Revised Draft Geotechnical Engineering Report
Oregon Soluations Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

November 24, 2014

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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24-1-03858-005

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1.0 INTRODUCTION

This report presents the results of our field explorations, laboratory testing, geotechnical engineering analysis, and design recommendations related to proposed flood control improvements that are part of the Southern Flow Corridor Project sponsored by Tillamook County and later transferred to ownership under the Port of Tillamook Bay in Tillamook County, Oregon. The Southern Flow Corridor Project is a part of the Oregon Solutions Project Exodus, which is providing flood mitigation efforts for Tillamook County. Northwest Hydraulic Consultants, Inc., (NHC) is the lead designer, and Shannon & Wilson, Inc., provided geotechnical design to support final engineering design of the Southern Flow Corridor Project under a subcontract with NHC, dated April 16, 2014, Contract No. 200133 Shannon & Wilson.

The Southern Flow Corridor project site is located in a portion of Section 22 and 23 of Township 1 South, Range 10 West of the Willamette Meridian, Tillamook County, Oregon, as shown on Figure 1, Vicinity Map. The proposed improvements include removal of approximately 6.9 miles of existing levees, filling of 3.3 miles of existing ditches, construction of 7,390 feet of new levees, and upgrading of 3,700 feet of existing levees, new culverts, a new flood gate, and new tidal channels.

There are three new levees that are designated as North Levee, Middle Levee, and South Levee, as shown on Figure 2, Site and Exploration Plan. The new North Levee is approximately 4,500 feet long with a maximum height of 9 feet and an average height of 6 feet. The new Middle Levee is approximately 1,000 feet long with a maximum height of 8 feet and an average height of 4 feet. The new portion of the South Levee is approximately 1,700 feet long with a maximum height of 10 feet and an average height of 4 feet. The new North Levee and Middle Levee have side slopes of 5 Horizontal:1 Vertical (5H:1V) on the riverside and 3H:1V on the landside. The new South Levee has side slopes of 3H:1V on the riverside and landside. The proposed top of levee is at elevation 12 feet for the North and Middle Levees and elevation 11 feet for the South Levee (NAVD 88 Datum).

A portion of the South Levee System, designated South Levee Upgrade, was previously constructed. The South Levee Upgrade segment currently has levee crest elevations ranging from approximately 8 to 13 feet, with an average crest elevation of approximately 12 feet. Previous overtopping events appear to have eroded portions of the South Levee Upgrade segment; however, the levee remains generally intact. We understand that the South Levee Upgrade segment will mainly require regrading and erosion protection; however, partial reconstruction has been proposed where severe erosion has occurred.

The new tidal channels consist of a side slope of 3H:1V and an approximate depth of 4 to 7 feet. The bottoms of the new tidal channels are proposed at elevations of approximately 1 and 2 feet. The new culverts with flap gates are proposed at an elevation of approximately 2 feet. The new flood gate is located in the Middle Levee and at an elevation of approximately 4 feet.

The soils from the proposed new tidal channels, on-site spoil stockpiles, and levees to be removed will be used to construct the new levee embankments. Additional borrow of on-site soils may be required to construct new levee embankments.

2.0 SCOPE OF SERVICES

Shannon & Wilson's services were conducted in accordance with the Scope of Services defined in our contract, dated April 16, 2014. The completed geotechnical services for the project consisted of the following tasks.

- Review available existing information and visit the site to observe existing site conditions, geologic hazards, and site access for the field explorations, and mark proposed exploration locations;
- Explore the subsurface conditions with 20 geotechnical borings, 30 test pits, and four hand augers, and collect soil samples;
- Conduct laboratory testing on selected soil samples to characterize soils and develop soil properties for evaluation;
- Provide engineering interpretations of subsurface conditions;
- Establish representative cross sectional areas for stability analysis;
- Define geotechnical parameters required for stability analysis;
- Evaluate seismic hazards related to liquefaction;
- Evaluate static bearing capacity and settlement for each cross sectional area;
- Perform stability analysis, including flow nets and slope stability analyses, for each cross sectional area;
- Evaluate underseepage for each cross sectional area;
- Evaluate suitability of the existing levee, tidal channels, and dredged spoil materials for use in constructing new levee embankments;
- Provide geotechnical construction considerations, including review of anticipated

excavation conditions, cut-and-fill slope recommendations, fill materials, compaction, mitigation of deleterious soil, and subgrade preparation;

- Prepare this report summarizing our explorations and preliminary design and construction recommendations.

Items not in our scope of services included, but were not limited to, the following:

- Mitigation design for seismic-induced liquefaction,
- Evaluation of surface water flow on either side of the levee,
- Evaluation of the pre-project existing levee in any area,
- Evaluation of the existing levee in areas outside of the project limits,
- Evaluation of and/or providing details on shoring, coffer dams, and dewatering needed for excavations below the groundwater,
- Evaluation of scour or the need for slope protection, and
- Environmental evaluations of the project site or surrounding area.

3.0 REGIONAL GEOLOGY AND SEISMIC SETTING

3.1 Regional Geology

The western edge of Oregon lies along an active tectonic plate boundary, where oceanic crust is being subducted beneath the North American continental crust. The project site lies at the northwestern margin of the Oregon Coast Range, which began to form more than 50 million years ago when an oceanic volcanic island chain slowly collided with the ancient Oregon coast (Orr and Orr, 2000). The present Coast Range took shape as blocks of the volcanic island chain and sedimentary rocks, which had formed in a temporary basin between the islands, and the continent were compressed against the continental margin and uplifted. The northwestern portion of the Oregon Coast Range is now referred to as the Tillamook Highlands and has at its core the Tillamook Volcanics (former volcanic islands). The northwestern portion of the Coast Range has been mapped and described by Schlicker and Others (1972), and by Wells and Others (1994).

Five major rivers drain into Tillamook Bay; from north to south, they are the Miami, Kilchis, Wilson, Trask, and Tillamook Rivers. These rivers and their tributaries drain the Tillamook Highlands. During the last ice age, when the sea level was on the order of 300 feet lower than at present, the rivers eroded deep canyons in the bedrock formations. At the close of the ice age, about 15,000 years ago, the sea level began rising to its present level, drowning the mouths of the rivers that drained to the sea. With the rise in sea level, the former deep river channels aggraded with sediment, matching grade with the rising sea.

3.2 Local Geology

The lower valleys of the Wilson, Trask, and Tillamook Rivers merge to form a broad alluvial plain on the southern portion of Tillamook Bay. The City of Tillamook and the project area are located on this southern portion of the valley adjacent to Tillamook Bay.

Natural levees around the Wilson River channel have gradually built up over thousands of years due to flooding and deposition of over-bank sediment. This has caused the river channel to rise over time to a higher elevation than its floodplain and become perched. As a consequence, flood flows that overtop the Wilson River levees, especially to the much larger southern floodplain, never return to the Wilson River channel; instead, they flow south and west to the lowest part of the valley, where they meet the Trask and Tillamook Rivers. Several major sloughs have developed across the floodplain and interconnect the Wilson and Trask Rivers during a flood. During the low-flow periods, the sloughs and rivers are tidally influenced.

The two largest sloughs are Hoquarten and Dougherty Sloughs; they meander westward just north of downtown Tillamook. The Tillamook City Center is confined between the Trask River and Hoquarten Slough. Highway 101 crosses Hoquarten Slough just at the north edge of Tillamook City Center and crosses Dougherty Slough about 0.5 mile north of the city center.

The City of Tillamook is constructed on a low alluvial terrace, but ground surface elevations are only slightly higher than the adjacent valley floor. Elevations within the city center range from about 20 to 25 feet above mean sea level. Because of the low-lying terrain, the confluence of the three rivers, and particularly the complex flood hydraulics associated with the Wilson River; flooding in the Tillamook Valley is a common and persistent occurrence. Recent decades have seen a number of damaging floods occur in Tillamook County. The 1996 flood in particular was significant for its long duration and extensive damage. Since then, large floods have occurred in 1998 and most recently in 2006 and 2007, causing additional damage to homes, businesses, and public infrastructure.

The Wilson-Trask-Tillamook floodplain geology is dominated by alluvial deposits. Up to 120 feet or more of alluvial sediments underlie the city center. The oldest and deepest sediments are dominated by semi-consolidated basaltic gravel and cobbles with interstratified sand, silt, and clay. The older deposits are in most areas mantled by younger alluvial flood deposits consisting of fine sandy to clayey silt and silty clay soils, which may locally incorporate significant organic material (Schlicker and Others, 1972).

3.3 Seismic Setting

Oregon's position at the western margin of the North American Plate, relative to the Pacific and Juan de Fuca Plates, has had a major impact on the geologic development of the state. Earthquakes in the western part of Oregon occur as a result of the collision of these two plates and related volcanic activity. These two plates meet along a mega thrust fault called the Cascadia Subduction Zone (CSZ). The CSZ runs approximately parallel to the coastline from northernmost California to southern British Columbia. The compressional forces that exist between these two colliding plates cause the oceanic plate to descend, or subduct, beneath the continental plate at a rate of about 1.5 inches per year. This process leads to contortion and faulting of both crustal plates throughout much of the western regions of southern British Columbia, Washington, Oregon, and northern California. Stress built up between the colliding plates is periodically relieved through great earthquakes at the plate interface (CSZ) (Goldfinger and Others, 2012).

Within our present understanding of the regional tectonic framework and historical seismicity, three broad earthquake sources have been identified. These three types of earthquakes and their maximum plausible earthquakes, as determined by Wells and Others (1998), are as follows.

- **Subduction Zone Interface Earthquakes** originate along the CSZ, which is located 25 miles beneath the coastline. Paleoseismic evidence and historic tsunami studies indicate that the most recent subduction zone thrust fault event occurred in the year 1700, probably ruptured the full length of the CSZ, and may have reached Magnitude 9.
- **Deep-Focus, Intraplate Earthquakes** originate from within the subducting Juan de Fuca oceanic plate as a result of the downward bending and contortion of the subducting slab. These earthquakes typically occur 28 to 38 miles beneath the surface. Such events could be as large as Magnitude 7.5. Examples of this type of earthquake include the 1949 Magnitude 7.1 Olympia earthquake, the 1965 Magnitude 6.5 earthquake between Tacoma and Seattle, and the 2001 Nisqually Magnitude 6.8 earthquake. Intraslab events have occurred frequently in the Puget Sound area but are historically rare in Oregon.
- **Shallow-Focus Crustal Earthquakes** are typically located within the upper 12 miles of the continental crust and could be generated by contortion of the overriding North American plate beneath the project area. The largest known crustal earthquake in the Pacific Northwest is the 1872 North Cascades earthquake at Magnitude 7.4. Other

examples include the 1993 Magnitude 5.6 Scotts Mill earthquake and 1993 Magnitude 6 Klamath Falls earthquake.

The U.S. Geological Survey's Earthquake Hazards Program, Quaternary Fault and Fold Database (USGS, 2013), lists six faults within 25 miles of the project site, as shown in Table 1. The Cascadia Subduction Zone itself, one of the principal seismic hazards, is approximately 78 miles west of the site. It is designated Fault No. 781, approximately 469 miles long, and its most recent time of deformation is about year 1700. Its slip rate category is greater than 5 millimeters per year (mm/yr).

TABLE 1: QUATERNARY FAULTS WITHIN A 25-MILE RADIUS OF PROJECT SITE

Fault Name	Fault Length (miles)	Fault No.	Distance and Direction from Site	Time of Most Recent Deformation	Slip Rate Category
Tillamook Bay Fault Zone	20	881	2.2 miles NE	<1.6 Ma	<0.2 mm/yr
Happy Camp Fault	2	882	3.5 miles SW	<1.6 Ma	<0.2 mm/yr
Unnamed Offshore Faults	174	785	8.9 miles SW	<15 ka	1 - 5 mm/yr
Nehalem Bank Fault	63	789	11.1 miles W	<15 ka	1 - 5 mm/yr
Cascade Fold-Thrust Belt	301	784	22.9 miles SW	<15 ka	1 - 5 mm/yr
Fault "G"	35	791	24.0 miles NW	<15 ka	>5 mm/yr

*ka = "kilo-annum," or 1,000 years; Ma = "Mega-annum," or 1,000,000 years

4.0 FIELD EXPLORATIONS AND LABORATORY TESTING

4.1 Field Explorations

Subsurface explorations generally followed the USACE Engineer Manual EM 1110-1-1804, Geotechnical Investigations and Engineer Regulations and ER 1110-1-1807, Procedures for Drilling in Earth Embankment. The field explorations for this site were conducted between May 27 and June 3, 2014. The exploration program consisted of 20 borings (B-1 through B-20) drilled using mud rotary drilling techniques, 30 test pits (TP-1 through TP-30), and four hand auger borings (HA-1 though HA-4), as shown on Figure 2, Site Plan. Exploration depths ranged from 4.2 to 41.5 feet below the existing ground surface (bgs).

A Shannon & Wilson geologist was present during the field exploration program to locate the borings, log materials encountered in the borings, and collect soil samples. The completed boring locations were not surveyed. They were located in the field using a handheld GPS unit with approximately 3-meter accuracy. Approximate locations of the borings are shown on the Site Plan, Figure 2. Approximate coordinates, obtained from the GPS unit, are shown in the boring logs. The elevations of the borings were estimated using nearby elevation data collected by the Tillamook County Surveyor. Details of the site explorations and sampling procedures, as well as detailed subsurface soil and groundwater conditions encountered in the borings, are presented in Appendix A.

4.2 Laboratory Testing

During the Shannon & Wilson field explorations, soil samples were taken at selected depths and returned to our laboratory for further examination. The laboratory testing program consisted of moisture content analysis, particle size analysis, Atterberg limits determinations, undisturbed density tests, direct shear tests, an undrained triaxial compression test, and one-dimensional consolidation tests. Details of the testing program, as well as test results, are presented in Appendix B.

5.0 SUMMARY OF SUBSURFACE CONDITIONS

5.1 Geotechnical Soil Units

We grouped the materials encountered in our field explorations into four geotechnical-soil units, as described below. Our interpretation of the subsurface conditions is based on the explorations and regional geologic information from published sources. The geotechnical units are as follows.

- **Fill**: SILT (ML) and Elastic SILT (MH) with varying amounts of sand, trace gravel; SAND with silt (SW-SM); Silty SAND with Gravel (SM); GRAVEL (GP); also includes wood/lumber, concrete, brick, plastic, rubber, wire, and glass debris.
- **Tidal Flat Deposits:** Predominantly very soft to soft Elastic SILT (MH) and few to some woody organics; also includes SILT to SILT with sand (ML) and trace fibrous organics.
- **Peat:** Very soft, brown, PEAT (PT), trace to some low- to medium-plasticity fines.
- **Alluvium:** Loose to medium-dense, Poorly Graded SAND with silt (SP-SM); Silty SAND (SM), Well Graded SAND with silt (SW-SM), and Poorly Graded GRAVEL with silt and sand (GP-GM); may also contain thin beds of SILT (ML) and Elastic SILT (MH) material.

These geotechnical soil units were grouped based on their engineering properties, geologic origins, and their distribution in the subsurface. Interpretive subsurface profiles were developed along the recommended levee alignments shown on Proposed and Recommended Levee Alignments, Figure 3. The recommended levee alignments are discussed in Section 6.6. The soil units and their inter-relationships along the new levee alignments are shown on the Interpretive Subsurface Profiles, Figures 4 through 6. The profiles are interpretive, and variations in subsurface conditions may exist between the borings. Contacts between the units may be more gradational than shown in the profiles and in the exploration logs in Appendix A. The Standard Penetration Test (SPT) N-values are as counted in the field (uncorrected). The following sections describe the geotechnical unit characteristics in greater detail.

5.1.1 Fill

The Fill unit is composed of material placed by humans. It was encountered in drilled borings B-1, B-2, B-10, B-16, B-18, and B-20; all test pits except TP-11 through TP-13 and TP-20; and all hand auger borings from the ground surface to depths ranging from 4 to 9 feet. Gravel is occasionally present as road bed material and classified as Fill for this report. Gravel road fill ranged in thickness from about 0.5 feet at B-2 to about 2 feet at B-1. Composition of the fill, other than road gravel, was variable, consisting generally of sand and gravel, silt, wood/lumber debris, and occasionally anthropogenic debris such as wire, plastic, and glass. Fill materials encountered in explorations advanced during this investigation are described below.

Where encountered, fill materials were present at the ground surface and were overlying native soils. Fill materials consisting of SILT (ML) and Elastic SILT (MH), typically with woody debris, were encountered in drilled borings B-1, B-2, B-10, B-16, B-18, and B-20 ranging between 5.5 and 7.5 feet in thickness; in hand auger borings HA-1 through HA-4 between 4.5 and 9 feet thick; and in test pits TP-6, TP-16, TP-17, TP-23, TP-24, and TP-25, from 2 feet to 6 feet thick. SPT N-values in the SILT and Elastic SILT Fill ranged from 0 to 3 blows per foot (bpf). Natural moisture content analyses ranged from 48 to 103 percent with an average of 73.5 percent. Atterberg limits test results for five SILT/Elastic SILT Fill specimens indicated a plasticity index ranging from 12 percent to 27 percent and Unified Soil Classification System (USCS) designations of MH.

Fill consisting of SAND with silt (SP-SM), Silty SAND with gravel (SM), and Gravel with sand (GP) was encountered in test pits TP-1, TP-3, TP-4, TP-5, TP-7 through TP-10, TP-14, TP-15, and TP-18 through TP-21. No SPT N-values are available for the sand- or gravel-dominated fill as no SPT borings encountered this material. Natural moisture content determinations for sand- and gravel-dominated fill material ranged from 8 to 23 percent, and averaged 15.5 percent.

Between 5 and 8 feet of Fill consisting primarily of wood/lumber debris with minor amounts of rubber belts, plastic, wire, and glass beneath a thin cover of silty sand or silt was encountered in test pits TP-27 through TP-29. Dark brown to black soot, organic debris, pipe and plastic debris were encountered in TP-30 from 2.2 to 5 feet bgs and encapsulated by mixtures of silt, sand, and clay, with gravel. No SPT N-values or laboratory test data are available for this material as no SPT borings encountered this material.

5.1.2 Tidal Flat Deposits

Tidal Flat Deposits were encountered below the Fill unit in borings B-1, B-2, B-10, B-16, B-18, and B-20, and at the surface in all borings. This material was encountered in all test pits except TP-19 and was overlain by fill at all locations where encountered, except TP-11, TP-12, and TP-13, where it was present at the ground surface. Tidal Flat Deposits were also encountered beneath the Fill unit in all hand auger borings, except HA-1, where it was not encountered.

Tidal Flat Deposits ranged between depths of 13 and 32 feet, and in the drilled borings it varied in thickness from about 15 to 24.5 feet. Tidal Flat Deposits generally consist of very soft to soft, occasionally medium-stiff, gray or brown Elastic SILT with some to trace fine to medium sand, but also includes SILT and SILT with sand (ML). The soil is typically wet with low to medium plasticity.

SPT N-values in the Tidal Flat Deposits unit ranged from 0 to 3 bpf. Natural moisture content analyses ranged from 60 to 221 percent, and averaged 130 percent. The high moisture content of some samples is associated with the presence of organic matter. Atterberg limits tests yielded plasticity indices that ranged from 6 to 37, and averaged 26, resulting in USCS designations of MH with one ML classification. Dry unit weights of two specimens ranged from 34 to 48 pounds per cubic foot (pcf), and averaged 41 pcf.

5.1.3 Peat

Peat was encountered at the surface in drilled borings B-5, B-8, B-17, and B-19, which extended to depths ranging from 4 feet in B-8 to 13 feet in B-17. Peat deposits generally consist of very soft, brown fibrous organics with little to some low- to medium-plasticity fines. The soil is typically wet.

SPT N-values in the Peat unit were zero bpf. The average natural moisture content for the five samples analyzed was 228 percent. The high moisture content is associated with the presence of organic matter.

5.1.4 Alluvium

Alluvium was encountered below the Tidal Flat Deposits in all drilled borings except in Borings B-17 and B-19. Alluvium was also encountered below the Fill unit in Test Pit TP-19. The top of the alluvial sequence ranged from 13 to 32 feet bgs and averaged 18 feet bgs. The Alluvium unit is greater than 28.5 feet thick. All drilled borings except B-17 and B-19 were terminated in alluvium, but because none of the borings fully penetrated the unit, the total thickness of the unit is not known. Total thickness of the Alluvium unit likely approaches 300 feet (Schlicker and Others, 1972).

The Alluvium unit typically consisted of loose to medium-dense, gray, Silty SAND (SM), Poorly Graded Sand with silt (SP-SM), Poorly Graded Sand with silt and gravel (SP-SM), Well Graded SAND with silt (SW-SM), and Well Graded SAND with silt and gravel (SW-SM). The sand is typically fine- to medium-grained, and the gravel is typically fine to coarse and sub-rounded to rounded. Fines are typically nonplastic to low plasticity. The Alluvium unit penetrated in Borings B-4 and B-16 also contained one to two layers of soft to medium-stiff Silt (ML) or Elastic SILT (MH). Alluvium encountered in borings B-16, B-18, and B-20 included GRAVEL with silt and sand (GP-GM/GW-GM).

Refusal was met in one out of 42 SPTs attempted in the Alluvium Unit. Refusal is reached when more than 50 blows are required to advance the SPT sampler through a 6-inch interval of soil. Non-refusal SPT N-values ranged from 3 to 60 bpf and averaged 11 bpf. The natural moisture content of seven specimens from the Alluvium ranged from 30 to 56 percent and averaged 39.9 percent. The fines content of the 11 samples, determined from sieve analysis, ranged from 12 to 39 percent and averaged 19.5 percent.

5.2 Groundwater

The drilled borings were advanced using mud rotary drilling techniques, which make it difficult to discern the depth to groundwater, if it is encountered. No instrumentation or observation wells were installed in the borings. However, in several test pits excavated during this investigation, groundwater seeps were encountered at depths ranging from 2.5 to 5 feet bgs. From these observations, we infer that the groundwater table throughout the site is hydraulically connected to portions of the Wilson and Trask Rivers, as well as to Hall, Dougherty, and Hoquarton Sloughs, which divide or adjoin the site boundaries. Based on the materials encountered, we anticipate that the hydraulic conductivity values will be lowest in the Tidal Flat Deposits and highest in the Alluvium. Groundwater levels may vary with changes in precipitation as well as with surface water levels. Localized zones of perched water, above the river elevation, may also be present at the site. In general, highest groundwater levels will occur in late spring to early summer, and lowest groundwater levels will occur in early to mid-autumn, before the onset of the fall rainy season.

6.0 GEOTECHNICAL ANALYSES

6.1 General

This study evaluates the feasibility of the proposed improvements on the site and the potential impacts to surrounding structures. Our analyses have generally been performed in accordance with current U.S. Army Corps of Engineers (USACE) design guidance. Specific references are provided in each section below.

6.2 Slope Stability Analysis

6.2.1 General

Slope stability is influenced by various factors, including: (1) the geometry of the soil mass and subsurface materials; (2) the weight of soil materials overlying the failure surface; (3) the shear strength of soils and/or rock along the failure surface; and (4) the hydrostatic pressure (groundwater levels) present within the levee mass and along the failure surface. The stability of a slope is expressed in terms of a factor of safety (FS), which is defined as the ratio of resisting forces to driving forces. At equilibrium, the FS is equal to 1.0, and the driving forces are balanced by the resisting forces. Failure occurs when the driving forces exceed the resisting forces, i.e., the FS is less than 1.0. An increase in the FS greater than 1.0, whether by increasing the resisting forces or decreasing the driving forces, reflects a corresponding increase in the stability of the mass.

Stability analyses for the project were performed in general accordance with EM 1110-2-1913, Design and Construction of Levees, dated 30 April 2000, and EM 1110-2-1902, Slope Stability, dated 31 October 2003. EM 1110-2-1913 requires that three cases be evaluated as follows:

- Case I – End of Construction – This case applies to both the landside and riverside slope of the levee and will also apply to cut-and-fill slopes elsewhere on the project.
- Case II – Sudden Draw Down – This case applies to the riverside slope of the levee.
- Case III – Steady Seepage from Full Flood Stage – This case applies to the landside slope of the levee.

Each levee model was analyzed assuming flooding and over-topping can occur on both the land and river sides of the levee.

6.2.2 Slope Stability Criteria

The results of our slope stability analysis will be compared to the following criteria. For Cases I through III, this criteria was taken from EM 1110-2-1913.

TABLE 2: SLOPE STABILITY CRITERIA

Analyzed Condition	Factor of Safety
Case I	1.3
Case II	1.2
Case III	1.4

The actual FS may differ from the calculated FS due to variations or uncertainty in the soil strength, subsurface geometry, failure surface location and orientation, groundwater level, and other factors that are not completely known.

6.2.3 Slope Stability Soil Parameters

Information from the available subsurface explorations, laboratory testing, and our previous experience on similar projects were used to estimate appropriate material strength and unit weight parameters for the various soil units. Table 3 presents the soil unit designations and the parameters used in our stability analyses. Due to the variable nature of the existing non-levee fill, localized strength parameters were developed for each analysis section for this material.

TABLE 3: SOIL DENSITY AND SHEAR STRENGTH PARAMETERS

Type of Soil	Unit Weight[1] (pcf)	Shear Strength					
		End of Construction		Steady State Seepage		Rapid Drawdown	
		Φ' (deg)	*c' (psf)*	*Φ (deg)*[2]	*c (psf)*[3]	*Φ (deg)*	*c (psf)*
Levee Fill	120	32	50	32	50	32	50
Peat	70	0	Varies[4]	30	100	35	50
Tidal Flat Deposits	85	0	200	19	220	22	200
Alluvium (Sand)	110	28	0	28	0	28	0
Alluvium (Gravel)	130	35	0	35	0	35	0

[1] Unit weight is average moist condition in pounds per cubic foot
[2] Friction angle in degrees
[3] Cohesion in pounds per square foot
[4] Undrained shear strength varies with effective overburden stress

6.2.4 Groundwater Assumptions

Groundwater levels used for Case I, end of construction, were selected to be at or near the ground surface (i.e. elevation 6 feet). For Cases II and III, we used the design levee crest elevation.

6.2.5 Slope Stability Models

SLOPE/W, a commercially available limit-equilibrium analysis software program published by GeoSlope International as part of their GeoStudio 2012 (Version 8.12) package, was used to perform the calculations. Circular failure surfaces were analyzed using the Spencer's method of slices to calculate the FS. An automated search was used to identify the potential failure surface with the lowest FS (critical failure surface).

Four stability section models were developed for the new levees: two at the North Levee (A-A' and B-B'); one at the Middle Levee (C-C'); and one at the South Levee (D-D'). Locations of the sections were selected based on the existing and proposed geometry with consideration to variations in the subsurface conditions as disclosed by the explorations, laboratory testing, and our interpretation of the site. The locations of sections for stability analyses are shown on Figure C1, Slope Stability Site Plan in Appendix C. In addition, we assumed flooding may occur on both sides of the levees. These sections and our engineering analyses and conclusions are based upon the assumption that subsurface conditions across the evaluation areas are not significantly different from those encountered by the field explorations.

6.2.6 Static Stability Analysis Results

The factors of safety for all cases were greater than required for the North Levee (A-A' and B-B') and Middle Levee (C-C'). For the South Levee (D-D'), when modeling the proposed levee with the toe near the crest of the Aufdermauer drainage ditch (centerline of levee approximately 25 feet from centerline of ditch), the factors of safety for the critical slip surfaces were less than the USACE suggested factors of safety for Case II and Case III (the Sudden Drawdown and Steady Seepage cases). Modeling the 4-foot-tall South Levee with its center line set back to the north, approximately 45 feet from the centerline of the drainage ditch, produced factors of safety equal to or greater than those suggested by USACE. However, due to the large fill heights required to accommodate the South Levee settlements, as discussed in the following section, special construction sequencing (staged construction) and instrumentation will be required for stability of the South Levee during and just following construction; refer to Section 6.3.5 for details. Complete slope stability analysis results are included in Appendix C. Results of slope stability analyses for each cross section are summarized in Table 4.

TABLE 4: COMPUTED FACTORS OF SAFETY

Levee	Section	Location	Case I	Case II	Case III
North	A-A’	River Side	1.6	1.8	1.9
		Land Side[1]	1.4	1.4	1.5
	B-B’	River Side	1.7	2.9	1.6
		Land Side	1.9	1.9	2.3
Middle	C-C’	River Side	2.4	3.3	2.8
		Land Side[1]	2.3	2.2	2.6
South	D-D’	River Side	1.3	1.4	1.5
		Land Side[2]	1.4	1.6	1.3

[1] Analaysis assumes 75-foot setback from adjacent drainage ditch (centerline of levee to centerline of ditch)
[2] Analaysis assumes 45-foot setback from adjacent drainage ditch (centerline of levee to centerline of ditch)

Based on the results of our stability analyses, the proposed levees and foundation materials should have adequate shear strength to resist slope failure, provided that our recommendations in this report are incorporated into the design and construction.

6.3 Settlement Analysis

6.3.1 General

Placement of fill to construct the new levees will result in settlement of the foundation soils beneath the new levees and the resulting levee surface. This settlement is mainly due to consolidation settlement of the underlying foundation materials.

The software program Settle 3D, Version 2.0 and published by Rocscience, Inc., was used to estimate the amount of settlement of the foundation soils due to the new levee construction. The input parameters and analysis methods were in general agreement with EM 1110-1-1904, Settlement Analysis, September 30, 1990.

6.3.2 Settlement Soil Parameters

Information from the available subsurface explorations, laboratory testing, and our previous experience on similar projects was used to determine appropriate elastic and consolidation parameters for the various geologic units. Table 5 presents the geologic unit designations and the parameters used in our settlement analyses.

TABLE 5: SETTLEMENT ANALYSIS PARAMETERS

Soil Material	Unit Weight[1], γ (pcf)	Elastic Modulus, E_s (ksf)	Coefficient of Consolidation, $C_{c\varepsilon}$	Coefficient of Recompression, $C_{r\varepsilon}$	Preconsolidation Pressure, P_c(ksf)
Levee Fill	120	N/A	N/A	N/A	N/A
Tidal Flat Deposits & Peat	80	N/A	0.32 to 0.39	0.021 to 0.053	OCR = 1
Alluvium (Sand)	110	300	N/A	N/A	N/A
Alluvium (Gravel)	130	500	N/A	N/A	N/A

[1] Unit weight is average moist condition in pounds per cubic foot

6.3.3 Groundwater Assumptions

For the purposes of settlement calculations, groundwater was assumed to be at or near the ground surface.

6.3.4 Settlement Model

Because fill heights and layer thicknesses vary across levees as well as the project site, six settlement models were developed: three for the North Levee, two for the Middle Levee, and one for the South Levee.

6.3.5 Settlement Analysis Results for Proposed Levee Embankments

Settle 3D, Version 2.0, was used to estimate settlement. Based on our analysis, the North Levee and the Middle Levee may experience settlement up to 2.7 and 1.4 feet, respectively. The South Levee may experience the largest settlement of approximately 4.5 feet. The large estimated settlement for the South Levee is due to a thicker Tidal Flat Deposits layer. In addition, we understand that the new levees may be constructed over two years, and regrading will be performed on the levees after the majority of the settlement is completed. We evaluated the preload fill height required to produce a top-of-levee elevation of approximately 12 feet for the North and Middle Levees and 11 feet for the South Levee after settlement is nearly complete. The results of the settlement analyses are summarized in Tables 6 through 8. Where new levees are constructed on top of, or in close proximity to, an existing levee, settlements may be smaller than predicted.

The large excess fill heights required to accommodate the estimated settlements at the South levee will result in slope instability at the end of construction of both slopes of the South Levee and the Aufdermauer drainage ditch. Due to the adjacent wetland, moving the South Levee further away from the drainage ditch is not feasible. Therefore, we recommend that the South Levee be built in two stages with increased construction monitoring, as follows:

1. The initial 5 feet of fill is constructed at the beginning of the construction season, with settlement plates and piezometers to monitor settlement and pore water dissipation;
2. Once the Geotechnical Engineer of Record reviews the settlement readings and piezometer readings and decides adequate pore water pressure dissipation has occurred (approximately 2 months), the remaining fill may be placed.

The preload fill for the South Levee should be constructed with maximum slopes of 2H:1V, and the toes of the preload fill should be located at the toe locations of the new South Levee. Recommendations for settlement monitoring are provided in Section 6.3.7.

We understand that a portion of the old South Levee system will be reconstructed during the summer following the new South Levee construction so that overtopping of the new South Levee will not occur prior to its regrading. For the North and Middle Levees, we recommend that the preload fill geometry be similar to the geometry of the new levees (i.e., same slope gradient and same crown width and location).

TABLE 6: NORTH LEVEE SETTLEMENT ESTIMATES

Station	Design Fill Height[1] (ft)	Initial Settlement[2] (ft)	Preload Fill Height to Accommodate Settlement [3] (ft)	Time to complete 90% consolidation (months) [4]
Sta. 0+00 to 33+00 and Sta. 34+00 to 37+25	6	2	2.5	4 to 6
Sta. 33+00 to 34+00 and Sta. 37+25 to 39+00	9	2.7	3.5	3 to 6
Sta. 39+00 to 45+43	2	0.8	1.5	2 to 4

[1] Design Fill Height = (design top of levee elevation) - (ground surface elevation)
[2] Settlement caused by design fill height
[3] Preload fill required to produce the design top of levee elevation after settlement, rounded up to the nearest 0.5 feet
[4] Time to complete 90% consolidation settlement includes additional fill to accommodate settlement

TABLE 7: MIDDLE LEVEE SETTLEMENT ESTIMATES

Station	Design Fill Height[1] (ft)	Initial Settlement[2] (ft)	Preload Fill Height to Accommodate Settlement [3] (ft)	Time to complete 90% consolidation (months) [4]
Sta. 0+00 to 7+00	4	1.4	2	3 to 6
Sta. 7+00 to 10+25	2	1.0	1.5	4 to 6

[1] Design Fill Height = (design top of levee elevation) - (ground surface elevation)
[2] Settlement caused by design fill height
[3] Preload fill required to produce the design top of levee elevation after settlement, rounded up to the nearest 0.5 feet
[4] Time to complete 90% consolidation settlement includes additional fill to accommodate settlement

TABLE 8: SOUTH LEVEE SETTLEMENT ESTIMATES

Station	Design Fill Height[1] (ft)	Initial Settlement[2] (ft)	Preload Fill Height to Accommodate Settlement [3] (ft)	Time to complete 90% consolidation (months) [4]
Sta. 11+00 to 28+07	4	2.8	4.5	13 to 15

[1] Design Fill Height = (design top of levee elevation) - (ground surface elevation)
[2] Settlement caused by design fill height
[3] Preload fill required to produce the design top of levee elevation after settlement, rounded up to the nearest 0.5 feet
[4] Time to complete 90% consolidation settlement includes additional fill to accommodate settlement

The estimated time rate of settlement may be up to 14 months for the South Levee. We understand project sequencing may require all regrading activities be performed during the following construction season, approximately 12 months after initial construction. The time to complete 90 percent of settlement may be sooner than the estimated time rate settlement. We recommend that settlement plates and piezometer be installed along the new South Levee to monitor settlement. The settlements and piezometer data may allow regarding to be performed sooner than 14 months. Settlement monitoring program recommendations are provided in Section 6.3.7.

The settlement will result in lateral and vertical deformations of the levee embankments. After preload and settlement are essentially complete, regrading or reconstruction of the levee embankments will be required. Additional fills for regrading or reconstruction should be anticipated.

6.3.6 Settlement Analysis Results for Proposed Floodgate

Our analysis indicated that preloading of the planned floodgate area will be required and that adequate time should be allowed so that settlement can occur prior to excavation and construction of the concrete floodgate structure. The size, shape, and density of the preloading soil mass should, as a minimum, be equal to the adjacent levee segments; to accelerate settlement, we recommend that the initial preload fill height should be up to, but not in excess of, 8 feet due to stability. The preloading soil mass should extend at least 60 feet to both the north and the south of the proposed floodgate.

6.3.7 Settlement Monitoring

We recommend that a series of settlement plates on the subgrade of the new levees be set up to monitor settlements, which would ultimately control the timing of regrading. In addition, we recommend a piezometer be installed at the South Levee to measure groundwater dissipation for staged construction. Recommend settlement plates and piezometer locations are summarized in Table 9. We recommend readings of the settlement plates be performed weekly during levee construction and monthly after construction. The results of the survey may allow earlier regrading of the levees.

TABLE 9: SUMMARY OF SETTLEMENT PLATE AND PIEZOMETER LOCATIONS

Levee	Design Fill Height[1] (ft)	Approx. Locations of Settlement Plate and Piezometer
North Levee	6	10+00 [2]
	6	20+00 [2]
	9	33+50 [2]
	9	38+00 [2]
	2	41+00 [2]
Middle Levee	4	3+00 [2]
	2	8+00 [2]
South Levee	4	16+00 [2]
	4	26+00 [2]
	4	21+00 [2,3]

[1] Design Fill Height = (design top of levee elevation) - (ground surface elevation)
[2] Settlement plate location
[3] Piezometer location

We recommend that the piezometer should consist of 1½-inch-diameter PVC stand pipe and a 20-feet screen. The bottom of the piezometer should be located at approximate elevation -18 feet (approximately 25 feet). The piezometer should be installed in general accordance with the Oregon Water Resources Department. We recommend readings of the piezometer be performed weekly during levee construction.

6.4 Seepage Analysis

6.4.1 General

Failure due to seepage can occur through two mechanisms that include seepage through levee embankments and seepage through foundation soils (underseepage). Discussions of seepage through the levee embankment are provided in Section 7.4.

The purpose of an underseepage analysis is to evaluate safety against piping or uplift at the dry-side levee toe during a flooding event. Piping and uplift can lead to levee failure and/or damage to protected structures and utilities. The potential for piping or uplift is evaluated by comparing the estimated exit gradient for a design flood event and selected levee cross section to the critical gradient of the surface soil near the levee toe. The exit gradient is defined as the difference in total head between the bottom of the upper-most soil layer and the ground surface divided by the thickness of the upper-most soil layer. The critical gradient of a soil is dependent on (directly proportional to) its density; therefore, the critical gradients of the light-weight organic tidal flat and peat deposits near the surface of the project site are relatively low (0.32 and 0.18) compared to typical non-organic soils (approximately 0.5).

For the underseepage analysis, we developed numerical models of the proposed levee-river system based on cross sections of the North Levee (E-E' and F-F'), Middle Levee (G-G' and H-H'), and South Levee (I-I'), shown on Figure D1, Underseepage Site Plan. The models were developed to evaluate exit gradients during both landside and riverside flooding. Details of the modeling and conclusions are summarized in the following sections.

6.4.2 Underseepage Modeling

We modeled steady state seepage at cross sections E-E', H-H', and I-I' and Transient seepage at sections F-F' and G-G' using the computer program SEEP/W Version 8.12 (Geo-Slope International, 2012). Exit gradients at the riverside and landside levee toes and phreatic surfaces through each levee were estimated.

The hydraulic properties of the levee fill and underlying soils are required in the solution of the seepage analysis. The parameters used in the modeling are based on previous experience with similar soils and published empirical relationships. The soil hydraulic property values are summarized in Table 10.

TABLE 10: SEEP/W SOIL HYDRAULIC PROPERTIES

Material Type	SEEP/W Material Model	θ_{sat} (ft^3/ft^3)	k_h (ft/sec)	k_v/k_h	M_v (psf)
Levee Fill	Saturated/ Unsaturated	0.3	3.00E-07	1	5.00E-07
Peat	Saturated	0.75	1.00E-04	0.3	5.00E-07
Tidal Flat Deposits	Saturated	0.75	1.00E-07	1	5.00E-07
Alluvium (Sand)	Saturated	N/A	2.00E-04	0.5	5.00E-07
Alluvium (Gravel)	Saturated	N/A	3.00E-04	0.5	5.00E-07
Proposed Toe Drain (filter Material)	Saturated	N/A	1.00E-04	1	5.00E-07

θ_{sat} - Saturated volumetric water content
k_h - Horizontal hydraulic conductivity
k_v - Vertical hydraulic conductivity
M_v - Coefficient of volume compressibility

6.4.1 Underseepage Analysis Results

We assumed that the alluvial sand/gravel layer is hydraulically connected to the surrounding river system. This causes landside floodwater, which permeates through the tidal flat deposits to drain through the alluvial layer and into a nearby river, thereby eliminating seepage at the riverside toe. However, during riverside floods, the alluvium layer will become pressurized at the river channels. This, in turn, causes large exit gradients to develop at the landside toe. This is especially true where levees are located near river bends with deep scour pits (i.e. the south end of the Middle Levee).

Furthermore, we assumed that flood events occur during wet weather months, when low-lying areas (i.e. drainage ditches) on the landside of the levee are full of water. This assumption reduced exit gradients in some areas; however, large exit gradients still tended to concentrate around a couple of drainage ditches during riverside flooding, including:

- The drainage ditch on the landside to the north of the proposed North Levee, between approximate Stations 14+00 to 27+00; and
- The drainage ditch on the landside (to the west) of the Middle Levee.

We understand that it is not an option to fill in these drainage ditches; therefore, the levee alignments should be adjusted so that the centerline of the levee is at least 75 feet from the centerline of the drainage ditches. The 75-foot setback does not apply to the Aufdermauer drainage ditch on the landward side of the South Levee; here, the thicker tidal flat layer is sufficient to dissipate the seepage pressures.

Our models indicate that the critical gradient will be exceeded at the landside toe of the Flood Gate Structure (Section G-G'). Two mitigation options were considered: (1) a cut-off wall, and (2) a toe drain. In order to significantly reduce the exit gradient, a cut-off wall would need to penetrate at least 50 feet below ground surface. The toe drain significantly reduced the exit gradient in the model; however, the amount of seepage flow increased by three orders of magnitude, from approximately 10^{-6} ft^3/s to 10^{-3} ft^3/s (assuming a 12-foot-wide by 40-foot-long flood gate channel). Landside to riverside seepage was not considered at the flood gate because it is assumed that flood water levels will not be sustained for a significant amount of time on the landside of the flood gate as long as the flood gates remain operational.

Based on the recommended levee setback and toe drain for the floodgate discussed above, the seepage analysis results are summarized in Table 11.

TABLE 11: UNDERSEEPAGE ANALYSIS RESULTS

Section	[1]Estimated Gradient, Riverside	Estimated Gradient, Landside	Critical Gradient[6]
North Levee (E-E')	0	0.28	**0.32**
North Levee (F-F')	0	0.30 [2]	**0.32**
Middle Levee (G-G') Floodgate	N/A[3]	0.19 [2, 4]	**0.32**
Middle Levee (H-H')	0	0.09	**0.32**
South Levee (I-I')[5]	0	0.14	**0.18**

[1] The Alluvium layer is considered drained for all riverside cases
[2] Transient analysis was used with a 48-hour flood
[3] The flood gate will eliminate significant head differential between the landside and riverside
[4] Modeled with toe drain
[5] Modeled with set back from centerline of levee to centerline of drainage ditch of 45 feet
[6] The gradient at which the vertical seepage force exceeds the weight of the surface soil, which typically causes piping or uplift

6.5 Recommendations for Toe Drain

Based on our underseepage analysis, we recommend a toe drain be installed on the landside of the flood gate. The toe drain should extend laterally the full width of the approach channel and 6 feet in length along the approach channel. The toe drain should be located 10 feet east of the landside toe of the floodgate. The toe drain should extend from the approach channel bottom approximately at elevation 5 feet to the alluvial sand at approximately elevation -6 feet. We anticipate excavation depth is approximately 11 feet below the bottom of the approach channel. Water should be expected to fill the toe drain excavation during construction; refer to Section 7.9 for toe drain construction considerations. The sand materials from the existing levee in test pits TP-1 and TP-3 through TP-5 meet the sand filter gradation in Table 12, below, and are suitable to use as filter materials to backfill the toe drain. We recommend that a laboratory gradation analysis be performed on the materials to check gradation prior to use. Alternatively, if off-site material is used, a gradation analysis should be performed on the imported material, and the resulting gradation should meet the requirements outlined in Table 12. A 1-foot-thick layer of 3/4-inch minus crushed rock should be placed above the filter material prior to placement of the proposed 2-foot-thick riprap channel erosion protection layer.

The sand filter should be placed in the excavation of the toe drain using a bucket from an excavator or a backhoe. The sand filter should not be placed as free fall into the excavation. The sand filter should be compacted lightly using the bucket.

TABLE 12:
SAND FILTER GRADATION

Sieve Size	Percent Passing (by Weight)
1”	100
3/4”	72 – 100
No. 4	54 – 82
No. 10	34 – 56
No. 40	9 – 17
No. 100	0 – 3

6.6 Summary of Stability and Underseepage Analysis Results

Based on our stability and underseepage analyses, we recommend the following:

- The centerline of the North Levee, between approximate Stations 14+00 to 27+00, should be setback to the south at least 75 feet from the centerline of the drainage ditch;
- The centerline of the Middle Levee should be setback to the west at least 75 feet from the centerline of the drainage ditch;
- The centerline of the new portion of the South Levee should be setback to the north at least 45 feet from the centerline of the drainage ditch;
- The new portion of the South Levee should be constructed in two stages and piezometers installed to monitor pore water pressures;
- A toe drain should be installed on the landside of the flood gate.

The locations of the recommended levee alignments are shown on Figure 3, Proposed and Recommended Levee Alignment. The results of our underseepage analysis are included in Appendix D.

6.7 Preliminary Seismic-Induced Liquefaction Evaluation

Soils classified as loose, saturated, cohesionless sandy or silty soils with low plasticity, such as alluvial sand below the Tidal Flat Deposits, are susceptible to seismic-induced liquefaction. Liquefaction is defined as a decrease of the shearing resistance in soils due to the accumulation of excess pore pressures that can result from strong ground vibration. During liquefaction, soil experiences a temporary transformation into a viscous state. Liquefaction can result in variable ground settlement, flow failure, lateral spreading, and slope instability. Flow failure can occur in soil that is underlain by a liquefiable layer and has a free face, such as near the edge of a fill or embankment. Lateral spreading can occur on gently sloping or level ground and will also move toward a free face such as a riverbank or shoreline. The results of liquefaction settlement, flow failure, and lateral spreading will cause large and variable horizontal and vertical ground deformations.

Preliminary liquefaction screening was performed based on the Oregon Department of Transportation Geotechnical Design Manual. Soils that are clayey, with a Plastic Index $\geq$18 or $N1_{60} \geq 25$ bpf, are not considered susceptible to liquefaction. Based on preliminary screening results, the soils under the levee embankments are highly susceptible to liquefaction, flow failure, and lateral spreading during a seismic event.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 General

We understand that the project is inundated with standing water for most of the year, except during summer. We also understand that construction earthwork activities will be performed during periods of warm, dry weather, between May and October, when soil moisture can generally be controlled by aeration, and there is typically no standing water on the ground surface.

7.2 Clearing, Grubbing, and Stripping

All areas that will receive levee embankments and structures should be stripped to a depth that is sufficient to remove existing surface vegetation and organic soil, trunk (or stem), stump, rootball and all roots greater than 1/2 inch in diameter and any other deleterious materials encountered. The resulting voids should be backfilled with levee embankment materials. Prior to backfill, the voids should be free of standing water. We anticipate that the required stripping depths will be at least 12 inches and deeper in heavy vegetated areas. Stripped organic soils will not be suitable for re-use as fill for the levee embankment. Additional recommendations to backfill voids are provided in Section 7.7.

7.3 Subgrade Preparation

After clearing, grubbing, and stripping, the subgrade should be rolled and compacted using a sheepsfoot roller to breakup potential seepage paths created during the clearing, grubbing, and stripping process. After areas are stripped or excavated to design subgrade elevations, we recommend that the subgrade be evaluated by the Geotechnical Engineer of Record, or their representative, for the presence of potential soft or unsuitable soils. Any areas that pump, weave, or appear soft or muddy should be scarified, dried, and compacted, or else over-excavated to an engineer-approved subgrade and backfilled with levee embankment materials.

7.4 Levee Embankment Materials

Based on our field explorations and laboratory testing, a majority of the existing levee embankments to be removed consisted of silty sand and sand with silt and gravel. Gravel with sand was encountered in TP-2, which was located on a spoil stockpile to the north of the project site. The soils encountered in the test pits located in the new tidal channels consisted of primarily elastic silt. The soils encountered in the test pits located in the Sadri property consisted of elastic silt, silty sand, and sandy silt.

In our opinion, the soils encountered in our test pits located on the on-site spoil stockpiles, existing levees to be removed, and new tidal channels are suitable for use as fill to construct new levee embankments. However, minor seepage through the levee should be anticipated due to the amounts of sand in the soils. We recommend that if clean sand or gravel is present in the borrow soils, the sand and gravel should be thoroughly mixed with silty soils or stockpiled for other use. The mixed soils proportion should consist of at least 30 percent of silty soils by weight. New levee embankments should not consist of pockets or layers of clean sand or gravel.

7.5 Fill Placement and Compaction

This section contains our general recommendations for suitable fill material and its placement. The on-site soils are generally suitable for placement as fill during warm, dry weather when moisture contents can be maintained by air drying and/or the addition of water. In order to reduce moisture content, discing and drying of the soils may be required. We recommend that no construction be done during wet seasons of the year (October through April) or during periods of sustained and/or heavy rainfall. Based on our experience with similar soils, the optimum moisture content of the on-site soils ranges between 18 and 25 percent. At the time of our explorations, the in situ moisture content of the on-site soils (within the upper 25 feet, excluding peat) was about 8 to 40 percent, which is about 10 percent below and 20 percent above the optimum moisture content range. The silt and clay of the on-site soils is very moisture sensitive, and during wet weather, on-site soils may become unworkable because of excess moisture content. The moisture content of the near surface soils can be expected to vary depending on the time of year and recent weather conditions.

All fill material should be placed in loose lifts not exceeding 8 inches in thickness and compacted to at least 95 percent of the dry density as determined by the standard Proctor test, ASTM D 689. We recommend that the moisture content of fill be no more than 2 percent below or 4 percent above the optimum moisture content as determined by the Proctor test. At these moisture content ranges, it is generally easier to achieve the specified compaction. If the fill moisture content is too wet, it is almost impossible to achieve compaction. If the fill is too dry, adding water will be required to achieve compaction.

The surface of compacted fill can deteriorate and lose its support capabilities when exposed to construction activity. Fills that have deteriorated or softened should be scarified and recompacted immediately prior to placement of additional materials. Compaction of fill should be checked with a sufficient number of density tests to determine that adequate compaction is being achieved.

7.6 Erosion and Levee Crest Protection

Erosion control should be provided for the new levee embankments and possible overtopping of the levee. We are available to discuss appropriate levee crest protection against overtopping and erosion- and sedimentation-control measures as needed for this site.

7.7 Backfill of Existing Channels and Low-Lying Areas

Prior to backfilling the existing channels, low-lying areas, or voids, the areas should be cleared, grubbed, and prepared in accordance with Sections 7.2 and 7.3. In addition, the areas should be free of standing water. The standing water may be removed by sump pumping. If perched water and groundwater is encountered within the areas, temporary sheet piles may be required to provide cutoff. In existing channels, a sheet pile coffer dam may be required to control surface water.

The existing channels, low-lying areas, or voids should be backfilled with levee embankment materials and compacted to at least 90 percent of the dry density as determined by the standard Proctor test, ASTM D 689, for the lower 3 feet or below the adjacent ground surface, whichever is lower. Above 3 feet or the ground surface, the backfill should be compacted to 95 percent of the dry density as determined by the standard Proctor test, ASTM D 689.

7.8 Construction Monitoring Requirements

Fill placement and checking of the exposed subgrade should be monitored by the Geotechnical Engineer of Record, or their representative, to verify that unstable materials are not present and that proper materials are used for fill and placement and compaction of materials has been accomplished. Before fill and backfill operations begin, representative samples of the proposed fill and backfill material should be tested for determination of laboratory compaction characteristics in accordance with ASTM D 698, as recommended above. Liquid and plastic limit determinations should also be accomplished in accordance with ASTM D 4318 to check material classification.

Compaction of subgrade surfaces, fill, and backfill should be checked with a sufficient number of density tests to assure that adequate compaction is being achieved. Construction specifications should require at least one in-place density test of the compacted fill for every 2,000 square feet of fill placed in the levee prism and every 5,000 square feet of fill placed elsewhere. For backfill of utility trenches or around structures, construction specifications should require at least one in-place density test per lift for every 100 feet. At least one test should be completed per lift regardless of the size or location of the fill area.

8.0 OTHER CONSIDERATIONS

8.1 On-Site or Local Laboratory During Construction

In order to provide timely materials testing results during construction, we recommend an on-site materials testing laboratory be considered, or the hiring of a local materials testing laboratory.

8.2 Emergency Action Plan

We recommend that the Port of Tillamook Bay, Tillamook County, NHC, or the contractor develop an emergency action plan (EAP) to restore the levee (line of protection) during construction if high water is forecast. At a minimum, the construction plans and specifications should require the contractor to develop an EAP prior to the start of any construction. Items that should be addressed in the plan include limiting the amount of levee that can be at less than full functionality; establishing water levels (actual and forecast) based on gauge readings that require additional work to be suspended; establishing water levels (actual and forecast) based on gauge readings that require the levee be fully restored; and requiring that the contractor have sufficient equipment, material, and personnel to restore the levee within the required time frame.

9.0 LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based upon site conditions as they presently exist and further assume that the field explorations are representative of subsurface conditions throughout the site, i.e., the subsurface conditions throughout the site are not significantly different from those disclosed by the field explorations.

If, during construction, subsurface conditions different from those encountered in the field explorations are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of these conclusions and recommendations, considering the changed conditions and the elapsed time.

This report was prepared for the exclusive use of the Port of Tillamook Bay, Tillamook County, and Northwest Hydraulic Consultants, Inc., for the design and construction of the new levees. Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely taking soil samples from geotechnical borings. Such unexpected conditions frequently require that additional expenditures be made to attain properly constructed projects. This report is not a warranty of subsurface conditions described in this report.

Please note that the scope of our services did not include any environmental assessment or evaluation regarding the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around the project site.

Shannon & Wilson has prepared the attached, "Important Information About Your Geotechnical/Environmental Report," to assist you and others in understanding the use and limitations of our reports. This attachment is presented in Appendix E of this report.

SHANNON & WILSON, INC.

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JJW:TTN/JLJ:amn

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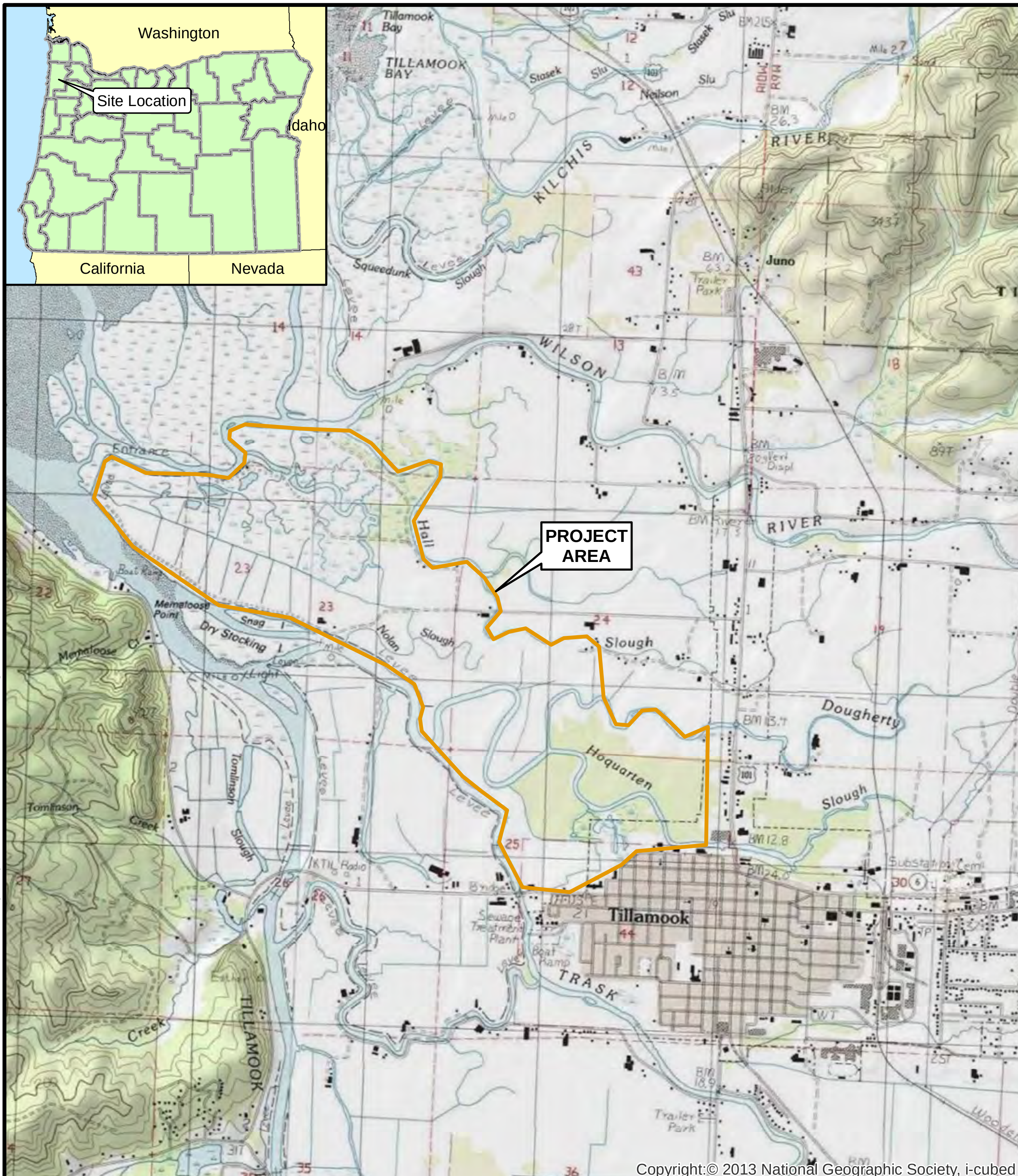

0 0.25 0.5 1

Scale in Miles

N

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VICINITY MAP

November 2014 24-1-03858-005

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FIG. 1

Filename: T:\Projects\24-1\3858_Oregon Solution Exodus S. Flow Corridor\Avmxd\Vicinity Map.mxd Date: 10/30/2014 Login: aeh

EXPLANATION

- Location and Designation of Boring
- Location and Designation of Test Pit
- Location and Designation of Hand Auger
- Existing Levee

Approximate Location of Proposed Levee

- North Levee
- Middle Levee
- South Levee
- South Levee (Upgrade)

0 500 1,000 2,000

Scale in Feet

N

NOTES

1. Aerial photograph and existing features provided by Northwest Hydraulic Consultants, December 18, 2013.

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Tillamook, Oregon

SITE AND EXPLORATION PLAN

November 2014 24-1-03858-005

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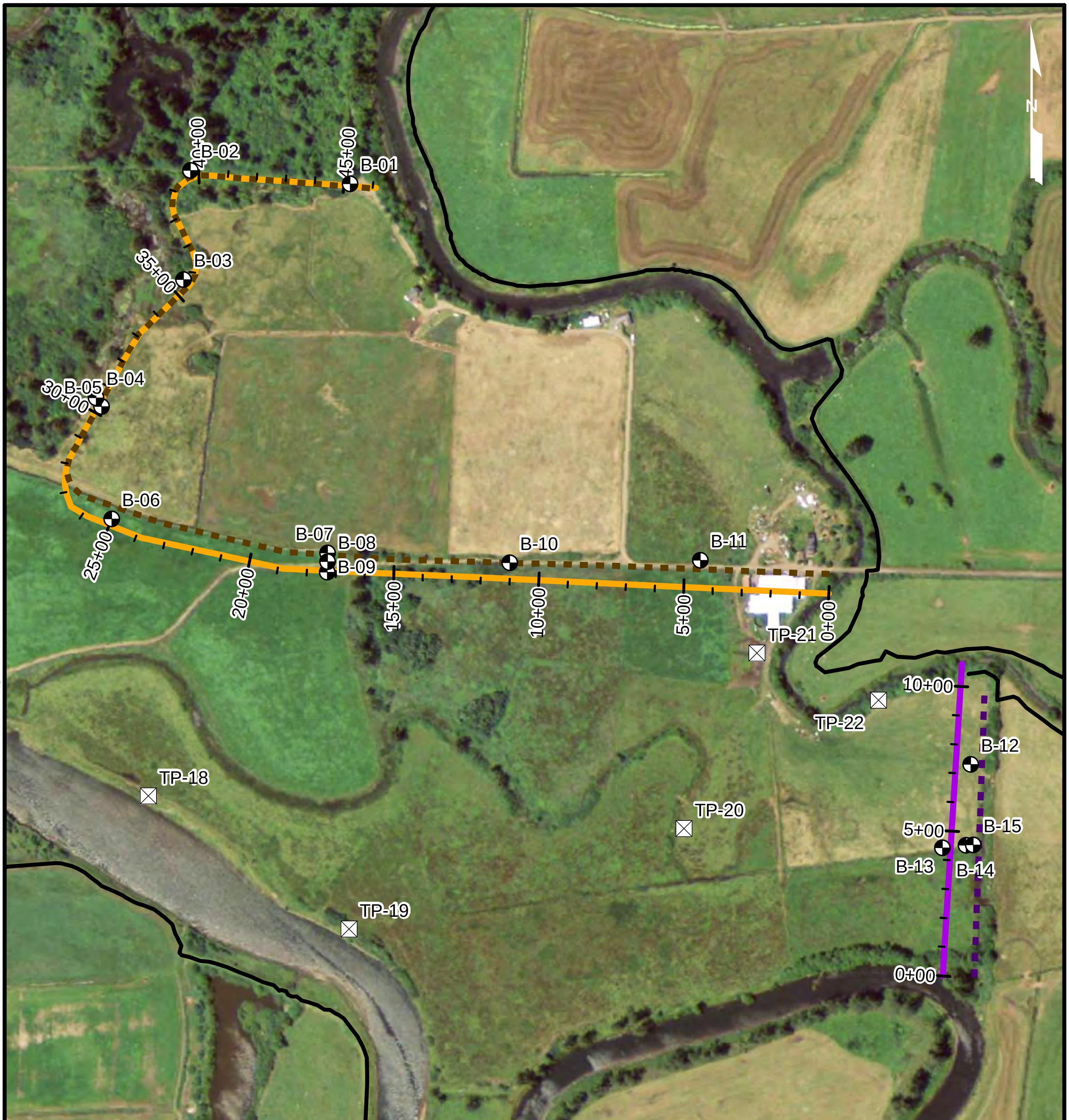
FIG. 2

Filename: T:\Projects\24-1\3858_Oregon Solution Exodus S. Flow Corridor\Avmxd\Site and Exploration Plan.mxd Date: 11/19/2014 Login: aeh



EXPLANATION

Location and Designation of Boring

Location and Designation of Test Pit

Existing Levee

Approximate Location of Levee

Proposed North Levee

Recommended North Levee

Proposed Middle Levee

Recommended Middle Levee

0 250 500 1,000

Scale in Feet

NOTES

1. Aerial photograph and existing features provided by Northwest Hydraulic Consultants, December 18, 2013.

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Tillamook, Oregon

PROPOSED AND RECOMMENDED LEVEE ALIGNMENTS

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FIG. 3
Sheet 1 of 2

Filename: T:\Projects\24-1\3858_Oregon Solution Exodus S. Flow Corridor\Avmxd\Station Site Plan.mxd Date: 11/4/2014 Login: aeh

EXPLANATION

- Location and Designation of Boring
- Location and Designation of Test Pit
- Location and Designation of Hand Auger
- Existing Levee

Approximate Location of Levee

- Proposed South Levee
- Recommended South Levee
- Proposed South Levee (Upgrade)
- Recommended South Levee (Upgrade)

0 250 500 1,000

Scale in Feet

NOTES

1. Aerial photograph and existing features provided by Northwest Hydraulic Consultants, December 18, 2013.

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PROPOSED AND RECOMMENDED LEVEE ALIGNMENTS

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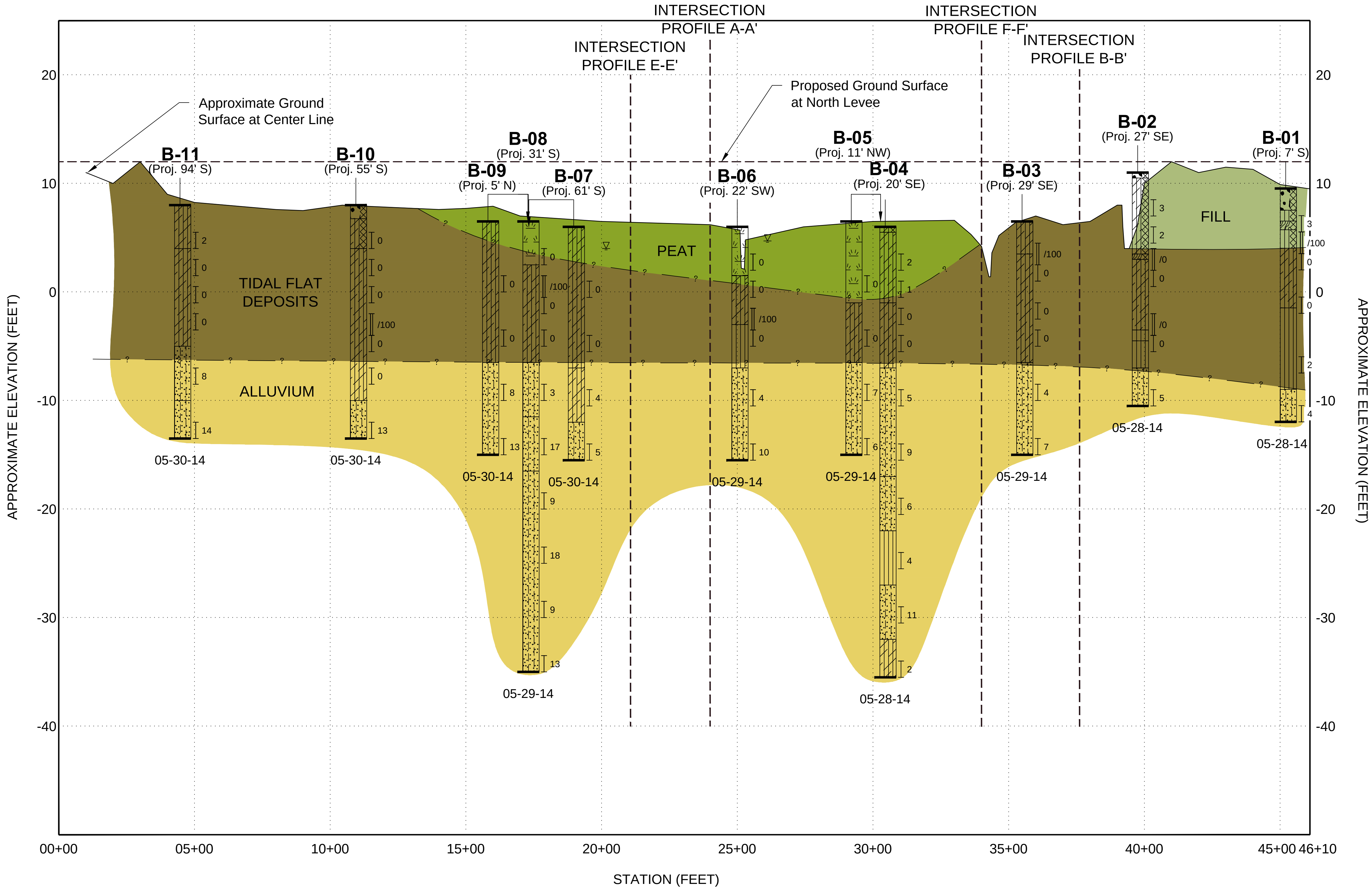
FIG. 3
Sheet 2 of 2

Filename: T:\Projects\24-1\3858_Oregon Solution Exodus S. Flow Corridor\Avmxd\Station Site Plan.mxd Date: 11/19/2014 Login: aeh



EXPLANATION

B-20 (Proj. 93' N) — Designation and projection of boring to profile line

Bag Sample

Estimated Water Level At Time of Drilling

Shelby Tube Sample with Recovery (e.g., /100 = 100% Recovery)

SPT Sample and Penetration Resistance in Blows/Foot or Blows/Inches Driven

05-29-14 — Date of Completion

0 400 800

Horizontal Scale in Feet

0 10 20

Vertical Scale in Feet (Vertical Exageration = 40X)

NOTES

1. Refer to Appendix A for complete boring logs.
2. See Figure 2 for profile location.
3. This subsurface profile is interpreted from materials observed in borings. Variations may exist between the profile and actual conditions.
4. Existing ground surface estimated from data provided by NHC.

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INTERPRETIVE SUBSURFACE PROFILE NORTH LEVEE

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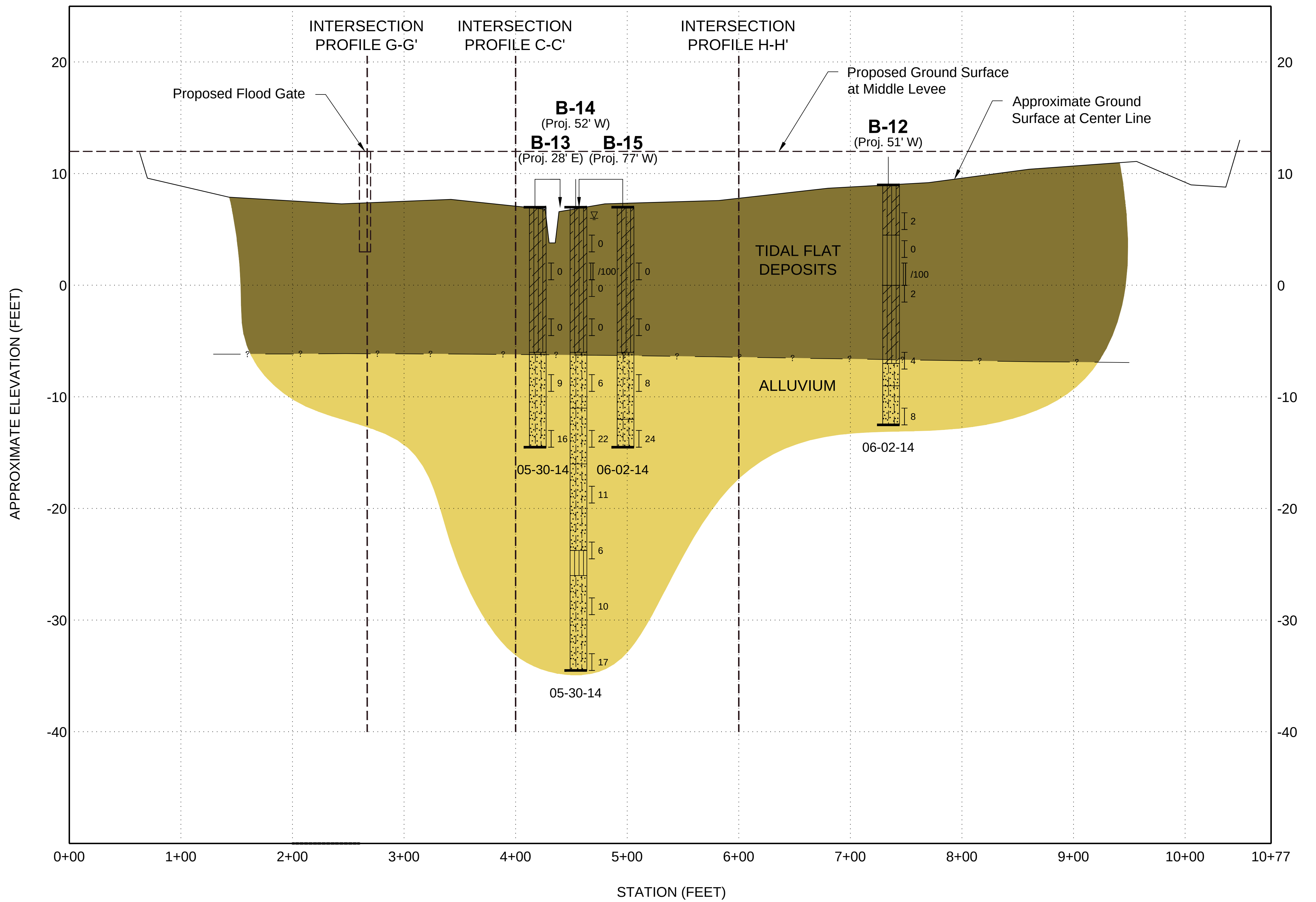
FIG. 4

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Profile Figures.dwg Date: 10-30-2014 Author: jjw



EXPLANATION

B-20 (Proj. 93' N) — Designation and projection of boring to profile line

Bag Sample

Estimated Water Level At Time of Drilling

Shelby Tube Sample with Recovery (e.g., /100 = 100% Recovery)

SPT Sample and Penetration Resistance in Blows/Foot or Blows/Inches Driven

05-29-14 — Date of Completion

0 100 200

Horizontal Scale in Feet

0 10 20

Vertical Scale in Feet (Vertical Exageration = 10X)

NOTES

1. Refer to Appendix A for complete boring logs.
2. See Figure 2 for profile location.
3. This subsurface profile is interpreted from materials observed in borings. Variations may exist between the profile and actual conditions.
4. Existing ground surface estimated from data provided by NHC.

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INTERPRETIVE SUBSURFACE PROFILE MI□□LE LEVEE

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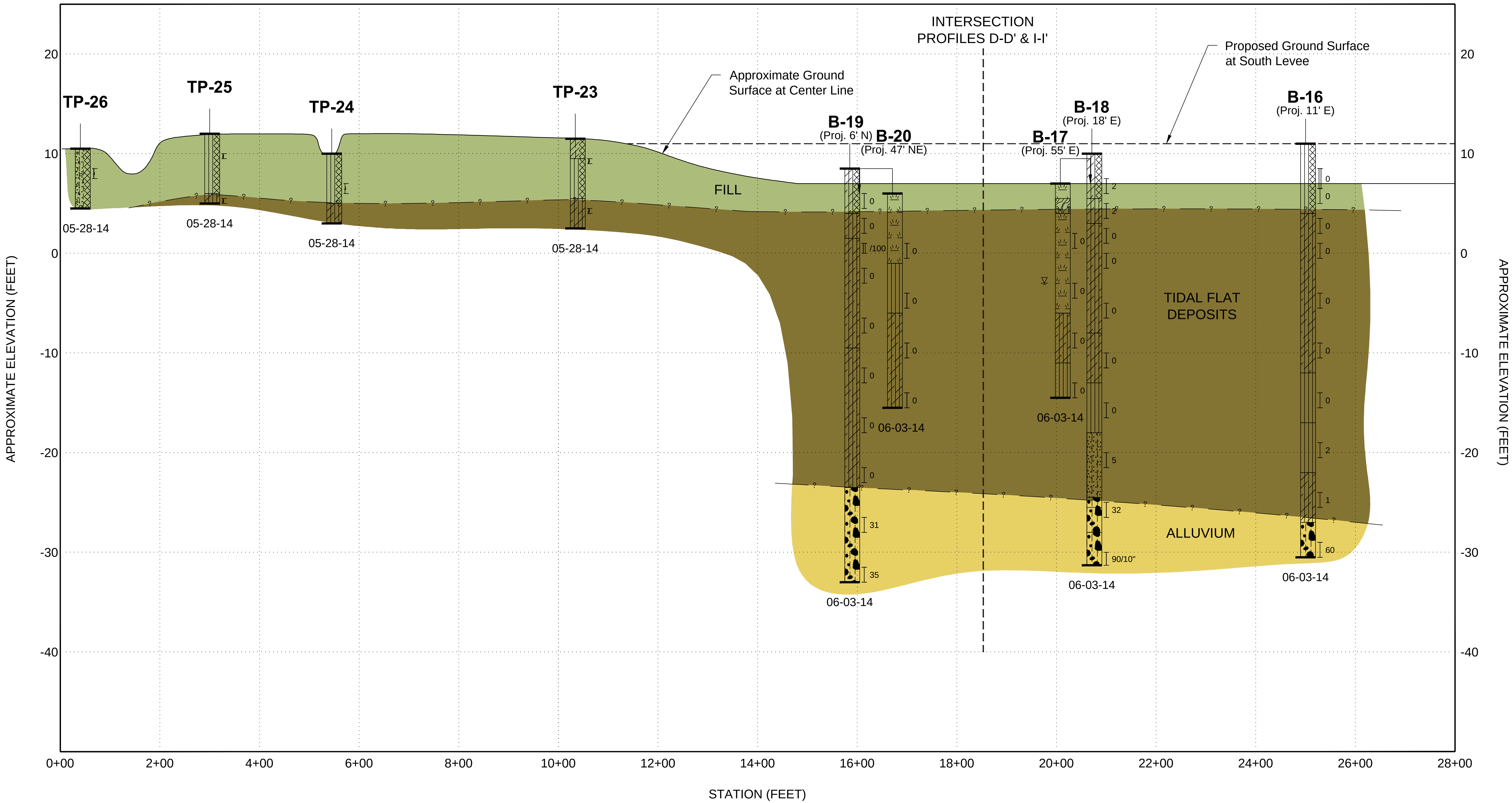
FIG. 5



EXPLANATION

B-20 (Proj. 93' N) — Designation and projection of boring to profile line

Jar Sample

Bag Sample

Estimated Water Level At Time of Drilling

Shelby Tube Sample with Recovery (e.g., /100 = 100% Recovery)

SPT Sample and Penetration Resistance in Blows/Foot or Blows/Inches Driven

05-29-14 — Date of Completion

0 200 400

Horizontal Scale in Feet

0 10 20

Vertical Scale in Feet

Vertical Exaggeration = 20x

NOTES

1. Refer to Appendix A for complete boring and test pit logs.
2. See Figure 2 for profile location.
3. This subsurface profile is interpreted from materials observed in explorations. Variations may exist between the profile and actual conditions.
4. Existing ground surface estimated from data provided by NHC.

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INTERPRETIVE SUBSURFACE PROFILE SOUTH LEVEE

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FIG. 6

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APPENDIX A

FIELD EXPLORATIONS

TABLE OF CONTENTS

FIGURES

APPENDIX A

FIELD EXPLORATIONS

A.1 GENERAL

Shannon & Wilson explored the subsurface conditions at the project site with 20 drilled borings, 30 test pit excavations, and three hand auger borings. Drilled borings were designated B-1 through B-20 and ranged in depth from 21.5 feet to 41.5 feet below the ground surface (bgs). Test pit excavations were designated TP-1 through TP-30 and ranged in depth from 4.2 feet to 9 feet bgs. Note that test pits TP-2, TP-16, TP-18, and TP-22 were excavated into the levee berm, as well as below the adjoining grade, and the excavation depths are measured from the highest point of excavation on the berm. Hand auger borings were designated HA-1 through HA-4 and ranged in depth from 6.5 feet to 9 feet bgs. All subsurface explorations are shown on the Site and Exploration Plan, Figure 2. This appendix describes the techniques used to advance and sample the explorations, and presents logs of the materials encountered.

A.2 DRILLED BORINGS

Borings were drilled between May 28 and June 3, 2014, by Hard Core Drilling, Inc., (Hard Core), of Dundee, Oregon, using a track-mounted CME-850 rotary drill rig and mud rotary drilling techniques. A Shannon & Wilson representative observed the exploratory drilling, collected samples, and logged the material encountered in the borings. Samples were collected from drilled borings as either disturbed or undisturbed sample types. A description of each drilled boring sample collection method is presented below.

A.2.1 Disturbed Sampling

Disturbed samples were collected in the borings, typically at 2.5- to 5-foot depth intervals, using a standard 2-inch outside diameter (O.D.) split spoon sampler in conjunction with Standard Penetration Testing. In a Standard Penetration Test (SPT), ASTM D1586, the sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance, or N-value. The SPT N-value provides a measure of in situ relative density of cohesionless soils (silt, sand, and gravel), and the consistency of cohesive soils (silt and clay). All disturbed samples were visually identified and described in the field, sealed to retain moisture, and returned to our laboratory for additional examination and testing.

SPT N-values can be significantly affected by several factors, including the efficiency of the hammer used. Based on information we received from Hard Core, the energy efficiency of their CME-75 and CME-850 automatic hammers used on site averaged 66 and 84 percent, respectively, when measured in January 2013. All N-values presented in this report are in blows per foot, as counted in the field. No corrections of any kind have been applied.

An SPT was considered to have met refusal where more than 50 blows were required to drive the sampler 6 inches. If refusal was encountered in the first 6-inch interval (for example, 50 for 1.5”), the count is reported as 50/1st 1.5”. If refusal was encountered in the second 6-inch interval (for example, 48, 50 for 1.5”), the count is reported as 50/1.5”. If refusal was encountered in the last 6-inch interval (for example, 39, 48, 50 for 1.5”), the count is reported as 98/7.5”.

A.2.2 Undisturbed Sampling

Undisturbed samples were collected in 3-inch O.D. thin-wall Shelby tubes, which were hydraulically pushed into the undisturbed soil at the bottoms of boreholes. The soils exposed at the ends of the tubes were examined and described in the field. After examination, the ends of the tubes were sealed to preserve the natural moisture of the samples. The sealed tubes were stored in the upright position, and care was taken to avoid shock and vibration during their transport and storage in our laboratory.

A.3 TEST PIT EXCAVATIONS

Test pits were excavated between May 27 and May 29, 2014, by Aufdermauer Trucking & Excavating LLC of Tillamook, Oregon, using a track-mounted excavator. The excavator removes soil, creating a narrow trench and exposing a viewable soil profile. A Shannon & Wilson geologist observed the explorations, collected samples, and logged the materials encountered in the excavations. Samples were collected from test pit excavations as grab samples based on observations made by the geologist.

A.4 HAND AUGER BORINGS

Hand auger borings were completed between May 27 and May 29, 2014, by a Shannon & Wilson geologist who also collected samples and logged the materials encountered in the borings. Hand auger borings were advanced using a small-diameter auger bucket that was attached to a short steel rod, fitted with a T-handle. The auger bucket was advanced by applying downward pressure as the T-handle was rotated. Additional sections of steel rod were attached to the T-handle as the boring was deepened. The auger bucket was retrieved after advancing the auger in approximately 10- to 12-inch increments. Samples were collected from the auger bucket at the desired depth interval as grab samples based on observations made by the geologist.

A.5 MATERIAL DESCRIPTIONS

In the field, soil samples were described and identified visually in accordance with ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Consistency, color, relative moisture, degree of plasticity, peculiar odors, and other distinguishing characteristics of the samples were noted. Once returned to our laboratory, the samples were re-examined, various standard laboratory tests were conducted, and the field descriptions and identifications were modified where necessary. We refined our visual-manual soil identifications based on the results of the laboratory tests, using elements of the Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487. However, ASTM D2487 was *not* followed in full because it requires that a suite of tests be performed to classify a single sample. In most cases, we did not have enough of any one sample to perform all of the tests required to fully classify it by ASTM D2487. The specific terminology used in the soil classifications is defined in the Soil Description and Log Key, Figure A1.

A.6 EXPLORATION DESCRIPTIVE LOGS

A.6.1 Drilled Borings

Descriptive summary logs of drilled borings are presented in Figures A2 through A21. Soil descriptions and interfaces on the logs are interpretive, and actual changes may be gradual. The left-hand portion of the boring logs gives our description, identification, and geotechnical unit designation of the soils encountered in the boring. The right-hand portion of the boring logs shows a graphic log, sample locations and designations, groundwater information, and a graphical representation of N-values, natural water contents, selected laboratory index test results, and sample recovery.

A.6.2 Test Pit Excavations

Descriptive summary logs of test pit excavations are presented in Figures A22 through A51. Soil descriptions and interfaces on the logs are interpretive, and actual changes may be gradual. The left-hand portion of the boring logs gives our description, identification, and geotechnical unit designation of the soils encountered in the boring. The right-hand portion of the excavation logs shows sample locations and designations, natural water contents, and selected laboratory index test results.

A.6.3 Hand Auger Borings

Descriptive summary logs of hand auger borings are presented in Figures A52 through A55. Soil descriptions and interfaces on the logs are interpretive, and actual changes may be gradual. The left-hand portion of the boring logs gives our description, identification, and geotechnical unit designation of the soils encountered in the boring. The right-hand portion of the boring logs shows sample locations and designations, natural water contents, and selected laboratory index test results.

A.7 GROUNDWATER

The drilled borings were advanced using mud rotary drilling techniques, which make it difficult to discern the depth to groundwater, if it is encountered. No instrumentation or observation wells were installed in the borings. However, in several test pits excavated during this investigation, groundwater seeps were encountered at depths ranging from 2.5 to 5 feet bgs. From these observations, we infer that the groundwater table throughout the site is hydraulically connected to portions of the Wilson and Trask Rivers, as well as to Hall, Dougherty, and Hoquarton Sloughs, which divide or adjoin the site boundaries. Based on the materials encountered, we anticipate that the hydraulic conductivity values will be lowest in the Tidal Flat Deposits and highest in the Alluvium. Groundwater levels may vary with changes in precipitation as well as with surface water levels. Localized zones of perched water, above the river elevation, may also be present at the site. In general, highest groundwater levels will occur in late spring to early summer, and lowest groundwater levels will occur in early to mid-autumn, before the onset of the fall rainy season.

A.8 BOREHOLE AND TEST PIT ABANDONMENT

Drilled borings were backfilled with bentonite chips in accordance with Oregon Water Resource Department regulations. Test pit locations were abandoned by backfilling with excavated material. Hand auger borings were abandoned by backfilling with auger cuttings.

Shannon & Wilson, Inc. (S&W), uses a soil identification system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following pages. Soil descriptions are based on visual-manual procedures (ASTM D2488) and laboratory testing procedures (ASTM D2487), if performed.

S&W INORGANIC SOIL CONSTITUENT DEFINITIONS

CONSTITUENT[2]	FINE-GRAINED SOILS (50% or more fines)[1]	COARSE-GRAINED SOILS (less than 50% fines)[1]
Major	***Silt, Lean Clay, Elastic Silt,*** or ***Fat Clay***[3]	***Sand*** or ***Gravel***[4]
Modifying (Secondary) Precedes major constituent	30% or more coarse-grained: ***Sandy*** or ***Gravelly***[4]	More than 12% fine-grained: ***Silty*** or ***Clayey***[3]
Minor Follows major constituent	15% to 30% coarse-grained: ***with Sand*** or ***with Gravel***[4]	5% to 12% fine-grained: ***with Silt*** or ***with Clay***[3]
	30% or more total coarse-grained *and* lesser coarse-grained constituent is 15% or more: ***with Sand*** or ***with Gravel***[5]	15% or more of a second coarse-grained constituent: ***with Sand*** or ***with Gravel***[5]

[1]All percentages are by weight of total specimen passing a 3-inch sieve.
[2]The order of terms is: *Modifying Major with Minor*.
[3]Determined based on behavior.
[4]Determined based on which constituent comprises a larger percentage.
[5]Whichever is the lesser constituent.

MOISTURE CONTENT TERMS

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table

STANDARD PENETRATION TEST (SPT) SPECIFICATIONS

Hammer:	140 pounds with a 30-inch free fall. Rope on 6- to 10-inch-diam. cathead 2-1/4 rope turns, > 100 rpm
Sampler:	10 to 30 inches long Shoe I.D. = 1.375 inches Barrel I.D. = 1.5 inches Barrel O.D. = 2 inches
N-Value:	Sum blow counts for second and third 6-inch increments. Refusal: 50 blows for 6 inches or less; 10 blows for 0 inches.

NOTE: Penetration resistances (N-values) shown on boring logs are as recorded in the field and have not been corrected for hammer efficiency, overburden, or other factors.

PARTICLE SIZE DEFINITIONS

DESCRIPTION	SIEVE NUMBER AND/OR APPROXIMATE SIZE
FINES	< #200 (0.075 mm = 0.003 in.)
SAND	
Fine	#200 to #40 (0.075 to 0.4 mm; 0.003 to 0.02 in.)
Medium	#40 to #10 (0.4 to 2 mm; 0.02 to 0.08 in.)
Coarse	#10 to #4 (2 to 4.75 mm; 0.08 to 0.187 in.)
GRAVEL	
Fine	#4 to 3/4 in. (4.75 to 19 mm; 0.187 to 0.75 in.)
Coarse	3/4 to 3 in. (19 to 76 mm)
COBBLES	3 to 12 in. (76 to 305 mm)
BOULDERS	> 12 in. (305 mm)

RELATIVE DENSITY / CONSISTENCY

COHESIONLESS SOILS		COHESIVE SOILS	
N, SPT, BLOWS/FT.	RELATIVE DENSITY	N, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
< 4	Very loose	< 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very dense	15 - 30	Very stiff
		> 30	Hard

WELL AND BACKFILL SYMBOLS

- Bentonite Cement Grout
- Bentonite Grout
- Bentonite Chips
- Silica Sand
- Gravel
- Perforated or Screened Casing
- Surface Cement Seal
- Asphalt or Cap
- Slough
- Inclinometer or Non-perforated Casing
- Vibrating Wire Piezometer

PERCENTAGES TERMS [1, 2]

Trace	< 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

[1]Gravel, sand, and fines estimated by mass. Other constituents, such as organics, cobbles, and boulders, estimated by volume.

[2]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

Oregon Solutions Project Exodus
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Tillamook, Oregon

SOIL DESCRIPTION AND LOG KEY

November 2014 24-1-03858-005

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FIG. A1
Sheet 1 of 3

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(Modified From USACE Tech Memo 3-357, ASTM D2487, and ASTM D2488)

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL		TYPICAL IDENTIFICATIONS
COARSE-GRAINED SOILS *(more than 50% retained on No. 200 sieve)*	Gravels *(more than 50% of coarse fraction retained on No. 4 sieve)*	Gravel *(less than 5% fines)*	GW		Well-Graded Gravel; Well-Graded Gravel with Sand
			GP		Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Silty or Clayey Gravel *(more than 12% fines)*	GM		Silty Gravel; Silty Gravel with Sand
			GC		Clayey Gravel; Clayey Gravel with Sand
	Sands *(50% or more of coarse fraction passes the No. 4 sieve)*	Sand *(less than 5% fines)*	SW		Well-Graded Sand; Well-Graded Sand with Gravel
			SP		Poorly Graded Sand; Poorly Graded Sand with Gravel
		Silty or Clayey Sand *(more than 12% fines)*	SM		Silty Sand; Silty Sand with Gravel
			SC		Clayey Sand; Clayey Sand with Gravel
FINE-GRAINED SOILS *(50% or more passes the No. 200 sieve)*	Silts and Clays *(liquid limit less than 50)*	Inorganic	ML		Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
			CL		Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
		Organic	OL		Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
	Silts and Clays *(liquid limit 50 or more)*	Inorganic	MH		Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
			CH		Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
		Organic	OH		Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
HIGHLY-ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT		Peat or other highly organic soils (see ASTM D4427)

FILL	Placed by humans, both engineered and nonengineered. May include various soil materials and debris.		The Fill graphic symbol is combined with the soil graphic that best represents the observed material

NOTE: No. 4 size = 4.75 mm = 0.187 in.; No. 200 size = 0.075 mm = 0.003 in.

NOTES

1. Dual symbols *(symbols separated by a hyphen, i.e., SP-SM, Sand with Silt)* are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the *CL-ML* area of the plasticity chart.

2. Borderline symbols *(symbols separated by a slash, i.e., CL/ML, Lean Clay to Silt; SP-SM/SM, Sand with Silt to Silty Sand)* indicate that the soil properties are close to the defining boundary between two groups.

3. The soil graphics above represent the various USCS identifications (i.e., *GP*, *SM*, etc.) and may be augmented with additional symbology to represent differences within USCS designations. *Sandy Silt (ML)*, for example, may be accompanied by the *ML* soil graphic with sand grains added.

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SOIL DESCRIPTION AND LOG KEY

November 2014 24-1-03858-005

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FIG. A1
Sheet 2 of 3

2013 BORING CLASS2 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SWNEW.GDT 10/22/14

GRADATION TERMS

Poorly Graded	Narrow range of grain sizes present or, within the range of grain sizes present, one or more sizes are missing (Gap Graded). Meets criteria in ASTM D2487, if tested.
Well-Graded	Full range and even distribution of grain sizes present. Meets criteria in ASTM D2487, if tested.

CEMENTATION TERMS[1]

Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

PLASTICITY[2]

DESCRIPTION	VISUAL-MANUAL CRITERIA	APPROX. PLASITICTY INDEX RANGE
Nonplastic	A 1/8-in. thread cannot be rolled at any water content.	< 4%
Low	A thread can barely be rolled and a lump cannot be formed when drier than the plastic limit.	4 to 10%
Medium	A thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. A lump crumbles when drier than the plastic limit.	10 to 20%
High	It take considerable time rolling and kneading to reach the plastic limit. A thread can be rerolled several times after reaching the plastic limit. A lump can be formed without crumbling when drier than the plastic limit.	> 20%

ADDITIONAL TERMS

Mottled	Irregular patches of different colors.
Bioturbated	Soil disturbance or mixing by plants or animals.
Diamict	Nonsorted sediment; sand and gravel in silt and/or clay matrix.
Cuttings	Material brought to surface by drilling.
Slough	Material that caved from sides of borehole.
Sheared	Disturbed texture, mix of strengths.

PARTICLE ANGULARITY AND SHAPE TERMS[1]

Angular	Sharp edges and unpolished planar surfaces.
Subangular	Similar to angular, but with rounded edges.
Subrounded	Nearly planar sides with well-rounded edges.
Rounded	Smoothly curved sides with no edges.
Flat	Width/thickness ratio > 3.
Elongated	Length/width ratio > 3.

[1]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.
[2]Adapted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

ACRONYMS AND ABBREVIATIONS

ATD	At Time of Drilling
approx.	Approximate/Approximately
Diam.	Diameter
Elev.	Elevation
ft.	Feet
FeO	Iron Oxide
gal.	Gallons
Horiz.	Horizontal
HSA	Hollow Stem Auger
I.D.	Inside Diameter
in.	Inches
lbs.	Pounds
MgO	Magnesium Oxide
mm	Millimeter
MnO	Manganese Oxide
NA	Not Applicable or Not Available
NP	Nonplastic
O.D.	Outside Diameter
OW	Observation Well
pcf	Pounds per Cubic Foot
PID	Photo-Ionization Detector
PMT	Pressuremeter Test
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
rpm	Rotations per Minute
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
q_u	Unconfined Compressive Strength
VWP	Vibrating Wire Piezometer
Vert.	Vertical
WOH	Weight of Hammer
WOR	Weight of Rods
Wt.	Weight

STRUCTURE TERMS[1]

Interbedded	Alternating layers of varying material or color with layers at least 1/4-inch thick; singular: bed.
Laminated	Alternating layers of varying material or color with layers less than 1/4-inch thick; singular: lamination.
Fissured	Breaks along definite planes or fractures with little resistance.
Slickensided	Fracture planes appear polished or glossy; sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps that resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay.
Homogeneous	Same color and appearance throughout.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

SOIL DESCRIPTION AND LOG KEY

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A1
Sheet 3 of 3

Total Depth:	*21.5 ft.*	Northing:	*~ 676,968 ft.*	Drilling Method:	*Mud Rotary*
Top Elevation:	*~ 10 ft.*	Easting:	*~ 7,338,079 ft.*	Drilling Company:	*Hardcore Drilling*
Vert. Datum:		Station:	*~*	Drill Rig Equipment:	*Track*
Horiz. Datum:		Offset:	*~*	Other Comments:	

Hole Diam.:	*4 in.*
Rod Type:	*NWJ*
Hammer Type:	*Automatic*

SOIL DESCRIPTION

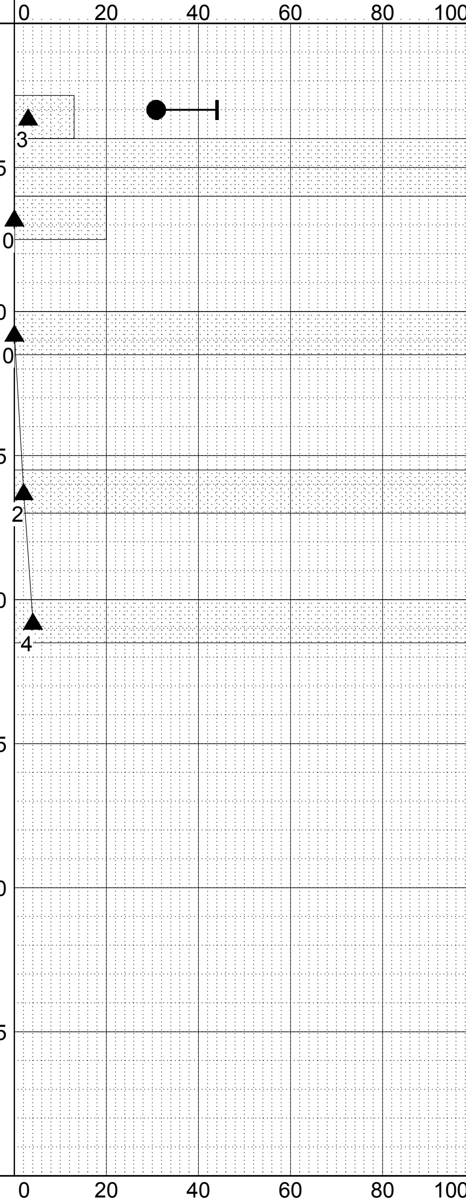
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Gravel Road	7.5 / 2.0	
Soft, dark gray, *Silt (ML)*; wet; low plasticity.	6.5 / 3.0	S-1
Wood debris, some silt (ML); low plasticity. **FILL**	5.7 / 3.8	U-1
Soft, dark gray, *Silt (ML)*; wet; low plasticity.	4.0 / 5.5	S-2
Very soft, dark gray and brown, *Elastic Silt (MH)*; wet; medium plasticity; trace fine roots. **TIDAL FLAT DEPOSITS**	-1.5 / 11.0	S-3
Very soft, dark gray, *Silt with Sand (ML)*; wet; fine subangular sand; low plasticity; trace fibrous organics.	-9.0 / 18.5	S-4
Loose, dark gray, *Silty Sand (SM)*; wet; fine subangular sand; nonplastic fines; trace wood. **ALLUVIUM**	-12.0 / 21.5	S-5

Completed - May 28, 2014

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Standard Penetration Test

3" O.D. Shelby Tube

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-01

November 2014 — 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A2

REV 3

MASTER_LOG_E 24-1-03858-002-BORINGS.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: EJOF Rev: PWB Typ: PAR

Total Depth:	21.5 ft.	Northing:	~ 677,014 ft.	Drilling Method:	Mud Rotary
Top Elevation:	~ 11 ft.	Easting:	~ 7,337,529 ft.	Drilling Company:	Hardcore Drilling
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.: 4 in.
Rod Type: NWJ
Hammer Type: Automatic

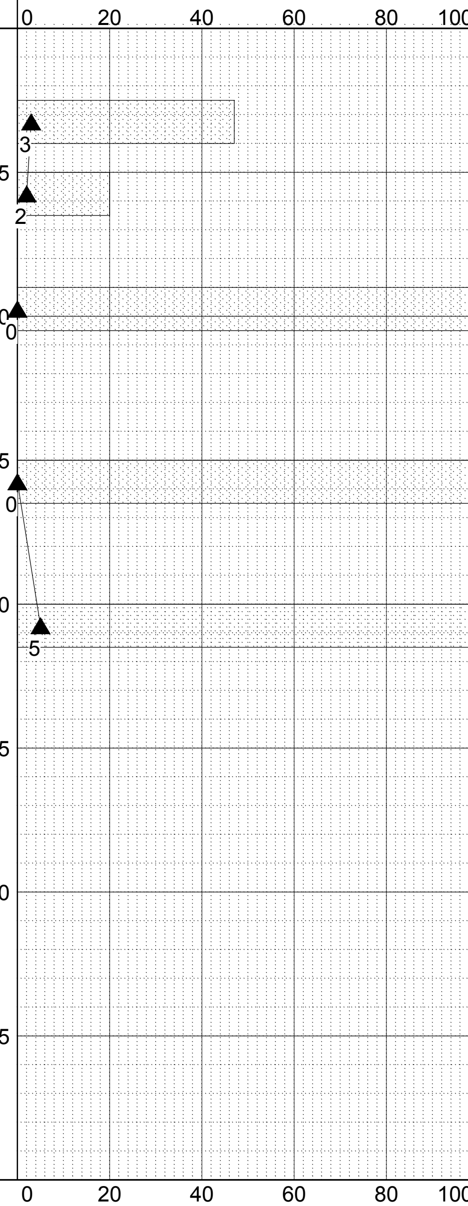
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Gravel Road	10.5 / 0.5	
Soft, dark brown, *Elastic Silt (MH)*; moist; medium plasticity; trace fine roots. **FILL**	3.5 / 7.5	S-1, S-2
Woody debris	3.0 / 8.0	U-1 *
Very soft, dark gray, *Elastic Silt (MH)*; wet; high plasticity; trace fibrous organics. **TIDAL FLAT DEPOSITS**	-3.5 / 14.5	S-3, U-2 *
Very soft, green-gray, *Silt (ML)*; wet; low plasticity; trace fibrous organics.	-4.5 / 15.5	S-4
Very soft, green-gray, *Silt (ML)*; wet; medium plasticity; trace fibrous organics.	-7.0 / 18.0	
Loose, green-gray, *Poorly Graded Sand with Silt (SP-SM)*; fine subangular sand; nonplastic fines; trace fibrous organics. **ALLUVIUM**	-10.5 / 21.5	S-5

Completed - May 28, 2014

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

- * Sample Not Recovered
- Standard Penetration Test
- 3" O.D. Shelby Tube

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

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Tillamook, Oregon

LOG OF BORING B-02

November 2014 24-1-03858-005

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FIG. A3

REV 3

Total Depth:	21.5 ft.	Northing:	~ 676,639 ft.	Drilling Method:	Mud Rotary
Top Elevation:	~ 7 ft.	Easting:	~ 7,337,507 ft.	Drilling Company:	Hardcore Drilling
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	4 in.
Rod Type:	NWJ
Hammer Type:	Automatic

SOIL DESCRIPTION

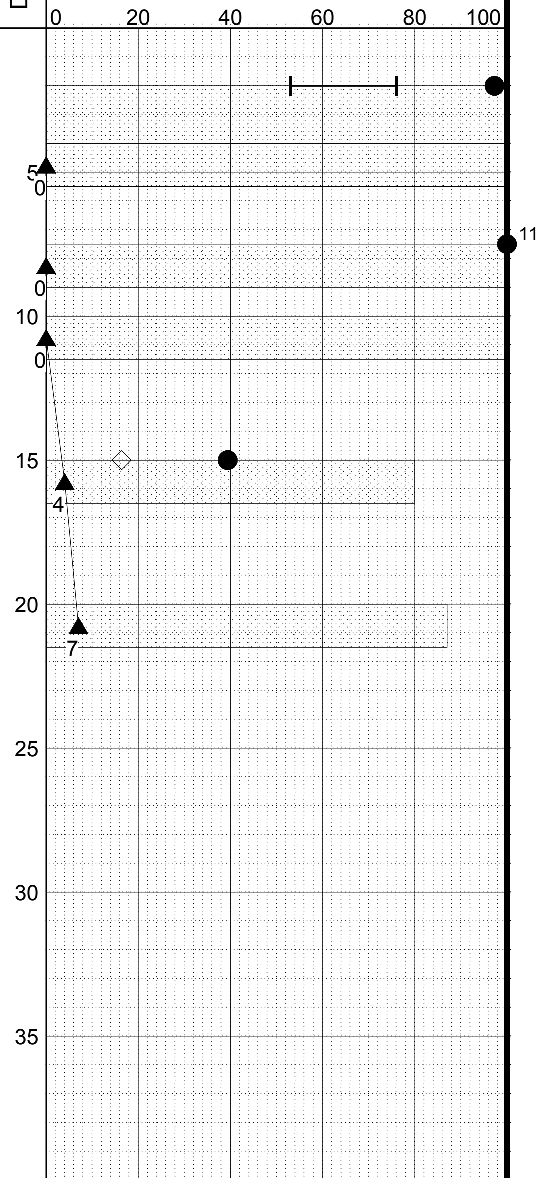
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Very soft, dark brown, *Elastic Silt (MH)*; moist; medium to high plasticity; trace organics. *U-1: Dry Density = 48.0 pcf*	3.5 / 3.0	U-1
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium to high plasticity; few organics. **TIDAL FLAT DEPOSITS**	-6.5 / 13.0	S-1, S-2, S-3
Loose, dark gray, *Silty Sand (SM)*; wet; fine subangular sand; nonplastic fines; trace woody organics. **ALLUVIUM**	-15.0 / 21.5	S-4, S-5
Completed - May 29, 2014		

Columns: Elev. Depth (ft.) | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

3" O.D. Shelby Tube

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit |———| Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-03

November 2014 24-1-03858-005

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FIG. A4

REV 3

MASTER_LOG_E 24-1-03858-002-BORINGS.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: EJOF Rev: PWB Typ: PAR

Total Depth:	41.5 ft.	Northing:	~ 676,231 ft.	Drilling Method:	Mud Rotary
Top Elevation:	~ 6 ft.	Easting:	~ 7,337,204 ft.	Drilling Company:	Hardcore Drilling
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track
Horiz. Datum:		Offset:	~	Other Comments:	

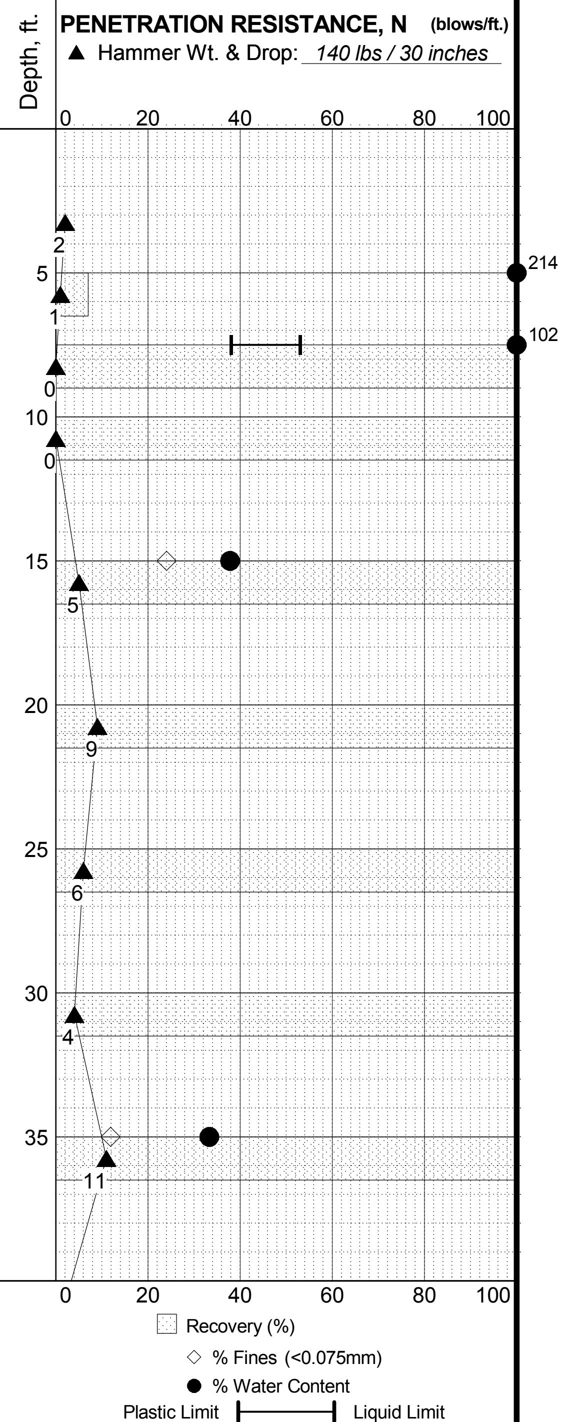
Hole Diam.: 4 in.
Rod Type: NWJ
Hammer Type: Automatic

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Topsoil.	5.5 / 0.5	
Soft to very soft, dark brown, *Elastic Silt (MH)*; wet; medium plasticity; few fibrous organics. **TIDAL FLAT DEPOSITS**		S-1 *, S-2
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few wood fibers.	-1.0 / 7.0	S-3, S-4
Loose, dark gray, *Silty Sand (SM)*; wet; fine subangular sand; low plasticity fines; trace wood. **ALLUVIUM**	-7.0 / 13.0	S-5, S-6
Loose, dark gray, *Sand with Silt (SP-SM)*; wet; fine subangular sand; nonplastic fines; one 1.5-in.-thick bed of organics.	-17.0 / 23.0	S-7
Soft, dark gray, *Silt (ML)*; wet; few fine sand; low plasticity.	-22.0 / 28.0	S-8
Medium dense, gray, *Poorly Graded Sand with Silt (SP-SM)*; wet; fine subangular sand; nonplastic fines.	-27.0 / 33.0	S-9
Soft, dark gray, *Elastic Silt (MH)*.	-32.0 / 38.0	

CONTINUED NEXT SHEET



LEGEND

* Sample Not Recovered

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
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Tillamook, Oregon

LOG OF BORING B-04

November 2014 24-1-03858-005

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FIG. A5
Sheet 1 of 2

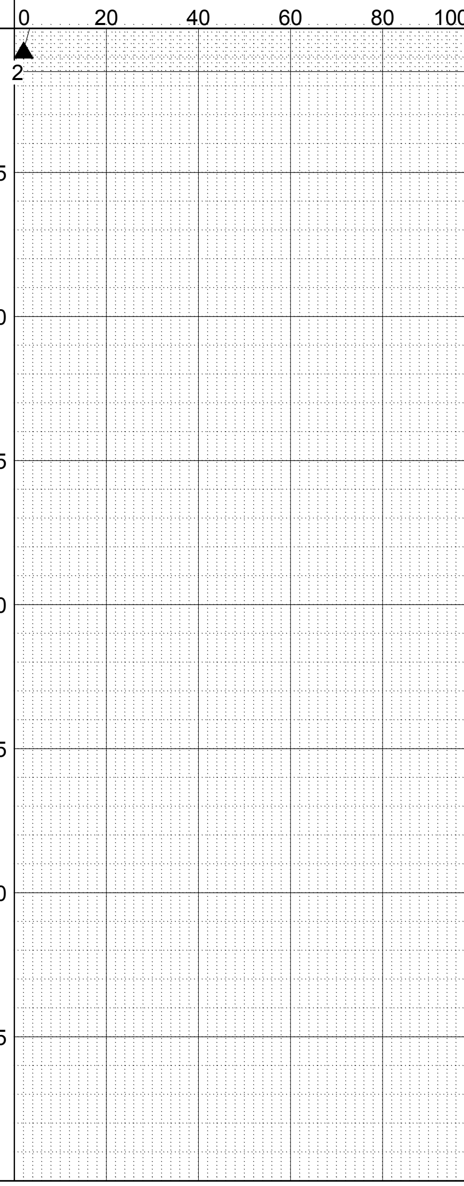
REV 3

Total Depth:	41.5 ft.	Northing:	~ 676,231 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	~ 6 ft.	Easting:	~ 7,337,204 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Continued: Soft, dark gray, *Elastic Silt (MH)*; wet; few fine sand; medium plasticity. **ALLUVIUM**	*-35.5* 41.5		S-10		
Completed - May 28, 2014					45
					50
					55
					60
					65
					70
					75

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

⌶ Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

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Tillamook, Oregon

LOG OF BORING B-04

November 2014 24-1-03858-005

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FIG. A5
Sheet 2 of 2

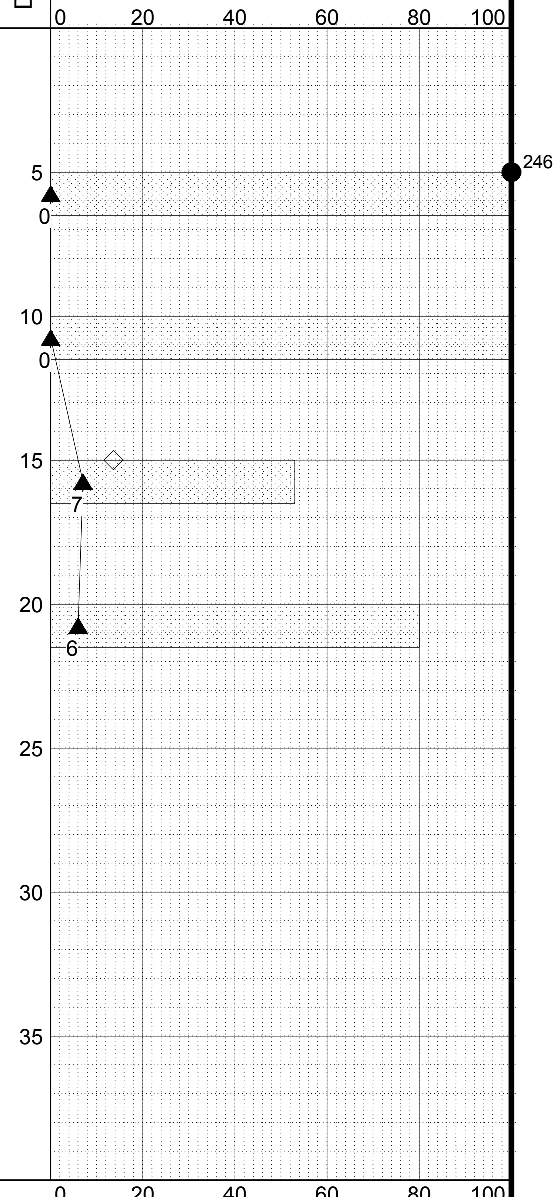
REV 3

Total Depth:	21.5 ft.	Northing:	~ 676,201 ft.	Drilling Method:	Mud Rotary
Top Elevation:	~ 7 ft.	Easting:	~ 7,337,224 ft.	Drilling Company:	Hardcore Drilling
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	4 in.
Rod Type:	NWJ
Hammer Type:	Automatic

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Samples
Very soft, dark brown, *Peat (PT)*; wet; some medium plasticity fines. **PEAT**	*-1.0* 7.5	S-1
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few organics. **TIDAL FLAT DEPOSITS**	*-6.5* 13.0	S-2
Loose, dark gray, *Silty Sand/Sand with Silt (SM/SP-SM)*; wet; fine to medium subangular sand; nonplastic fines; trace wood fragments and one 1-in.-thick bed of wood fragments. **ALLUVIUM**	*-15.0* 21.5	S-3, S-4
Completed - May 29, 2014		

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Standard Penetration Test

Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-05

November 2014 24-1-03858-005

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FIG. A6

REV 3

Total Depth:	*21.5 ft.*	Northing:	*~ 675,812 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*4 in.*
Top Elevation:	*~ 6 ft.*	Easting:	*~ 7,337,259 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:		Station:	~	Drill Rig Equipment:	*Track*	Hammer Type:	*Automatic*
Horiz. Datum:		Offset:	~	Other Comments:			

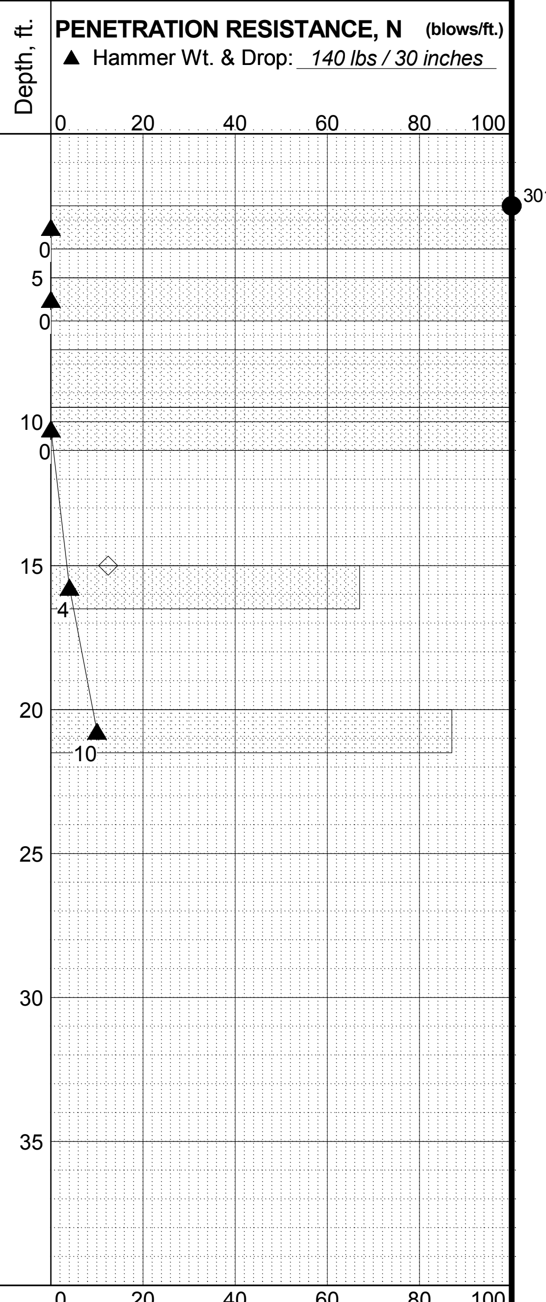
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples	Ground Water
Very soft, brown, *Peat (PT)*; wet; trace to some nonplastic to low plasticity fines. **PEAT**		S-1	During Drilling
Very soft, dark gray and brown, *Elastic Silt (MH)*; wet; medium plasticity; some fibrous organics. **TIDAL FLAT DEPOSITS**	*1.5* 4.5	S-2, U-1	
Very soft, dark gray, *Silt (ML)*; wet; low plasticity; little fibrous organics.	*-3.0* 9.0	S-3	
Loose grading to medium dense, dark gray, *Silty Sand/Poorly Graded Sand with Silt (SM/SP-SM)*; wet; fine to medium subangular sand; nonplastic fines; trace woody organics. **ALLUVIUM**	*-7.0* 13.0	S-4, S-5	
Completed - May 29, 2014	*-15.5* 21.5		

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube
- Groundwater Level ATD
- Recovery (%)
- % Fines (<0.075mm)
- % Water Content
- Plastic Limit —— Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-06

November 2014 24-1-03858-005

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FIG. A7

REV 3

Total Depth: 21.5 ft.	Northing: ~ 675,696 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation: ~ 6 ft.	Easting: ~ 7,338,002 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	Station: ~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:	Offset: ~	Other Comments:			

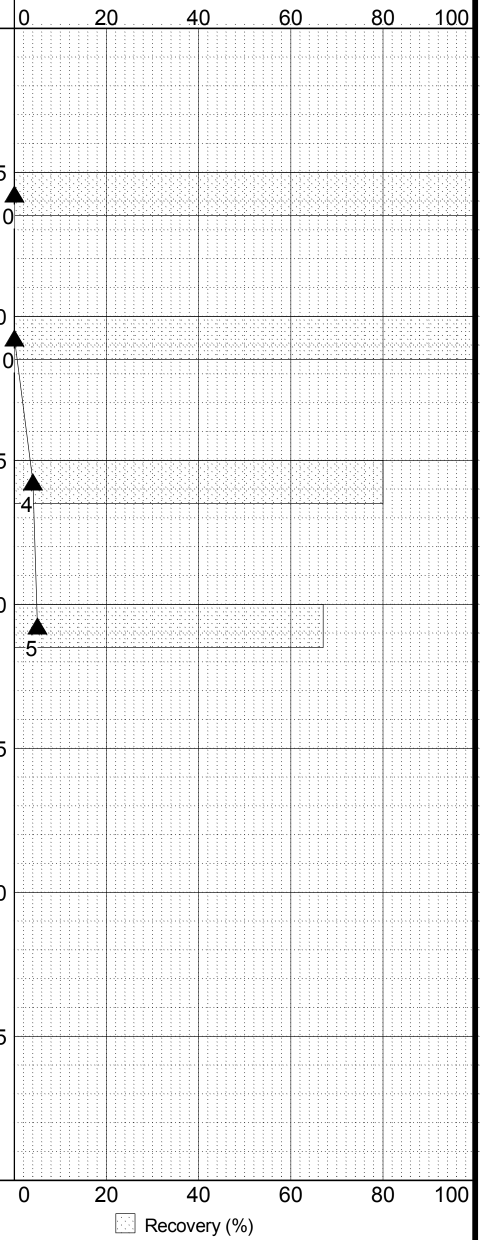
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Very soft, dark gray and brown, *Elastic Silt (MH)*; wet; medium plasticity; some organics. **TIDAL FLAT DEPOSITS**			S-1 (5–6.5), S-2 (10–11.5)	During Drilling ▽	5, 10
Soft, dark gray, *Elastic Silt (MH)*; wet; few coarse subangular sand; medium plasticity; trace woody organics; one 1-in.-thick bed of coarse sand.	*-7.0* 13.0		S-3 (15–16.5)		15
Loose, dark gray, *Poorly Graded Sand with Silt (SP-SM)*; wet; medium to coarse subrounded to subangular sand; nonplastic fines; trace woody organics. **ALLUVIUM**	*-12.0* 18.0		S-4 (20–21.5)		20
Completed - May 30, 2014	*-15.5* 21.5				25, 30, 35

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

Standard Penetration Test

▽ Groundwater Level ATD

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-07

November 2014 | 24-1-03858-005

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FIG. A8

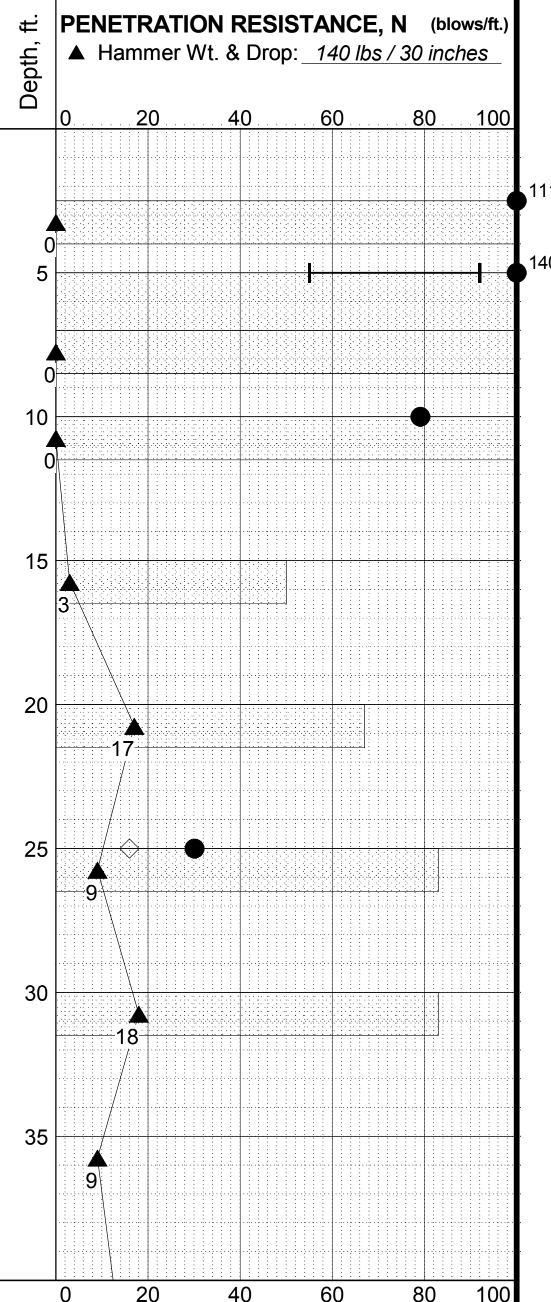
REV 3

Total Depth: 41.5 ft.	Northing: ~ 675,665 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation: ~ 7 ft.	Easting: ~ 7,338,001 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	Station: ~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Very soft, brown, *Peat (PT)*; wet; some low plasticity fines. **PEAT**		S-1
Very soft, dark gray, *Elastic Silt (MH)*; wet; high plasticity; some fibrous organics. *U-1: Dry Density = 34.0 pcf* **TIDAL FLAT DEPOSITS**	2.5 / 4.0	U-1, S-2, S-3
Very loose, dark gray, *Poorly Graded Sand with Silt (SP-SM)*; wet; fine to medium subangular sand; nonplastic fines; trace woody organics.	-6.5 / 13.0	S-4
Medium dense, dark gray, *Poorly Graded Sand with Silt (SP-SM)*; wet; trace fine rounded gravel; fine to medium subangular sand; nonplastic fines.	-11.5 / 18.0	S-5
Loose to medium dense, dark gray, *Silty Sand/Poorly Graded Sand with Silt (SM/SP-SM)*; wet; fine subangular sand; nonplastic fines; trace organics. **ALLUVIUM**	-16.5 / 23.0	S-6, S-7, S-8



CONTINUED NEXT SHEET

LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube
- Recovery (%)
- ◇ % Fines (<0.075mm)
- ● % Water Content
- Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-08

November 2014 24-1-03858-005

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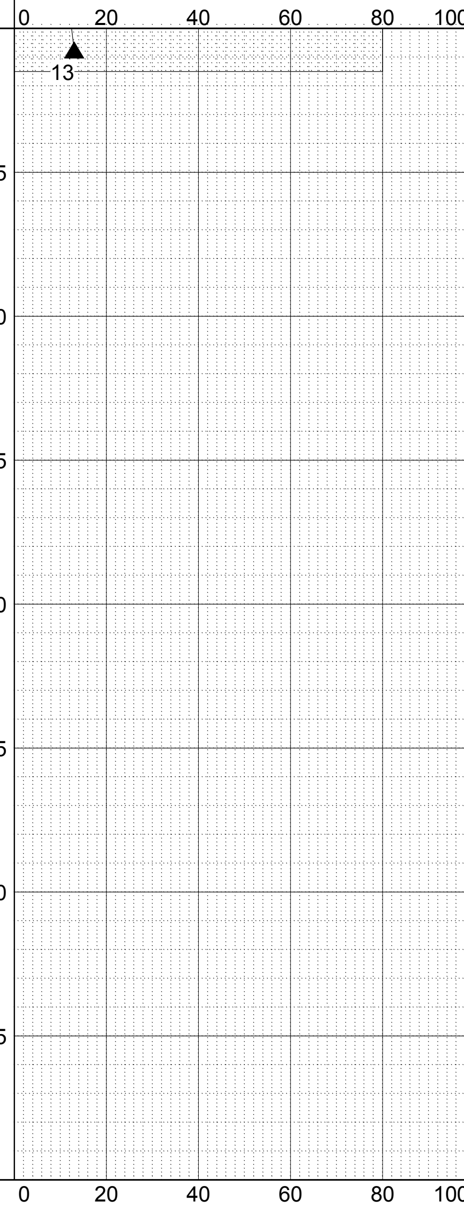
FIG. A9
Sheet 1 of 2

REV 3

Total Depth:	*41.5 ft.*	Northing:	*~ 675,665 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*4 in.*
Top Elevation:	*~ 7 ft.*	Easting:	*~ 7,338,001 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:		Station:	*~*	Drill Rig Equipment:	*Track*	Hammer Type:	*Automatic*
Horiz. Datum:		Offset:	*~*	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Continued: Loose to medium dense, dark gray, *Silty Sand/Sand with Silt (SM/SP-SM)*; wet; fine subangular sand; nonplastic fines; trace organics. **ALLUVIUM** Completed - May 29, 2014	*-35.0* 41.5		S-9		

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-08

November 2014 24-1-03858-005

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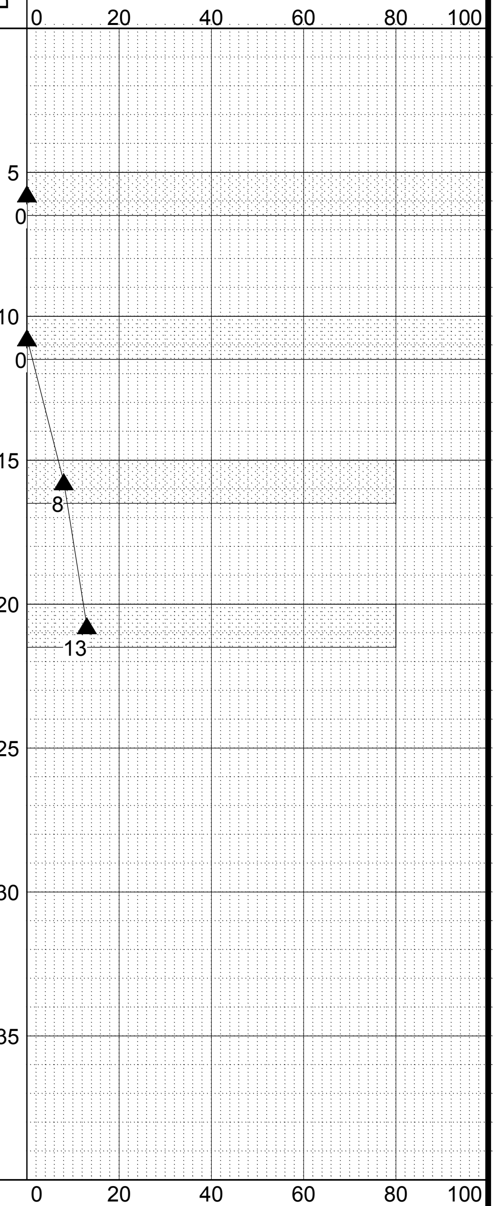
FIG. A9
Sheet 2 of 2

Total Depth:	*21.5 ft.*	Northing:	*~ 675,630 ft.*	Drilling Method:	*Mud Rotary*
Top Elevation:	*~ 7 ft.*	Easting:	*~ 7,338,001 ft.*	Drilling Company:	*Hardcore Drilling*
Vert. Datum:		Station:	*~*	Drill Rig Equipment:	*Track*
Horiz. Datum:		Offset:	*~*	Other Comments:	

Hole Diam.:	*4 in.*
Rod Type:	*NWJ*
Hammer Type:	*Automatic*

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Very soft, dark gray and brown, *Elastic Silt (MH)*; wet; medium plasticity; some organics. **TIDAL FLAT DEPOSITS**			S-1 S-2		5 10
Loose grading to medium dense, dark gray, *Well-Graded Sand with Silt (SW-SM)*; wet; fine to coarse subrounded to subangular sand; nonplastic fines; trace organics. **ALLUVIUM**	*-6.5* 13.0		S-3 S-4		15 20
Completed - May 30, 2014	*-15.0* 21.5				25 30 35

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Standard Penetration Test

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-09

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A10

REV 3

Total Depth:	*21.5 ft.*	Northing:	*~ 675,662 ft.*	Drilling Method:	*Mud Rotary*
Top Elevation:	*~ 8 ft.*	Easting:	*~ 7,338,630 ft.*	Drilling Company:	*Hardcore Drilling*
Vert. Datum:		Station:	*~*	Drill Rig Equipment:	*Track*
Horiz. Datum:		Offset:	*~*	Other Comments:	

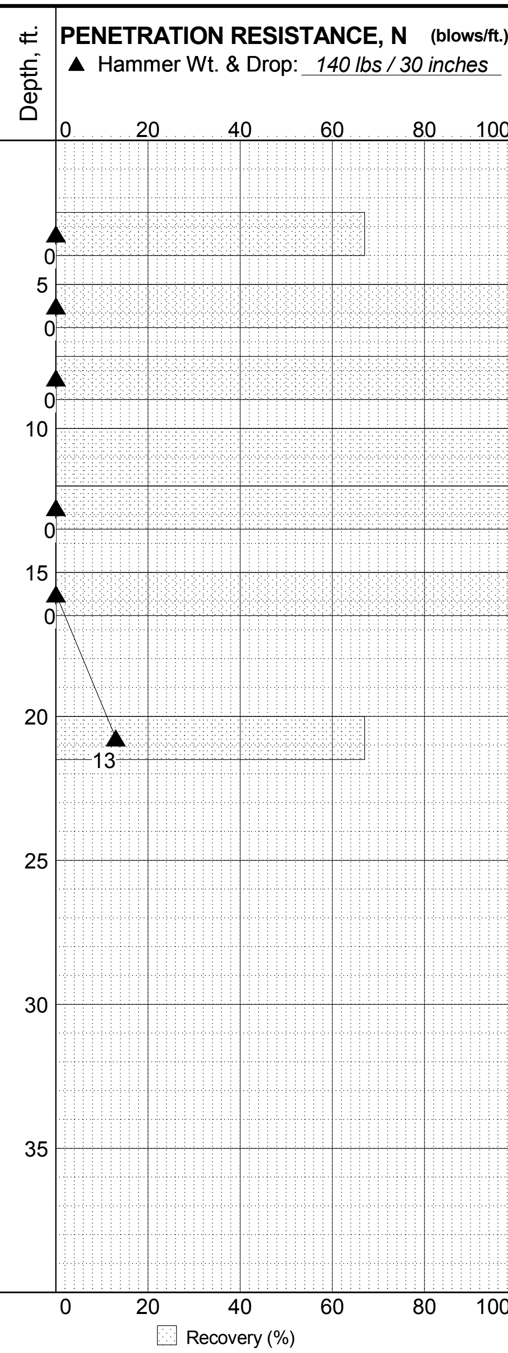
Hole Diam.:	*4 in.*
Rod Type:	*NWJ*
Hammer Type:	*Automatic*

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	*Elev.* Depth (ft.)	Samples
Gravel road	*6.8* 1.3	
Very soft, dark brown, *Elastic Silt (MH)*; wet; medium plasticity; few woody organics. **FILL**	*4.0* 4.0	S-1
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few organics. **TIDAL FLAT DEPOSITS**	*-10.0* 18.0	S-2, S-3, U-1, S-4, S-5
Medium dense, dark gray, *Well-Graded Sand with Silt (SW-SM)*; wet; fine to coarse subrounded to subangular sand; nonplastic fines. **ALLUVIUM**	*-13.5* 21.5	S-6

Completed - May 30, 2014



LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-10

November 2014 24-1-03858-005

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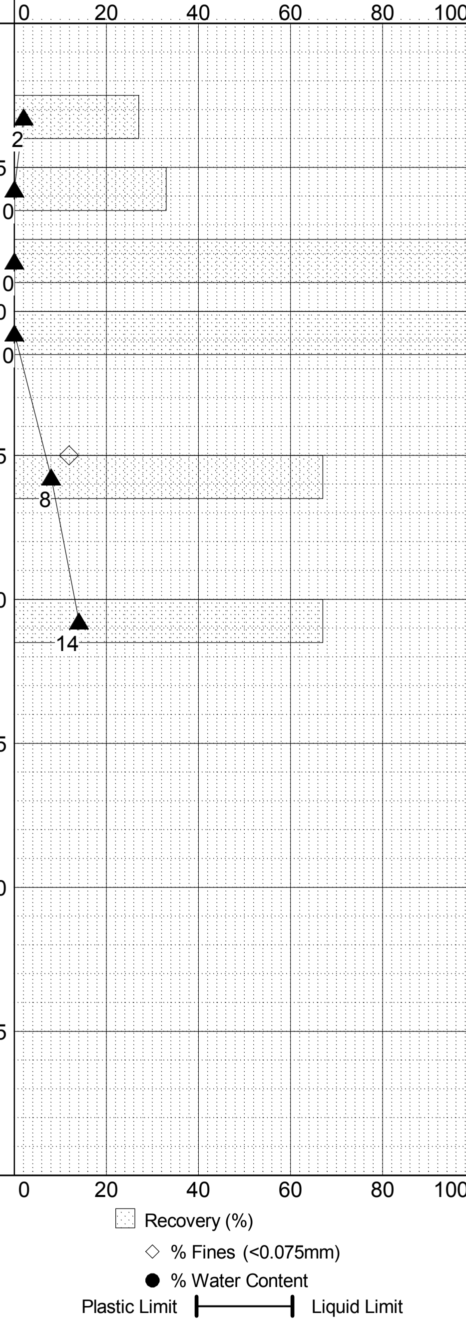
FIG. A11

REV 3

Total Depth:	21.5 ft.	Northing:	~ 675,672 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	~ 8 ft.	Easting:	~ 7,339,287 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Soft, dark brown, *Elastic Silt (MH)*; wet; medium plasticity; few woody organics.			S-1		
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few fibrous organics. **TIDAL FLAT DEPOSITS**	*4.0* 4.0		S-2, S-3, S-4		5, 10
Loose, dark gray, *Silty Sand/Poorly Graded Sand with Silt (SM/SP-SM)*; wet; fine to medium subrounded to subangular sand; low plasticity fines.	*-5.0* 13.0		S-5		15
Medium dense, dark gray, *Well-Graded Sand with Silt (SW-SM)*; wet; trace gravel; fine to coarse subrounded to subangular sand; nonplastic fines. **ALLUVIUM**	*-10.0* 18.0		S-6		20
Completed - May 30, 2014	*-13.5* 21.5				25, 30, 35

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-11

November 2014 24-1-03858-005

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FIG. A12

REV 3

Total Depth: 21.5 ft.	Northing: ~ 674,966 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation: ~ 9 ft.	Easting: ~ 7,340,217 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:	Station: ~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION

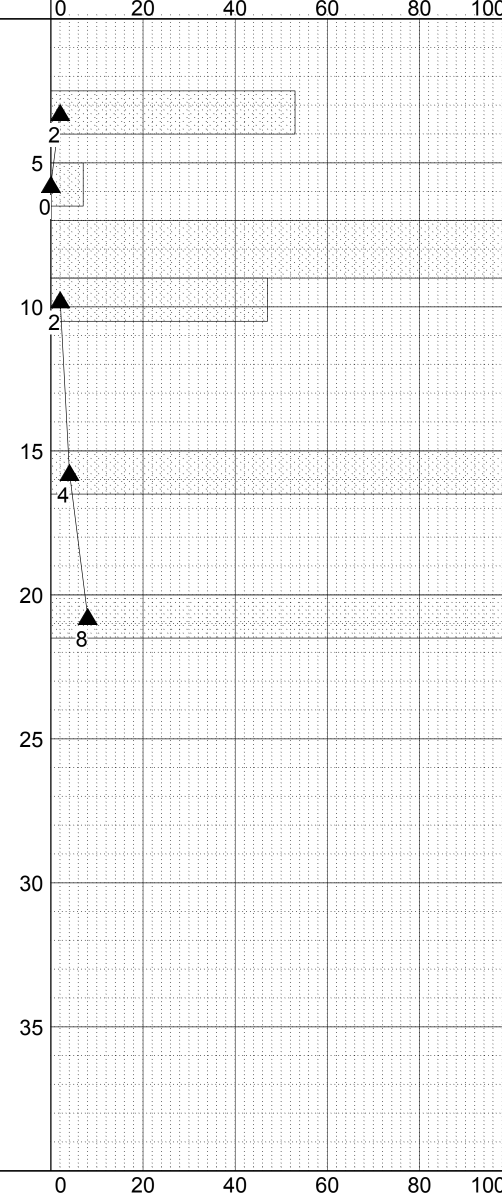
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Soft, dark brown, *Elastic Silt (MH)*; moist; medium plasticity; few woody organics. **TIDAL FLAT DEPOSITS**	*4.5* / 4.5	S-1
Very soft, dark gray and brown, *Silt (ML)*; moist; low plasticity; few woody organics.	*0.0* / 9.0	S-2, U-1
Soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few organics grades to trace.	*-7.0* / 16.0	S-3, S-4
Loose, dark gray, *Well-Graded Sand with Silt (SW-SM)*; wet; fine to coarse subangular sand; nonplastic fines.	*-9.0* / 18.0	
Loose, dark gray, *Silty Sand (SM)*; wet; fine subangular sand; low plasticity fines. **ALLUVIUM**	*-12.5* / 21.5	S-5

Completed - June 2, 2014

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-12

November 2014 — 24-1-03858-005

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FIG. A13

REV 3

Total Depth:	*21.5 ft.*	Northing:	*~ 674,678 ft.*	Drilling Method:	*Mud Rotary*
Top Elevation:	*~ 7 ft.*	Easting:	*~ 7,340,119 ft.*	Drilling Company:	*Hardcore Drilling*
Vert. Datum:		Station:	*~*	Drill Rig Equipment:	*Track*
Horiz. Datum:		Offset:	*~*	Other Comments:	

Hole Diam.:	*4 in.*
Rod Type:	*NWJ*
Hammer Type:	*Automatic*

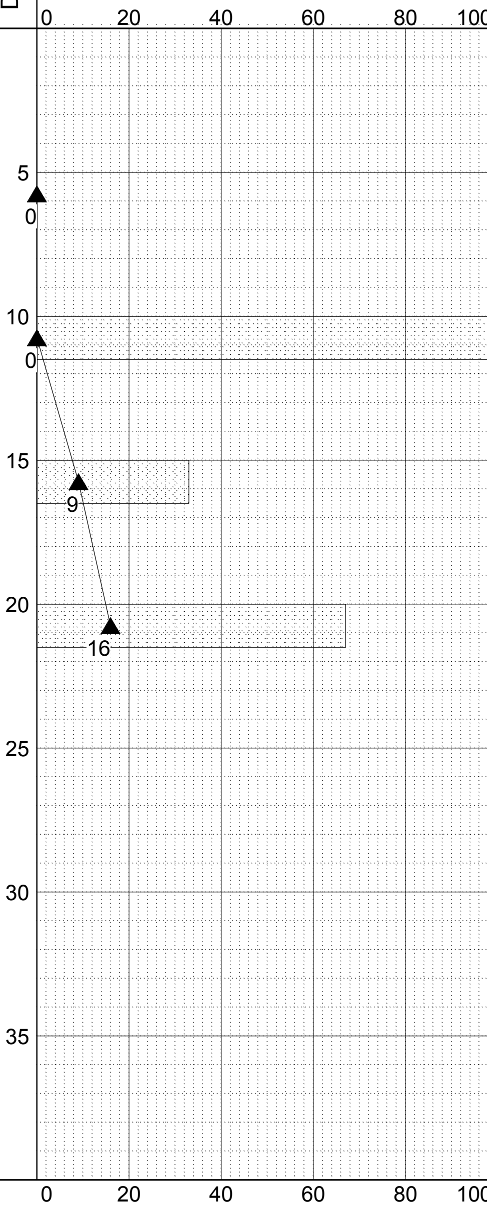
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few fibrous organics. **TIDAL FLAT DEPOSITS**		S-1 *, S-2
Loose grading to medium dense, dark gray, *Poorly Graded Sand with Silt and Gravel (SP-SM)*; wet; fine round gravel; coarse grading fine to medium subrounded to subangular sand; nonplastic fines; trace woody organics. **ALLUVIUM**	*-6.0* 13.0	S-3, S-4
Completed - May 30, 2014	*-14.5* 21.5	

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

* Sample Not Recovered

Standard Penetration Test

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-13

November 2014 24-1-03858-005

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FIG. A14

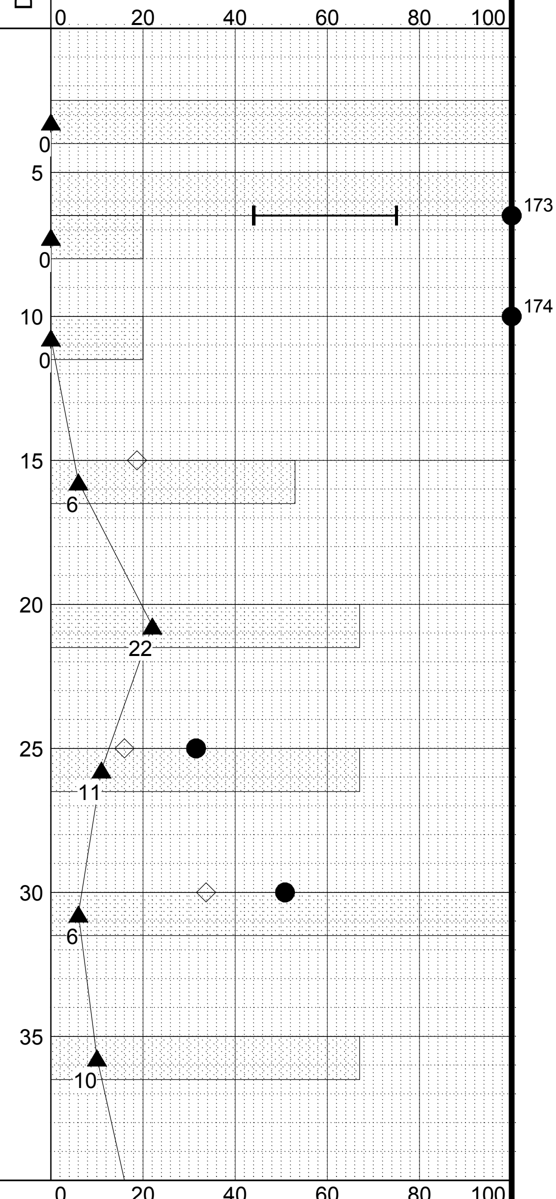
REV 3

MASTER_LOG_E 24-1-03858-002-BORINGS.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: EJOF Rev: PWB Typ: PAR*

Total Depth:	41.5 ft.	Northing:	~ 674,687 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	~ 7 ft.	Easting:	~ 7,340,202 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Samples	Ground Water
Very soft, dark gray and brown grading to dark gray, *Elastic Silt (MH)*; wet; high plasticity; few fibrous organics. **TIDAL FLAT DEPOSITS**		S-1, U-1, S-2, S-3	During Drilling
Loose, dark gray, *Silty Sand with Gravel (SM)*; wet; fine rounded gravel; fine to medium subrounded to subangular sand; low plasticity fines; trace woody organics.	*-6.0* 13.0	S-4	
Medium dense, dark gray, *Well-Graded Sand with Silt and Gravel (SW-SM)*; wet; fine rounded gravel; fine to coarse subangular sand; nonplastic fines.	*-11.0* 18.0	S-5	
Medium dense, dark gray, *Silty Sand (SM)*; wet; fine to medium subangular sand; nonplastic fines. **ALLUVIUM**	*-16.0* 23.0	S-6	
Loose, dark gray, *Silt (ML)*; wet; trace fine sand; nonplastic; trace woody organics.	*-23.8* 30.8	S-7	
Loose grading to medium dense, dark gray, *Poorly Graded Sand with Silt (SP-SM)*; few fine rounded gravel; fine subangular sand; nonplastic fines.	*-26.0* 33.0	S-8	

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



CONTINUED NEXT SHEET

LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube
- Groundwater Level ATD
- Recovery (%)
- ◇ % Fines (<0.075mm)
- ● % Water Content
- Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-14

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A15
Sheet 1 of 2

REV 3

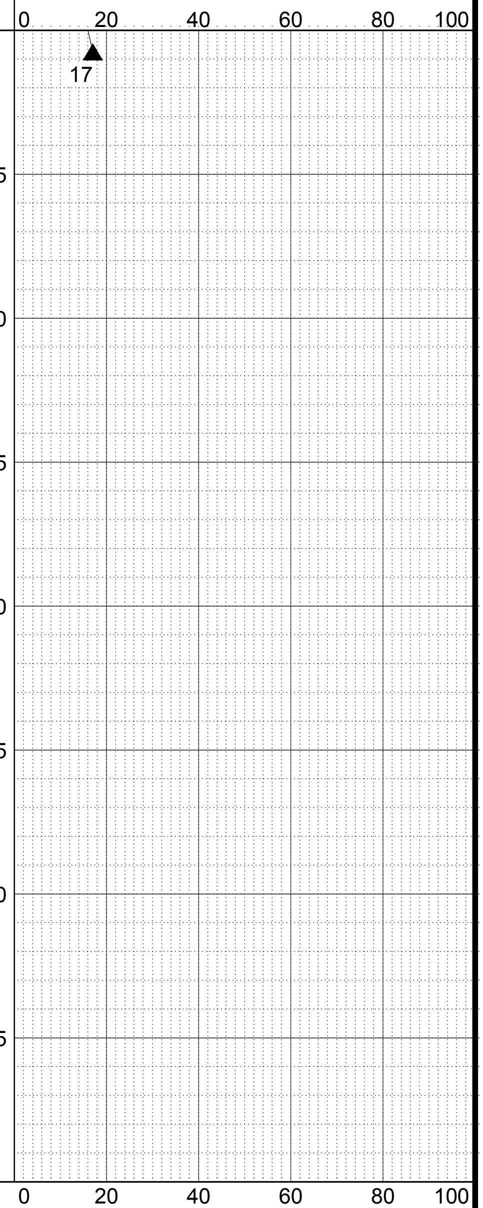
MASTER_LOG_E 24-1-03858-002-BORINGS.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: EJOF Rev: PWB Typ: PAR

Total Depth: *41.5 ft.*	Northing: *~ 674,687 ft.*	Drilling Method: *Mud Rotary*	Hole Diam.: *4 in.*
Top Elevation: *~ 7 ft.*	Easting: *~ 7,340,202 ft.*	Drilling Company: *Hardcore Drilling*	Rod Type: *NWJ*
Vert. Datum:	Station: *~*	Drill Rig Equipment: *Track*	Hammer Type: *Automatic*
Horiz. Datum:	Offset: *~*	Other Comments:	

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Continued: Loose grading to medium dense, dark gray, *Sand with Silt (SP-SM)*; few fine rounded gravel; fine subangular sand; nonplastic fines. **ALLUVIUM**	*-34.5* 41.5		S-9		
Completed - May 30, 2014					45
					50
					55
					60
					65
					70
					75

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├───┤ Liquid Limit

LEGEND

Standard Penetration Test

3" O.D. Shelby Tube

Groundwater Level ATD

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-14

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A15
Sheet 2 of 2

REV 3

Total Depth:	*21.5 ft.*	Northing:	*~ 674,689 ft.*	Drilling Method:	*Mud Rotary*
Top Elevation:	*~ 7 ft.*	Easting:	*~ 7,340,227 ft.*	Drilling Company:	*Hardcore Drilling*
Vert. Datum:		Station:	~	Drill Rig Equipment:	*Track*
Horiz. Datum:		Offset:	~	Other Comments:	

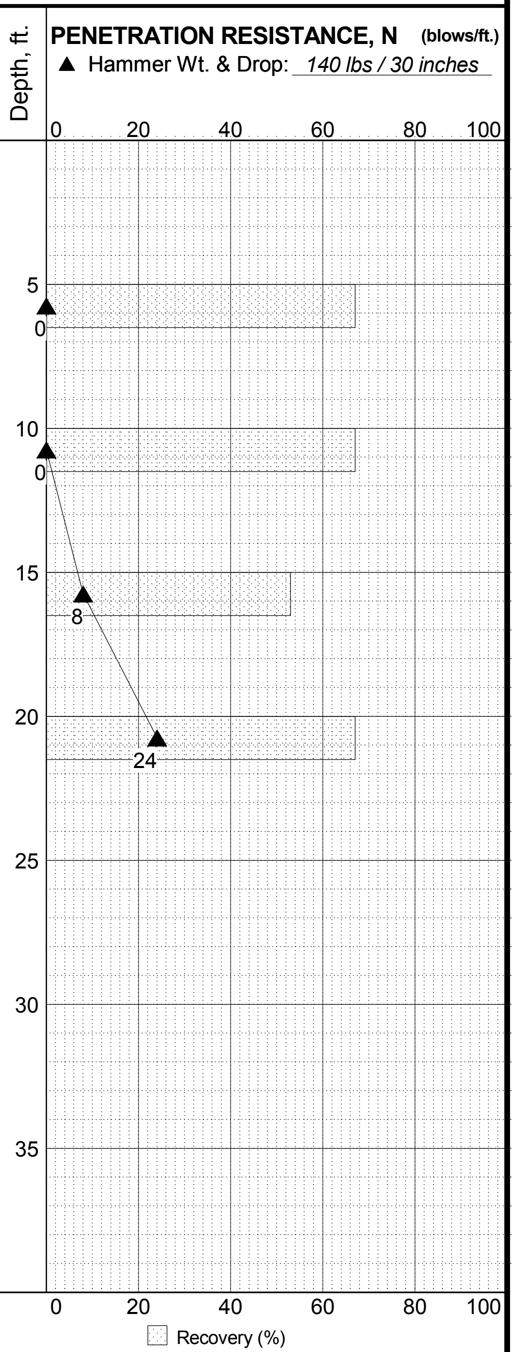
Hole Diam.: *4 in.*
Rod Type: *NWJ*
Hammer Type: *Automatic*

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Very soft, dark gray and brown, *Elastic Silt (MH)*; wet; medium plasticity; some organics grading to few. **TIDAL FLAT DEPOSITS**		S-1, S-2
Loose, dark gray, *Well-Graded Sand with Silt (SW-SM)*; wet; few fine rounded gravel; fine to coarse subrounded to subangular sand; nonplastic fines. **ALLUVIUM**	*-6.0* 13.0	S-3
Medium dense, dark gray, *Well-Graded Sand with Silt and Gravel (SW-SM)*; wet; fine rounded gravel; fine to coarse subangular sand; nonplastic fines.	*-12.0* 19.0	S-4
Completed - June 2, 2014	*-14.5* 21.5	

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-15

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A16

REV 3

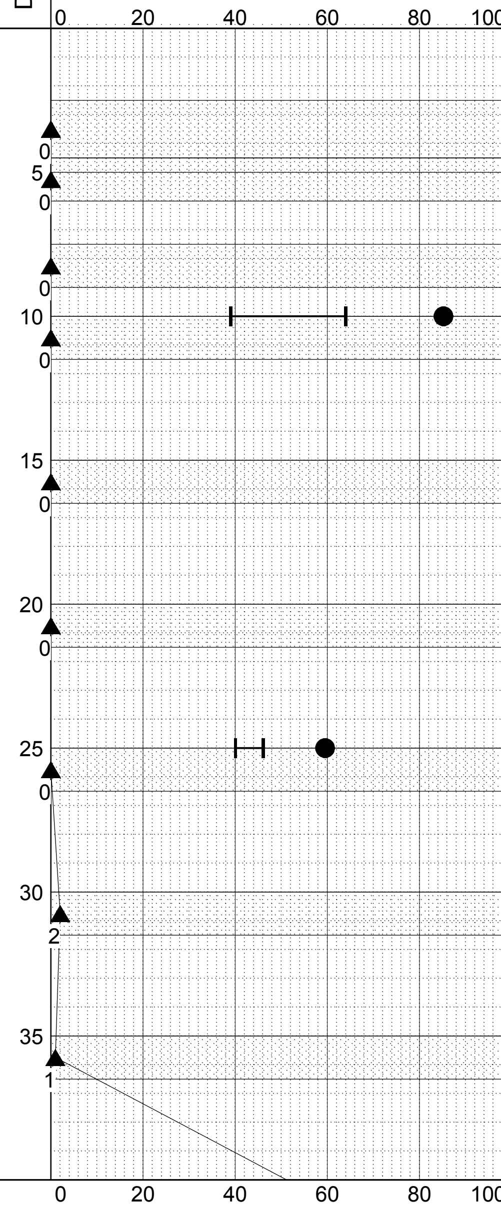
Total Depth:	41.5 ft.	Northing:	~ 672,151 ft.	Drilling Method:	Mud Rotary
Top Elevation:	~ 11 ft.	Easting:	~ 7,340,293 ft.	Drilling Company:	Hardcore Drilling
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.: 4 in.
Rod Type: NWJ
Hammer Type: Automatic

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Samples
Very soft, dark brown grading to gray, *Silt (ML)*; moist; low plasticity; trace woody organics. **FILL**		U-1, S-1
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium to high plasticity; trace woody organics. **TIDAL FLAT DEPOSITS**	*4.0* 7.0	S-2, S-3, S-4, S-5
Very soft, dark gray, *Silt (ML)*; wet; low plasticity; trace woody organics.	*-12.0* 23.0	S-6
Soft, dark gray, *Silt (ML)*; wet; low plasticity; trace woody organics.	*-17.0* 28.0	S-7
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity.	*-22.0* 33.0	S-8
Very dense, dark gray, *Poorly Graded Gravel with Silt and Sand (GP-GM)*.	*-27.0* 38.0	

CONTINUED NEXT SHEET

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

3" O.D. Shelby Tube
Standard Penetration Test

Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES
1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-16

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A17

REV 3

MASTER_LOG_E 24-1-03858-002-BORINGS.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: EJOF Rev: PWB Typ: PAR

Total Depth:	*41.5 ft.*	Northing:	*~ 672,151 ft.*	Drilling Method:	*Mud Rotary*
Top Elevation:	*~ 11 ft.*	Easting:	*~ 7,340,293 ft.*	Drilling Company:	*Hardcore Drilling*
Vert. Datum:		Station:	*~*	Drill Rig Equipment:	*Track*
Horiz. Datum:		Offset:	*~*	Other Comments:	

Hole Diam.:	*4 in.*
Rod Type:	*NWJ*
Hammer Type:	*Automatic*

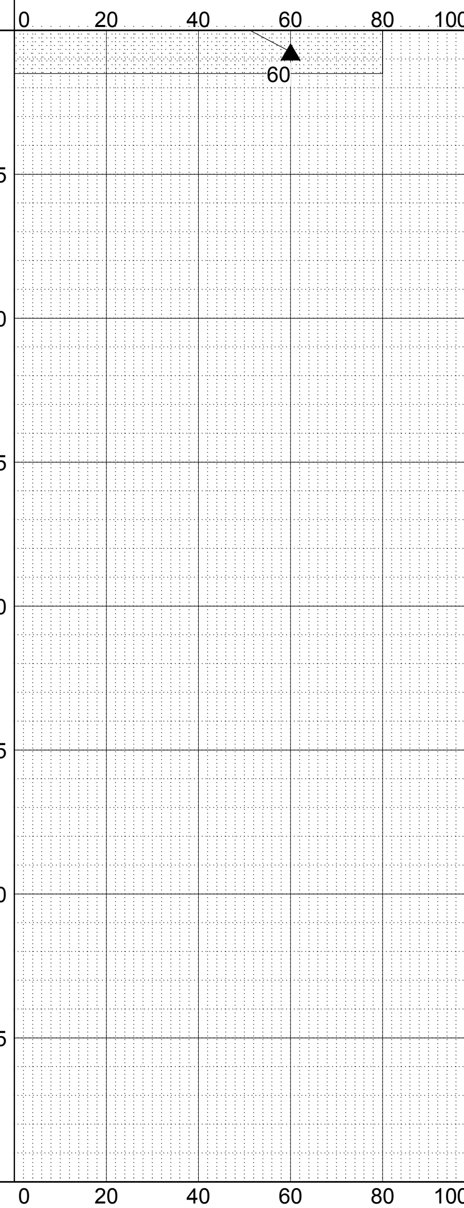
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Continued: *Poorly Graded Gravel with Silt and Sand (GP-GM)*; wet; coarse subrounded to subangular gravel; fine to coarse subangular sand; nonplastic fines. **ALLUVIUM**	*-30.5* 41.5		S-9		
Completed - June 3, 2014					

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

3" O.D. Shelby Tube

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-16

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A17
Sheet 2 of 2

REV 3

Total Depth:	21.5 ft.	Northing:	~ 671,725 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	~ 7 ft.	Easting:	~ 7,340,337 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:		Offset:	~	Other Comments:			

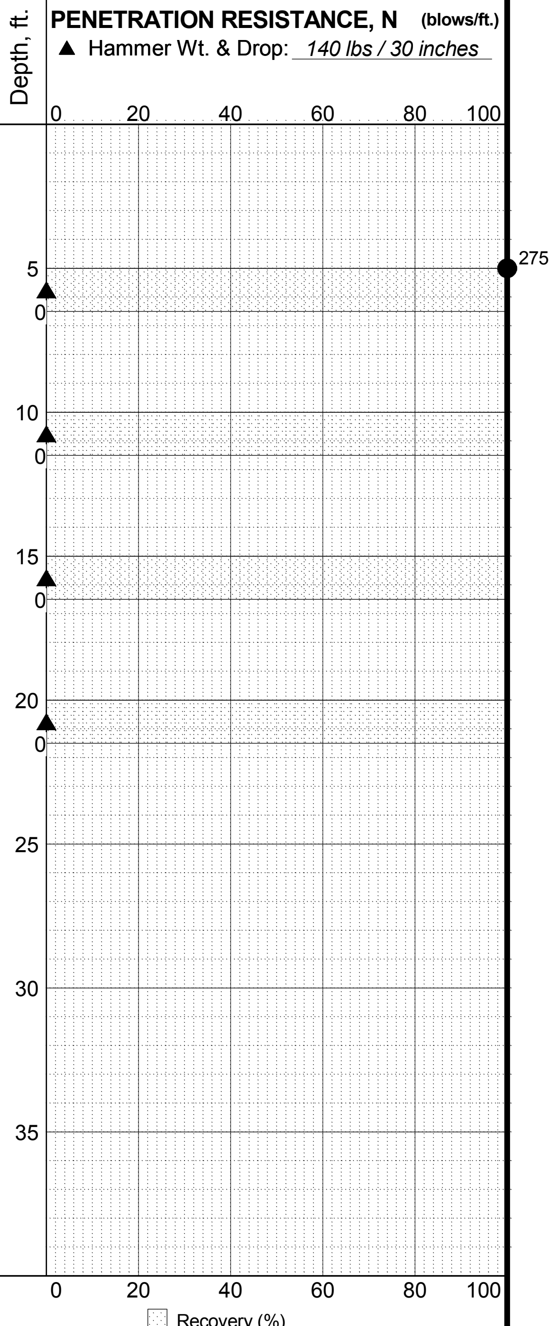
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples	Ground Water
Very soft, dark brown, *Peat (PT)*; moist; some low plasticity fines.	5.5 / 1.5		
Wood debris	4.0 / 3.0		
Very soft, dark brown, *Peat (PT)*; wet; some low plasticity fines. **PEAT**	-6.0 / 13.0	S-1, S-2	During Drilling
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; some fibrous organics. **TIDAL FLAT DEPOSITS**	-11.0 / 18.0	S-3	
Very soft, dark gray, *Silt (ML)*; wet; low plasticity; trace woody organics.	-14.5 / 21.5	S-4	
Completed - June 3, 2014			

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

Standard Penetration Test

Groundwater Level ATD

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-17

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A18

REV 3

MASTER_LOG_E 24-1-03858-002-BORINGS.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: EJOF Rev: PWB Typ: PAR

Total Depth:	41.3 ft.	Northing:	~ 671,733 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	~ 10 ft.	Easting:	~ 7,340,378 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:		Offset:	~	Other Comments:			

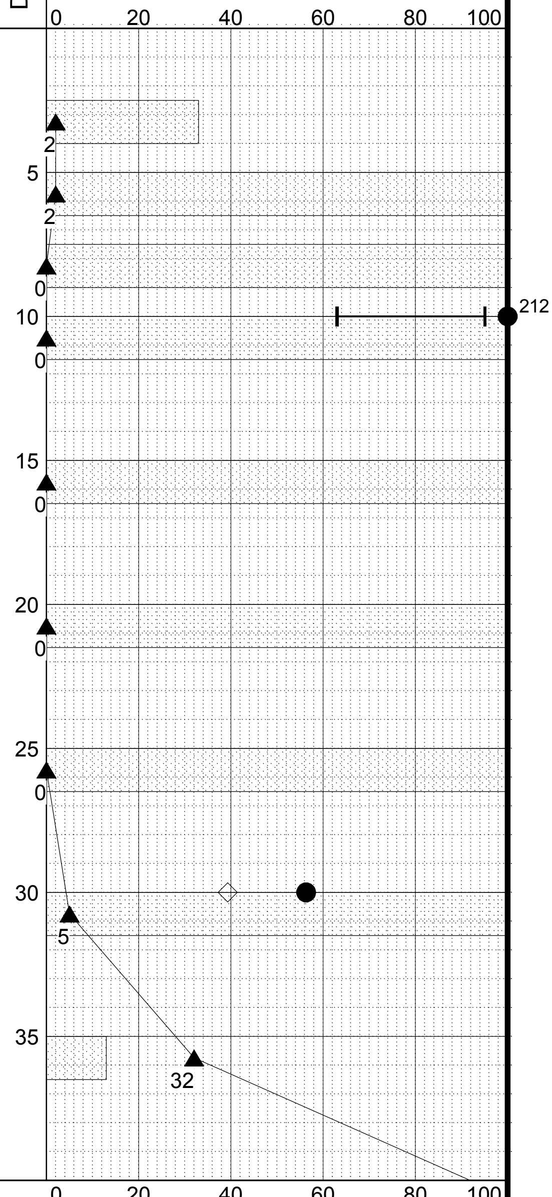
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Soft, dark brown, *Elastic Silt (MH)*; moist; medium plasticity; few woody organics. **FILL**	5.5 / 4.5	S-1
Soft, dark gray, *Elastic Silt (MH)*; moist; medium plasticity; few woody organics.	3.0 / 7.0	S-2
Very soft, dark brown, *Elastic Silt (MH)*; wet; high plasticity; little woody organics. **TIDAL FLAT DEPOSITS**	-8.0 / 18.0	S-3, S-4, S-5
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few woody organics.	-13.0 / 23.0	S-6
Very soft, dark gray, *Silt (ML)*; wet; low plasticity; trace woody organics.	-18.0 / 28.0	S-7
Loose, dark gray, *Silty Sand (SM)*; wet; fine subangular sand; nonplastic fines.	-24.5 / 34.5	S-8
Dense, dark gray, *Silty Gravel (GM)*; wet; coarse subangular gravel; low plasticity fines. **ALLUVIUM**	-28.0 / 38.0	S-9
Poorly Graded Gravel with Silt and Sand (GP-GM).		

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND

Standard Penetration Test

Recovery (%)
% Fines (<0.075mm)
% Water Content
Plastic Limit — Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-18

November 2014 — 24-1-03858-005

SHANNON & WILSON, INC.
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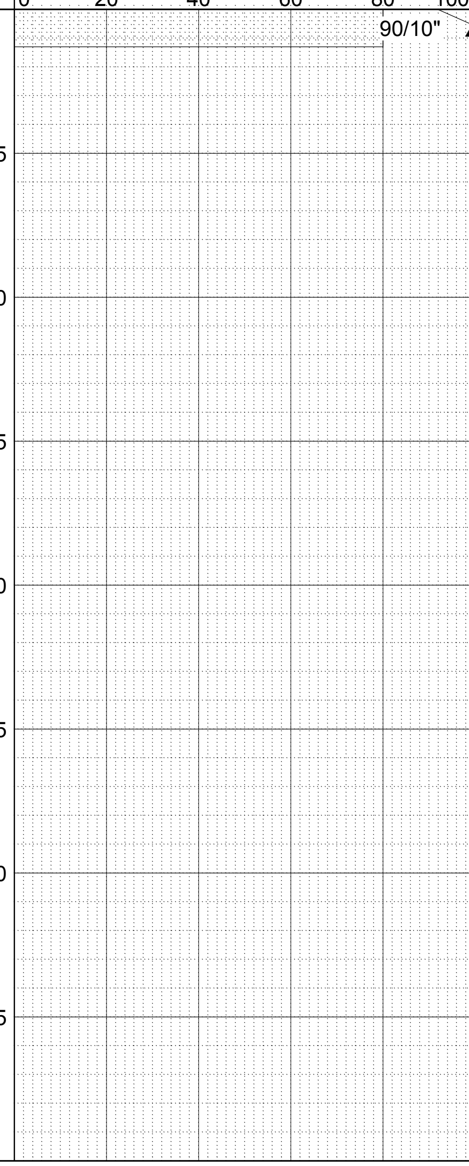
FIG. A19
Sheet 1 of 2

REV 3

Total Depth:	*41.3 ft.*	Northing:	*~ 671,733 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*4 in.*
Top Elevation:	*~ 10 ft.*	Easting:	*~ 7,340,378 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:		Station:	~	Drill Rig Equipment:	*Track*	Hammer Type:	*Automatic*
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.	**PENETRATION RESISTANCE, N** (blows/ft.) ▲ Hammer Wt. & Drop: *140 lbs / 30 inches*
Continued: Very dense, dark gray, *Poorly Graded Gravel with Silt and Sand (GP-GM)*; wet; coarse subrounded to subangular gravel; fine to coarse subangular sand; nonplastic fines. **ALLUVIUM**	*-31.3* 41.3		S-10			90/10"
Completed - June 3, 2014					45, 50, 55, 60, 65, 70, 75	0 20 40 60 80 100



LEGEND

Standard Penetration Test

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-18

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A19
Sheet 2 of 2

REV 3

Total Depth:	41.5 ft.	Northing:	~ 671,378 ft.	Drilling Method:	Mud Rotary
Top Elevation:	~ 9 ft.	Easting:	~ 7,340,670 ft.	Drilling Company:	Hardcore Drilling
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	4 in.
Rod Type:	NWJ
Hammer Type:	Automatic

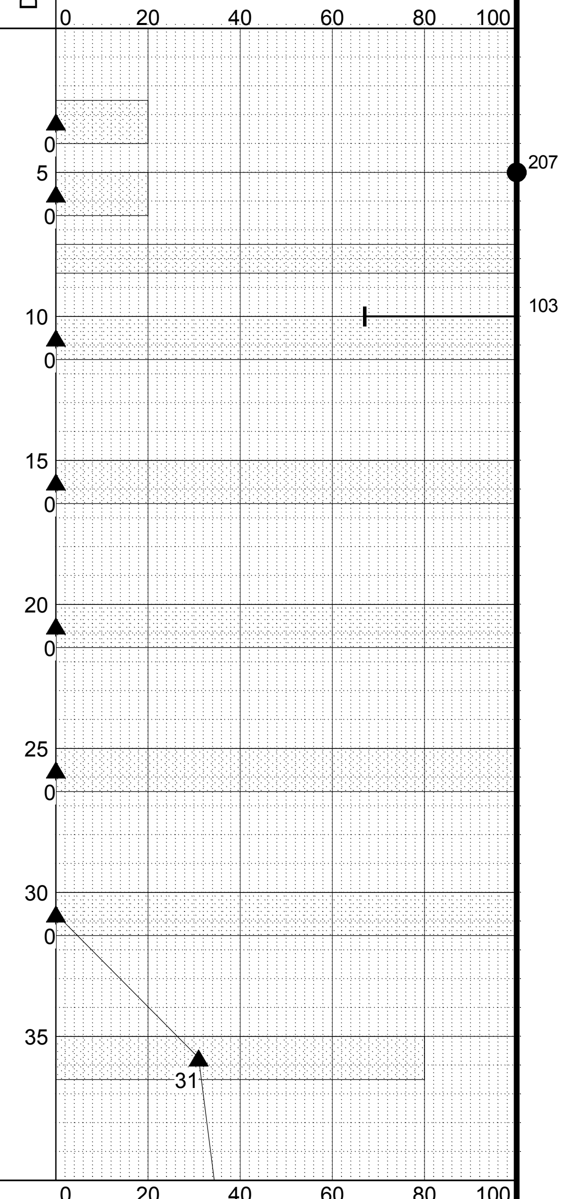
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. / Depth (ft.)	Samples
Very soft, dark brown, *Elastic Silt (MH)*; moist; medium plasticity; trace woody organics. **FILL**		S-1
Very soft, gray, *Elastic Silt (MH)*; moist; medium plasticity; few woody organics.	*4.0* / 4.5	S-2
Very soft, dark brown grading to gray, *Elastic Silt (MH)*; wet; high plasticity; some woody organics grading to few. **TIDAL FLAT DEPOSITS**	*1.5* / 7.0	U-1, S-3, S-4
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; trace woody organics.	*-9.5* / 18.0	S-5, S-6, S-7
Dense, dark gray, *Well-Graded Gravel with Silt and Sand (GW-GM)*; wet; fine to coarse subangular to subrounded gravel; fine to coarse subangular sand; nonplastic fines. **ALLUVIUM**	*-23.5* / 32.0	S-8

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

LOG OF BORING B-19

November 2014 24-1-03858-005

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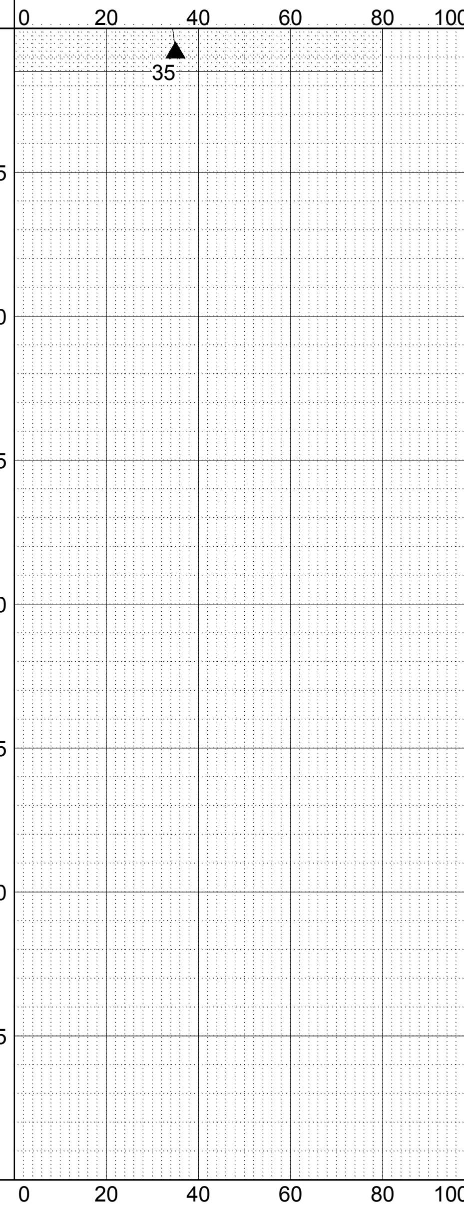
FIG. A20
Sheet 1 of 2

REV 3

Total Depth:	*41.5 ft.*	Northing:	*~ 671,378 ft.*	Drilling Method:	*Mud Rotary*	Hole Diam.:	*4 in.*
Top Elevation:	*~ 9 ft.*	Easting:	*~ 7,340,670 ft.*	Drilling Company:	*Hardcore Drilling*	Rod Type:	*NWJ*
Vert. Datum:		Station:	~	Drill Rig Equipment:	*Track*	Hammer Type:	*Automatic*
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Continued: Dense, dark gray, *Well-Graded Gravel with Silt and Sand (GW-GM)*; wet; fine to coarse subangular to subrounded gravel; fine to coarse subangular sand; nonplastic fines. **ALLUVIUM**	*-33.0* 41.5		S-9		
Completed - May 29, 2014					

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)

● % Water Content
Plastic Limit ├──┤ Liquid Limit

LEGEND

- Standard Penetration Test
- 3" O.D. Shelby Tube

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-19

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A20
Sheet 2 of 2

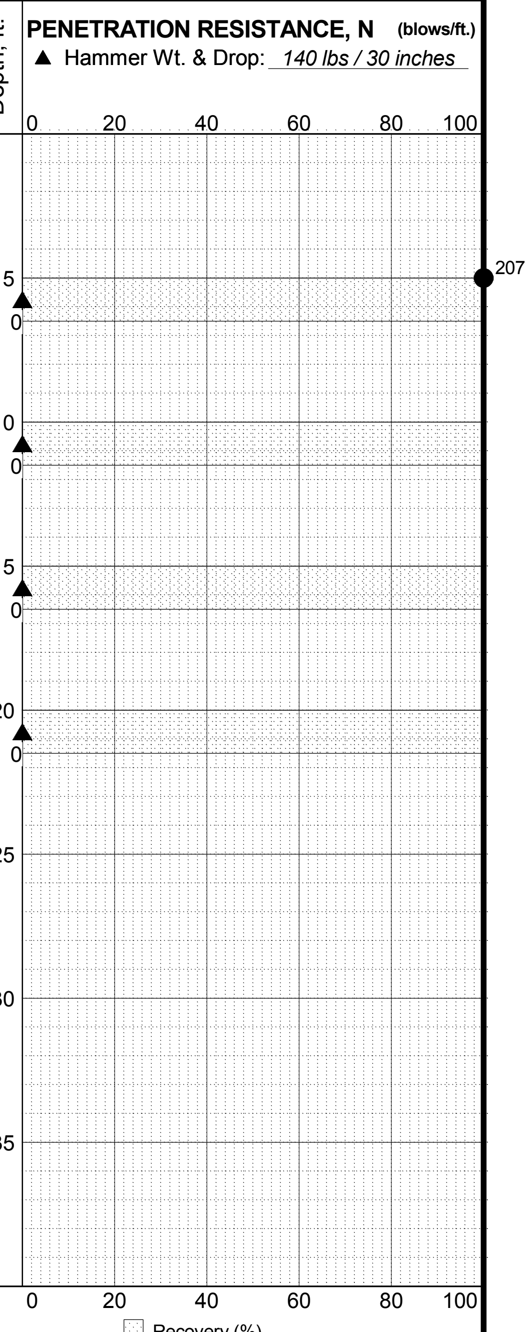
REV 3

Total Depth:	21.5 ft.	Northing:	~ 671,340 ft.	Drilling Method:	Mud Rotary	Hole Diam.:	4 in.
Top Elevation:	~ 6 ft.	Easting:	~ 7,340,642 ft.	Drilling Company:	Hardcore Drilling	Rod Type:	NWJ
Vert. Datum:		Station:	~	Drill Rig Equipment:	Track	Hammer Type:	Automatic
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples
Very soft, dark brown, *Peat (PT)*; wet; some low plasticity fines. **PEAT**	-1.0 7.0	S-1
Very soft, gray, *Silt (ML)*; wet; low plasticity; some fibrous organics. **TIDAL FLAT DEPOSITS**	-6.0 12.0	S-2
Very soft, dark gray, *Elastic Silt (MH)*; wet; medium plasticity; few woody organics.	-15.5 21.5	S-3, S-4
Completed - June 3, 2014		



LEGEND

Standard Penetration Test

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF BORING B-20

November 2014 24-1-03858-005

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FIG. A21

REV 3

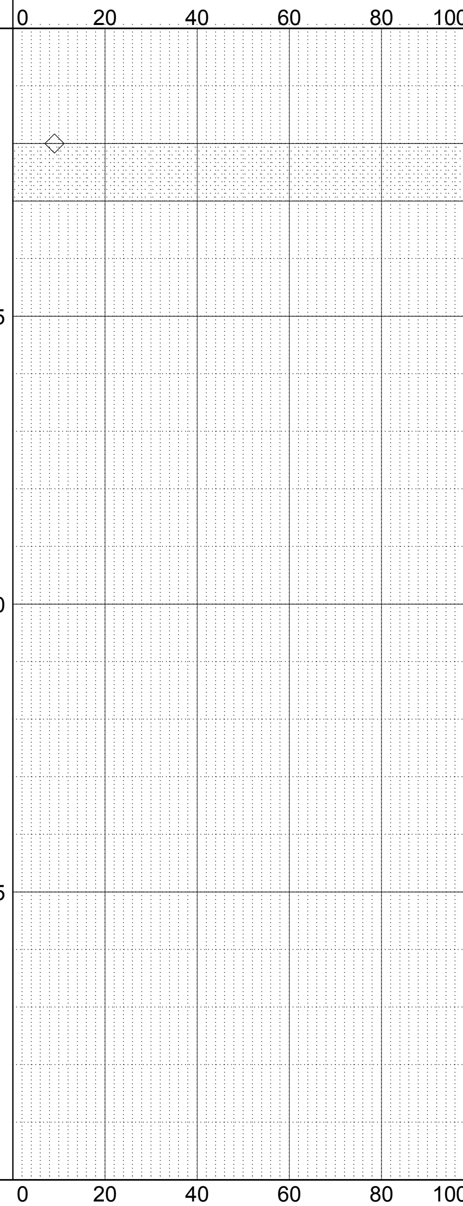
MASTER_LOG_E 24-1-03858-002-BORINGS.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: EJOF Rev: PWB Typ: PAR

Total Depth:	*5 ft.*	Northing:	~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.					
Dense to medium dense, brown, *Well-Graded Sand with Silt and Gravel (SW-SM)*; moist; fine to coarse gravel; fine to coarse subrounded sand; nonplastic fines. **FILL**			S-1		
Thin Log at 3.8 feet	4.0				
Soft to medium stiff, gray, *Elastic Silt with Sand (MH)*; moist; fine sand; medium plasticity; little fibrous organics and wood debris. **TIDAL FLAT DEPOSITS**	5.0				5
Completed - May 28, 2014					10
					15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Bag Sample

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-01

November 2014 24-1-03858-005

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FIG. A22

REV 3

Total Depth:	*16.5 ft.*	Northing:	~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Elev. Depth (ft.) | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

Soil Description	Elev. Depth (ft.)	Samples	Depth, ft.
Loose to medium dense, brown, *Poorly Graded Gravel with Sand (GP-GM)*; moist; fine to coarse subrounded gravel; fine to coarse subrounded sand; nonplastic fines. **LEVEE FILL**		S-1 (Bag)	5, 10
Heavy seepage at 13 feet			
Loose to medium dense, gray, *Poorly Graded Gravel with Silt and Sand (GP-GM)*; wet; fine to coarse subrounded gravel; fine to coarse subrounded sand; nonplastic fines; few logs and wood debris.	13.5		15
Soft to medium stiff, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some organics. **TIDAL FLAT DEPOSITS**	15.5	S-2 (Jar)	
Completed - May 28, 2014	16.5		

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Bag Sample

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-02

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A23

REV 3

Total Depth:	9 ft.	Northing:	~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

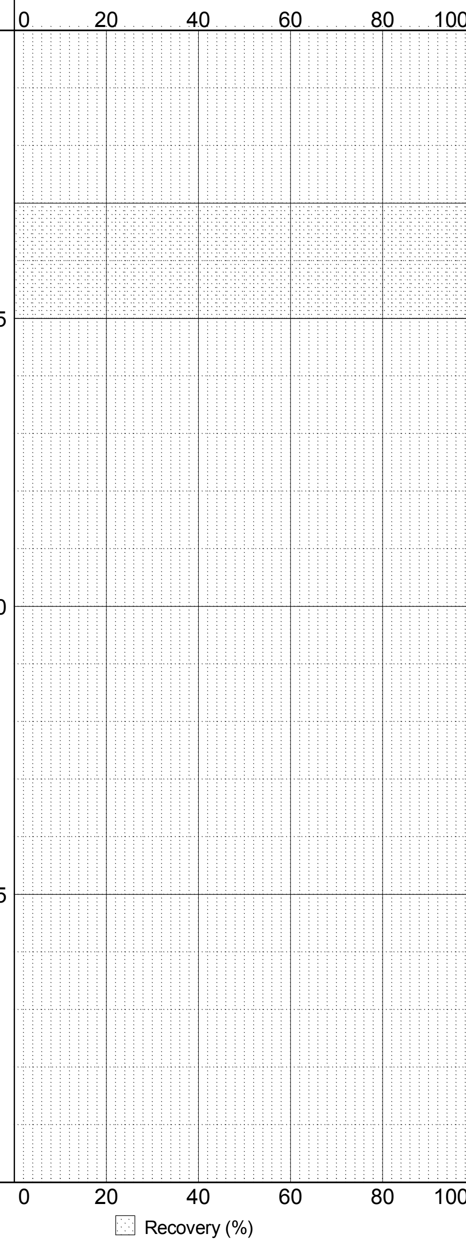
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose to medium dense, brown, *Well Graded Sand with Silt and Gravel (SW-SM)*; moist; fine to coarse subrounded gravel; fine to coarse sand; nonplastic fines. **LEVEE FILL**			S-1		5
Loose to medium dense, gray, *Poorly Graded Gravel with Sand* to *Poorly Graded Sand with Gravel (GP/SP)*; wet; fine to coarse subrounded gravel; fine to coarse subrounded sand. Seepage at 7.5 feet	7.0				
Soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; some fibrous organics and debris. **TIDAL FLAT DEPOSITS**	8.0				
Completed - May 27, 2014	9.0				10
					15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

Bag Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-03

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A24

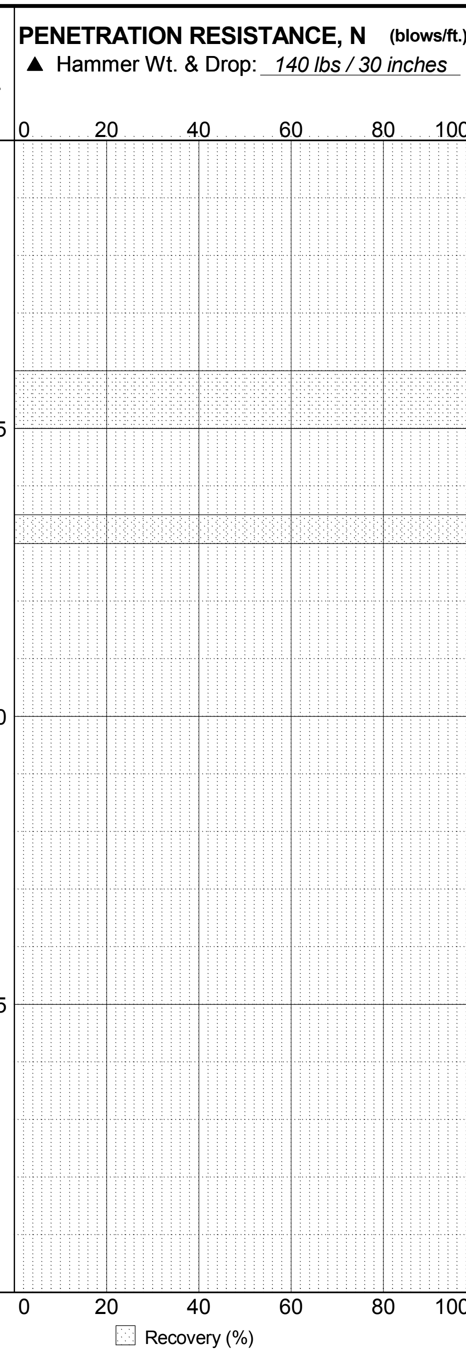
REV 3

Total Depth:	8 ft.	Northing:	~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Loose to medium dense, dark brown, *Well-Graded Sand with Silt and Gravel (SW-SM)*; moist; fine to coarse subrounded gravel; fine to coarse sand; medium plasticity fines. **FILL** Heavy seepage at 8 feet		S-1
Loose, gray, *Poorly Graded Gravel with Silt and Sand* to *Poorly Graded Sand with Silt and Gravel (GP-GM/SP-SM)*; wet; fine to coarse subrounded gravel; fine to coarse subrounded sand; nonplastic; little wood debris and fine fibrous organics.	6.0	S-2
Soft to medium stiff, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity fines; some fibrous organics. **TIDAL FLAT DEPOSITS**	7.0	
Completed - May 27, 2014	8.0	



LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-04

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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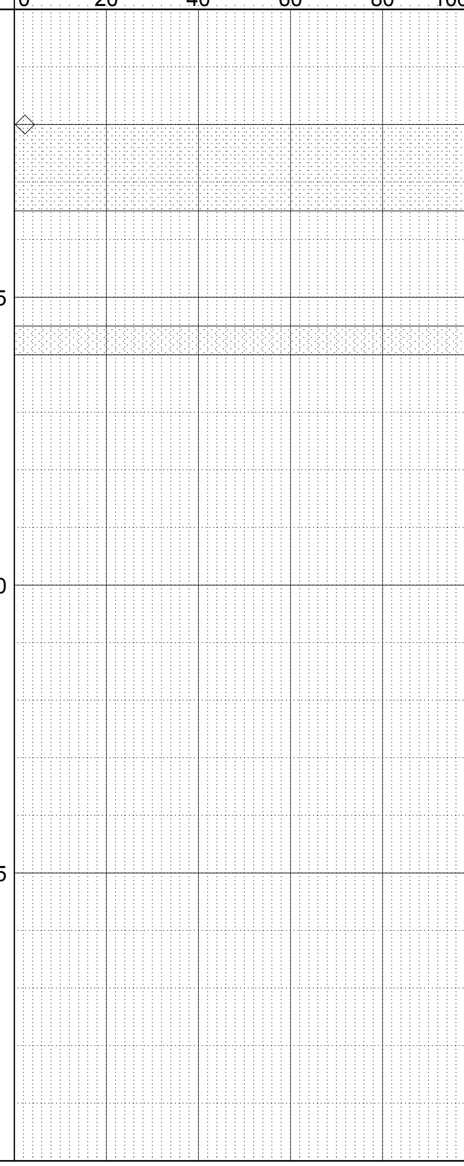
FIG. A25

REV 3

Total Depth: *7 ft.*	Northing: ~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose to medium dense, brown, *Well-Graded Sand with Gravel (SW)*; moist; fine to coarse subrounded gravel; fine to coarse subrounded sand; nonplastic fines. **FILL** Slight to moderate seepage at 4.5 feet			S-1		
Soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; little to some fibrous organics. **TIDAL FLAT DEPOSITS**	5.0		S-2		5
Completed - May 27, 2014	7.0				
					10
					15

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Bag Sample
Jar Sample

Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-05

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A26

REV 3

Total Depth:	*4.5 ft.*	Northing:	~	Drilling Method:	*Test Pit*
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

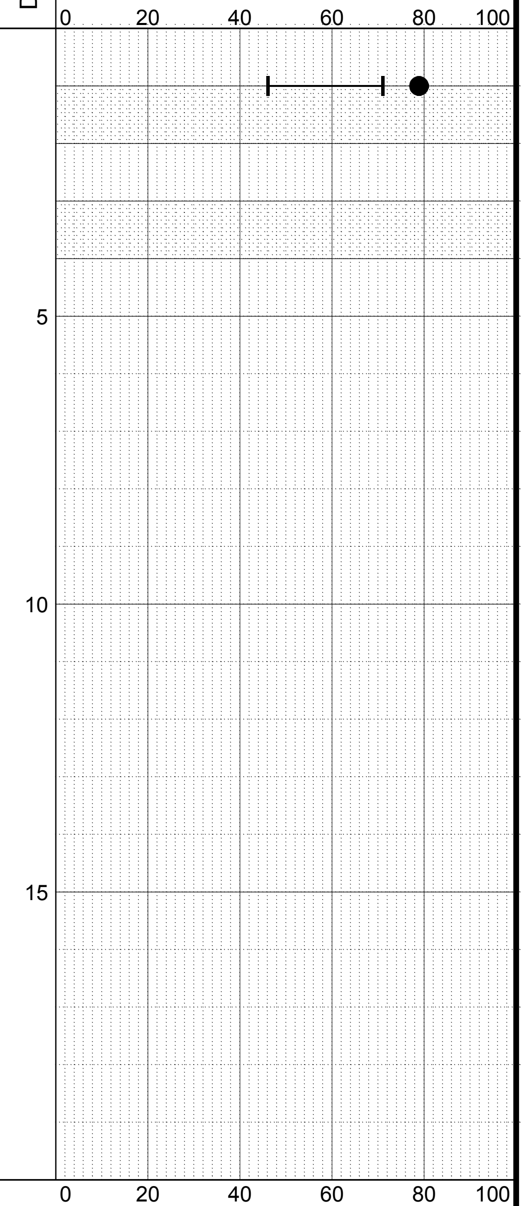
Hole Diam.: ~
Rod Type: ~
Hammer Type: ~

SOIL DESCRIPTION
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Soft, brown, *Elastic Silt (MH)*; moist; trace fine sand; low to medium plasticity; some roots and organics. **FILL** Slight seepage at 2.5 feet	2.5	S-1
Soft to medium stiff, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some fibrous organics and organic debris. **TIDAL FLAT DEPOSITS**	4.5	S-2

Completed - May 27, 2014

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)
● % Water Content
Plastic Limit |———| Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-06

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A27

REV 3

Total Depth: 8 ft.	Northing: ~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

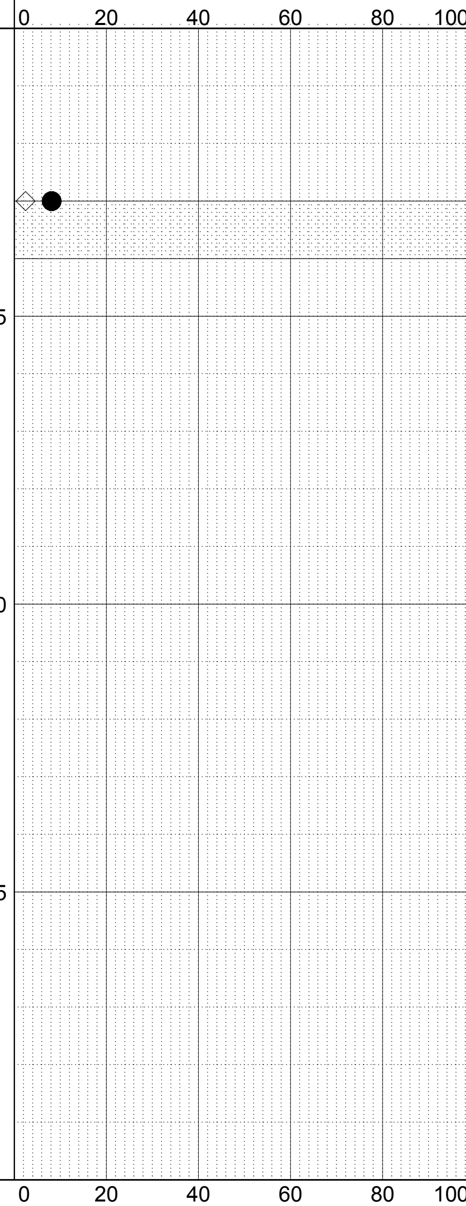
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose to medium dense, brown, *Well-Graded Sand with Gravel (SW)*; moist; fine to coarse subrounded gravel; fine to coarse subrounded sand; trace nonplastic fines. **FILL**			S-1		
Seepage at 5.5 feet					5
Loose to medium dense, gray, *Poorly Graded Sand with Gravel to Poorly Graded Gravel (SP/GP)*; wet; fine to coarse subrounded gravel; fine to coarse subrounded sand.	5.5				
Stiff, gray and black, *Silt with Sand (ML)*; moist to wet; fine sand; low plasticity; some organics and fine black organic debris. Sloughing at bottom of excavation **TIDAL FLAT DEPOSITS**	7.0				
Completed - May 27, 2014	8.0				10
					15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

Jar Sample

Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-07

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A28

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: CKS Rev: PWB Typ: PAR

Total Depth:	*10 ft.*	Northing:	~	Drilling Method:	*Test Pit*
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	~
Rod Type:	~
Hammer Type:	~

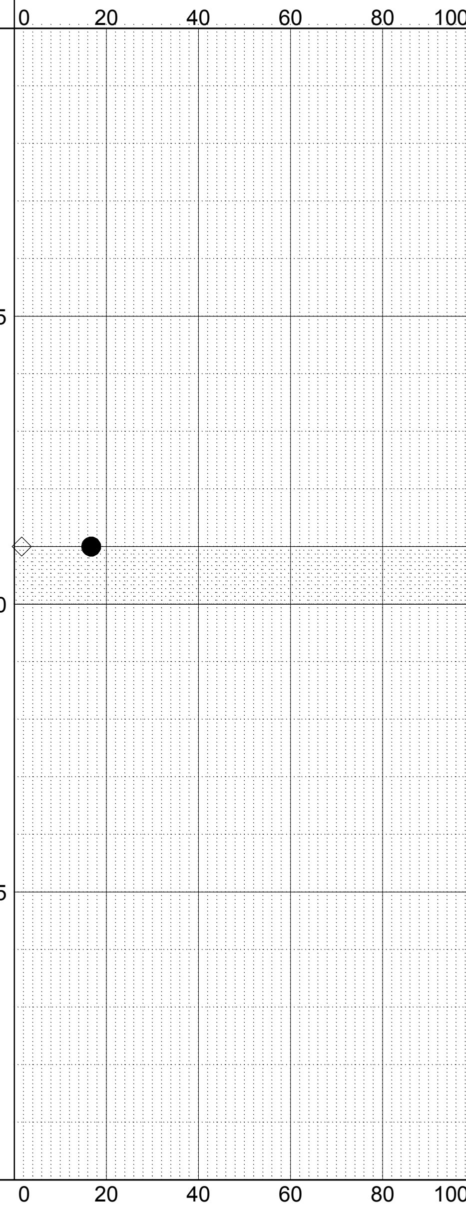
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose to medium dense, brown, *Well-Graded Sand with Gravel (SW)*; moist; fine to coarse subrounded gravel; fine to coarse sand; nonplastic fines. **FILL**					5
Loose to medium dense, gray, *Well-Graded Sand with Gravel (SW)*; wet; fine to coarse subrounded gravel; fine to coarse subrounded sand; nonplastic fines.	8.0		S-1		
Completed - May 27, 2014	10.0				10
					15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Jar Sample

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-08

November 2014 — 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A29

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS* *Rev: PWB* *Typ: PAR*

Total Depth: 8 ft.	Northing: ~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose to medium dense, brown, *Well Graded Sand with Silt and Gravel* to *Well Graded Sand with Gravel (SW-SM/SW)*; moist; fine to coarse subrounded gravel; fine to coarse subrounded sand; nonplastic fines. **FILL**			S-1		5
Loose to medium dense, gray, *Silty Sand with Gravel (SM)*; wet; fine to coarse subrounded to rounded gravel; fine to coarse sand; nonplastic fines.	5.5				
Soft to medium stiff, gray, *Elastic Silt with Sand (MH)*; wet; fine sand; medium plasticity; some fine organic debris. **TIDAL FLAT DEPOSITS**	6.5		S-2		
Completed - May 27, 2014	8.0				10, 15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-09

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A30

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS Rev: PWB Typ: PAR*

Total Depth:	6 ft.	Northing:	~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Loose to medium dense, brown, *Well-Graded Sand with Silt and Gravel (SW-SM)*; moist; fine to coarse subrounded gravel; fine to coarse subrounded sand; nonplastic fines. **FILL**	2.5	S-1
Medium dense, gray, *Silty Sand (SM)*; moist to wet; fine to coarse sand; nonplastic to low plasticity fines; little to some wood boards and organic debris. Seepage at 3 feet	4.0	S-2
Soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some fibrous organics and organic debris. **TIDAL FLAT DEPOSITS**	6.0	

Completed - May 27, 2014

Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60 80 100

Depth, ft.: 5, 10, 15

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Bag Sample

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-10

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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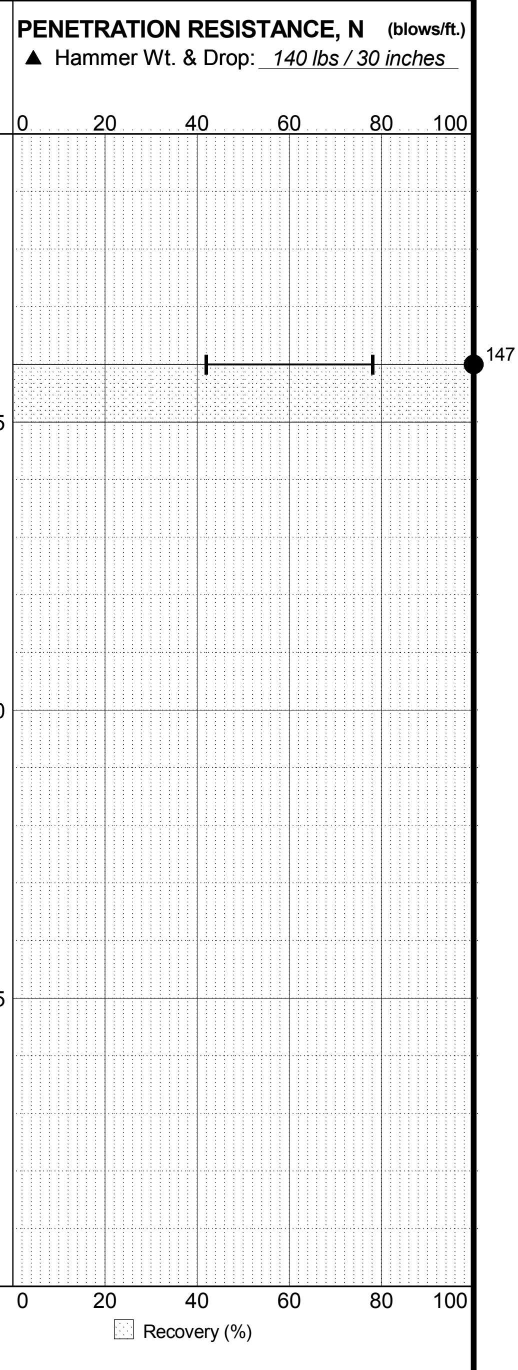
FIG. A31

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS* *Rev: PWB* *Typ: PAR*

Total Depth: 6 ft.	Northing: ~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Sod and brown *SILT (ML)* **TOPSOIL**	0.8				
Soft, gray and brown, *Elastic Silt with Sand (MH)*; wet; trace to little fine sand; medium plasticity; some fibrous organics, peat layers 3-to-6-in.-thick at 2.2 and 3.2 feet. **TIDAL FLAT DEPOSITS**	6.0		S-1		5
Completed - May 28, 2014					10 15



LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-11

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A32

REV 3

Total Depth: 5 ft.	Northing: ~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Elev. Depth (ft.) | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

Soft to very soft, brown, *Silt to Elastic Silt (ML/MH)*; moist; trace fine sand; low plasticity; some organics and roots.

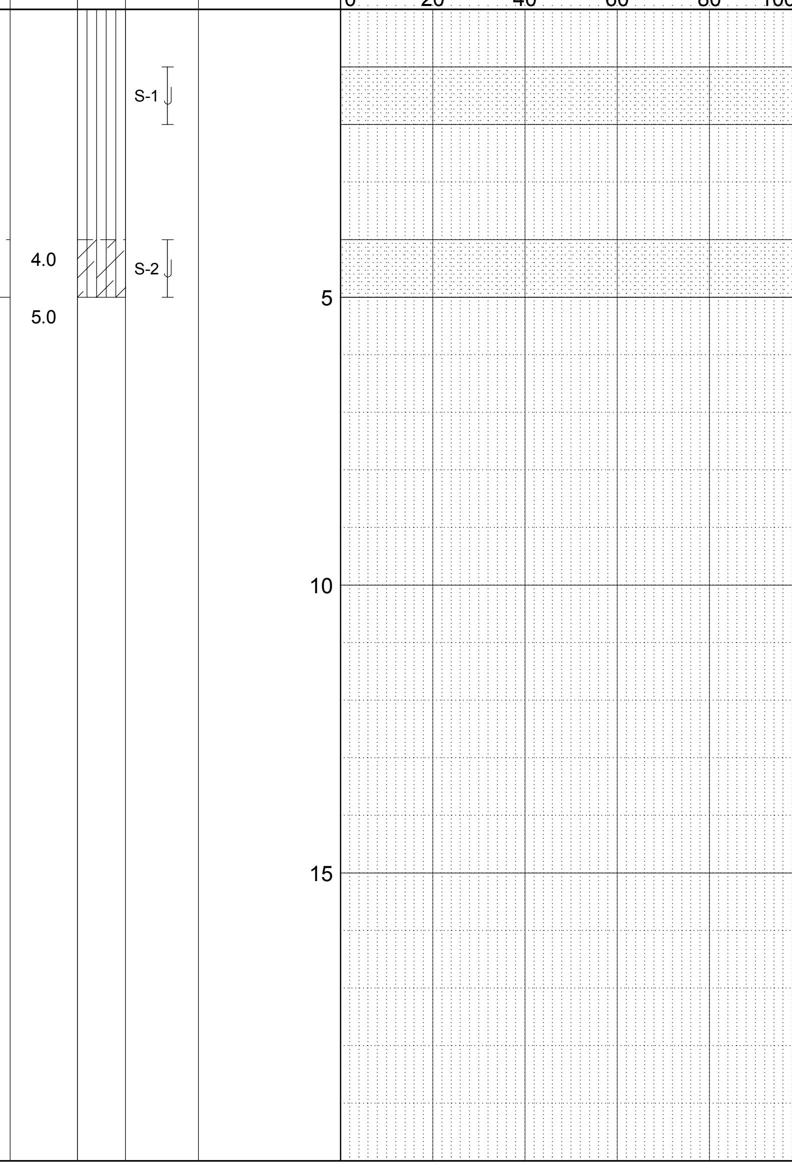
TIDAL FLAT DEPOSITS

Seepage at 3.5 feet

4.0 — Soft to very soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some organics, slight iron oxidation and staining.

5.0

Completed - May 27, 2014



0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-12

November 2014 24-1-03858-005

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FIG. A33

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: CKS Rev: PWB Typ: PAR

Total Depth: 4.5 ft.	Northing: ~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Soft to medium stiff, brown to red brown, *Silt (ML)*; wet; trace fine sand; nonplastic to low plasticity fines; trace wood fragments; slight iron oxidation and staining.			S-1		
TIDAL FLAT DEPOSITS					
Seepage at 3.5 feet					
Soft to medium stiff, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some organics.	4.0				
Completed - May 27, 2014	4.5				5
					10
					15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches

0 20 40 60 80 100

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-13

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A34

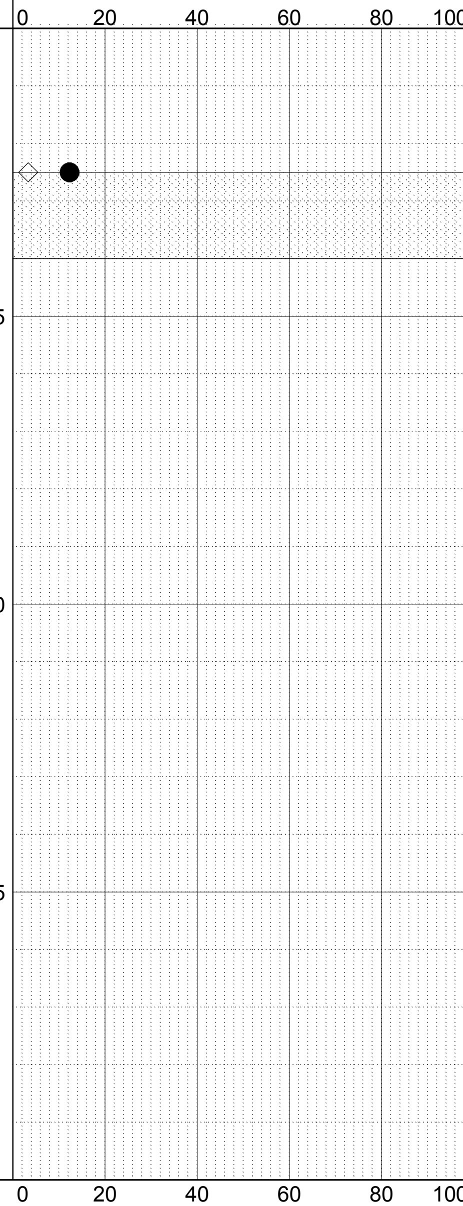
REV 3

Total Depth:	10 ft.	Northing:	~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose to medium dense, brown, *Well-Graded Sand with Gravel (SW)*; moist; fine to coarse subrounded to rounded gravel; fine to coarse subrounded sand; trace medium plasticity fines. **FILL** Seepage at 8 feet			S-1		5
Soft to medium stiff, gray, *Elastic Silt (MH)*; wet; trace sand; medium plasticity; few to little fibrous organics and debris. **TIDAL FLAT DEPOSITS**	8.0				10
Completed - May 27, 2014	10.0				15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Bag Sample

Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-14

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A35

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS Rev: PWB Typ: PAR*

Total Depth:	8 ft.	Northing:	~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Elev. Depth (ft.) | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

Loose to medium dense, gray brown, *Well-Graded Sand with Gravel (SW)*; moist; fine to coarse subrounded to rounded gravel; fine to coarse subrounded sand.

FILL

S-1

Seepage at 7 feet

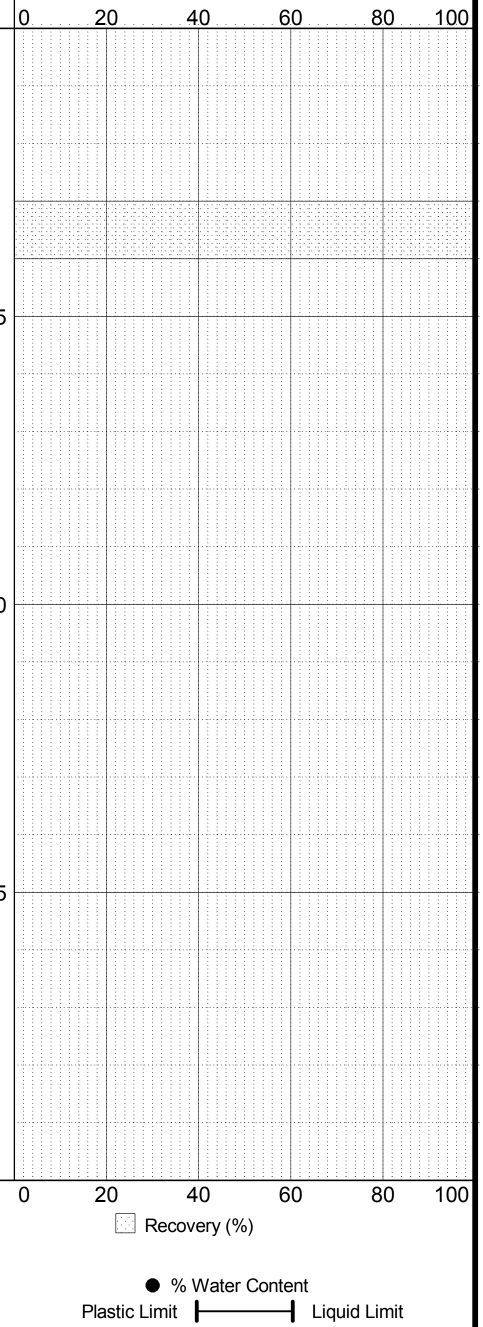
7.0

Very soft to soft, blue-gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some organics and roots.

TIDAL FLAT DEPOSITS

8.0

Completed - May 27, 2014



LEGEND

Bag Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-15

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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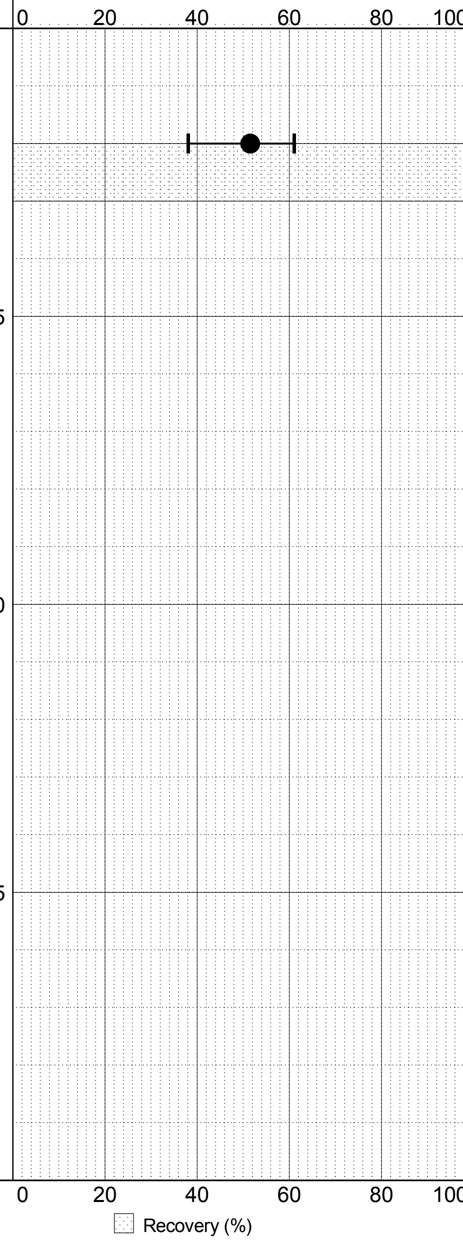
FIG. A36

REV 3

Total Depth: 8 ft.	Northing: ~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Soft to very soft, brown, *Elastic Silt with Sand (MH)*; moist; trace to little fine to medium sand; nonplastic to lowplasticity; slight iron oxidation; disturbed texture. **LEVEE FILL** Seepage at 7.5 feet	7.5		S-1		5
Soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; slight to medium iron oxidation and staining. **TIDAL FLAT DEPOSITS**	8.0				10
Completed - May 27, 2014					15

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-16

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A37

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: CKS Rev: PWB Typ: PAR

Total Depth: *6 ft.*	Northing: ~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

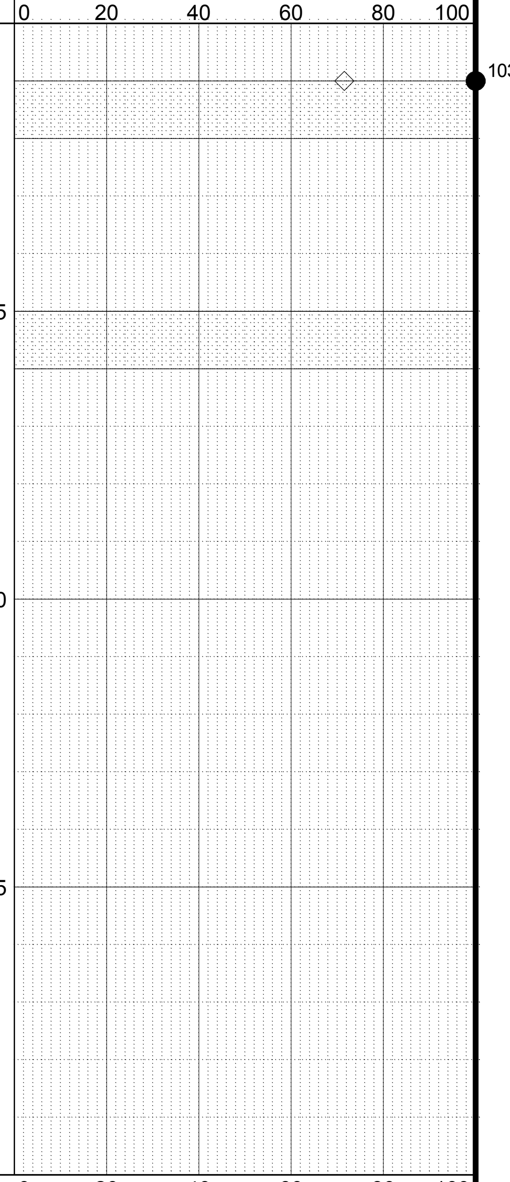
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Soft, brown, *Sandy Elastic Silt (MH)*; moist; fine to medium sand; low plasticity; trace to few roots, slight iron oxidation. **FILL** Seepage at 3 feet			S-1		
Soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some roots and organic debris. **TIDAL FLAT DEPOSITS**	3.0		S-2		5
Completed - May 27, 2014	6.0				10, 15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Bag Sample

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-17

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A38

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS Rev: PWB Typ: PAR*

Total Depth:	*6 ft.*	Northing:	~	Drilling Method:	*Test Pit*
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.: ~
Rod Type: ~
Hammer Type: ~

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Elev. Depth (ft.) | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60 80 100

Loose to medium dense, brown, *Well-Graded Sand with Silt and Gravel (SW-SM)*; moist; fine to coarse subrounded gravel; fine to coarse subrounded sand; medium plasticity fines; trace roots and organic debris; trace glass debris to 5.5 feet.

LEVEE FILL

Seepage at 5.5 feet

ALLUVIUM

6.0

Completed - May 27, 2014

S-1
S-2

5
10
15

0 20 40 60 80 100

Recovery (%)

● % Water Content
Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample
Bag Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-18

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A39

REV 3

Total Depth: 5 ft.	Northing: ~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

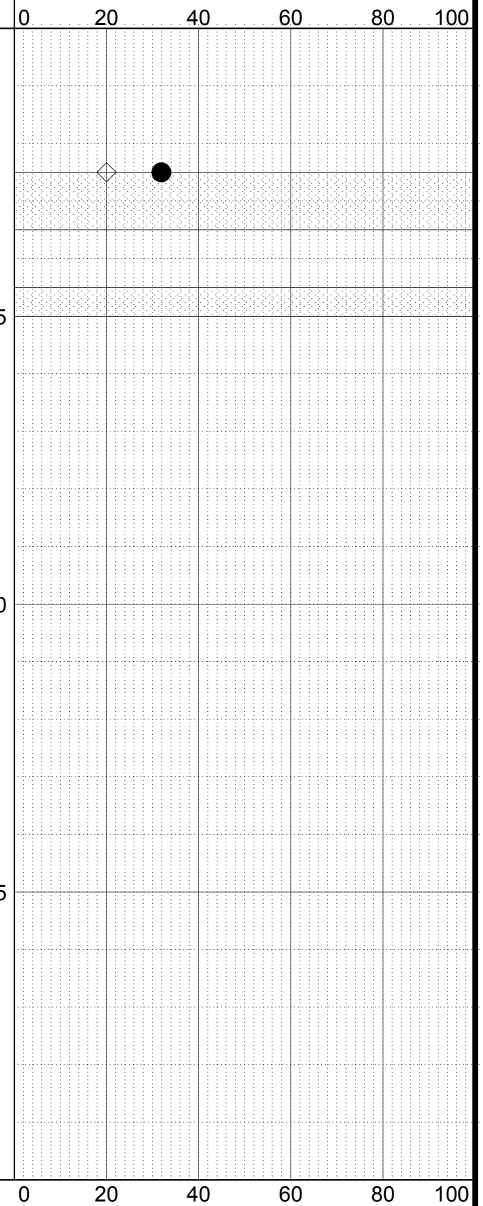
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Medium dense, brown, *Silty Sand with Gravel (SM)*; moist; fine to coarse subrounded to rounded gravel; fine to coarse subrounded sand; nonplastic fines; slight iron oxidation, trace roots. **FILL**			S-1		
Medium dense, gray, *Poorly Graded Gravel with Silt and Sand (GP-GM)*; wet; fine to coarse subrounded to rounded gravel; fine to coarse subrounded sand; nonplastic fines; trace wood debris. **ALLUVIUM**	4.5 5.0		S-2		5
Completed - May 27, 2014					

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-19

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A40

REV 3

Total Depth:	*4.2 ft.*	Northing:	~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Elev. Depth (ft.) | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60 80 100

Soft to medium stiff, gray and brown, *Silt (ML)*; moist; trace fine sand; few roots and rootlets.

S-1

TIDAL FLAT DEPOSITS

Heavy seepage at 3 feet

3.0 — Soft to medium stiff, gray, *Elastic Silt (MH)*; wet; trace fine sand; little to some organics and fibrous organic debris.

S-2

4.2

Completed - May 28, 2014

Depth, ft.: 5, 10, 15

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

Bag Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-20

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A41

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS Rev: PWB Typ: PAR*

Total Depth:	*8 ft.*	Northing:	~	Drilling Method:	*Test Pit*
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	~
Rod Type:	~
Hammer Type:	~

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.	PENETRATION RESISTANCE, N (blows/ft.) ▲ Hammer Wt. & Drop:
Brown and gray, *Silty Gravel (GM)*; moist; numerous fragments 3-in. to 3-ft. diameter of brick, concrete, and asphalt; pipe, wire, and wood debris. **FILL**					5	
Soft, gray, *Elastic Silt with Sand (MH)*; wet; fine rounded sand; medium plasticity; trace organics and wood debris. **TIDAL FLAT DEPOSITS**	5.5					
Soft, brown, *Elastic Silt (MH)*; moist; trace fine sand; medium plasticity; few organics.	7.0					
Completed - May 28, 2014	8.0				10	
					15	

0 20 40 60 80 100

LEGEND

Plastic Limit ├──┤ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-21

November 2014 24-1-03858-005

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FIG. A42

REV 3

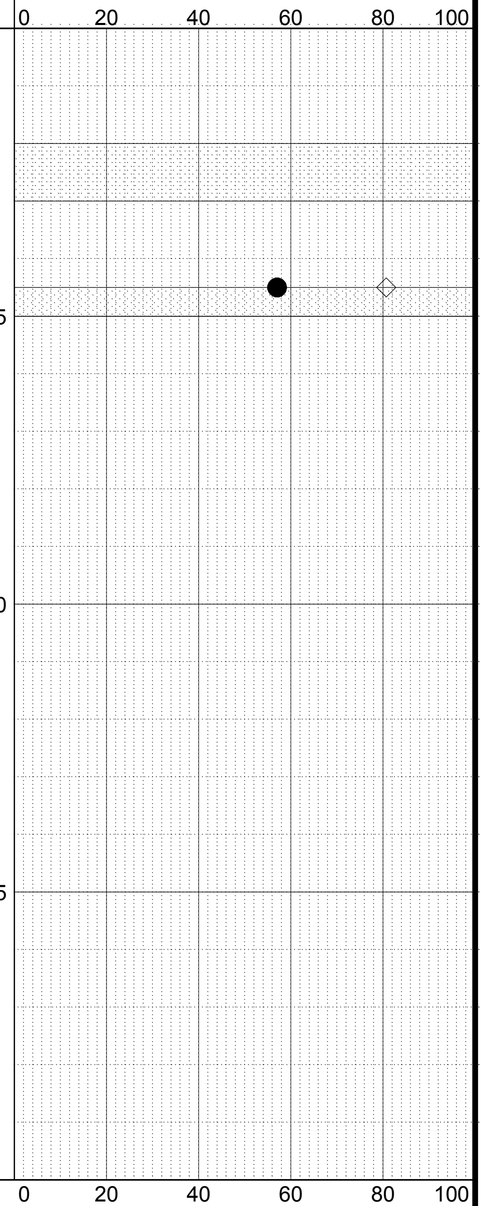
Total Depth:	*5 ft.*	Northing:	~	Drilling Method:	*Test Pit*
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.: ~
Rod Type: ~
Hammer Type: ~

SOIL DESCRIPTION
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose, brown, *Well-Graded Sand (SW)*; moist; trace subrounded gravel; fine to coarse subrounded sand; slight iron oxidation and staining. **FILL**			S-1		
Loose to medium dense, brown, *Silt with Sand (ML)*; moist to wet; fine sand; nonplastic; trace to few roots.	4.0 / 5.0		S-2		5
Completed - May 28, 2014					

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-22

November 2014 | 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A43

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS Rev: PWB Typ: PAR*

Total Depth: 9 ft.	Northing: ~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION

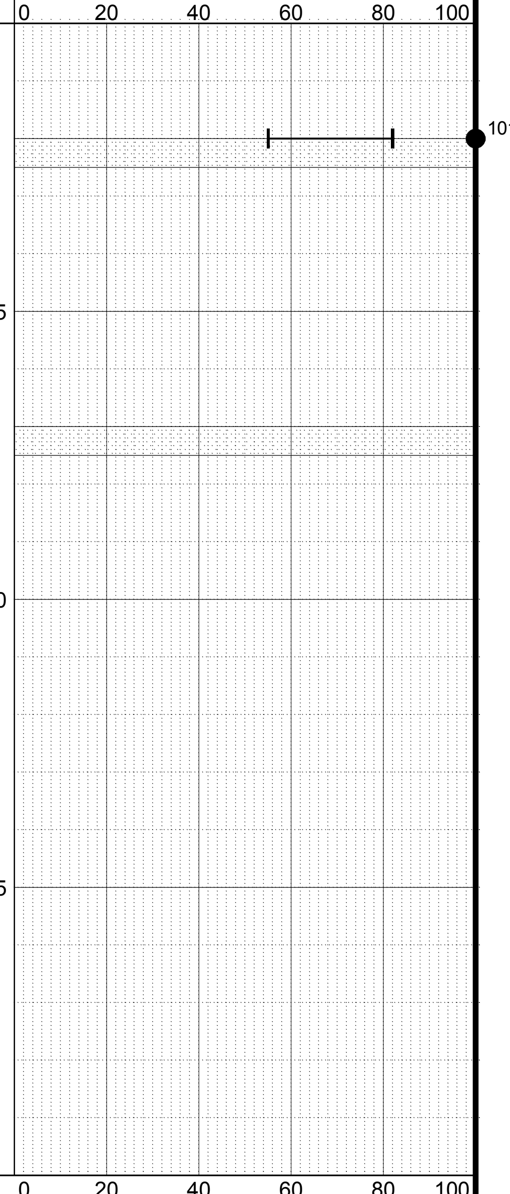
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples
Medium stiff, orange-brown, *Lean Clay with Sand and Gravel (CL)*; moist; fine to coarse subrounded to rounded gravel; fine to coarse sand; medium plasticity; disturbed texture. **FILL**	2.0	S-1
Soft to medium stiff, brown, *Silt to Elastic Silt (ML/MH)*; moist; trace fine sand; trace to few roots and rootlets.	6.0	
Soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some fine organic debris and fibrous organics. slight seepage at 8 feet **TIDAL FLAT DEPOSITS**	9.0	S-2
Completed - May 28, 2014		

Depth, ft.: 5, 10, 15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

Jar Sample

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-23

November 2014 24-1-03858-005

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FIG. A44

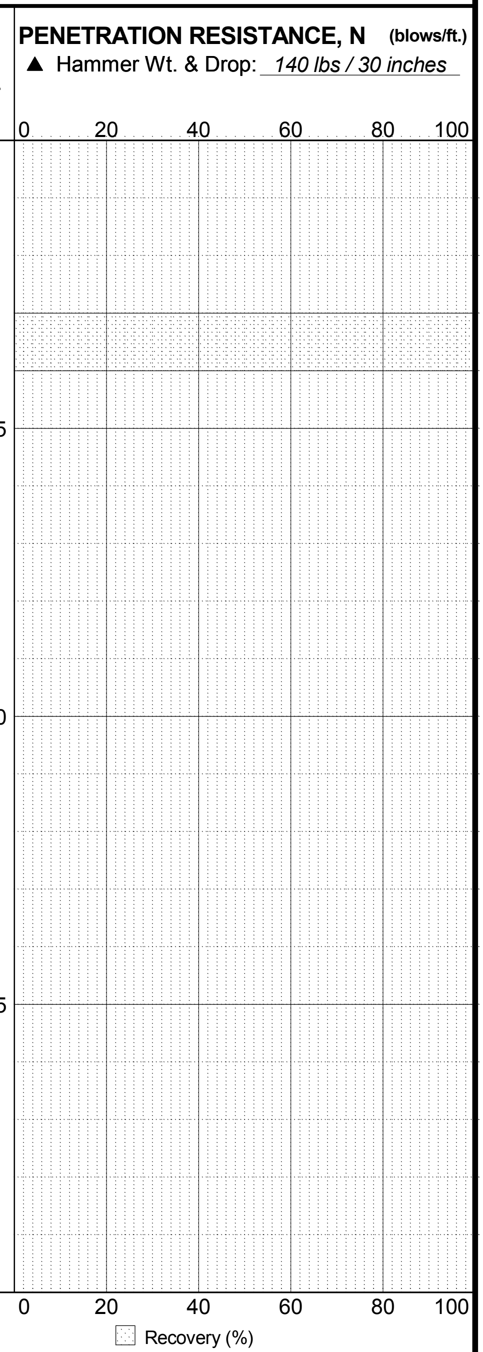
REV 3

Total Depth: 7 ft.	Northing: ~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Soft to medium stiff, brown, *Silt to Elastic Silt (ML/MH)*; moist; trace fine to medium sand; low to medium plasticity; trace to few roots. **FILL**			S-1		
Slight seepage at 4.8 feet					5
Soft, gray, *Elastic Silt (MH)*; moist to wet; trace fine sand; medium plasticity; some logs, roots, and organic debris. **TIDAL FLAT DEPOSITS**	5.0				
Completed - May 28, 2014	7.0				10
					15



LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-24

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A45

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: CKS Rev: PWB Typ: PAR

REV 3

Total Depth:	7 ft.	Northing:	~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Elev. Depth (ft.) | Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60 80 100

Soil Description	Elev. Depth (ft.)	Samples
Soft to medium stiff, brown, *Silt (ML)*; moist; trace fine sand; low plasticity; slight to moderate iron oxidation; few roots and rootlets. **FILL** Slight seepage at 5.5 feet		S-1
Soft to very soft, dark gray to dark gray-brown, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; little to some logs, wood fragments, and fine organics. **TIDAL FLAT DEPOSITS**	6.0	S-2
Completed - May 28, 2014	7.0	

Depth, ft.: 5, 10, 15

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-25

November 2014 24-1-03858-005

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FIG. A46

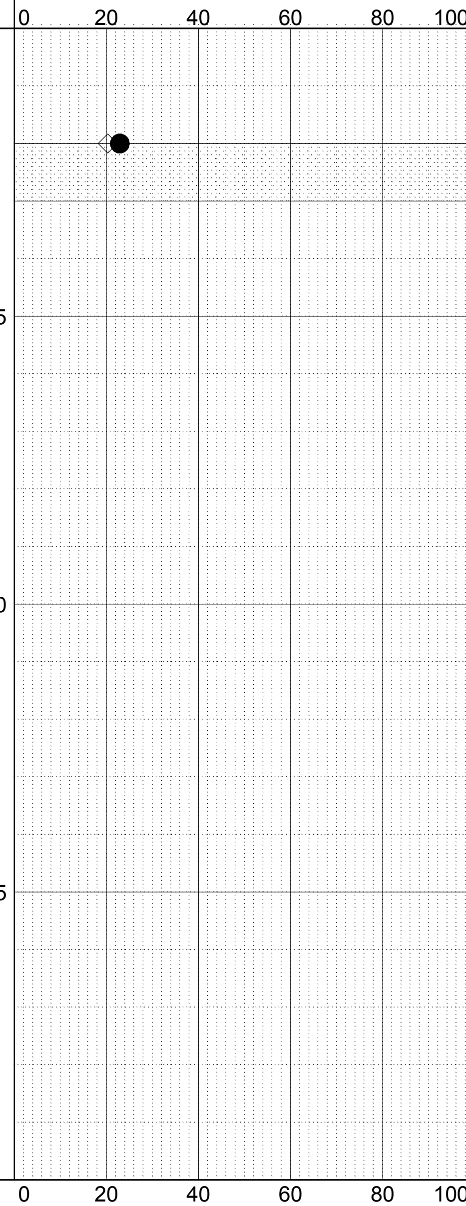
REV 3

Total Depth:	*6 ft.*	Northing:	~	Drilling Method:	*Test Pit*
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	~
Rod Type:	~
Hammer Type:	~

SOIL DESCRIPTION	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.					
Medium dense, brown to dark brown, *Silty Sand with Gravel (SM)*; moist; trace cobbles; fine to coarse subangular to rounded gravel; fine to coarse sand; nonplastic fines; some fragments of concrete and logs; some plastic netting and wire fragments. **FILL** Refusal at 6 feet - concrete	6.0		S-1		5
Completed - May 28, 2014					10
					15

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-26

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A47

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS* *Rev: PWB* *Typ: PAR*

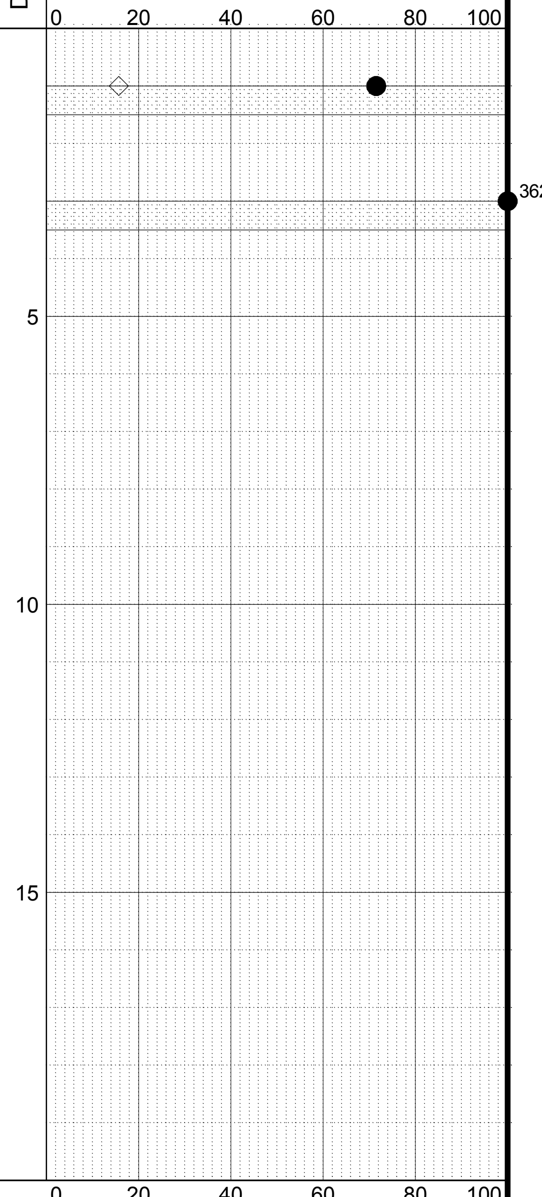
Total Depth:	6 ft.	Northing:	~	Drilling Method:	Test Pit
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	~
Rod Type:	~
Hammer Type:	~

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Samples	Ground Water
Loose, gray-brown, *Silty Sand (SM)*; wet; fine to coarse sand; nonplastic fines; some roots and organic debris. Seepage at 1.5 feet		S-1	During Drilling
Wood and Organic Debris, with trace silt, little peat, rubber tubing, belts, and trash **FILL**	2.0	S-2	
Soft, gray, *Organic Silt (OL)*; wet; low plasticity; mostly rootlets and fine organic debris. **TIDAL FLAT DEPOSITS**	5.0 6.0		

Completed - May 29, 2014

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



LEGEND

Jar Sample

Groundwater Level ATD

Recovery (%)
◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

NOTES
1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-27

November 2014 24-1-03858-005

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FIG. A48

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: CKS Rev: PWB Typ: PAR

Total Depth: 7.5 ft.	Northing: ~	Drilling Method: *Test Pit*	Hole Diam.: ~
Top Elevation: ~	Easting: ~	Drilling Company: *Aufdermauer Trucking and Excavating*	Rod Type: ~
Vert. Datum:	Station: ~	Drill Rig Equipment:	Hammer Type: ~
Horiz. Datum:	Offset: ~	Other Comments:	

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Loose, dark brown, *Silt* to *Organic Silt (ML/OL)*; wet; nonplastic fines; some roots, organics, and wood debris.	1.0			During Drilling	
Wood and Organic Debris, trace gravel, trace to few glass fragments, jars and bottles. Wood debris caving to 4 feet **FILL**	7.5				5
Completed - May 29, 2014					10, 15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop:

0 20 40 60 80 100

LEGEND

Groundwater Level ATD

Plastic Limit ├──┤ Liquid Limit
Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

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Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-28

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A49

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: CKS Rev: PWB Typ: PAR

REV 3

Total Depth:	*9 ft.*	Northing:	~	Drilling Method:	*Test Pit*	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	*Aufdermauer Trucking and Excavating*	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
Very soft, dark brown, *Silt (ML)*; moist to wet; trace fine to coarse sand; nonplastic to low plasticity fines; little to some roots, rootlets, and organic debris. **TOPSOIL**			S-1		
Wood and Organic Debris w/some silt and peat, trace gravel and cobbles, lumber chips and log fragments; moist to wet. Slight seepage at 3.5 feet **FILL**	2.5				5
Soft, gray and brown, *Organic Silt (OL)*; wet; low to medium plasticity; some organics, bark, and pine needles; reworked tidal flat deposits.	8.0				
Completed - May 29, 2014	9.0				10
					15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-29

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A50

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS Rev: PWB Typ: PAR*

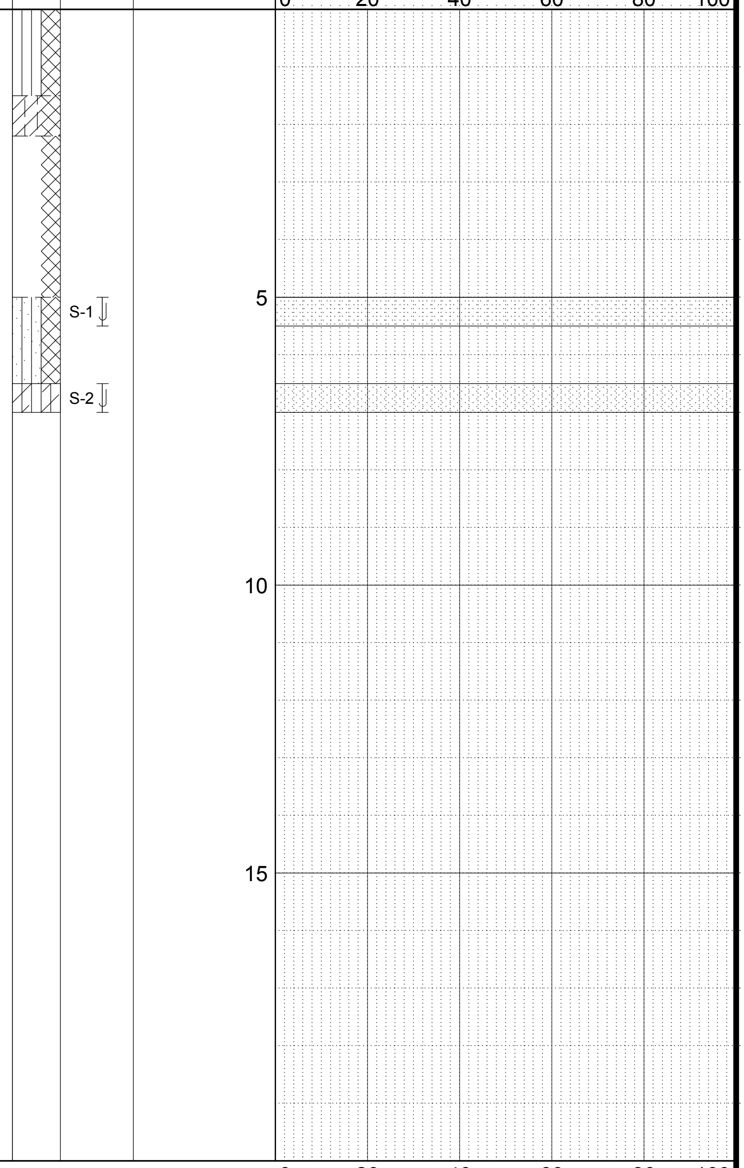
Total Depth:	7 ft.	Northing:	~	Drilling Method:	Test Pit	Hole Diam.:	~
Top Elevation:	~	Easting:	~	Drilling Company:	Aufdermauer Trucking and Excavating	Rod Type:	~
Vert. Datum:		Station:	~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:		Offset:	~	Other Comments:			

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Soft, dark brown, *Sandy Silt with Gravel (ML)*; moist; fine to coarse subrounded to angular gravel; fine to coarse subrounded sand; medium to low plasticity; few to little fragments of concrete, metal, and plastic debris.	1.5	
	2.2	
Soft to medium stiff, tan-brown, *Sandy Clay with Gravel (CL)*; moist; fine to coarse angular siltstone and sandstone fragments; fine to coarse subrounded to rounded gravel; fine to coarse sand; medium to high plasticity; disturbed texture.	5.0	S-1
Loose, dark brown to black organic debris, pipe, plastic garbage-mostly soot.	6.5	S-2
Loose, brown, *Silt with Sand and Gravel (ML)*; wet; fine to coarse angular fragments of siltstone; angular to subangular sand sized fragments of siltstone; nonplastic to low plasticity. **FILL**	7.0	
Soft, gray, *Elastic Silt (MH)*; wet; trace fine sand; medium plasticity; some fibrous organics and organic debris. **TIDAL FLAT DEPOSITS**		

Completed - May 29, 2014



LEGEND

Jar Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF TEST PIT TP-30

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. A51

REV 3

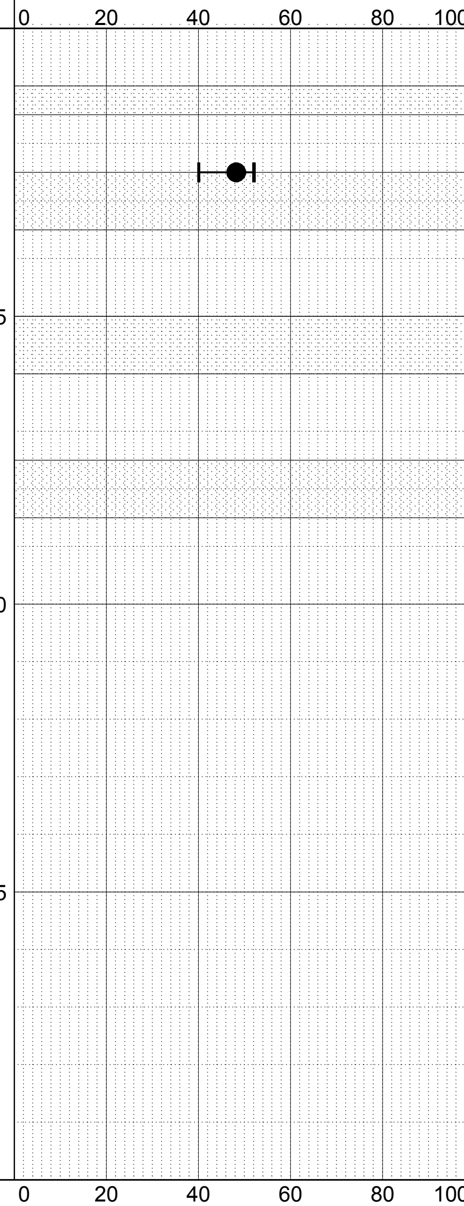
Total Depth:	8.5 ft.	Northing:	~	Drilling Method:	Hand Boring
Top Elevation:	~	Easting:	~	Drilling Company:	Shannon & Wilson, Inc.
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.: ~
Rod Type: ~
Hammer Type: ~

SOIL DESCRIPTION
Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
TOPSOIL	0.3				
Dark brown, *Elastic Silt (MH)*; moist; medium plasticity; trace organics. **FILL** Wood at 9 ft			S-1, S-2, S-3, S-4		5
Completed - May 27, 2014	9.0				10, 15

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: 140 lbs / 30 inches



Recovery (%)
● % Water Content
Plastic Limit ├──┤ Liquid Limit

LEGEND

G Grab Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF HAND AUGER HA-1

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A52

REV 3

Total Depth: 8.5 ft.	Northing: ~	Drilling Method: Hand Boring	Hole Diam.: ~
Top Elevation: ~	Easting: ~	Drilling Company: Shannon & Wilson, Inc.	Rod Type: ~
Vert. Datum:	Station: ~	Drill Rig Equipment:	Hammer Type: ~
Horiz. Datum:	Offset: ~	Other Comments:	

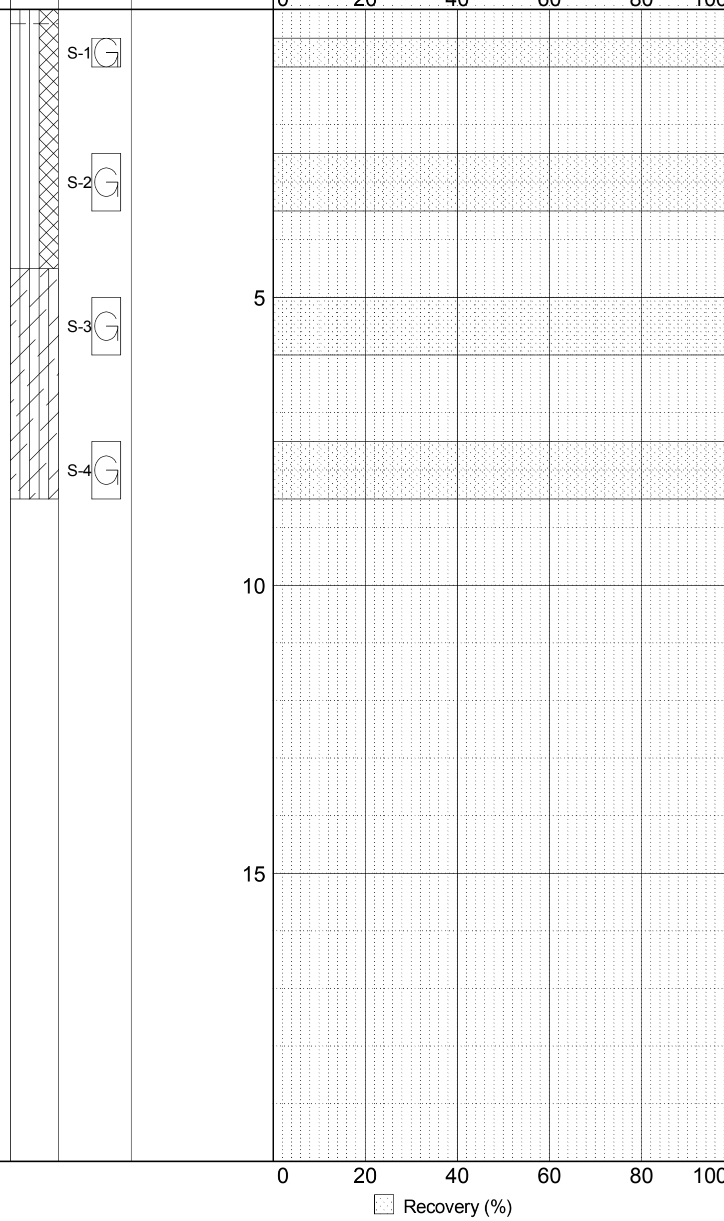
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
TOPSOIL	0.3	
Dark brown and light gray, *Silt (ML)*; moist; low plasticity; trace organics. **FILL**	4.5	S-1, S-2
Dark gray, *Elastic Silt (MH)*; moist; medium plasticity; trace organics. **TIDAL FLAT DEPOSITS**	8.5	S-3, S-4
Completed - May 27, 2014		

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



LEGEND

G Grab Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF HAND AUGER HA-2

November 2014 24-1-03858-005

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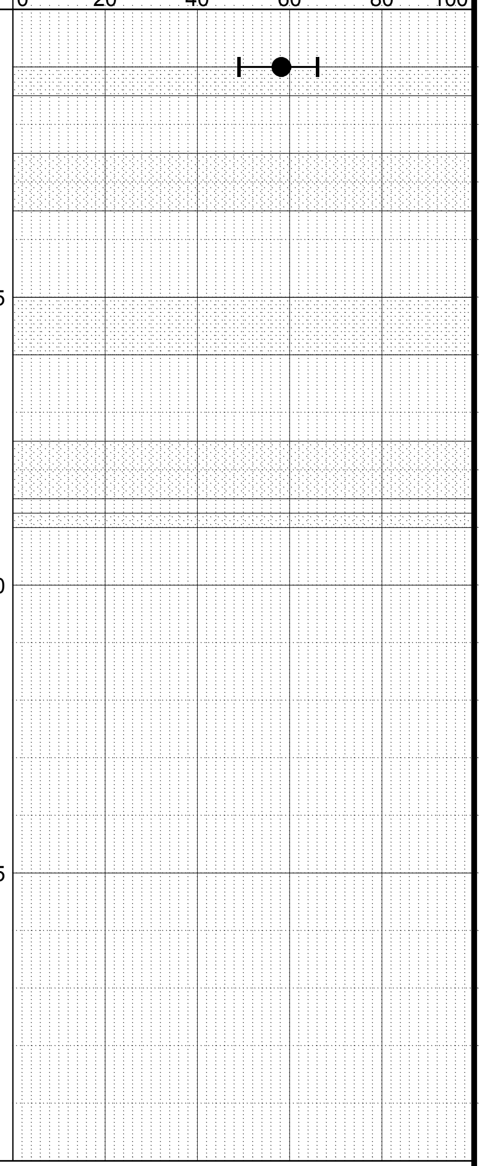
FIG. A53

REV 3

Total Depth: *9 ft.*	Northing: ~	Drilling Method:	*Hand Boring*	Hole Diam.:	~
Top Elevation: ~	Easting: ~	Drilling Company:	*Shannon & Wilson, Inc.*	Rod Type:	~
Vert. Datum:	Station: ~	Drill Rig Equipment:		Hammer Type:	~
Horiz. Datum:	Offset: ~	Other Comments:			

SOIL DESCRIPTION *Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.*	*Elev.* Depth (ft.)	Symbol	Samples	Ground Water	Depth, ft.
TOPSOIL	0.3				
Dark brown, *Elastic Silt (MH)*; moist; medium plasticity; trace organics. **FILL**			S-1, S-2, S-3, S-4		5
Dark gray, *Elastic Silt (MH)*; moist; medium plasticity; trace organics. **TIDAL FLAT DEPOSITS**	8.8 / 9.0		S-5		10, 15
Completed - May 27, 2014					

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: *140 lbs / 30 inches*



Recovery (%)

● % Water Content
Plastic Limit ├──┤ Liquid Limit

LEGEND

Bag Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF HAND AUGER HA-3

November 2014 24-1-03858-005

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FIG. A54

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 *Log: CKS Rev: PWB Typ: PAR*

Total Depth:	6.5 ft.	Northing:	~	Drilling Method:	Hand Boring
Top Elevation:	~	Easting:	~	Drilling Company:	Shannon & Wilson, Inc.
Vert. Datum:		Station:	~	Drill Rig Equipment:	
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	~
Rod Type:	~
Hammer Type:	~

SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples	Ground Water
TOPSOIL	0.3		
Dark brown, *Elastic Silt (MH)*; moist; medium plasticity; trace organics. **FILL**	6.0	S-1, S-2, S-3	During Drilling
Dark gray, *Elastic Silt (MH)*; moist; medium plasticity; trace organics. **TIDAL FLAT DEPOSITS**	6.5	S-4	
Completed - May 27, 2014			

Depth, ft.: 5, 10, 15

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: *140 lbs / 30 inches*

0 20 40 60 80 100

0 20 40 60 80 100

Recovery (%)

● % Water Content

Plastic Limit |——| Liquid Limit

LEGEND

Bag Sample

Groundwater Level ATD

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

LOG OF HAND AUGER HA-4

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A55

REV 3

MASTER_LOG_E 24-1-03858-002-TP&HA.GPJ SW2013LIBRARYPDX.GLB SHANWIL_PDX.GDT 10/30/14 Log: CKS Rev: PWB Typ: PAR

APPENDIX B

LABORATORY TEST RESULTS

TABLE OF CONTENTS

TABLE

FIGURES

ATTACHMENTS

APPENDIX B

LABORATORY TEST RESULTS

B.1 GENERAL

The soil samples obtained during the field explorations were described and identified in the field in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), ASTM D2488. The specific terminology used is presented in Appendix A, Figure A1. The samples were then reviewed in the laboratory. The physical characteristics of the samples were noted, and the field descriptions and identifications were modified where necessary in accordance with terminology presented in Appendix A, Figure A1. Representative samples were selected for various laboratory tests. We refined our visual-manual soil descriptions and identifications based on the results of the laboratory tests, using elements of the Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487. The refined descriptions and identifications were then incorporated into the logs of the explorations, presented in Appendix A. Note that ASTM D2487 was not followed in full because it requires that a suite of tests be performed to fully classify a single sample.

The soil testing program included moisture content analyses, unit weight determinations, Atterberg limits tests, particle-size analyses, torvane tests, direct shear tests, a consolidated undrained triaxial shear test, a consolidation test, and proctor tests. All testing was performed by Northwest Testing, Inc., (NTI) of Wilsonville, Oregon, in accordance with applicable ASTM International (ASTM) standards. Test procedures are summarized in the following paragraphs.

B.2 MOISTURE (NATURAL WATER) CONTENT

Natural moisture content determinations were performed, in accordance with ASTM D2216, on selected soil samples. The natural moisture content is a measure of the amount of moisture in the soil at the time of exploration. It is defined as the ratio of the weight of water to the dry weight of the soil, expressed as a percentage. The results of all moisture content analyses are shown on the exploration logs in Appendix A. They are also presented in tabular format in reports prepared by NTI, which are attached to the end of this appendix.

B.3 UNIT WEIGHT DETERMINATIONS

Unit weights were determined on selected undisturbed Shelby tube samples in accordance with ASTM D2937. The wet and dry unit weights were calculated by measuring the dimensions of selected cylindrical samples, the sample weights, and moisture contents. Unit weight is defined as the ratio of soil weight in pounds (wet and dry) to the in-place volume of the sample in cubic feet and is presented in pounds per cubic foot (pcf). Some sample unit weights were determined during other tests. The results of all unit weight determinations are presented on the Unit Weight Summary, Table B1, and in the reports prepared by NTI, which are attached to the end of this appendix.

TABLE B1: UNIT WEIGHT SUMMARY

Boring No.	Sample No.	Sample Depth (feet)	Moisture Content (%)	Dry Unit Weight (pcf)
B-3	U-1	2	97.3	48.0
B-8	U-1	5	146.3 140.3 142.8	33.4 34.0 34.9
B-14	U-1	5	157.2 136.0 105.5	29.6 34.1 43.1
B-16	U-1	2.5	64.0 67.6 73.2	54.9 56.0 48.5

B.4 ATTERBERG LIMITS

Atterberg limits were determined on selected samples in accordance with ASTM D4318. This analysis yields index parameters of the soil that are useful in soil identification, as well as in a number of analyses, including liquefaction analysis. An Atterberg limits test determines a soil's liquid limit (LL) and plastic limit (PL). These are the maximum and minimum moisture contents at which the soil exhibits plastic behavior. A soil's plasticity index (PI) can be determined by subtracting PL from LL. The LL, PL, and PI of tested samples are presented on the Atterberg Limits Results, Figures B1A and B1B. The results are also shown on the exploration logs in Appendix A, and in tabular format in reports prepared by NTI, which are attached to the end of this appendix. For the purposes of soil description, we use the term nonplastic to refer to soils with a PI range of 0 to 4, low plasticity for soils with a PI range of >4 to 10, medium plasticity for soils with a PI range of >10 to 20, and high plasticity for soils with a PI >20.

B.5 PARTICLE-SIZE ANALYSES

Particle-size analyses were conducted on selected samples to determine their grain-size distributions. Grain-size distributions were determined by sieve analysis in accordance with ASTM D422 or ASTM C136/C117. A wet sieve analysis was performed to determine a percentage (by weight) of the sample passing the No. 200 (0.075 mm) sieve. For select samples, the material retained on the No. 200 sieve was shaken through a series of sieves to determine the distribution of the plus No. 200 fraction. For some tests, only the percentage of the sample passing the No. 200 (0.075mm) sieve was determined, in accordance with ASTM D1140. Results of the particle-size analyses are presented on Figures B2A and B2B, Grain Size Distribution, and in reports prepared by NTI, which are attached to the end of this appendix. For all drilled borings, the percentage of material passing the No. 200 sieve is also shown graphically in the Logs of Borings in Appendix A.

B.6 CONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST

A consolidated undrained triaxial shear test was performed on an undisturbed specimen in general accordance with ASTM D4767. The sample was obtained from Boring B-8, sample U-1 at 5 feet depth. The triaxial testing was performed by NTI, and the results are presented in their report, which is attached to the end of this appendix.

B.7 CONSOLIDATION TEST

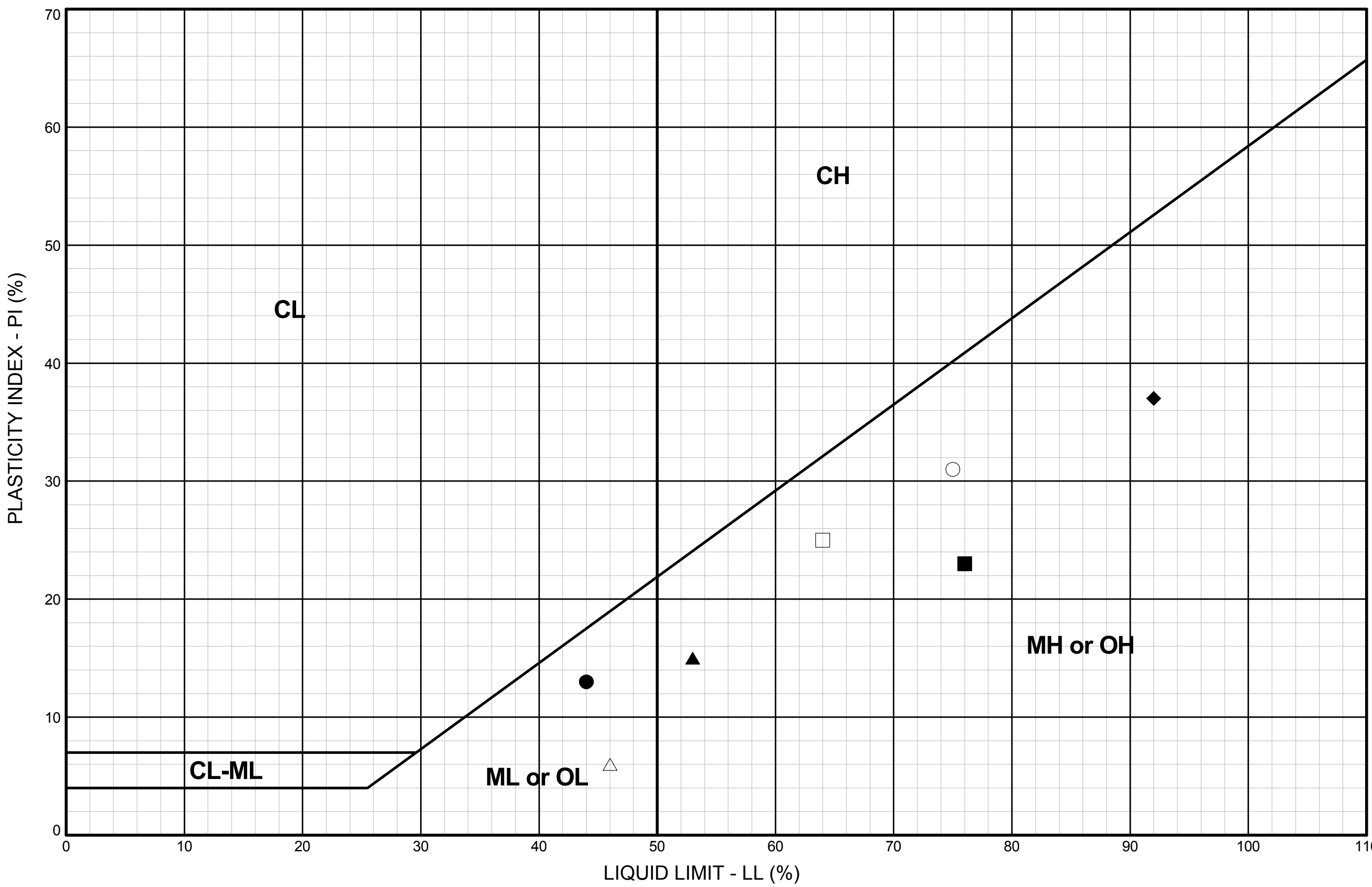
A one-dimensional incremental consolidation test was performed on a sample from Boring B-8, sample U-1 at 5 feet depth in general accordance with ASTM D2435, Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading. Consolidation tests measure the volume change and rate of volume change of the soil sample under predetermined loads. The results of the consolidation test are presented in the report prepared by NTI, which is attached to the end of this appendix.

B.8 DIRECT SHEAR TESTS

We performed two direct shear tests on undisturbed specimens. These were obtained from borings B-14, sample U-1 at 5 feet depth, and B-16, sample U-1 at 2.5 feet depth, in general accordance with ASTM D3080. The specimen was trimmed and fit into the testing apparatus. A vertical (normal) load was applied, and the sample was inundated with water. The specimen was permitted to consolidate under the applied normal load. After consolidation, the sample was sheared laterally at a constant strain rate, which was determined by an evaluation of the observed rate of consolidation. Successive shearing runs were conducted on the sample under higher vertical loads to determine the residual shear strength parameters. The results of the test are presented on a shear strength verses normal pressure plots on the attached NTI report.

B.9 COMPACTION TESTING

Standard proctor compaction testing was performed on two samples in general accordance with ASTM D698 Method C. This test produces a curve of moisture content versus dry density. The moisture-density curve can be used to determine the maximum dry density and corresponding optimum moisture content for the material. To produce the moisture-density curve, the material is passed through a ¾-inch (19.0 mm) sieve and compacted into a 6-inch-diameter mold in three layers with 25 blows per layer. Each blow is applied with a 5.5-pound rammer falling from a height of 12 inches. After compaction, the material density and moisture content is determined, more water is added to the sample, and the compaction process is repeated for the increased moisture content. A minimum of four points are required to define the moisture-density curve. Results of the compaction testing are presented in the NTI report attached to this appendix.



NOTES

1) Atterberg limits tests were performed in general accordance with ASTM D4318 unless otherwise noted in the report.

2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

3) Plasticity adjectives used in sample descriptions correspond to plasticity index as follows:
- Nonplastic (NP) (< 4%)
- Low Plasticity (4 to 10%)
- Medium Plasticity (10 to 20%)
- High Plasticity (> 20%)

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	LL %	PL %	PI %[3]	NAT. W.C. %	FINES %
● B-01	3.0	*ML*	*Silt*	44	31	13	31	
■ B-03, U-1	2.0	*MH*	*Elastic Silt*	76	53	23	97	
▲ B-04, S-3	7.5	*MH*	*Elastic Silt*	53	38	15	102	
◆ B-08, U-1	5.0	*MH*	*Elastic Silt*	92	55	37	140	
○ B-14, S-2	6.5	*MH*	*Elastic Silt*	75	44	31	173	
□ B-16, S-3	10.0	*MH*	*Elastic Silt*	64	39	25	85	
△ B-16, S-6	25.0	*ML*	*Silt*	46	40	6	60	

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

ATTERBERG LIMITS RESULTS DRILLED BORINGS

November 2014 24-1-03858-005

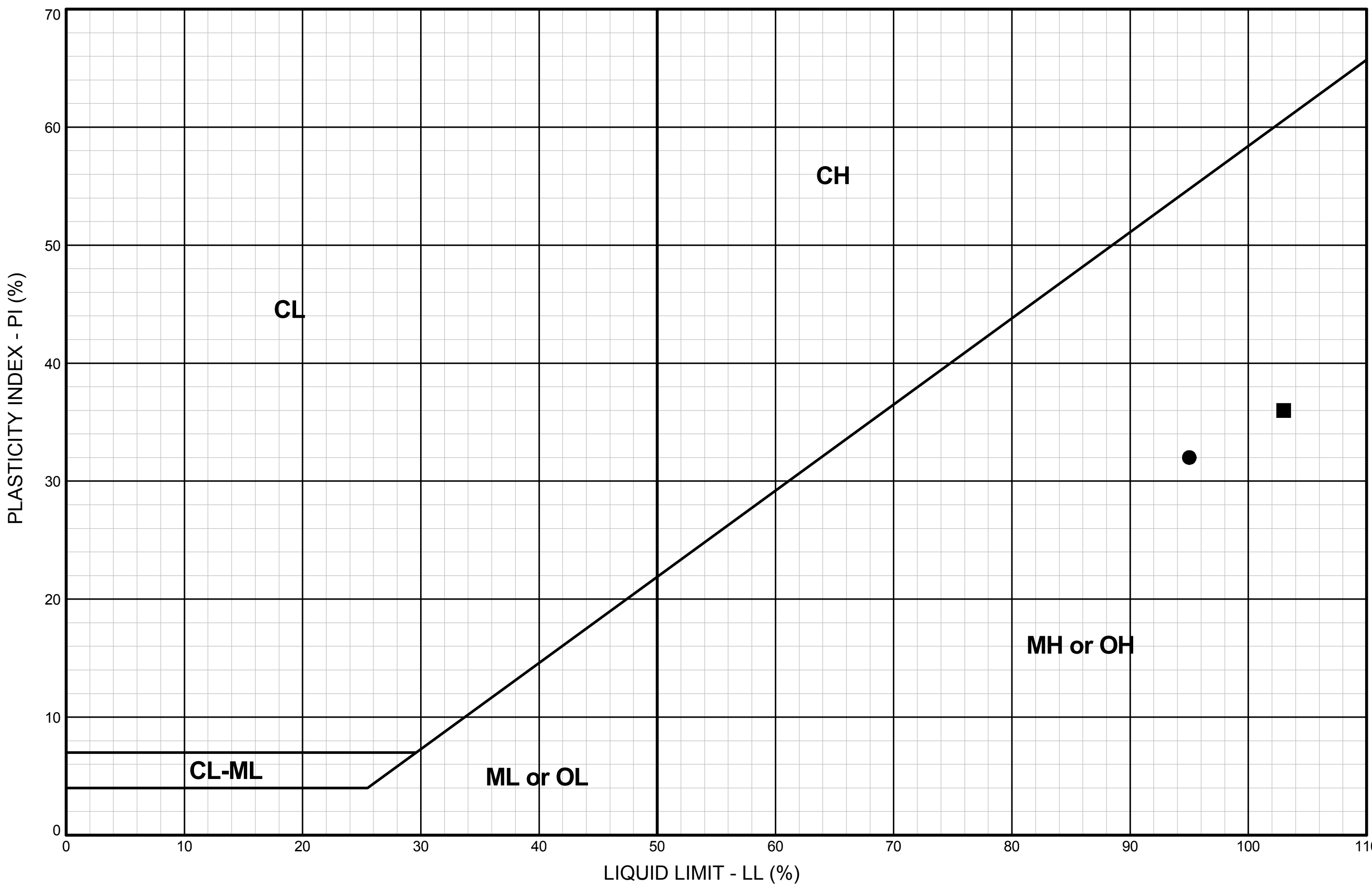
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B1A
Sheet 1 of 2

Northwest Hydraulic Consultants

FIG. B1A

ATT MAIN 24-1-03858-002-BORINGS.GPJ SHAN WIL.GDT 10/30/14



NOTES

1) Atterberg limits tests were performed in general accordance with ASTM D4318 unless otherwise noted in the report.

2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

3) Plasticity adjectives used in sample descriptions correspond to plasticity index as follows:
- Nonplastic (NP) (< 4%)
- Low Plasticity (4 to 10%)
- Medium Plasticity (10 to 20%)
- High Plasticity (> 20%)

ATT MAIN 24-1-03858-002-BORINGS.GPJ SHAN WIL.GDT 10/30/14

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	LL %	PL %	PI %[3]	NAT. W.C. %	FINES %
● B-18, S-4	10.0	*MH*	*Elastic Silt*	95	63	32	212	
■ B-19, S-3	10.0	*MH*	*Elastic Silt*	103	67	36		

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Tillamook, Oregon

ATTERBERG LIMITS RESULTS DRILLED BORINGS

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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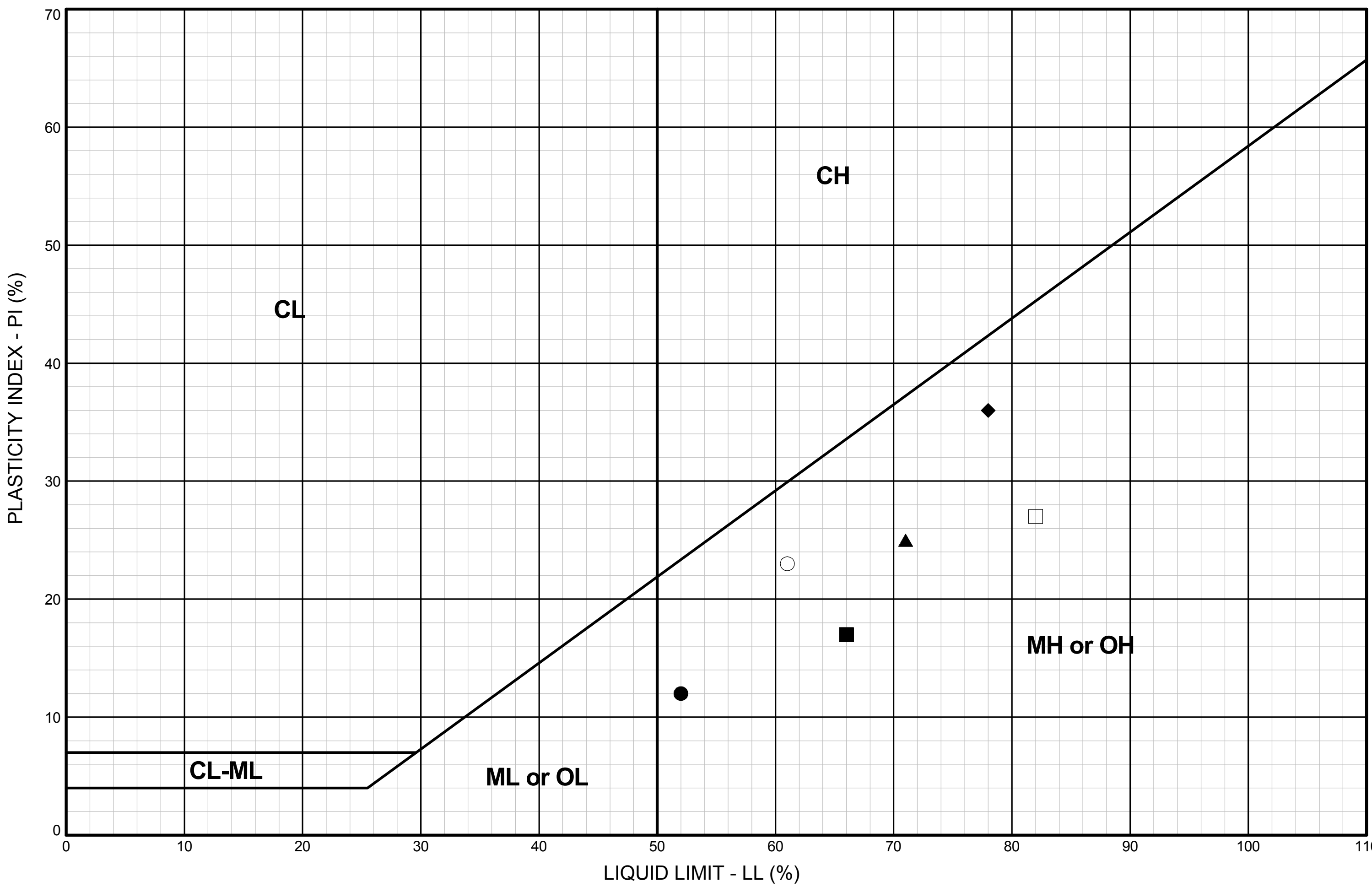
FIG. B1A
Sheet 2 of 2

Northwest Hydraulic Consultants

FIG. B1A



NOTES
1) Atterberg limits tests were performed in general accordance with ASTM D4318 unless otherwise noted in the report.

2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

3) Plasticity adjectives used in sample descriptions correspond to plasticity index as follows:
- Nonplastic (NP) (< 4%)
- Low Plasticity (4 to 10%)
- Medium Plasticity (10 to 20%)
- High Plasticity (> 20%)

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	LL %	PL %	PI %[3]	NAT. W.C. %	FINES %
● HA-1, S-2	2.5	*MH*	*Elastic Silt*	52	40	12	48	
■ HA-3, S-1	1.0	*MH*	*Elastic Silt*	66	49	17	58	
▲ TP-06, S-1	1.0	*MH*	*Elastic Silt*	71	46	25	79	
◆ TP-11, S-1	4.0	*MH*	*Elastic Silt*	78	42	36	147	
○ TP-16, S-1	2.0	*MH*	*Elastic Silt*	61	38	23	52	
□ TP-23, S-1	2.0	*MH*	*Elastic Silt*	82	55	27	101	
TP-27, S-2	3.0	*ML*	*Silt*	NP	NP	NP	362	

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Southern Flow Corridor Project
Tillamook, Oregon

ATTERBERG LIMITS RESULTS
TEST PITS AND HAND AUGERS

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

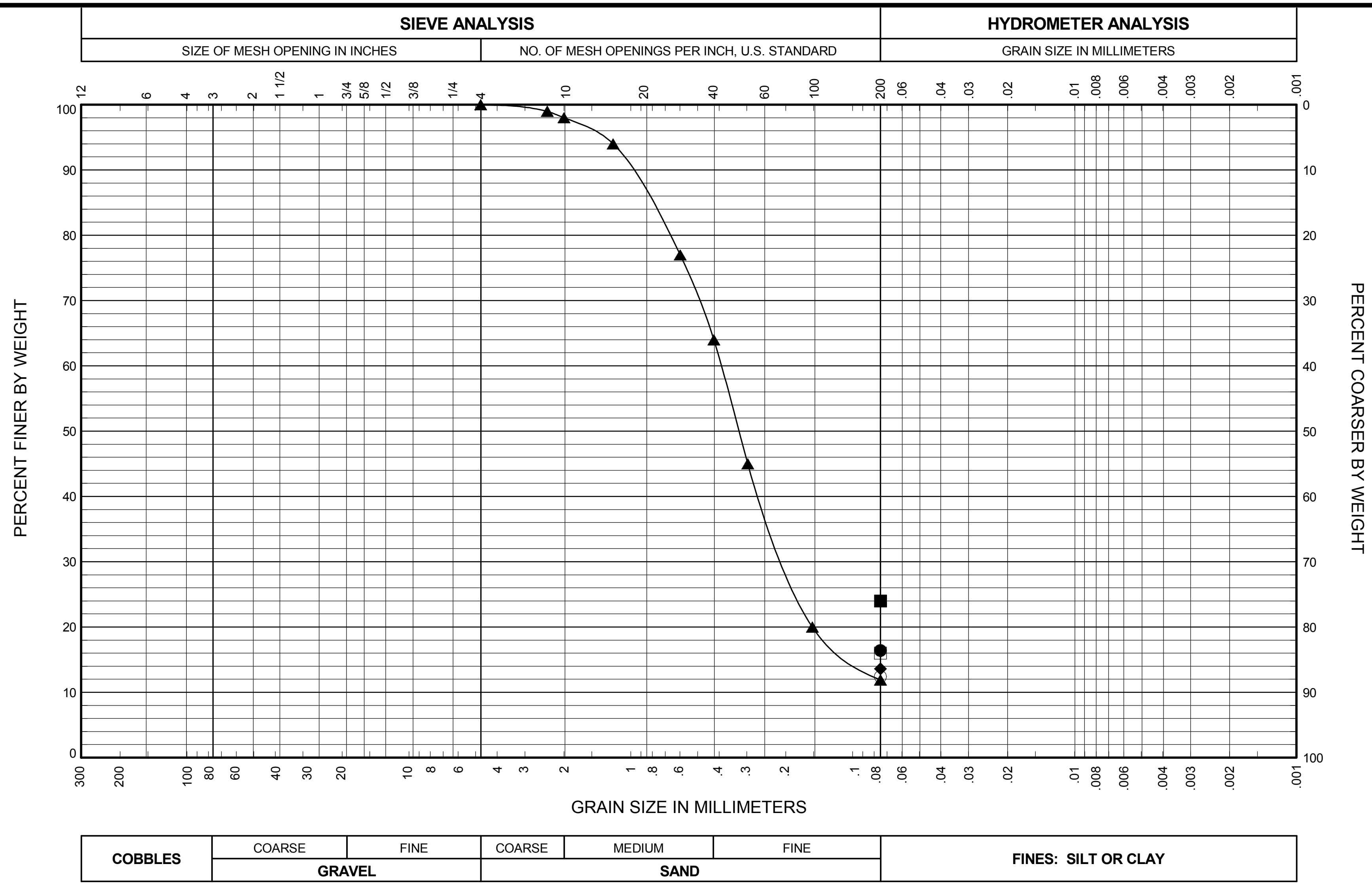
FIG. B1B

Northwest Hydraulic Consultants

FIG. B1B

ATT MAIN 24-1-03858-002-TP&HA.GPJ SHAN WIL.GDT 10/30/14

NOTES:
1) Sieve analyses were performed in general accordance with ASTM D6913 and sieve with hydrometer analyses were performed in general accordance with ASTM D422 unless otherwise noted in the report.
2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.



BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● B-03, S-4	15.0	*SM*	*Silty Sand*	-	-	16	39	
■ B-04, S-5	15.0	*SM*	*Silty Sand*	-	-	24	38	
▲ B-04, S-9	35.0	*SP-SM*	*Sand with SIlt*	-	88	12	33	
◆ B-05, S-3	15.0	*SP-SM*	*Sand with Silt*	-	-	14		
○ B-06, S-4	15.0	*SP-SM*	*Sand with Silt*	-	-	12		
□ B-08, S-6	25.0	*SM*	*Silty Sand*	-	-	16	30	
△ B-11, S-5	15.0	*SP-SM*	*Sand with Silt*	-	-	12		

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Tillamook, Oregon

GRAIN SIZE DISTRIBUTION DRILLED BORINGS

November 2014 24-1-03858-005

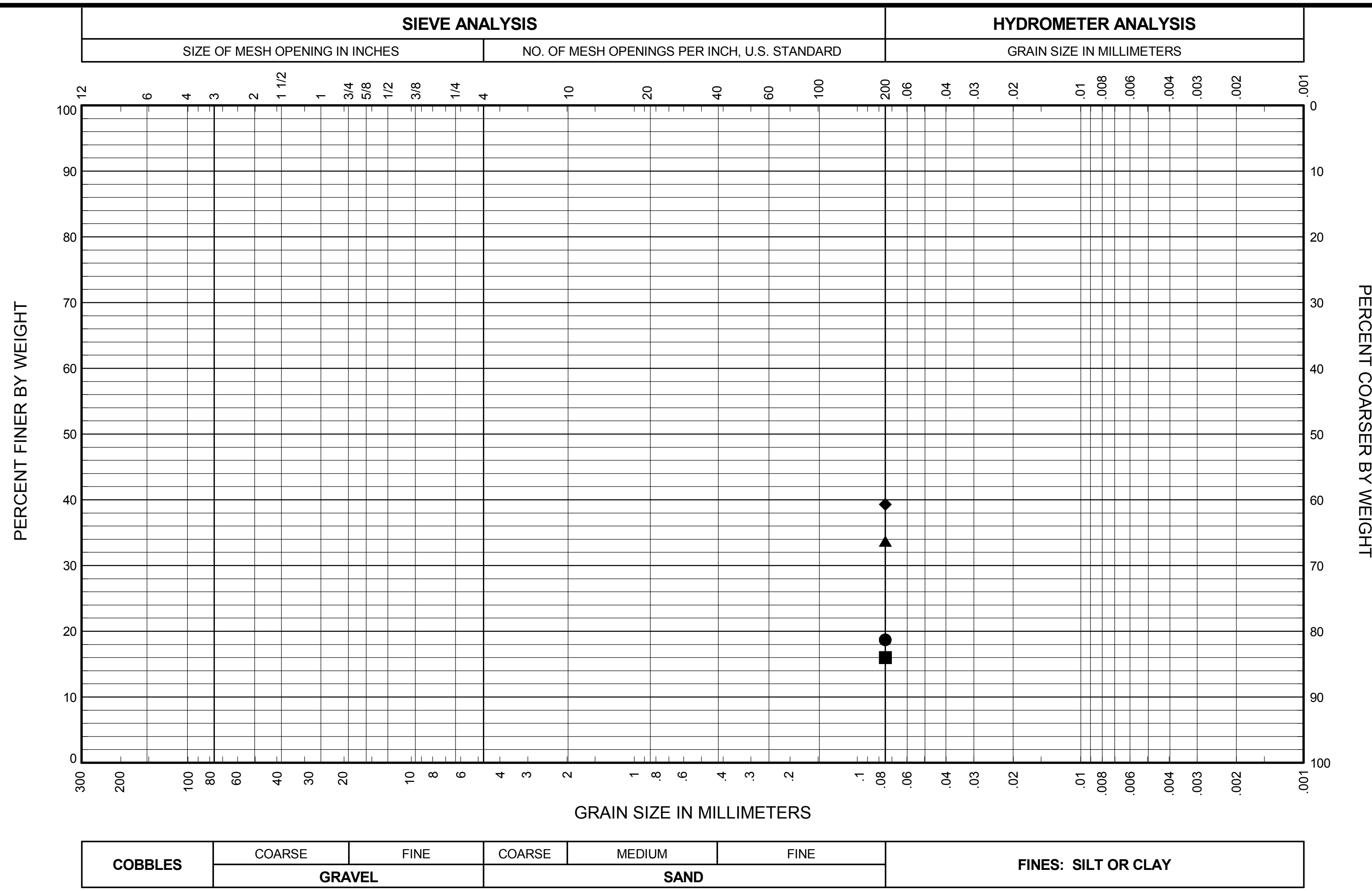
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B2A
Sheet 1 of 2

FIG. B2A

Northwest Hydraulic Consultants

NOTES:
1) Sieve analyses were performed in general accordance with ASTM D6913 and sieve with hydrometer analyses were performed in general accordance with ASTM D422 unless otherwise noted in the report.
2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.



BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● B-14, S-4	15.0	*SM*	*Silty Sand*	-	-	19		
■ B-14, S-6	25.0	*SM*	*Silty Sand*	-	-	16	32	
▲ B-14, S-7	30.0	*SM*	*Silty Sand*	-	-	34	51	
◆ B-18, S-8	30.0	*SM*	*Silty Sand*	-	-	39	56	

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Tillamook, Oregon

GRAIN SIZE DISTRIBUTION DRILLED BORINGS

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
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FIG. B2A
Sheet 2 of 2

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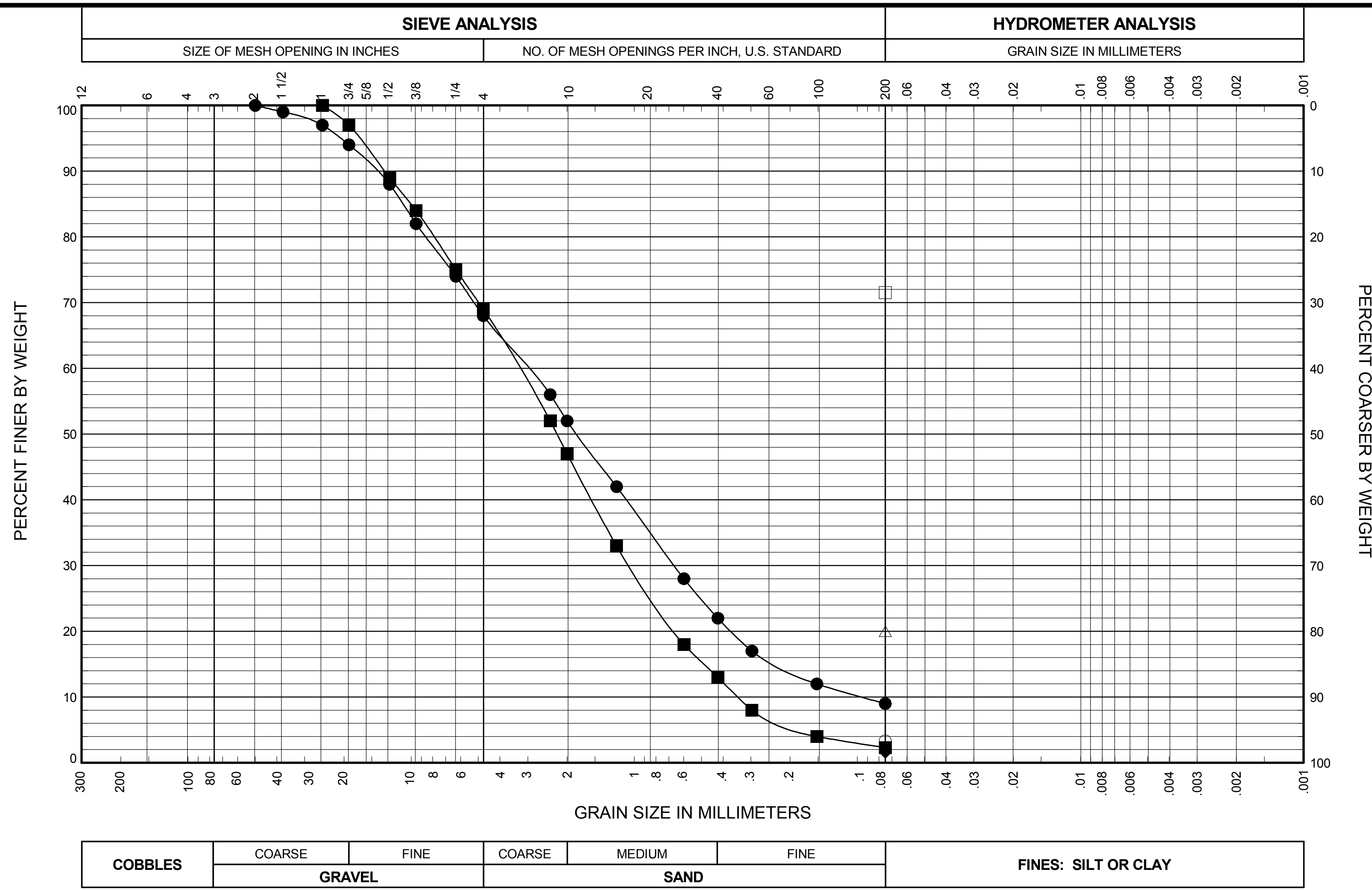
FIG. B2A

GSA_MAIN 24-1-03858-002-TP&HA.GPJ SHAN_WIL.GDT 10/30/14



NOTES:
1) Sieve analyses were performed in general accordance with ASTM D6913 and sieve with hydrometer analyses were performed in general accordance with ASTM D422 unless otherwise noted in the report.
2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● TP-01, S-1	2.0	SW-SM	*Well Graded Sand with Silt and Gravel*	-	59	9		
■ TP-05, S-1	2.0	SW	*Well Graded Sand with Gravel*	-	67	2		
▲ TP-07, S-1	3.0	SW	*Well Graded Sand with Gravel*	-	-	2	8	
◆ TP-08, S-1	9.0	SW	*Well Graded Sand with Gravel*	-	-	2	17	
○ TP-14, S-1	2.5	SW	*Well Graded Sand with Gravel*	-	-	3	12	
□ TP-17, S-1	1.0	MH	*Elastic Silt with Sand*	-	-	72	103	
△ TP-19, S-1	2.5	SM	*Silty Sand with Gravel*	-	-	20	32	

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GRAIN SIZE DISTRIBUTION TEST PITS AND HAND AUGERS

November 2014 24-1-03858-005

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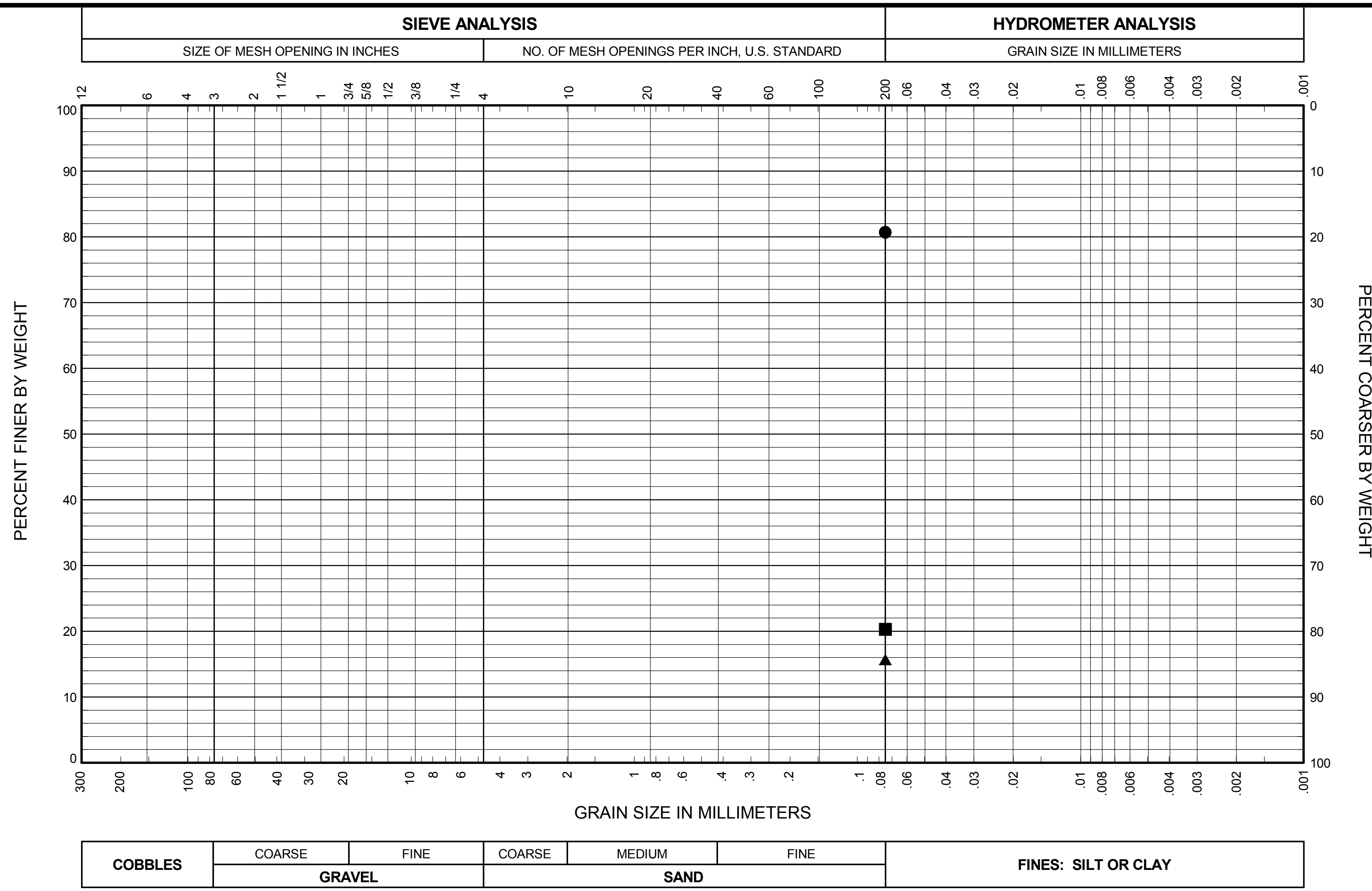
FIG. B2B
Sheet 1 of 2

FIG. B2B

Northwest Hydraulic Consultants



BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● TP-22, S-2	4.5	*ML*	*Silt with Sand*	-	-	81	57	
■ TP-26, S-1	2.0	*SM*	*Silty Sand with Gravel*	-	-	20	23	
▲ TP-27, S-1	1.0	*SM*	*Silty Sand*	-	-	16	72	

NOTES:
1) Sieve analyses were performed in general accordance with ASTM D6913 and sieve with hydrometer analyses were performed in general accordance with ASTM D422 unless otherwise noted in the report.
2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

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Southern Flow Corridor Project
Tillamook, Oregon

GRAIN SIZE DISTRIBUTION TEST PITS AND HAND AUGERS

November 2014 24-1-03858-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B2B
Sheet 2 of 2

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B • Wilsonville, Oregon 97070 503/682-1880 FAX: 503/682-2753

TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	6/27/14 14-215
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Report of: Moisture content, Atterberg limits, amount of material passing the number 200 sieve, sieve analysis, and moisture density relationship

Sample Identification

NTI completed moisture content, Atterberg limits, amount of material passing the number 200 sieve, sieve analysis, and moisture density relationship testing on samples of soil delivered to our laboratory on June 16, 2014. Testing was performed in accordance with the standards indicated. Our laboratory test results are summarized on the following tables and attached pages.

Laboratory Testing

Moisture Content of Soil and Dry Density (ASTM D2216/D2937)	
Sample ID	**Moisture Content (Percent)**
HA-1 S-2 @ 2.5 ft.	48.2
HA-3 S-1 @ 1 – 1.5 ft.	58.2
TP-6 S-1 @ 1 – 2 ft.	78.9
TP-11 S-1 @ 4 – 5 ft.	147.2
TP-16 S-1 @ 2 – 3 ft.	51.5
TP-23 S-1 @ 2 – 2.5 ft.	101.2
TP-27 S-2 @ 3 – 3.5 ft.	361.5

Atterberg Limits (ASTM D4318)			
Sample ID	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**
HA-1 S-2 @ 2.5 ft.	52	40	12
HA-3 S-1 @ 1 – 1.5 ft.	66	49	17
TP-6 S-1 @ 1 – 2 ft.	71	46	25
TP-11 S-1 @ 4 – 5 ft.	78	42	36
TP-16 S-1 @ 2 – 3 ft.	61	38	23
TP-23 S-1 @ 2 – 2.5 ft.	82	55	27
TP-27 S-2 @ 3 – 3.5 ft.	NP	NP	NP

Attachments: Laboratory Test Results
Maximum Density Test Results

Copies: Addressee

 REVIEWED BY: Bridgett Adame BKA

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B • Wilsonville, Oregon 97070 503/682-1880 FAX: 503/682-2753

TECHNICAL REPORT

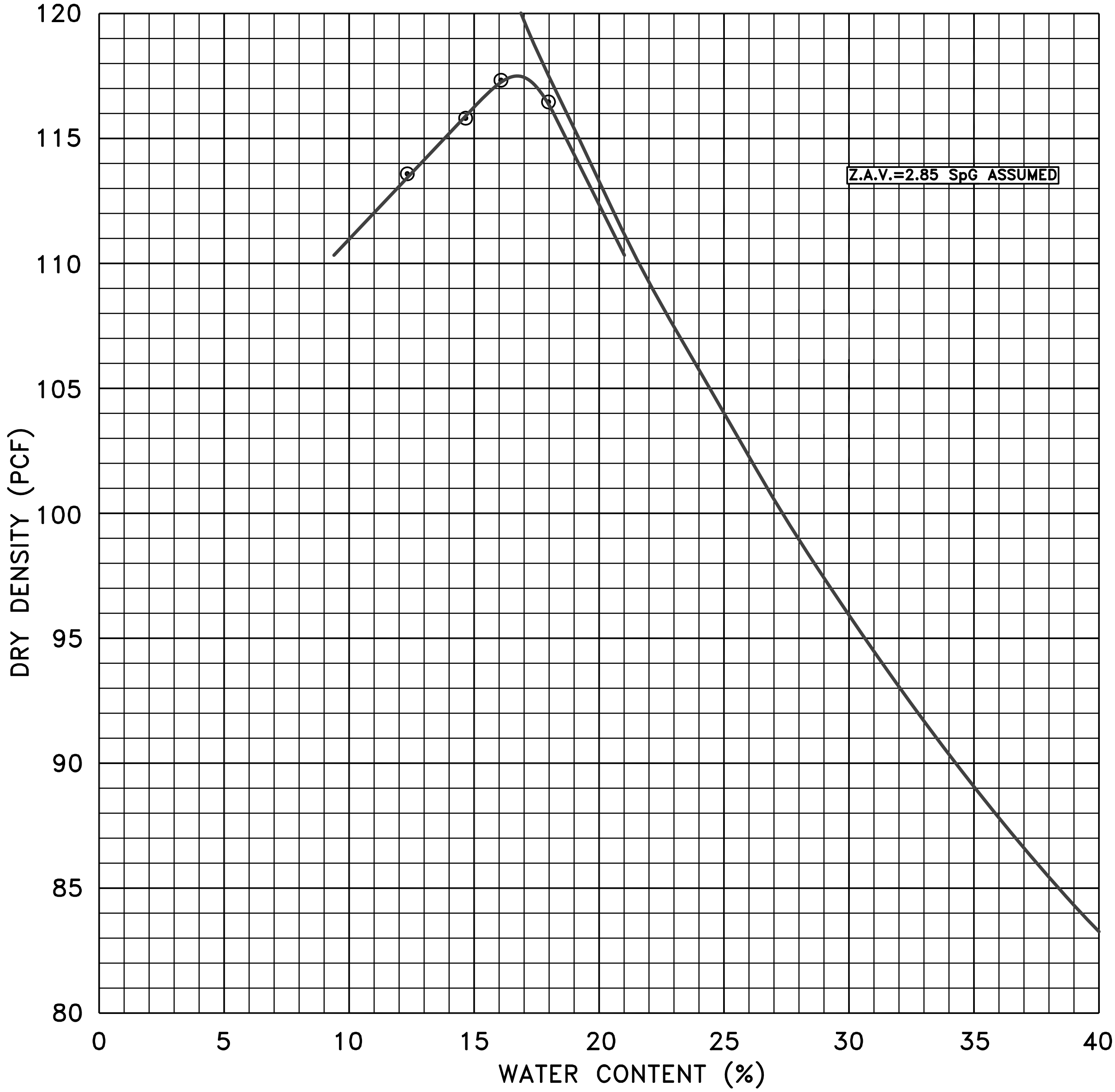
Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	6/27/14 14-215
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Laboratory Test Results

Amount of Material Finer than the No. 200 Sieve (ASTM D1140)		
Sample ID	**Moisture Content (Percent)**	**Percent Passing the No. 200 Sieve**
TP-7 S-1 @ 3 – 4 ft.	8.1	2.4
TP-8 S-1 @ 9 – 10 ft.	16.7	1.6
TP-14 S-1 @ 2.5 – 4 ft.	12.3	3.3
TP-17 S-1 @ 1 – 2 ft.	103.0	71.5
TP-19 S-1 @ 2.5 – 3.5 ft.	31.9	20.0
TP-22 S-2 @ 4.5 – 5 ft.	57.0	80.7
TP-26 S-1 @ 2 – 3 ft.	22.9	20.3
TP-27 S-1 @ 1 – 1.5 ft.	71.5	15.7

Sieve Analysis of Aggregates (ASTM C136/C117)		
Sieve Size	**TP-1 S-1 @ 2 – 3 ft. Percent Passing**	**TP-5 S-1 @ 2 – 3.5 ft. Percent Passing**
2”	100	100
1 ½”	99	100
1”	97	100
¾”	94	97
½”	88	89
⅜”	82	84
¼”	74	75
#4	68	69
#8	56	52
#10	52	47
#16	42	33
#30	28	18
#40	22	13
#50	17	8
#100	12	4
#200	9.0	2.3

REVIEWED BY: Bridgett Adame



SOIL TYPE	TEST METHOD	MAXIMUM DRY DENSITY (PCF)	OPTIMUM WATER CONTENT (%)	PERCENT OVERSIZE	CORRECTED MAXIMUM DRY DENSITY (PCF)	CORRECTED WATER CONTENT (%)
TP-2 S-1 @ 3 - 8 FT.	ASTM D698C	117.5	16.5	10	120.5	15.5

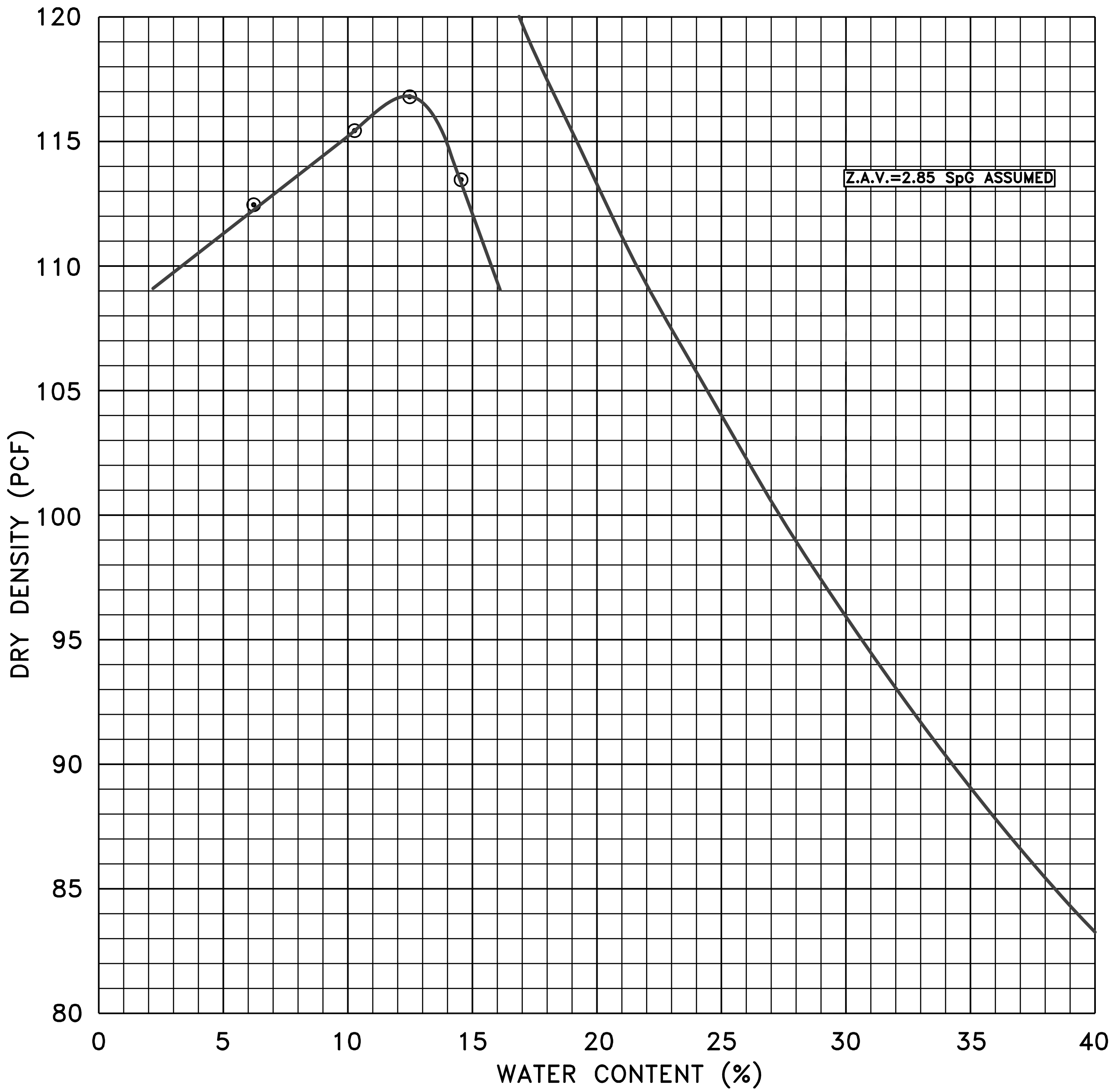
DATE TESTED: 6/18/14

MAXIMUM DENSITY TEST RESULTS

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC. LABORATORY TESTING	LAB NO. 14-215

Effective Date: 5/12/03

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.



SOIL TYPE	TEST METHOD	MAXIMUM DRY DENSITY (PCF)	OPTIMUM WATER CONTENT (%)	PERCENT OVERSIZE	CORRECTED MAXIMUM DRY DENSITY (PCF)	CORRECTED WATER CONTENT (%)
TP-3 S-1 @ 3 - 5 FT.	ASTM D698C	117.0	12.5	7	119.0	12.0

DATE TESTED: 6/18/14

MAXIMUM DENSITY TEST RESULTS

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC. LABORATORY TESTING	LAB NO. 14-215

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B • Wilsonville, Oregon 97070 503/682-1880 FAX: 503/682-2753

TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Report of: Moisture content, Atterberg limits, amount of material passing the number 200 sieve, sieve analysis, hydrometer sieve analysis, direct shear testing, moisture density relationship, one dimensional consolidation, and consolidated undrained triaxial shear

Sample Identification

NTI completed moisture content, Atterberg limits, amount of material passing the number 200 sieve, sieve analysis, hydrometer sieve analysis, direct shear testing, moisture density relationship, one dimensional consolidation, and consolidated undrained triaxial shear testing on samples of soil delivered to our laboratory on June 16, 2014. Testing was performed in accordance with the standards indicated. Our laboratory test results are summarized on the following table and attached pages.

Laboratory Testing

Moisture Content of Soil and Dry Density (ASTM D2216/D2937)		
Sample ID	**Moisture Content (Percent)**	**Dry Density (pcf)**
B-1 U-1 @ 4 – 6 ft.	30.8	--
B-3 U- 1 @ 2 – 4 ft.	97.3	48.0
B-3 S-2 @ 7.5 – 9 ft.	112.3	--
B-3 S-4 @ 15 – 16.5 ft.	39.4	--
B-4 S-2 @ 5 – 6.5 ft.	214.0	--
B-4 S-3 @ 7.5 – 9 ft.	101.6	--
B-4 S-5 @ 15 – 16.5 ft.	37.8	--
B-4 S-9 @ 35 – 36.5 ft.	33.3	--
B-8 S-1 @ 2.5 – 4 ft.	110.5	--
B-8 S-3 @ 10 – 11.5 ft.	79.1	--
B-8 S-6 @ 25 – 26.5 ft.	30.1	--
B-14 S-2 @ 6.5 – 8 ft.	172.5	--
B-14 S-3 @ 10 – 11.5 ft.	173.7	--
B-14 S-6 @ 25 – 26.5 ft.	31.5	--
B-14 S-7 @ 30 – 31.5 ft.	50.8	--
B-16 S-3 @ 10 – 11.5 ft.	85.2	--
B-16 S-6 @ 25 – 26.5 ft.	59.5	--
B-18 S-4 @ 10 – 11.5 ft.	212.2	--
B-18 S-8 @ 30 – 31.5 ft.	56.3	--
B-20 S-3 @ 10 – 11.5 ft.	220.7	--

Attachments: Laboratory Test Results

Copies: Addressee

 BKA

TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Laboratory Test Results

Atterberg Limits (ASTM D4318)			
Sample ID	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**
B-1 U-1 @ 4 – 6 ft.	44	31	13
B-3 U- 1 @ 2 – 4 ft.	76	53	23
B-4 S-3 @ 7.5 – 9 ft.	53	38	15
B-8 U-1 @ 5 – 7 ft.	92	55	37
B-14 S-2 @ 6.5 – 8 ft.	75	44	31
B-16 S-3 @ 10 – 11.5 ft.	64	39	25
B-16 S-6 @ 25 – 26.5 ft.	46	40	6
B-18 S-4 @ 10 – 11.5 ft.	95	63	32
B-20 S-3 @ 10 – 11.5 ft.	103	67	36

Amount of Material Finer than the No. 200 Sieve (ASTM D1140)		
Sample ID	**Moisture Content (Percent)**	**Percent Passing the No. 200 Sieve**
B-3 S-4 @ 15 – 16.5 ft.	39.4	16.4
B-4 S-7 @ 25 – 26.5 ft.	36.9	11.9
B-5 S-3 @ 15 – 16.5 ft.	40.0	13.6
B-6 S-5 @ 15 – 16.5 ft.	24.9	12.4
B-8 S-4 @ 15 – 16.5 ft.	27.3	8.9
B-11 S-5 @ 15 – 16.5 ft.	27.0	11.9
B-14 S-4 @ 15 – 16.5 ft.	29.2	18.7
B-14 S-7 @ 30 – 31.5 ft.	50.8	33.7
B-18 S-8 @ 30 – 31.5 ft.	56.3	39.3

Sieve Analysis of Aggregates (ASTM C136/C117)	
Sieve Size	**B4 S9 @ 35 – 36.5 ft. Percent Passing**
#4	100
#8	99
#10	98
#16	94
#30	77
#40	64
#50	45
#100	20
#200	11.9

 REVIEWED BY: Bridgett Adame

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TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Laboratory Test Results

Torvane Strength	
Sample ID	**Torvane Stress (tsf)**
B-1 U1 @ 4 – 6 ft.	0.1
B-3 U1 @ 2 – 4 ft.	0.25
B-8 U1 @ 5 – 7 ft.	0.9
B-20 U1 @ 7.5 – 8.5 ft.	0.35

Sample ID: B-14 U1 @ 5 – 6 ft.

Direct Shear Test of Soils Under Consolidated Drained Conditions – Sample Data (ASTM D 3080)			
Test	**500 psf Normal Load Initial Conditions**	**1000 psf Normal Load Initial Conditions**	**1500 psf Normal Load Initial Conditions**
Moisture Content, (%)	157.2	136.0	105.5
Dry Unit Weight, (pcf)	29.6	34.1	43.1

Sample ID: B-16 U1 @ 2.5 – 4.5 ft.

Direct Shear Test of Soils Under Consolidated Drained Conditions – Sample Data (ASTM D 3080)			
Test	**500 psf Normal Load Initial Conditions**	**1000 psf Normal Load Initial Conditions**	**1500 psf Normal Load Initial Conditions**
Moisture Content, (%)	64.0	67.6	73.2
Dry Unit Weight, (pcf)	54.9	56.0	48.5

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TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Laboratory Test Results

Sample ID: B-08 U1 @ 5.0 – 7.0 ft.

One Dimensional Consolidation of Soil (ASTM D 2435)		
Test	**Initial Conditions**	**Final Conditions**
Moisture Content, (%)	146.3	68.7
Dry Unit Weight, (pcf)	33.4	55.8
Height of Specimen, (inches)	0.7500	0.4496

One-Dimensional Consolidation Properties of Soils (ASTM D 2435)			
Load (psf)	**Dial Reading (inches)**	**Load (psf)**	**Dial Reading (inches)**
Initial	0.0000	8000	0.3250
250	0.0080	16,000	0.3729
500	0.0231	4000	0.3584
1000	0.0896	1000	0.3296
2000	0.1788	125	0.3004
4000	0.2560		

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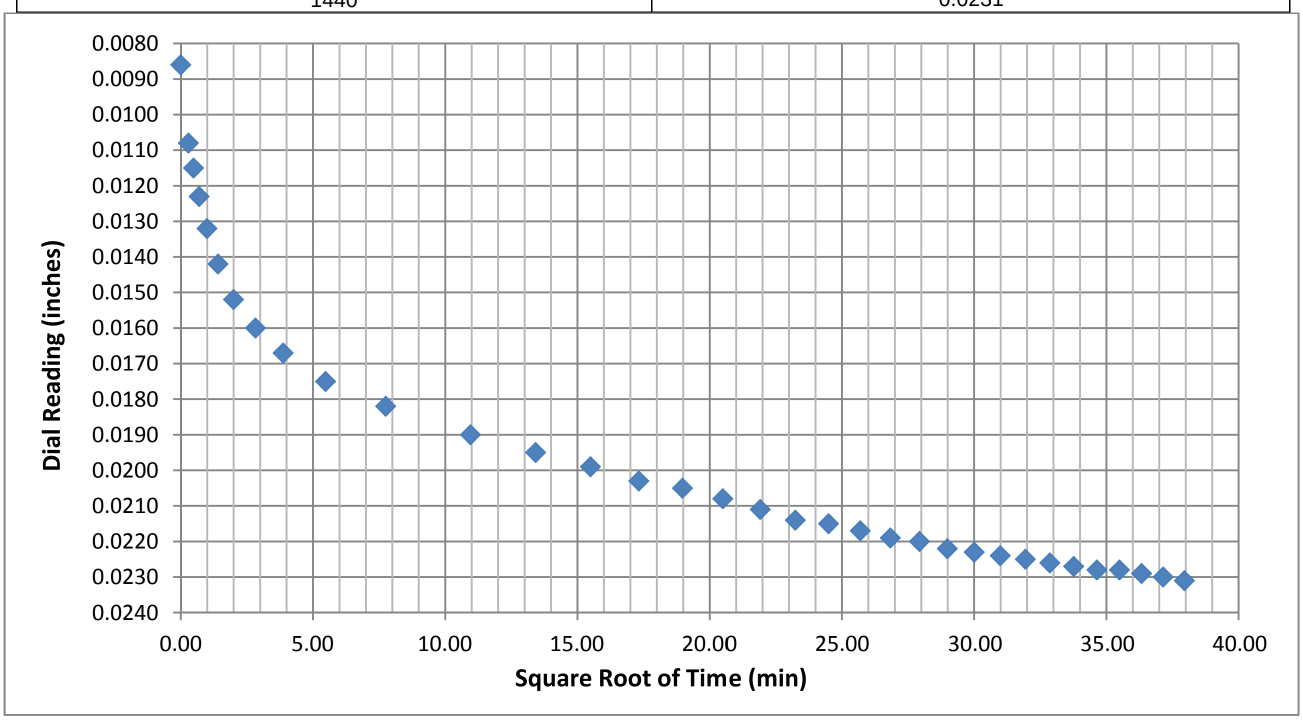
TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Laboratory Testing

Sample ID: B-08 U1 @ 5.0 – 7.0 ft. Time Rate of Consolidation at 500 psf

One-Dimensional Consolidation Properties of Soils (ASTM D 2435)	
Time (mins)	**Dial Reading (inches)**
0	0.0086
0.083	0.0108
0.25	0.0115
0.5	0.0123
1	0.0132
2	0.0142
4	0.0152
8	0.0160
15	0.0167
30	0.0175
60	0.0182
120	0.0190
240	0.0199
480	0.0211
1440	0.0231



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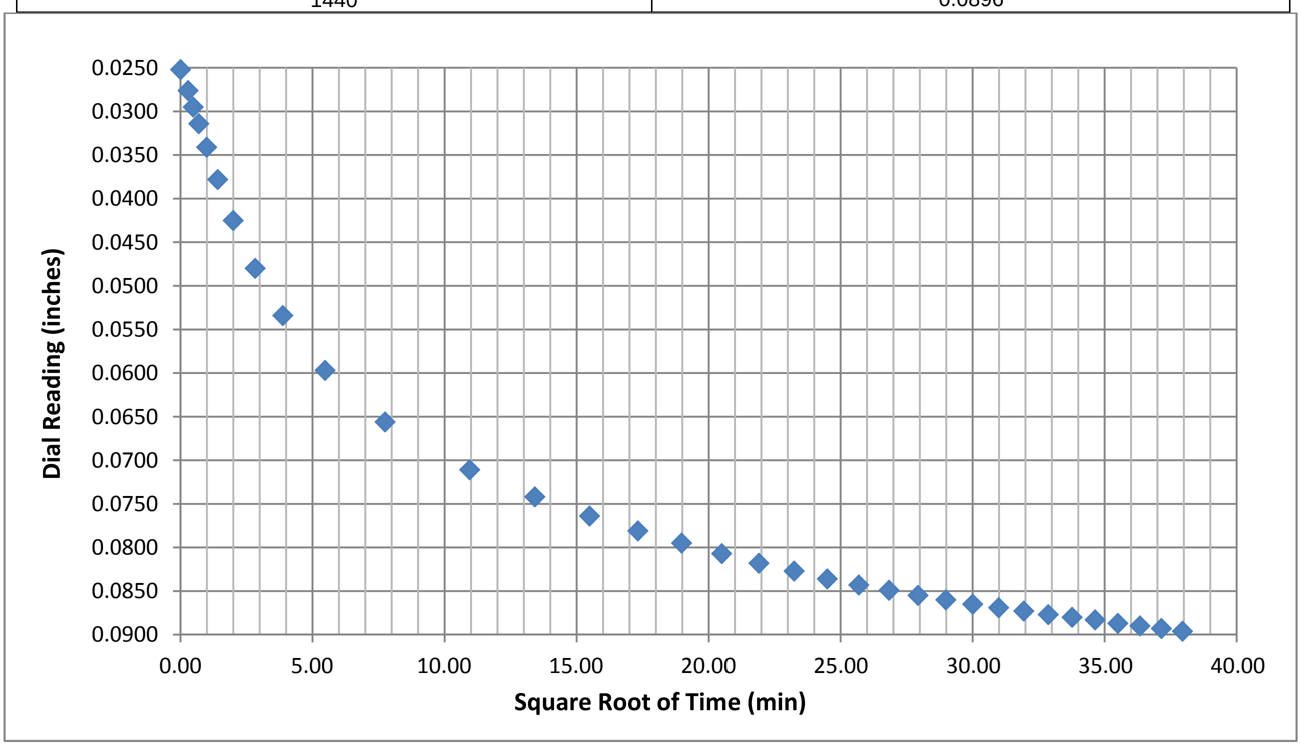
TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Laboratory Testing

Sample ID: B-08 U1 @ 5.0 – 7.0 ft. Time Rate of Consolidation at 1000 psf

One-Dimensional Consolidation Properties of Soils (ASTM D 2435)	
Time (mins)	**Dial Reading (inches)**
0	0.0252
0.083	0.0276
0.25	0.0295
0.5	0.0314
1	0.0341
2	0.0378
4	0.0425
8	0.0480
15	0.0534
30	0.0597
60	0.0656
120	0.0711
240	0.0764
480	0.0818
1440	0.0896



 REVIEWED BY: Bridgett Adame

TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

Laboratory Test Results
Consolidated Undrained Triaxial Shear
Point 1 (Effective Stress 500 psf)
(ASTM D4767)

Identification Data and Visual Description of Specimen			
Sample ID	**Soil Condition Undisturbed, compacted, or otherwise prepared**	**Plastic Limit and Liquid Limit, if determined (ASTM D4318)**	**Value of Specific Gravity of Solids (Determined by ASTM D854 or Assumed)**
B-08 U1 @ 5 – 7 ft.	Undisturbed	LL = 92, PL = 55	2.60 assumed

Sample Conditions					
Diameter (Inches)	**Height (Inches)**	**Sample Weight (Grams)**	**Initial Moisture Content Obtained from cuttings (%)**	**Dry Unit Weight (pcf)**	**Final Moisture Content Obtained from entire sample (%)**
2.842	6.025	819.2	140.3	34.0	129.7

Specimen Saturation		
Method Followed for Specimen Saturation (Dry or Wet)	**Total Back Pressure**	**Pore Pressure Parameter B at the End of Saturation**
Wet	2.0 psi	0.96

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TECHNICAL REPORT

Report To:	Ms. Aimee Holmes, P.E., C.E.G. Shannon & Wilson, Inc. 3990 S.W. Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	7/7/14 14-214
Project:	Laboratory Testing – 24-1-03858-002	**Project No.:**	1984.1.1

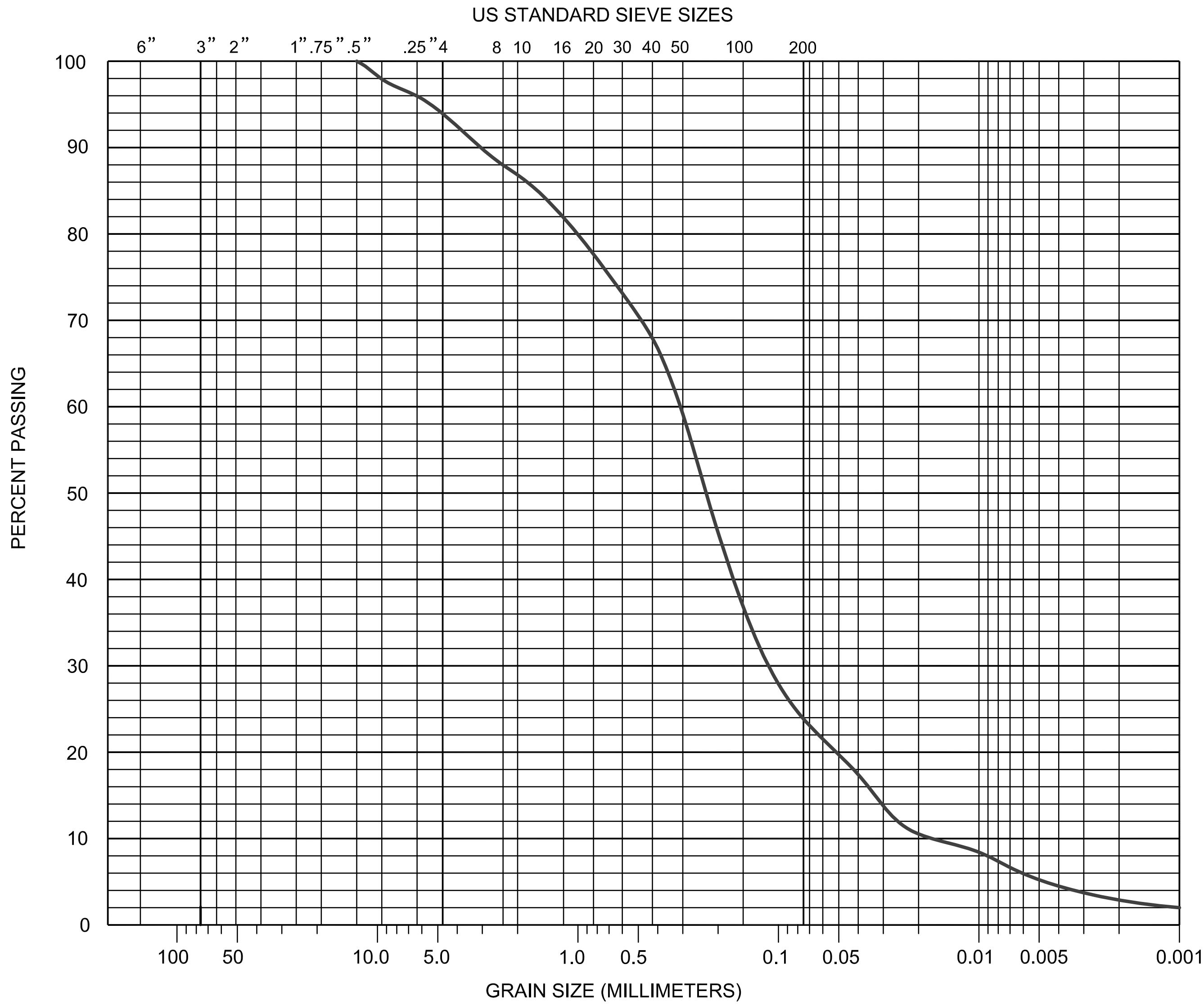
Laboratory Test Results
Consolidated Undrained Triaxial Shear
Point 2 (Effective Stress 1000 psf)
(ASTM D4767)

Identification Data and Visual Description of Specimen			
Sample ID	**Soil Condition Undisturbed, compacted, or otherwise prepared**	**Plastic Limit and Liquid Limit, if determined (ASTM D4318)**	**Value of Specific Gravity of Solids (Determined by ASTM D854 or Assumed)**
B-08 U1 @ 5 – 7 ft.	Undisturbed	LL = 92, PL = 55	2.60 assumed

Sample Conditions					
Diameter (Inches)	**Height (Inches)**	**Sample Weight (Grams)**	**Initial Moisture Content Obtained from cuttings (%)**	**Dry Unit Weight (pcf)**	**Final Moisture Content Obtained from entire sample (%)**
2.842	6.039	852.8	142.8	34.9	108.2

Specimen Saturation		
Method Followed for Specimen Saturation (Dry or Wet)	**Total Back Pressure**	**Pore Pressure Parameter B at the End of Saturation**
Wet	2.0 psi	0.95

 REVIEWED BY: Bridgett Adame



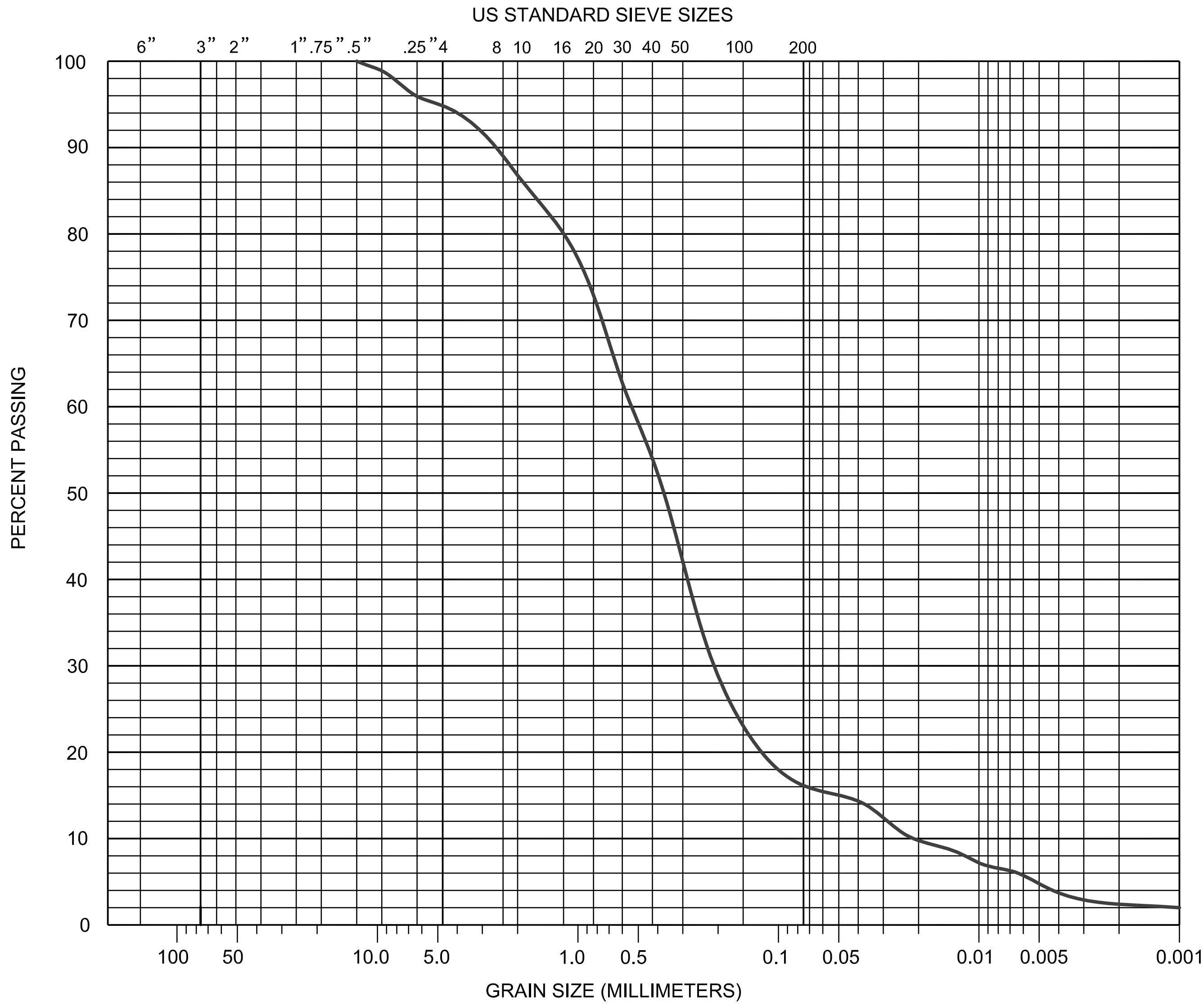
COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	SAMPLE LOCATION	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
———	B-04 S5 @ 15 - 16.5 FT.	--	24	3	--

GRADATION TEST RESULTS – ASTM D422

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC LABORATORY TESTING	LAB NO. 14-214

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.



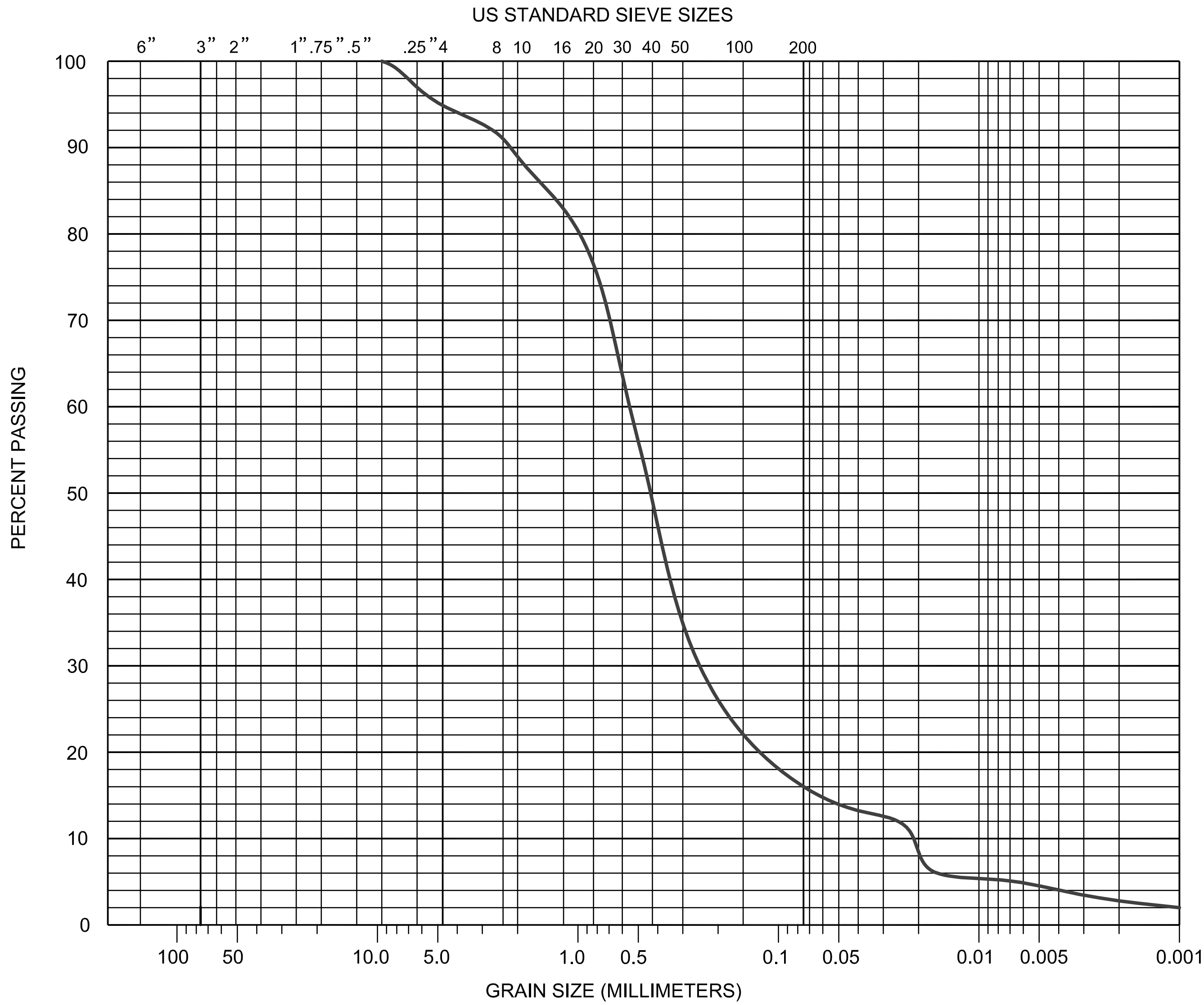
COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	SAMPLE LOCATION	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
———	B-08 S6 @ 25 - 26.5 FT.	--	16	3	--

GRADATION TEST RESULTS – ASTM D422

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC LABORATORY TESTING	LAB NO. 14-214

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.



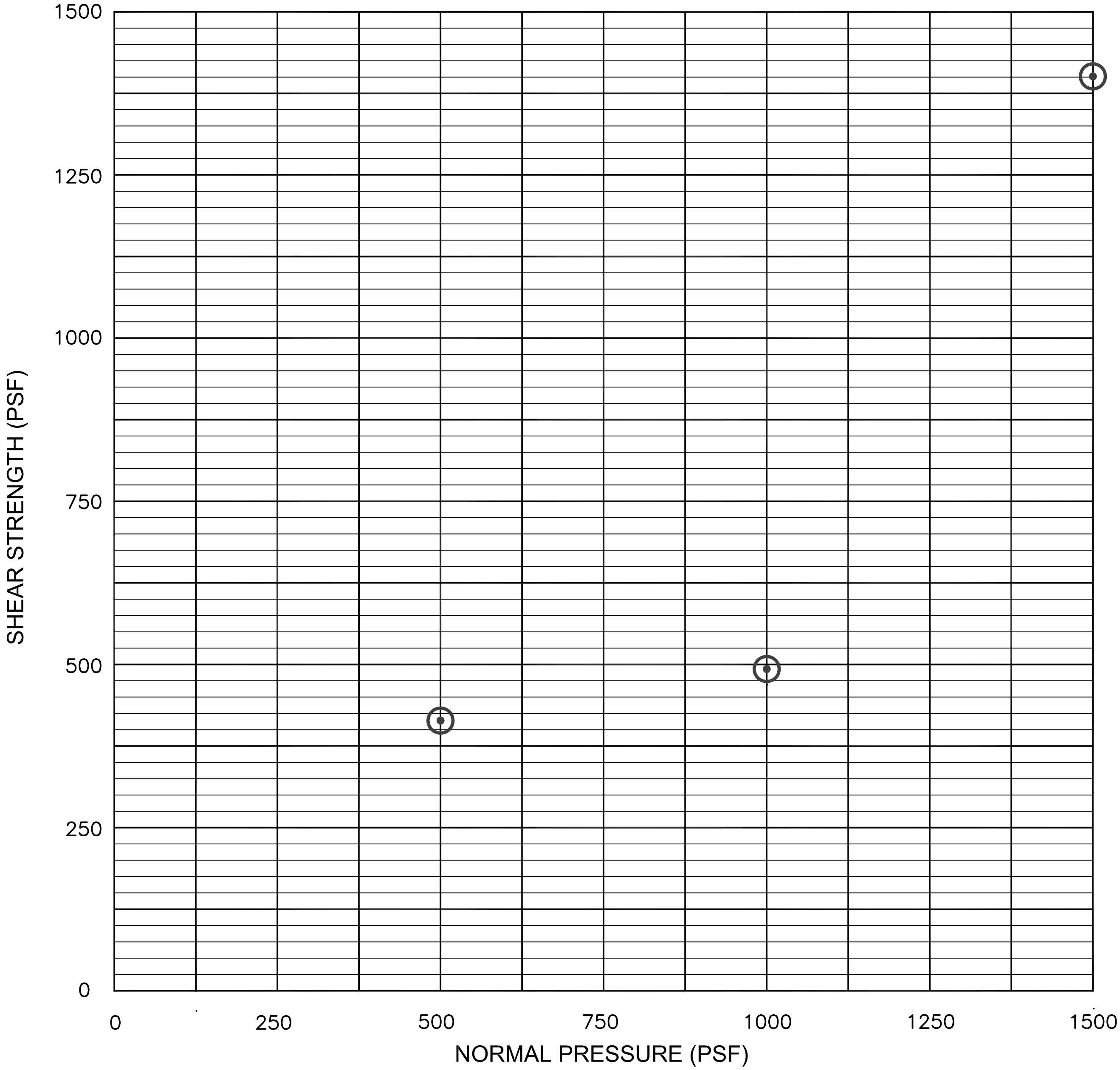
COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	SAMPLE LOCATION	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
———	B-14 S6 @ 25 - 26.5 FT.	--	16	3	--

GRADATION TEST RESULTS – ASTM D422

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC LABORATORY TESTING	LAB NO. 14-214

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.



SYMBOL	SAMPLE LOCATION	COHESION (psf)	FRICTION ANGLE	REMARKS
———	B-14 U1 @ 5.0 - 6.5 FT.	--	--	SATURATED; UNDISTURBED

DIRECT SHEAR TEST RESULTS

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC LABORATORY TESTING	LAB NO. 14-214

Northwest Testing, Inc.
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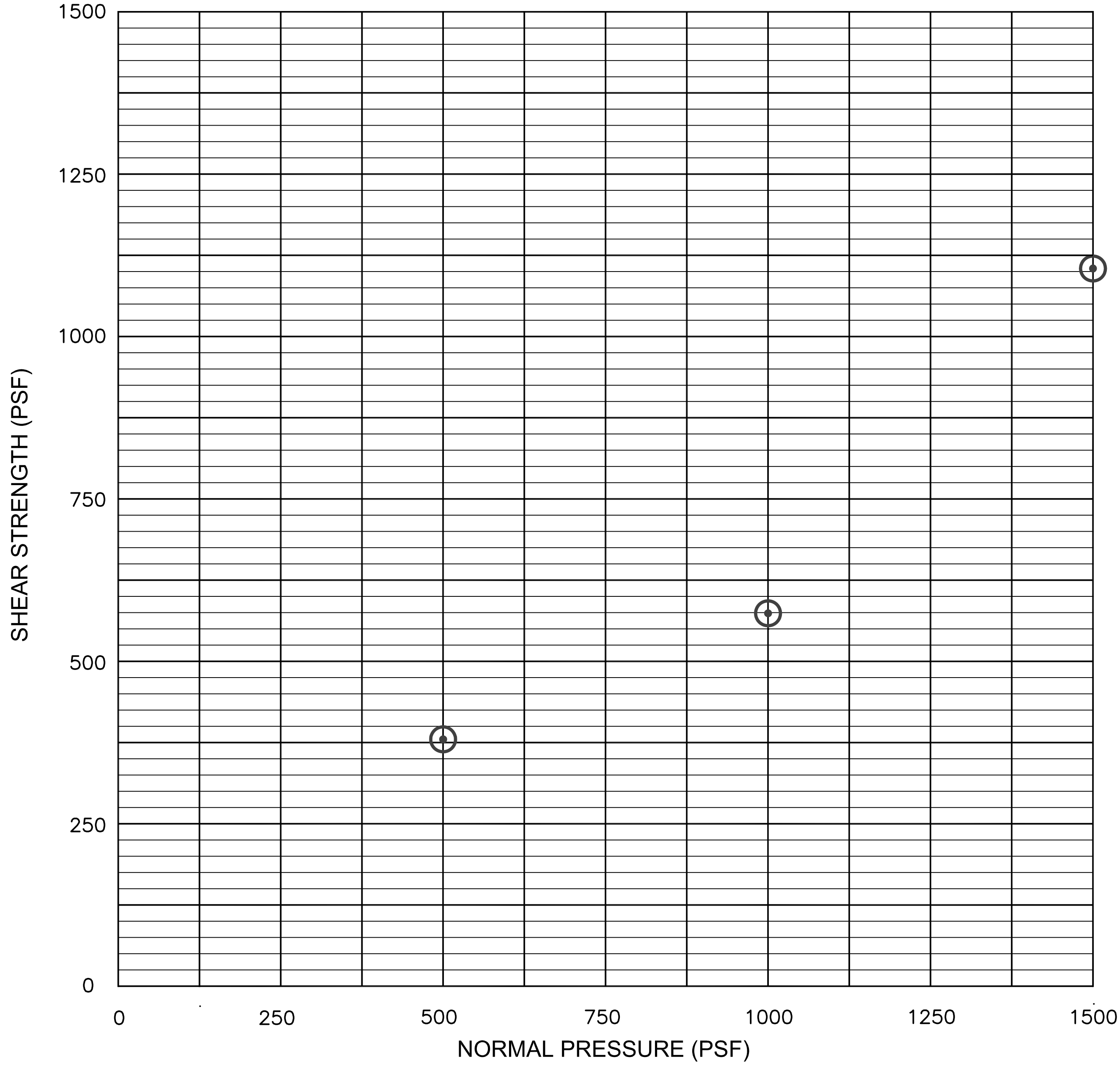
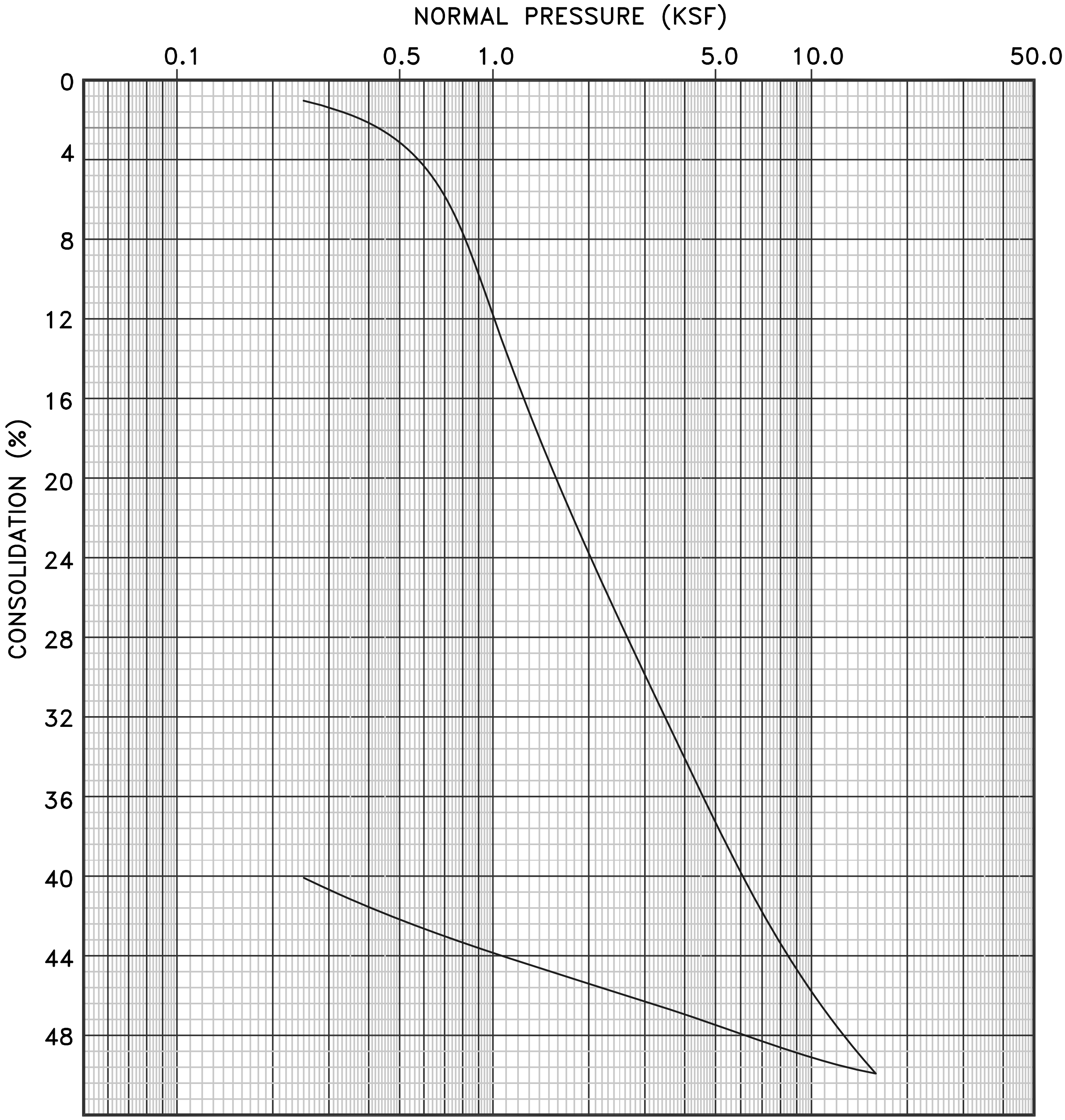


SYMBOL	SAMPLE LOCATION	COHESION (psf)	FRICTION ANGLE	REMARKS
———	B-16 U1 @ 2.5 - 4.5 FT.	--	--	SATURATED; UNDISTURBED

DIRECT SHEAR TEST RESULTS

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC LABORATORY TESTING	LAB NO. 14-214

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.



SYMBOL	SAMPLE LOCATION	NORMAL PRESSURE AT SATURATION (KSF)
———	B-08 U1 @ 5.0 - 7.0 FT.	0.25

CONSOLIDATION TEST RESULTS – ASTM D2435

PROJECT NO. 1984.1.1	SHANNON AND WILSON, INC. LABORATORY TESTING	LAB NO. 14-214

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.

Triaxial Shear Test
Test Procedure No. D4767-02
Specimen Data - Point 1

Project: Shannon & Wilson — Project No.: 1984.1.1 — Date: 6/18/2014
Sample No.: B-08 U1 @ 5 - 7 ft. — Depth: N/A
Type of test: CU — Tested By: B. Adame

Preparation-Condition

Sample Type: Shelby Tube — Interval Tested: N/A
Soil Description:

Compacted Sample	
% Compaction:	
Max Dry Dens.:	
Opt. Moisture:	

Notes: 500 psf effective consolidation stress
'B' Value at Saturation =1.00

Initial Condition of Specimen

Diameter	*Height*
2.846	6.030
2.842	6.022
2.838	6.022

				Moisture Sample	
Ave Diam:	2.842	**Total Wt (g):**	819.2	**Wet Wt. Soil +t**	112.6
Ave Height:	6.025	**Tube Wt (g):**	0	**Dry Wt. Soil +t**	83.7
Vol. (inches):	38.212	Sample Wt (g):	819.2	**Wt t:**	63.0
Vol. (cm):	626.23	**Spec Grav:**	2.6	Moisture %:	140.3%
Average A:	6.343	(Assumed)			

Total Vol (Vt):	626.23	SampleWt.(g) (Wt):	819.2	% Saturation [Vw/Vv]:	96.61%
Vol. Soil (Vs):	131.09	Soil Wt. (g) (Ws):	340.8	Void Ratio [Vv/Vs]:	3.78
Pore Vol. (Vv):	495.13	Water Wt. (g) (Ww):	478.4	Porosity [Vv/Vt]:	0.79
Vol Water (Vw):	478.36	Wet Density (g/cm3) [Wt/Vt]:	1.31	(pcf):	81.6
Vol Gas (Vg):	16.77	Dry Density (g/cm3)) [Ws/Vt]:	0.54	(pcf):	34.0

Final Condition of Specimen

Diameter	*Height*
1	1
2	2
3	3

Ave Diam:		**Total Wt (g):**		**Wet Wt. Soil+t:**	963.2
Ave Height:	3.873	**Tube Wt (g):**	0	**Dry Wt. Soil+t:**	526.1
Vol. (inches):		Sample Wt (g):	0	**Wt t:**	189
Vol. (cm):		**Spec Grav:**	2.6	Moisture %:	129.7%
Average A:	9.420				

Note: If final dimensions determined from shear data:

Effective Vol. Expelled:
Total Height Difference:

Total Vol (Vt):		SampleWt.(g) (Wt):	782.8	% Saturation [Vw/Vv]:	
Vol. Soil (Vs):	131.09	Soil Wt. (g) (Ws):	340.8	Void Ratio [Vv/Vs]:	
Pore Vol. (Vv):		Water Wt. (g) (Ww):	441.95	Porosity [Vv/Vt]:	
Vol Water (Vw):	441.95	Wet Density (pcf) [Wt/Vt]:			
Vol Gas (Vg):		Dry Density (pcf) [Ws/Vt]:			

Triaxial Shear Test
Test Procedure No. D4767-02
Specimen Data - Point 2

Project:	Shannon & Wilson	Project No.:	1984.1.1	Date:	6/24/2014
Sample No.:	B-08 U1 @ 5 - 7 ft.	Depth:			
Type of test:	CU	Tested By:	B. Adame		

Preparation-Condition

Sampler Type:	Shelby Tube	Interval Tested:	N/A
Soil Description:			

Compacted Sample	
% Compaction:	
Max Dry Dens.:	
Opt. Moisture:	

Notes: 1000 psf effective consolidation stress
'B' Value at Saturation = 1.00

Initial Condition of Specimen

Diameter	*Height*					*Moisture Sample*	
2.851	6.039	Ave Diam:	2.842	**Total Wt (g):**	852.8	**Wet Wt. Soil +t**	151.3
2.837	6.065	Ave Height:	6.039	**Tube Wt (g):**	0.0	**Dry Wt Soil +t**	99.2
2.836	6.013	Vol. (inches):	38.300	Sample Wt (g):	852.8	**Wt t:**	62.7
		Vol. (cm):	627.67	**Spec Grav:**	2.6	Moisture %:	142.8%
		Average A:	6.342	(Assumed)			

Total Vol (Vt):	627.67	SampleWt.(g) (Wt):	852.8	% Saturation [Vw/Vv]:	101.83%		
Vol. Soil (Vs):	135.09	Soil Wt. (g) (Ws):	351.2	Void Ratio [Vv/Vs]:	3.65		
Pore Vol. (Vv):	492.58	Water Wt. (g) (Ww):	501.6	Porosity [Vv/Vt]:	0.78		
Vol Water (Vw):	501.61	Wet Density (g/cm3) [Wt/Vt]:	1.36	(pcf):	84.8		
Vol Gas (Vg):	-9.03	Dry Density (g/cm3)) [Ws/Vt]:	0.56	(pcf):	34.9		

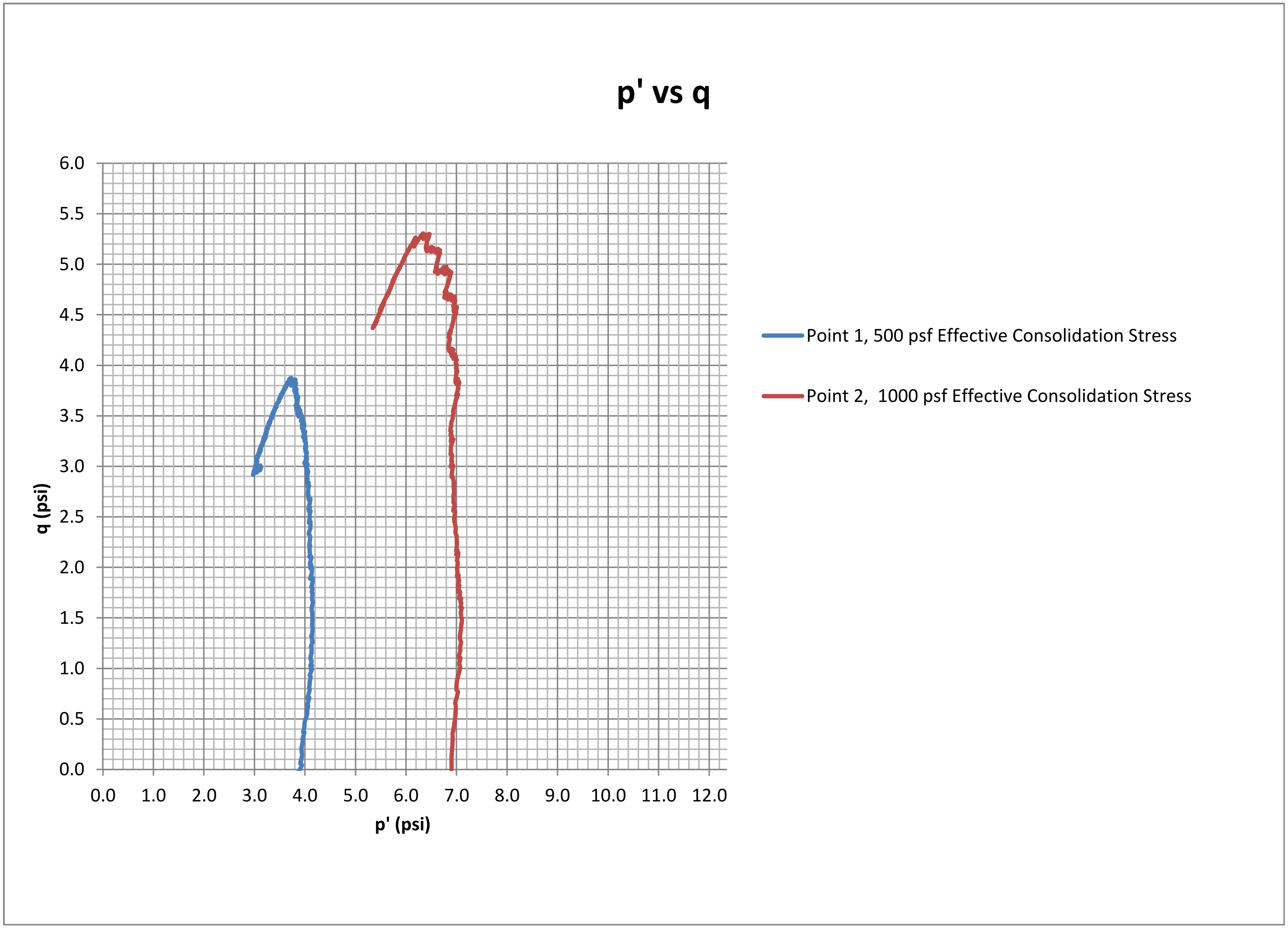
Final Condition of Specimen

Diameter	*Height*						
1	1	Ave Diam:		**Total Wt (g):**		**Wet Wt. Soil+t:**	948.5
2	2	Ave Height:	4.276	**Tube Wt (g):**	0	**Dry Wt. Soil+t:**	551.1
3	3	Vol. (inches):		Sample Wt (g):	0	**Wt t:**	183.8
		Vol. (cm):		**Spec Grav:**	2.6	Moisture %:	108.2%
		Average A:	8.450				

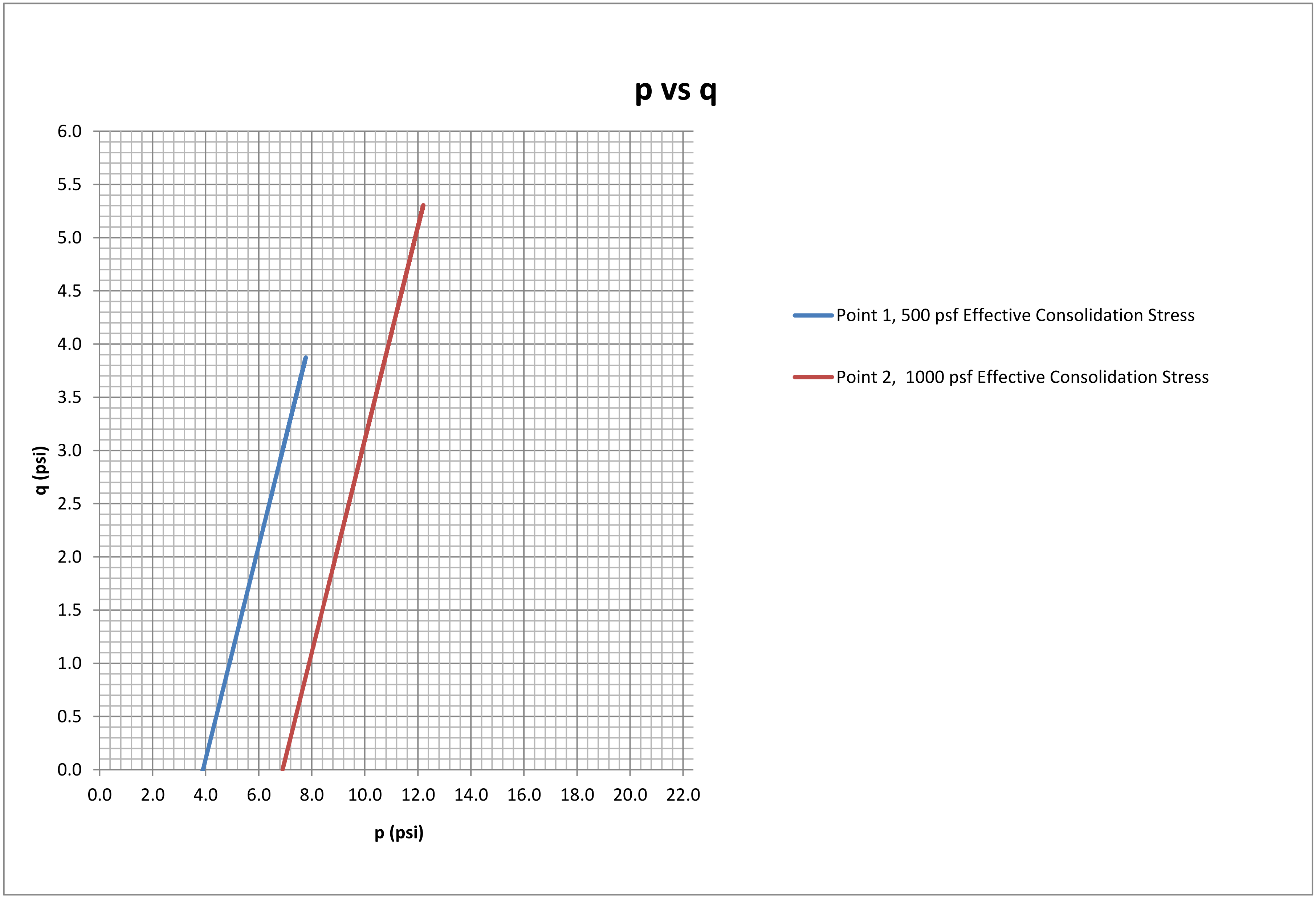
Note: If final dimensions determined from shear data:

Effective Vol. Expelled:
Total Height Difference:

Total Vol (Vt):		SampleWt.(g) (Wt):	731.2	% Saturation [Vw/Vv]:	
Vol. Soil (Vs):	135.09	Soil Wt. (g) (Ws):	351.2	Void Ratio [Vv/Vs]:	
Pore Vol. (Vv):		Water Wt. (g) (Ww):	380.01	Porosity [Vv/Vt]:	
Vol Water (Vw):	380.01	Wet Density (pcf) [Wt/Vt]:			
Vol Gas (Vg):		Dry Density (pcf) [Ws/Vt]:			



p' vs q
q (psi)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
p' (psi)
Point 1, 500 psf Effective Consolidation Stress
Point 2, 1000 psf Effective Consolidation Stress



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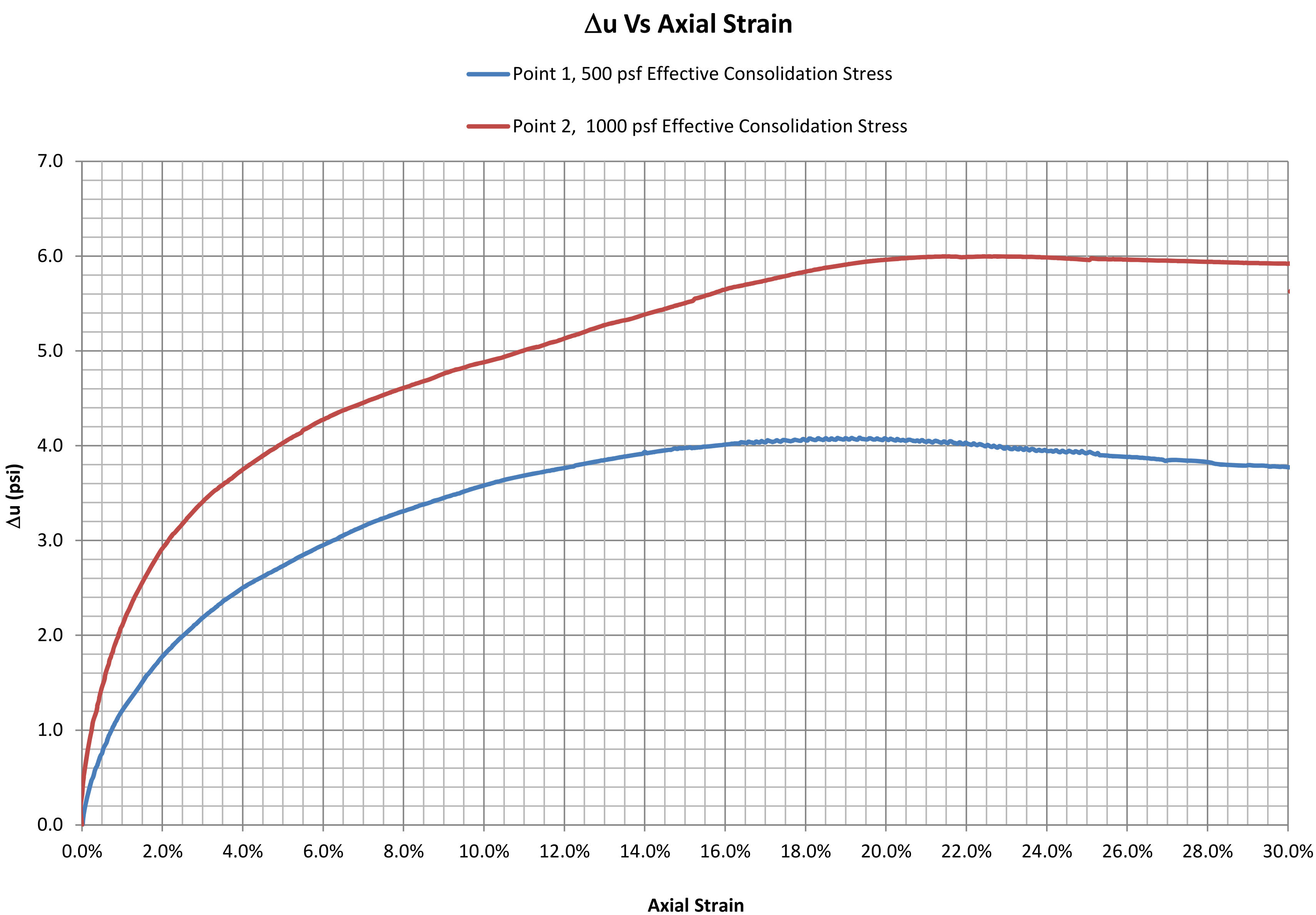

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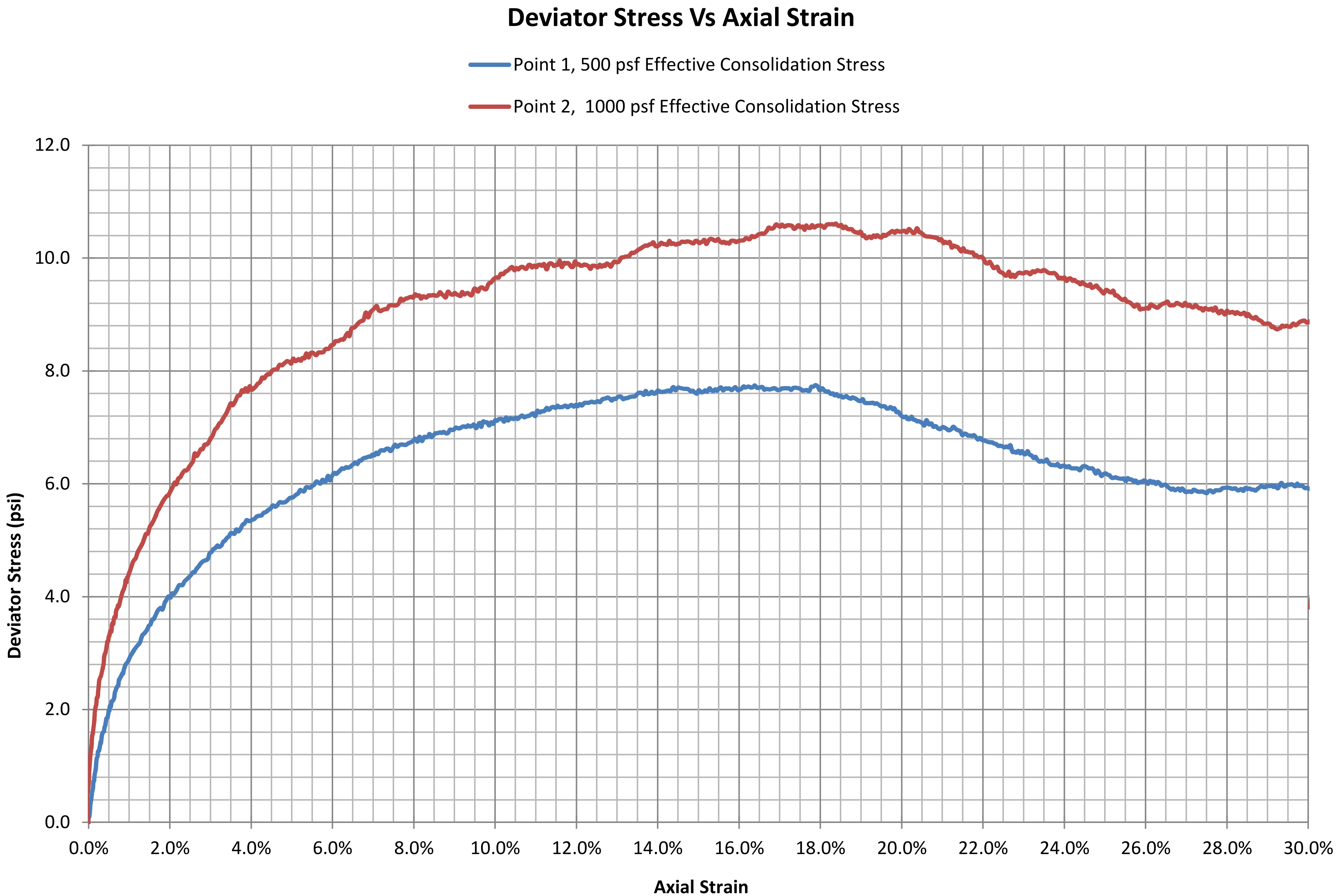

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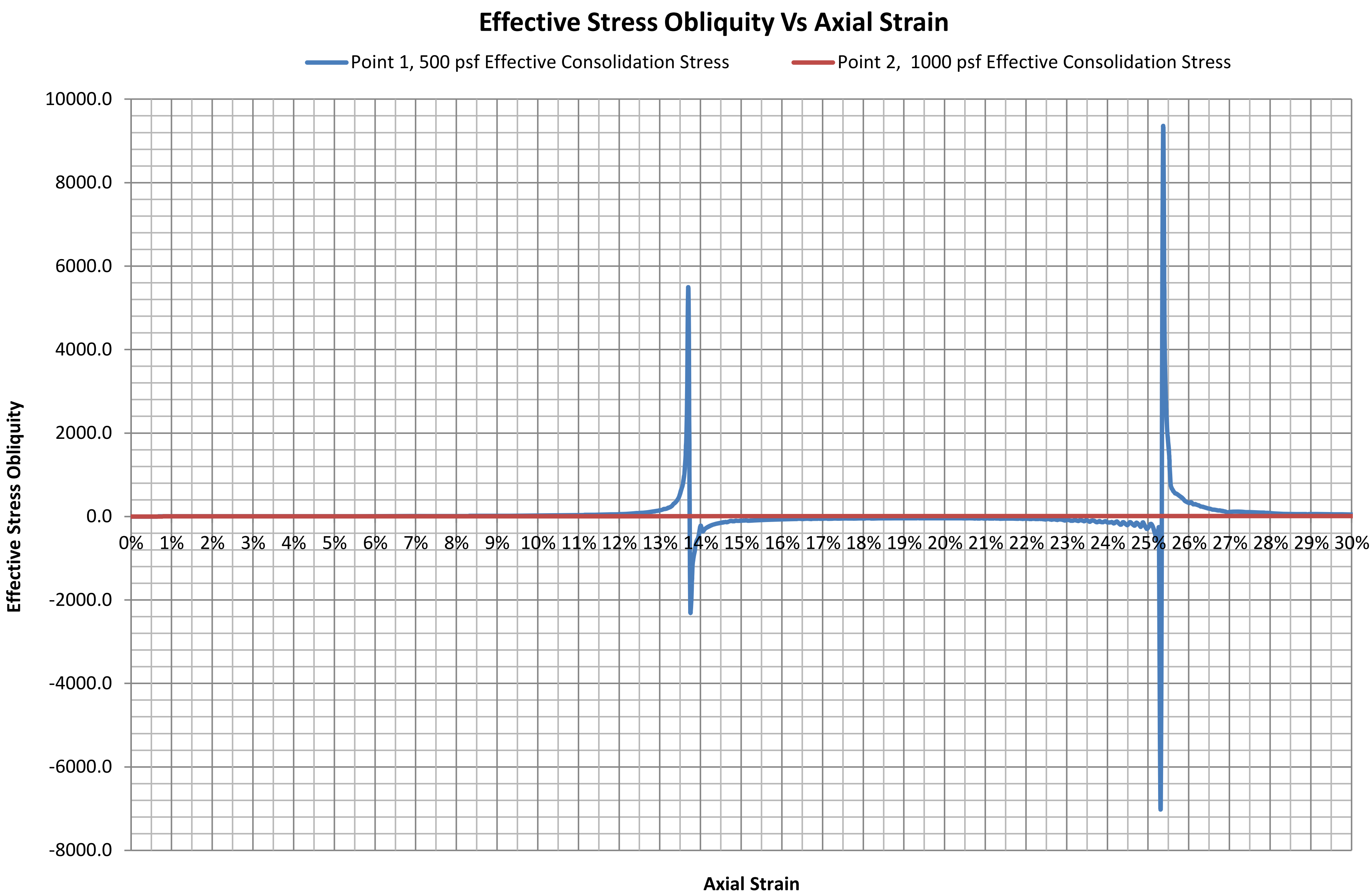

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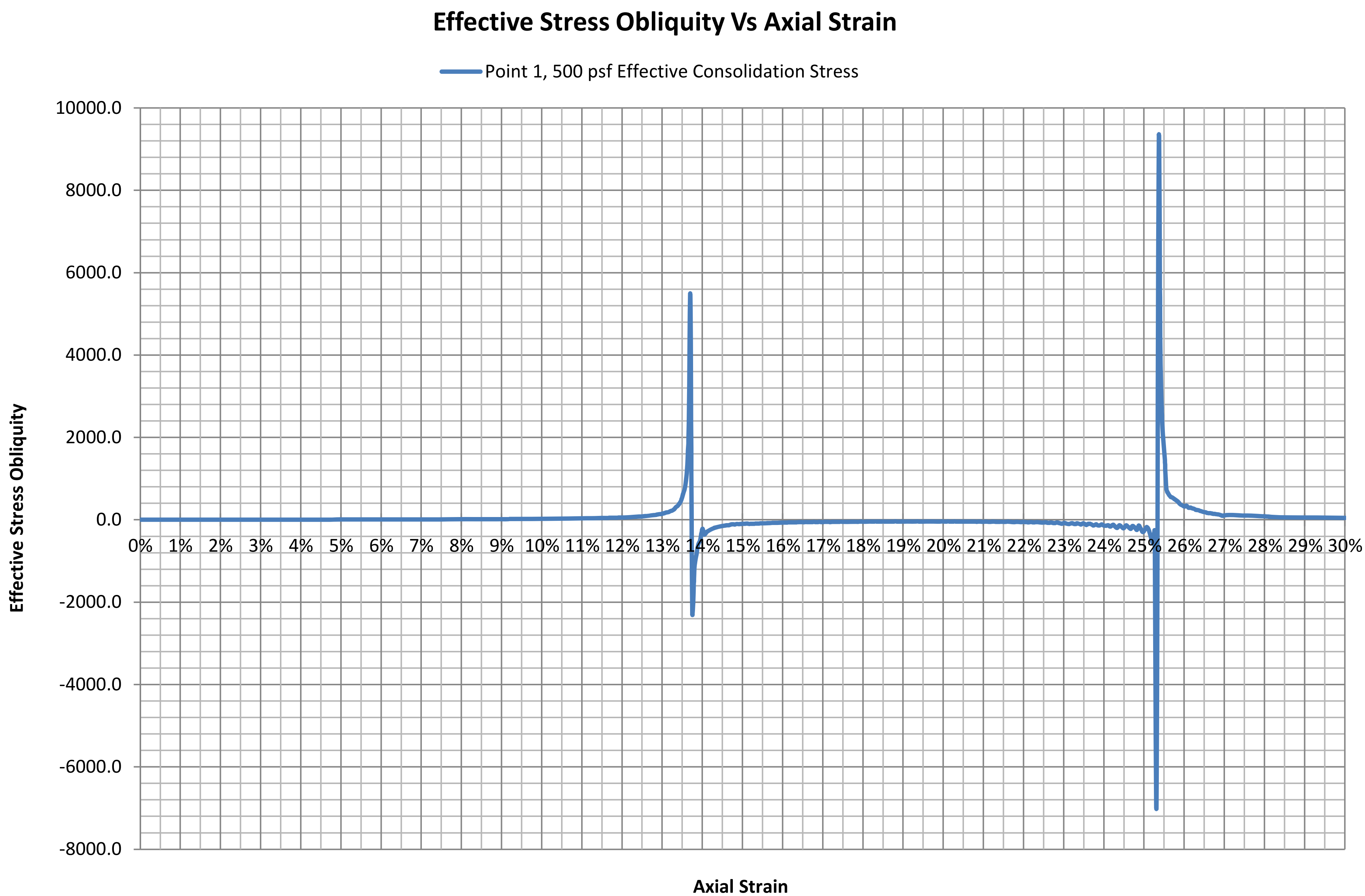

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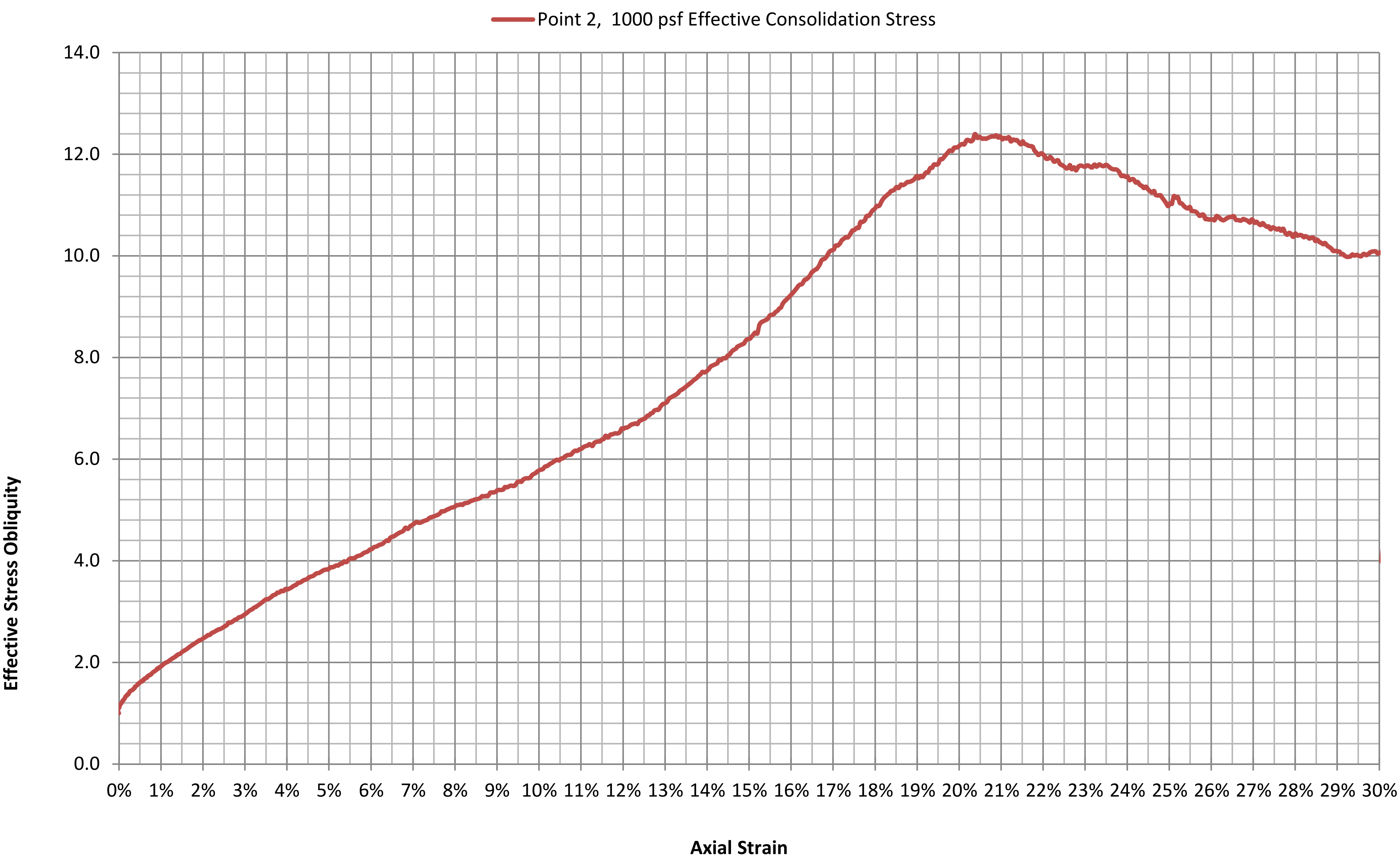
Effective Stress Obliquity Vs Axial Strain



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Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
0	-	0	0.000	-	0.00%	5.95	0.00	3.9	0.1	0.1	0.0	3.9	3.9	3.9	1.0	3.9	3.9	0.0
-4	-4	-4	-0.013	-0.013	-0.23%	5.93	-0.64	3.9	0.1	0.1	0.0	3.3	3.9	3.3	0.8	3.6	3.6	-0.3
-3	1	-3	-0.013	0.000	-0.23%	5.93	-0.56	3.9	0.1	0.1	0.0	3.3	3.9	3.3	0.9	3.6	3.6	-0.3
-3	0	-3	-0.013	0.000	-0.23%	5.93	-0.58	3.9	0.1	0.1	0.0	3.3	3.9	3.3	0.9	3.6	3.6	-0.3
-3	1	-3	-0.013	0.000	-0.22%	5.93	-0.46	3.9	0.1	0.1	0.0	3.4	3.9	3.4	0.9	3.7	3.7	-0.2
-1	2	-1	-0.013	0.001	-0.21%	5.93	-0.21	3.9	0.1	0.1	0.0	3.7	3.9	3.7	0.9	3.8	3.8	-0.1
0	1	0	-0.012	0.001	-0.20%	5.93	-0.03	3.9	0.1	0.1	0.0	3.9	3.9	3.9	1.0	3.9	3.9	0.0
0	1	0	0.000	0.012	0.00%	5.95	0.08	3.9	0.1	0.1	0.0	4.0	3.9	4.0	1.0	3.9	3.9	0.0
1	0	1	0.001	0.001	0.02%	5.95	0.11	3.9	0.2	0.2	0.0	4.0	3.9	4.0	1.0	4.0	3.9	0.1
2	1	2	0.002	0.001	0.04%	5.95	0.26	3.9	0.2	0.2	0.1	4.2	3.8	4.1	1.1	4.0	3.9	0.1
2	0	2	0.003	0.000	0.05%	5.95	0.33	3.9	0.2	0.2	0.1	4.2	3.8	4.1	1.1	4.1	3.9	0.2
2	0	2	0.004	0.001	0.06%	5.95	0.38	3.9	0.3	0.3	0.2	4.3	3.7	4.1	1.1	4.1	3.9	0.2
3	0	3	0.004	0.001	0.07%	5.95	0.45	3.9	0.3	0.3	0.2	4.4	3.7	4.2	1.1	4.1	3.9	0.2
3	1	3	0.006	0.001	0.09%	5.95	0.56	3.9	0.3	0.3	0.2	4.5	3.7	4.2	1.2	4.2	4.0	0.3
4	0	4	0.006	0.001	0.11%	5.95	0.60	3.9	0.4	0.4	0.2	4.5	3.7	4.3	1.2	4.2	4.0	0.3
4	1	4	0.007	0.001	0.12%	5.95	0.73	3.9	0.4	0.4	0.3	4.6	3.6	4.4	1.2	4.3	4.0	0.4
4	0	4	0.008	0.001	0.14%	5.95	0.74	3.9	0.4	0.4	0.3	4.6	3.6	4.3	1.2	4.3	4.0	0.4
5	1	5	0.009	0.001	0.15%	5.95	0.83	3.9	0.4	0.4	0.3	4.7	3.6	4.4	1.2	4.3	4.0	0.4
5	0	5	0.009	0.001	0.16%	5.96	0.88	3.9	0.5	0.5	0.4	4.8	3.5	4.4	1.2	4.3	4.0	0.4
6	0	6	0.010	0.001	0.18%	5.96	0.95	3.9	0.5	0.5	0.4	4.8	3.5	4.5	1.3	4.4	4.0	0.5
6	1	6	0.011	0.001	0.19%	5.96	1.07	3.9	0.5	0.5	0.4	5.0	3.5	4.6	1.3	4.4	4.0	0.5
7	0	7	0.012	0.001	0.20%	5.96	1.14	3.9	0.5	0.5	0.4	5.0	3.5	4.6	1.3	4.5	4.0	0.6
7	0	7	0.013	0.001	0.22%	5.96	1.17	3.9	0.6	0.6	0.4	5.1	3.5	4.6	1.3	4.5	4.0	0.6
8	1	8	0.014	0.001	0.24%	5.96	1.26	3.9	0.6	0.6	0.5	5.2	3.4	4.7	1.4	4.5	4.1	0.6
8	0	8	0.015	0.001	0.26%	5.96	1.27	3.9	0.6	0.6	0.5	5.2	3.4	4.7	1.4	4.5	4.0	0.6
8	1	8	0.017	0.001	0.28%	5.96	1.35	3.9	0.6	0.6	0.5	5.3	3.4	4.7	1.4	4.6	4.1	0.7
8	0	8	0.017	0.001	0.30%	5.96	1.42	3.9	0.6	0.6	0.5	5.3	3.4	4.8	1.4	4.6	4.1	0.7
8	0	8	0.018	0.001	0.31%	5.96	1.40	3.9	0.7	0.7	0.5	5.3	3.4	4.8	1.4	4.6	4.1	0.7
9	0	9	0.019	0.001	0.32%	5.96	1.47	3.9	0.7	0.7	0.6	5.4	3.3	4.8	1.4	4.6	4.1	0.7
9	1	9	0.020	0.001	0.34%	5.97	1.56	3.9	0.7	0.7	0.6	5.5	3.3	4.9	1.5	4.7	4.1	0.8
10	0	10	0.021	0.001	0.36%	5.97	1.60	3.9	0.7	0.7	0.6	5.5	3.3	4.9	1.5	4.7	4.1	0.8
10	0	10	0.022	0.001	0.38%	5.97	1.61	3.9	0.7	0.7	0.6	5.5	3.3	4.9	1.5	4.7	4.1	0.8
10	0	10	0.023	0.001	0.39%	5.97	1.68	3.9	0.8	0.8	0.6	5.6	3.3	4.9	1.5	4.7	4.1	0.8
10	0	10	0.024	0.001	0.41%	5.97	1.71	3.9	0.8	0.8	0.7	5.6	3.2	4.9	1.5	4.8	4.1	0.9
11	0	11	0.025	0.001	0.42%	5.97	1.77	3.9	0.8	0.8	0.7	5.7	3.2	5.0	1.5	4.8	4.1	0.9
11	0	11	0.026	0.001	0.44%	5.97	1.83	3.9	0.8	0.8	0.7	5.7	3.2	5.0	1.6	4.8	4.1	0.9
11	0	11	0.027	0.001	0.45%	5.97	1.85	3.9	0.8	0.8	0.7	5.8	3.2	5.0	1.6	4.8	4.1	0.9
11	0	11	0.028	0.001	0.47%	5.97	1.86	3.9	0.8	0.8	0.7	5.8	3.2	5.0	1.6	4.8	4.1	0.9
12	1	12	0.029	0.002	0.50%	5.98	1.98	3.9	0.9	0.9	0.8	5.9	3.1	5.1	1.6	4.9	4.1	1.0
12	0	12	0.030	0.001	0.51%	5.98	1.98	3.9	0.9	0.9	0.8	5.9	3.1	5.1	1.6	4.9	4.1	1.0
12	0	12	0.031	0.001	0.52%	5.98	2.05	3.9	0.9	0.9	0.8	5.9	3.1	5.2	1.7	4.9	4.1	1.0
12	0	12	0.031	0.001	0.53%	5.98	2.07	3.9	0.9	0.9	0.8	6.0	3.1	5.2	1.7	4.9	4.1	1.0
12	0	12	0.032	0.001	0.55%	5.98	2.05	3.9	0.9	0.9	0.8	6.0	3.1	5.1	1.7	4.9	4.1	1.0
13	1	13	0.033	0.001	0.57%	5.98	2.14	3.9	0.9	0.9	0.8	6.0	3.1	5.2	1.7	5.0	4.1	1.1
13	0	13	0.035	0.001	0.59%	5.98	2.15	3.9	1.0	1.0	0.9	6.1	3.0	5.2	1.7	5.0	4.1	1.1
13	0	13	0.036	0.001	0.61%	5.98	2.17	3.9	1.0	1.0	0.9	6.1	3.0	5.2	1.7	5.0	4.1	1.1
13	0	13	0.037	0.001	0.63%	5.98	2.20	3.9	1.0	1.0	0.9	6.1	3.0	5.2	1.7	5.0	4.1	1.1
13	0	13	0.038	0.001	0.64%	5.98	2.24	3.9	1.0	1.0	0.9	6.1	3.0	5.2	1.7	5.0	4.1	1.1

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p	p'	q
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		$(\sigma_1+\sigma_3)/2$ (psi)	$(\sigma_1'+\sigma_3')/2$ (psi)	$(\sigma_1-\sigma_3)/2$ (psi)
14	0	14	0.038	0.001	0.65%	5.98	2.31	3.9	1.0	1.0	0.9	6.2	3.0	5.3	1.8	5.1	4.1	1.2
14	0	14	0.039	0.001	0.67%	5.99	2.33	3.9	1.0	1.0	0.9	6.2	3.0	5.3	1.8	5.1	4.1	1.2
14	0	14	0.040	0.001	0.68%	5.99	2.38	3.9	1.1	1.1	1.0	6.3	2.9	5.3	1.8	5.1	4.1	1.2
14	0	14	0.041	0.001	0.70%	5.99	2.39	3.9	1.1	1.1	1.0	6.3	2.9	5.3	1.8	5.1	4.1	1.2
14	0	14	0.042	0.001	0.72%	5.99	2.42	3.9	1.1	1.1	1.0	6.3	2.9	5.3	1.8	5.1	4.1	1.2
15	0	15	0.043	0.001	0.73%	5.99	2.43	3.9	1.1	1.1	1.0	6.3	2.9	5.3	1.8	5.1	4.1	1.2
15	1	15	0.044	0.001	0.75%	5.99	2.53	3.9	1.1	1.1	1.0	6.4	2.9	5.4	1.9	5.2	4.2	1.3
15	0	15	0.045	0.001	0.76%	5.99	2.54	3.9	1.1	1.1	1.0	6.4	2.9	5.4	1.9	5.2	4.1	1.3
15	0	15	0.046	0.001	0.78%	5.99	2.57	3.9	1.1	1.1	1.0	6.5	2.9	5.4	1.9	5.2	4.1	1.3
15	0	15	0.047	0.001	0.80%	5.99	2.58	3.9	1.2	1.2	1.1	6.5	2.8	5.4	1.9	5.2	4.1	1.3
16	0	16	0.049	0.002	0.83%	6.00	2.64	3.9	1.2	1.2	1.1	6.5	2.8	5.5	1.9	5.2	4.1	1.3
16	0	16	0.050	0.001	0.85%	6.00	2.64	3.9	1.2	1.2	1.1	6.5	2.8	5.4	1.9	5.2	4.1	1.3
16	0	16	0.051	0.001	0.87%	6.00	2.70	3.9	1.2	1.2	1.1	6.6	2.8	5.5	2.0	5.3	4.1	1.4
17	1	17	0.054	0.003	0.91%	6.00	2.80	3.9	1.3	1.3	1.1	6.7	2.8	5.5	2.0	5.3	4.2	1.4
17	0	17	0.057	0.003	0.97%	6.00	2.85	3.9	1.3	1.3	1.2	6.8	2.7	5.6	2.1	5.3	4.1	1.4
18	1	18	0.061	0.003	1.03%	6.01	2.95	3.9	1.3	1.3	1.2	6.8	2.7	5.6	2.1	5.4	4.1	1.5
18	0	18	0.064	0.003	1.09%	6.01	3.01	3.9	1.4	1.4	1.3	6.9	2.6	5.7	2.1	5.4	4.1	1.5
19	0	19	0.068	0.004	1.15%	6.01	3.08	3.9	1.4	1.4	1.3	7.0	2.6	5.7	2.2	5.4	4.1	1.5
19	0	19	0.071	0.004	1.21%	6.02	3.14	3.9	1.4	1.4	1.3	7.0	2.6	5.7	2.2	5.5	4.1	1.6
19	0	19	0.074	0.003	1.27%	6.02	3.19	3.9	1.5	1.5	1.4	7.1	2.5	5.7	2.3	5.5	4.1	1.6
20	1	20	0.078	0.003	1.32%	6.03	3.31	3.9	1.5	1.5	1.4	7.2	2.5	5.8	2.3	5.6	4.2	1.7
20	0	20	0.081	0.003	1.38%	6.03	3.35	3.9	1.5	1.5	1.4	7.3	2.5	5.8	2.4	5.6	4.1	1.7
21	0	21	0.084	0.003	1.43%	6.03	3.40	3.9	1.6	1.6	1.5	7.3	2.4	5.8	2.4	5.6	4.1	1.7
21	0	21	0.087	0.003	1.48%	6.03	3.48	3.9	1.6	1.6	1.5	7.4	2.4	5.9	2.4	5.6	4.1	1.7
21	0	21	0.090	0.003	1.53%	6.04	3.51	3.9	1.6	1.6	1.5	7.4	2.4	5.9	2.5	5.7	4.1	1.8
22	0	22	0.092	0.002	1.56%	6.04	3.59	3.9	1.7	1.7	1.5	7.5	2.4	5.9	2.5	5.7	4.1	1.8
22	0	22	0.095	0.003	1.61%	6.04	3.61	3.9	1.7	1.7	1.6	7.5	2.3	5.9	2.6	5.7	4.1	1.8
22	1	22	0.098	0.004	1.67%	6.05	3.71	3.9	1.7	1.7	1.6	7.6	2.3	6.0	2.6	5.8	4.2	1.9
23	0	23	0.101	0.003	1.72%	6.05	3.77	3.9	1.7	1.7	1.6	7.7	2.3	6.0	2.7	5.8	4.2	1.9
23	0	23	0.104	0.003	1.77%	6.05	3.80	3.9	1.8	1.8	1.7	7.7	2.2	6.0	2.7	5.8	4.1	1.9
23	0	23	0.107	0.003	1.82%	6.06	3.77	3.9	1.8	1.8	1.7	7.7	2.2	6.0	2.7	5.8	4.1	1.9
24	1	24	0.110	0.003	1.87%	6.06	3.89	3.9	1.8	1.8	1.7	7.8	2.2	6.1	2.8	5.8	4.1	1.9
24	0	24	0.113	0.002	1.91%	6.06	3.94	3.9	1.8	1.8	1.7	7.8	2.2	6.1	2.8	5.9	4.1	2.0
24	0	24	0.116	0.003	1.97%	6.06	4.00	3.9	1.9	1.9	1.8	7.9	2.1	6.1	2.9	5.9	4.1	2.0
24	0	24	0.119	0.003	2.02%	6.07	3.98	3.9	1.9	1.9	1.8	7.9	2.1	6.1	2.9	5.9	4.1	2.0
25	0	25	0.121	0.003	2.06%	6.07	4.06	3.9	1.9	1.9	1.8	8.0	2.1	6.2	2.9	5.9	4.1	2.0
25	0	25	0.124	0.003	2.11%	6.07	4.05	3.9	1.9	1.9	1.8	8.0	2.1	6.1	3.0	5.9	4.1	2.0
25	0	25	0.127	0.003	2.16%	6.08	4.11	3.9	2.0	2.0	1.8	8.0	2.1	6.2	3.0	6.0	4.1	2.1
26	1	26	0.131	0.004	2.22%	6.08	4.20	3.9	2.0	2.0	1.9	8.1	2.0	6.2	3.1	6.0	4.1	2.1
26	0	26	0.133	0.002	2.26%	6.08	4.21	3.9	2.0	2.0	1.9	8.1	2.0	6.2	3.1	6.0	4.1	2.1
26	0	26	0.136	0.003	2.31%	6.09	4.21	3.9	2.0	2.0	1.9	8.1	2.0	6.2	3.1	6.0	4.1	2.1
26	0	26	0.139	0.003	2.36%	6.09	4.27	3.9	2.0	2.0	1.9	8.2	2.0	6.2	3.2	6.0	4.1	2.1
26	0	26	0.142	0.003	2.41%	6.09	4.30	3.9	2.1	2.1	2.0	8.2	1.9	6.2	3.2	6.1	4.1	2.2
26	0	26	0.145	0.003	2.46%	6.10	4.34	3.9	2.1	2.1	2.0	8.2	1.9	6.3	3.3	6.1	4.1	2.2
27	0	27	0.148	0.003	2.51%	6.10	4.37	3.9	2.1	2.1	2.0	8.3	1.9	6.3	3.3	6.1	4.1	2.2
27	0	27	0.151	0.003	2.56%	6.10	4.43	3.9	2.1	2.1	2.0	8.3	1.9	6.3	3.3	6.1	4.1	2.2
27	0	27	0.153	0.002	2.61%	6.10	4.43	3.9	2.1	2.1	2.0	8.3	1.9	6.3	3.4	6.1	4.1	2.2
27	0	27	0.156	0.003	2.66%	6.11	4.49	3.9	2.2	2.2	2.1	8.4	1.8	6.3	3.4	6.1	4.1	2.2

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell (pounds) Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge (inches) Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
28	0	28	0.159	0.003	2.71%	6.11	4.53	3.9	2.2	2.2	2.1	8.4	1.8	6.4	3.5	6.2	4.1	2.3
28	0	28	0.162	0.003	2.75%	6.11	4.58	3.9	2.2	2.2	2.1	8.5	1.8	6.4	3.5	6.2	4.1	2.3
28	0	28	0.164	0.002	2.79%	6.12	4.61	3.9	2.2	2.2	2.1	8.5	1.8	6.4	3.6	6.2	4.1	2.3
28	0	28	0.167	0.003	2.85%	6.12	4.64	3.9	2.2	2.2	2.1	8.5	1.8	6.4	3.6	6.2	4.1	2.3
29	0	29	0.172	0.005	2.93%	6.13	4.67	3.9	2.3	2.3	2.2	8.6	1.7	6.4	3.7	6.2	4.1	2.3
29	1	29	0.175	0.002	2.97%	6.13	4.76	3.9	2.3	2.3	2.2	8.7	1.7	6.5	3.8	6.3	4.1	2.4
29	0	29	0.178	0.003	3.03%	6.13	4.79	3.9	2.3	2.3	2.2	8.7	1.7	6.5	3.8	6.3	4.1	2.4
30	0	30	0.180	0.002	3.07%	6.13	4.84	3.9	2.3	2.3	2.2	8.7	1.7	6.5	3.9	6.3	4.1	2.4
30	0	30	0.183	0.003	3.12%	6.14	4.86	3.9	2.3	2.3	2.2	8.8	1.7	6.5	3.9	6.3	4.1	2.4
30	0	30	0.187	0.003	3.17%	6.14	4.91	3.9	2.4	2.4	2.2	8.8	1.7	6.6	4.0	6.4	4.1	2.5
30	0	30	0.189	0.002	3.21%	6.14	4.88	3.9	2.4	2.4	2.3	8.8	1.6	6.5	4.0	6.3	4.1	2.4
30	0	30	0.192	0.003	3.27%	6.15	4.91	3.9	2.4	2.4	2.3	8.8	1.6	6.5	4.0	6.4	4.1	2.5
31	0	31	0.195	0.003	3.31%	6.15	4.97	3.9	2.4	2.4	2.3	8.9	1.6	6.6	4.1	6.4	4.1	2.5
31	0	31	0.198	0.003	3.36%	6.15	5.00	3.9	2.4	2.4	2.3	8.9	1.6	6.6	4.1	6.4	4.1	2.5
31	0	31	0.200	0.002	3.40%	6.15	5.03	3.9	2.4	2.4	2.3	8.9	1.6	6.6	4.2	6.4	4.1	2.5
31	0	31	0.203	0.003	3.46%	6.16	5.07	3.9	2.4	2.4	2.3	9.0	1.6	6.6	4.2	6.4	4.1	2.5
32	0	32	0.206	0.002	3.49%	6.16	5.12	3.9	2.5	2.5	2.4	9.0	1.5	6.7	4.3	6.5	4.1	2.6
32	0	32	0.208	0.002	3.53%	6.16	5.13	3.9	2.5	2.5	2.4	9.0	1.5	6.7	4.3	6.5	4.1	2.6
32	0	32	0.211	0.003	3.59%	6.17	5.12	3.9	2.5	2.5	2.4	9.0	1.5	6.6	4.4	6.5	4.1	2.6
32	0	32	0.214	0.003	3.64%	6.17	5.19	3.9	2.5	2.5	2.4	9.1	1.5	6.7	4.4	6.5	4.1	2.6
32	0	32	0.217	0.003	3.69%	6.17	5.16	3.9	2.5	2.5	2.4	9.1	1.5	6.6	4.5	6.5	4.1	2.6
32	0	32	0.220	0.003	3.74%	6.18	5.21	3.9	2.5	2.5	2.4	9.1	1.5	6.7	4.5	6.5	4.1	2.6
33	0	33	0.223	0.003	3.79%	6.18	5.27	3.9	2.5	2.5	2.4	9.2	1.5	6.7	4.6	6.5	4.1	2.6
33	0	33	0.226	0.003	3.84%	6.18	5.30	3.9	2.6	2.6	2.5	9.2	1.4	6.7	4.7	6.5	4.1	2.6
33	0	33	0.229	0.003	3.89%	6.19	5.36	3.9	2.6	2.6	2.5	9.3	1.4	6.8	4.7	6.6	4.1	2.7
33	0	33	0.231	0.003	3.93%	6.19	5.34	3.9	2.6	2.6	2.5	9.2	1.4	6.8	4.8	6.6	4.1	2.7
33	0	33	0.234	0.003	3.98%	6.19	5.34	3.9	2.6	2.6	2.5	9.2	1.4	6.7	4.8	6.6	4.1	2.7
33	0	33	0.237	0.003	4.03%	6.20	5.36	3.9	2.6	2.6	2.5	9.3	1.4	6.8	4.9	6.6	4.1	2.7
33	0	33	0.240	0.003	4.09%	6.20	5.38	3.9	2.6	2.6	2.5	9.3	1.4	6.8	4.9	6.6	4.1	2.7
34	0	34	0.243	0.003	4.14%	6.20	5.42	3.9	2.6	2.6	2.5	9.3	1.4	6.8	5.0	6.6	4.1	2.7
34	0	34	0.247	0.003	4.19%	6.21	5.43	3.9	2.7	2.7	2.5	9.3	1.4	6.8	5.0	6.6	4.1	2.7
34	0	34	0.250	0.004	4.26%	6.21	5.44	3.9	2.7	2.7	2.6	9.3	1.3	6.8	5.1	6.6	4.1	2.7
34	0	34	0.253	0.003	4.30%	6.21	5.48	3.9	2.7	2.7	2.6	9.4	1.3	6.8	5.1	6.6	4.1	2.7
34	0	34	0.257	0.004	4.36%	6.22	5.50	3.9	2.7	2.7	2.6	9.4	1.3	6.8	5.2	6.6	4.1	2.7
34	0	34	0.260	0.004	4.42%	6.22	5.54	3.9	2.7	2.7	2.6	9.4	1.3	6.8	5.3	6.7	4.1	2.8
35	0	35	0.263	0.003	4.48%	6.22	5.56	3.9	2.7	2.7	2.6	9.5	1.3	6.8	5.3	6.7	4.1	2.8
35	0	35	0.267	0.003	4.53%	6.23	5.62	3.9	2.7	2.7	2.6	9.5	1.3	6.9	5.4	6.7	4.1	2.8
35	0	35	0.270	0.003	4.59%	6.23	5.59	3.9	2.7	2.7	2.6	9.5	1.3	6.9	5.4	6.7	4.1	2.8
35	0	35	0.273	0.003	4.64%	6.23	5.61	3.9	2.8	2.8	2.7	9.5	1.2	6.9	5.5	6.7	4.1	2.8
35	0	35	0.276	0.004	4.70%	6.24	5.67	3.9	2.8	2.8	2.7	9.6	1.2	6.9	5.6	6.7	4.1	2.8
35	0	35	0.280	0.003	4.75%	6.24	5.67	3.9	2.8	2.8	2.7	9.6	1.2	6.9	5.6	6.7	4.1	2.8
35	0	35	0.282	0.003	4.80%	6.25	5.67	3.9	2.8	2.8	2.7	9.6	1.2	6.9	5.7	6.7	4.0	2.8
36	0	36	0.286	0.004	4.86%	6.25	5.68	3.9	2.8	2.8	2.7	9.6	1.2	6.9	5.7	6.7	4.0	2.8
36	0	36	0.289	0.003	4.91%	6.25	5.72	3.9	2.8	2.8	2.7	9.6	1.2	6.9	5.8	6.8	4.0	2.9
36	0	36	0.291	0.003	4.96%	6.26	5.75	3.9	2.8	2.8	2.7	9.6	1.2	6.9	5.9	6.8	4.1	2.9
36	0	36	0.295	0.003	5.01%	6.26	5.75	3.9	2.8	2.8	2.7	9.7	1.2	6.9	5.9	6.8	4.0	2.9
36	0	36	0.298	0.003	5.07%	6.26	5.78	3.9	2.9	2.9	2.7	9.7	1.2	6.9	6.0	6.8	4.0	2.9
36	0	36	0.300	0.002	5.11%	6.27	5.81	3.9	2.9	2.9	2.8	9.7	1.1	7.0	6.1	6.8	4.0	2.9

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p	p'	q
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		$(\sigma_1+\sigma_3)/2$ (psi)	$(\sigma_1'+\sigma_3')/2$ (psi)	$(\sigma_1-\sigma_3)/2$ (psi)
37	0	37	0.303	0.003	5.16%	6.27	5.83	3.9	2.9	2.9	2.8	9.7	1.1	7.0	6.2	6.8	4.0	2.9
37	0	37	0.306	0.003	5.21%	6.27	5.89	3.9	2.9	2.9	2.8	9.8	1.1	7.0	6.3	6.8	4.1	2.9
37	0	37	0.309	0.003	5.25%	6.28	5.87	3.9	2.9	2.9	2.8	9.8	1.1	7.0	6.3	6.8	4.0	2.9
37	0	37	0.312	0.003	5.30%	6.28	5.87	3.9	2.9	2.9	2.8	9.8	1.1	7.0	6.4	6.8	4.0	2.9
37	0	37	0.314	0.002	5.35%	6.28	5.93	3.9	2.9	2.9	2.8	9.8	1.1	7.0	6.5	6.9	4.1	3.0
37	0	37	0.317	0.003	5.39%	6.28	5.94	3.9	2.9	2.9	2.8	9.8	1.1	7.0	6.5	6.9	4.0	3.0
37	0	37	0.321	0.004	5.45%	6.29	5.93	3.9	2.9	2.9	2.8	9.8	1.1	7.0	6.6	6.9	4.0	3.0
38	0	38	0.324	0.003	5.50%	6.29	5.96	3.9	3.0	3.0	2.8	9.9	1.1	7.0	6.7	6.9	4.0	3.0
38	0	38	0.326	0.003	5.55%	6.29	5.98	3.9	3.0	3.0	2.9	9.9	1.0	7.0	6.7	6.9	4.0	3.0
38	0	38	0.330	0.003	5.61%	6.30	6.04	3.9	3.0	3.0	2.9	9.9	1.0	7.1	6.9	6.9	4.1	3.0
38	0	38	0.333	0.003	5.65%	6.30	6.02	3.9	3.0	3.0	2.9	9.9	1.0	7.0	6.9	6.9	4.0	3.0
38	0	38	0.336	0.003	5.71%	6.31	6.00	3.9	3.0	3.0	2.9	9.9	1.0	7.0	6.9	6.9	4.0	3.0
38	0	38	0.338	0.003	5.75%	6.31	6.07	3.9	3.0	3.0	2.9	10.0	1.0	7.1	7.1	6.9	4.0	3.0
38	0	38	0.341	0.003	5.80%	6.31	6.05	3.9	3.0	3.0	2.9	9.9	1.0	7.0	7.1	6.9	4.0	3.0
38	0	38	0.344	0.002	5.84%	6.31	6.05	3.9	3.0	3.0	2.9	10.0	1.0	7.0	7.2	6.9	4.0	3.0
39	1	39	0.347	0.003	5.89%	6.32	6.14	3.9	3.0	3.0	2.9	10.0	1.0	7.1	7.3	7.0	4.0	3.1
38	0	38	0.349	0.003	5.94%	6.32	6.06	3.9	3.1	3.1	2.9	10.0	1.0	7.0	7.3	6.9	4.0	3.0
39	1	39	0.352	0.003	5.99%	6.32	6.14	3.9	3.1	3.1	2.9	10.0	1.0	7.1	7.5	7.0	4.0	3.1
39	0	39	0.356	0.003	6.05%	6.33	6.19	3.9	3.1	3.1	3.0	10.1	0.9	7.1	7.6	7.0	4.0	3.1
39	0	39	0.358	0.003	6.09%	6.33	6.17	3.9	3.1	3.1	3.0	10.1	0.9	7.1	7.6	7.0	4.0	3.1
39	0	39	0.361	0.002	6.13%	6.33	6.20	3.9	3.1	3.1	3.0	10.1	0.9	7.1	7.7	7.0	4.0	3.1
40	0	40	0.364	0.003	6.19%	6.34	6.23	3.9	3.1	3.1	3.0	10.1	0.9	7.1	7.8	7.0	4.0	3.1
40	0	40	0.366	0.003	6.23%	6.34	6.27	3.9	3.1	3.1	3.0	10.2	0.9	7.2	7.9	7.0	4.0	3.1
40	0	40	0.369	0.003	6.28%	6.34	6.27	3.9	3.1	3.1	3.0	10.2	0.9	7.2	8.0	7.0	4.0	3.1
40	0	40	0.373	0.004	6.34%	6.35	6.29	3.9	3.1	3.1	3.0	10.2	0.9	7.2	8.1	7.0	4.0	3.1
40	0	40	0.375	0.002	6.37%	6.35	6.29	3.9	3.1	3.1	3.0	10.2	0.9	7.2	8.2	7.0	4.0	3.1
40	0	40	0.378	0.003	6.42%	6.35	6.29	3.9	3.1	3.1	3.0	10.2	0.9	7.2	8.3	7.0	4.0	3.1
40	0	40	0.381	0.003	6.47%	6.36	6.32	3.9	3.2	3.2	3.0	10.2	0.9	7.2	8.4	7.1	4.0	3.2
40	0	40	0.383	0.003	6.52%	6.36	6.35	3.9	3.2	3.2	3.1	10.2	0.8	7.2	8.5	7.1	4.0	3.2
41	0	41	0.386	0.003	6.56%	6.36	6.38	3.9	3.2	3.2	3.1	10.3	0.8	7.2	8.7	7.1	4.0	3.2
40	0	40	0.389	0.003	6.62%	6.37	6.35	3.9	3.2	3.2	3.1	10.3	0.8	7.2	8.7	7.1	4.0	3.2
41	0	41	0.392	0.002	6.66%	6.37	6.41	3.9	3.2	3.2	3.1	10.3	0.8	7.2	8.9	7.1	4.0	3.2
41	0	41	0.394	0.003	6.70%	6.37	6.41	3.9	3.2	3.2	3.1	10.3	0.8	7.2	9.0	7.1	4.0	3.2
41	0	41	0.397	0.003	6.75%	6.38	6.45	3.9	3.2	3.2	3.1	10.3	0.8	7.2	9.1	7.1	4.0	3.2
41	0	41	0.399	0.002	6.79%	6.38	6.46	3.9	3.2	3.2	3.1	10.4	0.8	7.2	9.2	7.1	4.0	3.2
41	0	41	0.402	0.003	6.84%	6.38	6.47	3.9	3.2	3.2	3.1	10.4	0.8	7.2	9.3	7.1	4.0	3.2
41	0	41	0.405	0.003	6.89%	6.39	6.48	3.9	3.2	3.2	3.1	10.4	0.8	7.3	9.4	7.1	4.0	3.2
41	0	41	0.408	0.003	6.94%	6.39	6.48	3.9	3.2	3.2	3.1	10.4	0.8	7.2	9.5	7.1	4.0	3.2
42	0	42	0.410	0.002	6.98%	6.39	6.52	3.9	3.3	3.3	3.1	10.4	0.8	7.3	9.7	7.2	4.0	3.3
42	0	42	0.413	0.003	7.03%	6.40	6.50	3.9	3.3	3.3	3.2	10.4	0.7	7.2	9.8	7.2	4.0	3.3
42	0	42	0.416	0.003	7.08%	6.40	6.55	3.9	3.3	3.3	3.2	10.5	0.7	7.3	9.9	7.2	4.0	3.3
42	0	42	0.419	0.003	7.12%	6.40	6.53	3.9	3.3	3.3	3.2	10.4	0.7	7.3	10.0	7.2	4.0	3.3
42	0	42	0.422	0.003	7.17%	6.40	6.58	3.9	3.3	3.3	3.2	10.5	0.7	7.3	10.2	7.2	4.0	3.3
42	0	42	0.425	0.003	7.23%	6.41	6.60	3.9	3.3	3.3	3.2	10.5	0.7	7.3	10.3	7.2	4.0	3.3
42	0	42	0.428	0.003	7.27%	6.41	6.59	3.9	3.3	3.3	3.2	10.5	0.7	7.3	10.4	7.2	4.0	3.3
42	0	42	0.431	0.003	7.32%	6.42	6.62	3.9	3.3	3.3	3.2	10.5	0.7	7.3	10.6	7.2	4.0	3.3
43	0	43	0.434	0.003	7.38%	6.42	6.62	3.9	3.3	3.3	3.2	10.5	0.7	7.3	10.7	7.2	4.0	3.3
42	0	42	0.437	0.003	7.43%	6.42	6.58	3.9	3.3	3.3	3.2	10.5	0.7	7.3	10.8	7.2	4.0	3.3

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
43	0	43	0.440	0.003	7.48%	6.43	6.63	3.9	3.3	3.3	3.2	10.5	0.7	7.3	10.9	7.2	4.0	3.3
43	0	43	0.444	0.003	7.54%	6.43	6.69	3.9	3.4	3.4	3.2	10.6	0.7	7.4	11.2	7.2	4.0	3.3
43	0	43	0.447	0.003	7.60%	6.43	6.66	3.9	3.4	3.4	3.3	10.6	0.6	7.3	11.2	7.2	4.0	3.3
43	0	43	0.450	0.003	7.65%	6.44	6.69	3.9	3.4	3.4	3.3	10.6	0.6	7.3	11.4	7.2	4.0	3.3
43	0	43	0.453	0.003	7.70%	6.44	6.70	3.9	3.4	3.4	3.3	10.6	0.6	7.3	11.6	7.2	4.0	3.3
43	0	43	0.457	0.004	7.76%	6.45	6.69	3.9	3.4	3.4	3.3	10.6	0.6	7.3	11.7	7.2	4.0	3.3
43	0	43	0.459	0.003	7.81%	6.45	6.69	3.9	3.4	3.4	3.3	10.6	0.6	7.3	11.8	7.2	4.0	3.3
43	0	43	0.462	0.003	7.86%	6.45	6.71	3.9	3.4	3.4	3.3	10.6	0.6	7.3	12.0	7.3	4.0	3.4
43	0	43	0.466	0.004	7.92%	6.46	6.73	3.9	3.4	3.4	3.3	10.6	0.6	7.3	12.2	7.3	4.0	3.4
44	0	44	0.469	0.004	7.98%	6.46	6.76	3.9	3.4	3.4	3.3	10.7	0.6	7.4	12.4	7.3	4.0	3.4
44	0	44	0.473	0.004	8.04%	6.47	6.80	3.9	3.4	3.4	3.3	10.7	0.6	7.4	12.6	7.3	4.0	3.4
44	0	44	0.476	0.003	8.09%	6.47	6.75	3.9	3.4	3.4	3.3	10.6	0.6	7.3	12.7	7.3	4.0	3.4
44	1	44	0.479	0.003	8.14%	6.47	6.83	3.9	3.4	3.4	3.3	10.7	0.6	7.4	13.0	7.3	4.0	3.4
44	0	44	0.482	0.004	8.20%	6.48	6.76	3.9	3.4	3.4	3.3	10.7	0.6	7.3	13.0	7.3	3.9	3.4
44	0	44	0.486	0.003	8.26%	6.48	6.83	3.9	3.5	3.5	3.3	10.7	0.6	7.4	13.3	7.3	4.0	3.4
44	0	44	0.488	0.002	8.30%	6.48	6.82	3.9	3.5	3.5	3.4	10.7	0.5	7.4	13.5	7.3	4.0	3.4
44	0	44	0.491	0.003	8.35%	6.49	6.84	3.9	3.5	3.5	3.4	10.7	0.5	7.4	13.7	7.3	4.0	3.4
45	0	45	0.493	0.002	8.39%	6.49	6.88	3.9	3.5	3.5	3.4	10.8	0.5	7.4	13.9	7.3	4.0	3.4
44	0	44	0.496	0.003	8.44%	6.49	6.83	3.9	3.5	3.5	3.4	10.7	0.5	7.4	14.0	7.3	3.9	3.4
45	0	45	0.499	0.003	8.49%	6.50	6.86	3.9	3.5	3.5	3.4	10.8	0.5	7.4	14.2	7.3	4.0	3.4
45	0	45	0.502	0.003	8.53%	6.50	6.90	3.9	3.5	3.5	3.4	10.8	0.5	7.4	14.4	7.3	4.0	3.4
45	0	45	0.505	0.003	8.59%	6.50	6.90	3.9	3.5	3.5	3.4	10.8	0.5	7.4	14.6	7.3	4.0	3.4
45	0	45	0.509	0.003	8.65%	6.51	6.91	3.9	3.5	3.5	3.4	10.8	0.5	7.4	14.8	7.4	4.0	3.5
45	0	45	0.511	0.003	8.69%	6.51	6.90	3.9	3.5	3.5	3.4	10.8	0.5	7.4	15.0	7.4	3.9	3.5
45	0	45	0.514	0.003	8.74%	6.51	6.92	3.9	3.5	3.5	3.4	10.8	0.5	7.4	15.3	7.4	3.9	3.5
45	0	45	0.517	0.003	8.79%	6.52	6.90	3.9	3.5	3.5	3.4	10.8	0.5	7.4	15.4	7.3	3.9	3.4
45	0	45	0.520	0.003	8.84%	6.52	6.90	3.9	3.5	3.5	3.4	10.8	0.5	7.4	15.6	7.4	3.9	3.5
45	0	45	0.523	0.003	8.89%	6.53	6.96	3.9	3.5	3.5	3.4	10.9	0.5	7.4	15.9	7.4	3.9	3.5
45	0	45	0.526	0.003	8.94%	6.53	6.95	3.9	3.5	3.5	3.4	10.9	0.5	7.4	16.1	7.4	3.9	3.5
45	0	45	0.528	0.002	8.98%	6.53	6.96	3.9	3.6	3.6	3.4	10.9	0.5	7.4	16.4	7.4	3.9	3.5
46	0	46	0.531	0.003	9.03%	6.54	6.99	3.9	3.6	3.6	3.5	10.9	0.4	7.4	16.7	7.4	3.9	3.5
46	0	46	0.534	0.003	9.08%	6.54	6.99	3.9	3.6	3.6	3.5	10.9	0.4	7.4	17.0	7.4	3.9	3.5
46	0	46	0.537	0.003	9.13%	6.54	6.98	3.9	3.6	3.6	3.5	10.9	0.4	7.4	17.1	7.4	3.9	3.5
46	0	46	0.541	0.004	9.19%	6.55	7.01	3.9	3.6	3.6	3.5	10.9	0.4	7.4	17.5	7.4	3.9	3.5
46	0	46	0.543	0.003	9.24%	6.55	7.02	3.9	3.6	3.6	3.5	10.9	0.4	7.4	17.8	7.4	3.9	3.5
46	0	46	0.546	0.003	9.29%	6.55	7.01	3.9	3.6	3.6	3.5	10.9	0.4	7.4	17.9	7.4	3.9	3.5
46	0	46	0.549	0.003	9.33%	6.56	7.03	3.9	3.6	3.6	3.5	10.9	0.4	7.4	18.3	7.4	3.9	3.5
46	0	46	0.553	0.004	9.39%	6.56	7.01	3.9	3.6	3.6	3.5	10.9	0.4	7.4	18.5	7.4	3.9	3.5
46	0	46	0.555	0.003	9.44%	6.57	7.03	3.9	3.6	3.6	3.5	10.9	0.4	7.4	18.9	7.4	3.9	3.5
46	0	46	0.557	0.002	9.48%	6.57	7.05	3.9	3.6	3.6	3.5	10.9	0.4	7.4	19.3	7.4	3.9	3.5
46	0	46	0.561	0.003	9.53%	6.57	6.99	3.9	3.6	3.6	3.5	10.9	0.4	7.4	19.4	7.4	3.9	3.5
46	0	46	0.563	0.003	9.58%	6.58	7.03	3.9	3.6	3.6	3.5	10.9	0.4	7.4	19.8	7.4	3.9	3.5
47	0	47	0.566	0.002	9.62%	6.58	7.08	3.9	3.6	3.6	3.5	11.0	0.4	7.4	20.3	7.4	3.9	3.5
46	0	46	0.568	0.003	9.66%	6.58	7.01	3.9	3.6	3.6	3.5	10.9	0.4	7.4	20.5	7.4	3.9	3.5
47	1	47	0.571	0.002	9.70%	6.58	7.10	3.9	3.7	3.7	3.5	11.0	0.4	7.5	21.0	7.5	3.9	3.6
47	0	47	0.574	0.003	9.76%	6.59	7.09	3.9	3.7	3.7	3.6	11.0	0.3	7.4	21.3	7.4	3.9	3.5
47	0	47	0.577	0.003	9.81%	6.59	7.09	3.9	3.7	3.7	3.6	11.0	0.3	7.4	21.7	7.4	3.9	3.5
46	0	46	0.580	0.003	9.85%	6.60	7.03	3.9	3.7	3.7	3.6	10.9	0.3	7.4	21.9	7.4	3.9	3.5

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p	p'	q
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		$(\sigma_1+\sigma_3)/2$ (psi)	$(\sigma_1'+\sigma_3')/2$ (psi)	$(\sigma_1-\sigma_3)/2$ (psi)
47	0	47	0.582	0.003	9.90%	6.60	7.09	3.9	3.7	3.7	3.6	11.0	0.3	7.4	22.4	7.4	3.9	3.5
47	0	47	0.585	0.003	9.95%	6.60	7.06	3.9	3.7	3.7	3.6	11.0	0.3	7.4	22.7	7.4	3.9	3.5
47	0	47	0.588	0.003	10.00%	6.61	7.12	3.9	3.7	3.7	3.6	11.0	0.3	7.4	23.3	7.5	3.9	3.6
47	0	47	0.591	0.003	10.04%	6.61	7.12	3.9	3.7	3.7	3.6	11.0	0.3	7.4	23.6	7.5	3.9	3.6
47	0	47	0.593	0.002	10.08%	6.61	7.14	3.9	3.7	3.7	3.6	11.0	0.3	7.5	24.1	7.5	3.9	3.6
47	0	47	0.597	0.004	10.14%	6.62	7.15	3.9	3.7	3.7	3.6	11.0	0.3	7.5	24.6	7.5	3.9	3.6
47	0	47	0.599	0.002	10.18%	6.62	7.14	3.9	3.7	3.7	3.6	11.0	0.3	7.4	24.9	7.5	3.9	3.6
47	0	47	0.601	0.002	10.22%	6.62	7.10	3.9	3.7	3.7	3.6	11.0	0.3	7.4	25.3	7.5	3.8	3.6
48	1	48	0.604	0.003	10.27%	6.63	7.18	3.9	3.7	3.7	3.6	11.1	0.3	7.5	26.0	7.5	3.9	3.6
47	0	47	0.607	0.003	10.32%	6.63	7.12	3.9	3.7	3.7	3.6	11.0	0.3	7.4	26.4	7.5	3.8	3.6
48	0	48	0.610	0.003	10.37%	6.63	7.16	3.9	3.7	3.7	3.6	11.1	0.3	7.4	26.8	7.5	3.9	3.6
47	0	47	0.612	0.003	10.41%	6.64	7.16	3.9	3.7	3.7	3.6	11.1	0.3	7.4	27.3	7.5	3.8	3.6
47	0	47	0.615	0.003	10.46%	6.64	7.15	3.9	3.7	3.7	3.6	11.0	0.3	7.4	27.9	7.5	3.8	3.6
48	0	48	0.618	0.003	10.51%	6.64	7.17	3.9	3.7	3.7	3.6	11.1	0.3	7.4	28.6	7.5	3.8	3.6
48	0	48	0.621	0.003	10.56%	6.65	7.15	3.9	3.8	3.8	3.6	11.0	0.3	7.4	29.1	7.5	3.8	3.6
48	0	48	0.624	0.003	10.61%	6.65	7.19	3.9	3.8	3.8	3.6	11.1	0.3	7.4	29.7	7.5	3.8	3.6
48	0	48	0.627	0.003	10.66%	6.66	7.21	3.9	3.8	3.8	3.7	11.1	0.2	7.5	30.3	7.5	3.9	3.6
48	0	48	0.630	0.003	10.72%	6.66	7.18	3.9	3.8	3.8	3.7	11.1	0.2	7.4	30.9	7.5	3.8	3.6
48	0	48	0.633	0.003	10.76%	6.66	7.19	3.9	3.8	3.8	3.7	11.1	0.2	7.4	31.6	7.5	3.8	3.6
48	0	48	0.637	0.004	10.82%	6.67	7.20	3.9	3.8	3.8	3.7	11.1	0.2	7.4	32.3	7.5	3.8	3.6
48	0	48	0.640	0.003	10.87%	6.67	7.22	3.9	3.8	3.8	3.7	11.1	0.2	7.4	33.1	7.5	3.8	3.6
48	0	48	0.643	0.003	10.93%	6.68	7.25	3.9	3.8	3.8	3.7	11.1	0.2	7.5	34.0	7.5	3.8	3.6
48	0	48	0.646	0.003	10.99%	6.68	7.20	3.9	3.8	3.8	3.7	11.1	0.2	7.4	34.4	7.5	3.8	3.6
49	1	49	0.649	0.003	11.04%	6.68	7.29	3.9	3.8	3.8	3.7	11.2	0.2	7.5	35.6	7.5	3.9	3.6
49	0	49	0.653	0.004	11.10%	6.69	7.26	3.9	3.8	3.8	3.7	11.2	0.2	7.5	36.2	7.5	3.8	3.6
49	0	49	0.656	0.003	11.15%	6.69	7.29	3.9	3.8	3.8	3.7	11.2	0.2	7.5	37.1	7.5	3.8	3.6
49	0	49	0.659	0.004	11.21%	6.70	7.29	3.9	3.8	3.8	3.7	11.2	0.2	7.5	38.0	7.5	3.8	3.6
49	0	49	0.663	0.004	11.27%	6.70	7.34	3.9	3.8	3.8	3.7	11.2	0.2	7.5	39.2	7.6	3.9	3.7
49	0	49	0.666	0.003	11.32%	6.70	7.31	3.9	3.8	3.8	3.7	11.2	0.2	7.5	40.2	7.6	3.8	3.7
49	0	49	0.670	0.004	11.39%	6.71	7.35	3.9	3.8	3.8	3.7	11.3	0.2	7.5	41.0	7.6	3.9	3.7
49	0	49	0.673	0.003	11.44%	6.71	7.36	3.9	3.8	3.8	3.7	11.3	0.2	7.5	42.0	7.6	3.9	3.7
49	0	49	0.676	0.003	11.49%	6.72	7.35	3.9	3.8	3.8	3.7	11.2	0.2	7.5	43.0	7.6	3.8	3.7
50	0	50	0.678	0.003	11.54%	6.72	7.38	3.9	3.8	3.8	3.7	11.3	0.2	7.6	44.4	7.6	3.9	3.7
49	0	49	0.681	0.002	11.58%	6.72	7.36	3.9	3.8	3.8	3.7	11.3	0.2	7.5	45.2	7.6	3.8	3.7
50	0	50	0.685	0.004	11.64%	6.73	7.36	3.9	3.8	3.8	3.7	11.3	0.2	7.5	46.0	7.6	3.8	3.7
50	0	50	0.687	0.002	11.68%	6.73	7.37	3.9	3.8	3.8	3.7	11.3	0.2	7.5	47.2	7.6	3.8	3.7
50	0	50	0.690	0.003	11.73%	6.74	7.39	3.9	3.9	3.9	3.7	11.3	0.2	7.5	48.4	7.6	3.8	3.7
50	0	50	0.693	0.003	11.78%	6.74	7.36	3.9	3.9	3.9	3.7	11.3	0.2	7.5	49.7	7.6	3.8	3.7
50	0	50	0.696	0.003	11.84%	6.74	7.38	3.9	3.9	3.9	3.8	11.3	0.1	7.5	51.4	7.6	3.8	3.7
50	0	50	0.699	0.003	11.89%	6.75	7.40	3.9	3.9	3.9	3.8	11.3	0.1	7.5	52.5	7.6	3.8	3.7
50	0	50	0.702	0.003	11.94%	6.75	7.37	3.9	3.9	3.9	3.8	11.3	0.1	7.5	53.8	7.6	3.8	3.7
50	0	50	0.705	0.003	11.99%	6.76	7.40	3.9	3.9	3.9	3.8	11.3	0.1	7.5	55.5	7.6	3.8	3.7
50	0	50	0.708	0.002	12.03%	6.76	7.37	3.9	3.9	3.9	3.8	11.3	0.1	7.5	56.6	7.6	3.8	3.7
50	0	50	0.711	0.003	12.08%	6.76	7.41	3.9	3.9	3.9	3.8	11.3	0.1	7.5	58.5	7.6	3.8	3.7
50	0	50	0.714	0.003	12.13%	6.77	7.39	3.9	3.9	3.9	3.8	11.3	0.1	7.5	60.6	7.6	3.8	3.7
50	0	50	0.717	0.003	12.18%	6.77	7.43	3.9	3.9	3.9	3.8	11.3	0.1	7.5	62.2	7.6	3.8	3.7
50	0	50	0.719	0.003	12.23%	6.77	7.44	3.9	3.9	3.9	3.8	11.3	0.1	7.6	63.6	7.6	3.8	3.7
50	0	50	0.722	0.003	12.28%	6.78	7.43	3.9	3.9	3.9	3.8	11.3	0.1	7.5	70.2	7.6	3.8	3.7

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
50	0	50	0.725	0.002	12.32%	6.78	7.44	3.9	3.9	3.9	3.8	11.3	0.1	7.5	72.3	7.6	3.8	3.7
51	0	51	0.728	0.003	12.37%	6.79	7.45	3.9	3.9	3.9	3.8	11.4	0.1	7.6	75.8	7.6	3.8	3.7
51	0	51	0.731	0.003	12.43%	6.79	7.44	3.9	3.9	3.9	3.8	11.3	0.1	7.5	78.8	7.6	3.8	3.7
51	0	51	0.734	0.003	12.48%	6.79	7.45	3.9	3.9	3.9	3.8	11.3	0.1	7.5	81.8	7.6	3.8	3.7
51	0	51	0.737	0.003	12.53%	6.80	7.46	3.9	3.9	3.9	3.8	11.4	0.1	7.6	85.4	7.6	3.8	3.7
51	0	51	0.740	0.003	12.58%	6.80	7.45	3.9	3.9	3.9	3.8	11.3	0.1	7.5	89.5	7.6	3.8	3.7
51	0	51	0.743	0.003	12.63%	6.81	7.50	3.9	3.9	3.9	3.8	11.4	0.1	7.6	94.1	7.6	3.8	3.7
51	0	51	0.746	0.003	12.68%	6.81	7.51	3.9	3.9	3.9	3.8	11.4	0.1	7.6	99.9	7.7	3.8	3.8
51	0	51	0.749	0.003	12.73%	6.81	7.51	3.9	3.9	3.9	3.8	11.4	0.1	7.6	106.0	7.7	3.8	3.8
51	0	51	0.751	0.003	12.78%	6.82	7.53	3.9	3.9	3.9	3.8	11.4	0.1	7.6	111.4	7.7	3.8	3.8
51	0	51	0.754	0.003	12.82%	6.82	7.51	3.9	3.9	3.9	3.8	11.4	0.1	7.6	116.6	7.7	3.8	3.8
51	0	51	0.757	0.003	12.87%	6.82	7.48	3.9	3.9	3.9	3.8	11.4	0.1	7.5	124.4	7.6	3.8	3.7
51	0	51	0.759	0.002	12.91%	6.83	7.51	3.9	4.0	4.0	3.8	11.4	0.1	7.6	133.4	7.7	3.8	3.8
51	0	51	0.763	0.003	12.97%	6.83	7.50	3.9	4.0	4.0	3.8	11.4	0.1	7.6	139.4	7.7	3.8	3.8
51	0	51	0.765	0.002	13.01%	6.83	7.53	3.9	4.0	4.0	3.8	11.4	0.1	7.6	150.3	7.7	3.8	3.8
52	0	52	0.768	0.003	13.06%	6.84	7.55	3.9	4.0	4.0	3.9	11.4	0.0	7.6	161.7	7.7	3.8	3.8
52	0	52	0.771	0.003	13.10%	6.84	7.54	3.9	4.0	4.0	3.9	11.4	0.0	7.6	179.2	7.7	3.8	3.8
51	0	51	0.774	0.003	13.15%	6.85	7.50	3.9	4.0	4.0	3.9	11.4	0.0	7.5	184.6	7.7	3.8	3.8
51	0	51	0.776	0.003	13.20%	6.85	7.52	3.9	4.0	4.0	3.9	11.4	0.0	7.6	206.9	7.7	3.8	3.8
52	0	52	0.779	0.003	13.25%	6.85	7.52	3.9	4.0	4.0	3.9	11.4	0.0	7.6	223.6	7.7	3.8	3.8
52	0	52	0.782	0.003	13.30%	6.86	7.53	3.9	4.0	4.0	3.9	11.4	0.0	7.6	252.4	7.7	3.8	3.8
52	0	52	0.785	0.003	13.34%	6.86	7.54	3.9	4.0	4.0	3.9	11.4	0.0	7.6	303.4	7.7	3.8	3.8
52	0	52	0.788	0.003	13.39%	6.86	7.55	3.9	4.0	4.0	3.9	11.4	0.0	7.6	341.3	7.7	3.8	3.8
52	0	52	0.791	0.003	13.44%	6.87	7.55	3.9	4.0	4.0	3.9	11.4	0.0	7.6	410.1	7.7	3.8	3.8
52	0	52	0.792	0.002	13.47%	6.87	7.57	3.9	4.0	4.0	3.9	11.5	0.0	7.6	458.0	7.7	3.8	3.8
52	0	52	0.795	0.003	13.52%	6.88	7.61	3.9	4.0	4.0	3.9	11.5	0.0	7.6	626.9	7.7	3.8	3.8
52	0	52	0.798	0.003	13.57%	6.88	7.61	3.9	4.0	4.0	3.9	11.5	0.0	7.6	771.4	7.7	3.8	3.8
52	0	52	0.801	0.003	13.61%	6.88	7.61	3.9	4.0	4.0	3.9	11.5	0.0	7.6	1133.9	7.7	3.8	3.8
52	0	52	0.804	0.003	13.66%	6.89	7.58	3.9	4.0	4.0	3.9	11.5	0.0	7.6	2226.1	7.7	3.8	3.8
53	0	53	0.806	0.002	13.70%	6.89	7.65	3.9	4.0	4.0	3.9	11.5	0.0	7.6	5385.7	7.7	3.8	3.8
52	0	52	0.809	0.003	13.75%	6.89	7.59	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-2199.9	7.7	3.8	3.8
52	0	52	0.812	0.003	13.80%	6.90	7.60	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-1154.9	7.7	3.8	3.8
53	0	53	0.815	0.003	13.85%	6.90	7.63	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-848.5	7.7	3.8	3.8
52	0	52	0.817	0.003	13.90%	6.91	7.60	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-601.0	7.7	3.8	3.8
53	0	53	0.820	0.003	13.95%	6.91	7.60	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-492.7	7.7	3.8	3.8
53	0	53	0.824	0.003	14.00%	6.91	7.65	3.9	4.0	4.0	3.9	11.6	0.0	7.6	-220.5	7.7	3.8	3.8
53	0	53	0.826	0.003	14.05%	6.92	7.64	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-357.3	7.7	3.8	3.8
53	0	53	0.829	0.003	14.10%	6.92	7.63	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-302.2	7.7	3.8	3.8
53	0	53	0.832	0.003	14.15%	6.93	7.63	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-269.0	7.7	3.8	3.8
53	0	53	0.837	0.004	14.22%	6.93	7.65	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-231.8	7.7	3.8	3.8
53	0	53	0.839	0.003	14.27%	6.94	7.65	3.9	4.0	4.0	3.9	11.6	0.0	7.6	-207.8	7.7	3.8	3.8
53	0	53	0.842	0.003	14.32%	6.94	7.64	3.9	4.0	4.0	3.9	11.5	0.0	7.6	-190.0	7.7	3.8	3.8
54	1	54	0.846	0.004	14.38%	6.94	7.71	3.9	4.1	4.1	3.9	11.6	0.0	7.7	-175.8	7.8	3.8	3.9
53	0	53	0.849	0.003	14.44%	6.95	7.66	3.9	4.1	4.1	3.9	11.6	0.0	7.6	-163.1	7.7	3.8	3.8
54	0	54	0.853	0.004	14.50%	6.95	7.70	3.9	4.1	4.1	4.0	11.6	-0.1	7.7	-152.2	7.8	3.8	3.9
54	0	54	0.856	0.003	14.55%	6.96	7.70	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-143.3	7.7	3.8	3.8
54	0	54	0.859	0.003	14.61%	6.96	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-132.9	7.7	3.8	3.8
54	0	54	0.862	0.003	14.66%	6.97	7.68	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-133.8	7.7	3.8	3.8

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014
Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA
Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p	p'	q
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		$(\sigma_1+\sigma_3)/2$ (psi)	$(\sigma_1'+\sigma_3')/2$ (psi)	$(\sigma_1-\sigma_3)/2$ (psi)
54	0	54	0.865	0.003	14.71%	6.97	7.68	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-113.0	7.7	3.8	3.8
54	0	54	0.868	0.003	14.76%	6.98	7.67	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-107.5	7.7	3.8	3.8
53	0	53	0.871	0.003	14.81%	6.98	7.64	3.9	4.1	4.1	4.0	11.5	-0.1	7.6	-114.4	7.7	3.8	3.8
53	0	53	0.874	0.003	14.87%	6.98	7.65	3.9	4.1	4.1	4.0	11.5	-0.1	7.6	-100.2	7.7	3.7	3.8
53	0	53	0.877	0.003	14.91%	6.99	7.62	3.9	4.1	4.1	4.0	11.5	-0.1	7.5	-106.2	7.7	3.7	3.8
53	0	53	0.881	0.004	14.97%	6.99	7.60	3.9	4.1	4.1	4.0	11.5	-0.1	7.5	-100.7	7.7	3.7	3.8
54	0	54	0.883	0.002	15.01%	7.00	7.66	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-99.0	7.7	3.8	3.8
53	0	53	0.886	0.004	15.07%	7.00	7.62	3.9	4.1	4.1	4.0	11.5	-0.1	7.5	-96.3	7.7	3.7	3.8
53	0	53	0.890	0.003	15.12%	7.00	7.63	3.9	4.1	4.1	4.0	11.5	-0.1	7.6	-91.9	7.7	3.7	3.8
54	0	54	0.892	0.002	15.17%	7.01	7.66	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-100.5	7.7	3.8	3.8
54	0	54	0.895	0.003	15.22%	7.01	7.63	3.9	4.1	4.1	4.0	11.5	-0.1	7.6	-97.8	7.7	3.7	3.8
54	0	54	0.898	0.003	15.28%	7.02	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-97.0	7.7	3.8	3.8
54	0	54	0.901	0.002	15.32%	7.02	7.66	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-93.5	7.7	3.7	3.8
54	0	54	0.904	0.003	15.37%	7.03	7.64	3.9	4.1	4.1	4.0	11.5	-0.1	7.6	-91.1	7.7	3.7	3.8
54	0	54	0.907	0.003	15.42%	7.03	7.67	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-89.0	7.7	3.8	3.8
54	0	54	0.909	0.003	15.46%	7.03	7.65	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-84.6	7.7	3.7	3.8
54	0	54	0.912	0.003	15.51%	7.04	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-84.7	7.7	3.8	3.8
54	0	54	0.915	0.003	15.56%	7.04	7.71	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-83.8	7.8	3.8	3.9
54	0	54	0.918	0.003	15.61%	7.05	7.66	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-81.1	7.7	3.7	3.8
54	0	54	0.921	0.003	15.66%	7.05	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-79.4	7.7	3.7	3.8
54	0	54	0.924	0.003	15.72%	7.05	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-76.7	7.7	3.7	3.8
54	0	54	0.927	0.003	15.76%	7.06	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-74.7	7.7	3.7	3.8
54	0	54	0.930	0.003	15.82%	7.06	7.66	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-72.8	7.7	3.7	3.8
54	0	54	0.933	0.003	15.87%	7.07	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-72.8	7.7	3.7	3.8
55	0	55	0.936	0.003	15.91%	7.07	7.71	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-71.3	7.8	3.7	3.9
54	0	54	0.939	0.003	15.97%	7.08	7.66	3.9	4.1	4.1	4.0	11.6	-0.1	7.5	-68.7	7.7	3.7	3.8
54	0	54	0.942	0.003	16.02%	7.08	7.67	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-67.0	7.7	3.7	3.8
54	0	54	0.945	0.003	16.06%	7.08	7.68	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-66.1	7.7	3.7	3.8
55	0	55	0.948	0.003	16.11%	7.09	7.73	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-65.6	7.8	3.7	3.9
55	0	55	0.950	0.002	16.15%	7.09	7.71	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-63.5	7.8	3.7	3.9
55	0	55	0.953	0.003	16.21%	7.10	7.72	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-62.2	7.8	3.7	3.9
55	0	55	0.956	0.003	16.25%	7.10	7.72	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-61.6	7.8	3.7	3.9
55	0	55	0.959	0.003	16.30%	7.10	7.70	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-60.8	7.8	3.7	3.9
55	0	55	0.961	0.003	16.35%	7.11	7.71	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-62.5	7.8	3.7	3.9
55	0	55	0.964	0.002	16.39%	7.11	7.74	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-55.9	7.8	3.7	3.9
55	0	55	0.967	0.003	16.44%	7.12	7.70	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-56.1	7.8	3.7	3.9
55	0	55	0.970	0.003	16.49%	7.12	7.70	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-57.1	7.8	3.7	3.9
55	0	55	0.973	0.003	16.54%	7.12	7.71	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-59.5	7.8	3.7	3.9
55	0	55	0.975	0.003	16.58%	7.13	7.71	3.9	4.2	4.2	4.0	11.6	-0.1	7.6	-53.0	7.8	3.7	3.9
55	0	55	0.977	0.002	16.62%	7.13	7.67	3.9	4.1	4.1	4.0	11.6	-0.1	7.5	-54.9	7.7	3.7	3.8
55	0	55	0.980	0.003	16.67%	7.13	7.68	3.9	4.1	4.1	4.0	11.6	-0.1	7.5	-56.6	7.7	3.7	3.8
55	0	55	0.984	0.003	16.73%	7.14	7.67	3.9	4.1	4.1	4.0	11.6	-0.1	7.5	-58.8	7.7	3.7	3.8
55	0	55	0.986	0.002	16.77%	7.14	7.67	3.9	4.2	4.2	4.0	11.6	-0.1	7.5	-52.5	7.7	3.7	3.8
55	0	55	0.989	0.003	16.81%	7.15	7.68	3.9	4.1	4.1	4.0	11.6	-0.1	7.5	-54.4	7.7	3.7	3.8
55	0	55	0.991	0.003	16.86%	7.15	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-56.6	7.7	3.7	3.8
55	0	55	0.994	0.003	16.91%	7.16	7.68	3.9	4.2	4.2	4.0	11.6	-0.1	7.5	-50.6	7.7	3.7	3.8
55	0	55	0.997	0.003	16.95%	7.16	7.66	3.9	4.1	4.1	4.0	11.6	-0.1	7.5	-53.6	7.7	3.7	3.8
55	0	55	1.000	0.004	17.01%	7.16	7.67	3.9	4.1	4.1	4.0	11.6	-0.1	7.5	-55.2	7.7	3.7	3.8

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson Test type: CU Project No 1984.1.1 Sample ID: B-08 U1 @ 5 - 7 ft. Depth: N/A Date: 6/18/2014
Filter Paper type and design: 617 with filter strips Height (post consol): 5.882 in. Load Cell Constant: NA
Membrane Thickness: 0.016 in X 2 Cell Pressure 31.9 psi Strain Rate 0.005882 in/min Tested By: B. Adame Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p	p'	q
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		$(\sigma_1+\sigma_3)/2$ (psi)	$(\sigma_1'+\sigma_3')/2$ (psi)	$(\sigma_1-\sigma_3)/2$ (psi)
55	0	55	1.003	0.002	17.05%	7.17	7.69	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-47.9	7.7	3.7	3.8
55	0	55	1.005	0.002	17.09%	7.17	7.69	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-50.2	7.7	3.7	3.8
55	0	55	1.008	0.003	17.15%	7.18	7.69	3.9	4.2	4.2	4.0	11.6	-0.1	7.6	-52.4	7.7	3.7	3.8
55	0	55	1.010	0.002	17.18%	7.18	7.69	3.9	4.1	4.1	4.0	11.6	-0.1	7.6	-54.0	7.7	3.7	3.8
55	0	55	1.013	0.003	17.23%	7.18	7.69	3.9	4.2	4.2	4.0	11.6	-0.1	7.5	-52.1	7.7	3.7	3.8
55	0	55	1.016	0.003	17.28%	7.19	7.66	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-47.8	7.7	3.7	3.8
55	0	55	1.019	0.003	17.33%	7.19	7.70	3.9	4.2	4.2	4.0	11.6	-0.1	7.5	-50.7	7.7	3.7	3.8
55	0	55	1.023	0.003	17.39%	7.20	7.70	3.9	4.2	4.2	4.0	11.6	-0.1	7.6	-52.8	7.8	3.7	3.9
55	0	55	1.026	0.003	17.44%	7.20	7.70	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-47.3	7.7	3.7	3.8
55	0	55	1.029	0.004	17.50%	7.21	7.69	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-48.0	7.7	3.7	3.8
55	0	55	1.033	0.004	17.56%	7.21	7.65	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-49.0	7.7	3.7	3.8
55	0	55	1.036	0.003	17.62%	7.22	7.66	3.9	4.2	4.2	4.0	11.6	-0.1	7.5	-50.8	7.7	3.7	3.8
55	0	55	1.039	0.003	17.67%	7.22	7.66	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-49.8	7.7	3.7	3.8
55	0	55	1.043	0.003	17.73%	7.23	7.65	3.9	4.2	4.2	4.1	11.5	-0.2	7.5	-46.1	7.7	3.7	3.8
56	1	56	1.045	0.003	17.78%	7.23	7.72	3.9	4.2	4.2	4.1	11.6	-0.2	7.6	-47.6	7.8	3.7	3.9
56	0	56	1.049	0.003	17.83%	7.24	7.72	3.9	4.2	4.2	4.1	11.6	-0.2	7.6	-49.2	7.8	3.7	3.9
56	0	56	1.052	0.003	17.88%	7.24	7.75	3.9	4.2	4.2	4.1	11.6	-0.2	7.6	-49.9	7.8	3.7	3.9
56	0	56	1.055	0.003	17.94%	7.24	7.73	3.9	4.2	4.2	4.1	11.6	-0.2	7.6	-44.4	7.8	3.7	3.9
56	0	56	1.058	0.003	17.99%	7.25	7.66	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-46.7	7.7	3.7	3.8
56	0	56	1.061	0.003	18.05%	7.25	7.69	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-48.4	7.7	3.7	3.8
56	0	56	1.064	0.003	18.09%	7.26	7.66	3.9	4.2	4.2	4.1	11.6	-0.2	7.5	-42.3	7.7	3.7	3.8
55	0	55	1.068	0.004	18.16%	7.27	7.63	3.9	4.2	4.2	4.1	11.5	-0.2	7.5	-44.6	7.7	3.6	3.8
55	0	55	1.070	0.002	18.20%	7.27	7.64	3.9	4.2	4.2	4.1	11.5	-0.2	7.5	-45.8	7.7	3.7	3.8
55	0	55	1.074	0.003	18.26%	7.27	7.59	3.9	4.2	4.2	4.1	11.5	-0.2	7.4	-46.3	7.7	3.6	3.8
55	0	55	1.077	0.003	18.31%	7.28	7.60	3.9	4.2	4.2	4.1	11.5	-0.2	7.4	-41.5	7.7	3.6	3.8
55	0	55	1.079	0.002	18.35%	7.28	7.57	3.9	4.2	4.2	4.1	11.5	-0.2	7.4	-43.5	7.7	3.6	3.8
55	0	55	1.082	0.003	18.40%	7.29	7.59	3.9	4.2	4.2	4.1	11.5	-0.2	7.4	-45.3	7.7	3.6	3.8
55	0	55	1.085	0.003	18.45%	7.29	7.55	3.9	4.2	4.2	4.1	11.5	-0.2	7.4	-45.8	7.7	3.6	3.8
55	0	55	1.088	0.003	18.50%	7.30	7.56	3.9	4.2	4.2	4.1	11.5	-0.2	7.4	-41.3	7.7	3.6	3.8
55	0	55	1.091	0.003	18.55%	7.30	7.53	3.9	4.2	4.2	4.1	11.4	-0.2	7.4	-44.1	7.7	3.6	3.8
55	0	55	1.094	0.003	18.60%	7.30	7.54	3.9	4.2	4.2	4.1	11.4	-0.2	7.4	-45.4	7.7	3.6	3.8
55	0	55	1.096	0.003	18.64%	7.31	7.55	3.9	4.2	4.2	4.1	11.5	-0.2	7.4	-41.7	7.7	3.6	3.8
55	0	55	1.099	0.003	18.69%	7.31	7.53	3.9	4.2	4.2	4.1	11.4	-0.2	7.4	-43.9	7.7	3.6	3.8
55	0	55	1.103	0.004	18.76%	7.32	7.51	3.9	4.2	4.2	4.1	11.4	-0.2	7.3	-44.8	7.7	3.6	3.8
55	0	55	1.105	0.002	18.79%	7.32	7.53	3.9	4.2	4.2	4.1	11.4	-0.2	7.3	-40.5	7.7	3.6	3.8
55	0	55	1.109	0.004	18.85%	7.33	7.51	3.9	4.2	4.2	4.1	11.4	-0.2	7.3	-42.6	7.7	3.6	3.8
55	0	55	1.111	0.002	18.90%	7.33	7.50	3.9	4.2	4.2	4.1	11.4	-0.2	7.3	-43.3	7.6	3.6	3.7
55	0	55	1.114	0.003	18.95%	7.34	7.47	3.9	4.2	4.2	4.1	11.4	-0.2	7.3	-44.4	7.6	3.6	3.7
55	0	55	1.117	0.003	18.99%	7.34	7.47	3.9	4.2	4.2	4.1	11.4	-0.2	7.3	-40.6	7.6	3.6	3.7
55	0	55	1.120	0.003	19.05%	7.34	7.50	3.9	4.2	4.2	4.1	11.4	-0.2	7.3	-42.9	7.6	3.6	3.7
55	0	55	1.123	0.003	19.09%	7.35	7.44	3.9	4.2	4.2	4.1	11.3	-0.2	7.3	-44.1	7.6	3.6	3.7
55	0	55	1.126	0.003	19.15%	7.35	7.43	3.9	4.2	4.2	4.1	11.3	-0.2	7.3	-40.1	7.6	3.5	3.7
55	0	55	1.129	0.003	19.20%	7.36	7.43	3.9	4.2	4.2	4.1	11.3	-0.2	7.3	-42.2	7.6	3.5	3.7
55	0	55	1.132	0.002	19.24%	7.36	7.43	3.9	4.2	4.2	4.1	11.3	-0.2	7.3	-43.5	7.6	3.5	3.7
55	0	55	1.135	0.003	19.29%	7.37	7.44	3.9	4.2	4.2	4.1	11.3	-0.2	7.3	-44.3	7.6	3.6	3.7
55	0	55	1.138	0.003	19.34%	7.37	7.42	3.9	4.2	4.2	4.1	11.3	-0.2	7.2	-39.3	7.6	3.5	3.7
55	0	55	1.140	0.003	19.39%	7.38	7.43	3.9	4.2	4.2	4.1	11.3	-0.2	7.3	-41.8	7.6	3.5	3.7
55	0	55	1.143	0.003	19.44%	7.38	7.40	3.9	4.2	4.2	4.1	11.3	-0.2	7.2	-42.5	7.6	3.5	3.7

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p	p'	q
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		$(\sigma_1+\sigma_3)/2$ (psi)	$(\sigma_1'+\sigma_3')/2$ (psi)	$(\sigma_1-\sigma_3)/2$ (psi)
54	0	54	1.147	0.003	19.50%	7.39	7.37	3.9	4.2	4.2	4.1	11.3	-0.2	7.2	-43.2	7.6	3.5	3.7
55	0	55	1.149	0.003	19.54%	7.39	7.38	3.9	4.2	4.2	4.1	11.3	-0.2	7.2	-43.1	7.6	3.5	3.7
55	0	55	1.152	0.003	19.59%	7.39	7.37	3.9	4.2	4.2	4.1	11.3	-0.2	7.2	-40.2	7.6	3.5	3.7
54	0	54	1.155	0.003	19.64%	7.40	7.34	3.9	4.2	4.2	4.1	11.2	-0.2	7.2	-40.9	7.6	3.5	3.7
54	0	54	1.157	0.002	19.68%	7.40	7.34	3.9	4.2	4.2	4.1	11.2	-0.2	7.2	-42.9	7.6	3.5	3.7
55	0	55	1.160	0.003	19.73%	7.41	7.36	3.9	4.2	4.2	4.1	11.3	-0.2	7.2	-43.7	7.6	3.5	3.7
54	0	54	1.163	0.003	19.78%	7.41	7.32	3.9	4.2	4.2	4.1	11.2	-0.2	7.1	-40.4	7.6	3.5	3.7
54	0	54	1.166	0.003	19.82%	7.42	7.34	3.9	4.2	4.2	4.1	11.2	-0.2	7.2	-42.9	7.6	3.5	3.7
54	0	54	1.169	0.003	19.87%	7.42	7.27	3.9	4.2	4.2	4.1	11.2	-0.2	7.1	-43.4	7.5	3.5	3.6
54	0	54	1.172	0.003	19.92%	7.42	7.28	3.9	4.2	4.2	4.1	11.2	-0.2	7.1	-44.7	7.5	3.5	3.6
54	0	54	1.174	0.003	19.96%	7.43	7.23	3.9	4.2	4.2	4.1	11.1	-0.2	7.1	-39.7	7.5	3.4	3.6
53	0	53	1.177	0.003	20.01%	7.43	7.19	3.9	4.2	4.2	4.1	11.1	-0.2	7.0	-41.4	7.5	3.4	3.6
53	0	53	1.180	0.003	20.06%	7.44	7.18	3.9	4.2	4.2	4.1	11.1	-0.2	7.0	-43.9	7.5	3.4	3.6
54	0	54	1.183	0.003	20.11%	7.44	7.19	3.9	4.2	4.2	4.1	11.1	-0.2	7.0	-40.5	7.5	3.4	3.6
53	0	53	1.185	0.002	20.14%	7.45	7.15	3.9	4.2	4.2	4.1	11.0	-0.2	7.0	-41.4	7.5	3.4	3.6
53	0	53	1.188	0.003	20.20%	7.45	7.15	3.9	4.2	4.2	4.1	11.0	-0.2	7.0	-43.8	7.5	3.4	3.6
54	0	54	1.191	0.002	20.24%	7.45	7.19	3.9	4.2	4.2	4.1	11.1	-0.2	7.0	-45.2	7.5	3.4	3.6
53	0	53	1.193	0.002	20.28%	7.46	7.14	3.9	4.2	4.2	4.1	11.0	-0.2	7.0	-40.8	7.5	3.4	3.6
53	0	53	1.196	0.003	20.33%	7.46	7.13	3.9	4.2	4.2	4.1	11.0	-0.2	7.0	-44.0	7.5	3.4	3.6
53	0	53	1.199	0.003	20.38%	7.47	7.11	3.9	4.2	4.2	4.1	11.0	-0.2	7.0	-44.7	7.5	3.4	3.6
53	0	53	1.201	0.002	20.42%	7.47	7.11	3.9	4.2	4.2	4.1	11.0	-0.2	6.9	-43.0	7.5	3.4	3.6
53	0	53	1.204	0.003	20.47%	7.48	7.09	3.9	4.2	4.2	4.1	11.0	-0.2	6.9	-45.4	7.4	3.4	3.5
53	0	53	1.206	0.002	20.51%	7.48	7.08	3.9	4.2	4.2	4.1	11.0	-0.2	6.9	-45.1	7.4	3.4	3.5
53	0	53	1.209	0.003	20.56%	7.48	7.03	3.9	4.2	4.2	4.1	10.9	-0.2	6.9	-42.0	7.4	3.4	3.5
53	1	53	1.212	0.003	20.61%	7.49	7.13	3.9	4.2	4.2	4.1	11.0	-0.2	7.0	-43.0	7.5	3.4	3.6
53	-1	53	1.216	0.003	20.67%	7.49	7.05	3.9	4.2	4.2	4.1	11.0	-0.2	6.9	-45.2	7.4	3.4	3.5
53	0	53	1.219	0.004	20.73%	7.50	7.07	3.9	4.2	4.2	4.0	11.0	-0.1	6.9	-46.6	7.4	3.4	3.5
53	0	53	1.222	0.003	20.78%	7.51	7.01	3.9	4.2	4.2	4.1	10.9	-0.2	6.9	-44.0	7.4	3.3	3.5
53	0	53	1.225	0.003	20.83%	7.51	7.02	3.9	4.2	4.2	4.0	10.9	-0.1	6.9	-47.7	7.4	3.4	3.5
52	0	52	1.229	0.004	20.90%	7.52	6.98	3.9	4.2	4.2	4.1	10.9	-0.2	6.8	-42.8	7.4	3.3	3.5
52	0	52	1.232	0.003	20.95%	7.52	6.97	3.9	4.2	4.2	4.0	10.9	-0.1	6.8	-46.4	7.4	3.3	3.5
53	0	53	1.236	0.003	21.01%	7.53	7.01	3.9	4.1	4.1	4.0	10.9	-0.1	6.9	-49.0	7.4	3.4	3.5
53	0	53	1.238	0.003	21.05%	7.53	7.00	3.9	4.2	4.2	4.1	10.9	-0.2	6.8	-45.2	7.4	3.3	3.5
53	0	53	1.242	0.003	21.11%	7.54	6.97	3.9	4.2	4.2	4.0	10.9	-0.1	6.8	-48.1	7.4	3.3	3.5
52	0	52	1.245	0.003	21.16%	7.54	6.95	3.9	4.1	4.1	4.0	10.8	-0.1	6.8	-50.4	7.4	3.3	3.5
53	0	53	1.248	0.004	21.22%	7.55	6.97	3.9	4.2	4.2	4.1	10.9	-0.2	6.8	-45.1	7.4	3.3	3.5
53	0	53	1.251	0.003	21.27%	7.55	7.01	3.9	4.2	4.2	4.0	10.9	-0.1	6.9	-46.6	7.4	3.4	3.5
53	0	53	1.255	0.004	21.33%	7.56	6.97	3.9	4.1	4.1	4.0	10.9	-0.1	6.8	-49.9	7.4	3.3	3.5
53	0	53	1.258	0.003	21.39%	7.56	6.95	3.9	4.1	4.1	4.0	10.8	-0.1	6.8	-51.6	7.4	3.3	3.5
52	0	52	1.261	0.003	21.44%	7.57	6.93	3.9	4.2	4.2	4.0	10.8	-0.1	6.8	-46.8	7.4	3.3	3.5
52	-1	52	1.264	0.003	21.49%	7.57	6.86	3.9	4.1	4.1	4.0	10.8	-0.1	6.7	-49.8	7.3	3.3	3.4
52	0	52	1.267	0.003	21.54%	7.58	6.89	3.9	4.1	4.1	4.0	10.8	-0.1	6.8	-52.4	7.3	3.3	3.4
52	0	52	1.270	0.003	21.59%	7.58	6.88	3.9	4.2	4.2	4.0	10.8	-0.1	6.7	-45.7	7.3	3.3	3.4
52	0	52	1.272	0.002	21.63%	7.59	6.85	3.9	4.2	4.2	4.0	10.8	-0.1	6.7	-46.6	7.3	3.3	3.4
52	0	52	1.275	0.003	21.68%	7.59	6.86	3.9	4.1	4.1	4.0	10.8	-0.1	6.7	-51.1	7.3	3.3	3.4
52	0	52	1.278	0.003	21.73%	7.60	6.85	3.9	4.1	4.1	4.0	10.7	-0.1	6.7	-53.1	7.3	3.3	3.4
52	0	52	1.281	0.003	21.78%	7.60	6.86	3.9	4.1	4.1	4.0	10.8	-0.1	6.7	-55.5	7.3	3.3	3.4
52	0	52	1.284	0.003	21.83%	7.61	6.82	3.9	4.1	4.1	4.0	10.7	-0.1	6.7	-49.1	7.3	3.3	3.4

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
52	0	52	1.287	0.003	21.88%	7.61	6.79	3.9	4.1	4.1	4.0	10.7	-0.1	6.7	-53.4	7.3	3.3	3.4
52	0	52	1.290	0.003	21.93%	7.62	6.81	3.9	4.1	4.1	4.0	10.7	-0.1	6.7	-57.4	7.3	3.3	3.4
52	0	52	1.293	0.003	21.98%	7.62	6.77	3.9	4.1	4.1	4.0	10.7	-0.1	6.6	-50.2	7.3	3.3	3.4
52	0	52	1.296	0.003	22.04%	7.63	6.77	3.9	4.1	4.1	4.0	10.7	-0.1	6.6	-55.2	7.3	3.3	3.4
52	0	52	1.299	0.003	22.08%	7.63	6.75	3.9	4.1	4.1	4.0	10.7	-0.1	6.6	-58.1	7.3	3.3	3.4
51	0	51	1.302	0.003	22.13%	7.64	6.74	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-60.8	7.3	3.3	3.4
51	0	51	1.305	0.003	22.18%	7.64	6.74	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-53.2	7.3	3.2	3.4
51	0	51	1.308	0.003	22.23%	7.65	6.73	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-59.8	7.3	3.3	3.4
51	0	51	1.310	0.003	22.28%	7.65	6.71	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-61.9	7.3	3.3	3.4
51	0	51	1.313	0.003	22.33%	7.65	6.70	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-56.1	7.3	3.2	3.4
51	0	51	1.316	0.003	22.38%	7.66	6.67	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-59.7	7.2	3.2	3.3
51	0	51	1.319	0.002	22.42%	7.66	6.67	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-63.7	7.2	3.2	3.3
51	0	51	1.322	0.003	22.48%	7.67	6.66	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-69.9	7.2	3.2	3.3
51	0	51	1.325	0.003	22.53%	7.67	6.65	3.9	4.1	4.1	4.0	10.5	-0.1	6.5	-60.6	7.2	3.2	3.3
51	0	51	1.328	0.003	22.58%	7.68	6.66	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-67.9	7.2	3.2	3.3
51	0	51	1.331	0.003	22.63%	7.68	6.65	3.9	4.1	4.1	4.0	10.5	-0.1	6.6	-75.2	7.2	3.2	3.3
51	0	51	1.334	0.003	22.68%	7.69	6.68	3.9	4.1	4.1	4.0	10.6	-0.1	6.6	-65.9	7.2	3.2	3.3
51	-1	51	1.337	0.003	22.72%	7.69	6.57	3.9	4.1	4.1	4.0	10.5	-0.1	6.5	-73.0	7.2	3.2	3.3
51	0	51	1.340	0.003	22.78%	7.70	6.57	3.9	4.1	4.1	4.0	10.5	-0.1	6.5	-81.5	7.2	3.2	3.3
50	0	50	1.342	0.003	22.82%	7.70	6.55	3.9	4.1	4.1	4.0	10.5	-0.1	6.5	-67.4	7.2	3.2	3.3
51	0	51	1.345	0.003	22.87%	7.71	6.58	3.9	4.1	4.1	4.0	10.5	-0.1	6.5	-74.8	7.2	3.2	3.3
50	0	50	1.348	0.003	22.92%	7.71	6.54	3.9	4.1	4.1	4.0	10.4	-0.1	6.5	-86.8	7.2	3.2	3.3
51	0	51	1.350	0.002	22.96%	7.72	6.58	3.9	4.1	4.1	4.0	10.5	-0.1	6.5	-95.0	7.2	3.2	3.3
50	0	50	1.353	0.003	23.01%	7.72	6.53	3.9	4.1	4.1	4.0	10.4	-0.1	6.4	-75.9	7.2	3.2	3.3
50	0	50	1.356	0.003	23.06%	7.73	6.53	3.9	4.1	4.1	4.0	10.4	-0.1	6.5	-86.4	7.2	3.2	3.3
51	0	51	1.359	0.003	23.10%	7.73	6.58	3.9	4.1	4.1	4.0	10.5	-0.1	6.5	-99.7	7.2	3.2	3.3
50	0	50	1.361	0.003	23.15%	7.74	6.52	3.9	4.1	4.1	4.0	10.4	-0.1	6.5	-100.8	7.2	3.2	3.3
50	0	50	1.365	0.003	23.20%	7.74	6.50	3.9	4.1	4.1	4.0	10.4	-0.1	6.4	-81.7	7.1	3.2	3.2
50	0	50	1.367	0.002	23.24%	7.75	6.46	3.9	4.1	4.1	4.0	10.4	-0.1	6.4	-96.0	7.1	3.2	3.2
50	0	50	1.370	0.003	23.29%	7.75	6.48	3.9	4.1	4.1	4.0	10.4	-0.1	6.4	-104.9	7.1	3.2	3.2
50	0	50	1.372	0.002	23.33%	7.75	6.44	3.9	4.1	4.1	4.0	10.3	-0.1	6.4	-85.5	7.1	3.1	3.2
50	0	50	1.376	0.004	23.39%	7.76	6.39	3.9	4.1	4.1	4.0	10.3	-0.1	6.3	-98.6	7.1	3.1	3.2
50	0	50	1.378	0.003	23.43%	7.77	6.41	3.9	4.1	4.1	4.0	10.3	-0.1	6.4	-114.1	7.1	3.1	3.2
50	0	50	1.381	0.003	23.48%	7.77	6.39	3.9	4.1	4.1	4.0	10.3	-0.1	6.3	-85.6	7.1	3.1	3.2
50	0	50	1.384	0.003	23.53%	7.77	6.40	3.9	4.1	4.1	4.0	10.3	-0.1	6.3	-103.8	7.1	3.1	3.2
50	0	50	1.386	0.002	23.57%	7.78	6.43	3.9	4.1	4.1	4.0	10.3	-0.1	6.4	-125.9	7.1	3.2	3.2
50	0	50	1.389	0.003	23.61%	7.78	6.38	3.9	4.1	4.1	4.0	10.3	-0.1	6.3	-97.5	7.1	3.1	3.2
49	0	49	1.392	0.003	23.66%	7.79	6.34	3.9	4.1	4.1	4.0	10.2	-0.1	6.3	-98.8	7.1	3.1	3.2
49	0	49	1.394	0.002	23.70%	7.79	6.33	3.9	4.1	4.1	4.0	10.2	-0.1	6.3	-119.5	7.1	3.1	3.2
49	0	49	1.397	0.002	23.74%	7.80	6.33	3.9	4.1	4.1	3.9	10.2	0.0	6.3	-137.7	7.1	3.1	3.2
49	0	49	1.400	0.004	23.81%	7.80	6.33	3.9	4.1	4.1	4.0	10.2	-0.1	6.3	-110.1	7.1	3.1	3.2
50	0	50	1.402	0.002	23.84%	7.81	6.35	3.9	4.1	4.1	3.9	10.2	0.0	6.3	-131.1	7.1	3.1	3.2
49	0	49	1.405	0.003	23.90%	7.81	6.30	3.9	4.1	4.1	3.9	10.2	0.0	6.3	-135.4	7.1	3.1	3.2
49	0	49	1.409	0.003	23.95%	7.82	6.32	3.9	4.1	4.1	4.0	10.2	-0.1	6.3	-112.1	7.1	3.1	3.2
49	0	49	1.411	0.003	24.00%	7.82	6.32	3.9	4.1	4.1	3.9	10.2	0.0	6.3	-139.9	7.1	3.1	3.2
49	0	49	1.415	0.004	24.06%	7.83	6.29	3.9	4.1	4.1	3.9	10.2	0.0	6.3	-142.5	7.0	3.1	3.1
49	0	49	1.418	0.003	24.11%	7.83	6.31	3.9	4.1	4.1	3.9	10.2	0.0	6.3	-133.1	7.1	3.1	3.2
49	0	49	1.421	0.003	24.16%	7.84	6.28	3.9	4.0	4.0	3.9	10.2	0.0	6.2	-164.6	7.0	3.1	3.1

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
49	0	49	1.425	0.004	24.23%	7.85	6.27	3.9	4.1	4.1	4.0	10.2	-0.1	6.2	-119.4	7.0	3.1	3.1
49	0	49	1.427	0.002	24.27%	7.85	6.28	3.9	4.0	4.0	3.9	10.2	0.0	6.2	-155.1	7.0	3.1	3.1
49	0	49	1.431	0.004	24.33%	7.86	6.27	3.9	4.0	4.0	3.9	10.2	0.0	6.2	-197.0	7.0	3.1	3.1
49	0	49	1.434	0.003	24.39%	7.86	6.24	3.9	4.1	4.1	3.9	10.1	0.0	6.2	-133.7	7.0	3.1	3.1
50	0	50	1.437	0.003	24.44%	7.87	6.30	3.9	4.0	4.0	3.9	10.2	0.0	6.3	-171.5	7.0	3.1	3.1
50	0	50	1.441	0.003	24.49%	7.87	6.31	3.9	4.0	4.0	3.9	10.2	0.0	6.3	-205.7	7.1	3.1	3.2
50	0	50	1.444	0.003	24.55%	7.88	6.30	3.9	4.1	4.1	3.9	10.2	0.0	6.3	-135.7	7.1	3.1	3.2
49	0	49	1.447	0.003	24.60%	7.89	6.27	3.9	4.0	4.0	3.9	10.2	0.0	6.2	-163.7	7.0	3.1	3.1
50	0	50	1.451	0.004	24.67%	7.89	6.27	3.9	4.0	4.0	3.9	10.2	0.0	6.2	-219.8	7.0	3.1	3.1
49	0	49	1.454	0.003	24.71%	7.90	6.26	3.9	4.1	4.1	3.9	10.2	0.0	6.2	-148.6	7.0	3.1	3.1
49	-1	49	1.457	0.004	24.78%	7.90	6.18	3.9	4.0	4.0	3.9	10.1	0.0	6.2	-193.1	7.0	3.1	3.1
49	0	49	1.460	0.003	24.82%	7.91	6.23	3.9	4.0	4.0	3.9	10.1	0.0	6.2	-245.9	7.0	3.1	3.1
49	0	49	1.463	0.003	24.87%	7.91	6.19	3.9	4.1	4.1	3.9	10.1	0.0	6.2	-139.8	7.0	3.1	3.1
49	0	49	1.465	0.003	24.91%	7.92	6.14	3.9	4.0	4.0	3.9	10.0	0.0	6.1	-203.5	7.0	3.0	3.1
49	0	49	1.469	0.003	24.97%	7.92	6.17	3.9	4.0	4.0	3.9	10.1	0.0	6.2	-297.3	7.0	3.1	3.1
49	0	49	1.471	0.003	25.02%	7.93	6.18	3.9	4.0	4.0	3.9	10.1	0.0	6.2	-244.9	7.0	3.1	3.1
49	0	49	1.474	0.003	25.07%	7.93	6.16	3.9	4.0	4.0	3.9	10.1	0.0	6.1	-176.1	7.0	3.0	3.1
49	0	49	1.477	0.003	25.11%	7.94	6.15	3.9	4.0	4.0	3.9	10.1	0.0	6.1	-232.5	7.0	3.0	3.1
49	0	49	1.480	0.003	25.17%	7.95	6.11	3.9	4.0	4.0	3.9	10.0	0.0	6.1	-403.0	7.0	3.0	3.1
49	0	49	1.484	0.004	25.23%	7.95	6.11	3.9	4.0	4.0	3.9	10.0	0.0	6.1	-575.6	7.0	3.0	3.1
49	0	49	1.486	0.002	25.27%	7.96	6.11	3.9	4.0	4.0	3.9	10.0	0.0	6.1	-282.1	7.0	3.0	3.1
49	0	49	1.489	0.003	25.31%	7.96	6.10	3.9	4.0	4.0	3.9	10.0	0.0	6.1	-6799.4	7.0	3.0	3.1
49	0	49	1.492	0.003	25.37%	7.97	6.09	3.9	4.0	4.0	3.9	10.0	0.0	6.1	9024.4	6.9	3.0	3.0
49	0	49	1.495	0.003	25.41%	7.97	6.09	3.9	4.0	4.0	3.9	10.0	0.0	6.1	3870.5	6.9	3.0	3.0
49	0	49	1.498	0.003	25.46%	7.98	6.09	3.9	4.0	4.0	3.9	10.0	0.0	6.1	2184.1	6.9	3.0	3.0
48	0	48	1.501	0.003	25.52%	7.98	6.05	3.9	4.0	4.0	3.9	9.9	0.0	6.1	1541.6	6.9	3.0	3.0
49	0	49	1.503	0.002	25.56%	7.99	6.10	3.9	4.0	4.0	3.9	10.0	0.0	6.1	759.8	7.0	3.1	3.1
49	0	49	1.506	0.003	25.61%	7.99	6.08	3.9	4.0	4.0	3.9	10.0	0.0	6.1	636.8	6.9	3.0	3.0
49	0	49	1.509	0.003	25.66%	8.00	6.07	3.9	4.0	4.0	3.9	10.0	0.0	6.1	561.3	6.9	3.0	3.0
48	0	48	1.512	0.003	25.71%	8.00	6.04	3.9	4.0	4.0	3.9	9.9	0.0	6.1	541.9	6.9	3.0	3.0
49	0	49	1.515	0.003	25.76%	8.01	6.06	3.9	4.0	4.0	3.9	10.0	0.0	6.1	504.7	6.9	3.0	3.0
48	0	48	1.518	0.003	25.81%	8.01	6.01	3.9	4.0	4.0	3.9	9.9	0.0	6.0	469.9	6.9	3.0	3.0
48	0	48	1.521	0.003	25.86%	8.02	6.03	3.9	4.0	4.0	3.9	9.9	0.0	6.0	423.1	6.9	3.0	3.0
48	0	48	1.524	0.003	25.91%	8.02	6.03	3.9	4.0	4.0	3.9	9.9	0.0	6.0	372.9	6.9	3.0	3.0
49	0	49	1.527	0.003	25.96%	8.03	6.06	3.9	4.0	4.0	3.9	10.0	0.0	6.1	349.2	6.9	3.0	3.0
49	0	49	1.530	0.003	26.01%	8.04	6.04	3.9	4.0	4.0	3.9	9.9	0.0	6.1	322.5	6.9	3.0	3.0
48	0	48	1.533	0.003	26.06%	8.04	6.00	3.9	4.0	4.0	3.9	9.9	0.0	6.0	342.1	6.9	3.0	3.0
49	0	49	1.536	0.003	26.11%	8.05	6.05	3.9	4.0	4.0	3.9	10.0	0.0	6.1	294.3	6.9	3.0	3.0
48	0	48	1.539	0.003	26.16%	8.05	6.02	3.9	4.0	4.0	3.9	9.9	0.0	6.0	296.1	6.9	3.0	3.0
49	0	49	1.541	0.002	26.19%	8.06	6.04	3.9	4.0	4.0	3.9	9.9	0.0	6.1	281.7	6.9	3.0	3.0
48	0	48	1.544	0.004	26.25%	8.06	6.00	3.9	4.0	4.0	3.9	9.9	0.0	6.0	264.0	6.9	3.0	3.0
49	0	49	1.546	0.002	26.29%	8.07	6.03	3.9	4.0	4.0	3.9	9.9	0.0	6.1	240.7	6.9	3.0	3.0
49	0	49	1.550	0.003	26.35%	8.07	6.01	3.9	4.0	4.0	3.9	9.9	0.0	6.0	233.6	6.9	3.0	3.0
48	0	48	1.552	0.002	26.39%	8.08	5.97	3.9	4.0	4.0	3.9	9.9	0.0	6.0	218.4	6.9	3.0	3.0
48	0	48	1.555	0.003	26.44%	8.08	5.98	3.9	4.0	4.0	3.9	9.9	0.0	6.0	204.2	6.9	3.0	3.0
48	0	48	1.558	0.003	26.49%	8.09	5.98	3.9	4.0	4.0	3.9	9.9	0.0	6.0	188.1	6.9	3.0	3.0
48	0	48	1.561	0.003	26.54%	8.09	5.95	3.9	4.0	4.0	3.9	9.8	0.0	6.0	181.7	6.9	3.0	3.0
48	0	48	1.563	0.002	26.58%	8.10	5.93	3.9	4.0	4.0	3.9	9.8	0.0	6.0	166.6	6.9	3.0	3.0

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p	p'	q
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		$(\sigma_1+\sigma_3)/2$ (psi)	$(\sigma_1'+\sigma_3')/2$ (psi)	$(\sigma_1-\sigma_3)/2$ (psi)
48	0	48	1.566	0.003	26.63%	8.10	5.90	3.9	4.0	4.0	3.9	9.8	0.0	5.9	161.2	6.8	3.0	2.9
48	0	48	1.569	0.003	26.67%	8.11	5.91	3.9	4.0	4.0	3.9	9.8	0.0	6.0	157.1	6.9	3.0	3.0
48	0	48	1.572	0.003	26.73%	8.11	5.89	3.9	4.0	4.0	3.9	9.8	0.0	5.9	143.9	6.8	3.0	2.9
48	0	48	1.574	0.002	26.76%	8.12	5.90	3.9	4.0	4.0	3.9	9.8	0.0	5.9	143.0	6.9	3.0	3.0
48	0	48	1.577	0.003	26.81%	8.12	5.91	3.9	4.0	4.0	3.9	9.8	0.0	6.0	135.5	6.9	3.0	3.0
48	0	48	1.579	0.002	26.85%	8.13	5.88	3.9	4.0	4.0	3.9	9.8	0.0	5.9	129.0	6.8	3.0	2.9
48	0	48	1.582	0.003	26.90%	8.13	5.92	3.9	4.0	4.0	3.8	9.8	0.1	6.0	118.1	6.9	3.0	3.0
48	0	48	1.585	0.003	26.95%	8.14	5.88	3.9	3.9	3.9	3.8	9.8	0.1	5.9	97.6	6.8	3.0	2.9
48	0	48	1.587	0.002	26.99%	8.14	5.85	3.9	4.0	4.0	3.8	9.8	0.1	5.9	106.2	6.8	3.0	2.9
48	0	48	1.590	0.002	27.03%	8.15	5.86	3.9	4.0	4.0	3.8	9.8	0.1	5.9	109.8	6.8	3.0	2.9
48	0	48	1.593	0.003	27.08%	8.15	5.87	3.9	4.0	4.0	3.8	9.8	0.1	5.9	115.2	6.8	3.0	2.9
48	0	48	1.596	0.003	27.13%	8.16	5.85	3.9	4.0	4.0	3.8	9.8	0.1	5.9	115.9	6.8	3.0	2.9
48	0	48	1.599	0.003	27.18%	8.16	5.89	3.9	4.0	4.0	3.8	9.8	0.1	5.9	117.5	6.8	3.0	2.9
48	0	48	1.602	0.003	27.23%	8.17	5.88	3.9	4.0	4.0	3.8	9.8	0.1	5.9	115.5	6.8	3.0	2.9
48	0	48	1.605	0.003	27.28%	8.18	5.86	3.9	4.0	4.0	3.8	9.8	0.1	5.9	115.7	6.8	3.0	2.9
48	0	48	1.608	0.003	27.34%	8.18	5.86	3.9	4.0	4.0	3.8	9.8	0.1	5.9	109.2	6.8	3.0	2.9
48	0	48	1.611	0.003	27.40%	8.19	5.86	3.9	4.0	4.0	3.8	9.8	0.1	5.9	105.0	6.8	3.0	2.9
48	0	48	1.614	0.003	27.45%	8.20	5.85	3.9	4.0	4.0	3.8	9.7	0.1	5.9	104.6	6.8	3.0	2.9
48	0	48	1.618	0.003	27.51%	8.20	5.83	3.9	4.0	4.0	3.8	9.7	0.1	5.9	103.5	6.8	3.0	2.9
48	0	48	1.621	0.003	27.56%	8.21	5.88	3.9	4.0	4.0	3.8	9.8	0.1	5.9	102.5	6.8	3.0	2.9
48	0	48	1.624	0.003	27.61%	8.21	5.88	3.9	4.0	4.0	3.8	9.8	0.1	5.9	100.7	6.8	3.0	2.9
48	0	48	1.627	0.003	27.66%	8.22	5.85	3.9	4.0	4.0	3.8	9.7	0.1	5.9	100.2	6.8	3.0	2.9
48	0	48	1.630	0.003	27.72%	8.23	5.88	3.9	3.9	3.9	3.8	9.8	0.1	5.9	97.2	6.8	3.0	2.9
48	0	48	1.634	0.004	27.79%	8.23	5.89	3.9	3.9	3.9	3.8	9.8	0.1	5.9	94.0	6.8	3.0	2.9
49	0	49	1.637	0.003	27.84%	8.24	5.89	3.9	3.9	3.9	3.8	9.8	0.1	6.0	90.3	6.8	3.0	2.9
49	0	49	1.640	0.003	27.89%	8.24	5.92	3.9	3.9	3.9	3.8	9.8	0.1	6.0	89.9	6.9	3.0	3.0
49	0	49	1.643	0.003	27.94%	8.25	5.93	3.9	3.9	3.9	3.8	9.8	0.1	6.0	87.7	6.9	3.0	3.0
49	0	49	1.647	0.003	28.00%	8.26	5.93	3.9	3.9	3.9	3.8	9.8	0.1	6.0	82.7	6.9	3.0	3.0
49	0	49	1.650	0.003	28.06%	8.26	5.93	3.9	3.9	3.9	3.8	9.8	0.1	6.0	79.3	6.9	3.0	3.0
49	0	49	1.653	0.003	28.11%	8.27	5.92	3.9	3.9	3.9	3.8	9.8	0.1	6.0	74.6	6.9	3.0	3.0
49	0	49	1.656	0.003	28.16%	8.28	5.91	3.9	3.9	3.9	3.8	9.8	0.1	6.0	68.4	6.9	3.0	3.0
49	0	49	1.659	0.003	28.21%	8.28	5.92	3.9	3.9	3.9	3.8	9.8	0.1	6.0	65.7	6.9	3.1	3.0
49	0	49	1.662	0.003	28.26%	8.29	5.89	3.9	3.9	3.9	3.8	9.8	0.1	6.0	63.7	6.8	3.0	2.9
49	0	49	1.665	0.002	28.30%	8.29	5.89	3.9	3.9	3.9	3.8	9.8	0.1	6.0	61.3	6.8	3.0	2.9
49	0	49	1.668	0.003	28.35%	8.30	5.91	3.9	3.9	3.9	3.8	9.8	0.1	6.0	60.9	6.9	3.1	3.0
49	0	49	1.671	0.003	28.41%	8.30	5.87	3.9	3.9	3.9	3.8	9.8	0.1	6.0	60.6	6.8	3.0	2.9
49	0	49	1.673	0.003	28.45%	8.31	5.93	3.9	3.9	3.9	3.8	9.8	0.1	6.0	59.7	6.9	3.1	3.0
49	0	49	1.677	0.003	28.51%	8.32	5.91	3.9	3.9	3.9	3.8	9.8	0.1	6.0	59.5	6.9	3.1	3.0
49	0	49	1.679	0.003	28.55%	8.32	5.92	3.9	3.9	3.9	3.8	9.8	0.1	6.0	59.0	6.9	3.1	3.0
49	0	49	1.682	0.003	28.60%	8.33	5.90	3.9	3.9	3.9	3.8	9.8	0.1	6.0	57.9	6.8	3.1	2.9
49	0	49	1.685	0.003	28.66%	8.33	5.90	3.9	3.9	3.9	3.8	9.8	0.1	6.0	57.0	6.8	3.1	2.9
49	0	49	1.688	0.003	28.70%	8.34	5.88	3.9	3.9	3.9	3.8	9.8	0.1	6.0	56.1	6.8	3.0	2.9
49	0	49	1.691	0.003	28.75%	8.34	5.91	3.9	3.9	3.9	3.8	9.8	0.1	6.0	56.1	6.9	3.1	3.0
50	0	50	1.694	0.003	28.80%	8.35	5.94	3.9	3.9	3.9	3.8	9.8	0.1	6.0	55.8	6.9	3.1	3.0
50	0	50	1.697	0.003	28.85%	8.36	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	55.5	6.9	3.1	3.0
50	0	50	1.699	0.003	28.89%	8.36	5.95	3.9	3.9	3.9	3.8	9.8	0.1	6.1	54.9	6.9	3.1	3.0
50	0	50	1.702	0.003	28.95%	8.37	5.94	3.9	3.9	3.9	3.8	9.8	0.1	6.1	54.7	6.9	3.1	3.0
50	0	50	1.705	0.003	29.00%	8.37	5.97	3.9	3.9	3.9	3.8	9.9	0.1	6.1	57.4	6.9	3.1	3.0

Triaxial Compresion Test
Loading Data
Point 1

Project: Shannon & Wilson | Test type: CU | Project No 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/18/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.882 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 31.9 psi | Strain Rate 0.005882 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell (pounds) Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge (inches) Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
50	0	50	1.708	0.002	29.04%	8.38	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	58.2	6.9	3.1	3.0
50	0	50	1.711	0.004	29.10%	8.39	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	56.6	6.9	3.1	3.0
50	0	50	1.714	0.003	29.15%	8.39	5.95	3.9	3.9	3.9	3.8	9.8	0.1	6.1	55.5	6.9	3.1	3.0
50	0	50	1.717	0.002	29.19%	8.40	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	55.2	6.9	3.1	3.0
50	0	50	1.720	0.004	29.25%	8.40	5.92	3.9	3.9	3.9	3.8	9.8	0.1	6.0	55.0	6.9	3.1	3.0
50	0	50	1.723	0.003	29.30%	8.41	5.97	3.9	3.9	3.9	3.8	9.9	0.1	6.1	55.2	6.9	3.1	3.0
51	0	51	1.726	0.003	29.34%	8.41	6.02	3.9	3.9	3.9	3.8	9.9	0.1	6.1	55.7	6.9	3.1	3.0
50	0	50	1.729	0.003	29.40%	8.42	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	55.0	6.9	3.1	3.0
50	0	50	1.731	0.002	29.44%	8.43	5.95	3.9	3.9	3.9	3.8	9.9	0.1	6.1	54.5	6.9	3.1	3.0
50	0	50	1.734	0.003	29.49%	8.43	5.99	3.9	3.9	3.9	3.8	9.9	0.1	6.1	54.0	6.9	3.1	3.0
50	0	50	1.737	0.003	29.54%	8.44	5.98	3.9	3.9	3.9	3.8	9.9	0.1	6.1	50.9	6.9	3.1	3.0
51	0	51	1.740	0.003	29.59%	8.44	5.99	3.9	3.9	3.9	3.8	9.9	0.1	6.1	51.4	6.9	3.1	3.0
51	0	51	1.742	0.002	29.62%	8.45	5.99	3.9	3.9	3.9	3.8	9.9	0.1	6.1	51.7	6.9	3.1	3.0
50	0	50	1.746	0.004	29.69%	8.46	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	51.1	6.9	3.1	3.0
51	0	51	1.749	0.003	29.73%	8.46	6.00	3.9	3.9	3.9	3.8	9.9	0.1	6.1	51.2	6.9	3.1	3.0
50	0	50	1.751	0.003	29.78%	8.47	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	50.0	6.9	3.1	3.0
51	0	51	1.755	0.003	29.83%	8.47	5.97	3.9	3.9	3.9	3.8	9.9	0.1	6.1	50.1	6.9	3.1	3.0
50	0	50	1.757	0.003	29.88%	8.48	5.95	3.9	3.9	3.9	3.8	9.9	0.1	6.1	50.1	6.9	3.1	3.0
50	0	50	1.760	0.003	29.92%	8.48	5.92	3.9	3.9	3.9	3.8	9.8	0.1	6.0	49.4	6.9	3.1	3.0
50	0	50	1.763	0.003	29.97%	8.49	5.93	3.9	3.9	3.9	3.8	9.8	0.1	6.1	48.4	6.9	3.1	3.0
50	0	50	1.765	0.002	30.01%	8.49	5.91	3.9	3.9	3.9	3.8	9.8	0.1	6.0	48.0	6.9	3.1	3.0
50	0	50	1.768	0.003	30.06%	8.50	5.91	3.9	3.9	3.9	3.8	9.8	0.1	6.0	46.5	6.9	3.1	3.0
50	0	50	1.771	0.003	30.11%	8.51	5.92	3.9	3.9	3.9	3.8	9.8	0.1	6.1	45.5	6.9	3.1	3.0
51	0	51	1.773	0.002	30.14%	8.51	5.95	3.9	3.9	3.9	3.8	9.9	0.1	6.1	45.9	6.9	3.1	3.0
51	0	51	1.776	0.003	30.19%	8.52	5.96	3.9	3.9	3.9	3.8	9.9	0.1	6.1	45.0	6.9	3.1	3.0
51	0	51	1.779	0.003	30.24%	8.52	5.95	3.9	3.9	3.9	3.8	9.8	0.1	6.1	44.4	6.9	3.1	3.0
51	0	51	1.782	0.003	30.29%	8.53	5.97	3.9	3.9	3.9	3.8	9.9	0.1	6.1	43.2	6.9	3.1	3.0
51	0	51	1.784	0.002	30.33%	8.53	5.92	3.9	3.9	3.9	3.7	9.8	0.2	6.1	40.4	6.9	3.1	3.0

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
0	-	0	0.000	-	0.00%	5.32	0.00	6.9	0.0	0.0	0.0	6.9	6.9	6.9	1.0	6.9	6.9	0.0
2	2	2	-0.002	-0.002	-0.04%	5.32	0.38	6.9	0.2	0.2	0.2	7.3	6.7	7.1	1.1	7.1	6.9	0.2
3	1	3	-0.001	0.001	-0.02%	5.32	0.56	6.9	0.3	0.3	0.3	7.5	6.6	7.2	1.1	7.2	6.9	0.3
4	1	4	0.000	0.001	0.01%	5.32	0.71	6.9	0.4	0.4	0.3	7.6	6.6	7.3	1.1	7.3	6.9	0.4
5	1	5	0.001	0.001	0.02%	5.32	0.92	6.9	0.4	0.4	0.4	7.8	6.5	7.4	1.1	7.4	7.0	0.5
7	2	7	0.003	0.002	0.05%	5.32	1.23	6.9	0.6	0.6	0.5	8.1	6.4	7.6	1.2	7.5	7.0	0.6
7	0	7	0.004	0.001	0.07%	5.32	1.32	6.9	0.6	0.6	0.6	8.2	6.3	7.6	1.2	7.6	7.0	0.7
8	1	8	0.005	0.001	0.09%	5.32	1.53	6.9	0.7	0.7	0.6	8.4	6.3	7.8	1.2	7.7	7.0	0.8
8	0	8	0.006	0.001	0.11%	5.32	1.57	6.9	0.7	0.7	0.7	8.5	6.2	7.8	1.3	7.7	7.0	0.8
9	0	9	0.007	0.001	0.12%	5.32	1.66	6.9	0.8	0.8	0.7	8.6	6.2	7.8	1.3	7.7	7.0	0.8
9	1	9	0.008	0.001	0.14%	5.32	1.77	6.9	0.8	0.8	0.8	8.7	6.1	7.9	1.3	7.8	7.0	0.9
10	1	10	0.009	0.001	0.15%	5.33	1.95	6.9	0.9	0.9	0.8	8.8	6.1	8.0	1.3	7.9	7.1	1.0
11	1	11	0.010	0.001	0.17%	5.33	2.05	6.9	0.9	0.9	0.9	8.9	6.0	8.1	1.3	7.9	7.1	1.0
11	0	11	0.011	0.001	0.19%	5.33	2.09	6.9	0.9	0.9	0.9	9.0	6.0	8.1	1.3	7.9	7.1	1.0
12	1	12	0.012	0.001	0.20%	5.33	2.21	6.9	1.0	1.0	0.9	9.1	6.0	8.2	1.4	8.0	7.1	1.1
12	0	12	0.013	0.001	0.23%	5.33	2.22	6.9	1.0	1.0	1.0	9.1	5.9	8.2	1.4	8.0	7.0	1.1
13	1	13	0.014	0.001	0.24%	5.33	2.35	6.9	1.0	1.0	1.0	9.3	5.9	8.2	1.4	8.1	7.1	1.2
13	0	13	0.015	0.001	0.25%	5.33	2.41	6.9	1.1	1.1	1.0	9.3	5.9	8.3	1.4	8.1	7.1	1.2
13	1	13	0.016	0.001	0.26%	5.33	2.52	6.9	1.1	1.1	1.1	9.4	5.8	8.3	1.4	8.2	7.1	1.3
14	0	14	0.017	0.001	0.28%	5.33	2.55	6.9	1.1	1.1	1.1	9.5	5.8	8.4	1.4	8.2	7.1	1.3
14	0	14	0.018	0.002	0.31%	5.33	2.60	6.9	1.2	1.2	1.1	9.5	5.8	8.4	1.5	8.2	7.1	1.3
14	0	14	0.020	0.001	0.33%	5.33	2.67	6.9	1.2	1.2	1.2	9.6	5.7	8.4	1.5	8.2	7.1	1.3
15	1	15	0.021	0.001	0.36%	5.34	2.77	6.9	1.2	1.2	1.2	9.7	5.7	8.5	1.5	8.3	7.1	1.4
15	0	15	0.022	0.001	0.38%	5.34	2.83	6.9	1.3	1.3	1.2	9.7	5.7	8.5	1.5	8.3	7.1	1.4
16	0	16	0.023	0.000	0.38%	5.34	2.93	6.9	1.3	1.3	1.3	9.8	5.6	8.6	1.5	8.4	7.1	1.5
16	0	16	0.024	0.001	0.40%	5.34	2.99	6.9	1.3	1.3	1.3	9.9	5.6	8.6	1.5	8.4	7.1	1.5
16	0	16	0.025	0.001	0.42%	5.34	3.02	6.9	1.4	1.4	1.3	9.9	5.6	8.6	1.5	8.4	7.1	1.5
16	0	16	0.026	0.001	0.43%	5.34	3.06	6.9	1.4	1.4	1.3	10.0	5.6	8.6	1.6	8.4	7.1	1.5
17	0	17	0.026	0.001	0.45%	5.34	3.12	6.9	1.4	1.4	1.4	10.0	5.5	8.6	1.6	8.5	7.1	1.6
17	0	17	0.027	0.001	0.46%	5.34	3.20	6.9	1.4	1.4	1.4	10.1	5.5	8.7	1.6	8.5	7.1	1.6
17	0	17	0.028	0.001	0.48%	5.34	3.21	6.9	1.5	1.5	1.4	10.1	5.5	8.7	1.6	8.5	7.1	1.6
18	0	18	0.030	0.001	0.50%	5.34	3.29	6.9	1.5	1.5	1.5	10.2	5.4	8.7	1.6	8.5	7.1	1.6
18	0	18	0.030	0.001	0.51%	5.34	3.31	6.9	1.5	1.5	1.5	10.2	5.4	8.7	1.6	8.6	7.1	1.7
18	0	18	0.032	0.001	0.54%	5.35	3.39	6.9	1.5	1.5	1.5	10.3	5.4	8.8	1.6	8.6	7.1	1.7
18	0	18	0.033	0.001	0.56%	5.35	3.38	6.9	1.6	1.6	1.5	10.3	5.4	8.7	1.6	8.6	7.1	1.7
18	0	18	0.034	0.001	0.57%	5.35	3.43	6.9	1.6	1.6	1.6	10.3	5.3	8.8	1.6	8.6	7.1	1.7
19	0	19	0.034	0.000	0.58%	5.35	3.49	6.9	1.6	1.6	1.6	10.4	5.3	8.8	1.7	8.6	7.1	1.7
19	0	19	0.035	0.001	0.59%	5.35	3.53	6.9	1.6	1.6	1.6	10.4	5.3	8.8	1.7	8.7	7.1	1.8
19	0	19	0.036	0.001	0.61%	5.35	3.52	6.9	1.7	1.7	1.6	10.4	5.3	8.8	1.7	8.7	7.0	1.8
19	0	19	0.037	0.001	0.62%	5.35	3.60	6.9	1.7	1.7	1.7	10.5	5.2	8.8	1.7	8.7	7.0	1.8
20	0	20	0.038	0.001	0.65%	5.35	3.65	6.9	1.7	1.7	1.7	10.5	5.2	8.9	1.7	8.7	7.1	1.8
19	0	19	0.039	0.001	0.67%	5.35	3.64	6.9	1.7	1.7	1.7	10.5	5.2	8.8	1.7	8.7	7.0	1.8
20	1	20	0.040	0.001	0.68%	5.35	3.73	6.9	1.8	1.8	1.7	10.6	5.2	8.9	1.7	8.8	7.0	1.9
20	0	20	0.041	0.001	0.69%	5.35	3.77	6.9	1.8	1.8	1.7	10.7	5.2	8.9	1.7	8.8	7.0	1.9
20	0	20	0.042	0.001	0.71%	5.35	3.79	6.9	1.8	1.8	1.8	10.7	5.1	8.9	1.7	8.8	7.0	1.9
21	0	21	0.043	0.001	0.73%	5.36	3.85	6.9	1.8	1.8	1.8	10.7	5.1	9.0	1.8	8.8	7.0	1.9
20	0	20	0.044	0.001	0.74%	5.36	3.83	6.9	1.8	1.8	1.8	10.7	5.1	8.9	1.8	8.8	7.0	1.9

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell (pounds) Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge (inches) Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
21	0	21	0.045	0.002	0.77%	5.36	3.89	6.9	1.9	1.9	1.8	10.8	5.1	9.0	1.8	8.8	7.0	1.9
21	0	21	0.046	0.001	0.78%	5.36	3.92	6.9	1.9	1.9	1.8	10.8	5.1	9.0	1.8	8.9	7.0	2.0
21	0	21	0.047	0.001	0.79%	5.36	3.95	6.9	1.9	1.9	1.9	10.9	5.0	9.0	1.8	8.9	7.0	2.0
21	0	21	0.047	0.001	0.80%	5.36	4.00	6.9	1.9	1.9	1.9	10.9	5.0	9.0	1.8	8.9	7.0	2.0
22	0	22	0.049	0.001	0.82%	5.36	4.05	6.9	1.9	1.9	1.9	10.9	5.0	9.0	1.8	8.9	7.0	2.0
22	0	22	0.050	0.001	0.84%	5.36	4.09	6.9	2.0	2.0	1.9	11.0	5.0	9.1	1.8	8.9	7.0	2.0
22	0	22	0.051	0.001	0.86%	5.36	4.12	6.9	2.0	2.0	1.9	11.0	5.0	9.1	1.8	9.0	7.0	2.1
22	0	22	0.052	0.001	0.87%	5.36	4.14	6.9	2.0	2.0	2.0	11.0	4.9	9.1	1.8	9.0	7.0	2.1
23	0	23	0.053	0.001	0.90%	5.37	4.20	6.9	2.0	2.0	2.0	11.1	4.9	9.1	1.9	9.0	7.0	2.1
23	0	23	0.054	0.001	0.91%	5.37	4.27	6.9	2.0	2.0	2.0	11.2	4.9	9.2	1.9	9.0	7.0	2.1
23	0	23	0.054	0.000	0.91%	5.37	4.29	6.9	2.1	2.1	2.0	11.2	4.9	9.2	1.9	9.0	7.0	2.1
23	0	23	0.055	0.001	0.93%	5.37	4.25	6.9	2.1	2.1	2.0	11.2	4.9	9.1	1.9	9.0	7.0	2.1
23	0	23	0.056	0.001	0.95%	5.37	4.34	6.9	2.1	2.1	2.1	11.2	4.8	9.2	1.9	9.1	7.0	2.2
23	0	23	0.057	0.001	0.96%	5.37	4.33	6.9	2.1	2.1	2.1	11.2	4.8	9.2	1.9	9.1	7.0	2.2
24	1	24	0.060	0.004	1.02%	5.37	4.46	6.9	2.2	2.2	2.1	11.4	4.8	9.2	1.9	9.1	7.0	2.2
24	1	24	0.063	0.003	1.06%	5.37	4.55	6.9	2.2	2.2	2.2	11.4	4.7	9.3	2.0	9.2	7.0	2.3
25	0	25	0.065	0.002	1.11%	5.38	4.63	6.9	2.3	2.3	2.2	11.5	4.7	9.3	2.0	9.2	7.0	2.3
25	0	25	0.069	0.004	1.17%	5.38	4.69	6.9	2.3	2.3	2.3	11.6	4.6	9.3	2.0	9.2	7.0	2.3
26	1	26	0.072	0.003	1.21%	5.38	4.79	6.9	2.3	2.3	2.3	11.7	4.6	9.4	2.0	9.3	7.0	2.4
26	1	26	0.077	0.006	1.31%	5.39	4.91	6.9	2.4	2.4	2.4	11.8	4.5	9.4	2.1	9.4	7.0	2.5
27	0	27	0.080	0.003	1.36%	5.39	5.00	6.9	2.5	2.5	2.4	11.9	4.5	9.5	2.1	9.4	7.0	2.5
28	1	28	0.083	0.003	1.41%	5.39	5.11	6.9	2.5	2.5	2.5	12.0	4.4	9.5	2.2	9.5	7.0	2.6
28	0	28	0.086	0.003	1.46%	5.40	5.12	6.9	2.6	2.6	2.5	12.0	4.4	9.5	2.2	9.5	6.9	2.6
28	1	28	0.089	0.003	1.51%	5.40	5.24	6.9	2.6	2.6	2.6	12.1	4.3	9.6	2.2	9.5	7.0	2.6
29	0	29	0.092	0.002	1.55%	5.40	5.28	6.9	2.6	2.6	2.6	12.2	4.3	9.6	2.2	9.5	6.9	2.6
29	0	29	0.095	0.003	1.60%	5.40	5.35	6.9	2.7	2.7	2.6	12.3	4.3	9.6	2.3	9.6	6.9	2.7
29	0	29	0.098	0.003	1.65%	5.41	5.43	6.9	2.7	2.7	2.7	12.3	4.2	9.7	2.3	9.6	6.9	2.7
30	0	30	0.100	0.003	1.69%	5.41	5.51	6.9	2.7	2.7	2.7	12.4	4.2	9.7	2.3	9.7	6.9	2.8
30	0	30	0.103	0.003	1.74%	5.41	5.57	6.9	2.8	2.8	2.7	12.5	4.2	9.7	2.3	9.7	6.9	2.8
30	0	30	0.106	0.003	1.79%	5.41	5.63	6.9	2.8	2.8	2.8	12.5	4.1	9.8	2.4	9.7	6.9	2.8
31	0	31	0.108	0.003	1.83%	5.42	5.69	6.9	2.8	2.8	2.8	12.6	4.1	9.8	2.4	9.7	6.9	2.8
31	0	31	0.111	0.003	1.88%	5.42	5.74	6.9	2.9	2.9	2.8	12.6	4.1	9.8	2.4	9.8	6.9	2.9
31	0	31	0.114	0.003	1.92%	5.42	5.78	6.9	2.9	2.9	2.9	12.7	4.0	9.8	2.4	9.8	6.9	2.9
31	0	31	0.116	0.003	1.96%	5.42	5.80	6.9	2.9	2.9	2.9	12.7	4.0	9.8	2.4	9.8	6.9	2.9
32	0	32	0.119	0.003	2.02%	5.43	5.87	6.9	3.0	3.0	2.9	12.8	4.0	9.8	2.5	9.8	6.9	2.9
32	0	32	0.123	0.004	2.08%	5.43	5.95	6.9	3.0	3.0	3.0	12.9	3.9	9.9	2.5	9.9	6.9	3.0
33	0	33	0.125	0.002	2.12%	5.43	6.02	6.9	3.0	3.0	3.0	12.9	3.9	9.9	2.5	9.9	6.9	3.0
33	0	33	0.128	0.003	2.16%	5.43	5.99	6.9	3.0	3.0	3.0	12.9	3.9	9.9	2.5	9.9	6.9	3.0
33	1	33	0.130	0.003	2.21%	5.44	6.09	6.9	3.1	3.1	3.0	13.0	3.9	10.0	2.6	9.9	6.9	3.0
33	0	33	0.133	0.003	2.26%	5.44	6.12	6.9	3.1	3.1	3.1	13.0	3.8	10.0	2.6	10.0	6.9	3.1
34	0	34	0.137	0.003	2.31%	5.44	6.19	6.9	3.1	3.1	3.1	13.1	3.8	10.0	2.6	10.0	6.9	3.1
34	0	34	0.140	0.003	2.36%	5.45	6.23	6.9	3.1	3.1	3.1	13.1	3.8	10.0	2.6	10.0	6.9	3.1
34	0	34	0.143	0.003	2.42%	5.45	6.24	6.9	3.2	3.2	3.1	13.1	3.8	10.0	2.7	10.0	6.9	3.1
34	0	34	0.146	0.003	2.47%	5.45	6.30	6.9	3.2	3.2	3.2	13.2	3.7	10.0	2.7	10.0	6.9	3.1
35	0	35	0.149	0.003	2.52%	5.45	6.34	6.9	3.2	3.2	3.2	13.2	3.7	10.1	2.7	10.1	6.9	3.2
35	0	35	0.152	0.003	2.57%	5.46	6.41	6.9	3.2	3.2	3.2	13.3	3.7	10.1	2.7	10.1	6.9	3.2
36	1	36	0.154	0.002	2.61%	5.46	6.54	6.9	3.3	3.3	3.2	13.4	3.7	10.2	2.8	10.2	6.9	3.3

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
35	0	35	0.157	0.003	2.66%	5.46	6.49	6.9	3.3	3.3	3.3	13.4	3.6	10.1	2.8	10.1	6.9	3.2
36	0	36	0.160	0.003	2.71%	5.47	6.55	6.9	3.3	3.3	3.3	13.4	3.6	10.2	2.8	10.2	6.9	3.3
36	0	36	0.164	0.003	2.77%	5.47	6.61	6.9	3.3	3.3	3.3	13.5	3.6	10.2	2.8	10.2	6.9	3.3
36	0	36	0.166	0.002	2.81%	5.47	6.62	6.9	3.4	3.4	3.3	13.5	3.6	10.2	2.9	10.2	6.9	3.3
37	0	37	0.169	0.003	2.86%	5.47	6.69	6.9	3.4	3.4	3.3	13.6	3.6	10.2	2.9	10.2	6.9	3.3
37	0	37	0.172	0.003	2.91%	5.48	6.70	6.9	3.4	3.4	3.4	13.6	3.5	10.2	2.9	10.2	6.9	3.3
37	0	37	0.175	0.003	2.96%	5.48	6.74	6.9	3.4	3.4	3.4	13.6	3.5	10.3	2.9	10.3	6.9	3.4
37	0	37	0.178	0.003	3.01%	5.48	6.81	6.9	3.4	3.4	3.4	13.7	3.5	10.3	3.0	10.3	6.9	3.4
38	0	38	0.180	0.002	3.05%	5.48	6.85	6.9	3.5	3.5	3.4	13.8	3.5	10.3	3.0	10.3	6.9	3.4
38	1	38	0.184	0.003	3.11%	5.49	6.96	6.9	3.5	3.5	3.5	13.9	3.4	10.4	3.0	10.4	6.9	3.5
38	0	38	0.187	0.003	3.16%	5.49	6.99	6.9	3.5	3.5	3.5	13.9	3.4	10.4	3.0	10.4	6.9	3.5
39	0	39	0.190	0.003	3.21%	5.49	7.07	6.9	3.5	3.5	3.5	14.0	3.4	10.5	3.1	10.4	6.9	3.5
39	0	39	0.193	0.003	3.26%	5.50	7.09	6.9	3.5	3.5	3.5	14.0	3.4	10.5	3.1	10.4	6.9	3.5
39	0	39	0.196	0.003	3.32%	5.50	7.17	6.9	3.6	3.6	3.5	14.1	3.4	10.5	3.1	10.5	7.0	3.6
40	0	40	0.200	0.004	3.39%	5.50	7.25	6.9	3.6	3.6	3.5	14.1	3.4	10.6	3.2	10.5	7.0	3.6
40	0	40	0.203	0.003	3.43%	5.51	7.31	6.9	3.6	3.6	3.6	14.2	3.3	10.6	3.2	10.6	7.0	3.7
41	1	41	0.207	0.004	3.50%	5.51	7.43	6.9	3.6	3.6	3.6	14.3	3.3	10.7	3.2	10.6	7.0	3.7
41	0	41	0.210	0.003	3.54%	5.51	7.39	6.9	3.6	3.6	3.6	14.3	3.3	10.7	3.2	10.6	7.0	3.7
41	0	41	0.214	0.004	3.62%	5.52	7.47	6.9	3.7	3.7	3.6	14.4	3.3	10.7	3.3	10.6	7.0	3.7
42	0	42	0.217	0.003	3.66%	5.52	7.55	6.9	3.7	3.7	3.6	14.5	3.3	10.8	3.3	10.7	7.0	3.8
42	0	42	0.220	0.004	3.73%	5.52	7.57	6.9	3.7	3.7	3.7	14.5	3.2	10.8	3.3	10.7	7.0	3.8
42	0	42	0.223	0.003	3.77%	5.53	7.66	6.9	3.7	3.7	3.7	14.6	3.2	10.9	3.4	10.7	7.1	3.8
42	0	42	0.226	0.003	3.82%	5.53	7.63	6.9	3.7	3.7	3.7	14.5	3.2	10.8	3.4	10.7	7.0	3.8
43	0	43	0.229	0.003	3.87%	5.53	7.69	6.9	3.7	3.7	3.7	14.6	3.2	10.9	3.4	10.7	7.0	3.8
42	0	42	0.231	0.003	3.92%	5.53	7.64	6.9	3.8	3.8	3.7	14.5	3.2	10.8	3.4	10.7	7.0	3.8
43	1	43	0.234	0.003	3.97%	5.54	7.73	6.9	3.8	3.8	3.7	14.6	3.2	10.9	3.4	10.8	7.0	3.9
42	0	42	0.237	0.003	4.01%	5.54	7.67	6.9	3.8	3.8	3.8	14.6	3.1	10.8	3.4	10.7	7.0	3.8
43	0	43	0.241	0.003	4.07%	5.54	7.70	6.9	3.8	3.8	3.8	14.6	3.1	10.8	3.5	10.7	7.0	3.8
43	0	43	0.243	0.003	4.11%	5.55	7.73	6.9	3.8	3.8	3.8	14.6	3.1	10.8	3.5	10.8	7.0	3.9
43	0	43	0.246	0.003	4.16%	5.55	7.77	6.9	3.8	3.8	3.8	14.7	3.1	10.9	3.5	10.8	7.0	3.9
43	0	43	0.250	0.004	4.22%	5.55	7.81	6.9	3.8	3.8	3.8	14.7	3.1	10.9	3.5	10.8	7.0	3.9
44	0	44	0.252	0.003	4.27%	5.55	7.88	6.9	3.9	3.9	3.8	14.8	3.1	11.0	3.6	10.8	7.0	3.9
44	0	44	0.255	0.003	4.32%	5.56	7.87	6.9	3.9	3.9	3.8	14.8	3.1	10.9	3.6	10.8	7.0	3.9
44	0	44	0.258	0.003	4.37%	5.56	7.92	6.9	3.9	3.9	3.9	14.8	3.0	11.0	3.6	10.9	7.0	4.0
44	0	44	0.261	0.003	4.41%	5.56	7.94	6.9	3.9	3.9	3.9	14.8	3.0	11.0	3.6	10.9	7.0	4.0
44	0	44	0.264	0.003	4.46%	5.57	7.94	6.9	3.9	3.9	3.9	14.8	3.0	11.0	3.6	10.9	7.0	4.0
45	0	45	0.267	0.003	4.51%	5.57	8.00	6.9	3.9	3.9	3.9	14.9	3.0	11.0	3.7	10.9	7.0	4.0
45	0	45	0.270	0.003	4.56%	5.57	8.02	6.9	3.9	3.9	3.9	14.9	3.0	11.0	3.7	10.9	7.0	4.0
45	0	45	0.273	0.003	4.61%	5.57	8.03	6.9	4.0	4.0	3.9	14.9	3.0	11.0	3.7	10.9	7.0	4.0
45	0	45	0.275	0.002	4.65%	5.58	8.04	6.9	4.0	4.0	3.9	14.9	3.0	11.0	3.7	10.9	7.0	4.0
45	0	45	0.278	0.003	4.70%	5.58	8.11	6.9	4.0	4.0	4.0	15.0	2.9	11.1	3.7	11.0	7.0	4.1
45	0	45	0.282	0.004	4.76%	5.58	8.10	6.9	4.0	4.0	4.0	15.0	2.9	11.0	3.8	10.9	7.0	4.0
45	0	45	0.284	0.003	4.81%	5.59	8.13	6.9	4.0	4.0	4.0	15.0	2.9	11.1	3.8	11.0	7.0	4.1
46	0	46	0.287	0.003	4.85%	5.59	8.16	6.9	4.0	4.0	4.0	15.1	2.9	11.1	3.8	11.0	7.0	4.1
46	0	46	0.289	0.002	4.89%	5.59	8.17	6.9	4.0	4.0	4.0	15.1	2.9	11.1	3.8	11.0	7.0	4.1
46	0	46	0.293	0.003	4.95%	5.59	8.15	6.9	4.1	4.1	4.0	15.1	2.9	11.0	3.8	11.0	7.0	4.1
46	0	46	0.295	0.002	4.99%	5.60	8.13	6.9	4.1	4.1	4.0	15.0	2.9	11.0	3.8	11.0	6.9	4.1

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell (pounds) Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge (inches) Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
46	1	46	0.298	0.003	5.03%	5.60	8.22	6.9	4.1	4.1	4.0	15.1	2.9	11.1	3.9	11.0	7.0	4.1
46	0	46	0.300	0.003	5.08%	5.60	8.18	6.9	4.1	4.1	4.1	15.1	2.8	11.0	3.9	11.0	6.9	4.1
46	0	46	0.303	0.003	5.12%	5.60	8.18	6.9	4.1	4.1	4.1	15.1	2.8	11.0	3.9	11.0	6.9	4.1
46	0	46	0.305	0.002	5.17%	5.61	8.21	6.9	4.1	4.1	4.1	15.1	2.8	11.0	3.9	11.0	6.9	4.1
46	0	46	0.309	0.003	5.22%	5.61	8.18	6.9	4.1	4.1	4.1	15.1	2.8	11.0	3.9	11.0	6.9	4.1
46	0	46	0.311	0.002	5.26%	5.61	8.23	6.9	4.1	4.1	4.1	15.1	2.8	11.0	3.9	11.0	6.9	4.1
46	0	46	0.314	0.003	5.31%	5.62	8.22	6.9	4.1	4.1	4.1	15.1	2.8	11.0	3.9	11.0	6.9	4.1
47	1	47	0.317	0.003	5.36%	5.62	8.31	6.9	4.2	4.2	4.1	15.2	2.8	11.1	4.0	11.1	6.9	4.2
46	0	46	0.320	0.003	5.41%	5.62	8.24	6.9	4.2	4.2	4.1	15.1	2.8	11.0	4.0	11.0	6.9	4.1
47	0	47	0.323	0.003	5.46%	5.62	8.31	6.9	4.2	4.2	4.1	15.2	2.8	11.1	4.0	11.1	6.9	4.2
47	0	47	0.326	0.003	5.51%	5.63	8.32	6.9	4.2	4.2	4.2	15.2	2.7	11.1	4.0	11.1	6.9	4.2
47	0	47	0.329	0.003	5.56%	5.63	8.30	6.9	4.2	4.2	4.2	15.2	2.7	11.0	4.0	11.0	6.9	4.1
47	0	47	0.331	0.003	5.61%	5.63	8.28	6.9	4.2	4.2	4.2	15.2	2.7	11.0	4.1	11.0	6.9	4.1
47	0	47	0.334	0.003	5.65%	5.64	8.32	6.9	4.2	4.2	4.2	15.2	2.7	11.0	4.1	11.1	6.9	4.2
47	0	47	0.336	0.002	5.69%	5.64	8.33	6.9	4.2	4.2	4.2	15.2	2.7	11.0	4.1	11.1	6.9	4.2
47	0	47	0.339	0.003	5.74%	5.64	8.33	6.9	4.3	4.3	4.2	15.2	2.7	11.0	4.1	11.1	6.8	4.2
47	0	47	0.342	0.003	5.78%	5.64	8.34	6.9	4.3	4.3	4.2	15.2	2.7	11.0	4.1	11.1	6.8	4.2
47	0	47	0.344	0.002	5.82%	5.65	8.38	6.9	4.3	4.3	4.2	15.3	2.7	11.0	4.2	11.1	6.9	4.2
47	0	47	0.347	0.003	5.87%	5.65	8.39	6.9	4.3	4.3	4.3	15.3	2.6	11.0	4.2	11.1	6.8	4.2
47	0	47	0.350	0.003	5.92%	5.65	8.40	6.9	4.3	4.3	4.3	15.3	2.6	11.0	4.2	11.1	6.8	4.2
48	0	48	0.353	0.003	5.97%	5.65	8.45	6.9	4.3	4.3	4.3	15.4	2.6	11.1	4.2	11.1	6.9	4.2
48	0	48	0.356	0.004	6.03%	5.66	8.47	6.9	4.3	4.3	4.3	15.4	2.6	11.1	4.2	11.1	6.9	4.2
48	0	48	0.359	0.003	6.07%	5.66	8.53	6.9	4.3	4.3	4.3	15.4	2.6	11.1	4.3	11.2	6.9	4.3
48	0	48	0.363	0.004	6.13%	5.66	8.53	6.9	4.3	4.3	4.3	15.4	2.6	11.1	4.3	11.2	6.9	4.3
48	0	48	0.365	0.002	6.17%	5.67	8.54	6.9	4.3	4.3	4.3	15.4	2.6	11.1	4.3	11.2	6.9	4.3
49	0	49	0.368	0.003	6.23%	5.67	8.56	6.9	4.4	4.4	4.3	15.5	2.6	11.1	4.3	11.2	6.9	4.3
49	0	49	0.371	0.003	6.27%	5.67	8.56	6.9	4.4	4.4	4.3	15.5	2.6	11.1	4.3	11.2	6.8	4.3
49	0	49	0.374	0.003	6.32%	5.68	8.62	6.9	4.4	4.4	4.3	15.5	2.6	11.2	4.4	11.2	6.9	4.3
49	0	49	0.377	0.003	6.38%	5.68	8.67	6.9	4.4	4.4	4.4	15.6	2.5	11.2	4.4	11.2	6.9	4.3
49	0	49	0.379	0.002	6.42%	5.68	8.62	6.9	4.4	4.4	4.4	15.5	2.5	11.2	4.4	11.2	6.8	4.3
50	1	50	0.382	0.003	6.47%	5.68	8.75	6.9	4.4	4.4	4.4	15.7	2.5	11.3	4.5	11.3	6.9	4.4
50	0	50	0.386	0.004	6.53%	5.69	8.77	6.9	4.4	4.4	4.4	15.7	2.5	11.3	4.5	11.3	6.9	4.4
50	0	50	0.389	0.003	6.58%	5.69	8.80	6.9	4.4	4.4	4.4	15.7	2.5	11.3	4.5	11.3	6.9	4.4
50	0	50	0.392	0.003	6.64%	5.70	8.85	6.9	4.4	4.4	4.4	15.7	2.5	11.4	4.5	11.3	6.9	4.4
51	0	51	0.396	0.004	6.71%	5.70	8.88	6.9	4.4	4.4	4.4	15.8	2.5	11.4	4.6	11.3	6.9	4.4
51	0	51	0.400	0.003	6.76%	5.70	8.90	6.9	4.5	4.5	4.4	15.8	2.5	11.4	4.6	11.4	6.9	4.5
52	1	52	0.403	0.003	6.82%	5.71	9.03	6.9	4.5	4.5	4.4	15.9	2.5	11.5	4.6	11.4	7.0	4.5
51	0	51	0.407	0.003	6.88%	5.71	8.95	6.9	4.5	4.5	4.4	15.8	2.5	11.4	4.6	11.4	6.9	4.5
52	1	52	0.410	0.003	6.93%	5.71	9.04	6.9	4.5	4.5	4.4	15.9	2.5	11.5	4.7	11.4	7.0	4.5
52	0	52	0.413	0.003	6.99%	5.72	9.08	6.9	4.5	4.5	4.5	16.0	2.4	11.5	4.7	11.4	7.0	4.5
52	0	52	0.416	0.003	7.03%	5.72	9.11	6.9	4.5	4.5	4.5	16.0	2.4	11.6	4.7	11.5	7.0	4.6
52	0	52	0.419	0.003	7.09%	5.72	9.15	6.9	4.5	4.5	4.5	16.1	2.4	11.6	4.8	11.5	7.0	4.6
52	0	52	0.422	0.003	7.13%	5.73	9.08	6.9	4.5	4.5	4.5	16.0	2.4	11.5	4.7	11.4	7.0	4.5
52	0	52	0.425	0.003	7.19%	5.73	9.06	6.9	4.5	4.5	4.5	16.0	2.4	11.5	4.8	11.4	6.9	4.5
52	0	52	0.428	0.003	7.24%	5.73	9.08	6.9	4.5	4.5	4.5	16.0	2.4	11.5	4.8	11.4	6.9	4.5
52	0	52	0.431	0.004	7.30%	5.74	9.10	6.9	4.5	4.5	4.5	16.0	2.4	11.5	4.8	11.4	6.9	4.5
52	0	52	0.434	0.003	7.35%	5.74	9.10	6.9	4.5	4.5	4.5	16.0	2.4	11.5	4.8	11.5	6.9	4.6

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$	p' $(\sigma_1'+\sigma_3')/2$	q $(\sigma_1-\sigma_3)/2$
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		(psi)	(psi)	(psi)
53	0	53	0.437	0.002	7.39%	5.74	9.15	6.9	4.6	4.6	4.5	16.1	2.4	11.5	4.8	11.5	7.0	4.6
53	0	53	0.440	0.003	7.45%	5.74	9.16	6.9	4.6	4.6	4.5	16.1	2.4	11.5	4.9	11.5	7.0	4.6
53	0	53	0.443	0.003	7.50%	5.75	9.16	6.9	4.6	4.6	4.5	16.1	2.4	11.5	4.9	11.5	6.9	4.6
53	0	53	0.445	0.002	7.53%	5.75	9.16	6.9	4.6	4.6	4.5	16.1	2.4	11.5	4.9	11.5	6.9	4.6
53	0	53	0.448	0.003	7.59%	5.75	9.17	6.9	4.6	4.6	4.5	16.1	2.4	11.5	4.9	11.5	6.9	4.6
53	0	53	0.452	0.003	7.64%	5.76	9.21	6.9	4.6	4.6	4.6	16.1	2.3	11.5	4.9	11.5	6.9	4.6
53	0	53	0.454	0.003	7.68%	5.76	9.28	6.9	4.6	4.6	4.6	16.2	2.3	11.6	5.0	11.5	7.0	4.6
53	0	53	0.457	0.003	7.73%	5.76	9.25	6.9	4.6	4.6	4.6	16.1	2.3	11.6	5.0	11.5	7.0	4.6
53	0	53	0.461	0.004	7.79%	5.77	9.28	6.9	4.6	4.6	4.6	16.2	2.3	11.6	5.0	11.5	7.0	4.6
54	0	54	0.463	0.003	7.84%	5.77	9.29	6.9	4.6	4.6	4.6	16.2	2.3	11.6	5.0	11.5	7.0	4.6
54	0	54	0.466	0.002	7.88%	5.77	9.30	6.9	4.6	4.6	4.6	16.2	2.3	11.6	5.0	11.6	7.0	4.7
54	0	54	0.469	0.003	7.93%	5.78	9.31	6.9	4.6	4.6	4.6	16.2	2.3	11.6	5.0	11.6	7.0	4.7
54	0	54	0.472	0.003	7.98%	5.78	9.30	6.9	4.6	4.6	4.6	16.2	2.3	11.6	5.1	11.6	6.9	4.7
54	0	54	0.475	0.003	8.03%	5.78	9.36	6.9	4.7	4.7	4.6	16.3	2.3	11.6	5.1	11.6	7.0	4.7
54	0	54	0.478	0.003	8.08%	5.78	9.33	6.9	4.7	4.7	4.6	16.2	2.3	11.6	5.1	11.6	6.9	4.7
54	0	54	0.481	0.003	8.14%	5.79	9.34	6.9	4.7	4.7	4.6	16.2	2.3	11.6	5.1	11.6	6.9	4.7
54	0	54	0.483	0.002	8.18%	5.79	9.28	6.9	4.7	4.7	4.6	16.2	2.3	11.5	5.1	11.5	6.9	4.6
54	0	54	0.486	0.003	8.22%	5.79	9.32	6.9	4.7	4.7	4.6	16.2	2.3	11.6	5.1	11.6	6.9	4.7
54	0	54	0.489	0.003	8.27%	5.80	9.31	6.9	4.7	4.7	4.6	16.2	2.3	11.6	5.1	11.6	6.9	4.7
54	0	54	0.491	0.002	8.31%	5.80	9.30	6.9	4.7	4.7	4.7	16.2	2.2	11.5	5.1	11.6	6.9	4.7
54	0	54	0.495	0.003	8.37%	5.80	9.34	6.9	4.7	4.7	4.7	16.2	2.2	11.6	5.2	11.6	6.9	4.7
54	0	54	0.497	0.002	8.40%	5.80	9.34	6.9	4.7	4.7	4.7	16.2	2.2	11.6	5.2	11.6	6.9	4.7
54	0	54	0.500	0.003	8.45%	5.81	9.34	6.9	4.7	4.7	4.7	16.2	2.2	11.6	5.2	11.6	6.9	4.7
54	0	54	0.502	0.003	8.49%	5.81	9.35	6.9	4.7	4.7	4.7	16.2	2.2	11.6	5.2	11.6	6.9	4.7
54	0	54	0.506	0.003	8.55%	5.81	9.33	6.9	4.7	4.7	4.7	16.2	2.2	11.5	5.2	11.6	6.9	4.7
54	0	54	0.508	0.003	8.60%	5.82	9.35	6.9	4.7	4.7	4.7	16.2	2.2	11.6	5.2	11.6	6.9	4.7
55	0	55	0.511	0.003	8.64%	5.82	9.39	6.9	4.7	4.7	4.7	16.3	2.2	11.6	5.3	11.6	6.9	4.7
54	0	54	0.514	0.003	8.69%	5.82	9.36	6.9	4.7	4.7	4.7	16.3	2.2	11.6	5.3	11.6	6.9	4.7
54	0	54	0.516	0.002	8.74%	5.83	9.34	6.9	4.8	4.8	4.7	16.2	2.2	11.5	5.3	11.6	6.9	4.7
54	0	54	0.519	0.003	8.79%	5.83	9.30	6.9	4.8	4.8	4.7	16.2	2.2	11.5	5.3	11.6	6.8	4.7
55	1	55	0.522	0.003	8.84%	5.83	9.40	6.9	4.8	4.8	4.7	16.3	2.2	11.6	5.3	11.6	6.9	4.7
55	0	55	0.525	0.002	8.88%	5.83	9.39	6.9	4.8	4.8	4.7	16.3	2.2	11.5	5.3	11.6	6.9	4.7
55	0	55	0.527	0.002	8.92%	5.84	9.36	6.9	4.8	4.8	4.7	16.3	2.2	11.5	5.3	11.6	6.8	4.7
55	0	55	0.530	0.003	8.97%	5.84	9.35	6.9	4.8	4.8	4.8	16.3	2.1	11.5	5.4	11.6	6.8	4.7
55	0	55	0.533	0.002	9.01%	5.84	9.38	6.9	4.8	4.8	4.8	16.3	2.1	11.5	5.4	11.6	6.8	4.7
55	0	55	0.535	0.003	9.06%	5.85	9.36	6.9	4.8	4.8	4.8	16.3	2.1	11.5	5.4	11.6	6.8	4.7
55	0	55	0.538	0.003	9.11%	5.85	9.34	6.9	4.8	4.8	4.8	16.2	2.1	11.5	5.4	11.6	6.8	4.7
55	0	55	0.541	0.003	9.15%	5.85	9.33	6.9	4.8	4.8	4.8	16.2	2.1	11.5	5.4	11.6	6.8	4.7
55	0	55	0.543	0.002	9.19%	5.86	9.40	6.9	4.8	4.8	4.8	16.3	2.1	11.5	5.4	11.6	6.8	4.7
55	0	55	0.546	0.003	9.24%	5.86	9.36	6.9	4.8	4.8	4.8	16.3	2.1	11.5	5.4	11.6	6.8	4.7
55	0	55	0.549	0.002	9.28%	5.86	9.37	6.9	4.8	4.8	4.8	16.3	2.1	11.5	5.5	11.6	6.8	4.7
55	0	55	0.552	0.003	9.33%	5.86	9.38	6.9	4.8	4.8	4.8	16.3	2.1	11.5	5.5	11.6	6.8	4.7
55	0	55	0.556	0.004	9.40%	5.87	9.34	6.9	4.8	4.8	4.8	16.2	2.1	11.4	5.5	11.6	6.8	4.7
55	0	55	0.558	0.002	9.43%	5.87	9.35	6.9	4.9	4.9	4.8	16.2	2.1	11.4	5.5	11.6	6.8	4.7
56	1	56	0.561	0.003	9.49%	5.87	9.45	6.9	4.9	4.9	4.8	16.4	2.1	11.5	5.5	11.6	6.8	4.7
56	0	56	0.564	0.003	9.53%	5.88	9.45	6.9	4.9	4.9	4.8	16.3	2.1	11.5	5.6	11.6	6.8	4.7
55	0	55	0.566	0.003	9.58%	5.88	9.41	6.9	4.9	4.9	4.8	16.3	2.1	11.5	5.6	11.6	6.8	4.7

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell (pounds) Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge (inches) Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
56	0	56	0.569	0.002	9.62%	5.88	9.46	6.9	4.9	4.9	4.8	16.4	2.1	11.5	5.6	11.6	6.8	4.7
56	0	56	0.572	0.003	9.68%	5.89	9.48	6.9	4.9	4.9	4.8	16.4	2.1	11.5	5.6	11.6	6.8	4.7
56	0	56	0.575	0.003	9.73%	5.89	9.46	6.9	4.9	4.9	4.9	16.4	2.0	11.5	5.6	11.6	6.8	4.7
56	0	56	0.578	0.003	9.78%	5.89	9.45	6.9	4.9	4.9	4.9	16.4	2.0	11.5	5.6	11.6	6.8	4.7
56	1	56	0.582	0.004	9.84%	5.90	9.54	6.9	4.9	4.9	4.9	16.4	2.0	11.6	5.7	11.7	6.8	4.8
56	0	56	0.585	0.004	9.90%	5.90	9.57	6.9	4.9	4.9	4.9	16.5	2.0	11.6	5.7	11.7	6.8	4.8
57	0	57	0.590	0.004	9.97%	5.91	9.63	6.9	4.9	4.9	4.9	16.5	2.0	11.7	5.8	11.7	6.8	4.8
57	0	57	0.593	0.003	10.03%	5.91	9.66	6.9	4.9	4.9	4.9	16.6	2.0	11.7	5.8	11.7	6.8	4.8
57	0	57	0.597	0.004	10.09%	5.91	9.66	6.9	4.9	4.9	4.9	16.6	2.0	11.7	5.8	11.7	6.8	4.8
58	0	58	0.600	0.003	10.14%	5.92	9.72	6.9	4.9	4.9	4.9	16.6	2.0	11.7	5.9	11.8	6.9	4.9
58	0	58	0.603	0.003	10.20%	5.92	9.71	6.9	4.9	4.9	4.9	16.6	2.0	11.7	5.9	11.8	6.9	4.9
58	0	58	0.606	0.003	10.25%	5.92	9.76	6.9	4.9	4.9	4.9	16.7	2.0	11.7	5.9	11.8	6.9	4.9
58	0	58	0.610	0.003	10.31%	5.93	9.78	6.9	5.0	5.0	4.9	16.7	2.0	11.8	5.9	11.8	6.9	4.9
58	0	58	0.612	0.003	10.36%	5.93	9.81	6.9	5.0	5.0	4.9	16.7	2.0	11.8	6.0	11.8	6.9	4.9
58	0	58	0.616	0.004	10.42%	5.94	9.84	6.9	5.0	5.0	4.9	16.7	2.0	11.8	6.0	11.8	6.9	4.9
58	0	58	0.619	0.003	10.48%	5.94	9.78	6.9	5.0	5.0	4.9	16.7	2.0	11.8	6.0	11.8	6.9	4.9
58	0	58	0.622	0.003	10.52%	5.94	9.82	6.9	5.0	5.0	4.9	16.7	2.0	11.8	6.0	11.8	6.9	4.9
58	0	58	0.625	0.003	10.57%	5.95	9.80	6.9	5.0	5.0	4.9	16.7	2.0	11.8	6.0	11.8	6.9	4.9
58	0	58	0.628	0.003	10.62%	5.95	9.83	6.9	5.0	5.0	5.0	16.7	1.9	11.8	6.1	11.8	6.9	4.9
59	0	59	0.631	0.003	10.67%	5.95	9.85	6.9	5.0	5.0	5.0	16.7	1.9	11.8	6.1	11.8	6.9	4.9
58	0	58	0.634	0.003	10.73%	5.96	9.82	6.9	5.0	5.0	5.0	16.7	1.9	11.8	6.1	11.8	6.8	4.9
58	0	58	0.637	0.003	10.77%	5.96	9.81	6.9	5.0	5.0	5.0	16.7	1.9	11.7	6.1	11.8	6.8	4.9
59	0	59	0.640	0.003	10.82%	5.96	9.87	6.9	5.0	5.0	5.0	16.8	1.9	11.8	6.1	11.8	6.9	4.9
59	0	59	0.642	0.003	10.87%	5.97	9.88	6.9	5.0	5.0	5.0	16.8	1.9	11.8	6.2	11.8	6.8	4.9
59	0	59	0.645	0.002	10.91%	5.97	9.84	6.9	5.0	5.0	5.0	16.7	1.9	11.7	6.2	11.8	6.8	4.9
59	0	59	0.648	0.003	10.96%	5.97	9.87	6.9	5.0	5.0	5.0	16.8	1.9	11.8	6.2	11.8	6.8	4.9
59	0	59	0.651	0.003	11.01%	5.98	9.84	6.9	5.0	5.0	5.0	16.7	1.9	11.7	6.2	11.8	6.8	4.9
59	0	59	0.654	0.003	11.06%	5.98	9.88	6.9	5.1	5.1	5.0	16.8	1.9	11.8	6.2	11.8	6.8	4.9
59	0	59	0.657	0.003	11.11%	5.98	9.88	6.9	5.1	5.1	5.0	16.8	1.9	11.8	6.3	11.8	6.8	4.9
59	0	59	0.660	0.003	11.16%	5.98	9.86	6.9	5.1	5.1	5.0	16.8	1.9	11.7	6.3	11.8	6.8	4.9
59	0	59	0.662	0.003	11.21%	5.99	9.89	6.9	5.1	5.1	5.0	16.8	1.9	11.8	6.3	11.8	6.8	4.9
59	-1	59	0.666	0.004	11.27%	5.99	9.80	6.9	5.1	5.1	5.0	16.7	1.9	11.7	6.3	11.8	6.8	4.9
59	1	59	0.669	0.003	11.32%	6.00	9.89	6.9	5.1	5.1	5.0	16.8	1.9	11.7	6.3	11.8	6.8	4.9
59	0	59	0.672	0.003	11.36%	6.00	9.91	6.9	5.1	5.1	5.0	16.8	1.9	11.8	6.3	11.9	6.8	5.0
59	0	59	0.675	0.003	11.42%	6.00	9.89	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.3	11.8	6.8	4.9
59	0	59	0.677	0.002	11.45%	6.00	9.86	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.3	11.8	6.8	4.9
59	0	59	0.680	0.003	11.49%	6.01	9.88	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.4	11.8	6.8	4.9
59	0	59	0.682	0.003	11.54%	6.01	9.88	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.4	11.8	6.8	4.9
60	0	60	0.685	0.003	11.59%	6.01	9.95	6.9	5.1	5.1	5.1	16.9	1.8	11.8	6.5	11.9	6.8	5.0
59	-1	59	0.688	0.003	11.64%	6.02	9.84	6.9	5.1	5.1	5.1	16.7	1.8	11.7	6.4	11.8	6.7	4.9
60	0	60	0.691	0.003	11.70%	6.02	9.91	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.5	11.9	6.8	5.0
60	0	60	0.694	0.003	11.74%	6.02	9.90	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.5	11.9	6.8	5.0
60	0	60	0.697	0.003	11.78%	6.03	9.91	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.5	11.9	6.8	5.0
60	0	60	0.699	0.002	11.82%	6.03	9.89	6.9	5.1	5.1	5.1	16.8	1.8	11.7	6.5	11.8	6.7	4.9
59	0	59	0.702	0.003	11.88%	6.03	9.84	6.9	5.1	5.1	5.1	16.7	1.8	11.6	6.5	11.8	6.7	4.9
59	0	59	0.705	0.003	11.93%	6.04	9.85	6.9	5.2	5.2	5.1	16.8	1.8	11.6	6.5	11.8	6.7	4.9
60	1	60	0.707	0.002	11.97%	6.04	9.94	6.9	5.2	5.2	5.1	16.8	1.8	11.7	6.6	11.9	6.7	5.0

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell (pounds) Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge (inches) Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
60	0	60	0.710	0.003	12.01%	6.04	9.89	6.9	5.2	5.2	5.1	16.8	1.8	11.7	6.6	11.8	6.7	4.9
60	0	60	0.713	0.003	12.05%	6.05	9.89	6.9	5.2	5.2	5.1	16.8	1.8	11.7	6.6	11.8	6.7	4.9
60	0	60	0.716	0.003	12.10%	6.05	9.86	6.9	5.2	5.2	5.1	16.8	1.8	11.6	6.6	11.8	6.7	4.9
60	0	60	0.719	0.003	12.15%	6.05	9.87	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.7	11.8	6.7	4.9
60	0	60	0.721	0.002	12.19%	6.06	9.89	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.7	11.8	6.7	4.9
60	0	60	0.724	0.004	12.25%	6.06	9.87	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.7	11.8	6.7	4.9
60	0	60	0.727	0.002	12.29%	6.06	9.86	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.7	11.8	6.7	4.9
59	0	59	0.730	0.003	12.35%	6.07	9.81	6.9	5.2	5.2	5.2	16.7	1.7	11.5	6.7	11.8	6.6	4.9
60	0	60	0.732	0.002	12.38%	6.07	9.86	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.7	11.8	6.6	4.9
60	0	60	0.735	0.003	12.44%	6.07	9.86	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.8	11.8	6.6	4.9
60	0	60	0.738	0.003	12.49%	6.08	9.86	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.8	11.8	6.6	4.9
60	0	60	0.741	0.002	12.53%	6.08	9.84	6.9	5.2	5.2	5.2	16.7	1.7	11.5	6.8	11.8	6.6	4.9
60	0	60	0.743	0.003	12.57%	6.08	9.88	6.9	5.2	5.2	5.2	16.8	1.7	11.6	6.9	11.8	6.6	4.9
60	0	60	0.746	0.003	12.62%	6.08	9.85	6.9	5.3	5.3	5.2	16.7	1.7	11.5	6.9	11.8	6.6	4.9
60	0	60	0.749	0.003	12.67%	6.09	9.87	6.9	5.3	5.3	5.2	16.8	1.7	11.5	6.9	11.8	6.6	4.9
60	0	60	0.751	0.002	12.70%	6.09	9.86	6.9	5.3	5.3	5.2	16.8	1.7	11.5	6.9	11.8	6.6	4.9
60	0	60	0.754	0.003	12.75%	6.09	9.90	6.9	5.3	5.3	5.2	16.8	1.7	11.6	7.0	11.9	6.6	5.0
60	0	60	0.757	0.003	12.80%	6.10	9.89	6.9	5.3	5.3	5.2	16.8	1.7	11.5	7.0	11.8	6.6	4.9
60	0	60	0.759	0.003	12.85%	6.10	9.85	6.9	5.3	5.3	5.3	16.7	1.6	11.5	7.0	11.8	6.6	4.9
60	0	60	0.762	0.003	12.89%	6.10	9.90	6.9	5.3	5.3	5.3	16.8	1.6	11.5	7.0	11.8	6.6	4.9
61	0	61	0.765	0.003	12.94%	6.11	9.94	6.9	5.3	5.3	5.3	16.8	1.6	11.6	7.1	11.9	6.6	5.0
61	0	61	0.768	0.003	12.98%	6.11	9.93	6.9	5.3	5.3	5.3	16.8	1.6	11.6	7.1	11.9	6.6	5.0
61	0	61	0.771	0.004	13.05%	6.11	9.94	6.9	5.3	5.3	5.3	16.8	1.6	11.6	7.1	11.9	6.6	5.0
61	0	61	0.774	0.003	13.10%	6.12	10.00	6.9	5.3	5.3	5.3	16.9	1.6	11.6	7.2	11.9	6.6	5.0
61	0	61	0.778	0.004	13.16%	6.12	10.02	6.9	5.3	5.3	5.3	16.9	1.6	11.6	7.2	11.9	6.6	5.0
61	0	61	0.782	0.004	13.23%	6.13	10.03	6.9	5.3	5.3	5.3	16.9	1.6	11.6	7.3	11.9	6.6	5.0
62	0	62	0.786	0.004	13.30%	6.13	10.03	6.9	5.3	5.3	5.3	16.9	1.6	11.6	7.3	11.9	6.6	5.0
62	0	62	0.789	0.003	13.35%	6.14	10.09	6.9	5.3	5.3	5.3	17.0	1.6	11.7	7.3	11.9	6.6	5.0
62	0	62	0.793	0.003	13.41%	6.14	10.09	6.9	5.4	5.4	5.3	17.0	1.6	11.7	7.4	11.9	6.6	5.0
62	0	62	0.796	0.003	13.47%	6.14	10.12	6.9	5.4	5.4	5.3	17.0	1.6	11.7	7.4	12.0	6.6	5.1
62	0	62	0.800	0.003	13.53%	6.15	10.15	6.9	5.4	5.4	5.3	17.0	1.6	11.7	7.4	12.0	6.6	5.1
63	0	63	0.806	0.007	13.64%	6.16	10.20	6.9	5.4	5.4	5.3	17.1	1.6	11.8	7.5	12.0	6.7	5.1
63	0	63	0.810	0.003	13.69%	6.16	10.22	6.9	5.4	5.4	5.3	17.1	1.6	11.8	7.6	12.0	6.7	5.1
63	0	63	0.813	0.003	13.75%	6.16	10.22	6.9	5.4	5.4	5.3	17.1	1.6	11.8	7.6	12.0	6.7	5.1
63	0	63	0.815	0.003	13.79%	6.17	10.24	6.9	5.4	5.4	5.4	17.1	1.5	11.8	7.6	12.0	6.7	5.1
63	0	63	0.819	0.003	13.85%	6.17	10.25	6.9	5.4	5.4	5.4	17.2	1.5	11.8	7.7	12.0	6.7	5.1
63	0	63	0.821	0.003	13.89%	6.17	10.28	6.9	5.4	5.4	5.4	17.2	1.5	11.8	7.7	12.0	6.7	5.1
63	0	63	0.824	0.003	13.94%	6.18	10.22	6.9	5.4	5.4	5.4	17.1	1.5	11.7	7.7	12.0	6.6	5.1
63	0	63	0.827	0.003	13.99%	6.18	10.21	6.9	5.4	5.4	5.4	17.1	1.5	11.7	7.7	12.0	6.6	5.1
63	0	63	0.830	0.003	14.04%	6.19	10.23	6.9	5.4	5.4	5.4	17.1	1.5	11.7	7.8	12.0	6.6	5.1
64	0	64	0.833	0.003	14.08%	6.19	10.27	6.9	5.4	5.4	5.4	17.2	1.5	11.8	7.8	12.0	6.6	5.1
63	0	63	0.836	0.003	14.13%	6.19	10.25	6.9	5.4	5.4	5.4	17.2	1.5	11.7	7.8	12.0	6.6	5.1
63	0	63	0.839	0.003	14.18%	6.20	10.25	6.9	5.4	5.4	5.4	17.1	1.5	11.7	7.9	12.0	6.6	5.1
63	0	63	0.842	0.003	14.24%	6.20	10.24	6.9	5.4	5.4	5.4	17.1	1.5	11.7	7.9	12.0	6.6	5.1
64	0	64	0.845	0.003	14.29%	6.20	10.31	6.9	5.5	5.5	5.4	17.2	1.5	11.8	8.0	12.1	6.6	5.2
64	0	64	0.847	0.003	14.33%	6.21	10.25	6.9	5.5	5.5	5.4	17.2	1.5	11.7	7.9	12.0	6.6	5.1
64	0	64	0.850	0.003	14.38%	6.21	10.26	6.9	5.5	5.5	5.4	17.2	1.5	11.7	8.0	12.0	6.6	5.1

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$	p' $(\sigma_1'+\sigma_3')/2$	q $(\sigma_1-\sigma_3)/2$
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		(psi)	(psi)	(psi)
64	0	64	0.854	0.004	14.44%	6.21	10.24	6.9	5.5	5.5	5.4	17.1	1.5	11.7	8.0	12.0	6.6	5.1
64	0	64	0.856	0.003	14.49%	6.22	10.25	6.9	5.5	5.5	5.4	17.2	1.5	11.7	8.0	12.0	6.6	5.1
64	0	64	0.859	0.003	14.54%	6.22	10.25	6.9	5.5	5.5	5.4	17.2	1.5	11.7	8.1	12.0	6.6	5.1
64	0	64	0.862	0.003	14.58%	6.22	10.29	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.1	12.0	6.6	5.1
64	0	64	0.865	0.002	14.62%	6.23	10.29	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.1	12.0	6.6	5.1
64	0	64	0.868	0.003	14.68%	6.23	10.29	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.2	12.0	6.6	5.1
64	0	64	0.871	0.002	14.73%	6.24	10.30	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.2	12.0	6.6	5.1
64	0	64	0.873	0.003	14.77%	6.24	10.29	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.2	12.0	6.6	5.1
64	0	64	0.876	0.003	14.82%	6.24	10.28	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.3	12.0	6.6	5.1
64	0	64	0.880	0.003	14.88%	6.25	10.26	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.3	12.0	6.5	5.1
64	0	64	0.882	0.002	14.92%	6.25	10.30	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.3	12.0	6.6	5.1
64	0	64	0.885	0.003	14.97%	6.25	10.30	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.4	12.1	6.6	5.2
64	0	64	0.888	0.003	15.02%	6.26	10.27	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.4	12.0	6.5	5.1
64	0	64	0.890	0.002	15.06%	6.26	10.28	6.9	5.5	5.5	5.5	17.2	1.4	11.7	8.4	12.0	6.5	5.1
65	0	65	0.893	0.003	15.11%	6.26	10.30	6.9	5.6	5.6	5.5	17.2	1.4	11.7	8.5	12.0	6.5	5.1
65	0	65	0.895	0.002	15.15%	6.27	10.32	6.9	5.6	5.6	5.5	17.2	1.4	11.7	8.5	12.1	6.5	5.2
64	0	64	0.898	0.003	15.20%	6.27	10.25	6.9	5.6	5.6	5.5	17.1	1.4	11.6	8.5	12.0	6.5	5.1
65	0	65	0.901	0.003	15.25%	6.27	10.31	6.9	5.6	5.6	5.6	17.2	1.3	11.7	8.6	12.1	6.5	5.2
65	0	65	0.904	0.003	15.30%	6.28	10.34	6.9	5.6	5.6	5.6	17.2	1.3	11.7	8.7	12.1	6.5	5.2
65	0	65	0.907	0.003	15.34%	6.28	10.33	6.9	5.6	5.6	5.6	17.2	1.3	11.7	8.7	12.1	6.5	5.2
65	0	65	0.910	0.003	15.39%	6.28	10.31	6.9	5.6	5.6	5.6	17.2	1.3	11.6	8.7	12.1	6.5	5.2
65	0	65	0.913	0.003	15.44%	6.29	10.31	6.9	5.6	5.6	5.6	17.2	1.3	11.6	8.8	12.1	6.5	5.2
65	0	65	0.916	0.003	15.49%	6.29	10.34	6.9	5.6	5.6	5.6	17.2	1.3	11.7	8.8	12.1	6.5	5.2
65	0	65	0.918	0.002	15.52%	6.29	10.30	6.9	5.6	5.6	5.6	17.2	1.3	11.6	8.8	12.1	6.5	5.2
65	0	65	0.921	0.004	15.58%	6.30	10.27	6.9	5.6	5.6	5.6	17.2	1.3	11.6	8.9	12.0	6.4	5.1
65	0	65	0.924	0.003	15.63%	6.30	10.29	6.9	5.6	5.6	5.6	17.2	1.3	11.6	8.9	12.0	6.4	5.1
65	0	65	0.927	0.003	15.68%	6.31	10.26	6.9	5.6	5.6	5.6	17.2	1.3	11.6	8.9	12.0	6.4	5.1
65	0	65	0.929	0.002	15.72%	6.31	10.27	6.9	5.6	5.6	5.6	17.2	1.3	11.6	9.0	12.0	6.4	5.1
65	0	65	0.932	0.003	15.76%	6.31	10.26	6.9	5.7	5.7	5.6	17.2	1.3	11.5	9.0	12.0	6.4	5.1
65	0	65	0.934	0.002	15.80%	6.31	10.30	6.9	5.7	5.7	5.6	17.2	1.3	11.6	9.1	12.1	6.4	5.2
65	0	65	0.937	0.003	15.85%	6.32	10.31	6.9	5.7	5.7	5.6	17.2	1.3	11.6	9.1	12.1	6.4	5.2
65	0	65	0.940	0.003	15.90%	6.32	10.30	6.9	5.7	5.7	5.6	17.2	1.3	11.6	9.1	12.1	6.4	5.2
65	0	65	0.942	0.002	15.93%	6.32	10.28	6.9	5.7	5.7	5.6	17.2	1.3	11.5	9.2	12.0	6.4	5.1
65	0	65	0.944	0.003	15.97%	6.33	10.30	6.9	5.7	5.7	5.6	17.2	1.3	11.6	9.2	12.1	6.4	5.2
65	0	65	0.948	0.003	16.03%	6.33	10.31	6.9	5.7	5.7	5.7	17.2	1.2	11.6	9.3	12.1	6.4	5.2
65	0	65	0.950	0.003	16.07%	6.34	10.31	6.9	5.7	5.7	5.7	17.2	1.2	11.6	9.3	12.1	6.4	5.2
65	0	65	0.953	0.002	16.11%	6.34	10.32	6.9	5.7	5.7	5.7	17.2	1.2	11.6	9.3	12.1	6.4	5.2
66	0	66	0.956	0.003	16.17%	6.34	10.35	6.9	5.7	5.7	5.7	17.3	1.2	11.6	9.4	12.1	6.4	5.2
66	0	66	0.958	0.002	16.21%	6.35	10.34	6.9	5.7	5.7	5.7	17.2	1.2	11.6	9.4	12.1	6.4	5.2
66	0	66	0.962	0.003	16.27%	6.35	10.34	6.9	5.7	5.7	5.7	17.2	1.2	11.6	9.4	12.1	6.4	5.2
66	0	66	0.965	0.003	16.32%	6.35	10.39	6.9	5.7	5.7	5.7	17.3	1.2	11.6	9.5	12.1	6.4	5.2
66	0	66	0.968	0.003	16.37%	6.36	10.37	6.9	5.7	5.7	5.7	17.3	1.2	11.6	9.5	12.1	6.4	5.2
66	0	66	0.972	0.004	16.44%	6.36	10.40	6.9	5.7	5.7	5.7	17.3	1.2	11.6	9.6	12.1	6.4	5.2
66	0	66	0.975	0.003	16.49%	6.37	10.42	6.9	5.7	5.7	5.7	17.3	1.2	11.6	9.7	12.1	6.4	5.2
67	0	67	0.979	0.004	16.56%	6.37	10.44	6.9	5.7	5.7	5.7	17.3	1.2	11.6	9.7	12.1	6.4	5.2
67	0	67	0.982	0.003	16.62%	6.38	10.43	6.9	5.7	5.7	5.7	17.3	1.2	11.6	9.7	12.1	6.4	5.2
67	0	67	0.986	0.004	16.68%	6.38	10.48	6.9	5.7	5.7	5.7	17.4	1.2	11.7	9.8	12.1	6.4	5.2

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
67	0	67	0.989	0.003	16.73%	6.39	10.54	6.9	5.8	5.8	5.7	17.4	1.2	11.7	9.9	12.2	6.5	5.3
67	0	67	0.993	0.004	16.79%	6.39	10.52	6.9	5.8	5.8	5.7	17.4	1.2	11.7	9.9	12.2	6.4	5.3
67	0	67	0.996	0.003	16.85%	6.39	10.54	6.9	5.8	5.8	5.7	17.4	1.2	11.7	10.0	12.2	6.4	5.3
68	0	68	1.000	0.004	16.91%	6.40	10.60	6.9	5.8	5.8	5.7	17.5	1.2	11.8	10.1	12.2	6.5	5.3
68	0	68	1.003	0.003	16.96%	6.40	10.57	6.9	5.8	5.8	5.7	17.5	1.2	11.7	10.1	12.2	6.4	5.3
68	0	68	1.006	0.003	17.02%	6.41	10.56	6.9	5.8	5.8	5.7	17.5	1.2	11.7	10.1	12.2	6.4	5.3
68	0	68	1.008	0.002	17.06%	6.41	10.59	6.9	5.8	5.8	5.7	17.5	1.2	11.7	10.2	12.2	6.4	5.3
68	0	68	1.012	0.003	17.12%	6.42	10.56	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.2	12.2	6.4	5.3
68	0	68	1.015	0.003	17.17%	6.42	10.57	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.2	12.2	6.4	5.3
68	0	68	1.017	0.002	17.21%	6.42	10.58	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.3	12.2	6.4	5.3
68	0	68	1.021	0.004	17.27%	6.43	10.58	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.3	12.2	6.4	5.3
68	0	68	1.023	0.002	17.31%	6.43	10.57	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.4	12.2	6.4	5.3
68	0	68	1.026	0.003	17.35%	6.43	10.52	6.9	5.8	5.8	5.8	17.4	1.1	11.6	10.4	12.2	6.4	5.3
68	0	68	1.029	0.003	17.41%	6.44	10.55	6.9	5.8	5.8	5.8	17.4	1.1	11.7	10.4	12.2	6.4	5.3
68	0	68	1.032	0.003	17.46%	6.44	10.58	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.5	12.2	6.4	5.3
68	0	68	1.035	0.003	17.51%	6.45	10.55	6.9	5.8	5.8	5.8	17.4	1.1	11.7	10.5	12.2	6.4	5.3
68	0	68	1.039	0.003	17.57%	6.45	10.56	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.6	12.2	6.4	5.3
68	0	68	1.041	0.002	17.61%	6.45	10.50	6.9	5.8	5.8	5.8	17.4	1.1	11.6	10.6	12.2	6.3	5.3
68	1	68	1.044	0.002	17.65%	6.46	10.58	6.9	5.8	5.8	5.8	17.5	1.1	11.7	10.7	12.2	6.4	5.3
68	0	68	1.046	0.003	17.70%	6.46	10.54	6.9	5.8	5.8	5.8	17.4	1.1	11.6	10.7	12.2	6.4	5.3
68	0	68	1.050	0.003	17.76%	6.47	10.54	6.9	5.9	5.9	5.8	17.4	1.1	11.6	10.7	12.2	6.4	5.3
68	0	68	1.052	0.002	17.80%	6.47	10.58	6.9	5.9	5.9	5.8	17.5	1.1	11.7	10.8	12.2	6.4	5.3
68	0	68	1.055	0.003	17.85%	6.47	10.54	6.9	5.9	5.9	5.8	17.4	1.1	11.6	10.8	12.2	6.3	5.3
68	0	68	1.058	0.003	17.90%	6.48	10.57	6.9	5.9	5.9	5.8	17.5	1.1	11.6	10.8	12.2	6.4	5.3
69	0	69	1.061	0.003	17.94%	6.48	10.58	6.9	5.9	5.9	5.8	17.5	1.1	11.6	10.9	12.2	6.4	5.3
69	0	69	1.064	0.004	18.00%	6.48	10.58	6.9	5.9	5.9	5.8	17.5	1.1	11.6	10.9	12.2	6.4	5.3
69	0	69	1.067	0.002	18.04%	6.49	10.57	6.9	5.9	5.9	5.8	17.5	1.1	11.6	11.0	12.2	6.3	5.3
68	0	68	1.070	0.003	18.10%	6.49	10.54	6.9	5.9	5.9	5.8	17.4	1.1	11.6	11.0	12.2	6.3	5.3
69	0	69	1.073	0.003	18.15%	6.50	10.59	6.9	5.9	5.9	5.8	17.5	1.1	11.6	11.1	12.2	6.3	5.3
69	0	69	1.075	0.002	18.19%	6.50	10.60	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.1	12.2	6.3	5.3
69	0	69	1.078	0.002	18.23%	6.50	10.60	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.2	12.2	6.3	5.3
69	0	69	1.081	0.004	18.29%	6.51	10.60	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.2	12.2	6.3	5.3
69	0	69	1.084	0.003	18.33%	6.51	10.59	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.2	12.2	6.3	5.3
69	0	69	1.087	0.003	18.38%	6.51	10.61	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.3	12.2	6.3	5.3
69	0	69	1.089	0.002	18.42%	6.52	10.58	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.3	12.2	6.3	5.3
69	0	69	1.092	0.002	18.46%	6.52	10.57	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.3	12.2	6.3	5.3
69	0	69	1.094	0.003	18.51%	6.52	10.59	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.4	12.2	6.3	5.3
69	0	69	1.097	0.003	18.56%	6.53	10.53	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.3	12.2	6.3	5.3
69	0	69	1.100	0.003	18.62%	6.53	10.56	6.9	5.9	5.9	5.9	17.5	1.0	11.6	11.4	12.2	6.3	5.3
69	0	69	1.103	0.003	18.66%	6.54	10.52	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.4	12.2	6.3	5.3
69	0	69	1.106	0.003	18.71%	6.54	10.51	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.4	12.2	6.3	5.3
69	0	69	1.109	0.003	18.77%	6.55	10.51	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.5	12.2	6.3	5.3
69	0	69	1.112	0.003	18.81%	6.55	10.48	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.5	12.1	6.2	5.2
69	0	69	1.114	0.002	18.85%	6.55	10.46	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.5	12.1	6.2	5.2
69	0	69	1.117	0.003	18.90%	6.56	10.46	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.5	12.1	6.2	5.2
69	0	69	1.120	0.002	18.94%	6.56	10.44	6.9	5.9	5.9	5.9	17.3	1.0	11.4	11.5	12.1	6.2	5.2
69	0	69	1.123	0.003	18.99%	6.56	10.47	6.9	5.9	5.9	5.9	17.4	1.0	11.5	11.6	12.1	6.2	5.2

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
68	0	68	1.126	0.003	19.04%	6.57	10.39	6.9	5.9	5.9	5.9	17.3	1.0	11.4	11.5	12.1	6.2	5.2
68	0	68	1.128	0.002	19.08%	6.57	10.40	6.9	6.0	6.0	5.9	17.3	1.0	11.4	11.6	12.1	6.2	5.2
68	0	68	1.131	0.003	19.13%	6.57	10.35	6.9	6.0	6.0	5.9	17.3	1.0	11.3	11.5	12.1	6.2	5.2
68	0	68	1.133	0.002	19.17%	6.58	10.36	6.9	6.0	6.0	5.9	17.3	1.0	11.3	11.6	12.1	6.2	5.2
68	0	68	1.136	0.003	19.21%	6.58	10.38	6.9	6.0	6.0	5.9	17.3	1.0	11.4	11.6	12.1	6.2	5.2
68	0	68	1.139	0.003	19.26%	6.59	10.36	6.9	6.0	6.0	5.9	17.3	1.0	11.3	11.6	12.1	6.2	5.2
69	0	69	1.142	0.003	19.31%	6.59	10.40	6.9	6.0	6.0	5.9	17.3	1.0	11.4	11.7	12.1	6.2	5.2
68	0	68	1.145	0.003	19.36%	6.59	10.38	6.9	6.0	6.0	5.9	17.3	1.0	11.3	11.7	12.1	6.2	5.2
69	0	69	1.147	0.002	19.40%	6.60	10.41	6.9	6.0	6.0	5.9	17.3	1.0	11.4	11.8	12.1	6.2	5.2
69	0	69	1.150	0.003	19.45%	6.60	10.38	6.9	6.0	6.0	5.9	17.3	1.0	11.3	11.8	12.1	6.1	5.2
68	0	68	1.153	0.003	19.50%	6.61	10.37	6.9	6.0	6.0	5.9	17.3	1.0	11.3	11.8	12.1	6.1	5.2
69	0	69	1.156	0.003	19.55%	6.61	10.41	6.9	6.0	6.0	5.9	17.3	1.0	11.4	11.9	12.1	6.2	5.2
69	0	69	1.159	0.003	19.60%	6.61	10.39	6.9	6.0	6.0	5.9	17.3	1.0	11.3	11.9	12.1	6.2	5.2
69	0	69	1.162	0.003	19.65%	6.62	10.42	6.9	6.0	6.0	5.9	17.3	1.0	11.4	12.0	12.1	6.2	5.2
69	0	69	1.165	0.004	19.71%	6.62	10.45	6.9	6.0	6.0	6.0	17.3	0.9	11.4	12.0	12.1	6.2	5.2
69	0	69	1.169	0.004	19.77%	6.63	10.48	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.1	12.1	6.2	5.2
69	0	69	1.173	0.004	19.83%	6.63	10.45	6.9	6.0	6.0	6.0	17.3	0.9	11.4	12.1	12.1	6.2	5.2
70	0	70	1.175	0.003	19.88%	6.64	10.48	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.1	12.1	6.2	5.2
70	0	70	1.179	0.004	19.95%	6.64	10.47	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.1	12.1	6.2	5.2
70	0	70	1.183	0.004	20.01%	6.65	10.48	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.2	12.1	6.2	5.2
70	0	70	1.186	0.003	20.07%	6.65	10.48	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.2	12.1	6.2	5.2
70	0	70	1.190	0.003	20.12%	6.66	10.46	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.2	12.1	6.2	5.2
70	0	70	1.193	0.003	20.18%	6.66	10.51	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.3	12.2	6.2	5.3
70	0	70	1.196	0.003	20.23%	6.67	10.49	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.3	12.1	6.2	5.2
70	0	70	1.199	0.003	20.28%	6.67	10.45	6.9	6.0	6.0	6.0	17.3	0.9	11.4	12.3	12.1	6.2	5.2
70	0	70	1.202	0.003	20.33%	6.67	10.46	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.3	12.1	6.2	5.2
70	1	70	1.205	0.003	20.38%	6.68	10.53	6.9	6.0	6.0	6.0	17.4	0.9	11.5	12.4	12.2	6.2	5.3
70	0	70	1.208	0.003	20.43%	6.68	10.46	6.9	6.0	6.0	6.0	17.4	0.9	11.4	12.3	12.1	6.2	5.2
70	0	70	1.211	0.003	20.48%	6.69	10.45	6.9	6.0	6.0	6.0	17.3	0.9	11.4	12.3	12.1	6.1	5.2
70	0	70	1.215	0.004	20.55%	6.69	10.40	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.3	12.1	6.1	5.2
70	0	70	1.218	0.003	20.60%	6.70	10.39	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.3	12.1	6.1	5.2
70	0	70	1.220	0.002	20.64%	6.70	10.38	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.3	12.1	6.1	5.2
70	0	70	1.223	0.003	20.69%	6.70	10.38	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.3	12.1	6.1	5.2
70	0	70	1.226	0.003	20.74%	6.71	10.37	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.3	12.1	6.1	5.2
70	0	70	1.229	0.003	20.79%	6.71	10.37	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.4	12.1	6.1	5.2
70	0	70	1.232	0.003	20.84%	6.72	10.36	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.3	12.1	6.1	5.2
70	0	70	1.234	0.003	20.88%	6.72	10.35	6.9	6.0	6.0	6.0	17.3	0.9	11.3	12.4	12.1	6.1	5.2
69	0	69	1.237	0.003	20.93%	6.72	10.32	6.9	6.0	6.0	6.0	17.2	0.9	11.2	12.3	12.1	6.1	5.2
70	0	70	1.240	0.002	20.97%	6.73	10.34	6.9	6.0	6.0	6.0	17.2	0.9	11.2	12.4	12.1	6.1	5.2
69	0	69	1.243	0.003	21.03%	6.73	10.27	6.9	6.0	6.0	6.0	17.2	0.9	11.2	12.3	12.0	6.0	5.1
69	0	69	1.245	0.002	21.07%	6.74	10.29	6.9	6.0	6.0	6.0	17.2	0.9	11.2	12.3	12.0	6.1	5.1
69	0	69	1.249	0.004	21.14%	6.74	10.27	6.9	6.0	6.0	6.0	17.2	0.9	11.2	12.3	12.0	6.0	5.1
69	0	69	1.252	0.003	21.19%	6.75	10.28	6.9	6.0	6.0	6.0	17.2	0.9	11.2	12.3	12.0	6.0	5.1
69	-1	69	1.255	0.003	21.23%	6.75	10.19	6.9	6.0	6.0	6.0	17.1	0.9	11.1	12.3	12.0	6.0	5.1
69	0	69	1.258	0.003	21.28%	6.75	10.22	6.9	6.0	6.0	6.0	17.1	0.9	11.1	12.3	12.0	6.0	5.1
69	0	69	1.261	0.003	21.33%	6.76	10.20	6.9	6.0	6.0	6.0	17.1	0.9	11.1	12.3	12.0	6.0	5.1
69	0	69	1.264	0.003	21.38%	6.76	10.19	6.9	6.0	6.0	6.0	17.1	0.9	11.1	12.3	12.0	6.0	5.1

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$	p' $(\sigma_1'+\sigma_3')/2$	q $(\sigma_1-\sigma_3)/2$
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		(psi)	(psi)	(psi)
69	0	69	1.267	0.003	21.43%	6.77	10.15	6.9	6.0	6.0	6.0	17.1	0.9	11.1	12.2	12.0	6.0	5.1
69	0	69	1.269	0.003	21.47%	6.77	10.12	6.9	6.0	6.0	6.0	17.0	0.9	11.0	12.2	12.0	6.0	5.1
69	0	69	1.272	0.003	21.51%	6.77	10.17	6.9	6.0	6.0	6.0	17.1	0.9	11.1	12.3	12.0	6.0	5.1
69	0	69	1.274	0.003	21.56%	6.78	10.12	6.9	6.0	6.0	6.0	17.0	0.9	11.0	12.2	12.0	6.0	5.1
69	0	69	1.277	0.003	21.61%	6.78	10.12	6.9	6.0	6.0	6.0	17.0	0.9	11.0	12.2	12.0	6.0	5.1
69	0	69	1.280	0.002	21.65%	6.79	10.11	6.9	6.0	6.0	6.0	17.0	0.9	11.0	12.2	12.0	6.0	5.1
69	0	69	1.283	0.003	21.70%	6.79	10.10	6.9	6.0	6.0	6.0	17.0	0.9	11.0	12.2	11.9	6.0	5.0
69	0	69	1.286	0.003	21.75%	6.80	10.10	6.9	6.0	6.0	6.0	17.0	0.9	11.0	12.1	11.9	6.0	5.0
68	0	68	1.288	0.002	21.79%	6.80	10.05	6.9	6.0	6.0	6.0	16.9	0.9	11.0	12.1	11.9	5.9	5.0
68	0	68	1.291	0.003	21.84%	6.80	10.05	6.9	6.0	6.0	6.0	17.0	0.9	11.0	12.0	11.9	5.9	5.0
68	0	68	1.294	0.003	21.89%	6.81	10.02	6.9	6.0	6.0	6.0	16.9	0.9	10.9	12.0	11.9	5.9	5.0
68	0	68	1.297	0.003	21.94%	6.81	10.02	6.9	6.0	6.0	6.0	16.9	0.9	10.9	12.0	11.9	5.9	5.0
68	0	68	1.300	0.003	21.98%	6.82	10.02	6.9	6.0	6.0	6.0	16.9	0.9	10.9	12.0	11.9	5.9	5.0
68	0	68	1.303	0.003	22.03%	6.82	9.96	6.9	6.0	6.0	6.0	16.9	0.9	10.9	12.0	11.9	5.9	5.0
68	0	68	1.305	0.002	22.07%	6.82	9.91	6.9	6.0	6.0	6.0	16.8	0.9	10.8	11.9	11.9	5.9	5.0
68	0	68	1.308	0.003	22.13%	6.83	9.91	6.9	6.0	6.0	6.0	16.8	0.9	10.8	11.9	11.9	5.9	5.0
68	0	68	1.311	0.002	22.17%	6.83	9.93	6.9	6.0	6.0	6.0	16.8	0.9	10.8	11.9	11.9	5.9	5.0
68	0	68	1.313	0.003	22.22%	6.84	9.88	6.9	6.0	6.0	6.0	16.8	0.9	10.8	11.9	11.8	5.8	4.9
67	0	67	1.316	0.003	22.26%	6.84	9.82	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.9	11.8	5.8	4.9
67	0	67	1.319	0.003	22.32%	6.84	9.84	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.9	11.8	5.8	4.9
67	0	67	1.322	0.002	22.36%	6.85	9.84	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.9	11.8	5.8	4.9
67	0	67	1.324	0.003	22.40%	6.85	9.77	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
67	0	67	1.328	0.004	22.46%	6.86	9.75	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.8	11.8	5.8	4.9
67	0	67	1.330	0.003	22.50%	6.86	9.72	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.8	11.8	5.8	4.9
67	0	67	1.333	0.003	22.55%	6.86	9.69	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.7	5.7	4.8
67	0	67	1.336	0.003	22.60%	6.87	9.70	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.7	5.8	4.8
67	0	67	1.338	0.002	22.64%	6.87	9.76	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
67	-1	67	1.341	0.002	22.68%	6.88	9.67	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.7	5.7	4.8
67	0	67	1.344	0.003	22.74%	6.88	9.70	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.8	5.8	4.9
67	0	67	1.347	0.003	22.78%	6.89	9.67	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.7	5.7	4.8
67	0	67	1.350	0.003	22.84%	6.89	9.72	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.8	11.8	5.8	4.9
67	0	67	1.353	0.003	22.89%	6.90	9.74	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.8	11.8	5.8	4.9
67	0	67	1.356	0.003	22.94%	6.90	9.73	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.8	11.8	5.8	4.9
67	0	67	1.360	0.004	23.00%	6.91	9.73	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.8	11.8	5.8	4.9
67	0	67	1.363	0.003	23.06%	6.91	9.75	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
67	0	67	1.367	0.004	23.12%	6.92	9.74	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.8	11.8	5.8	4.9
67	0	67	1.369	0.003	23.17%	6.92	9.71	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.8	5.8	4.9
68	0	68	1.373	0.003	23.22%	6.93	9.77	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
68	0	68	1.376	0.003	23.27%	6.93	9.75	6.9	6.0	6.0	6.0	16.6	0.9	10.7	11.8	11.8	5.8	4.9
68	0	68	1.379	0.004	23.33%	6.94	9.78	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
68	0	68	1.382	0.003	23.38%	6.94	9.77	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
68	0	68	1.386	0.004	23.44%	6.94	9.77	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
68	0	68	1.389	0.003	23.50%	6.95	9.79	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
68	0	68	1.392	0.003	23.55%	6.96	9.77	6.9	6.0	6.0	6.0	16.7	0.9	10.7	11.8	11.8	5.8	4.9
68	0	68	1.395	0.003	23.60%	6.96	9.75	6.9	6.0	6.0	6.0	16.6	0.9	10.7	11.7	11.8	5.8	4.9
68	0	68	1.398	0.003	23.65%	6.96	9.73	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.8	5.8	4.9
68	0	68	1.402	0.003	23.71%	6.97	9.73	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.8	5.8	4.9

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
68	0	68	1.405	0.003	23.76%	6.97	9.73	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.8	5.8	4.9
68	0	68	1.408	0.003	23.81%	6.98	9.70	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.7	11.8	5.8	4.9
67	0	67	1.411	0.003	23.86%	6.98	9.64	6.9	6.0	6.0	6.0	16.5	0.9	10.6	11.6	11.7	5.7	4.8
67	0	67	1.414	0.003	23.92%	6.99	9.65	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.6	11.7	5.7	4.8
67	0	67	1.416	0.003	23.96%	6.99	9.64	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.6	11.7	5.7	4.8
68	0	68	1.419	0.003	24.01%	7.00	9.66	6.9	6.0	6.0	6.0	16.6	0.9	10.6	11.6	11.7	5.7	4.8
67	0	67	1.422	0.003	24.06%	7.00	9.60	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.5	11.7	5.7	4.8
67	0	67	1.425	0.003	24.10%	7.01	9.63	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.5	11.7	5.7	4.8
68	0	68	1.428	0.003	24.15%	7.01	9.64	6.9	6.0	6.0	6.0	16.5	0.9	10.6	11.5	11.7	5.7	4.8
67	0	67	1.431	0.003	24.21%	7.02	9.60	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.4	11.7	5.7	4.8
67	0	67	1.434	0.003	24.25%	7.02	9.61	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.5	11.7	5.7	4.8
67	0	67	1.437	0.003	24.31%	7.02	9.58	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.4	11.7	5.7	4.8
67	0	67	1.440	0.003	24.35%	7.03	9.57	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.4	11.7	5.7	4.8
67	0	67	1.442	0.003	24.40%	7.03	9.54	6.9	6.0	6.0	6.0	16.4	0.9	10.5	11.3	11.7	5.7	4.8
67	0	67	1.445	0.003	24.45%	7.04	9.57	6.9	6.0	6.0	6.0	16.5	0.9	10.5	11.4	11.7	5.7	4.8
67	0	67	1.448	0.003	24.50%	7.04	9.54	6.9	6.0	6.0	6.0	16.4	0.9	10.5	11.3	11.7	5.7	4.8
67	0	67	1.451	0.003	24.54%	7.05	9.52	6.9	6.0	6.0	6.0	16.4	0.9	10.4	11.3	11.7	5.7	4.8
67	0	67	1.454	0.003	24.59%	7.05	9.51	6.9	6.0	6.0	6.0	16.4	0.9	10.4	11.2	11.7	5.7	4.8
67	0	67	1.457	0.003	24.64%	7.06	9.54	6.9	6.0	6.0	6.0	16.4	0.9	10.5	11.3	11.7	5.7	4.8
67	0	67	1.459	0.002	24.68%	7.06	9.47	6.9	6.0	6.0	6.0	16.4	0.9	10.4	11.2	11.6	5.7	4.7
67	0	67	1.462	0.003	24.73%	7.06	9.49	6.9	6.0	6.0	6.0	16.4	0.9	10.4	11.2	11.6	5.7	4.7
67	0	67	1.466	0.003	24.79%	7.07	9.51	6.9	6.0	6.0	6.0	16.4	0.9	10.4	11.2	11.7	5.7	4.8
67	0	67	1.468	0.002	24.83%	7.07	9.48	6.9	6.0	6.0	6.0	16.4	0.9	10.4	11.1	11.6	5.7	4.7
67	0	67	1.471	0.003	24.88%	7.08	9.45	6.9	6.0	6.0	6.0	16.3	0.9	10.4	11.1	11.6	5.7	4.7
67	0	67	1.474	0.003	24.93%	7.08	9.40	6.9	6.0	6.0	6.0	16.3	0.9	10.3	11.0	11.6	5.6	4.7
66	0	66	1.476	0.003	24.97%	7.09	9.37	6.9	6.0	6.0	6.0	16.3	0.9	10.3	11.0	11.6	5.6	4.7
67	0	67	1.479	0.003	25.02%	7.09	9.43	6.9	6.0	6.0	6.0	16.3	0.9	10.4	11.0	11.6	5.7	4.7
67	0	67	1.482	0.003	25.07%	7.10	9.43	6.9	6.0	6.0	6.0	16.3	0.9	10.4	11.0	11.6	5.7	4.7
67	0	67	1.484	0.003	25.11%	7.10	9.40	6.9	6.0	6.0	6.0	16.3	0.9	10.3	11.2	11.6	5.6	4.7
67	0	67	1.488	0.003	25.16%	7.10	9.39	6.9	6.0	6.0	6.0	16.3	0.9	10.3	11.1	11.6	5.6	4.7
67	0	67	1.490	0.002	25.21%	7.11	9.42	6.9	6.0	6.0	6.0	16.3	0.9	10.4	11.2	11.6	5.6	4.7
66	-1	66	1.493	0.003	25.25%	7.11	9.34	6.9	6.0	6.0	6.0	16.2	0.9	10.3	11.0	11.6	5.6	4.7
66	0	66	1.496	0.003	25.30%	7.12	9.34	6.9	6.0	6.0	6.0	16.2	0.9	10.3	11.0	11.6	5.6	4.7
66	0	66	1.499	0.003	25.35%	7.12	9.30	6.9	6.0	6.0	6.0	16.2	0.9	10.2	11.0	11.5	5.6	4.6
66	0	66	1.502	0.003	25.40%	7.13	9.27	6.9	6.0	6.0	6.0	16.2	0.9	10.2	10.9	11.5	5.6	4.6
66	0	66	1.504	0.003	25.45%	7.13	9.26	6.9	6.0	6.0	6.0	16.2	0.9	10.2	10.9	11.5	5.6	4.6
66	0	66	1.507	0.003	25.49%	7.14	9.28	6.9	6.0	6.0	6.0	16.2	0.9	10.2	11.0	11.5	5.6	4.6
66	0	66	1.509	0.002	25.53%	7.14	9.23	6.9	6.0	6.0	6.0	16.1	0.9	10.2	10.9	11.5	5.5	4.6
66	0	66	1.513	0.004	25.59%	7.15	9.22	6.9	6.0	6.0	6.0	16.1	0.9	10.2	10.9	11.5	5.5	4.6
66	0	66	1.516	0.003	25.65%	7.15	9.19	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.9	11.5	5.5	4.6
66	0	66	1.518	0.002	25.68%	7.15	9.17	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.8	11.5	5.5	4.6
65	0	65	1.521	0.003	25.73%	7.16	9.14	6.9	6.0	6.0	6.0	16.0	0.9	10.1	10.8	11.5	5.5	4.6
66	0	66	1.524	0.003	25.78%	7.16	9.17	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.8	11.5	5.5	4.6
66	0	66	1.527	0.003	25.82%	7.17	9.17	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.8	11.5	5.5	4.6
65	0	65	1.529	0.002	25.86%	7.17	9.09	6.9	6.0	6.0	6.0	16.0	0.9	10.0	10.7	11.4	5.5	4.5
65	0	65	1.532	0.003	25.91%	7.18	9.10	6.9	6.0	6.0	6.0	16.0	0.9	10.0	10.7	11.5	5.5	4.6
65	0	65	1.534	0.002	25.94%	7.18	9.10	6.9	6.0	6.0	6.0	16.0	0.9	10.0	10.7	11.4	5.5	4.5

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell (pounds) Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge (inches) Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
65	0	65	1.537	0.003	26.00%	7.18	9.11	6.9	6.0	6.0	6.0	16.0	0.9	10.0	10.7	11.5	5.5	4.6
66	0	66	1.539	0.002	26.04%	7.19	9.12	6.9	6.0	6.0	6.0	16.0	0.9	10.1	10.7	11.5	5.5	4.6
66	0	66	1.542	0.003	26.08%	7.19	9.11	6.9	6.0	6.0	6.0	16.0	0.9	10.0	10.7	11.5	5.5	4.6
66	1	66	1.545	0.003	26.13%	7.20	9.18	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.8	11.5	5.5	4.6
66	0	66	1.548	0.003	26.19%	7.20	9.15	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.8	11.5	5.5	4.6
66	0	66	1.551	0.003	26.24%	7.21	9.13	6.9	6.0	6.0	6.0	16.0	0.9	10.1	10.7	11.5	5.5	4.6
66	0	66	1.555	0.003	26.30%	7.21	9.12	6.9	6.0	6.0	6.0	16.0	0.9	10.1	10.7	11.5	5.5	4.6
66	0	66	1.558	0.004	26.36%	7.22	9.16	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
66	0	66	1.562	0.003	26.42%	7.23	9.19	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.8	11.5	5.5	4.6
67	0	67	1.565	0.004	26.48%	7.23	9.20	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.8	11.5	5.5	4.6
67	0	67	1.569	0.004	26.54%	7.24	9.23	6.9	6.0	6.0	6.0	16.1	0.9	10.2	10.8	11.5	5.6	4.6
66	0	66	1.572	0.003	26.59%	7.24	9.17	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
66	0	66	1.575	0.003	26.65%	7.25	9.16	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
67	0	67	1.579	0.003	26.70%	7.25	9.17	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
67	0	67	1.582	0.004	26.76%	7.26	9.20	6.9	6.0	6.0	6.0	16.1	0.9	10.2	10.7	11.5	5.5	4.6
67	0	67	1.585	0.003	26.81%	7.27	9.19	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
67	0	67	1.588	0.003	26.87%	7.27	9.17	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
67	0	67	1.592	0.003	26.92%	7.28	9.15	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
67	0	67	1.595	0.003	26.97%	7.28	9.21	6.9	6.0	6.0	6.0	16.1	0.9	10.2	10.7	11.5	5.6	4.6
67	0	67	1.598	0.004	27.03%	7.29	9.15	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
67	0	67	1.601	0.003	27.08%	7.29	9.17	6.9	6.0	6.0	6.0	16.1	0.9	10.1	10.7	11.5	5.5	4.6
67	0	67	1.604	0.003	27.12%	7.30	9.14	6.9	6.0	6.0	6.0	16.0	0.9	10.1	10.6	11.5	5.5	4.6
67	0	67	1.607	0.003	27.18%	7.30	9.13	6.9	6.0	6.0	5.9	16.0	1.0	10.1	10.6	11.5	5.5	4.6
67	0	67	1.610	0.003	27.23%	7.31	9.17	6.9	6.0	6.0	5.9	16.1	1.0	10.1	10.6	11.5	5.5	4.6
67	0	67	1.612	0.003	27.27%	7.31	9.14	6.9	6.0	6.0	5.9	16.0	1.0	10.1	10.6	11.5	5.5	4.6
67	0	67	1.616	0.003	27.33%	7.32	9.11	6.9	6.0	6.0	5.9	16.0	1.0	10.1	10.6	11.5	5.5	4.6
67	0	67	1.618	0.002	27.37%	7.32	9.11	6.9	6.0	6.0	5.9	16.0	1.0	10.1	10.6	11.5	5.5	4.6
66	0	66	1.621	0.003	27.42%	7.33	9.07	6.9	6.0	6.0	5.9	16.0	1.0	10.0	10.5	11.4	5.5	4.5
67	0	67	1.624	0.003	27.46%	7.33	9.11	6.9	6.0	6.0	5.9	16.0	1.0	10.1	10.6	11.5	5.5	4.6
67	0	67	1.627	0.003	27.52%	7.34	9.09	6.9	6.0	6.0	5.9	16.0	1.0	10.0	10.5	11.4	5.5	4.5
67	0	67	1.630	0.003	27.57%	7.34	9.09	6.9	6.0	6.0	5.9	16.0	1.0	10.0	10.5	11.4	5.5	4.5
67	0	67	1.633	0.003	27.62%	7.35	9.10	6.9	6.0	6.0	5.9	16.0	1.0	10.1	10.5	11.5	5.5	4.6
67	0	67	1.635	0.003	27.66%	7.35	9.07	6.9	6.0	6.0	5.9	16.0	1.0	10.0	10.5	11.4	5.5	4.5
67	0	67	1.638	0.003	27.72%	7.36	9.12	6.9	6.0	6.0	5.9	16.0	1.0	10.1	10.5	11.5	5.5	4.6
67	0	67	1.641	0.003	27.76%	7.36	9.06	6.9	6.0	6.0	5.9	16.0	1.0	10.0	10.5	11.4	5.5	4.5
66	0	66	1.644	0.003	27.81%	7.37	9.02	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.647	0.003	27.86%	7.37	9.07	6.9	6.0	6.0	5.9	16.0	1.0	10.0	10.5	11.4	5.5	4.5
67	0	67	1.650	0.003	27.90%	7.37	9.04	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
66	0	66	1.653	0.003	27.95%	7.38	9.00	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	1	67	1.655	0.003	28.00%	7.39	9.07	6.9	6.0	6.0	5.9	16.0	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.658	0.003	28.05%	7.39	9.03	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.661	0.002	28.09%	7.39	9.04	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.664	0.003	28.14%	7.40	9.04	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.668	0.004	28.21%	7.41	9.01	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.670	0.002	28.24%	7.41	9.04	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.673	0.003	28.29%	7.41	9.02	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.675	0.003	28.34%	7.42	9.00	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.3	11.4	5.5	4.5

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds) Reading	Load Cell Δ	Deviator Load (pounds)	Dial Gauge (inches) Reading	Dial Gauge Δ	Axial Strain ε	Corrected Area (in2)	Dev. Stress P/A (psi)	Effective Stress σ_3 (psi)	Pressure Transducer (psi)	Pore Pressure u (psi)	Δu (psi)	σ_1 (psi)	σ_3' (psi)	σ_1' (psi)	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$ (psi)	p' $(\sigma_1'+\sigma_3')/2$ (psi)	q $(\sigma_1-\sigma_3)/2$ (psi)
67	0	67	1.678	0.002	28.38%	7.42	9.02	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.681	0.003	28.43%	7.43	9.03	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.4	11.4	5.5	4.5
67	0	67	1.684	0.003	28.48%	7.43	8.97	6.9	6.0	6.0	5.9	15.9	1.0	9.9	10.3	11.4	5.5	4.5
67	0	67	1.686	0.002	28.52%	7.44	9.01	6.9	6.0	6.0	5.9	15.9	1.0	10.0	10.3	11.4	5.5	4.5
67	0	67	1.689	0.003	28.57%	7.44	8.97	6.9	6.0	6.0	5.9	15.9	1.0	9.9	10.3	11.4	5.5	4.5
67	0	67	1.692	0.003	28.62%	7.45	8.94	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.3	11.4	5.4	4.5
67	0	67	1.695	0.003	28.67%	7.45	8.93	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.2	11.4	5.4	4.5
67	0	67	1.697	0.002	28.71%	7.46	8.96	6.9	6.0	6.0	5.9	15.9	1.0	9.9	10.3	11.4	5.4	4.5
67	0	67	1.701	0.003	28.77%	7.46	8.91	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.2	11.4	5.4	4.5
66	0	66	1.704	0.003	28.82%	7.47	8.89	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.2	11.3	5.4	4.4
66	0	66	1.706	0.002	28.86%	7.47	8.87	6.9	6.0	6.0	5.9	15.8	1.0	9.8	10.1	11.3	5.4	4.4
66	0	66	1.709	0.003	28.91%	7.48	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.1	11.3	5.4	4.4
66	0	66	1.712	0.003	28.96%	7.48	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.1	11.3	5.4	4.4
66	0	66	1.715	0.002	29.00%	7.49	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.1	11.3	5.4	4.4
66	0	66	1.718	0.003	29.06%	7.49	8.83	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.1	11.3	5.4	4.4
66	0	66	1.720	0.002	29.10%	7.50	8.78	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
66	0	66	1.723	0.002	29.14%	7.50	8.79	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
66	0	66	1.725	0.003	29.18%	7.51	8.76	6.9	6.0	6.0	5.9	15.7	1.0	9.7	10.0	11.3	5.4	4.4
66	0	66	1.728	0.003	29.23%	7.51	8.74	6.9	6.0	6.0	5.9	15.6	1.0	9.7	10.0	11.3	5.3	4.4
66	0	66	1.730	0.002	29.26%	7.52	8.75	6.9	6.0	6.0	5.9	15.6	1.0	9.7	10.0	11.3	5.3	4.4
66	0	66	1.733	0.003	29.32%	7.52	8.76	6.9	6.0	6.0	5.9	15.7	1.0	9.7	10.0	11.3	5.4	4.4
66	0	66	1.736	0.003	29.36%	7.53	8.80	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
66	0	66	1.739	0.003	29.41%	7.53	8.79	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
66	0	66	1.742	0.004	29.47%	7.54	8.80	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
66	0	66	1.745	0.003	29.52%	7.54	8.78	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
66	0	66	1.748	0.003	29.57%	7.55	8.79	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
67	0	67	1.752	0.003	29.63%	7.56	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
67	0	67	1.755	0.004	29.69%	7.56	8.81	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
67	0	67	1.759	0.003	29.75%	7.57	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
67	0	67	1.762	0.003	29.80%	7.57	8.87	6.9	6.0	6.0	5.9	15.8	1.0	9.8	10.1	11.3	5.4	4.4
67	0	67	1.765	0.004	29.86%	7.58	8.89	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.1	11.3	5.4	4.4
67	0	67	1.768	0.003	29.91%	7.59	8.89	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.1	11.3	5.4	4.4
67	0	67	1.772	0.003	29.97%	7.59	8.86	6.9	6.0	6.0	5.9	15.8	1.0	9.8	10.0	11.3	5.4	4.4
67	0	67	1.776	0.004	30.03%	7.60	8.88	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.1	11.3	5.4	4.4
67	0	67	1.778	0.003	30.08%	7.60	8.85	6.9	6.0	6.0	5.9	15.8	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.782	0.004	30.14%	7.61	8.88	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.1	11.3	5.4	4.4
68	0	68	1.785	0.003	30.20%	7.62	8.89	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.1	11.3	5.4	4.4
67	0	67	1.788	0.003	30.24%	7.62	8.85	6.9	6.0	6.0	5.9	15.8	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.791	0.003	30.30%	7.63	8.87	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.1	11.3	5.4	4.4
68	0	68	1.794	0.003	30.35%	7.63	8.87	6.9	6.0	6.0	5.9	15.8	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.797	0.003	30.40%	7.64	8.89	6.9	6.0	6.0	5.9	15.8	1.0	9.9	10.1	11.3	5.4	4.4
67	-1	67	1.800	0.003	30.45%	7.65	8.79	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.803	0.003	30.50%	7.65	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.805	0.002	30.54%	7.65	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.809	0.004	30.60%	7.66	8.83	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.812	0.003	30.64%	7.67	8.82	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.814	0.003	30.69%	7.67	8.84	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4

Triaxial Compression Test
Loading Data
Point 2

Project: Shannon & Wilson | Test type: CU | Project No: 1984.1.1 | Sample ID: B-08 U1 @ 5 - 7 ft. | Depth: N/A | Date: 6/24/2014

Filter Paper type and design: 617 with filter strips | Height (post consol): 5.912 in. | Load Cell Constant: NA

Membrane Thickness: 0.016 in X 2 | Cell Pressure 34.9 psi | Strain Rate 0.0059118 in/min | Tested By: B. Adame | Pressure Transducer Correction: 0 psi

Load Cell (pounds)		Deviator Load	Dial Gauge (inches)		Axial Strain	Corrected Area	Dev. Stress P/A	Effective Stress	Pressure Transducer	Pore Pressure	Δu	σ_1	σ_3'	σ_1'	σ_1'/σ_3'	p $(\sigma_1+\sigma_3)/2$	p' $(\sigma_1'+\sigma_3')/2$	q $(\sigma_1-\sigma_3)/2$
Reading	Δ	(pounds)	Reading	Δ	ε	(in2)	(psi)	σ_3 (psi)	(psi)	u (psi)	(psi)	(psi)	(psi)	(psi)		(psi)	(psi)	(psi)
68	0	68	1.818	0.004	30.75%	7.68	8.82	6.9	6.0	6.0	5.9	15.7	1.0	9.8	10.0	11.3	5.4	4.4
68	0	68	1.821	0.003	30.80%	7.68	8.80	6.9	6.0	6.0	5.9	15.7	1.0	9.8	9.9	11.3	5.4	4.4

APPENDIX C

SLOPE STABILITY ANALYSIS

FIGURES

EXPLANATION

- Location and Designation of Boring
- Location and Designation of Test Pit
- Existing Levee

Approximate Location of Recommended Levee

- North Levee
- Middle Levee

A A'

Location and Designation of Slope Stability Analysis

0 250 500 1,000

Scale in Feet

NOTES

1. Aerial photograph and existing features provided by Northwest Hydraulic Consultants, December 18, 2013.

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Tillamook, Oregon

SLOPE STABILITY SITE PLAN

November 2014 24-1-03858-005

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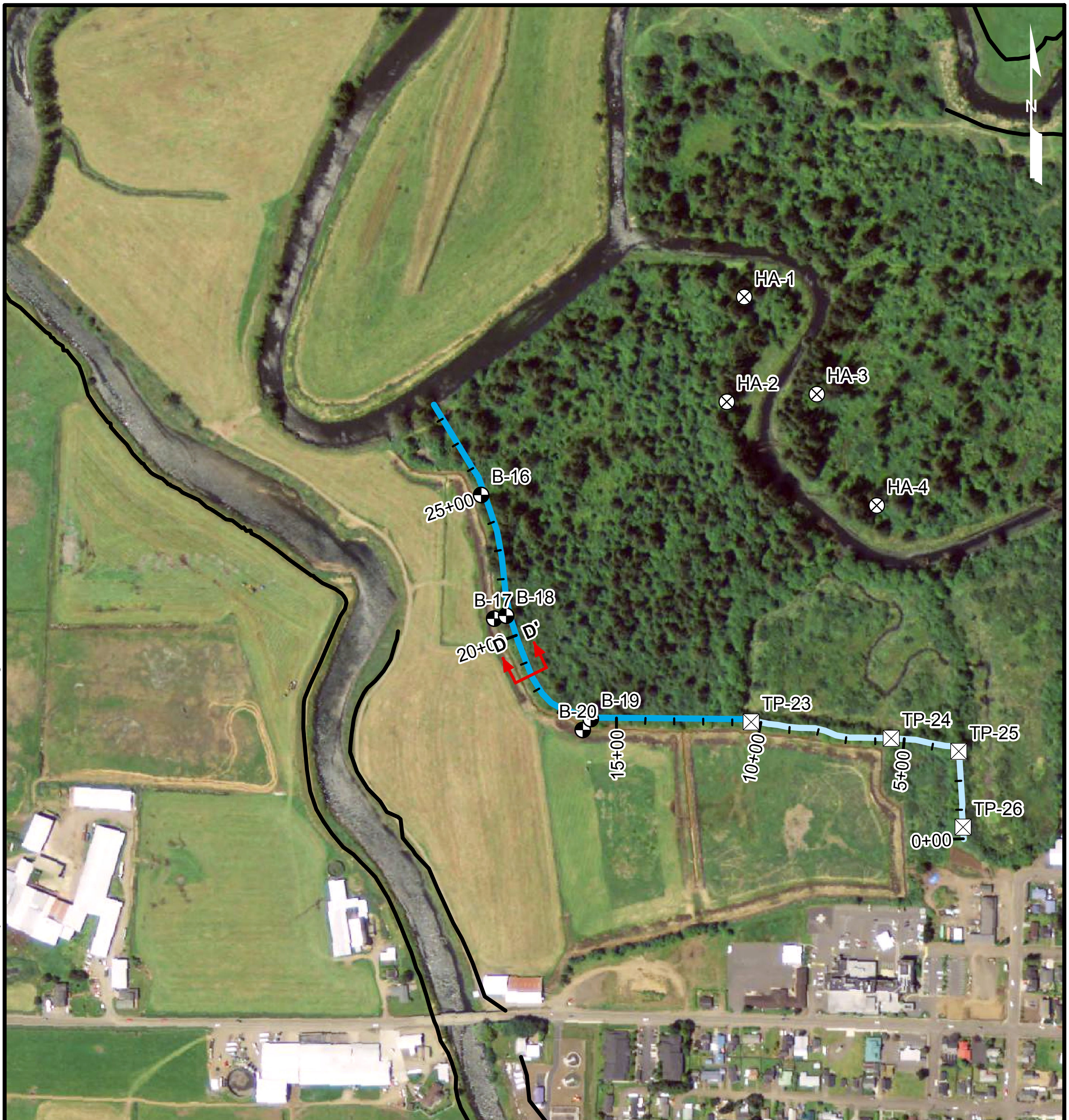
FIG. C1
Sheet 1 of 2

Filename: T:\Projects\24-1\3858_Oregon Solution Exodus S. Flow Corridor\Avmxd\Stability Site Plan.mxd Date: 10/30/2014 Login: aeh



EXPLANATION

- Location and Designation of Boring
- Location and Designation of Test Pit
- Location and Designation of Hand Auger
- Existing Levee

Approximate Location of Recommended Levee

- South Levee
- South Levee (Upgrade)

A A' Location and Designation of Slope Stability Analysis

NOTES

1. Aerial photograph and existing features provided by Northwest Hydraulic Consultants, December 18, 2013.

0 250 500 1,000

Scale in Feet

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Tillamook, Oregon

SLOPE STABILITY SITE PLAN

November 2014 24-1-03858-005

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FIG. C1
Sheet 2 of 2

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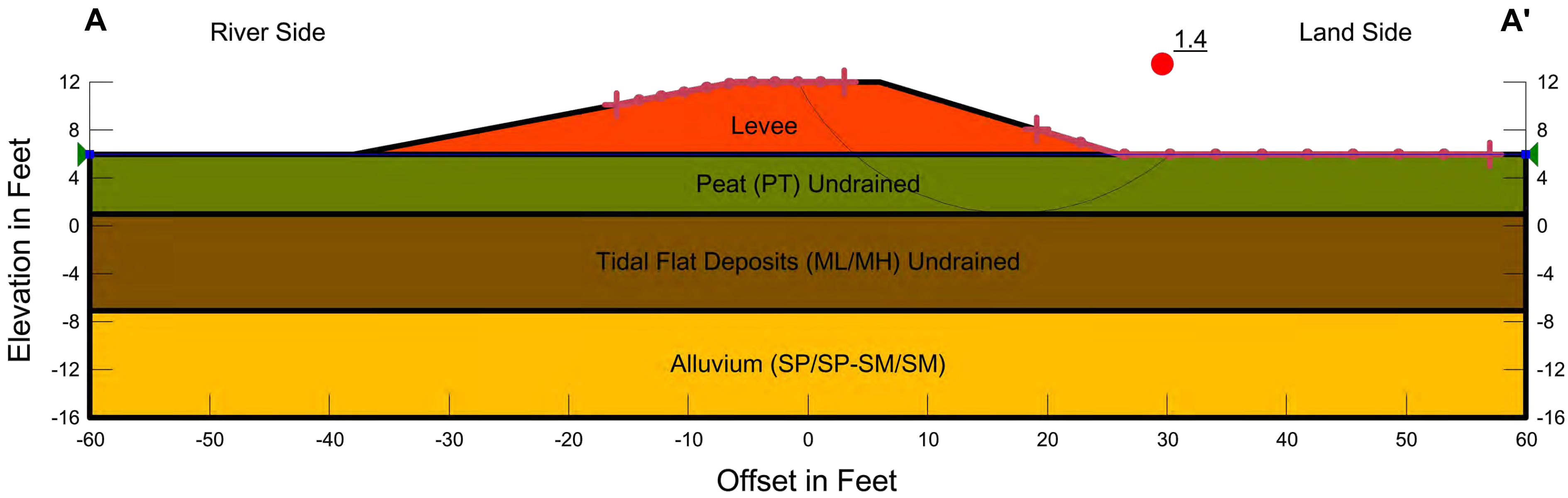

Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Tidal Flat Deposits (ML/MH) Undrained Unit Weight: 85 pcf Cohesion': 200 psf
Name: Peat (PT) Undrained Unit Weight: 70 pcf C-Top of Layer: 130 psf C-Rate of Change: 5.3 psf/ft C-Maximum: 200 psf

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SECTION A - A'
END OF CONSTRUCTION
LAND SIDE

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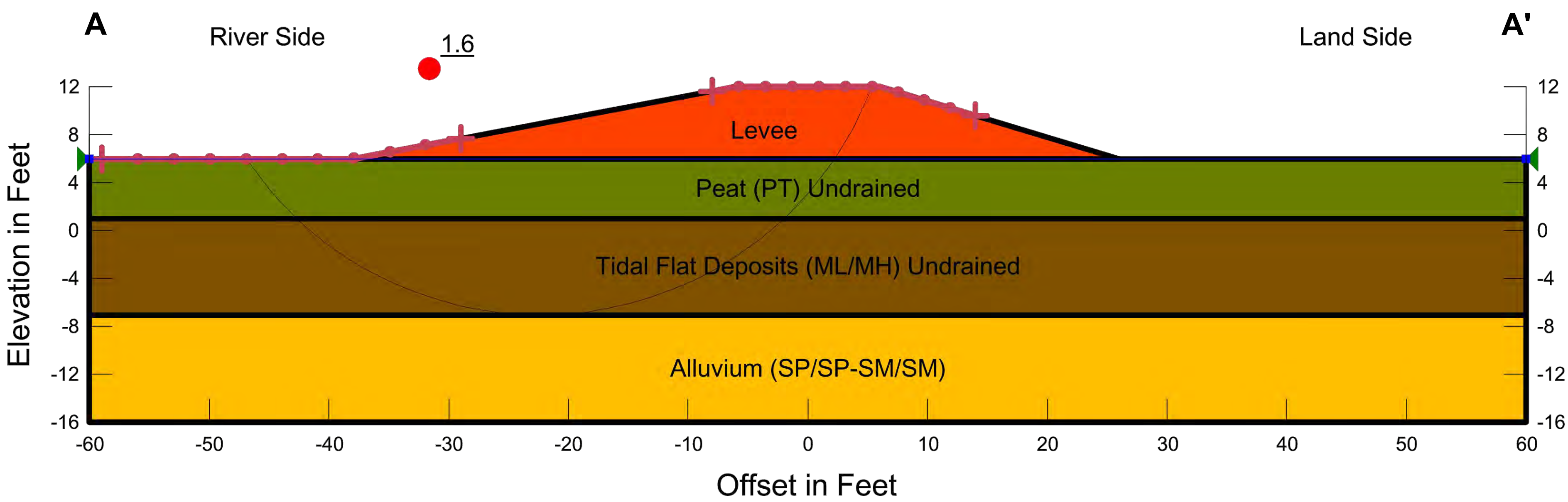
FIG. C2.1

FIG. C2.1

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures AA.dwg Date: 10-30-2014 Author: jjw



Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Tidal Flat Deposits (ML/MH) Undrained Unit Weight: 85 pcf Cohesion': 200 psf
Name: Peat (PT) Undrained Unit Weight: 70 pcf C-Top of Layer: 130 psf C-Rate of Change: 5.3 psf/ft C-Maximum: 200 psf

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Tillamook, Oregon

SECTION A - A'
END OF CONSTRUCTION
RIVER SIDE

November 2014 24-1-03858-005

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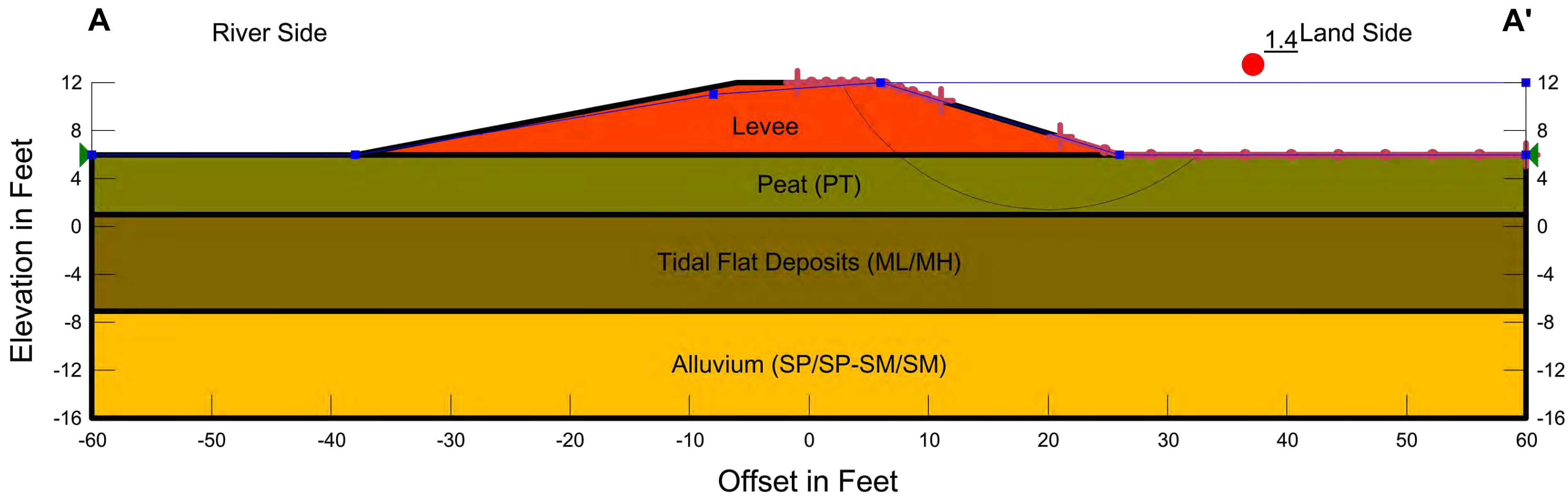
FIG. C2.2

FIG. C2.2



Name: Tidal Flat Deposits (ML/MH) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 24 ° Total Cohesion: 220 psf Total Phi: 19 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 ° Total Cohesion: 100 psf Total Phi: 30 °

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Tillamook, Oregon

SECTION A - A'
SUDDEN DRAWDOWN
LAND SIDE

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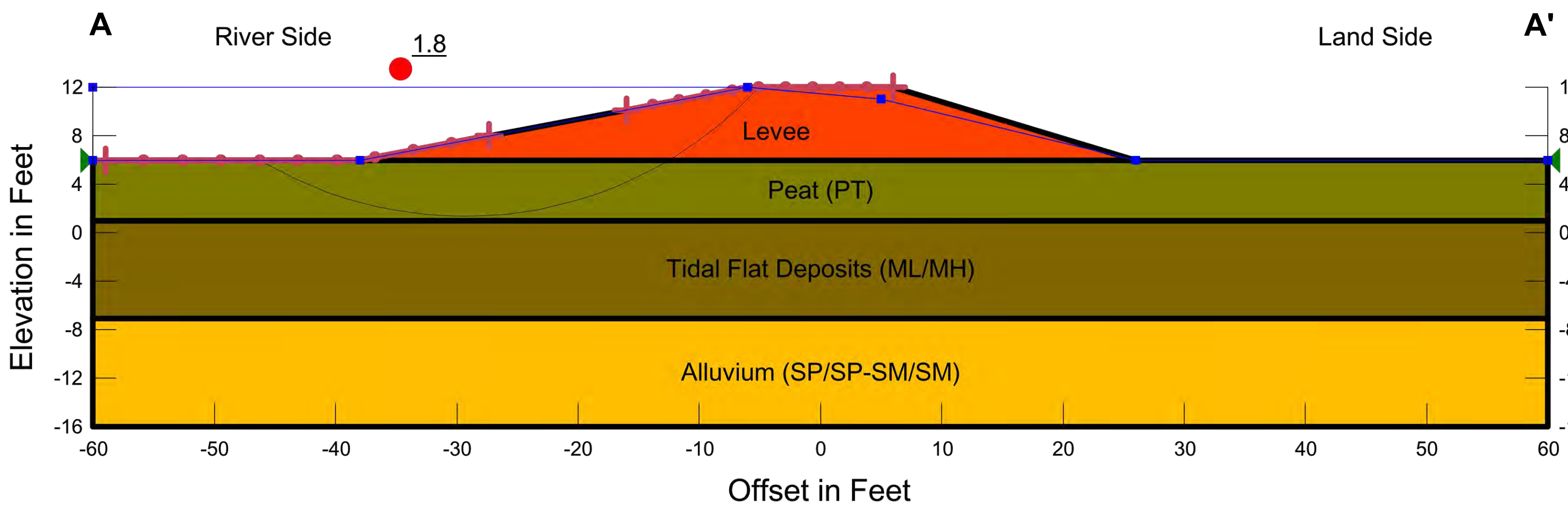
FIG. C2.3

FIG. C2.3



Name: Tidal Flat Deposits (ML/MH) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 24 ° Total Cohesion: 220 psf Total Phi: 19 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 ° Total Cohesion: 100 psf Total Phi: 30 °

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Tillamook, Oregon

SECTION A - A'
SUDDEN DRAWDOWN
RIVER SIDE

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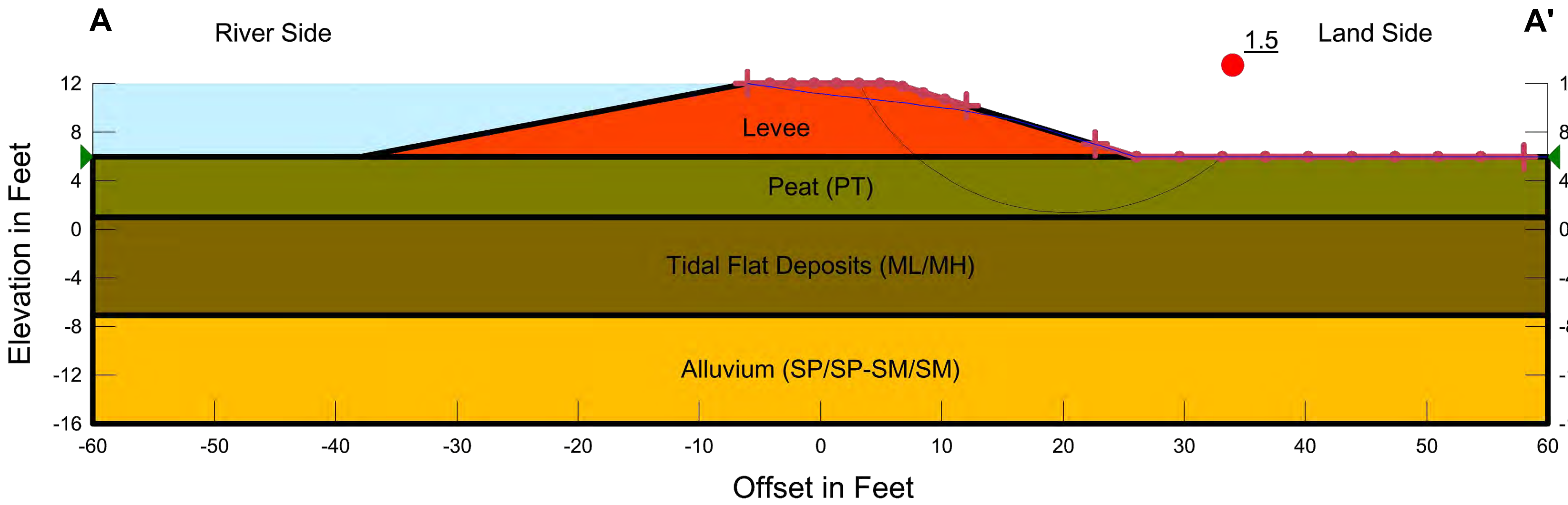
FIG. C2.4

FIG. C2.4

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures AA.dwg Date: 10-30-2014 Author: jjw



Name: Tidal Flat Deposits (ML/MH) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 24 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 °

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SECTION A - A'
STEADY SEEPAGE FROM FLOOD
LAND SIDE STABILITY

November 2014 24-1-03858-005

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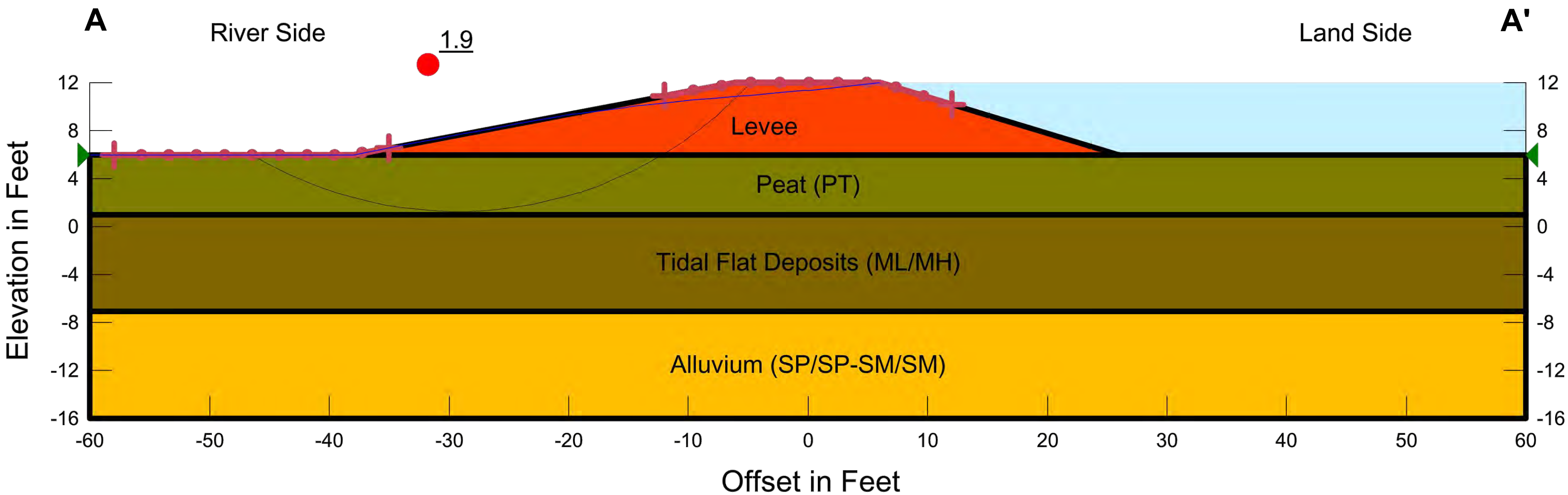
FIG. C2.5

FIG. C2.5

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures AA.dwg Date: 10-30-2014 Author: jjw



Name: Tidal Flat Deposits (ML/MH) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 24 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 °

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION A - A'
STEADY SEEPAGE FROM FLOOD
RIVER SIDE STABILITY

November 2014 24-1-03858-005

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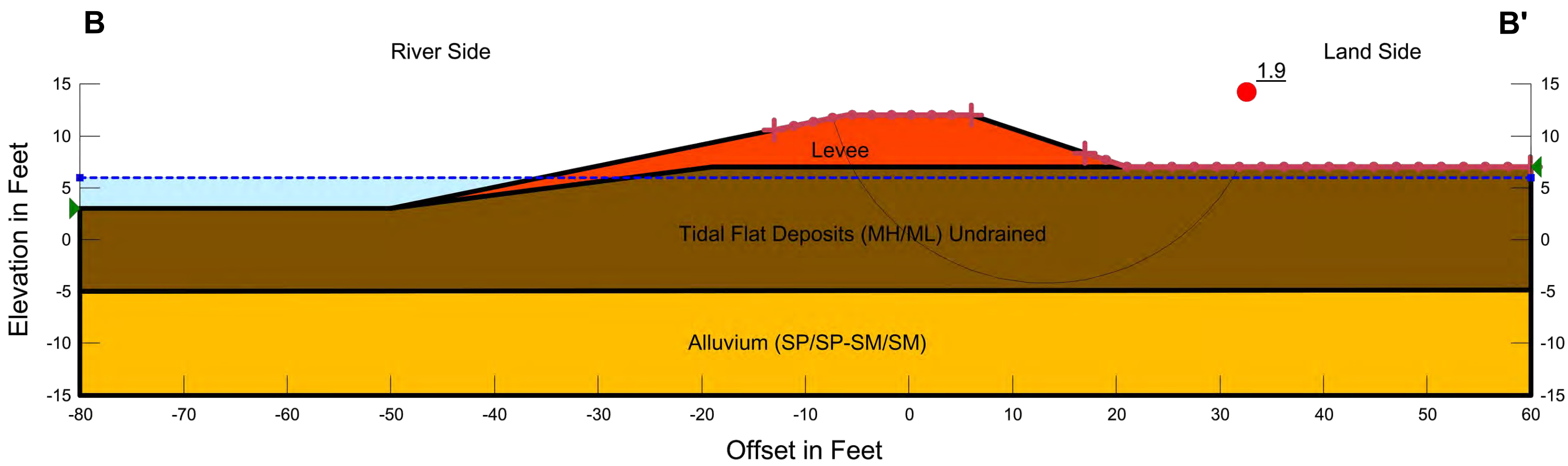
FIG. C2.6

FIG. C2.6



Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Tidal Flat Deposits (MH/ML) Undrained Unit Weight: 85 pcf Cohesion': 200 psf Phi': 0 °

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION B - B'
END OF CONSTRUCTION
LAND SIDE

November 2014 24-1-03858-005

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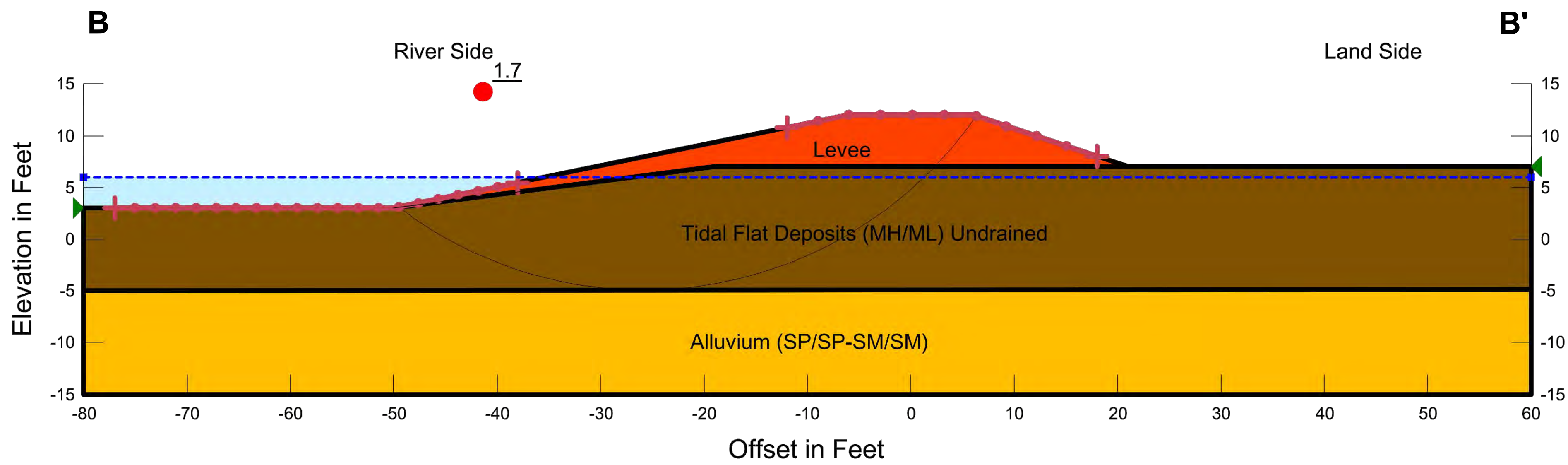
FIG. C3.1

FIG. C3.1

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures BB.dwg Date: 10-30-2014 Author: jjw



Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °

Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °

Name: Tidal Flat Deposits (MH/ML) Undrained Unit Weight: 85 pcf Cohesion': 200 psf Phi': 0 °

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION B - B'
END OF CONSTRUCTION
RIVER SIDE

November 2014 24-1-03858-005

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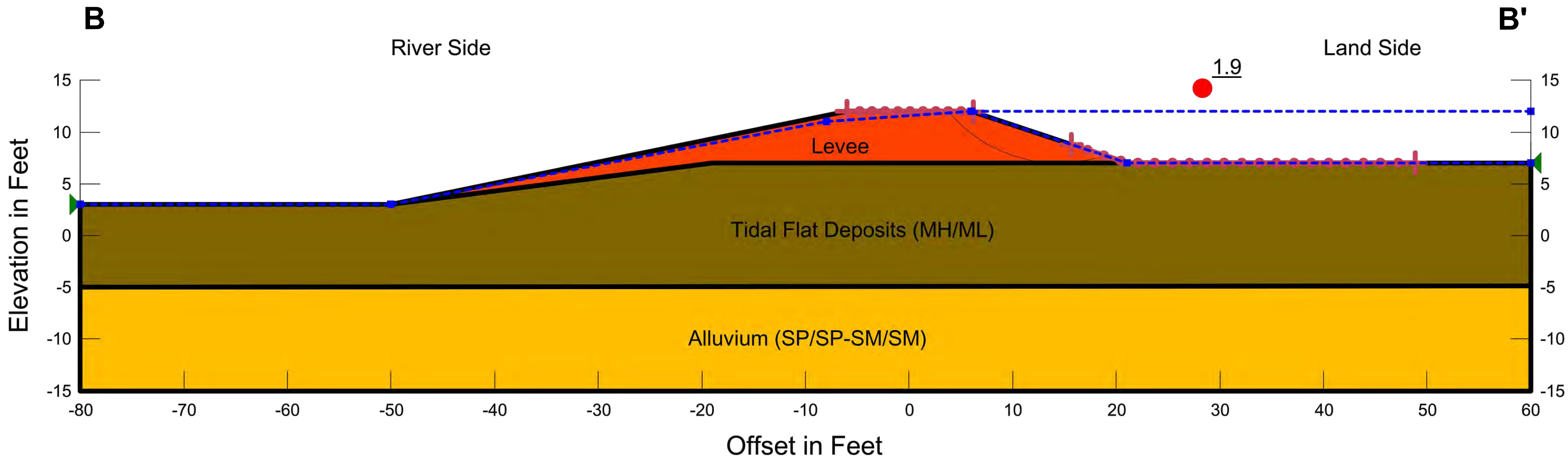
FIG. C3.2

FIG. C3.2



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 24 ° Total Cohesion: 220 psf Total Phi: 19 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 °

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION B - B'
SUDDEN DRAWDOWN
LAND SIDE

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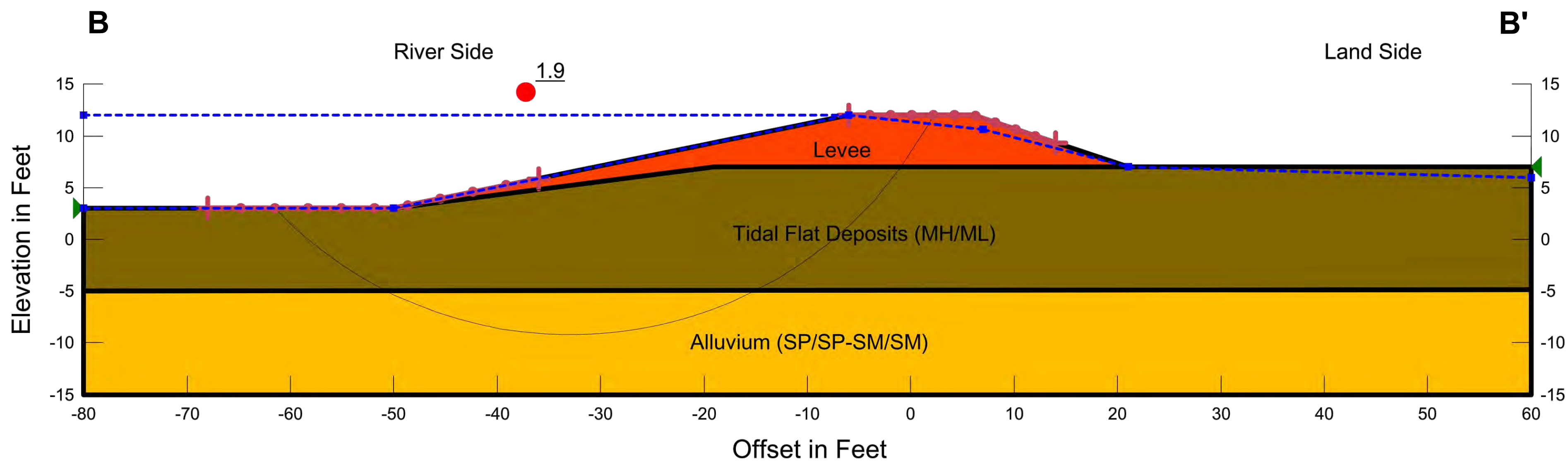
FIG. C3.3

FIG. C3.3

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures BB.dwg   Date: 10-30-2014   Author: jjw



Name: Tidal Flat Deposits (MH/ML)   Unit Weight: 85 pcf   Cohesion': 200 psf   Phi': 24 °   Total Cohesion: 220 psf   Total Phi: 19 °

Name: Alluvium (SP/SP-SM/SM)   Unit Weight: 110 pcf   Cohesion': 0 psf   Phi': 28 °   Total Cohesion: 0 psf   Total Phi: 0 °

Name: Levee   Unit Weight: 120 pcf   Cohesion': 50 psf   Phi': 32 °   Total Cohesion: 0 psf   Total Phi: 0 °

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Tillamook, Oregon

SECTION B - B'
SUDDEN DRAWDOWN
RIVER SIDE

November 2014   24-1-03858-005

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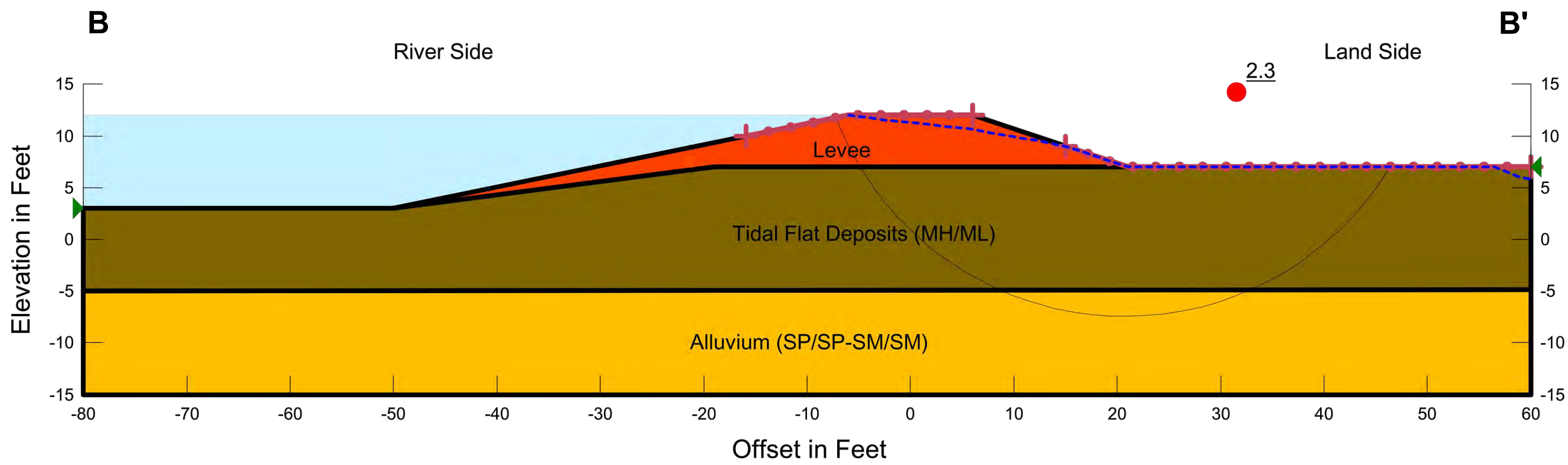
FIG. C3.4

FIG. C3.4



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 24 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °

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Tillamook, Oregon

SECTION B - B'
STEADY SEEPAGE FROM FLOOD
LAND SIDE STABILITY

November 2014 24-1-03858-005

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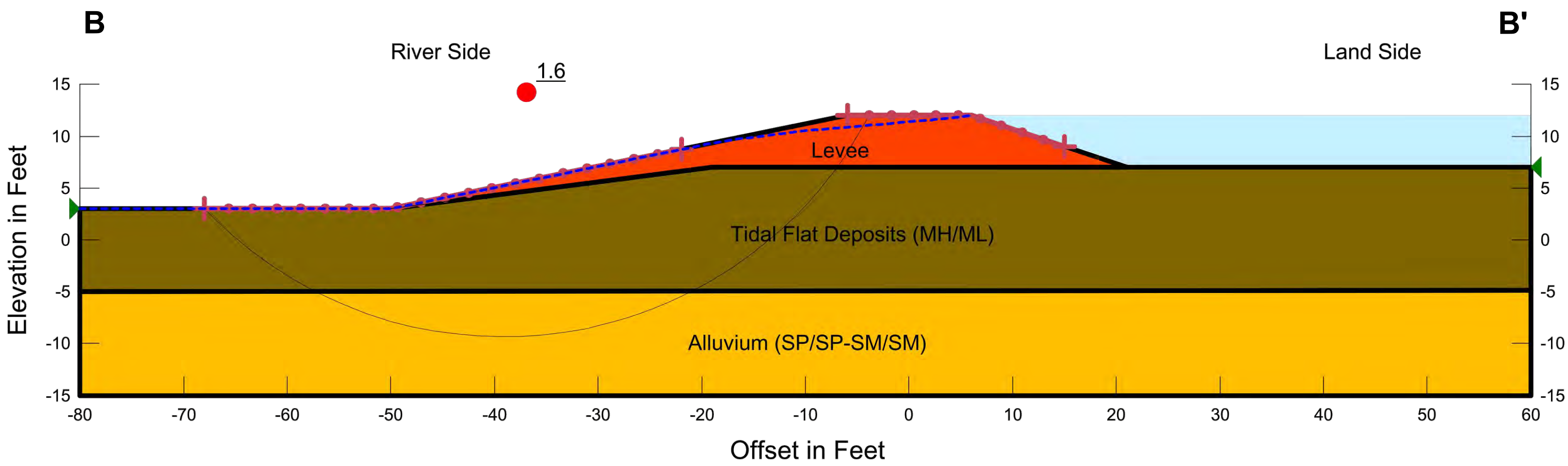
FIG. C3.5

FIG. C3.5



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 24 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °

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Southern Flow Corridor Project
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SECTION B - B'
STEADY SEEPAGE FROM FLOOD
RIVER SIDE STABILITY

November 2014 24-1-03858-005

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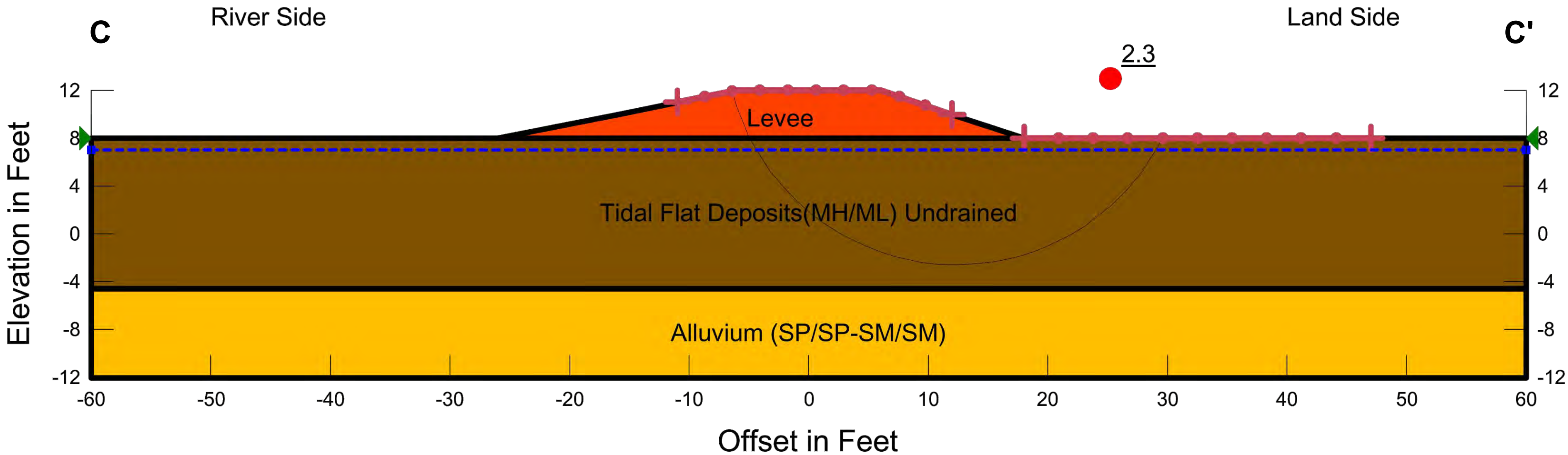
FIG. C3.6

FIG. C3.6



Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Tidal Flat Deposits(MH/ML) Undrained Unit Weight: 80 pcf Cohesion': 200 psf Phi': 0 °

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

SECTION C - C'
END OF CONSTRUCTION
LAND SIDE

November 2014 24-1-03858-005

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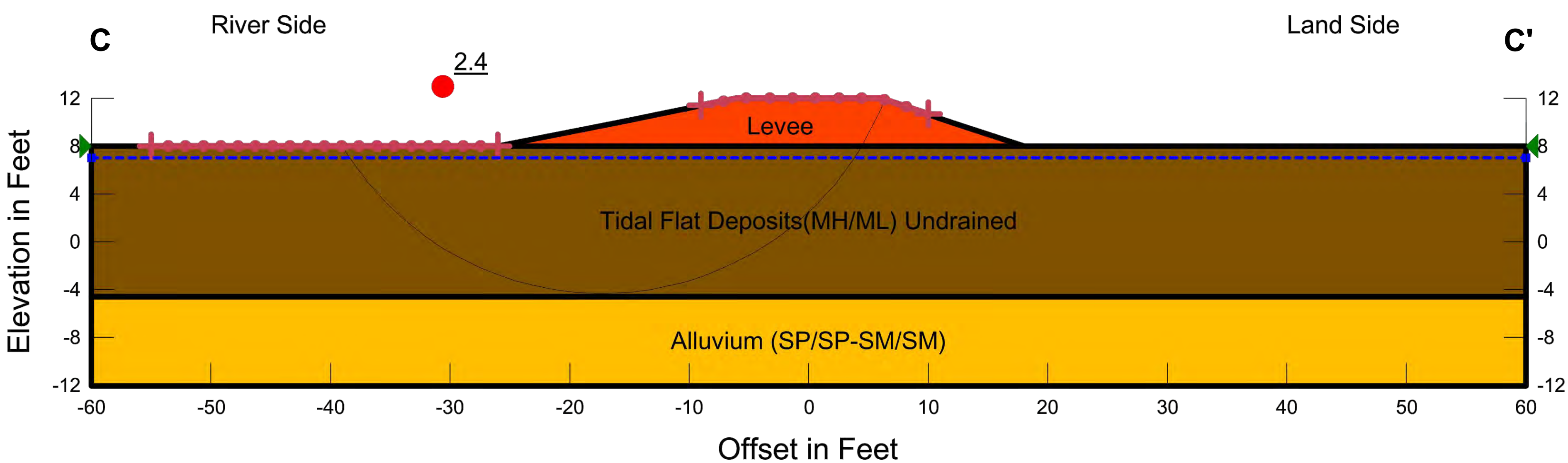
FIG. C4.1

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures CC.dwg Date: 10-30-2014 Author: jjw



Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Tidal Flat Deposits(MH/ML) Undrained Unit Weight: 80 pcf Cohesion': 200 psf Phi': 0 °

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

SECTION C - C'
END OF CONSTRUCTION
RIVER SIDE

November 2014 24-1-03858-005

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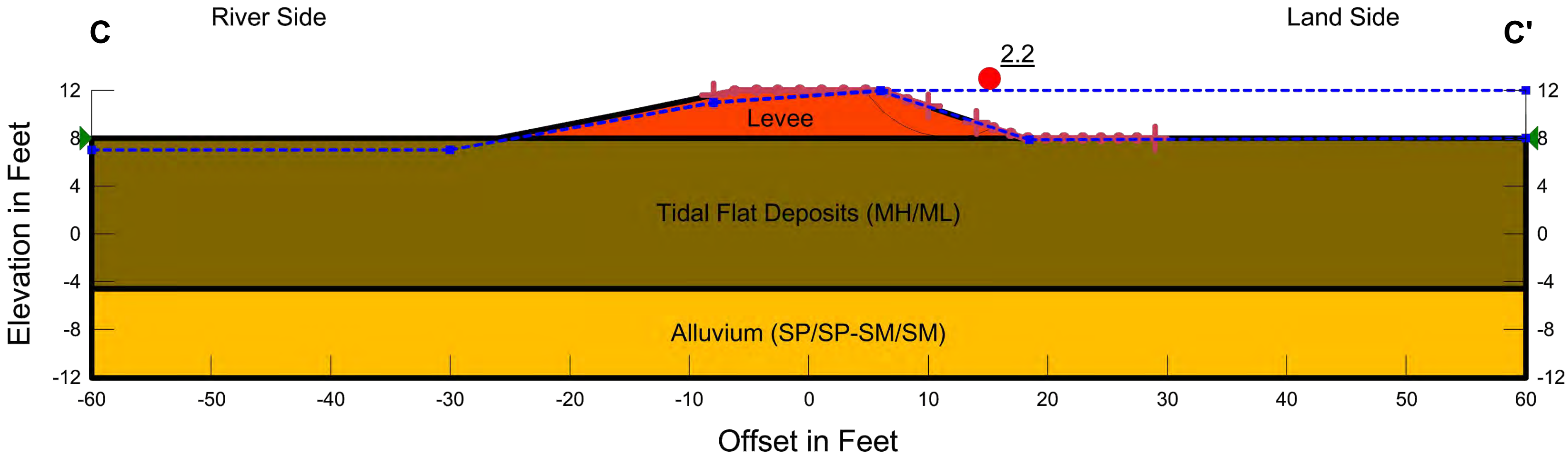
FIG. C4.2

FIG. C4.2



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 80 pcf Cohesion': 200 psf Phi': 22 ° Total Cohesion: 220 psf Total Phi: 19 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 °

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION C - C'
SUDDEN DRAWDOWN
LAND SIDE

November 2014 24-1-03858-005

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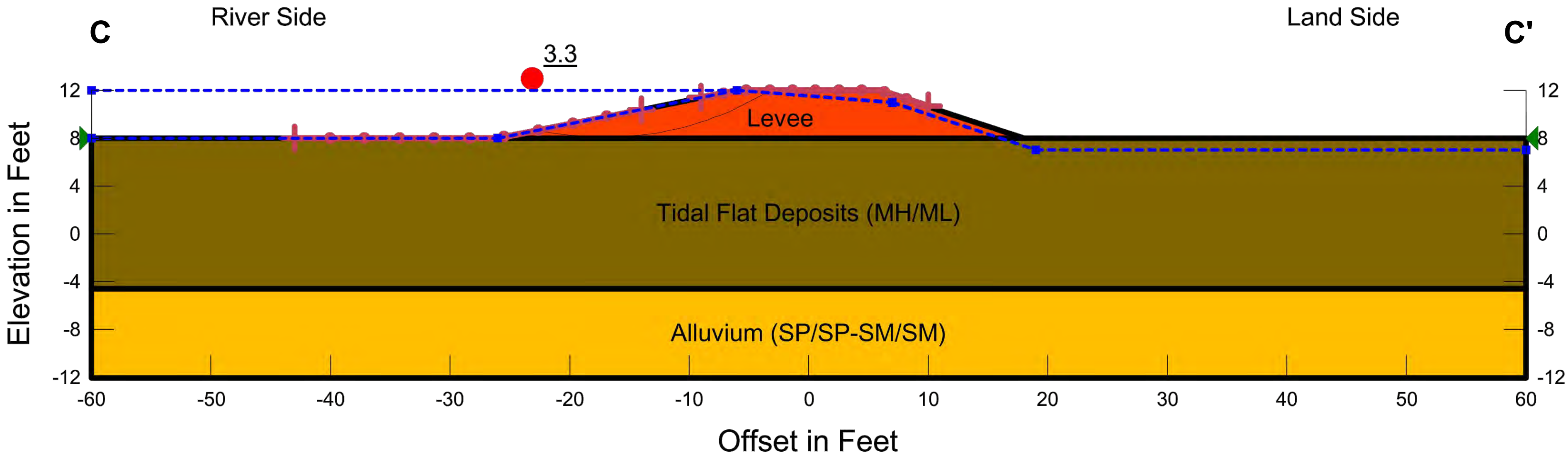
FIG. C4.3

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures CC.dwg Date: 10-30-2014 Author: jjw



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 80 pcf Cohesion': 200 psf Phi': 22 ° Total Cohesion: 220 psf Total Phi: 19 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 °

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION C - C'
SUDDEN DRAWDOWN
RIVER SIDE

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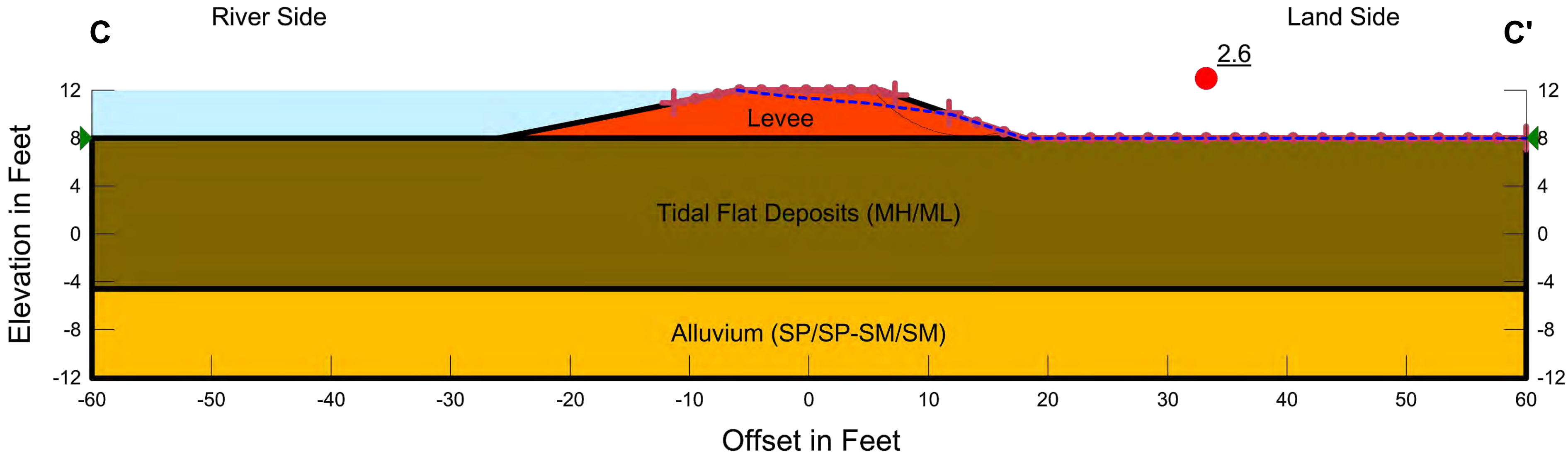
FIG. C4.4

FIG. C4.4

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures CC.dwg Date: 10-30-2014 Author: jjw



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 80 pcf Cohesion': 200 psf Phi': 22 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °

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Tillamook, Oregon

SECTION C - C'
STEADY SEEPAGE FROM FLOOD
LAND SIDE STABILITY

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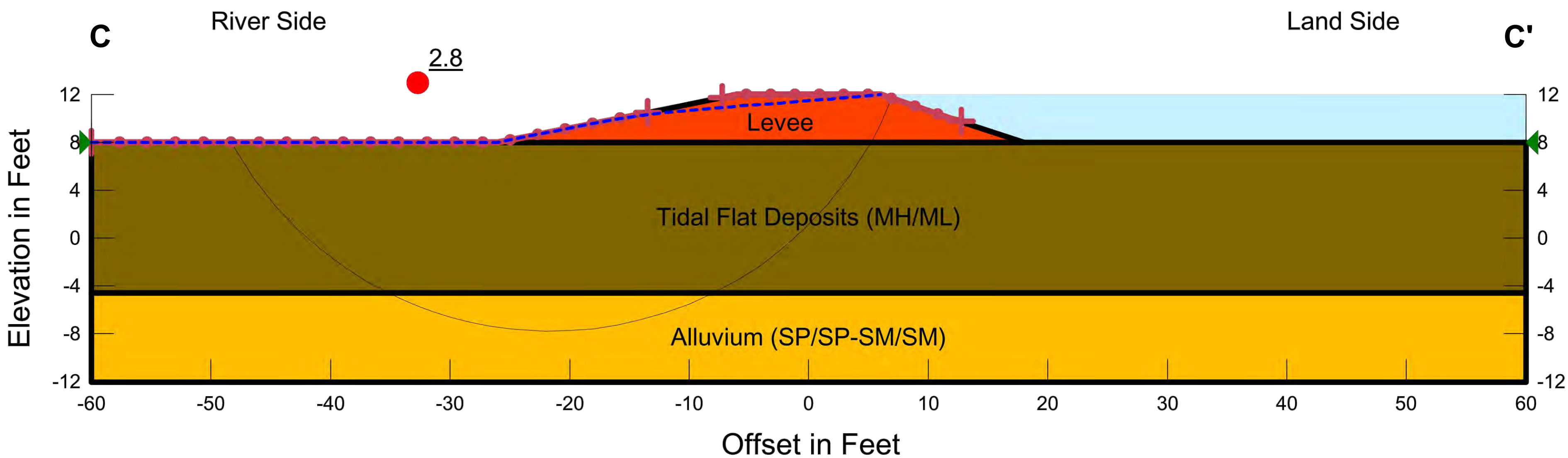
FIG. C4.5

FIG. C4.5

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures CC.dwg Date: 10-30-2014 Author: jjw



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 80 pcf Cohesion': 200 psf Phi': 22 °
Name: Alluvium (SP/SP-SM/SM) Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °

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Tillamook, Oregon

SECTION C - C'
STEADY SEEPAGE FROM FLOOD
RIVER SIDE STABILITY

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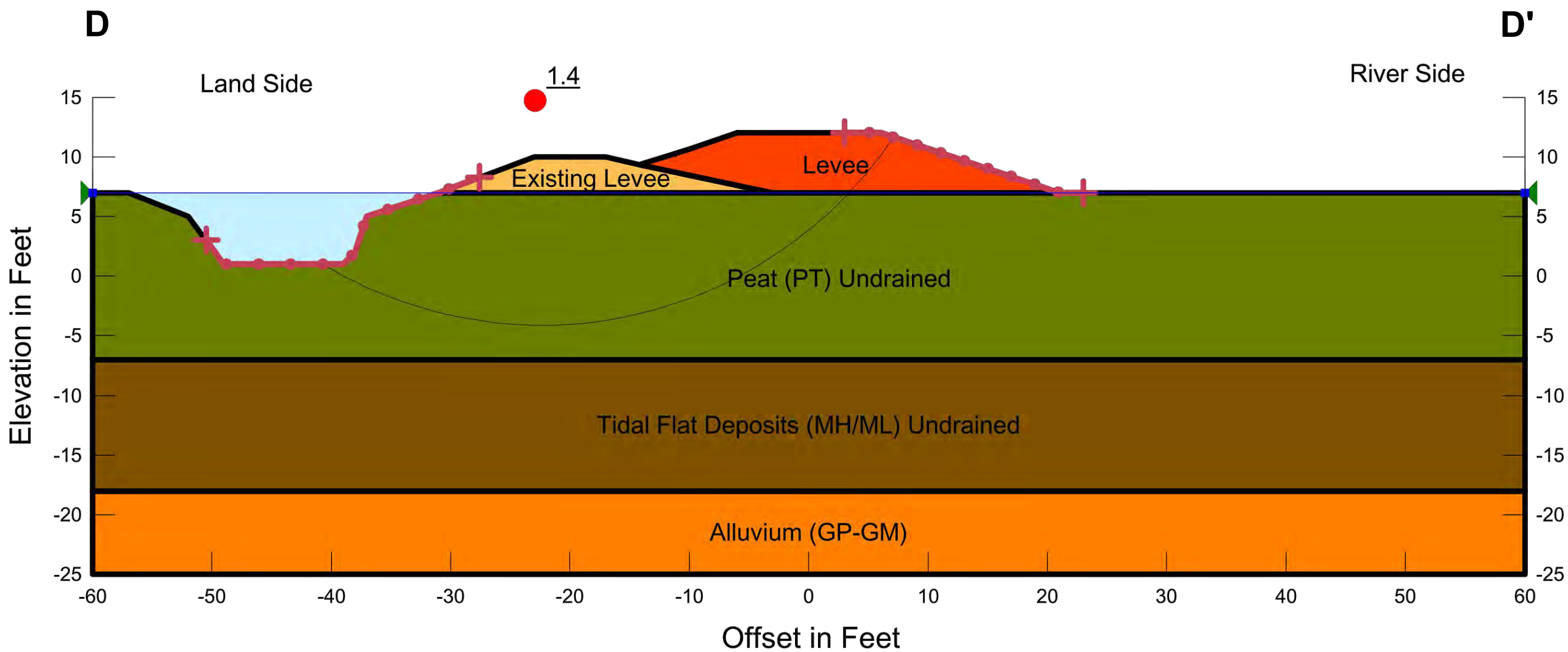
FIG. C4.6

FIG. C4.6

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures DD.dwg Date: 10-30-2014 Author: jjw



Name: Alluvium (GP-GM) Unit Weight: 130 pcf Cohesion': 0 psf Phi': 35 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Tidal Flat Deposits (MH/ML) Undrained Unit Weight: 85 pcf Cohesion': 200 psf Phi': 0 °
Name: Peat (PT) Undrained Unit Weight: 70 pcf C-Top of Layer: 110 psf C-Rate of Change: 5.3 psf/ft C-Maximum: 200 psf
Name: Existing Levee Unit Weight: 100 pcf Cohesion': 50 psf Phi': 29 °

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

SECTION D - D'
END OF CONSTRUCTION
LAND SIDE

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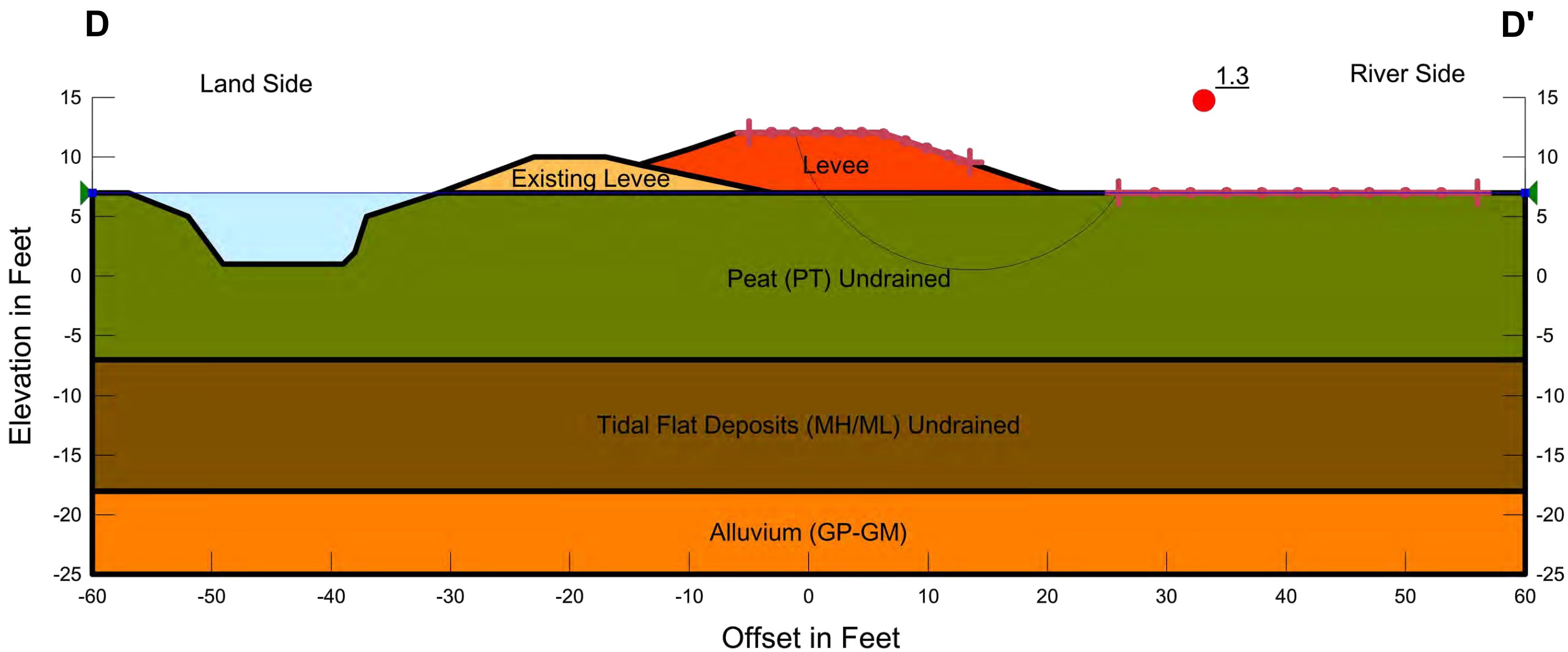
FIG. C5.1

FIG. C5.1



Name: Alluvium (GP-GM) Unit Weight: 130 pcf Cohesion': 0 psf Phi': 35 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Tidal Flat Deposits (MH/ML) Undrained Unit Weight: 85 pcf Cohesion': 200 psf Phi': 0 °
Name: Peat (PT) Undrained Unit Weight: 70 pcf C-Top of Layer: 110 psf C-Rate of Change: 5.3 psf/ft C-Maximum: 200 psf
Name: Existing Levee Unit Weight: 100 pcf Cohesion': 50 psf Phi': 29 °

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Southern Flow Corridor Project
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SECTION D - D'
END OF CONSTRUCTION
RIVER SIDE

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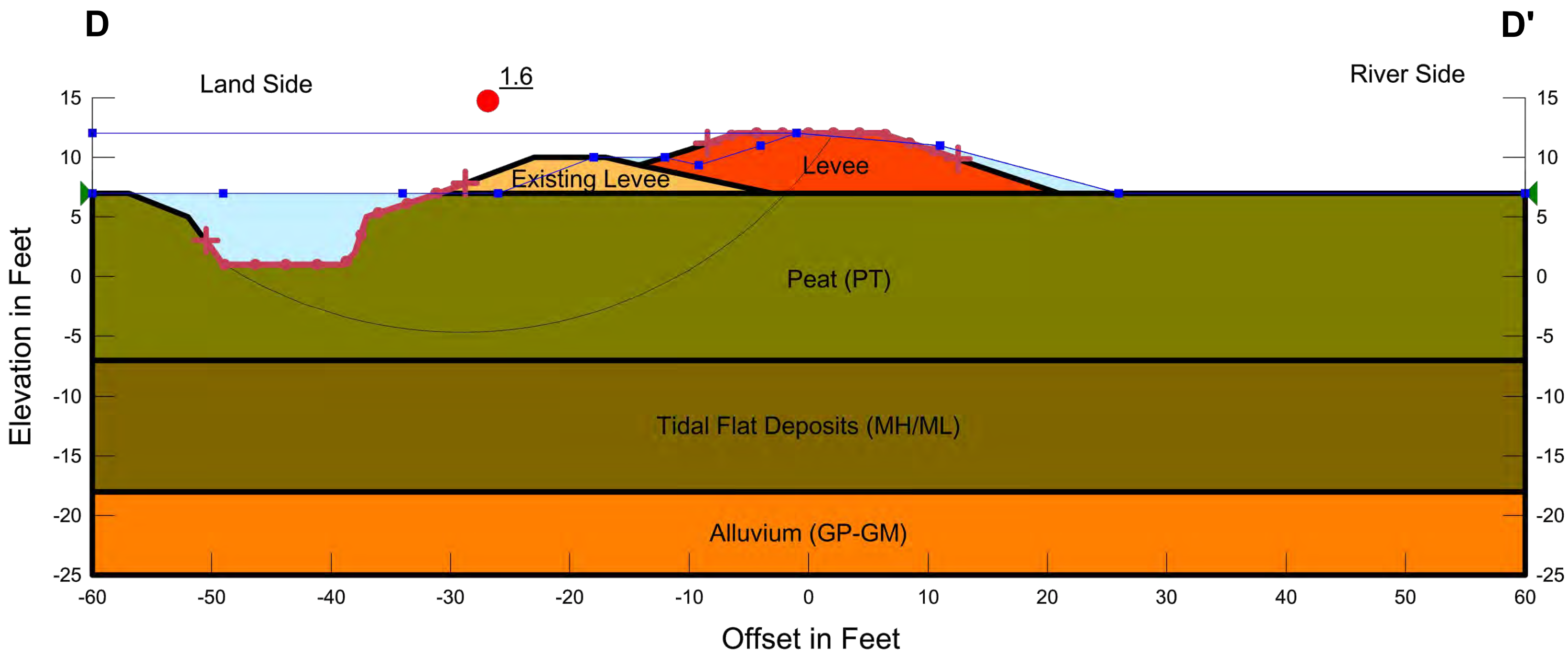
FIG. C5.2

FIG. C5.2



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 22 ° Total Cohesion: 220 psf Total Phi: 19 °
Name: Alluvium (GP-GM) Unit Weight: 130 pcf Cohesion': 0 psf Phi': 35 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 ° Total Cohesion: 100 psf Total Phi: 30 °
Name: Existing Levee Unit Weight: 100 pcf Cohesion': 50 psf Phi': 29 ° Total Cohesion: 0 psf Total Phi: 0 °

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SECTION D - D'
SUDDEN DRAWDOWN
LAND SIDE

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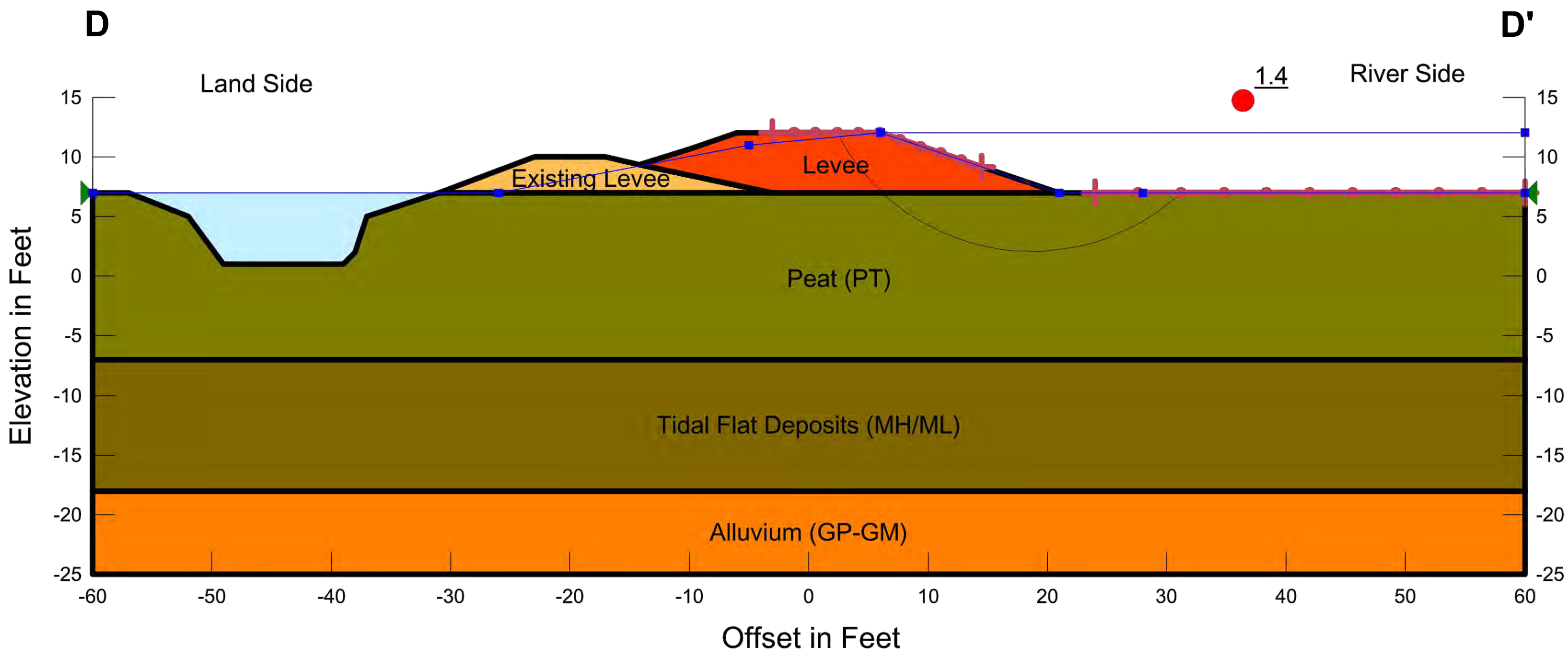
FIG. C5.3

FIG. C5.3



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 22 ° Total Cohesion: 220 psf Total Phi: 19 °
Name: Alluvium (GP-GM) Unit Weight: 130 pcf Cohesion': 0 psf Phi': 35 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 ° Total Cohesion: 100 psf Total Phi: 30 °
Name: Existing Levee Unit Weight: 100 pcf Cohesion': 50 psf Phi': 29 ° Total Cohesion: 0 psf Total Phi: 0 °

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

SECTION D - D'
SUDDEN DRAWDOWN
RIVER SIDE

November 2014 24-1-03858-005

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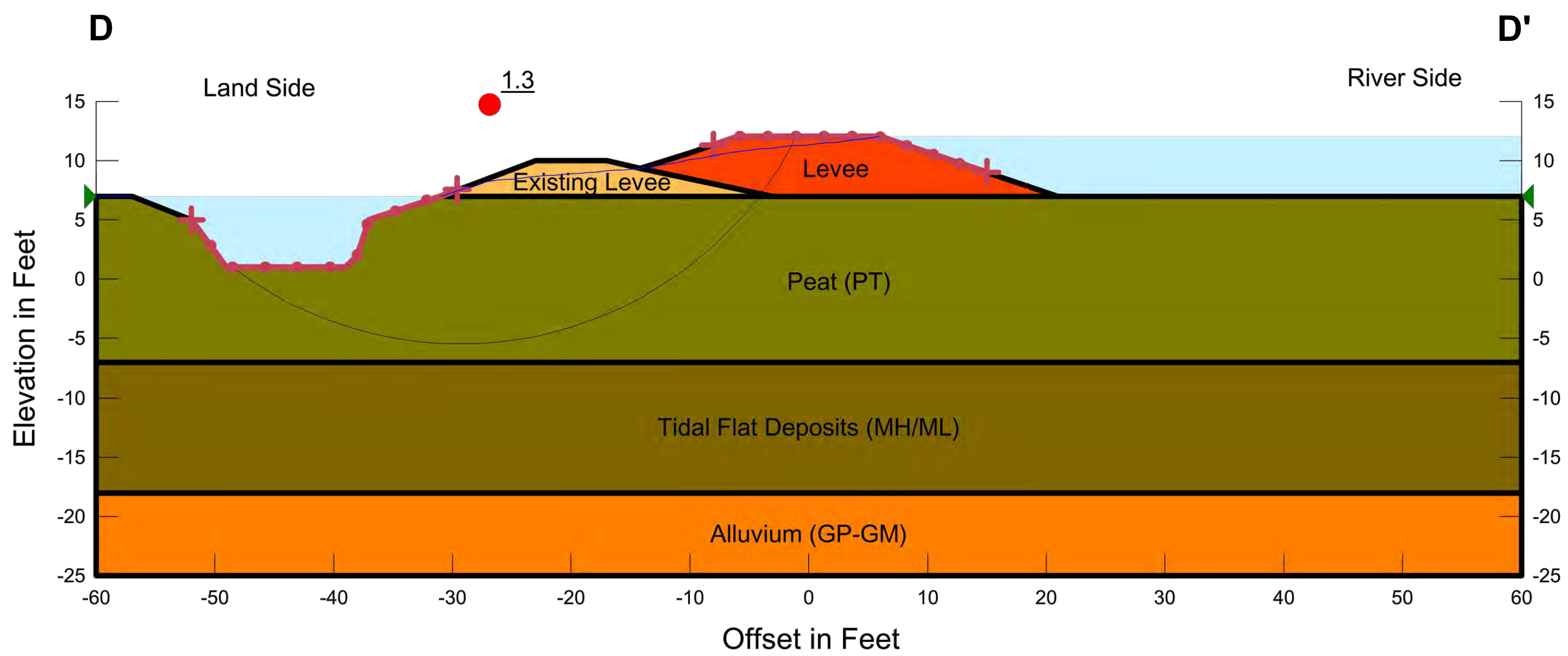
FIG. C5.4

FIG. C5.4

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Stability Figures DD.dwg Date: 10-30-2014 Author: jjw



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Name: Alluvium (GP-GM) Unit Weight: 130 pcf Cohesion': 0 psf Phi': 35 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 °
Name: Existing Levee Unit Weight: 100 pcf Cohesion': 50 psf Phi': 29 °

Oregon Solutions Project Exodus
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Tillamook, Oregon

SECTION D - D'
STEADY SEEPAGE FROM FLOOD
LAND SIDE STABILITY

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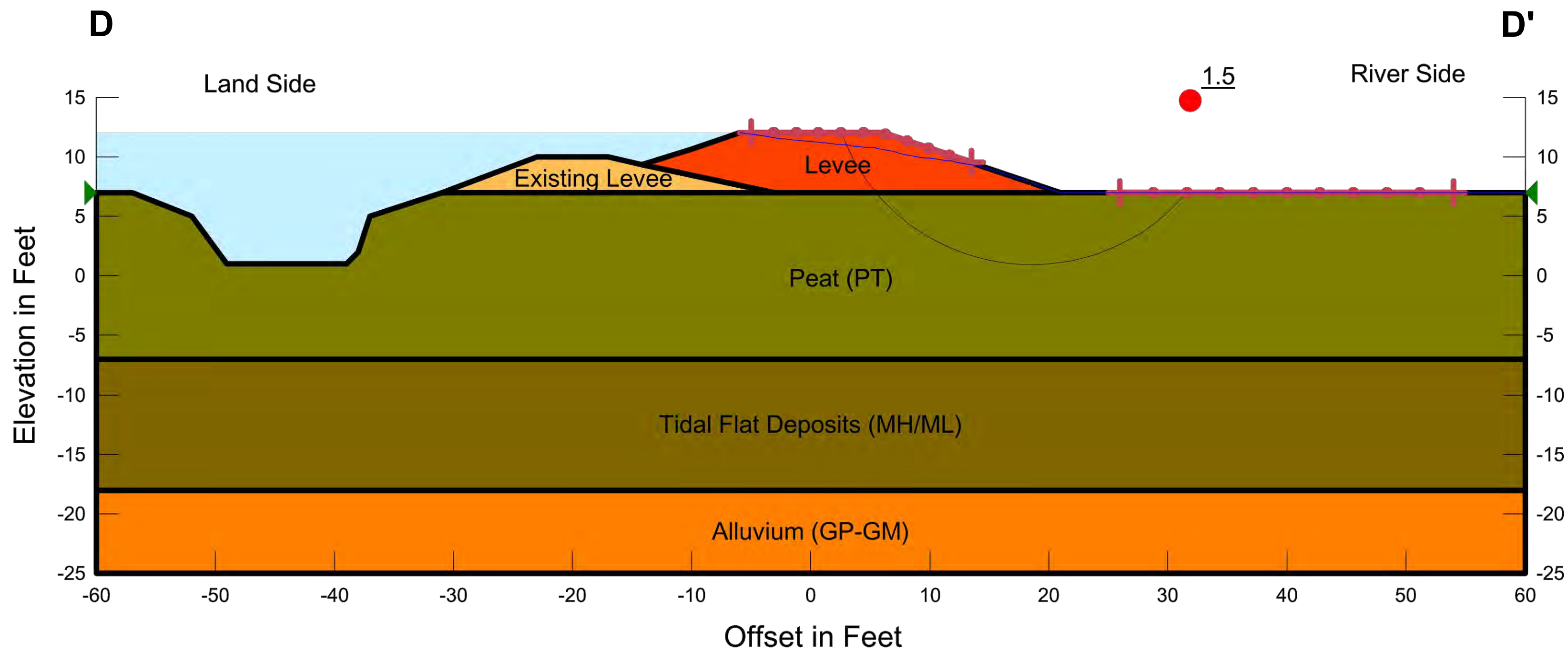
FIG. C5.5

FIG. C5.5



Name: Tidal Flat Deposits (MH/ML) Unit Weight: 85 pcf Cohesion': 200 psf Phi': 22 °
Name: Alluvium (GP-GM) Unit Weight: 130 pcf Cohesion': 0 psf Phi': 35 °
Name: Levee Unit Weight: 120 pcf Cohesion': 50 psf Phi': 32 °
Name: Peat (PT) Unit Weight: 70 pcf Cohesion': 50 psf Phi': 35 °
Name: Existing Levee Unit Weight: 100 pcf Cohesion': 50 psf Phi': 29 °

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SECTION D - D'
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RIVER SIDE STABILITY

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FIG. C5.6

FIG. C5.6

APPENDIX D

UNDERSEEPAGE ANALYSIS

FIGURES

EXPLANATION

Location and Designation of Boring

Location and Designation of Test Pit

Existing Levee

Approximate Location of Recommended Levee

North Levee

Middle Levee

E E' Location and Designation of Underseepage Analysis

0 250 500 1,000

Scale in Feet

NOTES

1. Aerial photograph and existing features provided by Northwest Hydraulic Consultants, December 18, 2013.

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

UNDERSEEPAGE SITE PLAN

November 2014 24-1-03858-005

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FIG. D1
Sheet 1 of 2

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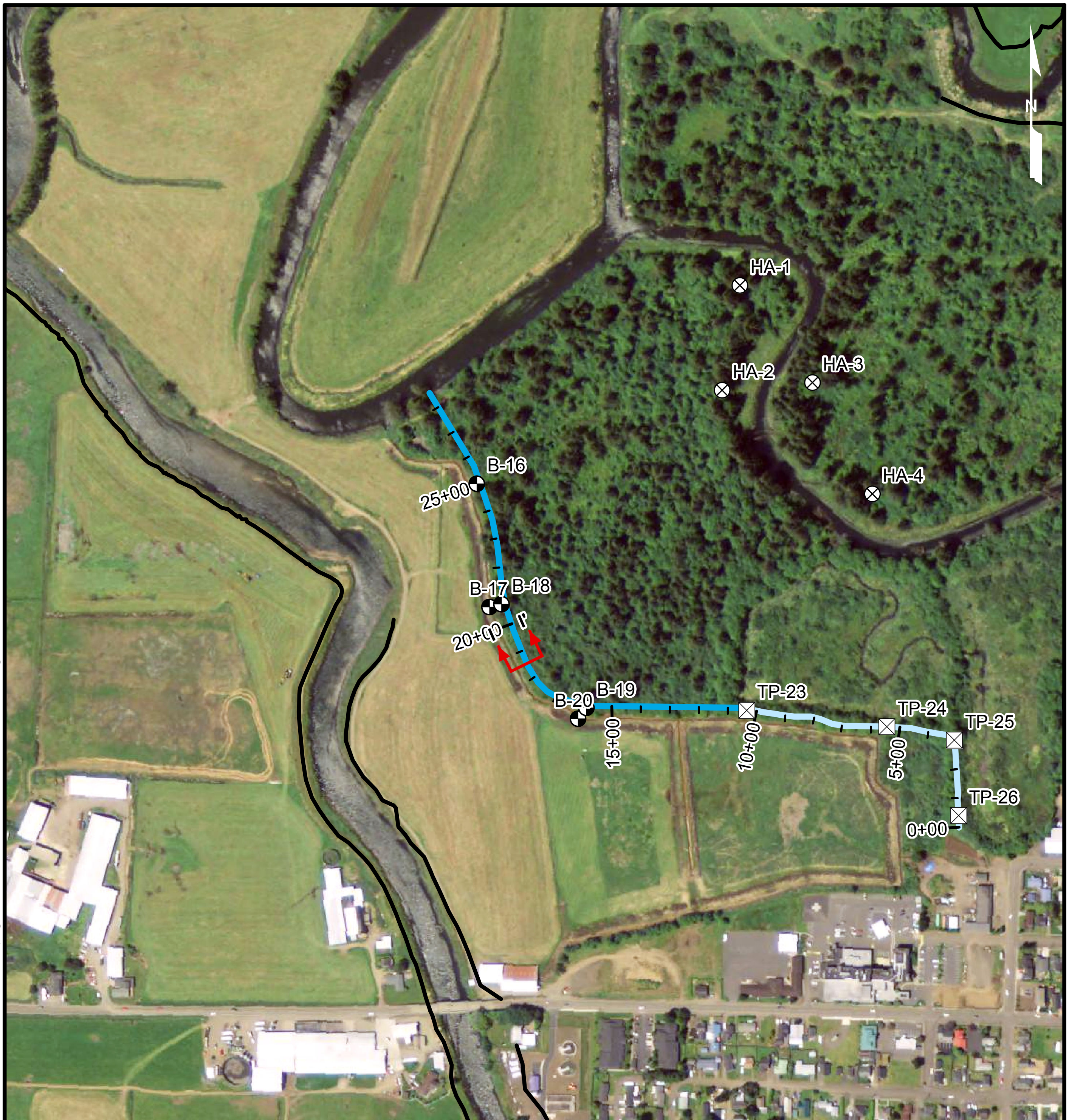

EXPLANATION

Location and Designation of Boring

Location and Designation of Test Pit

Location and Designation of Hand Auger

Existing Levee

Approximate Location of Recommended Levee

South Levee

South Levee (Upgrade)

E E' Location and Designation of Underseepage Analysis

NOTES

1. Aerial photograph and existing features provided by Northwest Hydraulic Consultants, December 18, 2013.

Oregon Solutions Project Exodus
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Tillamook, Oregon

UNDERSEEPAGE SITE PLAN

November 2014 24-1-03858-005

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FIG. D1
Sheet 2 of 2

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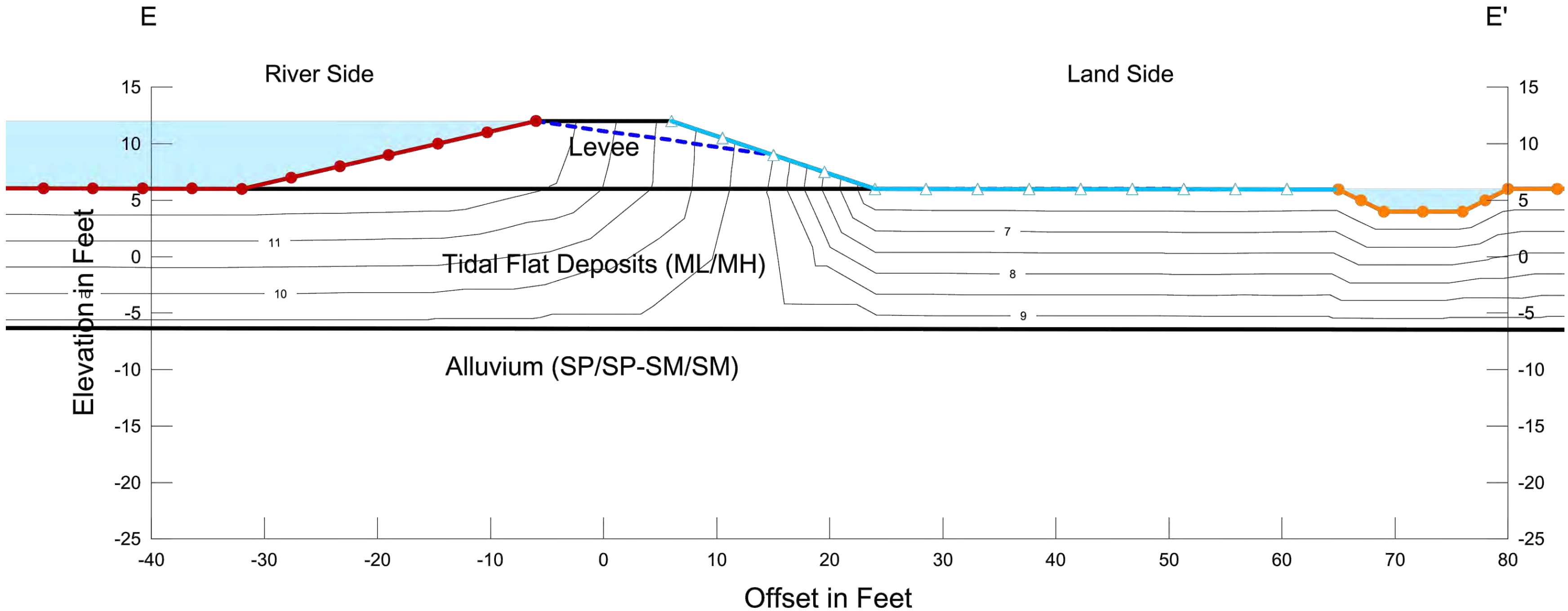

i = 3.3 / 12 = 0.28

Name: Tidal Flat Deposits (ML/MH) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Alluvium (SP/SP-SM/SM) K-Sat: 0.0002 ft/sec Ky'/Kx' Ratio: 0.5
Name: Levee K-Sat: 3e-007 ft/sec Ky'/Kx' Ratio: 1
Name: Boundary Material K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1

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SECTION E-E□
UN□ERSEEPAGE - LAN□ SI□E

November 2014 24-1-03858-005

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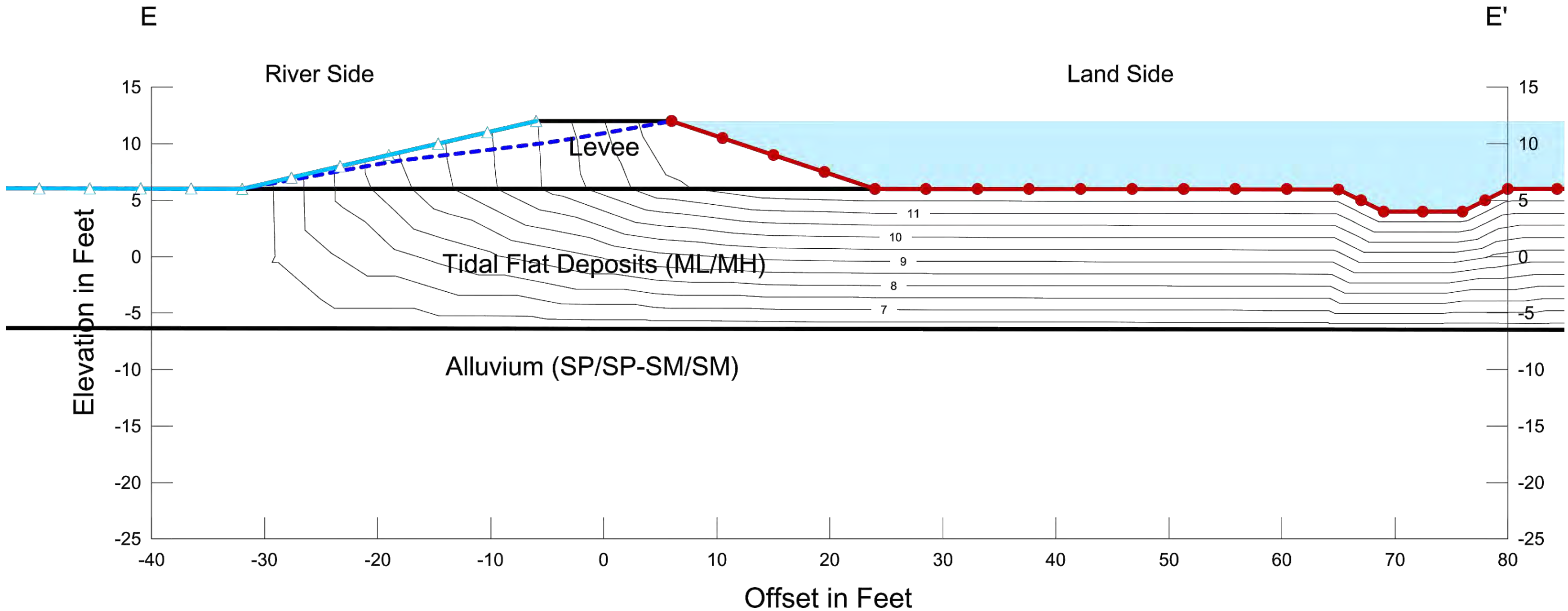
FIG. □2.1

FIG. □2.1



i = 0

Name: Tidal Flat Deposits (ML/MH) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Alluvium (SP/SP-SM/SM) K-Sat: 0.0002 ft/sec Ky'/Kx' Ratio: 0.5
Name: Levee K-Sat: 3e-007 ft/sec Ky'/Kx' Ratio: 1
Name: Boundary Material K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1

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Tillamook, Oregon

SECTION E-E□
UN□ERSEEPAGE - RIVER SI□E

November 2014 24-1-03858-005

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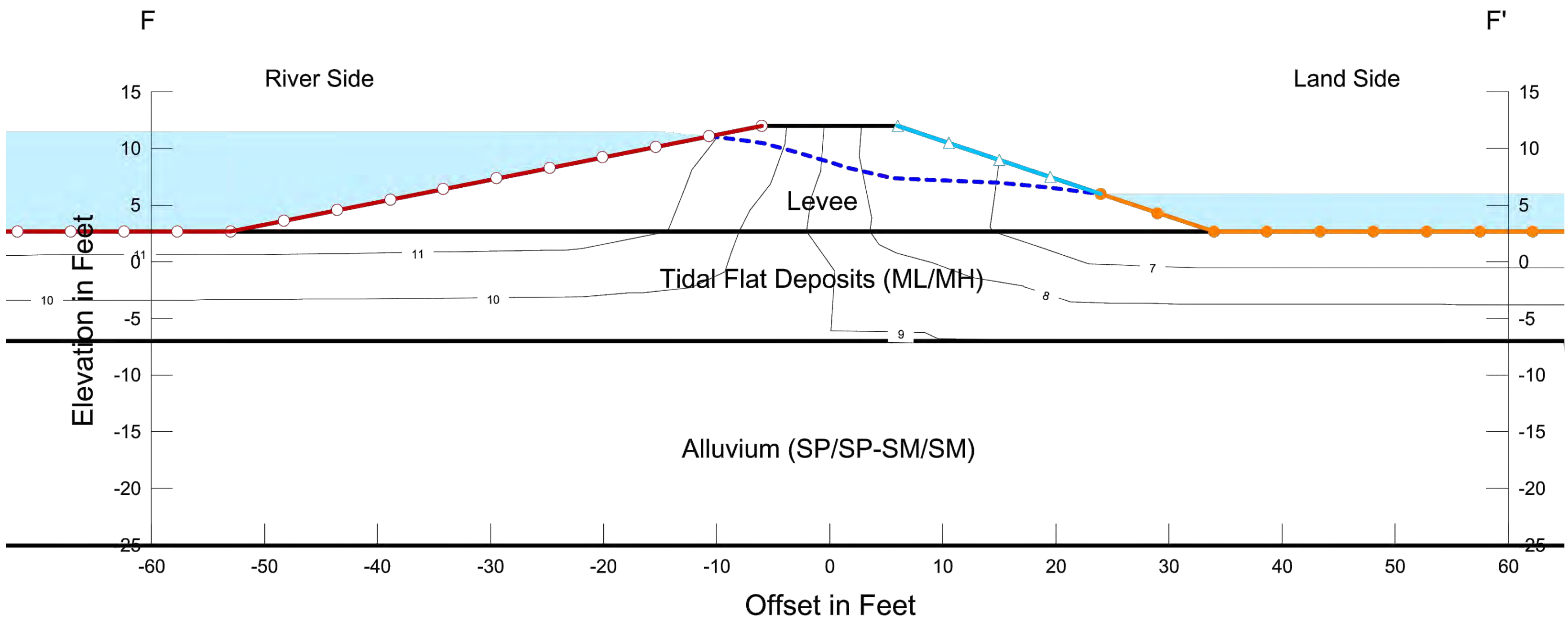
FIG. □2.2

FIG. □2.2



i = 3 / 10 = 0.30

Name: Tidal Flat Deposits (ML/MH) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 0.33
Name: Alluvium (SP/SP-SM/SM) K-Sat: 0.0002 ft/sec Ky'/Kx' Ratio: 0.5
Name: Levee K-Function: Levee Fill Ky'/Kx' Ratio: 1 Vol. WC. Function: Levee Fill

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION F-F□
UN□ERSEEPAGE - LAN□ SI□E

November 2014 24-1-03858-005

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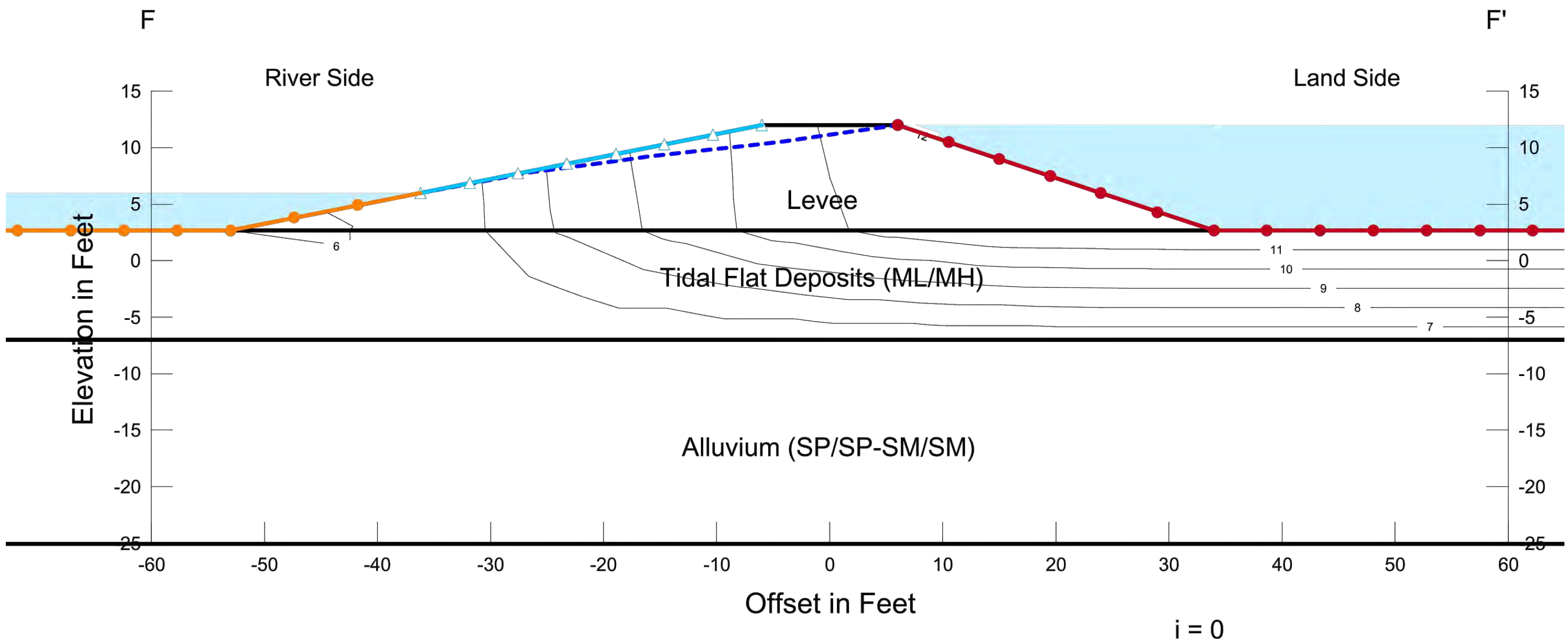
FIG. □3.1

FIG. □3.1



Name: Tidal Flat Deposits (ML/MH) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 0.33
Name: Alluvium (SP/SP-SM/SM) K-Sat: 0.0002 ft/sec Ky'/Kx' Ratio: 0.5
Name: Levee K-Function: Levee Fill Ky'/Kx' Ratio: 1 Vol. WC. Function: Levee Fill

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Tillamook, Oregon

SECTION F-F□
UN□ERSEEPAGE - RIVER SI□E

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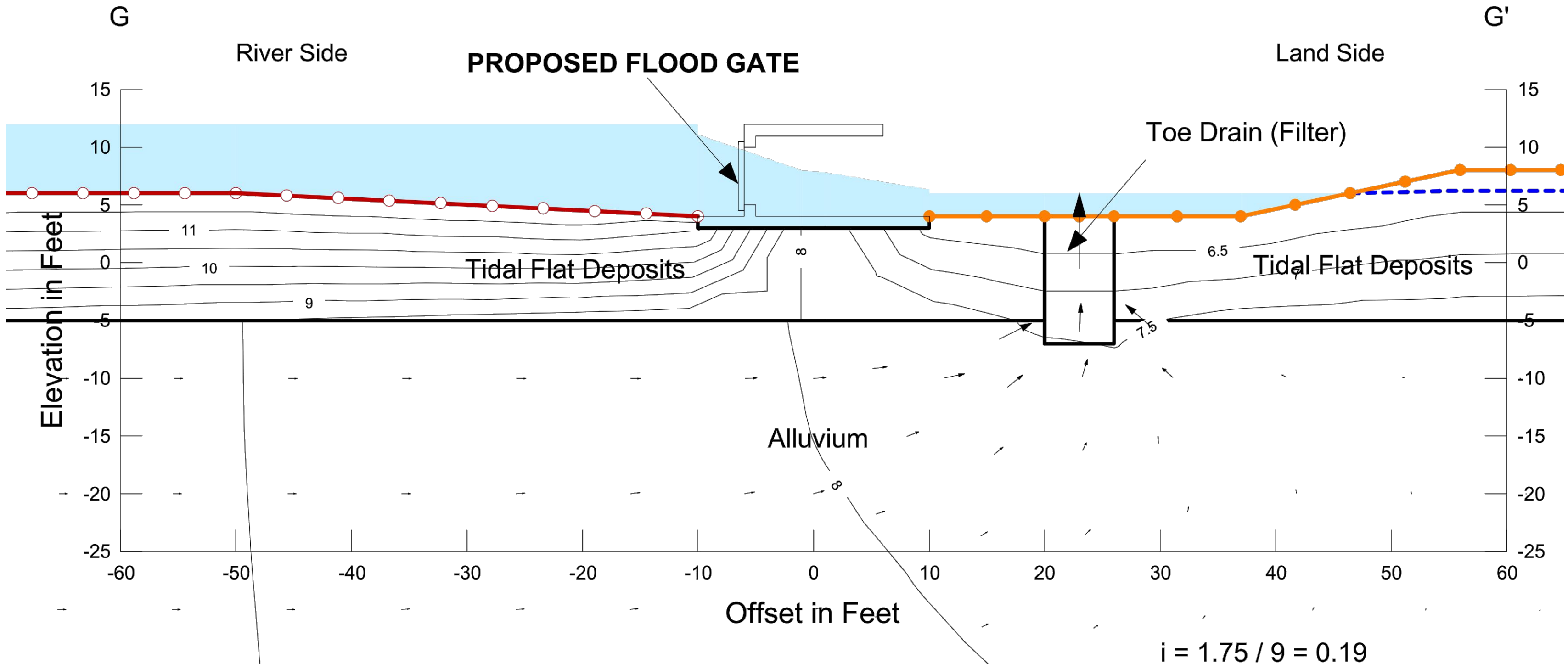
FIG. □3.2

FIG. □3.2



Name: Tidal Flat Deposits (MH/ML) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Alluvium (SP/SP-SM/SM) K-Sat: 0.0002 ft/sec Ky'/Kx' Ratio: 0.5
Name: Boundary Material K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Toe Drain (Filter) K-Sat: 0.0001 ft/sec Ky'/Kx' Ratio: 1

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Tillamook, Oregon

SECTION G-G'
UNDERSEEPAGE - LAND SIDE

November 2014 24-1-03858-005

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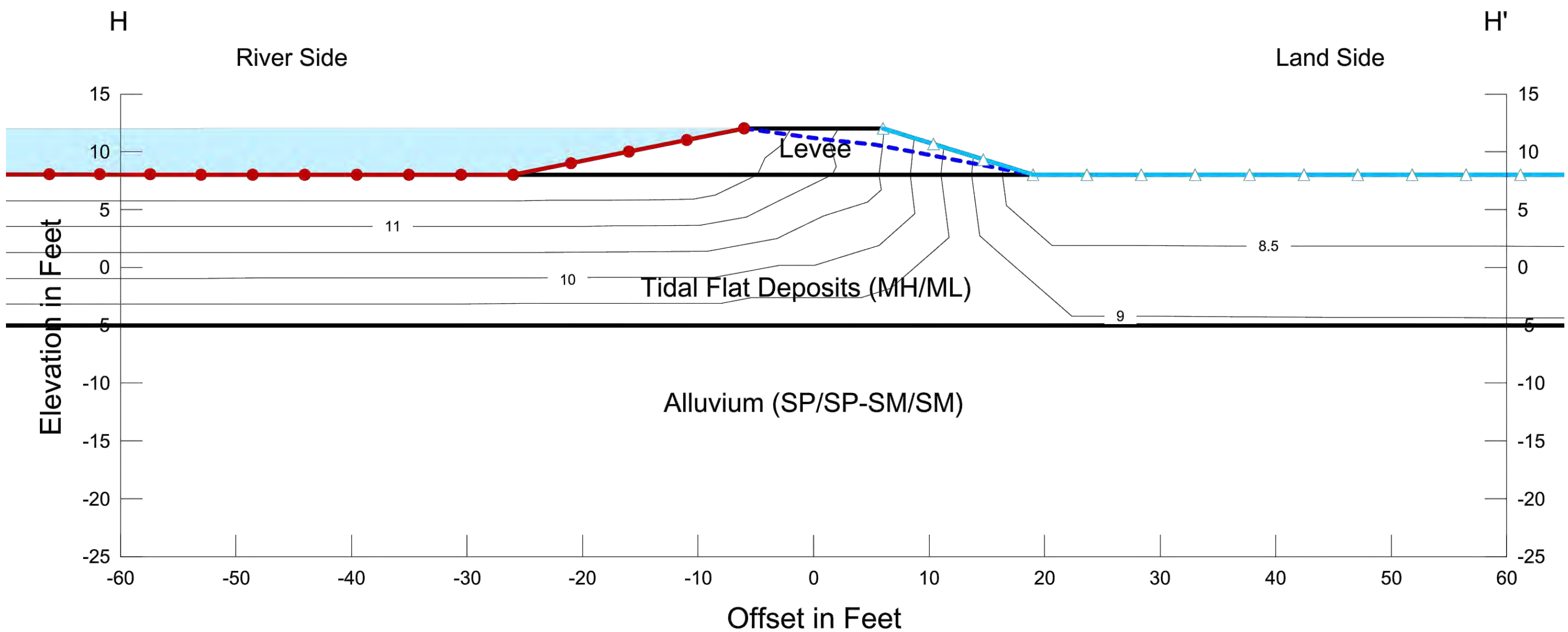
FIG. D4

FIG. D4

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Underseepage Figures.dwg   Date: 10-28-2014   Author: jjw



i = 1.1 / 12 = 0.09

Name: Tidal Flat Deposits (MH/ML)   K-Sat: 3e-008 ft/sec   Ky'/Kx' Ratio: 1
Name: Alluvium (SP/SP-SM/SM)   K-Sat: 0.0002 ft/sec   Ky'/Kx' Ratio: 0.5
Name: Levee   K-Sat: 3e-007 ft/sec   Ky'/Kx' Ratio: 1
Name: Boundary Material   K-Sat: 3e-008 ft/sec   Ky'/Kx' Ratio: 1

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Southern Flow Corridor Project
Tillamook, Oregon

SECTION H-H□
UN□ERSEEPAGE - LAN□ SI□E

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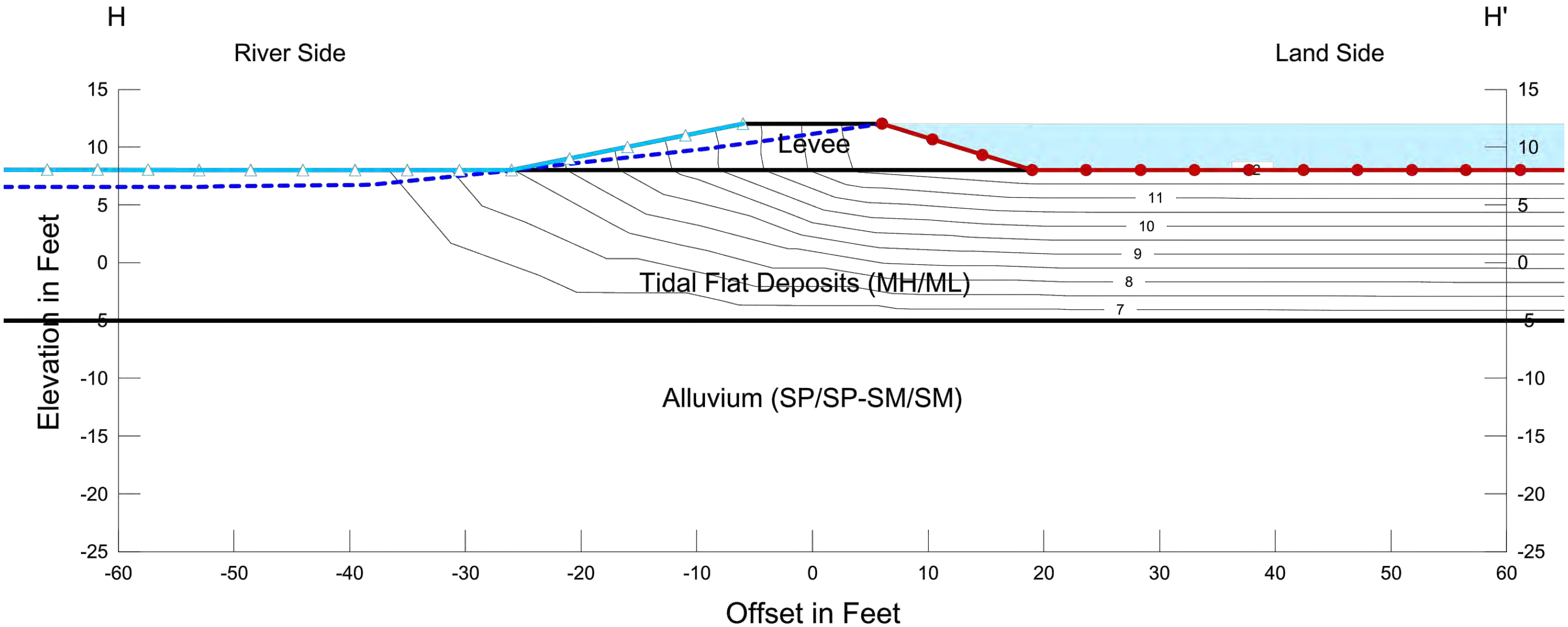
FIG. □5.1

FIG. □5.1

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Underseepage Figures.dwg Date: 10-28-2014 Author: jjw



i = 0

Name: Tidal Flat Deposits (MH/ML) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Alluvium (SP/SP-SM/SM) K-Sat: 0.0002 ft/sec Ky'/Kx' Ratio: 0.5
Name: Levee K-Sat: 3e-007 ft/sec Ky'/Kx' Ratio: 1
Name: Boundary Material K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

SECTION H-H'
UNDERSEEPAGE - RIVER SIDE

November 2014 24-1-03858-005

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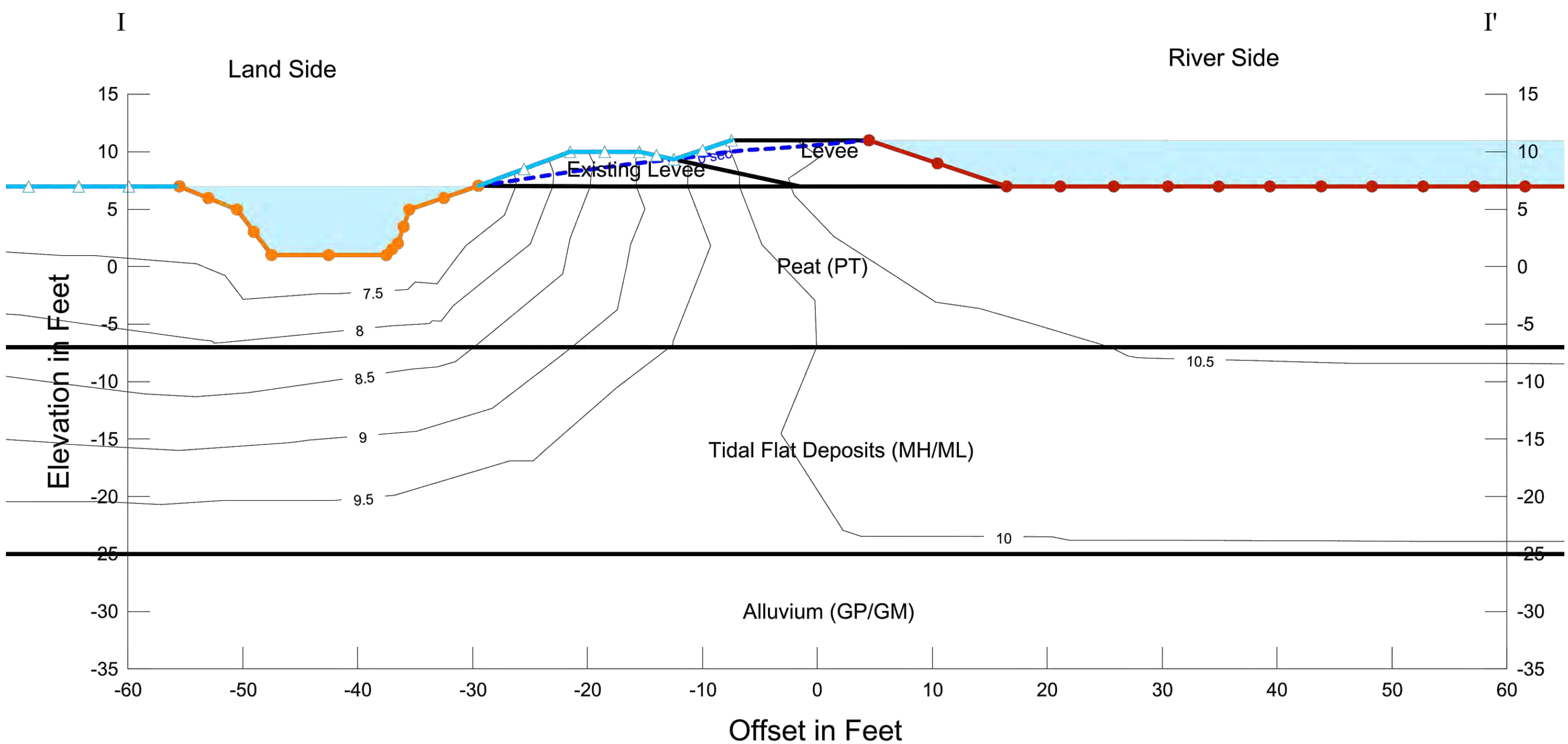
Geotechnical and Environmental Consultants

FIG. □5.2

FIG. □5.2

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Underseepage Figures.dwg Date: 10-28-2014 Author: jjw



Name: Tidal Flat Deposits (MH/ML) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Alluvium (SP/SP-SM/SM) K-Sat: 0.0002 ft/sec Ky'/Kx' Ratio: 0.5
Name: Levee K-Sat: 3e-007 ft/sec Ky'/Kx' Ratio: 1
Name: Peat (PT) K-Sat: 3e-008 ft/sec Ky'/Kx' Ratio: 1

i = 1.1 / 8 = 0.14

Oregon Solutions Project Exodus
Southern Flow Corridor Project
Tillamook, Oregon

SECTION I-I□
UN□ERSEEPAGE - LAN□ SI□E

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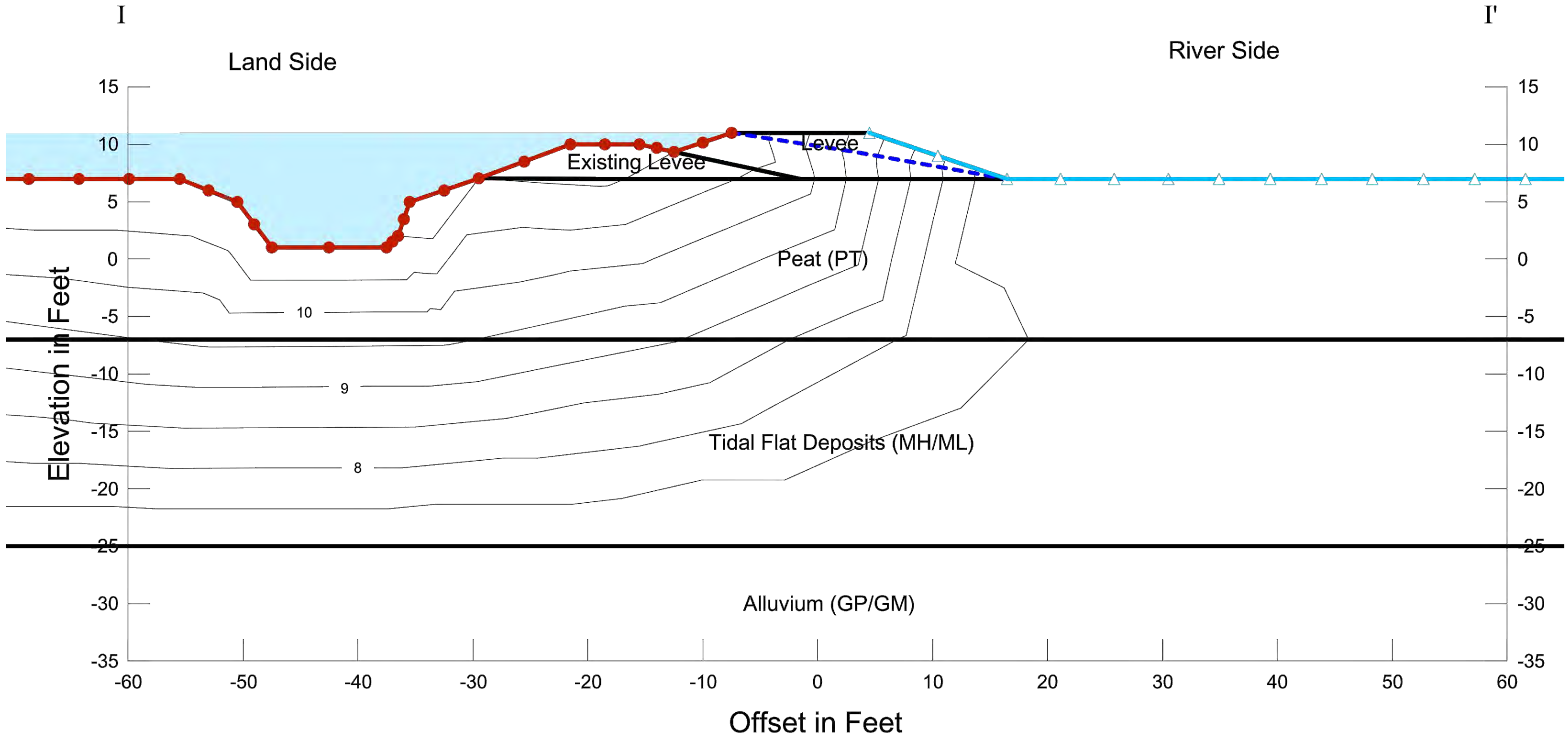
FIG. □6.1

FIG. □6.1

File: I:\WIP\Projects\24-1 Portland\3800\3858 Oregon Solution Exodus S. Flow Corridor\Graphics\CAD\Underseepage Figures.dwg   Date: 10-28-2014   Author: jjw



Name: Tidal Flat Deposits (MH/ML)   K-Sat: 3e-008 ft/sec   Ky'/Kx' Ratio: 1
Name: Alluvium (SP/SP-SM/SM)   K-Sat: 0.0002 ft/sec   Ky'/Kx' Ratio: 0.5
Name: Levee   K-Sat: 3e-007 ft/sec   Ky'/Kx' Ratio: 1
Name: Peat (PT)   K-Sat: 3e-008 ft/sec   Ky'/Kx' Ratio: 1

i = 0

Oregon Solutions Project Exodus
Southern Flow Corridor Project
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SECTION I-I□
UN□ERSEEPAGE - RIVER SI□E

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FIG. □6.2

FIG. □6.2

APPENDIX E

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 24-1-03858-005

Date: November 2014
To: Vaughn Collins
Northwest Hydraulic Consultants (nhc)

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland