Cobalt Geosciences, LLC
P.O. Box 1792
North Bend, WA 98045

August 9, 2023

Sam Adams
samad@microsoft.com

RE: Limited Geotechnical Evaluation
Proposed Residence
3508 96th Avenue SE
Mercer Island, Washington

In accordance with your authorization, Cobalt Geosciences, LLC has prepared this letter to discuss the results of our geotechnical evaluation at the referenced site.

The purpose of our evaluation was to provide recommendations for foundation design, grading, and earthwork as well as discussion of mapped geologic hazards.

Site Description

The site is located at 3508 96th Avenue SE in Mercer Island, Washington. The site consists of one irregularly shaped parcel (No. 4139300045) with a total area of 11,900 square feet.

The site is undeveloped and vegetated with grasses, blackberry vines, understory, and sparse small diameter trees.

The site is nearly level to slightly sloping downward to the south with relief of about 5 feet. There is a graded slope embankment south of the property and paved trail extending downward to the south toward I-90 with magnitudes of about 50 percent and relief of about 15 feet. There are walls on both sides of this graded slope.

The northern margin of the site contains seismic hazard areas per City mapping.

The site is bordered to the north and east by residential properties, to the west by a tract and to the south by a trail and I-90.

The proposed development includes a new residence and driveway in the central portion of the property.

Stormwater will be routed to City infrastructure since the site is within an infiltration infeasibility area. Site grading may include cuts and fills of about 12 feet or less for driveway and basement construction and foundation loads are expected to be light. We should be provided with the final plans to verify that our recommendations remain valid and do not require updating.

We note that we have reviewed provided plans from late 2022 and early 2023 which show shoring locations, grading, and finish floor elevations.

Area Geology

The Geologic Map of Mercer Island, indicates that the site is underlain by Vashon Recessional Lacustrine Deposits.

These materials include silt and clay deposited in lake environments during glacial retreat. These materials are normally consolidated and typically soft to medium stiff near the ground surface, becoming stiff and locally very stiff at depth.

Soil & Groundwater Conditions

As part of our evaluation, we advanced two hand borings where accessible to determine if soils consistent with seismic hazard areas are present at the site.

The soils encountered were logged in the field and are described in accordance with the Unified Soil Classification System (USCS).

The hand borings encountered approximately 6 inches of topsoil and vegetation underlain by about 3 to 5 feet of medium stiff, silt trace to with clay (Weathered Recessional Lacustrine Deposits). These soils were underlain by stiff to very stiff, sandy silt trace gravel (Vashon Recessional Lacustrine Deposits) which continued to the termination depths of the hand borings.

Groundwater was not observed or encountered in the explorations. Light volumes of groundwater could be present on or within the silt and clay deposits at variable depths below grade.

We reviewed nearby boring and test pit logs which encountered variable density silt and clay (low to high plasticity) underlain by stiff or firmer silts and fine grained deposits. It appears that this area is underlain consistently by lacustrine silts and clays and not outwash sands, which often have susceptibility to seismic activity.

Water table elevations often fluctuate over time. The groundwater level will depend on a variety of factors that may include seasonal precipitation, irrigation, land use, climatic conditions and soil permeability. Water levels at the time of the field investigation may be different from those encountered during the construction phase of the project. It would be necessary to install a piezometer to determine groundwater depths over a typical year.

City of Mercer Island GIS Mapped Hazards

The City of Mercer Island GIS maps indicate that the northern edge of the site is within a seismic hazard area. This designation is likely due to the mapped Vashon Recessional Outwash in the area. These deposits can include sands which can have susceptibility to liquefaction.

It is our opinion that the seismic hazard risks are low due to the very fine grained nature of the near surface soils. Mitigation for these hazards is not warranted.

Statement of Risk

Per Section 19.07.160B3 of the Mercer Island City Code, development within geologic hazard areas require that a Geotechnical Engineer licensed within the State of Washington provide a statement of risk with supporting documentation indicating that one of the following conditions can be met:

a. The geologic hazard area will be modified, or the development has been designed so that the risk to the lot and adjacent property is eliminated or mitigated such that the site is determined to be safe; or

b. An evaluation of site specific subsurface conditions demonstrates that the proposed development is not located in a geologic hazard area; or

c. Development practices are proposed for the alteration that would render the development as safe as if it were not located in a geologic hazard area; or

d. The alteration is so minor as not to pose a threat to the public health, safety and welfare.

The project meets the criteria of b from above. The site is underlain by very fine grained soils which have a low risk of liquefaction.

This proposed development can be completed without adversely affecting geologic hazards near or within the site.

Seismic Parameters

The overall subsurface profile corresponds to a Site Class *D* as defined by Table 1613.5.2 of the International Building Code (IBC). A Site Class *D* applies to an overall profile consisting of medium dense to very dense soils within the upper 100 feet.

We referenced the U.S. Geological Survey (USGS) Earthquake Hazards Program Website to obtain values for S_S, S_1, F_a, and F_v. The USGS website includes the most updated published data on seismic conditions. The following tables provide seismic parameters from the USGS web site with referenced parameters from ASCE 7-16.

Seismic Design Parameters (ASCE 7-16)

Site Class	Spectral Acceleration at 0.2 sec. (g)	Spectral Acceleration at 1.0 sec. (g)	Site Coefficients		Design Spectral Response Parameters		Design PGA
			F_a	F_v	S_{DS}	S_{D1}	
D	1.395	0.486	1.0	Null	0.93	Null	0.597

Additional seismic considerations include liquefaction potential and amplification of ground motions by soft/loose soil deposits. The liquefaction potential is highest for loose sand with a high groundwater table. The site has a low likelihood of liquefaction. For items listed as "Null" see Section 11.4.8 of the ASCE.

Conclusions and Recommendations

General

The site appears to be underlain by Lacustrine Deposits, consisting of silt with variable amounts of clay and fine sand. There may be areas of fill associated with historic grading in this area.

Foundation elements for the new residence should bear on medium dense/stiff or firmer native soils. Overexcavation of loose soils or fill is required if and where present.

The underlying stiff to very stiff and possibly hard silts have a low risk of liquefaction. Mitigation is not warranted.

Site Preparation

Trees, shrubs and other vegetation should be removed prior to stripping of surficial organic-rich soil and fill. Based on observations from the site investigation program, it is anticipated that the stripping depth will be 6 to 18 inches. Deeper excavations will be necessary in areas of loose soils and fill, where present.

The native soils consist of silt with fine sand and variable amounts of clay. These soils are not suitable for use as structural fill but may be used in landscaping areas if they can achieve 90 percent compaction (ASTM D1557 Test Method).

Imported structural fill should consist of a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). Structural fill should be placed in maximum lift thicknesses of 12 inches and should be compacted to a minimum of 95 percent of the modified proctor maximum dry density, as determined by the ASTM D 1557 test method.

Temporary Excavations

Based on our understanding of the project, we anticipate that the grading could include local cuts on the order of approximately 3 feet or less for foundation and most of the utility placement. Any deeper temporary excavations should be sloped no steeper than 1.5H:1V (Horizontal:Vertical) in loose/soft/medium stiff native soils and fill and 1H:1V in medium dense/stiff native soils. If an excavation is subject to heavy vibration or surcharge loads, we recommend that the excavations be sloped no steeper than 2H:1V, where room permits.

Temporary cuts should be in accordance with the Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. Temporary slopes should be visually inspected daily by a qualified person during construction activities and the inspections should be documented in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and reducing slope erosion during construction.

Temporary cut slopes should be covered with visqueen to help reduce erosion during wet weather, and the slopes should be closely monitored until the permanent retaining systems or slope configurations are complete. Materials should not be stored or equipment operated within 10 feet of the top of any temporary cut slope.

Soil conditions may not be completely known from the geotechnical investigation. In the case of temporary cuts, the existing soil conditions may not be completely revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of temporary slopes will need to be re-evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed and required deadlines can be met.

If any variations or undesirable conditions are encountered during construction, we should be notified so that supplemental recommendations can be made. If room constraints or groundwater conditions do not permit temporary slopes to be cut to the maximum angles allowed by the WAC, temporary shoring systems may be required. The contractor should be responsible for developing temporary shoring systems, if needed. We recommend that Cobalt Geosciences and the project structural engineer review temporary shoring designs prior to installation, to verify the suitability of the proposed systems.

Foundation Design

The proposed structure may be supported on a shallow spread footing foundation system bearing on undisturbed medium dense/stiff or firmer native soils or on properly compacted structural fill placed on the suitable native soils. Any undocumented fill and/or loose native soils should be removed and replaced with structural fill below foundation elements. Structural fill below footings should consist of clean angular rock 5/8 to 4 inches in size. We should verify soil conditions during foundation excavation work.

For shallow foundation support, we recommend widths of at least 16 and 24 inches, respectively, for continuous wall and isolated column footings supporting the proposed structure. Provided that the footings are supported as recommended above, a net allowable bearing pressure of 1,500 pounds per square foot (psf) may be used for design.

A 1/3 increase in the above value may be used for short duration loads, such as those imposed by wind and seismic events. Structural fill placed on bearing, native subgrade should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Footing excavations should be inspected to verify that the foundations will bear on suitable material.

Exterior footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Interior footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower.

If constructed as recommended, the total foundation settlement is not expected to exceed 1 inch. Differential settlement, along a 25-foot exterior wall footing, or between adjoining column footings, should be less than ½ inch. This translates to an angular distortion of 0.002. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. All footing excavations should be observed by a qualified geotechnical consultant.

Resistance to lateral footing displacement can be determined using an allowable friction factor of 0.30 acting between the base of foundations and the supporting subgrades. Lateral resistance for footings can also be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglect the upper 12 inches below grade in exterior areas). The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance.

Care should be taken to prevent wetting or drying of the bearing materials during construction. Any extremely wet or dry materials, or any loose or disturbed materials at the bottom of the footing excavations, should be removed prior to placing concrete. The potential for wetting or drying of the bearing materials can be reduced by pouring concrete as soon as possible after completing the footing excavation and evaluating the bearing surface by the geotechnical engineer or his representative.

Concrete Retaining Walls

The following table, titled **Wall Design Criteria**, presents the recommended soil related design parameters for retaining walls with a level backslope. Contact Cobalt if an alternate retaining wall system is used. This has been included for new cast in place walls, if any are proposed.

Wall Design Criteria	
"At-rest" Conditions (Lateral Earth Pressure – EFD[+])	60 pcf (Equivalent Fluid Density)
"Active" Conditions (Lateral Earth Pressure – EFD[+])	40 pcf (Equivalent Fluid Density)
Seismic Increase for "At-rest" Conditions (Lateral Earth Pressure)	14H* (Uniform Distribution)
Seismic Increase for "Active" Conditions (Lateral Earth Pressure)	7H* (Uniform Distribution)
Passive Earth Pressure on Low Side of Wall (Allowable, includes F.S. = 1.5)	Neglect upper 2 feet, then 250 pcf EFD[+]
Soil-Footing Coefficient of Sliding Friction (Allowable; includes F.S. = 1.5)	0.30

*H is the height of the wall; Increase based on one in 500 year seismic event (10 percent probability of being exceeded in 50 years),
[+]EFD – Equivalent Fluid Density. Assumes excavation into stiff to hard soils for passive pressures.

The stated lateral earth pressures do not include the effects of hydrostatic pressure generated by water accumulation behind the retaining walls. Uniform horizontal lateral active and at-rest pressures on the retaining walls from vertical surcharges behind the wall may be calculated using active and at-rest lateral earth pressure coefficients of 0.3 and 0.5, respectively. A soil unit weight of 125 pcf may be used to calculate vertical earth surcharges.

To reduce the potential for the buildup of water pressure against the walls, continuous footing drains (with cleanouts) should be provided at the bases of the walls. The footing drains should consist of a minimum 4-inch diameter perforated pipe, sloped to drain, with perforations placed down and enveloped by a minimum 6 inches of pea gravel in all directions.

The backfill adjacent to and extending a lateral distance behind the walls at least 2 feet should consist of free-draining granular material. All free draining backfill should contain less than 3 percent fines (passing the U.S. Standard No. 200 Sieve) based upon the fraction passing the U.S. Standard No. 4 Sieve with at least 30 percent of the material being retained on the U.S. Standard No. 4 Sieve. The primary purpose of the free-draining material is the reduction of hydrostatic pressure. Some potential for the moisture to contact the back face of the wall may exist, even with treatment, which may require that more extensive waterproofing be specified for walls, which require interior moisture sensitive finishes.

We recommend that the backfill be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. In place density tests should be performed to verify adequate compaction. Soil compactors place transient surcharges on the backfill. Consequently, only light hand operated equipment is recommended within 3 feet of walls so that excessive stress is not imposed on the walls.

Stormwater Management Feasibility

All stormwater should be collected and routed via tightline or perforated connection into City infrastructure. The near surface soils consist of silt trace to with clay and very fine sand. These deposits are typically impermeable or near-impermeable. Systems for flow control may be feasible provided there is overflow and possibly collection systems near property margins. We can provide additional input if other systems are under consideration.

Slab-on-Grade

We recommend that the upper 12 inches of the existing native soils within slab areas be re-compacted to at least 95 percent of the modified proctor (ASTM D1557 Test Method).

Often, a vapor barrier is considered below concrete slab areas. However, the usage of a vapor barrier could result in curling of the concrete slab at joints. Floor covers sensitive to moisture typically requires the usage of a vapor barrier. A materials or structural engineer should be consulted regarding the detailing of the vapor barrier below concrete slabs. Exterior slabs typically do not utilize vapor barriers.

The American Concrete Institutes ACI 360R-06 Design of Slabs on Grade and ACI 302.1R-04 Guide for Concrete Floor and Slab Construction are recommended references for vapor barrier selection and floor slab detailing.

Slabs on grade may be designed using a coefficient of subgrade reaction of 150 pounds per cubic inch (pci) assuming the slab-on-grade base course is underlain by structural fill placed and compacted as outlined above. A 4- to 6-inch-thick capillary break layer should be placed over the prepared subgrade. This material should consist of pea gravel or 5/8 inch clean angular rock.

A perimeter drainage system is recommended unless interior slab areas are elevated a minimum of 12 inches above adjacent exterior grades. If installed, a perimeter drainage system should consist of a 4-inch diameter perforated drain pipe surrounded by a minimum 6 inches of drain rock wrapped in a non-woven geosynthetic filter fabric to reduce migration of soil particles into the drainage system. The perimeter drainage system should discharge by gravity flow to a suitable stormwater system.

Exterior grades surrounding buildings should be sloped at a minimum of one percent to facilitate surface water flow away from the building and preferably with a relatively impermeable surface cover immediately adjacent to the building.

Erosion and Sediment Control

Erosion and sediment control (ESC) is used to reduce the transportation of eroded sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be implemented, and these measures should be in general accordance with local regulations. At a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features for the site:

- Schedule the soil, foundation, utility, and other work requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities can be completed during the wet season (generally October through April).
- All site work should be completed and stabilized as quickly as possible.

- Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.
- Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

Utilities

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards, by a contractor experienced in such work. The contractor is responsible for the safety of open trenches. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

In general, silty and sandy soils were encountered at shallow depths in the explorations at this site. These soils have low cohesion and density and will have a tendency to cave or slough in excavations. Shoring or sloping back trench sidewalls is required within these soils in excavations greater than 4 feet deep.

All utility trench backfill should consist of imported structural fill or suitable on site soils. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. Depending on the depth and location of the proposed utilities, we anticipate the need to re-compact existing fill soils below the utility structures and pipes. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction procedures.

CONSTRUCTION FIELD REVIEWS

Cobalt Geosciences should be retained to provide part time field review during construction in order to verify that the soil conditions encountered are consistent with our design assumptions and that the intent of our recommendations is being met. This will require field and engineering review to:

- Monitor and test structural fill placement and soil compaction
- Observe bearing capacity at foundation locations
- Observe slab-on-grade preparation
- Monitor foundation drainage placement
- Observe excavation stability

Geotechnical design services should also be anticipated during the subsequent final design phase to support the structural design and address specific issues arising during this phase. Field and engineering review services will also be required during the construction phase in order to provide a Final Letter for the project.

CLOSURE

This report was prepared for the exclusive use of Sam Adams and his appointed consultants. Any use of this report or the material contained herein by third parties, or for other than the intended purpose, should first be approved in writing by Cobalt Geosciences, LLC.

The recommendations contained in this report are based on assumed continuity of soils with those of our test holes and assumed structural loads. Cobalt Geosciences should be provided with final architectural and civil drawings when they become available in order that we may review our design recommendations and advise of any revisions, if necessary.

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of Sam Adams who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Cobalt Geosciences should any of these not be satisfied.

Sincerely,

Cobalt Geosciences, LLC

8/9/2023
Phil Haberman, PE, LG, LEG
Princip

Statement of General Conditions

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Cobalt Geosciences and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Cobalt Geosciences present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Cobalt Geosciences is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

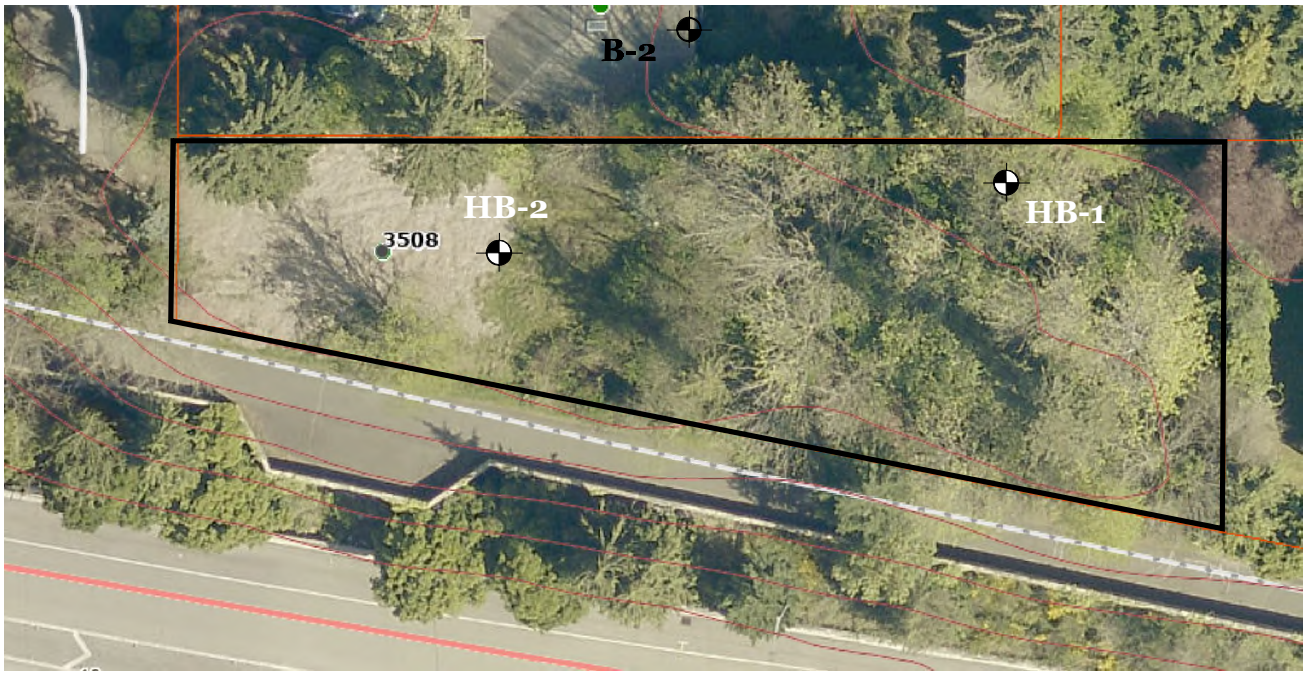
STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Cobalt Geosciences at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Cobalt Geosciences must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Cobalt Geosciences will not be responsible to any party for damages incurred as a result of failing to notify Cobalt Geosciences that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Cobalt Geosciences, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Cobalt Geosciences cannot be responsible for site work carried out without being present.

King County Imap



HB-1 **Approximate Hand Boring Location**

N

King County Imap

Not to Scale

COBALT GEOSCIENCES	Proposed Residence 3508 96th Avenue SE Mercer Island, Washington	**SITE MAP** **FIGURE 1**	Cobalt Geosciences, LLC P.O. Box 82243 Kenmore, WA 98028 (206) 331-1097 www.cobaltgeo.com cobaltgeo@gmail.com

Log of Hand Boring HB-1

Date: August 2023	Depth: 6'	Initial Groundwater: None
Contractor:	Elevation:	Sample Type: Grab
Method: Hand Auger	Logged By: PH Checked By: SC	Final Groundwater: N/A

Depth (Feet)	Interval	% Recovery	Blows/6"	Graphic Log	USCS Symbol	Material Description
						Vegetation/Topsoil
1					ML	Medium stiff, silt trace clay, locally mottled yellowish brown to grayish brown, moist. (Possible Fill over Weathered Lacustrine Deposits)
2	■					
3						
4					ML	Stiff, silt trace clay, locally mottled olive brown to grayish brown, moist. (Lacustrine Deposits)
5						
6	■					End of Hand Boring 6'
7						
8						
9						
10						

Groundwater

Moisture Content (%)
Plastic Limit — Liquid Limit

SPT N-Value
0 10 20 30 40 50

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Proposed Residence
3508 96th Avenue SE
Mercer Island, Washington

Hand Boring Log

Log of Hand Boring HB-2

Date: August 2023	Depth: 6'	Initial Groundwater: None
Contractor:	Elevation:	Sample Type: Grab
Method: Hand Auger	Logged By: PH Checked By: SC	Final Groundwater: N/A

Depth (Feet)	Interval	% Recovery	Blows/6"	Graphic Log	USCS Symbol	Material Description
						Vegetation/Topsoil
1					ML	Medium stiff to locally stiff, silt trace clay, locally mottled yellowish brown to grayish brown, moist. (Possible Fill over Weathered Lacustrine Deposits)
2						
3						
4						
5						
6					ML	Stiff to very stiff, silt trace clay, locally mottled olive brown to grayish brown, moist. (Lacustrine Deposits)
						End of Hand Boring 6'
7						
8						
9						
10						

Groundwater

Moisture Content (%)
Plastic Limit — Liquid Limit

SPT N-Value
0 10 20 30 40 50

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Proposed Residence
3508 96th Avenue SE
Mercer Island, Washington

Hand Boring Log

MATCHLINE SHEET 2

MATCHLINE SHEET 4

B-19

LS II VALVE VAULT

NME-15

97th AVE SE

REHABILITATED EXISTING LS II FORCE MAIN

EAST CHANNEL SIPHON ROCK CATCHER, INLET, AND ODOR CONTROL STRUCTURES

NME-39

SE 34th ST

NEW LS II FORCE MAIN

CONTRACT NO.C01339C20
CONTRACT NO.C01340C20

104+10

201+00

NME-40

100+00

NME-16

TP-4

100th AVE SE

NMPS FORCE MAIN DISCHARGE AND ODOR CONTROL STRUCTURES

N MERCER WAY

FORTUNA DR

PIPE ALIGNMENT

95+00

NME-14

96th AVE SE SIPHON

I-90

90+00

NME-37

B-13-85

75+00

NME-12

B-4-89

B-1-03

B-7-93

B-2-03

80+00

NME-13

85+00

I-90

B-5-79

B-203

I-90

B-4-85

SE 36th ST

N

LEGEND

NME-01 Current Exploration Designation and Approximate Location (Completed by Shannon & Wilson)

B-1, TP-1 Existing Exploration Designation and Approximate Location (Completed by Others)

0 200 400

Scale in Feet

NOTE

Figure adapted from JACOBS' file *E00306E13-PIPE-ALIGN,* dated 4-10-20 and Tetra Tech's files *E00306E-PIPE-ALIGN-ECS_EAST,* dated 5-1-20, and *E00306E-PIPE-EIR_EAST, E00306E-PIPE-EIS_EAST, and E00306E-PIPE-SSWR-N_EAST.dwg* dated 4-13-20.

SHEET KEY

North Mercer Island Interceptor and Enatai Interceptor Upgrade Project
King County, Washington

SITE AND EXPLORATION PLAN
CONVEYANCE
CONTRACT NO. C01340C20

May 2020 21-1-22000-212

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 3 of 6

Filename: F:\J21\122000\212\21-1-22000 Plans.dwg Layout: Sheet 3_GDR Date: 05-06-2020 Login: SAC

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

S&W INORGANIC SOIL CONSTITUENT DEFINITIONS

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

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

MOISTURE CONTENT TERMS

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

STANDARD PENETRATION TEST (SPT) SPECIFICATIONS

Hammer:	140 pounds with a 30-inch free fall. Rope on 6- to 10-inch-diam. cathead 2-1/4 rope turns, > 100 rpm NOTE: If automatic hammers are used, blow counts shown on boring logs should be adjusted to account for efficiency of hammer.
Sampler:	10 to 30 inches long Shoe I.D. = 1.375 inches Barrel I.D. = 1.5 inches Barrel O.D. = 2 inches
N-Value:	Sum blow counts for second and third 6-inch increments. Refusal: 50 blows for 6 inches or less; 10 blows for 0 inches.

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

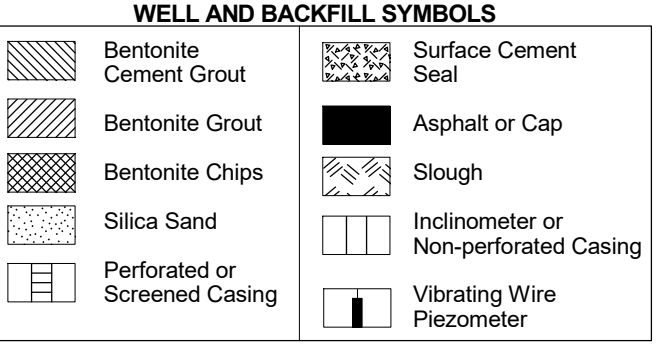
PARTICLE SIZE DEFINITIONS

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

RELATIVE DENSITY / CONSISTENCY

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

WELL AND BACKFILL SYMBOLS



PERCENTAGES TERMS [1, 2]

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

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

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

North Mercer Island Interceptor and
Enatai Interceptor Upgrade Project
King County, Washington

SOIL DESCRIPTION AND LOG KEY

May 2020 21-1-22000-212

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-1
Sheet 1 of 3

SOIL_CLASS_KEY_PG1 21-22000.GPJ SHAN_WIL.GDT 4/21/20

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

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

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

NOTES

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

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

North Mercer Island Interceptor and
Enatai Interceptor Upgrade Project
King County, Washington

SOIL DESCRIPTION AND LOG KEY

May 2020 21-1-22000-212

SHANNON & WILSON, INC.
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FIG. A-1
Sheet 2 of 3

SOIL_CLASS_KEY_PG2 21-22000.GPJ SHAN_WIL.GDT 4/21/20

GRADATION TERMS

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

CEMENTATION TERMS[1]

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

PLASTICITY[2]

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

ADDITIONAL TERMS

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

PARTICLE ANGULARITY AND SHAPE TERMS[1]

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

ACRONYMS AND ABBREVIATIONS

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

STRUCTURE TERMS[1]

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

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North Mercer Island Interceptor and
Enatai Interceptor Upgrade Project
King County, Washington

SOIL DESCRIPTION AND LOG KEY

May 2020 21-1-22000-212

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-1
Sheet 3 of 3

SOIL_CLASS_KEY_PG3 21-22000.GPJ SHAN_WIL.GDT 4/21/20

Total Depth:	*21.5 ft.*	Northing:	*~ 214,309 ft.*	Drilling Method:	*Hollow Stem Auger*	Hole Diam.:	*8 in.*
Top Elevation:	*~ 179 ft.*	Easting:	*~ 1,300,464 ft.*	Drilling Company:	*Holt*	Rod Diam.:	*NWJ*
Vert. Datum:	*KC Metro*	Station:	*~*	Drill Rig Equipment:	*Mobile Drill B57 Track Rig*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD83*	Offset:	*~*	Other Comments:	*~*		

SOIL DESCRIPTION

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

Asphalt. — 0.4

Medium dense, brown *Silt with Sand (ML)* to *Sandy Silt (ML)*; moist; less than 5% fine, subrounded to subangular gravel; fine to coarse sand; nonplastic to low plasticity fines; trace organics; trace pockets with iron-oxide staining; trace asphalt clasts.
(Hf)

7.5

Dense, brown, *Silt with Sand (ML)*; to *Sandy Silt (ML)*; moist; fine sand; nonplastic fines; trace partings with iron-oxide staining.
(Qvgl)

12.5

Medium dense, brown *Silt (ML)*; moist; less than 10% fine sand; nonplastic to low plasticity fines; trace partings with iron-oxide staining.
(Qvgl)

17.0

Medium dense, gray *Silt with Sand (ML)*; moist; fine sand; nonplastic fines.
(Qvgl)

CONTINUED NEXT SHEET

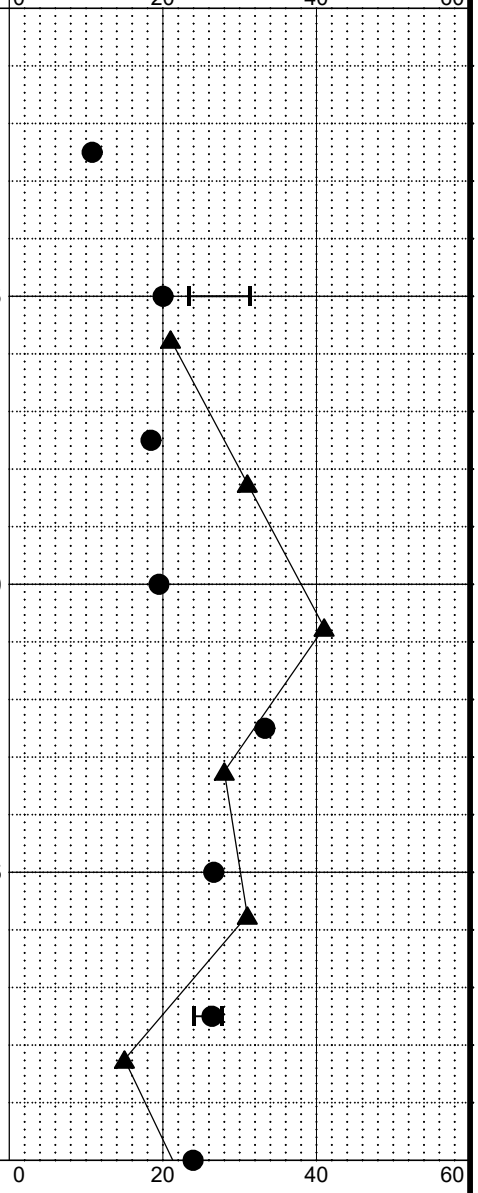
Depth, ft. | Symbol | Samples | Ground Water | Depth, ft.

Samples: S-2, S-3, S-4, S-5, S-6, S-7

Ground Water: None Observed During Drilling; Dry (06/04/19)

PENETRATION RESISTANCE (blows/foot)

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



◇ % Fines (<0.075mm)
● % Water Content
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

LEGEND

- I Sample Recovery
- * Sample Not Recovered
- Sonic Core Sample
- 2.0" O.D. Split Spoon Sample
- Ground Water Level in Well

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

North Mercer Island Interceptor and Enatai Interceptor Upgrade Project
King County, Washington

LOG OF BORING NME-14

May 2020 — 21-1-22000-212

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-13
Sheet 1 of 2

REV 3 - Approved for Submittal

MASTER LOG BFW 21-22000.GPJ SHAN WIL.GDT 4/29/20 Log: JAA Rev: EAS Typ: LKN

Total Depth:	*21.5 ft.*	Northing:	*~ 214,309 ft.*	Drilling Method:	*Hollow Stem Auger*	Hole Diam.:	*8 in.*
Top Elevation:	*~ 179 ft.*	Easting:	*~ 1,300,464 ft.*	Drilling Company:	*Holt*	Rod Diam.:	*NWJ*
Vert. Datum:	*KC Metro*	Station:	*~*	Drill Rig Equipment:	*Mobile Drill B57 Track Rig*	Hammer Type:	*Automatic*
Horiz. Datum:	*NAD83*	Offset:	*~*	Other Comments:	*~*		

SOIL DESCRIPTION

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

Depth, ft. | Symbol | Samples | Ground Water Depth, ft.

PENETRATION RESISTANCE (blows/foot)

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

Depth, ft.	Soil Description	Samples	Penetration Resistance (blows/foot)
21.5	BOTTOM OF BORING COMPLETED 12/1/2016	S-8	

0 20 40 60

25

30

35

0 20 40 60

LEGEND

- I Sample Recovery
- * Sample Not Recovered
- Sonic Core Sample
- 2.0" O.D. Split Spoon Sample
- Ground Water Level in Well

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ⊢●⊣ Liquid Limit

Natural Water Content

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

North Mercer Island Interceptor and
Enatai Interceptor Upgrade Project
King County, Washington

LOG OF BORING NME-14

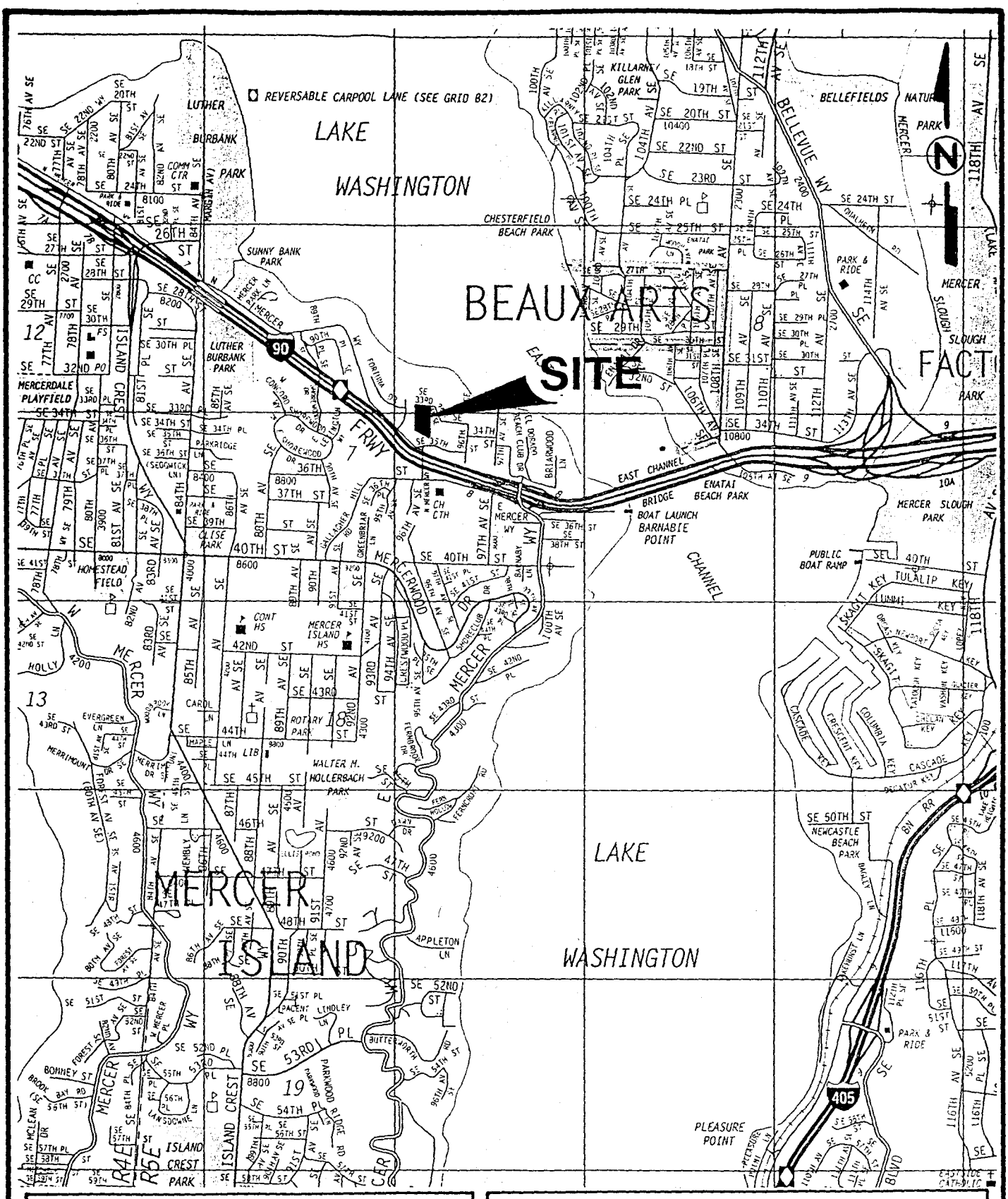
May 2020 | 21-1-22000-212

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-13
Sheet 2 of 2

REV 3 - Approved for Submittal

MASTER LOG BFW 21-22000.GPJ SHAN WIL.GDT 4/29/20 Log: JAA Rev: EAS Typ: LKN



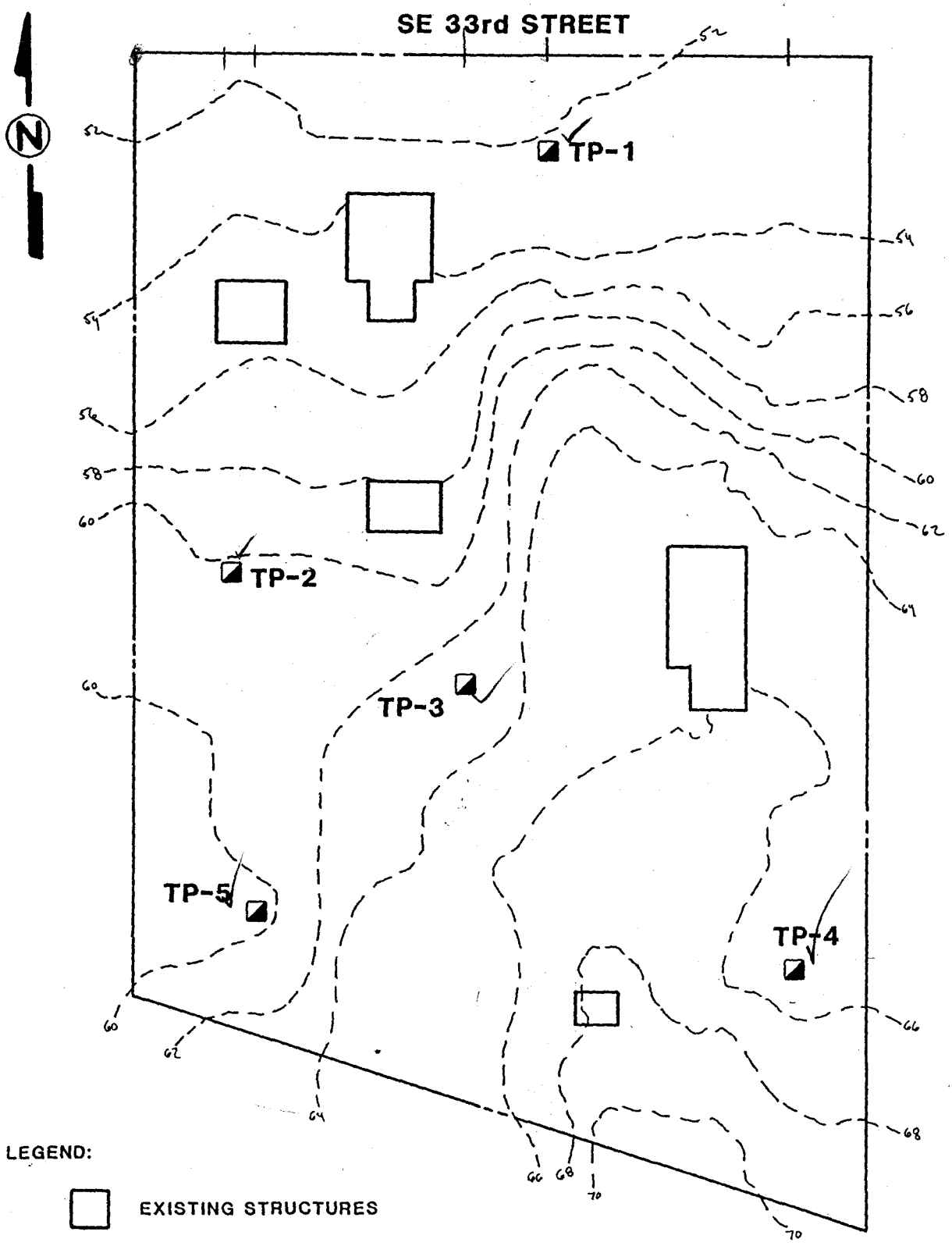
GEOTECH CONSULTANTS

VICINITY MAP

SE 33rd STREET

MERCER ISLAND, WA

Job No.:	Date:	Logged By:	Plate:
96316	SEP 1996		1



LEGEND:

EXISTING STRUCTURES

APPROXIMATE TEST PIT LOCATIONS

GEOTECH CONSULTANTS

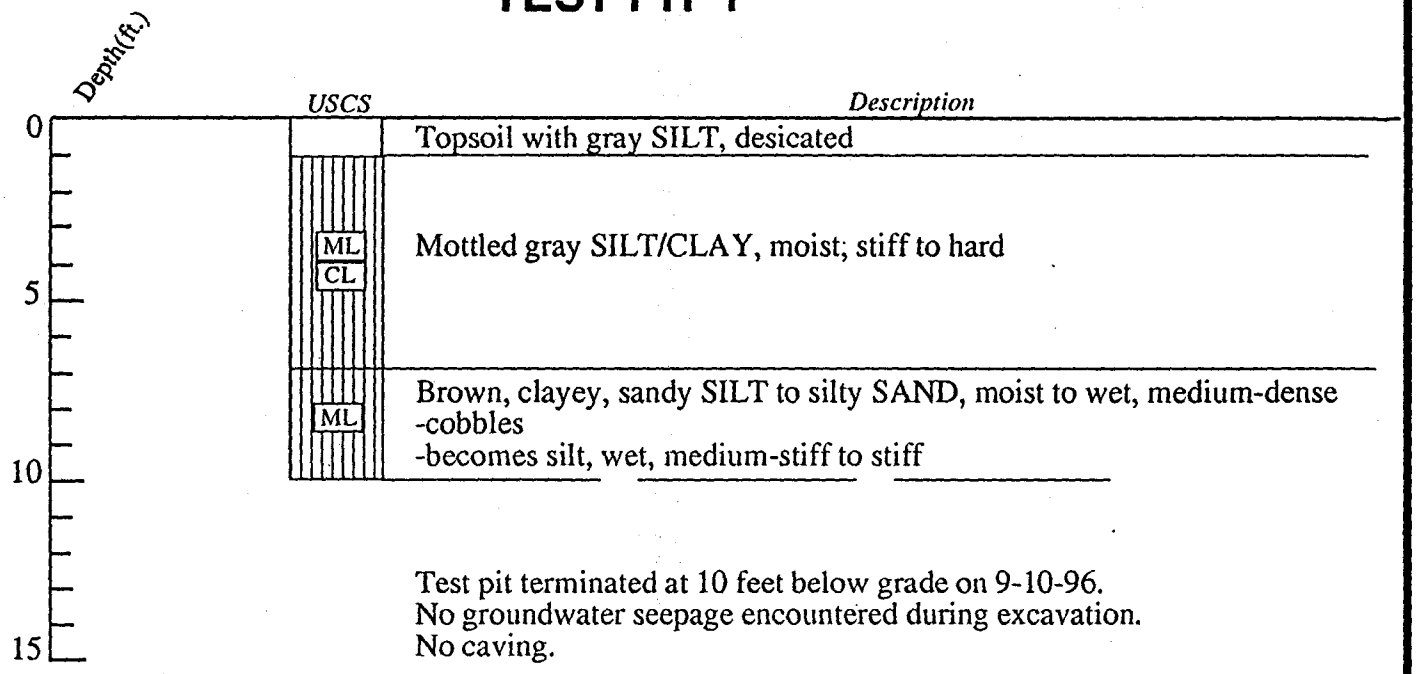
SITE EXPLORATION PLAN

SE 33rd STREET

MERCER ISLAND, WA

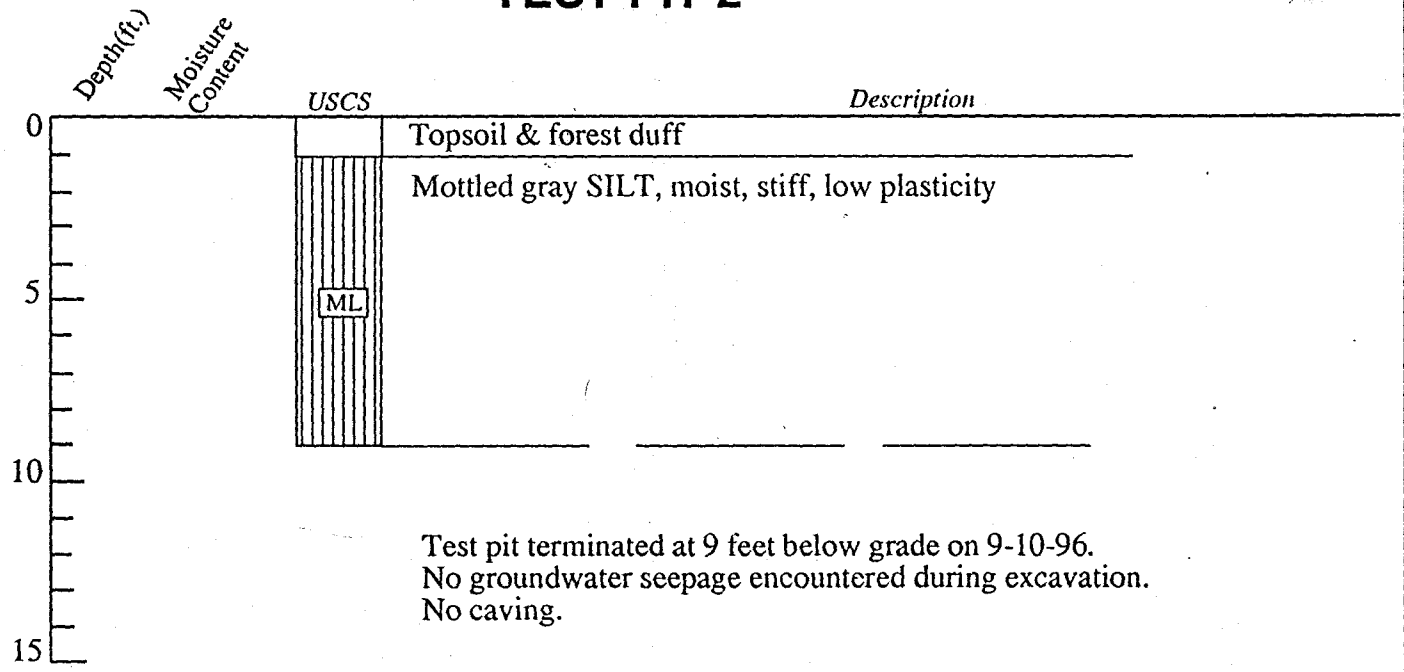
Job No.:	Date:		Plate:
96316	SEP 1996		2

TEST PIT 1



Test pit terminated at 10 feet below grade on 9-10-96.
No groundwater seepage encountered during excavation.
No caving.

TEST PIT 2



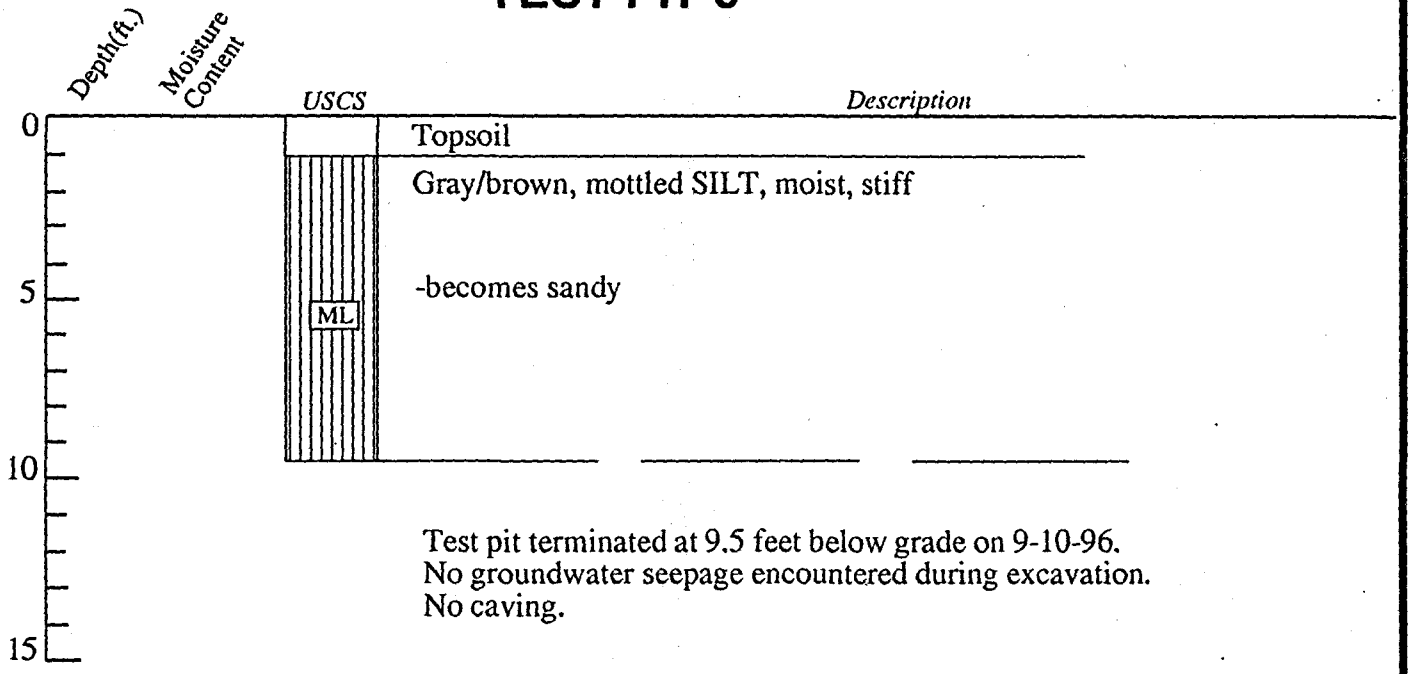
Test pit terminated at 9 feet below grade on 9-10-96.
No groundwater seepage encountered during excavation.
No caving.

GEOTECH
CONSULTANTS, INC.

TEST PIT LOGS
SE 33rd STREET
MERCER ISLAND, WA

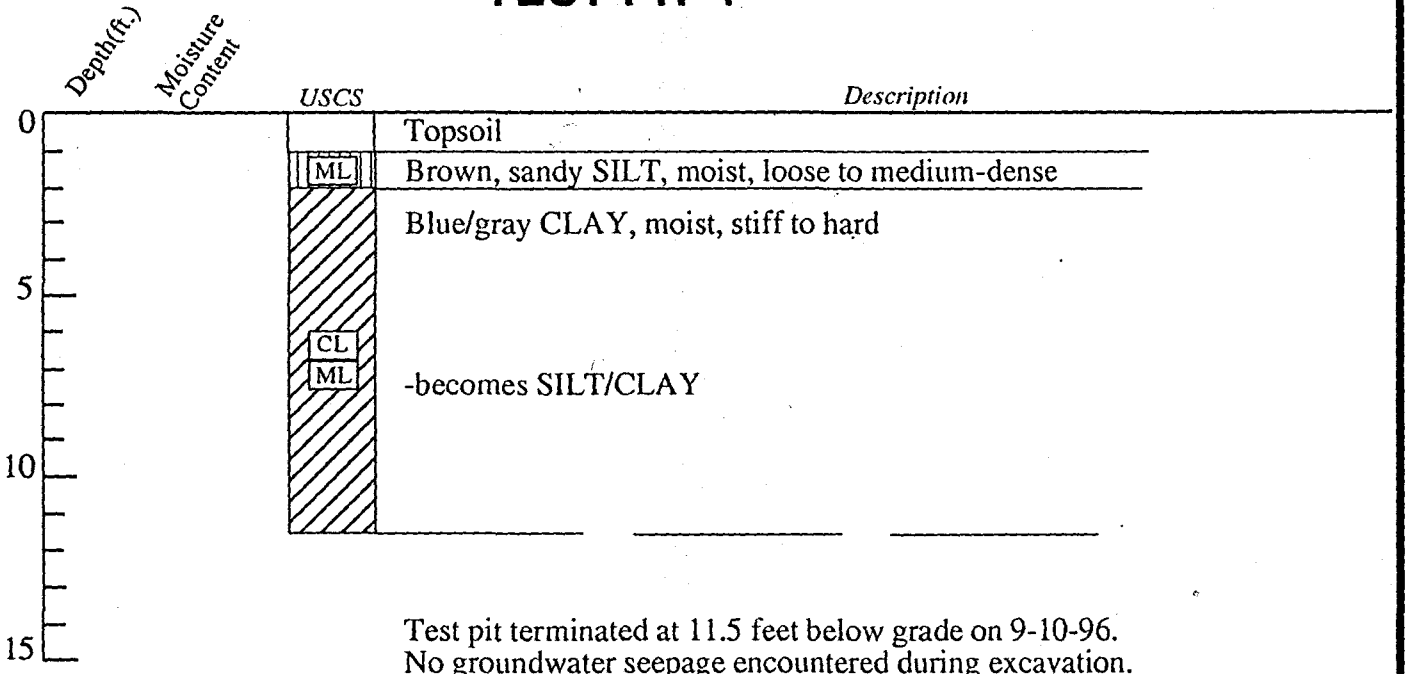
Job No:	Date:	Logged by:	Plate:
96316	SEP 1996	DBG	3

TEST PIT 3



Test pit terminated at 9.5 feet below grade on 9-10-96.
No groundwater seepage encountered during excavation.
No caving.

TEST PIT 4



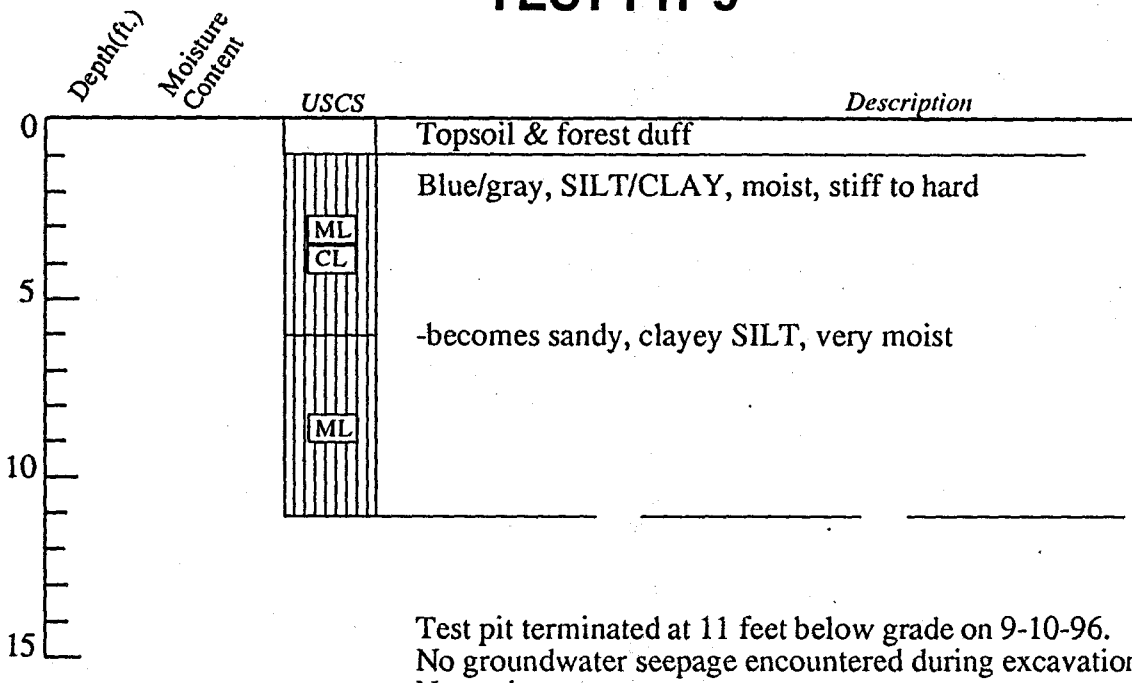
Test pit terminated at 11.5 feet below grade on 9-10-96.
No groundwater seepage encountered during excavation.
No caving.

GEOTECH
CONSULTANTS, INC.

TEST PIT LOGS
SE 33rd STREET
MERCER ISLAND, WA

Job No:	Date:	Logged by:	Plate:
96316	SEP 1996	DBG	4

TEST PIT 5



Test pit terminated at 11 feet below grade on 9-10-96.
No groundwater seepage encountered during excavation.
No caving.

GEOTECH
CONSULTANTS, INC.

TEST PIT LOGS
SE 33rd STREET
MERCER ISLAND, WA

Job No:	Date:	Logged by:	Plate:
96316	SEP 1996	DBG	5

HR LINE

WING WALL "C"

WING WALL "D"

10

S-23

TO SEATTLE

TP-3

TP-2

TP-1

B-9

B-13

P-69

42" STORM DRAIN

Landscaped

NORTH MERCER WAY

End of Barrier

SR 90

TO BELLEVUE

Curb

End of Curb

WING WALL "B"

B-3

TP-4

B-1

P-71

WING WALL "A"

12

B-2

H-7-11

H-7-12

H-7-13

Parking

B-6

HR LINE

D-13

B-4

B-7

Asph.

Brush

Trees

Barrier

TEMP. S.E. 36TH EXIT

N 214,000

E 1,660,000

8

Lawn

LEGEND

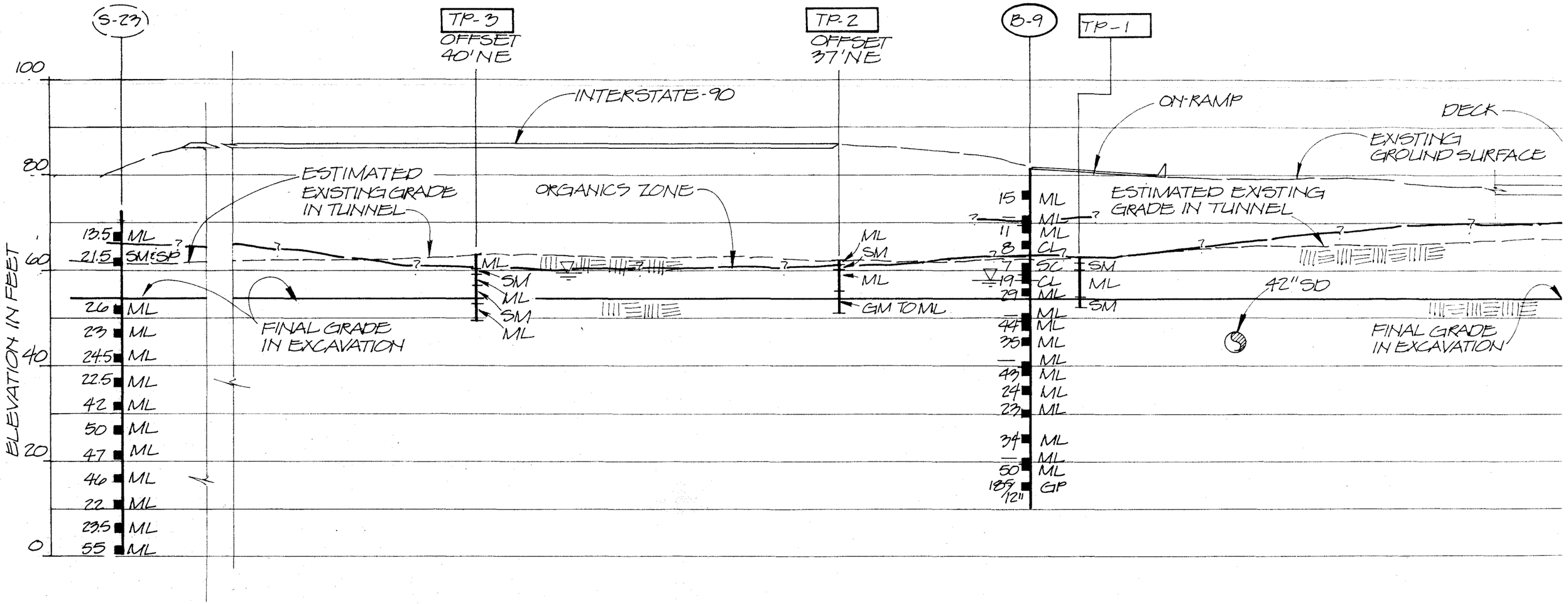
△ H-7-11	WSDOT BORING LOCATIONS
△ D-13	WSDOT BORING LOCATIONS
▲ P-71	CONVERSE WARD DAVIS DIXON BORING LOCATIONS
◓ B-13	CH2M HILL BORING LOCATIONS
▪ TP-1	CH2M HILL TEST PIT LOCATIONS
○ 10	LOCATIONS PROPOSED BY CH2M HILL, BUT NOT DRILLED
●	RZA BORINGS

NOTES:
1. BASE MAP TAKEN FROM WSDOT PHOTOGRAMETRIC MAP, FLOWN 12 / 17 / 83.

0 60 120

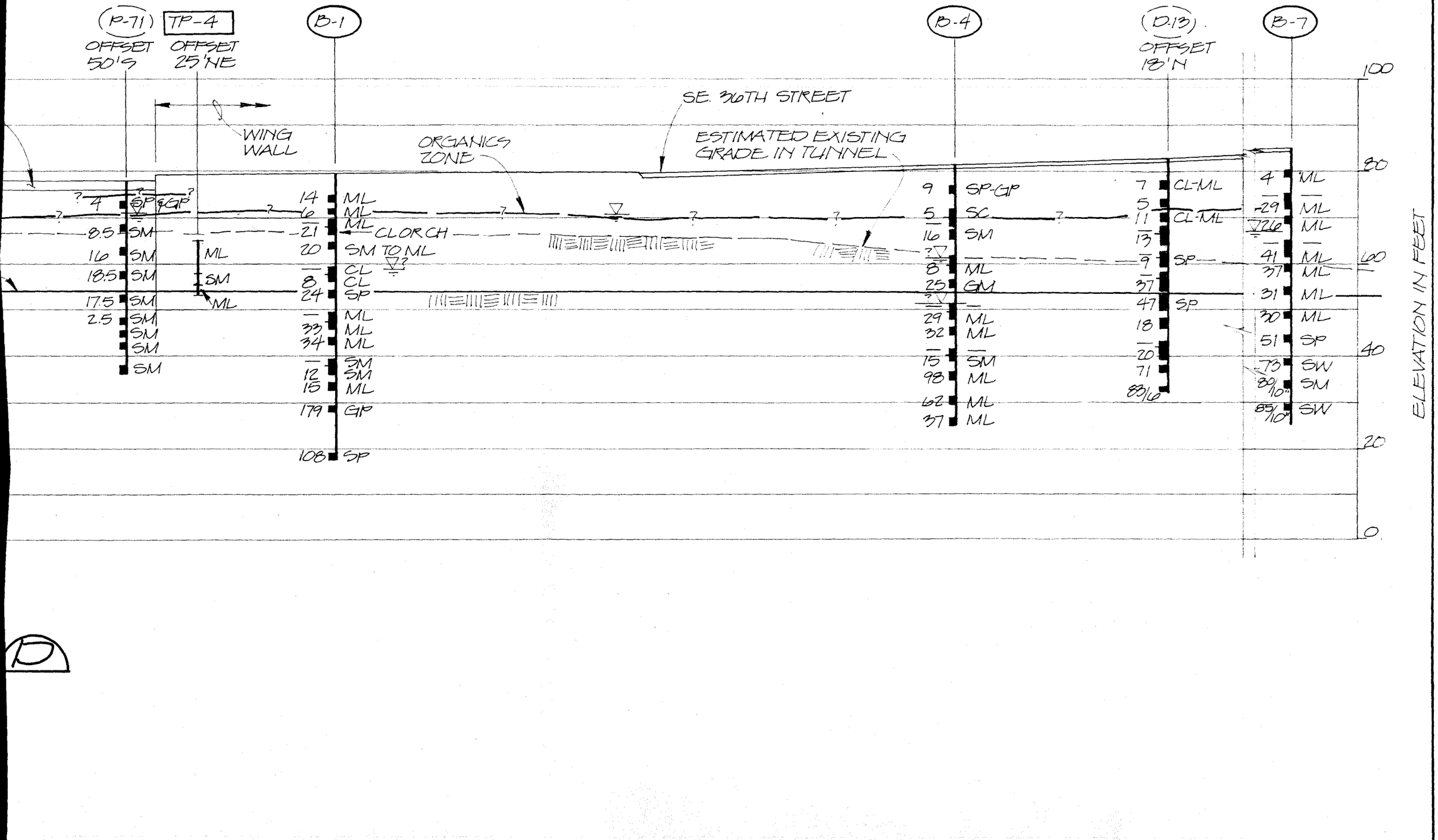
SCALE IN FEET

SITE PLAN AND TEST HOLE LOCATIONS


S-23
TP-3
OFFSET
40'NE
TP-2
OFFSET
37'NE
B-9
TP-1
INTERSTATE-90
ON-RAMP
DECK
EXISTING
GROUND SURFACE
ESTIMATED
EXISTING GRADE
IN TUNNEL
ORGANICS ZONE
ESTIMATED EXISTING
GRADE IN TUNNEL
FINAL GRADE
IN EXCAVATION
42" SD
FINAL GRADE
IN EXCAVATION
ELEVATION IN FEET
100
80
60
40
20
0
13.5 ML
21.5 SM/SP
26 ML
23 ML
24.5 ML
22.5 ML
42 ML
50 ML
47 ML
46 ML
22 ML
23.5 ML
55 ML
ML
SM
ML
SM
ML
ML
SM
ML
GM TO ML
15 ML
ML
11 ML
8 CL
7 SC
19 CL
29 ML
ML
44 ML
35 ML
ML
43 ML
24 ML
23 ML
34 ML
ML
50 ML
18/12" GP
SM
ML
SM

SECTION (

PRELIMINARY



SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-1**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 21' 6/28/85

ELEVATION: 79.6'
DATE: JUNE 28, 1985
START TIME: 1130 6/28/85
COMPLETION: 1300 6/28/85
LOGGER: K.D. SHARP
PAGE: 1 OF: 3

DEPTH ELEVATION	DEPTH FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	0					PRELIMINARY		
	5		S-1 JAR	1"	5-7-7 (14)	CLAYEY SILT, medium plastic, 5-10% fine sand, gray, slightly moist, medium (ML)		
			S-2 JAR	7"	2-2-4 (6)	SILT, gray to blue with mottled brown, 1/2" to 1" layers of fine SANDY SILT, moist, soft (ML)		
	10		S-3 TUBE	6"		SANDY SILT, gray at end of tube (ML)		100 psi to push tube
			S-4 JAR	13"	2-8-13 (21)	CLAY, medium to highly plastic, with silty sand layers, 1-2" layer fine gravel in matrix, gray, some mottled brown layers, moist, very stiff (CL or CH)		
	15		S-5 JAR	12"	2-6-14 (20)	ORGANIC CLAY, black and brown mottles, moist, very stiff (OL or OH) with SILTY SAND or SANDY SILT layers, fine sand, wet (SM to ML)		
	20		S-6 TUBE	24"		CLAY, medium plastic, gray, moist, medium stiff (CL)		100 psi to push tube
			S-7 JAR	11"	2-3-5 (8)	CLAY, medium plastic, gray, moist, medium stiff, 1" saturated sand on top, some gravel in matrix, (CL)		gravel in drilling
	25							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-1**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: ~21' 6/28/85

ELEVATION: 79.6'
DATE: JUNE 28, 1985
START TIME: 1130 6/28/85
COMPLETION: 1300 6/28/85
LOGGER: K.D. SHARP
PAGE: 2 OF: 3

DEPTH ELEVATION FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-8 JAR	10"	4-12-12 (24)	SAND, poorly graded, medium to fine, gray, saturated, medium dense, clay and silt in matrix (SP)		
					PRELIMINARY		
30		S-9 TUBE	15"		SILT, plastic, 5% very fine sand, gray, moist, very stiff to hard, (ML)		Tube crimped 300-500 psi to push tube
		S-10 JAR	18"	4-9-24 (33)	SILT, low plasticity, lenses of fine sand, (ML)		
35		S-11 JAR	18"	7-13-21 (34)	SILT, same as S-9 (ML)		
40		S-12 TUBE	24"		SILT, same as S-9, very stiff to hard, gravel in matrix (ML)		550 psi to push tube
		S-13 JAR	18"	23-40-80 (120)	SILTY SAND, fine to medium, hard, fine rounded gravel in matrix (SM)		
45		S-14 JAR	18"	37-57-100 (157)	SANDY SILT, with lenses of fine sand, fractured, hard, gravel size increasing (ML)		
50							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-1**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: ~21' 6/28/85

ELEVATION: 79.6'
DATE: JUNE 28, 1985
START TIME: 1130 6/28/85
COMPLETION: 1300 6/28/85
LOGGER: K.D. SHARP
PAGE: 3 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
50		S-15 JAR	18"	41-75-104 (179)	SANDY GRAVEL, some fines, gray, saturated, very dense (GP)		Difficult augering, very hard
55							Inclinometer installed at 61' with much difficulty, heave 10', jetted out hole to reinstall, pipe pushed up 10' then went down 3' below g.s. grouted with weak grout, will take one week to get first reading.
60		S-16 JAR	15"	55-48-60 (108)	SAND, poorly graded, fine, gray, wet, very dense, 5-10% silt (SP)		
					End of Boring = 61.5 feet		
65							

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-2**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 3' 6/30/85

ELEVATION: 77.0'
DATE: JUNE 30, 1985
START TIME: 3:00 6/29/85
COMPLETION: 9:00 6/30/85
LOGGER: K.D. SHARP
PAGE: 1 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
0					PRELIMINARY		Water at 3'
5		S-1 JAR	1"	3-3-3 (6)	SANDY GRAVEL, poorly graded, brown, moist, (GP)		
		S-2 JAR	3"	2-3-4 (7)	CLAY, medium plastic, brown, moist (CL)		
10		S-3 JAR	2"	1-1-2 (3)	CLAY, highly plastic, 10% fine sand, brown to gray, moist, soft, (CH)		
15		S-4 TUBE	24"		SANDY SILT, non-plastic, fine sand, gray, moist, stiff, (ML)		75 psi to 125 psi to push tube
		S-5 JAR		4-8-9 (17)	SANDY CLAY, fine sand, gray, moist to wet, medium dense, layers of medium sand, 1/2 - 1" layer of plastic silt, (SC)		6" heave
20		S-6 JAR	18"	3-5-7 (12)	SILT, medium plastic, gray, moist, stiff, 5% very fine sand and pebbles (ML)		
25							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-2**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 3', 6/30/85

ELEVATION: 77.0'
DATE: JUNE 30, 1985
START TIME: 3:00 6/29/85
COMPLETION: 9:00 6/30/85
LOGGER: K.D. SHARP
PAGE: 2 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-7 TUBE	2'		CLAY, medium plastic, gray, moist, stiff, 5% sand (CL)		75 psi to push tube
		S-8 JAR	7"	12-29-53 (82)	SILT, medium plastic, gray, moist to wet, stiff, some fine angular gravel (ML)		hard at 27.5
30		S-9 JAR	16"	9-16-21 (37)	SILT, low plasticity, gray, moist, very stiff, massive (ML)		
35		S-10 JAR	18"	13-16-29 (45)	SILT, low plasticity, gray, wet, stiff, some rounded gravel and fine sand (ML)		Attempted shelby, could not push gravels at 37'
40		S-11 JAR	15"	27-34-50/4" (84)	SILTY SAND, fine to medium, 5% gravel, gray, saturated, dense to very dense, 1" layers of medium gravel and sand (SM)		
45		S-12 JAR	15"	37-41-50/4" (91)	SILTY SAND, fine sand and 3/4" gravel, gray, wet, very dense, with 2" layer of sandy silt (SM)		Hard drilling
50							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-2**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 3' 6/30/85

ELEVATION: 77.0'
DATE: JUNE 30, 1985
START TIME: 3:00 6/29/85
COMPLETION: 9:00 6/30/85
LOGGER: K.D. SHARP
PAGE: 3 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
50		S-13 JAR	8"	50-50/3" (100)	SANDY SILT, non-plastic, 40% very fine sand, 5% gravel, gray, moist, very dense, hard (ML)		Drilling softer Drilling hard gravel
55		S-14 JAR	10"	30-50/4" (80)	SILT, low plasticity, 10% fine sand, gray, moist, very stiff to hard, top 2" includes sand and gravel (ML)		
					End of boring at 56.0 feet		
60							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-3**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 20' 6/30/85

ELEVATION: 81.4'
DATE: JUNE 30, 1985
START TIME: 11:00 6/30/85
COMPLETION: 1700 6/30/85
LOGGER: K.D. SHARP
PAGE: 1 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
0					PRELIMINARY		
5		S-1 JAR	13"	9-8-9 (17)	CLAY and SILTY SAND, medium to fine, brown to gray, moist, medium dense, layers of gravelly sand, clayey sand, and fractured low plastic clay (CL)		
10		S-2 TUBE	20"		SANDY SILT, with 5-10% small gravel, brown, gray, moist, very dense (ML)		250 psi to push tube
		S-3 JAR	16"	3-3-3 (6)	SILTY SAND, poorly graded, fine, brown grades to gray, very moist, loose (SM)		
15		S-4 JAR	16"	3-6-8 (14)	SILTY CLAY, low plasticity, 5-10% fine sand, brown gray with mottles of brown and gray, moist, stiff, vertical seam in top 3" (1/4" thick) of fine white sand (CL)		
20		S-5 TUBE	24"		Top 2": SILT, medium plastic (ML) over: SILTY SAND, gray, loose (SM)		300 psi to push tube
		S-6 JAR	15"	5-4-4 (8)	SILTY SAND, poorly graded, fine, gray, wet, loose, layers of silt with organics (SM)		Easy drilling
25							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-3**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 20' 6/30/85

ELEVATION: 81.4'
DATE: JUNE 30, 1985
START TIME: 11:00 6/30/85
COMPLETION: 1700 6/30/85
LOGGER: K.D. SHARP
PAGE: 2 OF: 3

DEPTH ELEVATION FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-7 JAR	18"	1-2-2 (4)	SANDY SILT, low plasticity, fine sand, gray, very moist, loose/soft (ML)		
							Easy drilling
					PRELIMINARY		
30		S-8 TUBE	24"		Top: SILTY SAND, fine sand, nonplastic, gray, wet, loose (SM) Bottom: SILT, low plasticity, fine sand, gray, moist, very stiff, (ML)		500 psi to push tube Hard drilling
		S-9 JAR	18"	14-18-32 (50)	SILT, low plasticity, 10% fine sand, gray, moist, very stiff (ML) 2" layer of medium to fine sand, grades to silt.		
35		S-10A JAR S-10B JAR	18"	9-11-18 (29)	SILT, same as S-9, softer, more moist, lenses of clayey silt, (ML) SAND, poorly graded, medium to fine, 10% silt, gray, wet, medium dense, distinct layering, (SP)		Layers of hard/soft/hard
40		S-11 TUBE	12"		SILT, low plasticity, 5% very fine sand, gray, moist (ML)		400 psi to push 1' hard pushing
		S-12 JAR	18"	12-16-21 (37)	SILT, same as S-10A, very moist, (ML) SAND, same as S-10B, saturated, (SP)		
45		S-13 JAR	16"	12-35-22 (57)	SILT, same as S-10A, very moist 9", (ML) SAND, same as S-10B, saturated 9", (SP)		
50							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-3**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 20' 6/30/85

ELEVATION: 81.4'
DATE: JUNE 30, 1985
START TIME: 11:00 6/30/85
COMPLETION: 1100 6/30/85
LOGGER: K.D. SHARP
PAGE: 3 OF: 3

DEPTH ELEVATION FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
50		S-14 JAR	16"	9-20-26 (46)	SILT, low plasticity, 10% sand, 5% gravel, gray, very moist, stiff, (ML) over: SAND, medium to fine, gray, saturated, loose to medium dense (SM) distinct layering silt to sand		Hard drilling
55		S-15 JAR	18"	14-28-50 (78)	9' SAND, poorly graded, medium to fine, clean, gray, saturated, very dense (SP) over 9' SILTY SAND, coarse (SM) gravel at interface		
60		No Sample Saved	12"	45-50/5" (95)	SAND grades to SILTY SAND, with gravel, wet, very dense (SP-SM)		
					End of boring at 61 feet		

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-4**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 29'-5" 7/3/85 0700

ELEVATION: 81.4'
DATE: 7/3/85
START TIME: 1530 7/2/85
COMPLETION: 0820 7/3/85
LOGGER: A.E. ERICKSON
PAGE: 1 OF: 3

DEPTH ELEVATION FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
81.4 0.0					1 1/2' Cold mix asphalt		
					PRELIMINARY		Auger cuttings: well graded sandy gravel, 2 to 3" minus
5 75		S-1 JAR	6"	3-5-4 (9)	SANDY GRAVEL, poorly graded 1" minus pea gravel, 5% fines, brown, slightly moist, loose (GP)		
10 70		S-2 JAR	6"	1-2-3 (5)	CLAYEY SAND, 10-15% gravel, medium to fine sand, orange gray vertical bands, moist, medium (SC) with 1" SAND, coarse, in bottom (SP)		Noisy drilling
		S-3 TUBE	20"		SILTY SAND, poorly graded, brown, moist, loose, (SM)		150 psi push
15 65		S-4 JAR	8"	5-9-7 (16)	SILTY SAND, poorly graded, fine sand, silty lenses, tan and brown, wet, medium (SM)		
20 60		S-5 TUBE	24"		SANDY SILT, (ML)		50 to 100 psi push
		S-6 JAR	18"	3-4-4 (8)	SILT, low plasticity, 5-10% fine sand, occasional 1" minus gravel, gray, wet, medium (ML)		Water in hole, wet 2' above sampler
25							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-4**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 29' 5" 7/3/85 0700

ELEVATION: 81.4'
DATE: 7/3/85
START TIME: 1530 7/2/85
COMPLETION: 0820 7/3/85
LOGGER: A. E. ERICKSON
PAGE: 2 OF: 3

DEPTH ELEVATION FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-7 JAR	12"	10-17-8 (25)	Top 3" SANDY SILT, low PI, fine sand, brown, soft, moist, stiff (ML)		Sampler wet
					Bottom 9" SANDY GRAVEL, well graded fractured gravel 1 1/2" minus, 5 to 15% fines, brown, wet, loose (GW)		Hitting cobbles at 26'
30		S-8 TUBE	21"		SILT, nonplastic (ML)		600 psi push Gravel in top of tube, harder @ 31'
		S-9	16"	15-12-17 (29)	SILT, low plasticity, 5% fine sand w/medium sand, 1/2" lenses in lower 10", coarse sand upper 6", gray, moist, stiff (ML)		
35		S-10 JAR	14"	4-9-23 (32)	SANDY SILT, low PI, 20-40% fine sand, occasional gravel, gray, slightly moist, hard, (ML)		3 1/2' of water
40		TUBE					
		S-11	5"				5" push @ 650 psi Rods wet 10' water in sampler
		S-12 JAR	14"	13-21-24 (45)	SILTY SAND, fine, with 1/4" to 1/2" medium sand lenses, hard (SM)		
							Gravel @ 43'
45		S-13 JAR	18"	19-50-43 (98)	SANDY SILT, same as S-12 with coarser gravel, thinly laminated, sand and silt layers, (ML)		Rods wet 8' (Very hard drilling)
50							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: B-4

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 29'-5" 7/3/85

ELEVATION: 81.4'
DATE: 7/3/85
START TIME: 1530 7/2/85
COMPLETION: 0820 7/3/85
LOGGER: A.E. ERICKSON
PAGE: 3 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
50		S-14 JAR	18"	13-28-34 (62)	SANDY SILT, nonplastic to low plasticity 15-30% fine sand, lenses of fine sand, gray, slightly moist, very hard (ML)		
55		S-15 JAR	20"	6-12-25 (37)	Top 14" SAND, well graded, gray, wet, loose, (SW) Bottom 6" SANDY SILT, same as S-14 (ML)		
					End of boring at 56.5 feet		

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-6**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 16' @ 1200 7/5/85

ELEVATION: 65.3'
DATE: 7/5/85
START TIME: 0800
COMPLETION: 1130
LOGGER: A.E. ERICKSON
PAGE: 1 OF: 2

DEPTH ELEVATION	DEPTH FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
65	0					GRAVEL, poorly graded, 2", brown dry, medium, (GP)		Boring in bottom of Haul Rd. excavation Auger cuttings wet
	5		S-1 JAR	16"	1-3-6 (9)	SILT, low to medium plastic, 5-15% fine sand, gray, very moist, stiff (ML)		
			S-2 TUBE	22"		SANDY SILT, (ML)		50 psi push 2' of water in hole
55	10		S-3 TUBE	22"		SANDY SILT, low plasticity, 20-40% fine sand, gray (ML)		
			S-4 JAR	16"	3-4-4 (8)	SILTY SAND, poorly graded, medium to fine, w/5 to 15% #4 sand, 10 to 25% fines, gray, wet, loose, (SM)		Cuttings very wet and soupy
50	15		S-5 JAR	16"	8-11-12 (23)	Top 8" SILTY SAND, same as S-4 Bottom 8" SILT, med. plastic, 5% very fine sand, gray, slightly moist, v. stiff, slightly laminated, (ML)		Rough drilling, possible cobble layer
								Hard drilling
45	20		S-6 TUBE	10"		SANDY SILT in tip with 1" medium silty sand zones, gray, moist to slightly moist, stiff, (ML)		550 psi for 9" push Tip of tube deformed on obstruction
1			S-7 JAR	18"	15-28-30 (58)	SILTY SAND with GRAVEL, well graded 1" minus with 2" silt layer 10" above tip, gray, moist (silt is slightly moist) v. dense, (SM)		
40	25							

NOTE: Soil descriptions on this log are a summary of field logs visual classifications and laboratory tests if any

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: B-6

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 16' @ 1200 7/5/85

ELEVATION: 65.3'
DATE: 7/5/85
START TIME: 0800
COMPLETION: 1130
LOGGER: A.E. ERICKSON
PAGE: 2 OF: 2

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-8 JAR	18"	13-15-21 (36)	SANDY SILT, medium plastic, 5-15% fine sand with sloping 1/4" thick medium sand layers, gray, slightly moist, hard, horizontal bedding, (ML)		Auger hits cobbles
30		S-9 JAR	16"	6-15-24 (39)	SAND and SANDY SILT layers, poorly graded, 1/8" layers of sandy silt with 3/4" minus gravel, and sand with 10-25% fines, gray, slightly moist, dense, (SM) and (ML)		
35		S-10 JAR	18"	12-18-14 (32)	SANDY SILT, with silty sand layers and occasional gravel, low to no PI, 1/8" sand layer dips @ 20 degrees 5" above tip, 1/2" minus gravel and coarse sand, gray, slightly moist silt, wet sand, stiff, (ML)		Harder drilling
40		S-11	16"	15-25-38 (63)	GRAVELLY SAND, poorly graded, layers of fine gravel and coarse to medium sand, dark gray, wet, very dense, (SP)		
					End of boring at 41.5 feet		
45							

NOTE: Soil descriptions on this log are a summary of field logs visual classifications and laboratory tests if any

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: B-7

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 17' 7/3/85

ELEVATION: 84.7'
DATE: JULY 3, 1985
START TIME: 0900 7/3/85
COMPLETION: 1530 7/3/85
LOGGER: A.E. ERICKSON
PAGE: 1 OF: 3

DEPTH ELEVATION	DEPTH FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
85	0					10" Asphalt Concrete SANDY GRAVEL with SILT, well graded, cobbles 6" minus (GW-GM)		Pavement Auger cuttings sandy gravel with cobbles. (Fill)
80	5		S-1 JAR	1'	6-1-3 (4)	SANDY SILT with GRAVEL, (material caked around rock in tip), low PI, fine sand, 50-70% fines, brown, moist, soft, (ML)		Sampler tip blocked by rock
75	10		S-2 TUBE	10"		SANDY SILT, (ML)		550 psi push Rock bent tip of tube
			S-3 JAR	16"	9-13-16 (29)	SANDY SILT, low to no PI, 5-20% fine sand, brown with gray mottles, slightly moist, very stiff, (ML)		
70	15		S-4 JAR	18"	6-9-17 (26)	SANDY SILT, med. plastic, 5-15% fine sand, gray, slightly moist, very stiff, laminated fine sand and silt (ML)		
						(Laminated fine sand and silt)		
65	20		S-5 TUBE	21"		SANDY SILT, in tip, same as S-4, (ML)		Push 350 psi
			S-6 JAR	18"	7-16-25 (41)	SANDY SILT, low PI, same as S-4, (ML)		
60	25							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: B-7

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 17' 7/3/85

ELEVATION: 84.7'
DATE: JULY 3, 1985
START TIME: 0900 7/3/85
COMPLETION: 1530 7/3/85
LOGGER: A.E. ERICKSON
PAGE: 2 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-7	18"	8-16-21 (37)	SANDY SILT, same as S-6, (ML)		
30		S-8 JAR	18"	10-13-18 (31)	SANDY SILT, same as S-7, (ML)		
35		S-9 JAR	18"	10-14-16 (30)	SANDY SILT, same as S-7, with lenses of fine sand (ML)		
40		S-10 JAR	18"	12-22-29 (51)	SILTY SAND, poorly graded, medium to fine sand, 5-15% fines, gray/black, wet, very dense, (SP-SM)		18" of water on rods
45		S-11 JAR	18"	24-33-40 (73)	SILTY SAND, poorly graded, medium to fine and coarse to medium layers, dark gray, wet, very dense (SP-SM)		
50							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-7**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 17' 7/3/85

ELEVATION: 84.7'
DATE: JULY 3, 1985
START TIME: 0900 7/3/85
COMPLETION: 1530 7/3/85
LOGGER: A.E. ERICKSON
PAGE: 3 OF: 3

DEPTH ELEVATION FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
50		S-12 JAR	18"	7-30-50/4 80/10"	SILTY SAND, poorly graded 5"-3" layers of medium to fine and coarse sand with silt, dark gray, wet, very dense, (SP-SM)		17 1/2' of water on rods
55		S-13 JAR	10"	35-50/4 85/10"	SILTY SAND, poorly graded, layers of medium to fine sand, coarser sand with 1/2" minus gravel in lower 3', dark gray, wet, very dense, (SP-SM)		3' of heave removed More gravelly drilling 4' heave
60					End of boring at 60 feet No sample attempted at 60' due to 4' heave. (Gravelly drilling below 57')		Depth to water level measured in augers 12 hours after finish

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: B-9

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 22'-8" 7/5/85

ELEVATION: 81.2'
DATE: 7/1/85
START TIME: 1200 7/1/85
COMPLETION: 1520 7/2/85
LOGGER: A.E. ERICKSON
PAGE: 1 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
0					PRELIMINARY		
5		S-1 JAR	12"	2-5-8 (13)	SILT, medium plastic, 5 to 20% fine sand, brown & gray mottle, slightly moist, stiff, (ML)		
10		S-2 TUBE	23"		SANDY SILT, medium plastic, 27% fine sand, mottled gray and brown, moist, stiff,(ML)		Push 300 psi
		S-3	10"	3-6-5 (11)	SILT, med. plastic, 20-25% medium to fine sand, top 2" silty sand, gray with brown spots, occasional #4 sand, moist, stiff, (ML)		
15		S-4 JAR	18"	3-4-4 (8)	SANDY CLAY, 5% small gravel, fine sand, gray with brown, moist, loose (CL)		Piece of wood in top 1" of sample
20		S-5 TUBE	23"		CLAYEY SAND, (SC)		100 psi push
		S-6 JAR	15"	3-6-13 (19)	SANDY CLAY, medium to fine sand, 1/4" to 3/4" bands of silt, brown with orange brown, moist, medium (CL)		Soft drilling with rocks similar to 19'
25							

...of field logs, visual classifications and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-9**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 22'8" 7/5/85

ELEVATION: 81.2'
DATE: 7/1/85
START TIME: 1200 7/1/85
COMPLETION: 1520 7/2/85
LOGGER: A.E. ERICKSON
PAGE: 2 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-7 JAR	16"	8-13-16 (29)	SILT, low plasticity, 5-10% very fine sand, brown, and gray brown zones, slightly moist, medium (ML)		
30		S-8 TUBE	12"		Top 10" SILT, medium plastic, lenses of fine sand (ML) Bottom 2" SANDY SILT, nonplastic, fine sand (ML)		700 psi push
		S-9 JAR	16"	14-20-24 (44)	SANDY SILT, nonplastic to low plasticity, very fine sand, gray, slightly moist with wet sand lenses (horizontal bed), hard (ML)		Tube S-8 came off of rod upon pulling. Drove spoon into tube and drilled around tube to remove tube from hole. 12" of sample remained in tube.
35		S-10 JAR	16"	12-14-21 (35)	SILT, same as S-9		Sampler wet
40		S-11 TUBE	12"		SILT, moist, gray, same as S-9,(ML)		400 psi push
		S-12 JAR	16"	12-17-26 (43)	SILT, nonplastic to low plasticity, 5-10% very fine sand, 1/4" sand lense in center of sample, gray, slightly moist, dense (ML)		Hit gravels
45		S-13 JAR	16"	7-10-14 (24)	SILT, low plasticity, 5-10% very fine sand, occasional gravel and #4 sand, gray, moist, very stiff (ML)		Wet sampler but no water on rods Attempt to push shelby tube at 47'-no penetration with 450 psi push.
50							

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-9**

PRELIMINARY

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: 22'-8" 7/5/85

ELEVATION: 81.2'
DATE: JULY 7, 1985
START TIME: 1200 7/1/85
COMPLETION: 1520 7/2/85
LOGGER: A.E. ERICKSON
PAGE: 3 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
50		S-14 JAR	16"	7-10-13 (23)	SILT, same as S-13, very uniform homogeneous material, (ML)		
55		S-15 JAR	18"	8-14-20 (34)	SILT, same as S-13, (ML)		
60		S-16 TUBE	9"		SILT, same as S-13, (ML)		600 psi push Water on top of sample
		S-17 JAR	18"	10-14-36 (50)	SILT, same as S-13, (ML)		
							Gravel at 63'
65		S-18 JAR	6"	100-85/6" (185)/12"	SANDY GRAVEL, well graded 2" minus, gray, wet, very dense, (GW)		~2' heave at 65'
							Drilling through variable densities of gravel material
70							Very hard drilling. Auger refusal at 71' - not sampled
					End of boring 71 feet		
75							

* Field and laboratory classifications and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-13**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: NOT MEASURABLE

ELEVATION: 78.7' ± 1/2'
DATE: 7/6/85
START TIME: 1000
COMPLETION: 1445
LOGGER: A.E. ERICKSON
PAGE: 1 OF: 3

DEPTH ELEVATION	DEPTH FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
79						7 1/2" Asphalt Concrete		
						SANDY GRAVEL with COBBLES, 5" minus cobbles, dense, (GP)		Very hard drilling on cobbles and gravel to 4.5'
75								Fractured gravel in top 6" of sampler
	5		S-1 JAR	12"	22-7-8 (15)	CLAY, medium plastic ~~SANDY SILT, low PI, 10 to 25%~~ fine sand, brown & gray mottled, slightly moist, stiff, ~~(ML)~~ (CL)		
70								
	10		S-2 TUBE	24"		SANDY SILT--~~SILTY SAND,~~ low to no PI, 42% medium to fine sand lenses, gray & brown mottle, moist, soft, (ML ~~SM~~)		Push 100 psi
			S-3 JAR	16"	5-7-12 (19)	~~SANDY SILT-SILTY SAND, same as S-2, (ML-SM)~~ SILT, med. plastic 5-10% fine sand (ML)		
65	15		S-4 JAR	14"	5-5-6 (11)	SILTY SAND, poorly graded, medium to fine sand, 15 to 30% fines, w/1/8" thick plant roots, gray, moist, medium, (SM)		
60								
	20		S-5 TUBE	24"		SANDY SILT, low to no PI, 5 to 15% very fine sand, brown w/gray mottle, moist, medium, (ML)		Push 100 psi
			S-6 JAR	18"	2-2-3 (5)	SANDY SILT, non plastic ~~same as S-5,~~ brown w/red mottles, horizontal bedding to 6" above tip, gray sandier silt in tip, (ML)		
55	25							

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: **B-13**

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOW STEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: NOT MEASURABLE

ELEVATION: 78.7' ± 1/2'
DATE: 7/6/85
START TIME: 1000
COMPLETION: 1445
LOGGER: A.E. ERICKSON
PAGE: 2 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
25		S-7 TUBE	24"		2" SANDY SILT (ML) over SILTY SAND, poorly graded, medium to fine sand, gray, wet, loose (SM)		Push 50 psi
		S-8 JAR	18"	2-1-2 (3)	~~CLAYEY~~ SILT, ~~low~~ to highly plastic to ~~medium~~ PI, 1/8" medium sand layer, gray, moist, soft ~~(ML-CL)~~ (MH)		
30		S-9 TUBE	24"		~~SANDY~~ SILT, in tip, (ML)		0 psi push 200 psi push
		S-10 JAR	18"	7-10-12 (22)	~~SANDY~~ SILT, low PI, 5 to 15% fine sand with horizontal bed of medium to fine silty sand and sand layers, gray, moist, stiff (ML)		No auger cutting return Gravelly zone
35		S-11 JAR		4-10-10 (20)	~~SANDY~~ SILT, with SAND, low PI, layers (2 to 4") of silty sand and sandy silt, gray, moist, layers vary from soft to stiff (ML)		8' of water on rods Limited auger cuttings at top of hole Harder drilling
40		S-12 TUBE	6"		SILTY SAND with GRAVEL in tip, gray, moist, dense, (SM)		Tip of tube bent 600 psi for 6" push
		S-13 JAR	18"	10-18-22 (40)	~~SILTY SAND with GRAVEL~~ SANDY SILT poorly graded, 5 to 20% 1" minus gravel, in lenses w/bands of red sand, medium to fine sand with 15 to 30% fines, gray, moist, dense, ~~(SM)~~ (ML)		
45		S-14 JAR	18"	6-5-5 (10)	SANDY SILT, low PI, occasional gravel, 1/2" minus, 5 to 20% fine sand w/1/8" medium sand layers, gray, moist, medium dense w/soft spots, (ML)		
50							Limited auger cuttings return

NOTE: Soil descriptions on this log are a summary of field logs visual classifications and laboratory tests, if any.

SOIL BORING LOG

PROJECT NO.: S19746.A1

BORING NO.: B-13

PROJECT: I-90 HAUL ROAD
BORING LOCATION: SEE MAP
DRILLING METHOD AND EQUIPMENT: MOBILE B-61 HOLLOWSTEM AUGER
CONTRACTOR: WSDOT
DEPTH TO WATER SURFACE AND DATE: NOT MEASURABLE

ELEVATION: 78.7' ± 1/2'
DATE: 7/6/85
START TIME: 1200
COMPLETION: 1445
LOGGER: A.E. ERICKSON
PAGE: 3 OF: 3

DEPTH ELEVATION / FT BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
50		S-15 JAR	18"	11-21-30 (51)	~~SANDY~~ SILT, low PI, 5 to 15% very fine sand, 1" coarse to fine silty sand layer, laminated silt beds, gray, slightly moist, hard, (ML)		Smooth drilling
55		S-16 JAR	18"	14-14-18 (32)	~~SANDY~~ SILT, same as S-15; 1" layer of hard cube fractured clayey silt, (ML)		
60		S-17 JAR	18"	6-13-45 (58)	SANDY SILT, same as S-15 except moist. Top of sample contains 6 inches of well graded sand, (ML)		
					End of Boring = 62 feet		Insufficient time available for water to stabilize in boring prior to auger removal. Therefore, the depth to water surface is considered unmeasurable.

NOTE: Soil descriptions on this log are a summary of field logs, visual classifications, and laboratory tests, if any.