GEOTECHNICAL REPORT

SR 534/Unnamed Tributary to Carpenter Creek – Fish Passage

XL6097, NWR, SR 534, MP 0.49 – 0.69

Washington State Department of Transportation
Multimodal Development & Delivery
Construction Division
Geotechnical Office
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Tumwater, WA 98512-6951

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This report has been prepared to assist the Washington State Department of Transportation (WSDOT) in the engineering design and construction of the subject Project. It should not be used, in part or in whole, for other purposes, without contacting the WSDOT Geotechnical Office for a review of the applicability of such reuse.

10-19-2022

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ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
BDM	Bridge Design Manual (WSDOT, 2022a)
BDS	Bridge Design Specifications
bgs	below ground surface
BSO	Bridge and Structures Office (WSDOT)
CPT	Cone Penetration Test
CSBC	Crushed Surfacing Base Course
ESU	Engineering Stratigraphic Unit
FS	factor of safety
GDM	Geotechnical Design Manual (WSDOT, 2022b)
HW	high water
k_h	horizontal acceleration coefficient
k_v	vertical acceleration coefficient
MP	Milepost
NAD 83	North American Datum of 1983, WA State Plane North
NAVD 88	North American Vertical Datum of 1988
NE	northeast
NW	northwest
OHW	Ordinary High Water (2-Yr High Water)
PEO	Mount Vernon Project Engineer's Office
PGA	peak ground acceleration
PI	Plasticity Index
Project	SR 534/Unnamed Tributary to Carpenter Creek – Fish Passage
PS&E	plans, specifications, and estimate
RME	Regional Materials Engineer
SE	southeast
SPT	Standard Penetration Test
SR	State Route
SW	southwest
USCS	Unified Soil Classification System
USGS	United States Geologic Survey
V	Version
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

1 INTRODUCTION

This geotechnical report presents the results of subsurface explorations and laboratory testing coordinated by the Washington State Department of Transportation (WSDOT) Geotechnical Office, and provides geotechnical recommendations for the design and construction of the State Route (SR) 534/Unnamed Tributary to Carpenter Creek – Fish Passage Project (Project). This report was prepared for use by the Mount Vernon Project Engineer's Office (PEO) and the Bridge and Structures Office (BSO) to support design and preparation of Project plans, specifications, and estimate documents (PS&E).

1.1 SITE DESCRIPTION

The Project site is located between Milepost (MP) 0.49 to 0.69 on SR 534, in Skagit County, immediately east of the City of Conway. A site vicinity map illustrating the Project location is shown on Figure 1.

SR 534 extends in an east-west direction at the Project site and is supported on a 4-foot high fill embankment. The Unnamed Tributary to Carpenter Creek flows northwest through a 3.5-foot diameter concrete pipe, beneath SR 534. The Project is bordered by the Hill Ditch River to the west and an unnamed tributary to the south. Sixteen Lake is located 1.5 miles northeast of the site and approximately 400 feet higher in elevation than the Project site.

A two-story residential home (19510 WA-534, Mount Vernon, WA 98274) is located 100 feet southwest of the site and The Olympic Pipeline Company maintains two active gas lines (liquid petroleum) underground, 380 feet east of the site.

1.2 PROJECT DESCRIPTION

Our understanding of the Project and site is based on information provided by the PEO. The Project vertical datum is the North American Vertical Datum of 1988 (NAVD 88) and the horizontal datum is the North American Datum of 1983, WA State Plane North (NAD 83). All elevations contained in this report are based on the NAVD 88 vertical datum.

We understand that the Project includes construction of the following:

- A Contractor designed, concrete box culvert with a structural clear span of 19.5 feet. Approximate dimensions of the box culvert are 60 feet (length), 24 feet (width), and 15 feet (height).
- Reinforced concrete retaining walls (wingwalls) at the northwest (NW), northeast (NE), southwest (SW), and southeast (SE) corners of the culvert.
- Up to 4 feet of new fill on the embankment side slopes, but outside of the SR 534 roadway shoulder.

We understand the Project will be constructed under a full roadway closure of SR 534.

Figure 2 presents a Site and Exploration Plan depicting the locations of geotechnical explorations and proposed structures.

2 SITE INVESTIGATION

2.1 HISTORIC DATA REVIEW

We searched existing WSDOT records for geotechnical information in the Project area. Our review of historic data included:

- Secondary State Highway No. 1 – Hill Ditch Bridge No. 1-H/1 & Approaches; Construction Documents (State of Washington Department of Highways, 1950).

In 1950 on SR 534, approximately 250 feet west of the Project site, a historic timber trestle bridge was replaced with a reinforced concrete slab bridge. One test boring was drilled for the project and a new bridge was constructed and supported on precast concrete piling. The bridge approaches were widened and raised with Select Borrow. The reconstructed bridge approach was 140 feet in length. Construction encountered multiple delays due to high groundwater levels and rainfall. Construction records indicate that the excavated material had no salvage value and was yarded along the side. See Exhibit 2-1 for historic photos of the project.

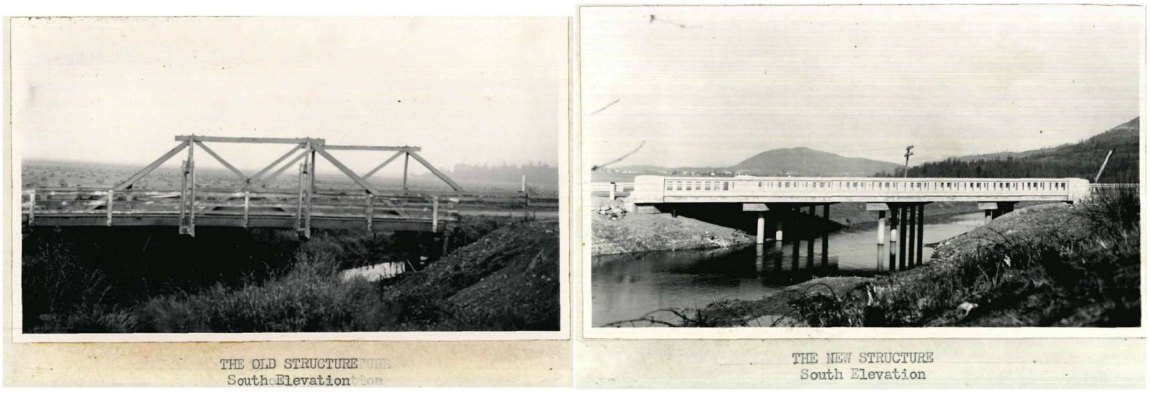

EXHIBIT 2-1. HISTORIC BRIDGE (ON THE LEFT) AND 1950 REPLACEMENT BRIDGE (ON THE RIGHT)

Geotechnical reports associated with the above project were not found, but the historic As-Built plan sheets showed a single boring log (Test Hole No. 1). Test Hole No. 1 encountered dense to very dense sand and gravel, underlain by hard clay, underlain by dense sand and gravel.

Based on conversations with the PEO, there are no as-built or construction records for the existing concrete pipe culvert at the Project Site.

2.2 SUBSURFACE EXPLORATION PROGRAM

WSDOT drill crews completed two test borings (H-1vwp-20 and H-2vwp-20) to collect subsurface information regarding soil and groundwater conditions. ConeTec completed three Cone Penetration Test (CPT) holes (CPT-1-21, CPT-2-21, and CPT-3-21).

WSDOT survey crews surveyed the test borings and CPT holes. Exploration locations are shown on Figure 2. Information on the exploration methods and sampling for the borings are included in Section 2.2.1. The summary borings logs and legend for interpretation are included in Appendix A. The ConeTec CPT logs and report are provided in Appendix D.

The final boring logs and CPT logs should be made available to all prospective bidders and included in the contract documents.

2.2.1 *Drilling and Sampling*

For each boring, a WSDOT drill crew used casing advancer methods to drill through the subsurface materials. The casing advancer drilling method uses a 4-inch inner diameter casing that is advanced with water mixed with bentonite and polymer to remove cuttings. Each boring was drilled to a pre-planned depth based on assumed subsurface conditions and existing information. The boring depths were adjusted, if necessary, based on the conditions encountered during drilling.

Disturbed soil samples were obtained at 2.5-foot to 5-foot depth intervals in conjunction with Standard Penetration Test (SPT) methods. The SPT provides an estimate of soil relative density and consistency. SPTs were performed in accordance with American Association of State Highway and Transportation Officials (AASHTO) T 206 and American Society for Testing and Materials (ASTM) D1586, with a 2-inch-outside-diameter, split-spoon sampler driven a distance of 18 to 24 inches with a 140-pound hammer dropped 30 inches. During the test, a WSDOT drilling inspector recorded the number of blows (blow counts) required to achieve each 6-inch increment of sampler penetration. The sum of the number of blows required to cause the second and third 6-inch increment is termed the penetration resistance, or N-value. If 50 blows resulted in less than 6 inches of sampler penetration, the test was terminated due to refusal conditions.

Relatively undisturbed samples were collected when fine-grained, cohesive soils were suspected using a 3-inch-diameter, thin-walled, Shelby tube sampler. During sampling, the tube was pushed into the undisturbed soil at the bottom of borehole either by directly pushing the tube with the drill rig or hydraulically using a piston sampler. After a Shelby tube was collected, it was sealed, stored in an upright position, and protected against shock and vibration during transport back to the State Materials Laboratory. The soil samples were transported back to the WSDOT Materials Laboratory for further examination and testing.

Blow counts, SPT-N values, SPT hammer efficiencies, and sampler types are shown on the boring logs in Appendix A.

2.2.2 *Piezometer Installation and Groundwater Monitoring*

The WSDOT drill crew installed vibrating wire piezometers in each borehole. Each piezometer consists of a 1-inch-diameter polyvinyl chloride pipe with the vibrating wire

piezometer installed at depths of interest (see boring logs in Appendix A for the well installation graphic). The piezometers were then sealed with grout. The exploration locations where a vibration wire piezometer was installed are indicated by "vwp" after the exploration number (e.g., H-1vwp-20).

Two monitoring points were installed in each piezometer in March 2020. The monitoring systems were programmed to collect groundwater data at six-hour intervals. Groundwater measurement plots are provided in Appendix B.

Our field inspector noted challenges in sealing the vibrating wire piezometers during installation, due to artesian groundwater encountered at a depth of 29 feet below ground surface (bgs). Multiple attempts were required to seal the holes. See Exhibit 2-2 for an example of water rising above the ground surface during borehole sealing.

EXHIBIT 2-2. WATER FLOWING ABOVE THE GROUND SURFACE DURING BOREHOLE SEALING

2.2.3 LABORATORY TESTING

Soil samples collected from the borings were transported to the WSDOT Materials Laboratory for examination and testing. We visually examined the soil samples and then grouped them based on particle size distribution, consistency, and color. Once groups of samples were established that had similar characteristics, a minimum of one sample per group in each boring was tested for index properties. Soil testing for this geotechnical investigation consisted of the following:

- Moisture Content (AASHTO T 265),
- Gradation (AASHTO T 11, T 27),
- Hydrometer (AASHTO T 88),
- Atterberg Limits (AASHTO T 89 and T 90),
- Specific Gravity (AASHTO T 100),

- One-Dimensional Consolidation Properties of Soil (AASHTO T 216),
- Consolidated, Undrained Triaxial Compression Test on Cohesive Soils (AASHTO 297).

A laboratory test summary table (Table C-1) and test data sheets are included in Appendix C.

2.3 Review and Classification Of Samples

2.3.1 Field Observations

All borings were observed by a WSDOT field inspector who collected, classified, stored, and transported soil samples and prepared a detailed field log of the exploration. In addition to examining and collecting soil samples, the field inspectors also noted drill action (indicating a material change), problems during drilling (e.g., heave, hole collapse, artesian pressures, etc.), and sample odors.

2.3.2 Soil Classification System

Soil classification for the Project was performed in accordance with Chapter 4.2 of the WSDOT Geotechnical Design Manual (GDM), which references ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Per ASTM D 2487, the Unified Soil Classification System (USCS) was used where laboratory index testing was available. The Exploration Log Legend in Appendix A includes a summary of the soil classification components used to prepare the descriptions on the boring logs.

2.3.3 Boring Logs

A boring log is a written record of the subsurface conditions encountered in the drill hole. The log graphically depicts the soil layers encountered in the exploration and provides a description of each sample. The log also provides the SPT N-values and water content, where measured. Other information shown in the boring logs includes groundwater level measurements and types and depths of sampling.

2.4 Cone Penetration Testing

CPT holes were completed at three locations by ConeTec crews using a C20-30 Ton Truck Rig. CPT logs present a relatively continuous measurement of corrected tip resistance (q_t), sleeve friction (f_s), and pore water pressure (u) versus depth. Calculated values of friction ratio (R_f) and normalized soil behavior type (SBT Q_{tn}) are also shown on the CPT logs.

Six Pore pressure dissipation tests were performed in CPT-01-21 and CPT-02-21. Seismic cone penetration testing was performed to determine shear wave velocity in CPT-01-21 and CPT-02-21 as well.

The report prepared by ConeTec, the CPT logs, and data are provided in Appendix D. Table D-1 (summary of survey coordinates for CPT logs) is also provided in Appendix D. The ConeTec report contains geotechnical data and geotechnical parameters. Geotechnical parameters provided by ConeTec were not considered in our geotechnical analyses and recommendations (Section 5 of this report).

3 SUBSURFACE CONDITIONS

3.1 GEOLOGIC SETTING

We reviewed the following published documents to evaluate the geologic setting of the Project:

- Geologic Map of the Utsalady and Conway 7.5-minute Quadrangles, Skagit, Snohomish, and Island Counties (Dragovich et al., 2002).

The Project site consists of fill, underlain by Everson-age glaciomarine drift (Qgdm-ec), Everson-age glaciomarine outwash (Qgome-e), Vashon-age glacial till (Qgt-v), and advance outwash deposits (Qga-v). An excerpt of the geologic map depicting these units in the vicinity of the site is presented in Exhibit 3-1. Materials encountered during the subsurface exploration program are generally consistent with the mapped geology.

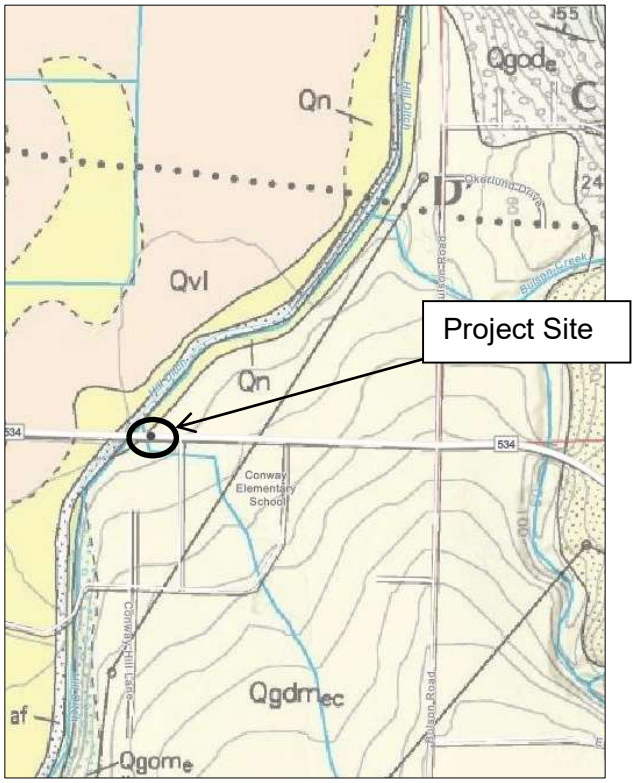

EXHIBIT 3-1. EXCERPT FROM THE GEOLOGIC MAP OF THE UTSALADY AND CONWAY 7.5-MINUTE QUADRANGLES (DRAGOVICH ET AL., 2002)

3.2 ENGINEERING STRATIGRAPHIC UNITS (ESUS)

We classified the materials underlying the Project site into the following Engineering Stratigraphic Units (ESUs):

- ESU 1a,
- ESU 1b,
- ESU 2,
- ESU 3,
- ESU 4,
- ESU 5.

The ESUs are subjective classifications made for convenience to group materials for our geotechnical analyses. Exhibit 3-2 provides brief descriptions for all ESUs.

EXHIBIT 3-2: ESU DESCRIPTIONS

ESU	Geologic map abbreviation	Average N_{60} [1,2] (blows/ foot)	Color	Relative Density or Consistency	Soil Type
1a	Fill	57	Dark gray to light brown	Dense	Well graded gravel with sand. Contains cobbles and potentially boulders.
1b	Qgdm-ec	18	Gray	Stiff	Elastic silt and lean clay with varying amounts of sand and gravel. Contains cobbles and potentially boulders.
2	Qgdm-ec	5	Gray	Very soft to medium stiff	Silt, lean clay, and fat clay.
3	Qgome-e	35	Gray	Medium dense to dense	Silty sand and sandy silt.
4	Qgt-v	100	Gray to dark gray	Very dense	Silty sand with gravel and well graded gravel.
5	Qga-v	70	Gray to dark gray	Medium dense to very dense	Poorly graded sand and silty sand with varying amounts of gravel. Although not encountered in borings, this geologic unit can contain cobbles and boulders.

Note:

1. SPT blow count corrected for hammer efficiency (overburden corrections are not accounted for).
2. Limited to 100 blows/foot.

For ESU 1a, historic data did not indicate any pertinent information associated with fill placement and compaction (i.e., lift thickness, compaction machine make and model, number of passes, or measured soil density after compaction). We surmise that the fill material was placed without strict gradation or compaction control. Therefore, variable gradations and densities within ESU 1a should be expected. Based on our experience with embankment fill and our site visits, cobbles, construction debris, and wood debris may also be encountered in ESU 1a.

ESU 1b consists of the original ground surface, prior to the placement of fill. Portions of ESU 1b may be mixed with fill.

The elevations at which these ESUs were encountered in the test borings are listed in Exhibit 3-3.

EXHIBIT 3-3: ENGINEERING STRATIGRAPHIC UNIT ELEVATIONS

ESU	Approximate Elevation Range in Boring (feet)	
	H-1vwp-20	H-2vwp-20
ESU 1a	26.5 to 22.5	27.4 to 23.4
ESU 1b	22.5 to 17.5	23.4 to 20.4
ESU 2	17.5 to -4.5	20.4 to 1.4
ESU 3	-4.5 to -17.5	1.4 to -11.6
ESU 4	-17.5 to -22.5	-11.6 to -16.6
ESU 5	-22.5 to -39.5*	-16.6 to -38.6*

*Represents bottom of boring. Bottom depth of ESU is not known.

3.3 GROUNDWATER

3.3.1 MONITORED GROUNDWATER ELEVATIONS

Appendix B presents plots of the groundwater measurements versus time taken in vibrating wire piezometers installed in selected borings (see Section 2.2.2). Exhibit 3-4 contains groundwater measurements obtained between March 2020 and July 2022.

EXHIBIT 3-4: GROUNDWATER MONITORING SUMMARY

Boring	Ground Surface Elevation (feet)	Sensor Elevation (feet)	Water Elevation		
			Low (feet)	Average (feet)	High (feet)
H-1vwp-20	26.5	8.5	26.9	28.1	29.1
		-6.5	33.1	35.5	37.3
H-2vwp-20	27.4	11.9	28.5	30.1	33.1
		-8.1	34.2	36.6	38.4

Exhibit 3-4 displays artesian ground water conditions. ESU 2 is a low permeability soil layer that confines the upward movement of water from ESU 3. Artesian pressures in ESU 3 are likely dissipating back to hydrostatic pressures within ESU 2. On April 1, 2021, a static water level (perched groundwater) was measured during a site

visit to be approximately 5 feet below the roadway (elevations 21.5 to 22.4 feet), within ESU 1b.

We collected groundwater data that reflects seasonal variations, though during periods of high surface water flow or precipitation, the groundwater levels could be higher than we measured in the vibrating wire piezometers.

3.3.2 Pore Pressure Dissipation Tests in CPT Holes

At specific depths, the CPT was halted to carry out pore pressure dissipation tests. For a dissipation test, the cone and rods are decoupled from the CPT rig while the cone records pore pressure over time. The pore pressure typically dissipates until reaching an equilibrium pore pressure (near horizontal line on the pore pressure versus time graph). The equilibrium pore pressure (u_{eq}) and the depth of the cone are used to calculate the depth to groundwater.

Three out of six dissipation tests captured the equilibrium pore pressure on April 12, 2021. The remaining tests were not held long enough to capture the equilibrium pore pressure. A summary of the three relevant dissipation tests is presented in Exhibit 3-5.

Exhibit 3-5: Pore Pressure Dissipation Summary

CPT	Ground Surface Elevation (feet)	Test Elevation (feet)	Water Elevation (feet)
CPT-01-21	26.6	-9.1	37.6
CPT-02-21	27.6	-2.5	37.5
		-9.6	38.9

The water elevations for CPT dissipation tests were consistent with the artesian groundwater conditions observed during groundwater monitoring.

3.3.3 Ordinary, 100-year, and 500-year High Water Elevations

The ordinary high water (OHW), 100-year high water (HW), and 500-year HW elevations were provided by the PEO. Exhibit 3-6 presents high water elevations.

Exhibit 3-6: High Water Elevations

Location	2-year OHW Elevation (feet)	100-year HW Elevation (feet)	500-year HW Elevation (feet)
Upstream	21.1	21.7	21.9
Downstream	19.3	20.1	20.3

3.4 CONTAMINATION

During drilling, the field inspector identified the soils in ESU 1a as having potential soil contamination due to a petroleum smell. The WSDOT Environmental Services Department collected samples for environmental analysis where contamination was suspected. Based on correspondence received from the WSDOT Environmental Services Department, we understand analytical tests performed on these samples indicated that detected analytes were below cleanup standards.

3.5 POTENTIAL VARIATION

Our subsurface interpretation and engineering analyses are based on our observations in the borings, laboratory testing program, and interpretation of cone penetration test data. Our interpretations are specific to the locations and depths noted on the boring logs (Appendix A) and CPT logs (Appendix D), and may not be applicable to all areas of the Project alignment. No number of explorations can precisely predict the characteristics, quality, or distribution of subsurface conditions. Potential variation includes but is not limited to:

- The conditions between and below explorations may be different.
- The passage of time or intervening causes (both natural and manmade) may result in changes to site and subsurface conditions.
- Groundwater levels at the site fluctuate seasonally and/or due to river/creek levels and may be higher than measured during our monitoring period.
- Where existing borings are at distances greater than 100 feet of the proposed structures, the assumed subsurface conditions may be significantly different.

If conditions differ from those described herein are encountered during construction, the Geotechnical Office should be contacted so we can review our interpretation and reconsider our geotechnical recommendations presented herein.

4 GEOLOGIC HAZARDS

4.1 SEISMIC HAZARDS

4.1.1 FAULT RUPTURE

The potential impacts of fault rupture include abrupt, large, differential ground movements and associated damage to structures that might straddle a fault. We reviewed online maps hosted by the United States Geologic Survey (USGS) and the Washington State Department of Natural Resources for faults close to the Project site. Figure 3 shows mapped faults near the Project site. Based on our review, the Project site is within 6 miles of the Darrington-Devils Mountain Fault, described in Exhibit 4-1.

EXHIBIT 4-1: FAULTS IN THE VICINITY OF THE PROJECT SITE

Name	Fault ID No.	USGS Fault Class[1]	Reliability of Location[2]	Most Recent Deformation	Slip Rate (mm/yr)	Distance from Project Site
Darrington-Devils Mountain	574	A	Good	< 130 ka	< 0.2	1.1 miles north

Notes:

1. Class A = Geologic evidence demonstrates the existence of a Quaternary fault of tectonic origin.
2. Location reliability is based on the USGS rating system.

Abbreviations:

ka = 1,000 years; mm = millimeter; USGS = U.S. Geological Survey; yr = year.

In our opinion, the risk of fault rupture at the Project site is low, given the estimated slip rate of less than 0.2 millimeter per year as well as a recurrence interval of approximately 6,000 years.

4.1.2 LIQUEFACTION

Soil liquefaction is a phenomenon whereby saturated soil deposits temporarily lose strength and behave as a viscous fluid in response to cyclic loading. Soil types considered at the highest risk of liquefaction during a seismic event are loose to medium dense sandy soils.

We used preliminary screening criteria from GDM Section 6-4.2.1 to evaluate the liquefaction potential of subsurface soils. We found all ESUs to not be susceptible to liquefaction below the water table for the following reasons:

- Plasticity index (PI) values were greater than 7 to 12 (ESUs 1b and 2).
- The measured SPT resistance, corrected for overburden depth and hammer energy ($N1_{60}$) was on average greater than 30 blows per foot (ESUs 3, 4, and 5).

4.1.3 CYCLIC SOFTENING

Cyclic softening can occur during a seismic event in fine-grained soils that have a PI > 7 to 12 and exhibit clay-like behavior (Boulanger and Idriss, 2007). Cyclic softening can result in significant losses in soil strength. According to GDM Section 6-4.3.1, silts and clays with low to moderate sensitivity can experience a strength reduction of 10 to 15 percent during cyclic softening. Cyclic softening and the degree to which it was considered in our analyses is discussed further in Section 5.2.3.

4.2 SCOUR

The Final Hydraulic Design Report (WSDOT, 2022c) indicates the following:

- Scour is expected at the culvert crossing.
- There is a risk that the channel thalweg can migrate over to the retaining walls.
- Recommended scour elevations as shown in Exhibit 4-2.

EXHIBIT 4-2. SCOUR RESULTS

Limit State	Upstream		Downstream	
	Depth of Scour (feet)	Elevation (feet)	Depth of Scour (feet)	Elevation (feet)
Thalweg	N/A	20.1	N/A	18.4
100-year Scour	2.4	17.7	3.4	15.0
50% of 100-year Scour	1.2	18.9	1.7	16.7
500-year Scour	4.8	15.3	5.3	13.1

5 GEOTECHNICAL ANALYSES AND RECOMMENDATIONS

We have performed our analyses and prepared our design recommendations considering the Project configuration as described herein. If the PEO or BSO develops additional or revised information about final structure or walls, the recommendations presented herein may need to be revised. The Geotechnical Office must be made aware of the revised or additional information so that we can re-evaluate our recommendations for applicability.

For purposes of our analyses, it was necessary for us to assume that the results of subsurface explorations, as described in Section 3, are representative of conditions throughout the Project alignment. However, subsurface conditions should be expected to vary (see Section 3.5). We may need to revise our recommendations during construction if different conditions are encountered.

Based on our understanding of the Project and the subsurface conditions, we performed analyses and prepared geotechnical design recommendations for the following:

- Seismic Design,
- Box Culvert,
- Reinforced Concrete Retaining Walls,
- Overall Stability,
- Over-excavation, Replacement, and Base Reinforcement,
- Lightweight Volcanic Backfill,
- Roadway shoulder settlement.

We present our analysis summaries and geotechnical recommendations in the following sections.

5.1 DESIGN CRITERIA

This Project will be designed in accordance with the WSDOT GDM (WSDOT, 2022b), the WSDOT Bridge Design Manual (BDM) (WSDOT, 2022a), the American Association of State and Highway Transportation Officials (AASHTO) LRFD Bridge Design Specifications (BDS) (AASHTO, 2020), and the WSDOT Standard Specifications for

Road, Bridge, and Municipal Construction (WSDOT, 2022d). Based on these documents and discussions with the PEO and BSO, the following general design criteria were considered when performing our analyses:

- Seismic design is not required for the buried structure, as it is a Class 1 structure with a structural clear span of less than 20.0 feet (BDM Section 8.3.3.H).
- Seismic design should be performed for the Project retaining walls because the site has a site-adjusted peak ground acceleration (A_s) of more than 0.4 times gravity (0.4g) (AASHTO BDS Section 11.5.4.2) and the retaining walls have a maximum height greater than 10 feet (GDM Section 6.1.2.1).
- Design of the box culvert and retaining walls should include the effects of potential 100-year and 500-year event scour levels (BDM Section 7.1.7, 7.7.1.A, and 8.3.3.D). Under static and seismic loading, 100% and 50% of the 100-year scour (design flood), respectively, shall be considered. 100% of the 500-year scour shall also be considered as an extreme event condition.

5.2 Seismic Design Considerations

Per AASHTO and WSDOT seismic design criteria, the seismic demand is evaluated using a design horizontal response spectrum based on ground motions with a 7% probability of exceedance in 75 years (a 975-year return period). Computation of the seismic demand is based on seismological input and site soil response factors. AASHTO and the GDM outline a general procedure for developing a design response spectrum based on design spectral acceleration values. Chapter 6-3 of the WSDOT GDM indicates that a site-specific procedure to evaluate the seismic demand is required if any of the following apply:

1. If the structure is considered to be “Critical” or “Essential” per the BDM.
2. If the structure is located within 6 miles of a known active fault and its response could be significantly and adversely influenced by near-fault ground motion characteristics.
3. If the soils at the site can be classified as Class F soils, and those soils have the potential to result in a significantly higher response of the bridge. Class F soils consist of peats or highly organic clays, very high-plasticity clays, or very thick, soft/medium stiff clays.
4. If there are different site classes across the length of the structure.

Item No. 2 above applies to this site; however, the risk of fault rupture is low due to a 6,000-year return interval on the fault. Our analysis, therefore uses the AASHTO-WSDOT general procedure to develop the seismic design ground motions without further consideration of near-fault effects.

5.2.1 Site Classification

We evaluated the site classification for the Project based on AASHTO BDS Table 3.10.3.1-1, which specifies the site class based on a time-weighted average shear wave

velocity, depth-weighted average SPT blow count, or undrained shear strength in the upper 100 feet of the soil profile. Based on our analyses, the site can be classified as a Site Class E.

5.2.2 *Design Response Spectrum*

The seismological inputs in the general procedure to develop a design response spectrum include the horizontal peak ground acceleration (PGA), the horizontal response spectrum acceleration at 0.2-second period (S_S), and the horizontal response spectrum acceleration at 1.0-second period (S_1). The seismological inputs are evaluated using seismic design maps provided in the GDM for Site Class B. To account for the dynamic site response at the Project site, site soil response factors (F_{pga}, F_a, and F_v) provided in the WSDOT GDM are used to scale the reference seismological inputs to Site Class E and estimate the site-specific design spectral acceleration values (A_S, S_{DS}, and S_{D1}). We recommend using the seismic design parameters provided in Exhibit 5-1 for design of reinforced concrete retaining walls.

Exhibit 5-1: Seismic Design Parameters

Parameter	Recommended Value[1]	
Site class based on soil conditions	Site Class =	E
Mean magnitude	M =	6.96
Peak horizontal ground acceleration coefficient on Class B rock[1,2]	PGA =	0.35 g
0.2-second period spectral acceleration coefficient on Class B rock[1,2]	S_s =	0.80 g
1.0-second period spectral acceleration coefficient on Class B rock[1,2]	S_1 =	0.22 g
Site coefficient for the peak ground acceleration coefficient	F_{pga} =	1.50
Site coefficient for 0.2-second period spectral acceleration	F_a =	1.24
Site coefficient for 1.0-second period spectral acceleration	F_v =	3.20
Effective peak ground acceleration coefficient	$A_s = F_{pga}(PGA)$ =	0.53 g
Design earthquake response spectral acceleration coefficient at 0.2-second period	$S_{DS} = F_aS_s$ =	0.99 g
Design earthquake response spectral acceleration coefficient at 1.0-second period	$S_{D1} = F_vS_1$ =	0.70 g
Seismic Design Category based on S_{D1}	SDC =	D

Notes:

1. Latitude = 48.341°, longitude = -122.323°.
2. Based on the USGS Uniform Hazard Tool using the U.S. Dynamic Conterminous edition for 2014 (update) (v.4.2.0) (United States Geological Survey, 2022).

5.2.3 *Cyclic Softening Analyses*

We evaluated cyclic softening potential of subsurface soils based on correlations between undrained shear strength, PGA, and earthquake magnitude using methods published in Soil Liquefaction During Earthquakes (Idriss and Boulanger, 2008). We

performed cyclic softening analyses using a 2-year high water elevation of 19.3 feet, an earthquake magnitude of 6.96, and an effective peak ground acceleration (A_s) of 0.53g. We considered a soil susceptible to cyclic softening if the factor of safety (FS) against cyclic softening in our analysis was less than 1.2.

Our results show that ESU 2 may cyclically soften under the design earthquake between elevation 7.5 feet to -4.5 feet (H-1vwp-20) and 8.4 feet to 1.4 feet (H-2vwp-20). Based on the GDM and local experience, we used a 20 percent strength reduction when assessing post-cyclic overall stability of the retaining walls.

5.3 Box Culvert

Based on information provided by the PEO, the proposed box culvert will consist of a 4-sided reinforced concrete box, approximately 60 feet in length, an outside wall span of 24 feet, and an inner wall span of 19.5 feet. The bottom of the box culvert is planned to be at elevation 9.8 feet. The location of the box culvert is shown on Figure 2 and soil profiles at the inlet and outlet are shown on Figures 4 and 5.

If the elevation and/or geometry of the proposed structure changes in the future, the Geotechnical Office should be contacted so we can review our recommendations and revise if necessary.

5.3.1 *Subgrade Considerations*

We recommend that very soft soils (ESU 2) 1-foot below the culvert subgrade be removed and replaced with Crushed Surfacing Base Course (CSBC), as described for the retaining walls in Section 5.4.1.2 to allow for a stable subgrade for culvert construction.

5.3.2 *Resistance Factors*

Exhibit 5-2 contains the appropriate resistance factors for the bottom of the box culvert.

Exhibit 5-2: Geotechnical Resistance Factors for Box Culvert

Limit State	Resistance Factor, φ		
	Bearing	Shear Resistance to Sliding	Passive Pressure Resistance to Sliding
Service	1.0	1.0	1.0
Strength	0.45	0.90 (precast concrete on sand) 0.8 (cast-in-place concrete)	0.50
Extreme Event	0.90	1.0	1.0

5.3.3 *Bearing Resistance*

We performed bearing resistance calculations in accordance with AASHTO BDS including service, strength, and extreme event limit states. Bearing resistance calculations assume that the bottom of the box culvert will be at elevation 9.8 feet. Our

results indicate the following nominal bearing resistances for the box culvert as shown in Exhibit 5-3:

EXHIBIT 5-3: UNFACTORED BEARING RESISTANCE SUMMARY FOR BOX CULVERT

Effective Footing Length, L' (feet)	Effective Footing Width, B' (feet)	Bearing Resistance			
		Service Limit State (ksf)	Strength Limit State (ksf)	Extreme Event I Limit State (ksf)	Extreme Event II Limit State (ksf)
60	24	2.0	5.8	4.9	5.7

Abbreviations:

ksf = kips per square foot

Factored resistances for different limit states can be calculated by multiplying the resistance factors from Exhibit 5-2 by the unfactored bearing resistances in Exhibit 5-3.

The Service limit state bearing resistance corresponds to 1 inch of total settlement including immediate settlement, primary consolidation settlement, and secondary compression settlement. We anticipate less than 1 inch of differential settlement between the ends of the box culvert.

5.3.4 LATERAL EARTH PRESSURE PARAMETERS

Lateral earth pressure parameters for the box culvert were calculated assuming the materials given in Exhibit 5-4.

EXHIBIT 5-4: LATERAL EARTH PRESSURE PARAMETERS FOR BOX CULVERT

Material	Elevation Range (feet)	Unit Weight (pcf)	Friction Angle (deg)	At-Rest Earth Pressure Coefficient, K_o
Lightweight Volcanic Backfill	20.0 to Top of Culvert	50	40	0.36
Gravel Backfill for Walls	9.8 to 20.0	130	38	0.38

Gravel backfill for Walls per the WSDOT Standard Specification 9-03.12(2) should be compacted in accordance with WSDOT Standard Specifications 2-03.3(14)C, Method C. Material specifications and compaction considerations for Lightweight Volcanic Backfill will be discussed in subsequent Sections 5.4.4.1 and 6.5. We further assume that drainage will be provided in accordance with WSDOT Standard Specification 6-02.3(22) so that hydrostatic pressures do not build up behind culvert components.

The box culvert will be constructed on CSBC; therefore, the recommended coefficient of sliding is as follows:

- Cast-in-place concrete = 0.84;
- Precast concrete = 0.67.

5.4 REINFORCED CONCRETE RETAINING WALLS

The retaining walls will be used at the four corners of the culvert near the inlet and outlet to retain embankment soil and provide a transition from the roadway to the toe of the roadway embankment. Based on wall site data provided by the PEO, our understanding of the proposed retaining wall lengths and heights are summarized in Exhibit 5-5.

EXHIBIT 5-5: RETAINING WALL DIMENSIONS

Location	Length (feet)	Height (feet)
NW Wall	12	17
NE Wall	26	18
SW Wall	15	18
SE Wall	11	19

We considered the following information for each wall in the geotechnical analyses:

- The base elevation of each wall will be located at elevation 9.8 feet.
- Scour will remove a portion of the soil in front of all retaining walls within the footprint of the wetted perimeter.
- The low service limit state bearing resistance of very soft ESU 2 soils preclude the use of WSDOT standard plan reinforced concrete retaining walls.

5.4.1 OVERALL STABILITY

We performed overall stability analyses for Strength, Extreme Event I (pseudo-static and cyclic softened), and Extreme Event II (check flood) limit states on retaining wall cross sections. We used the computer program Slide2 v. 2021 9.019 (Rocscience Inc., 2021) for our analyses. Our analyses and conclusions are discussed in the following sections.

5.4.1.1 Overall Stability Evaluation

We selected representative upstream and downstream retaining wall cross sections for our stability analyses from Figures 6 through 9. We analyzed cross section 14+82 on Figure 6 (determined to be similar to cross section 15+06 on Figure 7) and cross section 15+52 on Figure 9 (determined to be similar to cross section 15+28 on Figure 8).

Initially, overall stability was inadequate with a FS less than 1.3 in the Strength limit state and less than 1.1 in the Extreme Event I, and Extreme Event II limit states. To improve overall stability, we considered over-excavation, replacement with Crushed Surfacing Base Course (CSBC), and a layer of geosynthetic base reinforcement. The details of this over-excavation, replacement, and base reinforcement are provided in Figure 10 (Over-excavation and Base Reinforcement Plan View) and Figure 11 (Over-excavation and Base Reinforcement Section View). Details are further discussed in Section 5.4.1.2.

5.4.1.2 Mitigation with Over-excavation, Replacement, and Base Reinforcement

To improve overall stability and provide a stable subgrade for construction, we recommend the following detail, from bottom up.

- At elevation 8.8 feet, Geotextile for Soil Stabilization in accordance with the WSDOT Standard Specifications Section 9-33.2(1), Table 3 and Section 2-12.3(3). Separation geosynthetic should extend across the width and length of the excavation.
- From elevation 8.8 feet to 9.3 feet, 0.5-foot-thick layer of CSBC bedding in accordance with the WSDOT Standard Specifications 9-03.9(3), compacted to Method C per the WSDOT Standard Specifications 2-03.3(14)C. Compaction of CSBC bedding material should occur statically without vibration due to the saturated and very soft underlying soils of ESU 2.
- At elevation 9.3 feet, geosynthetic (base) reinforcement with allowable Long Term Tensile strength (T_{al}) of 5,000 lb/ft, placed as shown in Figures 10 and 11. Several geosynthetic products with $T_{al} \geq 5{,}000$ lb/ft exist in Appendix D of the WSDOT Qualified Products List.
- From elevation 9.3 to 9.8 feet, 0.5-foot-thick layer of CSBC with specifications and compaction as described above.

Geotextile for Soil Stabilization, CSBC, and base reinforcement will cover the full footprint as shown in Figure 10 and therefore, also be underneath the box culvert structure. This will prevent bearing the retaining walls and box culvert on different materials.

5.4.2 RESISTANCE FACTORS

Exhibit 5-6 contains the appropriate resistance factors for retaining wall footings.

EXHIBIT 5-6: GEOTECHNICAL RESISTANCE FACTORS FOR RETAINING WALLS

Limit State	Resistance Factor, φ		
	Bearing	Shear Resistance to Sliding	Passive Pressure Resistance to Sliding
Service	1.0	1.0	1.0
Strength	0.55	1.0	0.50
Extreme Event	0.90	1.0	1.0

5.4.3 BEARING RESISTANCE

We performed bearing resistance calculations in accordance with AASHTO BDS including service, strength, and extreme event limit states. Bearing resistance calculations assume that the bottom of all retaining walls will be at elevation 9.8 feet. Our results indicate nominal bearing resistance charts for the retaining walls as shown in the following Exhibits:

- NW Wall – Exhibit 5-7,
- NE Wall – Exhibit 5-8,

- SW Wall – Exhibit 5-9,
- SE Wall – Exhibit 5-10.

Service limit state values for Exhibits 5-7 through 5-10 correspond to 1 inch or less of total settlement including immediate settlement, primary consolidation settlement, and secondary compression settlement. We anticipate less than 1 inch of differential settlement across the length of each wall. Service limit state bearing resistances are the same across retaining walls and different footing widths because they approximately equal the existing overburden pressure at elevation 9.8 feet (2 ksf). This results in a net overburden pressure increase of 0 psf to minimize long-term settlement in the underlying very soft ESU 2 soil.

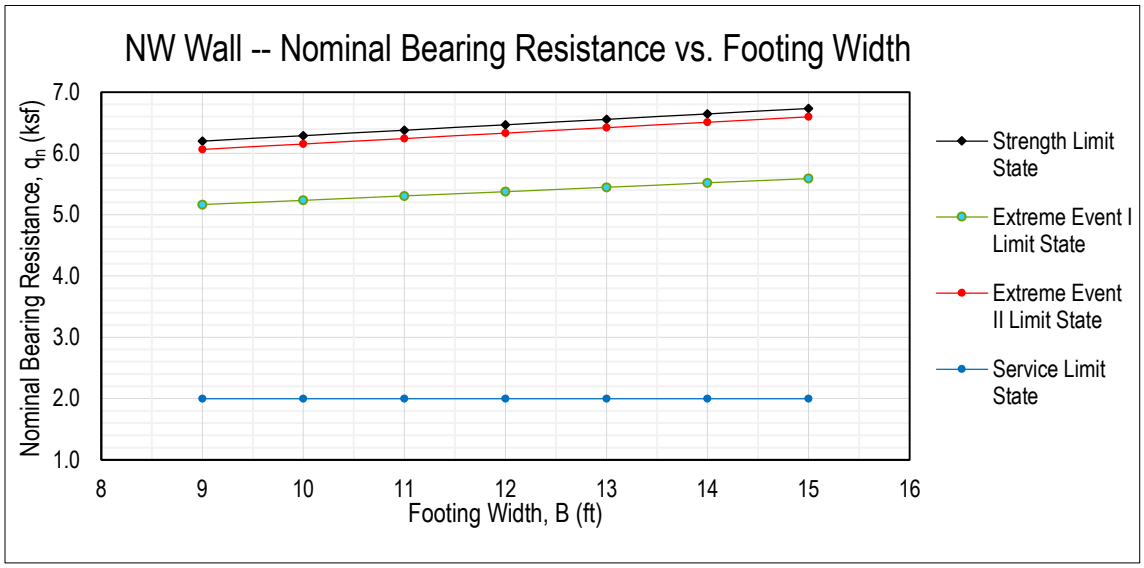

EXHIBIT 5-7: NW WALL NOMINAL BEARING RESISTANCE

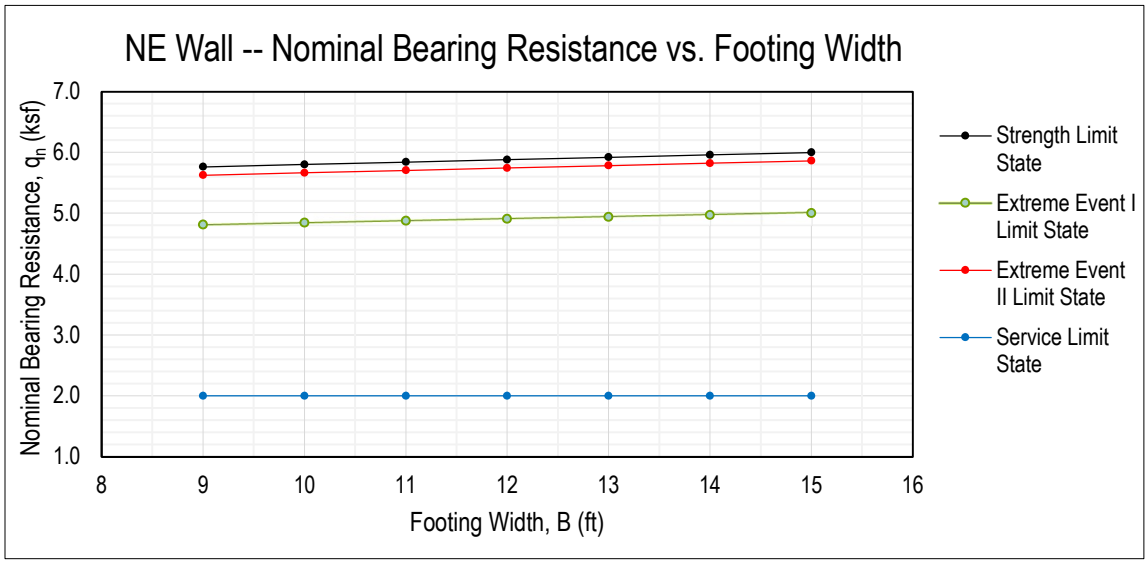

EXHIBIT 5-8: NE WALL NOMINAL BEARING RESISTANCE

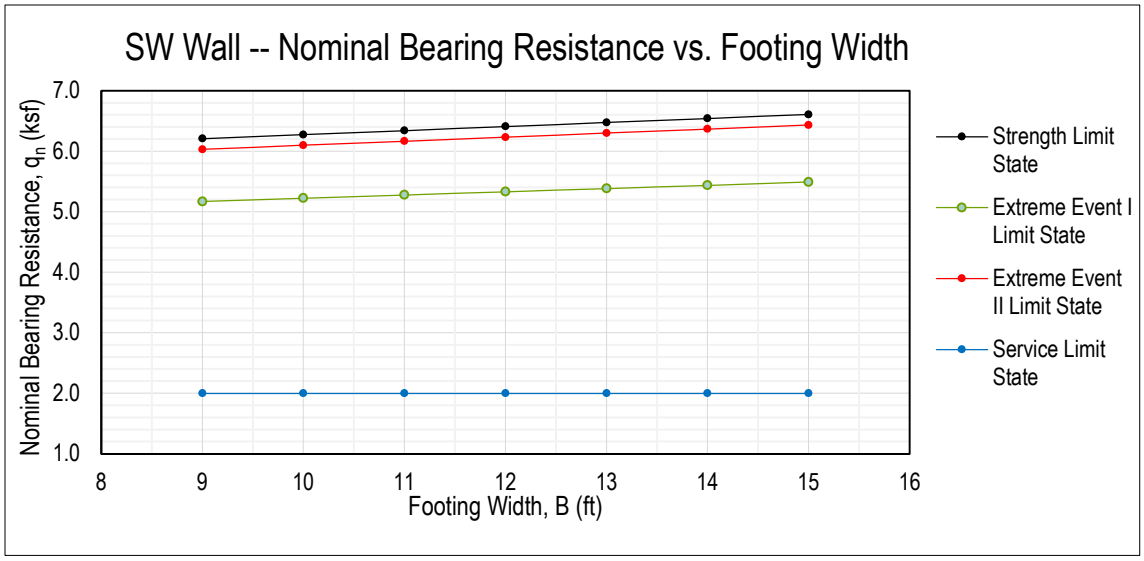

EXHIBIT 5-9: SW WALL NOMINAL BEARING RESISTANCE

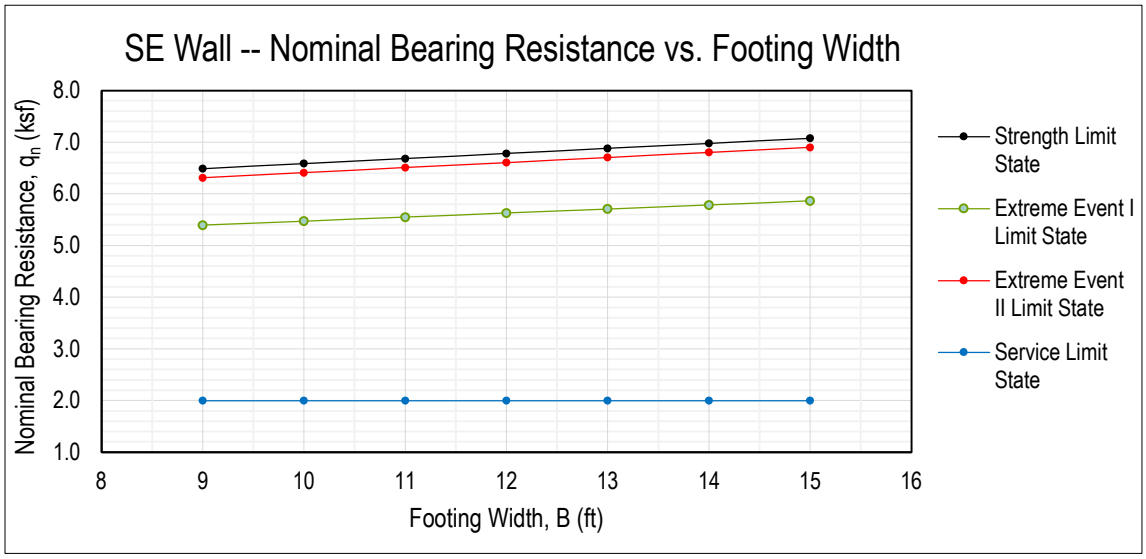

EXHIBIT 5-10: SE WALL NOMINAL BEARING RESISTANCE

Factored resistances for different limit states can be calculated by multiplying the resistance factors from Exhibit 5-6 by the unfactored bearing resistances in Exhibits 5-7 through 5-10.

5.4.4 LATERAL EARTH PRESSURE PARAMETERS

Lateral earth pressure diagrams for the retaining walls are provided in Figures 12A through 12D and 13A through 13D. Earth pressure diagrams assume the following:

- Gravel Backfill for Walls from elevation 9.8 feet to 20.0 feet,
- Lightweight Volcanic Backfill from elevation 20 feet to the top of wall.

Gravel Backfill for Walls should conform to the WSDOT Standard Specifications 9-03.12(2) and should be compacted using Method C from the WSDOT Standard Specifications 2-03.3(14)C. Lightweight Volcanic Backfill is a crushable material that should be compacted and handled as described in Section 6.5.

Drainage should be provided in accordance with WSDOT Standard Specification 6-02.3(22) so that hydrostatic pressures do not build up behind retaining walls.

Per AASHTO BDS Table C3.11.1-1, walls will need to move 0.001*H, where H is the height of the wall, to mobilize the active earth pressures shown in Figures 12A through 12D and 13A through 13D. Walls that move less than 0.001*H will experience at-rest earth pressures. For seismic design of the retaining walls, we used a horizontal acceleration coefficient (k_h) equal to 0.27g. Our k_h assumption assumes that retaining walls can displace up to 1 inch (unrestrained) during a seismic event. The vertical acceleration coefficient (k_v) was not considered for design.

The retaining walls will be constructed on CSBC, the recommended coefficient of sliding is as follows:

- Cast-in-place concrete = 0.84;
- Precast concrete = 0.67.

5.4.4.1 Lightweight Volcanic Backfill

We recommend the use of lightweight volcanic backfill to reduce long term settlement of very soft soils (ESU 2) beneath of the embankment and retaining walls. The material should be free draining, free from organic and deleterious material, and substantially free of shale and other soft, poor durability particles. We recommend that lightweight volcanic backfill meet the requirements shown in Exhibit 5-11, gradation specifications shown in Exhibit 5-12, and be comprised of vesicular basalt or scoria.

EXHIBIT 5-11: LIGHTWEIGHT VOLCANIC BACKFILL REQUIREMENTS

Property	Test Method	Allowable Test Value
pH	AASHTO T 289-91	4.5 to 9
Los Angeles Wear 500 rev.	AASHTO T 96	40 percent maximum
Degradation	WSDOT Test Method No. 113	15 minimum
Dry Unit Weight	WSDOT Test Method No. 606	50 pounds per cubic foot maximum
Specific Gravity of Solids	ASTM C127	1.2 minimum

EXHIBIT 5-12: LIGHTWEIGHT VOLCANIC BACKFILL GRADATION SPECIFICATIONS

Sieve Size	Percent Passing	Tolerances (%)
3” square	100	95-100
No. 4	5 maximum	10 maximum

5.5 ROADWAY SHOULDER SETTLEMENT

We analyzed the total settlement of a new 4 feet of fill beyond the roadway shoulder and within the constructed embankment slopes of SR 534 between approximate C Line Stations 14+90 to 15+10. We estimated up to 15 inches of settlement to occur in areas of new fill that experience a net increase of overburden stress below elevation 9.8 feet (i.e., final overburden stress greater than the in-situ overburden stress). About 50% of this settlement would occur during the first month after placement, and another 45% would occur in the following 3 months. The remaining secondary compression settlement would occur over the lifespan of the structure. The magnitude of total settlement will be greatest at the locations where the depth and aerial footprint of the placed fill are greatest.

Additional placement of fill and regrading may be required following settlement in this area. We understand the PEO has elected to resurface the affected areas following Project completion to avoid the necessity of placing a preload or leaving a preload in place for an extended period.

Considering the footprint of excavation and replacement with a combination of Gravel Backfill for Walls and Lightweight Volcanic Backfill, other areas of the Project beyond the SR 534 roadway shoulder should experience net decreases in the overburden pressure at the bottom of the excavation, and therefore little to no settlement.

6 GEOTECHNICAL CONSTRUCTION CONSIDERATIONS

The Project will be constructed per the WSDOT Standard Specifications for Road, Bridge and Municipal Construction (WSDOT, 2022d). We have developed construction considerations for the Project to assist in preparation of Special Provisions and to identify key geotechnical issues that should be prepared for and observed during construction. Our recommendations are not intended to dictate methods or sequences used by contractors. Prospective contractors must undertake their own independent review and evaluation of the subsurface data to arrive at decisions concerning the planning of the work; the selection of equipment, means and methods, techniques, and sequences of construction; establishment of safety precautions; and evaluation of the influence of construction on adjacent sites.

6.1 DEWATERING

We presented the Project to the Association of General Contractors (AGC) on January 21, 2022, to discuss dewatering challenges. The AGC recommended a pump test prior to construction for the following reasons:

- Assess drawdown and hydraulic properties of the site to design a dewatering system.
- Assess potential settlement risks to the 2-story residence to manage effective stress changes beneath the residence.

Re-injection wells and cut-off walls (if necessary) were also identified as options to protect the 2-story residence from dewatering induced settlement at the AGC meeting.

The groundwater conditions described in Section 3.3 should be considered by the Contractor when planning temporary excavations. Bottom heave and water seepage into the excavation may be present without the use of dewatering to depressurize the artesian pressures directly below the excavation within ESU 2 and ESU 3. Dewatering will be required prior to commencing the excavation. The potential impacts of dewatering induced settlement on the 2-story residential home (100 feet southwest of the site) and underground gas lines (380 feet east of the site) should be carefully considered in the dewatering plan and monitored during construction. Dewatering is a significant construction challenge and will be included in the Contract Special Provisions.

Dewatering is the responsibility of the Contractor, who is solely responsible for construction means and methods and site safety. The Contractor should select, design, construct, and operate the dewatering system in conjunction with design and construction of the excavation and shoring system.

6.2 EARTHWORK, TEMPORARY SLOPES, AND SHORING

Temporary slopes for excavation will expose material from ESU 1a, ESU 1b, and ESU 2. Where groundwater seepage is encountered, if any, erosion could occur such that the stability of temporary slopes is adversely affected. The contractor should be prepared to control groundwater seepage and prevent erosion that could cause slope instability.

Temporary slopes are the responsibility of the Contractor. The Contractor should determine the appropriate measures to ensure that all excavation work follows local, state, and federal safety codes. Washington Administrative Code (WAC) Section 296 -155 contains maximum allowable temporary cut slope inclinations and is applicable to cuts of 20 feet or less in height. Slope heights greater than 20 feet must be designed by a registered professional engineer. GDM Section 15-7 contains additional requirements for the design of temporary cut slopes. For planning and cost estimating, a 2H:1V slope for Project excavations can be assumed.

Sheet piles used as temporary shoring may require predrilling, as cobbles may be encountered in ESU 1 and 1b. Furthermore, vibration from sheet pile installation should be monitored to prevent damage to the adjacent 2-story residence. There is also a risk

of upward groundwater flow and potential artesian pressures along the face of sheet piles which should be accounted for. Drilled shoring systems may be difficult to install due to artesian pressure head within the shafts. If drilling is required, the Contractor should carefully consider methods to maintain a pressure head greater than the artesian pressure head.

6.3 Subgrade Preparation and Backfill

To aid in creating a firm subgrade for placement of the culvert and retaining wall footings, we recommend the following

- Install geotextile for Soil Stabilization in accordance with the WSDOT Standard Specifications 9-33.2(1), Table 3 prior to any fill placement.
- Place geotextile in accordance with WSDOT Standard Specifications Section 2-12.3(3), Soil Stabilization.

Because the bottom of excavation will be below the natural groundwater level and will be in very soft ESU 2 soil, the Contractor should be prepared for challenges excavating and preparing the subgrade and use excavation, fill placement, and compaction techniques appropriate for the conditions encountered.

Very soft ESU 2 soil will be exposed on unshored excavation slopes in the lower portions of culvert and retaining wall excavation. If difficulty achieving compaction occurs where compacting backfill adjacent to very soft soil, we also recommend placing a soil stabilization geotextile against ESU 2 soils exposed on the excavation slope prior to placing any backfill. Geotextile type and placement can be in accordance with WSDOT Standard Specifications 9-33.2(1), Table 3 and Section 2-12.3(3) as well.

6.4 Reuse of Excavated Material

Excavated material from ESU 1b and ESU 2 is not suitable for reuse for embankment fill due to their high fines content and high natural water content. We do not recommend the reuse of material from ESU 1b and ESU 2 for embankment fill.

Material from ESU 1 may be usable as Common Borrow provided it meets the requirements of WSDOT Standard Specification Section 9-03.14(3) and is free of contaminants. The excavated material may be above or below the optimum moisture content and may require moisture conditioning to meet compaction requirements.

6.5 Lightweight Volcanic Backfill

The lightweight volcanic backfill should be carefully placed to prevent crushing of the particles. Layers should be placed no more than 18 inches deep with a minimum layer thickness of 12 inches. Each layer of backfill should be compacted by one complete coverage of a tracked dozer with a minimum weight of 18,000 pounds and a maximum ground pressure of 6.0 pounds per square inch. Sharp turns, sudden stops, and multiple passes should not be performed.

6.6 GEOTECHNICAL INSTRUMENTATION AND TEST HOLE ABANDONMENT

All test holes with vibrating wire piezometers will need to be decommissioned in accordance with WAC 173-160. The PEO is responsible for making sure well decommissioning occurs. Well decommissioning can be coordinated by contacting Robert Shepard (360-709-5526) at the WSDOT Headquarters Materials Laboratory to schedule abandoning of the test holes where vibrating wire piezometers have been installed. Test hole abandonment should occur prior to construction.

7 RECOMMENDED ADDITIONAL SERVICES

Because the future performance and integrity of the structural and geotechnical elements of the Project will depend largely on proper preparation of the plans, specification, and estimate (PS&E) documents and diligent construction procedures, we recommend that the Geotechnical Office in conjunction with the Regional Materials Engineer (RME) provide the following post-report services:

- The Geotechnical Office should prepare the Summary of Geotechnical Conditions to be included in the PS&E as an appendix. The summary should be prepared as part of the PS&E review process.
- The Geotechnical Office should provide input into special provisions for dewatering.
- The Geotechnical Office and RME should review all construction plans and specifications to verify that the design criteria presented in this report have been interpreted correctly and properly integrated into the design.
- The Geotechnical Office and RME should attend pre-construction conferences with the Construction Project Engineer and Contractor to discuss important construction related issues.
- The Geotechnical Office should review Contractor submittals.
- The Geotechnical Office and RME should review Contractor submittals for all dewatering studies, dewatering plans, temporary slopes, and geotechnically challenging elements of the Project.
- A representative from the Geotechnical Office should be present on the Project site during the excavation and preparation of the foundation subgrade.

In addition to the aforementioned services, the Geotechnical Office can provide inspector training for construction personnel, assist in change of conditions claims, and review value engineering change proposals.

8 CLOSURE

This geotechnical report was prepared to summarize our subsurface explorations, laboratory tests, engineering analyses, and to provide final design recommendations and construct considerations for the SR 534/Unnamed Tributary to Carpenter Creek – Fish Passage Project. This report should not be used for other purposes without contacting the Geotechnical Office for a review of the applicability of such reuse. This report should

be made available to prospective contractors for their information or factual data only and not as a warranty of ground conditions.

9 REFERENCES

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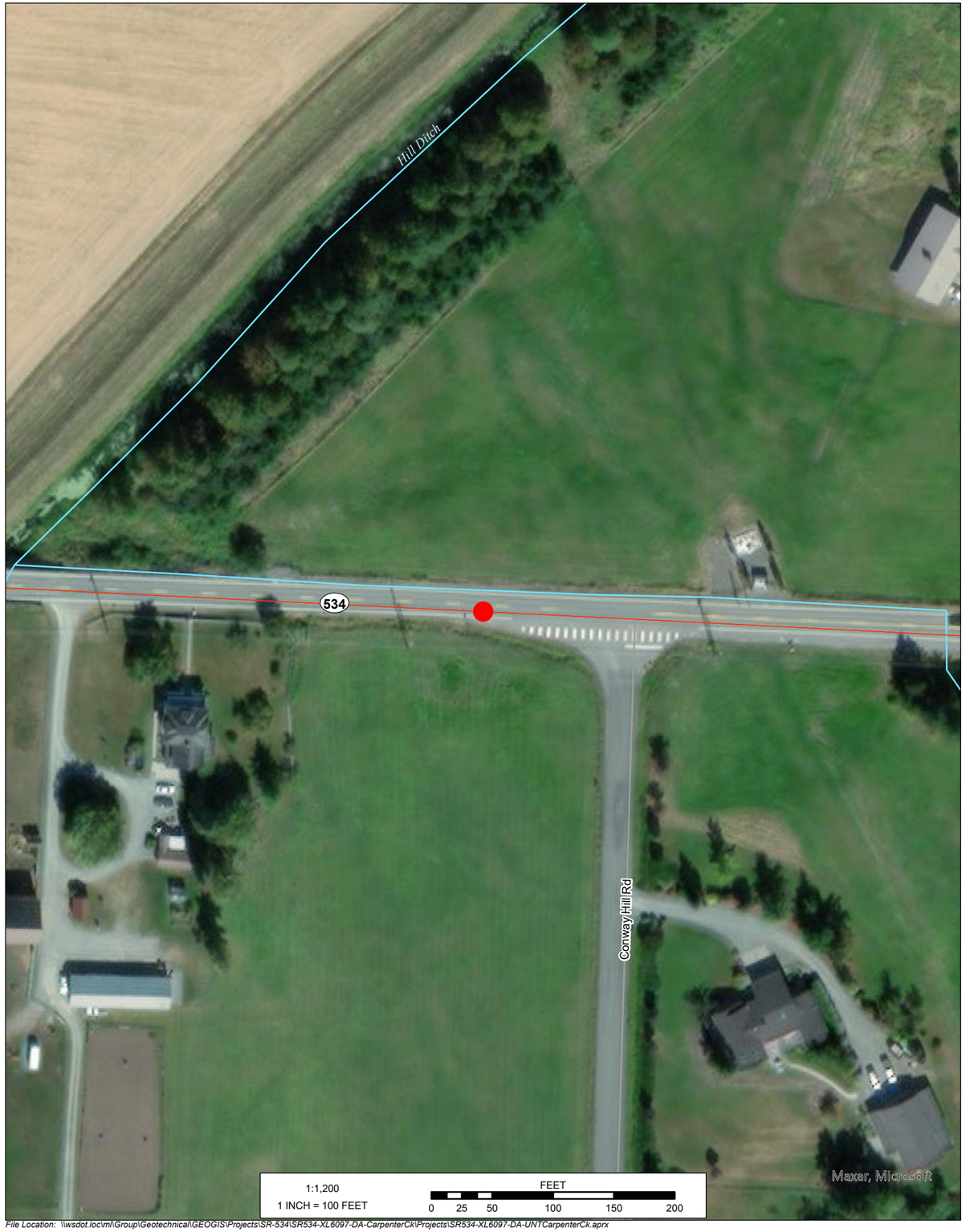
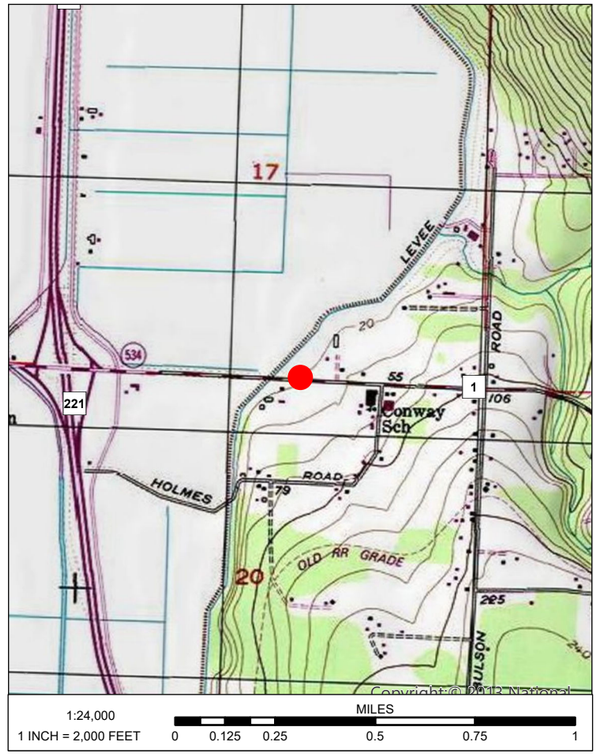
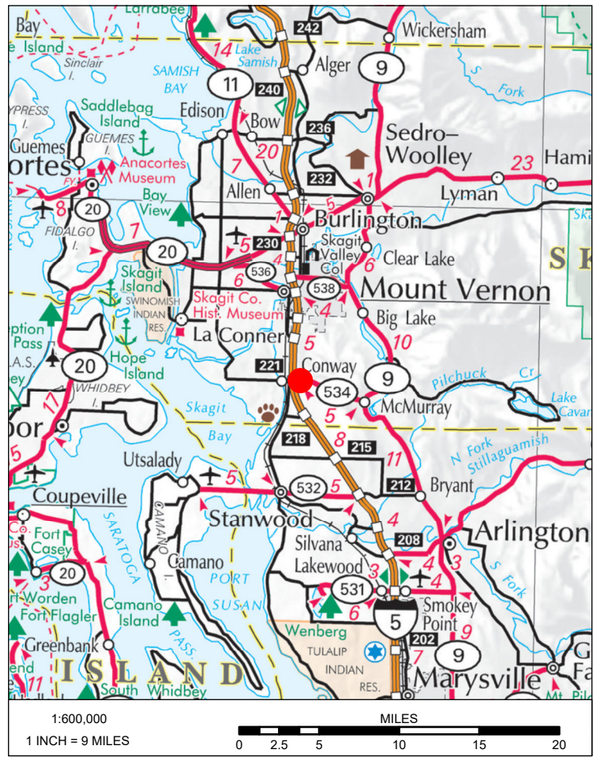


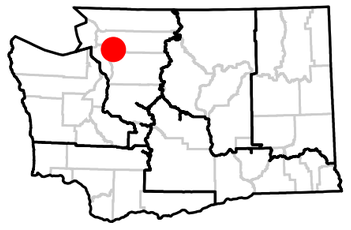




Legend

- Site
- Milepost Markers
- State Route
- NHD Rivers & Streams
- WSDOT Regions
- County Boundaries (1:500K)

N



JOB # XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 TO 0.69

FIGURE 1: SITE VICINITY MAP

SR 534/Unnamed Tributary to Carpenter Creek – Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY TropleT Date: May 13, 2021

File Location: \\wsdot.loc\rnl\Group\Geotechnical\GEOGIS\Projects\SR-534\SR534-XL6097-DA-CarpenterCk\Projects\SR534-XL6097-DA-UNTCarpenterCk.aprx

Sta. 14+82 X-Sec.

Sta. 15+06 X-Sec.

TEMPORARY CONSTRUCTION EASEMENT

WSDOT RIGHT OF WAY

TRIBUTARY TO CARPENTER CREEK

Flow Line

NW Wall

NE Wall

SW Wall

SE Wall

B

B'

A

A'

H-1vwp-20

CPT-1-21

H-2vwp-20

CPT-3-21

CPT-2-21

CARPENTER CREEK

Flow Line

WSDOT RIGHT OF WAY

TEMPORARY CONSTRUCTION EASEMENT

Sta. 15+28 X-Sec.

Sta. 15+52 X-Sec.

SR 534

C LINE

N

SURVEYED CONE PENETROMETER TEST LOCATION

SURVEYED TEST BORING AND PIEZOMETER LOCATION

0 15 30

SCALE IN FEET

JOB# XL6097	**STATE ROUTE** 534	**MILEPOST(S)** 0.49 - 0.69

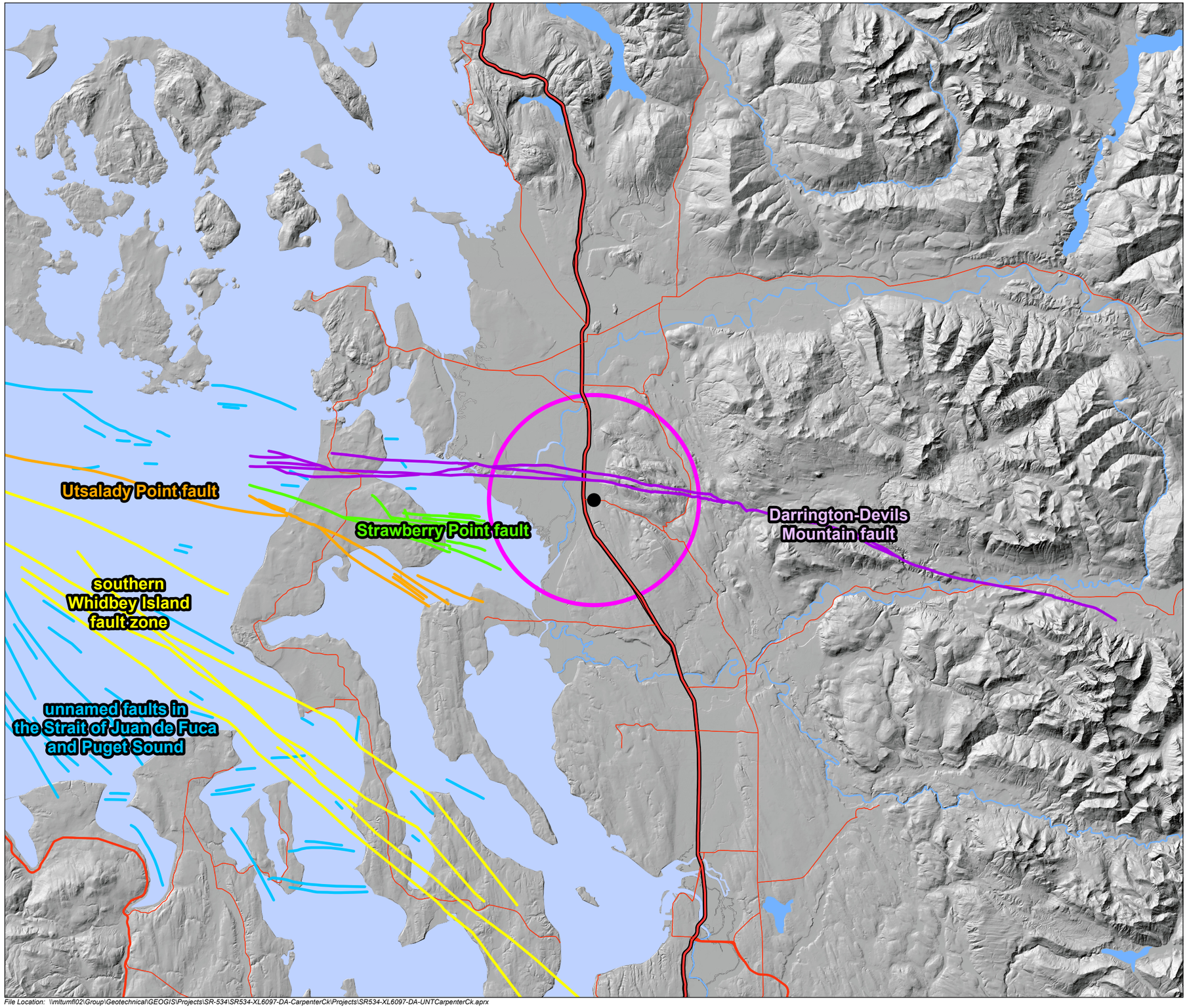
FIGURE 2:
SITE AND EXPLORATION PLAN

SR 534/Unnamed Tributary to
Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534_BM_Alignment 30.dgn



Legend

- Site
- U.S. Interstate
- U.S. Highway
- State Route
- Major Rivers
- 6 Mile Buffer of Site
- Major Lakes
- Major Shorelines

USGS Quaternary Faults

- Darrington-Devils Mountain fault
- Strawberry Point fault
- Utsalady Point fault
- southern Whidbey Island fault zone
- unnamed faults in the Strait of Juan de Fuca and Puget Sound

N

Fault	Miles
Darrington-Devils Mountain fault	1.12
Strawberry Point fault	6.38
Utsalady Point fault	8.61
unnamed faults in the Strait of Juan de Fuca and Puget Sound	10.22
southern Whidbey Island fault zone	18.99

MILES
0 2 4 8 12 16
1:360,000
1 INCH = 6 FEET

JOB # XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.51 to 0.62

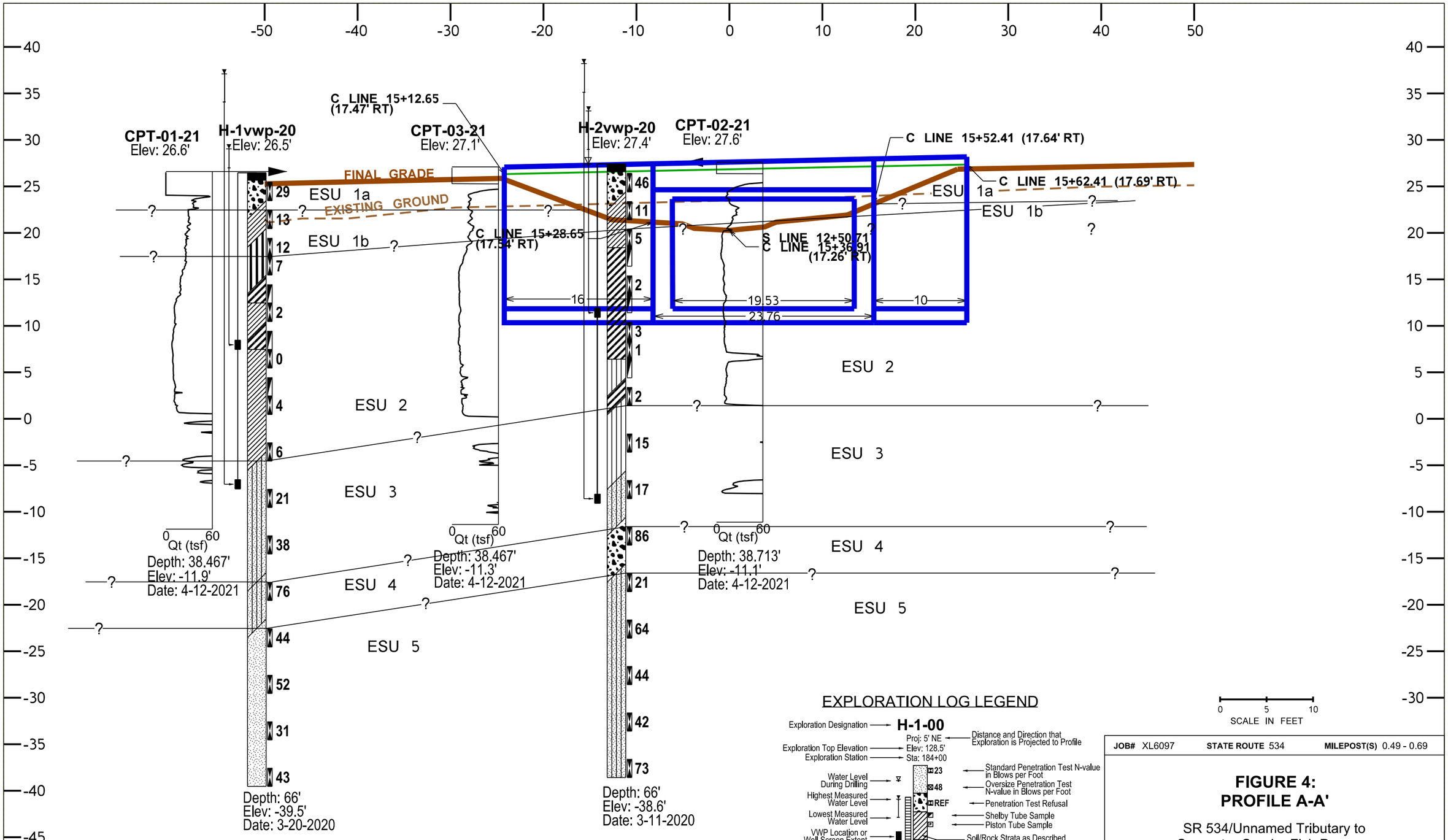
FIGURE 3: FAULT MAP

SR 534/Unnamed Tributary to Carpenter Creek – Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY TropleT Date: October 12, 2022

File Location: \\mltumfil02\Group\Geotechnical\GEOGIS\Projects\SR-534\SR534-XL6097-DA-CarpenterCk\Projects\SR534-XL6097-DA-UNTCarpenterCk.aprx



ESU 1a: (Fill) - Dense - Well graded GRAVEL with sand.
ESU 1b: (Qgdm-ec) - Stiff - Gravelly lean CLAY with sand, lean CLAY with sand, elastic SILT.
ESU 2: (Qgdm-ec) - Very soft to medium stiff - Elastic SILT, lean CLAY, fat CLAY, SILT.
ESU 3: (Qgome-e) - Medium dense to dense - Silty SAND, sandy SILT.
ESU 4: (Qgt-v) - Very dense - Silty SAND with gravel, well graded GRAVEL.
ESU 5: (Qga-v) - Medium dense to very dense - Poorly graded SAND, silty SAND, silty SAND with gravel.

EXPLORATION LOG LEGEND

0 5 10
SCALE IN FEET

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

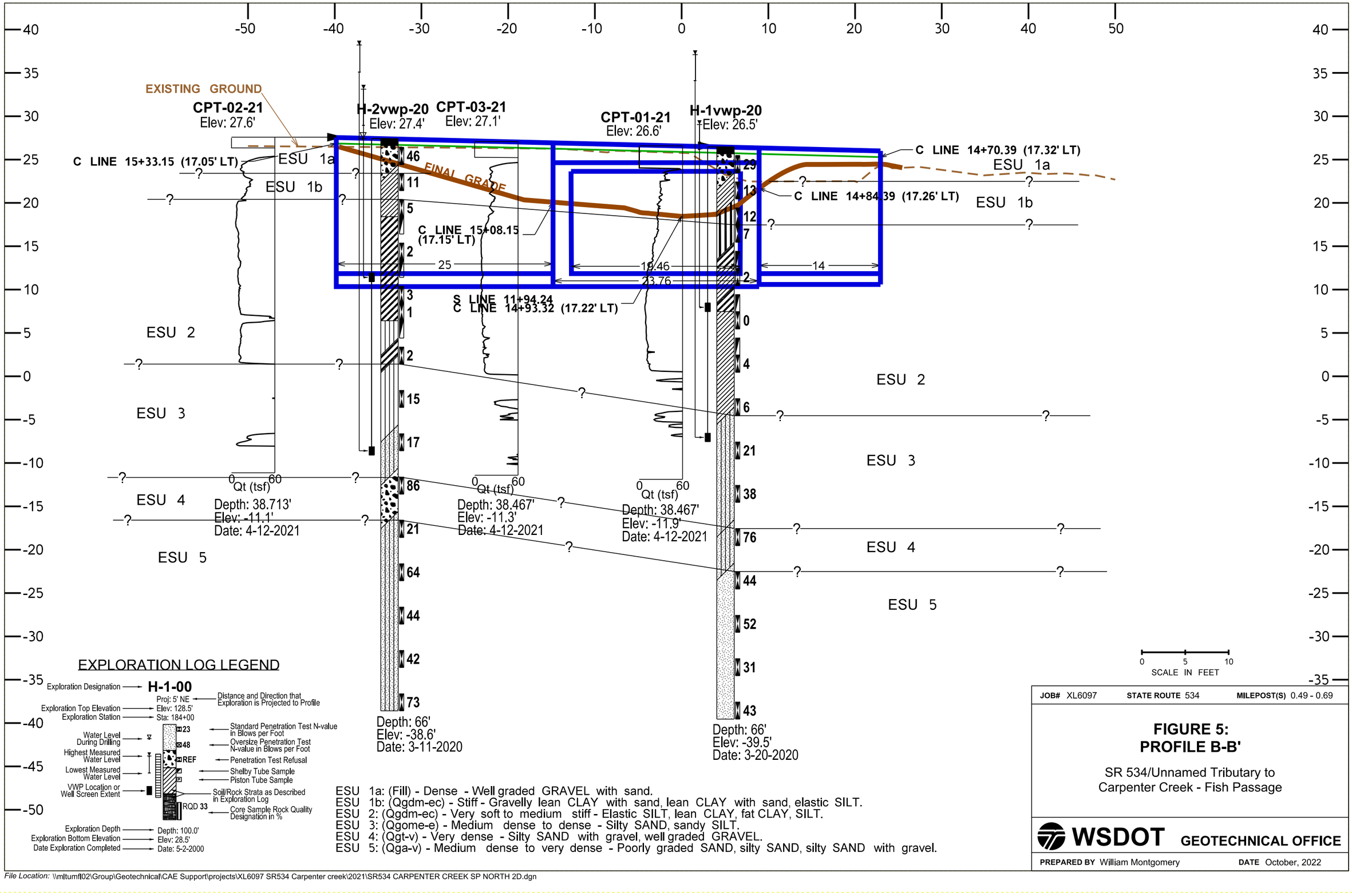
FIGURE 4: PROFILE A-A'

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534 CARPENTER CREEK SP NORTH 2D.dgn



EXPLORATION LOG LEGEND

ESU 1a: (Fill) - Dense - Well graded GRAVEL with sand.
ESU 1b: (Qgdm-ec) - Stiff - Gravelly lean CLAY with sand, lean CLAY with sand, elastic SILT.
ESU 2: (Qgdm-ec) - Very soft to medium stiff - Elastic SILT, lean CLAY, fat CLAY, SILT.
ESU 3: (Qgome-e) - Medium dense to dense - Silty SAND, sandy SILT.
ESU 4: (Qgt-v) - Very dense - Silty SAND with gravel, well graded GRAVEL.
ESU 5: (Qga-v) - Medium dense to very dense - Poorly graded SAND, silty SAND, silty SAND with gravel.

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

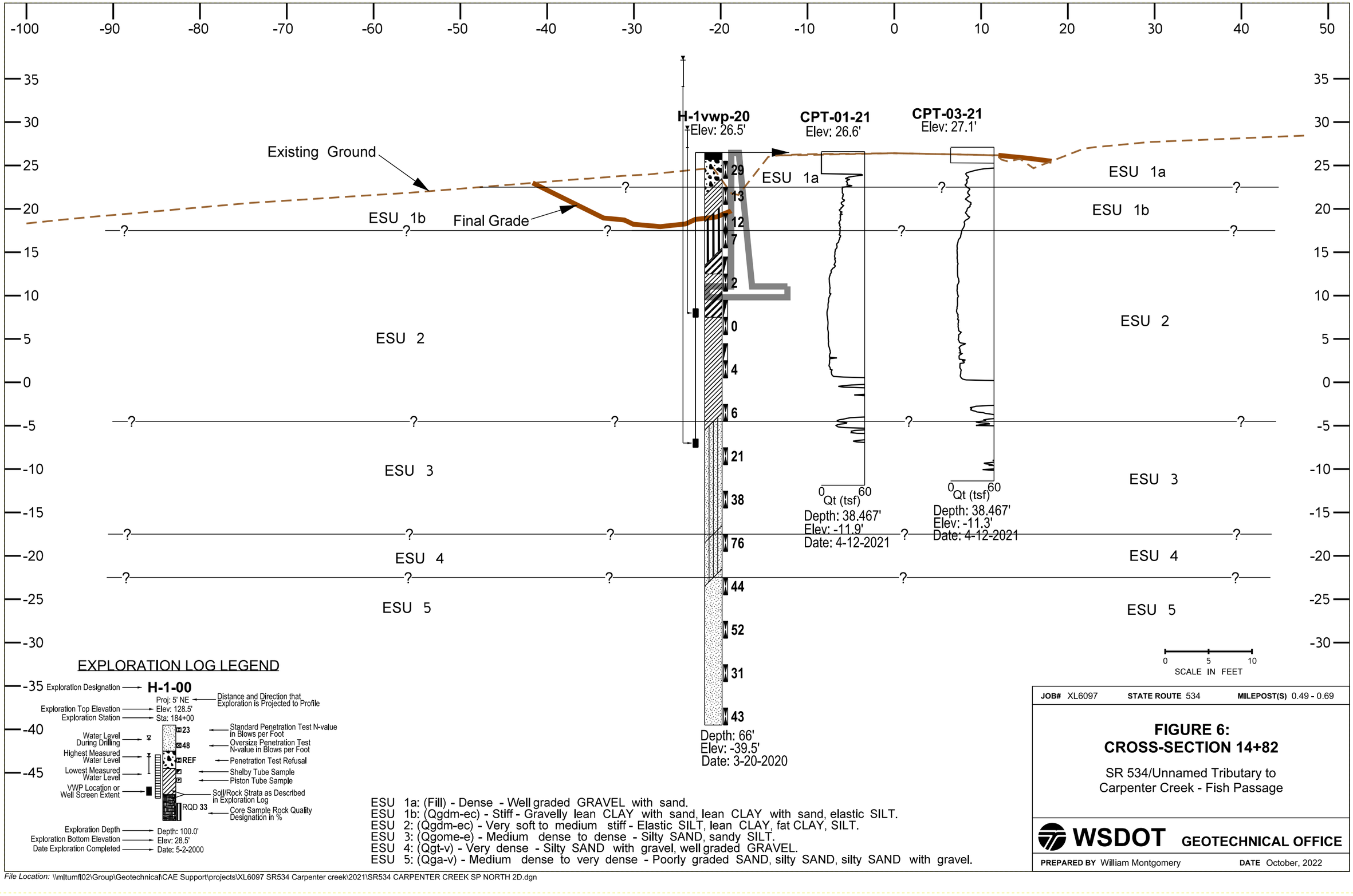
FIGURE 5: PROFILE B-B'

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534 CARPENTER CREEK SP NORTH 2D.dgn



EXPLORATION LOG LEGEND

ESU 1a: (Fill) - Dense - Well graded GRAVEL with sand.
ESU 1b: (Qgdm-ec) - Stiff - Gravelly lean CLAY with sand, lean CLAY with sand, elastic SILT.
ESU 2: (Qgdm-ec) - Very soft to medium stiff - Elastic SILT, lean CLAY, fat CLAY, SILT.
ESU 3: (Qgome-e) - Medium dense to dense - Silty SAND, sandy SILT.
ESU 4: (Qgt-v) - Very dense - Silty SAND with gravel, well graded GRAVEL.
ESU 5: (Qga-v) - Medium dense to very dense - Poorly graded SAND, silty SAND, silty SAND with gravel.

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

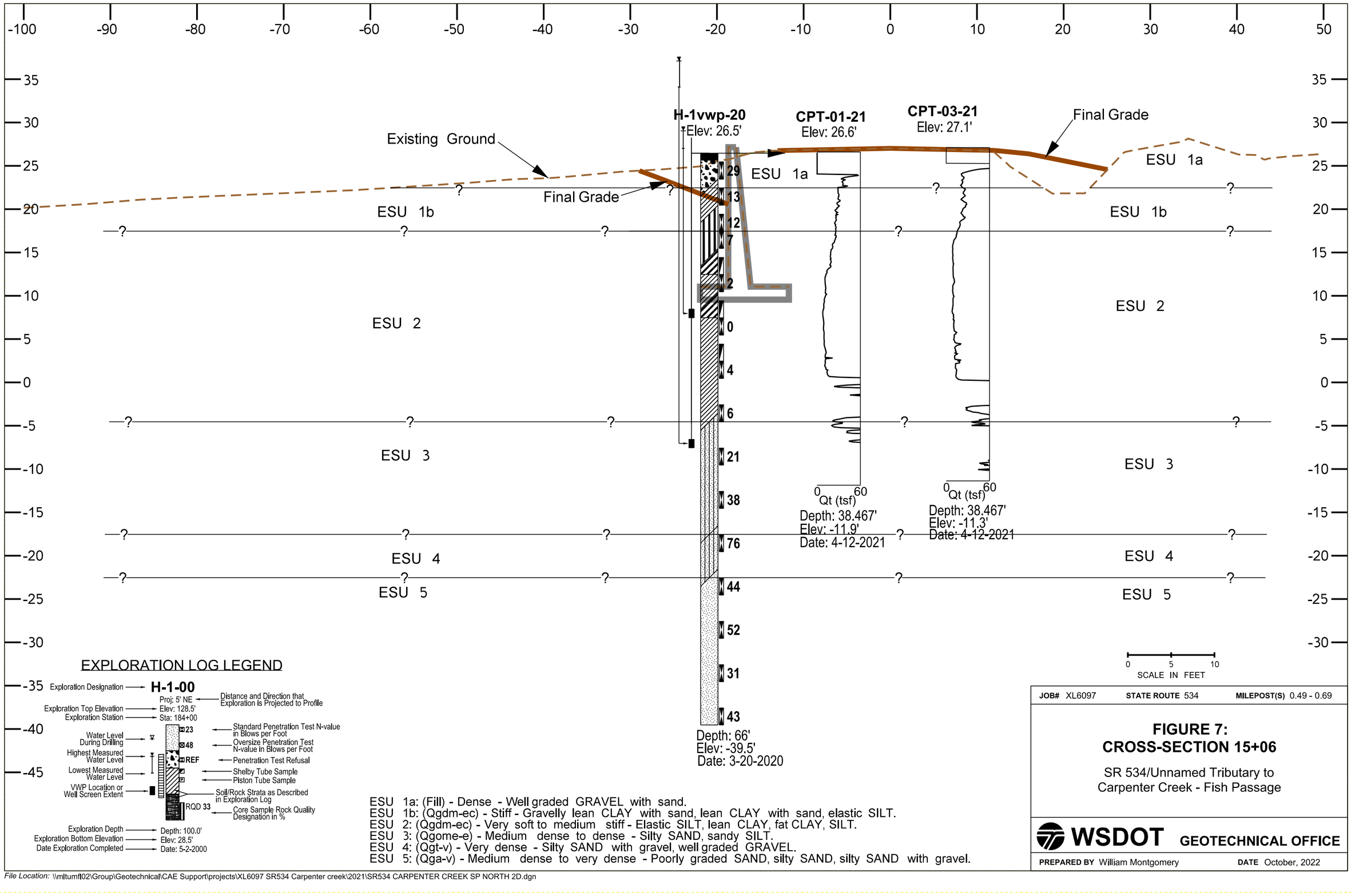
FIGURE 6: CROSS-SECTION 14+82

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534 CARPENTER CREEK SP NORTH 2D.dgn



EXPLORATION LOG LEGEND

ESU 1a: (Fill) - Dense - Well graded GRAVEL with sand.
ESU 1b: (Qgdm-ec) - Stiff - Gravelly lean CLAY with sand, lean CLAY with sand, elastic SILT.
ESU 2: (Qgdm-ec) - Very soft to medium stiff - Elastic SILT, lean CLAY, fat CLAY, SILT.
ESU 3: (Qgome-e) - Medium dense to dense - Silty SAND, sandy SILT.
ESU 4: (Qgt-v) - Very dense - Silty SAND with gravel, well graded GRAVEL.
ESU 5: (Qga-v) - Medium dense to very dense - Poorly graded SAND, silty SAND, silty SAND with gravel.

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

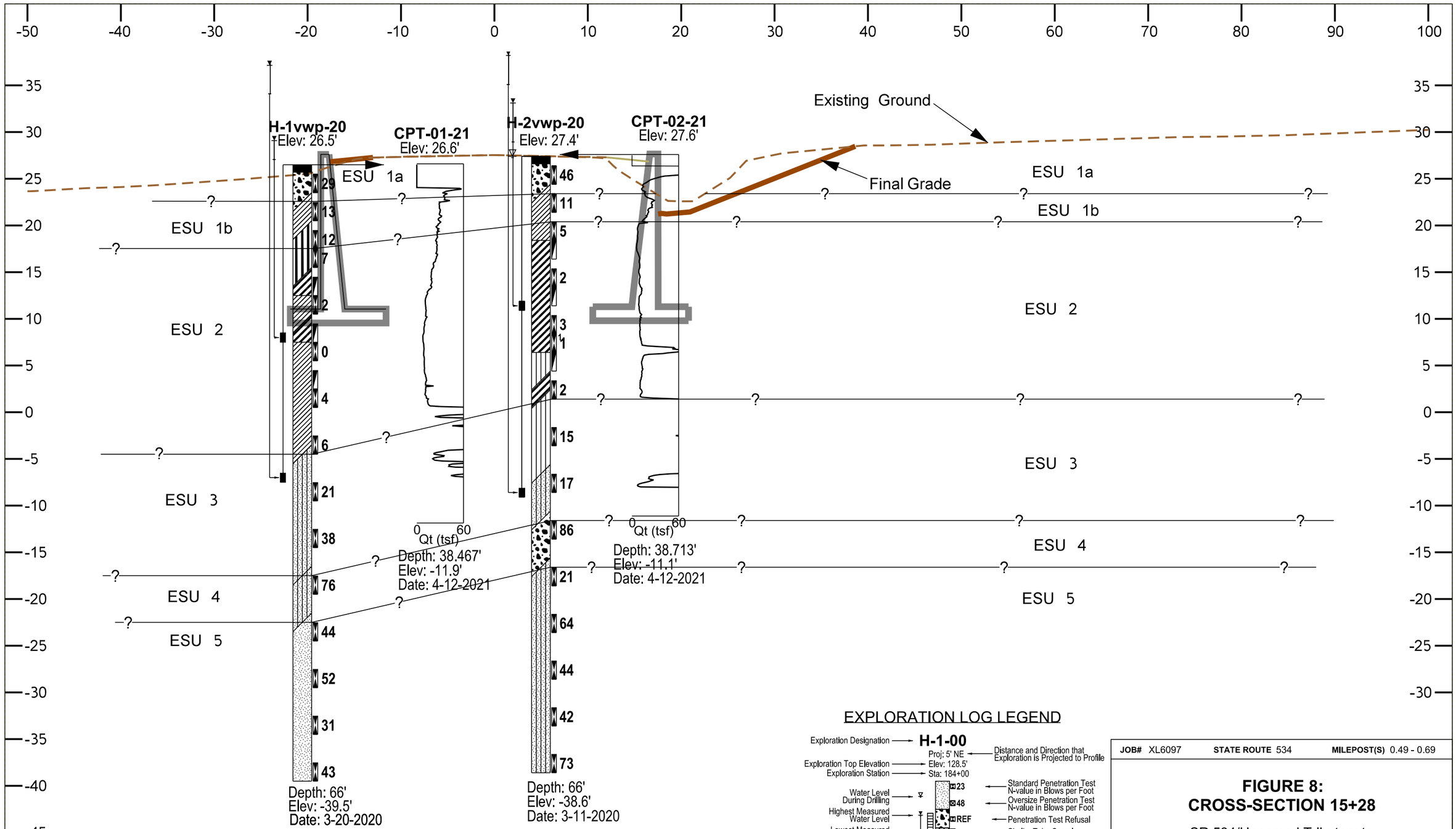
FIGURE 7: CROSS-SECTION 15+06

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

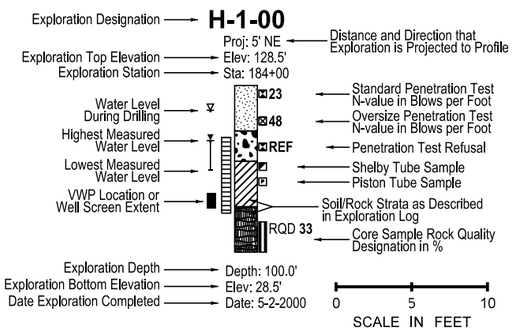
PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534 CARPENTER CREEK SP NORTH 2D.dgn



ESU 1a: (Fill) - Dense - Well graded GRAVEL with sand.
ESU 1b: (Qgdm-ec) - Stiff - Gravelly lean CLAY with sand, lean CLAY with sand, elastic SILT.
ESU 2: (Qgdm-ec) - Very soft to medium stiff - Elastic SILT, lean CLAY, fat CLAY, SILT.
ESU 3: (Qgome-e) - Medium dense to dense - Silty SAND, sandy SILT.
ESU 4: (Qgt-v) - Very dense - Silty SAND with gravel, well graded GRAVEL.
ESU 5: (Qga-v) - Medium dense to very dense - Poorly graded SAND, silty SAND, silty SAND with gravel.

EXPLORATION LOG LEGEND



JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

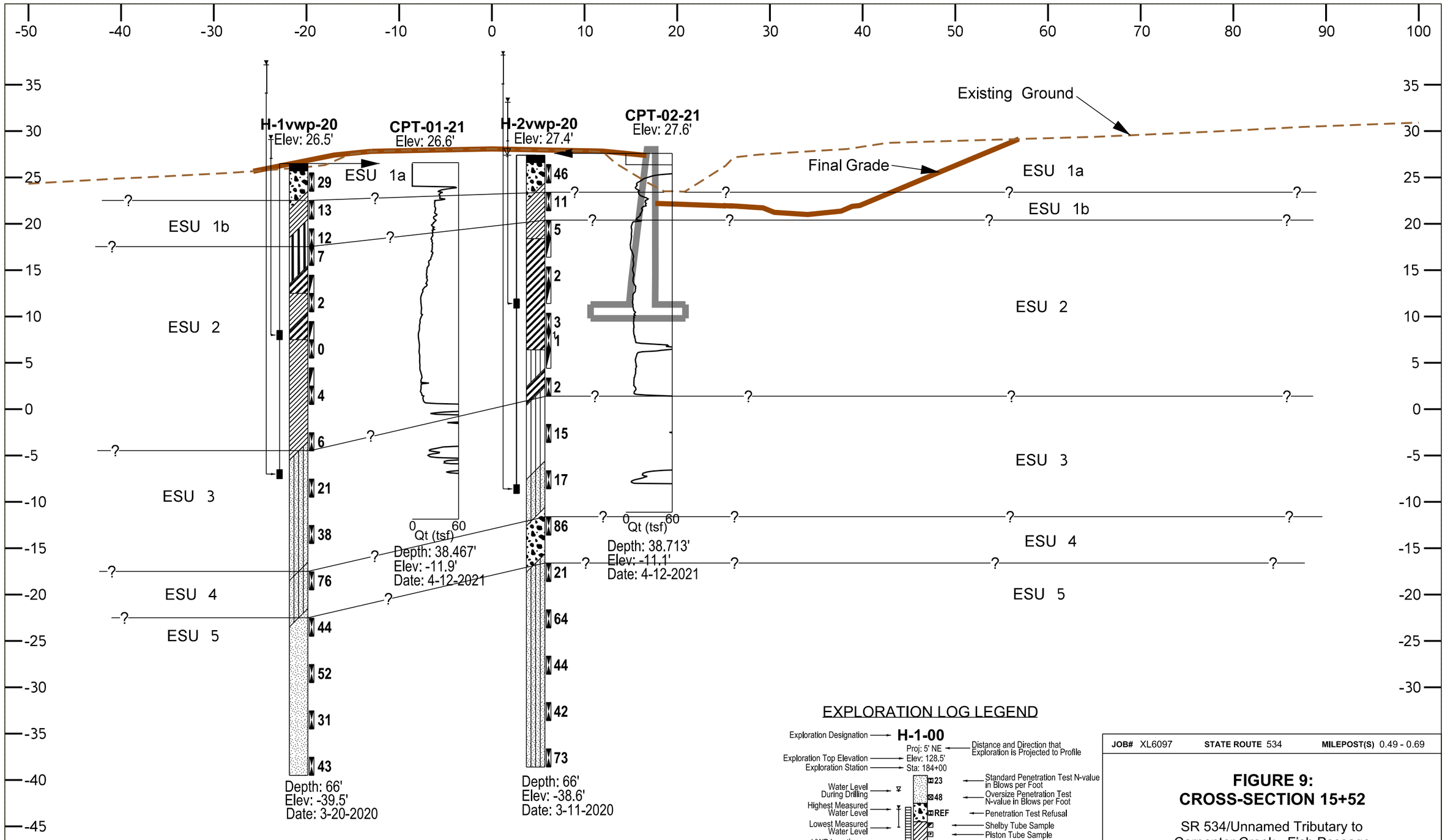
FIGURE 8: CROSS-SECTION 15+28

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534 CARPENTER CREEK SP NORTH 2D.dgn



ESU 1a: (Fill) - Dense - Well graded GRAVEL with sand.
ESU 1b: (Qgdm-ec) - Stiff - Gravelly lean CLAY with sand, lean CLAY with sand, elastic SILT.
ESU 2: (Qgdm-ec) - Very soft to medium stiff - Elastic SILT, lean CLAY, fat CLAY, SILT.
ESU 3: (Qgome-e) - Medium dense to dense - Silty SAND, sandy SILT.
ESU 4: (Qgt-v) - Very dense - Silty SAND with gravel, well graded GRAVEL.
ESU 5: (Qga-v) - Medium dense to very dense - Poorly graded SAND, silty SAND, silty SAND with gravel.

EXPLORATION LOG LEGEND

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

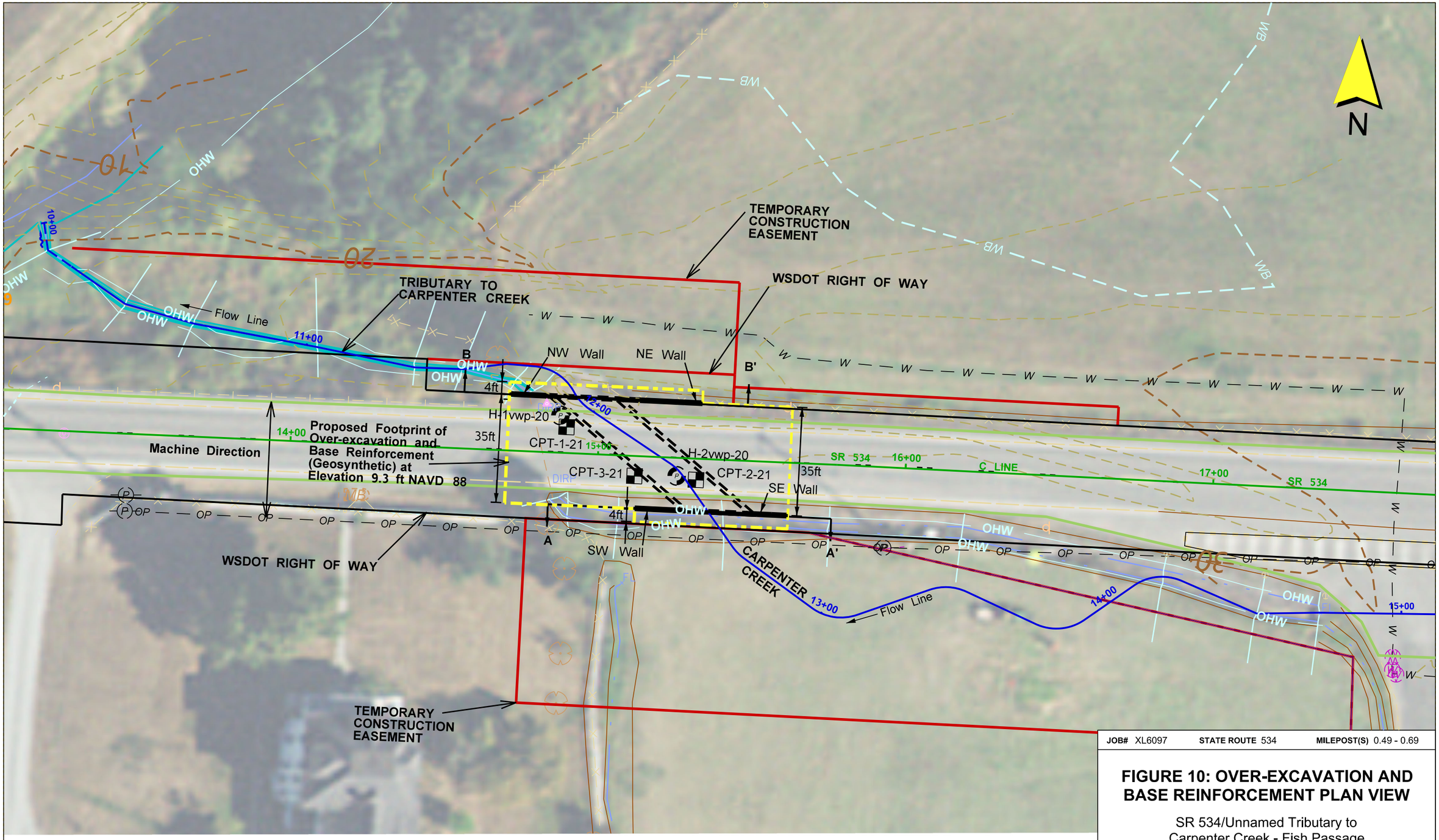
FIGURE 9: CROSS-SECTION 15+52

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534 CARPENTER CREEK SP NORTH 2D.dgn



JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

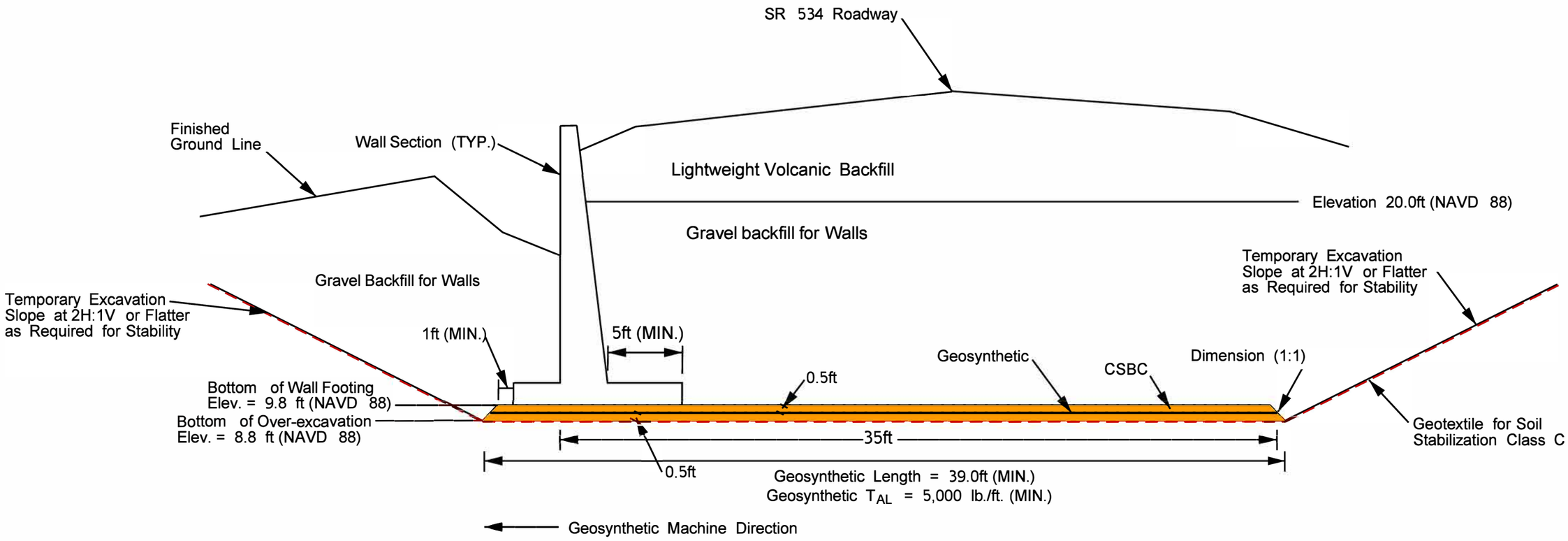
FIGURE 10: OVER-EXCAVATION AND BASE REINFORCEMENT PLAN VIEW

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\SR534_BM_Alignment 30.dgn



NOTES:

1. CSBC (Crushed Surfacing Base Course) in accordance with Section 9-03.9(3), WSDOT Standard Specifications (WSDOT, 2022).
2. Gravel Backfill for Walls in accordance with Section 9-03.12(2), WSDOT Standard Specifications (WSDOT, 2022).
3. Geotextile for Soil Stabilization in accordance with Section 9-33.2(1), Table 3 and Section 2-12.3(3),WSDOT Standard Specifications (WSDOT, 2022). Geotextile for Soil Stabilization should also be placed under the CSBC under the box culvert and along any excavation slopes.

ABBREVIATIONS
CSBC = Crushed Surfacing Base Course
H:V = Horizontal to Vertical
NAVD 88 = North American Vertical Datum of 1988
T_{AL} = Long-Term Tensile Strength

NOT TO SCALE

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 11: OVER-EXCAVATION AND BASE REINFORCEMENT SECTION VIEW

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

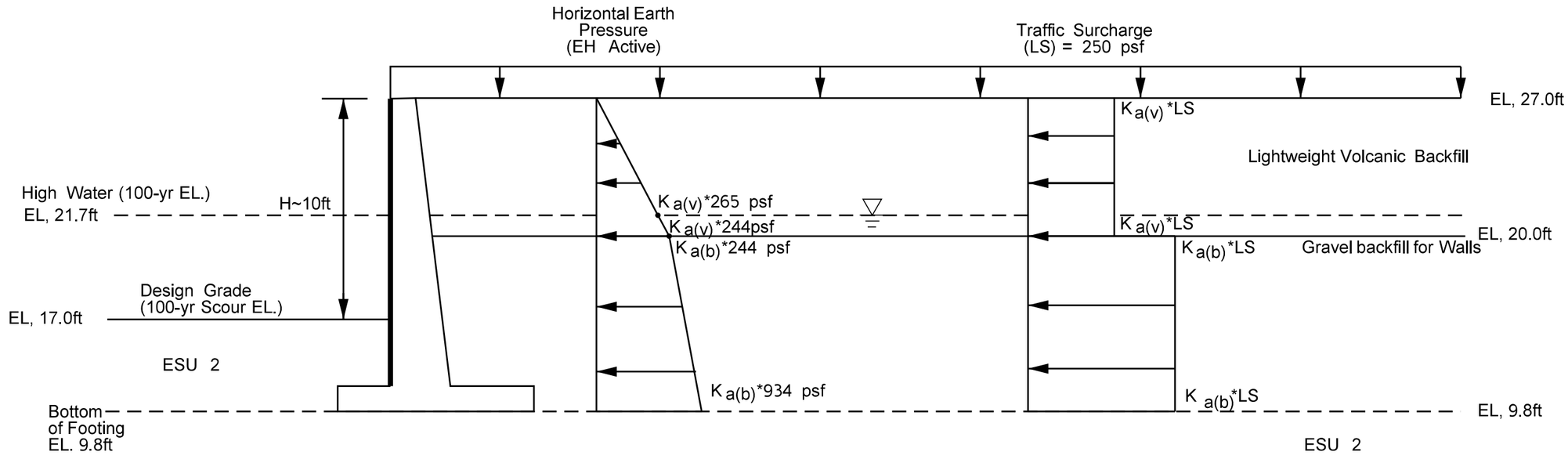
File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:

Unit Weight (γ_v):	50 pcf
Active Earth Pressure ($K_{a(v)}$):	0.20
δ=0.67*ϕ:	27 degrees
ϕ:	40 degrees

Gravel Backfill for Walls:

Unit Weight (γ_b):	130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$):	67.6 pcf
Active Earth Pressure ($K_{a(b)}$):	0.22
δ=0.67*ϕ:	25 degrees
ϕ':	38 degrees



Load Factor

LS	1.75
EH Active	1.50

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

NOT TO SCALE

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 12A: EARTH PRESSURE DIAGRAM
STRENGTH LIMIT STATE
NW AND NE WALLS

SR 534/Unnamed Tributary to
Carpenter Creek - Fish Passage

WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

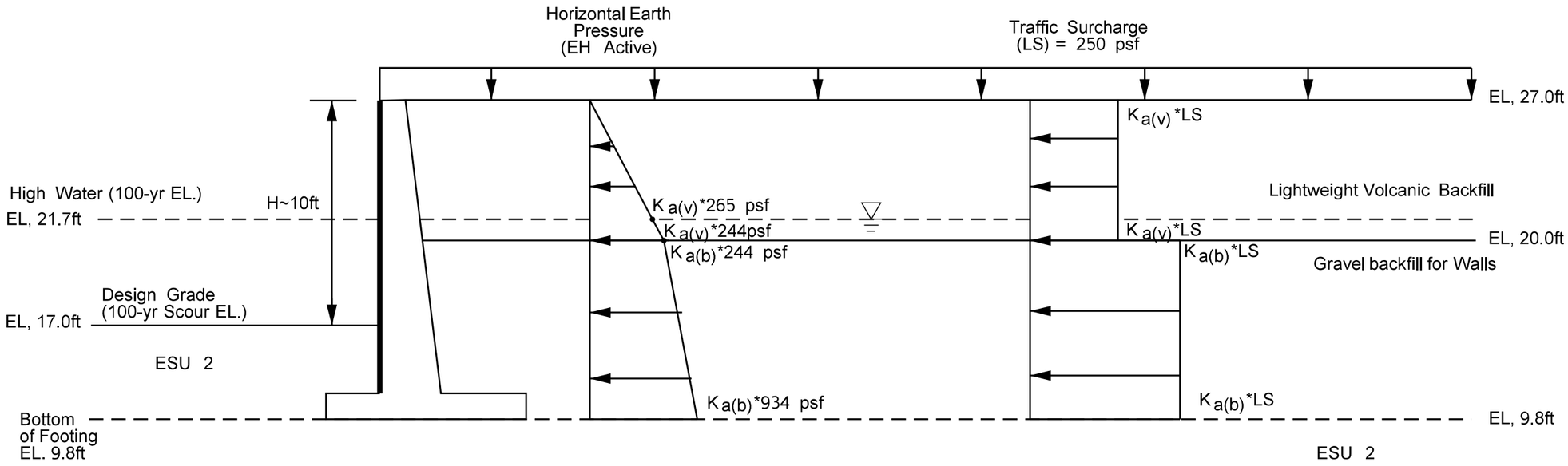
File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:

Unit Weight (γ_v):	50 pcf
Active Earth Pressure ($K_{a(v)}$):	0.20
δ=0.67*ϕ:	27 degrees
ϕ:	40 degrees

Gravel Backfill for Walls:

Unit Weight (γ_b):	130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$):	67.6 pcf
Active Earth Pressure ($K_{a(b)}$):	0.22
δ=0.67*ϕ:	25 degrees
ϕ':	38 degrees



Load Factor

LS	1.00
EH Active	1.50

NOT TO SCALE

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 12B: EARTH PRESSURE DIAGRAM
SERVICE LIMIT STATE
NW AND NE WALLS

SR 534/Unnamed Tributary to
Carpenter Creek - Fish Passage

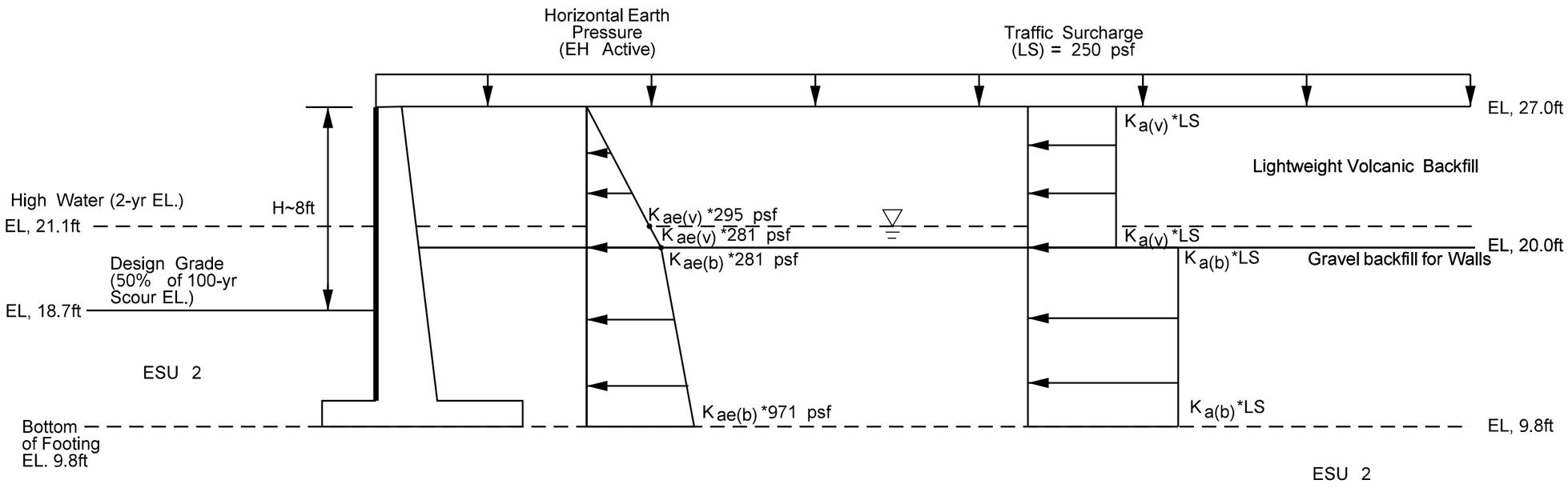
WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:
Unit Weight (γ_v): 50 pcf
Active Earth Pressure (Ka(v)): 0.20
Seismic Active Earth Pressure ($K_{ae(v)}$): 0.50
δ =0.67*ϕ: 27 degrees
ϕ: 40 degrees

Gravel Backfill for Walls:
Unit Weight (γ_b): 130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$): 67.6 pcf
Active Earth Pressure (Ka(b)): 0.22
Seismic Active Earth Pressure ($K_{ae(b)}$): 0.50
δ =0.67*ϕ: 25 degrees
ϕ': 38 degrees



Load Factor	
LS	0.50
EH Active	1.50
EQ	1.00

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

NOT TO SCALE

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 12C: EARTH PRESSURE DIAGRAM
EXTREME EVENT I LIMIT STATE
NW AND NE WALLS
SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

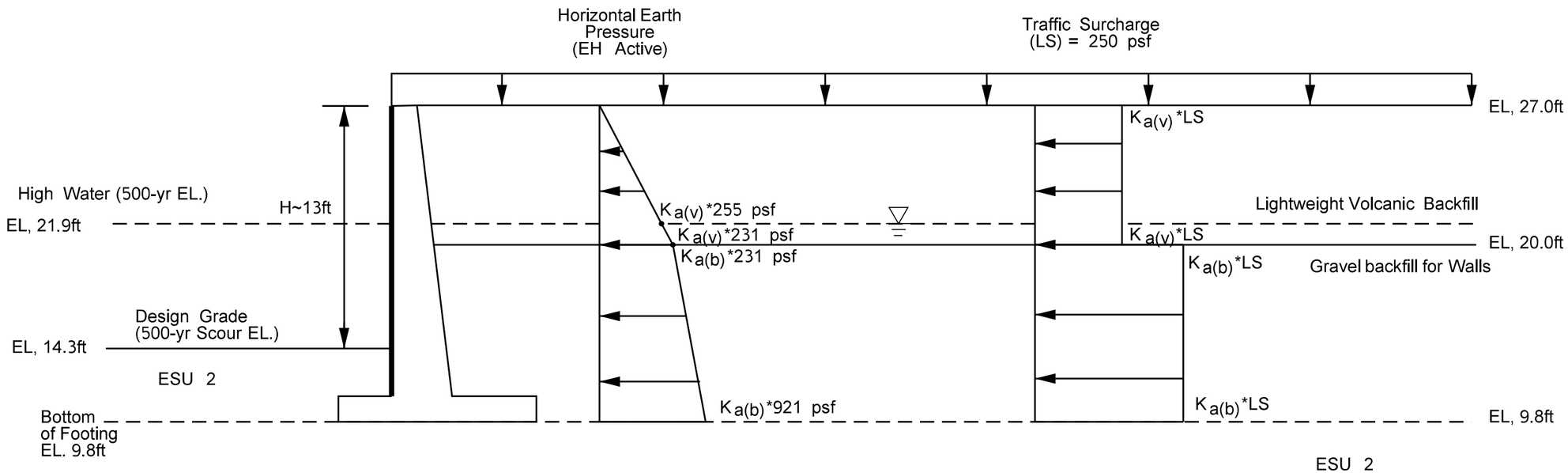
File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:

Unit Weight (γ_v):	50 pcf
Active Earth Pressure ($K_{a(v)}$):	0.20
δ=0.67*ϕ:	27 degrees
ϕ:	40 degrees

Gravel Backfill for Walls:

Unit Weight (γ_b):	130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$):	67.6 pcf
Active Earth Pressure ($K_{a(b)}$):	0.22
δ=0.67*ϕ:	25 degrees
ϕ':	38 degrees



Load Factor

LS	0.50
EH Active	1.50

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

NOT TO SCALE

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 12D: EARTH PRESSURE DIAGRAM
EXTREME EVENT II LIMIT STATE
NW AND NE WALLS

SR 534/Unnamed Tributary to
Carpenter Creek - Fish Passage

WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

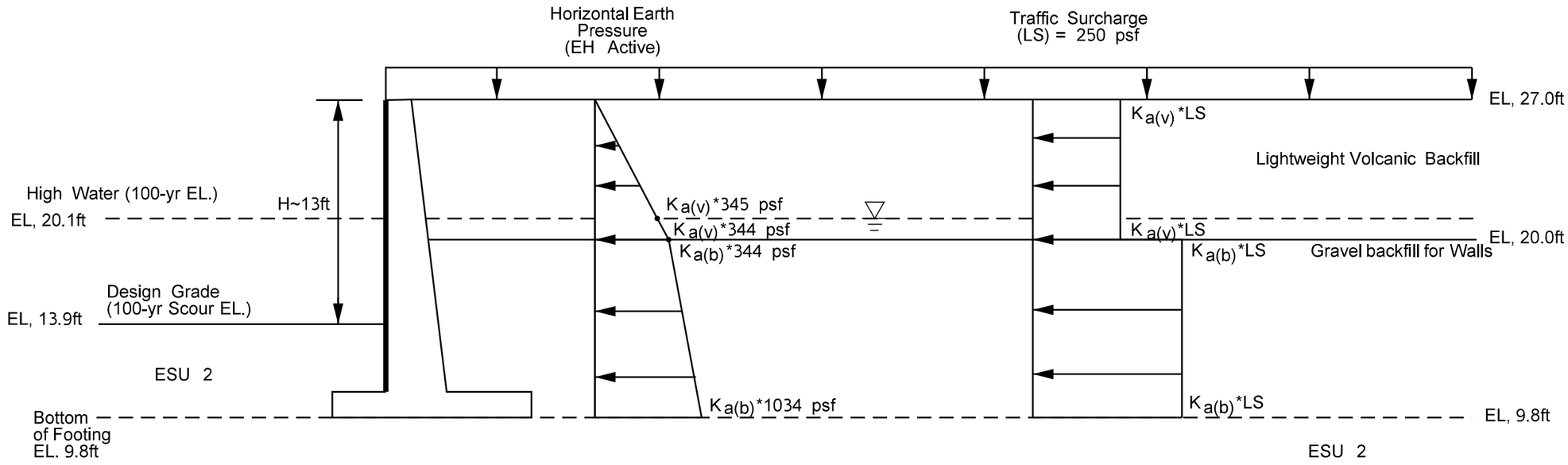
File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:

Unit Weight (γ_v):	50 pcf
Active Earth Pressure ($K_{a(v)}$):	0.20
δ=0.67*ϕ:	27 degrees
ϕ:	40 degrees

Gravel Backfill for Walls:

Unit Weight (γ_b):	130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$):	67.6 pcf
Active Earth Pressure ($K_{a(b)}$):	0.22
δ=0.67*ϕ:	25 degrees
ϕ:	38 degrees



Load Factor

LS	1.75
EH Active	1.50

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

NOT TO SCALE

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 13A: EARTH PRESSURE DIAGRAM
STRENGTH LIMIT STATE
SW AND SE WALLS

SR 534/Unnamed Tributary to
Carpenter Creek - Fish Passage

WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

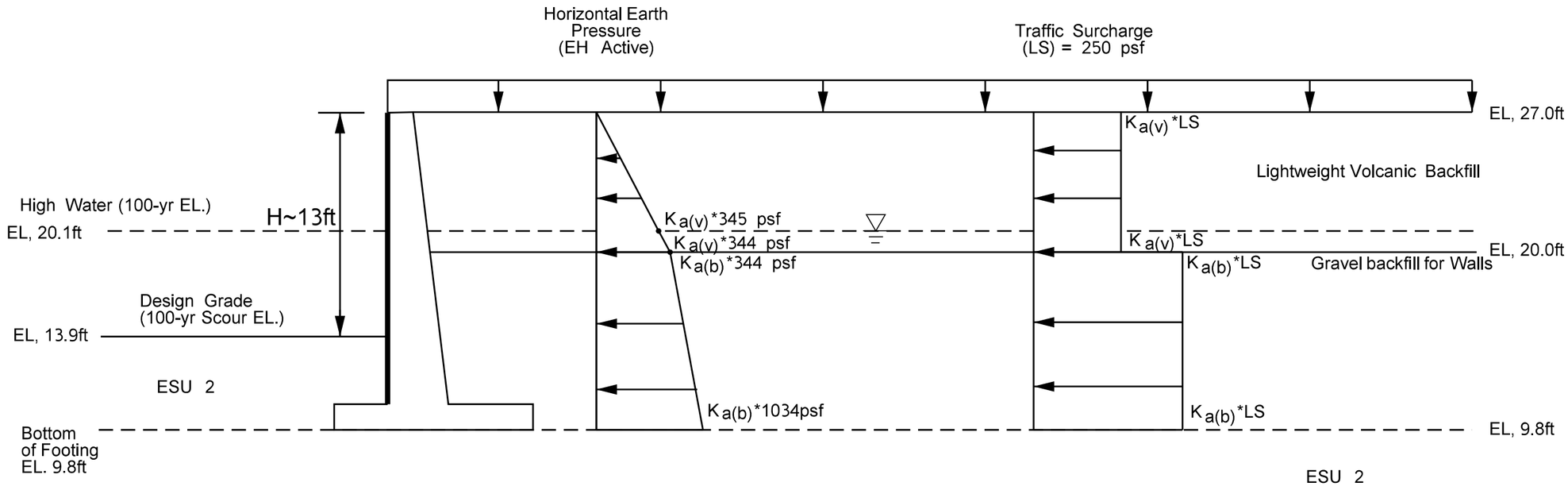
File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:

Unit Weight (γ_v):	50 pcf
Active Earth Pressure ($K_{a(v)}$):	0.20
δ=0.67*ϕ:	27 degrees
ϕ:	40 degrees

Gravel Backfill for Walls:

Unit Weight (γ_b):	130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$):	67.6 pcf
Active Earth Pressure ($K_{a(b)}$):	0.22
δ=0.67*ϕ:	25 degrees
ϕ':	38 degrees



Load Factor

LS	1.00
EH Active	1.50

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

NOT TO SCALE

JOB# XL6097 | STATE ROUTE 534 | MILEPOST(S) 0.49 - 0.69

FIGURE 13B: EARTH PRESSURE DIAGRAM
SERVICE LIMIT STATE
SW AND SE WALLS

SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

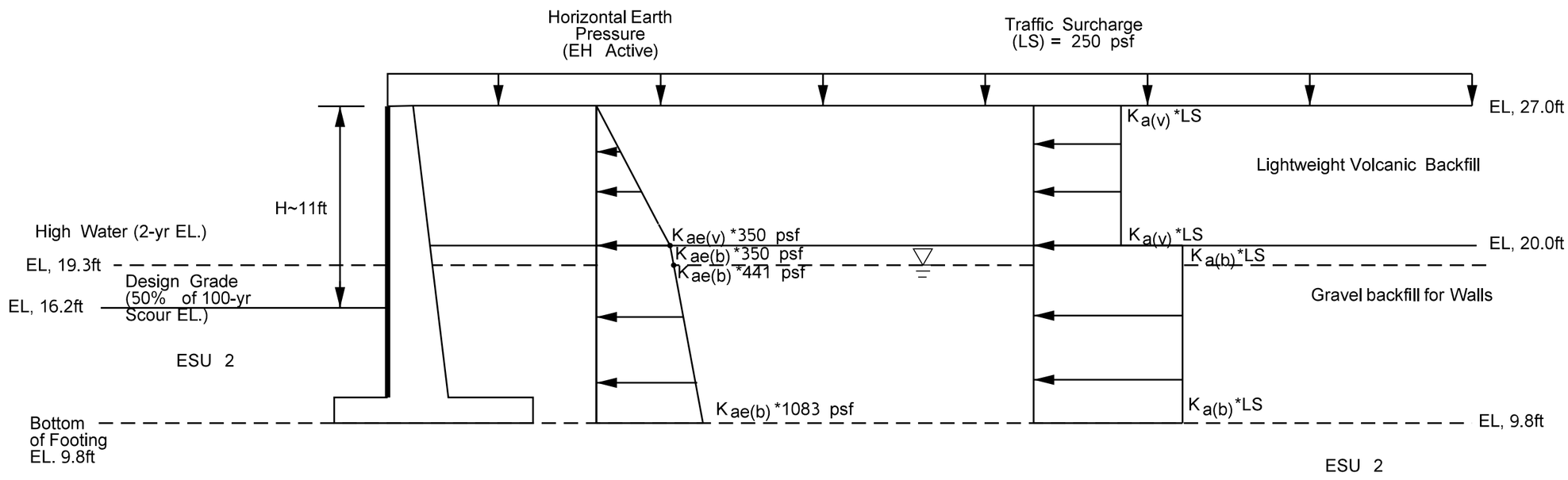
WSDOT GEOTECHNICAL OFFICE

PREPARED BY William Montgomery | DATE October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:
Unit Weight (γ_v): 50 pcf
Active Earth Pressure (Ka(v)): 0.20
Seismic Active Earth Pressure ($K_{ae(v)}$): 0.50
δ =0.67*ϕ: 27 degrees
ϕ: 40 degrees

Gravel Backfill for Walls:
Unit Weight (γ_b): 130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$): 67.6 pcf
Active Earth Pressure (Ka(b)): 0.22
Seismic Active Earth Pressure ($K_{ae(b)}$): 0.50
δ =0.67*ϕ: 25 degrees
ϕ': 38 degrees



Load Factor

LS	0.50
EH Active	1.50
EQ	1.00

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

NOT TO SCALE

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 13C: EARTH PRESSURE DIAGRAM
EXTREME EVENT I LIMIT STATE
SW AND SE WALLS
SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

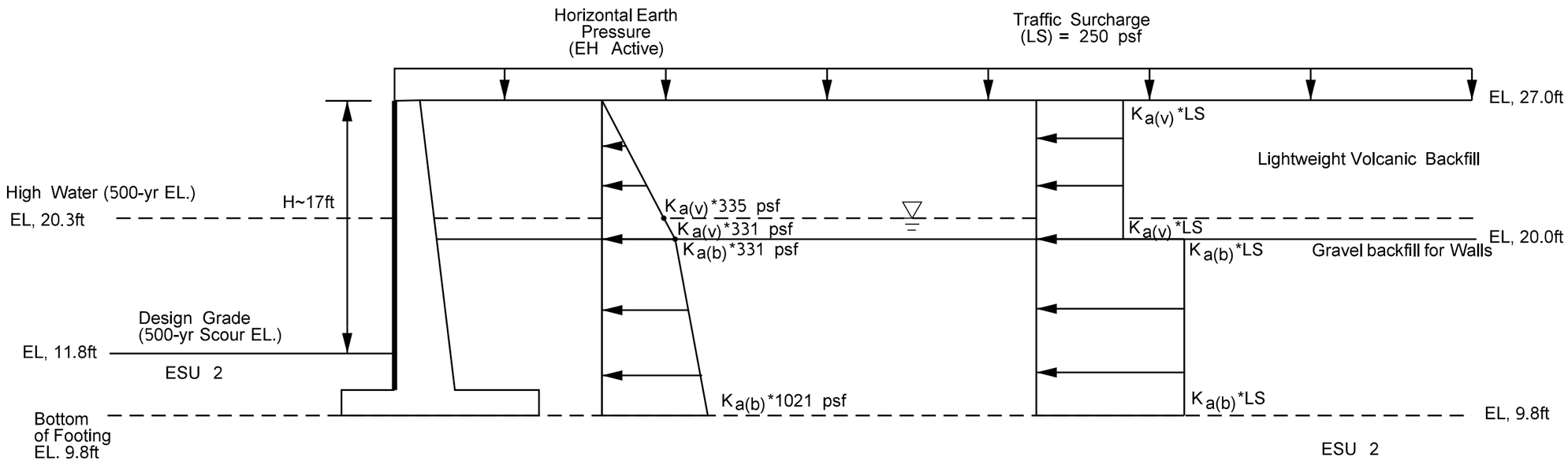
File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

ESU Parameters
Lightweight Volcanic Backfill:

Unit Weight (γ_v):	50 pcf
Active Earth Pressure ($K_{a(v)}$):	0.20
δ=0.67*ϕ:	27 degrees
ϕ:	40 degrees

Gravel Backfill for Walls:

Unit Weight (γ_b):	130 pcf
Saturated Unit Weight ($\gamma_{e(b)}$):	67.6 pcf
Active Earth Pressure ($K_{a(b)}$):	0.22
δ=0.67*ϕ:	25 degrees
ϕ:	38 degrees



Load Factor

LS	0.50
EH Active	1.50

NOTES:
1. All pressures are unfactored. Pressures should be factored according to AASHTO BDM (2020) Table 3.4.1-1 and Table 3.4.1-2 for the respective limit state.
2. Assume no differential pressure behind wall (i.e., no water pressure diagram).
3. Neglect ESU 2 passive resistance in front of the wall.

Abbreviations: ft = feet; pcf = pounds per cubic foot; psf = pounds per square foot.
ϕ = friction angle, δ = wall interface friction angle

NOT TO SCALE

JOB# XL6097 **STATE ROUTE** 534 **MILEPOST(S)** 0.49 - 0.69

FIGURE 13D: EARTH PRESSURE DIAGRAM
EXTREME EVENT II LIMIT STATE
SW AND SE WALLS

SR 534/Unnamed Tributary to
Carpenter Creek - Fish Passage

WSDOT **GEOTECHNICAL OFFICE**

PREPARED BY William Montgomery **DATE** October, 2022

File Location: \\mltumfl02\Group\Geotechnical\CAE Support\projects\XL6097 SR534 Carpenter creek\2021\EARTH PRESSURE DIAGRAM.dgn

APPENDIX A: FIELD EXPLORATIONS

CONTENTS

WSDOT EXPLORATION LOG LEGEND

In Situ Sample and Test Symbols

	Standard Penetration Test
	Non-standard Penetration Test
	Shelby Tube
P	Piston Sampler
	WSDOT Undisturbed Sampler
	Core Sample
G	Grab Sample
	California Sampler
	Vane Shear Test
P	Pressuremeter Test

Backfill and Instrument Symbols

	Cement Surface Seal
	Bentonite Chips
	Bentonite Cement Grout (BCM)
	Sand Filter Pack
	Slough (Hole Collapse)
	Pipe (Piezometer or Instrument) in BCM
	Well Screen in Sand Filter Pack
	Vibrating Wire Piezometer in BCM

Water Level Symbols

▽	Water Level During Drilling	→	Transducer Depth
	Water Range in Piezometer	DRY	Water is Below Transducer

Laboratory Testing Codes

AL	Atterberg Limits Test
CD	Consolidated Drained Triaxial Test
CN	1-Dimensional Consolidation Test
CSS	Cyclic Simple Shear Test
CU	Consolidated Undrained Triaxial Test
DG	Degradation Test
DN	Density Test
DS	Direct Shear Test
DSS	Direct Simple Shear Test
GS	Grain Size Distribution Test
HC	Hydraulic Conductivity Test
HT	Hydrometer Test
JS	Jar Slake Test
LA	LA Abrasion Test
LOI	Loss on Ignition Test
MC	Moisture Content Test
PH	pH Test
PT	Point Load Compressive Test
RES	Resistivity Test
RS	Torsional Ring Shear Test
SG	Specific Gravity Test
SL	Slake Durability Test
UC	Unconfined Compression Test
UU	Unconlidated Undrained Triaxal Test

Soil Stratigraphy Symbols

COARSE GRAINED	FINE GRAINED & ORGANIC
GW: Well-graded Gravel	CL: Lean Clay
GP: Poorly graded Gravel	ML: Silt
GM: Silty Gravel	CH: Fat Clay
GC: Clayey Gravel	MH: Elastic Silt
SW: Well-graded Sand	OL: Organic Silt
SP: Poorly graded Sand	OH: Organic Clay
SM: Silty Sand	CL-ML: Silty Clay (dual symbol)
SC: Clayey Sand	PT: Peat or Highly Organic Soil

Soil classification is per Chapter 4.2 of the WSDOT Geotechnical Design Manual (GDM). The soil groups above contain less than 15% of other constituents. When more than 15% other constituents are observed, the soil group names are modified (e.g. Silty Gravel with Sand; Sandy, Elastic Silt with Gravel) per ASTM 2488. For dual classifications, a split symbol is used (e.g. CL-ML above). Refer to the Material Description column on the log for a complete description of the observed soil conditions.

Soil Density/Consistency

WSDOT GDM 4.2.5

COHESIONLESS SOILS		COHESIVE SOILS	
Blows/Ft	Density Term	Blows/Ft	Consistency Term
< 5	Very Loose	< 2	Very Soft
5 - 10	Loose	2 - 4	Soft
11 - 24	Medium Dense	5 - 8	Medium Stiff
25 - 50	Dense	9 - 15	Stiff
> 50	Very Dense	16 - 30	Very Stiff
		31 - 60	Hard
		> 60	Very Hard

(REF) is indicated on the log for any soil type when the penetration resistance exceeded 100 blows per foot (refusal conditions).

Soil Angularity

WSDOT GDM 4.2.4

Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

Soil Moisture

WSDOT GDM 4.2.7

Dry	Absence of moisture, dusty, dry to touch
Moist	Damp but no visible water
Wet	Visible Free Water

Soil Structure

WSDOT GDM 4.2.8

Stratified	Alternating layers of varying material or color with layers at least 0.25 inch thick
Laminated	Alternating layers of varying material or color with layers less than 0.25 inch thick
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into smaller angular lumps which resists further breakdown
Disrupted	Soil structure is broken and mixed. Infers that material has moved substantially - landslide debris
Homogeneous	Same color and appearance throughout
Cemented	Particles are held together by a binding agent

DATUM ABBREVIATIONS: NAD = North American Datum; NAVD = North American Vertical Datum; SPN = State Plane North; SPS = State Plane South

WSDOT

LOG OF BORING H-1vwp-20

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage
Job Number: XL6097 *Route & MP Range:* SR 534 MP 0.49 - 0.69
Northing: 492,679.6 feet *Latitude:* 48.341026 deg. *Driller/Inspector:* Cahill, Kenneth (#3323T) / Cooper, Rich #2964
Easting: 1,278,050.4 feet *Longitude:* -122.323402 deg. *Start Card:* RE-19062 *Well Tag:* BBC-532 *Instrument:* VWP
Elevation: 26.5 feet *Collector:* Region Survey *Drilling Method:* Casing Advancer *Hole Diam.:* 6 in
Horizontal/Vertical Datum: NAD 83/91 HARN, SPN / NAVD88 *Equipment:* CME 45C (ID:9A4-7) *Rod Type:* AWJ
Started: March 17, 2020 *Completed:* March 20, 2020 *Hammer Type:* AutoHammer *Historic Efficiency:* 91.7%

Depth (feet)	Elevation (feet)	Blows/6" (N bpf) and other Field Data	Sample Type	Sample Number	Lab Tests	Material Description
						-Asphalt (0.8 ft)
	25	11 19 10 7 (29) Rec=1.8'		D-1		WELL-GRADED GRAVEL WITH SAND, sub-rounded, dense, dark gray, moist, stratified. *-NOTE: For sample D-1, observe petroleum odor.*
5	20	3 6 7 10 (13) Rec=1.8'		D-2	GS, AL	LEAN CLAY WITH SAND, stiff, olive, moist, homogeneous.
		3 6 6 7 (12) Rec=2.0'		D-3	GS, AL	ELASTIC SILT, stiff, gray, moist, homogeneous.
10	15	2 3 4 5 (7) Rec=2.0'		D-4	GS, AL, HT, SG	FAT CLAY, medium stiff, gray, moist, homogeneous.
		Rec=1.8'		S-5	GS, AL, HT, SG, DN	FAT CLAY, gray, wet.
15	10	0 1 1 1 (2) Rec=2.0'		D-6	GS, AL, HT, SG	LEAN CLAY, soft, gray, wet, homogeneous.
		Rec=1.4'		S-7	GS, AL	FAT CLAY, gray, wet.
20	5	0 0 0 0 (0) Rec=2.0'		D-8	GS, AL	LEAN CLAY, very soft, gray, wet, homogeneous.
		Rec=2.0'		S-9	GS, AL, HT, SG, DN AL	LEAN CLAY, gray, wet.
25	0	0 2 2 3 (4) Rec=2.0'		D-10		LEAN CLAY, soft, gray, wet, homogeneous.

Moisture Content (%) ✖
Fines Content (%) ○
Penetration Resistance (blows/ft)
Field N ◆ SPT N_{60} ◇
0 20 40 60 80 100

Groundwater Data — See Note 4

As-Built

CONTINUED NEXT PAGE *(see last page for notes)*

VERSION 1
FINAL

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Job Number: XL6097 *Route & MP Range:* SR 534 MP 0.49 - 0.69

Depth (feet)	Elevation (feet)	Blows/6" (N bpf) and other Field Data	Sample Type	Sample Number	Lab Tests	Material Description
30	-5	0 2 4 9 (6) Rec=2.0'		D-11		LEAN CLAY, medium stiff, gray, wet, homogeneous. *-NOTE: At 29.0 ft, observe artesian pressure.*
35	-10	6 10 11 15 (21) Rec=1.6'		D-12	GS, AL	SILTY SAND, medium dense, gray, wet, homogeneous.
40	-15	7 9 29 41 (38) Rec=2.0'		D-13	GS, AL, HT, SG	SANDY SILT, dense, gray, wet, homogeneous.
45	-20	18 30 46 50 (76) Rec=1.6'		D-14	GS, AL	SILTY SAND WITH GRAVEL, sub-rounded, very dense, dark gray, wet, homogeneous.
50	-25	14 21 23 25 (44) Rec=2.0'		D-15	GS, AL	POORLY GRADED SAND, dense, gray, wet, homogeneous.
55	-30	12 21 31 33 (52) Rec=1.7'		D-16		POORLY GRADED SAND, subangular, very dense, gray, wet, homogeneous. *-NOTE: At 54.0 ft, observe sand heave.*
60	-35	5 13 18 23 (31) Rec=2.0'		D-17		POORLY GRADED SAND, subrounded, dense, gray, wet, homogeneous. *-NOTE: At 59.0 ft, observe sand heave.*

Moisture Content (%) ✖
Fines Content (%) ○
Penetration Resistance (blows/ft)
Field N ◆ SPT N_{60} ◇
0 20 40 60 80 100

Groundwater Data *See Note 4*

As-Built

CONTINUED NEXT PAGE *(see last page for notes)*

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Job Number: XL6097 *Route & MP Range:* SR 534 MP 0.49 - 0.69

Depth (feet)	Elevation (feet)	Profile	Moisture Content (%) ✖ Fines Content (%) ○ Penetration Resistance (blows/ft) Field N ◆ SPT N_{60} ◇ 0 20 40 60 80 100	Blows/6" (N bpf) and other Field Data	Sample Type	Sample Number	Lab Tests	Material Description	Groundwater Data (See Note 4)	As-Built
65			◆ ◇	7 17 26 38 (43) Rec=2.0'		D-18		POORLY GRADED SAND, subangular, dense, gray, wet, homogeneous.		

HOLE ENDED AT 66.0 FEET ON 3-20-2020

NOTES:

1. This is a summary log of the boring. Soil/rock descriptions are derived from visual field identifications and laboratory test data (where tested). See exploration log legend for explanation of graphics and abbreviations.
2. The implied accuracy of the location information displayed on this log is typically sub-meter(X,Y) when collected using GPS methods by the Geotechnical Office and sub-centimeter (X,Y,Z) when collected by the Region survey crew.
3. Where oversized samplers were used, a correction was made to the N-value per the AASHTO Manual on Subsurface Investigations, 1988. Blow counts per 6-inch increment have not been corrected.
4. The groundwater level range shown on this log represents data collected between 5/7/2020 and 7/18/2022. The blue line extends between the minimum and maximum readings collected during the monitoring period. Artesian groundwater measurements were noted. See piezometer report for values.
5. Bail test not conducted due to artesian pressure.
6. Vibrating wire piezometers installed at 18.0 feet (SN: 1904890) and 33.0 feet (SN: 1904904).

WSDOT

LOG OF BORING H-2vwp-20

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage
Job Number: XL6097 *Route & MP Range:* SR 534 MP 0.49 - 0.69
Northing: 492,659.9 feet *Latitude:* 48.340974 deg. *Driller/Inspector:* Harrell, Nick (#3322T) / Cooper, Rich #2964
Easting: 1,278,088.2 feet *Longitude:* -122.323245 deg. *Start Card:* RE-19099 *Well Tag:* BBC-702 *Instrument:* VWP
Elevation: 27.4 feet *Collector:* Region Survey *Drilling Method:* Casing Advancer *Hole Diam.:* 6 in
Horizontal/Vertical Datum: NAD 83/91 HARN, SPN / NAVD88 *Equipment:* CME 45C (ID:9A4-7) *Rod Type:* AWJ
Started: March 9, 2020 *Completed:* March 11, 2020 *Hammer Type:* AutoHammer *Historic Efficiency:* 91.7%

Depth (feet)	Elevation (feet)	Blows/6" (N bpf) and other Field Data	Sample Type	Sample Number	Lab Tests	Material Description
						-Asphalt (0.8 ft)
	25	50 31 15 12 (46) Rec=0.9'		D-1		WELL-GRADED GRAVEL WITH SAND, sub-angular, dense, light brown, moist, homogeneous. *-NOTE: For sample D-1, observe petroleum odor.*
5		5 5 6 7 (11) Rec=1.5'		D-2	GS, AL	GRAVELLY LEAN CLAY WITH SAND, sub-angular, stiff, gray, moist, homogeneous.
	20	2 2 3 3 (5) Rec=2.0'		D-3	GS, AL, HT, SG	LEAN CLAY, medium stiff, gray, moist, homogeneous.
10		Rec=2.0'		S-4	GS, AL, HT, SG, DN	FAT CLAY, gray, moist.
	15	0 1 1 1 (2) Rec=1.8'		D-5	GS, AL, HT, SG	FAT CLAY, soft, gray, moist, homogeneous.
15		Rec=2.0'		S-6	GS, AL, HT, SG, DN AL GS, AL, HT, SG	FAT CLAY, gray, wet.
	10	0 2 1 1 (3) Rec=2.0'		D-7		FAT CLAY, soft, gray, wet, homogeneous.
20		0 0 1 1 (1) Rec=2.0'		D-8		FAT CLAY, very soft, gray, wet, homogeneous.
	5	Rec=2.0'		S-9	GS, AL, HT, SG, DN AL	SILT, gray, wet.
25		0 1 1 1 (2) Rec=2.0'		D-10		FAT CLAY, soft, gray, wet, homogeneous.
	0					

Moisture Content (%) ✖
Fines Content (%) ○
Penetration Resistance (blows/ft)
Field N ◆ SPT N_{60} ◇
0 20 40 60 80 100

Groundwater Data: See Note 4

As-Built

CONTINUED NEXT PAGE *(see last page for notes)*

VERSION 1
FINAL

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Job Number: XL6097 *Route & MP Range:* SR 534 MP 0.49 - 0.69

Depth (feet)	Elevation (feet)	Profile	Moisture Content (%) ✖ Fines Content (%) ○ Penetration Resistance (blows/ft) Field N ◆ SPT N_{60} ◇ (0 20 40 60 80 100)	Blows/6" (N bpf) and other Field Data	Sample Type	Sample Number	Lab Tests	Material Description	Groundwater Data (See Note 4)	As-Built
30	-5		◆ ◇ ✖ ○	5 7 8 14 (15) Rec=2.0'		D-11	GS, AL	SANDY SILT, medium dense, gray, wet, homogeneous. *-NOTE: At 29.0 ft, observe artesian pressure.*		
35	-10		◆ ✖ ○	4 3 14 27 (17) Rec=1.8'		D-12	GS, AL	SILTY SAND, sub-rounded, medium dense, gray, moist, stratified.		
40	-15		◆ >> ◇	17 43 43 26 (86) Rec=0.8'		D-13		WELL-GRADED GRAVEL, sub-rounded, very dense, gray, wet, homogeneous.		
45	-20		✖ ◆ ◇	8 13 8 10 (21) Rec=0.9'		D-14	GS, AL	SILTY SAND WITH GRAVEL, sub-rounded, medium dense, gray, wet, stratified.		
50	-25		✖ ○ ◆ ◇	16 36 28 32 (64) Rec=1.9'		D-15	GS, AL	SILTY SAND, very dense, gray, wet, homogeneous.		
55	-30		✖ ◆ ○ ◇	7 14 30 38 (44) Rec=1.8'		D-16	GS, AL, HT, SG	SILTY SAND, dense, dark gray, wet, homogeneous.		
60			◆ ◇	5 16 26 34 (42) Rec=1.9'		D-17		SILTY SAND, subangular, dense, dark gray, wet, homogeneous.		

STANDARD BORING LOG XL6097 534 TRIBTOCARPENTERCK.GPJ 2020 WSDOT GINT TEMPLATE.GDT 10/10/22

CONTINUED NEXT PAGE *(see last page for notes)*

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage *Job Number:* XL6097 *Route & MP Range:* SR 534 MP 0.49 - 0.69

Depth (feet)	Elevation (feet)	Profile	Moisture Content (%) ✖ Fines Content (%) ○ Penetration Resistance (blows/ft) Field N ◆ SPT N_{60} ◇ 0 20 40 60 80 100	Blows/6" (N bpf) and other Field Data	Sample Type	Sample Number	Lab Tests	Material Description	Groundwater Data (See Note 4)	As-Built
65	35		>>◇	15 31 42 50 (73) Rec=2.0'		D-18		SILTY SAND, subrounded, very dense, dark gray, wet, homogeneous.		

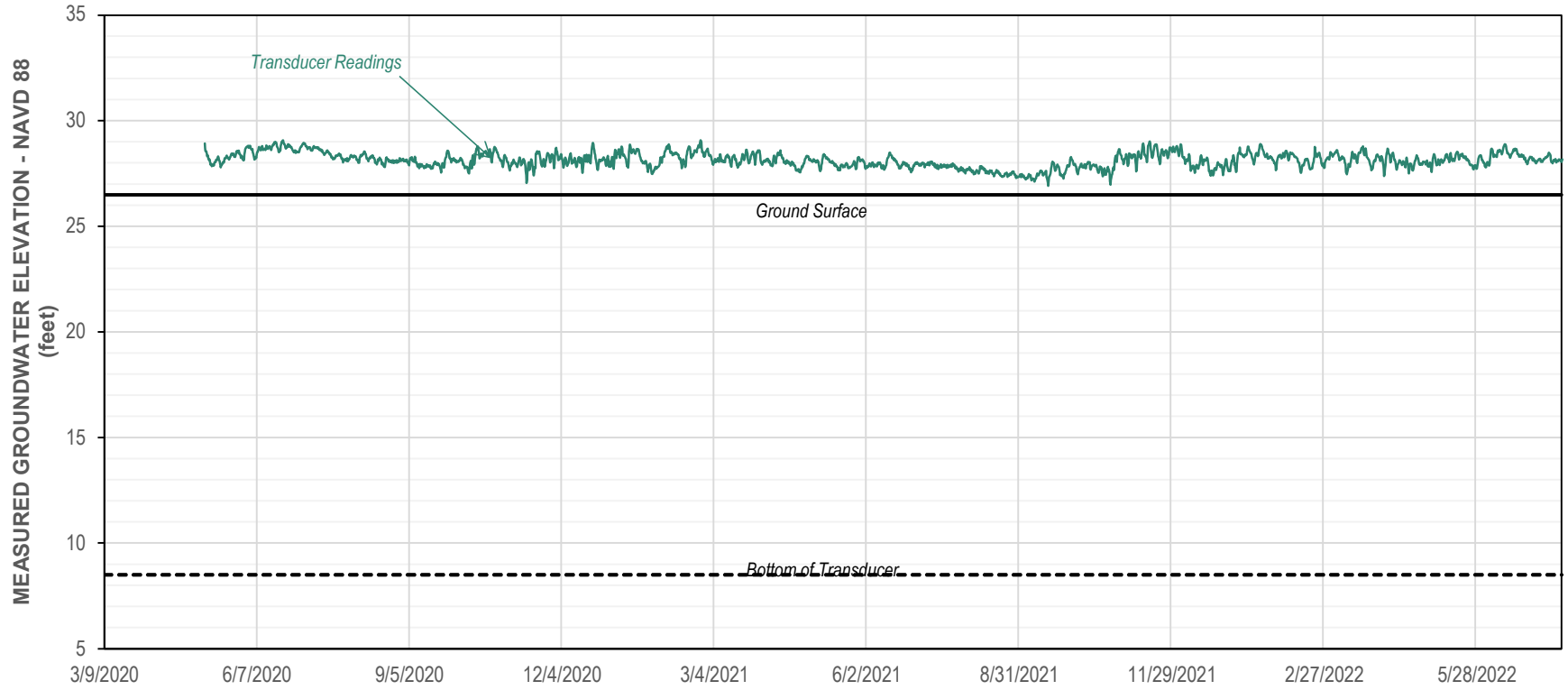
HOLE ENDED AT 66.0 FEET ON 3-11-2020

NOTES:

1. This is a summary log of the boring. Soil/rock descriptions are derived from visual field identifications and laboratory test data (where tested). See exploration log legend for explanation of graphics and abbreviations.
2. The implied accuracy of the location information displayed on this log is typically sub-meter(X,Y) when collected using GPS methods by the Geotechnical Office and sub-centimeter (X,Y,Z) when collected by the Region survey crew.
3. Where oversized samplers were used, a correction was made to the N-value per the AASHTO Manual on Subsurface Investigations, 1988. Blow counts per 6-inch increment have not been corrected.
4. The groundwater level range shown on this log represents data collected between 3/12/2020 and 7/18/2022. The blue line extends between the minimum and maximum readings collected during the monitoring period. Artesian groundwater measurements were noted. See piezometer report for values.
5. Bail test not conducted due to artesian pressure.
6. Vibrating wire piezometers installed at 15.5 feet (SN: 1904882) and 35.5 feet (SN: 1904891).

APPENDIX B: GROUNDWATER MEASUREMENT PLOTS

CONTENTS



Exploration Information	
Northing (feet)	492,679.6
Easting (feet)	1,278,050.4
Ground Elevation (feet)	26.5
Total Boring Depth (feet)	66.0
Date Completed	3/20/2020

Piezo Information	Depth*	Elevation*
Vibrating Wire Piezometer (VWP) - SN: 1904890		
Bottom of VWP	18.0	8.5
In-Situ Soil/Rock	See boring log	
Highest Reading	-2.6	29.1
Average Reading	-1.6	28.1
Lowest Reading	-0.4	26.9

** all units in feet*

NOTE:
Rainfall data was downloaded from https://www.ncdc.noaa.gov for the Mount Vernon 0.8 SW, WA US station (ID GHCND:US1WASG0024), located about 4 miles north of the project site (Lat: 48.41298°, Lon: -122.324868°).

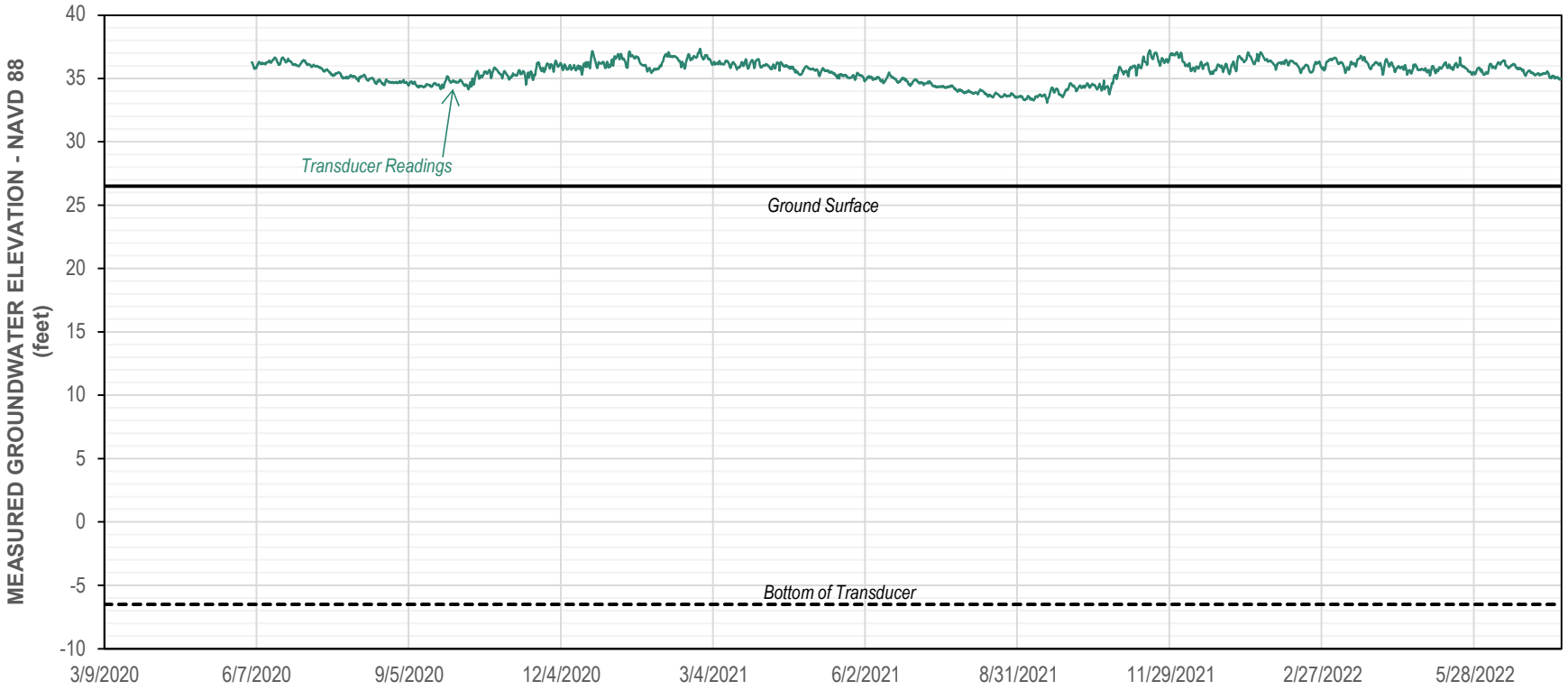
JOB# XL6097 | STATE ROUTE 534 | MILEPOST(S) 0.49 - 0.69

GROUNDWATER MEASUREMENT PLOT
BORING H-1VWP-20 (18.0 FT BGS)

SR534/UNNAMED TRIBUTARY TO CARPENTER CREEK - FISH PASSAGE

WSDOT GEOTECHNICAL OFFICE

PREPARED BY D. Anderson | DATE Mar 2022



Exploration Information	
Northing (feet)	492,679.6
Easting (feet)	1,278,050.4
Ground Elevation (feet)	26.5
Total Boring Depth (feet)	66.0
Date Completed	3/20/2020

Piezo Information	Depth*	Elevation*
Vibrating Wire Piezometer (VWP) - SN: 1904904		
Bottom of VWP	33.0	-6.5
In-Situ Soil/Rock	See boring log	
Highest Reading	-10.8	37.3
Average Reading	-9.0	35.5
Lowest Reading	-6.6	33.1

** all units in feet*

NOTE:
Rainfall data was downloaded from https://www.ncdc.noaa.gov for the Mount Vernon 0.8 SW, WA US station (ID GHCND:US1WASG0024), located about 4 miles north of the project site (Lat: 48.41298°, Lon: -122.324868°).

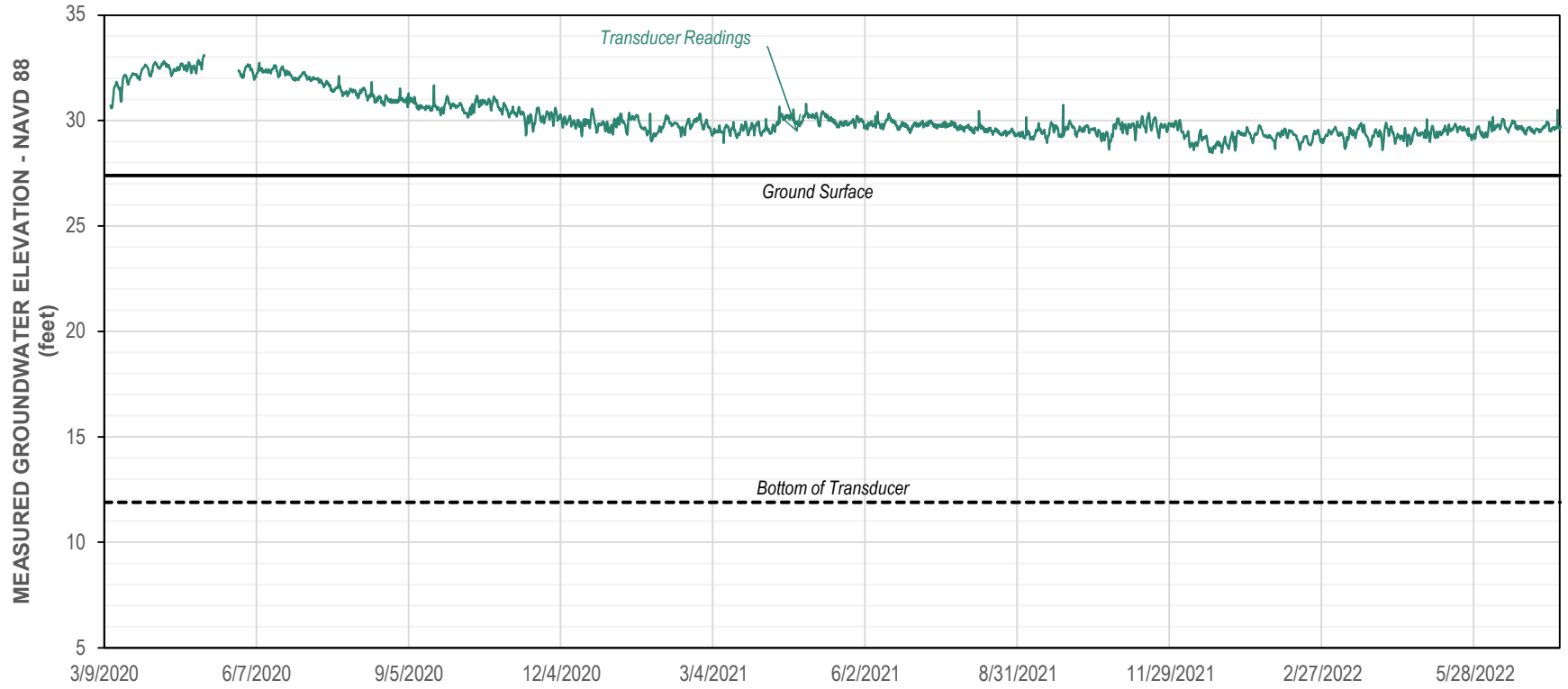
JOB# XL6097 | STATE ROUTE 534 | MILEPOST(S) 0.49 - 0.69

GROUNDWATER MEASUREMENT PLOT
BORING H-1VWP-20 (33.0 FT BGS)

SR534/UNNAMED TRIBUTARY TO CARPENTER CREEK - FISH PASSAGE

WSDOT GEOTECHNICAL OFFICE

PREPARED BY D. Anderson | DATE Mar 2022



Exploration Information	
Northing (feet)	492,659.9
Easting (feet)	1,278,088.2
Ground Elevation (feet)	27.4
Total Boring Depth (feet)	66.0
Date Completed	3/11/2020

Piezo Information	Depth*	Elevation*
Vibrating Wire Piezometer (VWP) - SN: 1904882		
Bottom of VWP	15.5	11.9
In-Situ Soil/Rock	See boring log	
Highest Reading	-5.7	33.1
Average Reading	-2.7	30.1
Lowest Reading	-1.1	28.5

** all units in feet*

NOTE:
Rainfall data was downloaded from https://www.ncdc.noaa.gov for the Mount Vernon 0.8 SW, WA US station (ID GHCND:US1WASG0024), located about 4 miles north of the project site (Lat: 48.41298°, Lon: -122.324868°).

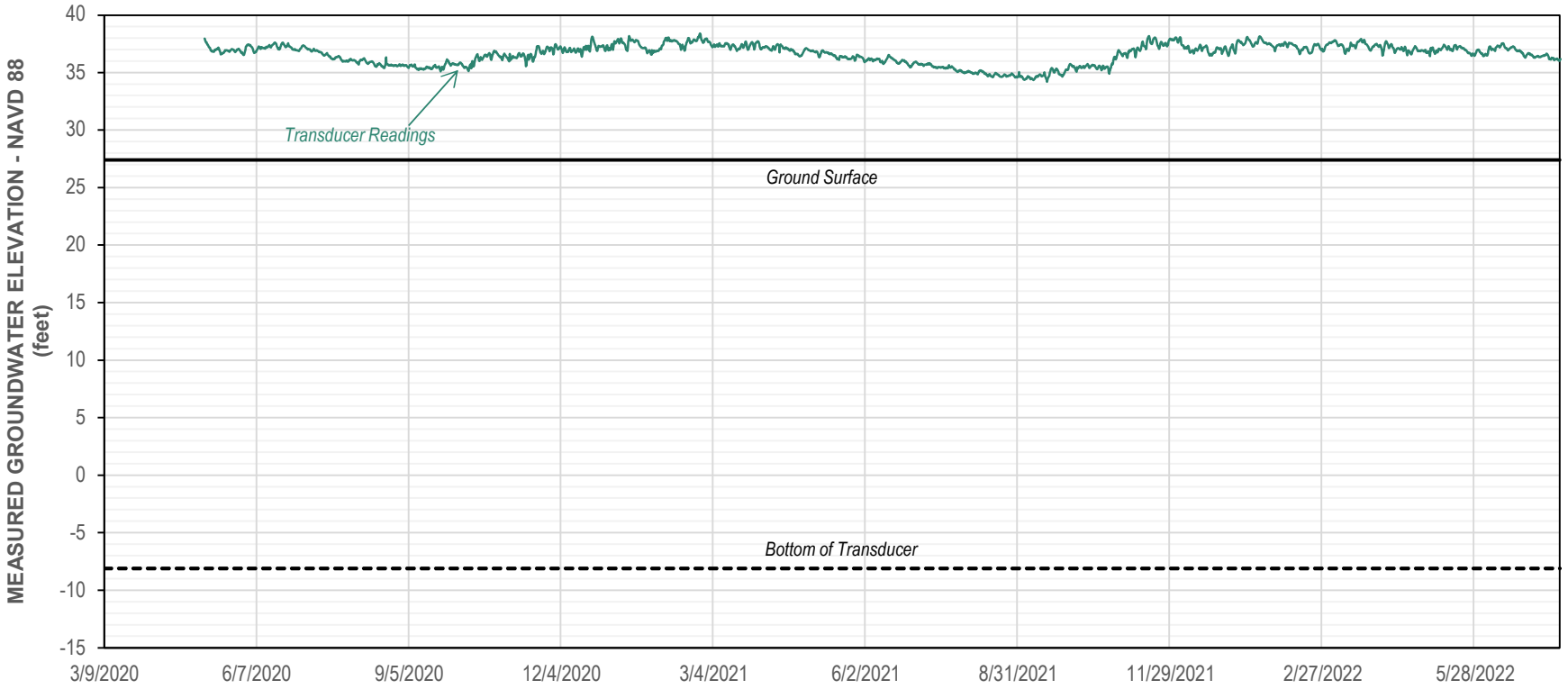
JOB# XL6097 | STATE ROUTE 534 | MILEPOST(S) 0.49 - 0.69

GROUNDWATER MEASUREMENT PLOT
BORING H-2VWP-20 (15.5 FT BGS)

SR534/UNNAMED TRIBUTARY TO CARPENTER CREEK - FISH PASSAGE

WSDOT GEOTECHNICAL OFFICE

PREPARED BY D. Anderson | DATE Mar 2022



Exploration Information	
Northing (feet)	492,659.9
Easting (feet)	1,278,088.2
Ground Elevation (feet)	27.4
Total Boring Depth (feet)	66.0
Date Completed	3/11/2020

Piezo Information	Depth*	Elevation*
Vibrating Wire Piezometer (VWP) - SN: 1904891		
Bottom of VWP	35.5	-8.1
In-Situ Soil/Rock	See boring log	
Highest Reading	-11.0	38.4
Average Reading	-9.2	36.6
Lowest Reading	-6.8	34.2

** all units in feet*

NOTE:
Rainfall data was downloaded from https://www.ncdc.noaa.gov for the Mount Vernon 0.8 SW, WA US station (ID GHCND:US1WASG0024), located about 4 miles north of the project site (Lat: 48.41298°, Lon: -122.324868°).

JOB# XL6097 | STATE ROUTE 534 | MILEPOST(S) 0.49 - 0.69

GROUNDWATER MEASUREMENT PLOT
BORING H-2VWP-20 (35.5 FT BGS)

SR534/UNNAMED TRIBUTARY TO CARPENTER CREEK - FISH PASSAGE

WSDOT GEOTECHNICAL OFFICE

PREPARED BY D. Anderson | DATE Mar 2022

APPENDIX C: LABORATORY TEST RESULTS

CONTENTS

Table C-1: Laboratory Test Result Summary

Boring Name	Sample Information			Project ESU[1]	USCS[2] [ASTM D2487]	USCS Group Name[2] [ASTM D2487]	Moisture Content [AASHTO T 265]	Atterberg Limits (Plasticity) [AASHTO T 89, T 90]			Grain Size Distribution/Hydrometer[3] (% of Sample by Weight) [AASHTO T 11, T 27, T 88]					Moist Unit Weight [ASTM D7263]	Specific Gravity [AASHTO T 100]
	No.	Depth (feet)	Elevation (feet NAVD 88)				(%)	LL (%)	PL (%)	PI (%)	Gravel (%)	Sand (%)	Fines (%)	Silt (%)	Clay (%)	(pcf)	
H-1vwp-20	D-2	4.0	22.5	1b	CL	LEAN CLAY with SAND	25	48	24	24	2	16	82				
H-1vwp-20	D-3	7.0	19.5	1b	MH	ELASTIC SILT	36	60	31	29	0	11	89				
H-1vwp-20	D-4	9.0	17.5	2	CH	FAT CLAY	34	65	27	38	0	2	98	45	53		2.73
H-1vwp-20	S-5	12.0	14.5	2	CH	FAT CLAY	39	59	28	31	0	2	97	50	47	114	2.78
H-1vwp-20	D-6	14.0	12.5	2	CL	LEAN CLAY	34	39	19	20	1	9	91	56	35		2.77
H-1vwp-20	S-7	17.0	9.5	2	CH	FAT CLAY	44	51	23	28	1	10	88				
H-1vwp-20	D-8	19.0	7.5	2	CL	LEAN CLAY	46	45	22	23	1	7	92				
H-1vwp-20	S-9	22.0	4.5	2	CL	LEAN CLAY	38	45	22	23	1	6	93	57	36	116	2.76
H-1vwp-20	S-9	22.0	4.5	2				40	22	18							
H-1vwp-20	D-12	34.0	-7.5	3	SM	SILTY SAND	24	n/a	n/a	NP	3	59	38				
H-1vwp-20	D-13	39.0	-12.5	3	ML	SANDY SILT	22	n/a	n/a	NP	2	48	50	43	7		2.66
H-1vwp-20	D-14	44.0	-17.5	4	SM	SILTY SAND with GRAVEL	11	n/a	n/a	NP	32	49	20				
H-1vwp-20	D-15	49.0	-22.5	5	SP	POORLY GRADED SAND	18	n/a	n/a	NP	5	95	0				
H-2vwp-20	D-2	4.0	23.4	1b	CL	GRAVELLY LEAN CLAY with SAND	24	47	25	22	18	15	66				
H-2vwp-20	D-3	7.0	20.4	2	CL	LEAN CLAY	33	43	21	22	0	12	88	53	35		2.72
H-2vwp-20	S-4	9.0	18.4	2	CH	FAT CLAY	44	71	28	43	0	2	98	50	48	109	2.82
H-2vwp-20	D-5	12.0	15.4	2	CH	FAT CLAY	61	60	26	34	0	0	100	49	51		2.70
H-2vwp-20	S-6	14.0	13.4	2	CH	FAT CLAY	52	53	25	28	0	0	100	78	23	107	2.76
H-2vwp-20	S-6	14.0	13.4	2				66	29	37							
H-2vwp-20	S-6	14.2	13.2	2	CH	FAT CLAY	47	60	28	32	0	1	98	50	49		2.77
H-2vwp-20	S-9	21.0	6.4	2	ML	SILT	23	49	31	18	0	6	94	55	39	113	2.74
H-2vwp-20	S-9	21.0	6.4	2				40	33	7							
H-2vwp-20	D-11	29.0	-1.6	3	ML	SANDY SILT	27	n/a	n/a	NP	1	38	62				
H-2vwp-20	D-12	34.0	-6.6	3	SM	SILTY SAND	27	n/a	n/a	NP	8	43	49				
H-2vwp-20	D-14	44.0	-16.6	5	SM	SILTY SAND with GRAVEL	12	n/a	n/a	NP	21	56	23				
H-2vwp-20	D-15	49.0	-21.6	5	SM	SILTY SAND	22	n/a	n/a	NP	7	53	40				
H-2vwp-20	D-16	54.0	-26.6	5	SM	SILTY SAND	24	n/a	n/a	NP	0	53	47	45	2		2.73

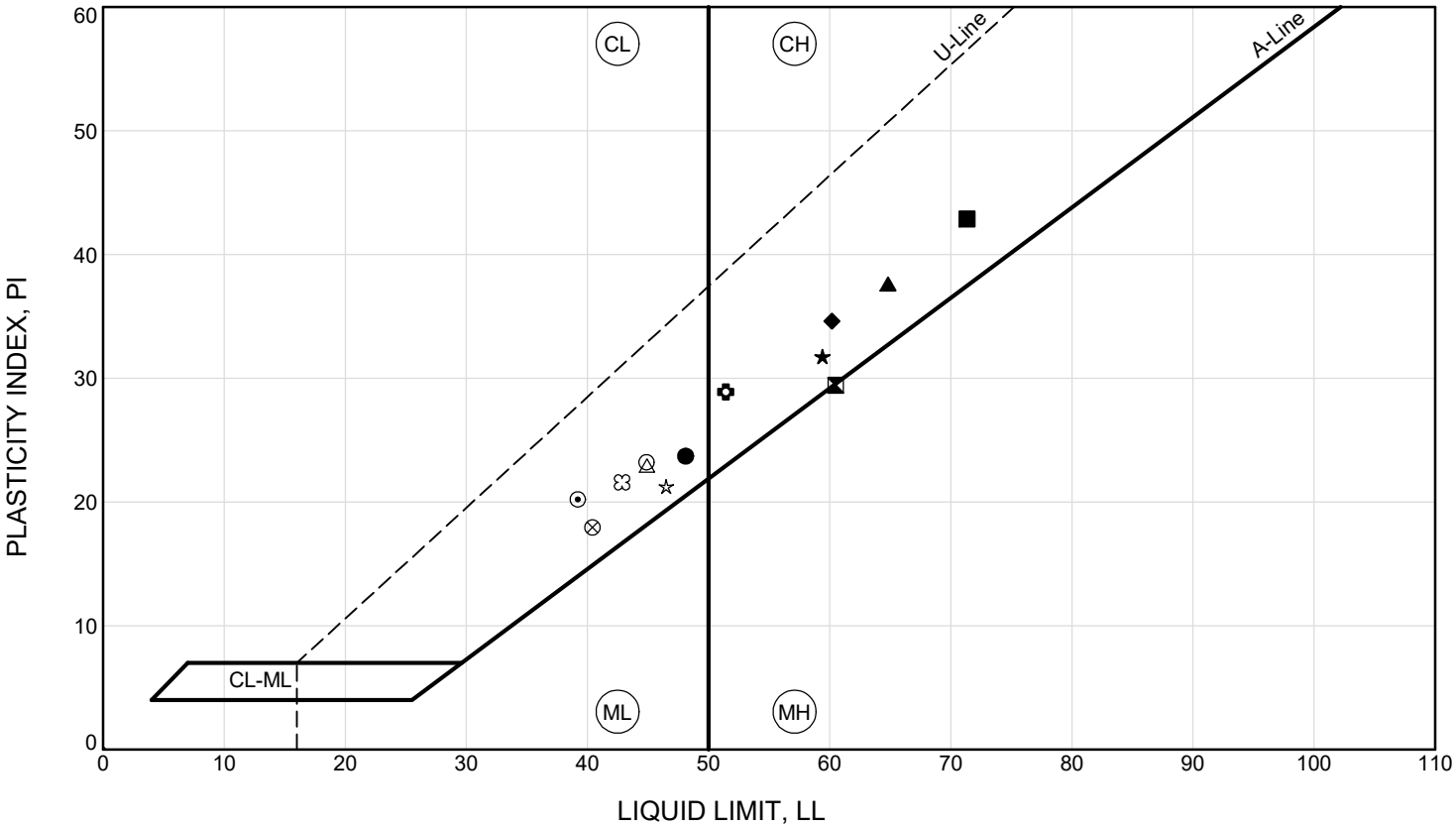
NOTES:

1. The Project ESU is provided to indicate which lab test results were in the development of soil parameters. The ESU should not be considered as data to be relied upon because it is subject to interpretation.
2. USCS Symbol and Group Name are listed only for those samples where sufficient laboratory testing was performed to determine the USCS group (e.g. Atterberg Limits and Grain Size Distribution).
3. Gravel, sand, and fines represents particle sizes greater than 4.75 mm, between 0.075 and 4.75 mm, and smaller than 0.075 mm, respectively. Silt and clay represents particle sizes between 0.075 and 0.002 mm and smaller than 0.002 mm, respectively. Fines = Silt + Clay.

ACRONYMS:

AASHTO = American Association of State Highway Transportation Officials
ESU = Engineering Stratigraphic Unit
LL = liquid limit
NP = nonplastic
NA = not tested or not applicable
pcf = pounds per cubic foot
PI = plasticity index
PL = plastic limit
USCS = unified soil classification system

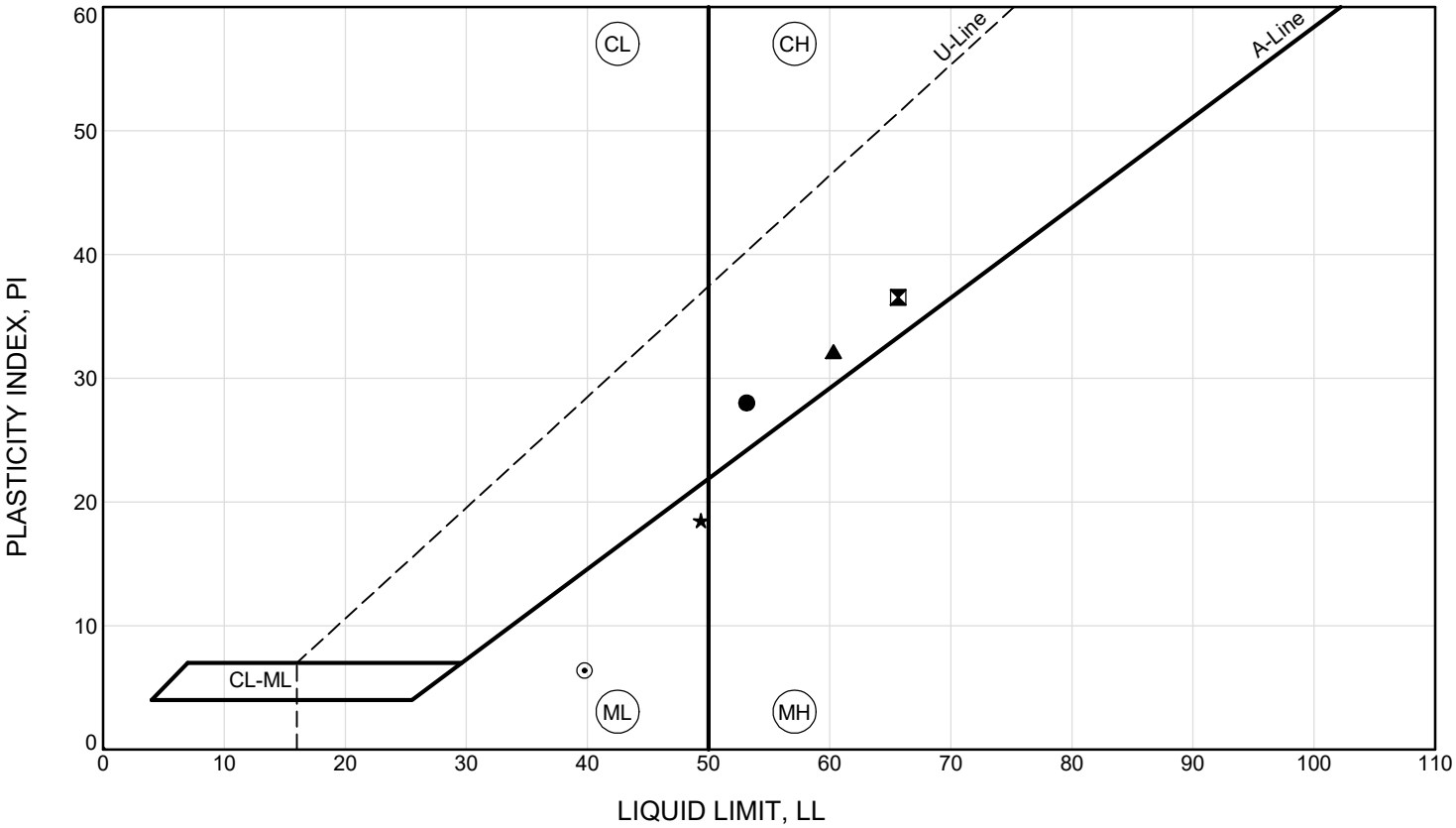
Job No: **XL6097**
Project: **SR534/Unnamed Tributary to Carpenter Creek - Fish Passage**



Symbol	Hole No.	Depth (feet)	Sample No.	USCS	Description	Test Date	MC (%)	LL	PL	PI	Fines (%)	Silt (%)	Clay (%)
●	H-1vwp-20	4.0	D-2	CL	LEAN CLAY with SAND	4-1-21	25	48	24	24	81.5		
⊠	H-1vwp-20	7.0	D-3	MH	ELASTIC SILT	6-12-20	36	60	31	29	89.3		
▲	H-1vwp-20	9.0	D-4	CH	FAT CLAY	3-15-22	34	65	27	38	98.0	44.9	53.0
★	H-1vwp-20	12.0	S-5	CH	FAT CLAY	7-10-20	39	59	28	31	97.4	50.0	47.4
⊙	H-1vwp-20	14.0	D-6	CL	LEAN CLAY	6-12-20	34	39	19	20	90.7	55.8	34.9
✿	H-1vwp-20	17.0	S-7	CH	FAT CLAY	3-15-22	44	51	23	28	88.4		
○	H-1vwp-20	19.0	D-8	CL	LEAN CLAY	6-12-20	46	45	22	23	91.8		
△	H-1vwp-20	22.0	S-9	CL	LEAN CLAY	6-3-20	38	45	22	23	92.9	56.8	36.1
⊗	H-1vwp-20	22.0	S-9		*Atterberg Limits only - no sieve analysis: Description not calculated*	6-3-20		40	22	18			
	H-1vwp-20	34.0	D-12	SM	SILTY SAND	6-12-20	24	n/a	n/a	NP	37.5		
	H-1vwp-20	39.0	D-13	ML	SANDY SILT	3-15-22	22	n/a	n/a	NP	50.0	43.0	7.0
	H-1vwp-20	44.0	D-14	SM	SILTY SAND with GRAVEL	6-12-20	11	n/a	n/a	NP	19.6		
	H-1vwp-20	49.0	D-15	SP	POORLY GRADED SAND	6-12-20	18	n/a	n/a	NP	0.0		
☆	H-2vwp-20	4.0	D-2	CL	GRAVELLY LEAN CLAY with SAND	4-1-21	24	47	25	22	66.4		
⊠	H-2vwp-20	7.0	D-3	CL	LEAN CLAY	6-12-20	33	43	21	22	88.2	53.0	35.2
■	H-2vwp-20	9.0	S-4	CH	FAT CLAY	10-14-20	44	71	28	43	97.7	50.1	47.5
◆	H-2vwp-20	12.0	D-5	CH	FAT CLAY	6-12-20	61	60	26	34	100.0	49.2	50.8

ABBREVIATIONS:
LL = liquid limit; MC = moisture content; n/a = test attempted; NP = nonplastic; PI = plasticity index; PL = plastic limit; USCS = Unified Soil Classification System code
USCS codes listed on graph: CL = lean clay; CH = fat clay; ML = silt; MH = elastic silt; CL-ML = silty clay

Job No: **XL6097**
Project: **SR534/Unnamed Tributary to Carpenter Creek - Fish Passage**



Symbol	Hole No.	Depth (feet)	Sample No.	USCS	Description	Test Date	MC (%)	LL	PL	PI	Fines (%)	Silt (%)	Clay (%)
●	H-2vwp-20	14.0	S-6	CH	FAT CLAY	8-5-20	52	53	25	28	99.9	77.4	22.5
⊠	H-2vwp-20	14.0	S-6		*Atterberg Limits only - no sieve analysis: Description not calculated*	3-15-22		66	29	37			
▲	H-2vwp-20	14.2	S-6	CH	FAT CLAY	11-16-20	47	60	28	32	98.4	49.8	48.6
★	H-2vwp-20	21.0	S-9	ML	SILT	6-12-20	23	49	31	18	94.2	54.9	39.3
⊙	H-2vwp-20	21.0	S-9		*Atterberg Limits only - no sieve analysis: Description not calculated*	3-15-22		40	33	7			
	H-2vwp-20	29.0	D-11	ML	SANDY SILT	6-12-20	27	n/a	n/a	NP	61.7		
	H-2vwp-20	34.0	D-12	SM	SILTY SAND	6-12-20	27	n/a	n/a	NP	49.1		
	H-2vwp-20	44.0	D-14	SM	SILTY SAND with GRAVEL	6-12-20	12	n/a	n/a	NP	22.8		
	H-2vwp-20	49.0	D-15	SM	SILTY SAND	6-12-20	22	n/a	n/a	NP	39.8		
	H-2vwp-20	54.0	D-16	SM	SILTY SAND	3-15-22	24	n/a	n/a	NP	46.8	45.2	1.6

ATTERBERG SUMMARY XL6097 534 TRIBTOCARPENTERCK.GPJ 2020 WSDOT GINT TEMPLATE.GDT 3/31/22

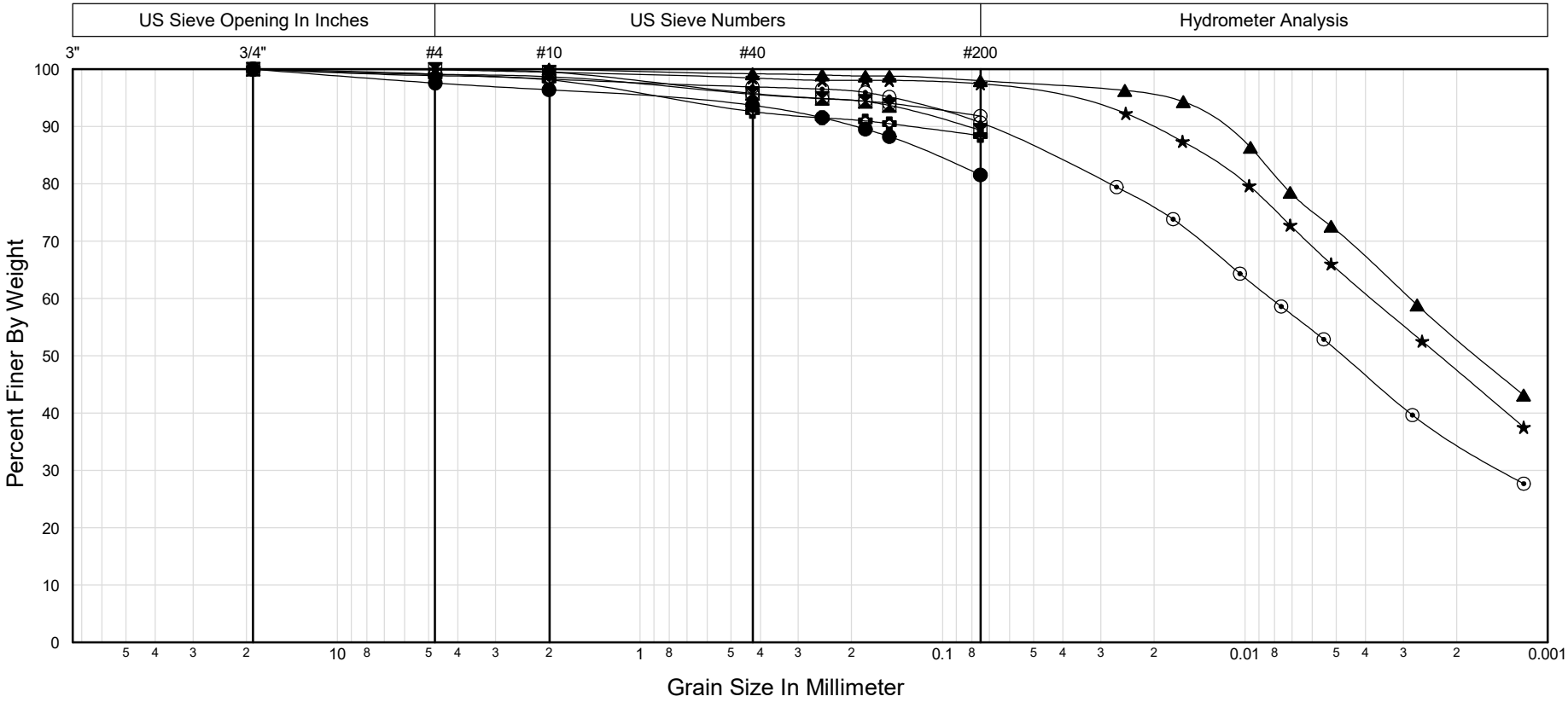
ABBREVIATIONS:
LL = liquid limit; MC = moisture content; n/a = test attempted; NP = nonplastic; PI = plasticity index; PL = plastic limit; USCS = Unified Soil Classification System code
USCS codes listed on graph: CL = lean clay; CH = fat clay; ML = silt; MH = elastic silt; CL-ML = silty clay

WSDOT

GRAIN SIZE ANALYSIS SUMMARY FOR H-1vwp-20

Job No: **XL6097**
Project: **SR534/Unnamed Tributary to Carpenter Creek - Fish Passage**

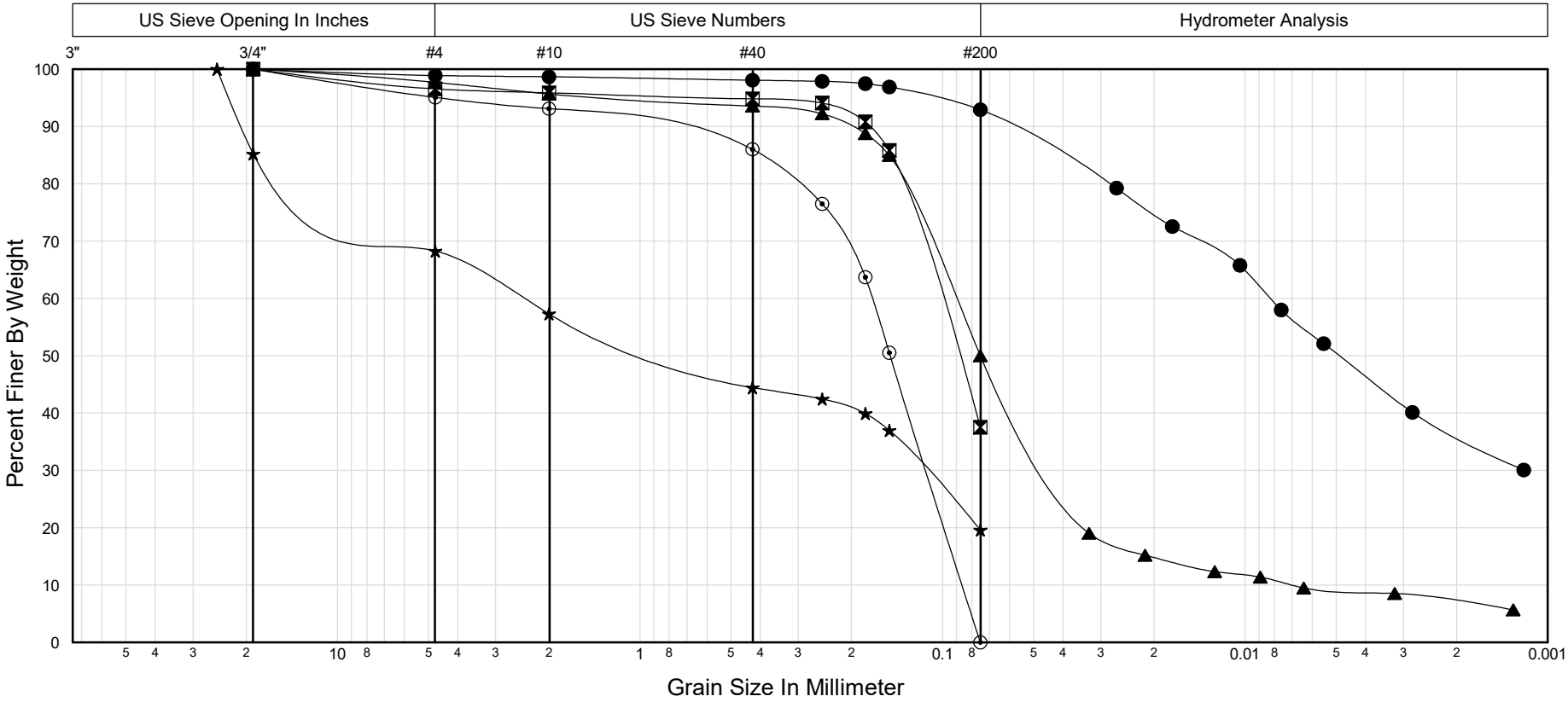
Symbol	Depth (feet)	Sample No.	USCS	Description	Test Date	MC (%)	LL	PL	PI	Moist Density (lbs/ft^3)	Specific Gravity	Gravel (%)	Sand (%)	Fines (%)	C_c	C_u	D_{60} (mm)	D_{50} (mm)	D_{30} (mm)	D_{20} (mm)	D_{10} (mm)
●	4.0	D-2	CL	LEAN CLAY with SAND	4-1-21	25	48	24	24			2.4	16.0	81.5							
⊠	7.0	D-3	MH	ELASTIC SILT	6-12-20	36	60	31	29			0.1	10.6	89.3							
▲	9.0	D-4	CH	FAT CLAY	3-15-22	34	65	27	38		2.73	0.0	2.0	98.0			0.003	0.002			
★	12.0	S-5	CH	FAT CLAY	7-10-20	39	59	28	31	114	2.78	0.1	2.4	97.4			0.004	0.002			
⊙	14.0	D-6	CL	LEAN CLAY	6-12-20	34	39	19	20		2.77	0.9	8.5	90.7			0.008	0.005	0.001		
✿	17.0	S-7	CH	FAT CLAY	6-11-21	44	51	23	28			1.1	10.4	88.4							
○	19.0	D-8	CL	LEAN CLAY	6-12-20	46	45	22	23			0.9	7.3	91.8							



GRAIN SIZE ANALYSIS SUMMARY FOR H-1vwp-20

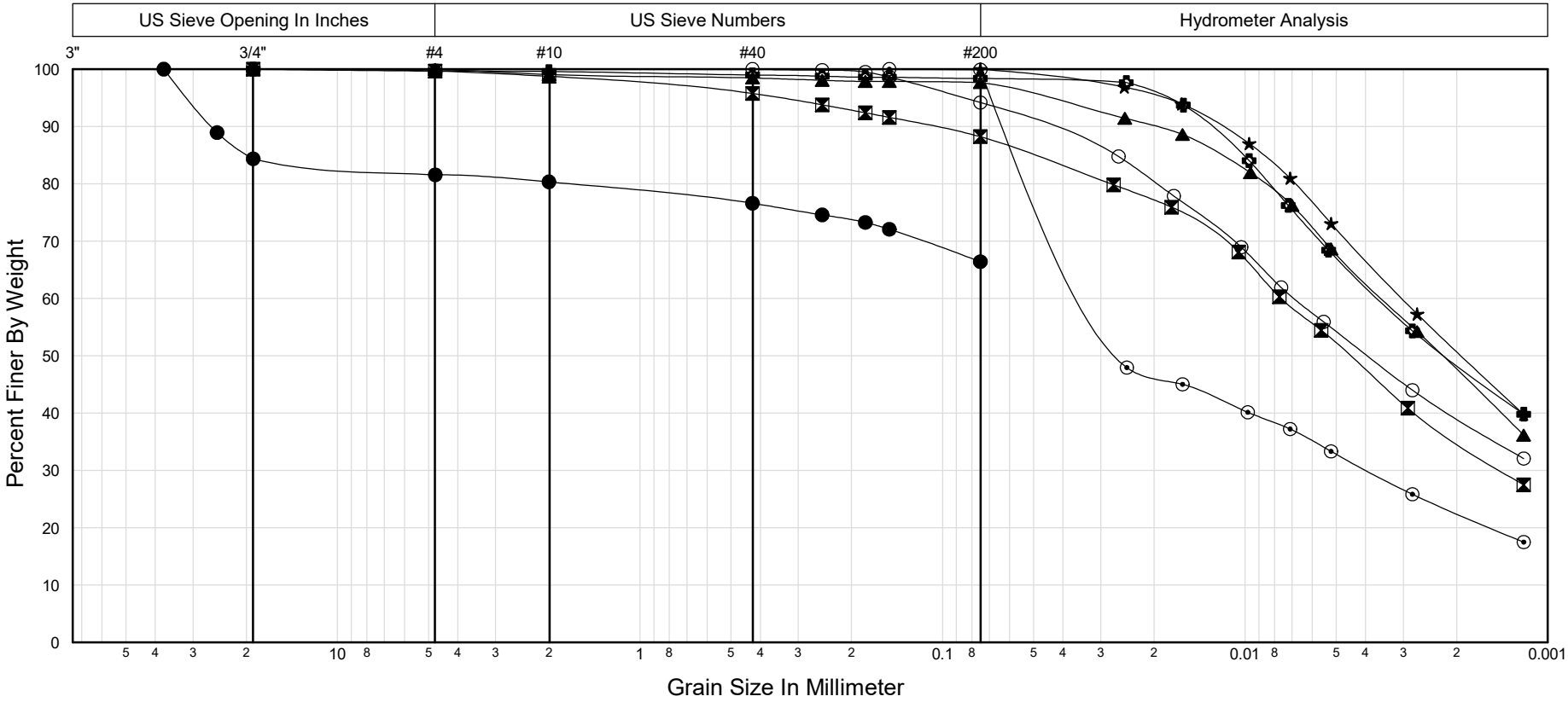
Job No: **XL6097**
Project: **SR534/Unnamed Tributary to Carpenter Creek - Fish Passage**

Symbol	Depth (feet)	Sample No.	USCS	Description	Test Date	MC (%)	LL	PL	PI	Moist Density (lbs/ft^3)	Specific Gravity	Gravel (%)	Sand (%)	Fines (%)	C_c	C_u	D_{60} (mm)	D_{50} (mm)	D_{30} (mm)	D_{20} (mm)	D_{10} (mm)
●	22.0	S-9	CL	LEAN CLAY	6-3-20	38	45	22	23	116	2.76	1.1	6.0	92.9			0.008	0.005			
⊠	34.0	D-12	SM	SILTY SAND	6-12-20	24	n/a	n/a	NP			3.4	59.0	37.5			0.104	0.090			
▲	39.0	D-13	ML	SANDY SILT	3-15-22	22	n/a	n/a	NP		2.66	2.3	47.7	50.0	3.0	13	0.091	0.075	0.044	0.034	0.007
★	44.0	D-14	SM	SILTY SAND with GRAVEL	6-12-20	11	n/a	n/a	NP			31.7	48.7	19.6			2.474	0.830	0.114	0.076	
⊙	49.0	D-15	SP	POORLY GRADED SAND	6-12-20	18	n/a	n/a	NP			4.9	95.1	0.0	0.9	2	0.171	0.149	0.113	0.099	0.086



Job No: **XL6097**
Project: **SR534/Unnamed Tributary to Carpenter Creek - Fish Passage**

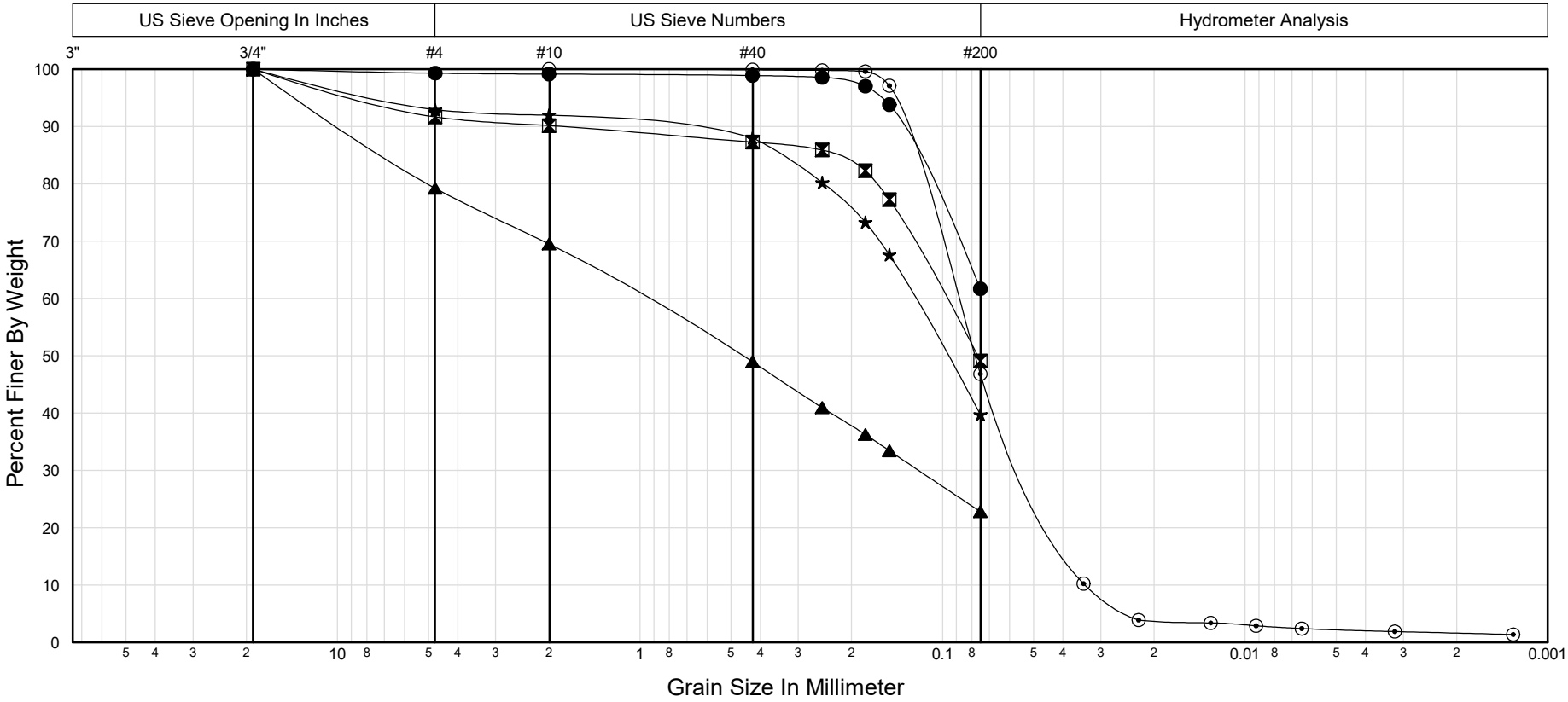
Symbol	Depth (feet)	Sample No.	USCS	Description	Test Date	MC (%)	LL	PL	PI	Moist Density (lbs/ft^3)	Specific Gravity	Gravel (%)	Sand (%)	Fines (%)	C_c	C_u	D_{60} (mm)	D_{50} (mm)	D_{30} (mm)	D_{20} (mm)	D_{10} (mm)
●	4.0	D-2	CL	GRAVELLY LEAN CLAY with SAND	4-1-21	24	47	25	22			18.4	15.1	66.4							
⊠	7.0	D-3	CL	LEAN CLAY	6-12-20	33	43	21	22		2.72	0.3	11.5	88.2			0.008	0.005	0.001		
▲	9.0	S-4	CH	FAT CLAY	10-14-20	44	71	28	43	109	2.82	0.0	2.3	97.7			0.004	0.002			
★	12.0	D-5	CH	FAT CLAY	6-12-20	61	60	26	34		2.70	N/A	N/A	100.0			0.003	0.002			
⊙	14.0	S-6	CH	FAT CLAY	8-5-20	52	53	25	28	107	2.76	0.0	0.1	99.9			0.032	0.026	0.004	0.002	
✪	14.2	S-6	CH	FAT CLAY	11-16-20	47	60	28	32		2.77	0.3	1.3	98.4			0.004	0.002			
○	21.0	S-9	ML	SILT	7-6-20	23	49	31	18	113	2.74	0.0	5.8	94.2			0.007	0.004			

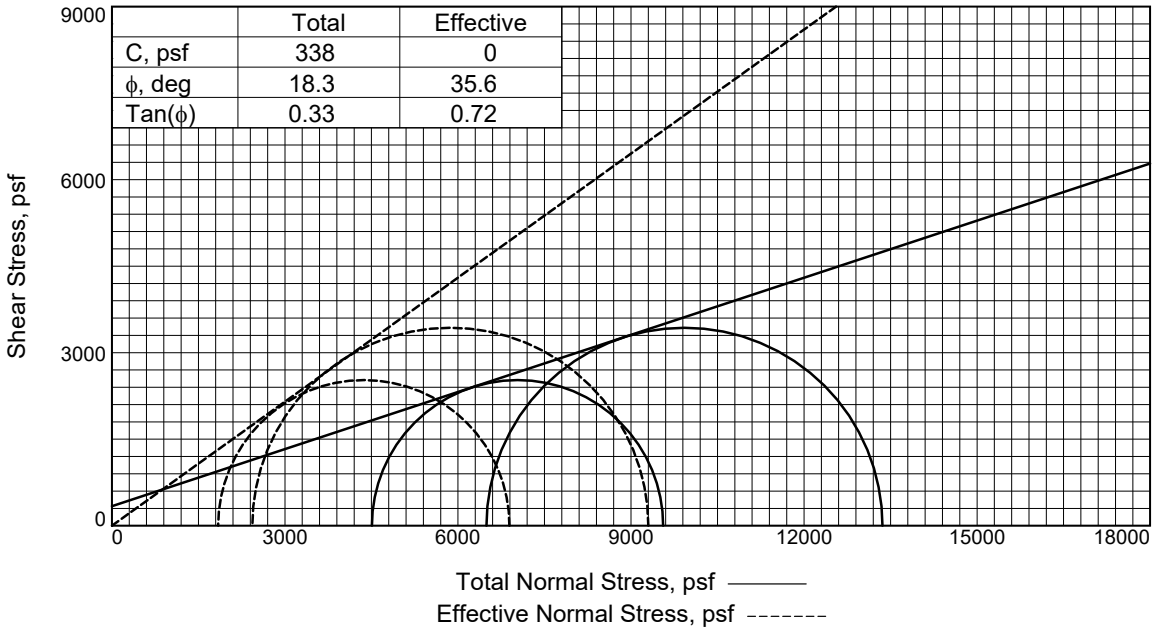


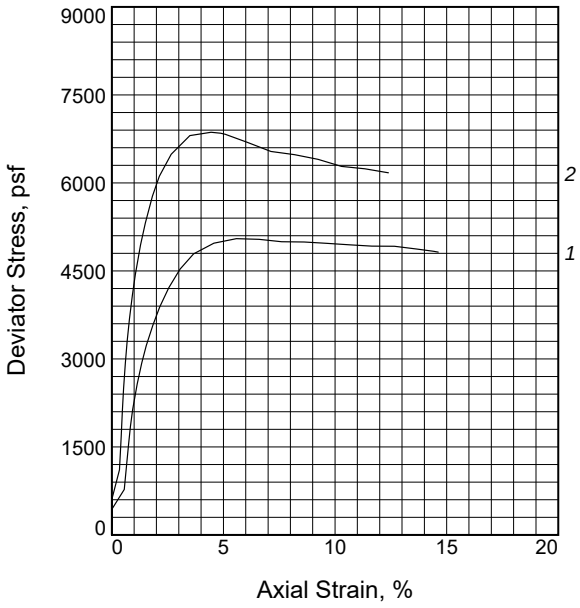
GRAIN SIZE ANALYSIS SUMMARY FOR H-2vwp-20

Job No: **XL6097**
Project: **SR534/Unnamed Tributary to Carpenter Creek - Fish Passage**

Symbol	Depth (feet)	Sample No.	USCS	Description	Test Date	MC (%)	LL	PL	PI	Moist Density (lbs/ft^3)	Specific Gravity	Gravel (%)	Sand (%)	Fines (%)	C_c	C_u	D_{60} (mm)	D_{50} (mm)	D_{30} (mm)	D_{20} (mm)	D_{10} (mm)
●	29.0	D-11	ML	SANDY SILT	6-12-20	27	n/a	n/a	NP			0.7	37.6	61.7							
⊠	34.0	D-12	SM	SILTY SAND	6-12-20	27	n/a	n/a	NP			8.3	42.6	49.1			0.098	0.077			
▲	44.0	D-14	SM	SILTY SAND with GRAVEL	6-12-20	12	n/a	n/a	NP			20.8	56.4	22.8			0.977	0.460	0.120		
★	49.0	D-15	SM	SILTY SAND	6-12-20	22	n/a	n/a	NP			7.1	53.2	39.8			0.124	0.097			
⊙	54.0	D-16	SM	SILTY SAND	3-15-22	24	n/a	n/a	NP		2.73	0.0	53.2	46.8	0.9	3	0.090	0.078	0.052	0.042	0.034







Sample No.		1	2
Initial	Water Content, %	39.5	39.5
	Dry Density, pcf	82.6	82.6
	Saturation, %	99.6	99.6
	Void Ratio	1.1022	1.1024
	Diameter, in.	2.87	2.87
	Height, in.	6.04	6.00
At Test	Water Content, %	35.3	28.8
	Dry Density, pcf	87.5	96.4
	Saturation, %	100.0	100.0
	Void Ratio	0.9827	0.8002
	Diameter, in.	2.81	2.72
	Height, in.	5.92	5.70
Strain rate, in./min.		0.01	0.01
Back Pressure, psi		50.00	85.00
Cell Pressure, psi		81.30	130.10
Fail. Stress, psf		5050	6865
Excess Pore Pr., psf		2665	4060
Ult. Stress, psf		4820	6173
Excess Pore Pr., psf		2470	4125
$\bar{\sigma}_1$ Failure, psf		6892	9300
$\bar{\sigma}_3$ Failure, psf		1842	2435

Type of Test:
CU with Pore Pressures
Sample Type: Shelby
Description: CH - Fat CLAY

LL= 59 **PL=** 28 **PI=** 31
Specific Gravity= 2.78
Remarks:

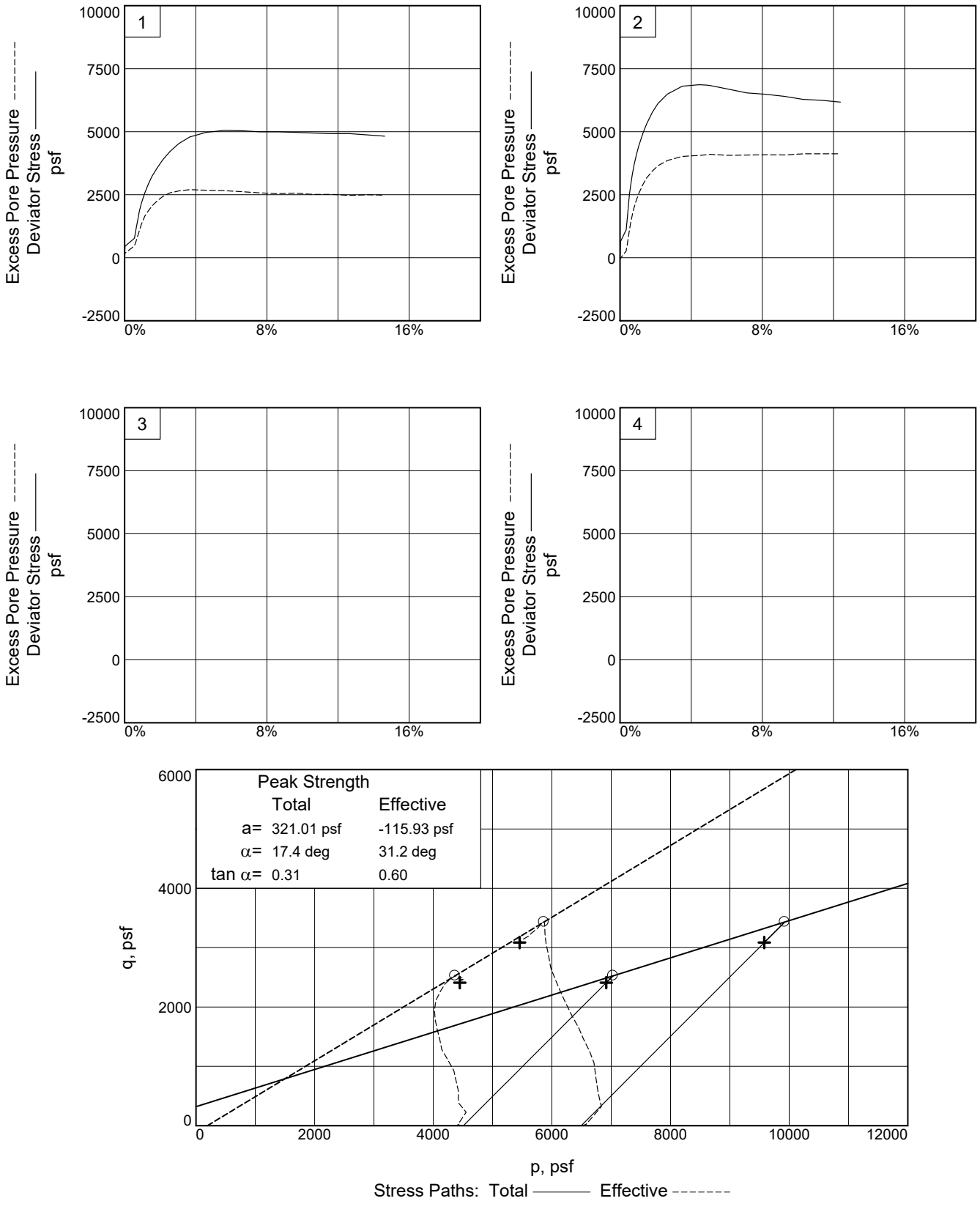
Client: WSDOT (Donald Anderson)

Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 12
Sample Number: S-5
Proj. No.: XL6097 **Date Sampled:** 12/10/2020

Figure _____

Tested By: SLW **Checked By:** SLW



Client: WSDOT (Donald Anderson)

Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 12 **Sample Number:** S-5

Project No.: XL6097 **Figure** _____

Washington State Department of Transportation

Tested By: SLW **Checked By:** SLW

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

1/19/2021
1:14 PM

Date: 12/10/2020
Client: WSDOT (Donald Anderson)
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project No.: XL6097
Location: H-1vwp-20
Depth: 12 **Sample Number:** S-5
Description: CH - Fat CLAY
Remarks:
Type of Sample: Shelby
Specific Gravity=2.78 **LL=**59 **PL=**28 **PI=**31
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	951.080			1241.760
Moisture content: Dry soil+tare, gms.	742.330			923.700
Moisture content: Tare, gms.	213.550			81.430
Moisture, %	39.5	39.1	35.3	37.8
Moist specimen weight, gms.	1181.1			
Diameter, in.	2.87	2.86	2.81	
Area, in.²	6.47	6.44	6.22	
Height, in.	6.04	6.03	5.92	
Net decrease in height, in.		0.01	0.10	
Wet density, pcf	115.1	115.7	118.5	
Dry density, pcf	82.6	83.2	87.5	
Void ratio	1.1022	1.0865	0.9827	
Saturation, %	99.6	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 81.30 psi (11707 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 4507 psf
Strain rate, in./min. = 0.01
Fail. Stress = 5050 psf **at reading no.** 17
Ult. Stress = 4820 psf **at reading no.** 27

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.6554	0.000	0.0	0.0	0	4507	4507	1.00	50.00	4507	0
1	2.6554	1.424	1.4	0.0	33	4398	4431	1.01	50.76	4414	16
2	2.6569	19.571	19.6	0.0	453	4327	4780	1.10	51.25	4554	226
3	2.6883	33.710	33.7	0.6	776	4035	4811	1.19	53.28	4423	388
4	2.6943	51.451	51.5	0.7	1183	3831	5014	1.31	54.70	4423	592
5	2.7003	67.947	67.9	0.8	1561	3598	5159	1.43	56.31	4379	780
6	2.7048	80.468	80.5	0.8	1847	3424	5272	1.54	57.52	4348	924
7	2.7108	93.286	93.3	0.9	2139	3197	5336	1.67	59.10	4267	1070
8	2.7228	112.477	112.5	1.1	2574	2856	5430	1.90	61.47	4143	1287
9	2.7347	128.325	128.3	1.3	2931	2643	5573	2.11	62.95	4108	1465
10	2.7467	141.608	141.6	1.5	3227	2454	5682	2.31	64.25	4068	1614
11	2.7647	157.445	157.4	1.8	3577	2244	5821	2.59	65.72	4032	1789
12	2.7826	171.572	171.6	2.1	3886	2077	5964	2.87	66.87	4020	1943
13	2.8066	186.870	186.9	2.6	4215	1935	6150	3.18	67.86	4043	2108
14	2.8365	201.920	201.9	3.1	4531	1856	6387	3.44	68.41	4121	2266
15	2.8724	214.819	214.8	3.7	4790	1806	6596	3.65	68.76	4201	2395
16	2.9263	225.140	225.1	4.6	4973	1827	6801	3.72	68.61	4314	2487
17	2.9862	231.089	231.1	5.6	5050	1842	6892	3.74	68.51	4367	2525
18	3.0460	233.106	233.1	6.6	5040	1888	6928	3.67	68.19	4408	2520
19	3.1059	233.690	233.7	7.6	4998	1934	6932	3.58	67.87	4433	2499
20	3.1658	236.122	236.1	8.6	4995	1967	6962	3.54	67.64	4465	2497
21	3.2256	237.658	237.7	9.6	4972	1944	6916	3.56	67.80	4430	2486
22	3.2855	239.077	239.1	10.6	4945	1997	6942	3.48	67.43	4469	2473
23	3.3454	240.703	240.7	11.6	4923	1994	6917	3.47	67.45	4455	2461
24	3.4052	243.399	243.4	12.7	4921	2035	6956	3.42	67.17	4495	2460
25	3.4651	243.902	243.9	13.7	4874	2009	6883	3.43	67.35	4446	2437
26	3.5100	244.019	244.0	14.4	4834	2021	6854	3.39	67.27	4437	2417
27	3.5217	243.894	243.9	14.6	4820	2038	6858	3.37	67.15	4448	2410

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	951.080			1368.240
Moisture content: Dry soil+tare, gms.	742.330			1061.900
Moisture content: Tare, gms.	213.550			215.280
Moisture, %	39.5	36.7	28.8	36.2
Moist specimen weight, gms.	1173.1			
Diameter, in.	2.87	2.83	2.72	
Area, in.²	6.47	6.30	5.83	
Height, in.	6.00	5.92	5.70	
Net decrease in height, in.		0.08	0.22	
Wet density, pcf	115.1	117.5	124.2	
Dry density, pcf	82.6	85.9	96.4	
Void ratio	1.1024	1.0193	0.8002	
Saturation, %	99.6	100.0	100.0	

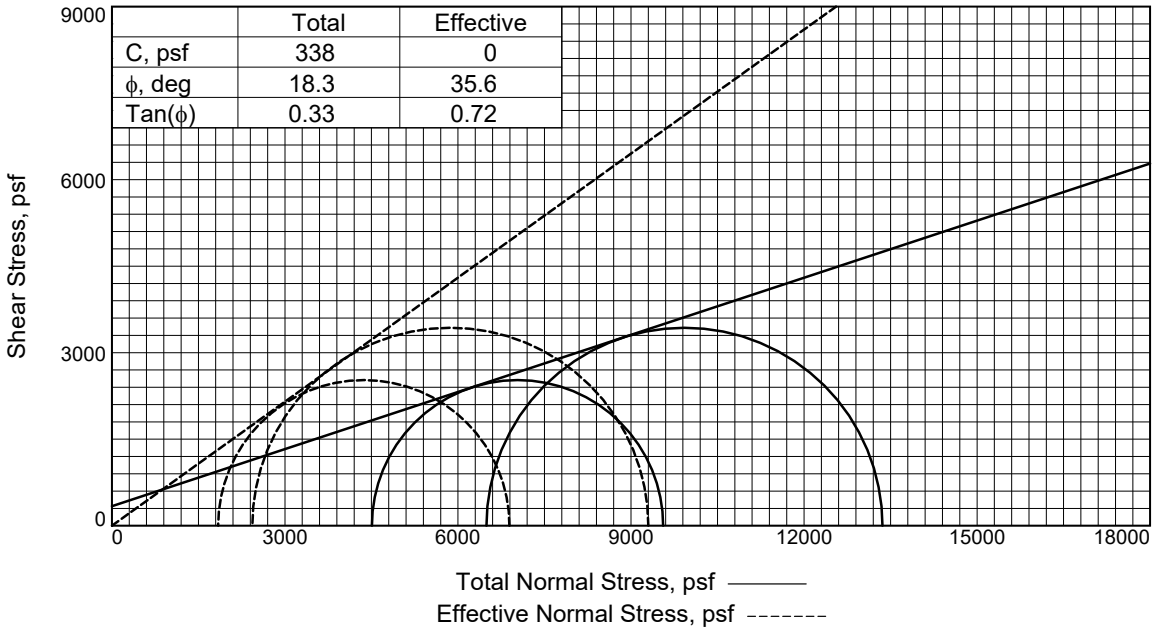
Test Readings for Specimen No. 2

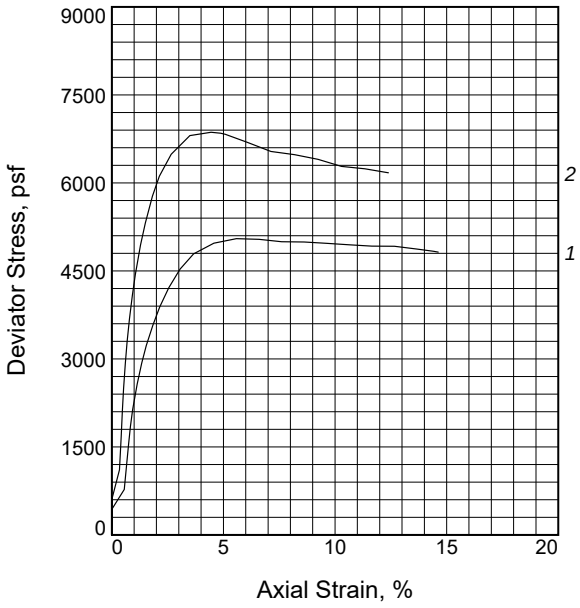
Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 130.10 psi (18734 psf)
Consolidation back pressure = 85.00 psi (12240 psf)
Consolidation effective confining stress = 6494 psf
Strain rate, in./min. = 0.01
Fail. Stress = 6865 psf **at reading no.** 18
Ult. Stress = 6173 psf **at reading no.** 27

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.7139	0.000	0.0	0.0	0	6494	6494	1.00	85.00	6494	0
1	2.7139	1.629	1.6	0.0	40	6553	6594	1.01	84.59	6573	20
2	2.7154	26.106	26.1	0.0	645	6512	7156	1.10	84.88	6834	322
3	2.7334	45.069	45.1	0.3	1110	6224	7334	1.18	86.88	6779	555
4	2.7379	68.090	68.1	0.4	1675	5901	7576	1.28	89.12	6738	838
5	2.7409	86.441	86.4	0.5	2126	5646	7772	1.38	90.89	6709	1063
6	2.7439	101.789	101.8	0.5	2502	5386	7888	1.46	92.70	6637	1251
7	2.7484	119.092	119.1	0.6	2925	5069	7993	1.58	94.90	6531	1462
8	2.7529	133.972	134.0	0.7	3287	4811	8098	1.68	96.69	6454	1644
9	2.7589	150.338	150.3	0.8	3685	4502	8187	1.82	98.84	6344	1843
10	2.7664	167.001	167.0	0.9	4088	4199	8288	1.97	100.94	6243	2044
11	2.7740	181.573	181.6	1.1	4439	3942	8381	2.13	102.73	6161	2220
12	2.7875	202.732	202.7	1.3	4944	3583	8527	2.38	105.22	6055	2472
13	2.7995	218.429	218.4	1.5	5316	3323	8639	2.60	107.02	5981	2658
14	2.8175	237.957	238.0	1.8	5773	3055	8827	2.89	108.89	5941	2886
15	2.8355	252.862	252.9	2.1	6114	2845	8960	3.15	110.34	5903	3057
16	2.8655	269.823	269.8	2.7	6490	2638	9128	3.46	111.78	5883	3245
17	2.9135	285.484	285.5	3.5	6807	2474	9281	3.75	112.92	5877	3403
18	2.9675	290.773	290.8	4.4	6865	2435	9300	3.82	113.19	5867	3432
19	2.9915	291.342	291.3	4.9	6848	2407	9255	3.84	113.38	5831	3424
20	3.0035	291.212	291.2	5.1	6830	2395	9224	3.85	113.47	5810	3415
21	3.0605	288.323	288.3	6.1	6691	2432	9122	3.75	113.21	5777	3345

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
22	3.1205	284.906	284.9	7.1	6537	2419	8957	3.70	113.30	5688	3269
23	3.1805	285.766	285.8	8.2	6483	2409	8892	3.69	113.37	5650	3241
24	3.2405	285.474	285.5	9.2	6402	2417	8819	3.65	113.32	5618	3201
25	3.3005	283.374	283.4	10.3	6281	2372	8653	3.65	113.63	5512	3141
26	3.3605	284.965	285.0	11.3	6242	2369	8611	3.64	113.65	5490	3121
27	3.4205	285.161	285.2	12.4	6173	2369	8542	3.61	113.65	5455	3086





Sample No.		1	2
Initial	Water Content, %	39.5	39.5
	Dry Density, pcf	82.6	82.6
	Saturation, %	99.6	99.6
	Void Ratio	1.1022	1.1024
	Diameter, in.	2.87	2.87
	Height, in.	6.04	6.00
At Test	Water Content, %	35.3	28.8
	Dry Density, pcf	87.5	96.4
	Saturation, %	100.0	100.0
	Void Ratio	0.9827	0.8002
	Diameter, in.	2.81	2.72
	Height, in.	5.92	5.70
Strain rate, in./min.		0.01	0.01
Back Pressure, psi		50.00	85.00
Cell Pressure, psi		81.30	130.10
Fail. Stress, psf		5050	6865
Excess Pore Pr., psf		2665	4060
Ult. Stress, psf		4820	6173
Excess Pore Pr., psf		2470	4125
$\bar{\sigma}_1$ Failure, psf		6892	9300
$\bar{\sigma}_3$ Failure, psf		1842	2435

Type of Test:
CU with Pore Pressures
Sample Type: Shelby
Description: CH - Fat CLAY

LL= 59 **PL=** 28 **PI=** 31
Specific Gravity= 2.78
Remarks:

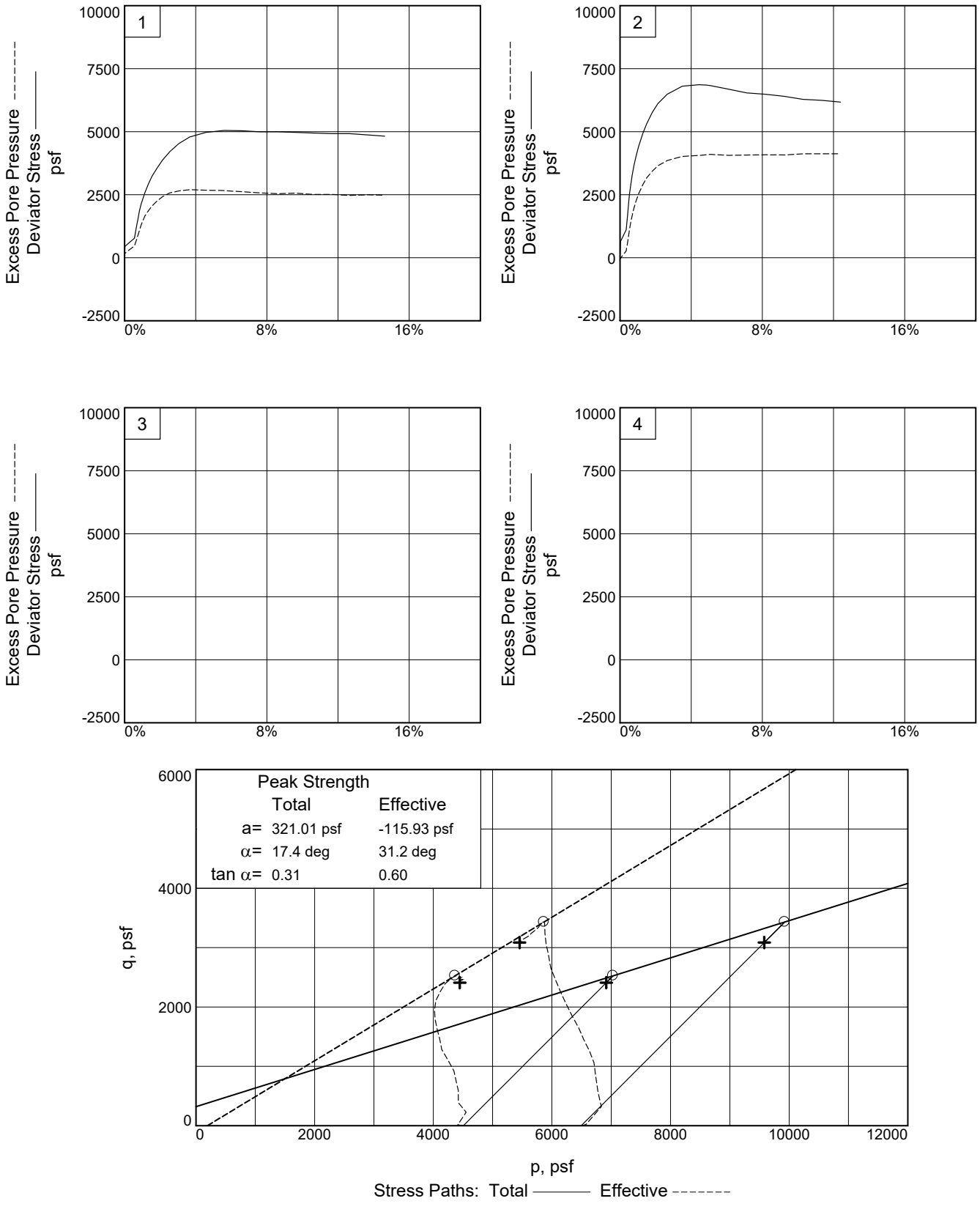
Client: WSDOT (Donald Anderson)

Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 12
Sample Number: S-5
Proj. No.: XL6097 **Date Sampled:** 12/10/2020

Figure _____

Tested By: SLW **Checked By:** SLW



Client: WSDOT (Donald Anderson)

Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 12 **Sample Number:** S-5

Project No.: XL6097 **Figure** _____

Washington State Department of Transportation

Tested By: SLW **Checked By:** SLW

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

1/19/2021
1:14 PM

Date: 12/10/2020
Client: WSDOT (Donald Anderson)
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project No.: XL6097
Location: H-1vwp-20
Depth: 12 **Sample Number:** S-5
Description: CH - Fat CLAY
Remarks:
Type of Sample: Shelby
Specific Gravity=2.78 **LL=**59 **PL=**28 **PI=**31
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	951.080			1241.760
Moisture content: Dry soil+tare, gms.	742.330			923.700
Moisture content: Tare, gms.	213.550			81.430
Moisture, %	39.5	39.1	35.3	37.8
Moist specimen weight, gms.	1181.1			
Diameter, in.	2.87	2.86	2.81	
Area, in.²	6.47	6.44	6.22	
Height, in.	6.04	6.03	5.92	
Net decrease in height, in.		0.01	0.10	
Wet density, pcf	115.1	115.7	118.5	
Dry density, pcf	82.6	83.2	87.5	
Void ratio	1.1022	1.0865	0.9827	
Saturation, %	99.6	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 81.30 psi (11707 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 4507 psf
Strain rate, in./min. = 0.01
Fail. Stress = 5050 psf **at reading no.** 17
Ult. Stress = 4820 psf **at reading no.** 27

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	951.080			1368.240
Moisture content: Dry soil+tare, gms.	742.330			1061.900
Moisture content: Tare, gms.	213.550			215.280
Moisture, %	39.5	36.7	28.8	36.2
Moist specimen weight, gms.	1173.1			
Diameter, in.	2.87	2.83	2.72	
Area, in.²	6.47	6.30	5.83	
Height, in.	6.00	5.92	5.70	
Net decrease in height, in.		0.08	0.22	
Wet density, pcf	115.1	117.5	124.2	
Dry density, pcf	82.6	85.9	96.4	
Void ratio	1.1024	1.0193	0.8002	
Saturation, %	99.6	100.0	100.0	

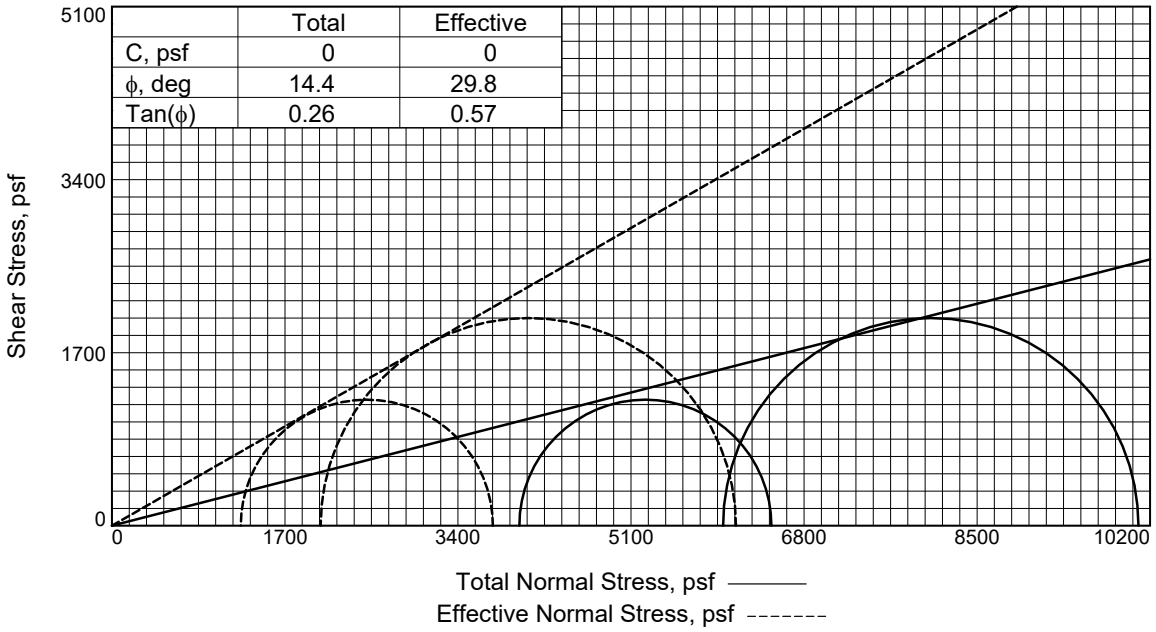
Test Readings for Specimen No. 2

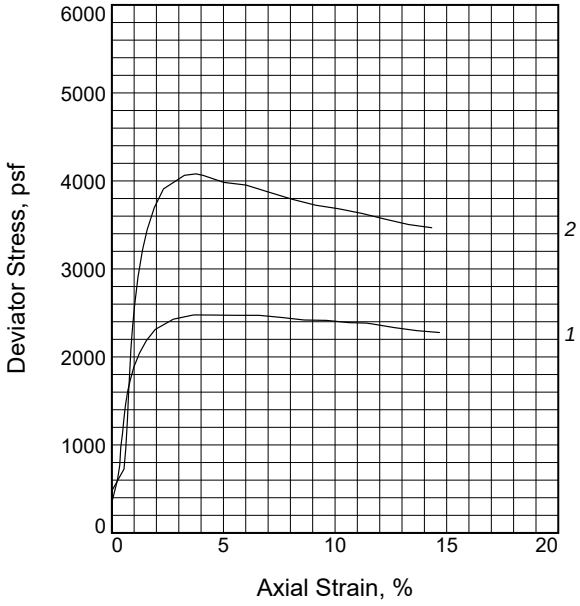
Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 130.10 psi (18734 psf)
Consolidation back pressure = 85.00 psi (12240 psf)
Consolidation effective confining stress = 6494 psf
Strain rate, in./min. = 0.01
Fail. Stress = 6865 psf **at reading no.** 18
Ult. Stress = 6173 psf **at reading no.** 27

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.7139	0.000	0.0	0.0	0	6494	6494	1.00	85.00	6494	0
1	2.7139	1.629	1.6	0.0	40	6553	6594	1.01	84.59	6573	20
2	2.7154	26.106	26.1	0.0	645	6512	7156	1.10	84.88	6834	322
3	2.7334	45.069	45.1	0.3	1110	6224	7334	1.18	86.88	6779	555
4	2.7379	68.090	68.1	0.4	1675	5901	7576	1.28	89.12	6738	838
5	2.7409	86.441	86.4	0.5	2126	5646	7772	1.38	90.89	6709	1063
6	2.7439	101.789	101.8	0.5	2502	5386	7888	1.46	92.70	6637	1251
7	2.7484	119.092	119.1	0.6	2925	5069	7993	1.58	94.90	6531	1462
8	2.7529	133.972	134.0	0.7	3287	4811	8098	1.68	96.69	6454	1644
9	2.7589	150.338	150.3	0.8	3685	4502	8187	1.82	98.84	6344	1843
10	2.7664	167.001	167.0	0.9	4088	4199	8288	1.97	100.94	6243	2044
11	2.7740	181.573	181.6	1.1	4439	3942	8381	2.13	102.73	6161	2220
12	2.7875	202.732	202.7	1.3	4944	3583	8527	2.38	105.22	6055	2472
13	2.7995	218.429	218.4	1.5	5316	3323	8639	2.60	107.02	5981	2658
14	2.8175	237.957	238.0	1.8	5773	3055	8827	2.89	108.89	5941	2886
15	2.8355	252.862	252.9	2.1	6114	2845	8960	3.15	110.34	5903	3057
16	2.8655	269.823	269.8	2.7	6490	2638	9128	3.46	111.78	5883	3245
17	2.9135	285.484	285.5	3.5	6807	2474	9281	3.75	112.92	5877	3403
18	2.9675	290.773	290.8	4.4	6865	2435	9300	3.82	113.19	5867	3432
19	2.9915	291.342	291.3	4.9	6848	2407	9255	3.84	113.38	5831	3424
20	3.0035	291.212	291.2	5.1	6830	2395	9224	3.85	113.47	5810	3415
21	3.0605	288.323	288.3	6.1	6691	2432	9122	3.75	113.21	5777	3345

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
22	3.1205	284.906	284.9	7.1	6537	2419	8957	3.70	113.30	5688	3269
23	3.1805	285.766	285.8	8.2	6483	2409	8892	3.69	113.37	5650	3241
24	3.2405	285.474	285.5	9.2	6402	2417	8819	3.65	113.32	5618	3201
25	3.3005	283.374	283.4	10.3	6281	2372	8653	3.65	113.63	5512	3141
26	3.3605	284.965	285.0	11.3	6242	2369	8611	3.64	113.65	5490	3121
27	3.4205	285.161	285.2	12.4	6173	2369	8542	3.61	113.65	5455	3086





Sample No.		1	2
Initial	Water Content, %	38.1	38.1
	Dry Density, pcf	80.9	81.5
	Saturation, %	93.2	94.5
	Void Ratio	1.1234	1.1071
	Diameter, in.	2.86	2.85
	Height, in.	6.03	5.67
At Test	Water Content, %	38.5	32.7
	Dry Density, pcf	83.4	90.4
	Saturation, %	100.0	100.0
	Void Ratio	1.0579	0.8993
	Diameter, in.	2.83	2.75
	Height, in.	5.97	5.48
Strain rate, in./min.		0.01	0.01
Back Pressure, psi		50.00	50.00
Cell Pressure, psi		77.80	91.70
Fail. Stress, psf		2476	4080
Excess Pore Pr., psf		2737	3954
Ult. Stress, psf		2277	3468
Excess Pore Pr., psf		3077	4578
$\bar{\sigma}_1$ Failure, psf		3742	6131
$\bar{\sigma}_3$ Failure, psf		1266	2051

Type of Test:
CU with Pore Pressures
Sample Type: Shelby
Description: CL - Lean CLAY

LL= 45 **PL=** 22 **PI=** 23
Specific Gravity= 2.75
Remarks:

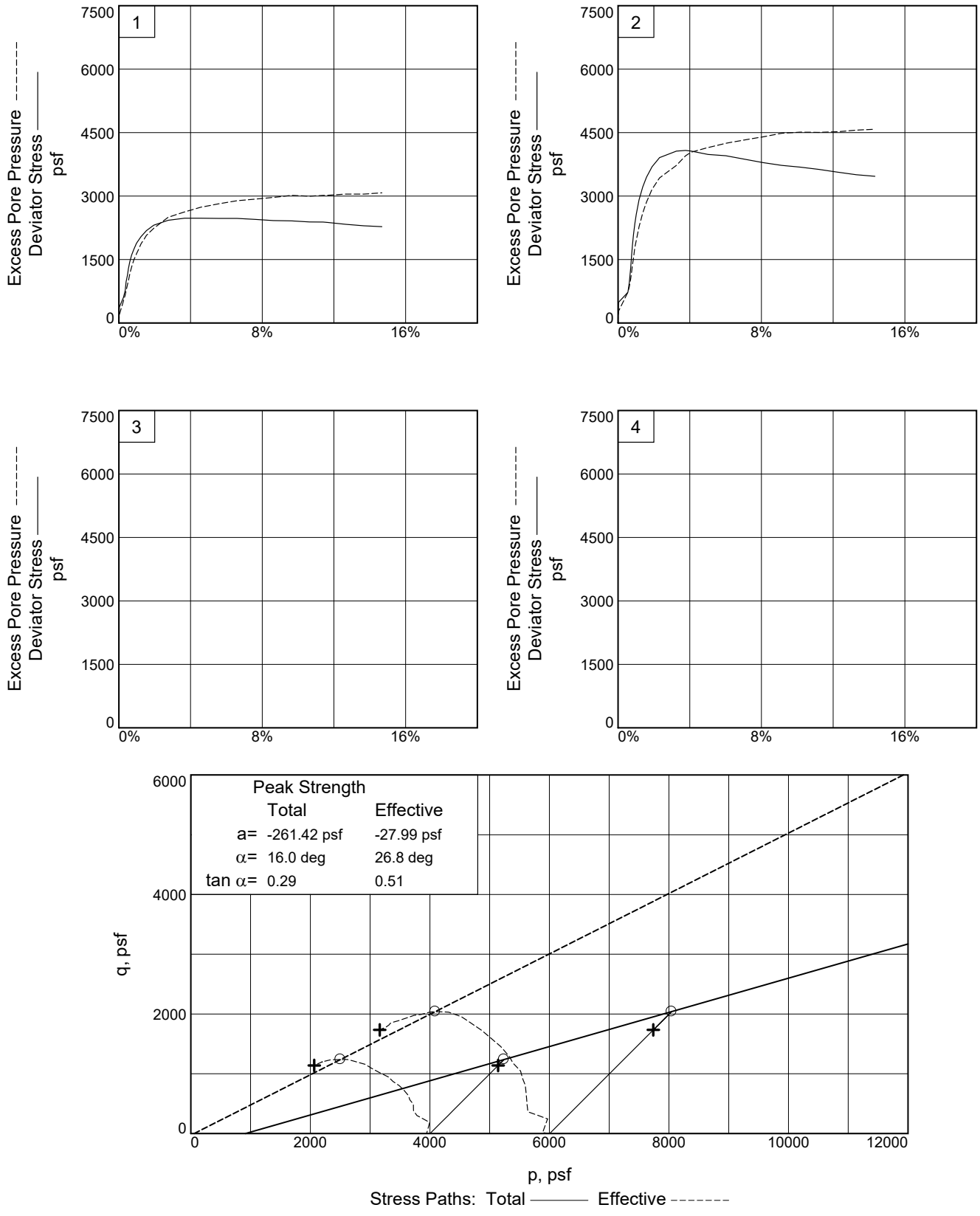
Client: WSDOT (Donald Anderson)

Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 22.5
Sample Number: S-9
Proj. No.: XL6097 **Date Sampled:** 1/11/2021

Figure _____

Tested By: SLW **Checked By:** SLW



Client: WSDOT (Donald Anderson)

Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 22.5 **Sample Number:** S-9

Project No.: XL6097 **Figure** _____

Washington State Department of Transportation

Tested By: SLW **Checked By:** SLW

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

1/19/2021
1:13 PM

Date: 1/11/2021
Client: WSDOT (Donald Anderson)
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project No.: XL6097
Location: H-1vwp-20
Depth: 22.5 **Sample Number:** S-9
Description: CL - Lean CLAY
Remarks:
Type of Sample: Shelby
Specific Gravity=2.75 **LL=**45 **PL=**22 **PI=**23
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1053.800			1170.090
Moisture content: Dry soil+tare, gms.	837.017			876.700
Moisture content: Tare, gms.	267.400			82.390
Moisture, %	38.1	39.2	38.5	36.9
Moist specimen weight, gms.	1135.0			
Diameter, in.	2.86	2.84	2.83	
Area, in.²	6.42	6.33	6.29	
Height, in.	6.03	5.99	5.97	
Net decrease in height, in.		0.04	0.02	
Wet density, pcf	111.6	115.0	115.5	
Dry density, pcf	80.9	82.6	83.4	
Void ratio	1.1234	1.0785	1.0579	
Saturation, %	93.2	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 77.80 psi (11203 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 4003 psf
Strain rate, in./min. = 0.01
Fail. Stress = 2476 psf **at reading no.** 17
Ult. Stress = 2277 psf **at reading no.** 28

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.8050	0.000	0.0	0.0	0	4003	4003	1.00	50.00	4003	0
1	2.8051	0.063	0.1	0.0	1	3944	3945	1.00	50.41	3945	1
2	2.8066	16.295	16.3	0.0	373	3811	4184	1.10	51.34	3997	186
3	2.8201	26.400	26.4	0.3	603	3481	4084	1.17	53.63	3783	301
4	2.8262	33.692	33.7	0.4	768	3342	4110	1.23	54.59	3726	384
5	2.8292	42.818	42.8	0.4	976	3236	4212	1.30	55.33	3724	488
6	2.8337	49.688	49.7	0.5	1132	3098	4230	1.37	56.29	3664	566
7	2.8367	56.096	56.1	0.5	1277	3001	4278	1.43	56.96	3639	639
8	2.8413	63.375	63.4	0.6	1442	2849	4290	1.51	58.02	3570	721
9	2.8473	70.673	70.7	0.7	1606	2682	4288	1.60	59.18	3485	803
10	2.8548	76.785	76.8	0.8	1743	2511	4253	1.69	60.37	3382	871
11	2.8639	83.264	83.3	1.0	1887	2366	4253	1.80	61.37	3310	944
12	2.8789	90.377	90.4	1.2	2043	2131	4174	1.96	63.00	3153	1022
13	2.8970	96.891	96.9	1.5	2184	1931	4115	2.13	64.39	3023	1092
14	2.9211	103.042	103.0	1.9	2313	1764	4077	2.31	65.55	2921	1156
15	2.9694	109.115	109.1	2.8	2429	1503	3931	2.62	67.37	2717	1214
16	3.0236	112.356	112.4	3.7	2477	1378	3856	2.80	68.23	2617	1239
17	3.0779	113.361	113.4	4.6	2476	1266	3742	2.96	69.01	2504	1238
18	3.1382	114.440	114.4	5.6	2473	1185	3659	3.09	69.57	2422	1237
19	3.1985	115.673	115.7	6.6	2473	1114	3587	3.22	70.07	2350	1237
20	3.2588	115.822	115.8	7.6	2449	1074	3524	3.28	70.34	2299	1225
21	3.3191	115.725	115.7	8.6	2421	1036	3456	3.34	70.61	2246	1210
22	3.3794	116.755	116.8	9.6	2415	987	3402	3.45	70.95	2194	1208
23	3.4396	116.801	116.8	10.6	2389	1006	3395	3.38	70.82	2200	1195
24	3.4849	117.613	117.6	11.4	2385	987	3372	3.42	70.95	2180	1193
25	3.4999	117.526	117.5	11.6	2377	985	3362	3.41	70.96	2174	1188
26	3.5602	116.739	116.7	12.7	2334	957	3291	3.44	71.16	2124	1167
27	3.6205	116.302	116.3	13.7	2298	957	3255	3.40	71.16	2106	1149
28	3.6808	116.613	116.6	14.7	2277	927	3204	3.46	71.37	2065	1139

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1053.800			1141.560
Moisture content: Dry soil+tare, gms.	837.017			818.400
Moisture content: Tare, gms.	267.400			82.650
Moisture, %	38.1	39.6	32.7	43.9
Moist specimen weight, gms.	1068.0			
Diameter, in.	2.85	2.84	2.75	
Area, in.²	6.38	6.34	5.95	
Height, in.	5.67	5.65	5.48	
Net decrease in height, in.		0.02	0.17	
Wet density, pcf	112.5	114.7	119.9	
Dry density, pcf	81.5	82.2	90.4	
Void ratio	1.1071	1.0893	0.8993	
Saturation, %	94.5	100.0	100.0	

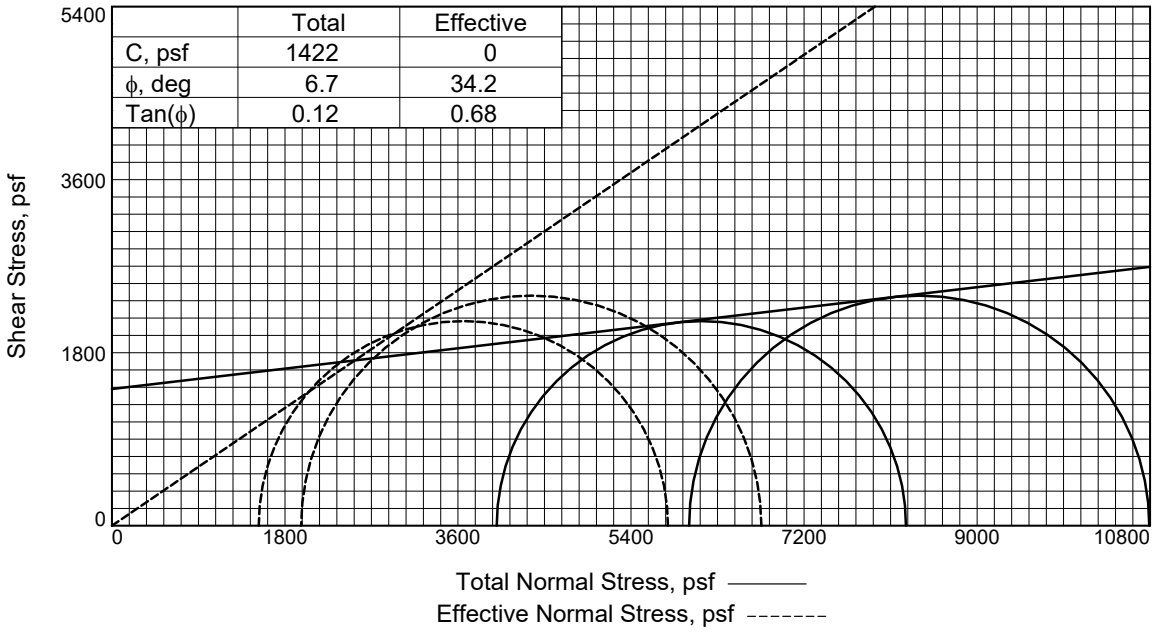
Test Readings for Specimen No. 2

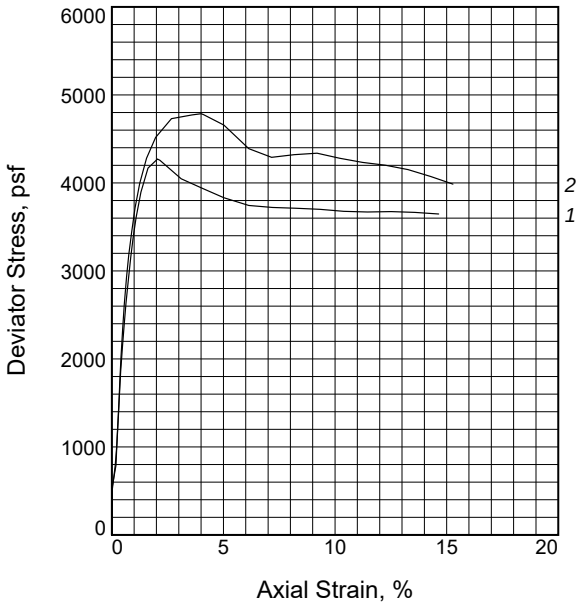
Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 91.70 psi (13205 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 6005 psf
Strain rate, in./min. = 0.01
Fail. Stress = 4080 psf **at reading no.** 17
Ult. Stress = 3468 psf **at reading no.** 28

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	3.0462	0.000	0.0	0.0	0	6005	6005	1.00	50.00	6005	0
1	3.0462	1.196	1.2	0.0	29	5871	5900	1.00	50.93	5886	14
2	3.0476	20.218	20.2	0.0	489	5725	6214	1.09	51.94	5970	245
3	3.0761	30.201	30.2	0.5	727	5278	6004	1.14	55.05	5641	363
4	3.0804	39.554	39.6	0.6	951	5151	6102	1.18	55.93	5627	476
5	3.0847	53.820	53.8	0.7	1293	4966	6260	1.26	57.21	5613	647
6	3.0876	67.019	67.0	0.8	1610	4793	6402	1.34	58.42	5597	805
7	3.0904	77.569	77.6	0.8	1862	4616	6478	1.40	59.64	5547	931
8	3.0933	87.291	87.3	0.9	2094	4470	6564	1.47	60.66	5517	1047
9	3.0975	98.173	98.2	0.9	2354	4215	6568	1.56	62.43	5392	1177
10	3.1018	107.171	107.2	1.0	2567	4049	6616	1.63	63.58	5333	1284
11	3.1104	121.673	121.7	1.2	2910	3732	6642	1.78	65.79	5187	1455
12	3.1218	134.778	134.8	1.4	3217	3398	6615	1.95	68.10	5006	1608
13	3.1332	144.748	144.7	1.6	3447	3147	6595	2.10	69.84	4871	1724
14	3.1503	155.653	155.7	1.9	3695	2839	6535	2.30	71.98	4687	1848
15	3.1731	165.366	165.4	2.3	3909	2573	6483	2.52	73.83	4528	1955
16	3.2244	173.558	173.6	3.3	4064	2279	6343	2.78	75.87	4311	2032
17	3.2529	175.211	175.2	3.8	4080	2051	6131	2.99	77.46	4091	2040
18	3.2700	175.060	175.1	4.1	4064	1966	6029	3.07	78.05	3997	2032
19	3.3213	173.316	173.3	5.0	3984	1858	5842	3.14	78.80	3850	1992
20	3.3755	173.792	173.8	6.0	3953	1757	5710	3.25	79.50	3733	1977
21	3.4325	172.105	172.1	7.0	3871	1678	5550	3.31	80.04	3614	1936

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
22	3.4895	170.472	170.5	8.1	3792	1605	5396	3.36	80.56	3500	1896
23	3.5465	169.384	169.4	9.1	3725	1521	5246	3.45	81.14	3383	1862
24	3.6035	169.477	169.5	10.2	3684	1493	5178	3.47	81.33	3335	1842
25	3.6605	168.955	169.0	11.2	3630	1499	5130	3.42	81.29	3314	1815
26	3.7175	167.918	167.9	12.3	3566	1484	5050	3.40	81.40	3267	1783
27	3.7745	167.059	167.1	13.3	3506	1446	4951	3.42	81.66	3199	1753
28	3.8315	167.270	167.3	14.3	3468	1427	4894	3.43	81.79	3161	1734





Sample No.		1	2
Initial	Water Content, %	56.3	56.3
	Dry Density, pcf	69.3	69.6
	Saturation, %	103.2	103.9
	Void Ratio	1.5396	1.5288
	Diameter, in.	2.86	2.80
	Height, in.	5.96	6.06
At Test	Water Content, %	39.4	40.4
	Dry Density, pcf	83.4	82.2
	Saturation, %	100.0	100.0
	Void Ratio	1.1100	1.1407
	Diameter, in.	2.69	2.65
	Height, in.	5.61	5.74
Strain rate, in./min.		0.01	0.01
Back Pressure, psi		50.00	50.00
Cell Pressure, psi		77.80	91.70
Fail. Stress, psf		4257	4787
Excess Pore Pr., psf		2476	4036
Ult. Stress, psf		4271	4787
Excess Pore Pr., psf		2401	4036
$\bar{\sigma}_1$ Failure, psf		5784	6756
$\bar{\sigma}_3$ Failure, psf		1527	1969

Type of Test:
CU with Pore Pressures
Sample Type: Shebly
Description: CH -Fat CLAY

LL= 71 **PL=** 28 **PI=** 43
Specific Gravity= 2.82
Remarks:

Figure _____

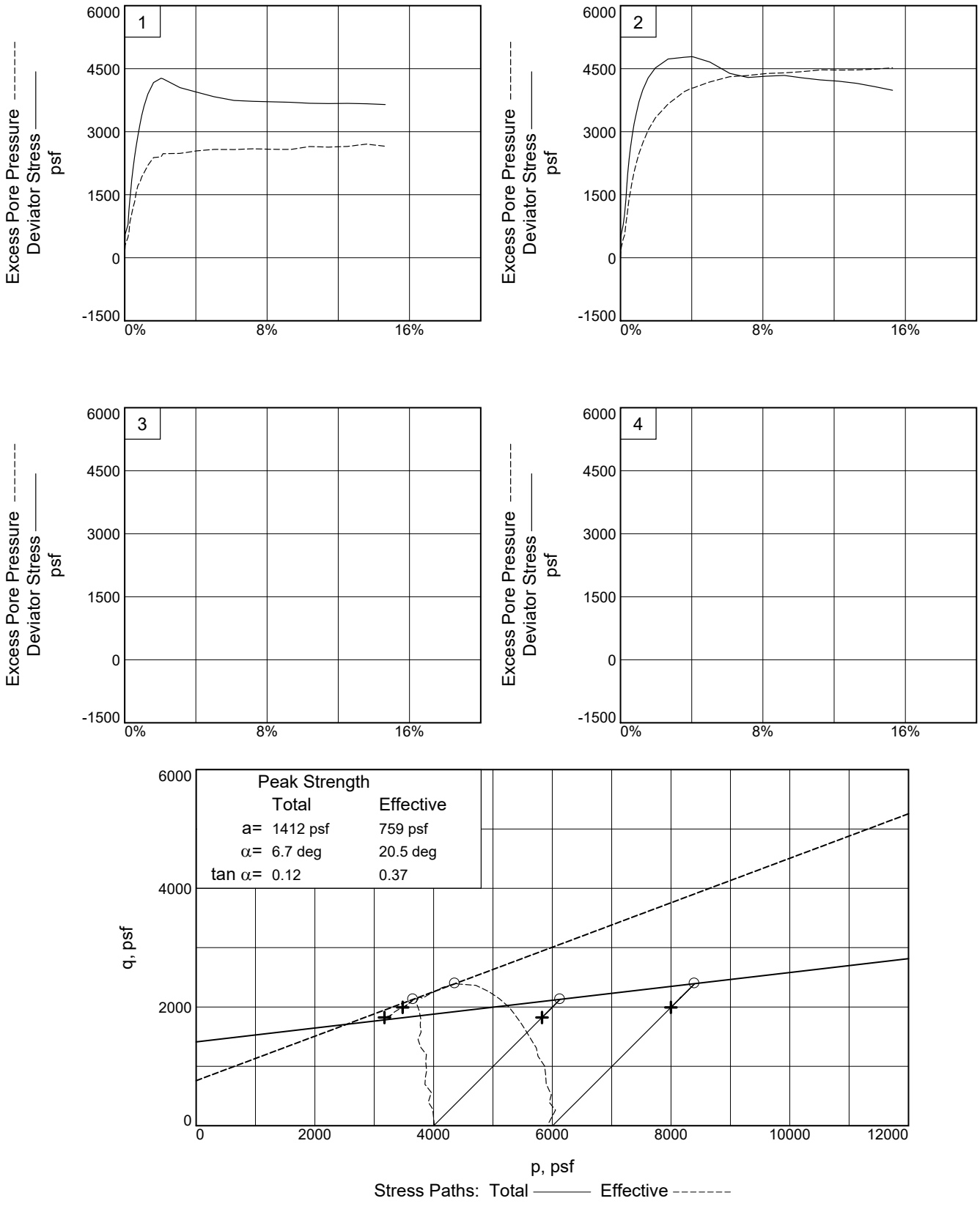
Client: WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 **Depth:** 9
Sample Number: S-4
Proj. No.: XL6097 **Date Sampled:** 9/17/2020

WSDOT

Tested By: SLW **Checked By:** SLW



Client: WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 **Depth:** 9 **Sample Number:** S-4

Project No.: XL6097 **Figure** _____

Washington State Department of Transportation

Tested By: SLW **Checked By:** SLW

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

12/1/2020
8:05 AM

Date: 9/17/2020
Client: WSDOT (Donald Anderson)
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project No.: XL6097
Location: H-2vwp-20
Depth: 9 **Sample Number:** S-4
Description: CH -Fat CLAY
Remarks:
Type of Sample: Shebly
Specific Gravity=2.82 **LL=**71 **PL=**28 **PI=**43
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	228.900			1305.130
Moisture content: Dry soil+tare, gms.	176.900			967.700
Moisture content: Tare, gms.	84.590			234.100
Moisture, %	56.3	48.5	39.4	46.0
Moist specimen weight, gms.	1089.2			
Diameter, in.	2.86	2.79	2.69	
Area, in.²	6.42	6.13	5.67	
Height, in.	5.96	5.82	5.61	
Net decrease in height, in.		0.14	0.21	
Wet density, pcf	108.4	110.4	116.3	
Dry density, pcf	69.3	74.4	83.4	
Void ratio	1.5396	1.3676	1.1100	
Saturation, %	103.2	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 77.80 psi (11203 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 4003 psf
Strain rate, in./min. = 0.01
Fail. Stress = 4257 psf **at reading no.** 18
Ult. Stress = 4271 psf **at reading no.** 17

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.9588	0.000	0.0	0.0	0	4003	4003	1.00	50.00	4003	0
1	2.9589	0.598	0.6	0.0	15	4005	4020	1.00	49.99	4012	8
2	2.9603	21.959	22.0	0.0	557	3706	4263	1.15	52.07	3985	279
3	2.9693	31.291	31.3	0.2	793	3515	4308	1.23	53.39	3911	397
4	2.9723	44.294	44.3	0.2	1122	3400	4522	1.33	54.19	3961	561
5	2.9753	54.978	55.0	0.3	1392	3159	4551	1.44	55.86	3855	696
6	2.9782	64.135	64.1	0.3	1623	3050	4673	1.53	56.62	3862	812
7	2.9812	73.399	73.4	0.4	1857	2955	4811	1.63	57.28	3883	928
8	2.9857	85.113	85.1	0.5	2151	2791	4942	1.77	58.42	3867	1076
9	2.9902	95.030	95.0	0.6	2400	2679	5079	1.90	59.19	3879	1200
10	2.9946	104.446	104.4	0.6	2635	2467	5103	2.07	60.67	3785	1318
11	3.0006	115.188	115.2	0.7	2903	2286	5190	2.27	61.92	3738	1452
12	3.0066	125.554	125.6	0.9	3161	2209	5370	2.43	62.46	3789	1581
13	3.0125	134.505	134.5	1.0	3383	2083	5466	2.62	63.34	3774	1692
14	3.0200	143.671	143.7	1.1	3609	1979	5588	2.82	64.06	3783	1804
15	3.0319	155.413	155.4	1.3	3895	1806	5702	3.16	65.26	3754	1948
16	3.0498	166.879	166.9	1.6	4169	1619	5788	3.58	66.56	3703	2085
17	3.0736	171.715	171.7	2.0	4271	1602	5874	3.67	66.67	3738	2136
18	3.0796	171.325	171.3	2.2	4257	1527	5784	3.79	67.20	3656	2129
19	3.1333	164.501	164.5	3.1	4048	1520	5568	3.66	67.24	3544	2024
20	3.1869	161.679	161.7	4.1	3939	1459	5397	3.70	67.67	3428	1969
21	3.2406	158.901	158.9	5.0	3833	1424	5257	3.69	67.91	3341	1916
22	3.3032	157.085	157.1	6.1	3744	1428	5172	3.62	67.88	3300	1872
23	3.3628	157.946	157.9	7.2	3722	1409	5132	3.64	68.01	3270	1861
24	3.4224	159.344	159.3	8.3	3712	1421	5133	3.61	67.93	3277	1856
25	3.4820	160.689	160.7	9.3	3700	1425	5126	3.60	67.90	3275	1850
26	3.5417	161.583	161.6	10.4	3677	1356	5033	3.71	68.38	3194	1839
27	3.6013	163.222	163.2	11.5	3670	1370	5040	3.68	68.29	3205	1835
28	3.6609	165.398	165.4	12.5	3675	1355	5029	3.71	68.39	3192	1837
29	3.7205	167.030	167.0	13.6	3666	1298	4964	3.82	68.79	3131	1833
30	3.7801	168.230	168.2	14.6	3647	1349	4996	3.70	68.43	3172	1823

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	228.900			262.780
Moisture content: Dry soil+tare, gms.	176.900			208.600
Moisture content: Tare, gms.	84.590			84.830
Moisture, %	56.3	51.8	40.4	43.8
Moist specimen weight, gms.	1066.0			
Diameter, in.	2.80	2.78	2.65	
Area, in.²	6.16	6.05	5.50	
Height, in.	6.06	6.01	5.74	
Net decrease in height, in.		0.05	0.27	
Wet density, pcf	108.8	108.6	115.5	
Dry density, pcf	69.6	71.5	82.2	
Void ratio	1.5288	1.4620	1.1407	
Saturation, %	103.9	100.0	100.0	

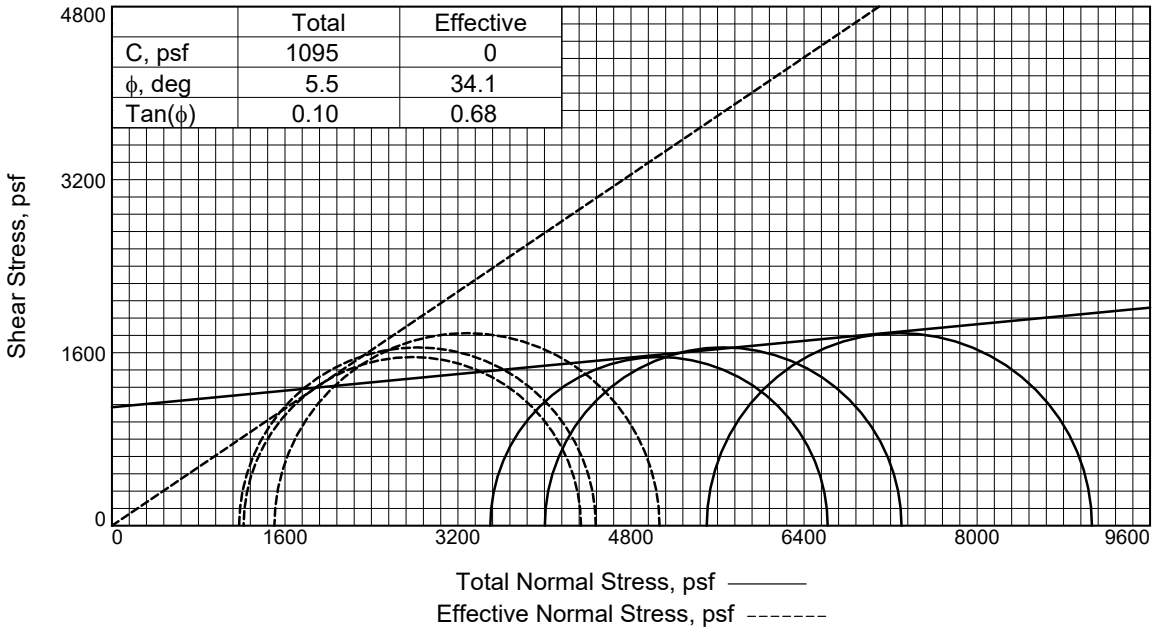
Test Readings for Specimen No. 2

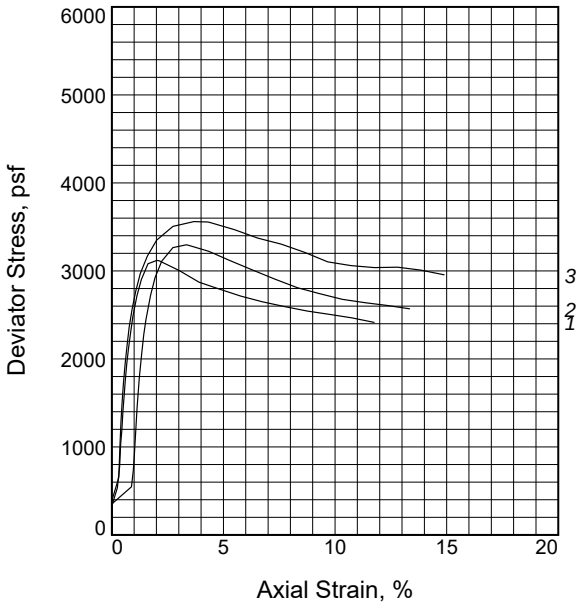
Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 91.70 psi (13205 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 6005 psf
Strain rate, in./min. = 0.01
Fail. Stress = 4787 psf **at reading no.** 19
Ult. Stress = 4787 psf **at reading no.** 19

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.5594	0.000	0.0	0.0	0	6005	6005	1.00	50.00	6005	0
1	2.5594	0.093	0.1	0.0	2	5915	5917	1.00	50.62	5916	1
2	2.5609	20.045	20.0	0.0	524	5791	6316	1.09	51.48	6053	262
3	2.5682	30.162	30.2	0.2	788	5556	6344	1.14	53.12	5950	394
4	2.5726	39.799	39.8	0.2	1039	5464	6503	1.19	53.76	5983	519
5	2.5769	53.969	54.0	0.3	1408	5194	6602	1.27	55.63	5898	704
6	2.5799	66.355	66.4	0.4	1730	5022	6752	1.34	56.82	5887	865
7	2.5828	77.015	77.0	0.4	2007	4867	6874	1.41	57.90	5870	1003
8	2.5872	89.920	89.9	0.5	2341	4589	6930	1.51	59.83	5759	1171
9	2.5916	100.668	100.7	0.6	2619	4421	7040	1.59	61.00	5731	1309
10	2.5974	112.708	112.7	0.7	2929	4171	7100	1.70	62.74	5635	1465
11	2.6033	122.739	122.7	0.8	3186	3965	7152	1.80	64.16	5559	1593
12	2.6106	132.962	133.0	0.9	3447	3751	7199	1.92	65.65	5475	1724
13	2.6193	143.650	143.7	1.0	3719	3518	7236	2.06	67.27	5377	1859
14	2.6310	154.639	154.6	1.2	3995	3275	7270	2.22	68.95	5273	1998
15	2.6486	166.226	166.2	1.6	4281	2965	7246	2.44	71.11	5106	2141
16	2.6719	176.133	176.1	2.0	4517	2674	7192	2.69	73.13	4933	2259
17	2.7129	185.784	185.8	2.7	4730	2346	7076	3.02	75.41	4711	2365
18	2.7655	189.234	189.2	3.6	4773	2049	6821	3.33	77.47	4435	2386
19	2.7889	190.600	190.6	4.0	4787	1969	6756	3.43	78.03	4362	2393
20	2.7947	190.434	190.4	4.1	4778	1960	6737	3.44	78.09	4349	2389
21	2.8473	187.438	187.4	5.0	4658	1820	6478	3.56	79.06	4149	2329

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
22	2.9116	178.748	178.7	6.1	4389	1695	6084	3.59	79.93	3889	2195
23	2.9701	176.676	176.7	7.2	4291	1667	5958	3.57	80.13	3812	2146
24	3.0285	179.891	179.9	8.2	4321	1620	5942	3.67	80.45	3781	2161
25	3.0870	182.630	182.6	9.2	4339	1605	5944	3.70	80.55	3774	2169
26	3.1454	182.232	182.2	10.2	4281	1575	5856	3.72	80.76	3715	2140
27	3.2039	182.293	182.3	11.2	4233	1534	5767	3.76	81.05	3650	2117
28	3.2623	183.014	183.0	12.2	4201	1537	5739	3.73	81.02	3638	2101
29	3.3208	182.982	183.0	13.3	4152	1535	5687	3.70	81.04	3611	2076
30	3.3792	181.621	181.6	14.3	4073	1515	5587	3.69	81.18	3551	2036
31	3.4363	179.881	179.9	15.3	3987	1486	5472	3.68	81.38	3479	1993





Sample No.		1	2	3
Initial	Water Content, %	52.5	52.5	52.5
	Dry Density, pcf	69.8	71.3	70.5
	Saturation, %	98.4	102.1	100.2
	Void Ratio	1.4786	1.4243	1.4518
	Diameter, in.	2.87	2.87	2.87
	Height, in.	5.96	5.95	6.07
At Test	Water Content, %	49.3	45.9	41.9
	Dry Density, pcf	73.1	76.1	80.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.3668	1.2726	1.1600
	Diameter, in.	2.83	2.81	2.75
	Height, in.	5.87	5.82	5.82
Strain rate, in./min.		0.01	0.01	0.01
Back Pressure, psi		50.00	50.00	40.00
Cell Pressure, psi		74.30	77.80	78.20
Fail. Stress, psf		3120	3298	3562
Excess Pore Pr., psf		2281	2827	3998
Ult. Stress, psf		2416	2741	3038
Excess Pore Pr., psf		2582	3274	4474
$\bar{\sigma}_1$ Failure, psf		4337	4474	5064
$\bar{\sigma}_3$ Failure, psf		1218	1177	1502

Type of Test:
CU with Pore Pressures
Sample Type: SHEBLY TUBE
Description: CH - Fat CLAY

LL= 53 **PL=** 25 **PI=** 28
Specific Gravity= 2.77
Remarks:

Figure _____

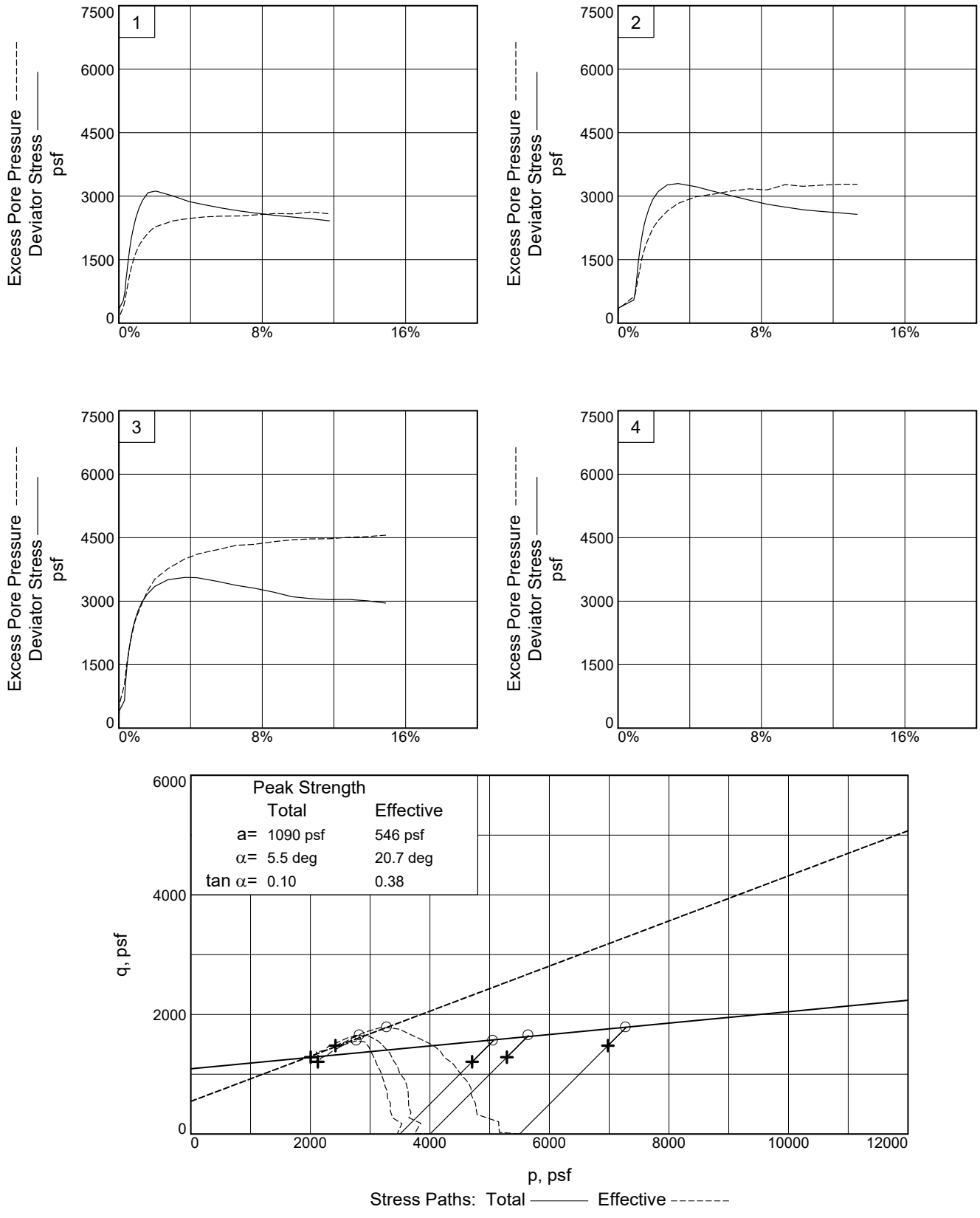
Client: WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 **Depth:** 14.4
Sample Number: S-6
Proj. No.: XL6097 **Date Sampled:** 11/17/2020

WSDOT

Tested By: SLW **Checked By:** SLW



Client: WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 **Depth:** 14.4 **Sample Number:** S-6

Project No.: XL6097 **Figure** _____

Washington State Department of Transportation

Tested By: SLW **Checked By:** SLW

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

12/1/2020
8:09 AM

Date: 11/17/2020
Client: WSDOT (Donald Anderson)
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project No.: XL6097
Location: H-2vwp-20
Depth: 14.4 **Sample Number:** S-6
Description: CH - Fat CLAY
Remarks:
Type of Sample: SHEBLY TUBE
Specific Gravity=2.77 **LL=**53 **PL=**25 **PI=**28
Test Method: COE uniform strain

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	502.900			1132.570
Moisture content: Dry soil+tare, gms.	404.070			785.200
Moisture content: Tare, gms.	215.830			84.910
Moisture, %	52.5	53.3	49.3	49.6
Moist specimen weight, gms.	1076.8			
Diameter, in.	2.87	2.87	2.83	
Area, in.²	6.47	6.46	6.27	
Height, in.	5.96	5.96	5.87	
Net decrease in height, in.		0.00	0.09	
Wet density, pcf	106.4	107.1	109.1	
Dry density, pcf	69.8	69.8	73.1	
Void ratio	1.4786	1.4761	1.3668	
Saturation, %	98.4	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 74.30 psi (10699 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 3499 psf
Strain rate, in./min. = 0.01
Fail. Stress = 3120 psf **at reading no.** 17
Ult. Stress = 2416 psf **at reading no.** 28

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.7647	0.000	0.0	0.0	0	3499	3499	1.00	50.00	3499	0
1	2.7647	0.975	1.0	0.0	22	3446	3469	1.01	50.37	3458	11
2	2.7662	15.289	15.3	0.0	351	3356	3707	1.10	50.99	3532	175
3	2.7794	23.408	23.4	0.3	536	3112	3648	1.17	52.69	3380	268
4	2.7852	33.751	33.8	0.3	772	2952	3724	1.26	53.80	3338	386
5	2.7882	45.116	45.1	0.4	1032	2825	3857	1.37	54.68	3341	516
6	2.7911	52.173	52.2	0.4	1192	2696	3888	1.44	55.58	3292	596
7	2.7940	61.569	61.6	0.5	1406	2588	3994	1.54	56.33	3291	703
8	2.7970	69.192	69.2	0.5	1580	2464	4043	1.64	57.19	3253	790
9	2.7999	76.383	76.4	0.6	1743	2361	4103	1.74	57.91	3232	871
10	2.8043	85.443	85.4	0.7	1948	2224	4172	1.88	58.86	3198	974
11	2.8087	93.124	93.1	0.7	2122	2107	4229	2.01	59.67	3168	1061
12	2.8145	101.699	101.7	0.8	2315	1957	4272	2.18	60.71	3114	1157
13	2.8204	109.370	109.4	0.9	2487	1839	4326	2.35	61.53	3083	1243
14	2.8306	119.698	119.7	1.1	2717	1665	4382	2.63	62.73	3024	1358
15	2.8423	128.105	128.1	1.3	2902	1531	4433	2.90	63.67	2982	1451
16	2.8599	136.458	136.5	1.6	3082	1369	4451	3.25	64.79	2910	1541
17	2.8833	138.697	138.7	2.0	3120	1218	4337	3.56	65.84	2778	1560
18	2.8892	138.646	138.6	2.1	3115	1211	4326	3.57	65.89	2769	1558
19	2.9419	134.966	135.0	3.0	3005	1082	4087	3.78	66.79	2584	1502
20	2.9946	130.209	130.2	3.9	2872	1026	3898	3.80	67.18	2462	1436
21	3.0473	127.860	127.9	4.8	2794	987	3781	3.83	67.44	2384	1397
22	3.1029	125.529	125.5	5.8	2716	971	3687	3.80	67.56	2329	1358
23	3.1615	123.778	123.8	6.8	2649	967	3617	3.74	67.58	2292	1325
24	3.2201	122.485	122.5	7.8	2594	938	3532	3.76	67.78	2235	1297
25	3.2786	121.477	121.5	8.8	2545	908	3452	3.80	67.99	2180	1272
26	3.3372	120.962	121.0	9.8	2506	919	3425	3.73	67.92	2172	1253
27	3.3957	120.390	120.4	10.8	2467	870	3337	3.84	68.26	2103	1233
28	3.4543	119.246	119.2	11.7	2416	918	3333	3.63	67.93	2125	1208

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	502.900			1156.500
Moisture content: Dry soil+tare, gms.	404.070			829.500
Moisture content: Tare, gms.	215.830			88.000
Moisture, %	52.5	50.4	45.9	44.1
Moist specimen weight, gms.	1099.1			
Diameter, in.	2.87	2.86	2.81	
Area, in.²	6.47	6.42	6.20	
Height, in.	5.95	5.93	5.82	
Net decrease in height, in.		0.02	0.10	
Wet density, pcf	108.8	108.5	111.1	
Dry density, pcf	71.3	72.2	76.1	
Void ratio	1.4243	1.3964	1.2726	
Saturation, %	102.1	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 77.80 psi (11203 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 4003 psf
Strain rate, in./min. = 0.01
Fail. Stress = 3298 psf **at reading no.** 15
Ult. Stress = 2741 psf **at reading no.** 22

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.8232	0.000	0.0	0.0	0	4003	4003	1.00	50.00	4003	0
1	2.8233	0.789	0.8	0.0	18	3736	3754	1.00	51.86	3745	9
2	2.8247	15.405	15.4	0.0	358	3668	4026	1.10	52.33	3847	179
3	2.8745	25.970	26.0	0.9	548	3374	3921	1.16	54.37	3648	274
4	2.8788	33.750	33.8	1.0	722	3323	4045	1.22	54.72	3684	361
5	2.8818	41.230	41.2	1.0	891	3201	4092	1.28	55.57	3647	445
6	2.8891	62.883	62.9	1.1	1445	2913	4358	1.50	57.57	3635	723
7	2.8949	77.941	77.9	1.2	1789	2693	4483	1.66	59.10	3588	895
8	2.9008	89.351	89.4	1.3	2049	2468	4517	1.83	60.66	3492	1025
9	2.9066	99.275	99.3	1.4	2274	2318	4593	1.98	61.70	3455	1137
10	2.9125	107.039	107.0	1.5	2450	2168	4617	2.13	62.75	3393	1225
11	2.9242	119.159	119.2	1.7	2722	1965	4687	2.38	64.15	3326	1361
12	2.9359	128.300	128.3	1.9	2924	1767	4691	2.66	65.53	3229	1462
13	2.9535	136.877	136.9	2.2	3110	1579	4690	2.97	66.83	3134	1555
14	2.9827	144.481	144.5	2.7	3266	1358	4624	3.41	68.37	2991	1633
15	3.0178	146.791	146.8	3.3	3298	1177	4474	3.80	69.63	2825	1649
16	3.0237	146.672	146.7	3.4	3292	1159	4450	3.84	69.75	2805	1646
17	3.0764	144.984	145.0	4.3	3223	1017	4240	4.17	70.74	2628	1612
18	3.1320	141.640	141.6	5.3	3118	956	4074	4.26	71.16	2515	1559
19	3.1905	138.278	138.3	6.3	3011	883	3894	4.41	71.67	2388	1506
20	3.2490	134.915	134.9	7.3	2907	832	3738	4.50	72.03	2285	1453
21	3.3075	131.806	131.8	8.3	2809	855	3664	4.28	71.86	2260	1404

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
22	3.3661	130.070	130.1	9.3	2741	729	3471	4.76	72.74	2100	1371
23	3.4246	128.503	128.5	10.3	2678	770	3449	4.48	72.45	2109	1339
24	3.4831	128.105	128.1	11.3	2640	743	3383	4.55	72.64	2063	1320
25	3.5416	127.969	128.0	12.3	2607	722	3330	4.61	72.78	2026	1304
26	3.6002	127.590	127.6	13.3	2570	721	3291	4.57	72.80	2006	1285

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	502.900			917.210
Moisture content: Dry soil+tare, gms.	404.070			695.670
Moisture content: Tare, gms.	215.800			219.390
Moisture, %	52.5	50.2	41.9	46.5
Moist specimen weight, gms.	1108.7			
Diameter, in.	2.87	2.85	2.75	
Area, in.²	6.47	6.36	5.94	
Height, in.	6.07	6.02	5.82	
Net decrease in height, in.		0.05	0.20	
Wet density, pcf	107.6	108.7	113.6	
Dry density, pcf	70.5	72.4	80.1	
Void ratio	1.4518	1.3900	1.1600	
Saturation, %	100.2	100.0	100.0	

Test Readings for Specimen No. 3

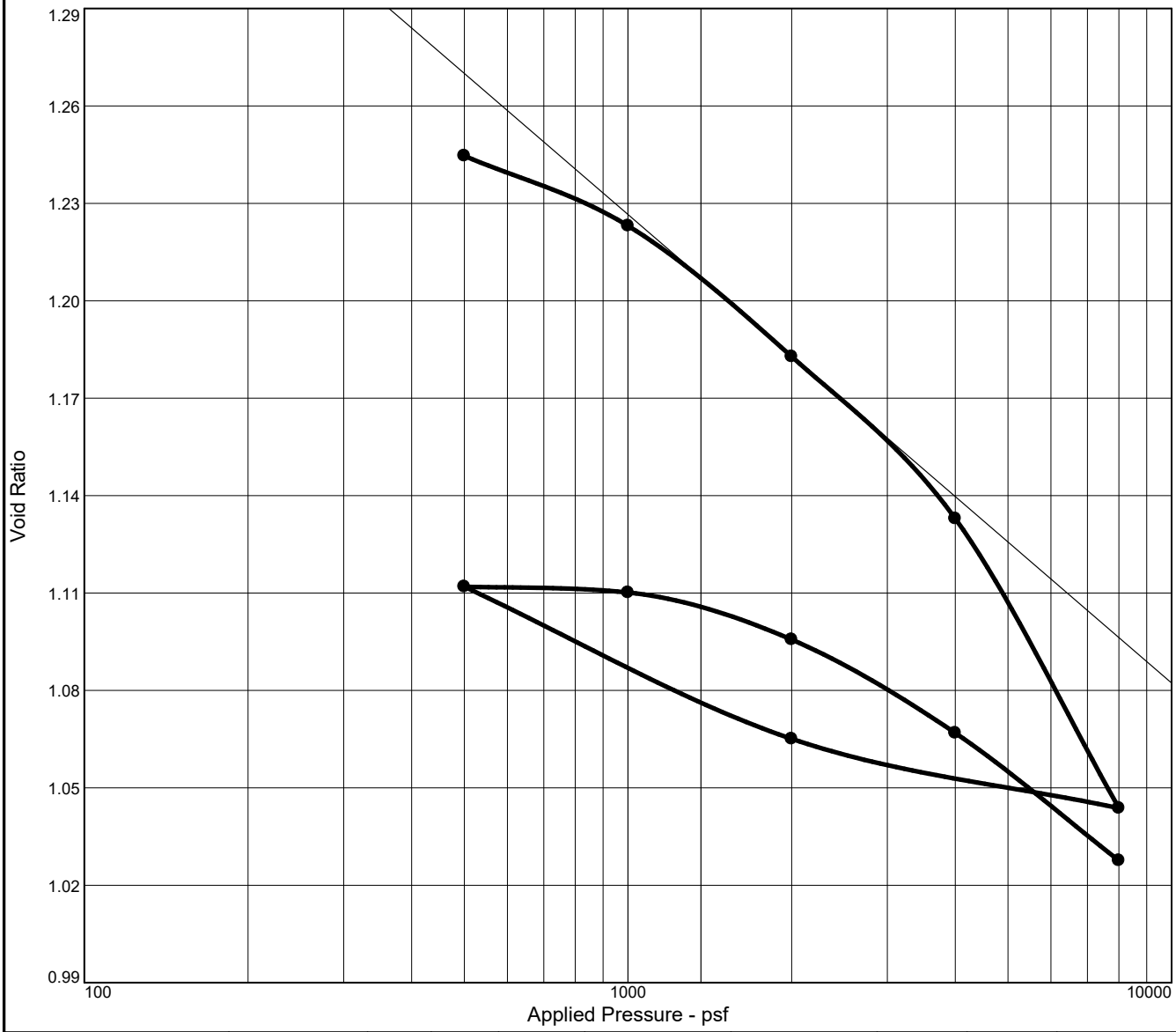
Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.025 cm
Filter paper coefficient = 0.001926 kN/cm
Filter paper coverage = 50%
Consolidation cell pressure = 78.20 psi (11261 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 5501 psf
Strain rate, in./min. = 0.01
Fail. Stress = 3562 psf **at reading no.** 17
Ult. Stress = 3038 psf **at reading no.** 26

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	2.2837	0.000	0.0	0.0	0	5501	5501	1.00	40.00	5501	0
1	2.2837	2.297	2.3	0.0	56	5135	5190	1.01	42.54	5163	28
2	2.2852	16.880	16.9	0.0	409	4946	5355	1.08	43.85	5150	204
3	2.3019	27.055	27.1	0.3	654	4462	5116	1.15	47.21	4789	327
4	2.3050	42.638	42.6	0.4	1030	4246	5276	1.24	48.71	4761	515
5	2.3080	54.121	54.1	0.4	1306	4039	5345	1.32	50.15	4692	653
6	2.3110	63.584	63.6	0.5	1534	3920	5454	1.39	50.98	4687	767
7	2.3141	71.672	71.7	0.5	1728	3777	5505	1.46	51.97	4641	864
8	2.3186	81.032	81.0	0.6	1952	3561	5514	1.55	53.47	4537	976
9	2.3232	88.866	88.9	0.7	2139	3398	5537	1.63	54.61	4467	1070
10	2.3292	98.311	98.3	0.8	2364	3200	5564	1.74	55.98	4382	1182
11	2.3368	106.990	107.0	0.9	2569	2954	5523	1.87	57.69	4238	1285
12	2.3459	115.561	115.6	1.1	2771	2789	5560	1.99	58.83	4175	1385

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
13	2.3581	124.109	124.1	1.3	2969	2569	5539	2.16	60.36	4054	1485
14	2.3763	132.820	132.8	1.6	3168	2265	5433	2.40	62.47	3849	1584
15	2.4006	141.044	141.0	2.0	3350	1979	5329	2.69	64.46	3654	1675
16	2.4431	148.772	148.8	2.7	3507	1734	5241	3.02	66.16	3488	1753
17	2.4977	152.565	152.6	3.7	3562	1502	5064	3.37	67.77	3283	1781
18	2.5342	153.315	153.3	4.3	3556	1406	4962	3.53	68.43	3184	1778
19	2.5402	153.261	153.3	4.4	3551	1385	4935	3.56	68.58	3160	1775
20	2.6040	151.431	151.4	5.5	3468	1283	4752	3.70	69.29	3017	1734
21	2.6647	148.945	148.9	6.5	3374	1182	4556	3.85	69.99	2869	1687
22	2.7254	147.542	147.5	7.6	3305	1156	4461	3.86	70.17	2809	1652
23	2.7861	145.101	145.1	8.6	3213	1096	4309	3.93	70.59	2702	1607
24	2.8468	141.784	141.8	9.7	3104	1051	4155	3.95	70.90	2603	1552
25	2.9075	141.443	141.4	10.7	3061	1029	4090	3.97	71.05	2559	1530
26	2.9683	142.071	142.1	11.8	3038	1026	4065	3.96	71.07	2546	1519
27	3.0290	143.960	144.0	12.8	3042	991	4033	4.07	71.32	2512	1521
28	3.0897	144.106	144.1	13.8	3009	976	3985	4.08	71.42	2480	1505
29	3.1504	143.302	143.3	14.9	2956	941	3898	4.14	71.66	2420	1478

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
86.9 %	39.5 %	80.1	59	31	2.78	1539	1388	0.14	0.07	1.262

MATERIAL DESCRIPTION	USCS	AASHTO
CH - Fat CLAY	CH	

Project No. XL6097 **Client:** WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 13.5 **Sample Number:** S-5

Remarks:

WSDOT

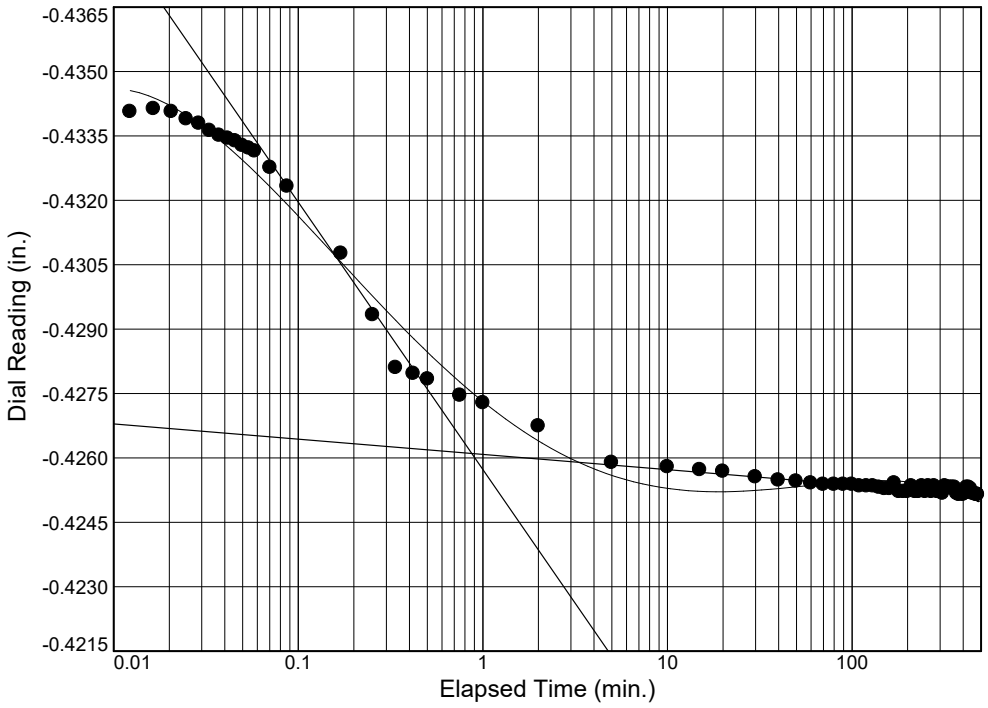
Figure

Tested By: SLW **Checked By:** SLW

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

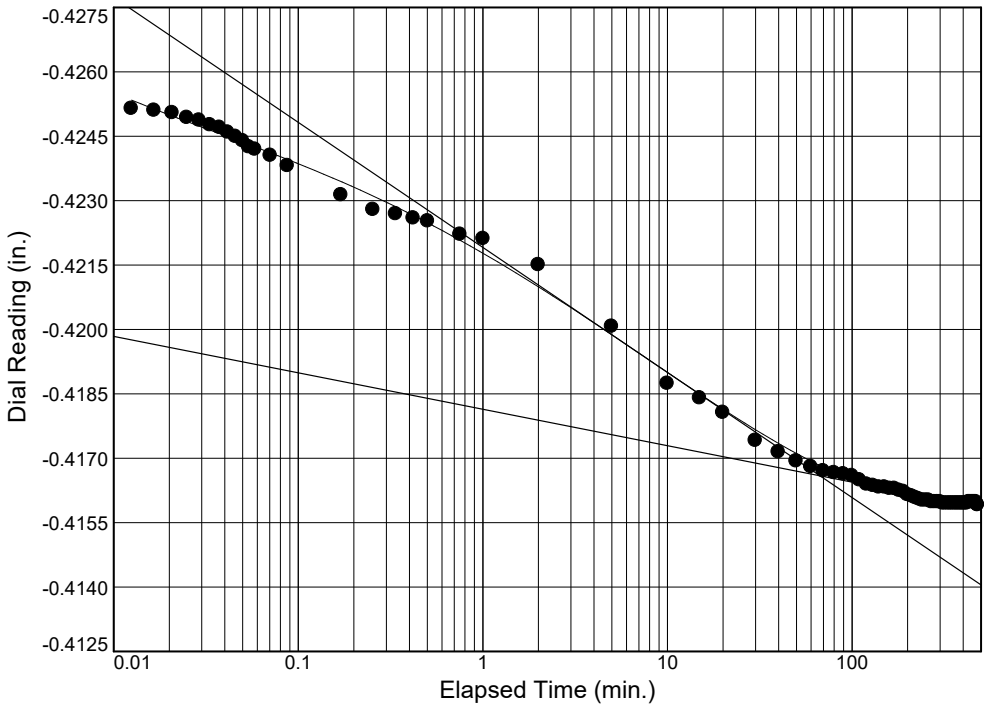
Source of Sample: H-1vwp-20 Depth: 13.5 Sample Number: S-5



Load No.= 1
Load= 500 psf
D_0 = -0.4340
D_{50} = -0.4300
D_{100} = -0.4261
T_{50} = 0.22 min.

C_v @ T_{50}
2.225 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 1000 psf
D_0 = -0.4251
D_{50} = -0.4209
D_{100} = -0.4166
T_{50} = 2.23 min.

C_v @ T_{50}
0.215 ft.^{2}/day

C_α = 0.002

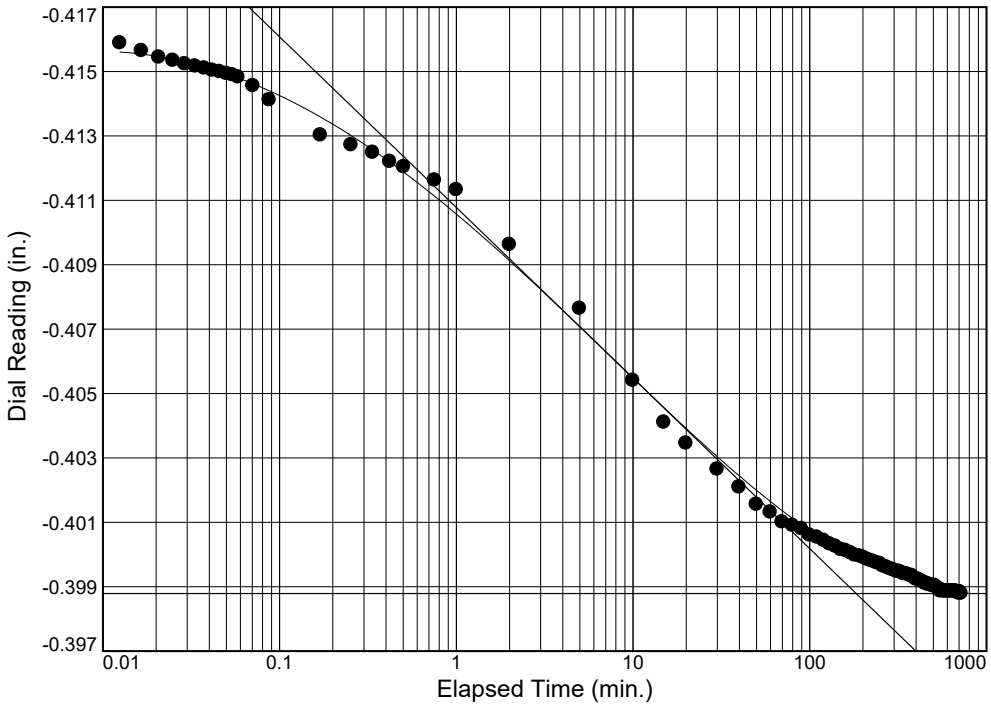
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

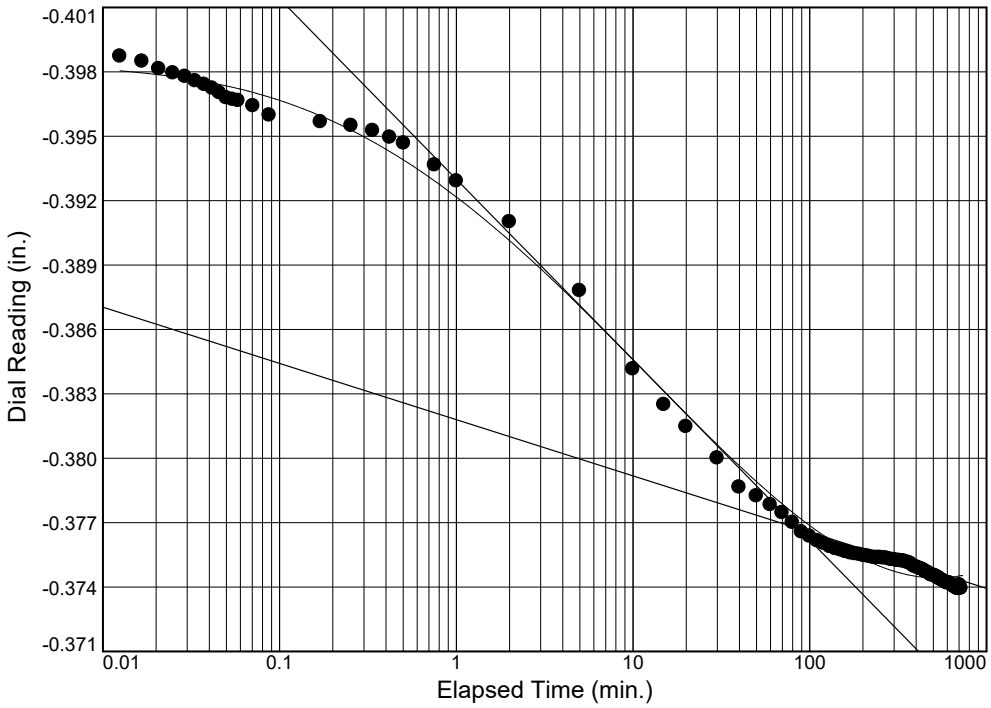
Source of Sample: H-1vwp-20 Depth: 13.5 Sample Number: S-5



Load No.= 3
Load= 2000 psf
D_0 = -0.4159
D_{50} = -0.4073
D_{100} = -0.3988
T_{50} = 4.43 min.

C_v @ T_{50}
0.105 ft.^{2}/day

C_α = 0.000



Load No.= 4
Load= 4000 psf
D_0 = -0.3988
D_{50} = -0.3878
D_{100} = -0.3767
T_{50} = 4.11 min.

C_v @ T_{50}
0.109 ft.^{2}/day

C_α = 0.006

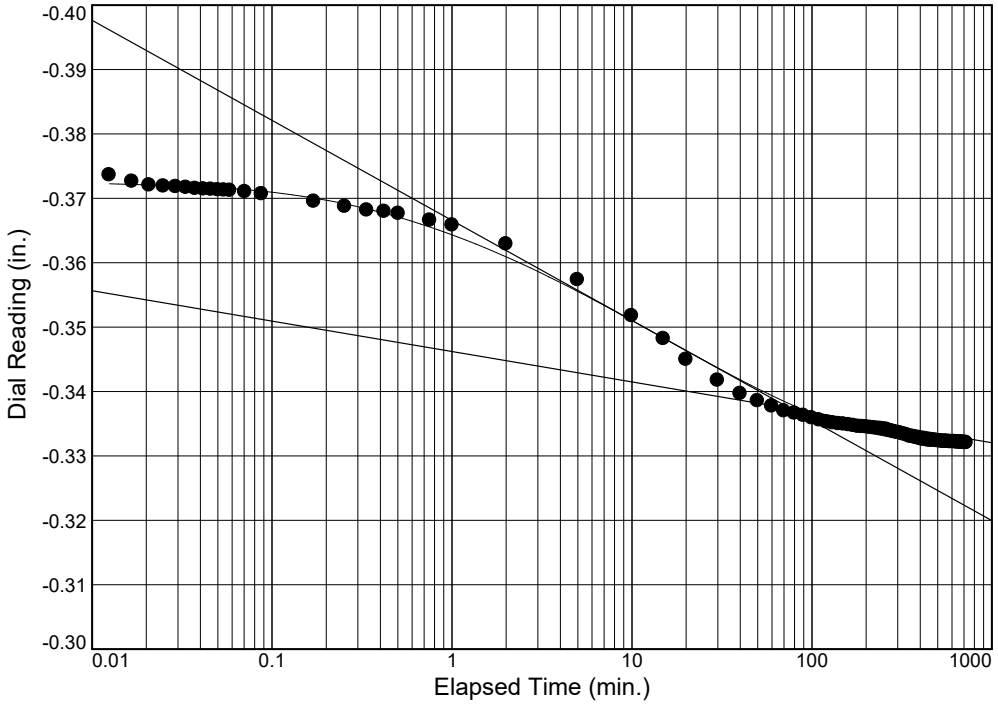
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

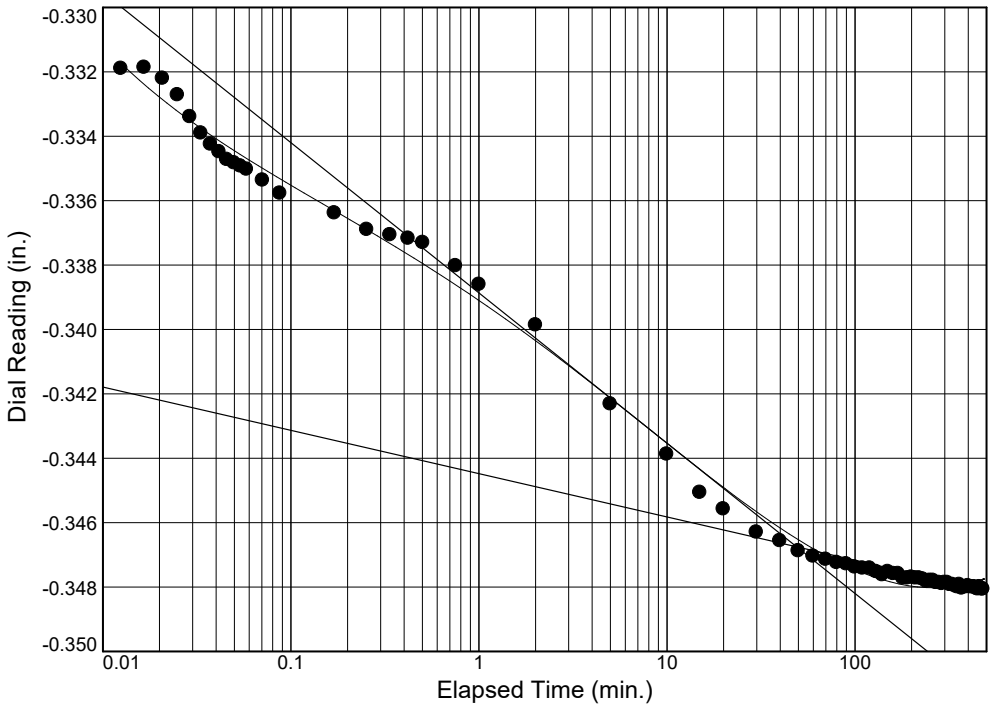
Source of Sample: H-1vwp-20 Depth: 13.5 Sample Number: S-5



Load No.= 5
Load= 8000 psf
D_0 = -0.3739
D_{50} = -0.3556
D_{100} = -0.3373
T_{50} = 4.92 min.

C_v @ T_{50}
0.085 ft.^{2}/day

C_α = 0.011



Load No.= 6
Load= 2000 psf
D_0 = -0.3320
D_{50} = -0.3394
D_{100} = -0.3468
T_{50} = 1.18 min.

C_v @ T_{50}
0.341 ft.^{2}/day

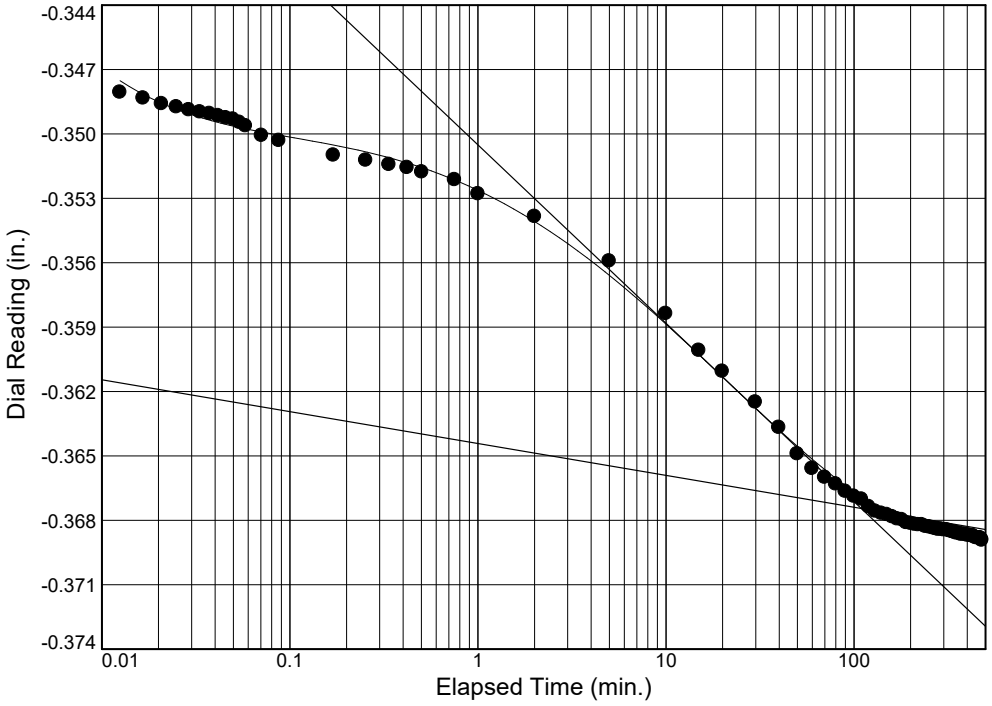
Figure

Washington State Department of Transportation

Dial Reading vs. Time

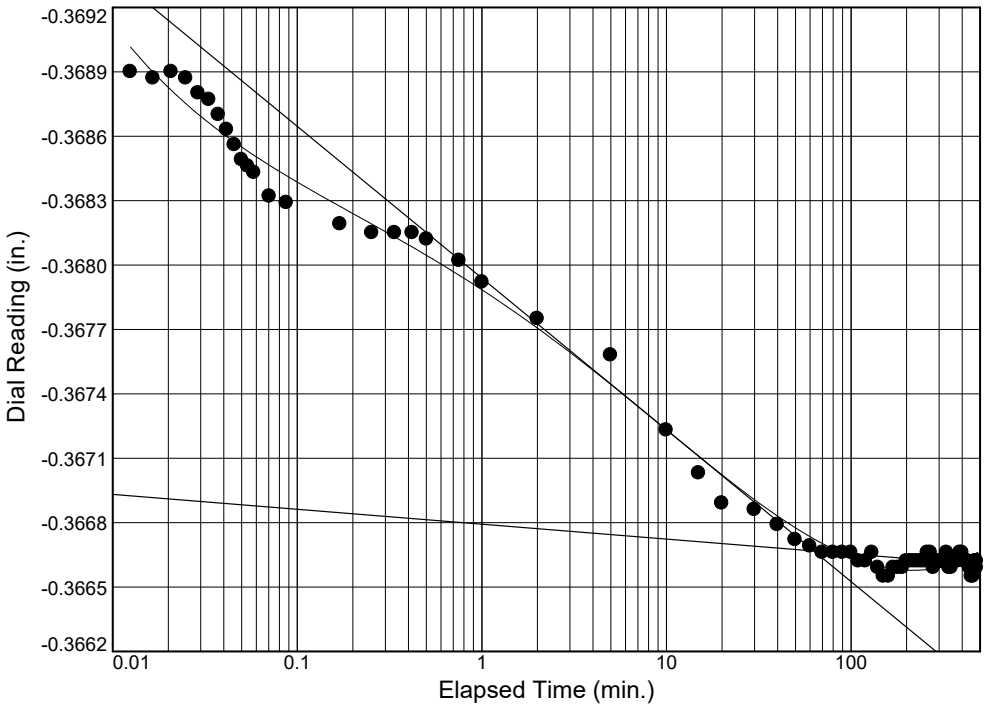
Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 Depth: 13.5 Sample Number: S-5



Load No.= 7
Load= 500 psf
D_0 = -0.3481
D_{50} = -0.3578
D_{100} = -0.3675
T_{50} = 7.21 min.

C_v @ T_{50}
0.058 ft.^{2}/day



Load No.= 8
Load= 1000 psf
D_0 = -0.3689
D_{50} = -0.3678
D_{100} = -0.3667
T_{50} = 1.49 min.

C_v @ T_{50}
0.288 ft.^{2}/day

C_α = 0.000

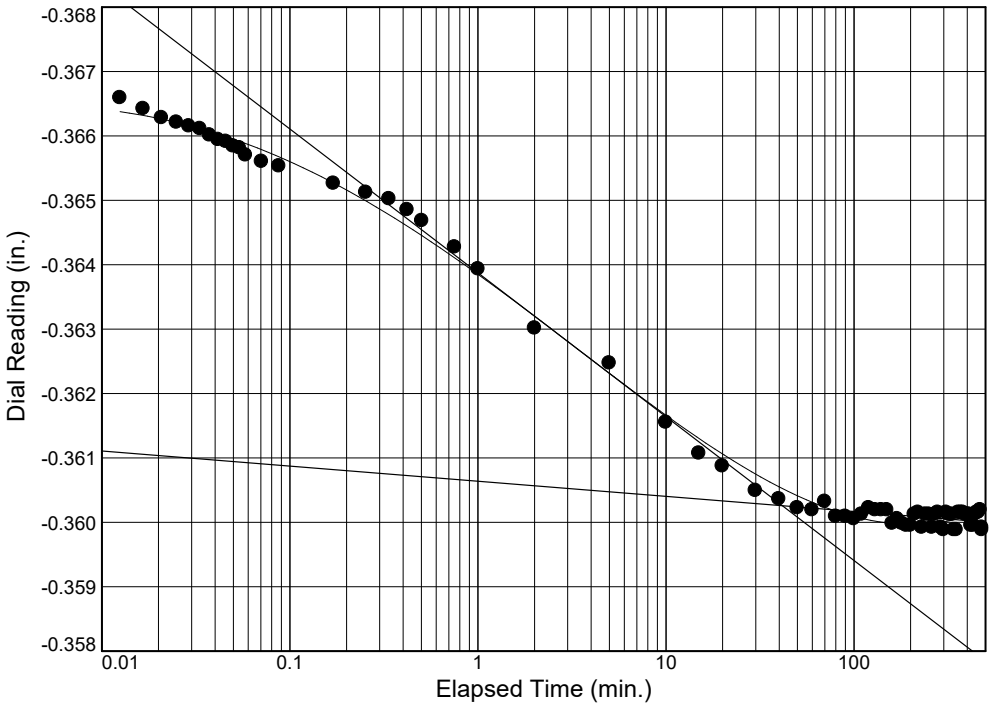
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

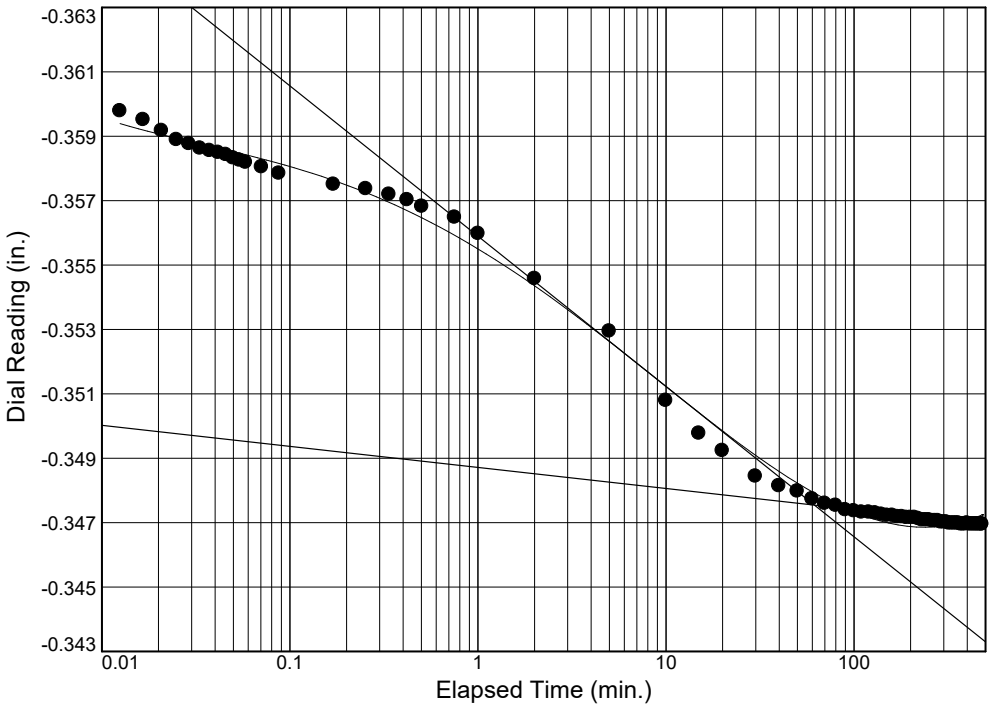
Source of Sample: H-1vwp-20 Depth: 13.5 Sample Number: S-5



Load No.= 9
Load= 2000 psf
D_0 = -0.3666
D_{50} = -0.3634
D_{100} = -0.3603
T_{50} = 1.56 min.

C_v @ T_{50}
0.273 ft.^{2}/day

C_α = 0.001



Load No.= 10
Load= 4000 psf
D_0 = -0.3599
D_{50} = -0.3537
D_{100} = -0.3475
T_{50} = 2.81 min.

C_v @ T_{50}
0.148 ft.^{2}/day

C_α = 0.001

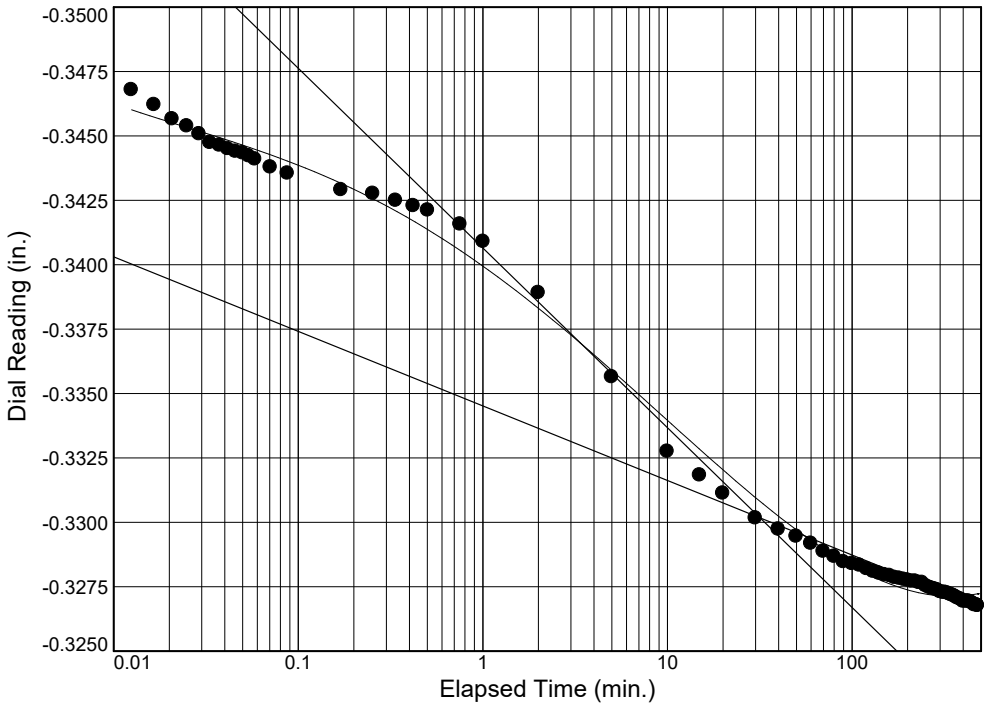
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 Depth: 13.5 Sample Number: S-5



Load No.= 11
Load= 8000 psf
D_0 = -0.3469
D_{50} = -0.3386
D_{100} = -0.3302
T_{50} = 1.80 min.

C_v @ T_{50}
0.223 $ft.^2/day$

C_α = 0.007

Figure

Washington State Department of Transportation

CONSOLIDATION TEST DATA

5/10/2021

Client: WSDOT (Donald Anderson)
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project Number: XL6097
Location: H-1vwp-20
Depth: 13.5 **Sample Number:** S-5
Material Description: CH - Fat CLAY
Liquid Limit: 59 **Plasticity Index:** 31
USCS: CH
Tested by: SLW **Checked by:** SLW

Test Specimen Data

NATURAL MOISTURE
Wet w+t = 951.08 g.
Dry w+t = 742.33 g.
Tare Wt. = 213.55 g.
Moisture = 39.5 %

VOID RATIO
Spec. Gr. = 2.78
Est. Ht. Solids = 0.442 in.
Init. V.R. = 1.262
Init. Sat. = 86.9 %

AFTER TEST
Wet w+t = 218.20 g.
Dry w+t = 181.50 g.
Tare Wt. = 82.66 g.
Moisture = 37.1 %

UNIT WEIGHT
Height = 1.000 in.
Diameter = 2.500 in.
Weight = 143.92 g.
Dry Dens. = 80.1 pcf

TEST START
Height = 1.000 in.
Diameter = 2.500 in.

Dry Wt. = 98.84* g.

End-Of-Load Summary

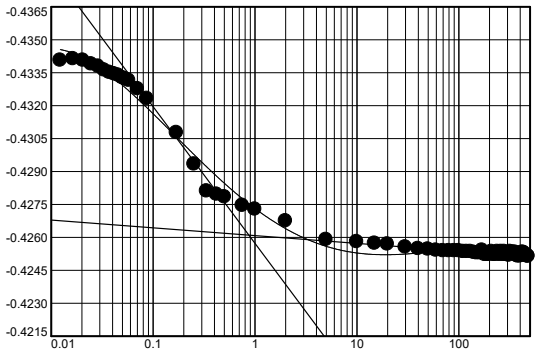
Pressure (psf)	Final Dial (in.)	Deformation (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Strain
start	-0.43399	0.00000			1.262	
500	-0.42514	0.00789*	2.225	0.001	1.245	0.8 Comprs.
1000	-0.41591	0.01740*	0.215	0.002	1.223	1.7 Comprs.
2000	-0.39879	0.03520*	0.105	0.000	1.183	3.5 Comprs.
4000	-0.37394	0.05726*	0.109	0.006	1.133	5.7 Comprs.
8000	-0.33204	0.09667*	0.085	0.011	1.044	9.7 Comprs.
2000	-0.34807	0.08724*	0.341		1.065	8.7 Comprs.
500	-0.36890	0.06654*	0.058		1.112	6.7 Comprs.
1000	-0.36662	0.06732*	0.288	0.000	1.110	6.7 Comprs.
2000	-0.35988	0.07373*	0.273	0.001	1.096	7.4 Comprs.
4000	-0.34695	0.08645*	0.148	0.001	1.067	8.6 Comprs.
8000	-0.32676	0.10382*	0.223	0.007	1.028	10.4 Comprs.

***CALCULATED USING D_{100} INSTEAD OF FINAL READING**

Compression index (C_c), psf = 0.14 **Preconsolidation pressure (P_p), psf =** 1388 **Void ratio at P_p (e_m) =** 1.205
Overburden (σ_{vo}), psf = 1539 **Void ratio at σ_{vo} (e_o) =** 1.199 **Recompression index (C_r) =** 0.07

Pressure: 500 psf | **TEST READINGS** | **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.43399	38	130.0007	-0.42534
2	0.0123	-0.43406	39	140.0007	-0.42531
3	0.0165	-0.43413	40	150.0008	-0.42528
4	0.0206	-0.43406	41	160.0008	-0.42528
5	0.0248	-0.43389	42	170.0009	-0.42541
6	0.0290	-0.43379	43	180.0010	-0.42521
7	0.0331	-0.43362	44	190.0010	-0.42521
8	0.0373	-0.43351	45	200.0011	-0.42521
9	0.0415	-0.43344	46	210.0011	-0.42534
10	0.0456	-0.43338	47	220.0012	-0.42521
11	0.0498	-0.43327	48	230.0012	-0.42521
12	0.0540	-0.43321	49	240.0013	-0.42534
13	0.0581	-0.43314	50	250.0013	-0.42521
14	0.0706	-0.43276	51	260.0014	-0.42534
15	0.0873	-0.43232	52	270.0014	-0.42521
16	0.1706	-0.43076	53	280.0015	-0.42534
17	0.2540	-0.42933	54	290.0016	-0.42521
18	0.3373	-0.4281	55	300.0016	-0.42521
19	0.4206	-0.42796	56	310.0016	-0.42517
20	0.5040	-0.42783	57	320.0017	-0.42534
21	0.7540	-0.42745	58	330.0017	-0.42531
22	1.0040	-0.42728	59	340.0018	-0.42531
23	2.0040	-0.42674	60	350.0019	-0.42531
24	5.0040	-0.42589	61	360.0019	-0.42531
25	10.0041	-0.42579	62	370.0019	-0.42517
26	15.0041	-0.42572	63	380.0020	-0.42514
27	20.0041	-0.42568	64	390.0020	-0.42517
28	30.0000	-0.42555	65	400.0021	-0.42514
29	40.0001	-0.42548	66	410.0021	-0.42517
30	50.0002	-0.42545	67	420.0022	-0.42531
31	60.0002	-0.42541	68	430.0022	-0.42531
32	70.0003	-0.42538	69	440.0023	-0.42528
33	80.0004	-0.42538	70	450.0023	-0.42517
34	90.0005	-0.42538	71	460.0024	-0.42517
35	100.0005	-0.42538	72	470.0024	-0.42514
36	110.0006	-0.42534	73	480.0025	-0.42514
37	120.0006	-0.42534	74	480.2069	-0.42514

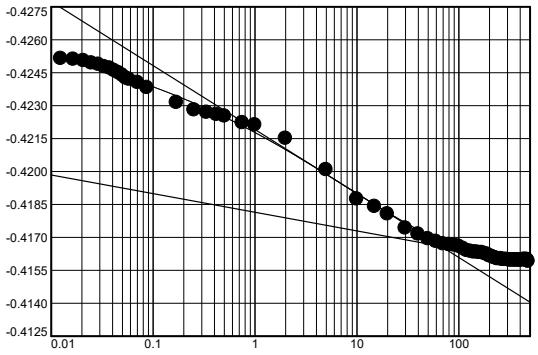


Void Ratio = 1.245 **Compression =** 0.8% >>> CALCULATED USING D_{100}

D_0 = -0.4340 **D_{50} =** -0.4300 **D_{100} =** -0.4261 **C_v at 0.22 min. =** 2.225 ft.^{2}/day **C_α =** 0.001

Pressure: 1000 psf	TEST READINGS	Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.42514	38	130.0008	-0.41636
2	0.0125	-0.42514	39	140.0008	-0.41632
3	0.0166	-0.4251	40	150.0009	-0.41632
4	0.0208	-0.42504	41	160.0010	-0.41629
5	0.0250	-0.42493	42	170.0010	-0.41629
6	0.0291	-0.42487	43	180.0011	-0.41625
7	0.0333	-0.42476	44	190.0011	-0.41622
8	0.0375	-0.4247	45	200.0012	-0.41615
9	0.0416	-0.42459	46	210.0013	-0.41612
10	0.0458	-0.42449	47	220.0013	-0.41608
11	0.0500	-0.42439	48	230.0014	-0.41605
12	0.0541	-0.42425	49	240.0015	-0.41602
13	0.0583	-0.42419	50	250.0015	-0.41602
14	0.0708	-0.42405	51	260.0016	-0.41602
15	0.0875	-0.42381	52	270.0017	-0.41598
16	0.1708	-0.42313	53	280.0017	-0.41598
17	0.2542	-0.42279	54	290.0018	-0.41598
18	0.3375	-0.42269	55	300.0019	-0.41598
19	0.4208	-0.42259	56	310.0019	-0.41595
20	0.5041	-0.42252	57	320.0020	-0.41595
21	0.7542	-0.42221	58	330.0021	-0.41595
22	1.0042	-0.42211	59	340.0021	-0.41595
23	2.0041	-0.4215	60	350.0022	-0.41595
24	5.0000	-0.42007	61	360.0023	-0.41595
25	10.0000	-0.41874	62	370.0023	-0.41595
26	15.0001	-0.4184	63	380.0024	-0.41595
27	20.0001	-0.41806	64	390.0025	-0.41595
28	30.0001	-0.41741	65	400.0025	-0.41595
29	40.0002	-0.41714	66	410.0026	-0.41595
30	50.0002	-0.41693	67	420.0027	-0.41595
31	60.0003	-0.4168	68	430.0027	-0.41598
32	70.0004	-0.4167	69	440.0028	-0.41598
33	80.0004	-0.41666	70	450.0029	-0.41598
34	90.0005	-0.41663	71	460.0029	-0.41598
35	100.0006	-0.41659	72	470.0030	-0.41598
36	110.0006	-0.41649	73	480.0031	-0.41591
37	120.0007	-0.41639	74	480.0617	-0.41591

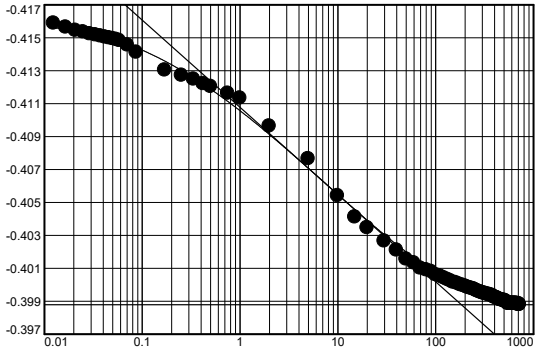


Void Ratio = 1.223 **Compression =** 1.7% >>> CALCULATED USING D_{100}

D_0 = -0.4251 **D_{50} =** -0.4209 **D_{100} =** -0.4166 **C_v at 2.23 min. =** 0.215 ft.^{2}/day **C_α =** 0.002

Pressure: 2000 psf	TEST READINGS	Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.41591	41	160.0010	-0.40012
2	0.0125	-0.41588	42	170.0010	-0.40005
3	0.0166	-0.41564	43	180.0011	-0.39998
4	0.0208	-0.41544	44	190.0011	-0.39995
5	0.0250	-0.41534	45	200.0012	-0.39991
6	0.0291	-0.41523	46	210.0013	-0.39985
7	0.0333	-0.41516	47	220.0013	-0.39981
8	0.0375	-0.4151	48	230.0014	-0.39978
9	0.0416	-0.41503	49	240.0014	-0.39974
10	0.0458	-0.41499	50	250.0015	-0.39971
11	0.0500	-0.41493	51	260.0016	-0.39964
12	0.0541	-0.41489	52	270.0016	-0.39961
13	0.0583	-0.41482	53	280.0017	-0.39957
14	0.0708	-0.41455	54	290.0017	-0.39954
15	0.0875	-0.41411	55	300.0018	-0.39951
16	0.1708	-0.41302	56	310.0019	-0.39947
17	0.2542	-0.41271	57	320.0019	-0.39947
18	0.3375	-0.41248	58	330.0020	-0.39944
19	0.4208	-0.4122	59	340.0020	-0.3994
20	0.5041	-0.41203	60	350.0021	-0.3994
21	0.7542	-0.41162	61	360.0022	-0.39937
22	1.0042	-0.41132	62	370.0022	-0.39934
23	2.0041	-0.40962	63	380.0023	-0.39934
24	5.0000	-0.40764	64	390.0024	-0.39927
25	10.0000	-0.4054	65	400.0024	-0.39923
26	15.0001	-0.4041	66	410.0025	-0.39923
27	20.0001	-0.40345	67	420.0026	-0.3992
28	30.0002	-0.40264	68	430.0026	-0.39917
29	40.0002	-0.40209	69	440.0027	-0.39913
30	50.0003	-0.40155	70	450.0028	-0.3991
31	60.0004	-0.40131	71	460.0028	-0.3991
32	70.0004	-0.401	72	470.0029	-0.39906
33	80.0005	-0.4009	73	480.0030	-0.39906
34	90.0005	-0.4008	74	490.0030	-0.39903
35	100.0006	-0.4006	75	500.0031	-0.39903
36	110.0007	-0.40053	76	510.0032	-0.39903
37	120.0007	-0.40043	77	520.0032	-0.399
38	130.0008	-0.40032	78	530.0033	-0.39896
39	140.0008	-0.40025	79	540.0034	-0.39889
40	150.0009	-0.40015	80	550.0034	-0.39886



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 3**

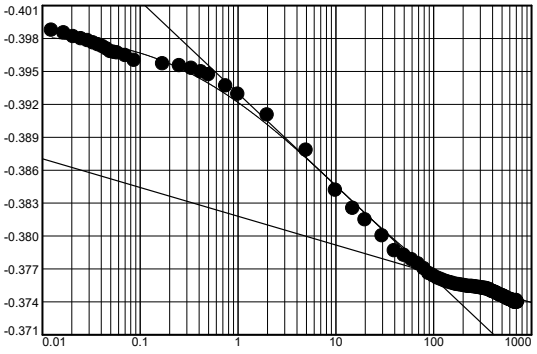
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
81	560.0035	-0.39889	91	660.0040	-0.39886
82	570.0035	-0.39886	92	670.0040	-0.39886
83	580.0036	-0.39886	93	680.0040	-0.39883
84	590.0036	-0.39886	94	690.0041	-0.39883
85	600.0036	-0.39886	95	700.0042	-0.39879
86	610.0037	-0.39886	96	710.0000	-0.39883
87	620.0037	-0.39886	97	720.0001	-0.39879
88	630.0038	-0.39886	98	720.0837	-0.39879
89	640.0038	-0.39886			
90	650.0039	-0.39886			

Void Ratio = 1.183 **Compression =** 3.5% >>> CALCULATED USING D_{100}

D_0 = -0.4159 **D_{50} =** -0.4073 **D_{100} =** -0.3988 **C_v at 4.43 min. =** 0.105 $ft.^2/day$ **C_α =** 0.000

Pressure: 4000 psf | **TEST READINGS** | **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.39879	25	10.0000	-0.38415
2	0.0125	-0.39872	26	15.0001	-0.38249
3	0.0167	-0.39848	27	20.0001	-0.38146
4	0.0208	-0.39814	28	30.0001	-0.38
5	0.0250	-0.39794	29	40.0002	-0.37864
6	0.0292	-0.39777	30	50.0002	-0.37823
7	0.0333	-0.39757	31	60.0002	-0.37782
8	0.0375	-0.3974	32	70.0003	-0.37745
9	0.0417	-0.39723	33	80.0003	-0.377
10	0.0458	-0.39702	34	90.0004	-0.37656
11	0.0500	-0.39678	35	100.0004	-0.37636
12	0.0542	-0.39671	36	110.0005	-0.37615
13	0.0583	-0.39665	37	120.0005	-0.37602
14	0.0708	-0.39641	38	130.0005	-0.37588
15	0.0875	-0.39597	39	140.0006	-0.37578
16	0.1708	-0.39566	40	150.0006	-0.37571
17	0.2542	-0.39549	41	160.0007	-0.37564
18	0.3375	-0.39525	42	170.0007	-0.37558
19	0.4208	-0.39494	43	180.0008	-0.37554
20	0.5041	-0.39467	44	190.0008	-0.37551
21	0.7542	-0.39365	45	200.0008	-0.37547
22	1.0042	-0.3929	46	210.0009	-0.37544
23	2.0041	-0.391	47	220.0010	-0.3754
24	5.0000	-0.3878	48	230.0010	-0.37537



Pressure: 4000 psf | **TEST READINGS (continued)** | **Load No. 4**

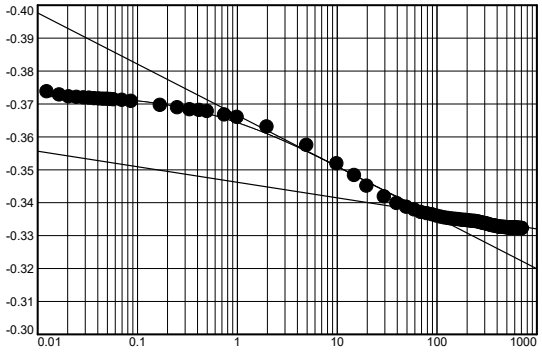
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0011	-0.37537	66	410.0021	-0.37489	83	580.0032	-0.37425
50	250.0011	-0.37537	67	420.0022	-0.37486	84	590.0033	-0.37421
51	260.0012	-0.37534	68	430.0022	-0.37483	85	600.0034	-0.37418
52	270.0012	-0.37534	69	440.0023	-0.37479	86	610.0035	-0.37418
53	280.0013	-0.3753	70	450.0024	-0.37472	87	620.0035	-0.37418
54	290.0013	-0.37527	71	460.0024	-0.37469	88	630.0036	-0.37415
55	300.0014	-0.37527	72	470.0025	-0.37466	89	640.0036	-0.37411
56	310.0015	-0.37523	73	480.0026	-0.37459	90	650.0037	-0.37404
57	320.0015	-0.37523	74	490.0026	-0.37455	91	660.0038	-0.37401
58	330.0016	-0.3752	75	500.0027	-0.37455	92	670.0038	-0.37398
59	340.0016	-0.3752	76	510.0028	-0.37452	93	680.0039	-0.37394
60	350.0017	-0.37517	77	520.0028	-0.37449	94	690.0040	-0.37391
61	360.0018	-0.37513	78	530.0029	-0.37442	95	700.0041	-0.37408
62	370.0018	-0.3751	79	540.0030	-0.37442	96	710.0041	-0.37408
63	380.0019	-0.37503	80	550.0030	-0.37435	97	720.0000	-0.37394
64	390.0020	-0.37496	81	560.0031	-0.37432	98	720.0836	-0.37394
65	400.0020	-0.37493	82	570.0032	-0.37428			

Void Ratio = 1.133 **Compression =** 5.7% >>> CALCULATED USING D_{100}

D_0 = -0.3988 **D_{50} =** -0.3878 **D_{100} =** -0.3767 **C_v at 4.11 min. =** 0.109 ft.^{2}/day **C_α =** 0.006

Pressure: 8000 psf | **TEST READINGS** | **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.37394	18	0.3375	-0.36812
2	0.0125	-0.3736	19	0.4208	-0.36792
3	0.0167	-0.37261	20	0.5042	-0.36761
4	0.0208	-0.37203	21	0.7542	-0.36655
5	0.0250	-0.37186	22	1.0042	-0.36581
6	0.0292	-0.37176	23	2.0042	-0.36288
7	0.0333	-0.37166	24	5.0000	-0.35733
8	0.0375	-0.37149	25	10.0001	-0.35175
9	0.0417	-0.37139	26	15.0001	-0.34817
10	0.0458	-0.37135	27	20.0001	-0.34494
11	0.0500	-0.37129	28	30.0002	-0.3417
12	0.0542	-0.37125	29	40.0002	-0.33966
13	0.0583	-0.37118	30	50.0003	-0.33854
14	0.0708	-0.37098	31	60.0004	-0.33769
15	0.0875	-0.37067	32	70.0004	-0.33694
16	0.1708	-0.36948	33	80.0005	-0.3366
17	0.2542	-0.3687	34	90.0006	-0.33626



Pressure: 8000 psf | **TEST READINGS (continued)** | **Load No. 5**

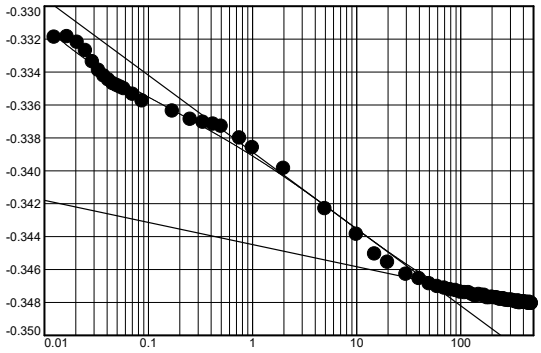
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
35	100.0006	-0.33588	57	320.0020	-0.3334	79	540.0033	-0.33224
36	110.0007	-0.33554	58	330.0020	-0.3333	80	550.0033	-0.33224
37	120.0007	-0.33527	59	340.0021	-0.33319	81	560.0034	-0.33221
38	130.0008	-0.3351	60	350.0022	-0.33302	82	570.0034	-0.33221
39	140.0008	-0.33496	61	360.0022	-0.33296	83	580.0035	-0.33217
40	150.0009	-0.3349	62	370.0023	-0.33289	84	590.0036	-0.33217
41	160.0010	-0.33479	63	380.0023	-0.33282	85	600.0036	-0.33217
42	170.0010	-0.33469	64	390.0024	-0.33275	86	610.0037	-0.33217
43	180.0011	-0.33456	65	400.0025	-0.33265	87	620.0037	-0.33217
44	190.0011	-0.33452	66	410.0025	-0.33258	88	630.0038	-0.33214
45	200.0012	-0.33445	67	420.0026	-0.33255	89	640.0038	-0.3321
46	210.0013	-0.33439	68	430.0026	-0.33248	90	650.0039	-0.3321
47	220.0014	-0.33432	69	440.0027	-0.33245	91	660.0040	-0.3321
48	230.0014	-0.33425	70	450.0028	-0.33241	92	670.0040	-0.3321
49	240.0015	-0.33422	71	460.0028	-0.33241	93	680.0041	-0.33207
50	250.0015	-0.33415	72	470.0029	-0.33238	94	690.0041	-0.33207
51	260.0016	-0.33408	73	480.0029	-0.33234	95	700.0000	-0.33207
52	270.0017	-0.33391	74	490.0030	-0.33234	96	710.0001	-0.33204
53	280.0017	-0.33381	75	500.0030	-0.33231	97	720.0001	-0.33204
54	290.0018	-0.33367	76	510.0031	-0.33231	98	720.0879	-0.33204
55	300.0019	-0.3336	77	520.0031	-0.33227			
56	310.0019	-0.33353	78	530.0032	-0.33224			

Void Ratio = 1.044 **Compression =** 9.7% >>> CALCULATED USING D_{100}

D_0 = -0.3739 **D_{50} =** -0.3556 **D_{100} =** -0.3373 **C_v at 4.92 min. =** 0.085 ft.^{2}/day **C_α =** 0.011

Pressure: 2000 psf | **TEST READINGS** | **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.33204	13	0.0583	-0.33503
2	0.0125	-0.3319	14	0.0708	-0.33537
3	0.0166	-0.33187	15	0.0875	-0.33578
4	0.0208	-0.33221	16	0.1708	-0.33639
5	0.0250	-0.33272	17	0.2541	-0.3369
6	0.0291	-0.3334	18	0.3375	-0.33707
7	0.0333	-0.33391	19	0.4208	-0.33718
8	0.0375	-0.33425	20	0.5041	-0.33731
9	0.0416	-0.33449	21	0.7541	-0.33803
10	0.0458	-0.33473	22	1.0042	-0.33861
11	0.0500	-0.33483	23	2.0041	-0.33987
12	0.0541	-0.33493	24	5.0042	-0.34232



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 6**

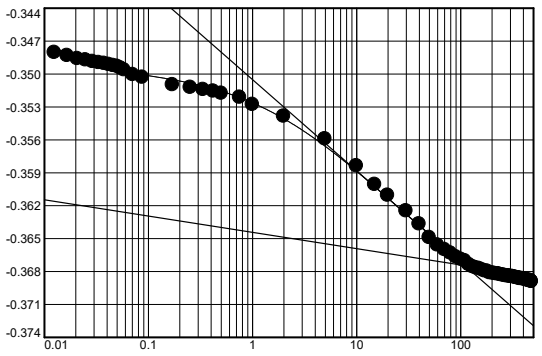
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
25	10.0000	-0.34388	42	170.0010	-0.34759	59	340.0021	-0.34797
26	15.0001	-0.34507	43	180.0011	-0.34773	60	350.0022	-0.348
27	20.0001	-0.34558	44	190.0011	-0.34773	61	360.0022	-0.34793
28	30.0002	-0.3463	45	200.0012	-0.3477	62	370.0023	-0.34804
29	40.0002	-0.34657	46	210.0013	-0.34773	63	380.0023	-0.348
30	50.0003	-0.34688	47	220.0013	-0.34773	64	390.0024	-0.348
31	60.0003	-0.34705	48	230.0014	-0.34776	65	400.0025	-0.34797
32	70.0004	-0.34715	49	240.0014	-0.34783	66	410.0025	-0.348
33	80.0005	-0.34725	50	250.0015	-0.3478	67	420.0026	-0.348
34	90.0005	-0.34729	51	260.0016	-0.3478	68	430.0027	-0.348
35	100.0006	-0.34739	52	270.0016	-0.34787	69	440.0027	-0.34804
36	110.0006	-0.34742	53	280.0017	-0.34787	70	450.0028	-0.34807
37	120.0007	-0.34742	54	290.0018	-0.3479	71	460.0029	-0.348
38	130.0007	-0.34753	55	300.0018	-0.34787	72	470.0029	-0.34807
39	140.0008	-0.34763	56	310.0019	-0.34787	73	480.0030	-0.34807
40	150.0009	-0.34753	57	320.0019	-0.34793	74	480.0782	-0.34807
41	160.0009	-0.34759	58	330.0020	-0.34793			

Void Ratio = 1.065 **Compression =** 8.7% >>> CALCULATED USING D_{100}

D_0 = -0.3320 **D_{50} =** -0.3394 **D_{100} =** -0.3468 **C_V at 1.18 min. =** 0.341 ft.^{2}/day

Pressure: 500 psf | **TEST READINGS** | **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.34807	18	0.3375	-0.35144
2	0.0125	-0.34807	19	0.4208	-0.35158
3	0.0166	-0.34834	20	0.5041	-0.35178
4	0.0208	-0.34861	21	0.7541	-0.35215
5	0.0250	-0.34875	22	1.0041	-0.3528
6	0.0291	-0.34889	23	2.0041	-0.35386
7	0.0333	-0.34899	24	5.0042	-0.35593
8	0.0375	-0.34906	25	10.0000	-0.35838
9	0.0416	-0.34916	26	15.0001	-0.36009
10	0.0458	-0.34926	27	20.0001	-0.36107
11	0.0500	-0.34933	28	30.0002	-0.3625
12	0.0541	-0.34947	29	40.0002	-0.36369
13	0.0583	-0.34964	30	50.0003	-0.36492
14	0.0708	-0.35008	31	60.0003	-0.3656
15	0.0875	-0.35032	32	70.0004	-0.36601
16	0.1708	-0.351	33	80.0005	-0.36632
17	0.2541	-0.35124	34	90.0005	-0.36666



Pressure: 500 psf | **TEST READINGS (continued)** | **Load No. 7**

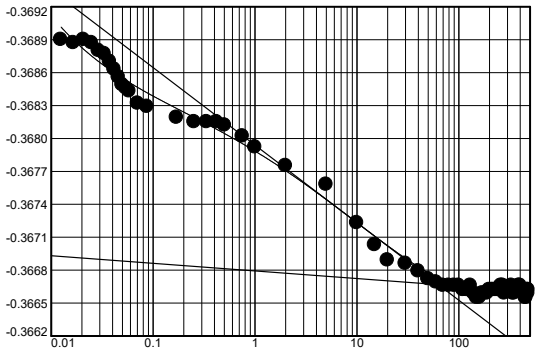
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
35	100.0006	-0.36689	49	240.0014	-0.36829	63	380.0023	-0.36866
36	110.0006	-0.36703	50	250.0015	-0.36832	64	390.0024	-0.36866
37	120.0007	-0.36737	51	260.0016	-0.36836	65	400.0024	-0.3687
38	130.0008	-0.36758	52	270.0016	-0.36839	66	410.0025	-0.3687
39	140.0008	-0.36768	53	280.0017	-0.36843	67	420.0025	-0.36873
40	150.0009	-0.36775	54	290.0018	-0.36843	68	430.0026	-0.36873
41	160.0010	-0.36785	55	300.0018	-0.36846	69	440.0027	-0.3688
42	170.0010	-0.36795	56	310.0019	-0.36846	70	450.0028	-0.36883
43	180.0011	-0.36798	57	320.0019	-0.36849	71	460.0028	-0.36883
44	190.0011	-0.36812	58	330.0020	-0.36853	72	470.0029	-0.36883
45	200.0012	-0.36815	59	340.0021	-0.36856	73	480.0029	-0.36894
46	210.0013	-0.36819	60	350.0021	-0.3686	74	480.0990	-0.3689
47	220.0013	-0.36822	61	360.0022	-0.3686			
48	230.0014	-0.36822	62	370.0022	-0.36866			

Void Ratio = 1.112 **Compression =** 6.7% >>> CALCULATED USING D_{100}

D_0 = -0.3481 **D_{50} =** -0.3578 **D_{100} =** -0.3675 **C_v at 7.21 min. =** 0.058 ft.^{2}/day

Pressure: 1000 psf | **TEST READINGS** | **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.3689	21	0.7541	-0.36802
2	0.0125	-0.3689	22	1.0042	-0.36792
3	0.0166	-0.36887	23	2.0041	-0.36775
4	0.0208	-0.3689	24	5.0042	-0.36758
5	0.0250	-0.36887	25	10.0000	-0.36723
6	0.0291	-0.3688	26	15.0001	-0.36703
7	0.0333	-0.36877	27	20.0001	-0.36689
8	0.0375	-0.3687	28	30.0002	-0.36686
9	0.0416	-0.36863	29	40.0002	-0.36679
10	0.0458	-0.36856	30	50.0003	-0.36672
11	0.0500	-0.36849	31	60.0004	-0.36669
12	0.0541	-0.36846	32	70.0004	-0.36666
13	0.0583	-0.36843	33	80.0005	-0.36666
14	0.0708	-0.36832	34	90.0006	-0.36666
15	0.0875	-0.36829	35	100.0006	-0.36666
16	0.1708	-0.36819	36	110.0007	-0.36662
17	0.2541	-0.36815	37	120.0008	-0.36662
18	0.3375	-0.36815	38	130.0008	-0.36666
19	0.4208	-0.36815	39	140.0009	-0.36659
20	0.5041	-0.36812	40	150.0010	-0.36655



Pressure: 1000 psf — **TEST READINGS (continued)** — **Load No. 8**

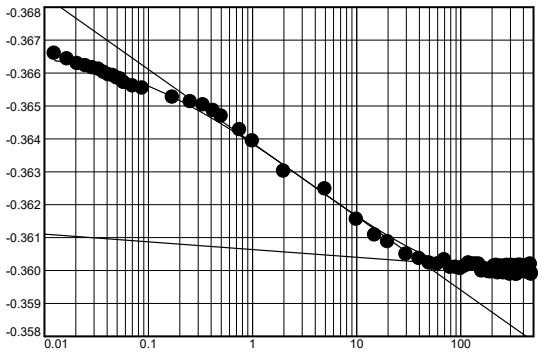
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
41	160.0010	-0.36655	53	280.0018	-0.36659	65	400.0026	-0.36666
42	170.0011	-0.36659	54	290.0019	-0.36662	66	410.0027	-0.36662
43	180.0011	-0.36659	55	300.0019	-0.36662	67	420.0028	-0.36662
44	190.0012	-0.36659	56	310.0020	-0.36662	68	430.0028	-0.36662
45	200.0013	-0.36662	57	320.0021	-0.36662	69	440.0029	-0.36659
46	210.0013	-0.36662	58	330.0021	-0.36666	70	450.0029	-0.36655
47	220.0014	-0.36662	59	340.0022	-0.36659	71	460.0030	-0.36655
48	230.0015	-0.36662	60	350.0023	-0.36659	72	470.0031	-0.36662
49	240.0015	-0.36662	61	360.0023	-0.36662	73	480.0031	-0.36659
50	250.0016	-0.36662	62	370.0024	-0.36662	74	480.0617	-0.36662
51	260.0017	-0.36666	63	380.0025	-0.36662			
52	270.0017	-0.36666	64	390.0025	-0.36666			

Void Ratio = 1.110 **Compression =** 6.7% >>> CALCULATED USING D_{100}

D_0 = -0.3689 **D_{50} =** -0.3678 **D_{100} =** -0.3667 **C_V at 1.49 min. =** 0.288 ft.^{2}/day **C_α =** 0.000

Pressure: 2000 psf — **TEST READINGS** — **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.36662	23	2.0041	-0.36301
2	0.0125	-0.36659	24	5.0042	-0.36247
3	0.0166	-0.36642	25	10.0000	-0.36155
4	0.0208	-0.36628	26	15.0001	-0.36107
5	0.0250	-0.36621	27	20.0001	-0.36087
6	0.0291	-0.36615	28	30.0002	-0.36049
7	0.0333	-0.36611	29	40.0002	-0.36036
8	0.0375	-0.36601	30	50.0003	-0.36022
9	0.0416	-0.36594	31	60.0004	-0.36019
10	0.0458	-0.36591	32	70.0004	-0.36032
11	0.0500	-0.36584	33	80.0005	-0.36009
12	0.0541	-0.36581	34	90.0006	-0.36009
13	0.0583	-0.3657	35	100.0006	-0.36005
14	0.0708	-0.3656	36	110.0007	-0.36012
15	0.0875	-0.36553	37	120.0008	-0.36022
16	0.1708	-0.36526	38	130.0009	-0.36019
17	0.2541	-0.36512	39	140.0009	-0.36019
18	0.3375	-0.36502	40	150.0010	-0.36019
19	0.4208	-0.36485	41	160.0011	-0.35998
20	0.5041	-0.36468	42	170.0011	-0.36005
21	0.7541	-0.36427	43	180.0012	-0.35998
22	1.0041	-0.36393	44	190.0013	-0.35995



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 9**

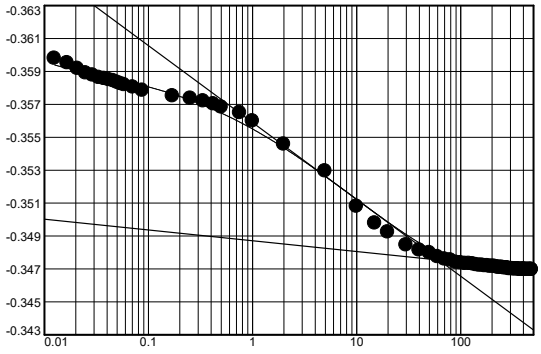
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
45	200.0013	-0.35995	55	300.0020	-0.35988	65	400.0027	-0.36012
46	210.0014	-0.36012	56	310.0021	-0.36015	66	410.0028	-0.36012
47	220.0015	-0.36015	57	320.0022	-0.36012	67	420.0028	-0.35995
48	230.0015	-0.35992	58	330.0022	-0.36012	68	430.0029	-0.35995
49	240.0016	-0.36012	59	340.0023	-0.35988	69	440.0030	-0.36012
50	250.0017	-0.36012	60	350.0024	-0.35988	70	450.0031	-0.36015
51	260.0017	-0.35992	61	360.0025	-0.36015	71	460.0031	-0.36015
52	270.0018	-0.36012	62	370.0025	-0.36015	72	470.0032	-0.36019
53	280.0019	-0.36015	63	380.0026	-0.36015	73	480.0032	-0.35992
54	290.0019	-0.35992	64	390.0026	-0.36012	74	480.0535	-0.35988

Void Ratio = 1.096 **Compression =** 7.4% >>> CALCULATED USING D_{100}

D_0 = -0.3666 **D_{50} =** -0.3634 **D_{100} =** -0.3603 **C_v at 1.56 min. =** 0.273 ft.^{2}/day **C_α =** 0.001

Pressure: 4000 psf | **TEST READINGS** | **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.35992	25	10.0000	-0.35079
2	0.0125	-0.35978	26	15.0001	-0.34977
3	0.0166	-0.35951	27	20.0001	-0.34923
4	0.0208	-0.35917	28	30.0002	-0.34844
5	0.0250	-0.35889	29	40.0002	-0.34814
6	0.0291	-0.35876	30	50.0003	-0.34797
7	0.0333	-0.35862	31	60.0004	-0.34773
8	0.0375	-0.35855	32	70.0004	-0.34759
9	0.0416	-0.35849	33	80.0005	-0.34753
10	0.0458	-0.35842	34	90.0006	-0.34739
11	0.0500	-0.35832	35	100.0006	-0.34736
12	0.0541	-0.35825	36	110.0007	-0.34732
13	0.0583	-0.35818	37	120.0007	-0.34732
14	0.0708	-0.35804	38	130.0008	-0.34729
15	0.0875	-0.35784	39	140.0009	-0.34725
16	0.1708	-0.3575	40	150.0009	-0.34722
17	0.2541	-0.35736	41	160.0010	-0.34722
18	0.3375	-0.35719	42	170.0011	-0.34718
19	0.4208	-0.35702	43	180.0011	-0.34718
20	0.5041	-0.35682	44	190.0012	-0.34715
21	0.7541	-0.35648	45	200.0013	-0.34715
22	1.0042	-0.35597	46	210.0013	-0.34715
23	2.0041	-0.35457	47	220.0014	-0.34712
24	5.0042	-0.35294	48	230.0014	-0.34708



Pressure: 4000 psf | **TEST READINGS (continued)** | **Load No. 10**

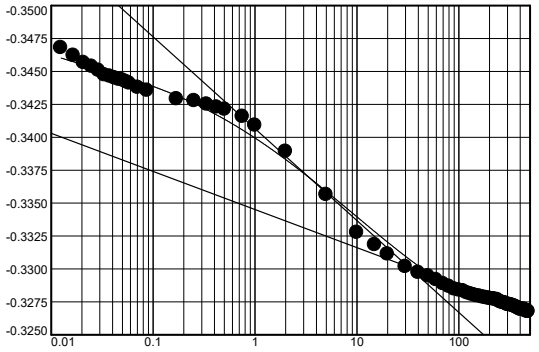
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0015	-0.34708	59	340.0022	-0.34698	69	440.0028	-0.34695
50	250.0016	-0.34708	60	350.0022	-0.34698	70	450.0028	-0.34695
51	260.0016	-0.34705	61	360.0023	-0.34698	71	460.0029	-0.34695
52	270.0017	-0.34705	62	370.0023	-0.34695	72	470.0030	-0.34695
53	280.0018	-0.34705	63	380.0024	-0.34695	73	480.0030	-0.34695
54	290.0018	-0.34701	64	390.0025	-0.34695	74	480.0616	-0.34695
55	300.0019	-0.34701	65	400.0025	-0.34698			
56	310.0019	-0.34701	66	410.0026	-0.34695			
57	320.0020	-0.34698	67	420.0026	-0.34695			
58	330.0021	-0.34698	68	430.0027	-0.34695			

Void Ratio = 1.067 **Compression =** 8.6% >>> CALCULATED USING D_{100}

D_0 = -0.3599 **D_{50} =** -0.3537 **D_{100} =** -0.3475 **C_V at 2.81 min. =** 0.148 ft.^{2}/day **C_α =** 0.001

Pressure: 8000 psf | **TEST READINGS** | **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.34695	25	10.0000	-0.33275
2	0.0125	-0.34678	26	15.0001	-0.33183
3	0.0166	-0.3462	27	20.0001	-0.33112
4	0.0208	-0.34565	28	30.0002	-0.33016
5	0.0250	-0.34538	29	40.0002	-0.32972
6	0.0291	-0.34507	30	50.0003	-0.32945
7	0.0333	-0.34473	31	60.0003	-0.32918
8	0.0375	-0.34463	32	70.0004	-0.32887
9	0.0416	-0.3445	33	80.0005	-0.32867
10	0.0458	-0.34439	34	90.0005	-0.32846
11	0.0500	-0.34433	35	100.0006	-0.32839
12	0.0541	-0.34422	36	110.0006	-0.32833
13	0.0583	-0.34409	37	120.0007	-0.32819
14	0.0708	-0.34378	38	130.0008	-0.32809
15	0.0875	-0.34354	39	140.0008	-0.32802
16	0.1708	-0.3429	40	150.0009	-0.32795
17	0.2541	-0.34276	41	160.0010	-0.32792
18	0.3375	-0.34249	42	170.0010	-0.32785
19	0.4208	-0.34228	43	180.0011	-0.32782
20	0.5041	-0.34211	44	190.0012	-0.32778
21	0.7541	-0.34157	45	200.0012	-0.32775
22	1.0041	-0.34089	46	210.0013	-0.32771
23	2.0041	-0.33891	47	220.0014	-0.32771
24	5.0042	-0.33564	48	230.0014	-0.32765



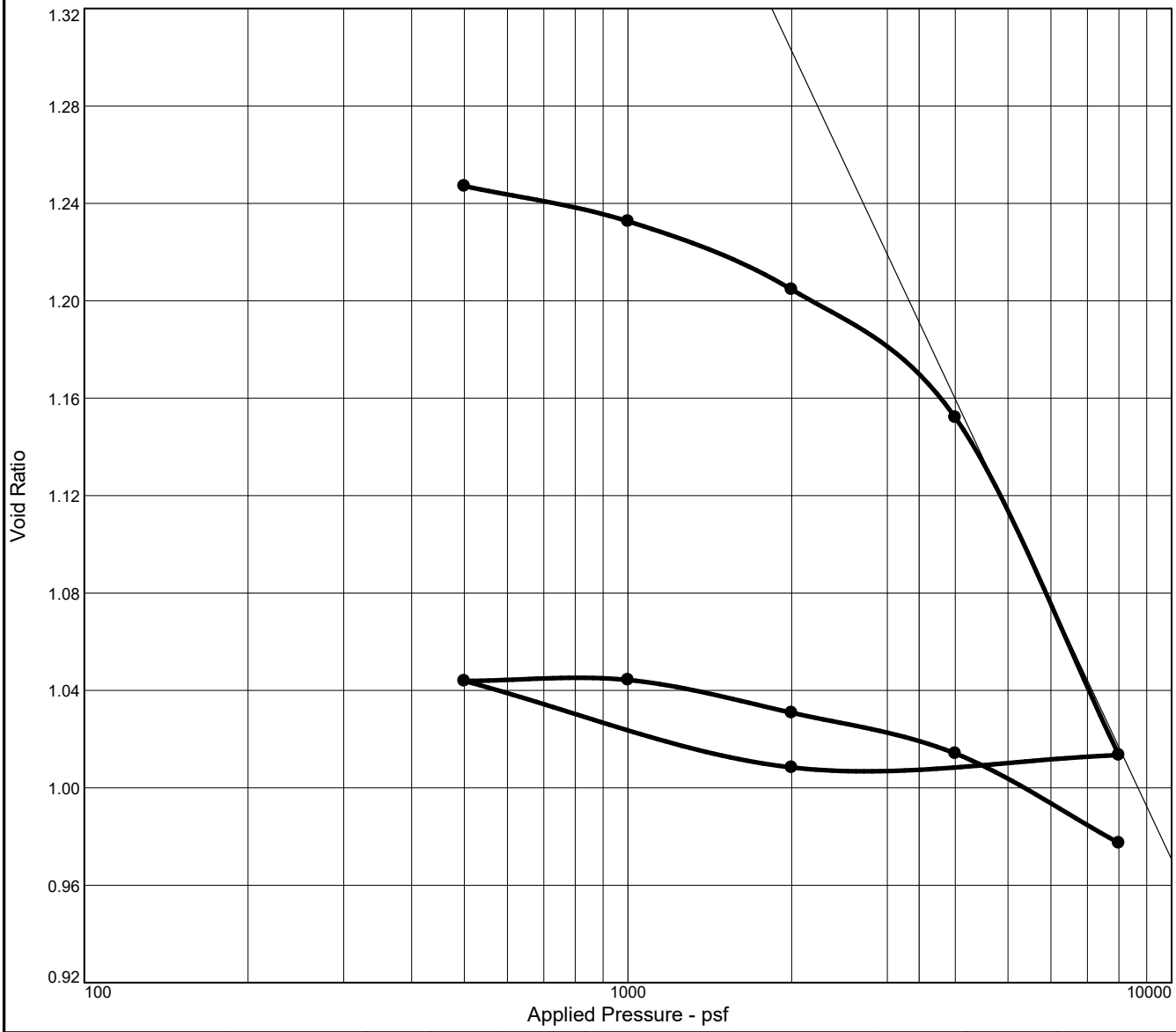
Pressure: 8000 psf	TEST READINGS (continued)	Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0015	-0.32765	59	340.0022	-0.3272	69	440.0028	-0.3269
50	250.0016	-0.32754	60	350.0022	-0.32717	70	450.0029	-0.32686
51	260.0016	-0.32748	61	360.0023	-0.32713	71	460.0030	-0.32679
52	270.0017	-0.32744	62	370.0023	-0.32707	72	470.0031	-0.32679
53	280.0017	-0.32741	63	380.0024	-0.32703	73	480.0031	-0.32676
54	290.0018	-0.32737	64	390.0025	-0.327	74	480.0659	-0.32676
55	300.0019	-0.3273	65	400.0026	-0.32693			
56	310.0019	-0.32727	66	410.0026	-0.32693			
57	320.0020	-0.32727	67	420.0027	-0.32693			
58	330.0021	-0.32724	68	430.0028	-0.32693			

Void Ratio = 1.028 **Compression =** 10.4% >>> CALCULATED USING D_{100}

D_0 = -0.3469 **D_{50} =** -0.3386 **D_{100} =** -0.3302 **C_V at 1.80 min. =** 0.223 $ft.^2/day$ **C_α =** 0.007

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
83.0 %	38.1 %	79.6	45	23	2.76	2726	3927	0.47	0.06	1.265

MATERIAL DESCRIPTION	USCS	AASHTO
CL - Lean CLAY	CL	

Project No. XL6097 **Client:** WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 **Depth:** 23.7 **Sample Number:** S-9

Remarks:

WSDOT

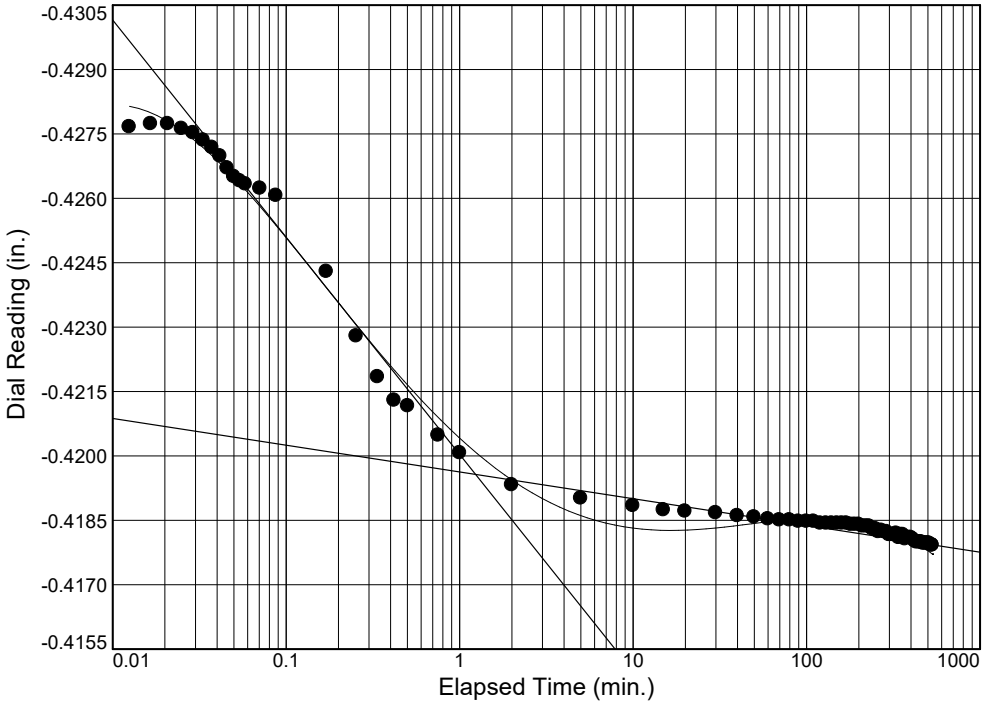
Figure

Tested By: SLW **Checked By:** SLW

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

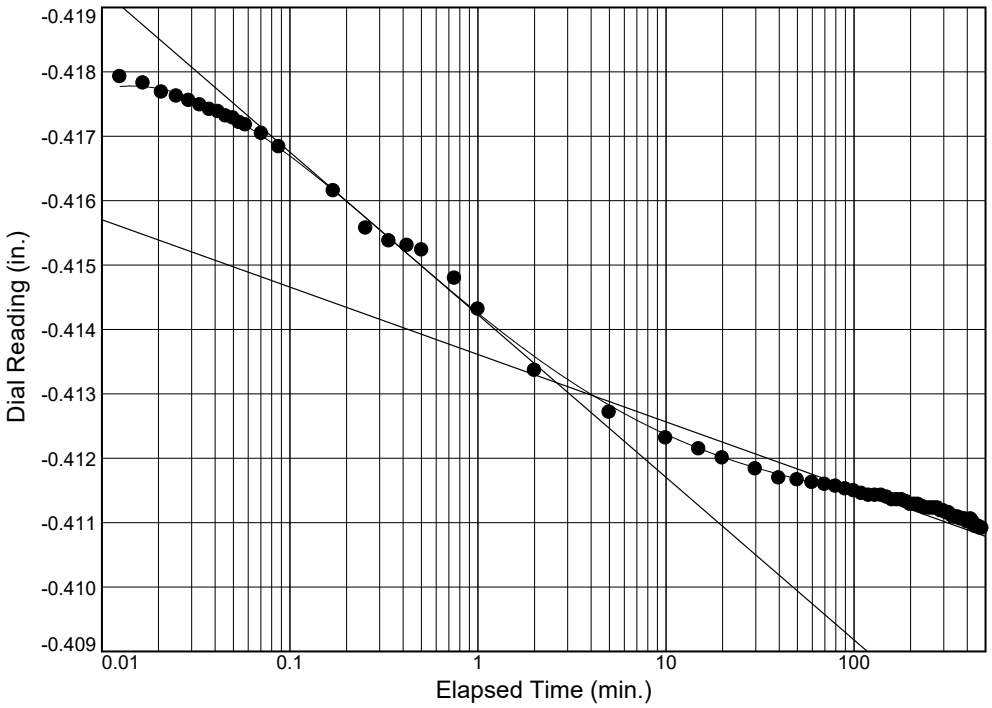
Source of Sample: H-1vwp-20 Depth: 23.7 Sample Number: S-9



Load No.= 1
Load= 500 psf
D_0 = -0.4277
D_{50} = -0.4236
D_{100} = -0.4196
T_{50} = 0.20 min.

C_v @ T_{50}
2.494 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 1000 psf
D_0 = -0.4179
D_{50} = -0.4155
D_{100} = -0.4132
T_{50} = 0.30 min.

C_v @ T_{50}
1.600 ft.^{2}/day

C_α = 0.002

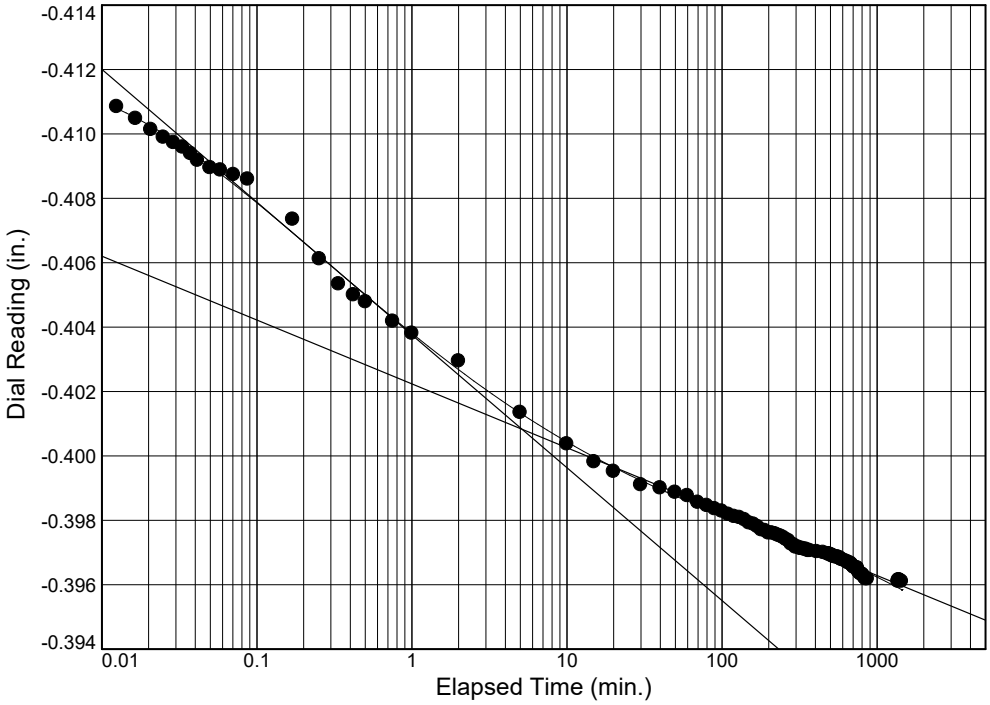
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

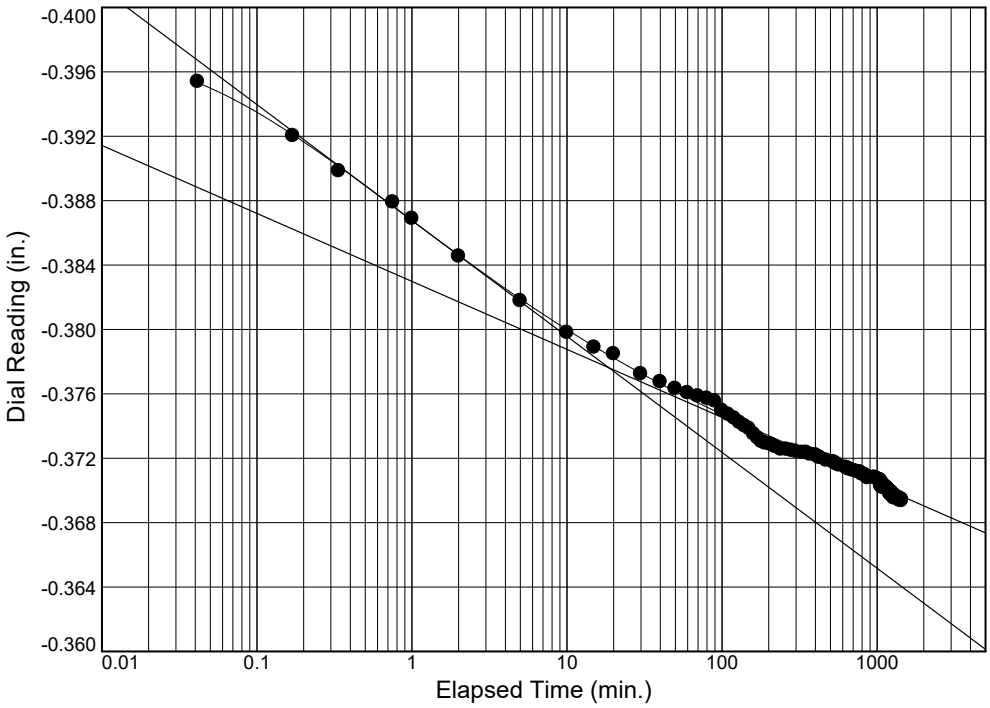
Source of Sample: H-1vwp-20 Depth: 23.7 Sample Number: S-9



Load No.= 3
Load= 2000 psf
D_0 = -0.4109
D_{50} = -0.4059
D_{100} = -0.4008
T_{50} = 0.31 min.

C_v @ T_{50}
1.532 ft.^{2}/day

C_α = 0.004



Load No.= 4
Load= 4000 psf
D_0 = -0.3961
D_{50} = -0.3869
D_{100} = -0.3776
T_{50} = 0.97 min.

C_v @ T_{50}
0.466 ft.^{2}/day

C_α = 0.010

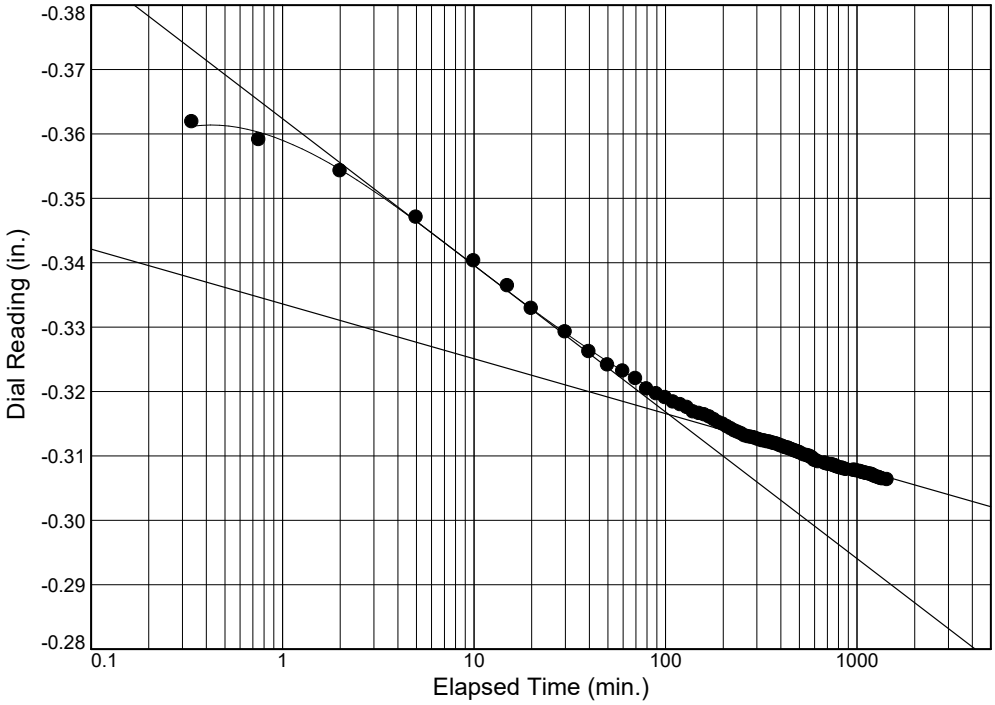
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

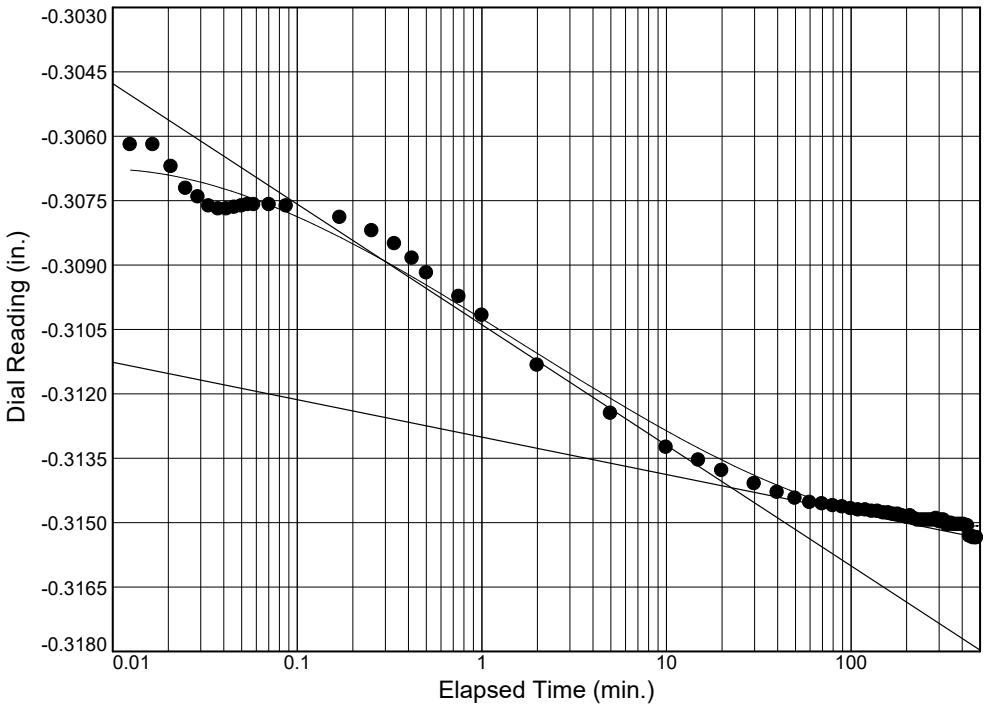
Source of Sample: H-1vwp-20 Depth: 23.7 Sample Number: S-9



Load No.= 5
Load= 8000 psf
D_0 = -0.3695
D_{50} = -0.3429
D_{100} = -0.3164
T_{50} = 7.13 min.

C_v @ T_{50}
0.058 ft.^{2}/day

C_α = 0.019



Load No.= 6
Load= 2000 psf
D_0 = -0.3063
D_{50} = -0.3102
D_{100} = -0.3142
T_{50} = 0.98 min.

C_v @ T_{50}
0.392 ft.^{2}/day

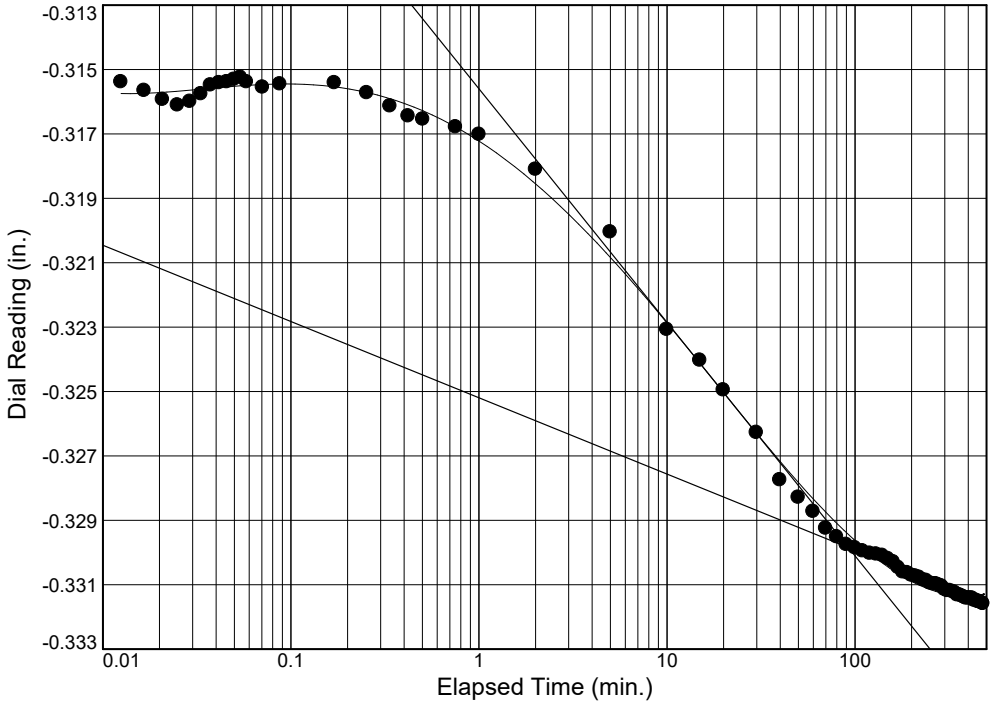
Figure

Washington State Department of Transportation

Dial Reading vs. Time

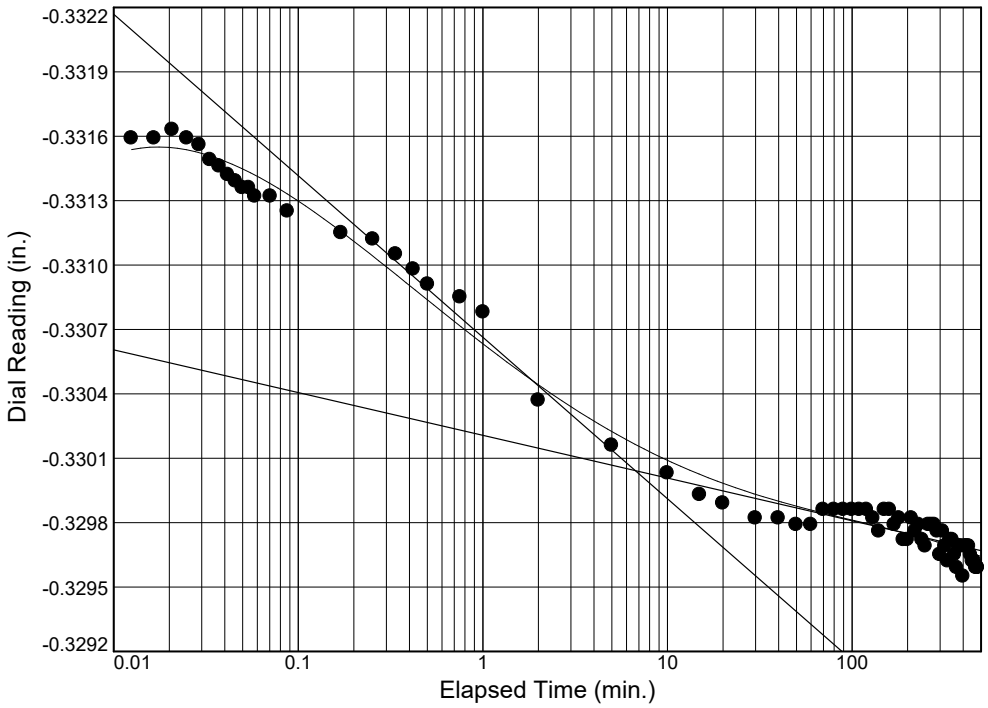
Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 Depth: 23.7 Sample Number: S-9



Load No.= 7
Load= 500 psf
D_0 = -0.3154
D_{50} = -0.3226
D_{100} = -0.3299
T_{50} = 9.17 min.

C_v @ T_{50}
0.043 ft.^{2}/day



Load No.= 8
Load= 1000 psf
D_0 = -0.3316
D_{50} = -0.3308
D_{100} = -0.3300
T_{50} = 0.54 min.

C_v @ T_{50}
0.747 ft.^{2}/day

C_α = 0.000

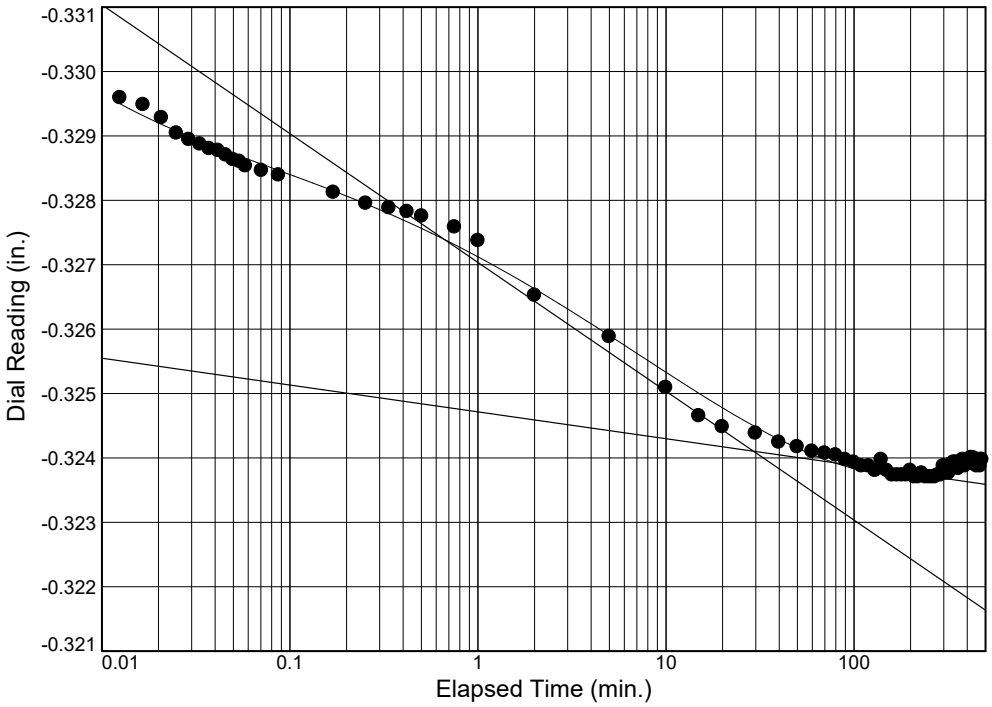
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

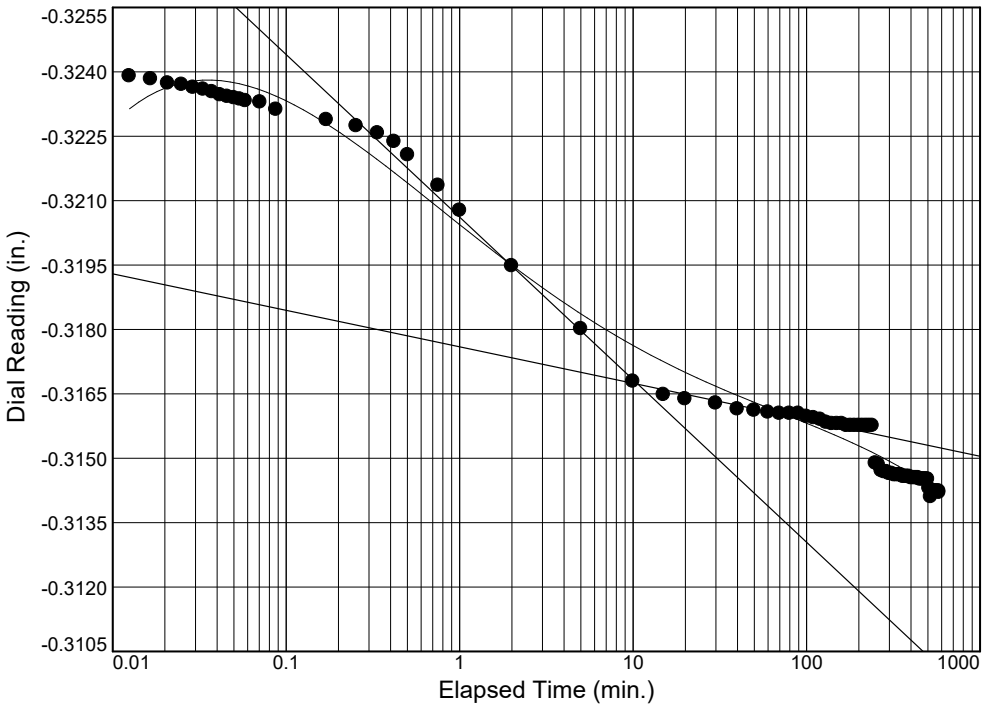
Source of Sample: H-1vwp-20 Depth: 23.7 Sample Number: S-9



Load No.= 9
Load= 2000 psf
D_0 = -0.3296
D_{50} = -0.3268
D_{100} = -0.3241
T_{50} = 1.48 min.

C_v @ T_{50}
0.269 ft.^{2}/day

C_α = 0.001



Load No.= 10
Load= 4000 psf
D_0 = -0.3240
D_{50} = -0.3203
D_{100} = -0.3167
T_{50} = 1.07 min.

C_v @ T_{50}
0.366 ft.^{2}/day

C_α = 0.002

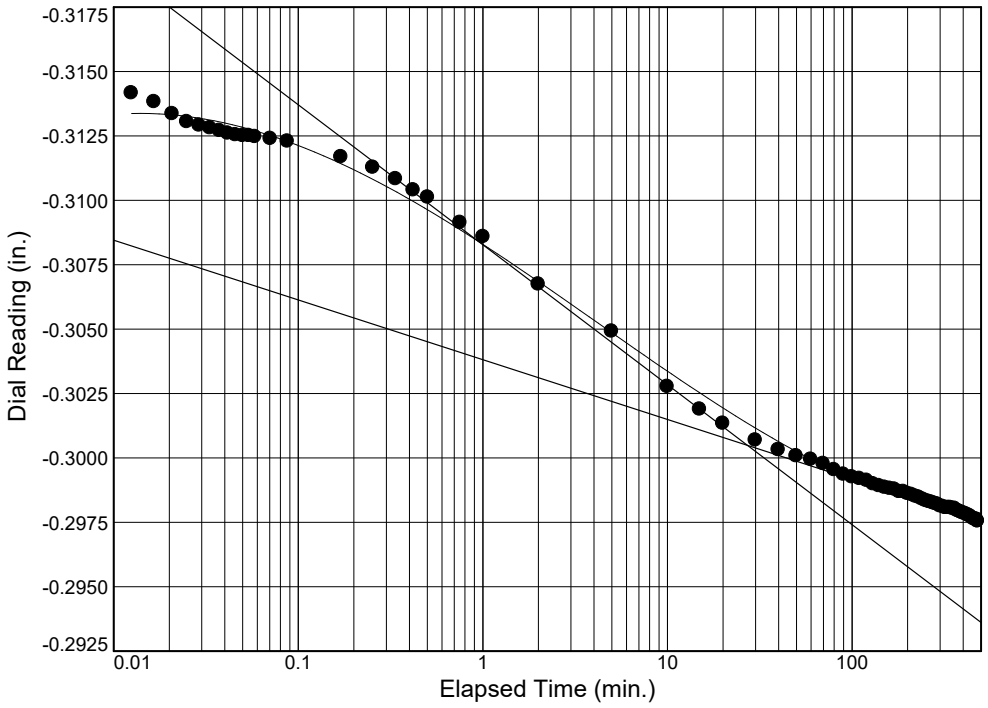
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-1vwp-20 Depth: 23.7 Sample Number: S-9



Load No.= 11
Load= 8000 psf
D_0 = -0.3142
D_{50} = -0.3073
D_{100} = -0.3005
T_{50} = 1.58 min.

C_v @ T_{50}
0.241 ft.^{2}/day

C_α = 0.005

Figure

Washington State Department of Transportation

CONSOLIDATION TEST DATA

5/10/2021

Client: WSDOT (Donald Anderson)
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project Number: XL6097
Location: H-1vwp-20
Depth: 23.7 **Sample Number:** S-9
Material Description: CL - Lean CLAY
Liquid Limit: 45 **Plasticity Index:** 23
USCS: CL
Tested by: SLW **Checked by:** SLW

Test Specimen Data

NATURAL MOISTURE
Wet w+t =1053.80 g.
Dry w+t = 837.02 g.
Tare Wt. = 267.40 g.
Moisture = 38.1 %

VOID RATIO
Spec. Gr. = 2.76
Est. Ht. Solids = 0.441 in.
Init. V.R. = 1.265
Init. Sat. = 83.0 %

AFTER TEST
Wet w+t = 222.31 g.
Dry w+t = 185.40 g.
Tare Wt. = 87.40 g.
Moisture = 37.7 %

UNIT WEIGHT
Height = 1.000 in.
Diameter = 2.500 in.
Weight = 141.60 g.
Dry Dens. = 79.6 pcf

TEST START
Height = 1.000 in.
Diameter = 2.500 in.

Dry Wt. = 98.00* g.

End-Of-Load Summary

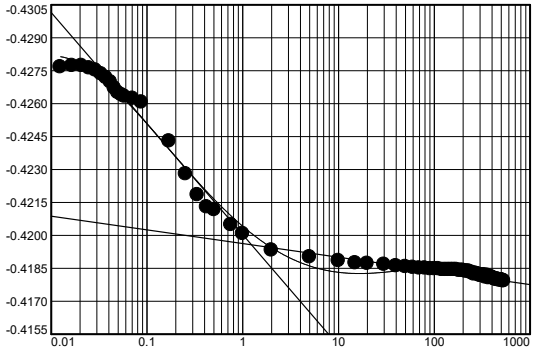
Pressure (psf)	Final Dial (in.)	Deformation (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Strain
start	-0.42766	0.00000			1.265	
500	-0.41792	0.00809*	2.494	0.001	1.247	0.8 Comprs.
1000	-0.41091	0.01449*	1.600	0.002	1.233	1.4 Comprs.
2000	-0.39610	0.02684*	1.532	0.004	1.205	2.7 Comprs.
4000	-0.36945	0.05005*	0.466	0.010	1.152	5.0 Comprs.
8000	-0.30627	0.11124*	0.058	0.019	1.013	11.1 Comprs.
2000	-0.31536	0.11347*	0.392		1.008	11.3 Comprs.
500	-0.33159	0.09781*	0.043		1.044	9.8 Comprs.
1000	-0.32959	0.09762*	0.747	0.000	1.044	9.8 Comprs.
2000	-0.32397	0.10356*	0.269	0.001	1.031	10.4 Comprs.
4000	-0.31420	0.11094*	0.366	0.002	1.014	11.1 Comprs.
8000	-0.29755	0.12717*	0.241	0.005	0.977	12.7 Comprs.

***CALCULATED USING D_{100} INSTEAD OF FINAL READING**

Compression index (C_c), psf = 0.47 **Preconsolidation pressure (P_p), psf =** 3927 **Void ratio at P_p (e_m) =** 1.155
Overburden (σ_{vo}), psf = 2726 **Void ratio at σ_{vo} (e_o) =** 1.189 **Recompression index (C_r) =** 0.06

Pressure: 500 psf	TEST READINGS	Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.42766	41	160.0009	-0.41843
2	0.0125	-0.42766	42	170.0009	-0.41843
3	0.0166	-0.42773	43	180.0010	-0.4184
4	0.0208	-0.42773	44	190.0011	-0.4184
5	0.0250	-0.42762	45	200.0011	-0.4184
6	0.0291	-0.42752	46	210.0011	-0.41836
7	0.0333	-0.42735	47	220.0012	-0.41836
8	0.0375	-0.42718	48	230.0013	-0.41836
9	0.0416	-0.42698	49	240.0013	-0.4183
10	0.0458	-0.4267	50	250.0014	-0.4183
11	0.0500	-0.4265	51	260.0014	-0.41823
12	0.0541	-0.4264	52	270.0014	-0.41826
13	0.0583	-0.42633	53	280.0015	-0.41823
14	0.0708	-0.42623	54	290.0016	-0.41823
15	0.0875	-0.42606	55	300.0016	-0.41816
16	0.1708	-0.42429	56	310.0016	-0.41816
17	0.2542	-0.42279	57	320.0017	-0.41816
18	0.3375	-0.42184	58	330.0017	-0.41819
19	0.4208	-0.42129	59	340.0018	-0.41809
20	0.5041	-0.42116	60	350.0018	-0.41816
21	0.7542	-0.42048	61	360.0019	-0.41816
22	1.0042	-0.42007	62	370.0019	-0.41806
23	2.0041	-0.41932	63	380.0020	-0.41809
24	5.0042	-0.41901	64	390.0020	-0.41809
25	10.0000	-0.41884	65	400.0021	-0.41809
26	15.0001	-0.41874	66	410.0021	-0.41806
27	20.0001	-0.41871	67	420.0022	-0.41802
28	30.0002	-0.41867	68	430.0022	-0.41799
29	40.0002	-0.4186	69	440.0023	-0.41799
30	50.0003	-0.41857	70	450.0023	-0.41799
31	60.0003	-0.41853	71	460.0024	-0.41799
32	70.0004	-0.4185	72	470.0024	-0.41796
33	80.0004	-0.4185	73	480.0025	-0.41796
34	90.0005	-0.41847	74	490.0025	-0.41796
35	100.0006	-0.41847	75	500.0026	-0.41796
36	110.0006	-0.41847	76	510.0027	-0.41796
37	120.0006	-0.41843	77	520.0027	-0.41792
38	130.0007	-0.41843	78	530.0028	-0.41792
39	140.0008	-0.41843	79	531.4614	-0.41792
40	150.0008	-0.41843			

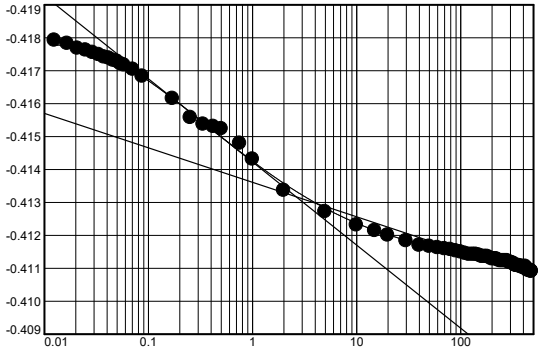


Void Ratio = 1.247 **Compression =** 0.8% >>> CALCULATED USING D_{100}

D_0 = -0.4277 **D_{50} =** -0.4236 **D_{100} =** -0.4196 **C_v at 0.20 min. =** 2.494 $ft.^2$/day **C_α =** 0.001

Pressure: 1000 psf	TEST READINGS	Load No. 2

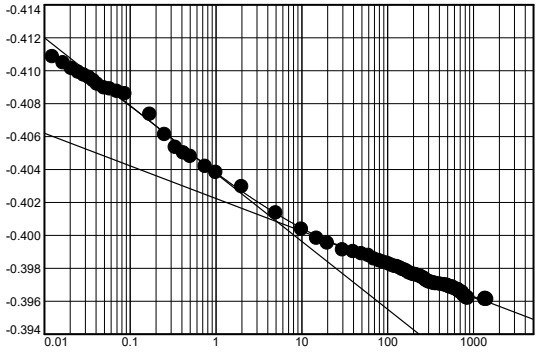
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.41792	38	130.0008	-0.41142
2	0.0125	-0.41792	39	140.0009	-0.41142
3	0.0166	-0.41782	40	150.0009	-0.41139
4	0.0208	-0.41768	41	160.0010	-0.41135
5	0.0250	-0.41762	42	170.0011	-0.41135
6	0.0291	-0.41755	43	180.0011	-0.41135
7	0.0333	-0.41748	44	190.0012	-0.41132
8	0.0375	-0.41741	45	200.0013	-0.41128
9	0.0416	-0.41738	46	210.0013	-0.41128
10	0.0458	-0.41731	47	220.0014	-0.41128
11	0.0500	-0.41728	48	230.0015	-0.41125
12	0.0541	-0.41721	49	240.0015	-0.41122
13	0.0583	-0.41717	50	250.0016	-0.41122
14	0.0708	-0.41704	51	260.0017	-0.41122
15	0.0875	-0.41683	52	270.0017	-0.41122
16	0.1708	-0.41615	53	280.0018	-0.41122
17	0.2541	-0.41557	54	290.0019	-0.41118
18	0.3375	-0.41537	55	300.0019	-0.41118
19	0.4208	-0.4153	56	310.0020	-0.41115
20	0.5041	-0.41523	57	320.0020	-0.41115
21	0.7542	-0.41479	58	330.0021	-0.41111
22	1.0042	-0.41431	59	340.0022	-0.41108
23	2.0041	-0.41336	60	350.0022	-0.41108
24	5.0042	-0.41271	61	360.0023	-0.41108
25	10.0000	-0.41231	62	370.0024	-0.41105
26	15.0001	-0.41214	63	380.0025	-0.41105
27	20.0001	-0.412	64	390.0025	-0.41105
28	30.0002	-0.41183	65	400.0026	-0.41101
29	40.0002	-0.41169	66	410.0026	-0.41101
30	50.0003	-0.41166	67	420.0027	-0.41105
31	60.0004	-0.41162	68	430.0028	-0.41101
32	70.0004	-0.41159	69	440.0028	-0.41094
33	80.0005	-0.41156	70	450.0029	-0.41094
34	90.0006	-0.41152	71	460.0029	-0.41094
35	100.0006	-0.41149	72	470.0030	-0.41091
36	110.0007	-0.41145	73	480.0031	-0.41091
37	120.0007	-0.41142	74	480.0908	-0.41091



Void Ratio = 1.233 **Compression =** 1.4% >>> CALCULATED USING D_{100}

D_0 = -0.4179 **D_{50} =** -0.4155 **D_{100} =** -0.4132 **C_v at 0.30 min. =** 1.600 ft.^{2}/day **C_α =** 0.002

Pressure: 2000 psf			TEST READINGS			Load No. 3
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	
1	0.0000	-0.41091	41	180.0009	-0.3977	
2	0.0125	-0.41084	42	190.0009	-0.39767	
3	0.0166	-0.41047	43	200.0010	-0.3976	
4	0.0208	-0.41013	44	210.0010	-0.3976	
5	0.0250	-0.40989	45	220.0011	-0.39757	
6	0.0291	-0.40972	46	230.0011	-0.39753	
7	0.0333	-0.40958	47	240.0012	-0.3975	
8	0.0375	-0.40938	48	250.0012	-0.39746	
9	0.0416	-0.40917	49	260.0013	-0.3974	
10	0.0500	-0.40894	50	270.0013	-0.39736	
11	0.0583	-0.40887	51	280.0014	-0.39726	
12	0.0708	-0.40873	52	290.0014	-0.39723	
13	0.0875	-0.40859	53	300.0015	-0.39716	
14	0.1708	-0.40734	54	310.0015	-0.39716	
15	0.2541	-0.40611	55	320.0016	-0.39712	
16	0.3375	-0.40533	56	330.0016	-0.39712	
17	0.4208	-0.40499	57	340.0017	-0.39709	
18	0.5041	-0.40478	58	350.0017	-0.39709	
19	0.7541	-0.40417	59	360.0018	-0.39705	
20	1.0041	-0.4038	60	370.0018	-0.39705	
21	2.0041	-0.40294	61	410.0021	-0.39702	
22	5.0042	-0.40134	62	450.0023	-0.39699	
23	10.0000	-0.40036	63	480.0025	-0.39695	
24	15.0001	-0.39981	64	490.0025	-0.39695	
25	20.0001	-0.39951	65	500.0025	-0.39692	
26	30.0001	-0.3991	66	510.0026	-0.39692	
27	40.0002	-0.399	67	520.0026	-0.39688	
28	50.0002	-0.39886	68	530.0027	-0.39688	
29	60.0003	-0.39876	69	540.0027	-0.39685	
30	70.0003	-0.39855	70	560.0028	-0.39685	
31	80.0004	-0.39845	71	570.0029	-0.39682	
32	90.0004	-0.39835	72	580.0029	-0.39682	
33	100.0005	-0.39828	73	590.0030	-0.39678	
34	110.0005	-0.39818	74	610.0031	-0.39675	
35	120.0006	-0.39811	75	640.0032	-0.39671	
36	130.0006	-0.39808	76	650.0033	-0.39668	
37	140.0007	-0.39801	77	660.0033	-0.39668	
38	150.0007	-0.39791	78	670.0034	-0.39665	
39	160.0008	-0.39787	79	680.0034	-0.39665	
40	170.0008	-0.3978	80	690.0035	-0.39661	



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 3**

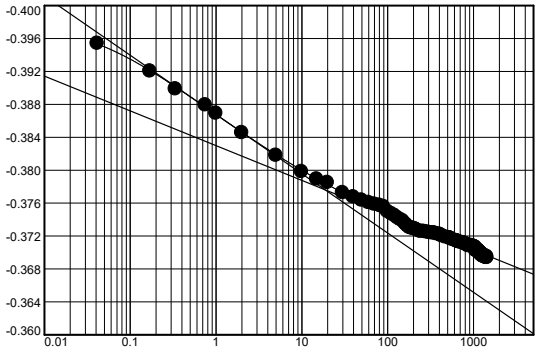
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
81	700.0036	-0.39658	91	810.0041	-0.39631
82	710.0036	-0.39654	92	820.0041	-0.39627
83	720.0036	-0.39654	93	830.0042	-0.39624
84	730.0037	-0.39651	94	840.0000	-0.3962
85	750.0038	-0.39651	95	850.0001	-0.39617
86	760.0038	-0.39641	96	870.0002	-0.39617
87	770.0039	-0.39637	97	1370.0032	-0.3961
88	780.0039	-0.39634	98	1380.0033	-0.39614
89	790.0040	-0.39634	99	1400.0034	-0.39614
90	800.0040	-0.39631	100	1440.1497	-0.3961

Void Ratio = 1.205 **Compression =** 2.7% >>> CALCULATED USING D_{100}

D_0 = -0.4109 **D_{50} =** -0.4059 **D_{100} =** -0.4008 **C_v at 0.31 min. =** 1.532 ft.^{2}/day **C_α =** 0.004

Pressure: 4000 psf | **TEST READINGS** | **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.3961	25	160.0008	-0.3735
2	0.0416	-0.39539	26	170.0008	-0.37326
3	0.1708	-0.39202	27	180.0009	-0.37302
4	0.3375	-0.38984	28	190.0009	-0.37292
5	0.7541	-0.3879	29	200.0010	-0.37289
6	1.0042	-0.38688	30	210.0010	-0.37282
7	2.0041	-0.38453	31	220.0011	-0.37272
8	5.0042	-0.38177	32	240.0012	-0.37255
9	10.0000	-0.3798	33	260.0013	-0.37255
10	15.0001	-0.37888	34	280.0014	-0.37248
11	20.0001	-0.37847	35	300.0015	-0.37241
12	30.0001	-0.37724	36	330.0017	-0.37234
13	40.0002	-0.37673	37	350.0018	-0.37234
14	50.0002	-0.37632	38	370.0019	-0.37224
15	60.0003	-0.37605	39	400.0021	-0.3722
16	70.0003	-0.37585	40	410.0022	-0.37214
17	80.0004	-0.37571	41	420.0022	-0.37207
18	90.0004	-0.37554	42	430.0023	-0.37203
19	100.0005	-0.37496	43	470.0025	-0.37186
20	110.0005	-0.37472	44	520.0028	-0.37176
21	120.0006	-0.37449	45	530.0029	-0.37173
22	130.0006	-0.37421	46	540.0037	-0.37169
23	140.0007	-0.37401	47	550.0037	-0.37163
24	150.0007	-0.37384	48	570.0038	-0.37156



Pressure: 4000 psf | **TEST READINGS (continued)** | **Load No. 4**

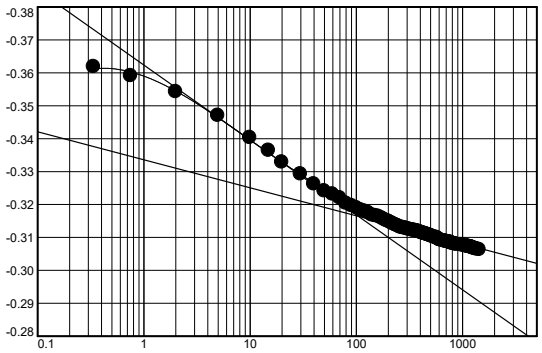
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	630.0041	-0.37142	67	1060.0021	-0.37026	85	1260.0033	-0.36965
50	640.0042	-0.37139	68	1070.0022	-0.37054	86	1270.0034	-0.36962
51	650.0000	-0.37135	69	1080.0022	-0.3702	87	1280.0034	-0.36955
52	660.0001	-0.37132	70	1090.0023	-0.3704	88	1290.0035	-0.36952
53	690.0002	-0.37125	71	1100.0024	-0.37016	89	1300.0036	-0.36969
54	730.0004	-0.37118	72	1110.0024	-0.37033	90	1310.0036	-0.36965
55	770.0006	-0.37112	73	1120.0025	-0.37026	91	1320.0037	-0.36962
56	780.0006	-0.37112	74	1150.0026	-0.3702	92	1340.0038	-0.36958
57	800.0007	-0.37101	75	1160.0027	-0.37016	93	1380.0041	-0.36955
58	830.0008	-0.37098	76	1170.0028	-0.37013	94	1390.0041	-0.36941
59	840.0009	-0.37095	77	1180.0028	-0.37009	95	1400.0000	-0.36938
60	870.0010	-0.37078	78	1190.0029	-0.37006	96	1410.0001	-0.36945
61	960.0015	-0.37081	79	1200.0030	-0.36999	97	1420.0001	-0.36945
62	990.0017	-0.37074	80	1210.0030	-0.36979	98	1430.0002	-0.36938
63	1010.0018	-0.37071	81	1220.0031	-0.36975	99	1440.0002	-0.36935
64	1020.0019	-0.37067	82	1230.0031	-0.36975	100	1440.1838	-0.36945
65	1040.0020	-0.37064	83	1240.0032	-0.36989			
66	1050.0020	-0.37064	84	1250.0033	-0.36986			

Void Ratio = 1.152 **Compression =** 5.0% >>> CALCULATED USING D_{100}

D_0 = -0.3961 **D_{50} =** -0.3869 **D_{100} =** -0.3776 **C_v at 0.97 min. =** 0.466 ft.^{2}/day **C_α =** 0.010

Pressure: 8000 psf | **TEST READINGS** | **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.36945	17	110.0006	-0.31832
2	0.3375	-0.36182	18	120.0007	-0.31791
3	0.7542	-0.35907	19	130.0008	-0.31747
4	2.0041	-0.3542	20	140.0008	-0.31679
5	5.0042	-0.34701	21	150.0009	-0.31655
6	10.0000	-0.34024	22	160.0009	-0.31634
7	15.0001	-0.33636	23	170.0010	-0.316
8	20.0001	-0.33285	24	180.0011	-0.31559
9	30.0002	-0.32921	25	190.0011	-0.31512
10	40.0002	-0.32615	26	200.0012	-0.31488
11	50.0003	-0.32407	27	210.0012	-0.31451
12	60.0003	-0.32312	28	220.0013	-0.31416
13	70.0004	-0.32196	29	230.0014	-0.31386
14	80.0005	-0.32033	30	240.0014	-0.31362
15	90.0005	-0.31961	31	250.0015	-0.31338
16	100.0006	-0.319	32	260.0015	-0.31308



Pressure: 8000 psf	TEST READINGS (continued)	Load No. 5

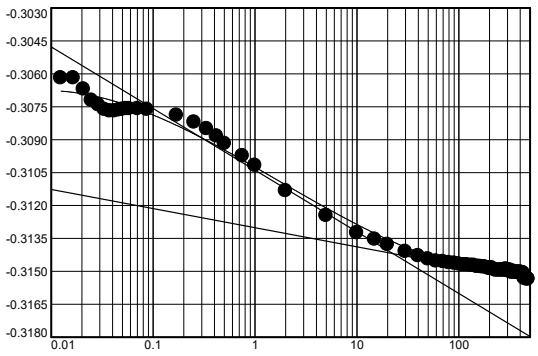
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
33	270.0016	-0.31294	56	500.0030	-0.31049	79	880.0013	-0.30783
34	280.0016	-0.31284	57	510.0031	-0.31035	80	960.0018	-0.30773
35	290.0017	-0.31277	58	530.0032	-0.31011	81	980.0019	-0.3077
36	300.0018	-0.3126	59	550.0034	-0.31001	82	1000.0020	-0.30763
37	310.0018	-0.31246	60	560.0034	-0.30991	83	1040.0023	-0.30753
38	320.0019	-0.31233	61	570.0035	-0.30988	84	1050.0023	-0.30749
39	330.0019	-0.31226	62	580.0036	-0.30971	85	1070.0024	-0.30739
40	340.0020	-0.31216	63	590.0036	-0.30957	86	1090.0025	-0.30736
41	350.0021	-0.31209	64	600.0037	-0.3093	87	1110.0027	-0.30725
42	360.0022	-0.31199	65	610.0037	-0.30923	88	1130.0028	-0.30722
43	370.0022	-0.31188	66	630.0038	-0.30906	89	1160.0030	-0.30715
44	380.0023	-0.31182	67	680.0000	-0.30882	90	1180.0031	-0.30708
45	390.0023	-0.31171	68	690.0001	-0.30875	91	1200.0032	-0.30705
46	400.0024	-0.31154	69	710.0002	-0.30865	92	1210.0033	-0.30698
47	410.0025	-0.31144	70	740.0004	-0.30858	93	1220.0033	-0.30691
48	420.0025	-0.31127	71	750.0005	-0.30851	94	1240.0034	-0.30681
49	430.0026	-0.3112	72	760.0005	-0.30845	95	1260.0036	-0.30674
50	440.0027	-0.31114	73	770.0006	-0.30841	96	1300.0038	-0.30661
51	450.0027	-0.311	74	780.0006	-0.30831	97	1310.0039	-0.30657
52	460.0028	-0.3109	75	790.0007	-0.30824	98	1330.0040	-0.30647
53	470.0028	-0.31076	76	810.0008	-0.30814	99	1360.0041	-0.3064
54	480.0029	-0.31069	77	840.0010	-0.30804	100	1440.1632	-0.30627
55	490.0030	-0.31059	78	850.0011	-0.30797			

Void Ratio = 1.013 **Compression =** 11.1% >>> CALCULATED USING D_{100}

D_0 = -0.3695 **D_{50} =** -0.3429 **D_{100} =** -0.3164 **C_v at 7.13 min. =** 0.058 ft.^{2}/day **C_α =** 0.019

Pressure: 2000 psf	TEST READINGS	Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.30627	12	0.0541	-0.3076
2	0.0125	-0.3062	13	0.0583	-0.3076
3	0.0166	-0.3062	14	0.0708	-0.3076
4	0.0208	-0.30671	15	0.0875	-0.30763
5	0.0250	-0.30722	16	0.1708	-0.3079
6	0.0291	-0.30742	17	0.2542	-0.30821
7	0.0333	-0.30763	18	0.3375	-0.30851
8	0.0375	-0.3077	19	0.4208	-0.30885
9	0.0416	-0.3077	20	0.5041	-0.30919
10	0.0458	-0.30766	21	0.7542	-0.30974
11	0.0500	-0.30763	22	1.0042	-0.31018



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 6**

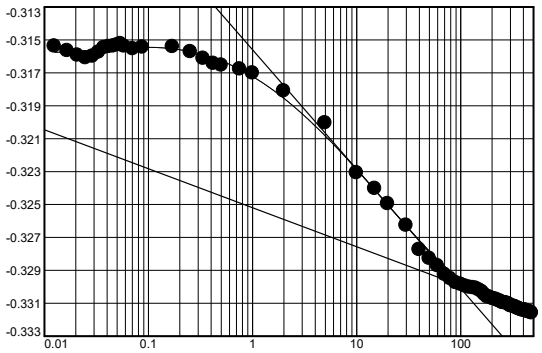
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
23	2.0041	-0.31134	41	160.0009	-0.31478	59	340.0024	-0.31505
24	5.0042	-0.31246	42	170.0014	-0.31481	60	350.0024	-0.31502
25	10.0000	-0.31325	43	180.0015	-0.31481	61	360.0025	-0.31505
26	15.0001	-0.31355	44	190.0016	-0.31485	62	370.0025	-0.31505
27	20.0001	-0.31379	45	200.0016	-0.31488	63	380.0026	-0.31505
28	30.0001	-0.3141	46	210.0017	-0.31485	64	390.0027	-0.31505
29	40.0002	-0.3143	47	220.0017	-0.31491	65	400.0027	-0.31505
30	50.0002	-0.31444	48	230.0018	-0.31495	66	410.0028	-0.31505
31	60.0003	-0.31454	49	240.0018	-0.31495	67	420.0028	-0.31508
32	70.0004	-0.31457	50	250.0019	-0.31495	68	430.0029	-0.31508
33	80.0004	-0.31461	51	260.0019	-0.31495	69	440.0030	-0.31532
34	90.0005	-0.31464	52	270.0020	-0.31495	70	450.0031	-0.31532
35	100.0005	-0.31468	53	280.0020	-0.31495	71	460.0031	-0.31536
36	110.0006	-0.31471	54	290.0021	-0.31491	72	470.0032	-0.31536
37	120.0006	-0.31471	55	300.0022	-0.31498	73	480.0032	-0.31536
38	130.0007	-0.31474	56	310.0022	-0.31495	74	480.0702	-0.31536
39	140.0008	-0.31474	57	320.0023	-0.31495			
40	150.0008	-0.31478	58	330.0023	-0.31505			

Void Ratio = 1.008 **Compression =** 11.3% >>> CALCULATED USING D_{100}

D_0 = -0.3063 **D_{50} =** -0.3102 **D_{100} =** -0.3142 **C_V at 0.98 min. =** 0.392 ft.^{2}/day

Pressure: 500 psf | **TEST READINGS** | **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.31536	17	0.2541	-0.31573
2	0.0125	-0.31539	18	0.3375	-0.31614
3	0.0166	-0.31566	19	0.4208	-0.31645
4	0.0208	-0.31594	20	0.5041	-0.31655
5	0.0250	-0.31611	21	0.7541	-0.31679
6	0.0291	-0.316	22	1.0041	-0.31702
7	0.0333	-0.31576	23	2.0041	-0.31811
8	0.0375	-0.31549	24	5.0042	-0.32005
9	0.0416	-0.31542	25	10.0000	-0.32308
10	0.0458	-0.31539	26	15.0001	-0.32404
11	0.0500	-0.31532	27	20.0001	-0.32496
12	0.0541	-0.31525	28	30.0002	-0.32628
13	0.0583	-0.31539	29	40.0002	-0.32775
14	0.0708	-0.31556	30	50.0003	-0.32829
15	0.0875	-0.31546	31	60.0004	-0.32873
16	0.1708	-0.31542	32	70.0004	-0.32925



Pressure: 500 psf | **TEST READINGS (continued)** | **Load No. 7**

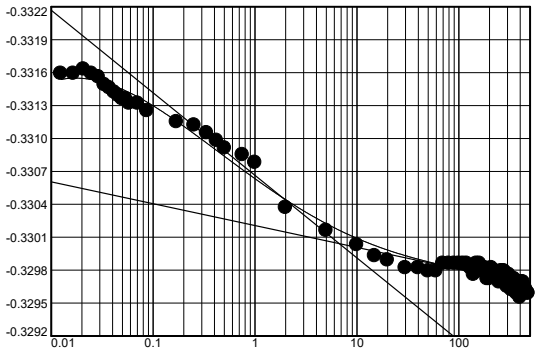
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
33	80.0005	-0.32952	47	220.0015	-0.33078	61	360.0025	-0.33132
34	90.0006	-0.32976	48	230.0015	-0.33085	62	370.0026	-0.33136
35	100.0006	-0.32986	49	240.0016	-0.33088	63	380.0026	-0.33139
36	110.0007	-0.32996	50	250.0017	-0.33095	64	390.0027	-0.33142
37	120.0008	-0.33003	51	260.0017	-0.33098	65	400.0028	-0.33142
38	130.0008	-0.33006	52	270.0018	-0.33098	66	410.0029	-0.33142
39	140.0009	-0.3301	53	280.0019	-0.33102	67	420.0029	-0.33142
40	150.0010	-0.3302	54	290.0020	-0.33105	68	430.0030	-0.33149
41	160.0010	-0.3303	55	300.0020	-0.33115	69	440.0031	-0.33149
42	170.0011	-0.33047	56	310.0021	-0.33119	70	450.0031	-0.33153
43	180.0012	-0.33061	57	320.0022	-0.33119	71	460.0032	-0.33153
44	190.0013	-0.33064	58	330.0023	-0.33122	72	470.0033	-0.33156
45	200.0013	-0.33071	59	340.0023	-0.33125	73	480.0034	-0.33159
46	210.0014	-0.33074	60	350.0024	-0.33132	74	480.1120	-0.33159

Void Ratio = 1.044 **Compression =** 9.8% >>> CALCULATED USING D_{100}

D_0 = -0.3154 **D_{50} =** -0.3226 **D_{100} =** -0.3299 **C_V at 9.17 min. =** 0.043 ft.^{2}/day

Pressure: 1000 psf | **TEST READINGS** | **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.33159	21	0.7541	-0.33085
2	0.0125	-0.33159	22	1.0041	-0.33078
3	0.0166	-0.33159	23	2.0041	-0.33037
4	0.0208	-0.33163	24	5.0000	-0.33016
5	0.0250	-0.33159	25	10.0000	-0.33003
6	0.0291	-0.33156	26	15.0001	-0.32993
7	0.0333	-0.33149	27	20.0001	-0.32989
8	0.0374	-0.33146	28	30.0002	-0.32982
9	0.0416	-0.33142	29	40.0002	-0.32982
10	0.0458	-0.33139	30	50.0003	-0.32979
11	0.0499	-0.33136	31	60.0004	-0.32979
12	0.0541	-0.33136	32	70.0005	-0.32986
13	0.0583	-0.33132	33	80.0005	-0.32986
14	0.0708	-0.33132	34	90.0006	-0.32986
15	0.0874	-0.33125	35	100.0007	-0.32986
16	0.1708	-0.33115	36	110.0008	-0.32986
17	0.2541	-0.33112	37	120.0008	-0.32986
18	0.3375	-0.33105	38	130.0009	-0.32982
19	0.4208	-0.33098	39	140.0010	-0.32976
20	0.5041	-0.33091	40	150.0010	-0.32986



Pressure: 1000 psf | **TEST READINGS (continued)** | **Load No. 8**

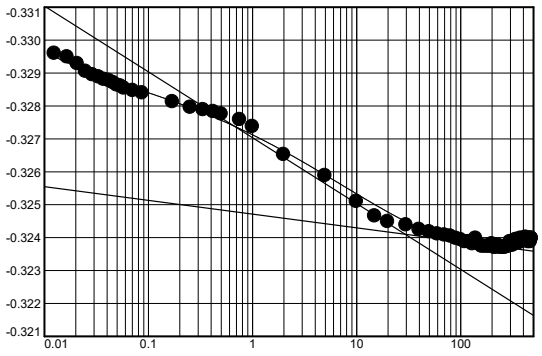
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
41	160.0011	-0.32986	53	280.0019	-0.32979	65	400.0027	-0.32955
42	170.0012	-0.32979	54	290.0020	-0.32976	66	410.0027	-0.32969
43	180.0012	-0.32982	55	300.0020	-0.32965	67	420.0028	-0.32969
44	190.0013	-0.32972	56	310.0021	-0.32976	68	430.0029	-0.32969
45	200.0014	-0.32972	57	320.0022	-0.32969	69	440.0029	-0.32965
46	210.0014	-0.32982	58	330.0022	-0.32962	70	450.0030	-0.32962
47	220.0015	-0.32976	59	340.0023	-0.32972	71	460.0030	-0.32962
48	230.0016	-0.32979	60	350.0023	-0.32972	72	470.0031	-0.32959
49	240.0016	-0.32972	61	360.0024	-0.32965	73	480.0031	-0.32959
50	250.0017	-0.32969	62	370.0025	-0.32959	74	480.0492	-0.32959
51	260.0018	-0.32979	63	380.0025	-0.32969			
52	270.0018	-0.32979	64	390.0026	-0.32969			

Void Ratio = 1.044 **Compression =** 9.8% >>> CALCULATED USING D_{100}

D_0 = -0.3316 **D_{50} =** -0.3308 **D_{100} =** -0.3300 **C_V at 0.54 min. =** 0.747 ft.^{2}/day **C_α =** 0.000

Pressure: 2000 psf | **TEST READINGS** | **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.32959	23	2.0041	-0.32652
2	0.0125	-0.32959	24	5.0042	-0.32588
3	0.0166	-0.32948	25	10.0000	-0.32509
4	0.0208	-0.32928	26	15.0000	-0.32465
5	0.0250	-0.32904	27	20.0001	-0.32448
6	0.0291	-0.32894	28	30.0001	-0.32438
7	0.0333	-0.32887	29	40.0002	-0.32424
8	0.0374	-0.3288	30	50.0002	-0.32417
9	0.0416	-0.32877	31	60.0003	-0.3241
10	0.0458	-0.3287	32	70.0003	-0.32407
11	0.0499	-0.32863	33	80.0004	-0.32404
12	0.0541	-0.3286	34	90.0004	-0.32397
13	0.0583	-0.32853	35	100.0005	-0.32393
14	0.0708	-0.32846	36	110.0005	-0.32387
15	0.0874	-0.32839	37	120.0006	-0.32387
16	0.1708	-0.32812	38	130.0006	-0.3238
17	0.2541	-0.32795	39	140.0007	-0.32397
18	0.3374	-0.32788	40	150.0007	-0.3238
19	0.4208	-0.32782	41	160.0008	-0.32373
20	0.5041	-0.32775	42	170.0008	-0.32373
21	0.7541	-0.32758	43	180.0009	-0.32373
22	1.0041	-0.32737	44	190.0009	-0.32373



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 9**

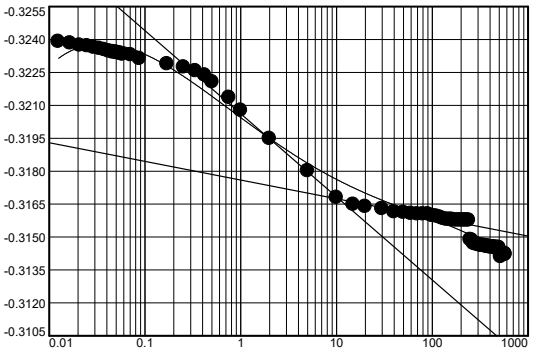
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
45	200.0010	-0.3238	55	300.0015	-0.32387	65	400.0020	-0.3239
46	210.0010	-0.3237	56	310.0016	-0.32376	66	410.0021	-0.32393
47	220.0011	-0.3237	57	320.0016	-0.32376	67	420.0022	-0.324
48	230.0011	-0.32376	58	330.0017	-0.3239	68	430.0022	-0.324
49	240.0012	-0.3237	59	340.0017	-0.32393	69	440.0023	-0.3239
50	250.0012	-0.3237	60	350.0018	-0.32393	70	450.0023	-0.32387
51	260.0013	-0.3237	61	360.0018	-0.32383	71	460.0024	-0.32397
52	270.0013	-0.3237	62	370.0019	-0.32387	72	470.0025	-0.32387
53	280.0014	-0.32373	63	380.0019	-0.32397	73	480.0025	-0.32397
54	290.0014	-0.32373	64	390.0020	-0.32387	74	480.0570	-0.32397

Void Ratio = 1.031 **Compression =** 10.4% >>> CALCULATED USING D_{100}

D_0 = -0.3296 **D_{50} =** -0.3268 **D_{100} =** -0.3241 **C_v at 1.48 min. =** 0.269 $ft.^2/day$ **C_α =** 0.001

Pressure: 4000 psf | **TEST READINGS** | **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.32397	25	10.0000	-0.31679
2	0.0125	-0.3239	26	15.0001	-0.31648
3	0.0166	-0.32383	27	20.0001	-0.31638
4	0.0208	-0.32373	28	30.0001	-0.31628
5	0.0250	-0.3237	29	40.0002	-0.31614
6	0.0291	-0.32363	30	50.0002	-0.31611
7	0.0333	-0.32359	31	60.0003	-0.31607
8	0.0375	-0.32353	32	70.0004	-0.31604
9	0.0416	-0.32346	33	80.0005	-0.31604
10	0.0458	-0.32342	34	90.0005	-0.31604
11	0.0500	-0.32339	35	100.0006	-0.31597
12	0.0541	-0.32336	36	110.0006	-0.31594
13	0.0583	-0.32332	37	120.0007	-0.3159
14	0.0708	-0.32329	38	130.0008	-0.31583
15	0.0875	-0.32312	39	140.0008	-0.3158
16	0.1708	-0.32288	40	150.0009	-0.3158
17	0.2541	-0.32274	41	160.0010	-0.3158
18	0.3375	-0.32257	42	170.0010	-0.31576
19	0.4208	-0.32237	43	180.0011	-0.31576
20	0.5041	-0.32206	44	190.0011	-0.31576
21	0.7541	-0.32135	45	200.0012	-0.31576
22	1.0041	-0.32077	46	210.0013	-0.31576
23	2.0041	-0.31948	47	220.0014	-0.31576
24	5.0042	-0.31801	48	230.0014	-0.31576



Pressure: 4000 psf	TEST READINGS (continued)	Load No. 10

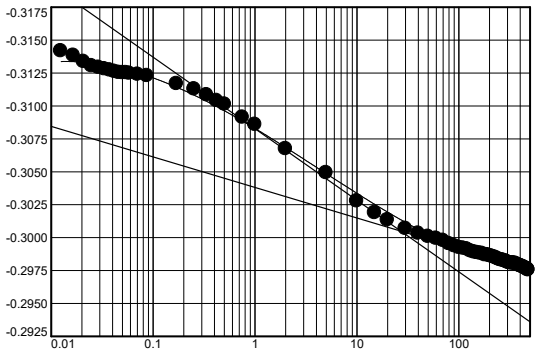
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0015	-0.31576	61	360.0022	-0.31457	73	480.0029	-0.31451
50	250.0015	-0.31488	62	370.0022	-0.31457	74	490.0030	-0.31451
51	260.0016	-0.31485	63	380.0023	-0.31457	75	500.0030	-0.31451
52	270.0017	-0.31471	64	390.0023	-0.31457	76	510.0031	-0.3143
53	280.0017	-0.31468	65	400.0024	-0.31454	77	520.0032	-0.3141
54	290.0017	-0.31468	66	410.0025	-0.31454	78	530.0032	-0.31423
55	300.0018	-0.31464	67	420.0025	-0.31454	79	540.0033	-0.31423
56	310.0019	-0.31464	68	430.0026	-0.31454	80	550.0034	-0.31423
57	320.0019	-0.31461	69	440.0026	-0.31454	81	560.0034	-0.31423
58	330.0020	-0.31461	70	450.0027	-0.31451	82	570.0035	-0.31423
59	340.0020	-0.31461	71	460.0028	-0.31451	83	580.0036	-0.31423
60	350.0021	-0.31461	72	470.0028	-0.31451	84	580.2788	-0.3142

Void Ratio = 1.014 **Compression =** 11.1% >>> CALCULATED USING D_{100}

D_0 = -0.3240 **D_{50} =** -0.3203 **D_{100} =** -0.3167 **C_v at 1.07 min. =** 0.366 ft.^{2}/day **C_α =** 0.002

Pressure: 8000 psf	TEST READINGS	Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.3142	23	2.0041	-0.30674
2	0.0125	-0.31416	24	5.0042	-0.30491
3	0.0166	-0.31382	25	10.0000	-0.30276
4	0.0208	-0.31335	26	15.0001	-0.30188
5	0.0250	-0.31304	27	20.0001	-0.30133
6	0.0291	-0.31291	28	30.0002	-0.30068
7	0.0333	-0.3128	29	40.0002	-0.30031
8	0.0375	-0.3127	30	50.0003	-0.30007
9	0.0416	-0.3126	31	60.0004	-0.29994
10	0.0458	-0.31253	32	70.0004	-0.29977
11	0.0500	-0.3125	33	80.0005	-0.29953
12	0.0541	-0.3125	34	90.0005	-0.29936
13	0.0583	-0.31246	35	100.0006	-0.29925
14	0.0708	-0.31239	36	110.0007	-0.29919
15	0.0875	-0.31229	37	120.0007	-0.29912
16	0.1708	-0.31168	38	130.0008	-0.29898
17	0.2541	-0.31127	39	140.0008	-0.29891
18	0.3375	-0.31083	40	150.0009	-0.29885
19	0.4208	-0.31039	41	160.0010	-0.29881
20	0.5041	-0.31011	42	170.0011	-0.29878
21	0.7541	-0.30913	43	180.0011	-0.29868
22	1.0041	-0.30858	44	190.0012	-0.29868



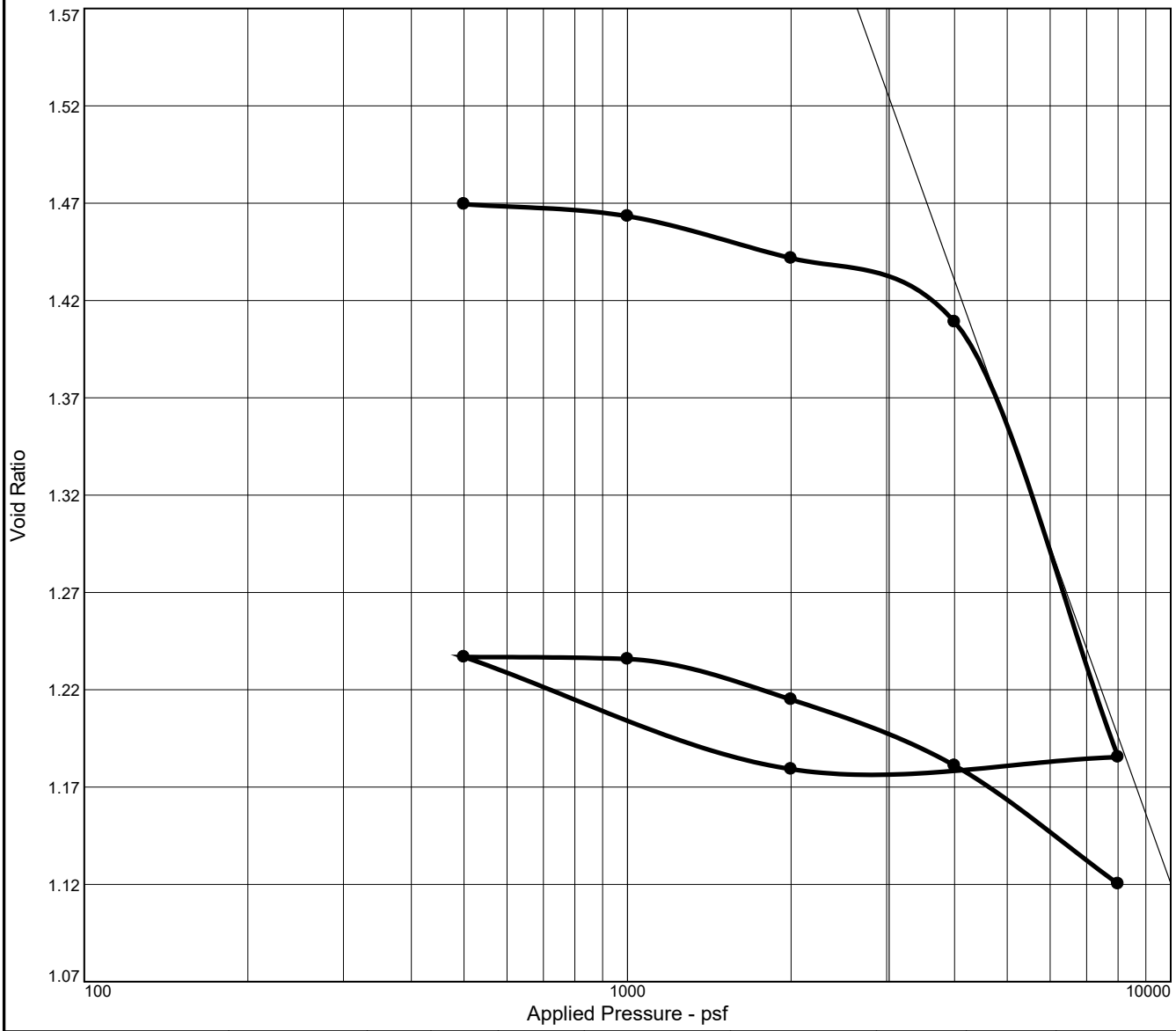
Pressure: 8000 psf	TEST READINGS (continued)	Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
45	200.0012	-0.29861	55	300.0019	-0.29813	65	400.0024	-0.29786
46	210.0013	-0.29857	56	310.0019	-0.2981	66	410.0025	-0.29783
47	220.0014	-0.29851	57	320.0020	-0.29806	67	420.0025	-0.29779
48	230.0014	-0.29847	58	330.0020	-0.29806	68	430.0026	-0.29776
49	240.0015	-0.2984	59	340.0021	-0.29806	69	440.0026	-0.29772
50	250.0016	-0.29834	60	350.0022	-0.29803	70	450.0027	-0.29766
51	260.0016	-0.2983	61	360.0022	-0.29803	71	460.0027	-0.29762
52	270.0017	-0.29827	62	370.0022	-0.29796	72	470.0028	-0.29762
53	280.0017	-0.29823	63	380.0023	-0.29793	73	480.0028	-0.29755
54	290.0018	-0.2982	64	390.0024	-0.29789	74	480.0739	-0.29755

Void Ratio = 0.977 **Compression =** 12.7% >>> CALCULATED USING D_{100}

D_0 = -0.3142 **D_{50} =** -0.3073 **D_{100} =** -0.3005 **C_V at 1.58 min. =** 0.241 $ft.^2/day$ **C_α =** 0.005

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.2 %	52.5 %	70.3	53	28	2.76	1680	3986	0.78	0.11	1.490

MATERIAL DESCRIPTION	USCS	AASHTO
CH - Fat CLAY	CH	

Project No. XL6097 **Client:** WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 **Depth:** 15.7 **Sample Number:** S-6

Remarks:

WSDOT

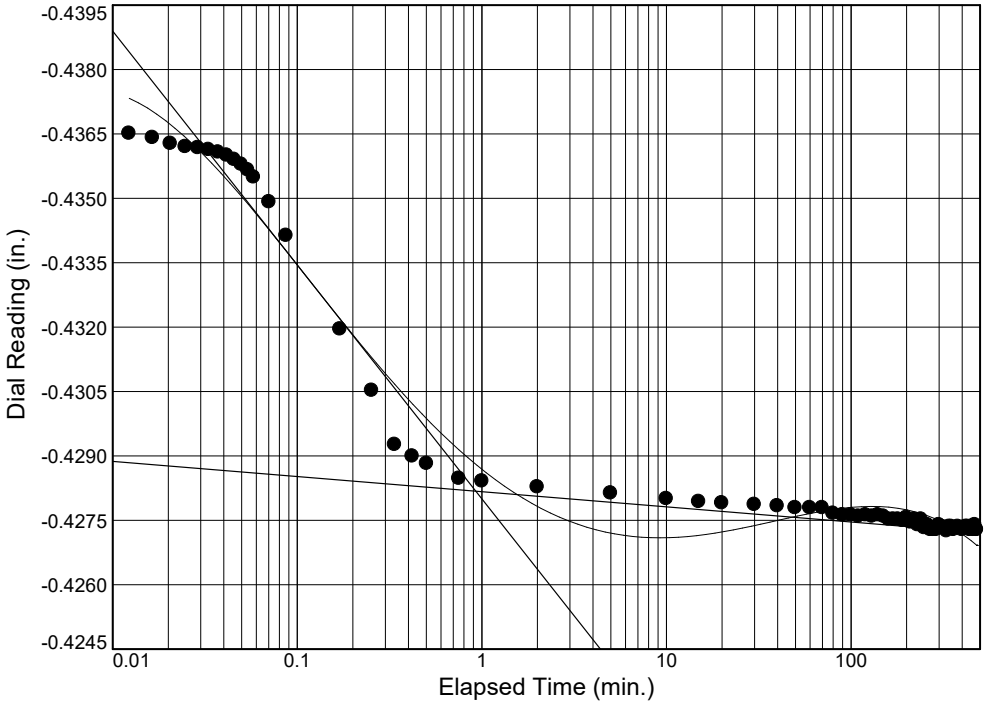
Figure

Tested By: SLW **Checked By:** SLW

Dial Reading vs. Time

Project No.: XL6097
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

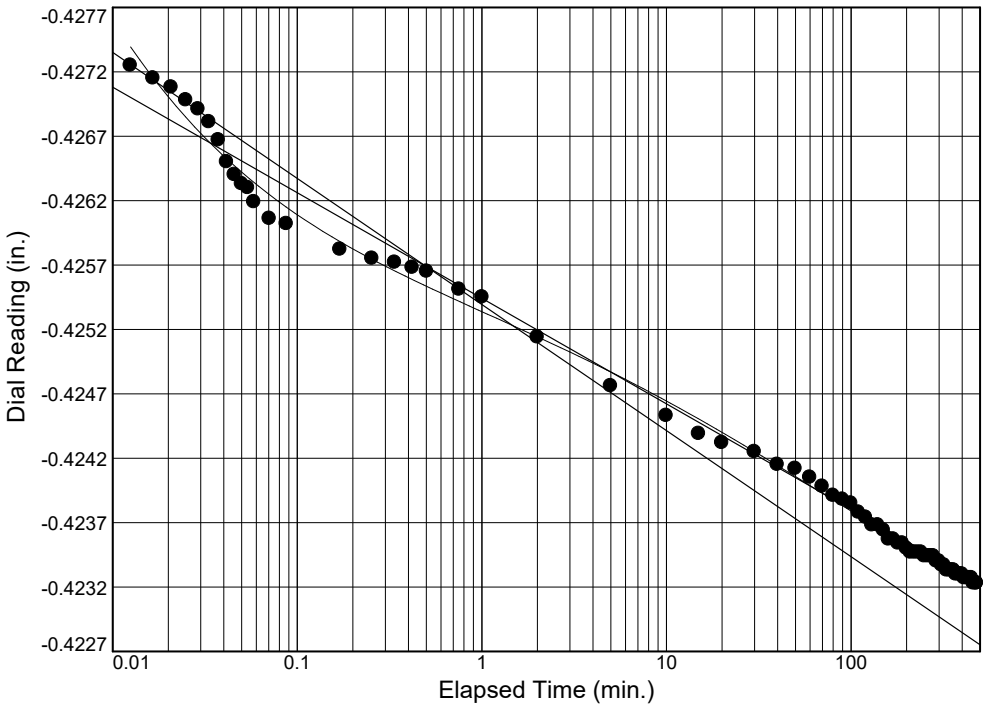
Source of Sample: H-2vwp-20 Depth: 15.7 Sample Number: S-6



Load No.= 1
Load= 500 psf
D_0 = -0.4365
D_{50} = -0.4324
D_{100} = -0.4282
T_{50} = 0.16 min.

C_v @ T_{50}
3.079 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 1000 psf
D_0 = -0.4273
D_{50} = -0.4265
D_{100} = -0.4257
T_{50} = 0.04 min.

C_v @ T_{50}
10.855 ft.^{2}/day

C_α = 0.002

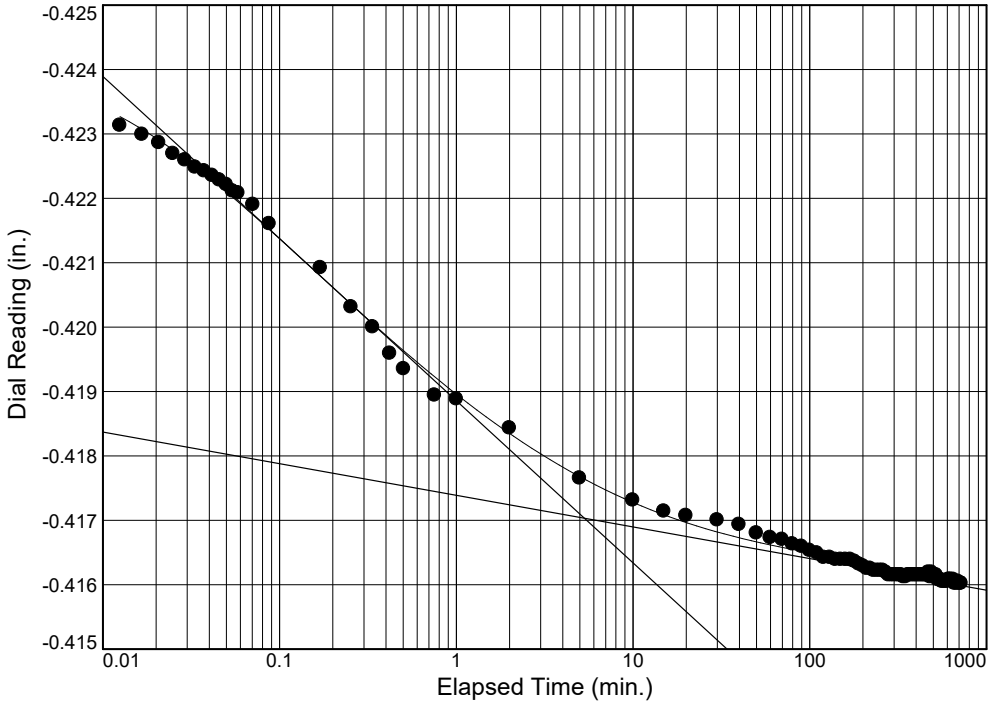
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

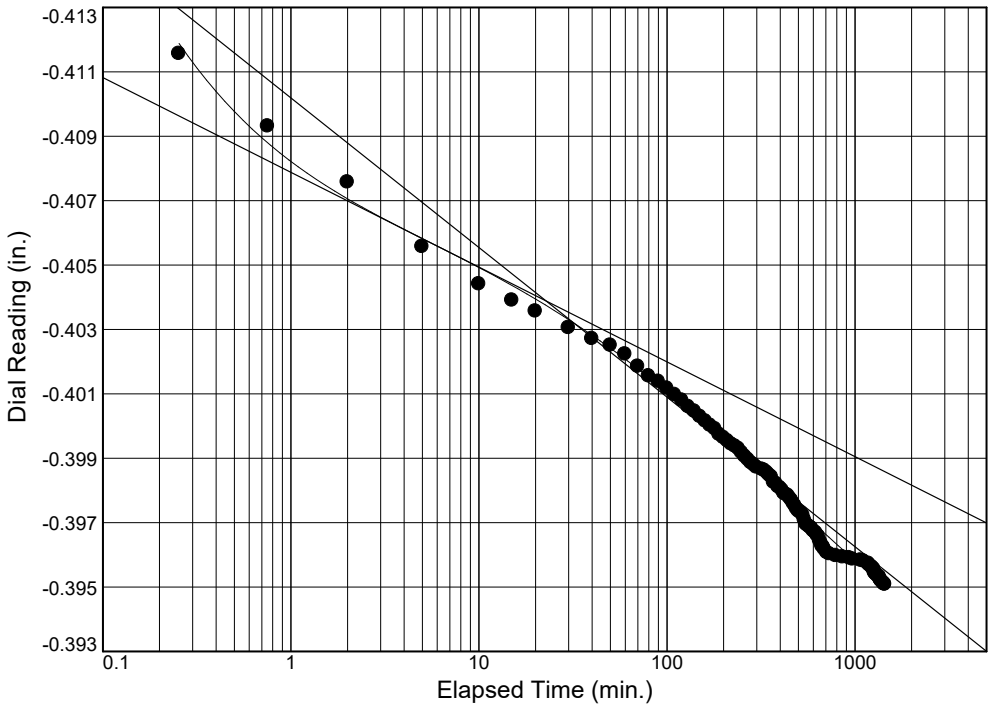
Source of Sample: H-2vwp-20 Depth: 15.7 Sample Number: S-6



Load No.= 3
Load= 2000 psf
D_0 = -0.4232
D_{50} = -0.4201
D_{100} = -0.4170
T_{50} = 0.31 min.

C_v @ T_{50}
1.522 ft.^{2}/day

C_α = 0.001



Load No.= 4
Load= 4000 psf
D_0 = -0.4160
D_{50} = -0.4099
D_{100} = -0.4039
T_{50} = 0.47 min.

C_v @ T_{50}
0.998 ft.^{2}/day

C_α = 0.012

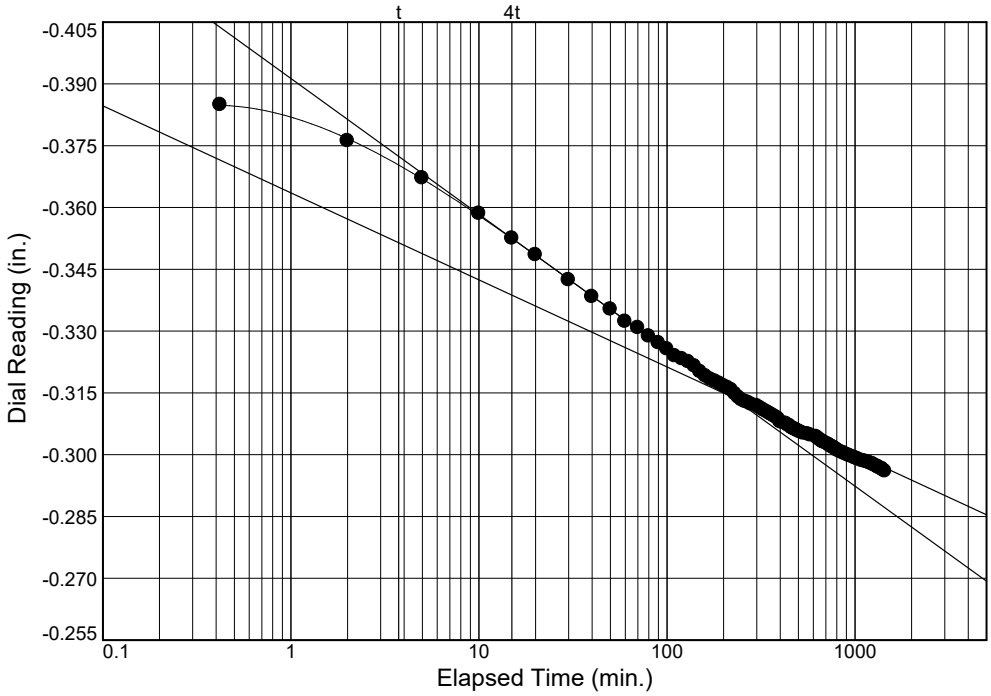
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

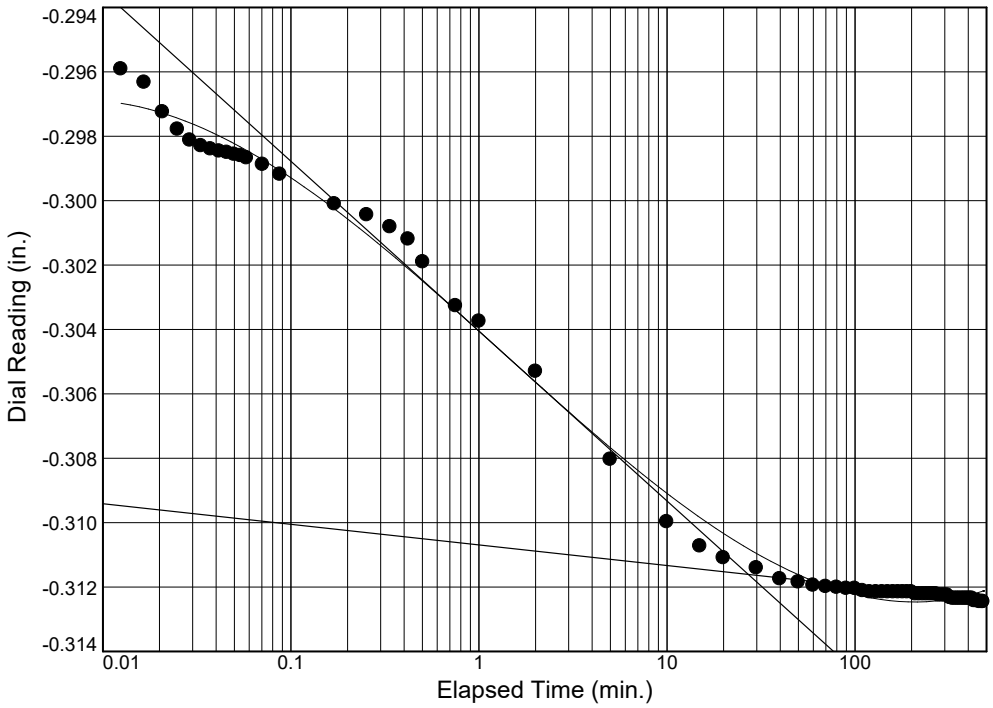
Source of Sample: H-2vwp-20 Depth: 15.7 Sample Number: S-6



Load No.= 5
Load= 8000 psf
D_0 = -0.3881
D_{50} = -0.3511
D_{100} = -0.3141
T_{50} = 16.47 min.

C_v @ T_{50}
0.025 ft.^{2}/day

C_α = 0.053



Load No.= 6
Load= 2000 psf
D_0 = -0.2960
D_{50} = -0.3038
D_{100} = -0.3116
T_{50} = 0.89 min.

C_v @ T_{50}
0.414 ft.^{2}/day

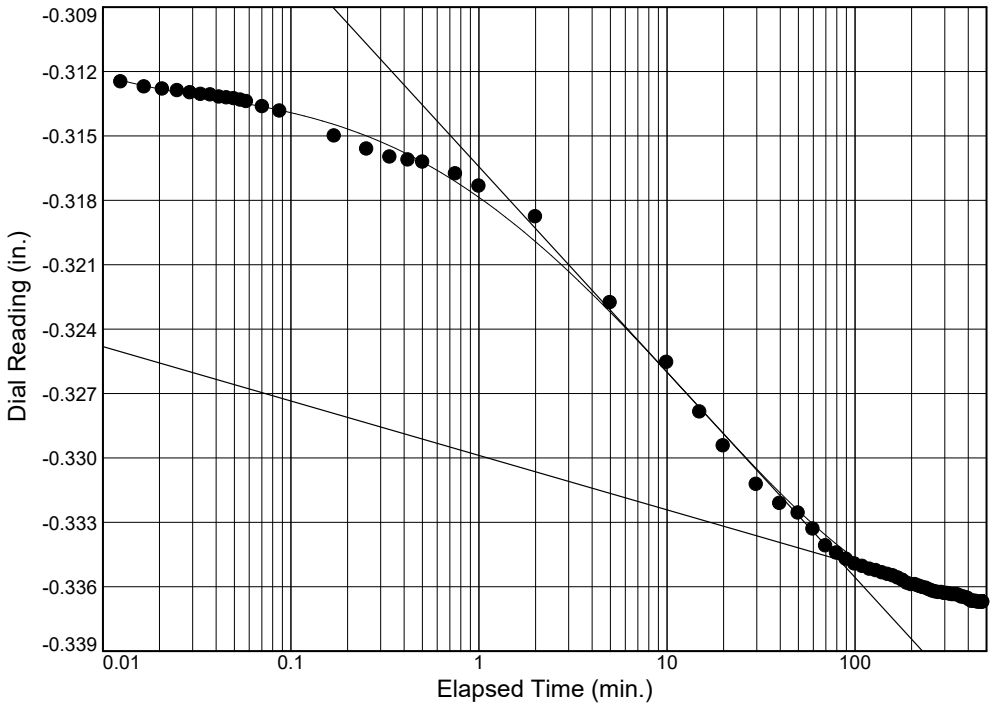
Figure

Washington State Department of Transportation

Dial Reading vs. Time

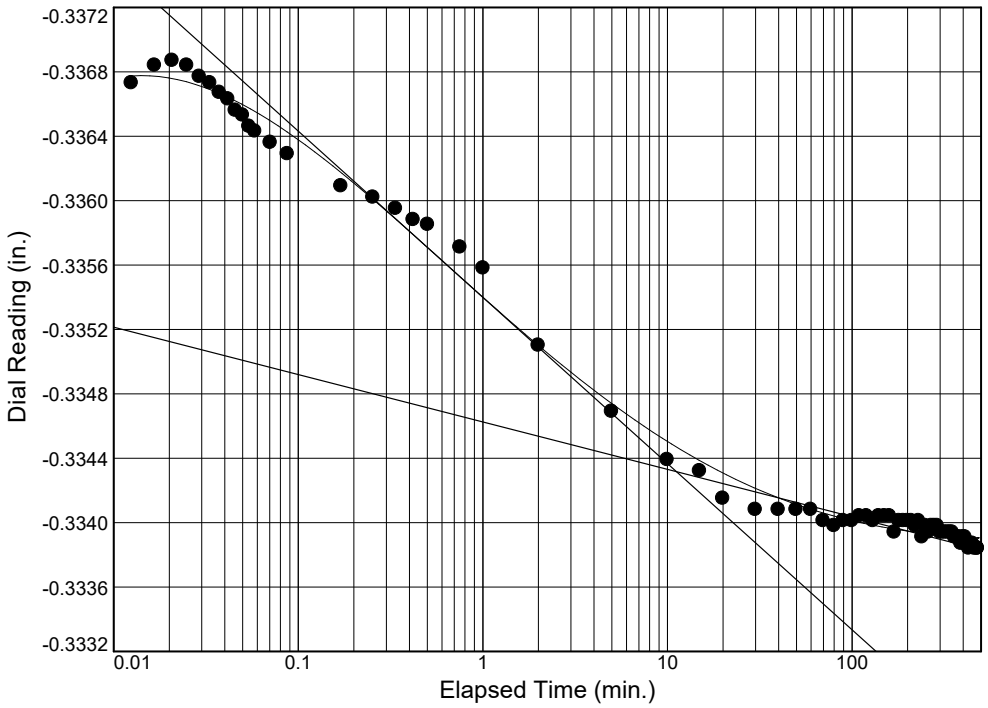
Project No.: XL6097
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 Depth: 15.7 Sample Number: S-6



Load No.= 7
Load= 500 psf
D_0 = -0.3125
D_{50} = -0.3236
D_{100} = -0.3347
T_{50} = 5.51 min.

C_v @ T_{50}
0.070 ft.^{2}/day



Load No.= 8
Load= 1000 psf
D_0 = -0.3367
D_{50} = -0.3355
D_{100} = -0.3343
T_{50} = 0.76 min.

C_v @ T_{50}
0.525 ft.^{2}/day

C_α = 0.001

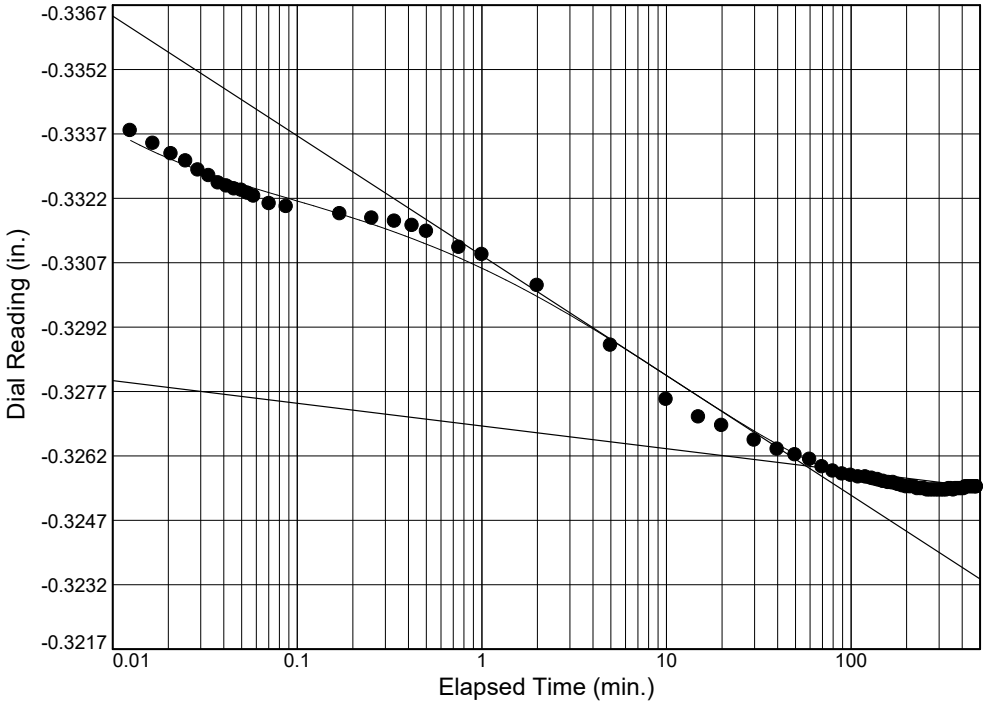
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

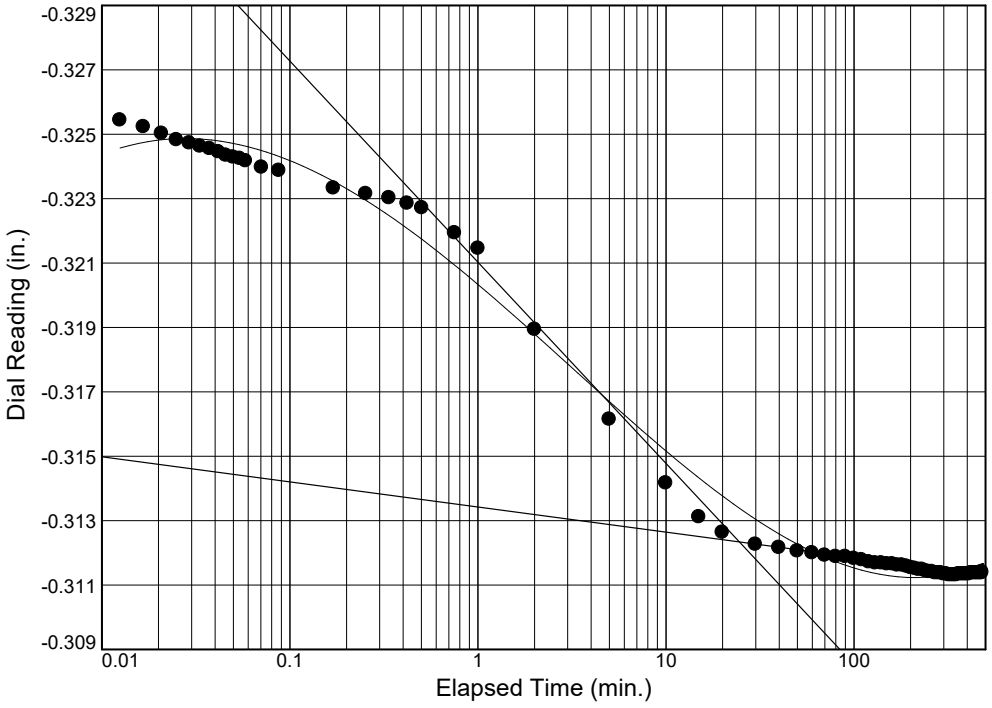
Source of Sample: H-2vwp-20 Depth: 15.7 Sample Number: S-6



Load No.= 9
Load= 2000 psf
D_0 = -0.3338
D_{50} = -0.3299
D_{100} = -0.3260
T_{50} = 2.01 min.

C_v @ T_{50}
0.196 ft.^{2}/day

C_α = 0.001



Load No.= 10
Load= 4000 psf
D_0 = -0.3255
D_{50} = -0.3189
D_{100} = -0.3123
T_{50} = 1.91 min.

C_v @ T_{50}
0.201 ft.^{2}/day

C_α = 0.002

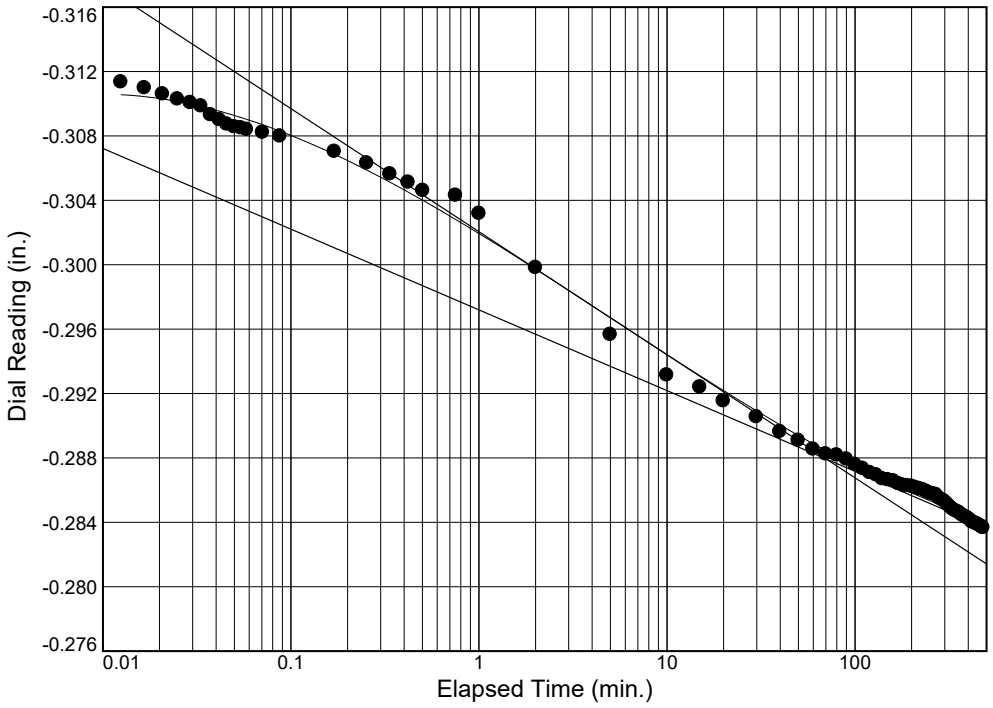
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR 534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 Depth: 15.7 Sample Number: S-6



Load No.= 11
Load= 8000 psf
D_0 = -0.3114
D_{50} = -0.2997
D_{100} = -0.2879
T_{50} = 2.04 min.

C_v @ T_{50}
0.180 ft.^{2}/day

C_α = 0.012

Figure

Washington State Department of Transportation

CONSOLIDATION TEST DATA

5/10/2021

Client: WSDOT (Donald Anderson)
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project Number: XL6097
Location: H-2vwp-20
Depth: 15.7 **Sample Number:** S-6
Material Description: CH - Fat CLAY
Liquid Limit: 53 **Plasticity Index:** 28
USCS: CH
Tested by: SLW **Checked by:** SLW

Test Specimen Data

NATURAL MOISTURE
Wet w+t = 502.90 g.
Dry w+t = 404.07 g.
Tare Wt. = 215.83 g.
Moisture = 52.5 %

VOID RATIO
Spec. Gr. = 2.76
Est. Ht. Solids = 0.402 in.
Init. V.R. = 1.490
Init. Sat. = 97.2 %

AFTER TEST
Wet w+t = 211.49 g.
Dry w+t = 174.00 g.
Tare Wt. = 84.85 g.
Moisture = 42.1 %

UNIT WEIGHT
Height = 1.000 in.
Diameter = 2.500 in.
Weight = 138.10 g.
Dry Dens. = 70.3 pcf

TEST START
Height = 1.000 in.
Diameter = 2.500 in.

Dry Wt. = 89.15* g.

End-Of-Load Summary

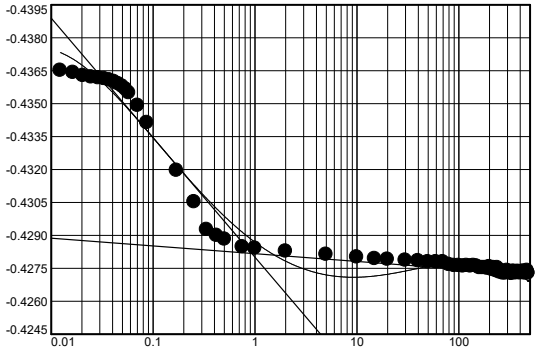
Pressure (psf)	Final Dial (in.)	Deformation (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Strain
start	-0.43654	0.00000			1.490	
500	-0.42728	0.00836*	3.079	0.001	1.470	0.8 Comprs.
1000	-0.42323	0.01085*	10.855	0.002	1.463	1.1 Comprs.
2000	-0.41602	0.01951*	1.522	0.001	1.442	2.0 Comprs.
4000	-0.39508	0.03266*	0.998	0.012	1.409	3.3 Comprs.
8000	-0.29599	0.12244*	0.025	0.053	1.185	12.2 Comprs.
2000	-0.31246	0.12493*	0.414		1.179	12.5 Comprs.
500	-0.33673	0.10180*	0.070		1.237	10.2 Comprs.
1000	-0.33384	0.10222*	0.525	0.001	1.236	10.2 Comprs.
2000	-0.32547	0.11057*	0.196	0.001	1.215	11.1 Comprs.
4000	-0.31141	0.12420*	0.201	0.002	1.181	12.4 Comprs.
8000	-0.28366	0.14861*	0.180	0.012	1.120	14.9 Comprs.

***CALCULATED USING D_{100} INSTEAD OF FINAL READING**

Compression index (C_c), psf = 0.78 **Preconsolidation pressure (P_p), psf =** 3986 **Void ratio at P_p (e_m) =** 1.410
Overburden (σ_{vo}), psf = 1680 **Void ratio at σ_{vo} (e_o) =** 1.445 **Recompression index (C_r) =** 0.11

Pressure: 500 psf | **TEST READINGS** | **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.43654	38	130.0008	-0.42759
2	0.0123	-0.43651	39	140.0008	-0.42762
3	0.0165	-0.43641	40	150.0009	-0.42759
4	0.0206	-0.43627	41	160.0010	-0.42752
5	0.0248	-0.4362	42	170.0011	-0.42752
6	0.0290	-0.43617	43	180.0011	-0.42752
7	0.0331	-0.43613	44	190.0012	-0.42749
8	0.0373	-0.43607	45	200.0013	-0.42756
9	0.0415	-0.436	46	210.0014	-0.42745
10	0.0456	-0.4359	47	220.0015	-0.42752
11	0.0498	-0.43579	48	230.0016	-0.42739
12	0.0540	-0.43566	49	240.0016	-0.42752
13	0.0581	-0.43549	50	250.0017	-0.42732
14	0.0706	-0.43491	51	260.0018	-0.42739
15	0.0873	-0.43413	52	270.0019	-0.42728
16	0.1707	-0.43195	53	280.0020	-0.42728
17	0.2540	-0.43052	54	290.0021	-0.42728
18	0.3373	-0.42926	55	300.0022	-0.42739
19	0.4207	-0.42899	56	310.0022	-0.42735
20	0.5040	-0.42882	57	320.0023	-0.42732
21	0.7540	-0.42847	58	330.0024	-0.42725
22	1.0040	-0.42841	59	340.0025	-0.42735
23	2.0040	-0.42827	60	350.0026	-0.42735
24	5.0040	-0.42813	61	360.0026	-0.42728
25	10.0041	-0.428	62	370.0027	-0.42732
26	15.0041	-0.42793	63	380.0028	-0.42735
27	20.0041	-0.4279	64	390.0029	-0.42732
28	30.0000	-0.42786	65	400.0029	-0.42728
29	40.0001	-0.42783	66	410.0030	-0.42732
30	50.0002	-0.42779	67	420.0031	-0.42735
31	60.0003	-0.42779	68	430.0032	-0.42735
32	70.0003	-0.42779	69	440.0033	-0.42728
33	80.0004	-0.42766	70	450.0034	-0.42735
34	90.0005	-0.42762	71	460.0034	-0.42728
35	100.0006	-0.42762	72	470.0035	-0.42739
36	110.0006	-0.42759	73	480.0036	-0.42728
37	120.0007	-0.42762	74	480.2413	-0.42728

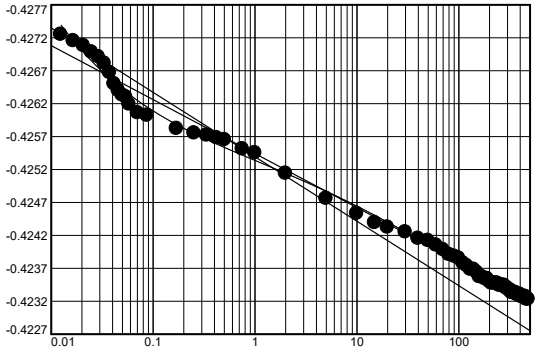


Void Ratio = 1.470 **Compression =** 0.8% >>> CALCULATED USING D_{100}

D_0 = -0.4365 **D_{50} =** -0.4324 **D_{100} =** -0.4282 **C_V at 0.16 min. =** 3.079 ft.^{2}/day **C_α =** 0.001

Pressure: 1000 psf	TEST READINGS	Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.42728	38	130.0013	-0.42368
2	0.0125	-0.42725	39	140.0014	-0.42368
3	0.0166	-0.42715	40	150.0015	-0.42364
4	0.0208	-0.42708	41	160.0016	-0.42357
5	0.0250	-0.42698	42	170.0017	-0.42357
6	0.0291	-0.42691	43	180.0017	-0.42354
7	0.0333	-0.42681	44	190.0018	-0.42354
8	0.0375	-0.42667	45	200.0019	-0.4235
9	0.0416	-0.4265	46	210.0020	-0.42347
10	0.0458	-0.4264	47	220.0021	-0.42347
11	0.0500	-0.42633	48	230.0022	-0.42347
12	0.0541	-0.4263	49	240.0023	-0.42347
13	0.0583	-0.42619	50	250.0024	-0.42344
14	0.0708	-0.42606	51	260.0025	-0.42344
15	0.0875	-0.42602	52	270.0026	-0.42344
16	0.1708	-0.42582	53	280.0026	-0.42344
17	0.2542	-0.42575	54	290.0027	-0.4234
18	0.3375	-0.42572	55	300.0028	-0.4234
19	0.4208	-0.42568	56	310.0029	-0.42337
20	0.5041	-0.42565	57	320.0030	-0.42337
21	0.7542	-0.42551	58	330.0031	-0.42333
22	1.0042	-0.42545	59	340.0032	-0.42333
23	2.0041	-0.42514	60	350.0032	-0.42333
24	5.0000	-0.42476	61	360.0033	-0.42333
25	10.0001	-0.42453	62	370.0034	-0.4233
26	15.0001	-0.42439	63	380.0035	-0.4233
27	20.0001	-0.42432	64	390.0036	-0.4233
28	30.0002	-0.42425	65	400.0037	-0.4233
29	40.0005	-0.42415	66	410.0038	-0.42327
30	50.0006	-0.42412	67	420.0039	-0.42327
31	60.0007	-0.42405	68	430.0040	-0.42327
32	70.0008	-0.42398	69	440.0040	-0.42327
33	80.0009	-0.42391	70	450.0041	-0.42327
34	90.0010	-0.42388	71	460.0001	-0.42323
35	100.0011	-0.42385	72	470.0001	-0.42323
36	110.0011	-0.42378	73	480.0002	-0.42323
37	120.0012	-0.42374	74	480.0630	-0.42323

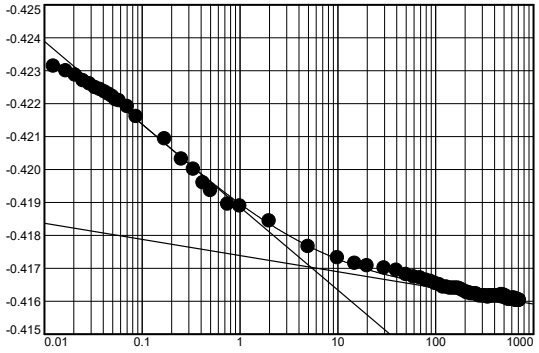


Void Ratio = 1.463 **Compression =** 1.1% >>> CALCULATED USING D_{100}

D_0 = -0.4273 **D_{50} =** -0.4265 **D_{100} =** -0.4257 **C_V at 0.04 min. =** 10.855 ft.^{2}/day **C_α =** 0.002

Pressure: 2000 psf	TEST READINGS	Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.42323	41	160.0014	-0.41639
2	0.0125	-0.42313	42	170.0015	-0.41639
3	0.0167	-0.42299	43	180.0016	-0.41636
4	0.0208	-0.42286	44	190.0017	-0.41632
5	0.0250	-0.42269	45	200.0018	-0.41629
6	0.0292	-0.42259	46	210.0019	-0.41625
7	0.0333	-0.42248	47	220.0019	-0.41625
8	0.0375	-0.42242	48	230.0020	-0.41622
9	0.0417	-0.42235	49	240.0021	-0.41622
10	0.0458	-0.42228	50	250.0022	-0.41622
11	0.0500	-0.42221	51	260.0023	-0.41622
12	0.0542	-0.42211	52	270.0024	-0.41619
13	0.0583	-0.42208	53	280.0025	-0.41615
14	0.0708	-0.4219	54	290.0025	-0.41615
15	0.0875	-0.4216	55	300.0026	-0.41615
16	0.1708	-0.42092	56	310.0027	-0.41615
17	0.2542	-0.42031	57	320.0028	-0.41615
18	0.3375	-0.42	58	330.0028	-0.41615
19	0.4208	-0.41959	59	340.0029	-0.41612
20	0.5041	-0.41935	60	350.0030	-0.41612
21	0.7542	-0.41894	61	360.0031	-0.41615
22	1.0042	-0.41888	62	370.0032	-0.41615
23	2.0042	-0.41843	63	380.0032	-0.41615
24	5.0000	-0.41765	64	390.0033	-0.41615
25	10.0001	-0.41731	65	400.0034	-0.41615
26	15.0001	-0.41714	66	410.0035	-0.41615
27	20.0002	-0.41707	67	420.0036	-0.41615
28	30.0002	-0.417	68	430.0036	-0.41615
29	40.0003	-0.41693	69	440.0037	-0.41615
30	50.0004	-0.4168	70	450.0038	-0.41615
31	60.0005	-0.41673	71	460.0039	-0.41615
32	70.0006	-0.4167	72	470.0040	-0.41619
33	80.0007	-0.41663	73	480.0040	-0.41612
34	90.0008	-0.41659	74	490.0041	-0.41619
35	100.0009	-0.41653	75	500.0000	-0.41612
36	110.0009	-0.41649	76	510.0001	-0.41615
37	120.0010	-0.41642	77	520.0001	-0.41615
38	130.0011	-0.41642	78	530.0002	-0.41608
39	140.0012	-0.41639	79	540.0003	-0.41608
40	150.0013	-0.41639	80	550.0003	-0.41608



Pressure: 2000 psf	TEST READINGS (continued)	Load No. 3

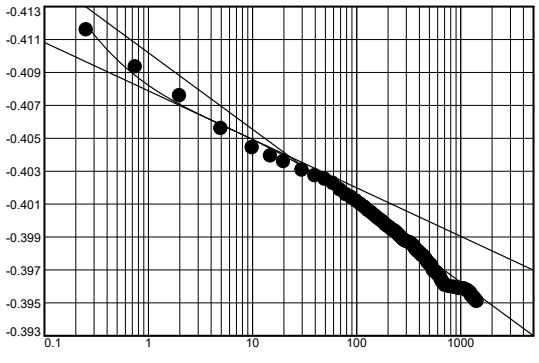
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
81	560.0004	-0.41605	91	660.0010	-0.41602
82	570.0005	-0.41605	92	670.0011	-0.41602
83	580.0005	-0.41605	93	680.0012	-0.41602
84	590.0006	-0.41605	94	690.0012	-0.41605
85	600.0007	-0.41605	95	700.0013	-0.41602
86	610.0007	-0.41608	96	710.0013	-0.41602
87	620.0008	-0.41608	97	720.0014	-0.41602
88	630.0008	-0.41608	98	720.0891	-0.41602
89	640.0009	-0.41605			
90	650.0010	-0.41608			

Void Ratio = 1.442 **Compression =** 2.0% >>> CALCULATED USING D_{100}

D_0 = -0.4232 **D_{50} =** -0.4201 **D_{100} =** -0.4170 **C_v at 0.31 min. =** 1.522 ft.^{2}/day **C_α =** 0.001

Pressure: 4000 psf	TEST READINGS	Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.41602	25	190.0010	-0.39974
2	0.2542	-0.41156	26	200.0011	-0.39964
3	0.7542	-0.40931	27	210.0011	-0.39954
4	2.0042	-0.40757	28	220.0012	-0.39944
5	5.0000	-0.40557	29	230.0012	-0.39937
6	10.0000	-0.40441	30	240.0013	-0.3993
7	15.0001	-0.4039	31	250.0013	-0.39917
8	20.0001	-0.40356	32	260.0014	-0.39906
9	30.0002	-0.40305	33	270.0014	-0.39896
10	40.0002	-0.40271	34	280.0014	-0.39886
11	50.0003	-0.4025	35	290.0015	-0.39879
12	60.0003	-0.40223	36	300.0016	-0.39872
13	70.0004	-0.40185	37	320.0016	-0.39865
14	80.0005	-0.40155	38	330.0017	-0.39862
15	90.0005	-0.40138	39	340.0018	-0.39855
16	100.0006	-0.40117	40	350.0018	-0.39848
17	110.0006	-0.40097	41	360.0019	-0.39842
18	120.0007	-0.4008	42	370.0020	-0.39825
19	130.0007	-0.4006	43	380.0020	-0.39821
20	140.0008	-0.40046	44	390.0021	-0.39811
21	150.0008	-0.40029	45	400.0022	-0.39808
22	160.0009	-0.40015	46	410.0022	-0.39801
23	170.0009	-0.40002	47	420.0023	-0.39791
24	180.0010	-0.39991	48	430.0024	-0.39787



Pressure: 4000 psf | **TEST READINGS (continued)** | **Load No. 4**

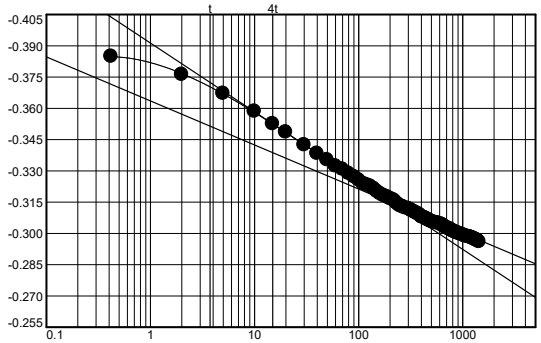
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	440.0025	-0.39784	67	620.0038	-0.39668	85	1230.0041	-0.39563
50	450.0025	-0.39777	68	630.0038	-0.39661	86	1240.0000	-0.39559
51	460.0026	-0.3977	69	640.0039	-0.39658	87	1260.0002	-0.39556
52	470.0026	-0.3976	70	650.0040	-0.39644	88	1270.0003	-0.39546
53	480.0027	-0.39753	71	660.0041	-0.39637	89	1280.0003	-0.39542
54	490.0028	-0.39743	72	670.0042	-0.39627	90	1290.0004	-0.39542
55	500.0029	-0.39736	73	680.0001	-0.39624	91	1300.0005	-0.39539
56	510.0029	-0.39733	74	690.0001	-0.39617	92	1320.0007	-0.39535
57	520.0030	-0.39729	75	710.0003	-0.39607	93	1350.0009	-0.39532
58	530.0031	-0.39723	76	730.0004	-0.39603	94	1360.0010	-0.39525
59	540.0032	-0.39709	77	790.0009	-0.39597	95	1370.0010	-0.39522
60	550.0032	-0.39695	78	860.0014	-0.39593	96	1380.0011	-0.39518
61	560.0033	-0.39692	79	930.0019	-0.3959	97	1410.0014	-0.39515
62	570.0034	-0.39688	80	970.0022	-0.39586	98	1420.0014	-0.39511
63	580.0035	-0.39685	81	1070.0029	-0.39583	99	1440.0016	-0.39508
64	590.0036	-0.39682	82	1110.0032	-0.3958	100	1440.1019	-0.39508
65	600.0036	-0.39675	83	1180.0038	-0.39573			
66	610.0037	-0.39671	84	1190.0038	-0.39569			

Void Ratio = 1.409 **Compression =** 3.3% >>> CALCULATED USING D_{100}

D_0 = -0.4160 **D_{50} =** -0.4099 **D_{100} =** -0.4039 **C_v at 0.47 min. =** 0.998 ft.^{2}/day **C_α =** 0.012

Pressure: 8000 psf | **TEST READINGS** | **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.39508	17	120.0010	-0.32325
2	0.4208	-0.3849	18	130.0011	-0.32251
3	2.0042	-0.37615	19	140.0011	-0.32148
4	5.0000	-0.36713	20	150.0012	-0.32016
5	10.0001	-0.35852	21	160.0013	-0.31913
6	15.0001	-0.3525	22	170.0014	-0.31835
7	20.0002	-0.34851	23	180.0015	-0.31781
8	30.0002	-0.34239	24	190.0016	-0.3173
9	40.0003	-0.3383	25	200.0016	-0.31672
10	50.0004	-0.33527	26	210.0017	-0.31624
11	60.0005	-0.33231	27	220.0018	-0.31576
12	70.0006	-0.33078	28	230.0019	-0.31474
13	80.0006	-0.32877	29	240.0020	-0.31393
14	90.0007	-0.32713	30	250.0021	-0.31328
15	100.0008	-0.32564	31	260.0022	-0.31291
16	110.0009	-0.32393	32	270.0022	-0.3126



Pressure: 8000 psf | **TEST READINGS (continued)** | **Load No. 5**

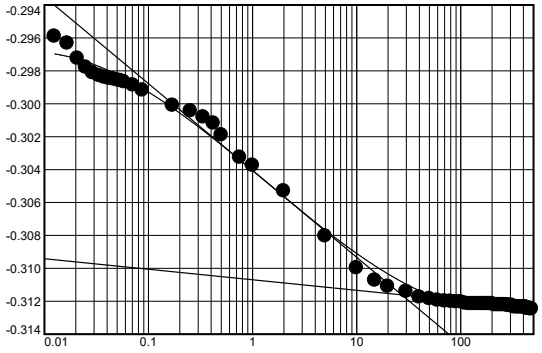
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
33	280.0023	-0.31222	56	560.0006	-0.30501	79	890.0036	-0.30014
34	300.0025	-0.31185	57	580.0008	-0.30474	80	920.0038	-0.2999
35	310.0026	-0.31144	58	620.0012	-0.30436	81	940.0040	-0.2997
36	320.0027	-0.31107	59	630.0012	-0.30412	82	980.0002	-0.29939
37	330.0028	-0.31066	60	640.0013	-0.30392	83	1010.0005	-0.29912
38	340.0028	-0.31039	61	650.0014	-0.30365	84	1030.0006	-0.29895
39	350.0029	-0.31005	62	660.0015	-0.30341	85	1080.0011	-0.29861
40	360.0030	-0.30971	63	670.0016	-0.3032	86	1120.0014	-0.2984
41	370.0031	-0.30937	64	680.0017	-0.30303	87	1150.0017	-0.29827
42	380.0032	-0.30909	65	690.0018	-0.3029	88	1180.0020	-0.2981
43	390.0033	-0.30875	66	720.0021	-0.30252	89	1200.0022	-0.29796
44	400.0034	-0.308	67	730.0022	-0.30225	90	1240.0025	-0.29772
45	410.0035	-0.30777	68	740.0023	-0.30211	91	1250.0026	-0.29762
46	430.0037	-0.30749	69	750.0023	-0.30198	92	1270.0028	-0.29742
47	440.0037	-0.30715	70	760.0024	-0.30184	93	1310.0031	-0.29718
48	450.0038	-0.30698	71	770.0025	-0.30171	94	1320.0032	-0.29704
49	460.0039	-0.30654	72	780.0026	-0.30157	95	1330.0033	-0.29694
50	470.0040	-0.30627	73	790.0027	-0.30133	96	1350.0035	-0.29677
51	480.0041	-0.30613	74	800.0028	-0.3012	97	1390.0039	-0.2966
52	490.0000	-0.30589	75	810.0029	-0.30106	98	1400.0039	-0.29646
53	500.0001	-0.30569	76	830.0030	-0.30075	99	1410.0040	-0.29629
54	510.0002	-0.30552	77	860.0033	-0.30048	100	1440.1546	-0.29599
55	530.0004	-0.30518	78	870.0034	-0.30038			

Void Ratio = 1.185 **Compression =** 12.2% >>> CALCULATED USING D_{100}

D_0 = -0.3881 **D_{50} =** -0.3511 **D_{100} =** -0.3141 **C_V at 16.47 min. =** 0.025 $ft.^2/day$ **C_α =** 0.053

Pressure: 2000 psf | **TEST READINGS** | **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.29599	12	0.0541	-0.29861
2	0.0125	-0.29592	13	0.0583	-0.29868
3	0.0166	-0.29633	14	0.0708	-0.29888
4	0.0208	-0.29725	15	0.0875	-0.29919
5	0.0250	-0.29779	16	0.1708	-0.30011
6	0.0291	-0.29813	17	0.2542	-0.30045
7	0.0333	-0.2983	18	0.3375	-0.30082
8	0.0375	-0.2984	19	0.4208	-0.3012
9	0.0416	-0.29847	20	0.5041	-0.30191
10	0.0458	-0.29851	21	0.7542	-0.30327
11	0.0500	-0.29857	22	1.0042	-0.30375



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 6**

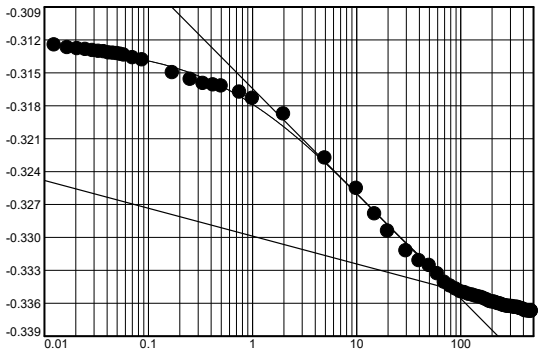
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
23	2.0042	-0.30531	41	160.0015	-0.31216	59	340.0033	-0.31236
24	5.0000	-0.30804	42	170.0016	-0.31216	60	350.0034	-0.31236
25	10.0001	-0.30998	43	180.0017	-0.31216	61	360.0035	-0.31236
26	15.0001	-0.31073	44	190.0018	-0.31216	62	370.0036	-0.31236
27	20.0002	-0.3111	45	200.0019	-0.31216	63	380.0037	-0.31236
28	30.0003	-0.31141	46	210.0020	-0.31222	64	390.0038	-0.31236
29	40.0004	-0.31175	47	220.0021	-0.31222	65	400.0039	-0.31236
30	50.0004	-0.31185	48	230.0022	-0.31222	66	410.0040	-0.31236
31	60.0005	-0.31195	49	240.0023	-0.31222	67	420.0041	-0.31236
32	70.0006	-0.31199	50	250.0024	-0.31222	68	430.0000	-0.31243
33	80.0007	-0.31202	51	260.0025	-0.31222	69	440.0001	-0.31243
34	90.0008	-0.31205	52	270.0026	-0.31222	70	450.0002	-0.31243
35	100.0009	-0.31205	53	280.0027	-0.31226	71	460.0003	-0.31246
36	110.0010	-0.31212	54	290.0028	-0.31226	72	470.0004	-0.31246
37	120.0011	-0.31216	55	300.0029	-0.31226	73	480.0005	-0.31246
38	130.0012	-0.31216	56	310.0030	-0.31226	74	480.0799	-0.31246
39	140.0013	-0.31216	57	320.0031	-0.31233			
40	150.0014	-0.31216	58	330.0032	-0.31236			

Void Ratio = 1.179 **Compression =** 12.5% >>> CALCULATED USING D_{100}

D_0 = -0.2960 **D_{50} =** -0.3038 **D_{100} =** -0.3116 **C_V at 0.89 min. =** 0.414 ft.^{2}/day

Pressure: 500 psf | **TEST READINGS** | **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.31246	17	0.2542	-0.31563
2	0.0125	-0.3125	18	0.3375	-0.316
3	0.0167	-0.31274	19	0.4208	-0.31614
4	0.0208	-0.31284	20	0.5042	-0.31624
5	0.0250	-0.31291	21	0.7542	-0.31679
6	0.0292	-0.31301	22	1.0042	-0.31736
7	0.0333	-0.31308	23	2.0042	-0.31879
8	0.0375	-0.31311	24	5.0000	-0.32278
9	0.0417	-0.31321	25	10.0001	-0.32557
10	0.0458	-0.31325	26	15.0001	-0.32788
11	0.0500	-0.31328	27	20.0002	-0.32945
12	0.0542	-0.31335	28	30.0003	-0.33125
13	0.0583	-0.31342	29	40.0004	-0.33214
14	0.0708	-0.31365	30	50.0005	-0.33258
15	0.0875	-0.31386	31	60.0006	-0.33333
16	0.1708	-0.31502	32	70.0007	-0.33411



Pressure: 500 psf | **TEST READINGS (continued)** | **Load No. 7**

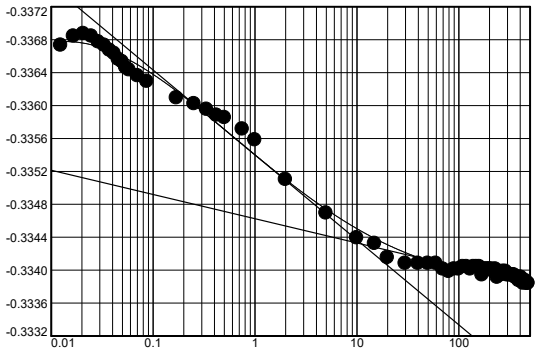
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
33	80.0008	-0.33445	47	220.0022	-0.33599	61	360.0037	-0.33643
34	90.0009	-0.33473	48	230.0023	-0.33605	62	370.0038	-0.3365
35	100.0010	-0.33496	49	240.0024	-0.33609	63	380.0039	-0.3365
36	110.0011	-0.33507	50	250.0025	-0.33616	64	390.0040	-0.33653
37	120.0012	-0.3352	51	260.0026	-0.33622	65	400.0041	-0.33656
38	130.0013	-0.33527	52	270.0027	-0.33626	66	410.0042	-0.33663
39	140.0014	-0.33537	53	280.0028	-0.33629	67	420.0001	-0.3367
40	150.0015	-0.33544	54	290.0029	-0.33629	68	430.0002	-0.3367
41	160.0016	-0.33551	55	300.0030	-0.33633	69	440.0003	-0.3367
42	170.0017	-0.33561	56	310.0031	-0.33633	70	450.0004	-0.33673
43	180.0018	-0.33571	57	320.0032	-0.33636	71	460.0005	-0.33673
44	190.0019	-0.33585	58	330.0033	-0.33639	72	470.0006	-0.33673
45	200.0020	-0.33592	59	340.0034	-0.33639	73	480.0007	-0.33673
46	210.0021	-0.33592	60	350.0035	-0.33639	74	480.0801	-0.33673

Void Ratio = 1.237 **Compression =** 10.2% >>> CALCULATED USING D_{100}

D_0 = -0.3125 **D_{50} =** -0.3236 **D_{100} =** -0.3347 **C_V at 5.51 min. =** 0.070 ft.^{2}/day

Pressure: 1000 psf | **TEST READINGS** | **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.33673	21	0.7542	-0.33571
2	0.0125	-0.33673	22	1.0042	-0.33558
3	0.0167	-0.33684	23	2.0042	-0.3351
4	0.0208	-0.33687	24	5.0000	-0.33469
5	0.0250	-0.33684	25	10.0001	-0.33439
6	0.0292	-0.33677	26	15.0001	-0.33432
7	0.0333	-0.33673	27	20.0002	-0.33415
8	0.0375	-0.33667	28	30.0003	-0.33408
9	0.0417	-0.33663	29	40.0004	-0.33408
10	0.0458	-0.33656	30	50.0005	-0.33408
11	0.0500	-0.33653	31	60.0005	-0.33408
12	0.0542	-0.33646	32	70.0006	-0.33401
13	0.0583	-0.33643	33	80.0007	-0.33398
14	0.0708	-0.33636	34	90.0008	-0.33401
15	0.0875	-0.33629	35	100.0009	-0.33401
16	0.1708	-0.33609	36	110.0010	-0.33404
17	0.2542	-0.33602	37	120.0011	-0.33404
18	0.3375	-0.33595	38	130.0012	-0.33401
19	0.4208	-0.33588	39	140.0013	-0.33404
20	0.5041	-0.33585	40	150.0013	-0.33404



Pressure: 1000 psf | **TEST READINGS (continued)** | **Load No. 8**

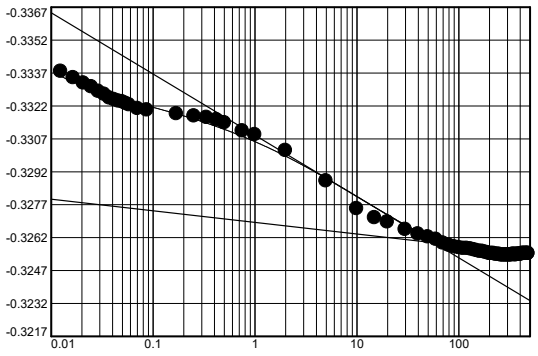
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
41	160.0014	-0.33404	53	280.0023	-0.33398	65	400.0032	-0.33391
42	170.0015	-0.33394	54	290.0023	-0.33398	66	410.0033	-0.33391
43	180.0016	-0.33401	55	300.0024	-0.33394	67	420.0034	-0.33387
44	190.0016	-0.33401	56	310.0025	-0.33394	68	430.0034	-0.33384
45	200.0017	-0.33401	57	320.0026	-0.33394	69	440.0035	-0.33387
46	210.0017	-0.33401	58	330.0026	-0.33394	70	450.0036	-0.33387
47	220.0018	-0.33398	59	340.0027	-0.33394	71	460.0037	-0.33384
48	230.0019	-0.33401	60	350.0028	-0.33394	72	470.0038	-0.33384
49	240.0020	-0.33391	61	360.0029	-0.33391	73	480.0038	-0.33384
50	250.0020	-0.33398	62	370.0030	-0.33391	74	480.0499	-0.33384
51	260.0021	-0.33394	63	380.0031	-0.33391			
52	270.0022	-0.33398	64	390.0031	-0.33387			

Void Ratio = 1.236 **Compression =** 10.2% >>> CALCULATED USING D_{100}

D_0 = -0.3367 **D_{50} =** -0.3355 **D_{100} =** -0.3343 **C_V at 0.76 min. =** 0.525 ft.^{2}/day **C_α =** 0.001

Pressure: 2000 psf | **TEST READINGS** | **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.33384	23	2.0041	-0.33016
2	0.0125	-0.33377	24	5.0000	-0.32877
3	0.0166	-0.33347	25	10.0001	-0.32751
4	0.0208	-0.33323	26	15.0001	-0.3271
5	0.0250	-0.33306	27	20.0001	-0.3269
6	0.0291	-0.33285	28	30.0002	-0.32656
7	0.0333	-0.33272	29	40.0003	-0.32635
8	0.0375	-0.33255	30	50.0004	-0.32622
9	0.0416	-0.33248	31	60.0005	-0.32611
10	0.0458	-0.33241	32	70.0006	-0.32594
11	0.0500	-0.33238	33	80.0006	-0.32584
12	0.0541	-0.33231	34	90.0007	-0.32577
13	0.0583	-0.33224	35	100.0008	-0.32574
14	0.0708	-0.33207	36	110.0009	-0.3257
15	0.0875	-0.332	37	120.0010	-0.3257
16	0.1708	-0.33183	38	130.0011	-0.32567
17	0.2542	-0.33173	39	140.0011	-0.32564
18	0.3375	-0.33166	40	150.0012	-0.3256
19	0.4208	-0.33156	41	160.0013	-0.32557
20	0.5041	-0.33142	42	170.0013	-0.32557
21	0.7542	-0.33105	43	180.0014	-0.32553
22	1.0042	-0.33088	44	190.0014	-0.3255



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 9**

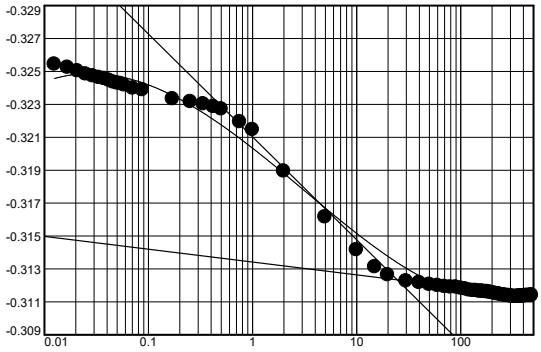
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
45	200.0015	-0.32547	55	300.0021	-0.3254	65	400.0028	-0.32543
46	210.0016	-0.32547	56	310.0022	-0.3254	66	410.0028	-0.32543
47	220.0016	-0.32547	57	320.0023	-0.3254	67	420.0029	-0.32547
48	230.0017	-0.32543	58	330.0023	-0.3254	68	430.0030	-0.32547
49	240.0017	-0.32543	59	340.0024	-0.32543	69	440.0030	-0.32547
50	250.0018	-0.32543	60	350.0025	-0.32543	70	450.0031	-0.32547
51	260.0019	-0.3254	61	360.0025	-0.3254	71	460.0031	-0.32547
52	270.0020	-0.3254	62	370.0026	-0.32543	72	470.0032	-0.32547
53	280.0020	-0.3254	63	380.0026	-0.32543	73	480.0033	-0.32547
54	290.0021	-0.3254	64	390.0027	-0.32543	74	480.0619	-0.32547

Void Ratio = 1.215 **Compression =** 11.1% >>> CALCULATED USING D_{100}

D_0 = -0.3338 **D_{50} =** -0.3299 **D_{100} =** -0.3260 **C_V at 2.01 min. =** 0.196 $ft.^2/day$ **C_α =** 0.001

Pressure: 4000 psf | **TEST READINGS** | **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.32547	25	10.0000	-0.31416
2	0.0125	-0.32543	26	15.0001	-0.31311
3	0.0167	-0.32523	27	20.0001	-0.31263
4	0.0208	-0.32502	28	30.0002	-0.31226
5	0.0250	-0.32482	29	40.0002	-0.31216
6	0.0292	-0.32472	30	50.0003	-0.31205
7	0.0333	-0.32462	31	60.0004	-0.31199
8	0.0375	-0.32455	32	70.0004	-0.31192
9	0.0417	-0.32445	33	80.0005	-0.31188
10	0.0458	-0.32434	34	90.0005	-0.31188
11	0.0500	-0.32428	35	100.0006	-0.31182
12	0.0542	-0.32424	36	110.0006	-0.31178
13	0.0583	-0.32417	37	120.0007	-0.31171
14	0.0708	-0.32397	38	130.0008	-0.31168
15	0.0875	-0.32387	39	140.0008	-0.31168
16	0.1708	-0.32332	40	150.0009	-0.31165
17	0.2542	-0.32315	41	160.0009	-0.31165
18	0.3375	-0.32302	42	170.0010	-0.31161
19	0.4208	-0.32285	43	180.0011	-0.31161
20	0.5041	-0.32271	44	190.0011	-0.31158
21	0.7542	-0.32193	45	200.0012	-0.31154
22	1.0042	-0.32145	46	210.0013	-0.31151
23	2.0042	-0.31893	47	220.0013	-0.31148
24	5.0000	-0.31614	48	230.0014	-0.31148



Pressure: 4000 psf | **TEST READINGS (continued)** | **Load No. 10**

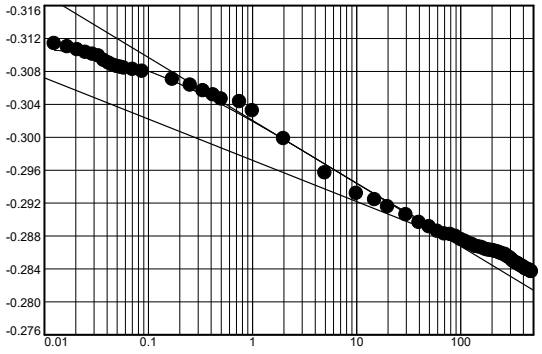
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0014	-0.31144	59	340.0022	-0.31131	69	440.0030	-0.31137
50	250.0015	-0.31141	60	350.0023	-0.31131	70	450.0031	-0.31137
51	260.0016	-0.31141	61	360.0024	-0.31134	71	460.0031	-0.31137
52	270.0017	-0.31137	62	370.0025	-0.31134	72	470.0032	-0.31137
53	280.0017	-0.31137	63	380.0025	-0.31134	73	480.0033	-0.31137
54	290.0018	-0.31137	64	390.0026	-0.31134	74	480.0744	-0.31141
55	300.0019	-0.31134	65	400.0027	-0.31134			
56	310.0020	-0.31134	66	410.0028	-0.31134			
57	320.0020	-0.31131	67	420.0028	-0.31137			
58	330.0021	-0.31131	68	430.0029	-0.31137			

Void Ratio = 1.181 **Compression =** 12.4% >>> CALCULATED USING D_{100}

D_0 = -0.3255 **D_{50} =** -0.3189 **D_{100} =** -0.3123 **C_v at 1.91 min. =** 0.201 $ft.^2/day$ **C_α =** 0.002

Pressure: 8000 psf | **TEST READINGS** | **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.31141	25	10.0001	-0.29313
2	0.0125	-0.31134	26	15.0001	-0.29238
3	0.0167	-0.31097	27	20.0001	-0.29153
4	0.0208	-0.31059	28	30.0002	-0.29054
5	0.0250	-0.31028	29	40.0003	-0.28962
6	0.0292	-0.31005	30	50.0003	-0.28908
7	0.0333	-0.30984	31	60.0004	-0.28853
8	0.0375	-0.3093	32	70.0005	-0.28823
9	0.0417	-0.30899	33	80.0005	-0.28816
10	0.0458	-0.30872	34	90.0006	-0.28792
11	0.0500	-0.30855	35	100.0007	-0.28758
12	0.0542	-0.30848	36	110.0008	-0.28734
13	0.0583	-0.30838	37	120.0008	-0.28707
14	0.0708	-0.30821	38	130.0009	-0.28693
15	0.0875	-0.30797	39	140.0010	-0.28669
16	0.1708	-0.30702	40	150.0011	-0.28663
17	0.2542	-0.3063	41	160.0011	-0.28656
18	0.3375	-0.30562	42	170.0013	-0.28639
19	0.4208	-0.30511	43	180.0013	-0.28629
20	0.5041	-0.3046	44	190.0014	-0.28625
21	0.7542	-0.30429	45	200.0015	-0.28622
22	1.0042	-0.30317	46	210.0016	-0.28615
23	2.0042	-0.2998	47	220.0017	-0.28608
24	5.0000	-0.29565	48	230.0017	-0.28601



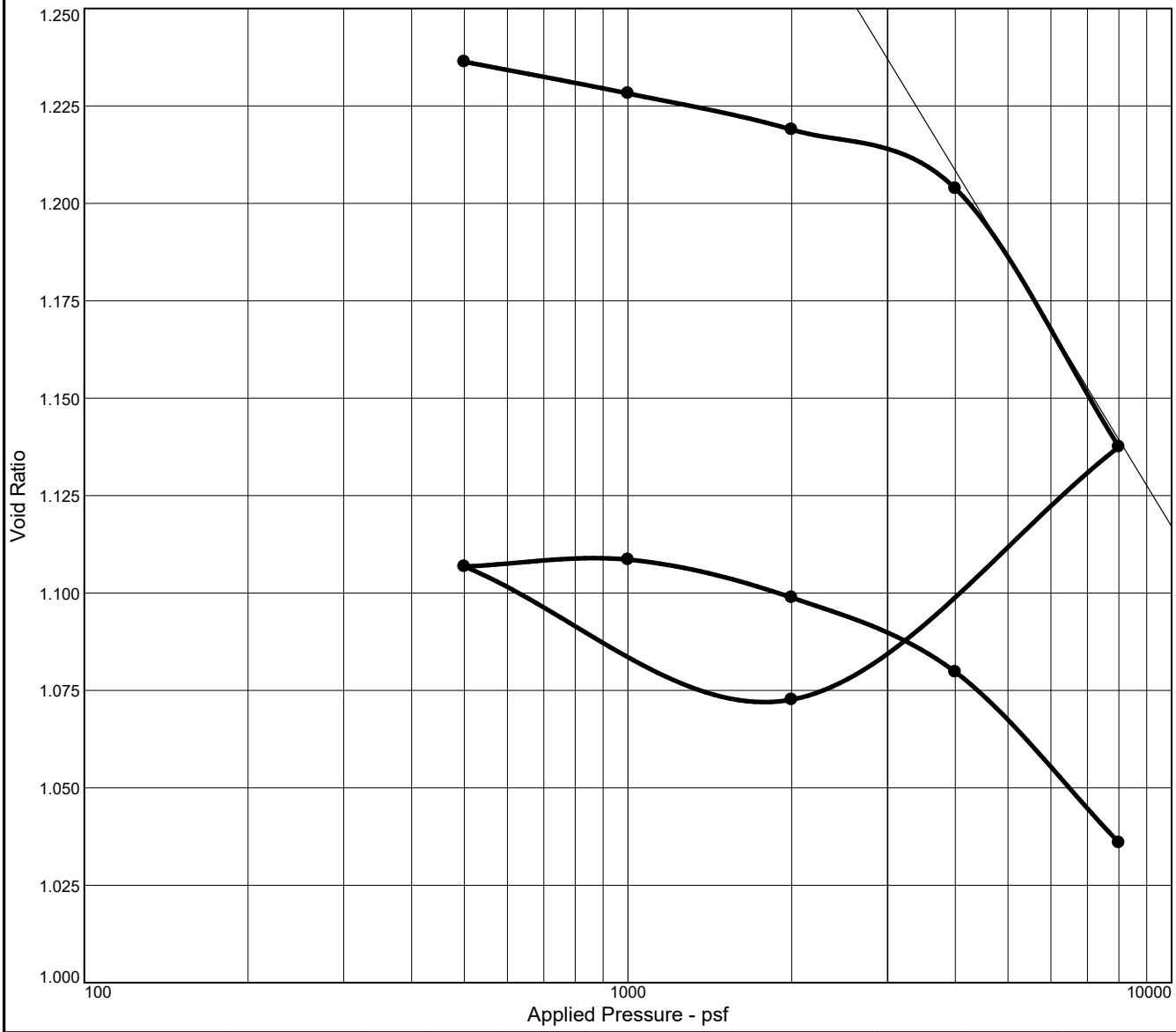
Pressure: 8000 psf	TEST READINGS (continued)	Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0018	-0.28591	59	340.0025	-0.28472	69	440.0031	-0.2839
50	250.0019	-0.28581	60	350.0025	-0.28465	70	450.0032	-0.28387
51	260.0020	-0.28574	61	360.0026	-0.28458	71	460.0032	-0.2838
52	270.0020	-0.28571	62	370.0027	-0.28445	72	470.0033	-0.28373
53	280.0021	-0.2855	63	380.0027	-0.28438	73	480.0034	-0.28366
54	290.0022	-0.2854	64	390.0028	-0.28431	74	480.0870	-0.28366
55	300.0022	-0.2853	65	400.0029	-0.28424			
56	310.0023	-0.28513	66	410.0029	-0.28414			
57	320.0023	-0.28496	67	420.0030	-0.284			
58	330.0024	-0.28482	68	430.0031	-0.28397			

Void Ratio = 1.120 **Compression =** 14.9% >>> CALCULATED USING D_{100}

D_0 = -0.3114 **D_{50} =** -0.2997 **D_{100} =** -0.2879 **C_V at 2.04 min. =** 0.180 $ft.^2/day$ **C_α =** 0.012

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
51.0 %	23.2 %	89.0	49	18	2.74	2565	3866	0.23	0.07	1.248

MATERIAL DESCRIPTION	USCS	AASHTO
ML - SILT	ML	

Project No. XL6097 **Client:** WSDOT (Donald Anderson)

Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 **Depth:** 22.7 **Sample Number:** S-9

Remarks:

WSDOT

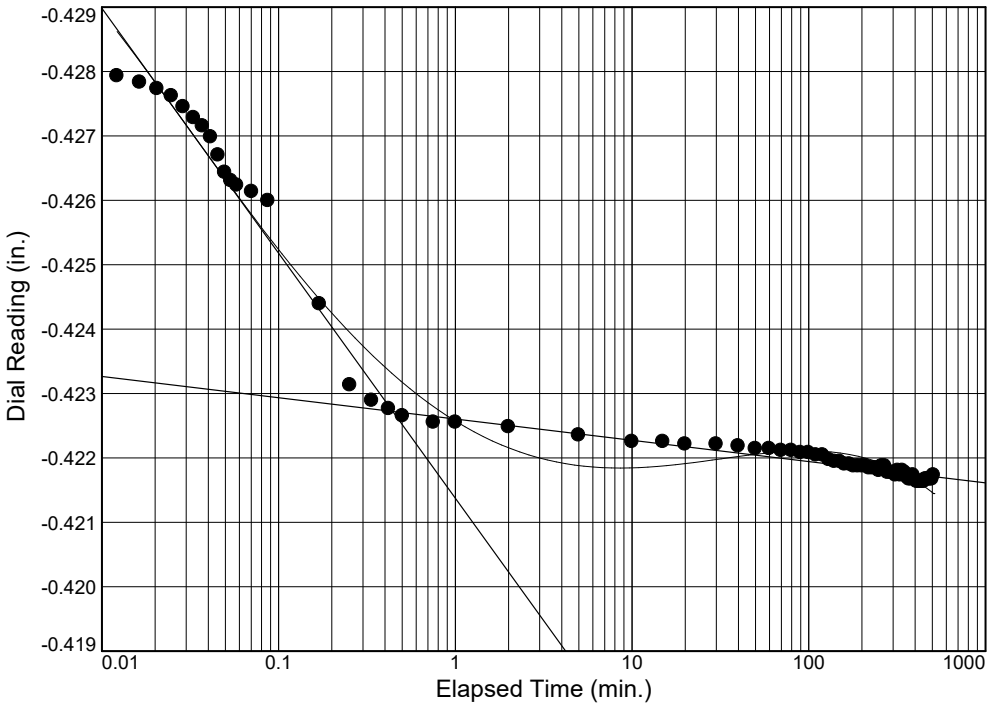
Figure

Tested By: SLW **Checked By:** SLW

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

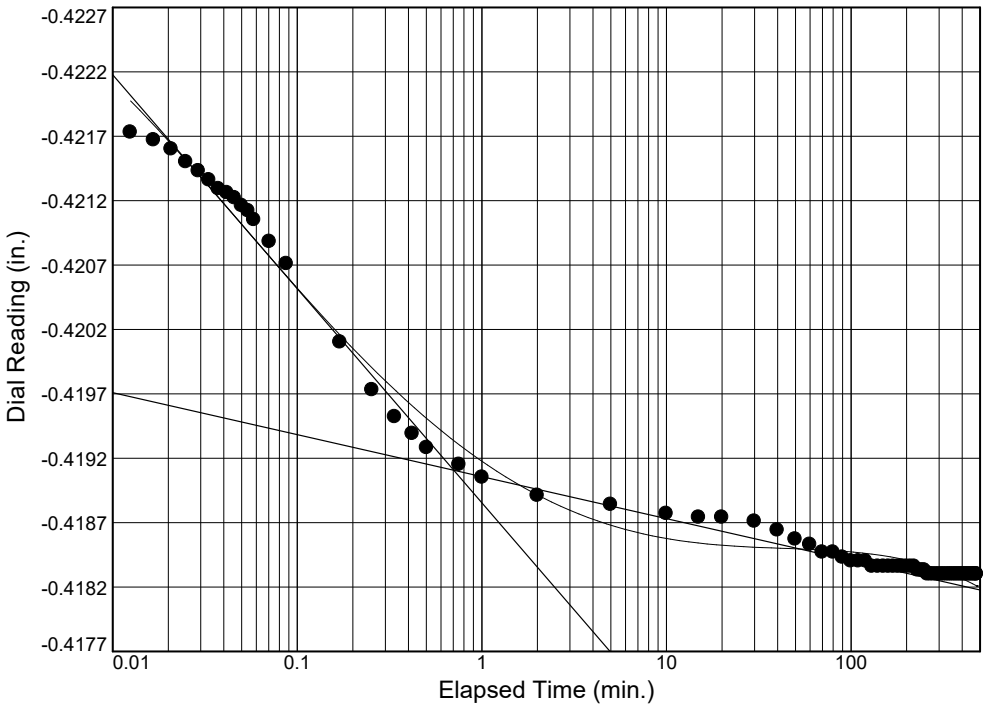
Source of Sample: H-2vwp-20 Depth: 22.7 Sample Number: S-9



Load No.= 1
Load= 500 psf
D_0 = -0.4280
D_{50} = -0.4253
D_{100} = -0.4227
T_{50} = 0.09 min.

C_v @ T_{50}
5.254 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 1000 psf
D_0 = -0.4217
D_{50} = -0.4204
D_{100} = -0.4191
T_{50} = 0.12 min.

C_v @ T_{50}
4.191 ft.^{2}/day

C_α = 0.001

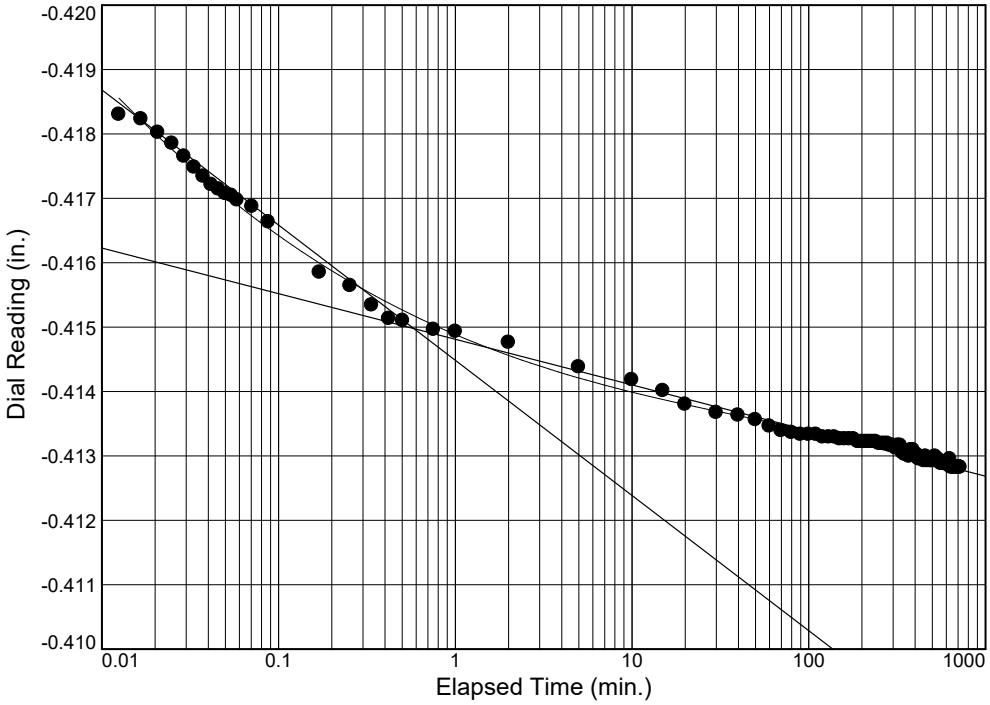
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

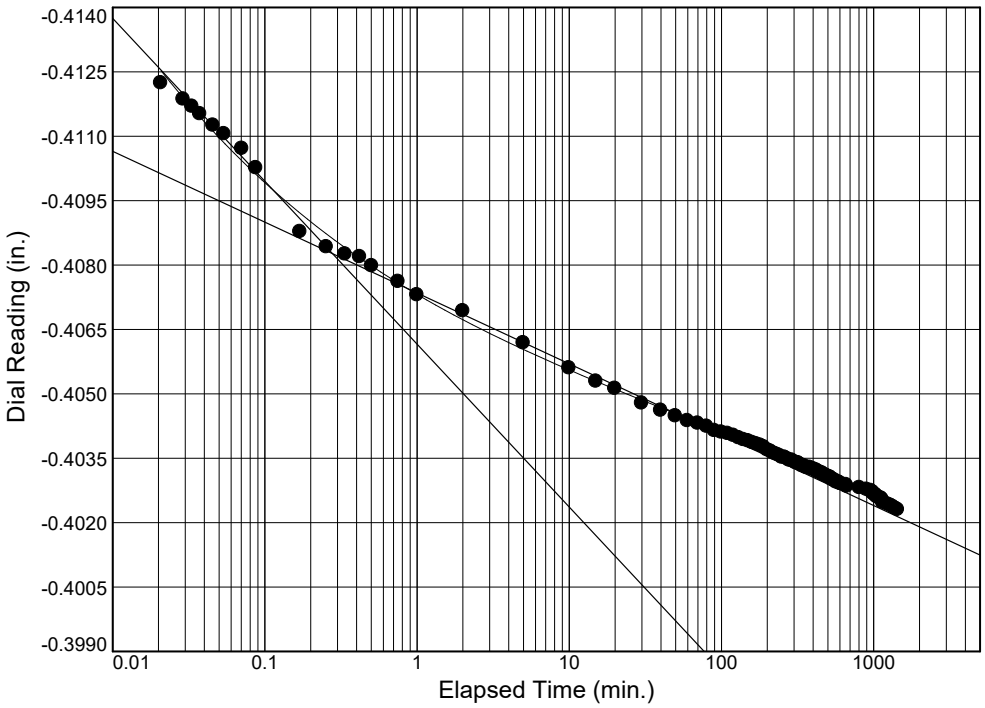
Source of Sample: H-2vwp-20 Depth: 22.7 Sample Number: S-9



Load No.= 3
Load= 2000 psf
D_0 = -0.4183
D_{50} = -0.4166
D_{100} = -0.4150
T_{50} = 0.08 min.

C_v @ T_{50}
6.195 ft.^{2}/day

C_α = 0.002



Load No.= 4
Load= 4000 psf
D_0 = -0.4128
D_{50} = -0.4105
D_{100} = -0.4083
T_{50} = 0.07 min.

C_v @ T_{50}
7.276 ft.^{2}/day

C_α = 0.004

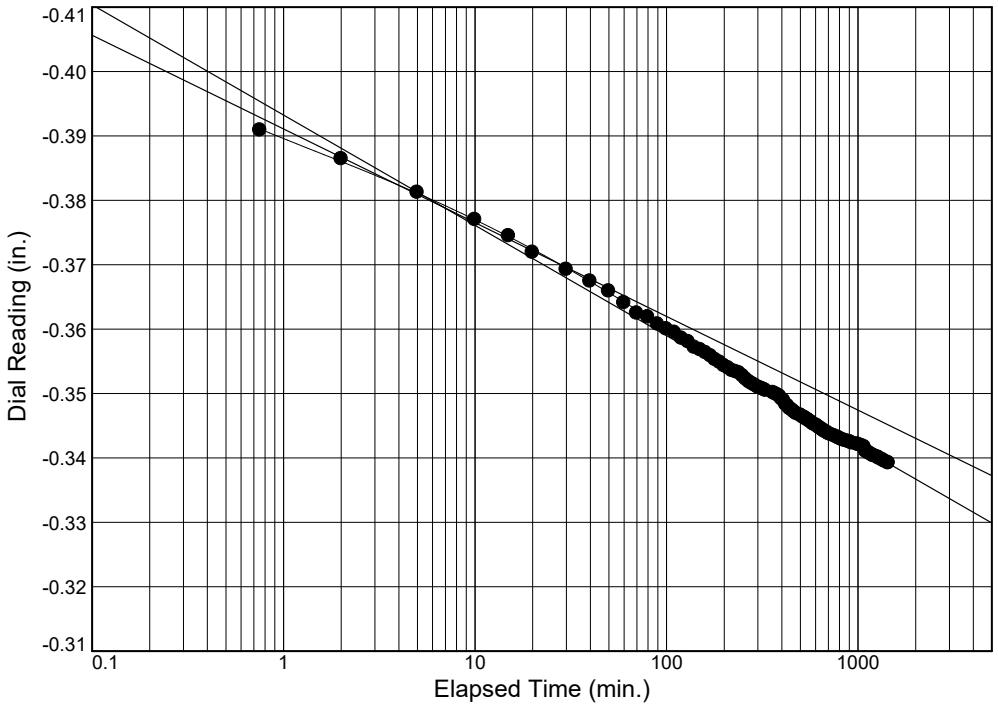
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

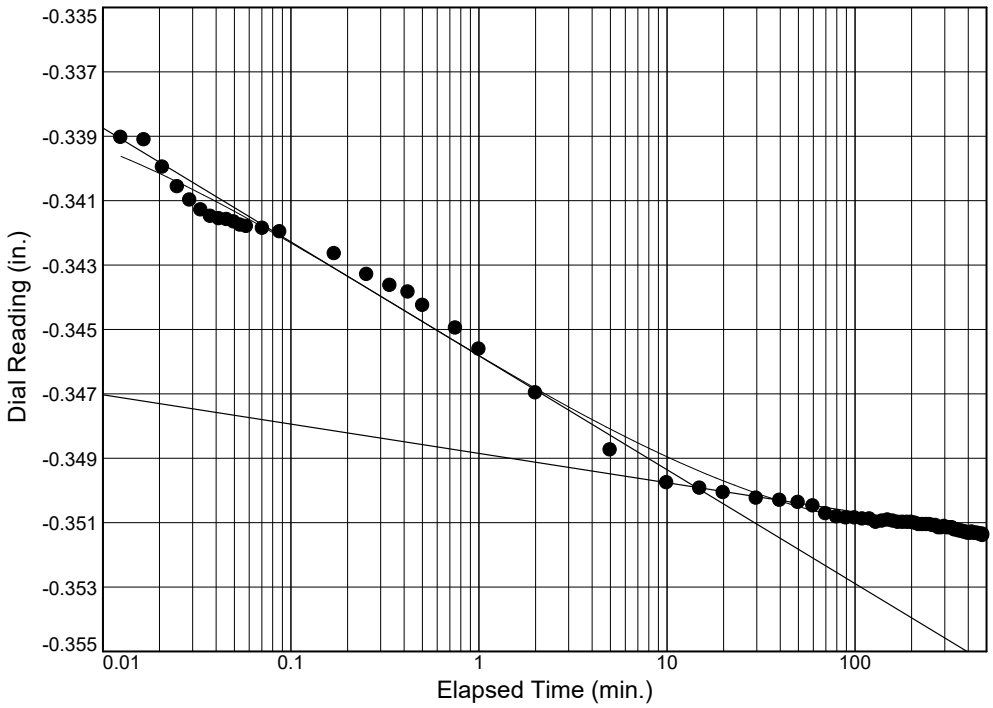
Source of Sample: H-2vwp-20 Depth: 22.7 Sample Number: S-9



Load No.= 5
Load= 8000 psf
D_0 = -0.4023
D_{50} = -0.3905
D_{100} = -0.3788
T_{50} = 0.83 min.

C_v @ T_{50}
0.548 ft.^{2}/day

C_α = 0.039



Load No.= 6
Load= 2000 psf
D_0 = -0.3392
D_{50} = -0.3446
D_{100} = -0.3499
T_{50} = 0.44 min.

C_v @ T_{50}
0.938 ft.^{2}/day

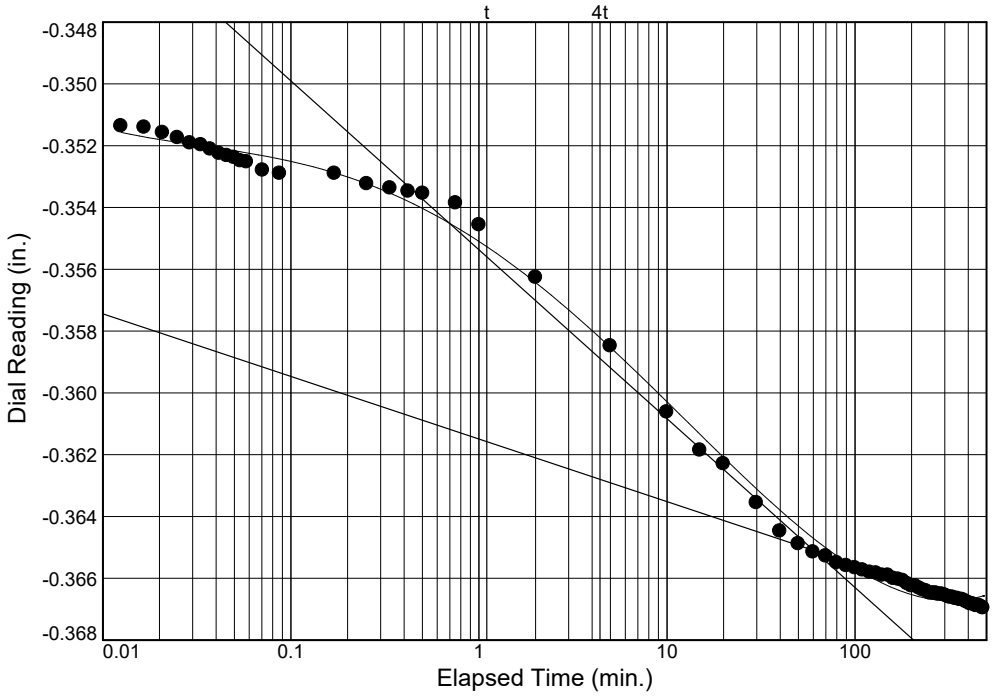
Figure

Washington State Department of Transportation

Dial Reading vs. Time

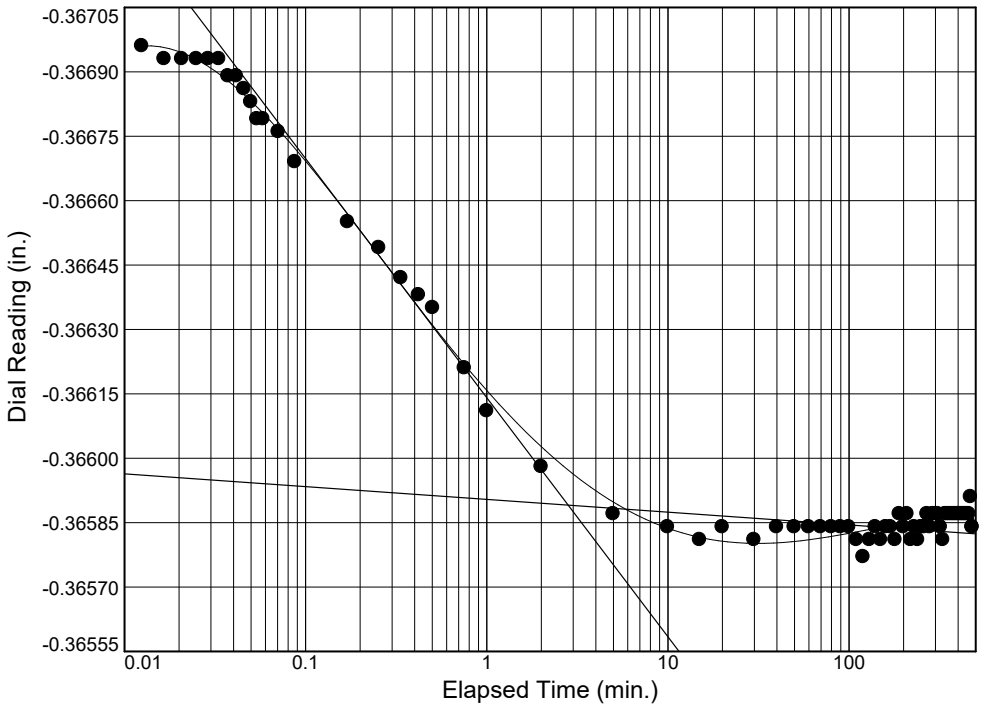
Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 Depth: 22.7 Sample Number: S-9



Load No.= 7
Load= 500 psf
D_0 = -0.3523
D_{50} = -0.3587
D_{100} = -0.3651
T_{50} = 5.38 min.

C_v @ T_{50}
0.079 ft.^{2}/day



Load No.= 8
Load= 1000 psf
D_0 = -0.3670
D_{50} = -0.3664
D_{100} = -0.3659
T_{50} = 0.31 min.

C_v @ T_{50}
1.406 ft.^{2}/day

C_α = 0.000

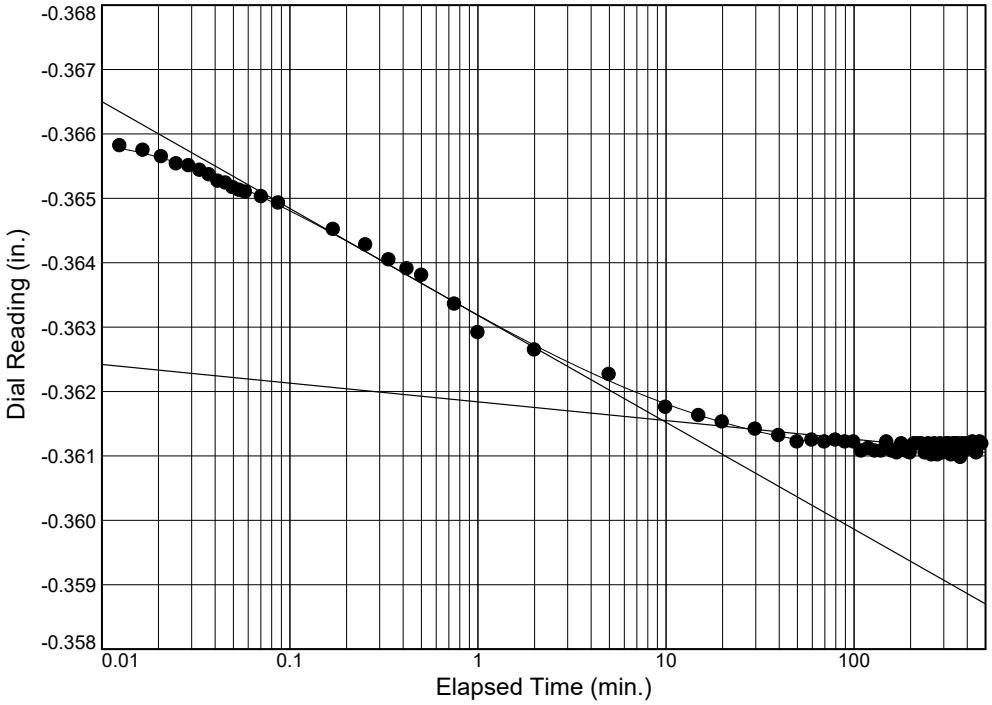
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

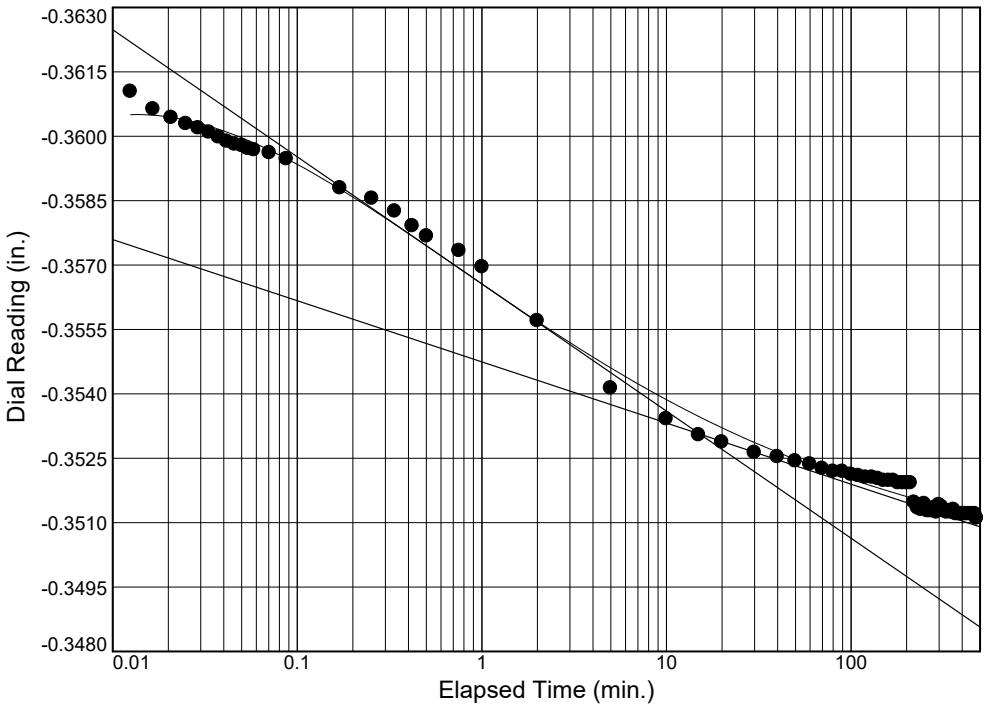
Source of Sample: H-2vwp-20 Depth: 22.7 Sample Number: S-9



Load No.= 9
Load= 2000 psf
D_0 = -0.3658
D_{50} = -0.3637
D_{100} = -0.3616
T_{50} = 0.49 min.

C_v @ T_{50}
0.884 ft.^{2}/day

C_α = 0.001



Load No.= 10
Load= 4000 psf
D_0 = -0.3612
D_{50} = -0.3571
D_{100} = -0.3531
T_{50} = 0.65 min.

C_v @ T_{50}
0.658 ft.^{2}/day

C_α = 0.003

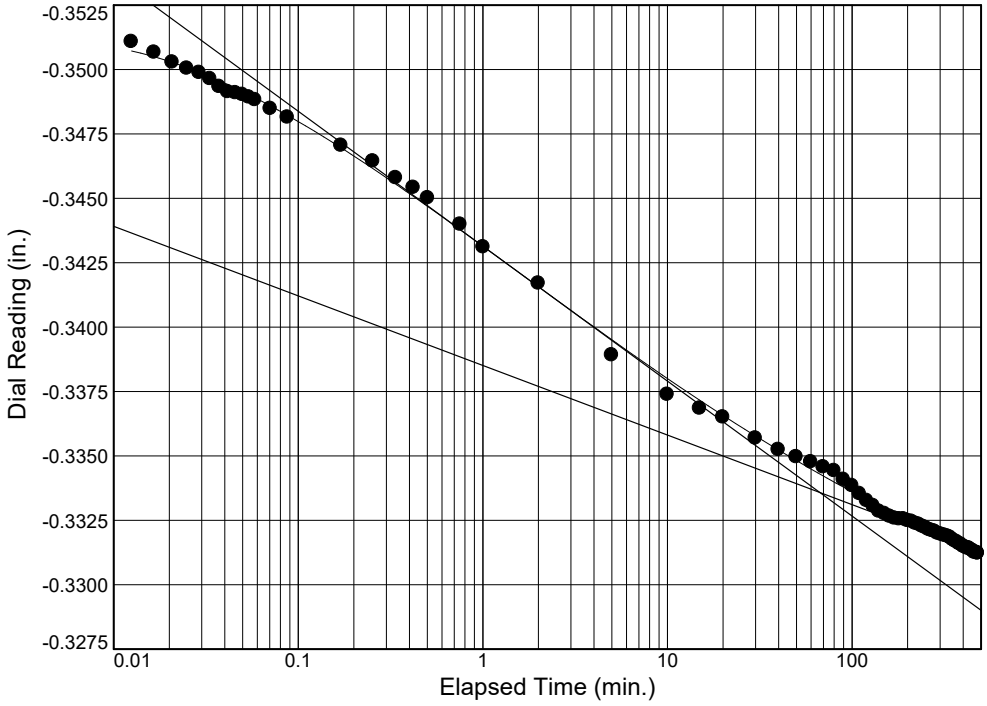
Figure

Washington State Department of Transportation

Dial Reading vs. Time

Project No.: XL6097
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage

Source of Sample: H-2vwp-20 Depth: 22.7 Sample Number: S-9



Load No.= 11
Load= 8000 psf
D_0 = -0.3511
D_{50} = -0.3423
D_{100} = -0.3336
T_{50} = 1.42 min.

C_v @ T_{50}
0.289 ft.^{2}/day

C_α = 0.006

Figure

Washington State Department of Transportation

CONSOLIDATION TEST DATA

5/10/2021

Client: WSDOT (Donald Anderson)
Project: SR534/Unnamed Tributary to Carpenter Creek - Fish Passage
Project Number: XL6097
Location: H-2vwp-20
Depth: 22.7 **Sample Number:** S-9
Material Description: ML - SILT
Liquid Limit: 49 **Plasticity Index:** 18
USCS: ML
Tested by: SLW **Checked by:** SLW

Test Specimen Data

NATURAL MOISTURE
Wet w+t = 974.73 g.
Dry w+t = 835.43 g.
Tare Wt. = 235.29 g.
Moisture = 23.2 %

VOID RATIO
Spec. Gr. = 2.74
Est. Ht. Solids = 0.445 in.
Init. V.R. = 1.248
Init. Sat. = 51.0 %

AFTER TEST
Wet w+t = 222.46 g.
Dry w+t = 185.90 g.
Tare Wt. = 87.86 g.
Moisture = 37.3 %

UNIT WEIGHT
Height = 1.000 in.
Diameter = 2.500 in.
Weight = 141.31 g.
Dry Dens. = 89.0 pcf

TEST START
Height = 1.000 in.
Diameter = 2.500 in.

Dry Wt. = 98.04* g.

End-Of-Load Summary

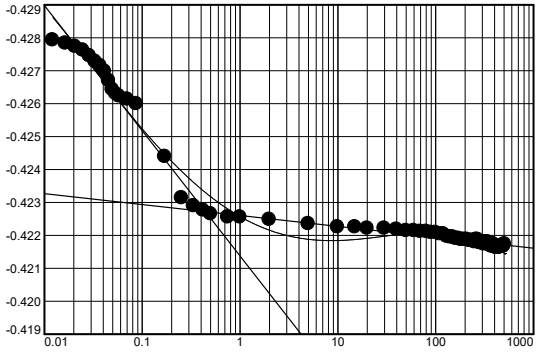
Pressure (psf)	Final Dial (in.)	Deformation (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Strain
start	-0.42796	0.00000			1.248	
500	-0.42173	0.00524*	5.254	0.001	1.236	0.5 Comprs.
1000	-0.41830	0.00885*	4.191	0.001	1.228	0.9 Comprs.
2000	-0.41282	0.01298*	6.195	0.002	1.219	1.3 Comprs.
4000	-0.40230	0.01969*	7.276	0.004	1.204	2.0 Comprs.
8000	-0.33922	0.04920*	0.548	0.039	1.138	4.9 Comprs.
2000	-0.35137	0.07806*	0.938		1.073	7.8 Comprs.
500	-0.36696	0.06286*	0.079		1.107	6.3 Comprs.
1000	-0.36584	0.06207*	1.406	0.000	1.109	6.2 Comprs.
2000	-0.36118	0.06641*	0.884	0.001	1.099	6.6 Comprs.
4000	-0.35110	0.07490*	0.658	0.003	1.080	7.5 Comprs.
8000	-0.33122	0.09438*	0.289	0.006	1.036	9.4 Comprs.

***CALCULATED USING D_{100} INSTEAD OF FINAL READING**

Compression index (C_c), psf = 0.23 **Preconsolidation pressure (P_p), psf =** 3866 **Void ratio at P_p (e_m) =** 1.206
Overburden (σ_{vo}), psf = 2565 **Void ratio at σ_{vo} (e_o) =** 1.217 **Recompression index (C_r) =** 0.07

Pressure: 500 psf	TEST READINGS	Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.42796	39	140.0005	-0.42194
2	0.0122	-0.42793	40	150.0005	-0.42194
3	0.0164	-0.42783	41	160.0006	-0.4219
4	0.0206	-0.42773	42	170.0007	-0.4219
5	0.0248	-0.42762	43	180.0007	-0.42187
6	0.0289	-0.42745	44	190.0008	-0.42187
7	0.0331	-0.42728	45	200.0008	-0.42187
8	0.0372	-0.42715	46	210.0009	-0.42187
9	0.0414	-0.42698	47	220.0009	-0.42184
10	0.0456	-0.4267	48	230.0010	-0.42184
11	0.0497	-0.42643	49	240.0010	-0.42184
12	0.0539	-0.4263	50	250.0011	-0.4218
13	0.0581	-0.42623	51	260.0011	-0.42187
14	0.0706	-0.42613	52	270.0012	-0.42187
15	0.0873	-0.42599	53	280.0013	-0.42177
16	0.1706	-0.42439	54	290.0013	-0.42177
17	0.2539	-0.42313	55	300.0014	-0.42177
18	0.3372	-0.42289	56	310.0014	-0.42173
19	0.4206	-0.42276	57	320.0015	-0.4218
20	0.5039	-0.42265	58	330.0015	-0.42173
21	0.7539	-0.42255	59	340.0016	-0.4218
22	1.0039	-0.42255	60	350.0016	-0.42177
23	2.0039	-0.42248	61	360.0017	-0.4217
24	5.0039	-0.42235	62	370.0017	-0.42167
25	10.0040	-0.42225	63	380.0018	-0.42167
26	15.0040	-0.42225	64	390.0019	-0.42173
27	20.0040	-0.42221	65	400.0019	-0.42167
28	30.0041	-0.42221	66	410.0020	-0.42163
29	40.0041	-0.42218	67	420.0020	-0.42163
30	50.0000	-0.42214	68	430.0021	-0.42163
31	60.0001	-0.42214	69	440.0021	-0.42163
32	70.0001	-0.42211	70	450.0022	-0.42163
33	80.0002	-0.42211	71	460.0022	-0.42167
34	90.0002	-0.42208	72	470.0023	-0.42167
35	100.0003	-0.42208	73	480.0023	-0.42167
36	110.0003	-0.42204	74	490.0024	-0.42167
37	120.0004	-0.42204	75	500.0024	-0.42167
38	130.0004	-0.42197	76	508.9277	-0.42173

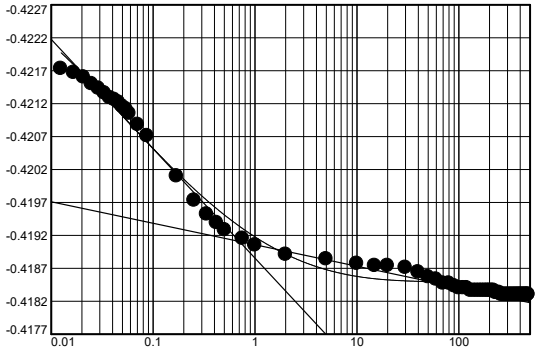


Void Ratio = 1.236 **Compression =** 0.5% >>> CALCULATED USING D_{100}

D_0 = -0.4280 **D_{50} =** -0.4253 **D_{100} =** -0.4227 **C_v at 0.09 min. =** 5.254 ft.^{2}/day **C_α =** 0.001

Pressure: 1000 psf | **TEST READINGS** | **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.42173	38	130.0008	-0.41836
2	0.0125	-0.42173	39	140.0008	-0.41836
3	0.0167	-0.42167	40	150.0009	-0.41836
4	0.0208	-0.4216	41	160.0010	-0.41836
5	0.0250	-0.4215	42	170.0011	-0.41836
6	0.0292	-0.42143	43	180.0011	-0.41836
7	0.0333	-0.42136	44	190.0012	-0.41836
8	0.0375	-0.42129	45	200.0013	-0.41836
9	0.0417	-0.42126	46	210.0014	-0.41836
10	0.0458	-0.42122	47	220.0014	-0.41836
11	0.0500	-0.42116	48	230.0015	-0.41833
12	0.0542	-0.42112	49	240.0016	-0.41833
13	0.0583	-0.42105	50	250.0017	-0.41833
14	0.0708	-0.42088	51	260.0017	-0.4183
15	0.0875	-0.42071	52	270.0018	-0.4183
16	0.1708	-0.4201	53	280.0019	-0.4183
17	0.2542	-0.41973	54	290.0019	-0.4183
18	0.3375	-0.41952	55	300.0020	-0.4183
19	0.4208	-0.41939	56	310.0021	-0.4183
20	0.5041	-0.41928	57	320.0022	-0.4183
21	0.7542	-0.41915	58	330.0022	-0.4183
22	1.0042	-0.41905	59	340.0023	-0.4183
23	2.0041	-0.41891	60	350.0024	-0.4183
24	5.0000	-0.41884	61	360.0025	-0.4183
25	10.0000	-0.41877	62	370.0025	-0.4183
26	15.0001	-0.41874	63	380.0026	-0.4183
27	20.0001	-0.41874	64	390.0027	-0.4183
28	30.0001	-0.41871	65	400.0028	-0.4183
29	40.0002	-0.41864	66	410.0028	-0.4183
30	50.0002	-0.41857	67	420.0029	-0.4183
31	60.0003	-0.41853	68	430.0030	-0.4183
32	70.0004	-0.41847	69	440.0031	-0.4183
33	80.0004	-0.41847	70	450.0031	-0.4183
34	90.0005	-0.41843	71	460.0032	-0.4183
35	100.0006	-0.4184	72	470.0033	-0.4183
36	110.0006	-0.4184	73	480.0034	-0.4183
37	120.0007	-0.4184	74	480.0620	-0.4183

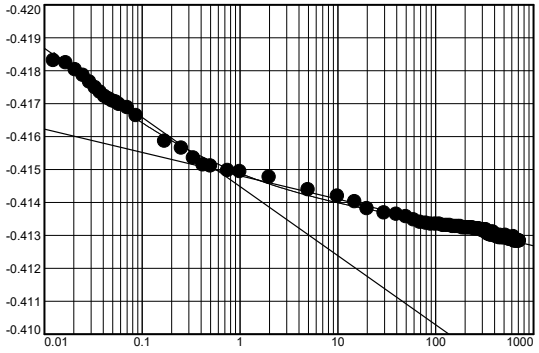


Void Ratio = 1.228 **Compression =** 0.9% >>> CALCULATED USING D_{100}

D_0 = -0.4217 **D_{50} =** -0.4204 **D_{100} =** -0.4191 **C_V at 0.12 min. =** 4.191 ft.^{2}/day **C_α =** 0.001

Pressure: 2000 psf	TEST READINGS	Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.4183	41	160.0012	-0.41326
2	0.0125	-0.4183	42	170.0013	-0.41326
3	0.0167	-0.41823	43	180.0013	-0.41326
4	0.0208	-0.41802	44	190.0014	-0.41322
5	0.0250	-0.41785	45	200.0014	-0.41322
6	0.0292	-0.41765	46	210.0015	-0.41322
7	0.0333	-0.41748	47	220.0016	-0.41322
8	0.0375	-0.41734	48	230.0017	-0.41322
9	0.0417	-0.41721	49	240.0017	-0.41322
10	0.0458	-0.41714	50	250.0018	-0.41319
11	0.0500	-0.41707	51	260.0019	-0.41319
12	0.0542	-0.41704	52	270.0020	-0.41319
13	0.0583	-0.41697	53	280.0020	-0.41319
14	0.0708	-0.41687	54	290.0021	-0.41316
15	0.0875	-0.41663	55	300.0022	-0.41316
16	0.1708	-0.41585	56	310.0022	-0.41312
17	0.2542	-0.41564	57	320.0023	-0.41316
18	0.3375	-0.41534	58	330.0024	-0.41316
19	0.4208	-0.41513	59	340.0024	-0.41305
20	0.5042	-0.4151	60	350.0025	-0.41302
21	0.7542	-0.41496	61	360.0025	-0.41302
22	1.0042	-0.41493	62	370.0026	-0.41299
23	2.0042	-0.41476	63	380.0027	-0.41309
24	5.0000	-0.41438	64	390.0028	-0.41309
25	10.0001	-0.41418	65	400.0028	-0.41299
26	15.0001	-0.41401	66	410.0029	-0.41302
27	20.0001	-0.4138	67	420.0029	-0.41295
28	30.0002	-0.41367	68	430.0030	-0.41295
29	40.0003	-0.41363	69	440.0031	-0.41295
30	50.0004	-0.41356	70	450.0031	-0.41292
31	60.0004	-0.41346	71	460.0032	-0.41299
32	70.0005	-0.41339	72	470.0032	-0.41292
33	80.0006	-0.41336	73	480.0033	-0.41295
34	90.0007	-0.41333	74	490.0033	-0.41292
35	100.0007	-0.41333	75	500.0034	-0.41292
36	110.0008	-0.41333	76	510.0034	-0.41292
37	120.0009	-0.41329	77	520.0035	-0.41299
38	130.0010	-0.41329	78	530.0035	-0.41292
39	140.0010	-0.41329	79	540.0036	-0.41295
40	150.0011	-0.41326	80	550.0036	-0.41292



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 3**

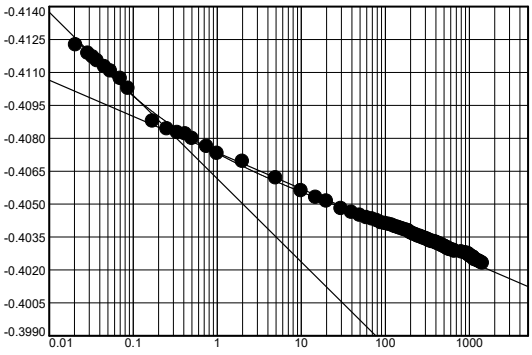
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
81	560.0037	-0.41288	91	660.0001	-0.41282
82	570.0037	-0.41288	92	670.0001	-0.41282
83	580.0038	-0.41288	93	680.0002	-0.41282
84	590.0039	-0.41288	94	690.0002	-0.41282
85	600.0039	-0.41288	95	700.0003	-0.41282
86	610.0040	-0.41288	96	710.0004	-0.41282
87	620.0040	-0.41285	97	720.0004	-0.41282
88	630.0041	-0.41295	98	720.0923	-0.41282
89	640.0042	-0.41282			
90	650.0000	-0.41282			

Void Ratio = 1.219 **Compression =** 1.3% >>> CALCULATED USING D_{100}

D_0 = -0.4183 **D_{50} =** -0.4166 **D_{100} =** -0.4150 **C_v at 0.08 min. =** 6.195 ft.^{2}/day **C_α =** 0.002

Pressure: 4000 psf | **TEST READINGS** | **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.41282	25	60.0003	-0.40437
2	0.0208	-0.41224	26	70.0003	-0.40431
3	0.0291	-0.41186	27	80.0004	-0.40424
4	0.0333	-0.41169	28	90.0004	-0.40414
5	0.0375	-0.41152	29	100.0005	-0.4041
6	0.0458	-0.41125	30	110.0005	-0.40407
7	0.0541	-0.41105	31	120.0006	-0.40403
8	0.0708	-0.41071	32	130.0006	-0.40397
9	0.0875	-0.41026	33	140.0007	-0.40393
10	0.1708	-0.40877	34	150.0007	-0.4039
11	0.2541	-0.40842	35	160.0007	-0.40386
12	0.3375	-0.40825	36	170.0008	-0.40383
13	0.4208	-0.40819	37	180.0008	-0.4038
14	0.5041	-0.40798	38	190.0009	-0.40376
15	0.7541	-0.40761	39	200.0009	-0.40369
16	1.0041	-0.4073	40	210.0010	-0.40366
17	2.0041	-0.40693	41	220.0011	-0.40362
18	5.0042	-0.40618	42	230.0011	-0.40359
19	10.0000	-0.4056	43	240.0012	-0.40356
20	15.0000	-0.40529	44	250.0012	-0.40352
21	20.0001	-0.40512	45	260.0013	-0.40352
22	30.0001	-0.40478	46	270.0014	-0.40349
23	40.0002	-0.40461	47	280.0014	-0.40345
24	50.0002	-0.40448	48	290.0015	-0.40345



Pressure: 4000 psf | **TEST READINGS (continued)** | **Load No. 4**

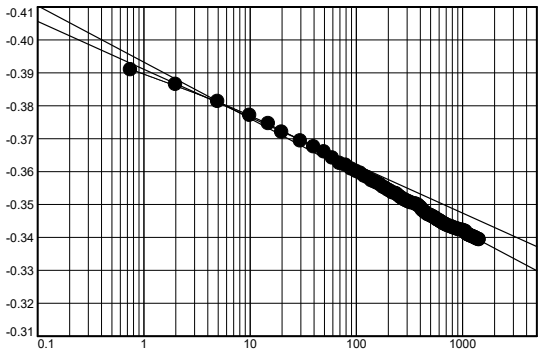
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	300.0016	-0.40342	67	490.0029	-0.40308	85	990.0021	-0.40271
50	310.0016	-0.40339	68	500.0030	-0.40308	86	1000.0022	-0.40267
51	320.0017	-0.40339	69	510.0030	-0.40305	87	1010.0022	-0.40267
52	330.0018	-0.40335	70	520.0031	-0.40305	88	1020.0023	-0.40264
53	340.0018	-0.40332	71	530.0032	-0.40301	89	1040.0024	-0.40264
54	350.0019	-0.40332	72	540.0032	-0.40301	90	1050.0024	-0.4026
55	360.0020	-0.40328	73	550.0033	-0.40298	91	1070.0026	-0.4026
56	380.0021	-0.40328	74	560.0034	-0.40298	92	1120.0029	-0.40257
57	390.0022	-0.40325	75	570.0035	-0.40294	93	1130.0029	-0.40254
58	400.0022	-0.40325	76	590.0036	-0.40294	94	1140.0030	-0.40254
59	410.0023	-0.40322	77	600.0037	-0.40291	95	1150.0031	-0.40247
60	420.0024	-0.40322	78	610.0037	-0.40291	96	1230.0035	-0.40243
61	430.0025	-0.40318	79	660.0041	-0.40288	97	1290.0038	-0.4024
62	440.0025	-0.40318	80	670.0000	-0.40284	98	1340.0041	-0.40237
63	450.0026	-0.40315	81	810.0010	-0.40281	99	1390.0002	-0.40233
64	460.0027	-0.40315	82	900.0015	-0.40277	100	1440.1007	-0.4023
65	470.0028	-0.40311	83	960.0019	-0.40274			
66	480.0028	-0.40311	84	970.0020	-0.40271			

Void Ratio = 1.204 **Compression =** 2.0% >>> CALCULATED USING D_{100}

D_0 = -0.4128 **D_{50} =** -0.4105 **D_{100} =** -0.4083 **C_V at 0.07 min. =** 7.276 ft.^{2}/day **C_α =** 0.004

Pressure: 8000 psf | **TEST READINGS** | **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.4023	17	120.0006	-0.35855
2	0.7541	-0.39086	18	130.0006	-0.35801
3	2.0041	-0.3864	19	140.0006	-0.35712
4	5.0042	-0.38119	20	150.0007	-0.35675
5	10.0000	-0.37697	21	160.0007	-0.35631
6	15.0000	-0.37445	22	170.0008	-0.35583
7	20.0001	-0.37186	23	180.0008	-0.35522
8	30.0001	-0.36924	24	190.0009	-0.35481
9	40.0002	-0.36741	25	200.0009	-0.3543
10	50.0002	-0.36587	26	210.0010	-0.35396
11	60.0003	-0.36404	27	220.0010	-0.35352
12	70.0003	-0.36244	28	230.0011	-0.35335
13	80.0003	-0.36186	29	240.0011	-0.35318
14	90.0004	-0.36073	30	250.0012	-0.3527
15	100.0005	-0.35998	31	260.0012	-0.35222
16	110.0005	-0.35944	32	270.0013	-0.35178



Pressure: 8000 psf | **TEST READINGS (continued)** | **Load No. 5**

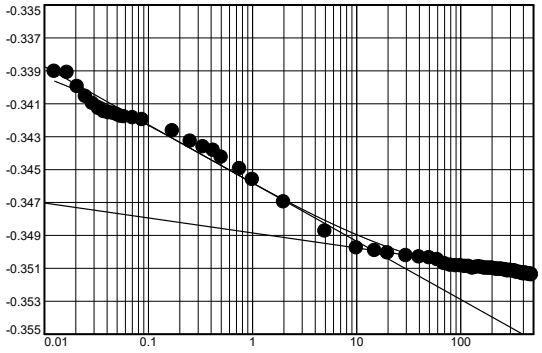
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
33	280.0013	-0.35151	56	540.0028	-0.34596	79	910.0011	-0.34242
34	290.0014	-0.35124	57	550.0029	-0.34586	80	930.0012	-0.34228
35	300.0014	-0.35096	58	560.0030	-0.34569	81	990.0016	-0.34211
36	310.0015	-0.35079	59	570.0030	-0.34555	82	1010.0017	-0.34204
37	320.0015	-0.35062	60	580.0031	-0.34535	83	1050.0019	-0.34187
38	330.0016	-0.35045	61	590.0032	-0.34518	84	1080.0021	-0.3417
39	360.0017	-0.35008	62	610.0033	-0.34501	85	1100.0022	-0.34099
40	370.0018	-0.34994	63	620.0034	-0.3448	86	1120.0023	-0.34089
41	380.0019	-0.34977	64	630.0035	-0.34467	87	1130.0023	-0.34082
42	390.0019	-0.34957	65	640.0035	-0.34453	88	1140.0024	-0.34075
43	400.0020	-0.34916	66	650.0036	-0.34439	89	1160.0025	-0.34061
44	410.0020	-0.34889	67	660.0036	-0.34426	90	1180.0026	-0.34048
45	420.0021	-0.34827	68	670.0037	-0.34409	91	1200.0027	-0.34034
46	430.0022	-0.34807	69	690.0039	-0.34392	92	1220.0028	-0.34027
47	440.0022	-0.34766	70	700.0039	-0.34378	93	1270.0031	-0.34007
48	450.0023	-0.34749	71	720.0041	-0.34358	94	1280.0032	-0.34
49	460.0023	-0.34725	72	750.0001	-0.34341	95	1300.0033	-0.33987
50	470.0024	-0.34698	73	780.0003	-0.3432	96	1340.0035	-0.3397
51	480.0025	-0.34681	74	790.0004	-0.3431	97	1360.0036	-0.33956
52	500.0026	-0.34661	75	810.0005	-0.34293	98	1390.0038	-0.33942
53	510.0026	-0.34644	76	830.0006	-0.34279	99	1440.0042	-0.33922
54	520.0027	-0.34627	77	860.0008	-0.34266	100	1440.1461	-0.33922
55	530.0028	-0.3462	78	890.0010	-0.34252			

Void Ratio = 1.138 **Compression =** 4.9% >>> CALCULATED USING D_{100}

D_0 = -0.4023 **D_{50} =** -0.3905 **D_{100} =** -0.3788 **C_v at 0.83 min. =** 0.548 ft.^{2}/day **C_α =** 0.039

Pressure: 2000 psf | **TEST READINGS** | **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.33922	12	0.0541	-0.34177
2	0.0125	-0.33905	13	0.0583	-0.34181
3	0.0166	-0.33912	14	0.0708	-0.34187
4	0.0208	-0.33997	15	0.0875	-0.34198
5	0.0250	-0.34058	16	0.1708	-0.34266
6	0.0291	-0.34099	17	0.2542	-0.3433
7	0.0333	-0.3413	18	0.3375	-0.34364
8	0.0375	-0.3415	19	0.4208	-0.34385
9	0.0416	-0.34157	20	0.5041	-0.34426
10	0.0458	-0.3416	21	0.7542	-0.34497
11	0.0500	-0.34167	22	1.0042	-0.34562



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 6**

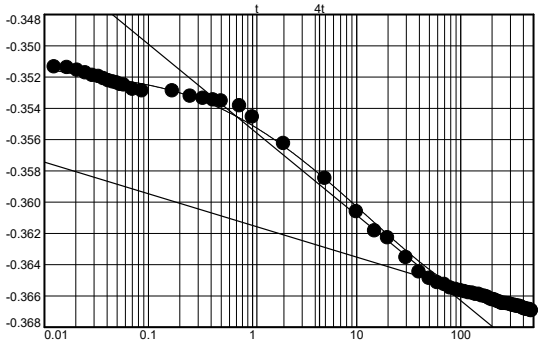
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
23	2.0041	-0.34698	41	160.0010	-0.35096	59	340.0024	-0.35124
24	5.0042	-0.34875	42	170.0011	-0.351	60	350.0025	-0.35124
25	10.0000	-0.34977	43	180.0011	-0.351	61	360.0025	-0.35127
26	15.0001	-0.34994	44	190.0012	-0.351	62	370.0026	-0.35127
27	20.0001	-0.35008	45	200.0013	-0.351	63	380.0027	-0.3513
28	30.0002	-0.35025	46	210.0014	-0.35103	64	390.0028	-0.3513
29	40.0002	-0.35032	47	220.0014	-0.35107	65	400.0028	-0.35134
30	50.0003	-0.35038	48	230.0015	-0.35107	66	410.0029	-0.35134
31	60.0004	-0.35049	49	240.0016	-0.35107	67	420.0030	-0.3513
32	70.0004	-0.35073	50	250.0017	-0.35107	68	430.0031	-0.35134
33	80.0005	-0.35083	51	260.0017	-0.3511	69	440.0031	-0.35134
34	90.0006	-0.35086	52	270.0018	-0.3511	70	450.0032	-0.35134
35	100.0006	-0.35086	53	280.0019	-0.35117	71	460.0033	-0.35137
36	110.0007	-0.3509	54	290.0020	-0.35117	72	470.0034	-0.35137
37	120.0007	-0.3509	55	300.0020	-0.35113	73	480.0035	-0.35141
38	130.0008	-0.351	56	310.0021	-0.35117	74	480.0829	-0.35137
39	140.0009	-0.35096	57	320.0022	-0.35117			
40	150.0009	-0.35093	58	330.0023	-0.35117			

Void Ratio = 1.073 **Compression =** 7.8% >>> CALCULATED USING D_{100}

D_0 = -0.3392 **D_{50} =** -0.3446 **D_{100} =** -0.3499 **C_V at 0.44 min. =** 0.938 ft.^{2}/day

Pressure: 500 psf | **TEST READINGS** | **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.35137	17	0.2541	-0.35324
2	0.0125	-0.35137	18	0.3375	-0.35338
3	0.0166	-0.35141	19	0.4208	-0.35348
4	0.0208	-0.35158	20	0.5041	-0.35355
5	0.0250	-0.35175	21	0.7541	-0.35386
6	0.0291	-0.35192	22	1.0041	-0.35457
7	0.0333	-0.35198	23	2.0041	-0.35627
8	0.0374	-0.35212	24	5.0000	-0.35849
9	0.0416	-0.35226	25	10.0000	-0.36063
10	0.0458	-0.35233	26	15.0001	-0.36186
11	0.0499	-0.35239	27	20.0001	-0.3623
12	0.0541	-0.3525	28	30.0002	-0.36356
13	0.0583	-0.35253	29	40.0003	-0.36448
14	0.0708	-0.3528	30	50.0004	-0.36489
15	0.0874	-0.3529	31	60.0004	-0.36516
16	0.1708	-0.3529	32	70.0005	-0.36529



Pressure: 500 psf | **TEST READINGS (continued)** | **Load No. 7**

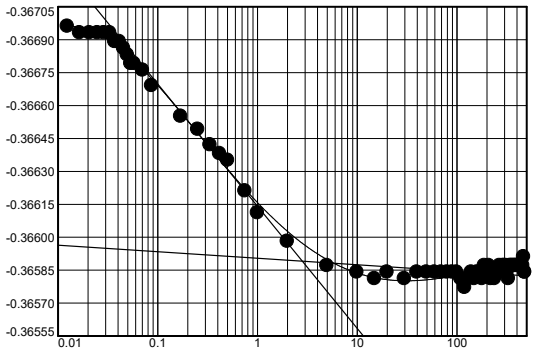
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
33	80.0006	-0.3655	47	220.0017	-0.36632	61	360.0027	-0.36669
34	90.0007	-0.3656	48	230.0017	-0.36638	62	370.0028	-0.36669
35	100.0007	-0.36567	49	240.0018	-0.36642	63	380.0028	-0.36672
36	110.0008	-0.36574	50	250.0019	-0.36649	64	390.0029	-0.36676
37	120.0009	-0.36581	51	260.0020	-0.36649	65	400.0030	-0.36679
38	130.0010	-0.36584	52	270.0020	-0.36649	66	410.0031	-0.36683
39	140.0011	-0.36591	53	280.0021	-0.36652	67	420.0031	-0.36683
40	150.0011	-0.36591	54	290.0022	-0.36652	68	430.0032	-0.36686
41	160.0012	-0.36601	55	300.0022	-0.36655	69	440.0033	-0.36689
42	170.0013	-0.36604	56	310.0023	-0.36659	70	450.0034	-0.36689
43	180.0014	-0.36608	57	320.0024	-0.36662	71	460.0034	-0.36689
44	190.0014	-0.36618	58	330.0025	-0.36662	72	470.0035	-0.36693
45	200.0015	-0.36625	59	340.0025	-0.36666	73	480.0036	-0.36696
46	210.0016	-0.36625	60	350.0026	-0.36666	74	480.0872	-0.36696

Void Ratio = 1.107 **Compression =** 6.3% >>> CALCULATED USING D_{100}

D_0 = -0.3523 **D_{50} =** -0.3587 **D_{100} =** -0.3651 **C_V at 5.38 min. =** 0.079 ft.^{2}/day

Pressure: 1000 psf | **TEST READINGS** | **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.36696	21	0.7541	-0.36621
2	0.0125	-0.36696	22	1.0041	-0.36611
3	0.0166	-0.36693	23	2.0041	-0.36598
4	0.0208	-0.36693	24	5.0042	-0.36587
5	0.0250	-0.36693	25	10.0000	-0.36584
6	0.0291	-0.36693	26	15.0001	-0.36581
7	0.0333	-0.36693	27	20.0001	-0.36584
8	0.0374	-0.36689	28	30.0002	-0.36581
9	0.0416	-0.36689	29	40.0002	-0.36584
10	0.0458	-0.36686	30	50.0003	-0.36584
11	0.0499	-0.36683	31	60.0004	-0.36584
12	0.0541	-0.36679	32	70.0005	-0.36584
13	0.0583	-0.36679	33	80.0005	-0.36584
14	0.0708	-0.36676	34	90.0006	-0.36584
15	0.0874	-0.36669	35	100.0007	-0.36584
16	0.1708	-0.36655	36	110.0008	-0.36581
17	0.2541	-0.36649	37	120.0008	-0.36577
18	0.3374	-0.36642	38	130.0009	-0.36581
19	0.4208	-0.36638	39	140.0010	-0.36584
20	0.5041	-0.36635	40	150.0011	-0.36581



Pressure: 1000 psf — **TEST READINGS (continued)** — **Load No. 8**

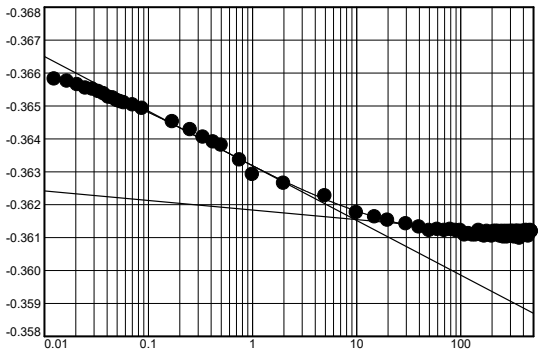
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
41	160.0011	-0.36584	53	280.0020	-0.36584	65	400.0029	-0.36587
42	170.0012	-0.36584	54	290.0021	-0.36587	66	410.0030	-0.36587
43	180.0013	-0.36581	55	300.0022	-0.36587	67	420.0031	-0.36587
44	190.0014	-0.36587	56	310.0022	-0.36587	68	430.0031	-0.36587
45	200.0014	-0.36584	57	320.0023	-0.36584	69	440.0032	-0.36587
46	210.0015	-0.36587	58	330.0024	-0.36581	70	450.0033	-0.36587
47	220.0016	-0.36581	59	340.0025	-0.36587	71	460.0034	-0.36587
48	230.0017	-0.36584	60	350.0025	-0.36587	72	470.0034	-0.36591
49	240.0017	-0.36581	61	360.0026	-0.36587	73	480.0035	-0.36584
50	250.0018	-0.36584	62	370.0027	-0.36587	74	480.0538	-0.36584
51	260.0019	-0.36584	63	380.0028	-0.36587			
52	270.0020	-0.36587	64	390.0028	-0.36587			

Void Ratio = 1.109 **Compression =** 6.2% >>> CALCULATED USING D_{100}

D_0 = -0.3670 **D_{50} =** -0.3664 **D_{100} =** -0.3659 **C_V at 0.31 min. =** 1.406 ft.^{2}/day **C_α =** 0.000

Pressure: 2000 psf — **TEST READINGS** — **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.36584	23	2.0041	-0.36264
2	0.0125	-0.36581	24	5.0042	-0.36226
3	0.0166	-0.36574	25	10.0000	-0.36175
4	0.0208	-0.36564	26	15.0001	-0.36162
5	0.0250	-0.36553	27	20.0001	-0.36152
6	0.0291	-0.3655	28	30.0002	-0.36141
7	0.0333	-0.36543	29	40.0002	-0.36131
8	0.0374	-0.36536	30	50.0003	-0.36121
9	0.0416	-0.36526	31	60.0004	-0.36124
10	0.0458	-0.36523	32	70.0005	-0.36121
11	0.0499	-0.36516	33	80.0006	-0.36124
12	0.0541	-0.36512	34	90.0006	-0.36121
13	0.0583	-0.36509	35	100.0007	-0.36121
14	0.0708	-0.36502	36	110.0008	-0.36107
15	0.0874	-0.36492	37	120.0009	-0.36111
16	0.1708	-0.36451	38	130.0009	-0.36107
17	0.2541	-0.36427	39	140.0010	-0.36107
18	0.3374	-0.36404	40	150.0011	-0.36121
19	0.4208	-0.3639	41	160.0012	-0.36107
20	0.5041	-0.3638	42	170.0013	-0.36104
21	0.7541	-0.36335	43	180.0013	-0.36118
22	1.0041	-0.36291	44	190.0014	-0.36107



Pressure: 2000 psf | **TEST READINGS (continued)** | **Load No. 9**

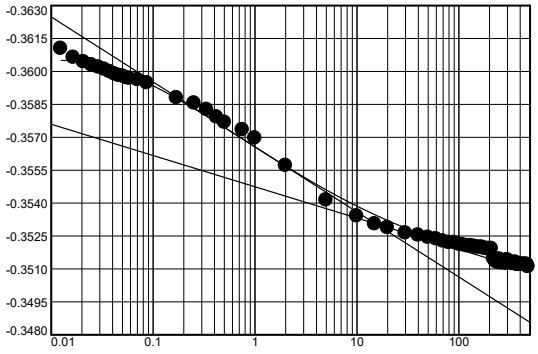
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
45	200.0015	-0.36104	55	300.0022	-0.36104	65	400.0030	-0.36118
46	210.0016	-0.36118	56	310.0023	-0.36118	66	410.0031	-0.36118
47	220.0016	-0.36118	57	320.0024	-0.36118	67	420.0031	-0.36118
48	230.0017	-0.36118	58	330.0025	-0.36101	68	430.0032	-0.36121
49	240.0018	-0.36104	59	340.0025	-0.36118	69	440.0033	-0.36118
50	250.0019	-0.36118	60	350.0026	-0.36118	70	450.0034	-0.36104
51	260.0019	-0.36101	61	360.0027	-0.36118	71	460.0034	-0.36118
52	270.0020	-0.36118	62	370.0028	-0.36097	72	470.0035	-0.36121
53	280.0021	-0.36101	63	380.0028	-0.36118	73	480.0036	-0.36118
54	290.0022	-0.36118	64	390.0029	-0.36107	74	480.0580	-0.36118

Void Ratio = 1.099 **Compression =** 6.6% >>> CALCULATED USING D_{100}

D_0 = -0.3658 **D_{50} =** -0.3637 **D_{100} =** -0.3616 **C_v at 0.49 min. =** 0.884 ft.^{2}/day **C_α =** 0.001

Pressure: 4000 psf | **TEST READINGS** | **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.36118	25	10.0000	-0.35341
2	0.0125	-0.36104	26	15.0001	-0.35304
3	0.0166	-0.36063	27	20.0001	-0.35287
4	0.0208	-0.36043	28	30.0002	-0.35263
5	0.0250	-0.36029	29	40.0003	-0.35253
6	0.0291	-0.36019	30	50.0003	-0.35243
7	0.0333	-0.36009	31	60.0004	-0.35236
8	0.0375	-0.35998	32	70.0005	-0.35226
9	0.0416	-0.35988	33	80.0006	-0.35219
10	0.0458	-0.35981	34	90.0006	-0.35219
11	0.0500	-0.35978	35	100.0007	-0.35212
12	0.0541	-0.35971	36	110.0008	-0.35209
13	0.0583	-0.35968	37	120.0009	-0.35205
14	0.0708	-0.35961	38	130.0009	-0.35205
15	0.0875	-0.35947	39	140.0010	-0.35202
16	0.1708	-0.35879	40	150.0011	-0.35198
17	0.2541	-0.35855	41	160.0011	-0.35198
18	0.3375	-0.35825	42	170.0012	-0.35198
19	0.4208	-0.35791	43	180.0013	-0.35192
20	0.5041	-0.35767	44	190.0014	-0.35192
21	0.7541	-0.35733	45	200.0014	-0.35192
22	1.0042	-0.35695	46	210.0015	-0.35192
23	2.0041	-0.3557	47	220.0016	-0.35147
24	5.0042	-0.35413	48	230.0017	-0.35134



Pressure: 4000 psf | **TEST READINGS (continued)** | **Load No. 10**

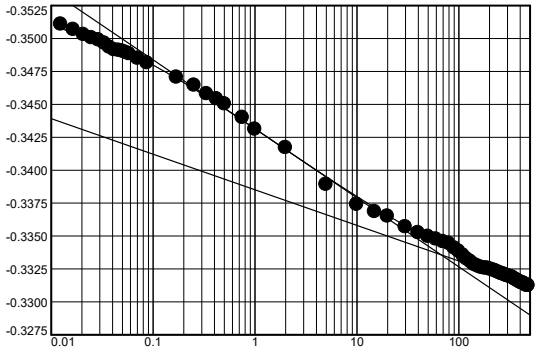
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0017	-0.3513	59	340.0024	-0.35127	69	440.0031	-0.3512
50	250.0018	-0.35144	60	350.0025	-0.35124	70	450.0032	-0.3512
51	260.0019	-0.35127	61	360.0026	-0.3513	71	460.0033	-0.3512
52	270.0019	-0.35127	62	370.0026	-0.3512	72	470.0034	-0.3512
53	280.0020	-0.35134	63	380.0027	-0.3512	73	480.0034	-0.3511
54	290.0021	-0.35124	64	390.0028	-0.3512	74	480.0745	-0.3511
55	300.0022	-0.35141	65	400.0028	-0.3512			
56	310.0022	-0.35137	66	410.0029	-0.3512			
57	320.0023	-0.35127	67	420.0030	-0.3512			
58	330.0023	-0.35124	68	430.0031	-0.3512			

Void Ratio = 1.080 **Compression =** 7.5% >>> CALCULATED USING D_{100}

D_0 = -0.3612 **D_{50} =** -0.3571 **D_{100} =** -0.3531 **C_v at 0.65 min. =** 0.658 ft.^{2}/day **C_α =** 0.003

Pressure: 8000 psf | **TEST READINGS** | **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	-0.3511	25	10.0000	-0.33738
2	0.0125	-0.35107	26	15.0001	-0.33684
3	0.0166	-0.35066	27	20.0001	-0.3365
4	0.0208	-0.35028	28	30.0002	-0.33568
5	0.0250	-0.35004	29	40.0002	-0.33524
6	0.0291	-0.34987	30	50.0003	-0.33496
7	0.0333	-0.34964	31	60.0004	-0.33476
8	0.0374	-0.34933	32	70.0005	-0.33456
9	0.0416	-0.34913	33	80.0005	-0.33442
10	0.0458	-0.34909	34	90.0006	-0.33408
11	0.0499	-0.34902	35	100.0007	-0.33384
12	0.0541	-0.34892	36	110.0007	-0.33353
13	0.0583	-0.34882	37	120.0008	-0.33326
14	0.0708	-0.34848	38	130.0009	-0.33306
15	0.0874	-0.34814	39	140.0010	-0.33285
16	0.1708	-0.34705	40	150.0010	-0.33275
17	0.2541	-0.34644	41	160.0011	-0.33265
18	0.3375	-0.34579	42	170.0012	-0.33258
19	0.4208	-0.34541	43	180.0012	-0.33255
20	0.5041	-0.34501	44	190.0013	-0.33255
21	0.7541	-0.34398	45	200.0014	-0.33248
22	1.0041	-0.3431	46	210.0015	-0.33245
23	2.0041	-0.3417	47	220.0015	-0.33238
24	5.0042	-0.33891	48	230.0016	-0.33234



Pressure: 8000 psf	TEST READINGS (continued)	Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
49	240.0017	-0.33227	59	340.0024	-0.33183	69	440.0032	-0.33136
50	250.0017	-0.33221	60	350.0025	-0.33176	70	450.0033	-0.33132
51	260.0018	-0.33214	61	360.0026	-0.3317	71	460.0034	-0.33125
52	270.0019	-0.3321	62	370.0026	-0.33166	72	470.0034	-0.33125
53	280.0020	-0.33207	63	380.0027	-0.33159	73	480.0035	-0.33122
54	290.0020	-0.332	64	390.0028	-0.33156	74	480.0871	-0.33122
55	300.0021	-0.33197	65	400.0029	-0.33149			
56	310.0022	-0.33193	66	410.0029	-0.33146			
57	320.0023	-0.3319	67	420.0030	-0.33142			
58	330.0023	-0.33187	68	430.0031	-0.33142			

Void Ratio = 1.036 **Compression =** 9.4% >>> CALCULATED USING D_{100}

D_0 = -0.3511 **D_{50} =** -0.3423 **D_{100} =** -0.3336 **C_V at 1.42 min. =** 0.289 $ft.^2/day$ **C_α =** 0.006

APPENDIX D: CONETEC PRESENTATION OF SITE INVESTIGATION RESULTS

CONTENTS

TABLE D-1: SUMMARY OF CONE PENETRATION TEST HOLE SURVEY COORDINATES

CPT	Ground Surface Elevation (feet NAVD 88)	Depth (feet)	Northing (feet)	Easting (feet)
CPT-01-21	26.6	38.5	492,675.8	1,278,052.4
CPT-02-21	27.6	38.7	492,658.6	1,278,094.3
CPT-03-21	27.1	38.5	492,659.9	1,278,074.4

PRESENTATION OF SITE INVESTIGATION RESULTS

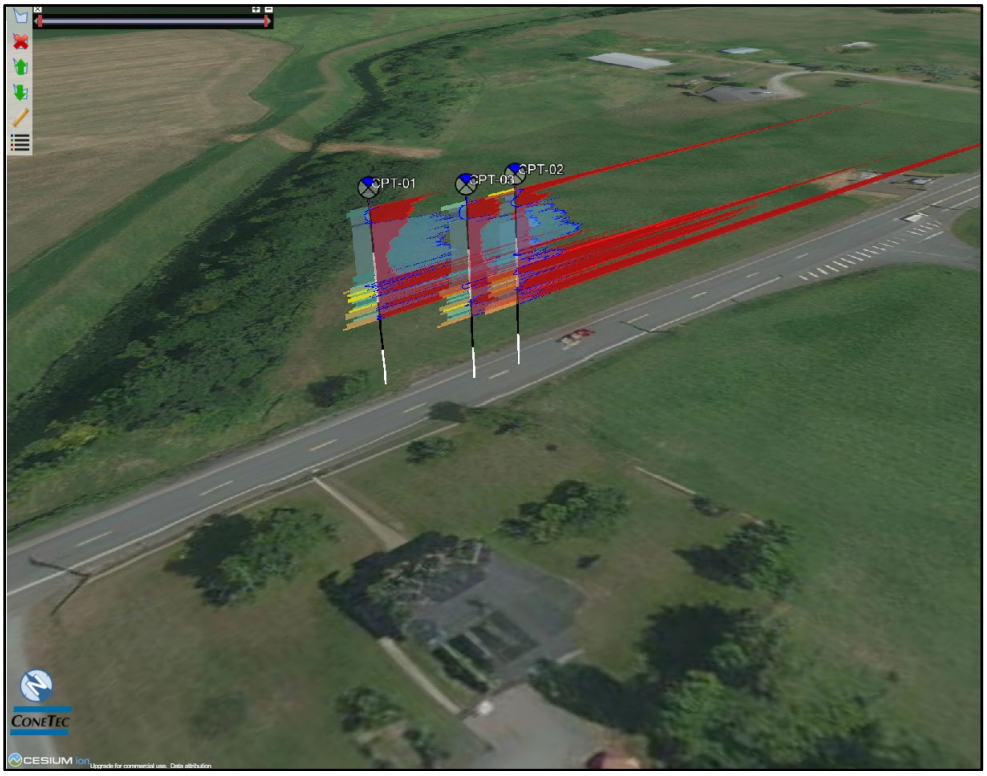
SR534

Prepared for:

WSDOT

ConeTec Job No: 21-59-22239

Project Start Date: 12-APR-2021
Project End Date: 12-APR-2021
Report Date: 16-APR-2021



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CONETEC

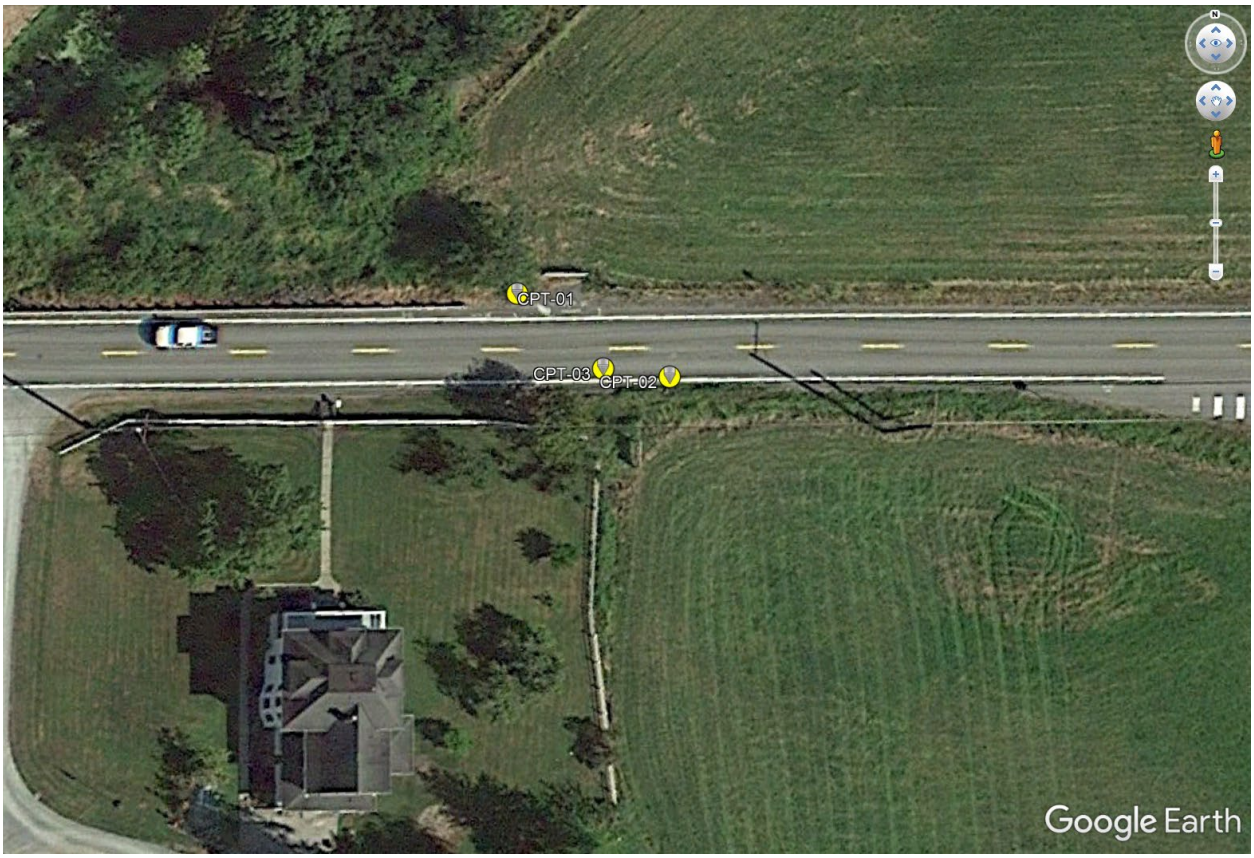
Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Inc. for WSDOT at the crossroads between HW534 and Conway Hill Rd, Mt Vernon, WA 98274. The program consisted of cone penetration tests and seismic cone penetration tests.

Project Information

Project	
Client	WSDOT
Project	SR534
ConeTec project number	21-59-22239

An aerial overview from Google Earth including the CPTu test locations is presented below.



Rig Description	Deployment System	Test Type
C20-30Ton Truck Rig	Integrated Push Cylinders	CPTu

Coordinates		
Test Type	Collection Method	EPSG Number
CPTu	Consumer grade GPS	4326

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
767:T1000F10U35	767	10.0	150	1000	10	35
Cone 767 was used for all CPTu soundings						

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	• Advanced plots with Ic, Su, phi and N(60)/N1(60) • Soil Behaviour Type (SBT) scatter plots • Seismic shear wave (Vs) plots • Seismic shear wave (Vs) Wave Trace plots

Calculated Geotechnical Parameter Tables	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behaviour type zones and the assumed equilibrium pore pressure profile. Soils were classified as either drained or undrained based on the Q_{tn} Normalized Soil Behaviour Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures (zone 4).

Limitations

This report has been prepared for the exclusive use of WSDOT (Client) for the project titled “SR534”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first appendix. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

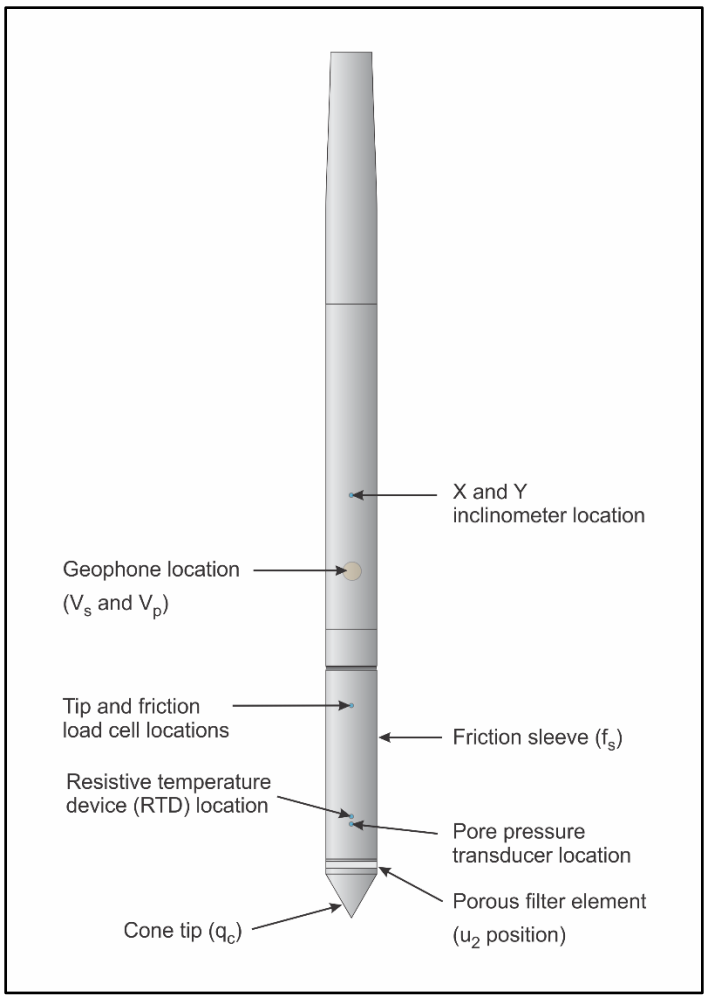


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal interface box and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches (38.1 millimeters) are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson et al. (1986) and Robertson (1990, 2009). It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (R_f) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of files with calculated geotechnical parameters were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the methods used is also included in the data release folder.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

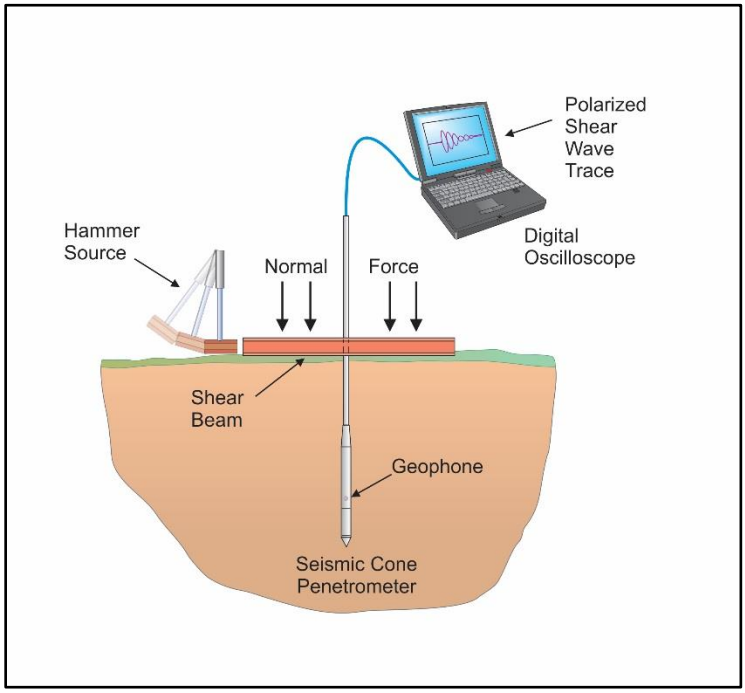


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for

each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

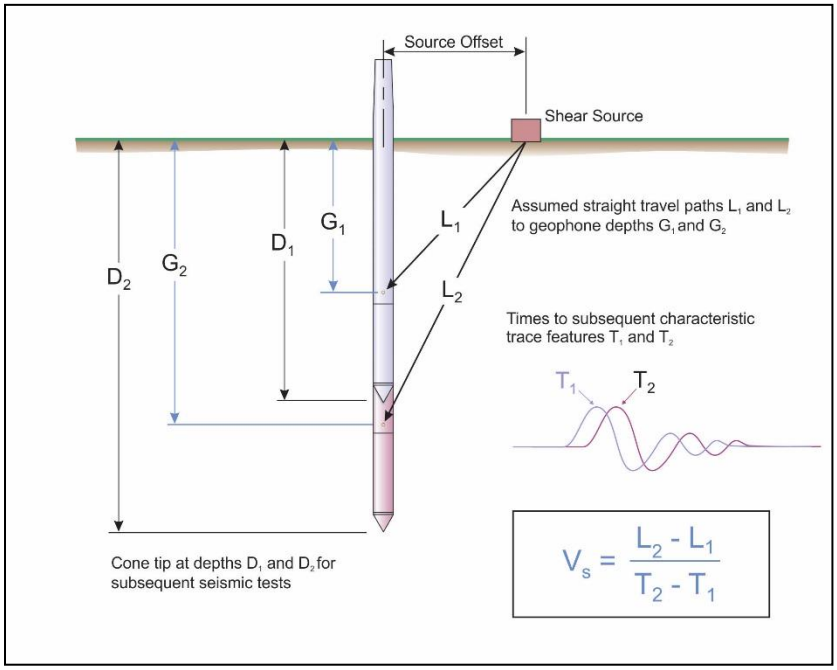


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE (2010).

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

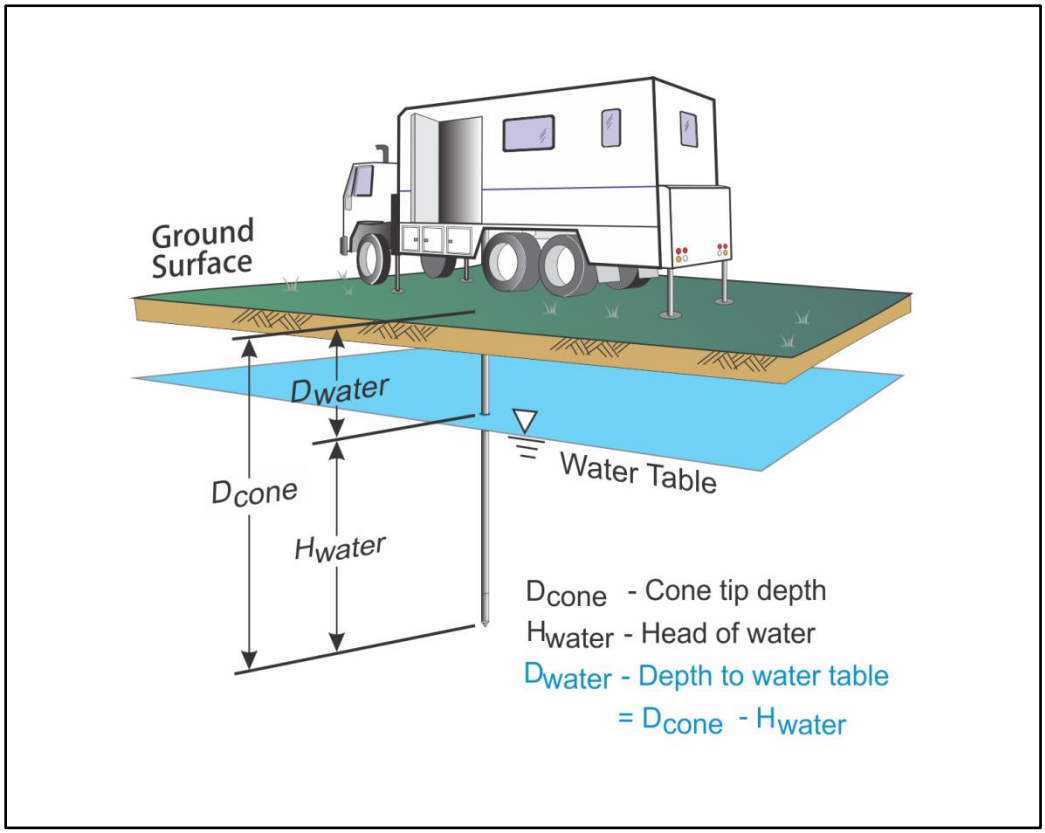


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

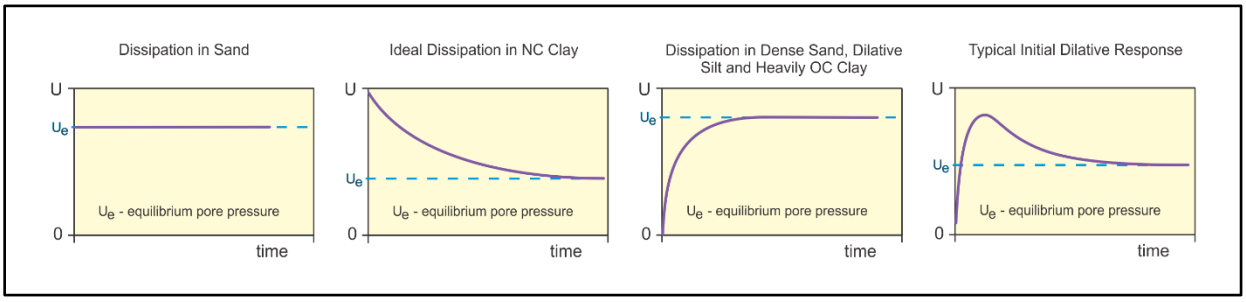


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:
T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby (1991))

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby (1991)), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

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The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi and N(60)Ic/N1(60)Ic
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Shear Wave (Vs) Tabular Results
- Seismic Cone Penetration Test Shear Wave (Vs) Traces
- Soil Behavior Type (SBT) Scatter Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No:	21-59-22239
Client:	WSDOT
Project:	SR534
Start Date:	12-Apr-2021
End Date:	12-Apr-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Latitude [3] (deg)	Longitude [3] (deg)	Refer to Notation Number
CPT-01	21-59-22239_SP01	12-Apr-2021	767: T1000F10U35	3.0	38.5	12	48.34105	-122.32345	2
CPT-02	21-59-22239_SP02	12-Apr-2021	767: T1000F10U35	3.0	38.7	12	48.34097	-122.32326	2
CPT-03	21-59-22239_CP03	12-Apr-2021	767: T1000F10U35	3.0	38.5		48.34098	-122.32335	2
Totals	3 soundings				115.65	24			

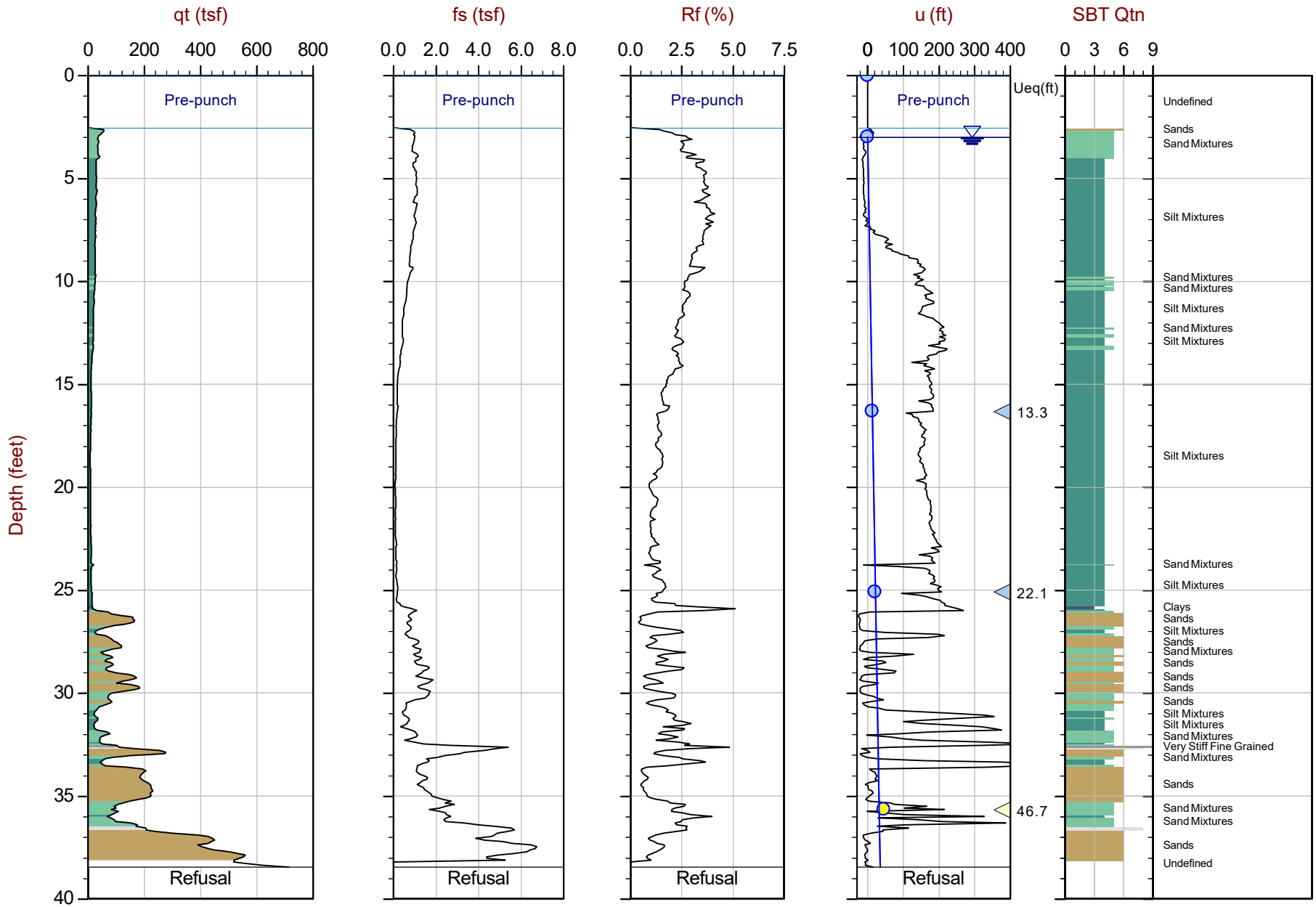
1. Phreatic surface based on pore pressure dissipation test unless otherwise noted. Hydrostatic profile applied to interpretation tables
2. Phreatic surface based on infered water table from nearby water source. Hydrostatic profile applied to interpretation tables
3. Coordinates were collected using a handheld GPS - WGS 84 Lat/Long

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 12:45
Site: SR534

Sounding: CPT-01
Cone: EC767



Max Depth: 11.725 m / 38.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_SP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34105 Long: -122.32345

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

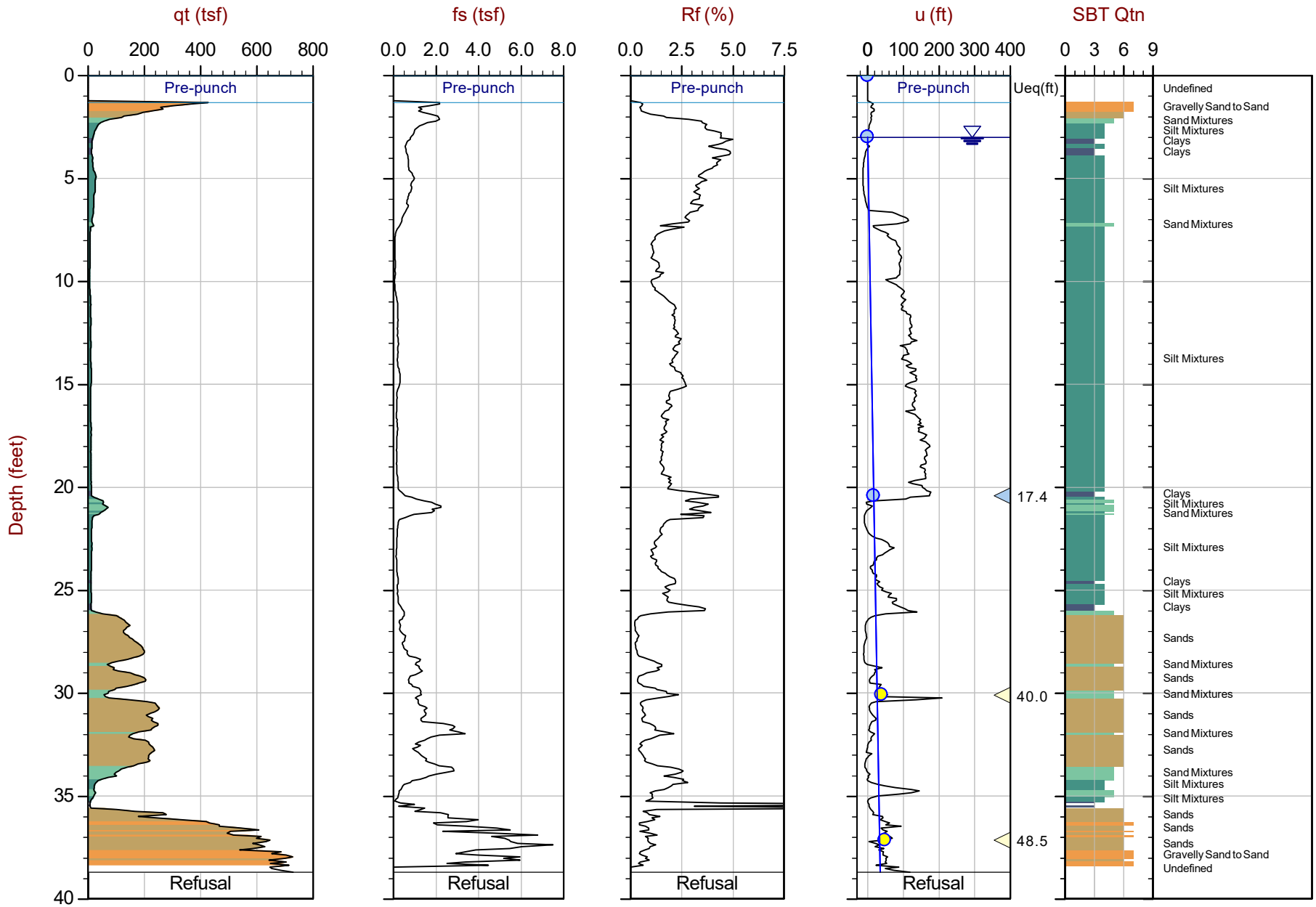
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 08:53
Site: SR534

Sounding: CPT-02
Cone: EC767



Max Depth: 11.800 m / 38.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_SP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34097 Long: -122.32326

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

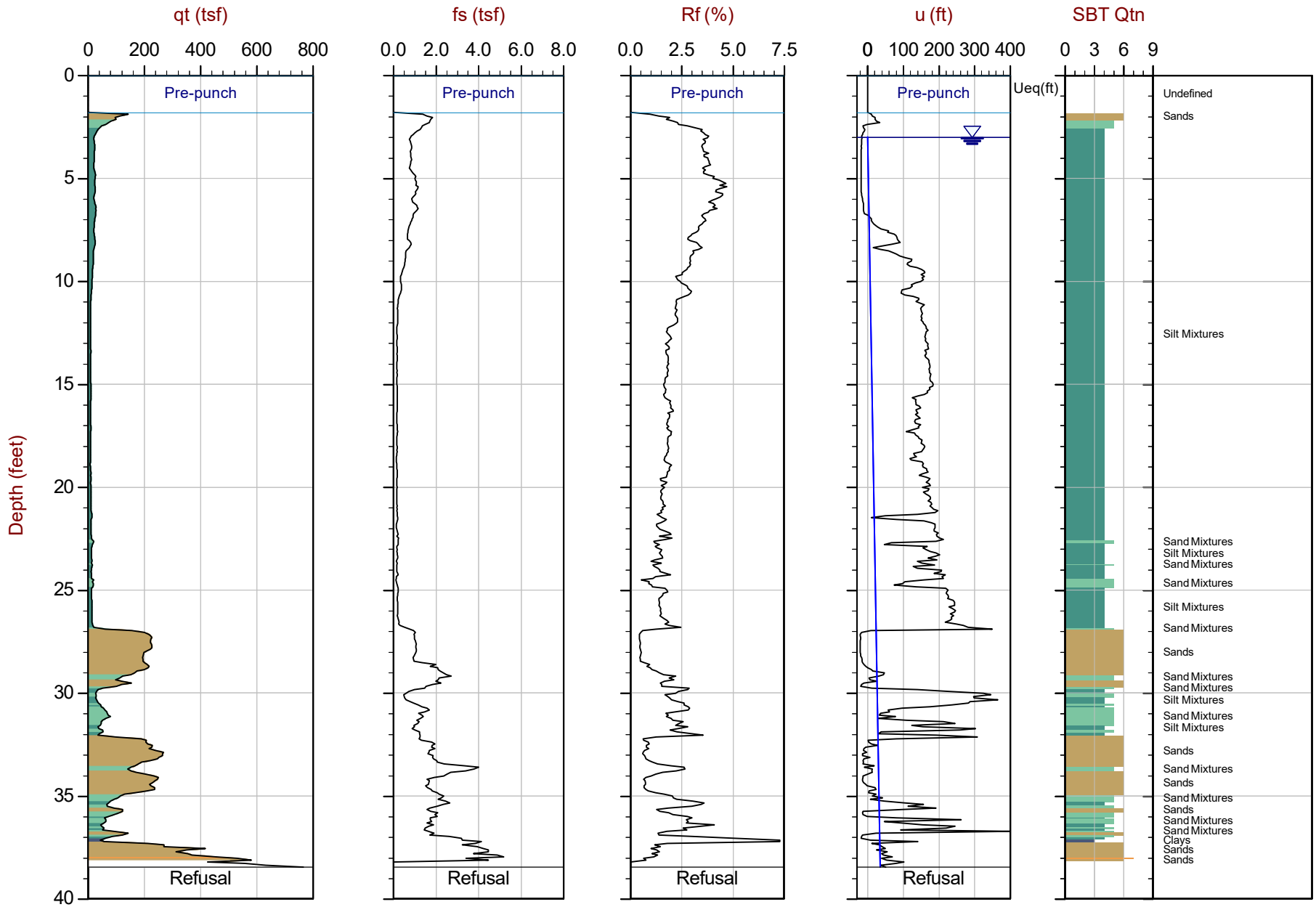
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 02:34
Site: SR534

Sounding: CPT-03
Cone: EC767



Max Depth: 11.725 m / 38.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_CP03.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34098 Long: -122.32335

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots with Ic, Su, Phi and N(60)/N1(60)

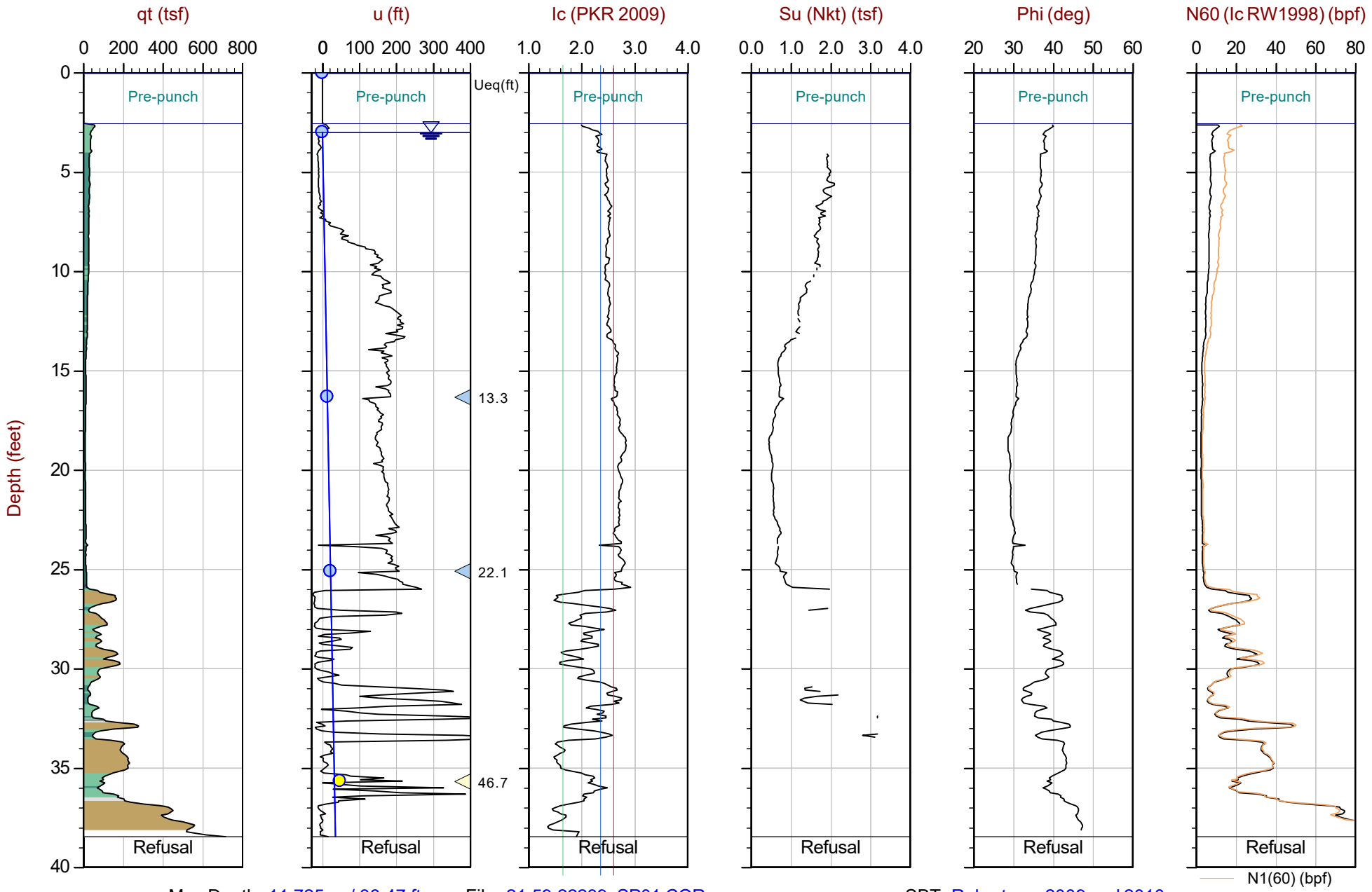
CONETEC

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 12:45
Site: SR534

Sounding: CPT-01
Cone: EC767



Max Depth: 11.725 m / 38.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_SP01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34105 Long: -122.32345

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

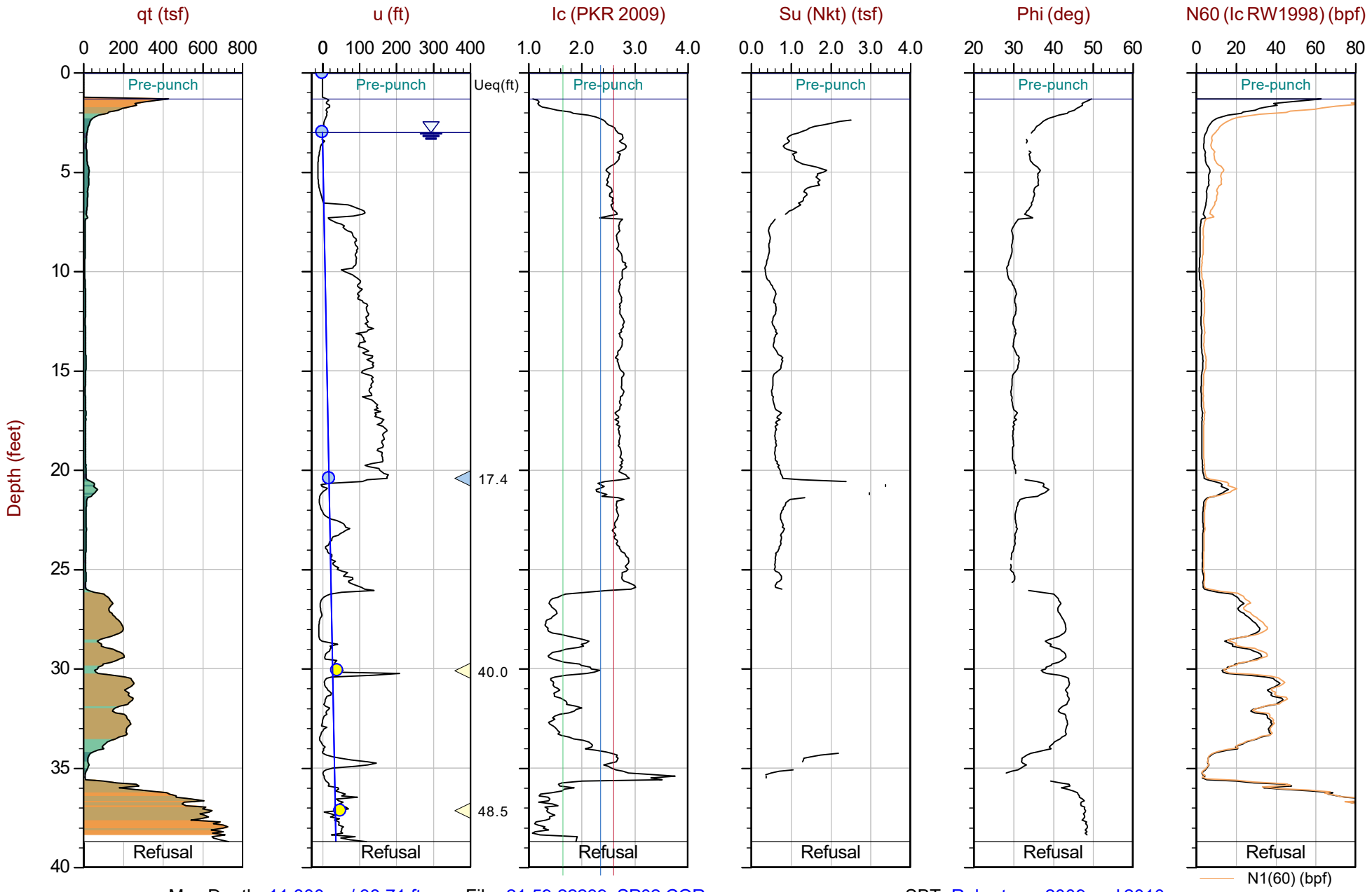
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 08:53
Site: SR534

Sounding: CPT-02
Cone: EC767



Max Depth: 11.800 m / 38.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_SP02.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34097 Long: -122.32326

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

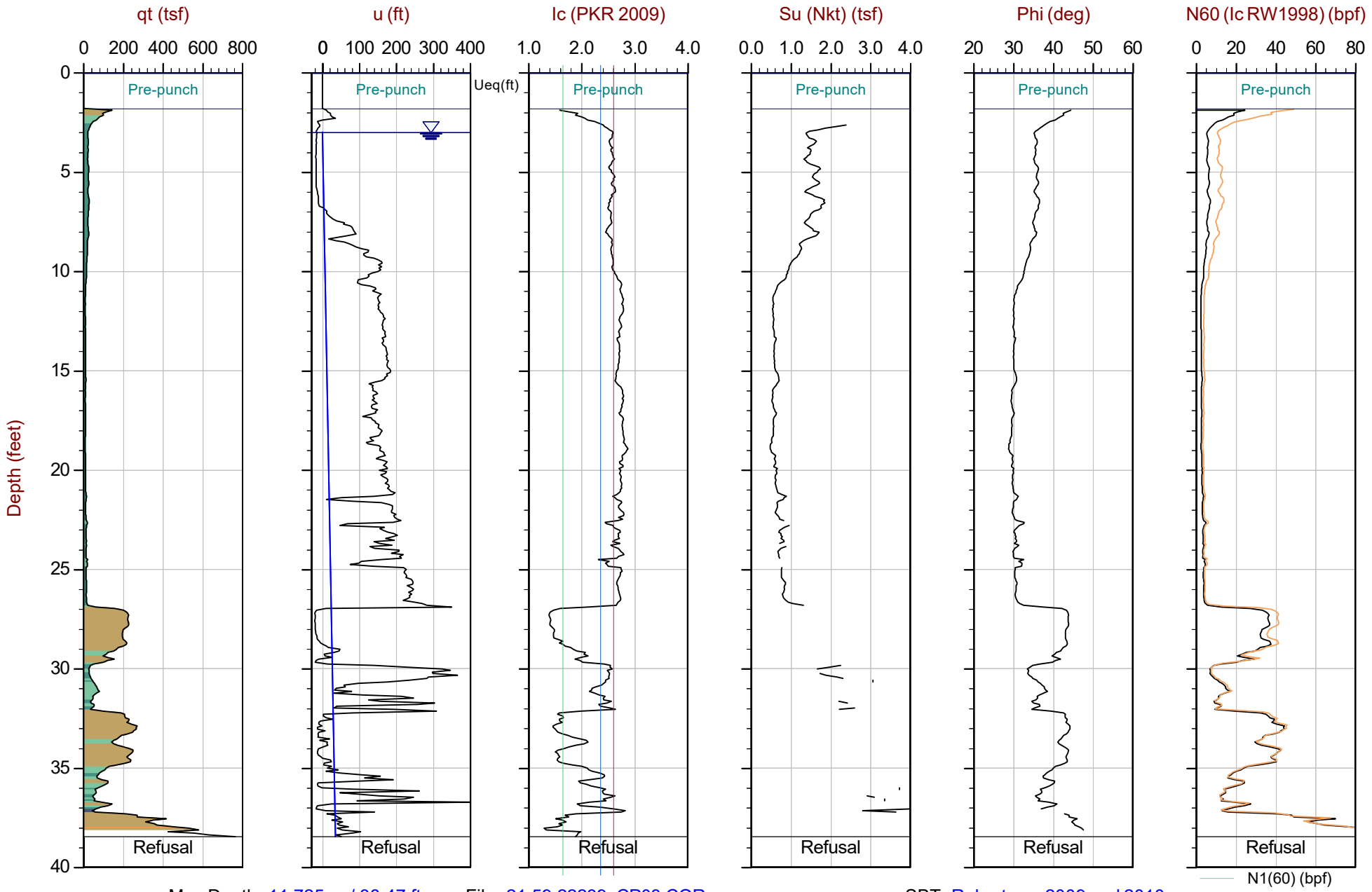
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 02:34
Site: SR534

Sounding: CPT-03
Cone: EC767



Max Depth: 11.725 m / 38.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_CP03.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34098 Long: -122.32335

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Plots

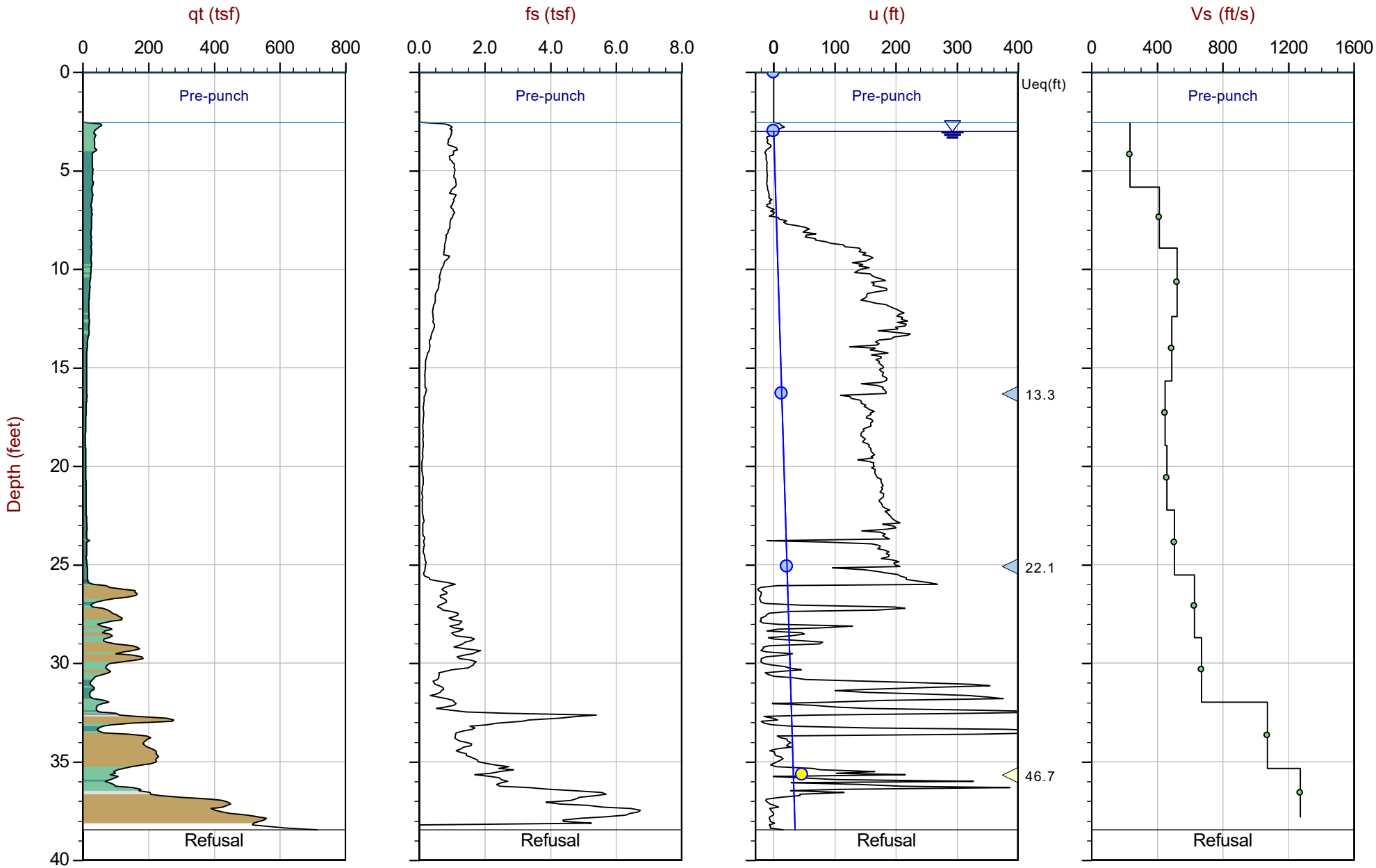
CONETEC

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 12:45
Site: SR534

Sounding: CPT-01
Cone: EC767



Max Depth: 11.725 m / 38.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_SP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34105 Long: -122.32345

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

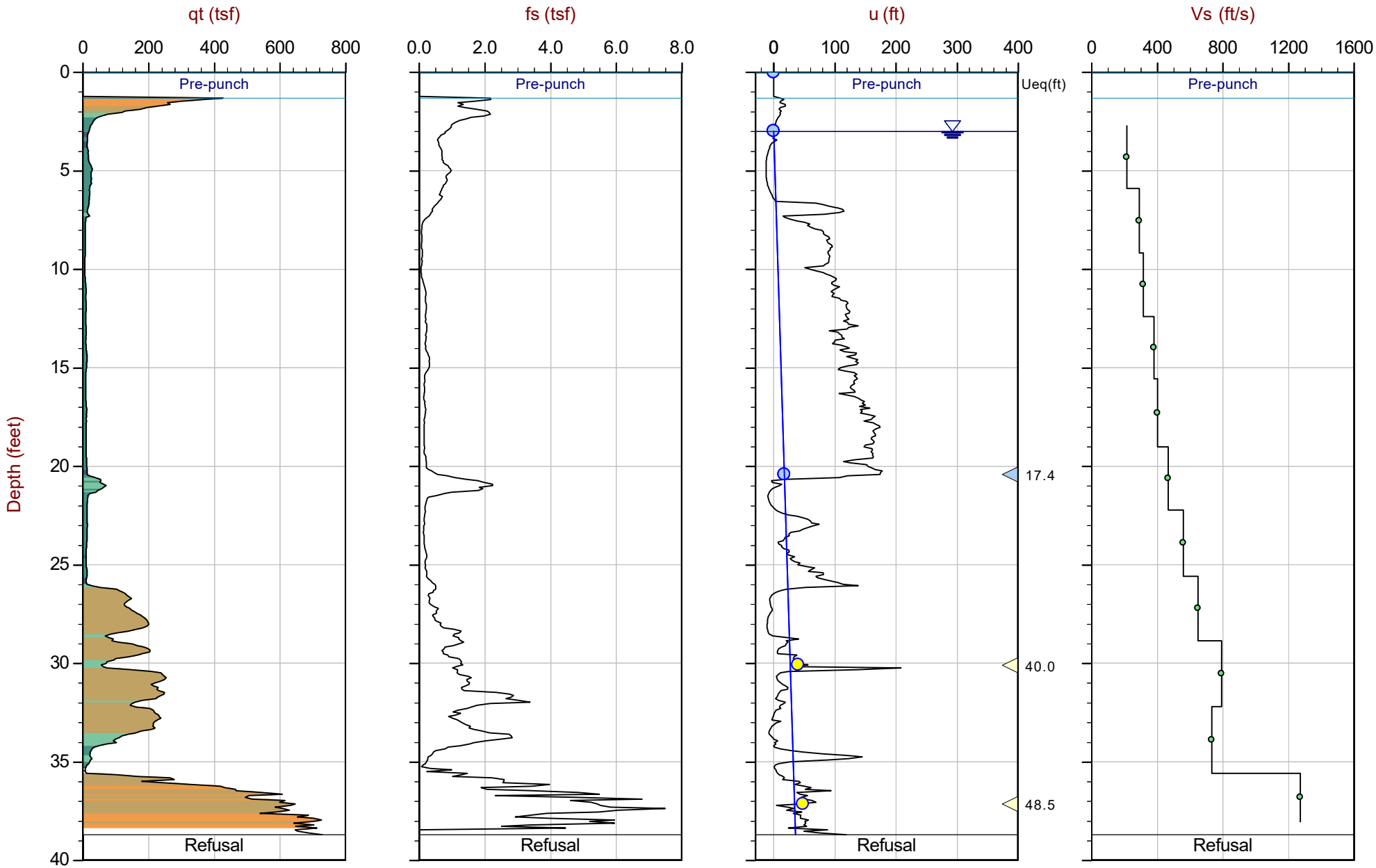
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

WSDOT

Job No: 21-59-22239
Date: 2021-04-12 08:53
Site: SR534

Sounding: CPT-02
Cone: EC767



Max Depth: 11.800 m / 38.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22239_SP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.34097 Long: -122.32326

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, Ueq assumed | Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Shear Wave (Vs) Tabular Results

CONETEC

Job No:	21-59-22239
Client:	WSDOT
Project:	SR534
Sounding ID:	CPT-01
Date:	12-Apr-2021

Seismic Source:	Beam
Source Offset (ft):	7.83
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
3.22	2.56	8.24			
6.50	5.84	9.77	1.53	6.51	235
9.58	8.92	11.87	2.10	5.08	414
13.06	12.40	14.67	2.79	5.35	522
16.34	15.68	17.53	2.86	5.86	489
19.62	18.96	20.52	2.99	6.66	449
22.90	22.24	23.58	3.07	6.67	460
26.18	25.52	26.70	3.12	6.16	506
29.36	28.71	29.76	3.06	4.86	629
32.64	31.99	32.93	3.18	4.73	671
36.02	35.37	36.22	3.29	3.07	1073
38.48	37.83	38.63	2.41	1.89	1272

Job No:	21-59-22239
Client:	WSDOT
Project:	SR534
Sounding ID:	CPT-02
Date:	12-Apr-2021

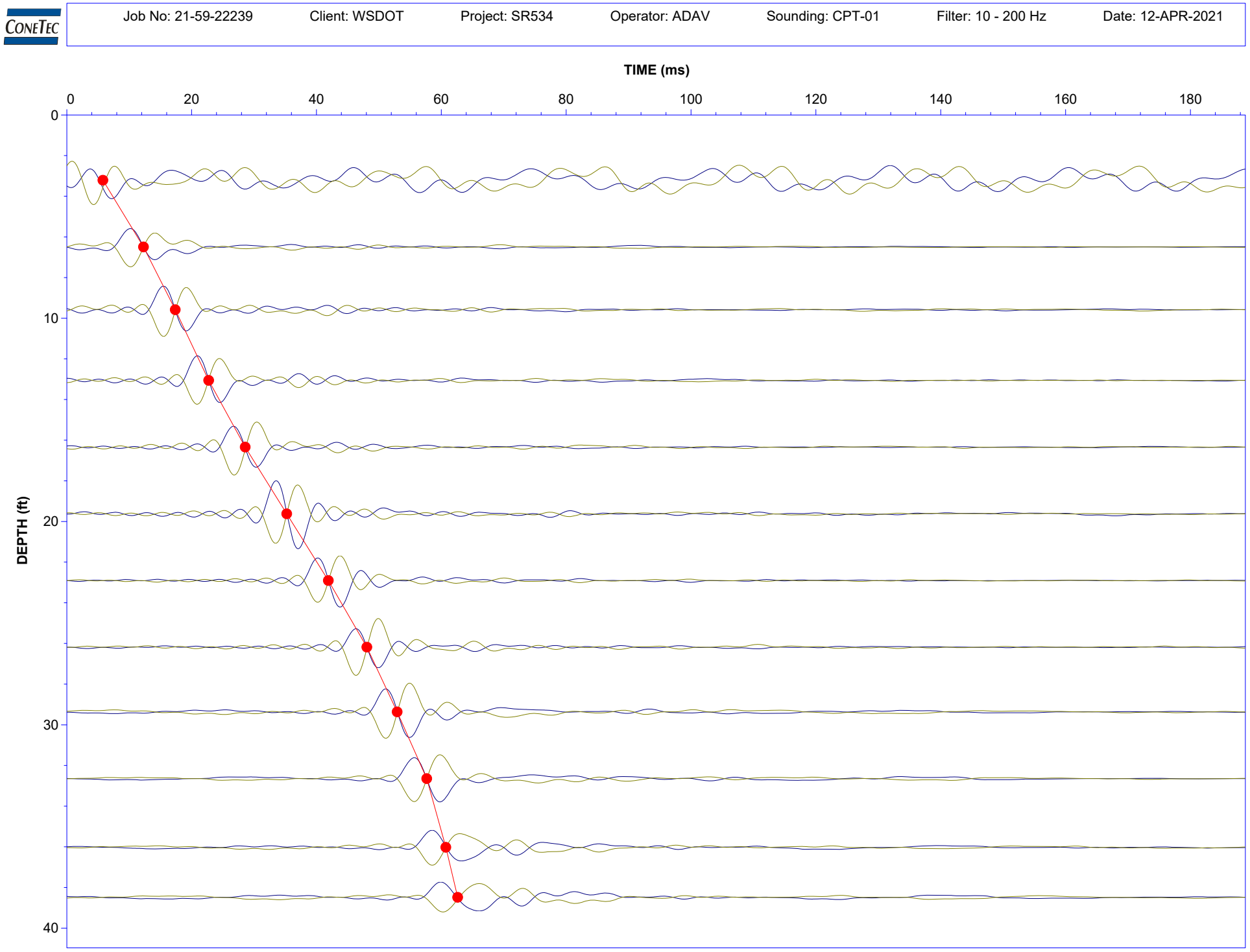
Seismic Source:	Beam
Source Offset (ft):	7.83
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

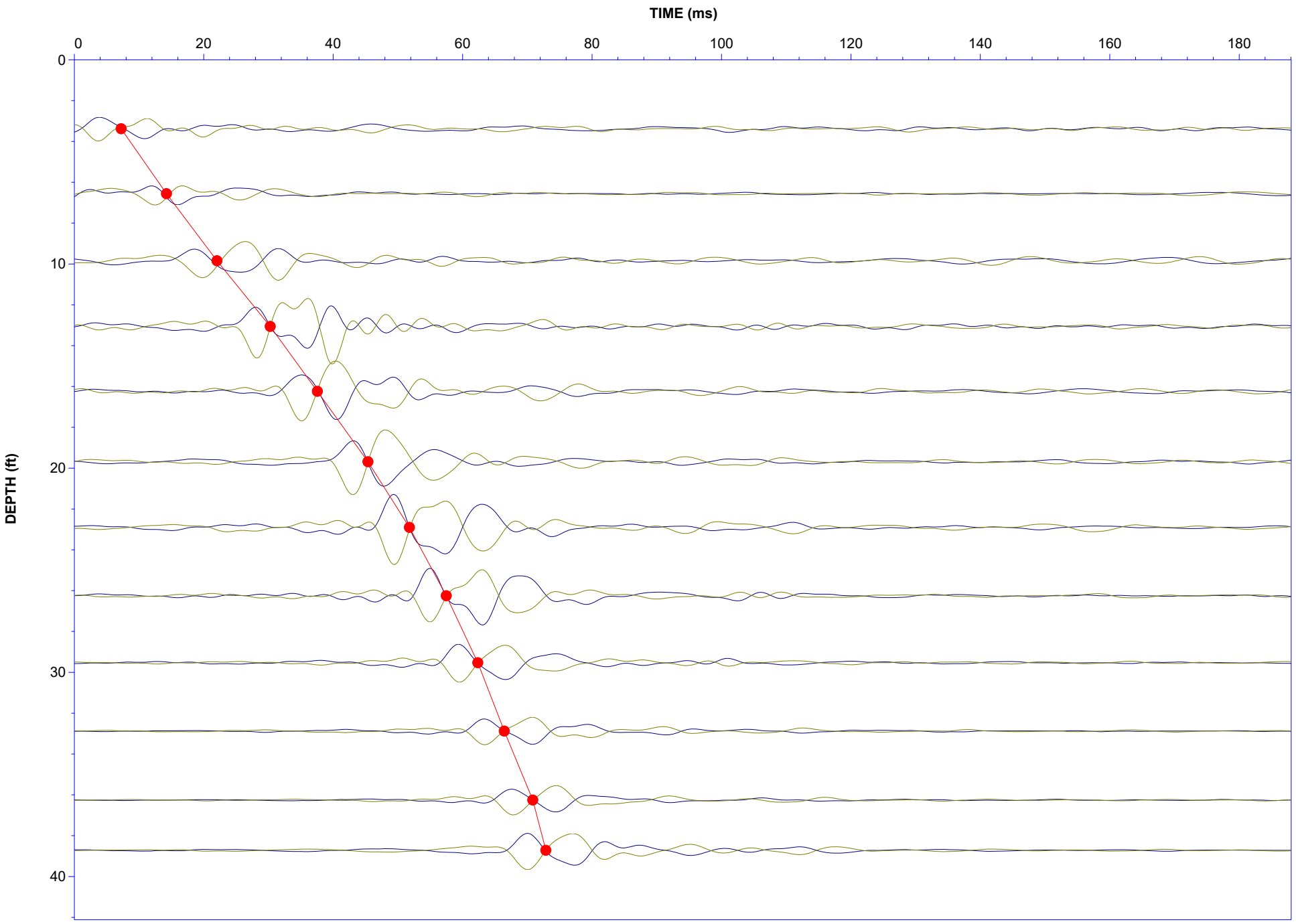
Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
3.38	2.72	8.29			
6.56	5.91	9.81	1.52	7.01	217
9.84	9.19	12.07	2.26	7.80	290
13.06	12.40	14.67	2.60	8.23	315
16.24	15.58	17.44	2.77	7.30	380
19.69	19.03	20.58	3.14	7.81	402
22.90	22.24	23.58	3.01	6.42	468
26.25	25.59	26.76	3.18	5.69	559
29.53	28.87	29.91	3.15	4.86	648
32.87	32.22	33.16	3.24	4.09	792
36.25	35.60	36.45	3.29	4.49	734
38.71	38.06	38.85	2.41	1.89	1272

Seismic Cone Penetration Test Shear Wave (Vs) Traces

CONETEC


Job No: 21-59-22239
Client: WSDOT
Project: SR534
Operator: ADAV
Sounding: CPT-01
Filter: 10 - 200 Hz
Date: 12-APR-2021
TIME (ms)
0
20
40
60
80
100
120
140
160
180
DEPTH (ft)
0
10
20
30
40

Job No: 21-59-22239 | Client: WSDOT | Project: SR534 | Operator: ADAV | Sounding: CPT-02 | Filter: 40 - 200 Hz | Date: 12-APR-2021



Soil Behavior Type (SBT) Scatter Plots

CONETEC

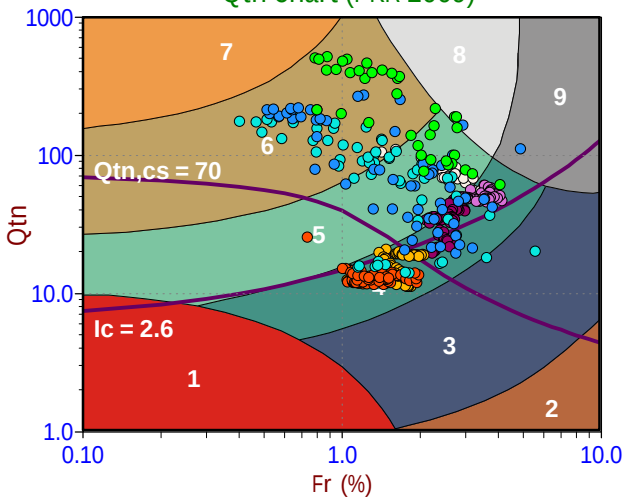
CONETEC

WSDOT

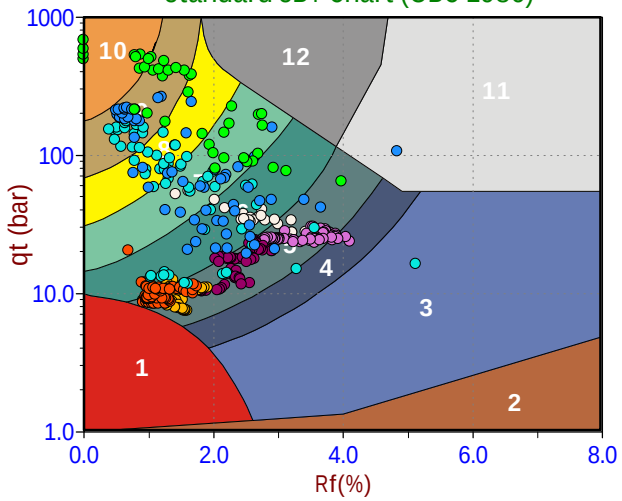
Job No: 21-59-22239
Date: 2021-04-12 12:45
Site: SR534

Sounding: CPT-01
Cone: EC767

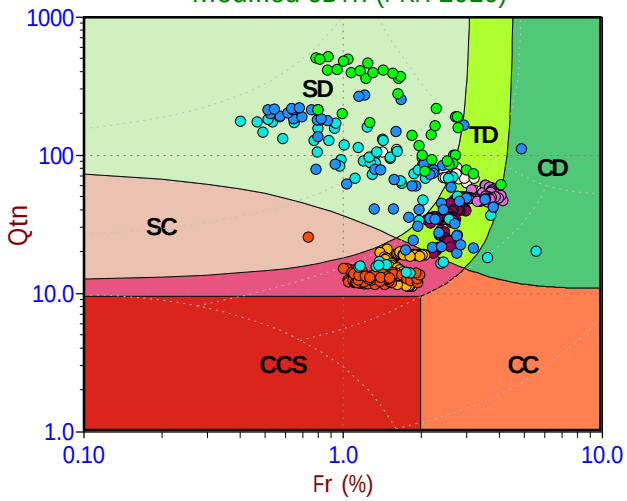
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

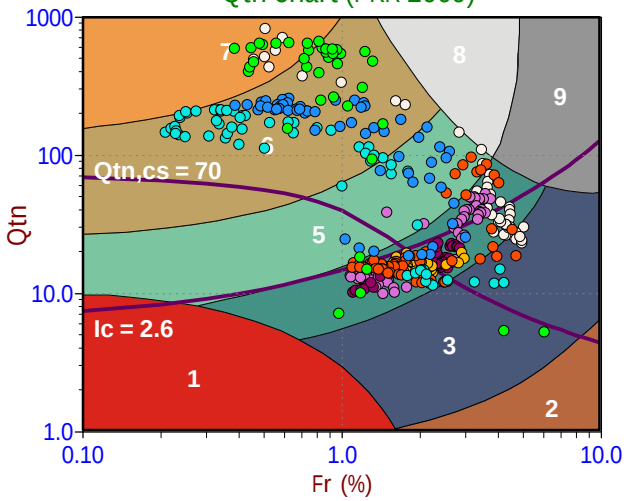
CONETEC

WSDOT

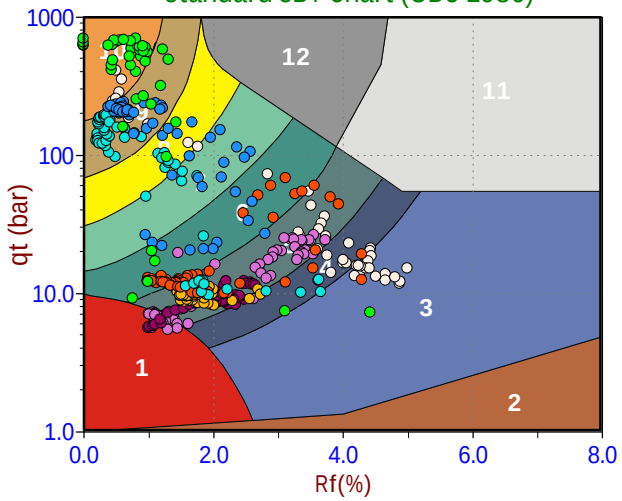
Job No: 21-59-22239
Date: 2021-04-12 08:53
Site: SR534

Sounding: CPT-02
Cone: EC767

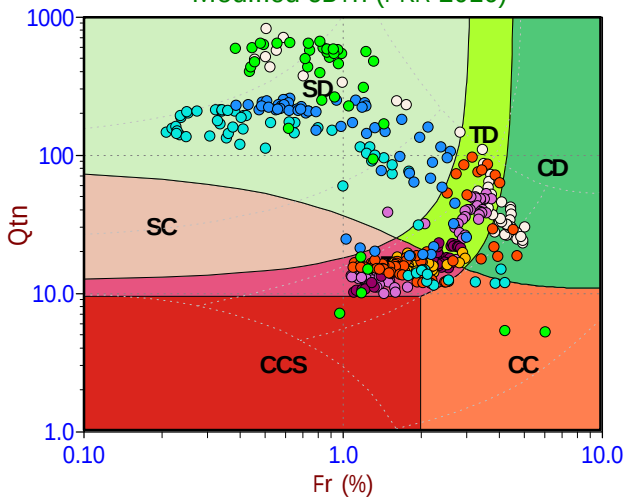
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

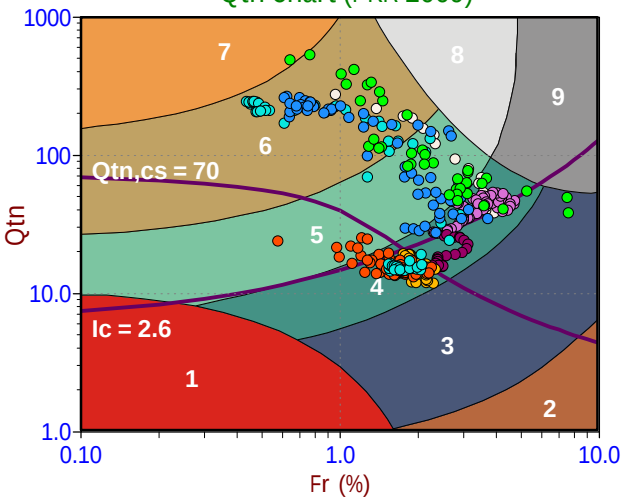
CONETEC

WSDOT

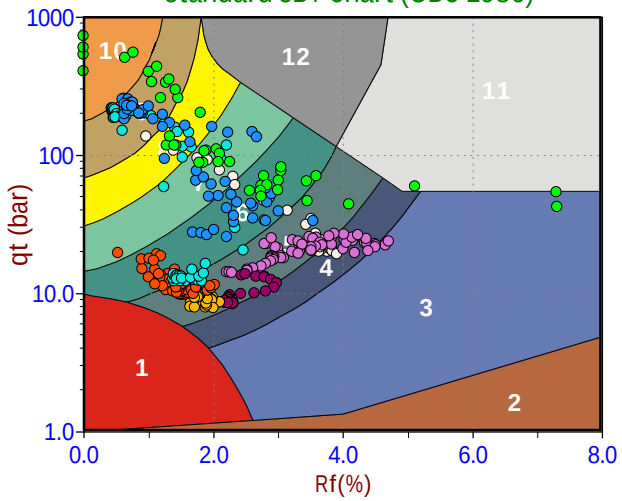
Job No: 21-59-22239
Date: 2021-04-12 02:34
Site: SR534

Sounding: CPT-03
Cone: EC767

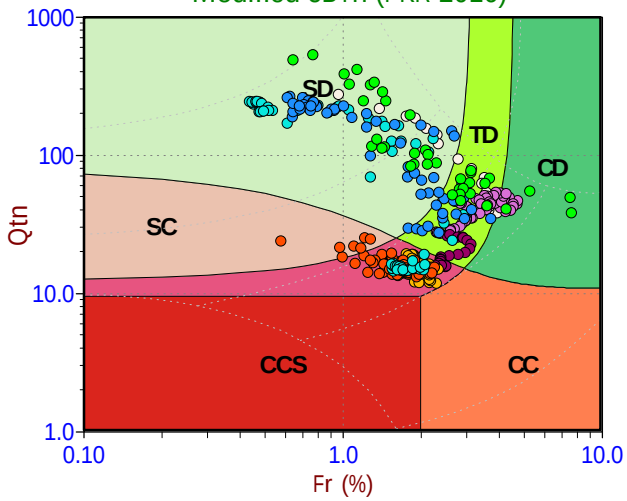
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Job No:	21-59-22239
Client:	WSDOT
Project:	SR534
Start Date:	12-Apr-2021
End Date:	12-Apr-2021

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
CPT-01	21-59-22239_SP01	10	1090	16.3	13.3		3.0	965	100	0.5
CPT-01	21-59-22239_SP01	10	1010	25.1	22.1		3.0	698	100	0.7
CPT-01	21-59-22239_SP01	10	325	35.7	46.7	-11.0				
CPT-02	21-59-22239_SP02	10	660	20.4	17.4		3.0	298	100	1.6
CPT-02	21-59-22239_SP02	10	300	30.1	40.0	-9.9				
CPT-02	21-59-22239_SP02	10	180	37.2	48.5	-11.4				
Total Duration			59.4 min							

a. Time is relative to where umax occurred.

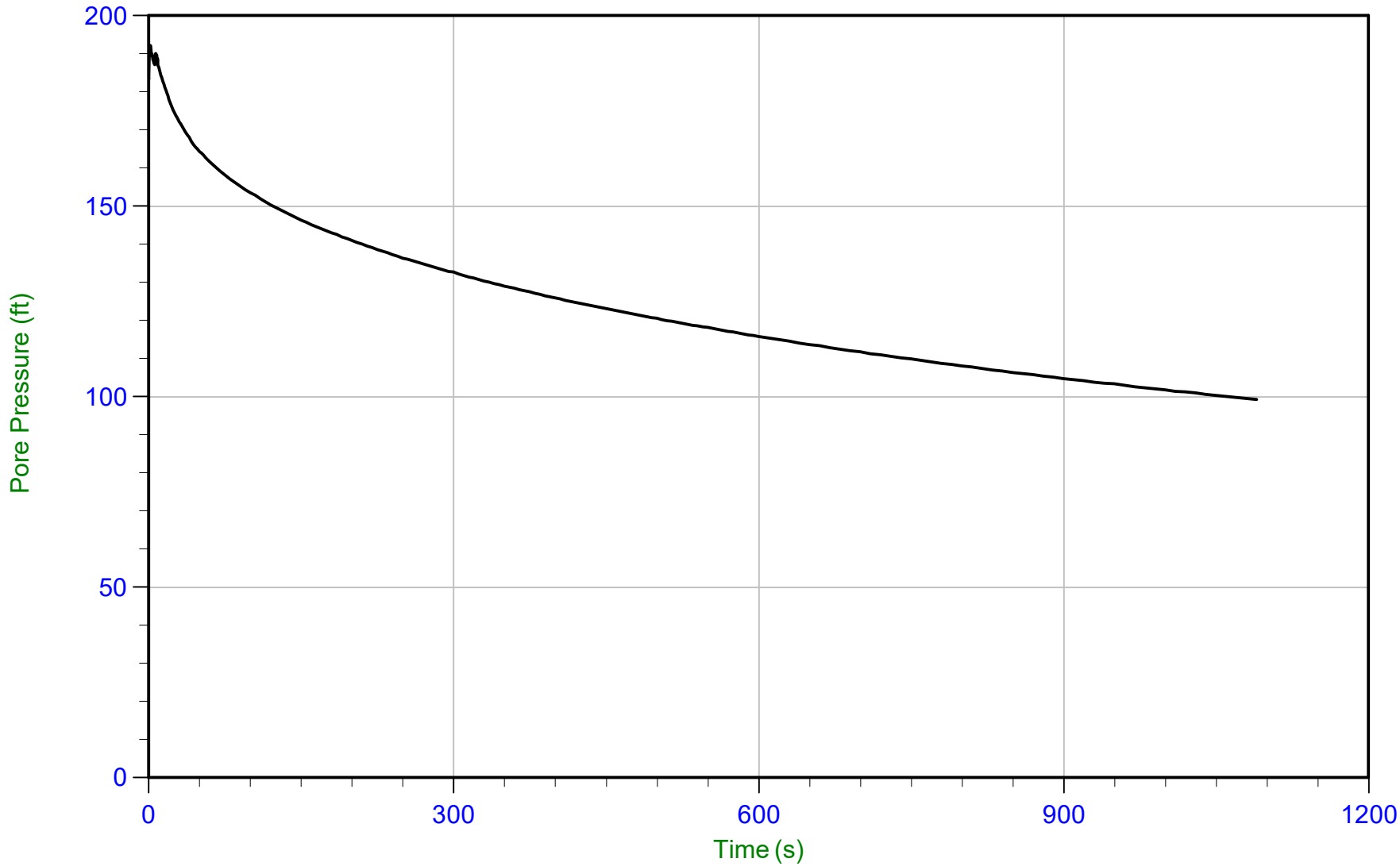
b. Houlsby and Teh, 1991.

CONETEC

WSDOT

Job No: 21-59-22239
Date: 04/12/2021 12:45
Site: SR534

Sounding: CPT-01
Cone: EC767 Area=10 cm²



Trace Summary:

Filename: 21-59-22239_SP01.ppd2
Depth: 4.975 m / 16.322 ft
Duration: 1090.0 s

u Min: 99.2 ft
u Max: 192.2 ft
u Final: 99.2 ft

WT: 0.914 m / 2.999 ft
Ueq: 13.3 ft
U(50): 102.77 ft

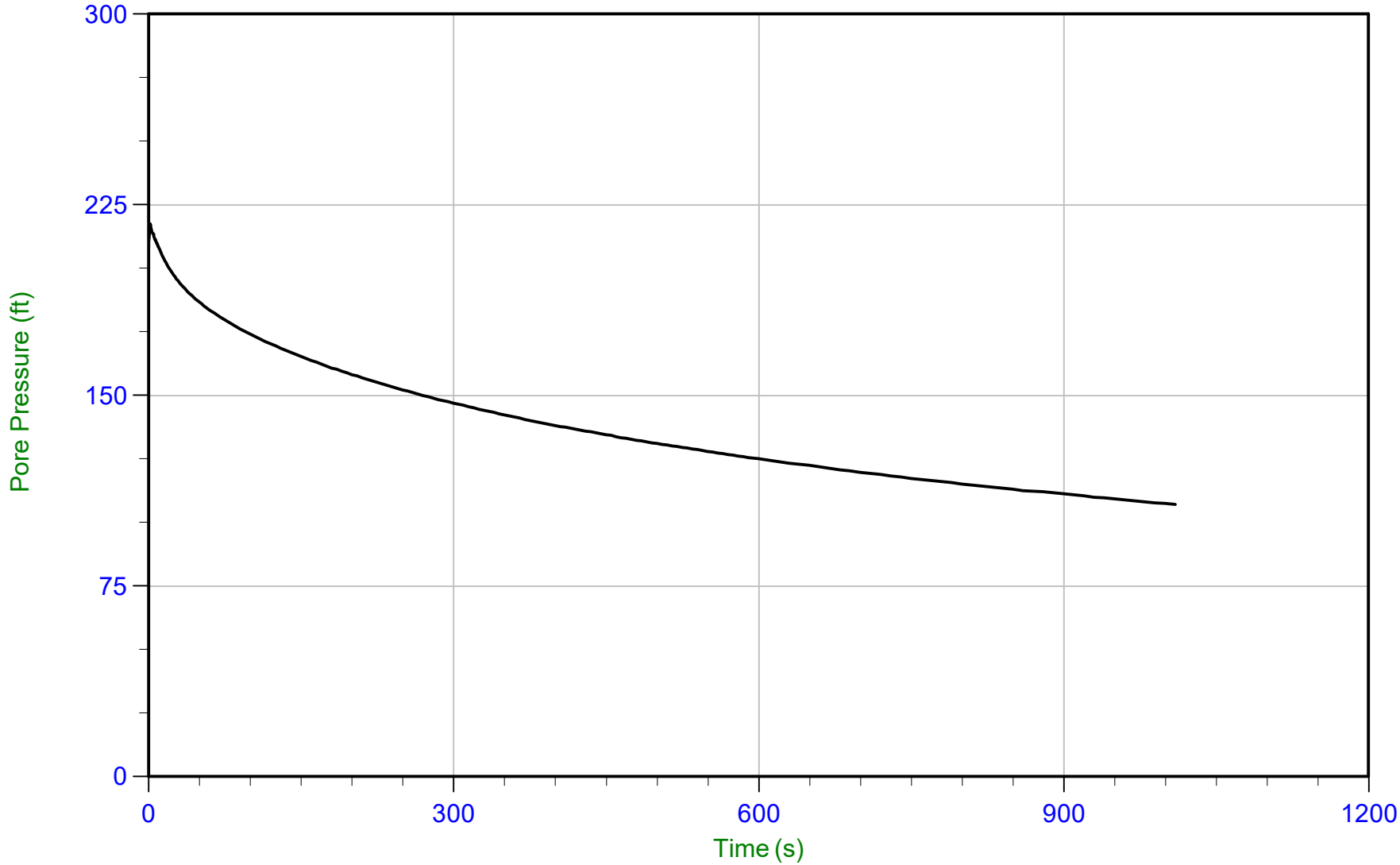
T(50): 964.7 s
Ir: 100
Ch: 0.5 cm²/min

CONETEC

WSDOT

Job No: 21-59-22239
Date: 04/12/2021 12:45
Site: SR534

Sounding: CPT-01
Cone: EC767 Area=10 cm²



Trace Summary:

Filename: 21-59-22239_SP01.ppd2
Depth: 7.650 m / 25.098 ft
Duration: 1010.0 s

u Min: 107.1 ft
u Max: 217.5 ft
u Final: 107.1 ft

WT: 0.914 m / 2.999 ft
Ueq: 22.1 ft
U(50): 119.80 ft

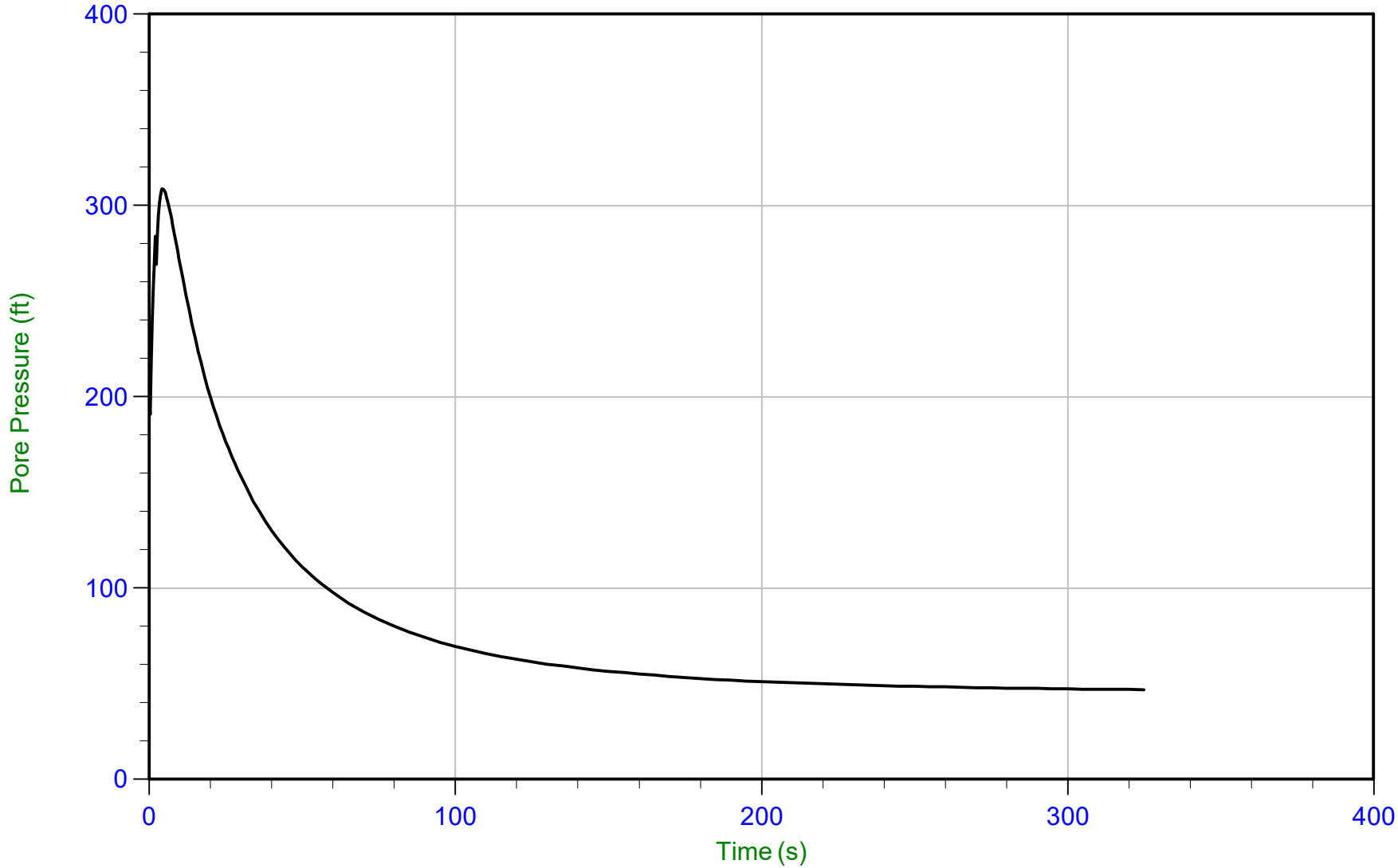
T(50): 697.7 s
Ir: 100
Ch: 0.7 cm²/min

CONETEC

WSDOT

Job No: 21-59-22239
Date: 04/12/2021 12:45
Site: SR534

Sounding: CPT-01
Cone: EC767 Area=10 cm²



Trace Summary:

Filename: 21-59-22239_SP01.ppd2
Depth: 10.875 m / 35.679 ft
Duration: 325.0 s

u Min: 46.9 ft
u Max: 308.7 ft
u Final: 46.9 ft

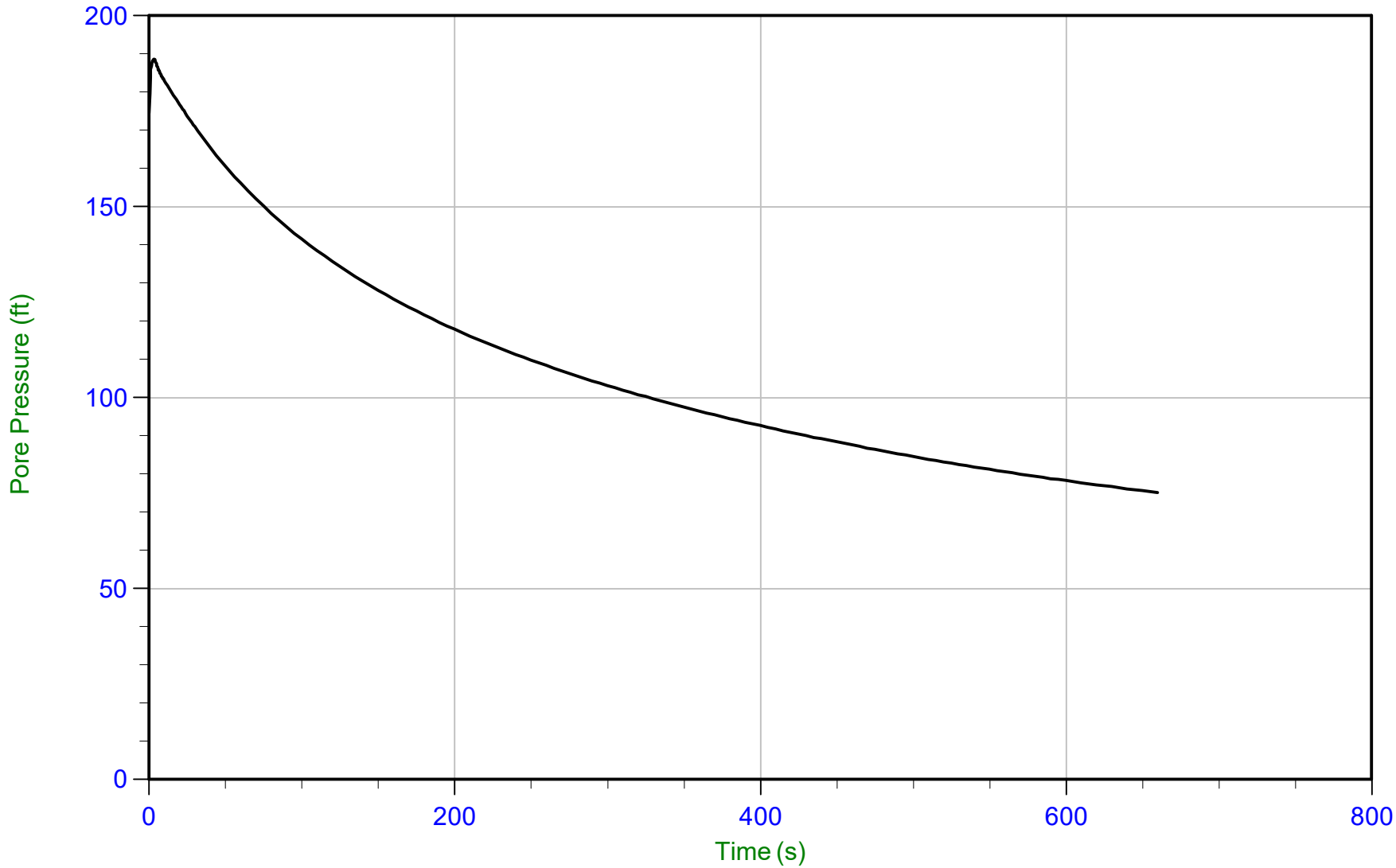
WT: -3.362 m / -11.030 ft
Ueq: 46.7 ft

CONETEC

WSDOT

Job No: 21-59-22239
Date: 04/12/2021 08:53
Site: SR534

Sounding: CPT-02
Cone: EC767 Area=10 cm²



Trace Summary:

Filename: 21-59-22239_SP02.ppd2
Depth: 6.225 m / 20.423 ft
Duration: 660.0 s

u Min: 75.1 ft
u Max: 188.6 ft
u Final: 75.1 ft

WT: 0.914 m / 2.999 ft
Ueq: 17.4 ft
U(50): 103.00 ft

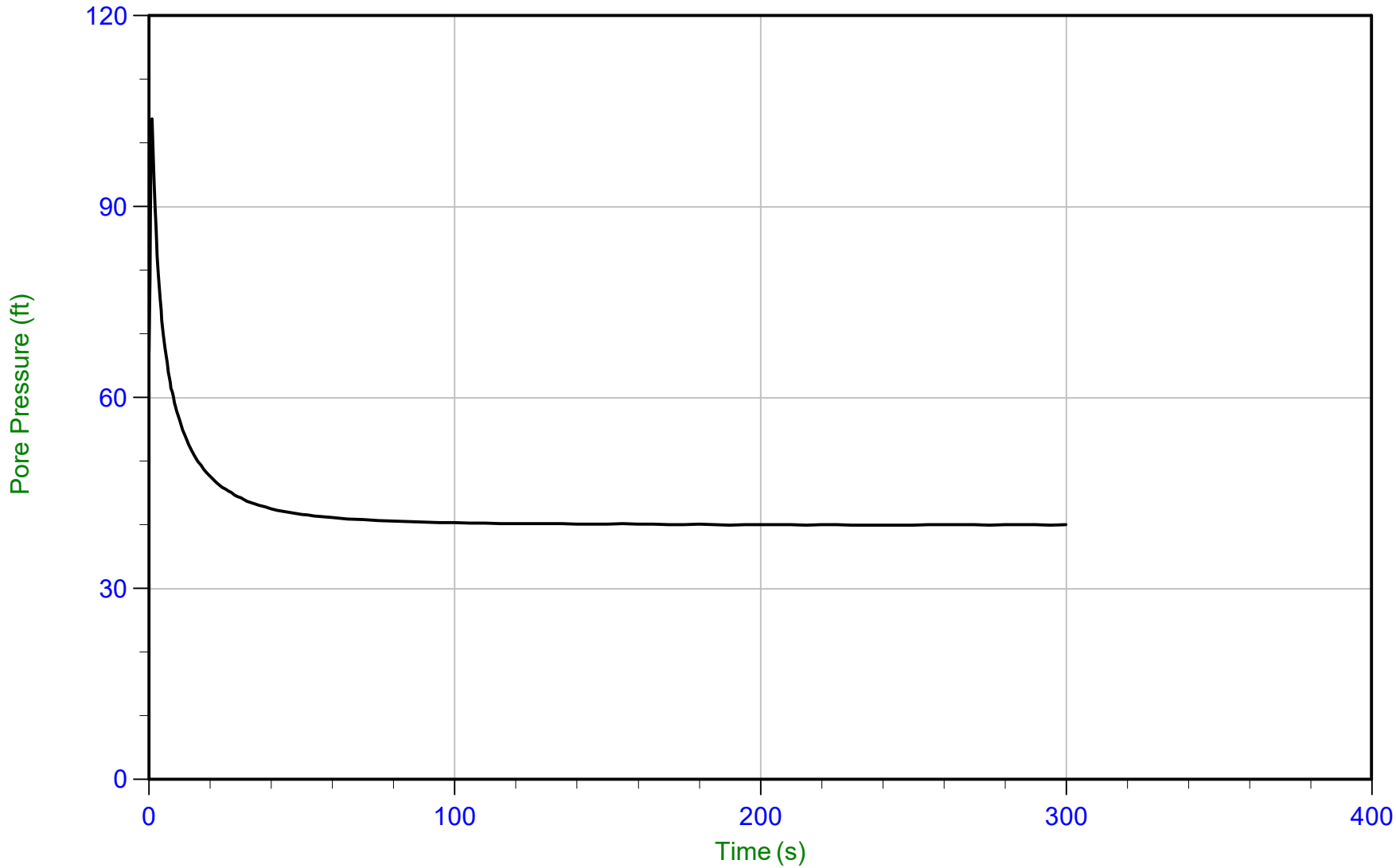
T(50): 297.9 s
Ir: 100
Ch: 1.6 cm²/min

CONETEC

WSDOT

Job No: 21-59-22239
Date: 04/12/2021 08:53
Site: SR534

Sounding: CPT-02
Cone: EC767 Area=10 cm²



Trace Summary:

Filename: 21-59-22239_SP02.ppd2
Depth: 9.175 m / 30.101 ft
Duration: 300.0 s

u Min: 40.0 ft
u Max: 103.8 ft
u Final: 40.0 ft

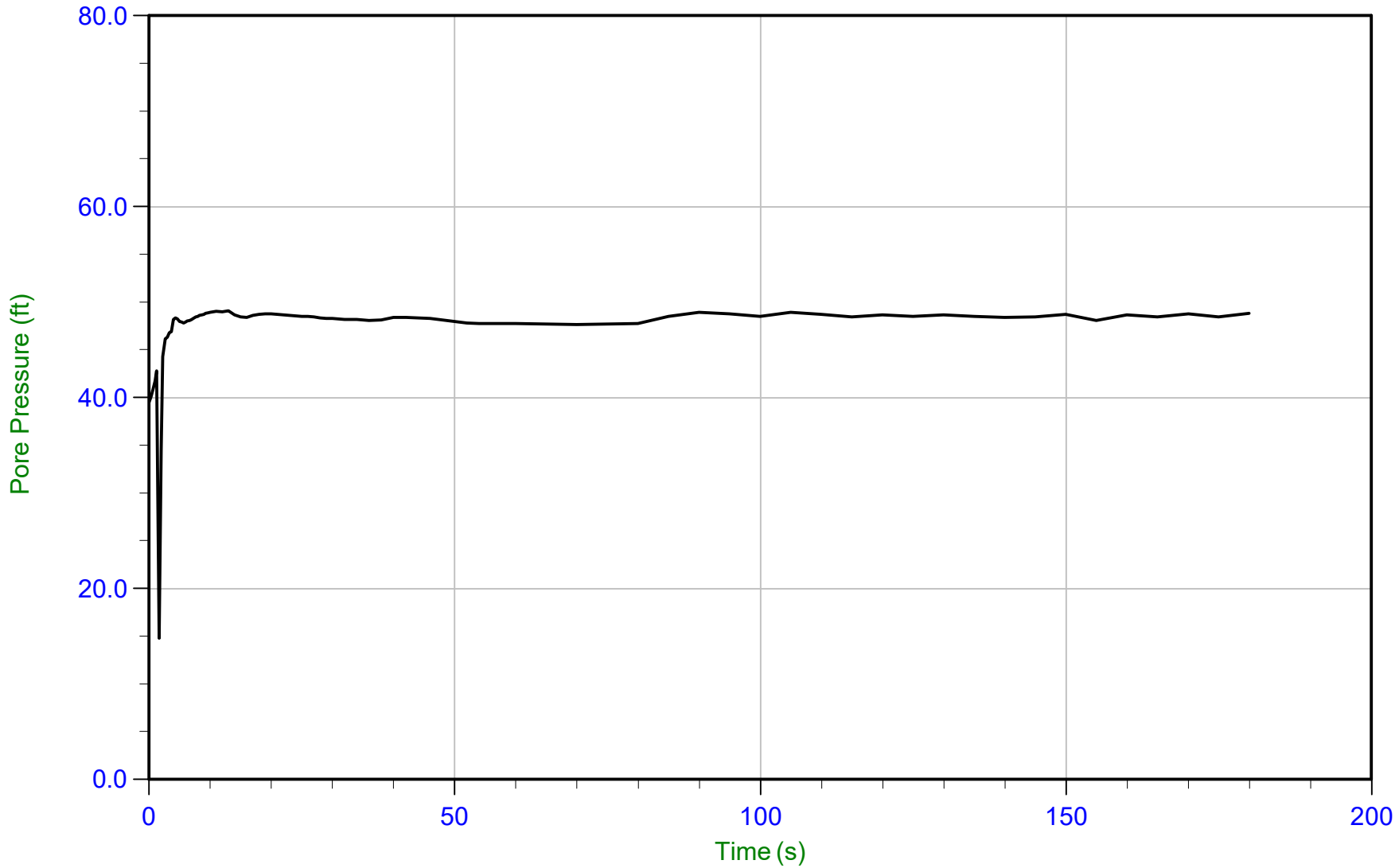
WT: -3.017 m / -9.898 ft
Ueq: 40.0 ft

CONETEC

WSDOT

Job No: 21-59-22239
Date: 04/12/2021 08:53
Site: SR534

Sounding: CPT-02
Cone: EC767 Area=10 cm²



Trace Summary:

Filename: 21-59-22239_SP02.ppd2
Depth: 11.325 m / 37.155 ft
Duration: 180.0 s

u Min: 14.8 ft
u Max: 49.1 ft
u Final: 48.8 ft

WT: -3.462 m / -11.358 ft
Ueq: 48.5 ft