GEOTECHNICAL DATA REPORT
TAYLOR CREEK RESTORATION PROJECT
DEAD HORSE CANYON
SEATTLE, WASHINGTON

Work Authorization No.: Project C399315
October 2022

707 South Plummer Street
Seattle, Washington 98134

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GEOTECHNICAL DATA REPORT
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1.0 INTRODUCTION

This geotechnical data report (GDR) presents the results of our geotechnical investigation for a temporary access road that Seattle Public Utilities (SPU) is considering constructing in Dead Horse Canyon as part of the Taylor Creek Restoration Project. We will provide geotechnical engineering recommendations in a separate report. The project limits addressed in this report are shown on Figures 1 through 3.

We have organized this report into several sections. The first three sections describe the purpose and scope of our work and our understanding of the project. The fourth section presents the site subsurface conditions. Figures illustrating site and project features are presented at the end of the text. Field data are presented in Appendix A, geotechnical laboratory test results are presented in Appendix B, and logs of relevant historical explorations are provided in Appendix C.

2.0 PURPOSE AND SCOPE OF WORK

The purpose of our work is to provide the SPU Project Team with subsurface information to support design of the proposed project features.

Our scope of work for this project included:

- Reviewing readily available geotechnical/geologic information for the project site and vicinity;
- Completing a geotechnical exploration program including 16 soil borings;
- Completing geotechnical laboratory testing; and,
- Preparing this geotechnical data report summarizing our investigation.

3.0 SITE AND PROJECT UNDERSTANDING

3.1 SURFACE CONDITIONS

The proposed work is in Dead Horse Canyon, an approximately 35-acre natural area in southeast Seattle which is generally bounded by Holyoke Way S to the north, Rustic Road S to the east, 69th Place S and 71st Place S to the south and 68th Place S and Waters Avenue S to the west. Dead Horse Canyon, which is part of Lakeridge Park and is under the jurisdiction of Seattle Parks and Recreation (Parks), consists of an approximately 2,600-foot-long, 500-foot-wide, and 50- to 130-foot-deep north-south oriented ravine that is densely vegetated with mature conifers and deciduous trees and low growing brush. Privately owned parcels, which are generally occupied by single family residences, are

located along the top of the ravine, and abut the east, south and west boundaries of the Lakeridge Park parcel.

The ground surface along the top of the ravine varies from elevation 270 feet at the south to elevation 215 feet at the north. Taylor Creek flows from south to north along the bottom of the ravine dropping from approximately elevation 230 feet at the southern extent of the east and west forks of the creek to 185 feet at the confluence of the east and west forks and elevation 75 feet at Holyoke Way S. After passing under Holyoke Way S, Taylor Creek continues to flow north for approximately 0.2 miles to Lake Washington. In general, the east slope of the ravine has a constant inclination from top to bottom, while the west slope of the ravine tends to be steep near the top of the slope, flatter near mid slope and becomes steeper again near the bottom of the slope. All elevations in this report are referenced to the NAVD88 datum, unless noted otherwise.

An approximately 4- to 6-foot-wide aggregate surfaced trail begins at Holyoke Way S and follows the west slope of the ravine south for approximately 1,700 feet where it splits with one trail continuing along the west slope of the ravine and the other trail crossing Taylor Creek to the east slope of the ravine. The two trails continue south and reconnect near the confluence of the east and west forks of Taylor Creek to form an approximately 1,100-foot-long loop. In general, the trail is approximately 20 to 40 feet above Taylor Creek. A 10-inch diameter sanitary sewer line that is owned by SPU is buried beneath the trail on the west slope of the ravine between Holyoke Way S and the trail junction at 1,700 feet. The sewer then crosses Taylor Creek and continues south beneath the trail on the east slope of the ravine.

3.2 PROJECT UNDERSTANDING

We understand that the proposed project scope within Dead Horse Canyon includes building wood structures in Taylor Creek to stabilize the channel and capture sediment and installing surface mounted stormwater drainpipes (tightlines) along the east slope of the ravine to reduce erosion. SPU has developed two potential options for providing access into Dead Horse Canyon to install the wood structures in Taylor Creek. One option includes an approximately 2,460-foot-long temporary access road that generally follows the existing trail alignment along the west slope of the ravine between Holyoke Way S and the confluence of the east and west forks of Taylor Creek then follows the trail alignment along the east slope of the ravine before terminating on the south side of the east fork. This option also includes a 240-foot-long temporary spur road that follows a portion of the trail alignment along the east slope of the ravine. The other option includes a temporary access road that follows the same alignment as the 2,460-foot-long temporary access road, but terminates approximately 1,250 feet south of Holyoke Way S. The proposed temporary access roads would have a 12-foot-wide aggregate surface and the proposed temporary spur road would have a 10-foot-wide aggregate surface. The

proposed alignments of the temporary access and spur roads are shown on Figures 1 through 3.

3.3 HISTORICAL LANDSLIDES

Based on our review of the Known Slide Environmental Critical Area (ECA) layer in the City of Seattle GIS online geodatabase, which includes information for landslides that have been reported in Seattle between 1890 and 2019, one historical landslide is mapped along the top of the west slope of the ravine upslope of the proposed alignment of both temporary access road options. Three historical landslides are mapped near the top of the ravine at locations that are not upslope of the proposed alignment of the temporary access and spur roads. Based on our review of other landslide related ECA layers in the City of Seattle GIS online geodatabase, most of the east and west slopes of the ravine are mapped as steep slope and/or potential slide ECAs. Steep slope ECAs are defined as slopes with an incline of 40 percent or more and a vertical elevation change of at least ten feet. Potential slide ECAs are defined as areas with indications of past landslide activity, such as landslide headscarps and sidescarps, hummocky terrain, areas with geologic conditions that can promote earth movement, and areas with signs of potential landsliding, such as springs, groundwater seepage, and bowed or backtilted trees. The location of landslide related ECAs that are mapped in the vicinity of Dead Horse Canyon are shown on Figure 1.

In 2005, the United States Geological Survey (USGS) (Schulz, 2005) used LIDAR imagery to create a landslide inventory map for Seattle. Based on landforms visible in the LIDAR imagery, possible headscarps, landslide deposits, and denuded slopes were identified. The historical landslides identified using LIDAR were compared to data from a landslide inventory based on historical records (Shannon and Wilson, Inc., 2003) to develop a relationship between landslide potential and the identified landslide landforms plus an additional landform representing the areas within Seattle where no landslide-related landforms were observed.

Schulz proposes that because future landslide activity in Seattle is expected to be similar in type and location to recent activity, projections can be made about the relative likelihood of landslides within a given area. The results of the study indicate that compared to areas where no landslide-related landforms have been observed, the likelihood of future landslides is 244, 86, and 47 times greater within areas mapped as headscarps, landslide deposits, and denuded slopes, respectively. As shown on Figure 2, the east and west slopes of the ravine are generally mapped within the three landslide-related landforms identified by Schulz, indicating that landslides are 47 to 244 times more likely to occur along these slopes when compared to slopes in Seattle where no landslide related landforms have been observed.

4.0 SUBSURFACE CONDITIONS

We based our interpretation of subsurface conditions at the project site on published geologic maps, information obtained from new and historical subsurface explorations, and laboratory tests on select soil samples. Figure 3 shows the mapped geology and the location of the new and historical explorations. We prepared a generalized subsurface profile along the proposed centerline of the 2,460-foot-long temporary access road based on our interpretation of the subsurface stratigraphy. The profile is shown on Figure 4. The proposed alignment of the temporary access road is shown on Figures 1 through 3.

The information provided in this report is based on subsurface soil conditions interpreted from these explorations. The nature and extent of variations between the explorations and current conditions may not become evident until additional explorations are completed, or construction begins. If variations are encountered, it will be necessary to reevaluate the information provided in this report.

4.1 General Geology

The general geologic condition of the Puget Sound region is a result of glacial and non-glacial activity that occurred over the course of millions of years. The most recent glacial activity in the Puget Sound area was the Vashon stade of the Fraser glaciation that ended about 10,000 years ago. Between each glaciation, non-glacial erosion and deposition shaped the region.

Review of the geologic map of Seattle (Troost, et al, 2005) indicates that the ravine is underlain by a sequence of glacial and non-glacial deposits with the youngest deposits along the top of the ravine and the oldest deposits near the bottom of the ravine.

The geologic map indicates the ravine is underlain by the following geologic units generally listed in order of highest to lowest elevation: Vashon subglacial till, Vashon advance outwash, Lawton Clay, pre-Olympia glacial diamict, pre-Olympia glacial fine-grained, pre-Olympia non-glacial, pre-Olympia glacial coarse grained, and pre-Olympia glacial till. These geologic units have been overridden by glacial ice and as a result, are over consolidated and generally dense to very dense or very stiff to hard.

Vashon subglacial till, pre-Olympia glacial diamict and pre-Olympia glacial till generally consist of a poorly sorted mix of silt, sand, and gravel that was deposited beneath a glacier. Lawton Clay and pre-Olympia glacial fine-grained deposits generally consist of laminated to massive silt and clayey silt that was deposited in lowland proglacial lakes. Vashon advance outwash and pre-Olympia glacial coarse-grained deposits generally consist of sand and gravel that was deposited in front of an advancing glacier or behind retreating glacier. pre-Olympia non-glacial deposits can consist of silt, clay, sand, or gravel of non-glacial origin that has been overridden by glacial ice.

The geologic map also indicates that a layer of landslide or mass wastage deposits could be present at the ground surface along all slopes within the ravine. Landslide and mass

wastage deposits consist of soil located on steep slopes that has been transported downslope by gravity. These deposits have not been overridden by glacial ice. The density and composition of landslide and mass wastage deposits are highly variable.

The subsurface conditions encountered in our explorations and indicated by the historical exploration logs generally agree with the mapped geology and the geologic history at the site.

4.2 SOIL CONDITIONS

We grouped the soil encountered in the new and historical explorations into the following soil units based on physical and behavioral characteristics:

4.2.1 Soil Unit 1

Soil unit 1 consists of a variable mixture of very soft to stiff silt and clay with variable amounts of sand and gravel. Soil Unit 1 includes fine-grained soil that was deposited fluvially by Taylor Creek (alluvium) and fine-grained native source material that has been reworked by human activity (fill) or natural processes (mass wastage and landslide deposits).

4.2.2 Soil Unit 2

Soil Unit 2 consists of a variable mixture of loose to medium dense silty sand with variable amounts of gravel. Soil Unit 2 includes coarse-grained soil that was deposited fluvially by Taylor Creek (alluvium) and coarse-grained native source material that has been reworked by human activity (fill) or natural processes (mass wastage and landslide deposits).

4.2.3 Soil Unit 3

Soil Unit 3 consists of dense to very dense silty sand with variable amounts of gravel and cobbles. It includes glacially overridden Vashon glacial till, pre-Olympia glacial till and pre-Olympia glacial diamict deposits.

4.2.4 Soil Unit 4

Soil Unit 4 consists of dense to very dense sand with silt and gravel to silty sand with gravel. It includes glacially overridden Vashon advance outwash and pre-Olympia glacial coarse-grained deposits.

4.2.5 Soil Unit 5

Soil Unit 5 consists of stiff to hard silt and clay. It includes glacially overridden Lawton Clay and pre-Olympia glacial fine-grained deposits.

4.2.6 Soil Unit 6

Soil Unit 6 consists of medium stiff to stiff silt and clay or medium dense to dense sand to silty sand. It includes glacially overridden pre-Olympia non-glacial deposits.

4.3 GROUNDWATER CONDITIONS

During drilling, we encountered groundwater between approximately 7 and 20 feet below ground surface in borings B-302, B-304, B-305, B-311, B-312, B-313 and B-314. In general, we interpret the groundwater we encountered as being perched on top of low permeability soil including Soil Units 3, 5 and 6. We anticipate that groundwater level fluctuates throughout the year and is generally highest during the late winter and spring seasons and lowest during the late summer and early fall seasons.

5.0 LIMITATIONS AND ADDITIONAL SERVICES

This report was prepared in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. This report does not include geotechnical engineering recommendations or conclusions based on the data obtained.

This geotechnical data report is intended to provide information to support preliminary engineering activities for this project. The data presented are from observed conditions during subsurface explorations and through laboratory testing of subsurface materials at the specific locations and depths indicated, using the means and methods described in this report. Subsurface conditions, as derived from exploration logs and test results, presented in this report should not be construed as a warranty of the subsurface conditions.

We appreciate the opportunity to be of service.

Sincerely,

SPU GEOTECHNICAL ENGINEERING

Aaron Clark, L.G.
Senior Geologist

Megan Higgins, P.E.
Senior Geotechnical Engineer

6.0 REFERENCES

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Approximate termination of proposed 1,250-foot-long temporary access road option.

LEGEND

- Proposed Temporary Access Road Alignment
- Proposed Temporary Spur Road Alignment
- Lakeridge Park
- Parcels
- Known Slide Location
- Steep Slope (40%)
- Potential Slide Area
- Topographic Contour - 10 Ft

N W E S

NAVD88

100 50 0 100 200
Feet

Taylor Creek Restoration Project
Dead Horse Canyon
Seattle, Washington

Site and ECA Map

Seattle Public Utilities
Geotechnical Engineering

Figure 1
October 2022
Project No. C399315

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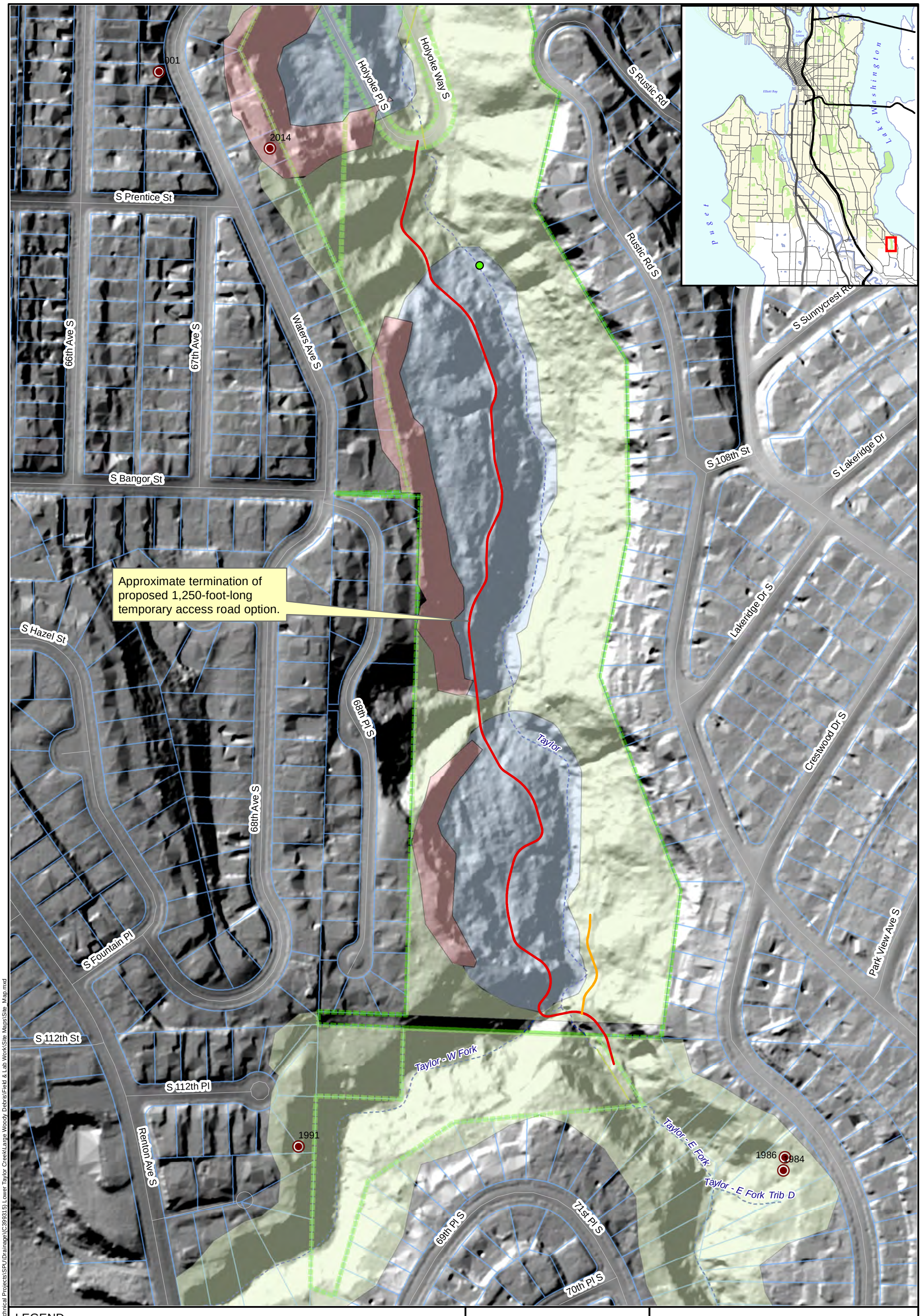

LEGEND

- Proposed Temporary Access Road Alignment
- Proposed Temporary Spur Road Alignment
- Known Slide Location
- Denuded Slopes
- Headscarp
- Landslide Deposits
- Lakeridge Park
- Parcels

N W E S NAVD88

100 50 0 100 200
Feet

Taylor Creek Restoration Project
Dead Horse Canyon
Seattle, Washington

Site and Landslide Map

Seattle Public Utilities
Geotechnical Engineering

Figure 2
October 2022
Project No. C399315

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Approximate termination of proposed 1,250-foot-long temporary access road option.

B-5
B-314
B-313
B-312
B-311
B-310
B-309
B-308A
B-308B
B-307
B-4
B-3
B-306
B-2
HA-102
HA-101
B-101 (5/31/2017)
B-101 (9/25/2014)
B-102
B-103
B-315
B-305
B-304
B-303
B-302
B-1
B-301

Holyoke Pl S
S Prentice St
67th Ave S
Waters Ave S
S Bangor St
S Sunnycrest
S 108th St
Lakeridge Dr S
68th Pl S
68th Ave S
S Fountain Pl
66th Ave S
S 112th Pl
Renton Ave S
Crestwood Dr S

Qpogt
Qva
Qpogd
Qpogf
Qvr
Qpogc
Qvt
Qvlc
Qpon
Qal

Taylor
Taylor - W Fork
Taylor - E Fork

Lake Washington
Puget
Lake Union
Elliott Bay

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LEGEND

- Boring Completed for Current Study
- Historical Boring by SPU
- Historical Hand Auger by SPU
- Historical Boring by Others
- Proposed Temporary Access Road Alignment
- Proposed Temporary Spur Road Alignment
- Topographic Contour - 10 Ft
- Lakeridge Park
- Parcels
- Landslide Deposits

- Qal *Alluvium*
- Qpogc *Pre-Olympia course-grained glacial deposits*
- Qpogd *Pre-Olympia glacial diamict*
- Qpogf *Pre-Olympia fine-grained glacial deposits*
- Qpogt *Pre-Olympia glacial till*
- Qpon *Pre-Olympia nonglacial deposits*
- Qva *Vashon advance outwash deposits*
- Qvlc *Lawton Clay member of the Vashon Drift*
- Qvr *Vashon recessional outwash deposits*
- Qvt *Vashon subglacial till*

N W E S NAVD88

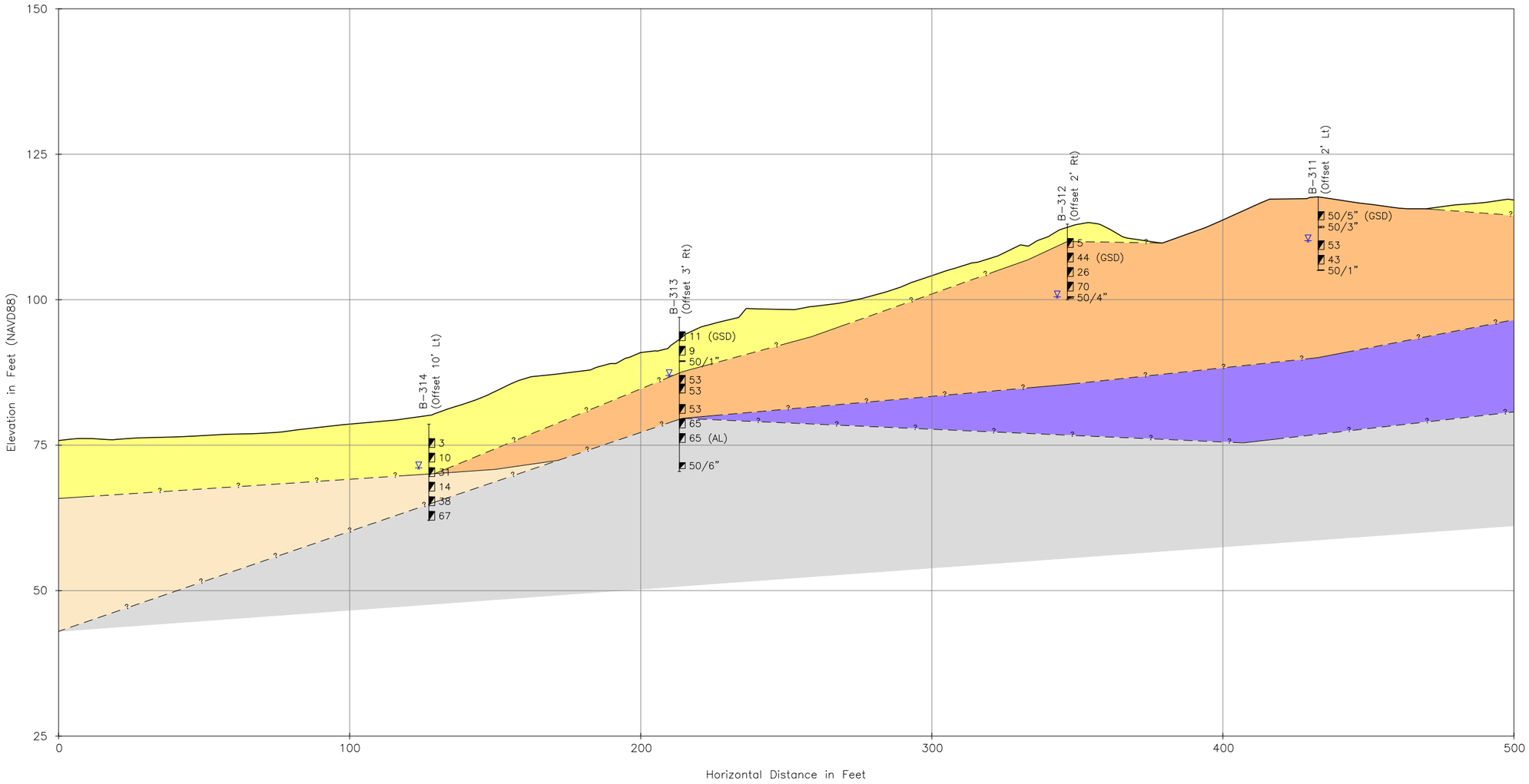
80 40 0 80 160
Feet

Taylor Creek Restoration Project
Dead Horse Canyon
Seattle, Washington

Site, Geology, and Exploration Map

Seattle Public Utilities
Geotechnical Engineering

Figure 3
October 2022
Project No. C399315



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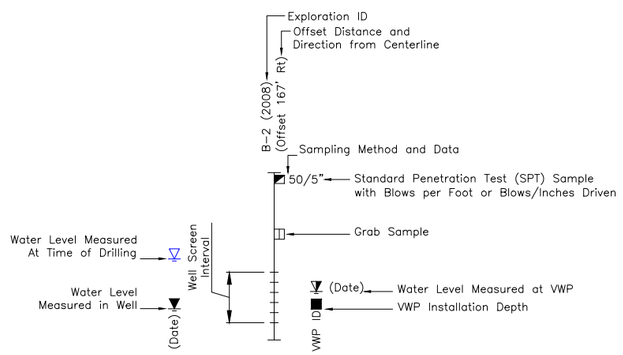

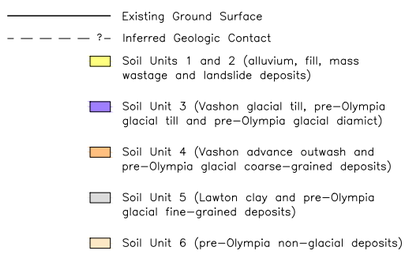

Taylor Creek Restoration
Dead Horse Canyon
Seattle, Washington

Generalized Subsurface Profile Along Access Road Centerline

Seattle Public Utilities
Geotechnical Engineering

Figure 4 (Sheet 1 of 5)
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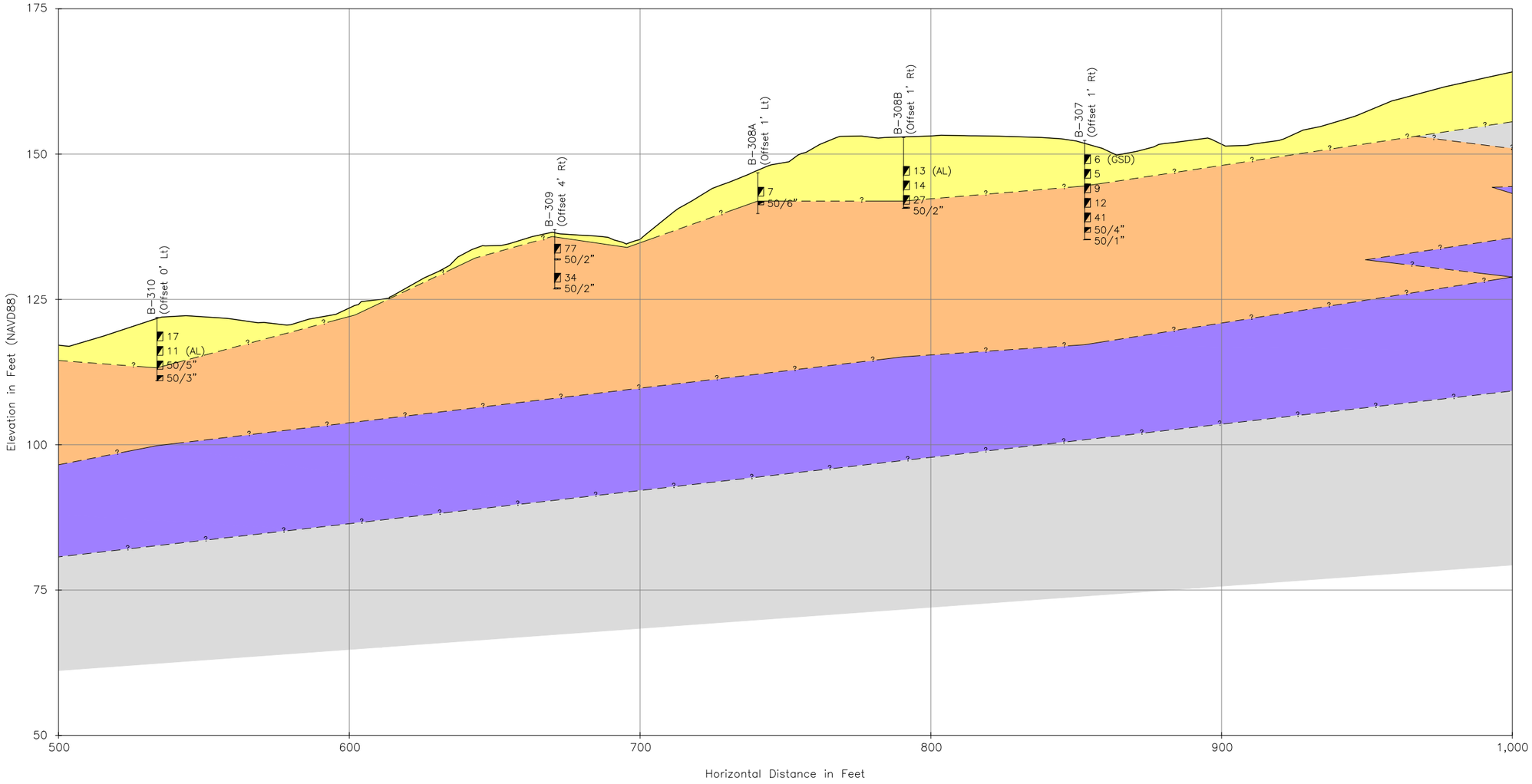

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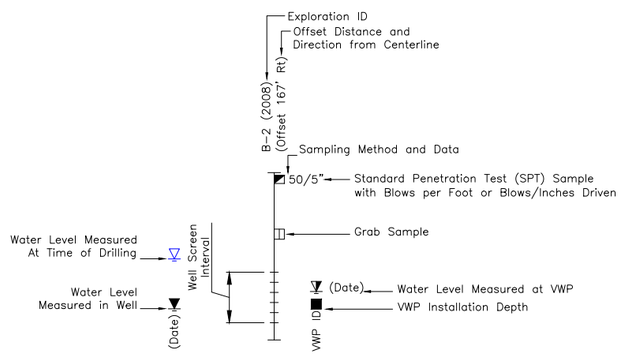

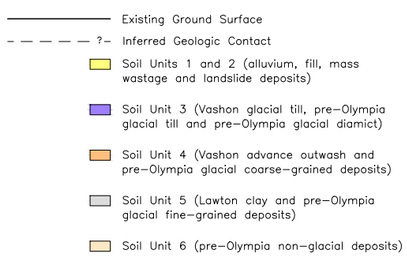

Taylor Creek Restoration
Dead Horse Canyon
Seattle, Washington

Generalized Subsurface Profile Along Access Road Centerline

Seattle Public Utilities
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Figure 4 (Sheet 2 of 5)
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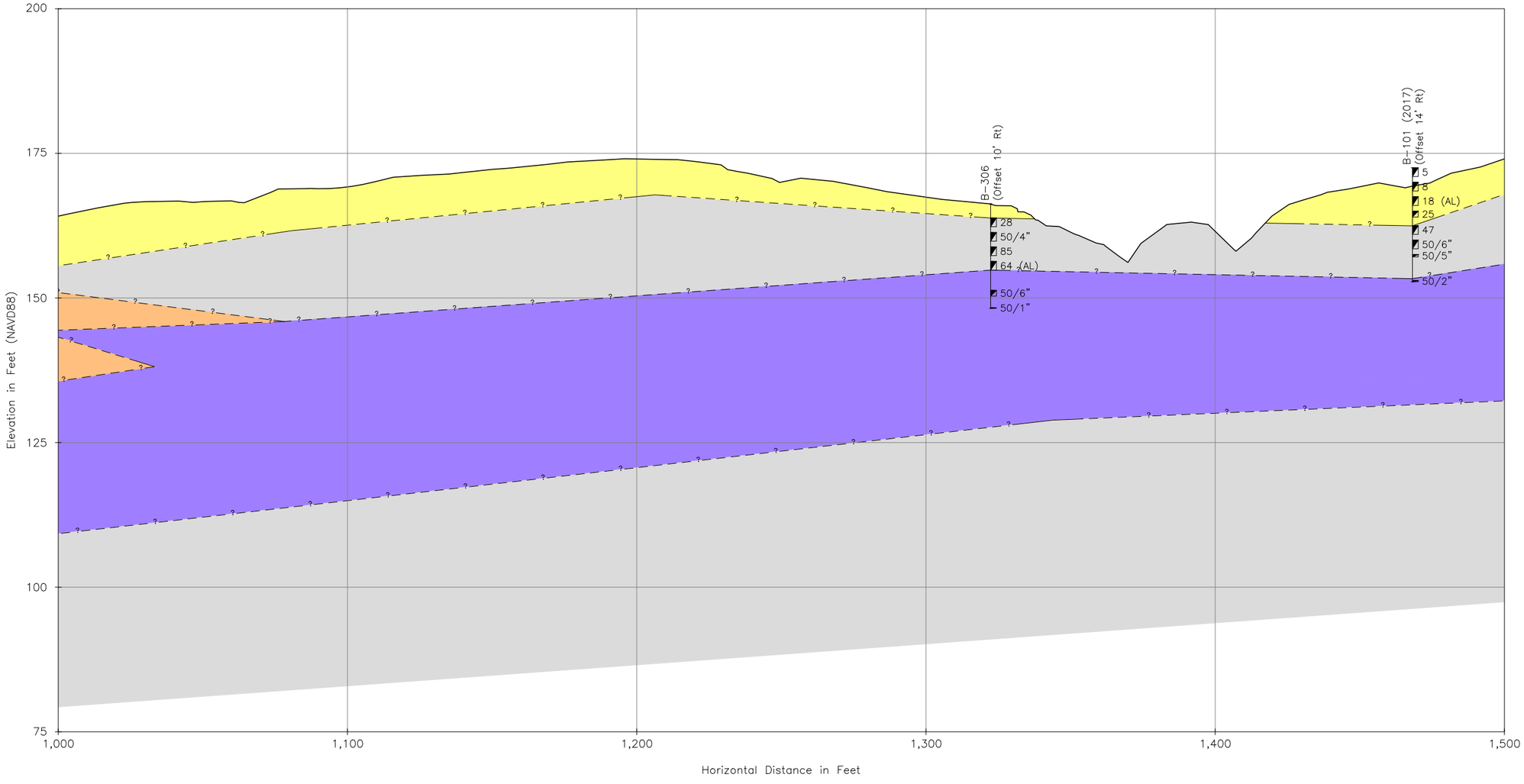
C399315



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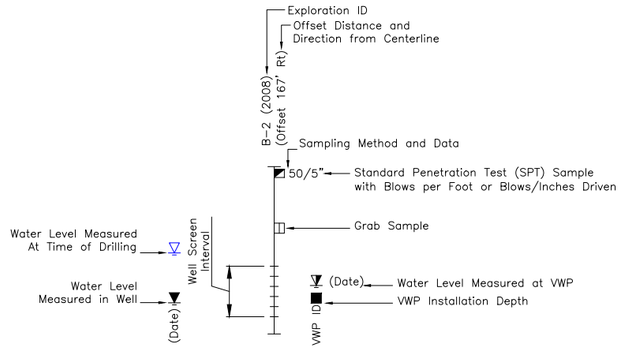

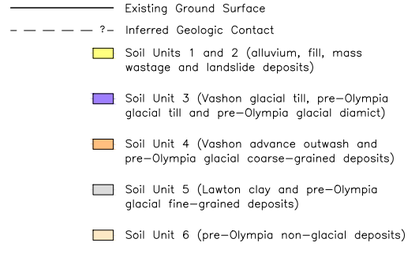

Taylor Creek Restoration
Dead Horse Canyon
Seattle, Washington

Generalized Subsurface Profile Along Access Road Centerline

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Figure 4 (Sheet 3 of 5)
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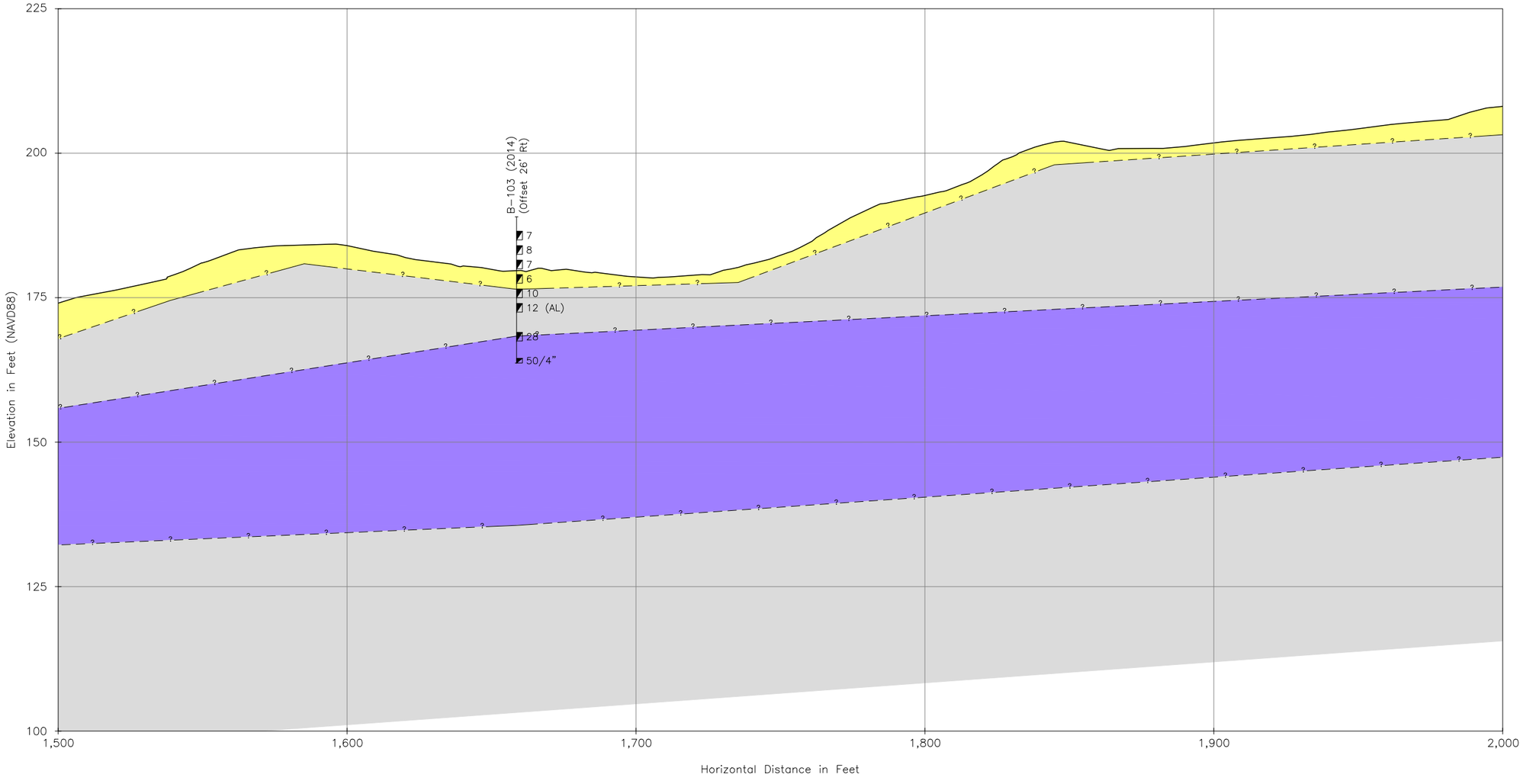

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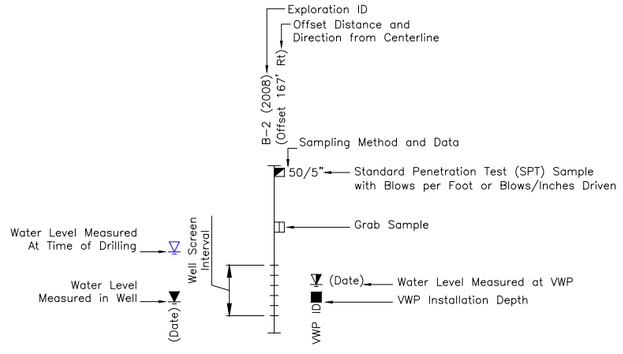

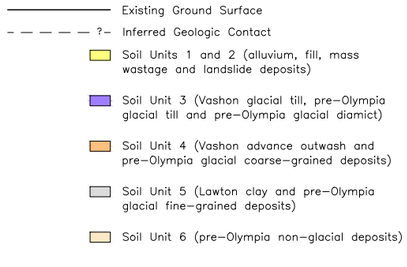

Taylor Creek Restoration
Dead Horse Canyon
Seattle, Washington

Generalized Subsurface Profile Along Access Road Centerline

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Figure 4 (Sheet 4 of 5)
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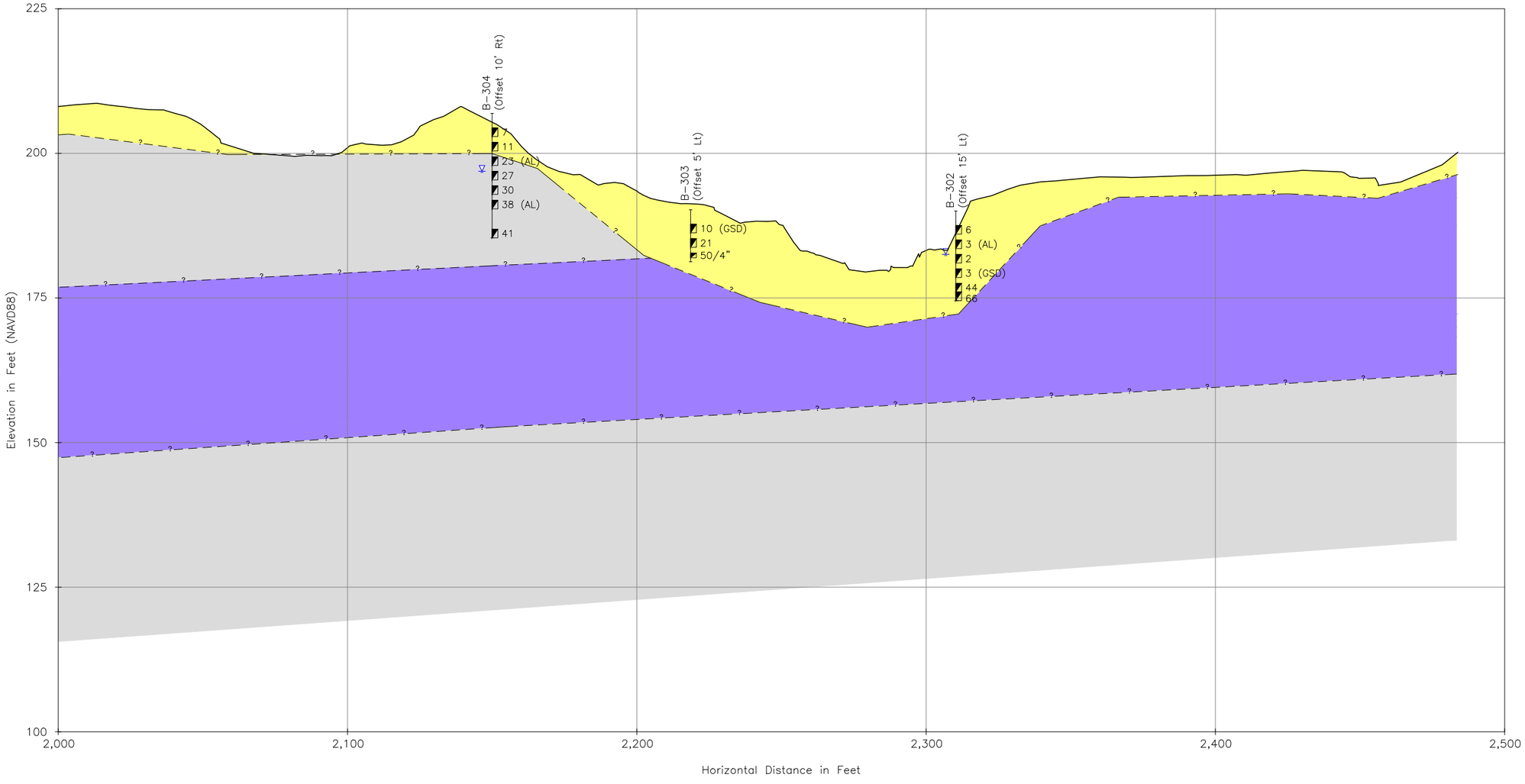

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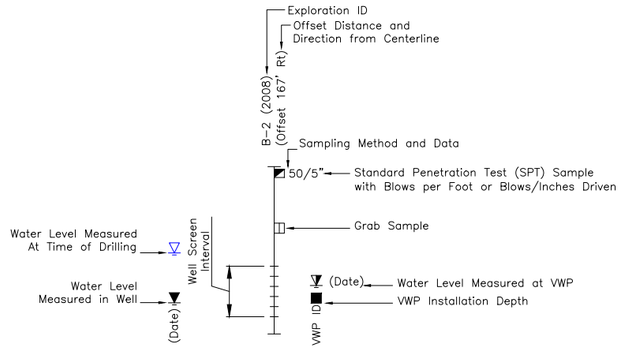

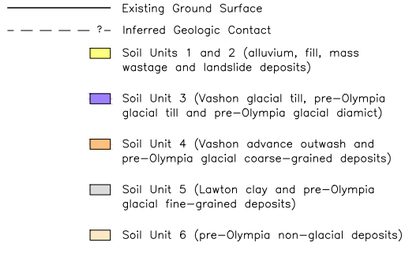

Taylor Creek Restoration
Dead Horse Canyon
Seattle, Washington

Generalized Subsurface Profile Along Access Road Centerline

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Figure 4 (Sheet 5 of 5)
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APPENDIX A

FIELD EXPLORATION PROGRAM

APPENDIX A

FIELD EXPLORATION PROGRAM

GEOTECHNICAL SOIL BORINGS

Subsurface conditions for the current study were explored using hollow stem auger (HSA) drilling techniques. 16 borings, B-301 through B-307, B-308A, B-308B, and B-309 through B-315, were completed to depths ranging from 7 to 26.5 feet between April 13 and April 21, 2021. The approximate location of the explorations is shown on Figure 1 in the main body of the text. The explorations were located relative to prominent features in the area. The approximate ground surface elevations at the exploration locations are referenced to the NAVD88 datum.

All borings were drilled by Geologic Drill Partners. Borings B-301 through B-305 were drilled using a hand carried Acker drill rig with a 2¼-inch inner diameter (ID) HSA. Borings B-306 through B-315 were drilled using an MT-55 tracked drill rig with 4¼-inch ID HSA. The results of the explorations are summarized on the individual summary boring logs, which are included here as Figures A-2 through A-17. A key to the symbols and terms used on the summary logs is presented as Figure A-1.

Soil samples were obtained from all borings at 2.5-foot and 5-foot depth intervals using the Standard Penetration Test (SPT, ASTM D-1586). The 2.0-inch outside diameter (OD) SPT sampler was driven into the soil a distance of 18 inches using a 140-pound drive automatic trip hammer or cathead falling a distance of 30 inches. Recorded blows for each 6 inches of sampler penetration (blow counts) are shown on the summary logs in this appendix. The blow counts provide a qualitative measure of the relative density of cohesionless soil, or the relative consistency of fine-grained soils. Representative portions of all recovered samples were placed in sealed containers and transported to our laboratory for further observation and testing.

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488

MAJOR DIVISION			GROUP SYMBOL	LETTER SYMBOL	GROUP NAME
COARSE GRAINED SOILS CONTAINS LESS THAN 50% FINES	**GRAVEL AND GRAVELLY SOILS** MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVEL WITH ≤ 5% FINES		GW	Well-graded GRAVEL
				GW	Well-graded GRAVEL WITH SAND
				GP	Poorly graded GRAVEL
				GP	Poorly graded GRAVEL WITH SAND
		GRAVEL WITH BETWEEN 5% AND 15% FINES		GW-GM	Well-graded GRAVEL WITH SILT
				GW-GC	Well-graded GRAVEL WITH CLAY
				GP-GM	Poorly graded GRAVEL WITH SILT
				GP-GC	Poorly graded GRAVEL WITH CLAY
		GRAVEL WITH ≥ 15% FINES		GM	SILTY GRAVEL
				GC	CLAYEY GRAVEL
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH ≤ 5% FINES		SW	Well-graded SAND
				SW	Well-graded SAND WITH GRAVEL
				SP	Poorly graded SAND
				SP	Poorly graded SAND WITH GRAVEL
		SAND WITH BETWEEN 5% AND 15% FINES		SW-SM	Well-graded SAND WITH SILT
				SW-SC	Well-graded SAND WITH CLAY
				SP-SM	Poorly graded SAND WITH SILT
				SP-SC	Poorly graded SAND WITH CLAY
		SAND WITH ≥ 15% FINES		SM	SILTY SAND
				SC	CLAYEY SAND
FINE GRAINED SOILS CONTAINS MORE THAN 50% FINES	**SILT AND CLAY**	LIQUID LIMIT LESS THAN 50		ML	Inorganic SILT, low plasticity
				ML	Inorganic SILT WITH SAND, low plasticity
				CL	Lean inorganic CLAY, low plasticity
				CL	Lean inorganic CLAY WITH SAND, low plasticity
				OL	ORGANIC SILT, low plasticity
		LIQUID LIMIT GREATER THAN 50		MH	Elastic inorganic SILT, moderate to high plasticity
				CH	Fat inorganic CLAY, moderate to high plasticity
				OH	ORGANIC SILT or CLAY, moderate to high plasticity
HIGHLY ORGANIC SOILS				PT	PEAT soils with high organic contents
TOPSOIL				TP	TOPSOIL

NOTES:

1. Sample descriptions are based on visual field and laboratory observations using classification methods of ASTM D2488. Where laboratory data are available, classifications are in accordance with ASTM D2487.
2. Solid lines between soil descriptions indicate change in interpreted geologic unit. Dashed lines indicate stratigraphic change within the unit.
3. Fines are material passing the U.S. std. #200 sieve.

SOIL CLASSIFICATION AND EXPLORATION LOG KEY

Seattle Public Utilities
Geotechnical Engineering

FIGURE A-1
(Sheet 1 of 2)

SAMPLING METHOD

- 2" OD SPT Split Spoon Sample with 140 lb hammer falling 30" (ASTM D1587)
- No Recovery
- Shelby Tube Sample (ASTM D1587)
- 3" OD Split Spoon Sample with 300 lb hammer falling 30"
- Grab Sample
- Non Standard (As noted on log)
- Core Run

LABORATORY TESTS

AL	Atterberg Limits
FC	Fines Content
GSD	Grain Size Distribution
ENV	Environmental Testing
SG	Specific Gravity
MD	Moisture Density Relationship
C	Consolidation
UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
UCS	Unconfined Compression Strength
PERM	Hydraulic Conductivity Test
PP	Pocket Penetrometer
TV	Torvane
DS	Direct Shear
ORG	Organic Content
PID	Photoionization Detector Reading

COMPONENT DEFINITIONS

Boulders	Larger than 12 in.
Cobbles	3 in. to 12 in.
Gravel	3 in. to No. 4 (4.75 mm)
Coarse Gravel	3 in. to 3/4 in.
Fine Gravel	3/4 in. to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

RELATIVE DENSITY OF COARSE-GRAINED COHESIONLESS SOILS

Relative Density	N (blows/ft)	Approximate Relative Density (lb/ft³)	1/2" Dia. Metal Probe Penetration Depth (ft)
Very Loose	0 to 4	0 - 15	> 3
Loose	4 to 10	15 - 35	1 - 3
Medium Dense	10 to 30	35 - 65	0.3 - 1
Dense	30 to 50	65 - 85	0.1 - 0.3
Very Dense	over 50	85 - 100	< 0.1

RELATIVE CONSISTENCY OF FINE-GRAINED COHESIVE SOILS

Relative Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)	1/2" Dia. Metal Probe Penetration Depth (ft)
Very Soft	0 to 2	< 250	> 2
Soft	2 to 4	250 - 500	1 - 2
Medium Stiff	4 to 8	500 - 1000	0.5 - 1
Stiff	8 to 15	1000 - 2000	0.25 - 0.5
Very Stiff	15 to 30	2000 - 4000	0.1 - 0.25
Hard	over 30	> 4000	< 0.1

COMPONENT PROPORTIONS

Trace	Less than 5%
Few	5 - 15%
Some	15 - 30%

MOISTURE CONTENT

Dry	Dusty, or dry to the touch.
Moist	No visible water. Near optimum moisture content.
Wet	Visible free water.
Saturated	Water content prevents soil from retaining structure.

ORGANIC CONTENT

TERM	PERCENT BY VOLUME
Occasional	0 to 1
Scattered	1 to 10
Numerous	10 to 30
Organic	30 to 50
PEAT	50 to 100

SEEPAGE

Slow	A small amount of water is observed flowing from the sides of the excavation.
Moderate	Water collects in the bottom of the excavation during digging. Some bailing is needed to observe the excavation bottom.
Rapid	Water collects in the bottom of the excavation during digging. Bailing may be ineffective to observe the excavation bottom.

CAVING

Slight	Soil sloughed from wall of excavation is < 6" thick.
Moderate	Soil sloughed from wall of excavation is between 6" - 12" thick.
Significant	Soil sloughed from wall of excavation is >12" thick.

DILATANCY

Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

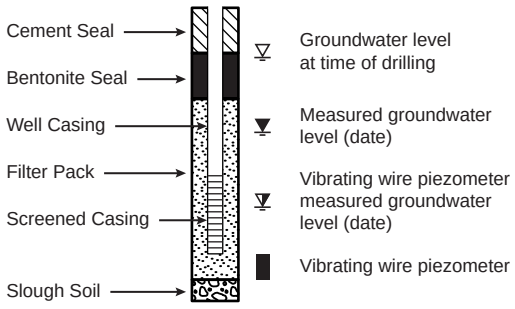
STRUCTURE

TERM	THICKNESS OR SPACING
Parting	0 - 1/16" thick
Seam	1/16 - 1/2" thick
Layer	1/2 - 12" thick
Pocket	Inclusions < 1" thick
Occasional	< 1 occurrence per foot
Scattered	1 > 10 occurrence per foot
Numerous	> 10 occurrence per foot

TERM	CRITERIA / DESCRIPTION
Laminated	Alternating layers (< 1/2") of varying material or color
Interbedded	Alternating layers (> 1/2") of varying material or color
Fractured	Breaks easily along definite fracture planes
Slickensided	Polished, glossy, striated fracture planes
Blocky	Readily breaks into small angular lumps
Lensed	Inclusions of small pockets of different soil
Homogenous	Same color and appearance throughout

TERM	CRITERIA
Near Horizontal	0 - 10 degrees
Low Angle	10 - 45 degrees
High Angle	45 - 80 degrees
Near Vertical	80 - 90 degrees

WELL CONSTRUCTION



ORDER OF CLASSIFICATION TERMS

Density/consistency, color, USCS group name, minor constituent; moisture; additional comments.

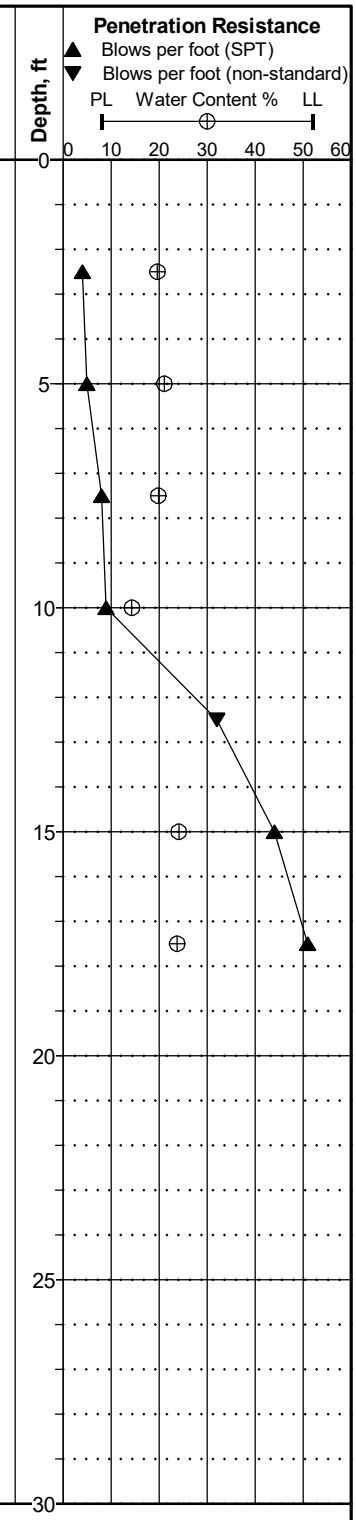
SOIL CLASSIFICATION AND EXPLORATION LOG KEY

Seattle Public Utilities
Geotechnical Engineering

FIGURE A-1
(Sheet 2 of 2)

P:\MatLab\Secure\GEOTECH\FORMS\Office\Boring Log Key

SOIL DESCRIPTION Surface Elevation: 245.77 NAVD88	Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
Soft to medium stiff, dark brown, fine SANDY SILT, few medium sand, trace coarse sand; moist; scattered organics.	0		ML	S-1	2,2,2	33	GSD	
Becomes medium stiff, brown, decreased sand, few gravel.	5			S-2	2,2,3	27		
Medium stiff to stiff, olive-brown, lean Clay, few sand, trace fine gravel; moist; scattered rust staining and black organic pockets.			CL	S-3	2,4,4	53	AL	
	10			S-4	3,4,5	7		
				S-5	12,16,16	0		
Becomes hard, gray, scattered light gray partings.	15			S-6	12,20,24	67		
Numerous light gray partings, scattered fine sand seams, occasional sub-vertical bedding.				S-7	12,22,29	100		
Boring completed at 19 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 17.5 feet bgs.	20							
	25							
	30							



Date Completed: 4/13/2021
Driller: Geologic Drill Partners
Equipment: Acker
Drilling Method: 2-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 3.5 feet west and 4 feet north of survey marker 61012. (N: 186522.1871 E: 1290999.469)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-301

C399315 **FIGURE A-2**

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 190.041 NAVD88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		CL					
			S-1	3,3,3	80		
5			S-2	2,1,2	100	AL	
		ML					
			S-3	1,1,1	100		▽
10		SM					
			S-4	2,2,1	67	GSD	
			S-5	12,28,16	100		
15		SW-SM	S-6	9,24,42	20		
20							
25							
30							

Medium stiff, dark olive-brown, lean CLAY , few sand, trace fine gravel; moist; scattered rust staining, occasional rootlets.

Becomes soft, mottled grayish brown, decreased sand, rust staining throughout, scattered organics.

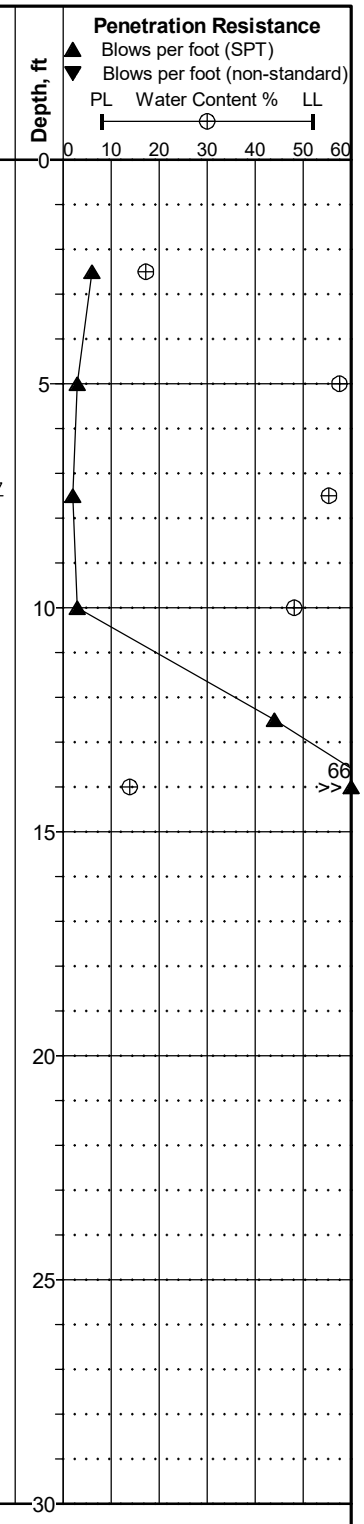
Soft, dark brown, SILT; moist; scattered organics (wood fragments, matter).
With trace sand and fine gravel.

Very loose, gray, fine to medium SAND, trace coarse sand; moist.

Stump encountered between 12.5-14 feet.

Very dense, gray, SAND WITH SILT AND GRAVEL; wet.

Boring completed at 15.5 feet below ground surface (bgs). Groundwater encountered at 7.5 feet bgs at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 12.5 feet due to stump. Total depth achieved by driving consecutive samples.



Date Completed: 4/13/2021
Driller: Geologic Drill Partners
Equipment: Acker
Drilling Method: 2-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 5 feet east of east bridge edge. 1.5 feet south of north bridge abutment. (N: 186739.0937 E: 1291138.994)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-302

C399315

FIGURE A-3

Logged by: AJC Reviewed by: HKH

SOIL DESCRIPTION

Surface Elevation: 190.255 NAVD88

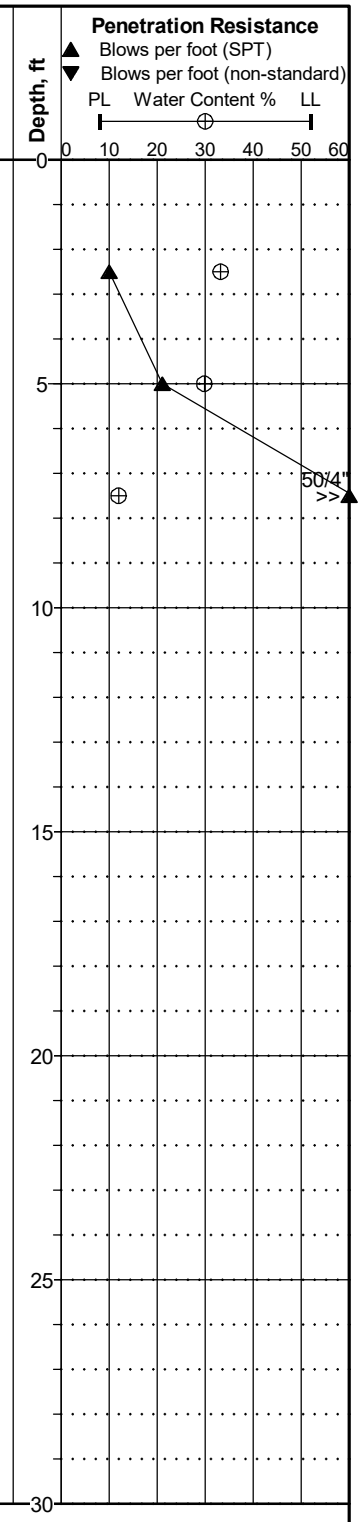
Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		ML	S-1	2,4,6	100	GSD	
5			S-2	3,8,13	67		
		SM	S-3	20,50/4"	100		
10							
15							
20							
25							
30							

Stiff, grayish brown, SILT, few fine sand, trace medium and coarse sand and fine gravel; moist; scattered rust staining.

Few clay.

Medium dense, brown, SILTY fine to medium SAND, few gravel; moist; scattered rust staining.
Becomes very dense, trace coarse sand, silt with trace sand in tip of sampler.

Boring completed at 9 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 7.6 feet due to gravels/cobbles.



Date Completed: 4/14/2021
Driller: Geologic Drill Partners
Equipment: Acker
Drilling Method: 2-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 6.5 feet west and 4 feet north of survey marker 60843. (N: 186739.1768 E: 1291073.407)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-303

C399315 **FIGURE A-4**

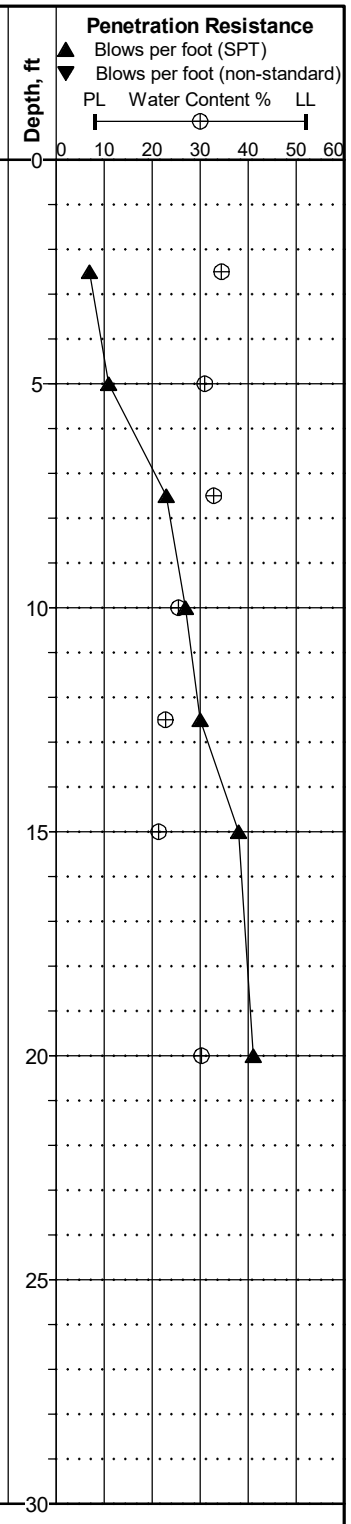
Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 206.91 NAVD88

Depth, ft	Soil Description	USCS	Sample	Blows/6"	Recovery, %	Lab tests	Ground Water
0	Medium stiff, grayish brown, SILT; moist; numerous rust staining.	ML					
			S-1	2,4,3	100		
5	Becomes stiff.		S-2	3,6,5	100		
	Becomes very stiff, olive-brown, few sand, occasional clay partings.		S-3	7,9,14	100	AL	
10	Becomes wet, brownish gray, scattered rust staining, scattered horizontal laminated bedding.		S-4	8,13,14	100		▽
	Very stiff to hard, gray, lean CLAY, trace fine gravel; moist.	CL	S-5	8,13,17	100		
15	Becomes hard, scattered rust staining.		S-6	8,17,21	100	AL	
20	Trace clay and sand, no fine gravel, occasional wet seams.		S-7	14,17,24	100		
25	Boring completed at 21.5 feet below ground surface (bgs). Perched groundwater encountered at 10 feet bgs at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 20 feet bgs.						
30							



Date Completed: 4/14/2021
Driller: Geologic Drill Partners
Equipment: Acker
Drilling Method: 2-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 9 feet south of survey marker 60827. 11.5 feet north of survey marker 60827. In center of trail. (N: 186800.2225 E: 1291084.593)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

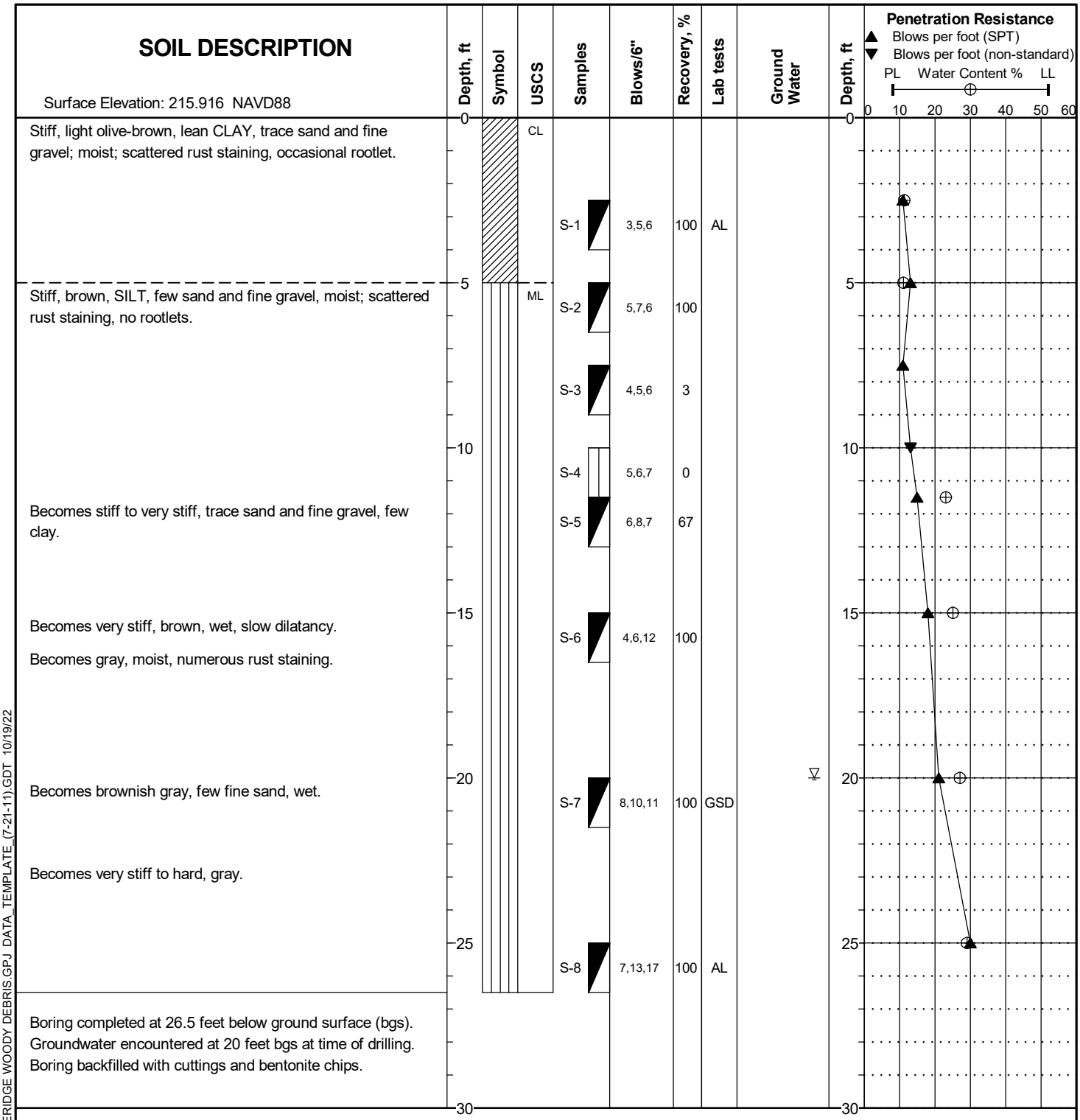
Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-304

C399315 **FIGURE A-5**

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22



Date Completed: 4/14/2021
Driller: Geologic Drill Partners
Equipment: Acker
Drilling Method: 2-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 16.5 feet east of tree 3678. 7 feet west of tree 3677. 26 feet north of tree 3676. (N: 187112.3277 E: 1290914.909)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-305

C399315 **FIGURE A-6**

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 166.318 NAVD88

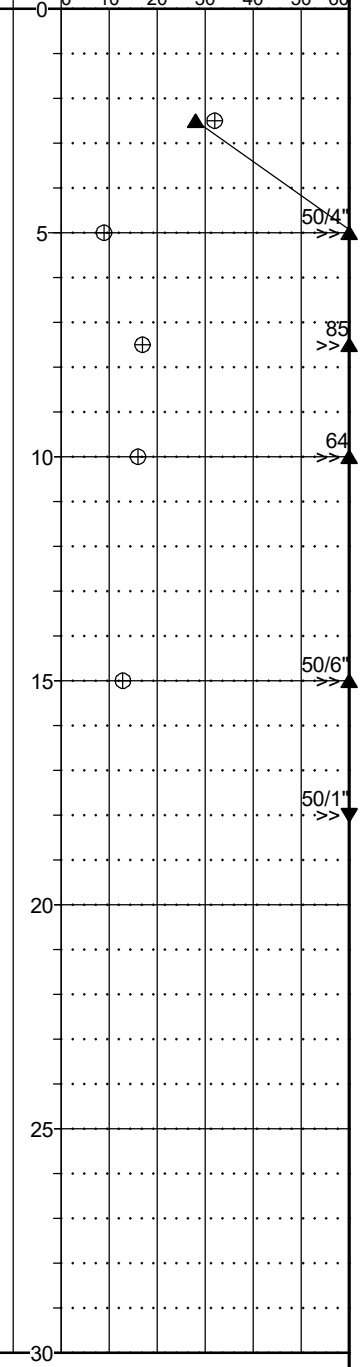
Depth, ft	Soil Description	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0	Stiff, brownish gray, SILT; moist; thinly laminated, numerous, scattered rust staining.		ML					
5	Dense, brown, SILTY fine SAND, trace medium to coarse sand and gravel; moist; scattered rust staining.		SM	S-1	4,6,22	100		
	Becomes very dense, few medium sand and gravel.			S-2	13,28,50/4"	100		
	Becomes gray (at 8 feet), numerous pockets of hard silt, scattered wet seams.			S-3	33,35,50	100		
10	Hard, grayish brown, lean CLAY WITH GRAVEL; moist; numerous fine sand seams.		CL	S-4	25,26,38	100	AL	
15	At 15 feet: decrease gravel, laminated horizontal bedding.							
	Very dense, brown, SILTY fine SAND WITH GRAVEL, few medium sand, trace coarse sand; moist; numerous rust staining.		SM	S-5	14,50/6"	150		
	(Sampler bouncing on on rock).			S-6	50/1"	0		
20	Boring completed at 18.1 feet below ground surface (bgs).Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 18 feet due to gravels/cobbles.							
25								
30								

Penetration Resistance

▲ Blows per foot (SPT)
▼ Blows per foot (non-standard)

PL Water Content % LL

0 10 20 30 40 50 60



Date Completed: 4/19/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 6.0 feet south and 4 feet west of survey marker 60489. (N: 187507.1509 E: 1290908.698)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-306

C399315

FIGURE A-7

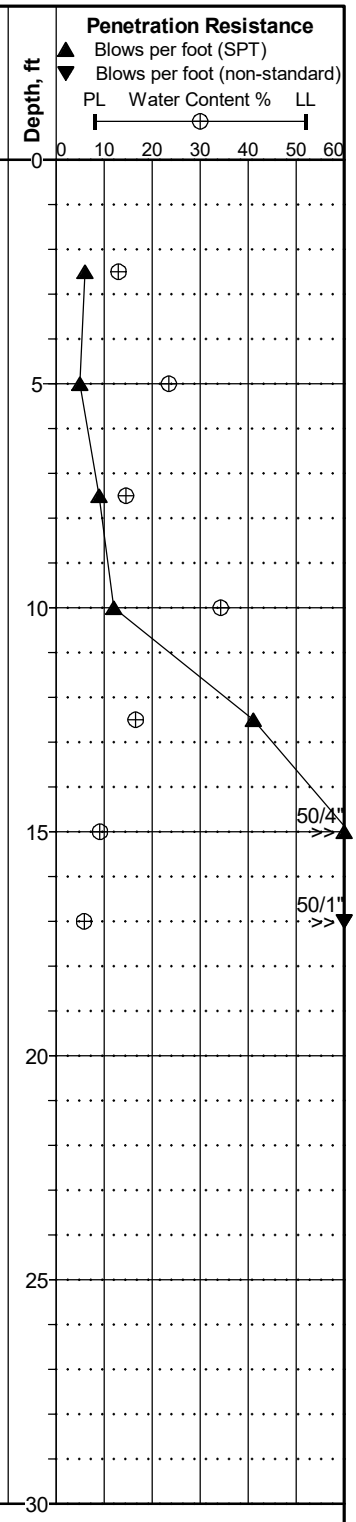
Logged by: AJC Reviewed by: HKH

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 152.353 NAVD88

Depth, ft	Soil Description	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0	Loose, brown mottled gray, SILTY fine to medium SAND WITH GRAVEL, few coarse sand; moist; scattered rust staining.		SM	S-1	4,3,3	67	GSD	
5	Becomes moist to wet, layer of brown mottled gray silt in tip of sampler.			S-2	3,1,4	27		
	Medium stiff, brown mottled gray, SILT, trace clay, few sand and gravel; moist to wet; occasional organics (matter).		ML	S-3	4,4,5	100		
10	Becomes brown, moist, trace sand and gravel.			S-4	3,5,7	100		
	Hard, brown mottled gray, SILT WITH SAND AND GRAVEL; moist to wet; occasional organics. (Drill action indicates increased gravels).		ML	S-5	9,18,23	100		
15	Very dense, brown, SILTY SAND WITH GRAVEL; moist to wet. (Blows may be overstated due to gravels)		SM	S-6	24,50/4"	100		
				S-7	50/1"	0		
20	Boring completed at 17 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 17 feet due to gravels/cobbles.							
25								
30								



Date Completed: 4/19/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 11 feet north and 5 feet east of survey marker 60373. (N: 187960.9151 E: 1290974.128)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-307

C399315

FIGURE A-8

Logged by: AJC Reviewed by: HKH

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

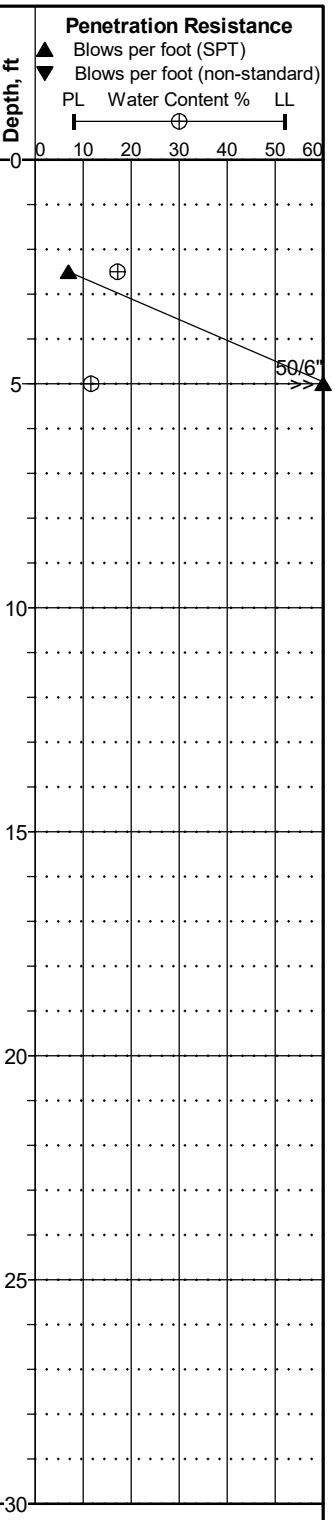
Surface Elevation: 146.773 NAVD88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		ML	S-1	2,3,4	67		
5		SM	S-2	50/6"	20		

Medium stiff, brown, SILT, few fine to medium sand, trace coarse sand and gravel; moist; occasional organics (matter), scattered rust staining.

Very dense, brown, SILTY SAND WITH GRAVEL; moist; occasional organics (matter).
(Drill action indicates increased gravels)

Boring completed at 7 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 7 feet due to gravels/cobbles.



Date Completed: 4/20/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 1.5 feet south and 1 foot east of survey marker 60323. (N: 188072.3592 E: 1290961.294)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-308A

C399315 **FIGURE A-9**

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 152.865 NAVD88

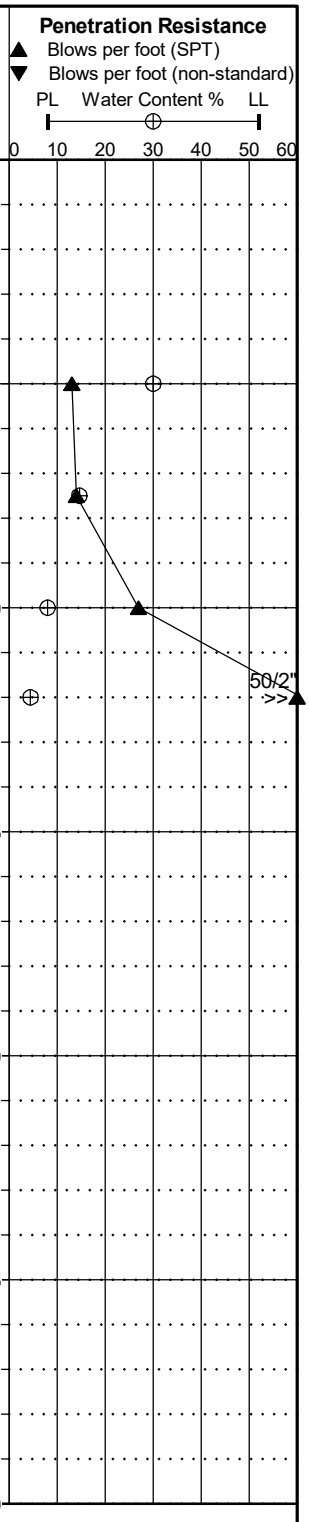
Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		CL					
			S-1	4,5,8	100	AL	
5							
		ML	S-2	7,7,7	100		
10			S-3	5,10,17	100		
		SM	S-4	50/2"	50		
15							
20							
25							
30							

Stiff, olive-brown, lean CLAY, trace sand and fine gravel; moist; scattered rust staining, occasional organics (matter, roots).

Stiff, brown, SILT, few sand and gravel, trace clay; moist; scattered pockets of silty sand, occasional wet pockets.

Medium dense, brown, SILTY SAND WITH GRAVEL; moist; numerous rust staining.
(Drill action indicates increased gravels/cobbles).

Boring completed at 12.2 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 12.2 feet due to gravels/cobbles.



Date Completed: 4/20/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 1 foot east of survey marker 201. (N: 188022.2266 E: 1290963.087)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-308B

C399315 **FIGURE A-10**

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

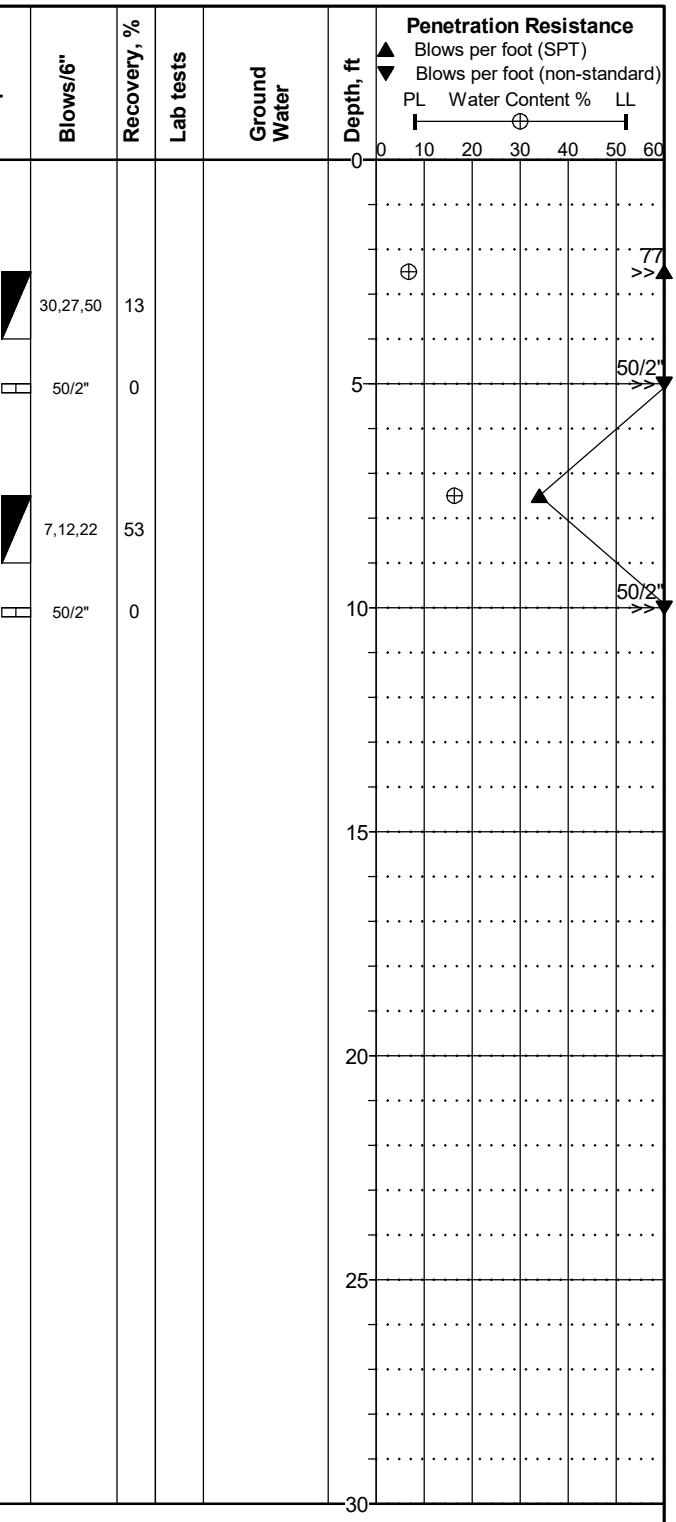
Surface Elevation: 137 NAVD88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		SM					
			S-1	30,27,50	13		
5			S-2	50/2"	0		
			S-3	7,12,22	53		
10			S-4	50/2"	0		
15							
20							
25							
30							

Very dense, brown, SILTY SAND WITH GRAVEL; moist; trace to few cobbles (seen in cuttings).
(Blows may be overstated due to gravels and cobbles).

Becomes dense, brown, numerous pockets of silt.

Boring completed at 10.2 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 10 feet due to gravels/cobbles.



Date Completed: 4/20/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 3.5 feet south and 2.5 feet east of survey marker 60320. (N: 188141.5785 E: 1290962.356)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-309

C399315

FIGURE A-11

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 121.887 NAVD88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		CL					
			S-1	6,8,9	80		
5			S-2	4,6,5	100	AL	
			S-3A S-3B	6,2,50/5"	100		
		SM					
10		SW-SM	S-4	35,50/3"	100		
15							
20							
25							
30							

Very stiff, olive-brown, lean CLAY, trace sand, few gravel; moist; occasional organics (rootlets), scattered rust staining.

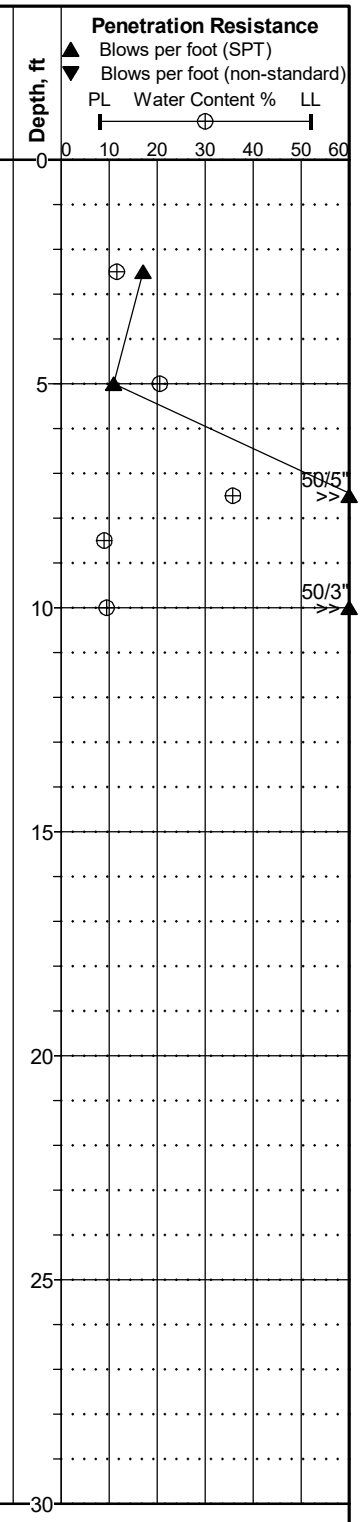
Becomes medium stiff, rust mottled throughout.

At 7 feet: Becomes very stiff, brownish gray, trace organics (matter, rootlets).

Very dense, brown, SILTY SAND WITH GRAVEL; moist.

Very dense, brown, SAND WITH SILT AND GRAVEL; moist to wet; occasional pockets of silty sand, rust mottled throughout.

Boring completed at 10.85 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 10 feet due to gravels/cobbles.



Date Completed: 4/20/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 16 feet south and 3.5 feet east of survey marker 60305. (N: 188271.1168 E: 1290932.917)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-310

C399315

FIGURE A-12

Logged by: AJC Reviewed by: HKH

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 117.629 NAVD88

Very dense, grayish brown, SILTY SAND WITH GRAVEL; moist; scattered pockets of brownish gray silt.

(Drill action indicates numerous gravels. S-1 and S-2 blow counts are likely overstated due to gravels.)

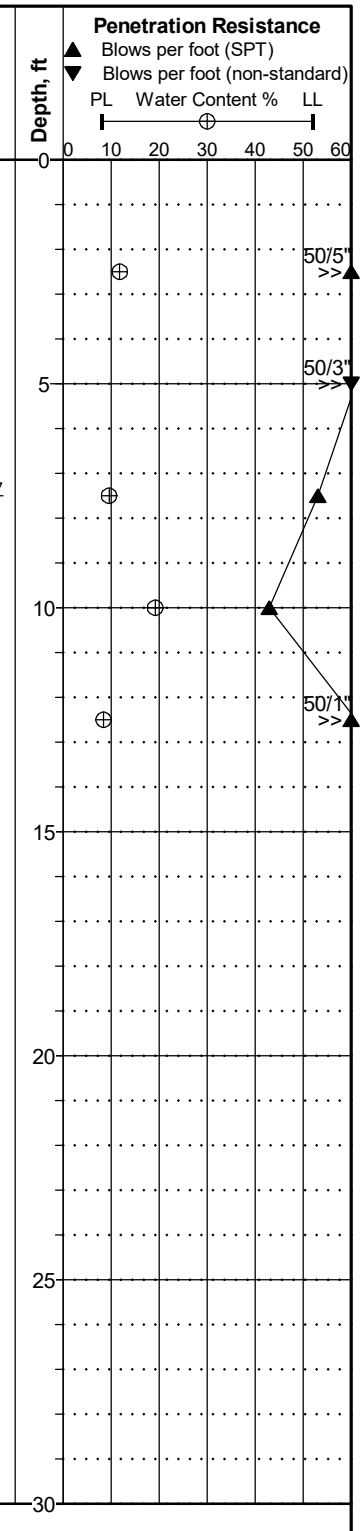
Becomes brown, wet, few coarse sand, increase silt in matrix toward bottom of sample.

Dense, brown, SILTY fine to medium SAND, trace coarse sand and fine gravel; wet.

(Drill action indicates increase gravels. Sample S-5 was driven on gravel/cobble.)

Boring completed at 12.8 feet below ground surface (bgs). Groundwater encountered at 7.5 feet bgs at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 12.5 feet due to gravels/cobbles.

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		SM	S-1	4,11,50/5"	71	GSD	
5			S-2	50/3"	0		
			S-3	19,32,21	100		
10		SM	S-4	12,20,23	100		
			S-5	50/1"	100		
15							
20							
25							
30							



Date Completed: 4/21/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 3.5 feet north and 6.5 feet east of survey marker 201. 19 feet south of survey marker 60262. (N: 188358.6194 E: 1290884.272)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-311

C399315 **FIGURE A-13**

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 113.001 NAVD88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		SM					
			S-1	3,2,3	27		
5			S-2	16,17,27	40	GSD	
			S-3	12,10,16	100		
10			S-4	35,28,42	100		
			S-5	50/4"	100		
15							
20							
25							
30							

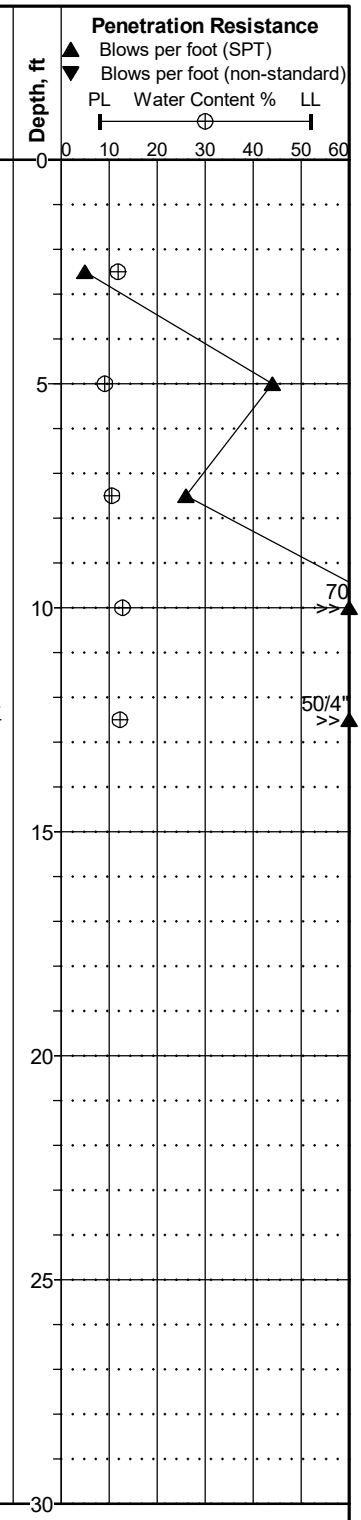
Loose, dark brown, SILTY fine to medium SAND WITH GRAVEL, few coarse sand; moist to wet; scattered organics (roots).

Becomes dense, brown, no roots.

Becomes medium dense, trace coarse sand, occasional fine sand layer (1/2" thick and horizontally bedded), scattered rust staining.
(Drill action indicates increased gravels/cobbles.)

Becomes wet, occasional rust staining.

Boring completed at 13 feet below ground surface (bgs). Groundwater encountered at 12.5 feet bgs at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 13 feet due to gravels/cobbles.



Date Completed: 4/21/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 8 feet south and 3 feet east of survey marker 60248. (N: 188415.95 E: 1290819.558)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-312

C399315

FIGURE A-14

Logged by: AJC Reviewed by: HKH

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 96.973 NAVD88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		GP-GM	S-1	5,6,5	33	GSD	
5		SM	S-2	3,4,5	40		
			S-3	50/1"	100		
10		SW-SM	S-4	19,29,24	100		▽
			S-5	29,29,24	100		
15			S-6	19,21,32	100		
		CL	S-7	22,32,33	100		
20			S-8	20,30,35	100	AL	
25			S-9	30,50/6"	100		
30							

Medium dense, dark brown, GRAVEL WITH fine to medium SAND AND SILT; moist; scattered rust staining.

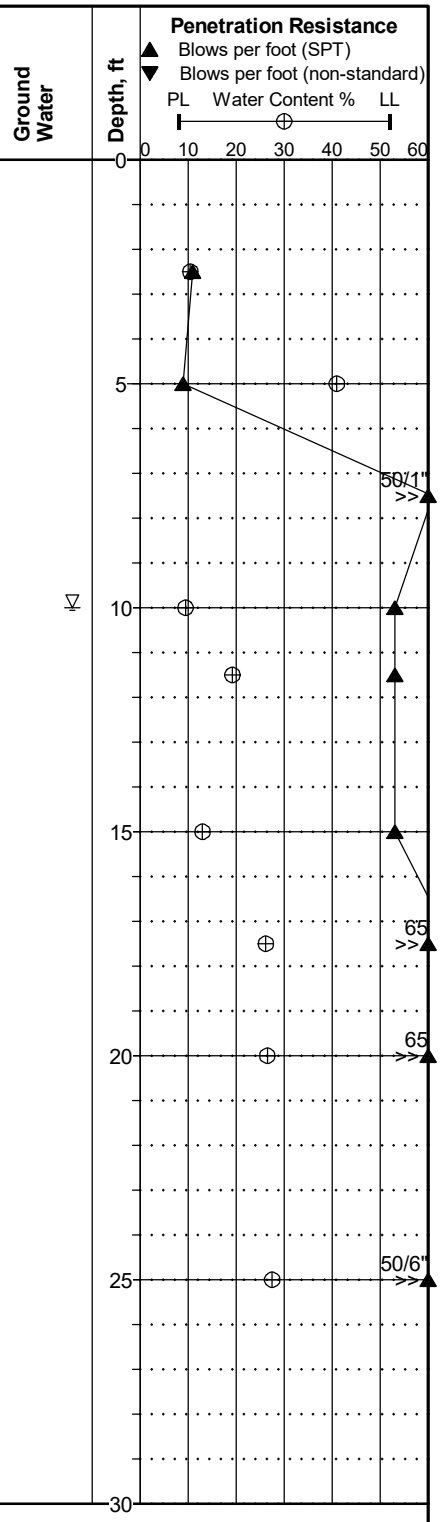
Loose, dark brown, SILTY SAND WITH GRAVEL; moist; scattered rust staining, numerous wood fibers in tip.

Stump encountered between 7 and 9 feet.

Very dense, gray, SAND WITH SILT AND GRAVEL; saturated.

Hard, gray, lean CLAY; moist; numerous dark gray and greenish gray silt pockets, occasional sand seams.

Boring completed at 26.5 feet below ground surface (bgs). Groundwater encountered at 10 feet bgs at time of drilling. Boring backfilled with cuttings and bentonite chips.



Date Completed: 4/21/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 4 feet north and 5.5 feet east of survey marker 60122. (N: 188527.89 E: 1290753.798)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-313

C399315

FIGURE A-15

Logged by: AJC Reviewed by: HKH

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 78.609 NAVD88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		ML					
			S-1	3,1,2	33		
5			S-2	1,6,4	100		
			S-3	11,15,16	67		
10		SW-SM	S-4	12,8,6	80		
			S-5	16,18,20	100		
15		ML	S-6	15,30,37	100		
20							
25							
30							

Soft, brown mottled gray, SILT, few sand and gravel; moist; 1.5 inch layer of dark brown organic silt in tip of sampler.

Becomes stiff, brownish gray, moist to wet, scattered organics (wood, matter).

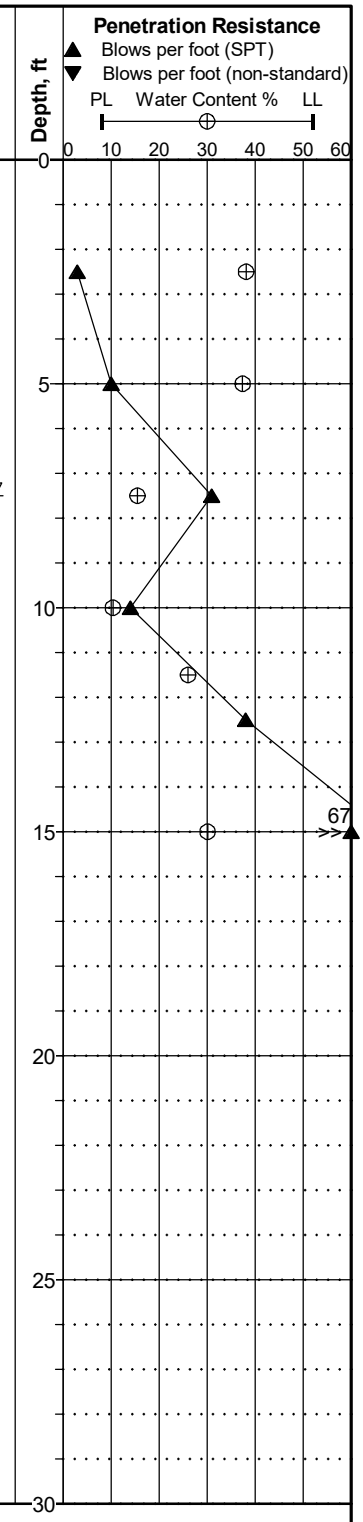
Dense, gray, SAND WITH SILT AND GRAVEL; saturated.

Becomes medium dense.

Occasional fine sand seam.

Hard, gray, SILT; moist; 1 inch layer of gray clay.

Boring completed at 16.5 feet below ground surface (bgs).
Groundwater encountered at 7.5 feet bgs at time of drilling.
Boring backfilled with cuttings and bentonite chips.



Date Completed: 4/16/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 3 feet north and 5.5 feet east of survey marker 60102. (N: 188609.6978 E: 1290775.74)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-314

C399315

FIGURE A-16

Logged by: AJC Reviewed by: HKH

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

SOIL DESCRIPTION

Surface Elevation: 255.038 NAVD88

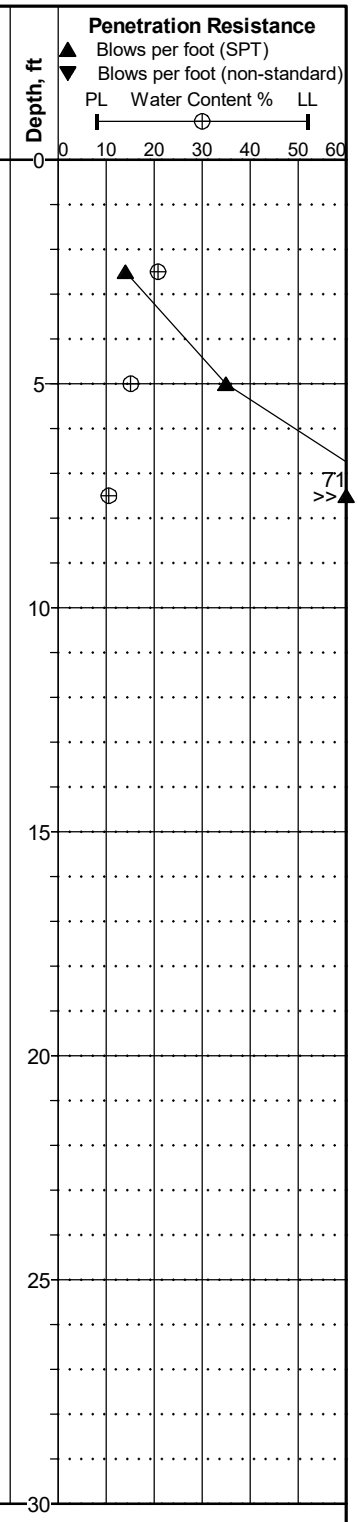
Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		CL					
			S-1	3,6,8	100	AL	
5			S-2	12,15,20	7		
		SM	S-3	21,31,40	100		
10							
15							
20							
25							
30							

Stiff, Olive-brown mottled gray, lean CLAY, few sand, trace fine gravel; moist; scattered rust staining and organics (matter, rootlets).

Becomes hard.

Very dense, brown, SILTY fine to medium SAND, few coarse sand and gravel; moist; scattered rust staining.

Boring completed at 9 feet below ground surface (bgs). Groundwater not encountered at time of drilling. Boring backfilled with cuttings and bentonite chips. Drilling could not advance below 13 feet due to gravels/cobbles.



Date Completed: 4/15/2021
Driller: Geologic Drill Partners
Equipment: MT55 Track Rig
Drilling Method: 4-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: 14 feet north and 12.5 west of survey stake 61228.
(N: 187152.6913 E: 1290782.49)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

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LOG OF BORING B-315

C399315 **FIGURE A-17**

Logged by: AJC Reviewed by: HKH Sheet 1 of 1

LOG OF BORING (2/1/11) LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/19/22

APPENDIX B

GEOTECHNICAL LABORATORY TESTING PROGRAM

APPENDIX B

GEOTECHNICAL LABORATORY TESTING PROGRAM

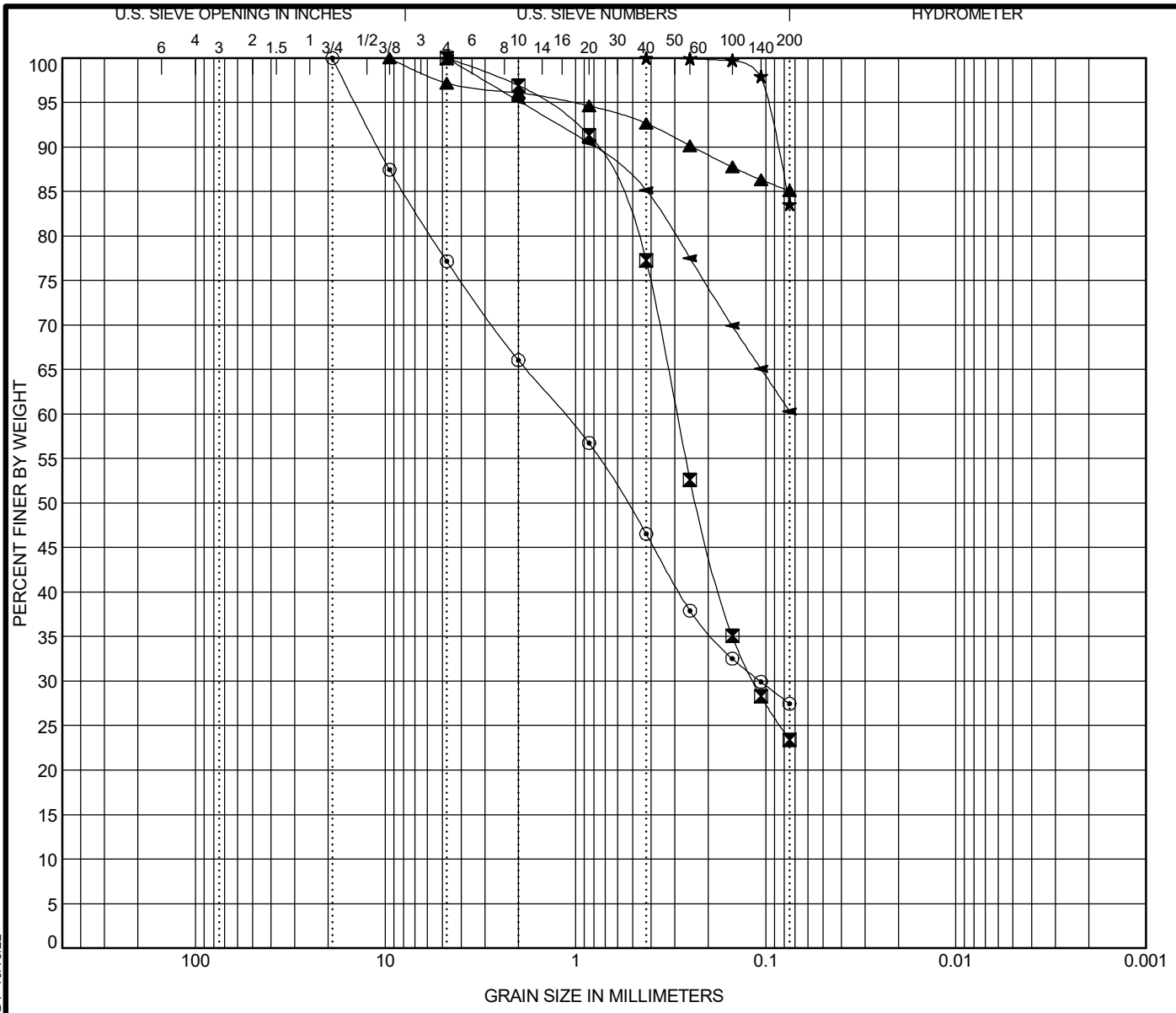
SPU Geotechnical Engineering representatives completed laboratory tests on select soil samples collected during our field investigation. The laboratory tests were completed in general accordance with appropriate ASTM test methods. The test procedures and test results are discussed below. Additional laboratory tests were completed by our consultant, HWA GeoSciences Inc. (HWA). HWA's test procedures and test results are provided in this Appendix after the results of testing completed by SPU Geotechnical Engineering.

Natural Water Content

Natural water content determinations were made on select soil samples in general accordance with ASTM D-2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass. Test results are graphically indicated at the appropriate sample depth on the summary logs in Appendix A.

Grain-size Distribution

The grain-size distribution of select samples was analyzed in general accordance with ASTM D422, Standard Test Method for Particle-Size Analysis of Soils. Results of grain size analyses are plotted on Figures B-1 and B-2 of this appendix. The soil samples tested for grain size distribution are indicated on the summary logs in Appendix A.



	Sample ID	Depth	Classification	LL	PL	PI	Cc	Cu
◄	B-301; S-1	2.5	Dark brown, fine SANDY SILT, few medium sand, trace coarse sand (ML)					
⊠	B-302; S-4	10.0	Gray, fine to medium SAND, trace coarse sand (SM)					
▲	B-303; S-1	2.5	Grayish brown, SILT, few fine sand, trace medium and coarse sand and fine gravel (ML)					
★	B-305; S-7	20.0	Brownish gray, SILT, few fine sand (ML)					
⊙	B-307; S-1	2.5	Brown mottled gray, SILTY fine to medium SAND WITH GRAVEL, few coarse sand (SM)					

	Sample ID	Depth	D90	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
◄	B-301; S-1	2.5	0.8				0.0	39.7	60.3	
⊠	B-302; S-4	10.0	0.8	0.29	0.12		0.0	76.6	23.4	
▲	B-303; S-1	2.5	0.24				2.8	12.1	85.1	
★	B-305; S-7	20.0	0.09				0.0	16.4	83.6	
⊙	B-307; S-1	2.5	10.93	1.15	0.11		22.8	49.7	27.4	

Seattle Public Utilities
Geotechnical Engineering

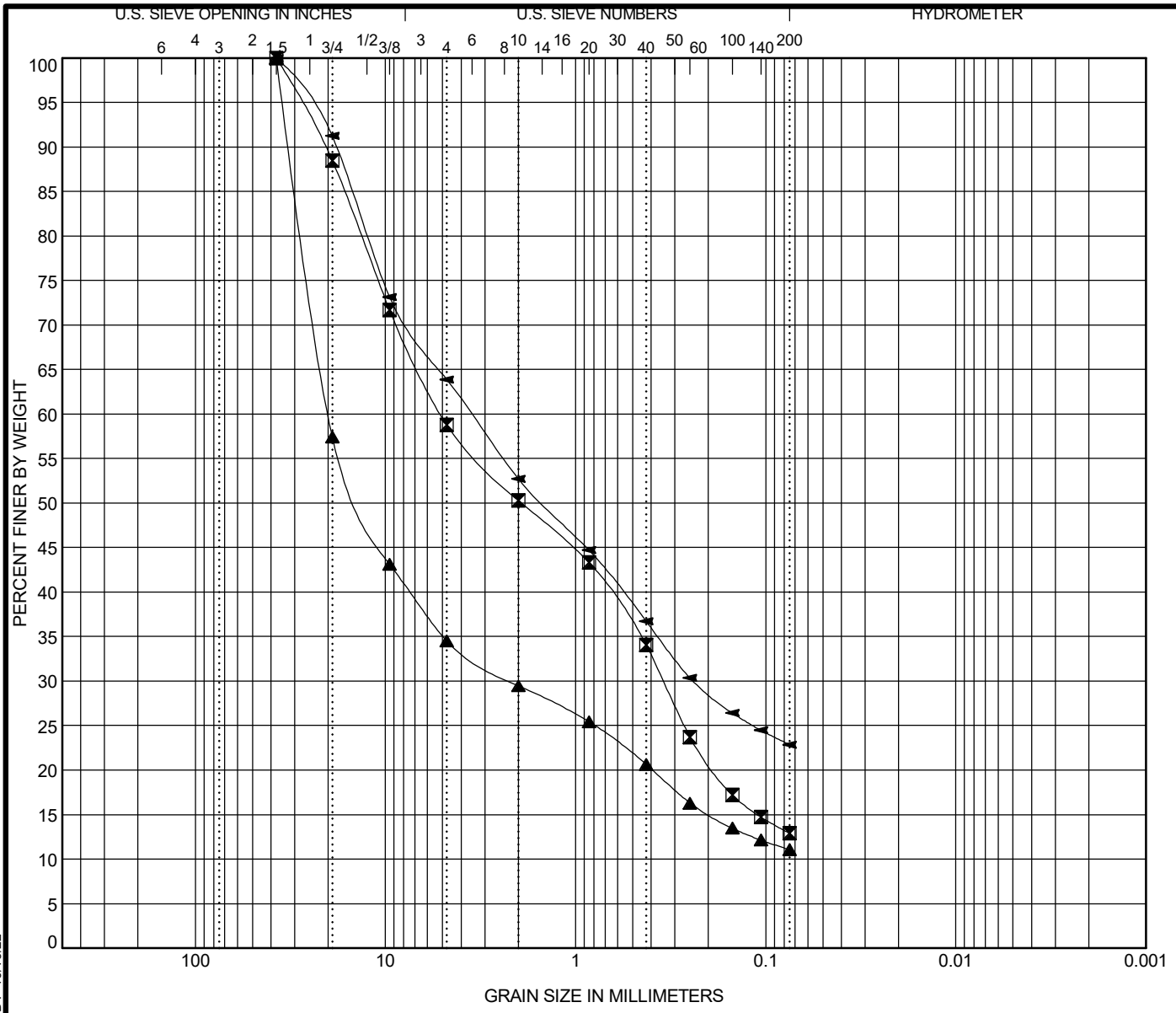
GRAIN SIZE DISTRIBUTION (ASTM D422)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

C399315

FIGURE: B-1

GSD D90 LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA TEMPLATE (7-21-11).GDT 10/19/22



	Sample ID	Depth	Classification	LL	PL	PI	Cc	Cu
◄	B-311; S-1	2.5	Grayish brown, SILTY SAND WITH GRAVEL (SM)					
⊠	B-312; S-2	5.0	Brown, SILTY fine to medium SAND WITH GRAVEL, few coarse sand (SM)					
▲	B-313; S-1	2.5	Dark brown, GRAVEL WITH fine to medium SAND AND SILT (GP-GM)				4.5	369.0

	Sample ID	Depth	D90	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
◄	B-311; S-1	2.5	18.11	3.52	0.24		36.1	41.0	22.9	
⊠	B-312; S-2	5.0	20.76	5.07	0.35		41.2	45.9	12.9	
▲	B-313; S-1	2.5	31.96	19.8	2.2		65.5	23.4	11.0	

Seattle Public Utilities
Geotechnical Engineering

GRAIN SIZE DISTRIBUTION (ASTM D422)

Taylor Creek Restoration: Dead Horse Canyon
Seattle, WA

C399315

FIGURE: B-2

GSD D90 LOWER TAYLOR CRK-LAKERIDGE WOODY DEBRIS.GPJ DATA TEMPLATE (7-21-11).GDT 10/19/22

HWA | GEOSCIENCES INC.
DBE/MWBE

May 27, 2021
HWA Project No. 2019-129-21 T2E

Seattle Public Utilities
700 5th Ave
P.O. Box 34018
Seattle, Washington 98124-4018

Attention: Mr. Aaron Clark, L.G.

Subject: **Materials Laboratory Report**
Atterberg Limits Testing
Lower Taylor Creek – Lakeridge Haul Road
Client Project No.: C399315

Dear Mr. Clark;

In accordance with your request, HWA GeoSciences Inc. (HWA) performed laboratory testing for the above referenced project. Herein we present the results of our laboratory analyses, which are summarized on the attached reports. The laboratory testing program was performed in general accordance with your instructions and appropriate ASTM Standards as outlined below.

SAMPLE DESCRIPTION: The subject samples were delivered to our laboratory on May 19, 2021 by the client. The samples were delivered in re-sealable plastic jars and were designated with exploration ID, sample number, and depth of sampling. The soil samples were classified using visual-manual methods. The descriptions may be found on the attached Summary of Material Properties, Figure 1.

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ATTERBERG LIMITS): The plasticity index of each specified sample was tested using method ASTM D4318, multi-point method. The results are reported on the attached Liquid Limit, Plastic Limit, and Plasticity Index Report, Figures 2 through 3.

CLOSURE: Experience has shown that test values on soil and other natural materials vary with each representative sample. As such, HWA has no knowledge as to the extent and quantity of material the tested samples may represent. HWA also makes no warranty as to how representative either the samples tested or the test results obtained are to actual field conditions. It is a well-established fact that sampling methods present varying degrees of disturbance that affect sample representativeness.

No copy should be made of this report except in its entirety.

We appreciate the opportunity to provide laboratory testing services on this project. Should you have any questions or comments, or if we may be of further service, please call.

HWA GEOSCIENCES INC.

Kristin Nolan
Materials Laboratory Manager

Steven E. Greene, L.G., L.E.G.
Principal Engineering Geologist
Vice President

Attachments:

Figure 1	Summary of Material Properties
Figures 2-3	Liquid Limit, Plastic Limit, and Plasticity Index Report

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%)			% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
						LL	PL	PI					
B-301,S-3	7.5	9.0	21.3			29	18	11				CL	Olive-brown, lean CLAY
B-302,S-2	5.0	6.5	23.8			33	22	11				CL	Dark olive-brown, lean CLAY with organics
B-304,S-3	7.5	9.0	28.4			32	25	7				ML	Olive-brown, sandy SILT
B-304,S-6	15.0	16.5	22.0			35	23	12				CL	Dark gray, lean CLAY
B-305,S-1	2.5	4.0	23.3			35	24	11				CL	Light olive-brown, lean CLAY with sand
B-305,S-8	25.0	26.5	29.2			24	21	3				ML	Gray, sandy SILT
B-306,S-4	10.0	11.5	15.6			32	17	15				CL	Grayish-brown, sandy lean CLAY
B-308B,S-1	5.0	6.5	27.9			49	26	23				CL	Olive-brown, lean CLAY
B-310,S-2	5.0	6.5	16.4			34	19	15				CL	Olive-brown, sandy lean CLAY with gravel
B-313,S-8	20.0	21.5	24.8			40	24	16				CL	Gray, lean CLAY
B-315,S-1	2.5	4.0	19.8			33	19	14				CL	Olive-brown, lean CLAY

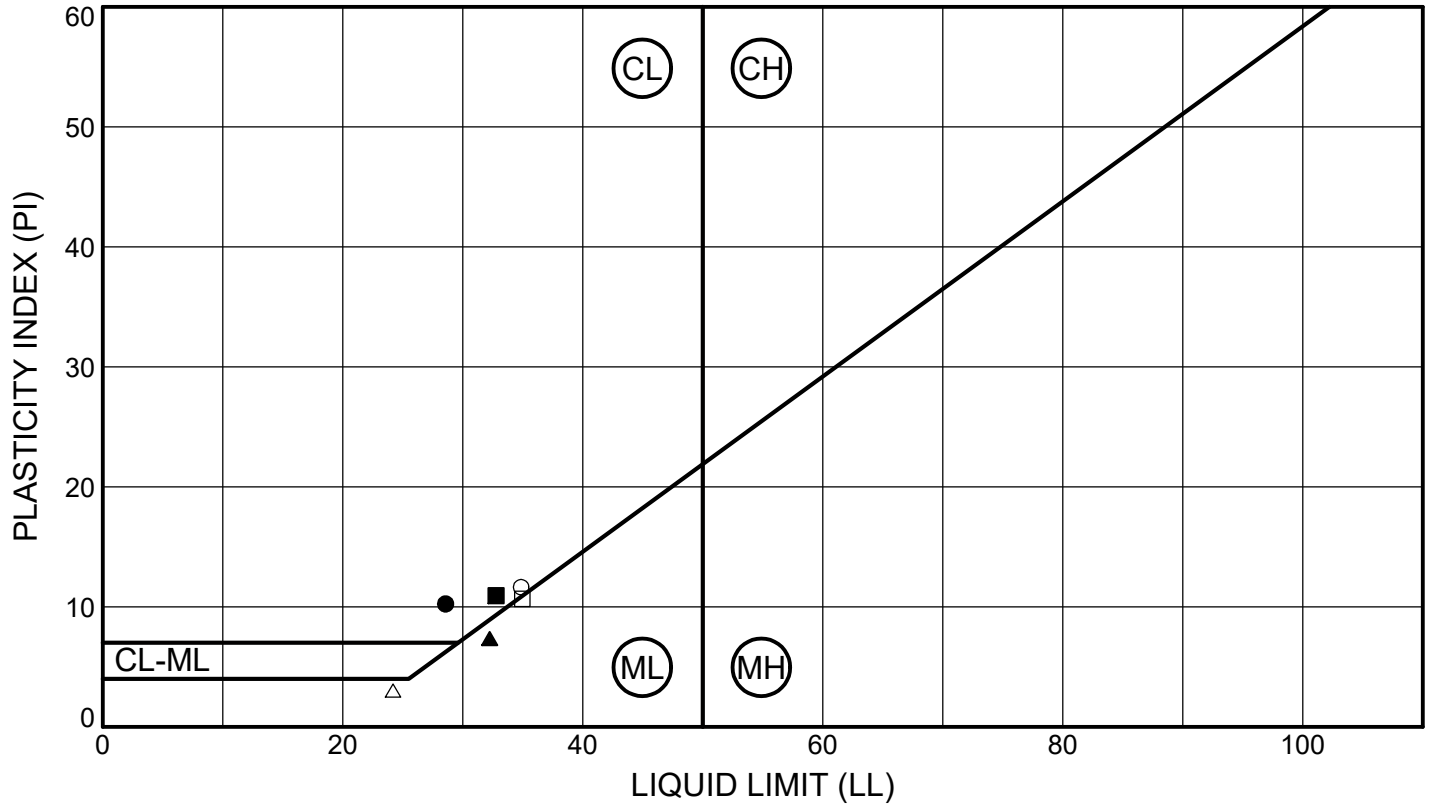
Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

GeoSciences Inc.

Seattle Public Utilities
Lower Taylor Creek - Lake Ridge Haul Road
Client Project No.: C399315

SUMMARY OF MATERIAL PROPERTIES

PROJECT NO.: 2019-129 T02E FIGURE: 1



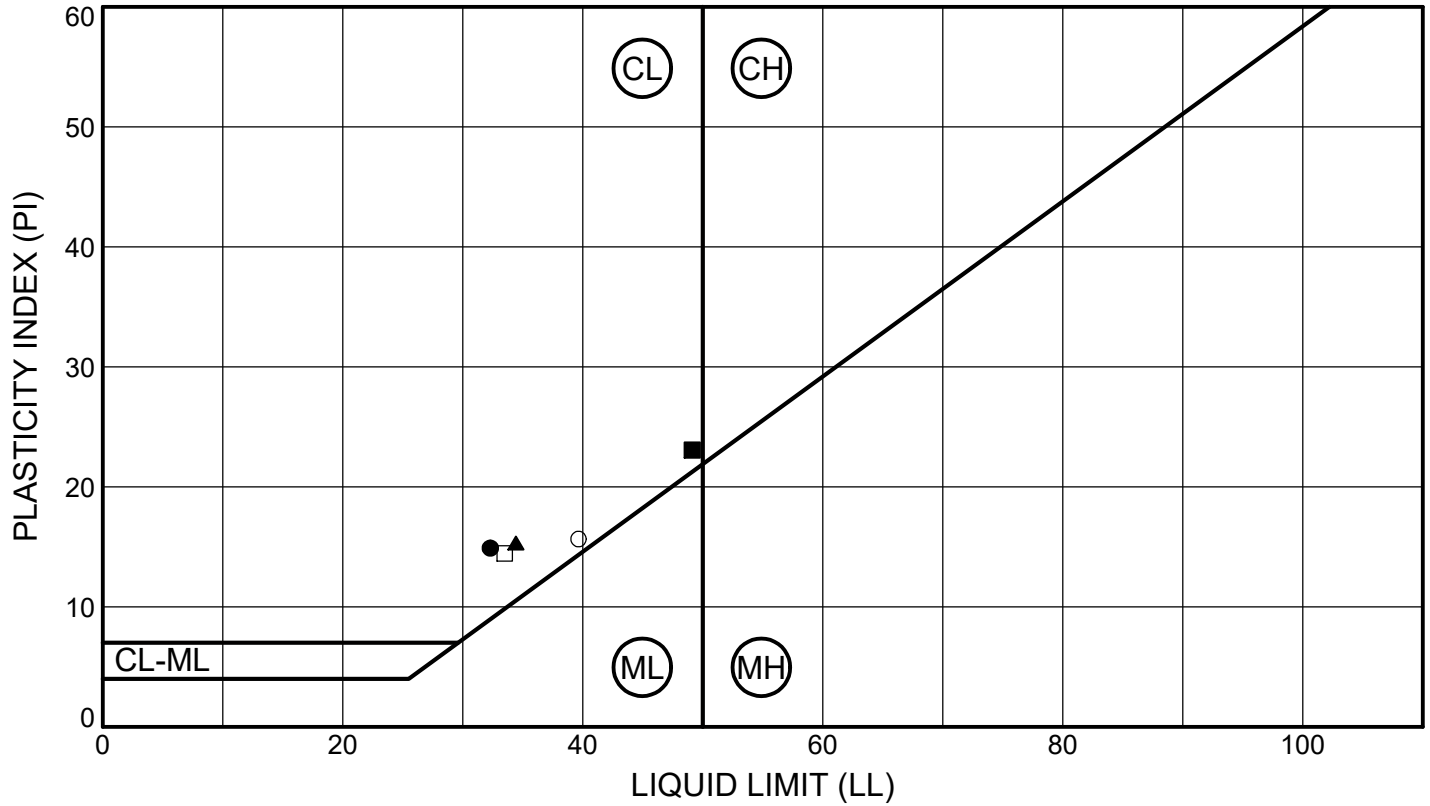
SYMBOL	SAMPLE		DEPTH (ft)	CLASSIFICATION	% MC	LL	PL	PI	% Fines
●	B-301	S-3	7.5 - 9.0	(CL) Olive-brown, lean CLAY	21	29	18	11	
■	B-302	S-2	5.0 - 6.5	(CL) Dark olive-brown, lean CLAY with organics	24	33	22	11	
▲	B-304	S-3	7.5 - 9.0	(ML) Olive-brown, sandy SILT	28	32	25	7	
○	B-304	S-6	15.0 - 16.5	(CL) Dark gray, lean CLAY	22	35	23	12	
□	B-305	S-1	2.5 - 4.0	(CL) Light olive-brown, lean CLAY with sand	23	35	24	11	
△	B-305	S-8	25.0 - 26.5	(ML) Gray, sandy SILT	29	24	21	3	

HWA GeoSciences Inc.

Seattle Public Utilities
Lower Taylor Creek - Lake Ridge Haul Road
Client Project No.: C399315

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS
METHOD ASTM D4318

PROJECT NO.: 2019-129 T02E FIGURE: 2



SYMBOL	SAMPLE		DEPTH (ft)	CLASSIFICATION	% MC	LL	PL	PI	% Fines
●	B-306	S-4	10.0 - 11.5	(CL) Grayish-brown, sandy lean CLAY	16	32	17	15	
■	B-308B	S-1	5.0 - 6.5	(CL) Olive-brown, lean CLAY	28	49	26	23	
▲	B-310	S-2	5.0 - 6.5	(CL) Olive-brown, sandy lean CLAY with gravel	16	34	19	15	
○	B-313	S-8	20.0 - 21.5	(CL) Gray, lean CLAY	25	40	24	16	
□	B-315	S-1	2.5 - 4.0	(CL) Olive-brown, lean CLAY	20	33	19	14	

HWA GeoSciences Inc.

Seattle Public Utilities
Lower Taylor Creek - Lake Ridge Haul Road
Client Project No.: C399315

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS
METHOD ASTM D4318

PROJECT NO.: 2019-129 T02E FIGURE: 3

APPENDIX C

HISTORICAL EXPLORATIONS

APPENDIX C

HISTORICAL EXPLORATIONS

In addition to the explorations and laboratory test results presented in Appendices A and B, respectively, historical explorations completed by others or completed by us for other projects were reviewed to gain an understanding of the subsurface conditions at the site. Figure 1 shows the approximate locations of the historical explorations in the vicinity of the project site.

The following historical exploration logs and laboratory test results were relevant in our analysis, in terms of depth and location, and are presented in this appendix.

- Seattle Public Utilities Geotechnical Engineering
    - Boring B-101, completed May 31, 2017
    - Hand Auger HA-101, completed May 31, 2017
    - Hand Auger HA-102, completed May 31, 2017
    - Atterberg Limits Results
- Seattle Public Utilities Geotechnical Engineering
    - Boring B-101, completed September 25, 2014
    - Boring B-102, completed September 25, 2014
    - Boring B-103, completed September 25, 2014
    - Atterberg Limits Results
- Golder Associates
    - Boring B-1, completed September 21, 1994
    - Boring B-2, completed September 25, 1994
    - Boring B-3, completed September 26, 1994
    - Boring B-4, completion date not reported
    - Boring B-5, completed September 21, 1994
    - Atterberg Limits Results (2 pages)
    - Grain Size Determination Results (4 pages)

These logs and laboratory tests are presented for reference only.

SOIL DESCRIPTION

Surface Elevation (ft): 180 NAVD 88

Surface is topsoil and ferns.

MASS WASTAGE DEPOSITS

Medium stiff, grayish brown, mottled with brown, SILT, trace fine SAND; moist; scattered rust mottling, occasional organics (rootlets).

Becomes medium stiff to stiff, mottled with light brown, pockets moderate plasticity gray clay, blocky; moist to wet.

Very stiff, gray, CLAY, trace fine sand; moist; moderate plasticity, occasional layer dark gray clay, fractured, blocky.

Medium dense, gray, SILTY fine to medium SAND, trace coarse sand and gravel; moist; gravels are subround to angular.

Hard, dark gray mottled with light gray, SILT WITH SAND AND GRAVEL; moist; pockets dark gray clay, slickensided. (Driller notes very difficult drilling at 10 feet below ground surface and added water to facilitate drilling.)

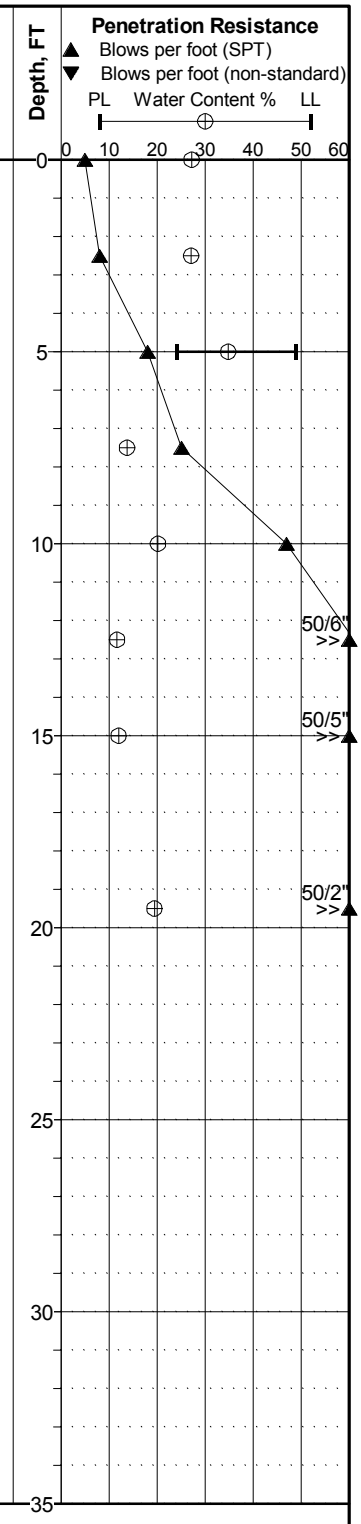
Very dense, gray, SILTY fine to medium SAND, few course sand, trace gravel; wet; scattered pockets moderate plasticity gray silt.

Very dense, gray, SILTY SAND WITH GRAVEL, few cobbles; wet. (Due to difficult drilling, driller added water to facilitate drilling.)

Hard, brown mottled with gray, SILT WITH SAND, few gravel; moist; gravels subround to round.

Boring completed at 19.7 feet below ground surface (bgs). Groundwater seepage encountered at 2.5 feet bgs. Hole backfilled with cuttings and surface restored.

Depth, FT	Symbol	USCS	Samples	Blows/6"	Lab tests	Ground Water
0		ML	1	1,1,4		
			2	2,3,5		
5		CL	3	3,7,11	AL	
		SM	4	6,11,14		
10		ML	5	10,17,30		
		SM	6	25,50/6"		
15		SM	7	50/5"		
		ML	8	50/2"		
20						
25						
30						
35						



Date Completed: 5/31/2017
Driller: CN Drilling
Equipment: Acker
Drilling Method: 2-1/4 inch ID HSA
Hammer System: Cathead

Approximate Location: In Lakeridge Park, approximately 9 feet west of the trail centerline and approximately 40 feet south of the first footbridge from the north trail entrance. (N: 187333 E: 1290937)

LAKERIDGE SEWER PROJECT
Seattle, Washington

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING B-101

E314059 Z 110 MG3

FIGURE A-2

Logged by: HKW Reviewed by: AJC

LOG OF BORING - (7/20/2009) LAKERIDGE PARK SEWER.GPJ DATA_TEMPLATE_(7-21-11).GDT 7/12/17

SOIL DESCRIPTION

Surface Elevation (ft): 170 NAVD 88

Surface is topsoil and ferns.

MASS WASTAGE DEPOSITS

Brown, SILT, trace sand and gravel; moist; scattered organics (rootlets).

Becomes grayish brown. Scattered rust mottling.

Increased rust mottling, fine sand. Occasional rust seam.

Becomes moist to wet.

Becomes moist.

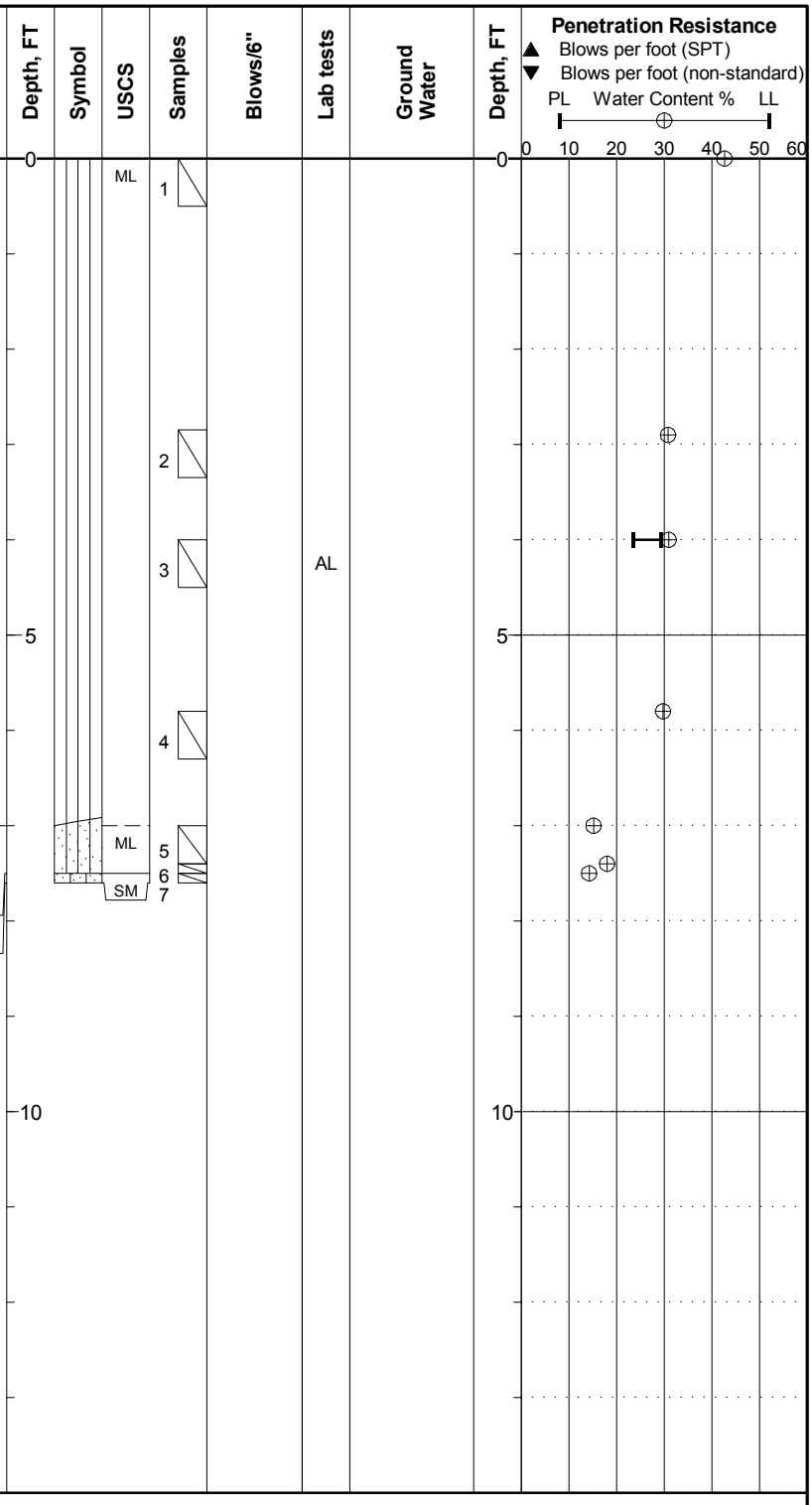
Increased coarse sand and fine gravel.

Increased fine to medium sand. (More difficult augering.)

Grayish brown, fine to medium SANDY SILT, trace gravel; moist; scattered rust mottled and partially cemented. Becomes gray. (Difficult augering.)

Gray, SILTY fine to medium SAND, trace gravel; moist.

Hand auger completed at 7.6 feet below ground surface (bgs). Groundwater seepage encountered at 4 feet bgs. Hole backfilled with cuttings and surface restored.



Date Completed: 5/31/2017
Driller: N/A
Equipment: Hand Auger
Drilling Method: 2 3/4-inch ID Hand Auger
Hammer System: N/A

Approximate Location: In Lakeridge Park, approximately 19 feet east of the trail centerline and approximately 50 feet south of the first footbridge from the north trail entrance. (N: 187348 E: 1290962)

LAKERIDGE SEWER PROJECT
Seattle, Washington

Seattle Public Utilities
Geotechnical Engineering

LOG OF BORING HA-101

E314059 Z 110 MG3

FIGURE A-3

Logged by: HKW/KH Reviewed by: HKW/KH

SOIL DESCRIPTION

Surface Elevation (ft): 152 NAVD 88

Surface is topsoil and ferns.

MASS WASTAGE DEPOSITS

Brown, SILT, trace gravel; moist to wet; scattered organics and tan/gray mottling. (Easy Augering).

Blueish gray, CLAY, trace gravel; moist to wet; interbedded with brown clay, occasional organics (roots, wood), scattered rust mottling, organic odor.

At 3.5 feet - 3 inch layer of dark brown silt with numerous organics and organic odor.
At 3.8 feet - 1 inch layer highly organic layer, grading to blueish gray clay.

Increased rust mottling, trace to few gravel.

Light brown, SILT WITH SAND, few gravel; moist; numerous rust mottling, scattered organics.

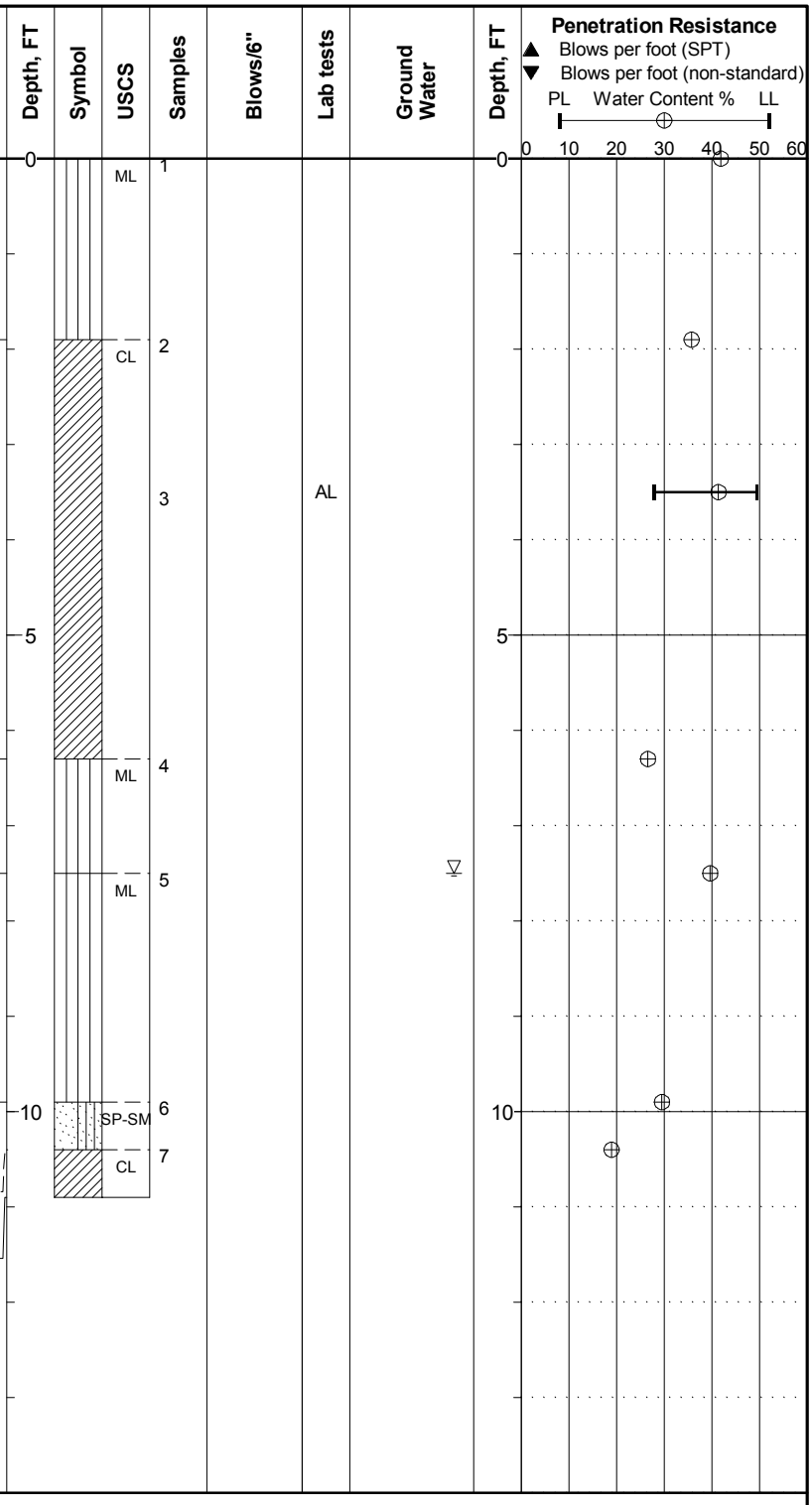
Blueish gray, SILT WITH fine SAND, trace gravel; wet; numerous rust mottling throughout, numerous organics.

Becomes saturated, trace to few fine gravel.

Brown, SAND WITH SILT, trave gravel; saturated; interbedded brown sand, scattered rust mottling, organics, blueish gray clay in tip of hand auger.

Blueish gray, CLAY WITH SAND, few gravel; saturated; numerous organics.

Boring completed at 10.9 feet below ground surface (bgs).
Groundwater was encountered at approximately 7.5 feet bgs.
Boring backfilled with cuttings.



Date Completed: 5/31/2017
Driller: N/A
Equipment: Hand Auger
Drilling Method: 2 3/4-inch ID Hand Auger
Hammer System: N/A

Approximate Location: In Lakeridge Park, approximately 45 feet east of the trail centerline and approximately 40 feet south of the first footbridge from the north trail entrance. (N: 187372 E: 1290978)

LAKERIDGE SEWER PROJECT
Seattle, Washington

Seattle Public Utilities
Geotechnical Engineering

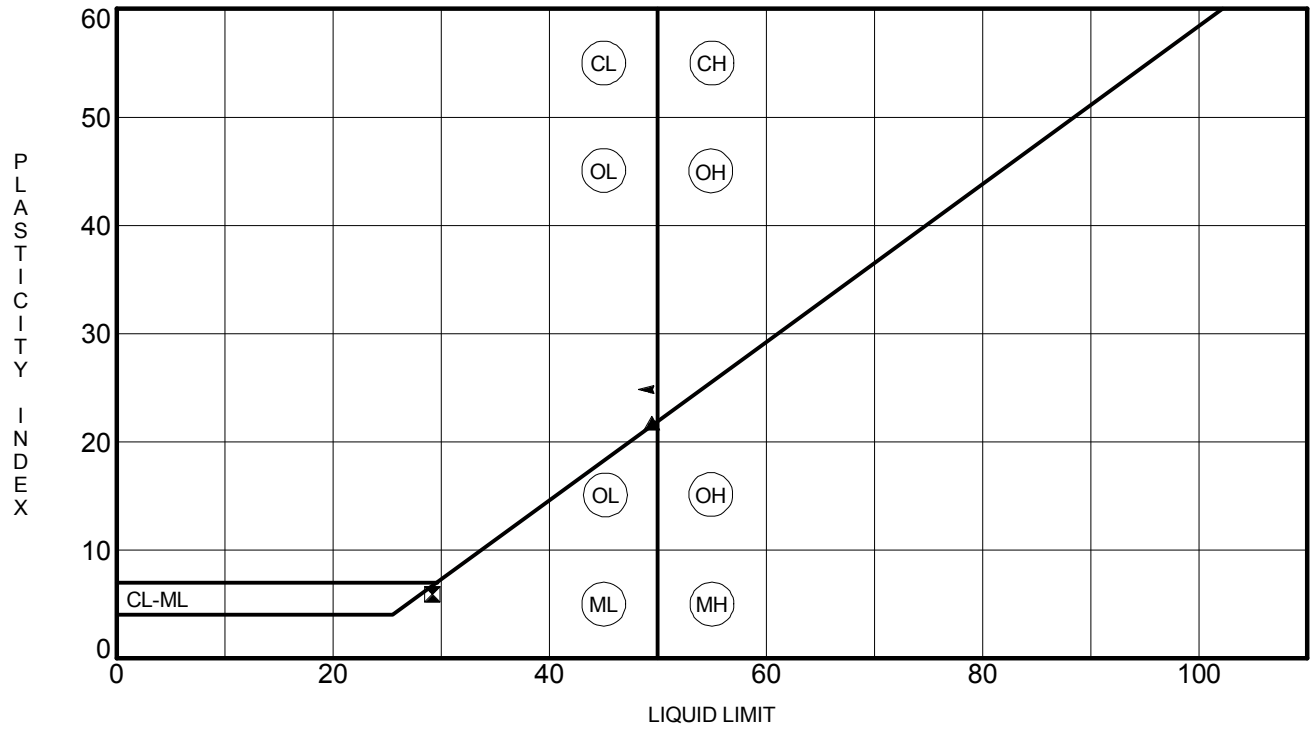
LOG OF BORING HA-102

E314059 Z 110 MG3

FIGURE A-4

Logged by: KH Reviewed by: HKW

LOG OF BORING - (7/20/2009) LAKERIDGE PARK SEWER.GPJ DATA_TEMPLATE_(7-21-11).GDT 7/12/17



	Sample ID	Depth	LL	PL	PI	Fines	Classification
◄	B-101, 3	5.0	49	24	25		Gray, CLAY (CL)
⊠	HA-101, 3	4.0	29	23	6		Brown, SILT (ML)
▲	HA-102, 3	3.5	49	28	21		Gray, CLAY/ORGANIC CLAY (CL-OL)

Seattle Public Utilities
Geotechnical Engineering

WA No.: E314059 Z 110 MG3

ATTERBERG LIMITS RESULTS

LAKERIDGE SEWER PROJECT
Seattle, Washington

FIGURE: B-1

US ATTERBERG LIMITS LAKERIDGE PARK SEWER.GPJ DATA_TEMPLATE_(7-21-11).GDT 6/16/17

SOIL DESCRIPTION

Surface Elevation: 167 NAVD 88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		ML	1	4,5,6	60		
5		CL-ML	2	4,7,9	53		
			3	2,3,4	47	AL	
10			4	1,3,5	100		
		ML	5	9,17,48	80		
15		ML	6	17,25,43	100		
20							
25							
30							
35							

Stiff, dark brown, SILT WITH fine to medium SAND, trace coarse sand; moist; some organics (rootlets).
Becomes light brown with trace organics and fine gravel.

Very stiff, gray, SILTY CLAY, trace fine to medium sand; moist.
Becomes brown, trace to few coarse sand and fine gravel.

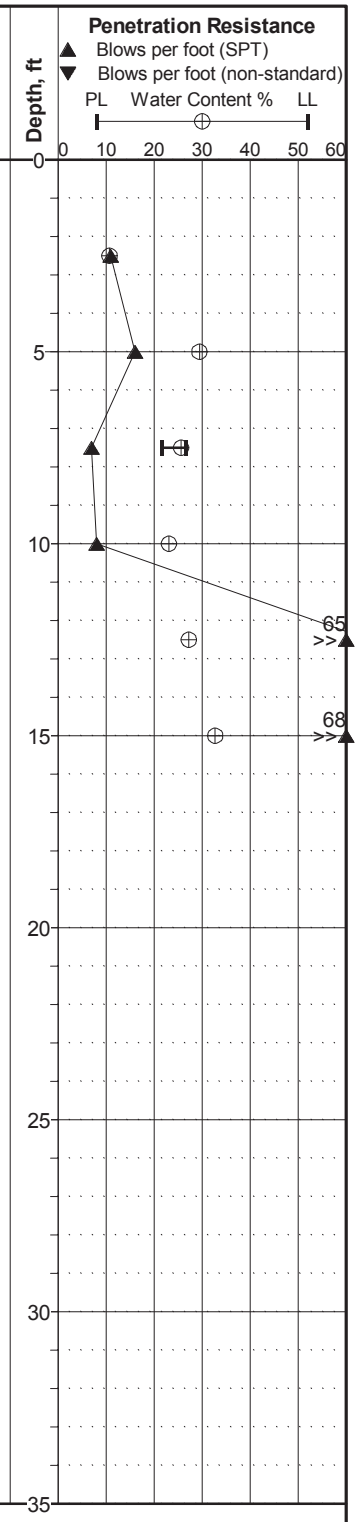
Becomes medium stiff and gray.

Becomes medium stiff to stiff with trace fine sand, scattered rust stained pockets and trace organics.

Hard, gray, CLAYEY SILT, trace fine sand; moist; occassional fine sand partings.
Trace coarse sand and rust staining throughout.

Hard, gray, SILT, trace fine sand; moist. Pinkish SILT WITH SAND in tip of sampler.

Boring completed at 16.5 feet below ground surface. Groundwater not encountered. Boring backfilled with bentonite chips and surface restored with soil plug.



Date Completed: 9/25/2014
Driller: CN Drilling
Equipment: Acker
Drilling Method: 4-1/2 inch OD HSA
Hammer System: Cathead

Approximate Location: 100 feet N of large bridge crossing the bridge, 52 feet E of center of trail and 23 feet W of creek. (N: 187235.8 E: 1291095)

Deadhorse Canyon Sewer
Seattle, Washington

Seattle Public Utilites
Geotechnical Engineering

LOG OF BORING B-101

E314059

FIGURE A-2

Logged by: HKW Reviewed by: MKH

LOG OF BORING (2/1/11) DEADHORSE CANYON.GPJ DATA_TEMPLATE_(7-21-11).GDT 11/25/14

SOIL DESCRIPTION

Surface Elevation: 174 NAVD 88

Depth, ft	Symbol	USCS	Samples	Blows/6"	Recovery, %	Lab tests	Ground Water
0		ML	1	5,5,5	100		
5		ML	2	3,4,4	60		
10		CL	3	3,5,11	100	AL	
15		SM	4	9,12,21	100		
			5	5,11,17	100	AL	
			6	19,37,42	100		
			7	50/5"	100		
20							
25							
30							
35							

Stiff, dark brown, SILT WITH fine to medium SAND, trace coarse sand; moist; some organics (rootlets).
Becomes tan with trace fine gravel.

Medium stiff to stiff, gray, SILT, trace to few fine sand, trace fine gravel; moist; interbedded layer light gray fine sand.

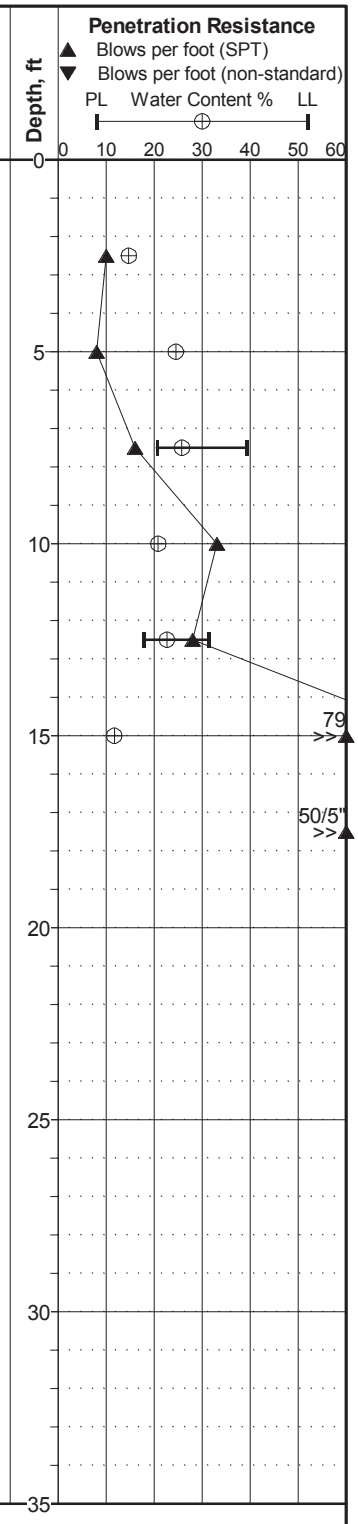
Very stiff, tannish gray, SILTY CLAY, trace sand and fine gravel; moist; scattered rust mottling.

Becomes hard, light brown with occassional fine sand partings.

Becomes very stiff, gray with rust pockets and occassional black silt pockets.

GLACIAL TILL
Very dense, tan, SILTY fine to medium SAND, few coarse sand and gravel; moist; rust mottling throughout.

Boring completed at 17.9 feet below ground surface. Groundwater not encountered. Boring backfilled with bentonite chips and surface restored with soil plug.



Date Completed: 9/25/2014
Driller: CN Drilling
Equipment: Acker
Drilling Method: 4-1/2 inch OD HSA
Hammer System: Cathead

Approximate Location: 100 feet N of large bridge crossing the bridge, 21 feet W of B-101 and 30 feet E of center of trail. (N: 187229.3 E: 1291080.8)

Deadhorse Canyon Sewer
Seattle, Washington

Seattle Public Utilites
Geotechnical Engineering

LOG OF BORING B-102

E314059

FIGURE A-3

Logged by: HKW Reviewed by: MKH

SOIL DESCRIPTION

Surface Elevation: 189 NAVD 88

Depth, ft	Soil Description	USCS	Sample	Blows/6"	Recovery, %	Lab tests
0	Medium stiff, dark brown, SILT, trace coarse sand; moist; some organics (rootlets). Becomes tan with trace fine sand and rust mottling throughout. Trace organics.	ML				
			1	2,3,4	100	
5	Becomes medium stiff to stiff and gray.		2	2,3,5	100	
	Loose, tan to light gray, SILTY fine SAND; moist; interbedded silt layers, rust mottling throughout.	SM	3	2,3,4	100	
10	Medium stiff, gray, SILT, trace to few sand; moist; rust mottling throughout. Silty sand in tip of sampler	ML	4	1,2,4	100	
			5	3,3,7	100	
15			6	5,6,6	100	AL
20			7	5,11,17	100	
	GLACIAL TILL Very dense, gray, SILTY GRAVEL WITH SAND; dry to moist; oxidation and cemented gravels.	GM				
25			8	29,50/4"	100	
	Boring completed at 25.3 feet below ground surface. Groundwater not encountered. Boring backfilled with bentonite chips and surface restored with soil plug.					
30						
35						

Ground Water

Penetration Resistance
▲ Blows per foot (SPT)
▼ Blows per foot (non-standard)
PL Water Content % LL
0 10 20 30 40 50 60

50/4" >>

Date Completed: 9/25/2014
Driller: CN Drilling
Equipment: Acker
Drilling Method: 4-1/2 inch OD HSA
Hammer System: Cathead

Approximate Location: 100 feet N of large bridge crossing the creek, 21.5 feet W of center of trail and 54.5 feet from B-102. Approximately 35 feet E of large cedar. (N: 187205.6 E: 1291030.4)

Deadhorse Canyon Sewer
Seattle, Washington

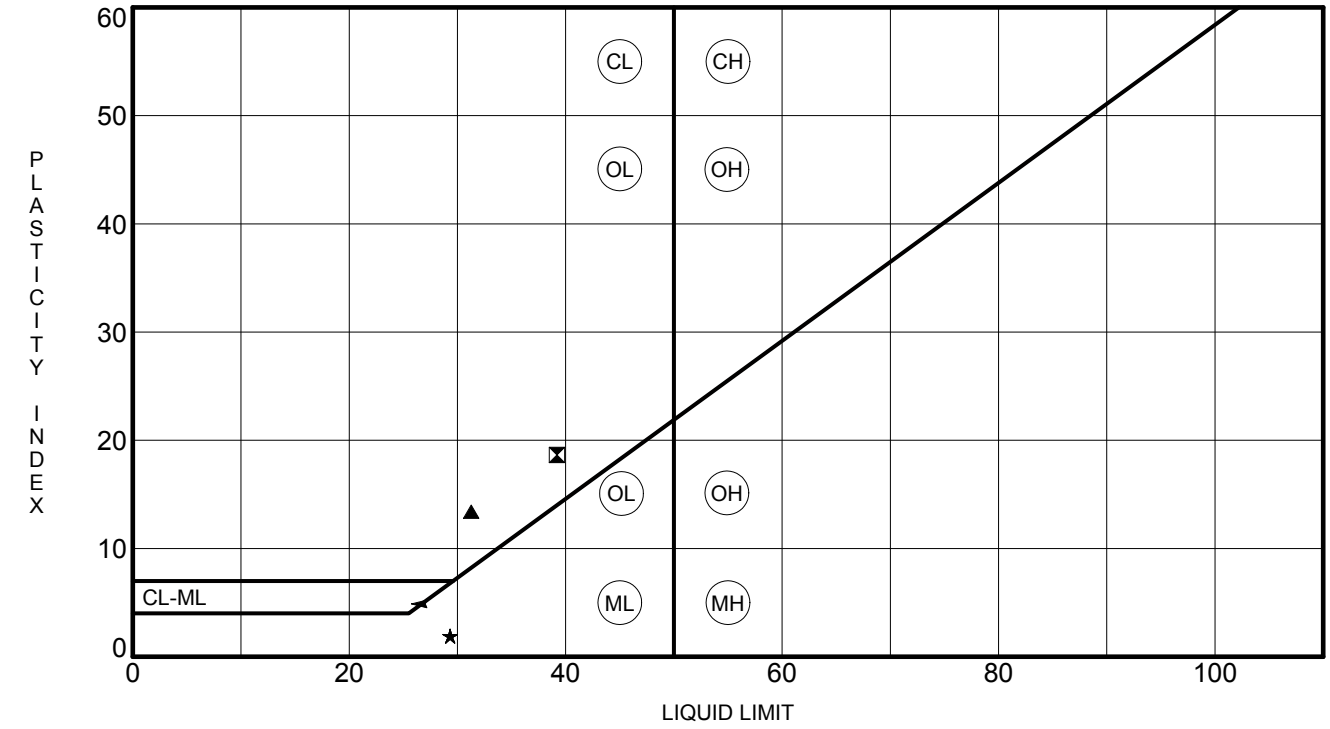
Seattle Public Utilites
Geotechnical Engineering

LOG OF BORING B-103

E314059

FIGURE A-4

Logged by: HKW Reviewed by: MKH



	Sample ID	Depth	LL	PL	PI	Fines	Classification
◄	B-101, 3	7.5	26	22	4		Gray, SILTY CLAY, trace to few sand and fine gravel (CL-ML)
⧓	B-102, 3	7.5	39	21	18		Gray, SILTY CLAY, trace to few sand and fine gravel (CL).
▲	B-102, 5	12.5	31	18	13		Gray, SILTY CLAY, trace to few sand and fine gravel (CL).
★	B-103, 6	15.0	29	27	2		Gray, SILT, trace to few sand (ML).

Seattle Public Utilites
Geotechnical Engineering

WA No.: E314059

ATTERBERG LIMITS RESULTS

Deadhorse Canyon Landslide Study
Seattle, Washington

FIGURE: C-1

US ATTERBERG LIMITS DEADHORSE CANYON.GPJ DATA_TEMPLATE_(7-21-11).GDT 10/22/14

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-1

SHEET 1 **OF** 2

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Crestwood Drive S.

BORING DATE: 9/21/94

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. (140 lb. hammer, 30 inch drop)	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT ■ (0 10 20 30 40 50) / WATER CONTENT, PERCENT (Wp — W — Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
0	4 inch I.D. HSA				275.0							
		Very dense, olive gray (5Y 4/1) to olive black (5Y 2/1), Silty fine to coarse SAND, trace to little gravel, trace cobble (TILL)										FLUSH MOUNT MONUMENT
10			SM		262.5 / 12.5	1	SS	50/5"	50+	4/5"		3/4" PVC
20												BENTONITE BACKFILL
			SM		247.5 / 27.5	2	SS	50/5"	50+	3/5"		
30												
40			SM		232.5 / 42.5	3	SS	100/6"	50+	6/6"		
50												
			SM		217.5 / 57.5	4	SS	50/4"	50+	3/4"		
60		Drilling eases 64-65 feet										
70		Very dense, medium grey (N5), non-stratified CLAYEY SILT, trace fine sand										
		Continued on page 2										

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: George Jewel

LOGGED: Richard Luark

CHECKED: Jim Johnson

DATE: 10/31/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-1

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Crestwood Drive S.

BORING DATE: 9/22/94

DEPTH FEET	BORING METHOD	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	NUMBER	TYPE	BLOWS / 6 IN. (140 lb. hammer, 30 inch drop)	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT / WATER CONTENT, PERCENT (Wp, W, Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
80	Mud Rotary	Very dense, medium grey (N5), non-stratified CLAYEY SILT, trace fine sand	CL		205.0 187.5 77.5	5	SS	100/6"	50+	5/6"	▫ 21.9%	BENTONITE SEAL 3/4" PVC
90		Very dense, medium gray (N5), silty coarse to fine SAND, little gravel (TILL)	SM		185.0 90.0	6	SS	50/5", 50/1"	50+	4/6"		8-20 SAND
100		Very dense, medium gray (N5), fine to coarse GRAVEL, little to some silty sand	GW		169.0 106.0	7	SS	50/6", 50/1"	50+	5/7"		
110		Very dense, brownish black (5YR 2/1), medium fibrous PEAT, some fine to medium sand	Pt		164.0 111.0	8	SS	43, 50/2"	50+	7/8"		
120		Boring terminated @ 116.0' Piezometer installed full depth.			159.0 116.0							
130												
140												
150												

DRILL RIG: 8-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: George Jewel

LOGGED: Richard Luark

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-2

SHEET 1 OF 3

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Lake Ridge Drive & Rustic Road

BORING DATE: 9/24-25/94

DEPTH FEET	BORING METHOD	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	NUMBER	TYPE	BLOWS / 6 IN. 140 lb. hammer 30 inch drop	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT ■ (0, 10, 20, 30, 40, 50) / WATER CONTENT, PERCENT Wp — W — Wl	PIEZOMETER GRAPHIC / WATER LEVEL
					265.0							
0	4-inch I.D. HSA	Very dense, moderate yellow brown (10YR 5/4), fine to medium SAND, some silt, little fine gravel (WEATHERED TILL)										
10												
			SM		250.0 / 15.0	1	SS	100/5"	50+	3/5"		
20												
		Very dense, medium gray (N5), non-stratified SILT, some fine to coarse gravel, little sand (TILL)										
30			ML		235.0 / 30.0	2	SS	50/4"	50+	3/4"		
		Sand lense from 37'-40' (based on drilling action)										
40												
		No recovery @S-3 gravel & cobbles	--		220.0 / 45.0	3	SS	22-38-50	88	0/18"		
50		Very dense, dusky yellow green (5GY 5/2), non-stratified SILT and SILT CLAY, little sand, trace gravel (TILL)										
	Mud Rotary											
60			CL		205.0 / 60.0	4	SS	16-45-50/5"	50+	17/17"	o26.6%	
		Hard, medium gray (N5), SILTY CLAY to CLAY, trace sand, trace gravel (LACUSTRINE DEPOSIT)										
70												

Continued on page 2

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: Dan Troxa

LOGGED: Scott Hutsell

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-2

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Lake Ridge Drive & Rustic Road

BORING DATE: 9/24-25/94

DEPTH FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES NUMBER	TYPE	BLOWS / 6 IN. 140 lb. hammer 30 inch drop	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT ■ (0 10 20 30 40 50) / WATER CONTENT,PERCENT Wp W Wl	PIEZOMETER GRAPHIC / WATER LEVEL
80	Mud Rotary	Hard, medium gray (N5), SILTY CLAY to CLAY, trace sand, trace gravel (LACUSTRINE DEPOSIT)	CL		190.0 / 75.0	5	SS	50/6"-50/4"	50+	6/10"	Wp 22% W 30% Wl 47%	
90			CH		175.0 / 90.0	6	SS	21-50/5.5"	50+	9/11.5		
100		No recovery on S-7	--		160.0 / 105.0	7	SS	50/3.5"	50+	0/3.5"		
110		Very dense, light olive gray (5Y 6/1) to very light gray (N8), fine to medium SAND, trace silt (weakly stratified)										
120			SP		145.0 / 120.0	8	SS	50/5"	50+	5/5"		
130		Hard, grayish black (N2) stratified, CLAYEY ORGANIC SILT	OH		130.0 / 135.0	9	SS	50/6"-50/5.5"	50+	11/11.5		
140		Hard, olive gray (5Y 4/1) stratified to non-stratified, CLAYEY SILT becoming CLAY with depth, trace fine sand, little organic silt in sample at 145 feet	MH		125.0 / 140.0	10	SS	50/5"-50/2"	50+	11/11.5		
			MH		120.0 / 145.0	11	SS	50/3"-50/1"	50+	11/11.5		
150		Continued on page 3										

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: George Jewel

LOGGED: Richard Luark

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-2

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Lake Ridge & Rustic Road

BORING DATE: 9/24-25/94

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. 140 lb. hammer 30 inch drop	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT ■ (0, 10, 20, 30, 40, 50) / WATER CONTENT, PERCENT (Wp, W, Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
150	Mud Rotary	Hard, olive gray (5Y 4/1), stratified to non-stratified, CLAYEY SILT becoming CLAY with depth, trace fine sand, little clayey organic silt in sample at 145 feet	--		115.0 150.0	12	SS	50/1"-5-/0.5	50+	0/1.5"		
			CL		110.0 155.0	13	SS	50/0.5-50/0.5-50/0.5	50+	0.5/1.5"		
160			CH		105.0 160.75	14	SS	50/5"-50/4"	50+	5/9"		
		Boring terminated @160.75 feet Backfilled with bentonite to surface										
170												
180												
190												
200												
210												
220												

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: Dan Troxa

LOGGED: Scott Hutsell

CHECKED: Jim Johnson

DATE: 10/31/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-3

SHEET 1 OF 3

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Rustic Rd. & 108th St.

BORING DATE: 9/26/94

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. 140 lb. hammer 30 inch drop	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT ■ (0, 10, 20, 30, 40, 50) / WATER CONTENT, PERCENT Wp — W — Wl	PIEZOMETER GRAPHIC / WATER LEVEL
0					240.0							
		Very dense, light olive gray (5Y 5/2), SILT, some fine to medium sand, trace gravel (TILL)										
10			SM		227.0 / 13.0	1	SS	16-29-42	50+	18/18		
20		Very dense, dark yellowish brown (10YR 4/2), fine to medium SAND, trace silt, trace gravel (ADVANCE OUTWASH)										
30			SP		212.0 / 28.0	2	SS	32-40-50/5"	50+	17/17		
40			SP		220.0 / 45.0	3	SS	15-36-46	50+	18/18		
50												
60			SP		182.0 / 58.0	4	SS	50/4"-50/2.5"	50+	4/6.5"		
70		Hard, medium gray (N5), SILTY CLAY, trace fine sand (PROGLACIAL LACUSTRINE CLAY)										

Continued on page 2

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: Mike Jordan

LOGGED: Scott Hutsell

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-3

SHEET 2 **OF** 3

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Rustic Rd. & 108th St.

BORING DATE: 9/26/94

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. (140 lb. hammer, 30 inch drop)	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT (10 20 30 40 50) / WATER CONTENT PERCENT (Wp — W — Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
80		Hard, medium gray (N5), SILTY CLAY, trace fine sand (PROGLACIAL LACUSTRINE CLAY)	CL		165.0 / 75.0	5	SS	50/5"	50+	4/5"		
90			CL		150.0 / 90.0	6	SS	50/3"-50/2"	50+	4/5"		
100		Sample S-7 becomes CLAYEY SILT, little organics (wood chips)	MH		135.0 / 105.0	7	SS	50/2"-50/1"	50+	2/3		
110		Hard, brownish black (5YR 2/1), fibrous PEAT and ORGANIC CLAYEY SILT	Pt		120.0 / 120.0	8	SS	100/3"	50+	3/3		
120		Hard, light olive gray (5Y 6/1), laminated CLAY (PROGLACIAL LACUSTRINE CLAY)	CH		105.0 / 135.0	9	SS	100/3"	50+	3/3		
130		1-1/4" gravel jammed in sample shoe, no recovery	--		95.0 / 145.0	10	SS	150/1"	50+	6/1		
140		Continued on page 3										
150												

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: Mike Jordan

LOGGED: Scott Hutsell

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-3

SHEET 3 **OF** 3

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Rustic Rd. & 108th St.

BORING DATE: 9/26/94

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. (140 lb. hammer, 30 inch drop)	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT ■ (0, 10, 20, 30, 40, 50) / WATER CONTENT, PERCENT (Wp, W, Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
150		Very dense, medium dark gray (N4), SILTY CLAY and fine to medium SAND, trace gravel (TILL)										
			CL		85.0 / 155.0	11	SS	100/2"	50+	2/2	10%	
160			CL		80.0 / 160.0	12	SS	100/2"	50+	2/2	10%	
			CL		75.0 / 165.0	13	SS	100/2"	50+	2/2	10%	
170			CL		70.0 / 170.0	14	SS	100/2"	50+	2/2	10%	
		Boring terminated @170.2 feet Backfilled with bentonite to surface			170.2							
180												
190												
200												
210												
220												

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: Mike Jordan

LOGGED: Scott Hutsell

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-4

SHEET 1 **OF** 2

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Bangor & Waters Street

BORING DATE:

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. (140 lb. hammer, 30 inch drop)	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT ■ (0, 10, 20, 30, 40, 50) / WATER CONTENT, PERCENT (Wp — W — Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
					230.0							
0	4-inch I.D. HSA	Very dense, brownish gray (5YR 4/1) fine to medium SAND, little gravel, cobbles, trace silt (OUTWASH)										
10			SP		215 / 15	1	SS	40-50/2"	50+	6/7		
20		Hard, medium dark gray (N4) CLAY, trace sand, trace gravel, becomes gravelly SILTY CLAY, little sand in S-3 (TILL)										
30			CL		200.0 / 30.0	2	SS	7-27-50/3.5	50+	2/15		
40		Boulder encountered @ 40 feet in re-drill attempt.										
			CL		185.0 / 45.0	3	SS	50/3"-50/1"	50+	1/4		
50		Hard medium gray (N5), non-stratified SILT to SILTY CLAY, to CLAY (PROGLACIAL LACUSTRINE CLAY)										
60			ML		170 / 60	4	SS	26-50/4"	50+	9/1		
70												

Continued on page 2

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: Rodney

LOGGED: Scott Hutsell

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-4

SHEET 2 OF 2

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Bangor & Waters Street

BORING DATE:

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. (140 lb. hammer, 30 inch drop)	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT (10 20 30 40 50) / WATER CONTENT PERCENT (Wp W Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
					155.0							
			CL		75.0	5	SS	19-20-50/5"	50+	16/17	Wp 24% W 26% Wl 38%	
80		Hard medium gray (N5) non-stratified CLAYEY SILT and CLAY (PROGLACIAL LACUSTRINE CLAY)										
					145.0							
			CL		85.0	6	SS	15-50-50/1"	50+	12/13		
90		Very dense GRAVEL, some cobbles (OUTWASH?)										
100		No sample. Hole caving on drill rods.										
110					120.0							
		Boring terminated @ 110.0' due to difficult drilling conditions Boring backfilled with Bentonite			110.0							
120												
130												
140												
150												

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: Rodney

LOGGED: Scott Hutsell

CHECKED: Jim Johnson

DATE: 11/1/94

Golder Associates

PROJECT: Seattle/Lakewood Sewer

RECORD OF BOREHOLE B-5

SHEET 1 **OF** 1

DATUM: MSL

PROJECT NUMBER: 943-1626

BORING LOCATION: Holyoke Way

BORING DATE: 9/21/94

DEPTH FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH	SAMPLES: NUMBER	TYPE	BLOWS / 6 IN. 140 lb. hammer 30 inch drop	N	REC/ATT	PENETRATION RESISTANCE BLOWS/FT. ■ (0 10 20 30 40 50) / WATER CONTENT, PERCENT (Wp — W — Wl)	PIEZOMETER GRAPHIC / WATER LEVEL
					50.0							
0	4-inch I.D. HSA	Compact, medium gray (N5), silty, fine to medium SAND, trace to some gravel, wood debris (FILL)	SM		47.5 / 2.5	1	SS	10-10-8	18	18/18	■	CONCRETE; BENTONITE SEAL; SOLID SCH PVC
5												
		Sample 2 driven on wood debris, possibly a log	--		42.5 / 7.5	2	SS	50/6"	50+	2/6	■	10-20 SILICA SAND
10												
			SM		37.5 / 12.5	3	SS	9-7-8	15	18/18	■	
15		Very dense, medium gray (N6), silty fine to medium SAND, trace gravel										
		Lense of CLAY, little coarse to fine sand in sample 4.	CL		32.5 / 17.5	4	SS	8-21-36	57	18/18	36% ○	
20												
			SM		27.5 / 22.5	5	SS	50/3.5"	50+	12/35	■	
25												SLOTS
			SM		22.5 / 27.5	6	SS	50-50/2	50+	2/8	■	
30		Boring terminated @28'2" Completed with piezometer			28'2"							
35												

DRILL RIG: B-61

DRILLING CONTRACTOR: RAM, Inc.

DRILLER: George Jewel

LOGGED: Richard Luark

CHECKED: Jim Johnson

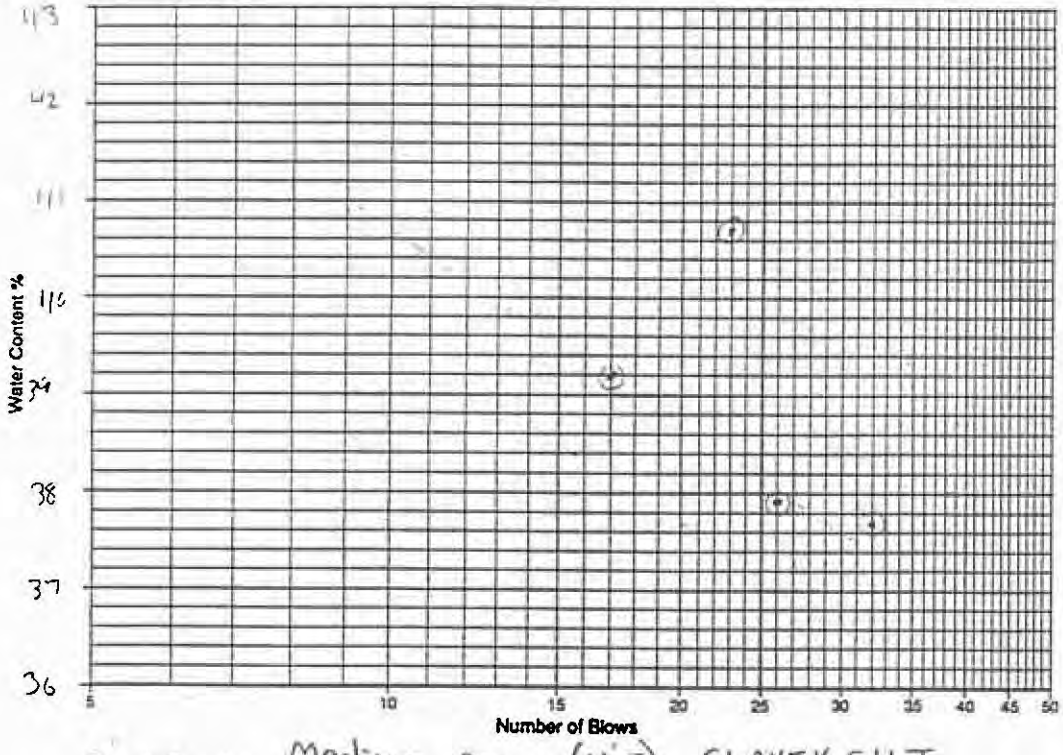
DATE: 11/1/94

Golder Associates

Type of Test	LL	LL	LL	LL	Nat. MC
Container #	T-71	T-78	T-87	T-90	30
Number of blows	22	23	17	26	–
Weight of sample wet + tare	36.57	38.19	39.49	38.03	50.03
Weight of sample dry + tare	32.43	33.31	34.33	33.31	44.87
Weight of water					
Tare	21.46	21.31	21.18	20.78	25.00
Weight of dry soil					
Water content %	37.7	40.7	39.2	37.7	26.0

Type of Test	PL	PL
Container #	T-119	T-120
Weight of sample wet + tare	36.26	35.96
Weight of sample dry + tare	34.85	34.56
Weight of water		
Tare	28.65	28.96
Weight of dry soil		
Water content %	32.7	25.0

Borehole #	B-4
Sample #	S-5
Depth	75'
Liquid Limit	38
Plastic Limit	24
Plasticity Index	14
Moisture Content	26.0
Liquidity Index	0.14



Sample Description Medium gray (N5), CLAYEY SILT, little F gravel, trace F sand, (CL).

ATTERBERG LIMITS, ASTM D4318

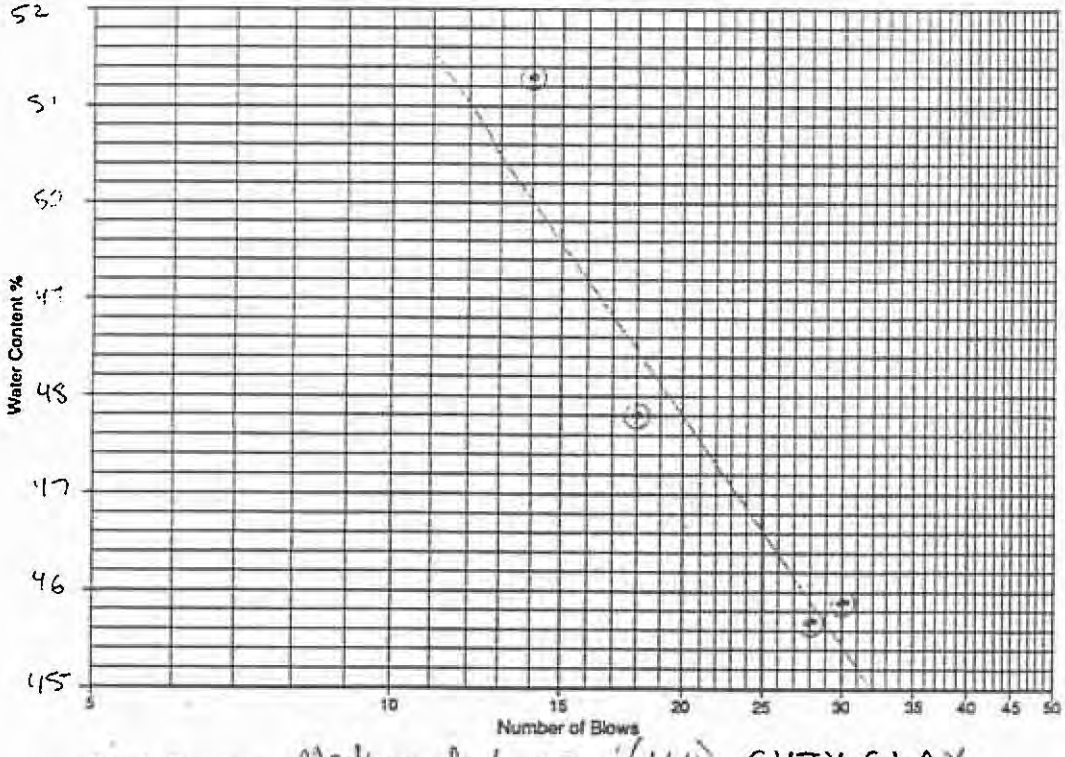
Project Seattle / Lakewood TUNNEL / GWA
Project No. 943-1626 Date 11-29-94 Tested By MSB Checked By DAO

Golder Associates

Type of Test	LL	LL	LL	LL	Nat. MC
Container #	T-65	T-88	T-96	T-110	29
Number of blows	30	14	18	28	–
Weight of sample wet + tare	38.82	40.56	38.65	40.48	40.45
Weight of sample dry + tare	33.31	33.83	32.91	34.12	36.83
Weight of water					
Tare	21.31	20.70	20.91	20.86	24.75
Weight of dry soil					
Water content %	45.9	51.3	47.8	45.7	30.0

Type of Test	PL	PL
Container #	T-113	T-117
Weight of sample wet + tare	35.50	36.34
Weight of sample dry + tare	34.29	34.91
Weight of water		
Tare	28.81	28.58
Weight of dry soil		
Water content %	22.1	22.6

Borehole #	B-2
Sample #	S-5
Depth	90'
Liquid Limit	47
Plastic Limit	22
Plasticity Index	25
Moisture Content	30.0
Liquidity Index	0.32



Sample Description Medium dark gray (N4), SILTY CLAY, some f gravel, little m-f sand, (CL).

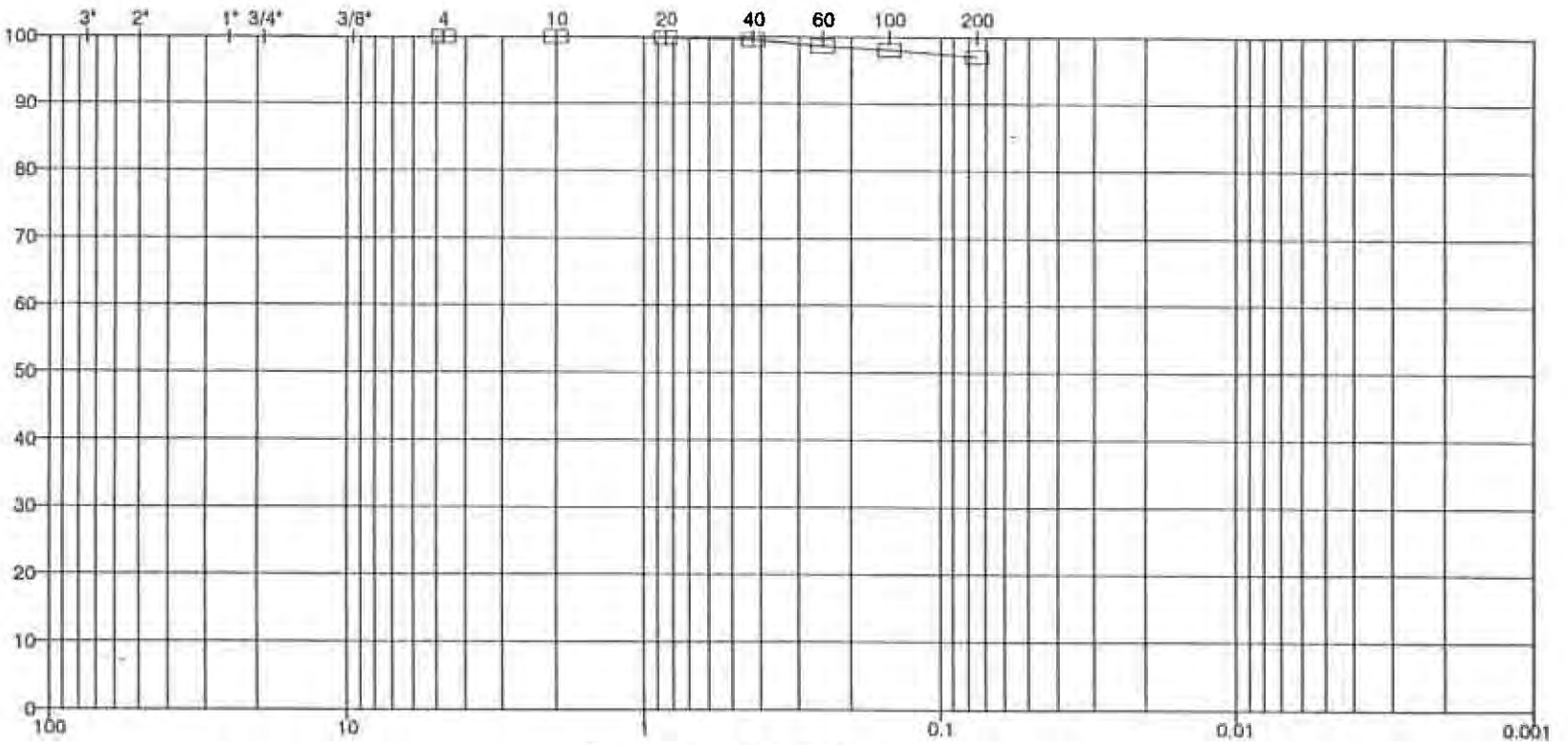
ATTERBERG LIMITS, ASTM D4318

Project Seattle / Lakewood Tunnel / WA
Project No. 943-1626 Date 11-29-94 Tested By MSB Checked By DWL

Golder Associates

PARTICLE SIZE DISTRIBUTION

US STANDARD SIEVE OPENING SIZES



Coarse	Fine	C	Med	Fine	
GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID	DEPTH	W%	LL	PL	PI	USCS	DESCRIPTION
B-1 S-5	77.5-78'	21.9				CL	Medium gray (N5), CLAYEY SILT, trace m-f sand, (CL).

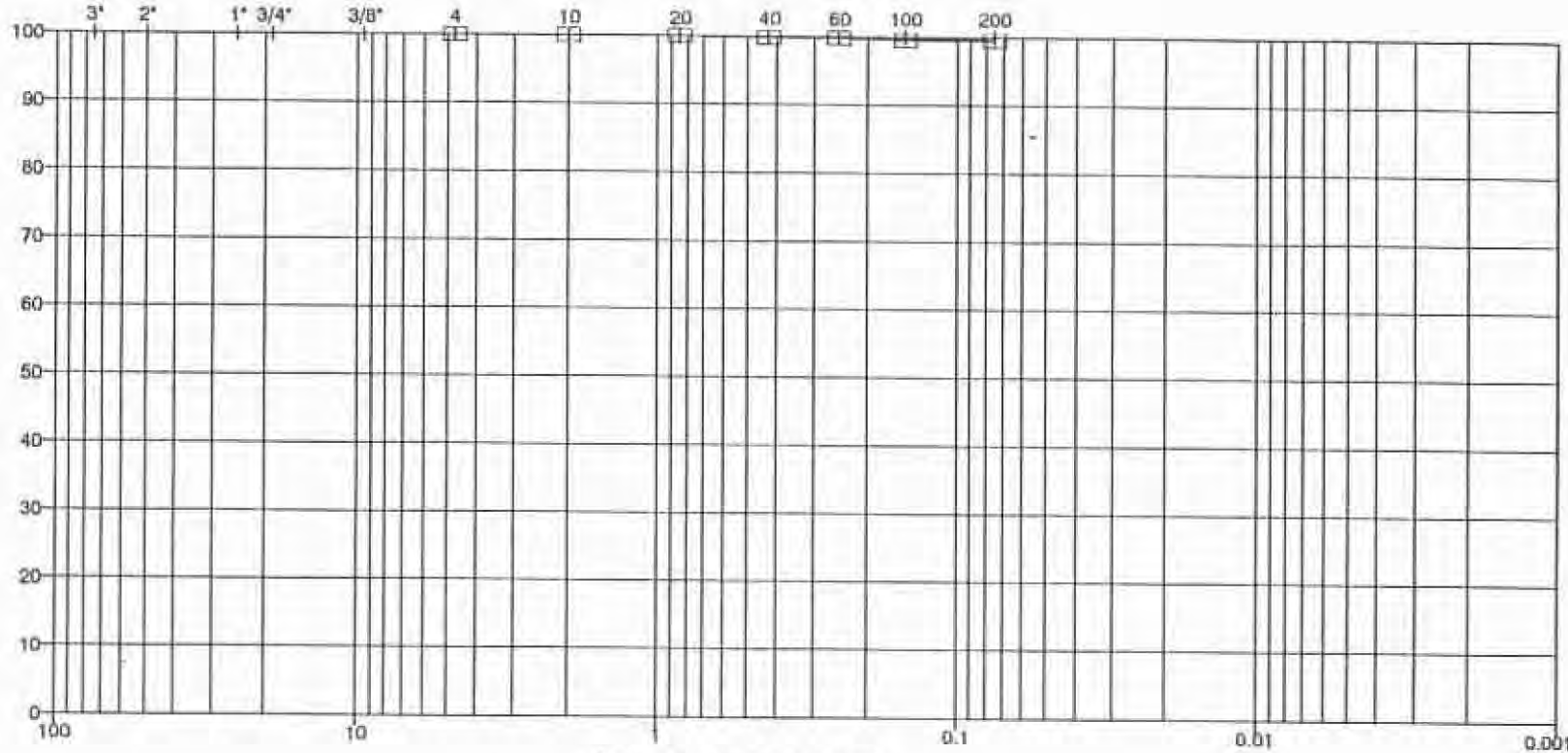
PROJECT: **SEATTLE / LAKEWOOD TUNNEL / WA**

PROJECT NO.: **943-1626** DATE: 11-30-94 TECH: MSB REVIEW: DPO

GOLDER ASSOCIATES INC.
REDMOND, WA

PARTICLE SIZE DISTRIBUTION

US STANDARD SIEVE OPENING SIZES



Coarse	Fine	C	Med	Fine	
GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID	DEPTH	W%	LL	PL	PI	USCS	DESCRIPTION
B-2 S-4	75'	26.6				CL	Medium gray (N5), SILTY CLAY, trace m-f sand, (CL).

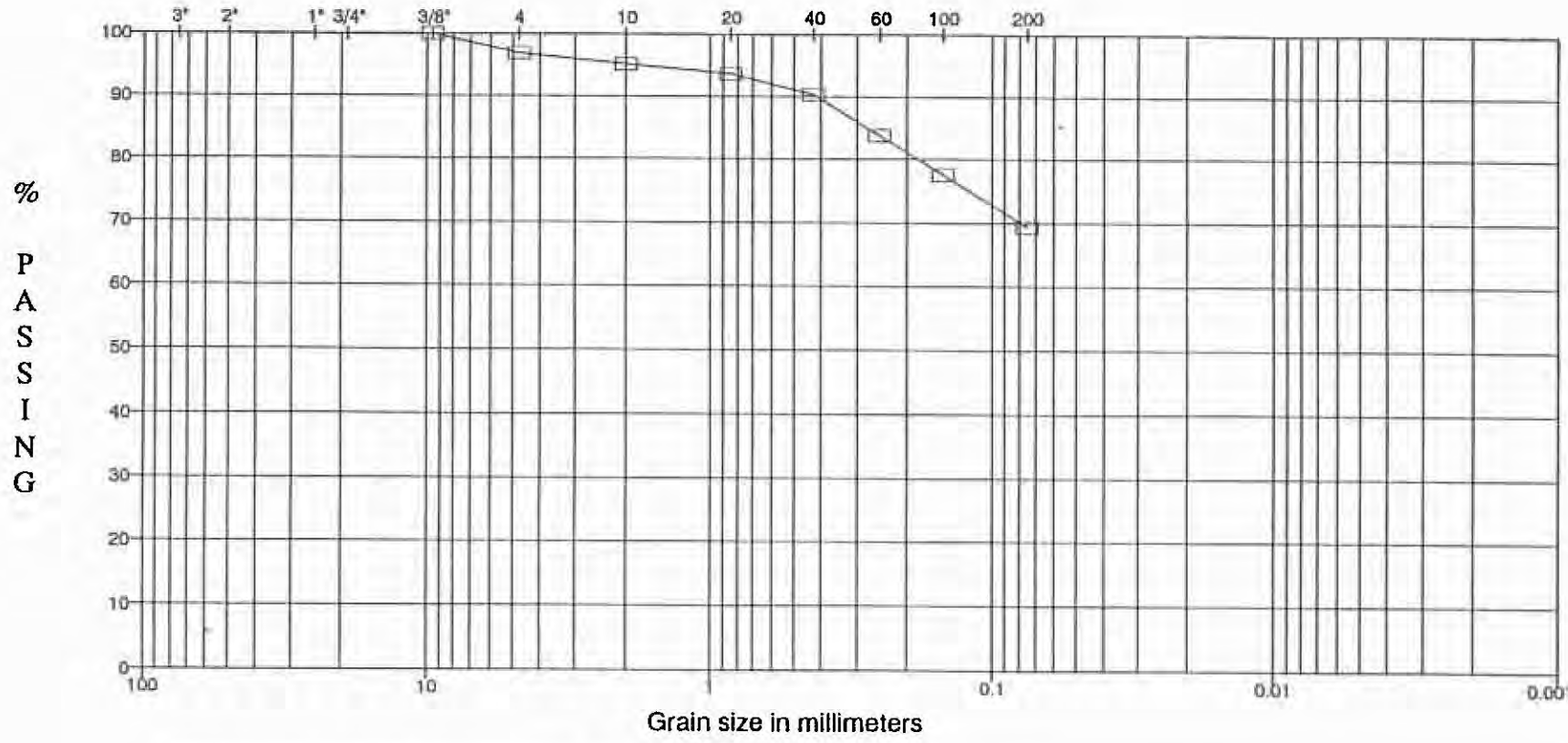
PROJECT: **SEATTLE / LAKEWOOD TUNNEL / WA**

PROJECT NO.: **943-1626** DATE: 11-30-94 TECH: MSB REVIEW: DPO

GOLDER ASSOCIATES INC.
REDMOND, WA

PARTICLE SIZE DISTRIBUTION

US STANDARD SIEVE OPENING SIZES



Coarse	Fine	C	Med	Fine	
GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID	DEPTH	W%	LL	PL	PI	USCS	DESCRIPTION
B-3 S-11-14	155-170'	10.1				CL	Medium dark gray (N4), SILTY CLAY, some m-f sand, trace f gravel, (CL).

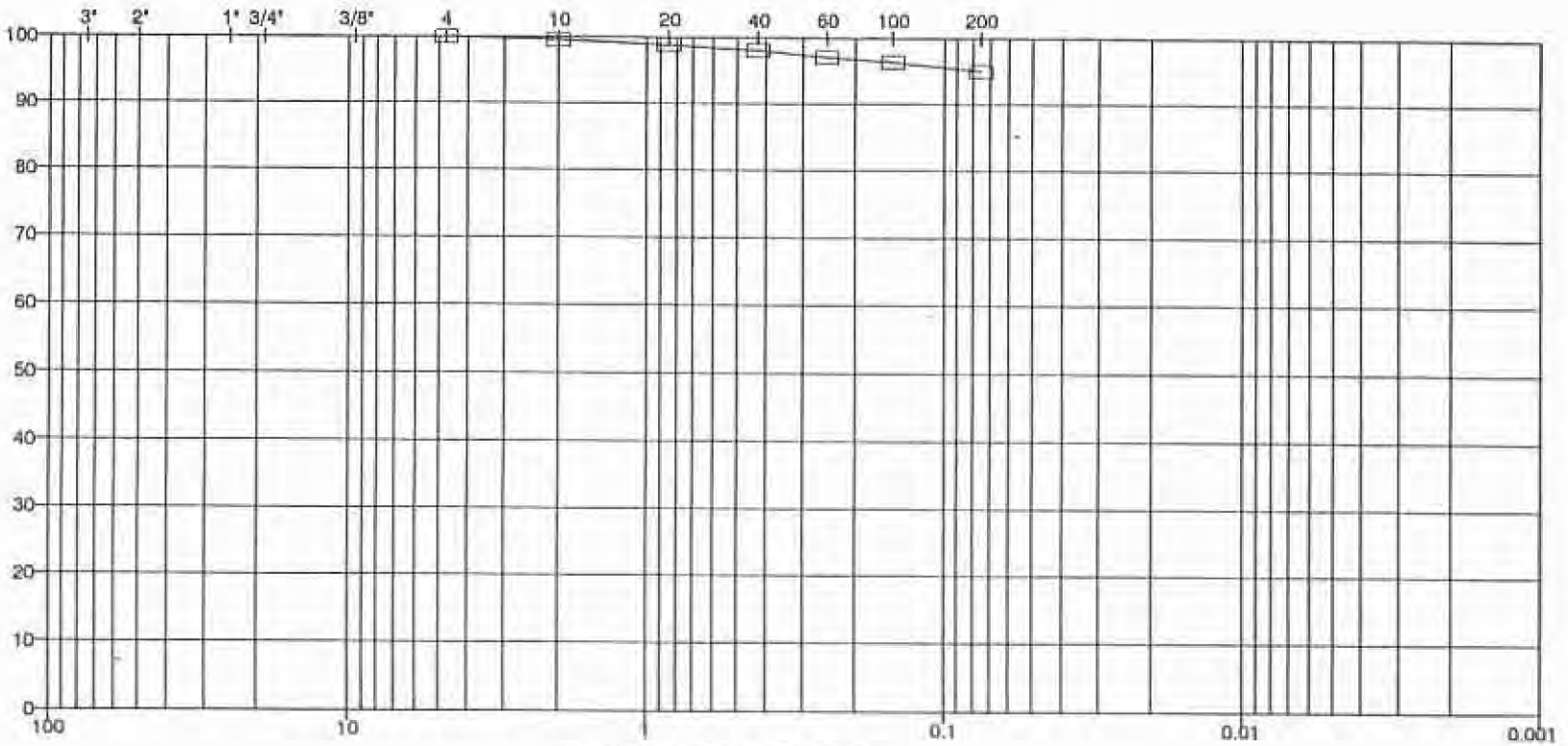
PROJECT: **SEATTLE / LAKEWOOD TUNNEL / WA**

PROJECT NO.: **943-1626** DATE: 11-30-94 TECH: MSB REVIEW: DPO

GOLDER ASSOCIATES INC.
REDMOND, WA

PARTICLE SIZE DISTRIBUTION

US STANDARD SIEVE OPENING SIZES



Coarse	Fine	C	Med	Fine	
GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID	DEPTH	W%	LL	PL	PI	USCS	DESCRIPTION
B-5 S-4	17.5-19'	36.2				CH	Medium gray (N5), CLAY, little c-f sand, (CH).

PROJECT: **SEATTLE / LAKEWOOD TUNNEL / WA**

GOLDER ASSOCIATES INC.

PROJECT NO.: **943-1626** DATE: **11-30-94** TECH: **MSB** REVIEW: **DPO**

REDMOND, WA