

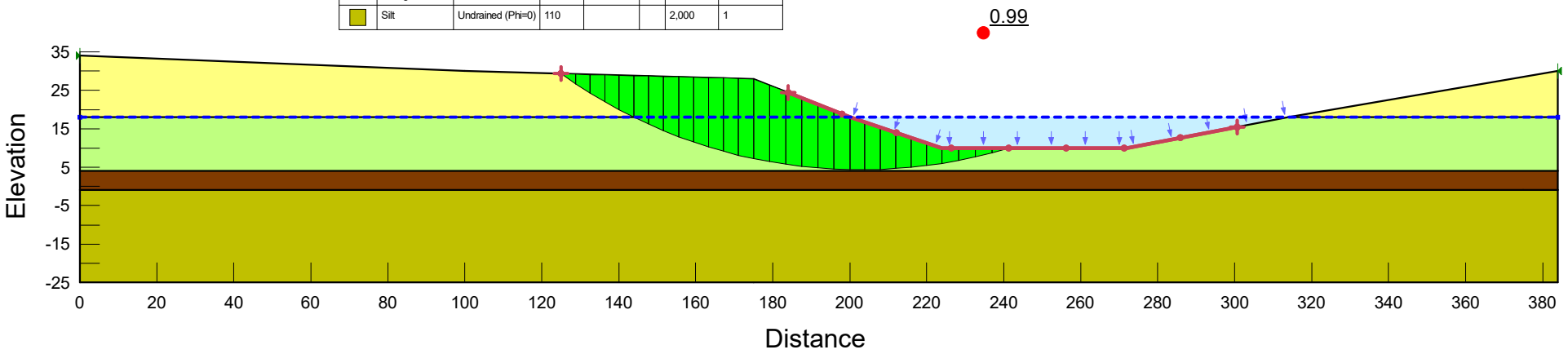
APPENDIX D

LIMIT EQUILIBRIUM STABILITY ANALYSIS

Results of our analysis are presented in this appendix.

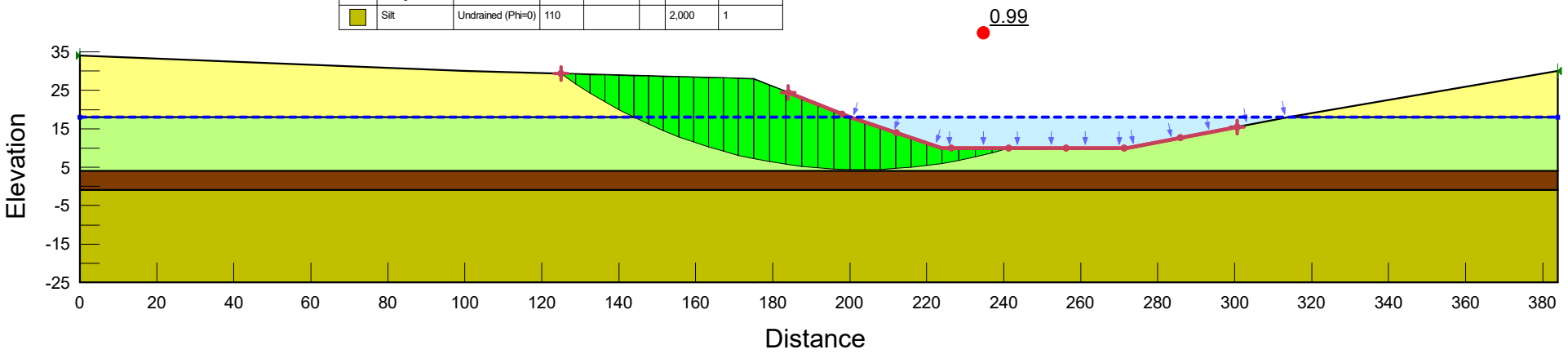
East Slough
Cyclically Softened
Ky:0.02

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Cohesion (psf)	Piezometric Line
	Clay	Undrained (Phi=0)	110			1,500	1
	Liquefiable Dredge Sand	Mohr-Coulomb	110	0	12		1
	Non-Liquefiable Dredge Sand	Mohr-Coulomb	115	0	37		1
	Silt	Undrained (Phi=0)	110			2,000	1



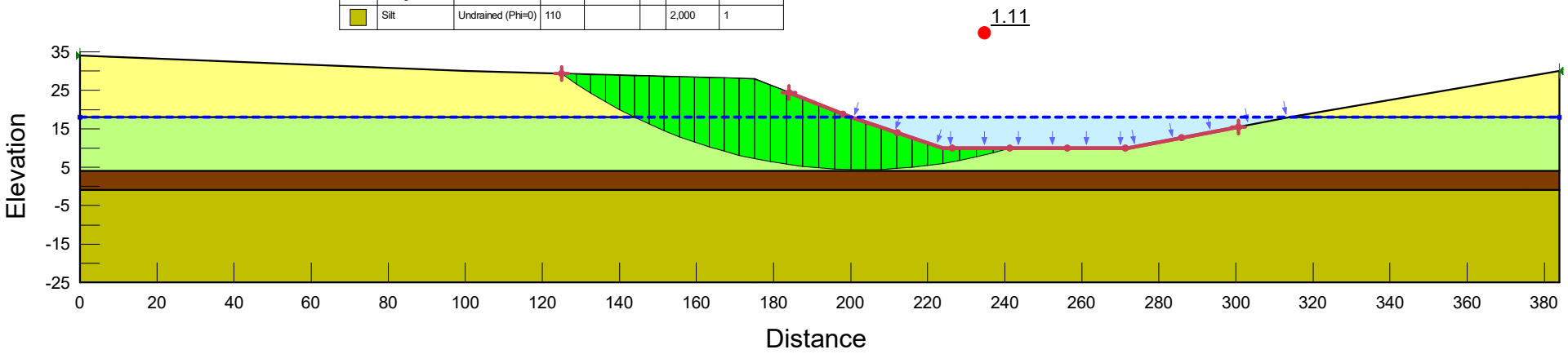
East Slough
Cyclically Softened
Ky:0.02

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Cohesion (psf)	Piezometric Line
	Clay	Undrained (Phi=0)	110			1,500	1
	Liquefiable Dredge Sand	Mohr-Coulomb	110	0	12		1
	Non-Liquefiable Dredge Sand	Mohr-Coulomb	115	0	37		1
	Silt	Undrained (Phi=0)	110			2,000	1



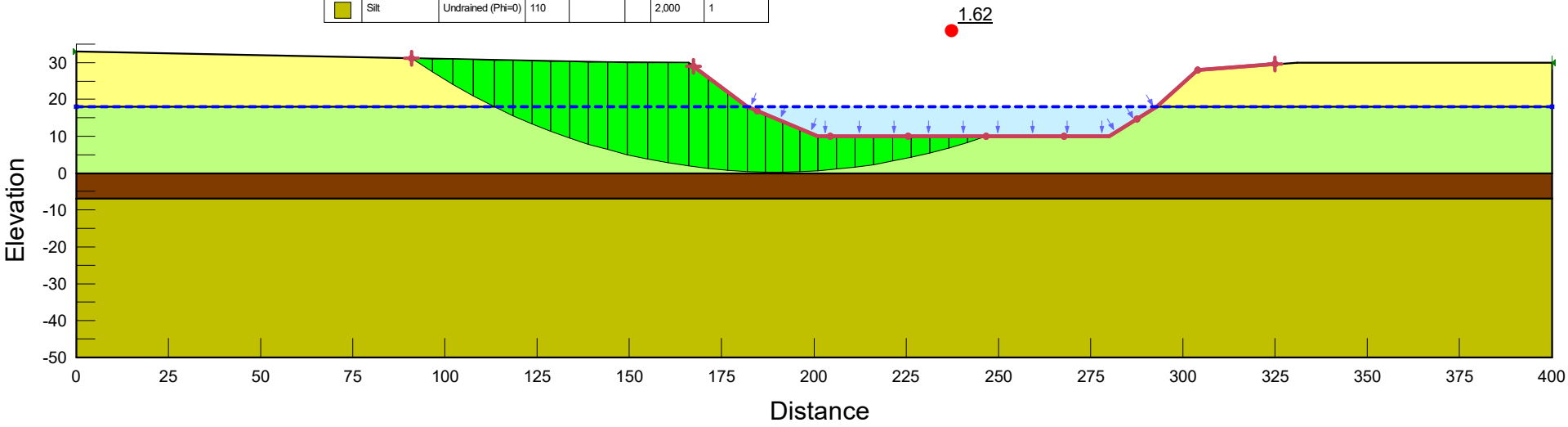
East Slough
Post Seismic
PGA:0

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Cohesion (psf)	Piezometric Line
	Clay	Undrained (Phi=0)	110			1,500	1
	Liquefiable Dredge Sand	Mohr-Coulomb	110	0	12		1
	Non-Liquefiable Dredge Sand	Mohr-Coulomb	115	0	37		1
	Silt	Undrained (Phi=0)	110			2,000	1



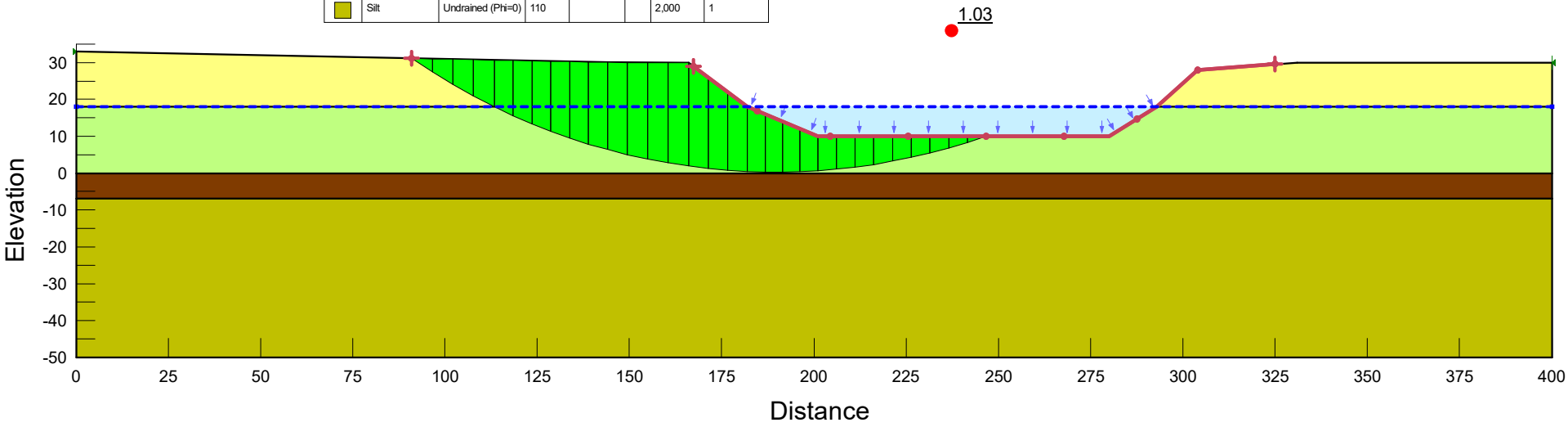
West Slough
Pseudostatic Conditions
PGA:0.125

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Cohesion (psf)	Piezometric Line
	Clay	Undrained (Phi=0)	110			1,500	1
	Liquefiable Dredge Sand	Mohr-Coulomb	110	0	33		1
	Non-Liquefiable Dredge Sand	Mohr-Coulomb	115	0	37		1
	Silt	Undrained (Phi=0)	110			2,000	1



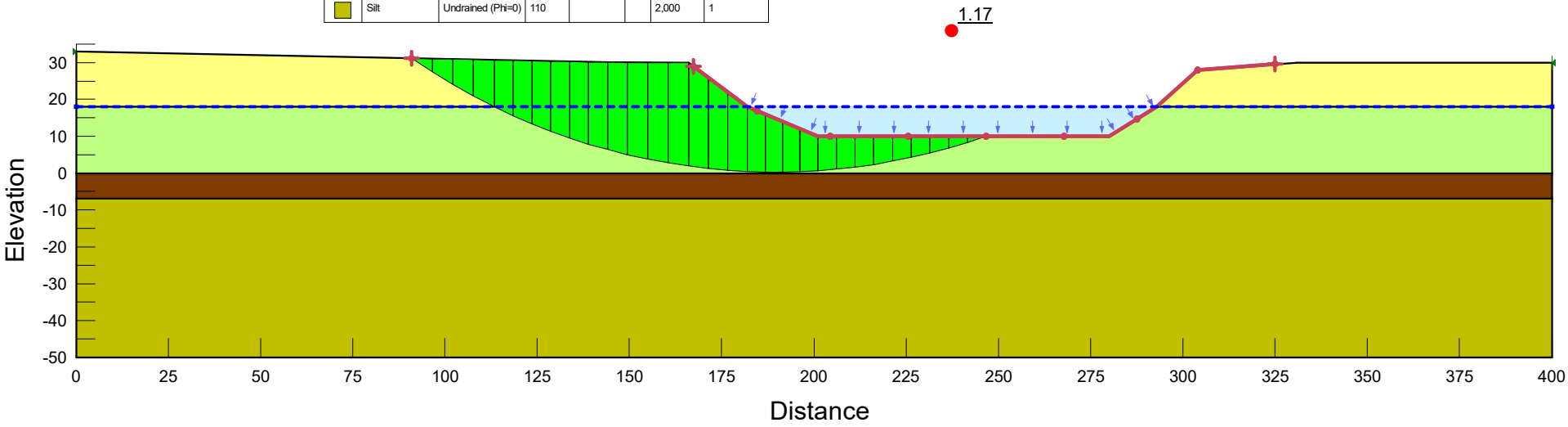
West Slough
Cyclically Softened Condition
Ky:0.02

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Cohesion (psf)	Piezometric Line
	Clay	Undrained (Phi=0)	110			1,500	1
	Liquefiable Dredge Sand	Mohr-Coulomb	110	0	12		1
	Non-Liquefiable Dredge Sand	Mohr-Coulomb	115	0	37		1
	Silt	Undrained (Phi=0)	110			2,000	1



West Slough
Cyclically Softened Condition
Ky:0

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Cohesion (psf)	Piezometric Line
	Clay	Undrained (Phi=0)	110			1,500	1
	Liquefiable Dredge Sand	Mohr-Coulomb	110	0	12		1
	Non-Liquefiable Dredge Sand	Mohr-Coulomb	115	0	37		1
	Silt	Undrained (Phi=0)	110			2,000	1



NV5

Delivering Solutions
Improving Lives