



Washington State  
Department of Transportation

## Memorandum

Date: February 13, 1997

From: T. M. Allen *T.M. Allen for:*  
D. V. Jenkins  
OSC Materials Laboratory, 47365  
Geotechnical Services Branch

Phone: 360-709-5455  
(FAX 360-709-5585)

Subject: SR-167, C.S. 2726, OL-2082  
Geotechnical Report - North Sumner I/C

To: P. Bakotich  
OR, 47440

This memorandum presents the results of a soils investigation and provides geotechnical design recommendations for the construction of a proposed interchange of SR-167 with 24th street in Sumner. The purpose of this investigation was to define the surface and subsurface conditions present at the site of the proposed interchange and to determine the effects of those conditions on the proposed new construction.

Details of the interchange configuration are shown in *Figure 1*, attached in Appendix A. The proposal is a split diamond interchange with 24th Street crossing above SR-167 on a multi-span bridge and intersecting the Union Pacific railroad tracks at grade. The 24th Street will be improved from West Valley Highway to 142nd Avenue East with two lanes in each direction and a two way left turn lane throughout. The north bound ramp movements will intersect with 24th Street, and the south bound ramps will intersect with West Valley Highway approximately 365 m south of 24th street. West Valley Highway will be widened to four lanes between the south bound ramps and 24th street. Construction of the new interchange will require new fills up 7 m in height, four new arch culverts and widening of an existing arch culvert.

The analyses, conclusions, and recommendations contained in this report are based on the project description and site conditions that existed at the time of the field investigation. The exploratory borings are assumed to represent the subsurface conditions throughout the project area. If subsurface conditions are different from those found by the explorations are encountered during construction, or appear to be present or beyond the excavations, we should be advised so that we can aid you and reevaluate our recommendations.

### CLIMATIC CONDITIONS

The climate of the project area is greatly influenced by winds from the Pacific Ocean.

Summers are fairly warm, but hot temperatures are not common and summer rainfall is extremely light. During the rest of the year rains are frequent, especially late in fall and winter.

Of the total annual precipitation (average of 1050 mm), about 25 percent usually falls during the period April through September. Overall, the climate at the project site affects many of the geotechnical conditions encountered, and is an important consideration with respect to construction issues, particularly regarding fill placement.

## **REGIONAL GEOLOGY**

The Green River valley was an inlet of Puget Sound at the conclusion of the most recent regional glaciation about 12,500 years ago. The marine embayment was gradually displaced by the deposition of alluvial soils by the ancestral and modern Green and White Rivers. The valley floor at Kent ( from El. 15.3 m., MSL) is underlain by about 120 m of loose alluvial soils. Very dense glacial and interglacial granular soils extend from the base of the alluvium to a depth in excess of 300 m. Underlying these interglacial soils is bedrock.

The valley floor surface is capped by overbank deposits of the modern Green and White Rivers consisting of fine sandy silt. Loose, reasonably well sorted, alluvial sand and silt deposited by the ancestral Green and White Rivers is randomly interbedded to a depth of about 46 m (El. -30 m) where it is underlain by marine silt. A volcanic mudflow, termed the Osceola mudflow, was deposited about 5,700 years ago. This volcanic mudflow is about 15 m thick and occurs within the marine sediments. The marine silts and fine sand deposits continue under the mudflow to a depth of about 120 meters.

## **SITE GEOLOGY**

For simplicity and design purposes, the deposits interpreted from the test borings have been grouped into six soil units. The location of all test borings are shown in *Figure 1*. Soil groupings are based primarily on engineering properties and classification. The interpreted depositional environment was also considered in the soil groupings. The six soil units, as identified in the test borings, are as follows:

**UNIT 1:** Dark gray to dark brown, very soft to stiff non-plastic silts, and silts with sand with frequent thin, discontinuous, interbeds of fine sand, organic silt and peat. Peat layers up to 1.5 m in thickness have been observed. Granular fills less than 2.7 m thick may be present on the ground surface. This unit forms the surface unit across the site and varies in thickness from 2.5 m to 5.5 m.

**UNIT 2:** Dark gray to dark brown, medium dense silty sands and poorly graded sands with silt. This unit is fairly uniform in thickness across the site and varies from 5 m to 6 m.

**UNIT 3:** Dark gray to gray, very loose to loose, silty sands and silty sands with gravels. This unit contains wood debris and possible logs. This unit was deposited as a volcanic mudflow originating from Mt. Rainier approximately 5700 years ago and has been termed the "Osceola Mudflow".

**UNIT 4:** Dark gray to dark brown, medium dense well and poorly graded sand and silty sand. This unit extends from 26 m to 35 m below the ground surface. A thin (<1.5 m) dark brown, medium stiff organic silt with peat occurs at the contact of this unit with Unit 3 soils. This layer is interpreted to be the pre-mudflow ground surface.

**UNIT 5:** Dark gray, medium stiff to hard silts with thin interbeds of fine sands. This unit was encountered in boring H-2-95 and occurs at a depth between 37 and 43 m below the ground surface.

**UNIT 6:** Gray, dense to very dense, well graded gravel with silt and sand. This unit was encountered approximately 35 m below the ground surface in boring H-1-95.

**UNIT 7:** Dark gray, dense well graded clean sand. This unit was encountered approximately 43 m below the ground surface in boring H-2-95

Low to moderate artesian water pressures were observed in soil Units 4, 5, 6 and 7. As much as 87 liters per minute with 3 meters of positive head were measured during test drilling.

## **INVESTIGATION**

The geotechnical field investigation consisted of the following major elements:

- A literature search consisting of reviewing, compiling and evaluating pertinent published and unpublished reports concerning the geology of the project area.
- Review of topographic maps, preliminary plan and sections to identify major features along the length of the project.
- A detailed site reconnaissance of the proposed interchange.
- The drilling of 19 test borings to determine the subsurface conditions along the proposed alignment. Standard penetrometer tests (SPT), in general, were taken at 1.5 m intervals in each test hole. Disturbed soil samples from the standard penetrometer were visually identified in the field and then submitted to the Materials Laboratory for more detailed classification.

A total of 221 standard penetrometer tests were performed, 24 undisturbed shelly tube samples, and 15 Washington undisturbed samples were obtained for soil gradation and strength testing.

Copies of the Logs of Test Borings are presented in Appendix B. Test hole locations are shown in the *Figure 1* attached in Appendix A.

## **LABORATORY TESTING**

Laboratory testing was performed on selected disturbed and undisturbed samples obtained from the test borings to characterize the soil material that will be encountered during construction. The testing included general soil classification tests and specific strength tests to confirm geotechnical design parameters. All testing was conducted in accordance with accepted WSDOT, ASTM and AASHTO test methods. The Unified Soil Classification System was used as the basis to describe all samples. Visual classification included consistency, color, moisture content, major soil type and modifying constituents of the samples. Laboratory test results are summarized in Appendix C.

## **GEOTECHNICAL DESIGN RECOMMENDATIONS**

Based on the results of the field investigation and laboratory testing, the major geotechnical design issues associated with this project are defined as follows:

1. Embankment Design
2. Culverts

### **Embankment Design**

Embankments up to 7 m in height are required for construction of the A24 line, A24-N line and S-A24 line. Embankments up to 3 m in height are required for the N-EW and EW-S lines. New embankments will require construction over soft silts and silts with sands with thin layers of fine sands and peat. This layer was described in the site geology section as Unit 1. Subsurface soil conditions for the proposed ramps are shown in *Figures 2 through 5* and are attached in Appendix A. These soils will provide a stable foundation for the new embankments provided the new embankments are constructed according to the following recommendations:

- All embankments must be constructed at a repose no steeper than 2:1.
- We recommend the existing vegetative mat not be removed and also be disturbed as little as possible to reduce the risk of instability during construction.

- The first layer of fill placed on the existing ground surface must be no more than 1.3 m thick and should be dumped, spread, and lightly compacted to form a uniform layer to support equipment used to place and compact the upper lifts.
- We recommend all embankments be constructed from select borrow. Embankments constructed within 12 m of the pavement seat of the A24 bridge over SR-167 must be constructed from material meeting gravel borrow specifications.
- In low areas (i.e. ditches and depressions), an extensive volume of fill is likely to push through the ground surface into underlying soft organic rich silts with very little effort. In these areas, geotextile for soil stabilization should be blanketed over the area to provide separation. The basal geotextile layer should then be overlain by quarry spalls or shoulder ballast if below standing water.
- We recommend the removal of soft unsuitable soils under the ramps as listed in the following table. Please refer to *Figure 7* for details of the overexcavation plan.

Ramp	Station	Overexcavation Depth
EW-S	0+150 to 0+190	1.75 m
N-EW	0+190 to 0+260	1.75 m
A24-N	0+200 to 0+325	1.5 m
A24	0+060 to 0+080	1.75 m

- As shown in *Figure 7*, a surcharge is required to accelerate and mitigate long term post construction settlement. The surcharge should be left in place for a maximum of 3 months and settlement should be monitored using survey control hubs placed every 50 meters (each side) along the shoulder. Survey readings should be taken every two weeks during the settlement delay period and the results sent to our office for review.
- The embankments constructed for the proposed bridge approaches must be built full height with the surcharge left in place for 3 months prior to bridge abutment construction.

It is estimated a maximum of 760 mm of settlement will occur based on maximum loading from the proposed 7 m high fills. In general, post construction settlement after removal of the surcharge should be less than 25 mm. The presence of deep peat layers in isolated areas may result in as much as 100 mm of long term (20 years or greater) post construction settlement. We feel this acceptable since routine maintenance (paving) would mitigate these problem areas.

### **Bottomless Pipe Arch Culvert Design**

The southbound on/off ramps will be constructed approximately 325 m south of 24th street/SR-167 interchange. The embankments for the new ramps must cross Soaton Creek which runs parallel to the south bound lanes of SR-167. The Region has proposed using twin bottomless pipe arches under the N-EW and EW-S ramps. The pipe arches will be approximately 32 m long and 4.3 m wide with a 2.2 m rise.

The foundation soils in the vicinity of the pipe arches consist of 2 m to 3 m of soft organic silts and sandy silts underlain by medium dense silty sands and poorly graded sands with silts. A subsurface profile is shown in *Figure 5* in Appendix A.

In order to provide a stable foundation for the new culverts and to limit foundation settlements to acceptable levels, we recommend following these design guidelines:

- The maximum allowable footing bearing pressure must not exceed 190 kPa.
- The culvert footings must not be less than 1 m in width.
- Soft soils below the footings must be removed. Please refer to *Figure 6* for the limits of overexcavation. The elevations specified will result in overexcavation depths of 1.0 to 1.5 m below the existing creek bottom. Quarry spalls should be used as backfill to within 0.3 m of the bottom of footing. Compacted gravel borrow, or shoulder ballast material if below the water table, should be placed between the quarry spalls and footing. To prevent the migration of fines, a high survivability, class A geotextile for erosion control should be placed between the quarry spalls and gravel borrow.

Based on these recommendations, settlement of the culvert foundations should be less than 30 mm. Post construction settlement should be negligible.

### **Widening Existing Pipe Arch**

We understand an existing structural steel pipe arch located approximate Station 16+727 on SR-167 will be extended approximately 6.5 m to the east. This structure was constructed in 1976 under C-0558. We have reviewed the boring logs drilled for this structure. We recommend overexcavating native soils to elevation 12.8 m and backfilling to the bottom of the pipe arch with 0.6 m of compacted gravel borrow (quarry spalls if below the water table) and 0.6 m of gravel backfill for pipe bedding. These recommendations are consistent with the design shown in the original contract plans.

## CONSTRUCTION CONSIDERATIONS

1. Widening of the West Valley highway to four lanes may require hillside terrace construction. This method of construction is necessary if the existing embankment are greater than 2 m in height and they have a repose 2:1 or steeper.
2. Section 2-03.3(14)I of the Standard Specifications should be followed when placing fill at the approaches to the new bridge structure over SR-167.
3. All existing buried utilities located under the footprint of the proposed embankments (new and widening) must be moved prior to fill placement. This is to prevent possible utility failure as a result of embankment induced settlements.
4. Geotextiles used as a soil stabilization layer must be sewn per the recommendations outlined in Section 9-33 of the Standard Specifications.
5. Ground water level near the existing ground surface may be present if construction is occurring during the wet time of year. Fill placement and compaction may be difficult, especially in the first initial lifts. A geotextile soil stabilization layer per the Standard Specifications may be used to facilitate embankment construction. We recommend the use of this material in selected areas under the new embankments where fill placement and compaction is difficult.
6. We are proposing to conduct additional soil probing in the area of the proposed EW-S and N-EW lines to better define the extent and station limits of the unsuitable soils. The limits we previously described is based on limited subsurface information along the alignments of the proposed ramps. We will up-date you with additional information as soon as the investigation is completed.

## CLOSURE

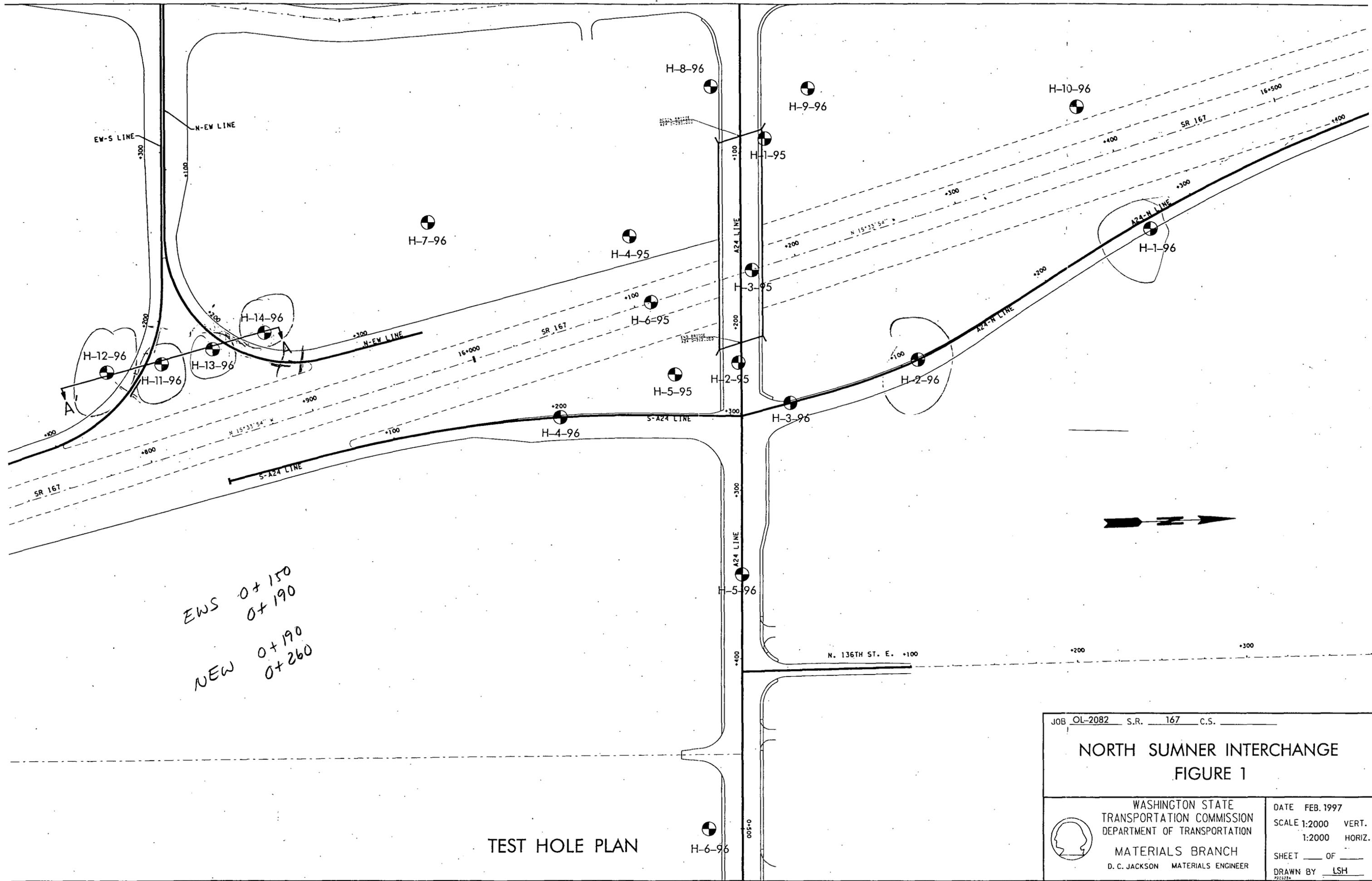
The soil profiles, figures and test hole plan sheets are included in Appendix A. Logs of Test Borings and Laboratory test data are contained in Appendices B, and C respectively. This report should be disclosed in its entirety to all prospective bidders.

TMA:dvj  
DVJ

cc: C. Keegan, OR, 47440  
M. Witecki, EESC - 47329

APPENDIX A

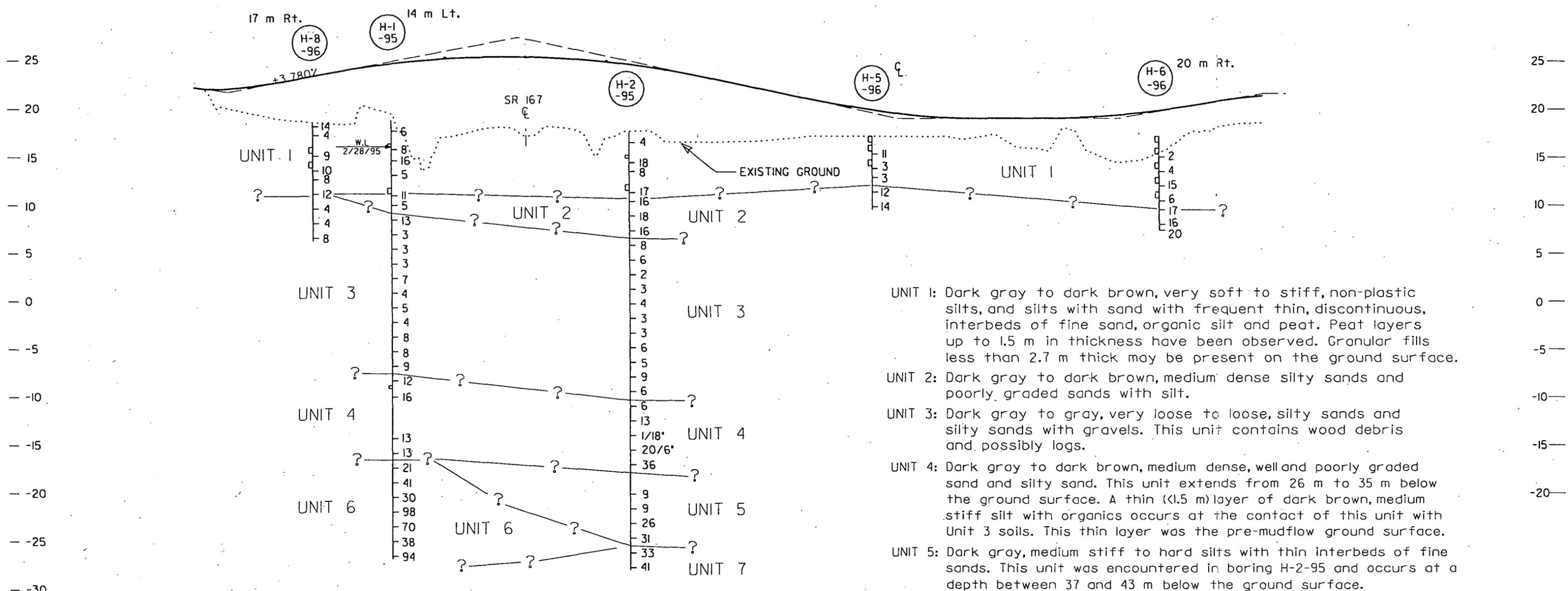
FIGURES



TEST HOLE PLAN

JOB OL-2082 S.R. 167 C.S. _____	
<b>NORTH SUMNER INTERCHANGE</b>	
<b>FIGURE 1</b>	
 <p>WASHINGTON STATE TRANSPORTATION COMMISSION DEPARTMENT OF TRANSPORTATION</p>	DATE FEB. 1997
	SCALE 1:2000 VERT. 1:2000 HORIZ.
	SHEET ____ OF ____
MATERIALS BRANCH	
D. C. JACKSON MATERIALS ENGINEER	
DRAWN BY LSH	

0+000 0+040 0+080 0+120 0+160 0+200 0+240 0+280 0+320 0+360 0+400 0+440 0+480 0+520 0+560



- UNIT 1: Dark gray to dark brown, very soft to stiff, non-plastic silts, and silts with sand with frequent thin, discontinuous, interbeds of fine sand, organic silt and peat. Peat layers up to 1.5 m in thickness have been observed. Granular fills less than 2.7 m thick may be present on the ground surface.
  - UNIT 2: Dark gray to dark brown, medium dense silty sands and poorly graded sands with silt.
  - UNIT 3: Dark gray to gray, very loose to loose, silty sands and silty sands with gravels. This unit contains wood debris and possibly logs.
  - UNIT 4: Dark gray to dark brown, medium dense, well and poorly graded sand and silty sand. This unit extends from 26 m to 35 m below the ground surface. A thin (1.5 m) layer of dark brown, medium stiff silt with organics occurs at the contact of this unit with Unit 3 soils. This thin layer was the pre-mudflow ground surface.
  - UNIT 5: Dark gray, medium stiff to hard silts with thin interbeds of fine sands. This unit was encountered in boring H-2-95 and occurs at a depth between 37 and 43 m below the ground surface.
  - UNIT 6: Gray, dense to very dense, well graded gravel with silt and sand. This unit was encountered approximately 35 m below the ground surface in boring H-1-95.
  - UNIT 7: Dark gray, dense, well graded clean sand. This unit was encountered approximately 43 m below the ground surface in boring H-2-95.
- Low to moderate artesian water pressures were observed in soil Units 4, 5, 6 and 7. As much as 87 liters per minute with 3 meters of positive head (above ground surface) were measured during test drilling.

JOB OL-2082 S.R. 167 C.S. 2726

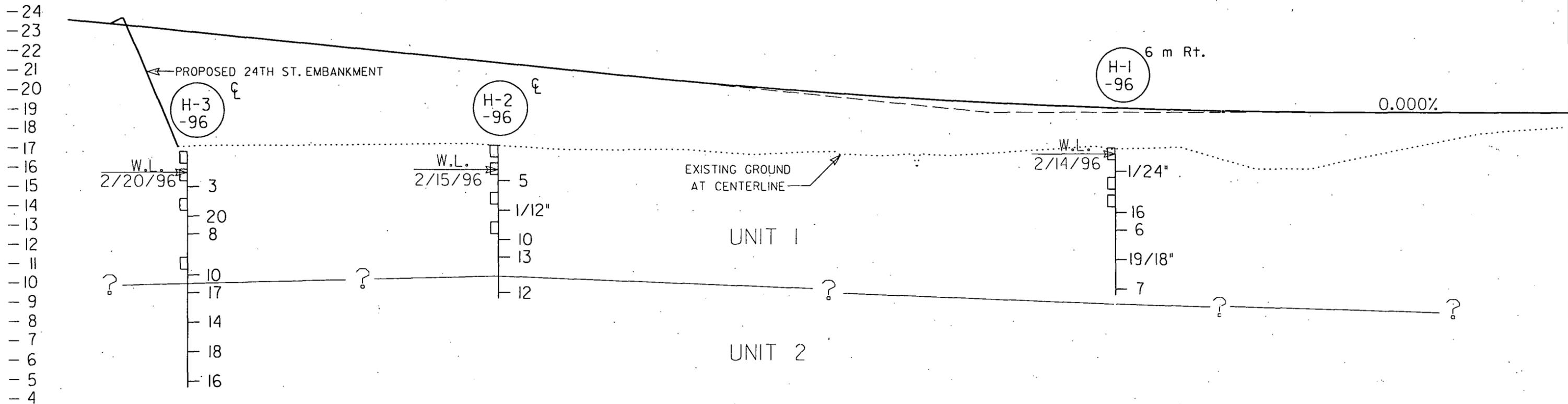
**NORTH SUMNER INTERCHANGE**  
**FIGURE 2**

<p>WASHINGTON STATE TRANSPORTATION COMMISSION DEPARTMENT OF TRANSPORTATION</p> <p>MATERIALS BRANCH D. C. JACKSON MATERIALS ENGINEER</p>	DATE FEB. 1997
	SCALE 1:400 VERT. 1:2000 HORIZ.
	SHEET ___ OF ___
	DRAWN BY LSHOI

**24TH STREET E. PROFILE**



0+000      0+040      0+080      0+120      0+160      0+200      0+240      0+280      0+320      0+360



UNIT 1: Dark gray to dark brown, very soft to stiff, non-plastic silts, and silts with sand with frequent thin, discontinuous, interbeds of fine sand, organic silt and peat. Peat layers up to 1.5 m in thickness have been observed. Granular fills less than 2.7 m thick may be present on the ground surface.

UNIT 2: Dark gray to dark brown, medium dense silty sands and poorly graded sands with silt.

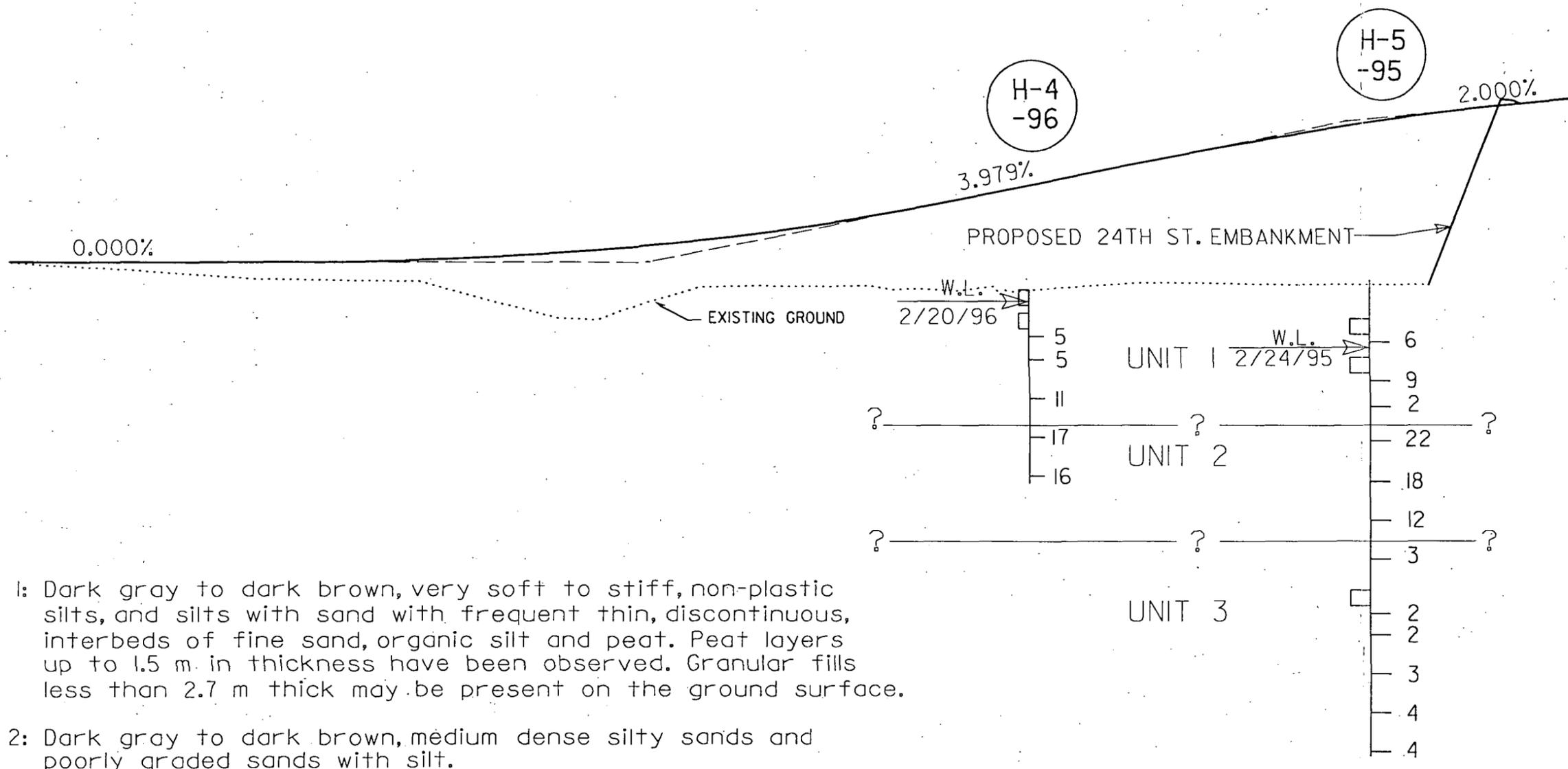
A24-N PROFILE

JOB <u>OL-2082</u> S.R. <u>167</u> C.S. <u>2726</u>	
<b>NORTH SUMNER INTERCHANGE</b> <b>FIGURE 3</b>	
 WASHINGTON STATE TRANSPORTATION COMMISSION DEPARTMENT OF TRANSPORTATION	DATE FEB. 1997
	SCALE 1:200 VERT. 1:1000 HORIZ.
	SHEET <u>    </u> OF <u>    </u>
MATERIALS BRANCH D. C. JACKSON MATERIALS ENGINEER	DRAWN BY <u>LSHOI</u>

0+000      0+040      0+080      0+120      0+160      0+200      0+240      0+280      0+320

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- UNIT 1: Dark gray to dark brown, very soft to stiff, non-plastic silts, and silts with sand with frequent thin, discontinuous, interbeds of fine sand, organic silt and peat. Peat layers up to 1.5 m in thickness have been observed. Granular fills less than 2.7 m thick may be present on the ground surface.
- UNIT 2: Dark gray to dark brown, medium dense silty sands and poorly graded sands with silt.
- UNIT 3: Dark gray to gray, very loose to loose, silty sands and silty sands with gravels. This unit contains wood debris and possibly logs.

JOB OL-2082 S.R. 167 C.S. 2726

**NORTH SUMNER INTERCHANGE**  
**FIGURE 4**

WASHINGTON STATE  
TRANSPORTATION COMMISSION  
DEPARTMENT OF TRANSPORTATION

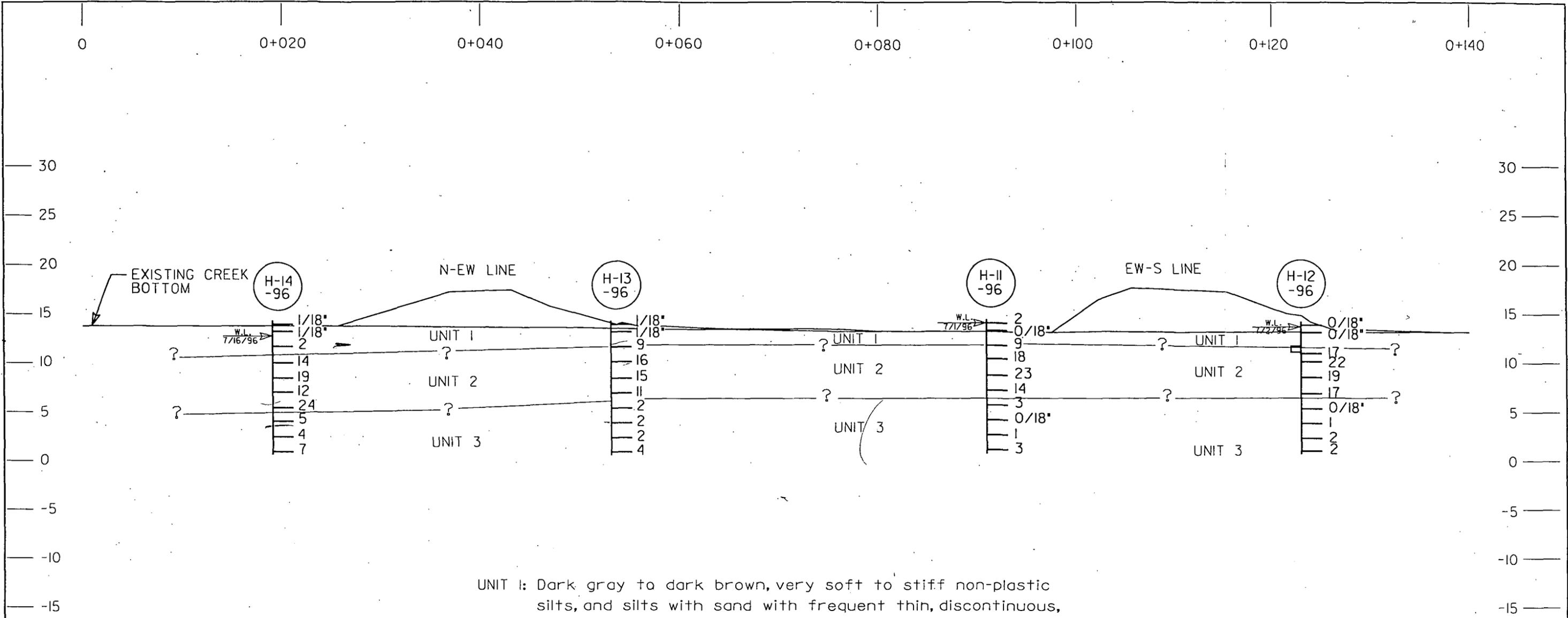
MATERIALS BRANCH  
D. C. JACKSON MATERIALS ENGINEER

DATE FEB. 1997  
SCALE 1:200 VERT.  
1:1000 HORIZ.

SHEET \_\_\_ OF \_\_\_  
DRAWN BY LSHOI

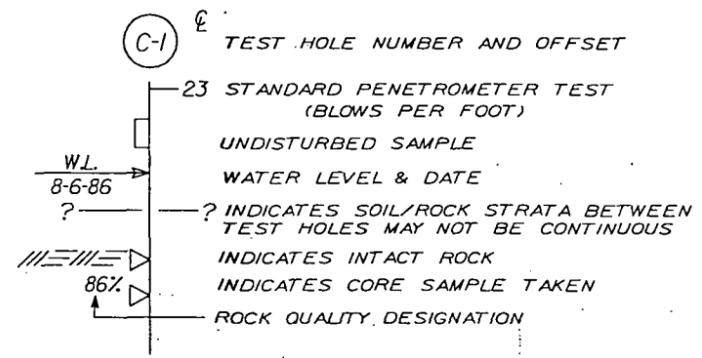


S-A24 PROFILE



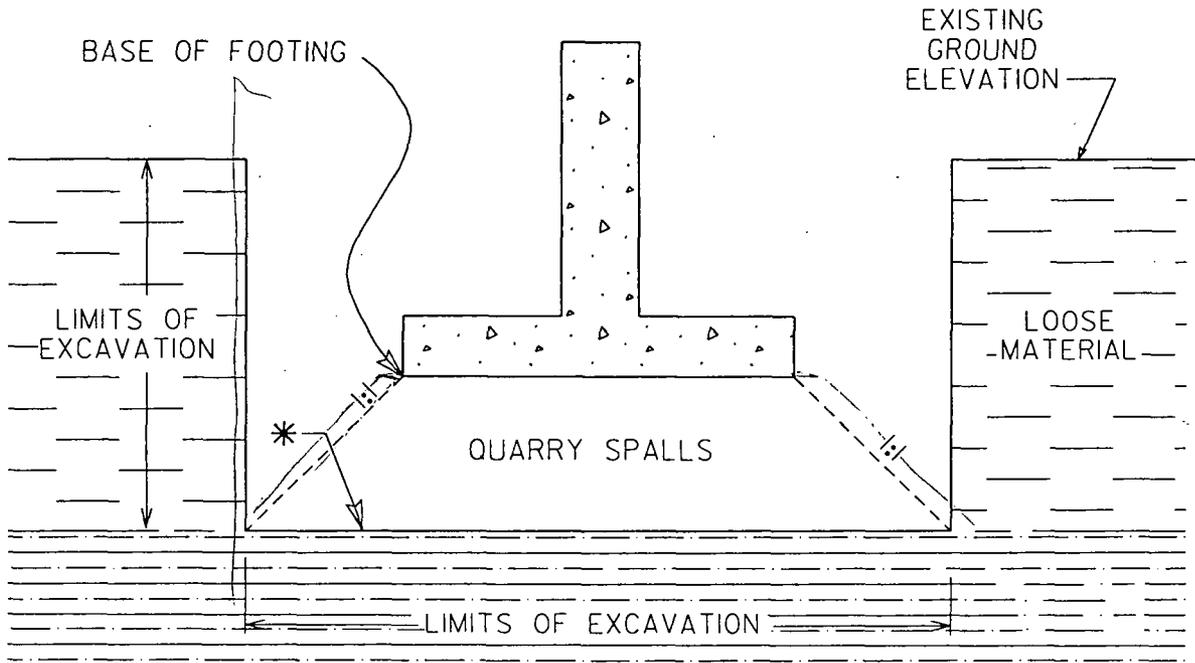
- UNIT 1: Dark gray to dark brown, very soft to stiff non-plastic silts, and silts with sand with frequent thin, discontinuous, interbeds of fine sand, organic silt and peat. Peat layers up to 1.5 m in thickness have been observed. Granular fills less than 2.7 m thick may be present on the ground surface.
- UNIT 2: Dark gray to dark brown, medium dense silty sands and poorly graded sands with silt.
- UNIT 3: Dark gray to gray, very loose to loose, silty sands and silty sands with gravels. This unit contains wood debris and possibly logs.

**TEST HOLE LEGEND**



**ARCH CULVERTS SECTION A - A'**

JOB 0L-2082 S.R. 167 C.S. 2726	
<b>NORTH SUMNER INTERCHANGE FIGURE 5</b>	
WASHINGTON STATE TRANSPORTATION COMMISSION DEPARTMENT OF TRANSPORTATION	DATE FEB. 1997 SCALE 1:400 VERT. 1:400 HORIZ.
MATERIALS BRANCH D. C. JACKSON MATERIALS ENGINEER	SHEET ___ OF ___ DRAWN BY LSHOI

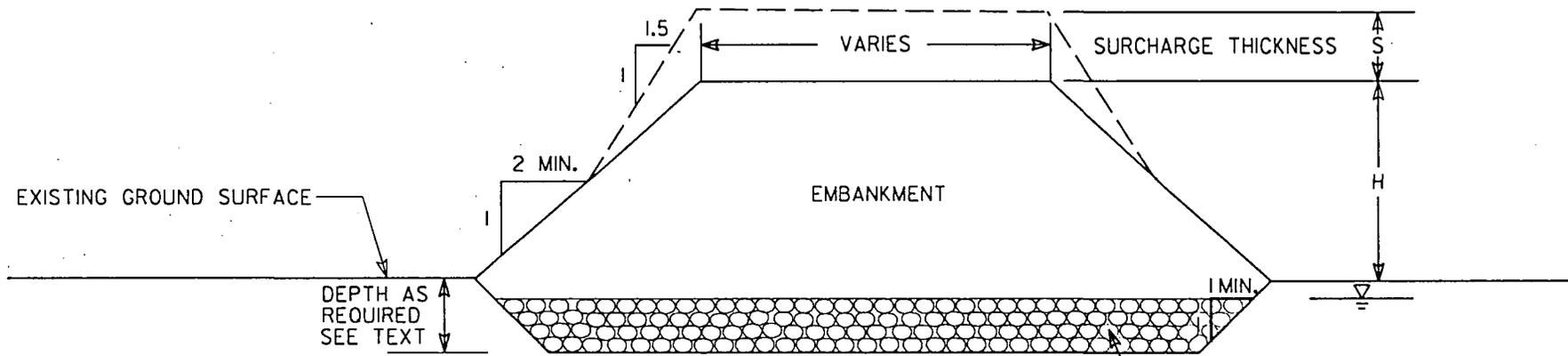


* EW-S LINE CULVERTS	ELEVATION AT BOTTOM OF OVEREXCAVATION
AT INLET	12.0 m
AT OUTLET	11.7 m
 N-EW LINE CULVERTS	
AT INLET	11.0 m
AT OUTLET	12.2 m

USE LINEAR INTERPOLATION BETWEEN INLET AND OUTLET TO ESTIMATE OVEREXCAVATION DEPTHS.

### PIPE ARCH OVEREXCAVATION DETAIL.

JOB OL-2082 S.R. 167 C.S. 2726	
<b>NORTH SUMNER INTERCHANGE FIGURE 6</b>	
 WASHINGTON STATE TRANSPORTATION COMMISSION DEPARTMENT OF TRANSPORTATION MATERIALS BRANCH D. C. JACKSON MATERIALS ENGINEER	DATE FEB. 1997 SCALE NONE VERT. HORIZ.
	SHEET ___ OF ___ DRAWN BY LSH



QUARRY SPALLS -  
PLACE IN ALL AREAS  
BELOW WATER TABLE

EMBANKMENT HEIGHT (H)	SURCHARGE HEIGHT (S)
H > 4m	1.5m
H < 4m	1.0m

OVEREXCAVATION AND SURCHARGE DETAIL

JOB OL-2082 S.R. 167 C.S. 2726

**NORTH SUMNER INTERCHANGE  
24th STREET INTERCHANGE  
FIGURE 7**

WASHINGTON STATE  
TRANSPORTATION COMMISSION  
DEPARTMENT OF TRANSPORTATION

MATERIALS BRANCH  
O. C. JACKSON MATERIALS ENGINEER

DATE FEB. 1997  
SCALE NONE VERT.  
NONE HORIZ.  
SHEET \_\_\_ OF \_\_\_  
DRAWN BY LSHOI

APPENDIX B

LOGS OF TEST BORINGS

**SR 167 - North Sumner Interchange  
Summary of Test Borings**

Boring	Station	Offset	Elevation
H-1-95	A24 0+091.5	14.4m Lt.	18.81m
H-2-95	A24 0+223.9	1.9m Rt.	17.6m
H-3-95	A24 0+168.9	6.6m Lt.	17.53m
H-4-95	16+110	41m Lt.	13.81m
H-5-95	S-A24 0+267.4	24.4m Lt.	16.49m
H-6-95	16+110	CL	16.40m
H-1-96	A24N 0+270	6.0m Rt.	16.99m
H-2-96	A24-N 0+110	CL	17.12m
H-3-96	A24-N 0+030	CL	16.81m
H-4-96	S-A24 0+200	CL	16.12m
H-5-96	A24 0+350	CL	17.15m
H-6-96	A24 0+500	20.0m Rt.	17.15m
H-7-96	15+999.1	85.5m Lt.	18.04m
H-8-96	A24 0+060.9	17.2m Rt.	18.37m
H-9-96	A24 0+062.0	40.4m Lt.	20.26m
H-10-96	16+386.9	32.0m Lt.	18.02m
H-11-96	EW-S 0+177.3	8.6m Rt.	14.40m
H-12-96	EW-S 0+155.2	17.1m Lt.	14.20m
H-13-96	N-EW 0+212.5	7.1m Rt.	14.20m
H-14-96	N-EW 0+230.5	15.4m Lt.	14.20m

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-1-95

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A24 0+091.5

Offset 14.4 m Lt.

C.S. 2726

Equipment \_\_\_\_\_

Casing HW X 38.7m, HQ X 38.7m Ground El 61.7 (18.81 m)

Method of Boring Wet Rotary

Start Date February 28, 1995

Completion Date March 3, 1995

Sheet 1 of 7

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
1		(Pattern: Sand with gravel)					5	D-1		1 ft. = 0.3048 m. Silty SAND with gravel (Fill).			
5		(Pattern: Well graded gravel)					4 2 (6)			Well graded GRAVEL with sand, angular to subrounded, loose, brown, moist. Recovered 60mm, Retained 60mm.			
2		(Pattern: Silty sand)					3	U-2		Silty SAND mixed with gravel and peat. No recovery.	2/28/95	▽	
10		(Pattern: Sandy silt)					4 4 (8)	D-3		Sandy silt, loose, dark grey, wet. Recovered 240mm, Retained 240mm.			
4		(Pattern: Sandy silt)					4 8 8 (16)	D-4		ML, M.C. = 36% Sandy SILT, very stiff, dark grey, wet. Recovered 335mm, Retained 335mm.			
15		(Pattern: Silty sand)					1 2 3 (5)	D-5		SILT interbedded with peat, sand and wood particles, soft, dark grey, moist. Recovered 460mm, Retained 460mm. Note: Very little water loss.			
20		(Pattern: Silty sand)											









LOG OF TEST BORING



HOLE No. **H-1-95**

Sheet **6** of **7**

PROJECT **North Sumner I/C**

Job No. **OL-2082**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
37											.9 meter head.		
125	38					28 18 23 (41)	D-26				Well graded GRAVEL with silt and sand, subangular to subrounded, dense, grey, wet. Recovered 240mm, Retained 240mm.		
130	39					12 16 14 (30)	D-27				Well graded GRAVEL with sand, subangular to subrounded, dense, grey, wet. Recovered 240mm, Retained 240mm. Note: Artesian flow of 69 liters per minute with a 3 meter head.		
135	40												
135	41					30 55 43 (98)	D-28				Well graded GRAVEL with silt and sand, subangular to subrounded, very dense, grey, wet. 3" layer of sand with gravel in end of sampler. Recovered 335mm, Retained 335mm. Note: Artesian flow of 69 liters per minute with a 3 meter head.		
140	42					30 36 34 (70)	D-29				Well graded GRAVEL with silt and sand, angular to subrounded, very dense, grey, wet. Recovered 300mm, Retained 300mm.		
140	43												
145	44					30 18 20 (38)	D-30				Well graded GRAVEL with sand, angular to subrounded, dense, grey, wet. Recovered 210mm, Retained 210mm. Note: Artesian flow increased to 87 liters per minute with a 3 meter head at depth of 43.6 meters.		

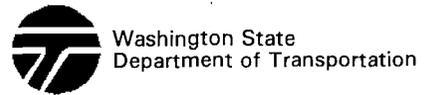








LOG OF TEST BORING



HOLE No. **H-2-95**

Sheet **4** of **7**

PROJECT **North Sumner I/C**

Job No. **OL-2082**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
22													
75													
23													
24													
80													
25													
85													
26													
27													
90													
28													
95		X X X X X								MC GS	ML, M.C. = 49% SILT with sand layered with fibrous organic material ( 50mm to 100mm layers of Peat), medium stiff, grey to dark brown, wet.		







LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-3-95

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A24 0 + 168.9

Offset 6.6 m Lt.

C.S. 2726

Equipment \_\_\_\_\_

Casing 100mm OD X 18m HC Auger Ground El 57.5 (17.53 m)

Method of Boring Dry Rotary

Start Date March 7, 1995

Completion Date March 7, 1995

Sheet 1 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40						
1							6	D-1	1 ft. = 0.3048 m. Silty SAND with gravel and cobbles.  GW, M.C. = 13% Well graded GRAVEL with sand and cobbles, subangular to subrounded, medium dense, brown, wet, fine to coarse grain. Recovered 180mm, Retained 180mm.			
5						6 6 5 (11)						
10							8 4 2 (6)	D-2	Silt with sand, loose, dark brown, wet, trace of organics. Recovered 360mm, Retained 360mm.			
15							2 1 1 (2)	D-3	ML, M.C. = 44% Silt with laminated sand lenses, soft, gray, wet, trace of organics and wood debris. Recovered 360mm, Retained 360mm.			
20							9 10	D-4	Poorly graded SAND with silt, medium dense, dark gray, wet.			

LOG OF TEST BORING



HOLE No. H-3-95

Sheet 2 of 3

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7						13 (23)	▲			Recovered 150mm, Retained 150mm.			
25						3 6 7 (13)	▲	D-5		SP-SM, M.C. = 25% Poorly graded SAND with silt, medium dense, dark gray, wet. Recovered 360mm, Retained 360mm.			
30						1 1 2 (3)	▲	D-6		Poorly graded SAND with silt, very loose, dark gray, wet. Recovered 400mm, Retained 400mm. Note: .6m of heaving sand in augers at depth of 8.8m.			
35						3 5 6 (11)	▲	D-7		Silty SAND with gravel, angular, medium dense, dark gray, moist, trace of wood debris. Recovered 460mm, Retained 460mm.			
40						1 1 2 (3)	▲	D-8		Silty SAND with gravel, subangular to subrounded, very loose, dark gray, moist, trace of wood debris. Recovered 460mm, Retained 460mm.			
45						1 1	▲	D-9		SM, M.C. = 18% Silty SAND with gravel, subangular to subrounded,			



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-4-95

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station 16 + 110

Offset 41 m Lt.

C.S. 2726

Equipment \_\_\_\_\_

Casing HW X 36.5m/HQ X 45.7m Ground El: 45.3 (13.81 m)

Method of Boring Wet Rotary

Start Date March 14, 1995

Completion Date March 16, 1995

Sheet 1 of 7

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40						
0 - 1	0 - 0.3048	X					1 1 2 (3)	D-1	1 ft. = 0.3048 m. SILT with root hairs, soft, dark brown, moist, trace of organics. Recovered 300mm, Retained 300mm. Note: Creek is 6.1 m S.W. of Test Hole Boring.			
1 - 5	0.3048 - 1.524	X					1 1 3 (4)	D-2	ML, M.C. = 37% SILT with sand lenses, soft, brown, wet. Recovered 300mm, Retained 300mm.			
5 - 10	1.524 - 3.048	X					5 4 3 (7)	D-3	SILT with sand, soft, dark brown, wet. Recovered 275mm, Retained 275mm.	3/14/95		
10 - 15	3.048 - 4.572	X					2 2 2 (4)	D-4	Silty SAND with wood debris, very loose, dark brown, moist. Recovered 300mm, Retained 300mm.			
15 - 20	4.572 - 6.096	X					8 9	D-5	SM, M.C. = 28% Silty SAND, medium dense, dark brown, wet.			



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-4-95

Sheet 3 of 7  
Job No. OL-2082

PROJECT North Sumner I/C

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
14						2 (3)				Recovered 300mm, Retained 300mm.			
15						5 10 5 (15)		D-11		Silty SAND with gravel, subrounded to subangular, medium dense, dark grey, moist. Recovered 180mm, Retained 180mm.			
55						2 2 3 (5)		D-12		Silty SAND with gravel, subangular to subrounded, loose, dark grey, moist, trace of wood debris. Recovered 240mm, Retained 240mm.			
18						1 2 2 (4)		D-13		Silty SAND with gravel, subangular to subrounded, very loose, dark grey, moist. Recovered 150mm, Retained 150mm.			
65						2 2 2 (4)		D-14		Silty SAND with gravel, subrounded to subangular, very loose, dark grey, moist. Recovered 300mm, Retained 300mm.			
21						2 2		D-15		Silty SAND with gravel, subrounded to subangular, very loose, dark grey, moist.			

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-4-95

Sheet 4 of 7

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
										Recovered 240mm, Retained 240mm.			
22													
75						3 2 2 (4)		D-16		Silty SAND with gravel, subrounded to subangular, very loose, dark grey, moist. Recovered 360mm, Retained 360mm.			
23													
24													
80						4 4 3 (7)		D-17		Silty SAND with gravel, subrounded to subangular, loose, dark grey, moist. Recovered 460mm, Retained 360mm.			
25													
85						2 4 5 (9)		D-18		Silty SAND with gravel, subangular, loose, dark grey, moist. Recovered 150mm, Retained 150mm.			
26													
27													
90						2 3 3 (6)		D-19		Silty SAND with gravel, subangular, loose, dark grey, moist. Recovered 180mm, Retained 180mm.			
28													
95						2 3		D-20		SILT with peat, medium stiff, dark brown to grey, moist.			









LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. **H-5-95**

Sheet **2** of **3**

PROJECT **North Sumner I/C**

Job No. **OL-2082**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
13													
45													

5  
10  
12  
(22)

D-6

Poorly graded SAND with silt, medium dense, dark grey, moist.  
Recovered 460mm, Retained 460mm.

7  
9  
9  
(18)

D-7

MC  
GS

SP-SM, M.C. = 24%  
Poorly graded SAND with silt, medium dense, dark grey, moist.  
Recovered 460mm, Retained 460mm,

2  
5  
7  
(12)

D-8

Poorly graded SAND with silt, medium dense, dark grey, moist.  
Recovered 360mm, Retained 360mm.

1  
2  
1  
(3)

D-9

Silty SAND with gravel, angular, very loose, dark grey, wet, with trace of wood.  
Recovered 360mm, Retained 360mm.

A  
B  
C

U-10

Silty SAND, dark grey, wet, fine to medium grained.  
Recovered 300mm, Retained 300mm.

1  
1  
1  
(2)

D-12

MC  
GS

SM, M.C. = 14%  
Silty SAND with gravel, angular, very loose, dark grey, moist, with trace of wood.  
Recovered 460mm, Retained 360mm.



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-6-95

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station 16+110

Offset C.L.

C.S. 2726

Equipment \_\_\_\_\_

Casing 100mm OD X 18m HC Augers Ground El 53.8 (16.40 m)

Method of Boring Dry Rotary

Start Date March 8, 1995

Completion Date March 8, 1995

Sheet 1 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40						
1									1 ft. = 0.3048 m. Silty SAND with organics			
5						2 2 2 (4)	D-1		ML, M.C. = 46% SILT with sand, very loose, gray, wet, trace of organics. Recovered 460mm, Retained 460mm.			
10						3 4 3 (7)	D-2		SILT with sand, loose, dark gray, wet. Recovered 335mm, Retained 335mm.	3/8/95		
15						2 4 6 (10)	D-3		SILT with laminated sand lenses, loose, dark gray, moist, trace of organics. Recovered 300mm, Retained 300mm.			
20						5 7	D-4		Poorly graded SAND with silt and laminated sand lenses, medium dense, dark gray, moist.			

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. **H-6-95**

Sheet 2 of 3

PROJECT **North Sumner I/C**

Job No. **OL-2082**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7													
25						8 (15)					Recovered 460mm, Retained 460mm.		
8													
25						5 7 7 (14)	D-5				Poorly graded SAND with silt, medium dense, dark gray, moist, clean. Recovered 300mm, Retained 300mm.		
9													
30						3 6 7 (13)	D-6				Poorly graded SAND with silt, medium dense, dark gray, moist, clean. Recovered 300mm, Retained 300mm.		
10													
35						2 1 2 (3)	D-7				Poorly graded SAND with silt and wood debris, very loose, dark gray, moist, trace of organics. Recovered 240mm, Retained 240mm.		
11													
40						1 1 1 (2)	D-8				Silty SAND with gravel, subangular to subrounded, very loose, dark gray, moist, trace of wood debris. Retained 460mm, Recovered 460mm.		
13													
45						1 2	D-9				Silty SAND with gravel, subangular to subrounded, very loose, dark gray, moist, trace of wood debris.		

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-6-95

Sheet 3 of 3

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
14							2 (2)				Retained 460mm, Recovered 460mm.		
15			1 1 2 (3)					D-10		Silty SAND with gravel, subangular to subrounded, very loose, dark gray, moist, trace of wood debris. Retained 460mm, Recovered 460mm.			
55			1 1 2 (3)					D-11		Silty SAND with gravel, subangular to subrounded, very loose, dark gray, moist, trace of wood debris. Retained 460mm, Recovered 460mm.			
17							1 1 1 (2)				Silty SAND with gravel, subangular to subrounded, very loose, dark gray, moist, trace of wood debris. Retained 460mm, Recovered 460mm.		
18											End of the Test Hole Boring at 18.4m below ground elevation.		
19											Water Table Elevation: 13.7m.		
65											This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
20													
21													
70													

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-1-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A24-N 0 + 270 Offset 6 m. Rt.

C.S. 2726

Equipment \_\_\_\_\_ Casing 4" Augers to 23'

Ground El 55.7 (16.99 m)

Method of Boring Hollow Core Augers

Start Date February 14, 1996 Completion Date February 14, 1996 Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
0	0							S-1		1 ft. = 0.3048 m. ORGANIC SOIL, brown, moist to wet, disrupted. Recovered 2.0 ft.			
1	0.3					1/24" (1/24")		D-2	GS MC	PT, M.C. = 636% PEAT, very soft, dark brown, wet, homogeneous. Retained 2.0 ft.			
5	1.5							S-3	GS MC	ML, M.C. = 33% SILT with sand, dark brown, wet, homogeneous. Recovered 2.0 ft.			
2	0.6							S-4		SILT with sand, gray, wet, homogeneous. Recovered 2.0 ft.			
10	3.0					11 7 9 11 (16)		D-5		SILT with sand, very stiff, gray, wet, homogeneous. Retained 2.0 ft.			
4	1.2					4 3 3 4 (6)		D-6		SILT with sand, medium stiff, gray, wet, homogeneous. Retained 2.0 ft.			
15	4.5							D-7		SILT with sand, very stiff, gray, wet with a one foot layer of organic SILT with sand in the middle of sample. Retained 2.0 ft.			
20	6.0					1 18 1/12"							



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-2-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A24-N 0 + 110 Offset CL

C.S. 2726

Equipment \_\_\_\_\_ Casing 4" Augers to 24'

Ground El 56.2 (17.12 m)

Method of Boring Hollow Core Augers

Start Date February 15, 1996 Completion Date February 15, 1996 Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
								S-1		1 ft. = 0.3048 m. Silty SAND, dark brown, moist, disrupted. Recovered 0.4 ft.			
1								S-2		ORGANIC SOIL, dark brown and gray, moist to wet. Recovered 2.0 ft.			
5						4		D-3		SILT with an eight inch layer of sand, medium stiff, gray, wet, stratified. Retained 1.5 ft.			
2						3 2 3 (5)		S-4		Silty SAND, gray, wet, homogeneous. Recovered 2.5 ft.			
10						4		D-5		SILT with sand, very soft, gray, wet, homogeneous. Retained 2.0 ft.			
						1/12 3 (1/12")		S-6		Poorly graded SAND, gray, wet, homogeneous. Recovered 2.4 ft.			
4								D-7	GS MC AL	ML, M.C. = 46%, PI = NP SILT with fibrous organic material, stiff, gray, wet, homogeneous. Retained 2.0 ft.			
15						1 4 6 9 (10)		D-8		SILT, stiff, gray, wet, homogeneous. Retained 2.0 ft.			
5													
20						6 8 5 5 (13)							











# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-5-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A24 0 + 350      Offset Centerline

C.S. 2726

Equipment \_\_\_\_\_      Casing 4" Augers to 23'

Ground El 56.3 (17.15 m)

Method of Boring Hollow Core Augers

Start Date February 20, 1996

Completion Date February 20, 1996

Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40						
0 - 1	0 - 0.3048	X X X X X X						S-1		1 ft. = 0.3048 m. SILT, dark brown, moist, disrupted. Recovered 2.0 ft.		
1 - 1.5	1 - 1.5	.....						S-2		Poorly graded SAND, brown, moist. Recovered 0.5 ft.		
1.5 - 2.0	1.5 - 2.0	.....					5 5 6 6 (11)	D-3	GS MC	Silty SAND, medium dense, gray and brown, moist to wet, stratified with an 8 inch layer of silt, brown and gray, with organics. Retained 2.0 ft.	▽	
2.0 - 3.0	2 - 3	.....					2 2 1 1 (3)	D-5	GS MC	SM, M.C. = 26% Silty SAND, gray, wet, homogeneous. Retained 2.0 ft.		
3.0 - 4.0	3 - 4	.....					.1 1 2 1 (3)	D-6		Silty SAND, very loose, gray, wet, layered, stratified. Retained 2.0 ft.		
4.0 - 6.0	4 - 6	.....					4 5 7 7 (12)	D-7		Silty SAND, medium dense, gray, wet, homogeneous. Retained 2.0 ft.		



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-6-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A24 0 + 500 Offset 20 m. Rt.

C.S. 2726

Equipment \_\_\_\_\_ Casing 4" Augers to 31'

Ground El 56.3 (17.15 m)

Method of Boring Hollow Core Augers

Start Date February 21, 1996 Completion Date February 21, 1996 Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
1		X						S-1		1 ft. = 0.3048 m. SILT, dark brown, moist. Recovered 1.3 ft.			
5		X						S-2		SILT, dark brown, moist. Recovered 1.0 ft.			
2		Wavy lines					1 1 1 2 (2)	D-3		PEAT, soft, dark brown, moist, homogeneous. Two inches of silt at bottom of sample. Retained 2.0 ft.			
10		X						S-4		February 21, 1996 SILT, dark brown, wet in top of tube. Silty SAND, gray, wet in bottom of tube. Recovered 2.2 ft.			
4		X					2 2 2 2 (4)	D-5		SILT, soft, gray, wet, stratified, with four two inch layers of organic silt. Retained 2.0 ft.			
15		X						S-6		SILT, gray, wet. Recovered 2.0 ft.			
5		X					5 6 9 9 (15)	D-7		SILT with sand, stiff, gray, wet, homogeneous. Retained 2.0 ft.			
20		X						S-8		Silty SAND, gray, wet. Recovered 1.2 ft.			









LOG OF TEST BORING



HOLE No. H-8-96

Sheet 2 of 2

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7		X											
25		X											
8		X											
9		X											
30		X											
10		X											
35		X											
11		X											
12		X											
40		X											
13		X											
45		X											

4  
4  
8  
9  
(12)

D-8

SILT with sand, stiff, gray, wet, homogeneous. Retained 2.0 ft.

1  
2  
2  
1  
(4)

D-9

PEAT, soft, dark brown, moist. Retained 1.3 ft.

8  
2  
2  
1  
(4)

D-10

No recovery. Piece of wood in bit of sampler and a few pieces of gravel.

3  
5  
3  
5  
(8)

D-11

GS  
MC

SM, M.C. = 19%  
Silty SAND with gravel and fibrous organic material, loose, gray, wet, homogeneous. Retained 2.0 ft.

End of test hole boring at 40.0 ft. below ground elevation.  
Installed piezometer.

This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-9-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A24 0+062.0      Offset 40.4 m Lt.

C.S. 2726

Equipment \_\_\_\_\_ Casing 4" Augers to 32'

Ground El 66.5 (20.26 m)

Method of Boring Hollow Core Augers

Start Date February 27, 1996      Completion Date February 27, 1996      Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40						
0	0						3 1 3 1 (4)	D-1	1 ft. = 0.3048 m. PEAT with a 6 inch gravel layer on the surface and wood fragments, soft, dark brown to black, wet, disrupted. Retained 1.6 ft.			
1	0.3							U-2	No Recovery.			
5	1.5						1 4 4 4 (8)	D-3	SILT with organic soil layers, medium stiff, gray, wet, disrupted. Retained 1.0 ft.			
2	0.6						A B C	U-4	SILT with sand layers, gray, moist.			
10	3.0						4 5 6 7 (11)	D-5	SILT with sand, stiff, gray, wet, homogeneous. Retained 1.7 ft.			
4	1.2						A	U-6	SILT with sand, gray, wet.			
15	4.5						7 9 9 9 (18)	D-7	SILT with sand and a one foot layer of organic soil, gray, wet, stratified. Retained 2.0 ft.			
6	1.8						4 9 10 11 (19)	D-8	Silty SAND, medium dense, gray, wet, homogeneous. Retained 2.0 ft.			



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-10-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station 16 + 386.9

Offset 32 m Lt.

C.S. 2726

Equipment \_\_\_\_\_

Casing 4" Augers to 24'

Ground El 59.1 (18.02 m)

Method of Boring Hollow Core Augers

Start Date February 28, 1996

Completion Date February 28, 1996

Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
1 5 10 15 20	0.3048 1.524 3.048 4.572 6.096						2 2 4 4 (6)	D-1		1 ft. = 0.3048 m. Silty SAND with gravel, loose, dark brown, moist, disrupted. Retained 0.7 ft.			
							A B C	U-2		ORGANIC SOIL, dark brown, moist.			
							3 5 7 7 (12)	D-3		Silty SAND, dark gray, moist, homogeneous. Retained 1.8 ft.			
							3 4 4 2 (8)	D-4		Silty SAND, loose, gray, wet, homogeneous. Retained 2.0 ft.			
							2 4 5 7 (9)	D-5		Silty SAND, loose, gray, wet, layered, stratified. Retained 2.0 ft.			
							5 5	D-6		Silty SAND, medium dense, gray, wet, homogeneous.			





LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-11-96

Sheet 2 of 3  
Job No. OL-2082

PROJECT North Sumner I/C

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
13													
45													

7 ft. of heave.  
Silty SAND, medium dense, gray, wet, homogeneous. Retained 1.3 ft.

Silty SAND with a 2 inch layer of sandy silt with wood and gravel at the bottom of sampler, very loose, gray, wet, laminated. Retained 1.5 ft.

2 ft. of heave.  
Silty SAND with gravel and wood fragments, very loose, gray, wet, homogeneous. Retained 0.9 ft.

SM, M.C. = 19%  
Silty SAND with gravel and wood fragments, very loose, gray, wet, homogeneous. Retained 1.5 ft.

Silty SAND with gravel, very loose, gray, wet, homogeneous. Retained 1.5 ft.

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-11-96

Sheet 3 of 3

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

End of test hole boring at 13.6 m. below ground elevation.

This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-12-96

Sheet 2 of 3

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
13													
45													

Silty SAND, medium dense, gray, wet, homogeneous. Retained 1.5 ft.

7 ft. of heave.

Silty SAND with gravel and wood fragments, very loose, gray, wet, homogeneous. Retained 1.5 ft.

Silty SAND with gravel, very loose, gray, wet, homogeneous. Retained 1.5 ft.

Silty SAND with gravel, very loose, gray, wet, homogeneous. Retained 1.5 ft.

Silty SAND with gravel and wood fragments, very loose, gray, wet, homogeneous. Retained 0.8 ft.

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-12-96

Sheet 3 of 3

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

End of test hole boring at 13.4 m. below ground elevation.

This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-13-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station N-EW 0 + 212.5      Offset 7.1 m Rt.

C.S. 2726

Equipment \_\_\_\_\_      Casing 4" Augers X 43'

Ground El 46.6 (14.20 m)

Method of Boring Hollow Core Augers

Start Date July 3, 1996

Completion Date July 3, 1996

Sheet 1 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
0	0						1/18" (1/18")	D-1		1 ft. = 0.3048 m. Silty SAND with organic material, very soft, gray and brown, moist, disturbed. Retained 0.2 ft.			
1	1						1/18" (1/18")	D-2		Sandy SILT with fibrous organic material, very soft, dark brown, moist, homogeneous. Retained 1.5 ft.			
3	3					4 4 5 (9)		D-3		Silty SAND, loose, gray, moist, homogeneous. Retained 1.0 ft.			
4	4					3 7 9 (16)		D-4		Silty SAND, medium dense, gray, wet, homogeneous. Retained 1.0 ft.			
6	6					4 7 8 (15)		D-5		Silty SAND, medium dense, gray, wet, homogeneous. Retained 1.5 ft.			





LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-14-96

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station N-EW 0 + 230.5 Offset 15.4 m Lt.

C.S. 2726

Equipment \_\_\_\_\_ Casing 4" Augers to 43'

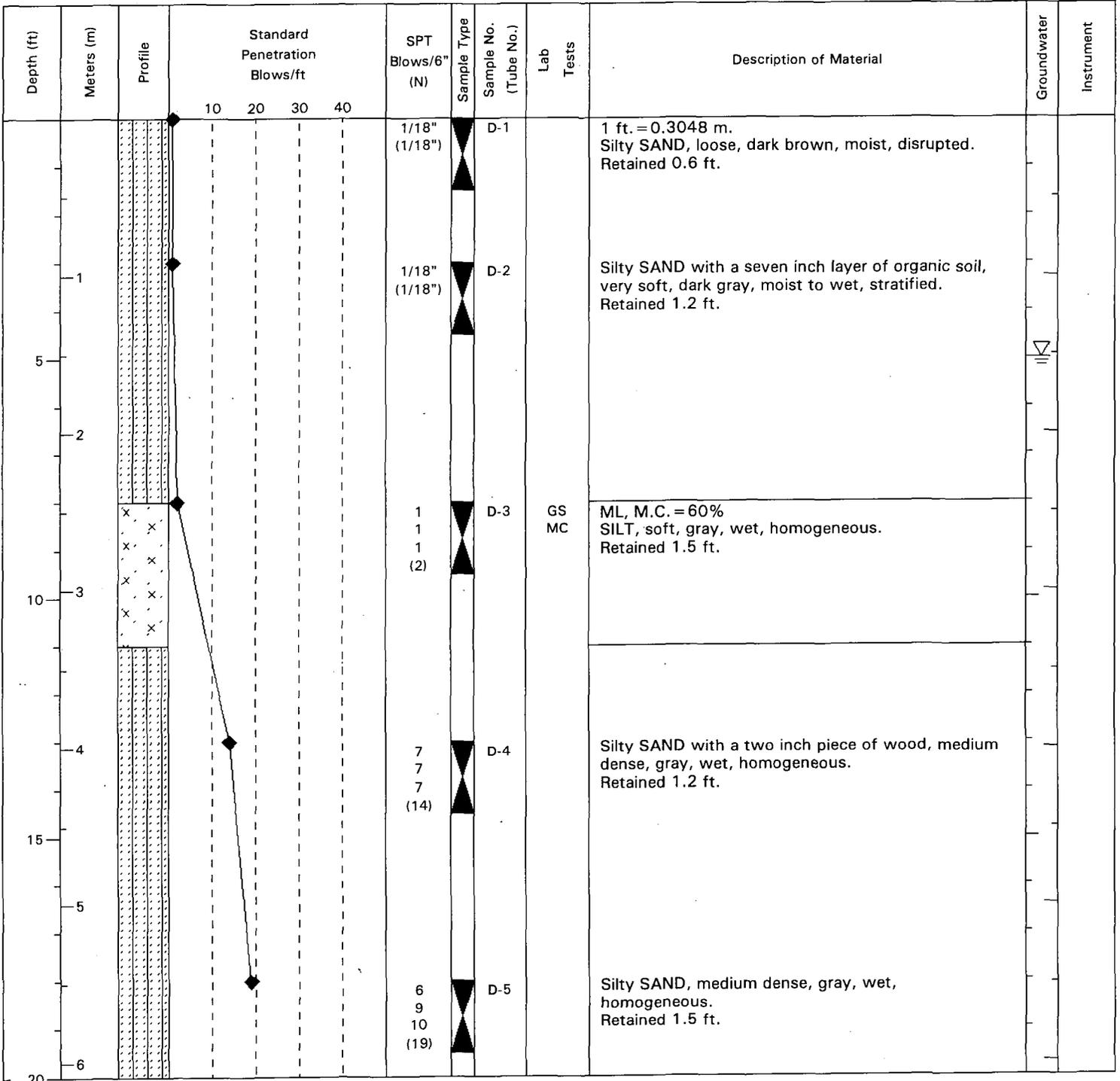
Ground El 46.6 (14.20 m)

Method of Boring Hollow Core Augers

Start Date July 16, 1996 Completion Date July 16, 1996

Sheet 1 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
1													
5													
2													
10													
3													
4													
15													
5													
6													
20													



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. **H-14-96**

Sheet 2 of 3  
Job No. **OL-2082**

PROJECT **North Sumner I/C**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
13													
45													

Silty SAND, medium dense, wet, homogeneous. Retained 1.5 ft.

Seven ft. of heave.

Silty SAND with 10 inches of wood in bottom of sampler, medium dense, gray, wet, homogeneous. Retained 1.3 ft.  
Note: Very hard drilling from 29.0 ft. to 33.0 ft. - possible log.

Six inches of wood. Possible log from 33 ft. to 36 ft. Retained 0.5 ft.

Six inches of wash.

Fourteen inch plug of wood in auger at 38 ft. Had to chop plug out of auger.  
Silty SAND with pieces of wood, very loose, gray, wet, homogeneous. Retained 1.0 ft.

Silty SAND, loose, gray, wet, homogeneous. Retained 0.5 ft.

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-14-96

Sheet 3 of 3

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

End of test hole boring at 44.5 ft. below ground elevation.

This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

APPENDIX C

LABORATORY TEST DATA

Job No. **OL-2082**

Date **May 29, 1996**

Hole No. **H-1-96**

Sheet **1 of 1**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **North Sumner I/C**

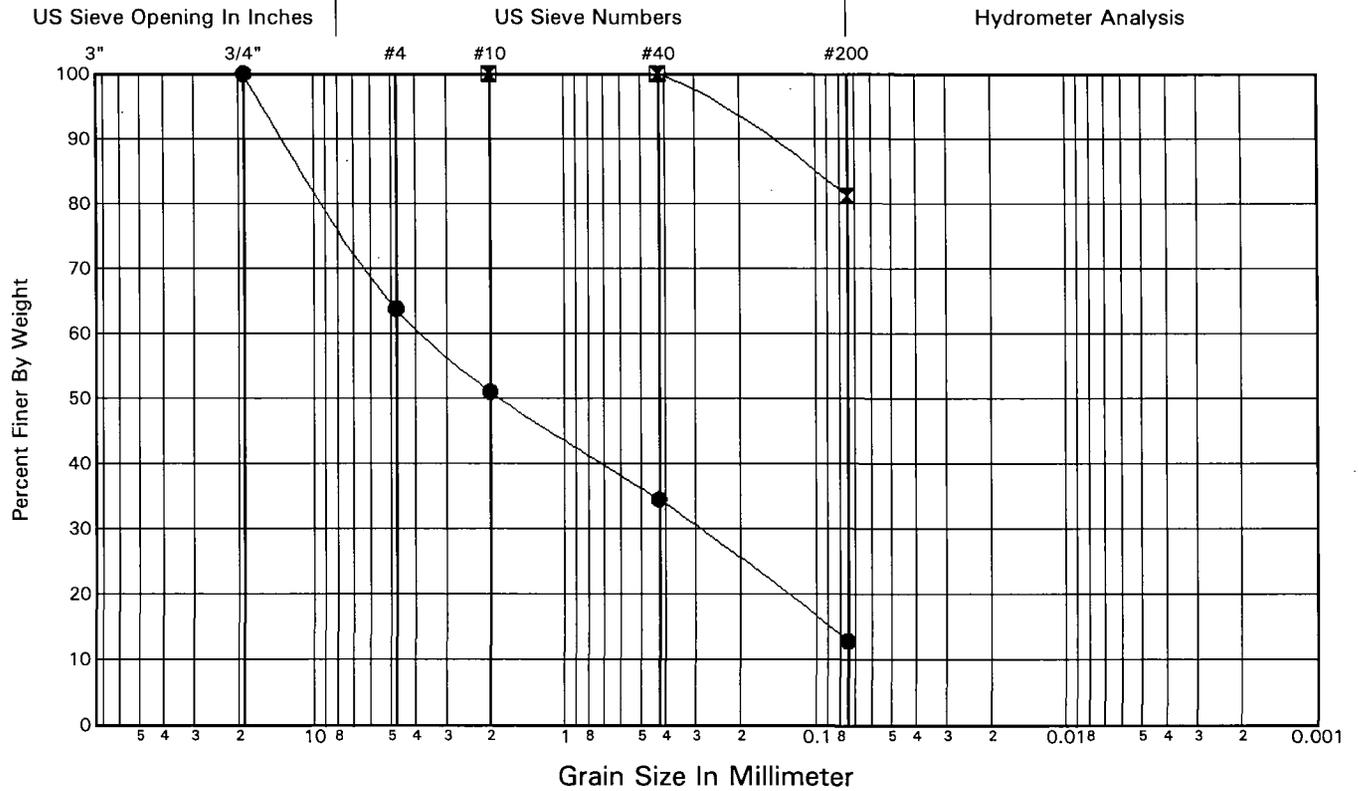
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	3.0	0.91	D-2	PT	VERY DARK BROWN	PEAT W/SMALL AMOUNT OF SILT	636	NP	NP	NP
☒	5.0	1.52	S-3	ML	DARK GRAY	SILT with SAND	33	NP	NP	NP

**GRADATION FRACTIONS**

	%Gravel	%Sand	%Fines	Cu	Cc
●	36.2	50.9	12.9		
☒	0.0	18.8	81.2		

**GRADATION VALUES**

	D60	D50	D30	D20	D10
●	3.67	1.82	0.30	0.13	
☒					



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2082**

Date **May 29, 1996**

Hole No. **H-2-96**

Sheet **1 of 1**

**Laboratory Summary**



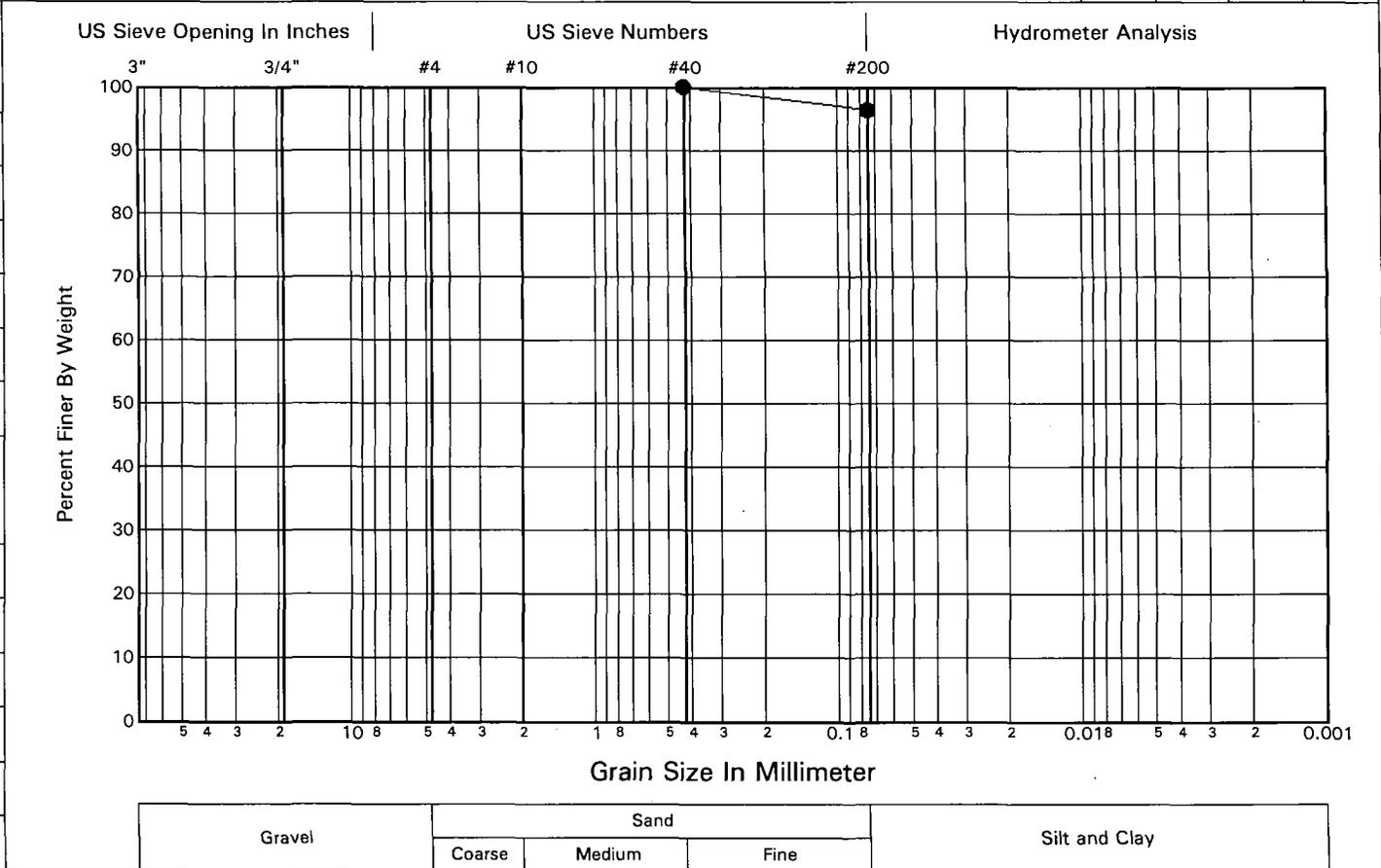
Washington State  
Department of Transportation

Project **North Sumner Interchange**

Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
● 15.0	4.57	D-7	ML	DARK GRAY	SILT with fibrous organic material	46	NP	NP	NP

GRADATION FRACTIONS				
%Gravel	%Sand	%Fines	Cu	Cc
● 0.0	3.6	96.4		

GRADATION VALUES				
D60	D50	D30	D20	D10
●				



Job No. **OL-2082**

Date **April 22, 1996**

Hole No. **H-3-96**

Sheet **1 of 1**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **North Sumner I/C**

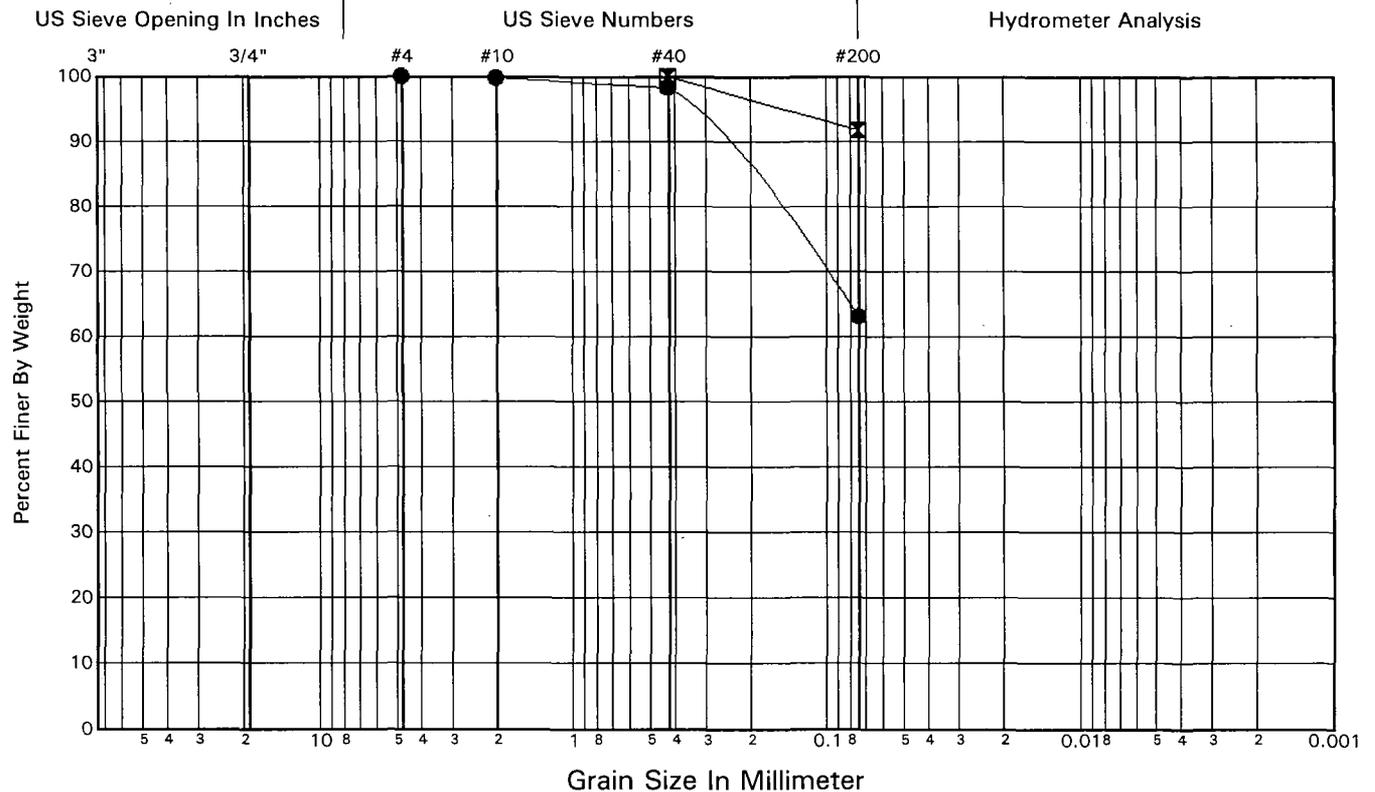
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	5.0	1.52	D-3	ML	DARK OLIVE BROWN	SANDY SILT w/root hairs	39	NP	NP	NP
☒	13.0	3.96	D-6	ML	DARK GRAY	SILT	47	NP	NP	NP

**GRADATION FRACTIONS**

	%Gravel	%Sand	%Fines	Cu	Cc
●	0.0	36.9	63.1		
☒	0.0	8.2	91.8		

**GRADATION VALUES**

	D60	D50	D30	D20	D10
●					
☒					



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2082**

Date **April 22, 1996**

Hole No. **H-4-96**

Sheet **1 of 1**

Laboratory Summary



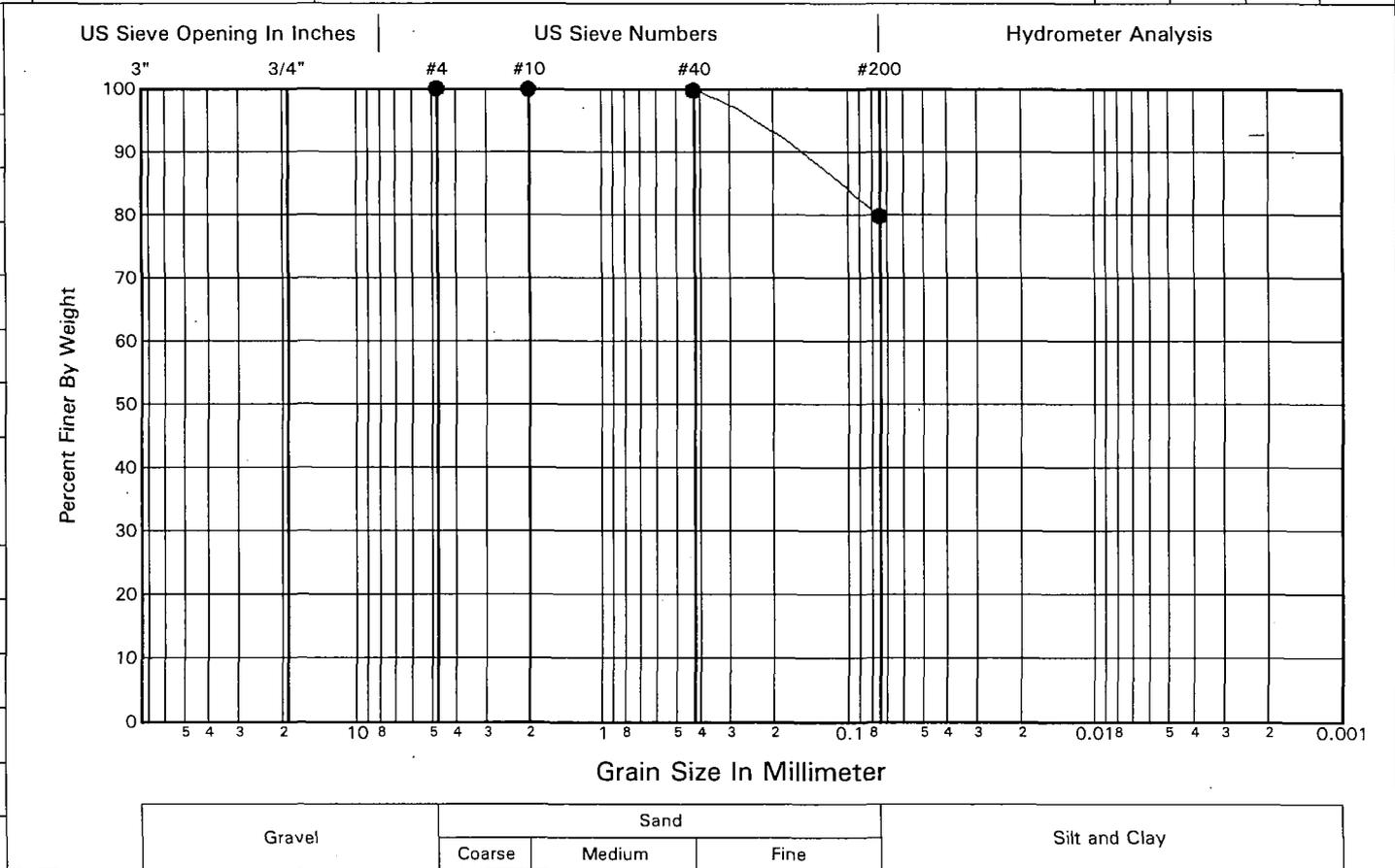
Washington State  
Department of Transportation

Project **North Sumner I/C**

Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
13.0	3.96	D-5	ML	DARK GRAYISH BROWN	SILT with SAND	33	NP	NP	NP

GRADATION FRACTIONS				
%Gravel	%Sand	%Fines	Cu	Cc
0.0	20.2	79.8		

GRADATION VALUES				
D60	D50	D30	D20	D10



Job No. **OL-2082**

Date **April 22, 1996**

Hole No. **H-5-96**

Sheet **1 of 1**

Laboratory Summary



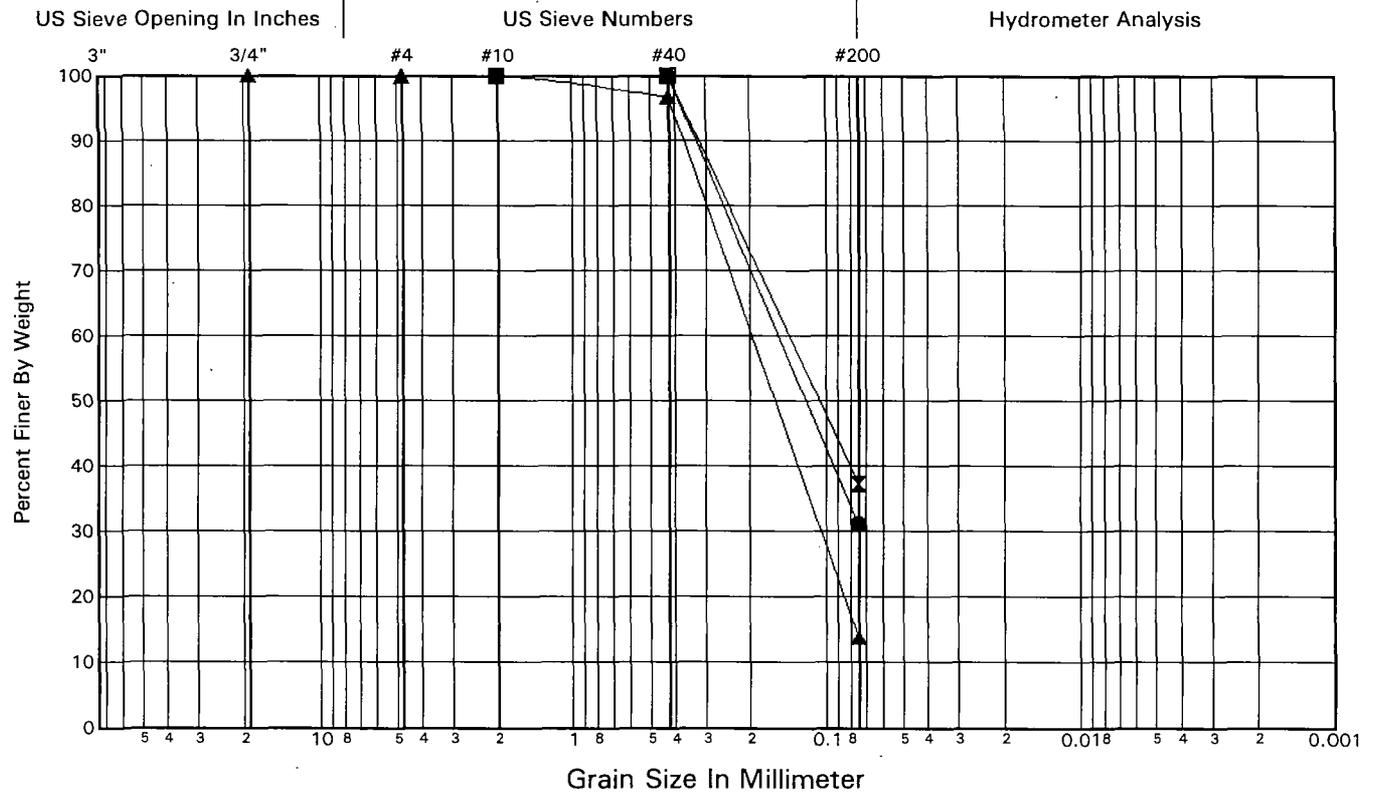
Washington State  
Department of Transportation

Project **North Sumner I/C**

	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	8.0	2.44	S-4	SM	DARK GRAY	SILTY SAND w/silt lenses not included here	30	NP	NP	NP
☒	10.0	3.05	D-5	SM	DARK BROWN	SILTY SAND	26	NP	NP	NP
▲	23.0	7.01	D-8	SM	DARK GRAY	SILTY SAND	25	NP	NP	NP

GRADATION FRACTIONS					
	%Gravel	%Sand	%Fines	Cu	Cc
●	0.0	68.9	31.1		
☒	0.0	62.8	37.2		
▲	0.1	86.1	13.8		

GRADATION VALUES					
	D60	D50	D30	D20	D10
●	0.16	0.12			
☒	0.14	0.11			
▲	0.20	0.16	0.11	0.09	



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2082**

Date **May 29, 1996**

Hole No. **H-8-96**

Sheet **1 of 1**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **North Sumner I/C**

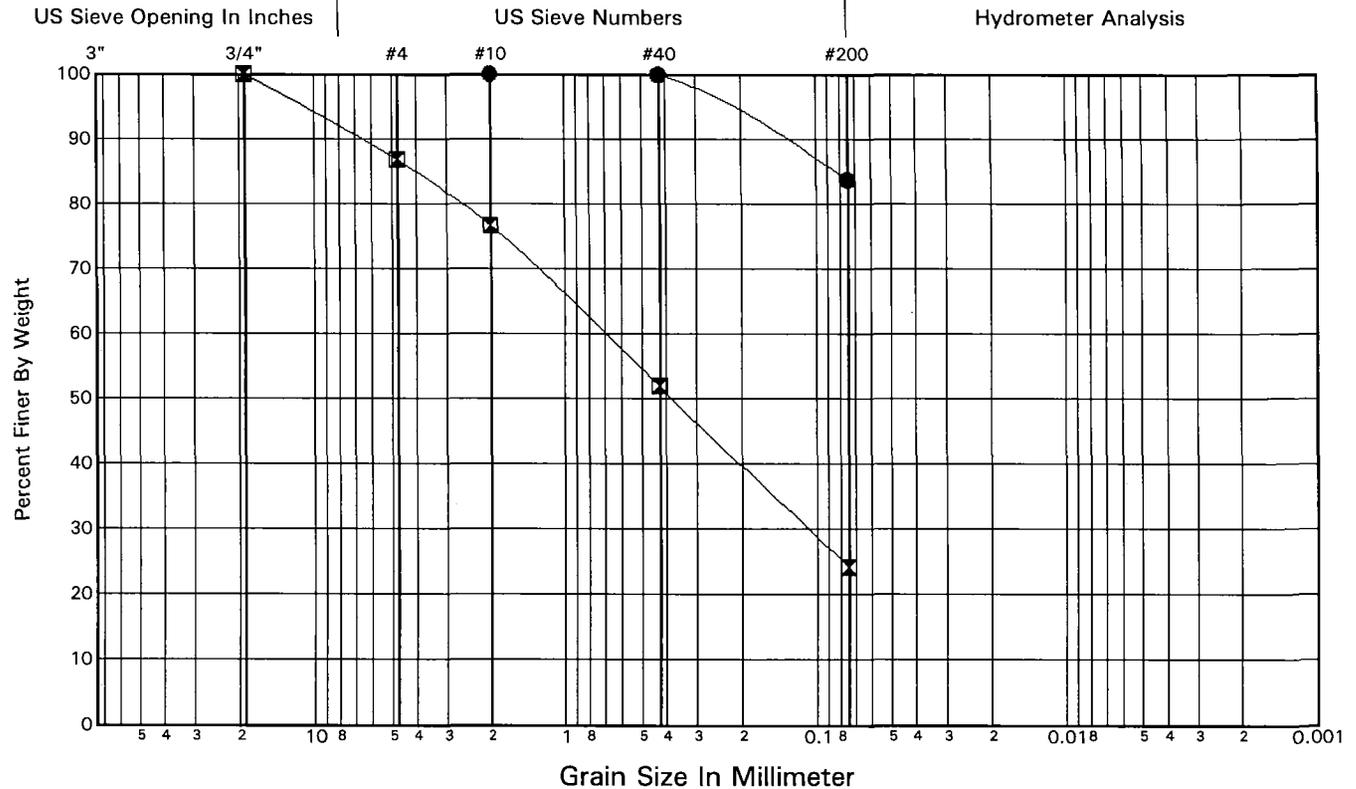
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	8.7	2.65	U-3C	ML	DARK GRAY	SILT with SAND	15	NP	NP	NP
☒	38.0	11.58	D-11	SM	DARK GRAY	SILTY SAND w/fibrous organic material	19	NP	NP	NP

**GRADATION FRACTIONS**

	%Gravel	%Sand	%Fines	Cu	Cc
●	0.0	16.3	83.7		
☒	13.2	62.6	24.2		

**GRADATION VALUES**

	D60	D50	D30	D20	D10
●					
☒	0.71	0.38	0.11		



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2082**

Date **August 7, 1996**

Hole No. **H-11-96**

Sheet **1 of 1**

**Laboratory Summary**



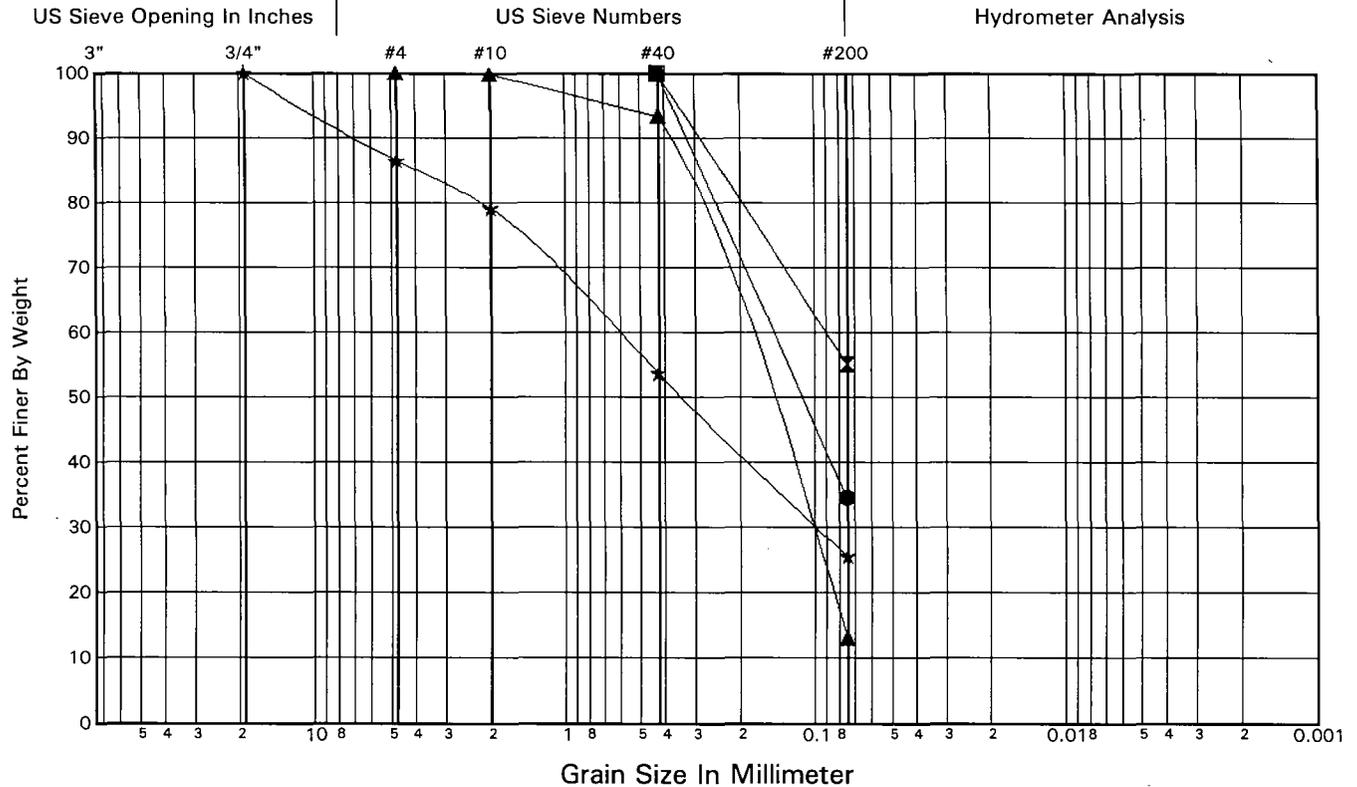
Washington State  
Department of Transportation

Project **North Sumner I/C**

	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	0.0	0.00	D-1	SM		SILTY SAND with root hairs and grass	35	NP	NP	NP
☒	3.0	0.91	D-2	ML		SANDY SILT with fibrous organic material and root hairs	110	NP	NP	NP
▲	18.0	5.49	D-5	SM		SILTY SAND	22	NP	NP	NP
★	38.0	11.58	D-9	SM		SILTY SAND	19	NP	NP	NP

GRADATION FRACTIONS					
	%Gravel	%Sand	%Fines	Cu	Cc
●	0.0	65.4	34.6		
☒	0.0	44.9	55.1		
▲	0.0	86.9	13.1		
★	13.5	60.9	25.6		

GRADATION VALUES					
	D60	D50	D30	D20	D10
●	0.15	0.11			
☒	0.09				
▲	0.21	0.17	0.11	0.09	
★	0.62	0.34	0.10		



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2082**

Date **August 7, 1996**

Hole No. **H-14-96**

Sheet **1 of 1**

**Laboratory Summary**



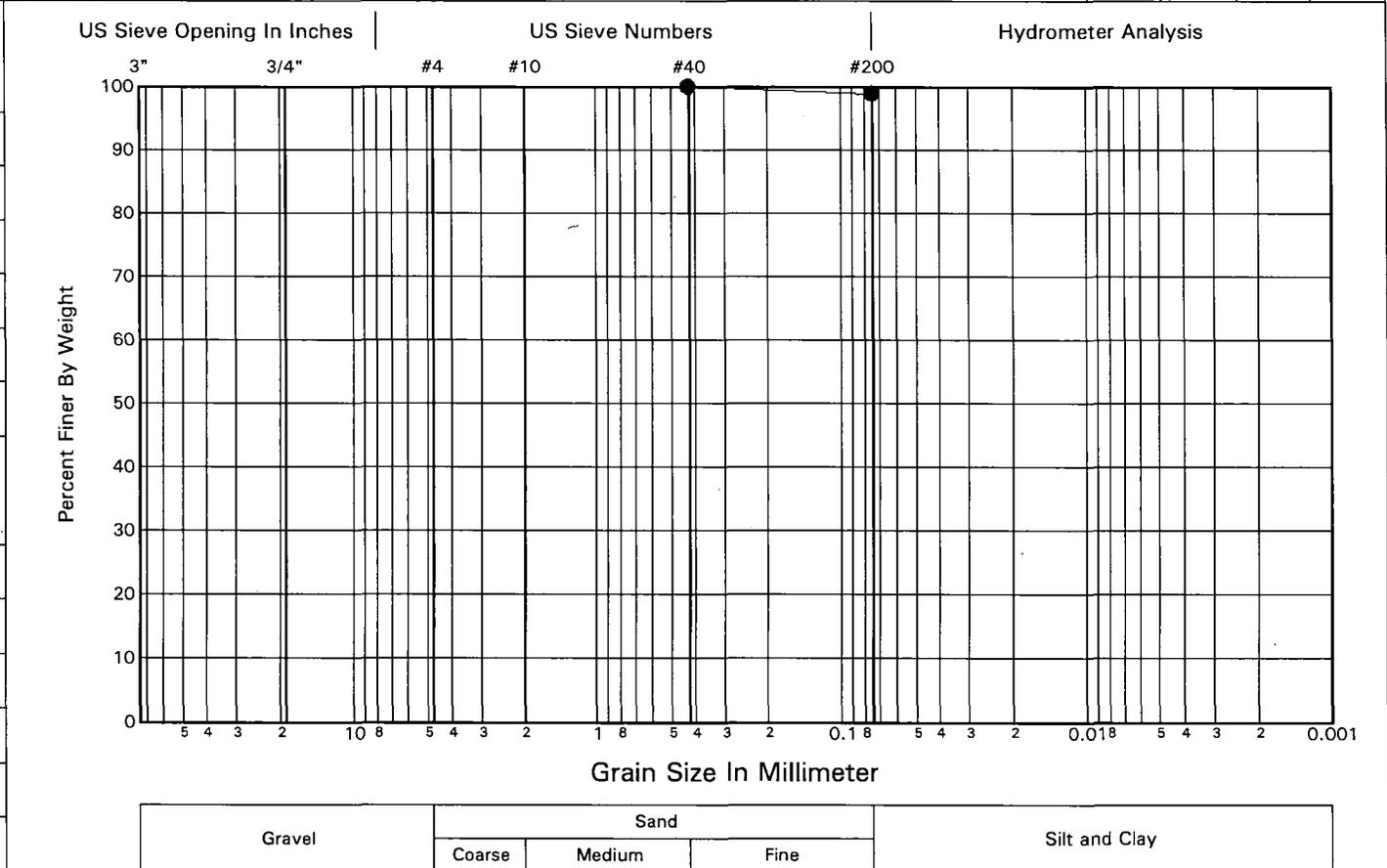
Washington State  
Department of Transportation

Project **North Sumner I/C**

	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	8.0	2.44	D-3	ML		SILT	60	NP	NP	NP

GRADATION FRACTIONS					
	%Gravel	%Sand	%Fines	Cu	Cc
●	0.0	1.1	98.9		

GRADATION VALUES					
	D60	D50	D30	D20	D10
●					





LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-3-95

*Pin 3*

Sheet 2 of 3

PROJECT North Sumner I/C

Job No. OL-2082

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7						13 (23)				Recovered 150mm, Retained 150mm.			
25						3 6 7 (13)	D-5			<p><i>10% 20</i></p> <p>SP-SM, M.C. = 25% Poorly graded SAND with silt, medium dense, dark gray, wet. Recovered 360mm, Retained 360mm.</p>			
30						1 2 (3)	D-6			<p><i>20</i></p> <p>Poorly graded SAND with silt, very loose, dark gray, wet. Recovered 400mm, Retained 400mm. Note: .6m of heaving sand in augers at depth of 8.8m.</p>			
35						3 5 6 (11)	D-7			Silty SAND with gravel, angular, medium dense, dark gray, moist, trace of wood debris. Recovered 460mm, Retained 460mm.			
40						1 1 2 (3)	D-8			Silty SAND with gravel, subangular to subrounded, very loose, dark gray, moist, trace of wood debris. Recovered 460mm, Retained 460mm.			
45						1 1	D-9			<p><i>25% 200</i></p> <p>SM, M.C. = 18% Silty SAND with gravel, subangular to subrounded,</p>			



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-4-97

*Pin 2*

PROJECT North Sumner I/C

Job No. OL-2082

S.R. 167

Station A 24 0 + 133 Offset Centerline

C.S. 2726

Equipment BK-80 Casing \_\_\_\_\_

Ground El 55.8 (17.01 m)

Method of Boring Wet Rotary

Start Date June 30, 1997 Completion Date July 1, 1997

Sheet 1 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
										1 ft. = 0.3048 m.			
1						2 3 3 (6)	D-1	GS MC	ML, M.C. = 43% Sandy SILT with organics, medium stiff, dusky brown, wet, very fine grained. Recovered 1.5 ft, retained 1.0 ft.				
5													
2													
10						A B C D	U-2	MC	U-2B M.C. = 35% Silty SAND with organics, brownish black, laminated with very fine grained SILT with traces of small pieces of wood debris, wet.				
3						1 1 1 (2)	D-3	GS MC	ML, M.C. = 44% Sandy SILT with organics, soft, brownish black, wet. Recovered 1.0 ft.				
4						A B C D E	U-4	GS MC AL UU	U-4C: ML, M.C. = 39% PI = NP SILT with sand; U-4E: ML, M.C. = 67%, PI = NP SILT, brownish gray, wet, traces of organics.				
15						5 6 7 (13)	D-5		Sandy SILT, horizontally laminated with organics and medium to coarse sand, medium dense, brownish gray, wet. Recovered 1.2 ft, retained 1.0 ft.				
5													
20						8 9 9 10 (18)	D-6	GS MC	SM, M.C. = 39% Silty SAND with trace of organics, stratified with slightly coarser sand, medium dense, gray, wet, stratified. Recovered 2.0 ft.				

*30% 250*

