



Date: January 18, 2001

TO: David L. Edwards/Jim Davidson, MS- NB82-117  
NW Region Project Office

FROM: T. M. Allen/D.A. Williams  
FOSSC Geotechnical Branch

SUBJECT: SR-203 OL-2263  
NE Stillwater Hill Road and Fay Road Intersection  
MP 8.69 to MP 9.75  
Final Geotechnical Documentation

Attached with this memorandum are the geotechnical reports for the subject project. In accordance with Design Office direction, we are transmitting them in a camera-ready format for reproduction and provision to prospective bidders. The final geotechnical documentation package consists of:

1. Memorandum dated November 6, 2000. "*NE Stillwater Hill Road and Fay Road Intersections, MP 8.69 to MP 9.75, Geotechnical Recommendations.*" This memorandum documents the geotechnical information for the subject project and supplements our recommendations dated December 20, 1999.
2. Memorandum dated December 20, 1999. "*NE Stillwater Hill Road and Fay Road Intersections, MP 8.69 to MP 9.75, Detention Pipes.*" This memorandum documents the geotechnical information for the two detention pipes for subject project.
3. Design Memorandum to OSC Bridge & Structures dated June 11, 1998. "*NE Stillwater Hill Road and Fay Road I/C, MP 8.69 to MP 8.92 Retaining Wall Recommendations.*" This memorandum documents the soil nail wall design for the project.

If you have any questions regarding this memorandum, please contact Donald Williams at (360) 709-5457.

TMA:daw  
DAW  
Attachments

cc: Earl E. Franzen, NW Plans, N. W. Region, NB82-111 (cover Memorandum only)

# FILE



Washington State  
Department of Transportation

Memorandum

1

Date: November 6, 2000

TO: David L. Edwards/ Jim Davidson  
NW Region, MS: NB82-117

FROM: T. M. Allen/D.A. Williams  
FOSSC Geotechnical Branch, 47365

SUBJECT: SR-203, OL-2263  
NE Stillwater Hill Road to Fay Road Intersection  
MP 8.69 to MP 9.75  
Geotechnical Recommendations

As requested, we are providing geotechnical recommendations for two detention pipes and two retaining walls located within the project limits. It is our understanding that the detention pipes will store and treat storm-water runoff from the highway. The retaining walls are required to keep the new sliver fill from encroaching on the wetland areas. In our memorandum dated December 20, 1999, we evaluated the first detention pipe between Stations 3+170 and 3+380. To further evaluate the second detention pipe and the wall locations, we requested additional geotechnical investigation. The investigation required drilling three additional test holes below the proposed wall location. We expected potential stability and/or settlement of the proposed walls for this project. Due to I-695, this project was put on hold. The additional test holes were not completed until October 6, 2000.

### Field Investigation

The field investigation for the project consisted of one test pit, 5 portable penetrometer holes, and 10 test holes. Soil sampling was performed at the test pit and test hole locations. The samples were visually identified in the field and then submitted to the Materials Laboratory for more detailed classification. Copies of all the test hole logs are included in Appendix B.

Laboratory testing was performed on selected samples. The tests were done in accordance with AASHTO T-88, T-89, and T-90 guide specifications. After the testing was complete, the samples were classified using the Unified Soil Classification System (USCS). Copies of the laboratory test data are included in Appendix C.

### Site Soil Conditions

At the proposed location of the first detention pipe and Wall 1, the soils consist of medium dense to dense sand and gravel with cobbles. The soils are described in Test holes TH-2-99, TH-3-99, TH-5-00, TH #3, PP-2-99, and PP-3-99.

At the proposed location for the second detention pipe and Wall 2, the soils are variable. In general, there is up to 4.6 m of medium dense to very loose fill, underlain by soft silt with organics to very loose silt with sand. The fill consists of loose to medium dense sandy silt with

gravel to silty sand with gravel. A dense to very dense well-graded sand and gravel was encountered approximately 6.4 m below the ground surface. The soils are described in Test holes TH-2-97, TH-2A-97, TH-1-99, TH-6-00, TH-7-00, TH #1, and TH #2.

Ground water was encountered in TH-2-97, TH-2A-97, TH-1-99, TH-2-99, TH-5-00, and TH-7-00. The water level varies between 1.2 m to 6.4 m below the ground surface. Water level likely varies seasonally. During the wet months between November and June, the water levels are expected to be near the ground surface in the low-lying areas. During the dryer months between July and October, the ground water can vary by as much as 3 m.

### **Detention Pipes**

It is our understanding that approximately 1.2 m diameter pipes need to be constructed in the edge of the existing shoulder. The pipes will store and treat storm water runoff from the highway. The first pipe is 210 meters in length between Stations 3+170 and 3+380. The second pipe is approximately 51 m in length between Stations 4+620 and 4+670.

As stated in our memorandum dated December 20, 1999, we do not expect a major stability or settlement problem at the first pipe location. The pipe will be set back from the new slope face approximately 5 m with between 1.2 m and 2.0 m of cover.

The second detention pipe site, between Stations 4+620 and 4+673, is located approximately 1.5 m behind the proposed face of Wall 2 at approximate elevation 15.75 m. The foundation soils will likely vary along the pipes length. We expect the pipe at Station 4+620 will be in dense sands and gravel. The pipe at Station 4+673 will likely be in very loose to loose silty sand with gravel. The volume of soil displaced by the pipe will compensate for any potential settlement under the pipe.

We recommend the soil under the second detention pipe be over excavated and replaced by approximately 0.5 m of gravel backfill in accordance with Section 7-10 of the Standard Specifications. This should provide a stable base for the new pipe. The bedding material should meet the Gravel Backfill for Pipe Zone Bedding or Gravel Backfill for Foundations – Class B.

### **Geotechnical Recommendations for Retaining Walls**

Three walls have been proposed for this project. The location of the walls is as follows:

- Soil Nail Wall will be located in the existing embankment right of Stations 3+245 and 3+343. The wall will be approximately 98 m long with an exposed wall height of up to 10.4 m.
- Wall 1 is located in the shoulder of new sliver fill between Stations 3+530 and 3+555 (Left) and will have a length of 25 m. The exposed wall face will vary up to 1.5 meters in height.
- Wall 2 is located between the existing roadway and a wetland area between Stations 4+625 and 4+716 (Left) and will have a length of approximately 92 m. The wall will vary up to 2.8 m in height.

Our geotechnical design includes evaluation of overall external stability, wall foundation bearing capacity and embedment depth required, wall settlement, and soil properties to be used for design. Special Designed Walls, such as soil nail walls and soldier pile walls, are design by both FOSSC Geotechnical Branch and Bridge and Structures.

The soil nail wall design recommendations were provided in a memorandum dated June 11, 1998. The wall is a special design that was designed by both FOSSC Geotechnical Branch and Bridge and Structures. Please refer to that memorandum concerning the soil nail wall design.

### **Wall 1**

Wall 1 can be a Concrete Modular Block Wall (MBW) without soil reinforcement. The wall needs to meet the minimum embedment criteria for foundations on slopes. The following items should be considered in preparation of contract documents:

1. The wall should be placed on a level foundation in the direction perpendicular to the wall face.
2. The wall base should be located using a minimum embedment criterion. We recommend a minimum embedment of 600 mm below final ground surface and a minimum set back of 1.2 m at the base of the wall from the face of the slope. In no case should the wall base/footing embedment be less than 10 percent of the wall height.
3. MBW walls should have a wall face batter of 6V:1H.
4. The base width of the MBW walls should not be less than 60 percent of the wall height to satisfy overall stability. Greater wall base widths may be needed to provide adequate overturning, sliding, and internal stability for the walls.
5. Backfill within the reinforced wall prism should consist of gravel borrow.
6. Compacted gravel borrow per Method B may be used behind the reinforced wall prism depending on weather conditions during construction. Common Borrow is not recommended.
7. The concrete used for the blocks must be new (return concrete is not acceptable).

To satisfy the base width requirements, the lowest level of blocks should be placed perpendicular to the roadway. We know of only one proprietary modular block system, which meets the minimum base width requirements. If competing proprietary systems are needed, additional wall options, such as a gabion wall or MSE wall, will need to be included in the contract documents. Please contact us for assistance if this is the case.

### **Wall 2**

The Project Office had proposed a MBW wall at the location of Wall 2. However due to the presences of soft soils and high ground water, a MBW design does not meet the minimum factor of safety (FS) for sliding, overturning and global stability. Due to limited room, a cantilever

soldier pile wall is recommended. This wall type will allow a wall to be built along the same "foot print" as the proposed wall alignment with the detention pipe extending behind the new wall. Other wall types, such as MSE wall, would result in a net pressure beyond their footprint, leading to differential settlement of the detention pipe.

The soldier pile wall will require a special design by Bridge and Structures. Design earth pressure diagrams are presented on Figures 1 and 2 in Appendix A. The earth pressure diagrams assume a horizontal backfill condition behind the wall. If sloping backfill above the wall is designed, these diagrams will need to be revised to reflect higher earth pressures due to the sloping backfill. Seismic earth pressure shown in the Figures is based on a peak ground acceleration of 0.28 g. This value is shown on the 1996 USGS National Seismic Hazards Map for a 10% probability of exceedance in 50 years.

Since the soldier pile wall will be placed on sloping ground, a minimum tip is recommended. In order to satisfy global stability requirements, the tip of the soldier piles should be at/or below elevation 12 m (4.5 m below ground surface). It should be noted that at the critical wall section at Station 4+700, the top of the dense sand and gravel layer is at approximate elevation 9.5 m. The tips of the soldier piles may be founded in this dense layer.

Settlement of the fill behind the walls should be 50 mm or less. Settlement should occur as the wall is being constructed. Post-construction settlement is expected to occur within 30 days after the fill is in place.

### **Construction Considerations**

The construction consideration that will require attention during design and construction of this project are as follows:

1. We understand that there is limited working space for this project. We expect that a minimum of one travel lane of traffic is needed to supply working room for the soldier pile.
2. Due to the soft ground and potential caving conditions, we recommend temporary casing for the full depth of soldier pile.
3. We recommend that a Summary of Geotechnical Conditions should be included in the contract documents to identify potential construction difficulties. The Summary of Geotechnical Conditions will be written during the PS&E review after the structural design work has been completed.

### **Closure**

The analysis, conclusion and recommendations contained in this memorandum are based on the project description and subsurface information supplied by your office. It is further assumed that the subsurface conditions as interpreted from the borings are representative of the soil conditions

David L. Edwards/ Jim Davidson  
November 6, 2000  
Page 5

throughout the wall alignments. If during construction, subsurface conditions are different from those encountered in the exploratory borings, or appear to be present beneath or beyond the excavations, we should be advised so that we can assist you and re-evaluate our recommendations.

If you have any questions regarding this memorandum or require further information, please contact Donald Williams at (360) 709-5457.

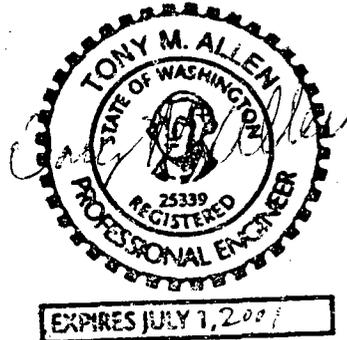
*Donald A. Williams*

Donald A. Williams  
Geotechnical Engineer

*Tony M. Allen*

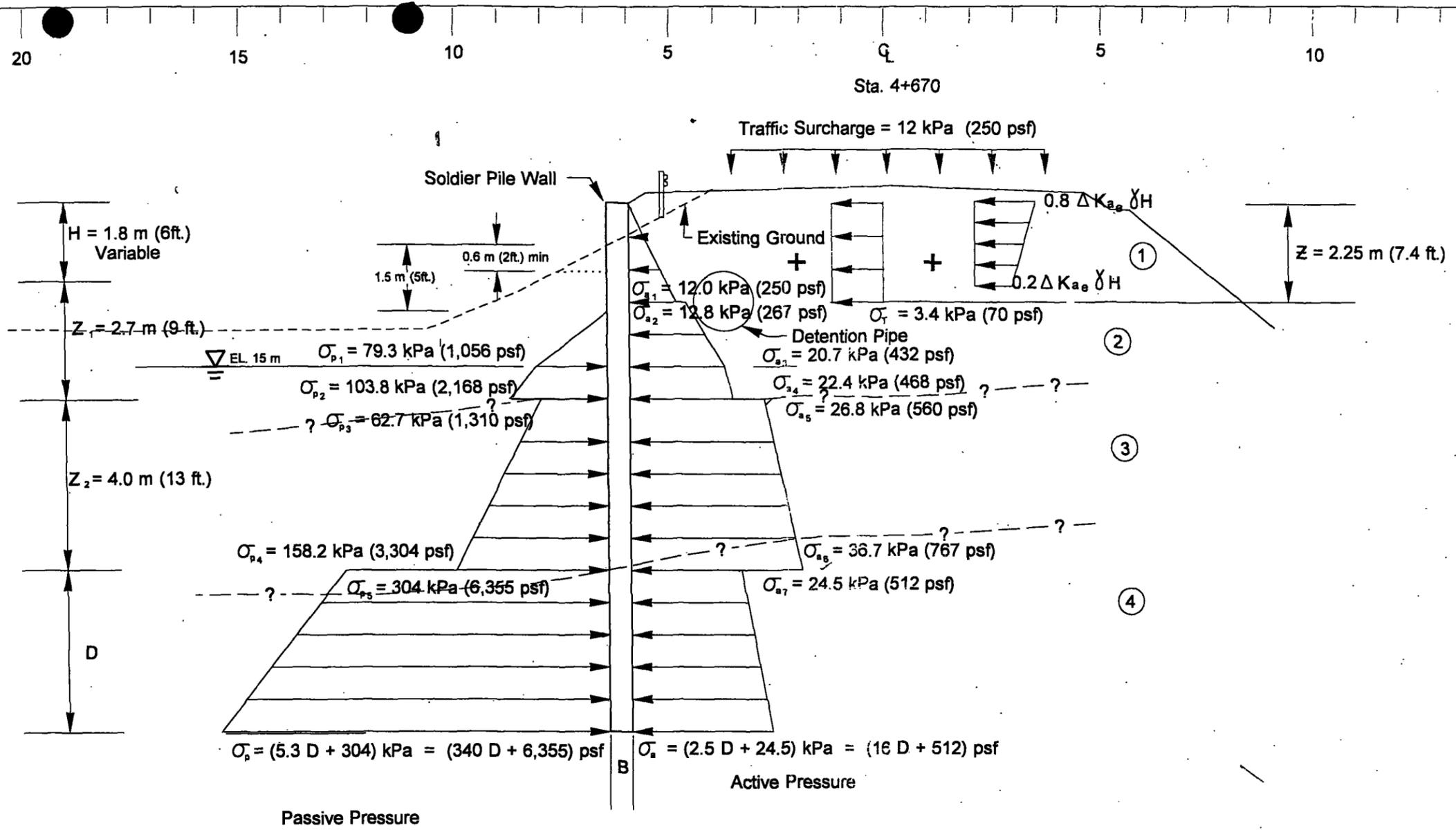
Tony M. Allen, P.E.  
State Geotechnical Engineer

TMA:daw  
DAW  
Attachments



cc: T. M. Smith, Materials Engineer, N.W. Region, NB82-29  
K. N. Kirker, Bridge and Structures, 47340 (2 copies)  
Alex Young, Principal Architect, 47329

**APPENDIX A**



- ① FILL - Silty SAND with gravel  
 $\phi = 34^\circ$   
 $\gamma = 18.9 \text{ KN/m}^3 (120 \text{ pcf})$   
 $K_a = 0.28$   
 $K_{ae} = 0.35$
- ② Loose silty SAND  
 $\phi = 32^\circ$   
 $\gamma = 17.3 \text{ KN/m}^3 (110 \text{ pcf})$   
 $K_a = 0.3$   
 $K_p = 4.3$
- ③ Soft SILT with sand  
 $\phi = 28^\circ$   
 $\gamma = 16.5 \text{ KN/m}^3 (105 \text{ pcf})$   
 $K_a = 0.36$   
 $K_p = 2.6$
- ④ Dense SAND and GRAVEL  
 $\phi = 38^\circ$   
 $\gamma = 20.4 \text{ KN/m}^3 (130 \text{ pcf})$   
 $K_a = 0.24$   
 $K_p = 5.0$

NOTES: (1) Active pressure is given as  $\sigma_a = K_a \gamma H$  below the dredge line. Active pressure acts over one soldier pile diameter.

(2) Passive pressure is given as  $\sigma_p = K_p \gamma H$ ,  $K_p$  includes a factor of safety of 1.5( $K_p/1.5$ ). Passive pressure may be taken to act over three soldier pile diameters where piles are spaced greater than 3D.

(3)  $\Delta K_{ae} = K_{ae} - K_a$

**FIGURE 1:**  
**Typical Earth pressure Diagram**  
**Station 4+625 to Station 4+675**

JOB OL-2263 S.R. 203 C.S. 1750 LAYOUT \_\_\_\_\_

**NE Stillwater Hill Rd. to Fay Rd.**

WASHINGTON STATE  
 TRANSPORTATION COMMISSION  
 DEPARTMENT OF TRANSPORTATION

MATERIALS BRANCH  
 J. C. BAKER MATERIALS ENGINEER

DATE 10/2000  
 SCALE \_\_\_\_\_ VERT. \_\_\_\_\_  
 HORIZ. \_\_\_\_\_  
 SHEET \_\_\_\_\_ OF \_\_\_\_\_  
 DRAWN BY DWG

**APPENDIX B**

**Test Hole Logs**





# Test Boring Legend

Grain Size		
Fine Grained	< 1mm	Few crystal Boundaries/grains are distinguishable in the field or with hand lense.
Medium Grained	1mm to  5mm	Most crystal Boundaries/grains are distinguishable with the aid of a hand lense.
Coarse Grained	> 5mm	Most crystal Boundaries/grains are distinguishable with the naked eye.

Weathered State		
Term	Description	Grade
Fresh	No visible sign of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as core stones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as core stone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength			
Grade	Description	Field Identification	Uniaxial Compressive Strength approx
R1	Very Weak	Specimen crumbles under sharp blow from point of geological hammer, and can be cut with a pocket knife.	1 to 25 MPa
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket Knife. Geological hammer point indents deeply with firm blow.	25 to 50 MPa
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer.	50 to 100 MPa
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	100 to 200 MPa
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 200 MPa

Discontinuities			
Spacing		Condition	
Very Widely	Greater than 3 m	Excellent	Very rough surfaces, no separation, hard discontinuity wall
Widely	1 m to 3 m	Good	Slightly rough surfaces, separation less than 1 mm, hard discontinuity wall.
Moderately	0.3 m to 1 m	Fair	Slightly rough surfaces, separation greater than 1 mm, soft discontinuity wall.
Closely	50 mm to 300 mm	Poor	Slickensided surfaces, or soft gouge less than 5 mm thick, or open discontinuities 1 to 5 mm.
Very Closely	Less than 50 mm	Very Poor	Soft gouge greater than 5 mm thick, or open discontinuities greater than 5 mm.
<b>RQD (%)</b> $\frac{100(\text{length of core in pieces} > 100\text{mm})}{\text{Length of core run}}$			

Fracture Frequency (FF) is the average number of fractures per 300 mm of core.  
Does not include mechanical breaks caused by drilling or handling.

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-5-00

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 3+540

Offset 9.9 m Lt.

C.S. 1750

Equipment CME 850 w/ autohammer

Casing HW x 12 HQ x 27

Ground El 64.3 (19.60 m)

Method of Boring Wet Rotary

Start Date October 5, 2000

Completion Date October 6, 2000

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 ft.=0.3048 m.			
						9	▲	D-1		Silty SAND with gravel, dense, brown, wet, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
						14	▲						
						11	▲						
						(25)							
1						6	▲	D-2	GS MC	SM, M.C.= 22% Silty SAND with gravel, loose, brown, wet, Homogeneous, no HCl reaction Length Recovered 0.6 ft, Length Retained 0.6 ft			
						3	▲						
						3	▲						
						(6)							
5						4	▲	D-3		Well graded SAND with gravel, dense, brown, wet, Homogeneous, no HCl reaction Length Recovered 0.4 ft, Length Retained 0.4 ft			
						12	▲						
						14	▲						
						(26)							
2						17	▲	D-4		Well graded GRAVEL with sand, subangular, dense, grayish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft	▽		
						24	▲						
						18	▲						
						(42)							
						16	▲	D-5		Well graded GRAVEL with sand, subangular, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft			
10						22	▲						
						17	▲						
						(39)							
						12	▲	D-6		Silty GRAVEL with sand, loose, brownish gray, wet, Homogeneous, no HCl reaction, NOTE - ( Loose area - 14.5' to - 16.0' ) Length Recovered 0.5 ft, Length Retained 0.5 ft			
15						3	▲						
						4	▲						
						(7)							
5							▲	S-7		No Recovery			
						8	▲	D-8		Silty GRAVEL with sand, dense, brownish gray, moist, Homogeneous, no HCl reaction			
20						11	▲						

SOIL 0L2263-1.GPJ\_SOIL\_GDT 11/1/00 3:37:11 P11



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-6-00

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263 10/01/300

S.R. 203

Station 4+671

Offset 8.3 m Lt.

C.S. 1750

Equipment CME 45 w/ cathead

Casing HQ

Ground El 53.8 (16.40 m)

Method of Boring Wet Rotary

Start Date October 2, 2000

Completion Date October 3, 2000

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						1	D-1			Silty SAND with gravel, very loose, brown, dry, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
						2							
						2							
						(4)							
5						3	D-2		GS MC	SM, MC=16% Silty SAND with gravel, loose, brown, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft			
						2							
						3							
2						(5)	S-3			Sandy SILT with gravel, with traces of organic material, loose, gray, wet, Laminated, Fissured, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft			
10						1	D-4			SILT, with organic material, very loose, gray, wet, Homogeneous, no HCl reaction, Drilled through 1' diameter log at -7' Length Recovered 0.7 ft, Length Retained 0.7 ft			
						1							
						(2)							
4						12	D-5			Silty SAND with gravel, medium dense, gray, wet, Homogeneous, no HCl reaction, attempted to push a shelly tube at -11'. Met refusal Length Recovered 0.4 ft, Length Retained 0.4 ft			
						9							
						8							
						(17)							
15						6	D-6			Silty SAND with gravel, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.2 ft, Length Retained 0.2 ft			
						2							
						2							
						(4)							
5							S-7			Sandy SILT, loose, gray, wet, Homogeneous, no HCl reaction, shelly tube had sand in the tip. Length Recovered 2.0 ft, Length Retained 2.0 ft			
20						2	D-8			Sandy SILT with some organics, sand is fine grained, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.9 ft, Length Retained 0.9 ft			
						3							
						5							
						(8)							

SOIL 0L2263-1.GPJ SOIL.GDT 11/1/00 3:51:11 P11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. **TH-6-00**

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

PROJECT **STILLWATER HILL RD. TO FAY RD.**

Job No. **0L-2263**

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					30			D-9		Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
					28			D-10		Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.4 ft, Length Retained 0.4 ft			
8					24			D-11		Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.6 ft, Length Retained 0.6 ft			
9					>>			D-12		Well graded SAND with gravel, very dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft			
10					50			D-13		Well graded SAND with gravel, very dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.2 ft, Length Retained 0.2 ft			
12			End of test hole boring at 38.5 ft below ground elevation.										
13			This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.										

SOIL 0L2263-1.GPJ SOIL.GDT 11/1/00 3:51:11P11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-7-00

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 4+702

Offset 9.5 m Lt.

C.S. 1750

Equipment CME 45 w/ cathead

Casing HQ x 36

Ground El 51.2 (15.61 m)

Method of Boring Wet Rotary

Start Date September 27, 2000

Completion Date September 28, 2000

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							
0.7						4	D-1	D-1	GS MC	SP-SM, MC=16% Poorly graded SAND with silt and gravel, loose, brown, moist, Homogeneous, no HCl reaction Length Recovered 0.7 ft, Length Retained 0.7 ft			
1.5						3	S-2	S-2		Sandy SILT, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft			
2.0						5	D-3	D-3		Silty SAND, (fine), medium dense, gray, wet, Homogeneous, no HCl reaction, Note - Layer of gravel from - 7.5' to - 8.5'. Length Recovered 0.5 ft, Length Retained 0.5 ft			
3.0						1	D-4	D-4	GS MC	ML, MC=34% SILT with sand and organic material, with layers of fine silt SAND, loose, gray, wet, Laminated, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft			
4.0						2	S-5	S-5		Sandy SILT, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 2.0 ft, Length Retained 2.0 ft			
15.0						1	D-6	D-6		SILT with sand and gravel, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft			
2.0						2	S-7	S-7		Silty SAND, (fine), loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 2.0 ft, Length Retained 2.0 ft			
20.0						2	D-8	D-8		Poorly graded SAND, medium dense, gray, wet, Homogeneous, no HCl reaction			

SOIL\_0L2263-1.GPJ SOIL.GDT 11/1/00 3:37:17 P11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-7-00

Sheet 2 of 2

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

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							
										Length Recovered 1.0 ft, Length Retained 1.0 ft			
7						12 (20)							
						4 15 16 (31)	D-9		GS MC	SW, MC=15% Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.7 ft, Length Retained 0.7 ft			
8						7 15 16 (31)	D-10			Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.7 ft, Length Retained 0.7 ft			
9													
10						6 23 16 (39)	D-11			Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
11						20 28 11 (39)	D-12			Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction. Length Recovered 0.9 ft, Length Retained 0.9 ft			
12										End of test hole boring at 37.5 ft below ground elevation.			
13										This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.			

SOIL\_0L2263-1.GPJ SOIL\_GDT\_11/1/00 3:37:18.P11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE NO. TH-1-99

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 4+695 Offset 6 m Lt.

C.S. 1750

Equipment Tripod Casing \_\_\_\_\_

Ground El 58.2 (17.74 m)

Method of Boring Jet Wash

Start Date October 4, 1999 Completion Date October 7, 1999

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						5 6 6 (12)	D-1	Silty SAND with gravel, medium dense, brown, dry, homogeneous, no HCL reaction, NOTE-Drilling became soft at -4.0'. Recovered and Retained: 0.7 ft.			
1	1											
5	5						2 2 2 (4)	D-2	Sandy SILT with gravel, loose, gray, wet, homogeneous, no HCL reaction. Recovered and Retained: 0.5 ft.			
2	2						4 2 2 (4)	D-3	Silty SAND with gravel, very loose, gray, wet, homogeneous, no HCL reaction. Recovered and Retained: 0.7 ft.			
10	3						5 6 5 (11)	D-4	Silty SAND with gravel, medium dense, gray, wet, homogeneous, no HCL reaction. Recovered and Retained: 0.2 ft.			
4	4											
15	5						1 1 3 (4)	D-5	SILT with organics, loose, gray, moist, homogeneous, no HCL reaction. Recovered and Retained: 1.5 ft.			
5	5											
20	6											

SOIL 0L2263-1.GPJ SOIL.GDT 11/1/00 1:38:43 P11



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2-99

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 3+222

Offset 2 m Lt.

C.S. 1750

Equipment Dietrich 25 w/ cathead

Casing HQ

Ground El 75.4 (22.98 m)

Method of Boring Wet Rotary

Start Date October 26, 1999

Completion Date October 26, 1999

Sheet 1 of 1

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.			
5													
2													
10													
3													
4													
15													
5													
6													
20													

SOIL 0L2263-1.GPJ SOIL.GDT 11/1/00 1:43:26 P11

End of test hole boring at 16.5 ft below ground elevation.

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



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. PP-2-99

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 3+320 Offset 10 m Lt.

C.S. 1750

Equipment Handtools Casing HQ

Ground El 65.6 (19.99 m)

Method of Boring Portable Penetrometer

Start Date October 28, 1999 Completion Date October 28, 1999 Sheet 1 of 1

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 gravel, medium dense, brown, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft			
5										End of test hole boring at 4 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications.			
10													
15													
20													

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. PP-3-99

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 3+220 Offset 13 m Lt.

C.S. 1750

Equipment Handtools Casing HQ

Ground El 59.0 (17.98 m)

Method of Boring Portable Penetrometer

Start Date October 28, 1999

Completion Date October 28, 1999

Sheet 1 of 1

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 ft.=0.3048 m.			
1	1						1 2 2 (4)	D-1		Silty SAND, very loose, Brown, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 0.0 ft			
1	1						1 6 6 (12)	D-2		Silty SAND, medium dense, Brown, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 0.0 ft			
5	5									End of test hole boring at 4 ft below ground elevation.			
20	20									This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications.			

SOIL\_0L2263-1.GPJ SOIL\_GDT 11/1/00 1:18:09 P11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH#1

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 4+700

Offset 7 m Lt.

C.S. 1750

Equipment Handtools

Casing \_\_\_\_\_

Ground El 58.1 (17.71 m)

Method of Boring Portable Penetrometer

Start Date August 25, 1999

Completion Date August 25, 1999

Sheet 1 of 1

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							8	D-1		Well graded GRAVEL with cobbles, subrounded, loose, brown, moist, homogeneous, No HCl reaction.			
							7						
							6						
							13						
5							8	D-2		Poorly graded SAND with gravel, medium dense, brown, moist, with silt balls, homogeneous, No HCl reaction.			
							12						
							14						
							26						
2							8	D-3		Poorly graded SAND with gravel, loose, brown, moist, with silt balls, homogeneous, No HCl reaction.			
							8						
							8						
							16						
3							7	D-4		Poorly graded SAND with gravel, medium dense, brown, moist, with silt balls, homogeneous, No HCl reaction.			
							11						
							13						
							24						
10	3								End of Test Hole Boring at 8.5 feet below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications.				
4													
15													
5													
6													
20													

SOIL 0L2263-1.GPJ SOIL\_GDT 11/1/00 1:13:19 P11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH#2

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 4+650

Offset 7 m Lt.

C.S. 1750

Equipment Handtools

Casing \_\_\_\_\_

Ground El 55.8 (17.01 m)

Method of Boring Portable Penetrometer

Start Date August 25, 1999

Completion Date August 25, 1999

Sheet 1 of 1

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												
0.5	0.5												
1	1												
1.5	1.5												
2	2												
2.5	2.5												
3	3												
3.5	3.5												
4	4												
4.5	4.5												
5	5												
5.5	5.5												
6	6												
6.5	6.5												
7	7												
7.5	7.5												
8	8												
8.5	8.5												
9	9												
10	10												
11	11												
12	12												
13	13												
14	14												
15	15												
16	16												
17	17												
18	18												
19	19												
20	20												

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH#3

PROJECT STILLWATER HILL RD. TO FAY RD.

Job No. 0L-2263

S.R. 203

Station 3+540

Offset 6 m Lt.

C.S. 1750

Equipment Handtools

Casing \_\_\_\_\_

Ground El 71.3 (21.75 m)

Method of Boring Portable Penetrometer

Start Date August 25, 1999

Completion Date August 25, 1999

Sheet 1 of 1

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												
0.5	0.5						5	D-1		Well graded GRAVEL with cobbles, subrounded, loose, brown, moist, homogeneous, No HCl reaction.			
1.0	1.0					5							
1.5	1.5					5	D-2			Poorly graded SAND with gravel, medium dense, brown, moist, homogeneous, No HCl reaction.			
2.0	2.0					8							
2.5	2.5					14	D-3			Poorly graded SAND with gravel, loose, brown, moist, homogeneous, No HCl reaction.			
3.0	3.0					9							
3.5	3.5					23							
4.0	4.0					8							
4.5	4.5					18							
5.0	5.0					14							
5.5	5.5					32							
6.0	6.0									End of Test Hole Boring at 6.5 feet below ground elevation.			
6.5	6.5									This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications.			
7.0	7.0												
8.0	8.0												
9.0	9.0												
10.0	10.0												
11.0	11.0												
12.0	12.0												
13.0	13.0												
14.0	14.0												
15.0	15.0												
16.0	16.0												
17.0	17.0												
18.0	18.0												
19.0	19.0												
20.0	20.0												

SOIL 0L2263-1.GPJ SOIL.GDT 11/1/00 1:13:22 P11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2A-97

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station 4+670

Offset 2.7 m Lt

C.S. 1750

Equipment Diedrich D-25

Casing HQ Advancer

Ground El 62.7 (19.11 m)

Method of Boring Rotary Drill

Start Date December 2, 1997

Completion Date December 2, 1997

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 ft.=0.3048 m. 0.3 ft Asphalt.			
1						2 3 3 (6)	D-1			Sandy SILT with gravel, angular and subangular, medium stiff, brown, wet, homogeneous. Recovered and retained 0.4 ft.			
2						4 5 6 (11)	D-2	GS MC AL		ML, M.C.=19%, PI=NP Sandy SILT with gravel, angular and subangular, stiff, brown, wet, homogeneous. Recovered and retained 1.0 ft.			
3						3 2 3 (5)	D-3	GS MC		SM, M.C.=16% Silty SAND, loose, brown, moist. Recovered and retained 0.6 ft.			
4						1 1 2 (3)	D-4	GS MC		SM, M.C.=22% Silty SAND, very loose, brown, wet. Recovered and retained 0.5 ft.			
5						1 1 2 (3)	D-5			Silty SAND, very loose, brown, wet. Recovered and retained 0.1 ft.			
6						1 2 2 (4)	D-6	GS MC AL		ML, M.C.=25%, PI=NP Sandy SILT with some organics, soft, gray, wet, homogeneous. Recovered and retained 1.2 ft.			
							S-7			Smashed tube. Sand and gravel. No recovery.			

SOIL L2263.GPJ SOIL.GDT 11/1/00 11:59:13 A11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2A-97

Sheet 2 of 2  
Job No. OL-2263

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

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													
7.5													
8													
8.5													
9													
9.5													
10													
10.5													
11													
12													
13													
14													
15													
16													
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42													
43													
44													
45													

SOIL L2263.GPJ SOIL.GDT 11/1/00 11:59:13 A11

End of test hole boring at 34.5 ft (10.5 m) below ground elevation.  
\*Elevation of test boring same as centerline of roadway.  
  
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-2-97

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station 4+701

Offset 1 m Lt

C.S. 1750

Equipment CME 850 Auto Hammer

Casing HQ X 24.0'

Ground El 63.0 (19.20 m)

Method of Boring Wet Rotary

Start Date November 4, 1997

Completion Date November 4, 1997

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									1 ft.=0.3048 m. Sand and gravel.			
1 - 5	0.3048 - 1.524					3 2 2 (4)		D-1	GS MC AL	CL-ML, M.C.=20%, PI=6 Gravelly, silty CLAY with sand, soft, light-brown, wet, stratified. Recovered and retained 0.8 ft.			
5 - 10	1.524 - 3.048							S-2		No recovery.			
10 - 15	3.048 - 4.572					2 2 2 (4)		D-3	GS MC AL	ML, M.C. = 25%, PI=NP SILT with sand and gravel, very loose, gray, wet, homogeneous. Recovered and retained 0.8 ft.			
15 - 20	4.572 - 6.096							S-4		Sandy SILT with gravel, gray, wet. Recovered and retained 1.0 ft.			
20 - 25	6.096 - 7.620					3 3 3 (6)		D-5	GS MC AL	ML, M.C.=47%, PI=10 SILT with sand and gravel and decayed wood, very loose, gray, wet, stratified. Recovered and retained 0.8 ft.			
25 - 30	7.620 - 9.144							S-6		No recovery.			

SOIL L2263.GPJ\_SOIL\_GDT 11/1/00 11:58:54A11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-2-97

Sheet 2 of 2

PROJECT N.E. Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

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						5 6 10 (16)		D-7		No recovery.			
25						8 10 15 (25)		D-8	GS MC	SM, M.C.=11% Silty SAND with gravel, very dense, gray, wet, homogeneous. Recovered and retained 0.8 ft.			
8										End of test hole boring at 25.5 ft below ground elevation.			
9										Bail Test: Start test at -7.0 ft. Bailed to -24.0 ft. Recharged 3 min --23.0 ft. 8 min --22.0 ft. 12 min --21.0 ft.			
30										*Ground elevation of test boring same as centerline of roadway.			
10										This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.			
35													
11													
40													
12													
45													

SOIL L2263.GPJ SOIL\_GDT 11/1/00 11:58:54 A:11

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-1-96

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station SR 203 3+300

Offset 10.7 m Rt

C.S. 1750

Equipment Diedrich 25

Casing HQ X 25'

Ground El 90.2 (27.49 m)

Method of Boring \_\_\_\_\_

Start Date June 12, 1996

Completion Date June 12, 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
0				1	▲	D-1	GS MC	1 ft.=0.3048 m. GM, M.C.=4% Silty GRAVEL with sand and cobbles, very loose, brown, dry. Recovered 0.3 ft.		
1				2	▲	D-2	GS MC	GW-GM, M.C.=2% Well graded GRAVEL with silt and sand, very loose, brown, moist. Recovered 0.3 ft.		
5				3	▲	D-3		Well graded GRAVEL with silt and sand, loose, brown, moist. Recovered 0.1 ft.		
2				4	▲					
				4	▲					
				(8)	▲					
				0	▲	D-4	GS MC	GW-GM, M.C.=1% Well graded GRAVEL with silt and sand, medium dense, brown, moist. Recovered 0.4 ft.		
				12	▲					
				11	▲					
				(23)	▲					
10				7	▲	D-5		Well graded GRAVEL with silt and sand, medium dense, brown, moist. Recovered 0.2 ft.		
				8	▲					
				7	▲					
				(15)	▲					
				8	▲	D-6		Poorly graded SAND with silt and gravel, dense, brown, moist. No recovery.		
4				10	▲					
				21	▲					
				(31)	▲					
15				4	▲	D-7	GS MC	GW, M.C.=1% Well graded GRAVEL with sand, medium dense, brown, moist. Recovered 0.4 ft.		
				8	▲					
				12	▲					
				(20)	▲					
5				7	▲	D-8	GS MC AL	CL, N.C.=2%, PI=8 Gravelly LEAN CLAY with sand, very hard, gray, moist. Recovered 1.0 ft.		
				30	▲					
				40	▲					
				(70)	▲					
20				>>	▲					

SOIL L2263.GPJ SOIL.GDT 11/1/00 11:59:00 A11



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2-96

PROJECT N.E. Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station 3+270

Offset 12 m Rt

C.S. 1750

Equipment Dietrich D-25

Casing HQ & BX Advancer

Ground El 91.9 (28.01 m)

Method of Boring Wash Boring

Start Date June 25, 1996

Completion Date June 25, 1996

Sheet 1 of 2

SOIL L2263.GPJ SOIL.GDT 11/1/00 11:59:06 A:11

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.			
5						8 8 2 (10)	D-1	GS MC	GS MC	GW, M.C.=1% Well graded GRAVEL with sand, subround, medium dense, brown, wet. Recovered and retained 0.5 ft.			
10						6 8 12 (20)	D-2			Silty SAND with gravel and wood (root), subround, medium dense, brown, moist. Recovered and retained 0.3 ft.			
15						7 9 12 (21)	D-3	GS MC	GS MC	SW-SM, M.C.=5% Well graded SAND with silt and gravel, subround, medium dense, brown, wet. Recovered and retained 1.0 ft.			
20						8 9 10 (19)	D-4	GS MC	GS MC	GW-GM, M.C.=1% Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 0.9 ft.			
25						7 10 10 (20)	D-5			Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 0.8 ft.			
30						9 10 13 (23)	D-6	GS MC	GS MC	GW, M.C.=1% Well graded GRAVEL with sand and cobbles, angular to rounded, medium dense, gray, wet. Recovered and retained 0.5 ft.			
35						8 8 10 (18)	D-7			Well graded GRAVEL with sand and cobbles, angular to rounded, medium dense, gray, wet.			

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. **TH-2-96**

Sheet **2** of **2**  
Job No. **OL-2263**

PROJECT **N.E.Stillwater Hill Road and Fay Road I/S**

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				20			12	D-8	GS MC	GW-GM, M.C.=3% Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 1.0 ft.			
						10							
25	8						12	D-9	GS MC	Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 1.0 ft.			
						9							
30	9					9	D-10	GS MC	Silty SAND with gravel, subangular, very dense, gray, wet. Recovered and retained 0.8 ft.				
					9								
						44	D-11	GS MC	SM, M.C.=10% Silty SAND with gravel subangular, very dense, gray, wet. Recovered and retained 0.8 ft.				
					50/3 (50/3")								
35	11					30/50/6 (50/6")	D-12	GS MC	Silty SAND with gravel, subangular, very dense, gray, wet. Recovered and retained 1.0 ft.				
						50/4" (50/4")							
40	12					50/4" (50/4")			End of test hole boring at 40.4 ft (12.3 m) below ground elevation. Water table elevation not determined.				
									This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.				
45	13												

SOIL L2263.GPJ SOIL\_GDT 11/1/00 11:59:06 A11



LOCATION Station 3+300	OFFSET	TEST PIT NUMBER TP-1
PROJECT NAME N.E. Stillwater Hill Road and Fay Road Intersection		PROJECT NUMBER OL-2263
EQUIPMENT	DATE STARTED	DATE COMPLETED

ELEV DEPTH	DESCRIPTION
0 m	<p>6 m</p> <p>Poorly graded SAND with gravel, cobbles and boulders. Roots in top 0.6 m of pit. Minor seepage while excavating.</p> <p>Boulders</p> <p>Well graded GRAVEL with sand and cobbles.</p>
1 m	
2 m	

## **APPENDIX C**

### **Laboratory Test Data**

Job No. **0L-2263**

Date **October 24, 2000**

Hole No. **TH-5-00**

Sheet **1 of 1**

Laboratory Summary



Washington State  
Department of Transportation

Project **STILLWATER HILL RD. TO FAY RD.**

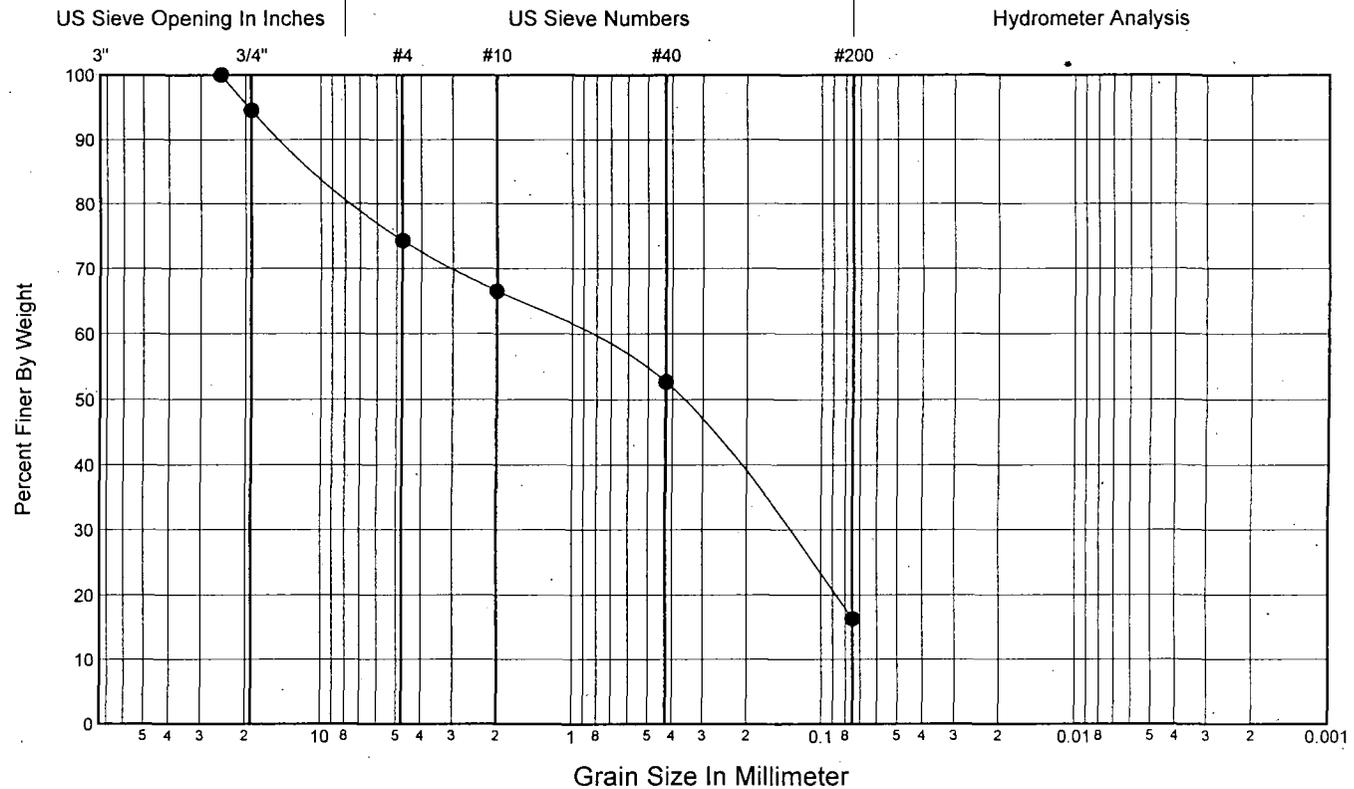
Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
● 3.0	0.91	D-2	SM	See Boring Log	SILTY SAND with GRAVEL	22	NP	NP	NP

GRADATION FRACTIONS

%Gravel	%Sand	%Fines	Cc	Cu
● 25.7	58.0	16.3		

GRADATION VALUES

D60	D50	D30	D20	D10
● 0.96	0.37	0.14	0.09	



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **0L-2263**

Date **October 24, 2000**

Hole No. **TH-6-00**

Sheet **1 of 1**

Laboratory Summary



Washington State  
Department of Transportation

Project **STILLWATER HILL RD. TO FAY RD.**

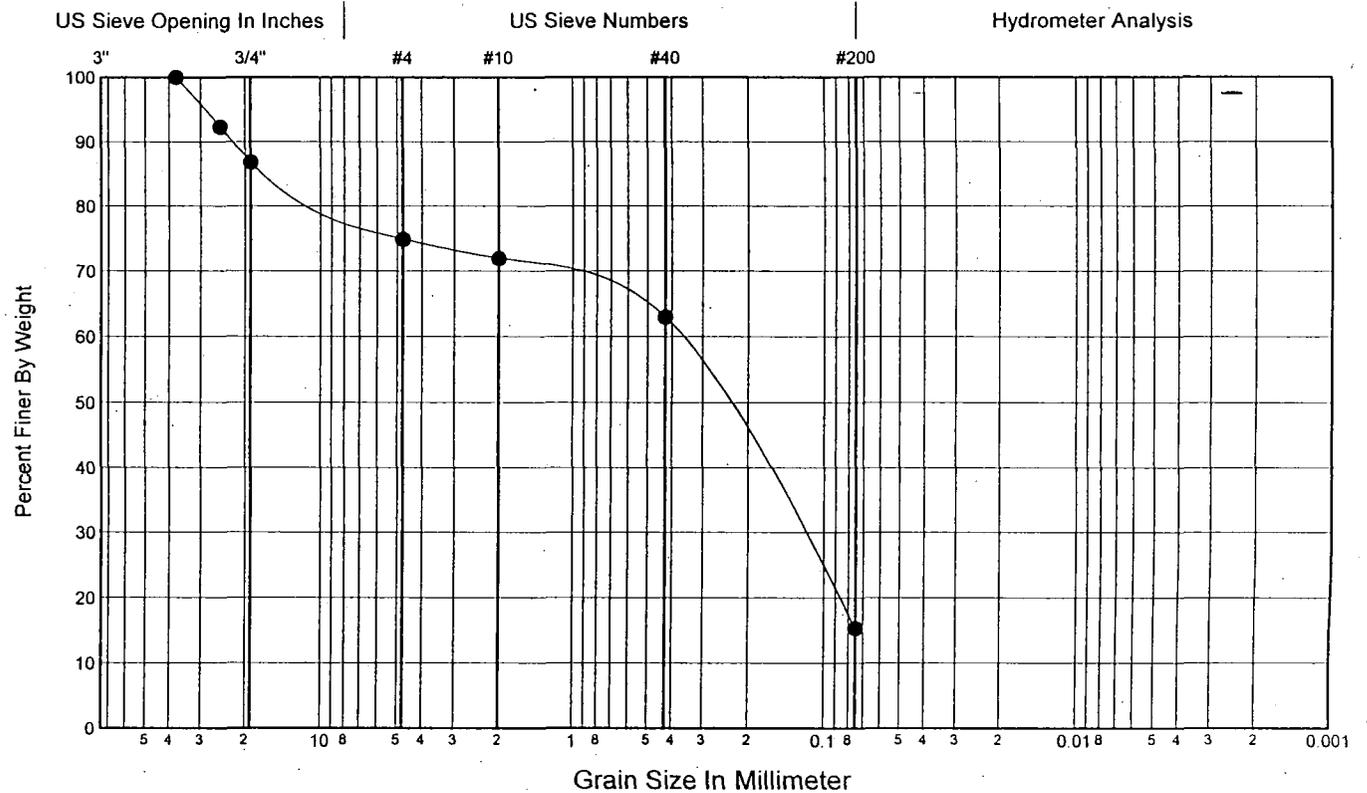
Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
● 3.0	0.91	D-2	SM	See Boring Log	SILTY SAND with GRAVEL	16	NP	NP	NP

GRADATION FRACTIONS

%Gravel	%Sand	%Fines	Cc	Cu
● 25.1	59.6	15.4		

GRADATION VALUES

D60	D50	D30	D20	D10
● 0.38	0.26	0.13	0.09	



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **0L-2263**

Date **October 25, 2000**

Hole No. **TH-7-00**

Sheet **1 of 1**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **STILLWATER HILL RD. TO FAY RD.**

	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	1.0	0.30	D-1	SP-SM	See Boring Log	POORLY GRADED SAND with SILT and GRAVEL	16	NP	NP	NP
☒	9.0	2.74	D-4	ML	See Boring Log	SILT with SAND with organic material	34	25	NP	NP
▲	21.0	6.40	D-9	SW	See Boring Log	WELL-GRADED SAND with GRAVEL	15			

**GRADATION FRACTIONS**

	%Gravel	%Sand	%Fines	Cc	Cu
●	29.2	59.5	11.3	0.4	36.1
☒	0.0	17.0	83.0		
▲	26.2	70.3	3.5	1.3	13.9

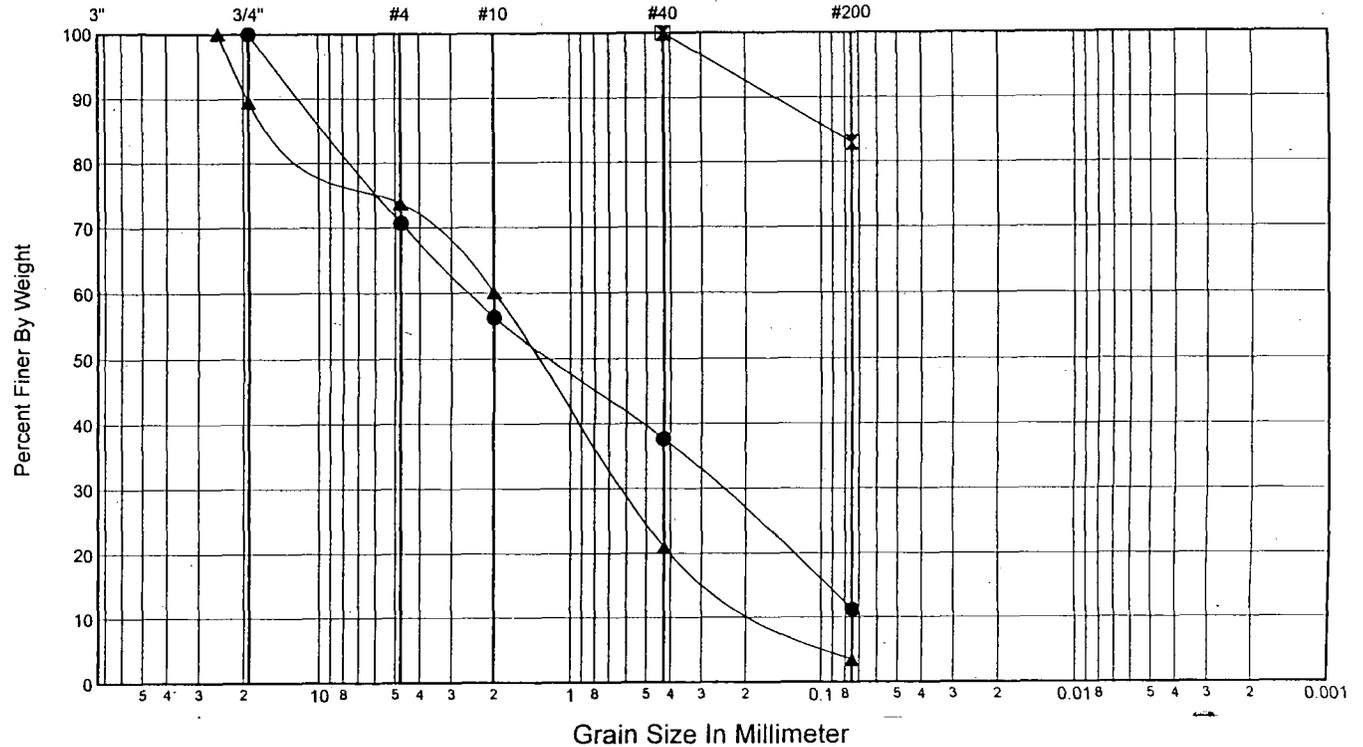
**GRADATION VALUES**

	D60	D50	D30	D20	D10
●	2.49	1.18	0.26	0.13	
☒					
▲	1.99	1.34	0.61	0.38	0.14

US Sieve Opening In Inches

US Sieve Numbers

Hydrometer Analysis



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2263**

Date **December 2, 1999**

Hole No. **TH-2A-97**

Sheet **1** of **2**

Laboratory Summary



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

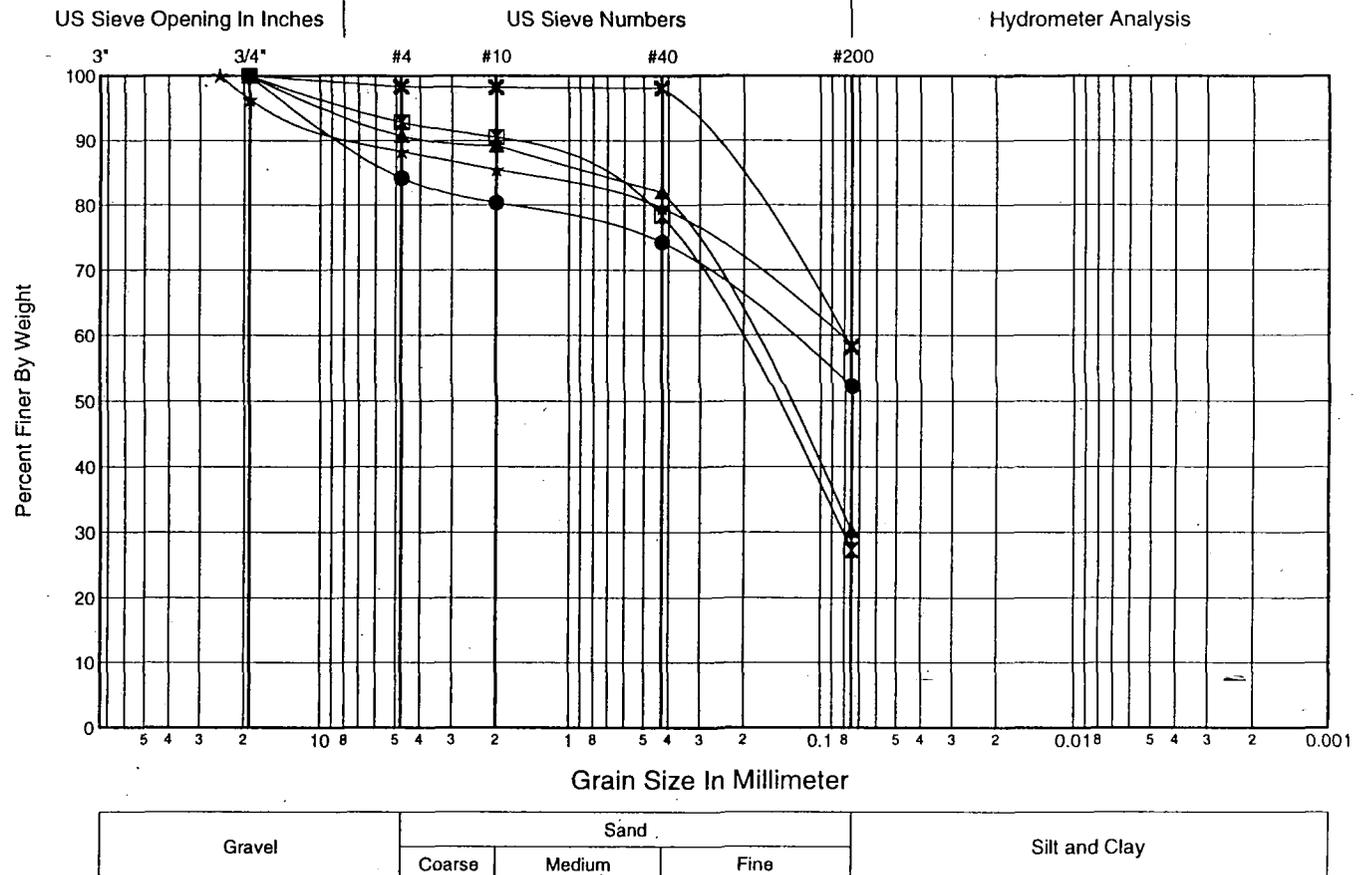
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	6.0	1.83	D-2	ML	SEE BORING LOG	SANDY SILT with GRAVEL		NP	NP	NP
☒	8.0	2.44	D-3	SM	SEE BORING LOG	SILTY SAND		NP	NP	NP
▲	11.0	3.35	D-4	SM	SEE BORING LOG	SILTY SAND		NP	NP	NP
★	16.0	4.88	D-6	ML	SEE BORING LOG	SANDY SILT		NP	NP	NP
✕	21.0	6.40	D-8	ML	SEE BORING LOG	SANDY SILT		NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	15.8	31.9	52.3		
☒	7.2	65.5	27.3		
▲	9.3	60.5	30.2		
★	11.7	29.6	58.7		
✕	1.7	40.1	58.2		

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.14				
☒	0.23	0.16	0.08		
▲	0.20	0.15			
★	0.08				
✕	0.08				



Job No. **OL-2263**

Date **December 2, 1999**

Hole No. **TH-2A-97**

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

Laboratory Summary



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

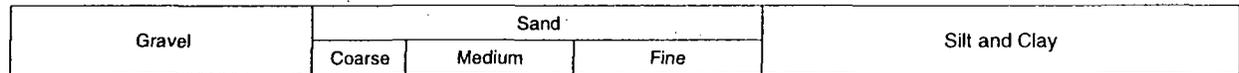
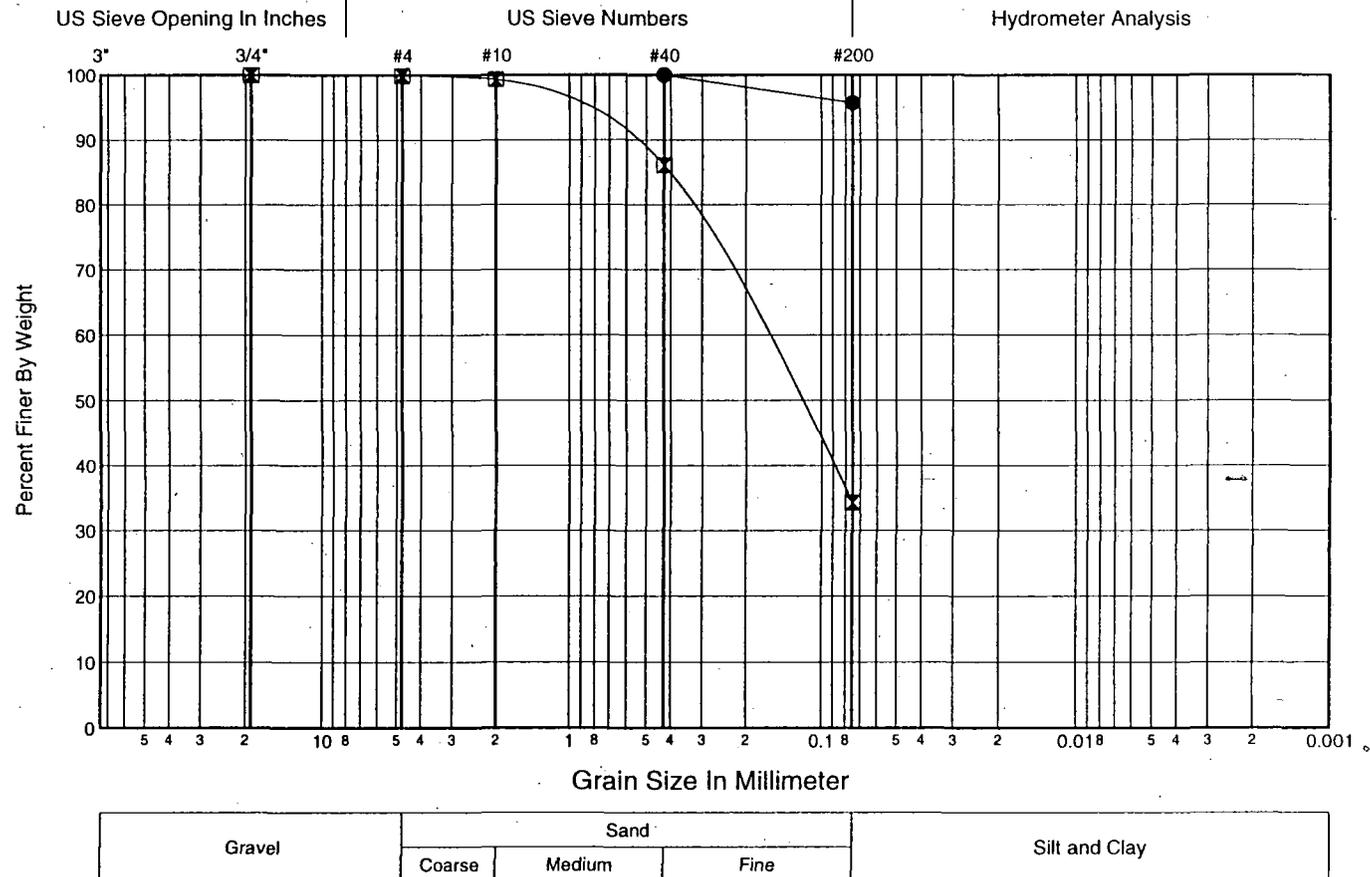
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	23.0	7.01	D-9	ML	SEE BORING LOG	SILT		NP	NP	NP
☒	28.0	8.53	D-11	SM	SEE BORING LOG	SILTY SAND		NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	4.3	95.7		
☒	0.1	65.6	34.3		

GRADATION VALUES

	D60	D50	D30	D20	D10
●					
☒	0.18	0.13			



Job No. **OL-2263**

Date **December 2, 1999**

Hole No. **H-2-97**

Sheet **1** of **1**

Laboratory Summary



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

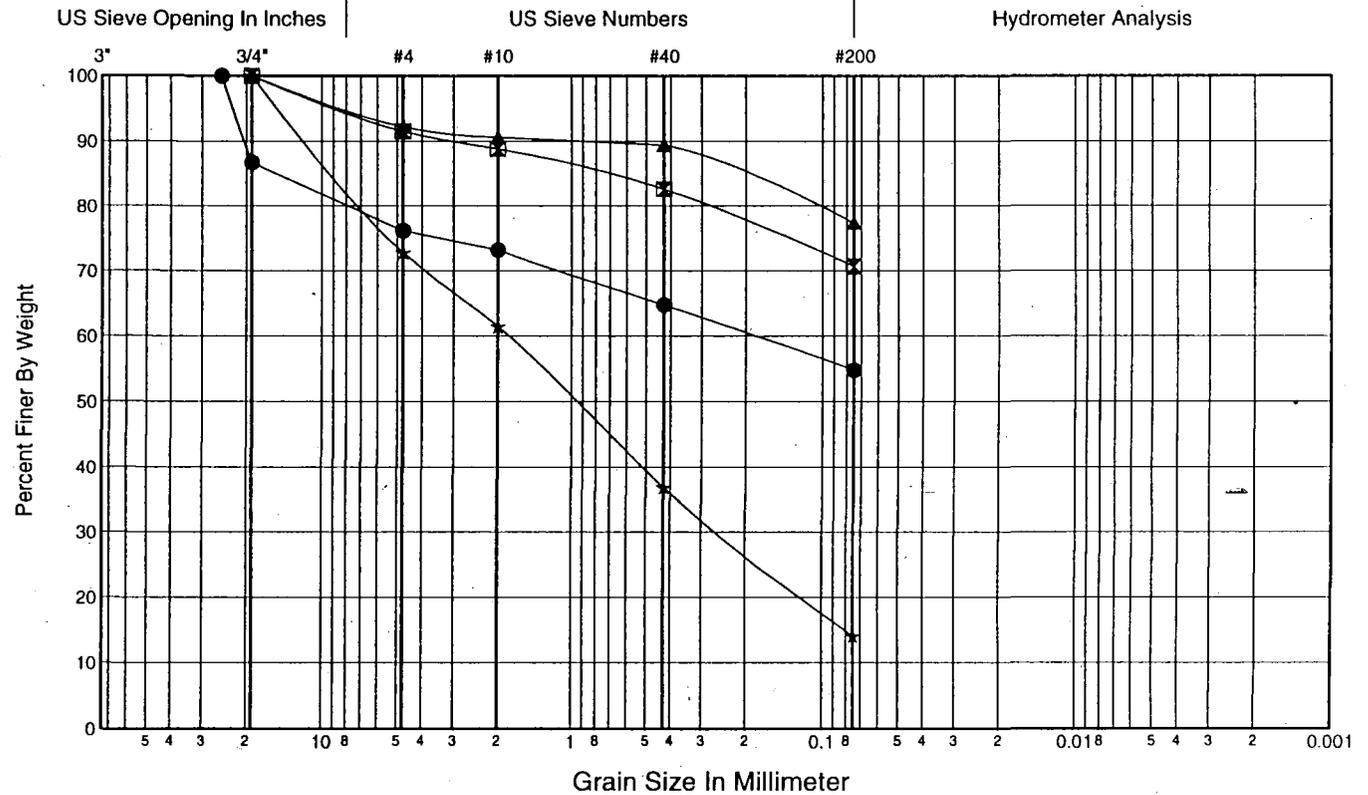
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	4.0	1.22	D-1	CL-ML	SEE BORING LOG	GRAVELLY SILTY CLAY with SAND		28	22	6
☒	12.0	3.66	D-3	ML	SEE BORING LOG	SILT with SAND		NP	NP	NP
▲	16.0	4.88	D-5	ML	SEE BORING LOG	SILT with SAND		39	29	10
★	24.0	7.32	D-8	SM	SEE BORING LOG	SILTY SAND with GRAVEL		NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	23.8	21.4	54.8		
☒	8.5	20.8	70.7		
▲	7.8	14.8	77.4		
★	27.2	58.7	14.1		

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.18				
☒					
▲					
★	1.82	0.97	0.25	0.12	



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2263**

Date **February 5, 1998**

Hole No. **TH-1-96**

Sheet **1 of 1**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

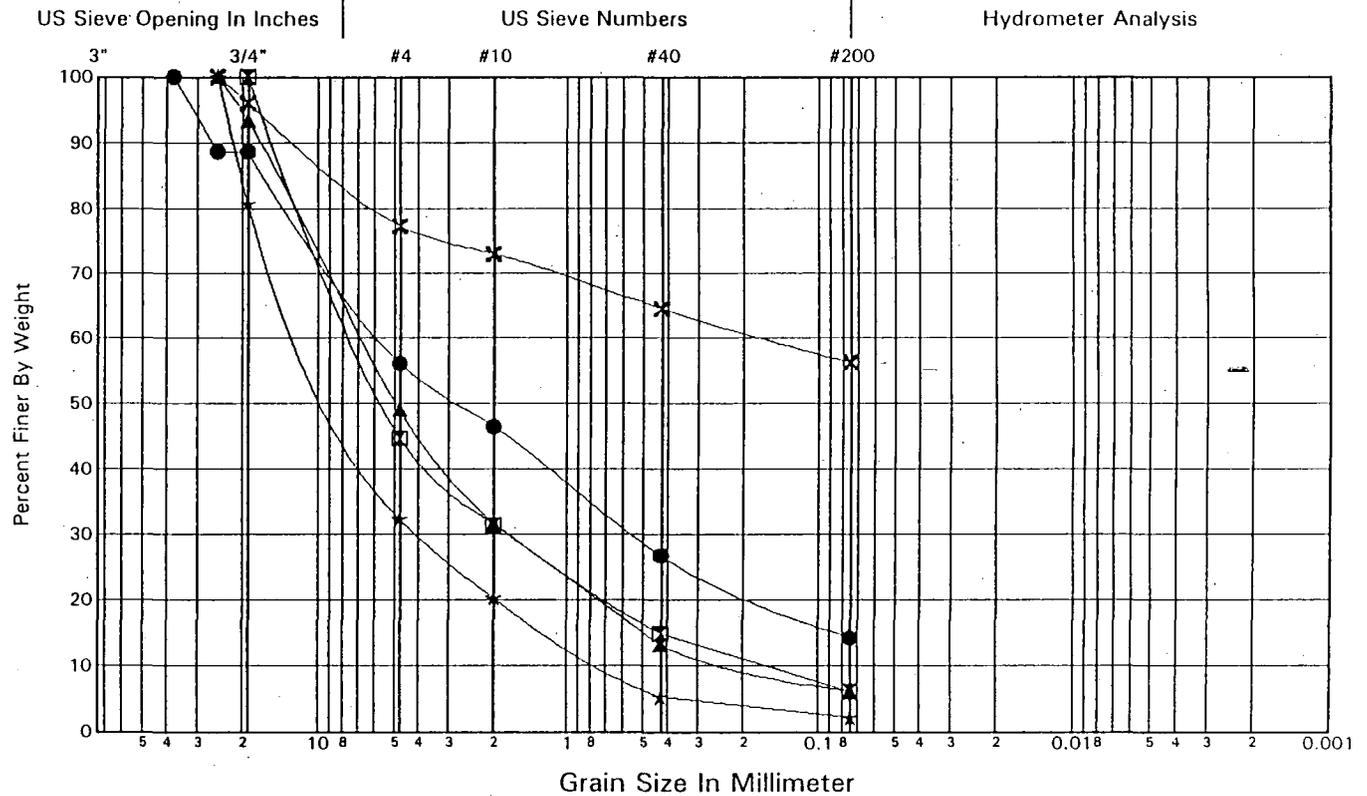
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	0.0	0.00	D-1	GM	SEE BORING LOG	SILTY GRAVEL with SAND	4	NP	NP	NP
☒	2.5	0.76	D-2	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	2	NP	NP	NP
▲	7.5	2.29	D-4	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	1	NP	NP	NP
★	15.0	4.57	D-7	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	1	NP	NP	NP
✕	17.5	5.33	D-8	CL	SEE BORING LOG	GRAVELLY LEAN CLAY with SAND	2	29	21	8

**GRADATION FRACTIONS**

	%Gravel	%Sand	%Fines	Cc	Cu
●	43.9	41.8	14.3		
☒	55.2	38.7	6.1	2.7	43.4
▲	51.0	42.8	6.2	2.3	34.8
★	67.6	30.2	2.2	2.2	15.2
✕	22.7	21.1	56.2		

**GRADATION VALUES**

	D60	D50	D30	D20	D10
●	5.61	2.74	0.55	0.17	
☒	6.96	5.41	1.74	0.68	0.16
▲	6.70	4.90	1.74	0.75	0.19
★	10.47	7.86	4.00	1.94	0.69
✕	0.17				



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. OL-2263

Date February 5, 1998

Hole No. TH-2-96

Sheet 1 of 2

Laboratory Summary



Washington State  
Department of Transportation

Project N.E. Stillwater Hill Road and Fay Road I/S

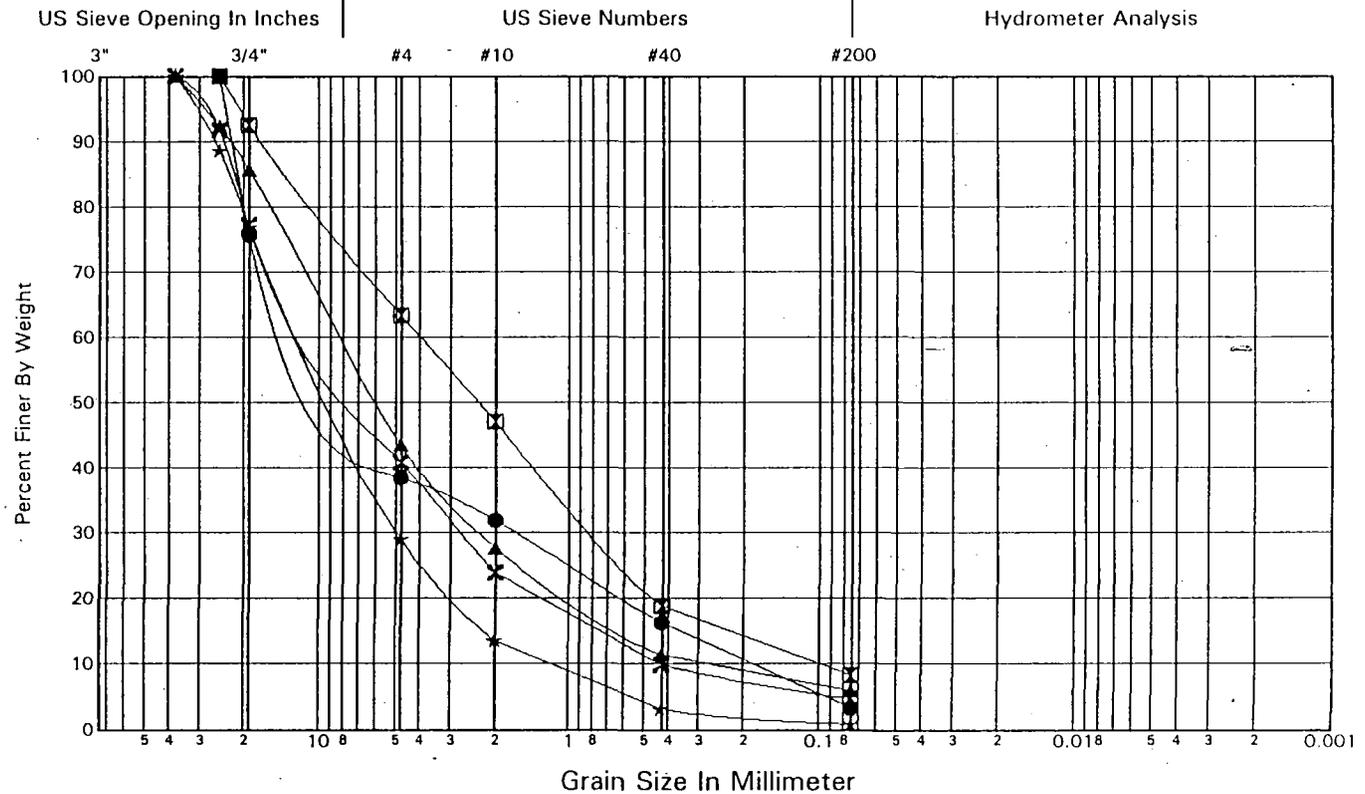
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	2.0	0.61	D-1	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	1	NP	NP	NP
☒	8.0	2.44	D-3	SW-SM	SEE BORING LOG	WELL GRADED SAND with SILT and GRAVEL	5	NP	NP	NP
▲	10.0	3.05	D-4	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	1	NP	NP	NP
★	15.0	4.57	D-6	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	1	NP	NP	NP
✕	20.0	6.10	D-8	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	3	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	61.5	35.2	3.3	1.4	57.7
☒	36.6	55.2	8.2	1.5	39.4
▲	56.5	37.5	6.0	2.3	30.1
★	70.9	28.2	0.9	1.7	9.9
✕	59.1	36.2	4.7	1.8	22.9

GRADATION VALUES

	D60	D50	D30	D20	D10
●	10.58	7.29	1.66	0.61	0.18
☒	3.97	2.34	0.79	0.45	0.10
▲	8.17	5.88	2.27	0.96	0.27
★	11.64	8.71	4.88	2.86	1.17
✕	9.85	6.72	2.73	1.30	0.43



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2263**

Date **February 5, 1998**

Hole No. **TH-2-96**

Sheet **2 of 2**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

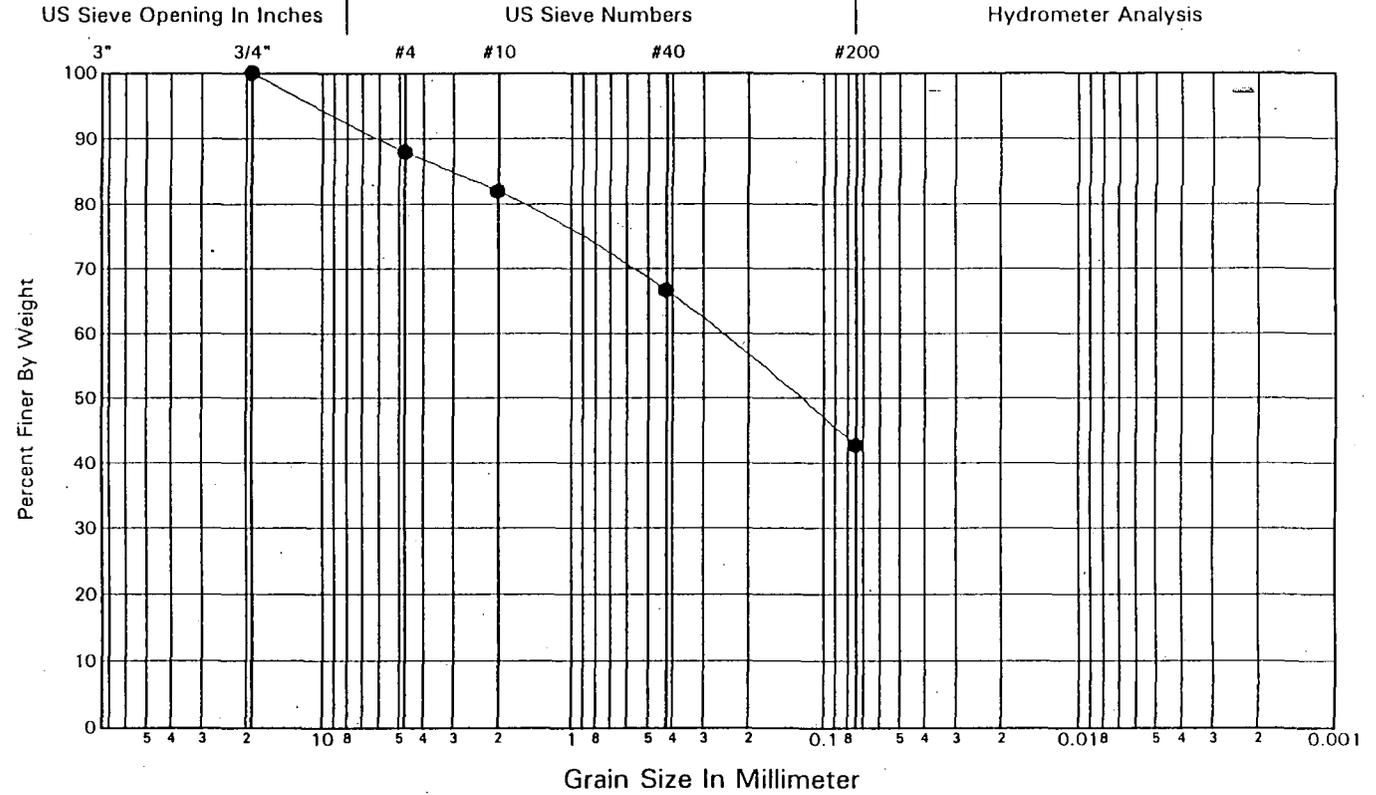
Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
● 35.0	10.67	D-11	SM	SEE BORING LOG	SILTY SAND	10	NP	NP	NP

**GRADATION FRACTIONS**

%Gravel	%Sand	%Fines	Cc	Cu
● 12.0	45.2	42.8		

**GRADATION VALUES**

D60	D50	D30	D20	D10
● 0.26	0.13			



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. OL-2263

Date March 19, 1998

Hole No. TP-1

Sheet 1 of 1

Laboratory Summary



Washington State  
Department of Transportation

Project N.E. Stillwater Hill Road and Fay Road I/S

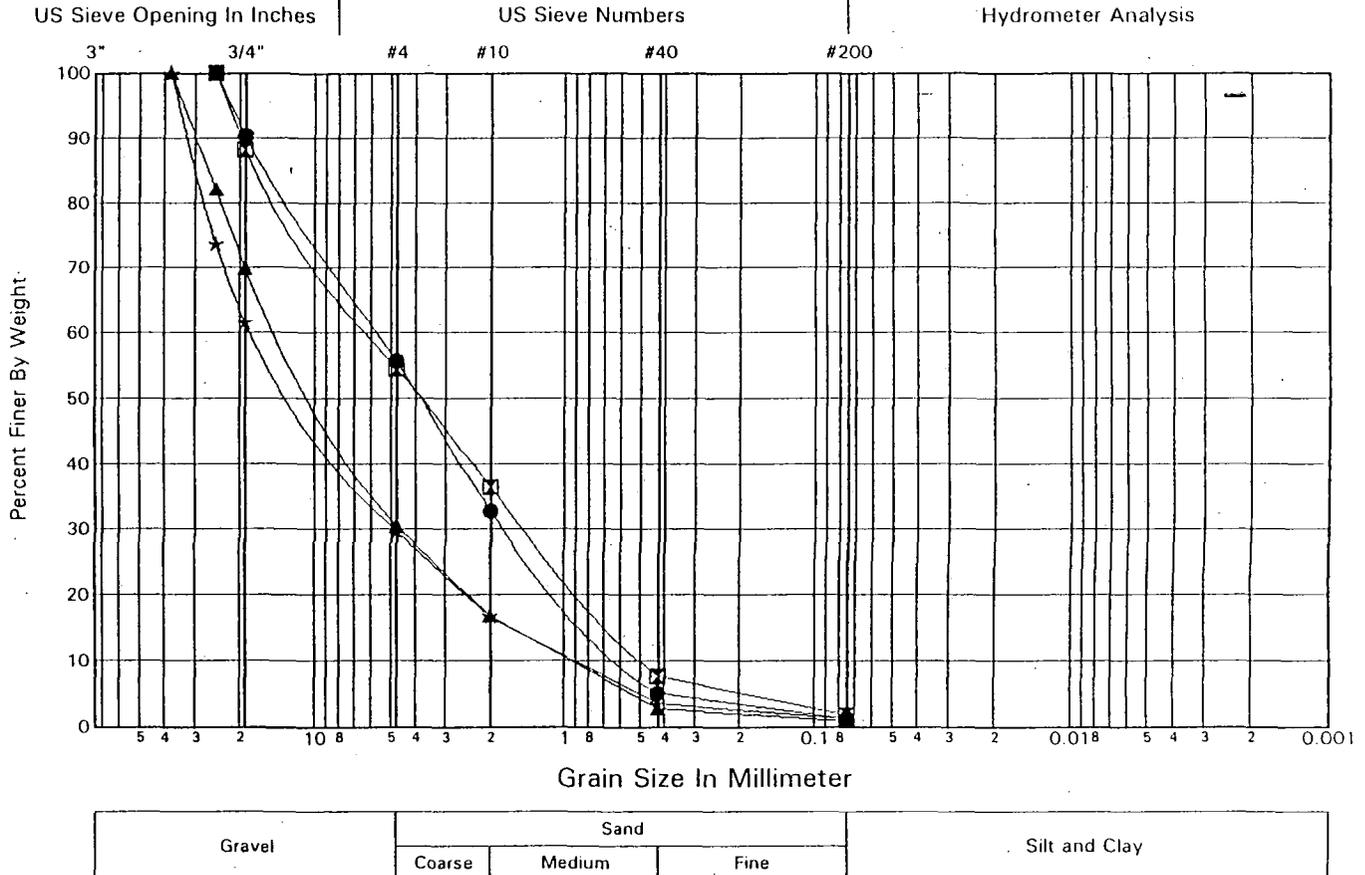
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	2.5	0.76	2	SP	SEE BORING LOG	POORLY GRADED SAND with GRAVEL	7	NP	NP	NP
☒	4.0	1.22	3	SP	SEE BORING LOG	POORLY GRADED SAND with GRAVEL	8	NP	NP	NP
▲	5.5	1.68	5	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	5	NP	NP	NP
★	6.0	1.83	6	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	5	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	44.3	54.4	1.3	0.9	10.1
☒	45.4	52.7	1.9	0.7	12.4
▲	69.5	29.6	0.9	1.7	14.3
★	70.3	28.5	1.2	1.4	19.6

GRADATION VALUES

	D60	D50	D30	D20	D10
●	5.64	3.83	1.71	0.98	0.56
☒	5.93	3.81	1.41	0.82	0.48
▲	13.41	9.43	4.60	2.44	0.94
★	17.72	11.48	4.81	2.48	0.91





Plan sheets and cross sections showing the proposed improvements are attached. Also attached are copies of boring logs and retaining wall data sheets. If any further information is required please advise us as soon as possible.

All soils samples have been forwarded to your office.

This project is considerably behind schedule and we request that you act upon this as expeditiously as is reasonably possible. Thank you.

NJC:njc

File: SR 203 0L-2263

Serial No. 98-086

cc: D. L. Edwards

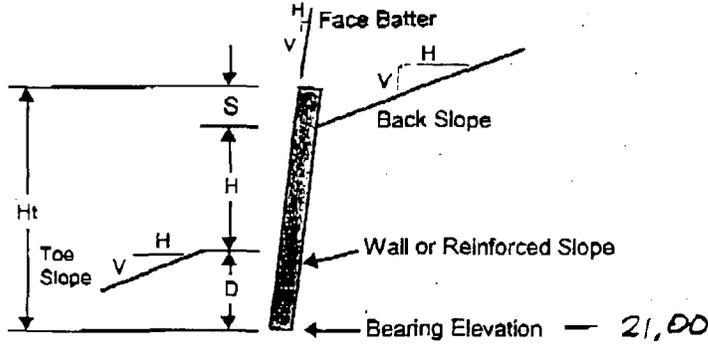
MS-117



Washington State  
Department of Transportation

# Retaining Wall/Reinforced Slope Site Data Check List

Region <b>NORTHWEST</b>	State Route <b>SR 203</b>	Job No. <b>DL2263</b>	Date <b>10-27-99</b>
Project <b>NE STILLWATER HILL RD &amp; FAY RD</b>			
Region Office <b>D. EDWARDS</b>		Region Contact Person <b>Jim DAVIDSON</b>	Phone <b>206-440-4336</b>



Wall Number or Name <b>WALL 1</b>		Begin Station <b>3+530</b>	End Station <b>3+553</b>
Maximum Ht <b>1.52m</b>	Maximum H <b>1.15m</b>	S <b>0.3 AVG</b>	Back Slope <b>1 V: 1.5 H</b>
		Toe Slope <b>1 V: 1.6 H AVG</b>	Face Batter <b>6 V: 1 H</b>

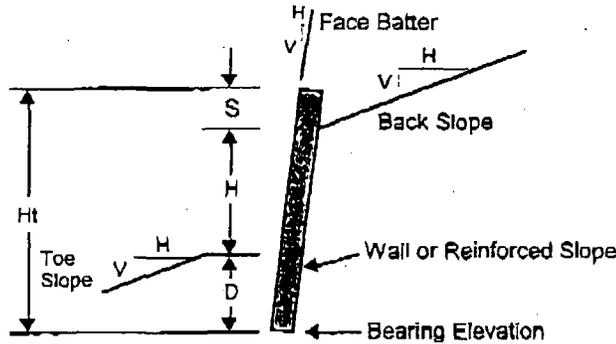
- Plans showing location of wall or reinforced slope:
  - Utilities (existing or proposed) that may influence wall design or selection are shown.
  - Buildings, bridges, existing and proposed adjacent walls, culverts, drainage structures, and minor structures that may influence wall design are shown.
  - Right of way lines and other geometric constraints to wall construction are shown.
  - Existing ground contours are shown.
- Wall or reinforced slope profiles:
  - Existing grades in front of and behind the wall are shown.
  - Final grades in front of and behind the wall are shown.
- Wall or reinforced slope cross-sections:
  - Provided at approximately every 15 m or at \_\_\_\_\_ m, or CAICE files provided.
  - Shows existing and proposed ground lines.
  - Shows locations of existing and proposed utilities.
  - Shows locations of culverts, drainage structures, and adjacent structures that may interfere with wall or reinforced slope or that may create surcharge loads.
  - Shows intensity and aerial extent of surcharge loads, if known.
- Traffic barrier locations provided as needed.
- Desired aesthetics described.



Washington State  
Department of Transportation

# Retaining Wall/Reinforced Slope Site Data Check List

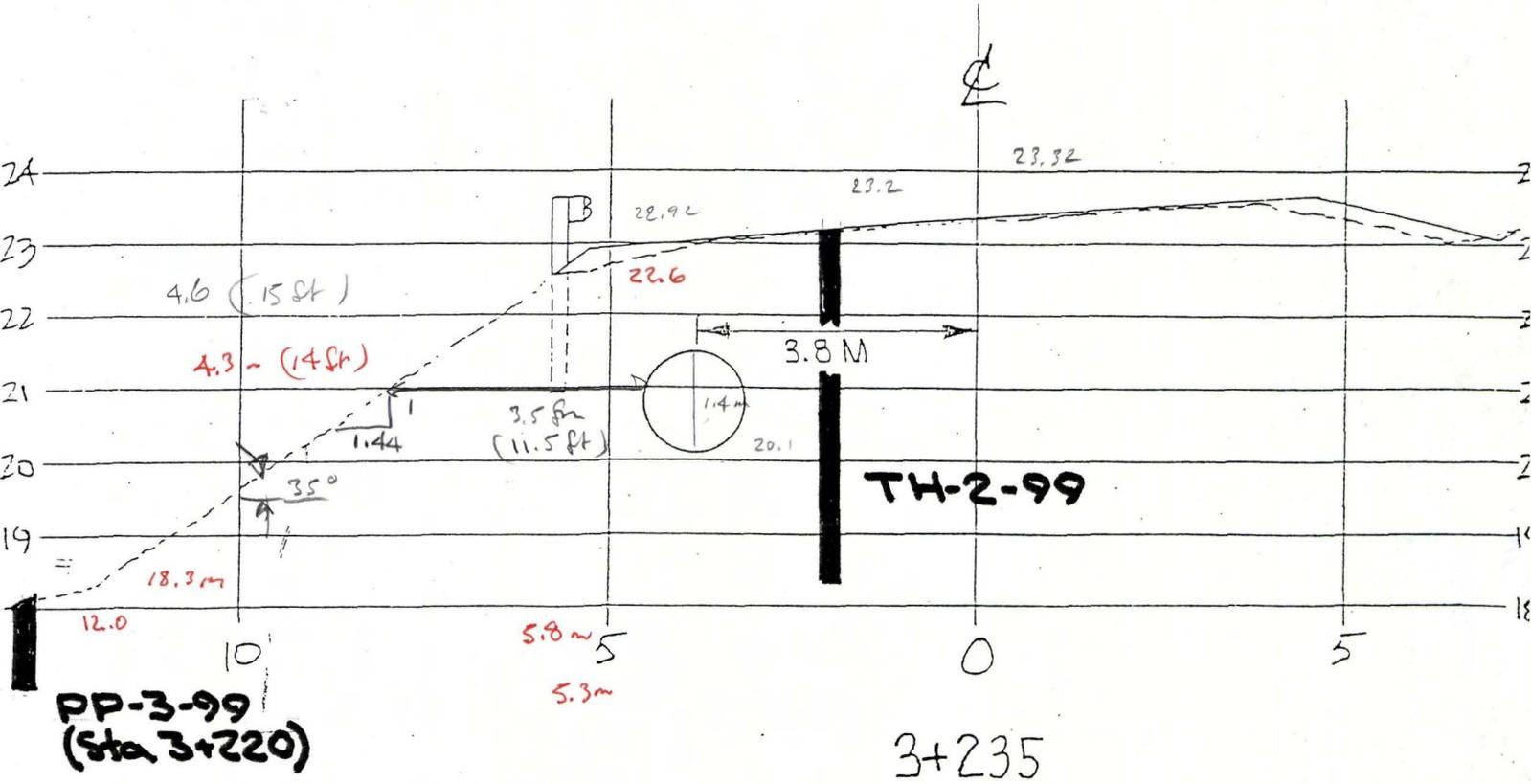
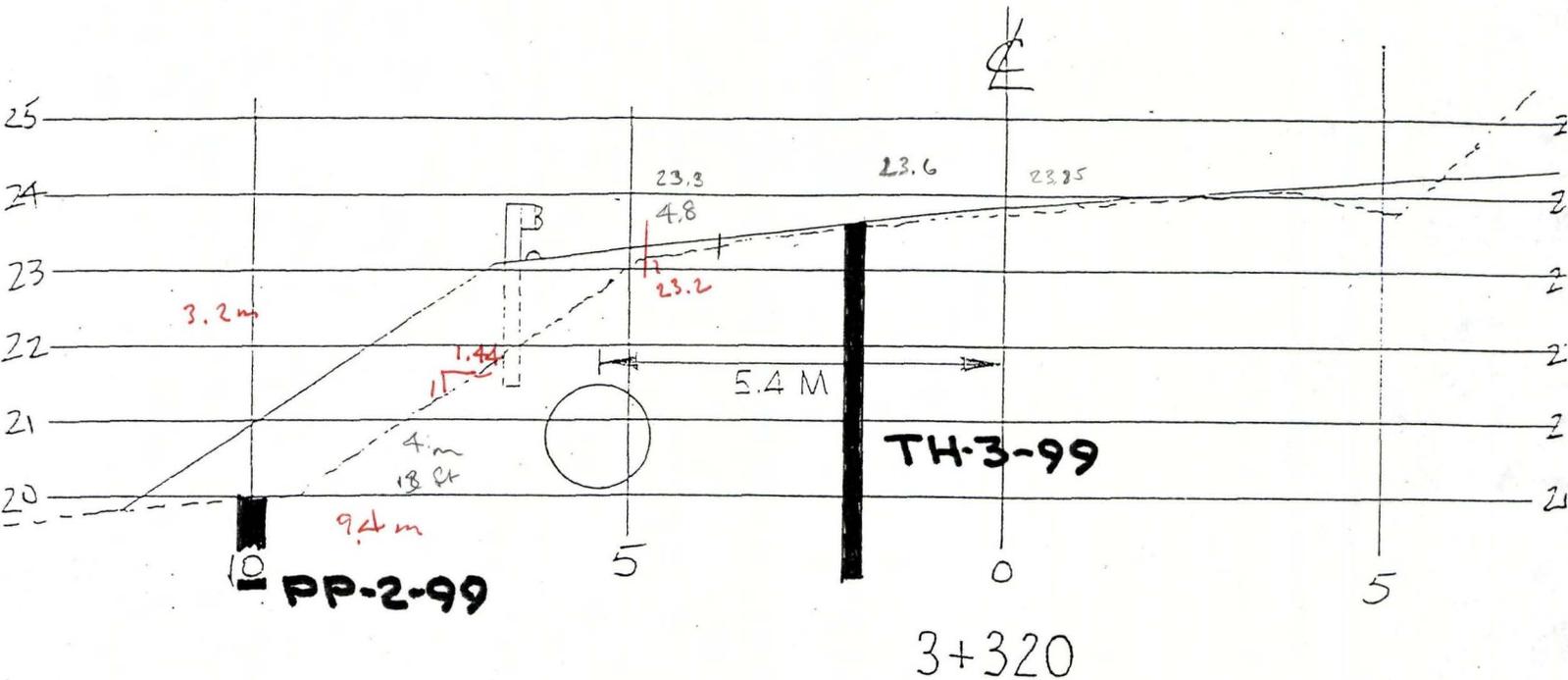
Region <b>NORTHWEST</b>	State Route <b>SR 203</b>	Job No. <b>DL 2263</b>	Date <b>10-27-99</b>
Project <b>NE SILCUMATER HILL RD &amp; FAY RD</b>			
Region Project Office <b>D EDWARDS</b>		Region Contact Person <b>JIM DAVIDSON</b>	Phone <b>206-440-4336</b>

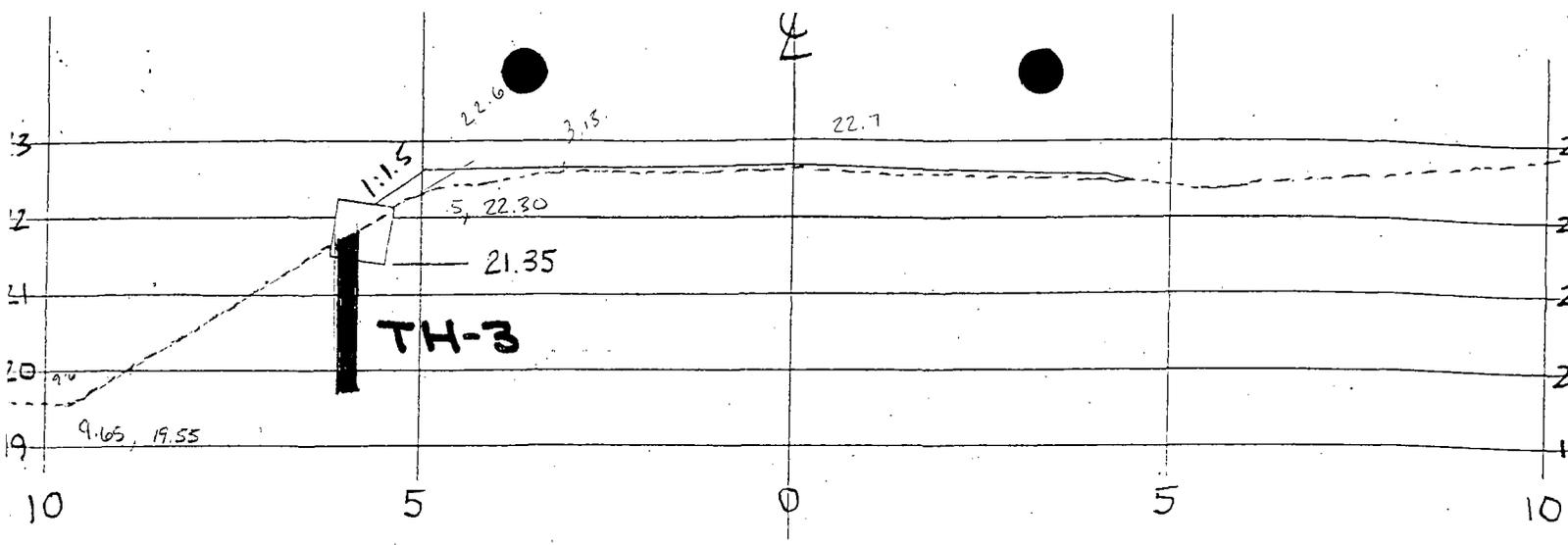


Wall Number or Name <b>WALL 2</b>	Begin Station <b>4+625</b>	End Station <b>4+716</b>
Maximum Ht <b>3.05M</b>	Maximum H <b>2.65M</b>	S <b>0.3</b>
Back Slope <b>1 V: 1.5 H</b>	Toe Slope <b>1 V: 1.35 H AVG</b>	Face Batter <b>6 V: 1 H</b>

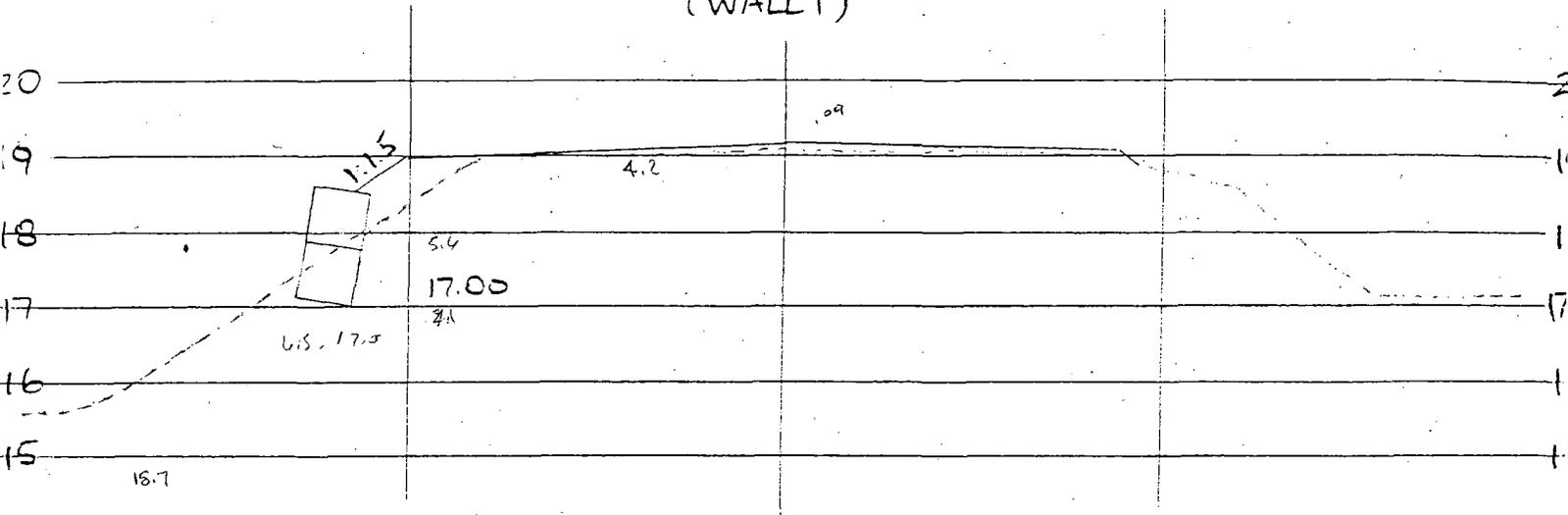
- Plans showing location of wall or reinforced slope:
  - Utilities (existing or proposed) that may influence wall design or selection are shown.
  - Buildings, bridges, existing and proposed adjacent walls, culverts, drainage structures, and minor structures that may influence wall design are shown.
  - Right of way lines and other geometric constraints to wall construction are shown.
  - Existing ground contours are shown.
- Wall or reinforced slope profiles:
  - Existing grades in front of and behind the wall are shown.
  - Final grades in front of and behind the wall are shown.
- Wall or reinforced slope cross-sections:
  - Provided at approximately every 15 m or at \_\_\_\_\_ m, or CAICE files provided.
  - Shows existing and proposed ground lines.
  - Shows locations of existing and proposed utilities.
  - Shows locations of culverts, drainage structures, and adjacent structures that may interfere with wall or reinforced slope or that may create surcharge loads.
  - Shows intensity and aerial extent of surcharge loads, if known.
- Traffic barrier locations provided as needed.
- Desired aesthetics described.

# SILLWATER HILL RD.

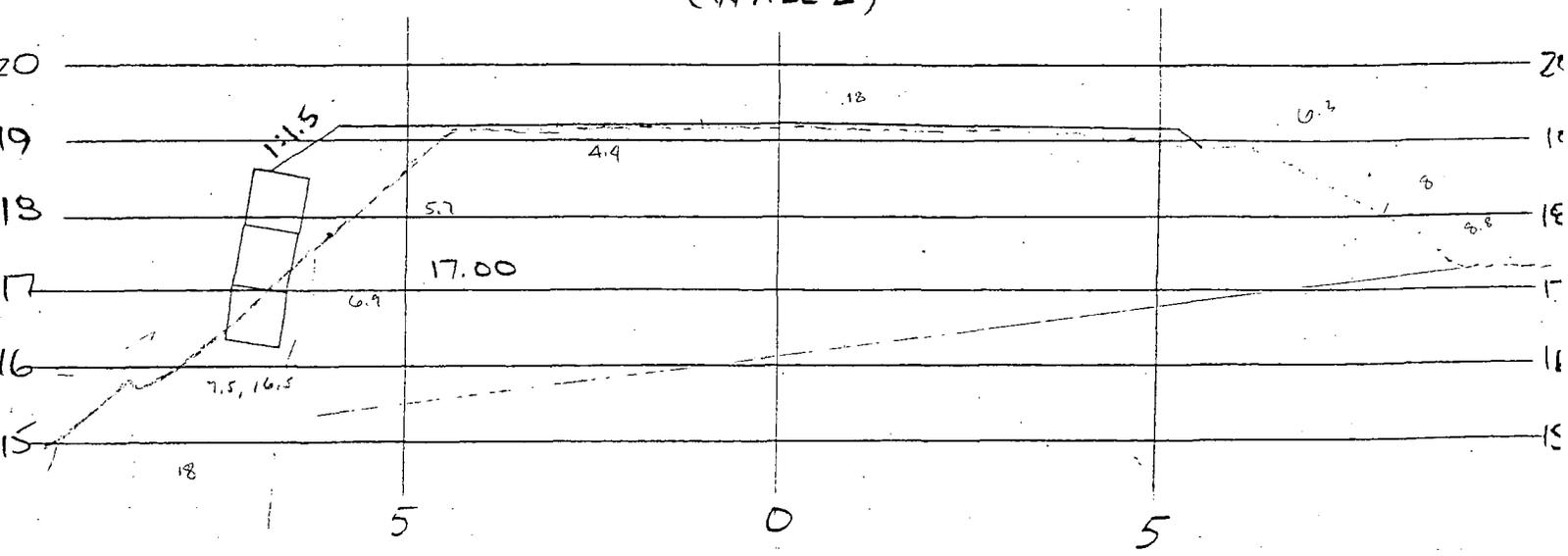




3+540  
(WALL 1)



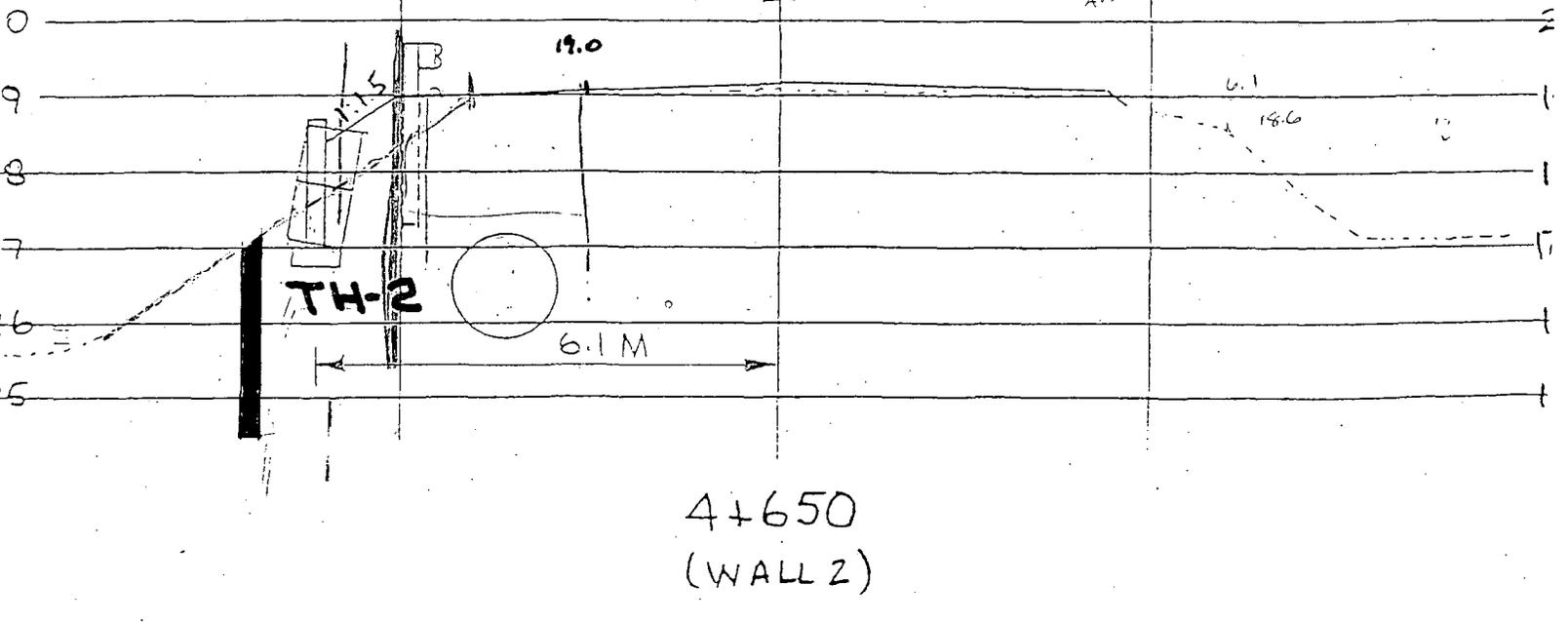
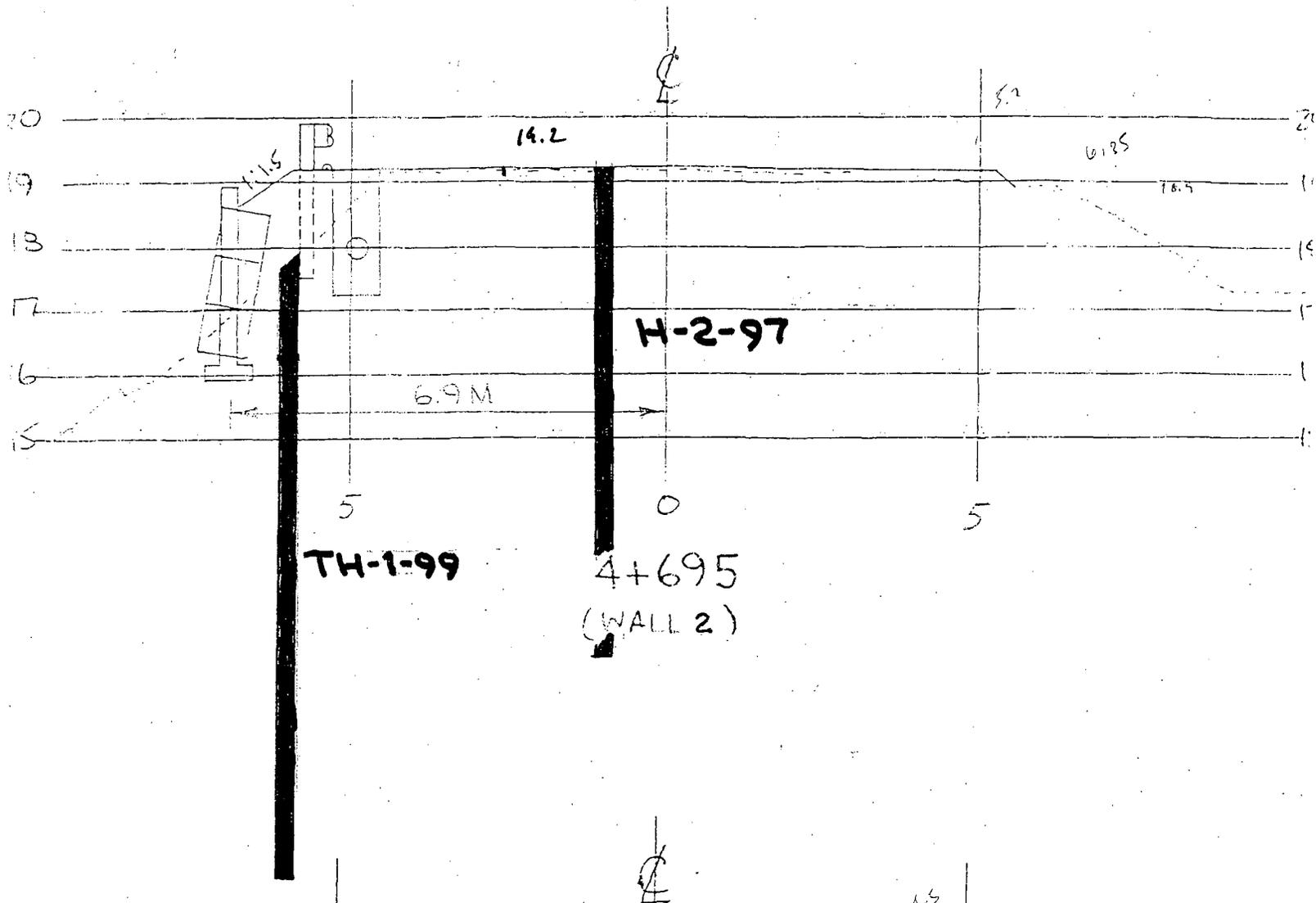
4+650  
(WALL 2)



4+695  
(WALL 2)

0.2  
45

FAY RD.











S.R. 203 Section N.E. STILLWATER HILL ROAD&FAY ROAD Job No. OL-2263  
 Hole No. TH#3 For WALL #1 Cont. Sec. \_\_\_\_\_  
 Station 3+540 Offset 6 METERS LEFT Ground El. \_\_\_\_\_  
 Type Of Boring HANDTOOLS Drill PORTABLE PENETROMETER W.T. El. NO FREE WATER  
 Inspector VERNON F. WILLIAMS Starting Date 8/25/99 Sheet 1 of 1

DEPTH	BLOWS / FT.	PROFILE	SAMPLE #'s	DESCRIPTION OF MATERIAL
0	D-1			Well graded, GRAVEL, with cobbles, sub-rounded, loose, brown, moist, homogeneous, no HCL reaction
	5		↑ 5 5 5	
	D-2			
	11		↑ 8 14 9	Poorly graded, SAND, with gravel, medium dense, brown, moist, Homogeneous, no HCL, reaction.
5	D-3			
	16		↑ 8 18 14	
				Poorly graded, SAND, with gravel, loose, brown, moist, with silt balls, Homogeneous, no HCL, reaction.
10				
15				
20				NOTE: BLOWS PER FOOT ARE EQUIVALENT TO STANDARD PENETROMETER VALUES .NO SAMPLES WERE RETAINED AT PENETROMETER DEPTHS

DOT  
NW Region Form



Original to Materials Engineer  
 Copy to Bridge Engineer  
 Copy to District Administrator  
 Copy to \_\_\_\_\_

S.R. 203 Section N.E. STILLWATER HILL ROAD&FAY ROAD Job No. 0L-2263  
 Hole No. TH#2 For WALL#2 Cont. Sec. \_\_\_\_\_  
 Station 4 + 650 Offset 7 METERS LEFT Ground El. \_\_\_\_\_  
 Type Of Boring HANDTOOLS Drill PORTABLE PENETROMETER W.T. El. NO FREE WATER  
 Inspector VERNON F. WILLIAMS Starting Date 8/25/99 Sheet 1 of 1

DEPTH	BLOWS / FT.	PROFILE	SAMPLE #'s	DESCRIPTION OF MATERIAL
0	D-1			Well graded, GRAVEL, with cobbles, sub-rounded, loose, brown, moist, homogeneous, no HCL reaction Poorly graded, SAND, with gravel, loose, brown, moist, with silt balls, Homogeneous, no HCL, reaction. Poorly graded, SAND, with gravel, loose, brown, moist, with silt balls, Homogeneous, no HCL, reaction. Poorly graded, SAND, with gravel, loose, brown, moist, with silt balls, Homogeneous, no HCL, reaction.  END OF BORING AT MINUS 7.5' NO FREE WATER  NOTE: BLOWS PER FOOT ARE EQUIVALENT TO STANDARD PENETROMETER VALUES .NO SAMPLES WERE RETAINED AT PENETROMETER DEPTHS
	4		2\3\4	
	D-2			
	7		2\3\12	
5	D-3			
	8		5\4\4	
	D-4			
	10		12\8\12	
10				
15				
20				



# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH - 1 - 99

PROJECT NE Stillwater Road and Fay Road I/S

Job No. OL - 2263

Vicinity MP. 9.6

S.R. 203

Station 4 + 695 Offset 6M Left

C.S. \_\_\_\_\_

Equipment Tripod Casing 4" x 30'

Ground El ( m )

Method of Boring Jet Wash

Start Date October 4, 1999 Completion Date October 7, 1999

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												
1	0.3					5	▲	D-1		Silty SAND with gravel, medium dense, brown, dry, Homogeneous, no HCl reaction, Note - Drilling became soft at - 4.0'. Length Recovered 0.7 ft, Length Retained 0.7 ft			
						6 6 (12)	▲						
5	1.5					2	▲	D-2		Sandy SILT with gravel, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
						2 2 (4)	▲						
2	2.7					4	▲	D-3		Silty SAND with gravel, very loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.7 ft, Length Retained 0.7 ft			
						2 2 (4)	▲						
10	3.0					5	▲	D-4		Silty SAND with gravel, medium dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.2 ft, Length Retained 0.2 ft			
						6 5 (11)	▲						
15	4.5					1	▲	D-5		SILT, with organic's, loose, gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft			
						1 3 (4)	▲						
20	6.0												

10/07/1999



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-2-97

PROJECT N.E.Stillwater Hill Road and Fay Road I/S  
M.P. 9.63

Job No. OL-2263

S.R. 203

Station 4+701 Offset 1 m Lt

C.S. 1750

Equipment CME 850 Auto Hammer Casing HQ X 24.0'

Ground El \* ( m )

Method of Boring Wet Rotary

Start Date November 4, 1997

Completion Date November 4, 1997

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									1 ft.=0.3048 m. Sand and gravel.			
1 - 5	1 - 1.524					3 2 2 (4)	D-1	GS MC AL	CL-ML, M.C.=20%, PI=6 Gravelly, silty CLAY with sand, soft, light-brown, wet, stratified. Recovered and retained 0.8 ft.				
5 - 10	5 - 10.06						S-2		No recovery.				
10 - 15	10 - 15.09					2 2 2 (4)	D-3	GS MC AL	ML, M.C.= 25%, PI=NP SILT with sand and gravel, very loose, gray, wet, homogeneous. Recovered and retained 0.8 ft.				
15 - 20	15 - 20.12						S-4		Sandy SILT with gravel, gray, wet. Recovered and retained 1.0 ft.				
20 - 25	20 - 25.15					3 3 3 (6)	D-5	GS MC AL	ML, M.C.=47%, PI=10 SILT with sand and gravel and decayed wood, very loose, gray, wet, stratified. Recovered and retained 0.8 ft.				
25 - 30	25 - 30.18						S-6		No recovery.				

SOIL L2263.GPJ SOIL.GDT 10/13/99 8:17:27 A10



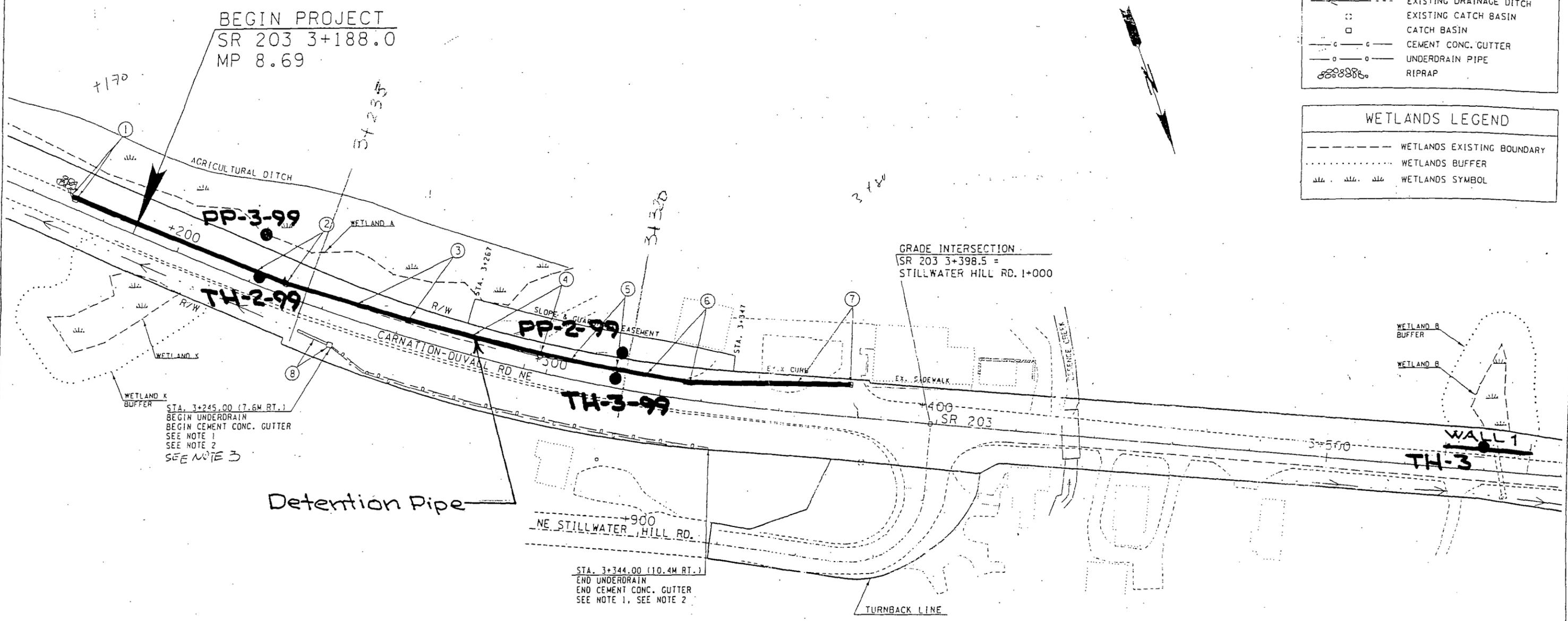
T.25N. R.7E. W.M.

DRAINAGE LEGEND	
	PIPE
	EXISTING CULVERT
	EXISTING DRAINAGE DITCH
	EXISTING CATCH BASIN
	CATCH BASIN
	CEMENT CONC. GUTTER
	UNDERDRAIN PIPE
	RIPRAP

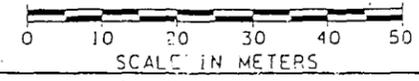
  

WETLANDS LEGEND	
	WETLANDS EXISTING BOUNDARY
	WETLANDS BUFFER
	WETLANDS SYMBOL

Causlas  
 ... \Swtr Plnsht.dgn  
 PLOT1 27 SEP 1999



ALL DIMENSIONS SHOWN ARE IN METERS  
UNLESS OTHERWISE DESIGNATED



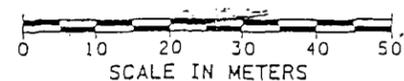
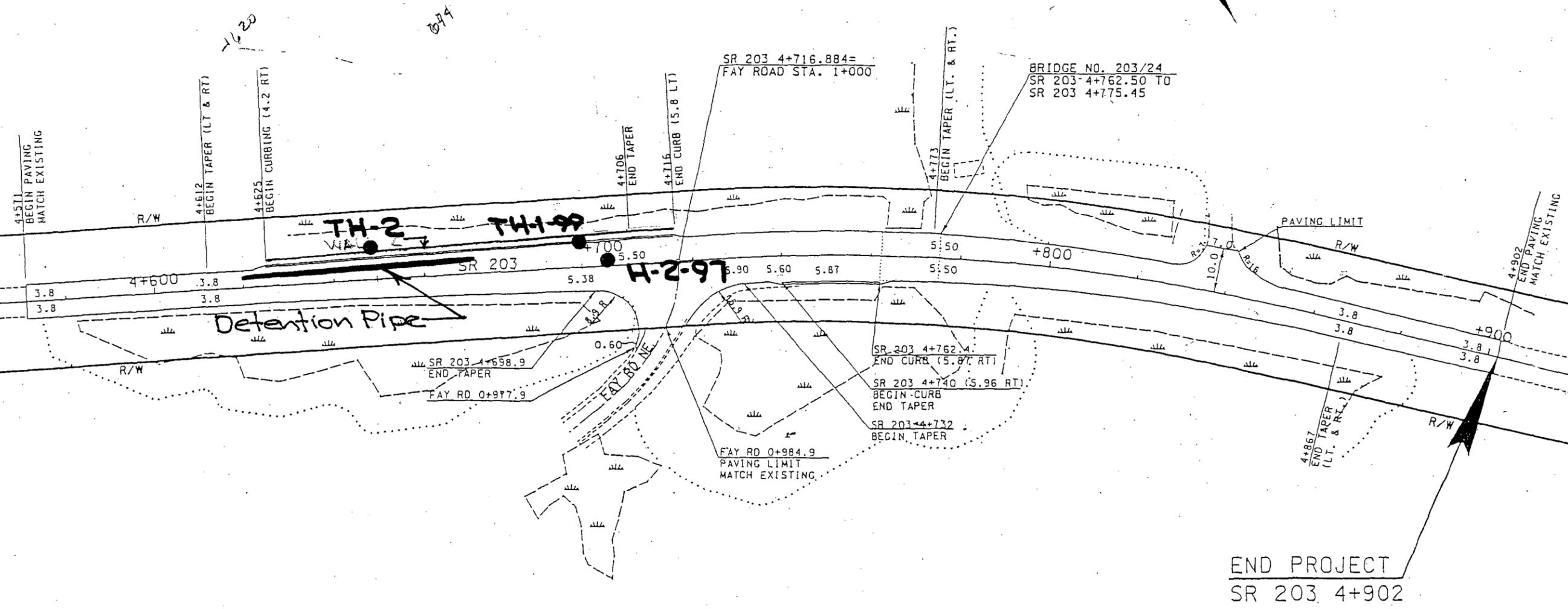
- NOTES:**
1. UNDERDRAIN RUNS BELOW SOIL NAIL WALL. SEE SHEET B5.
  2. CEMENT CONC. GUTTER RUNS ABOVE AND BEHIND SOIL NAIL WALL. SEE SHEET B5.
  3. SEE DRAINAGE PROFILE SHEET DP1

DESIGNED BY H. NGUYEN		REGION NO. 10	STATE WASH	FED. AID PROJ. NO.	ENVIRONMENTAL AND ENGINEERING SERVICE CENTER	Washington State Department of Transportation	SR 203 NE STILLWATER HILL RD & FAY RD	DR1
ENTERED BY S. CAUSLAND		JOB NUMBER 98A016	CONTRACT NO.					
CHECKED BY M. NEWMAN		DATE	DATE	REVISION	BY		DRAINAGE PLAN	SHEET OF SHEETS
PROJ. ENGR. D. EDWARDS								
REGIONAL ADM. J. OKAMOTO								

... \fyrd plnsht.dgn  
PLOT4 09 AUG 99

T. 26N. R. 7E. W.M.

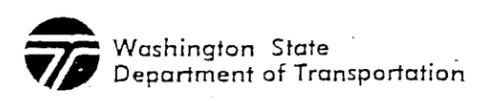
WETLANDS LEGEND	
	WETLANDS EXISTING BOUNDARY
	WETLANDS BUFFER
	WETLANDS SYMBOL



DESIGNED BY	R. DE LEON
ENTERED BY	S. CAUSLAND
CHECKED BY	H. NEWMAN
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. OKAMOTO

REGION NO.	STATE	FED. AID PROJ. NO.
10	WASH	
JOB NUMBER	98A016	
CONTRACT NO.		

ENVIRONMENTAL AND ENGINEERING SERVICE CENTER



SR 203  
NE STILLWATER HILL RD & FAY RD  
PAVING PLAN

PV2  
SHEET OF

Date: December 20, 1999

TO: David L. Edwards/ Jim Davidson, MS- NB82-117  
NW Region

FROM:  T. M. Allen/D.A. Williams  
FOSSC Geotechnical Branch

SUBJECT: SR-203, OL-2263  
NE Stillwater Hill Road and Fay Road Intersections  
MP 8.69 to MP 9.75 Detention Pipes

We were requested to provide geotechnical recommendations for two detention pipes which are within the project limits. The pipes will store and treat storm water runoff from the highway. Since one pipe will be placed next to a steep slope and the other will be behind a new retaining wall, an evaluation of the slope stability is needed for the Hydraulic Report. The first pipe is 210 m in length between Stations 3+170 and 3+380. The second pipe is approximately 53 m in length between Stations 4+620 and 4+673. Both pipes are 1.2 m in diameter.

The first detention pipe is constructable. The pipe is located between Stations 3+170 and 3+380 at an approximately elevation 20.0 m. The pipe will be set back from the slope face approximately 5 m and has a cover of between 1.2 m and 2.0 m. The pipe will be founded in medium dense to dense sand and gravel with cobbles. The soils are described in test holes TH-2-99, TH-3-99, PP-2-99, and PP-3-99. We do not expect a major stability or settlement problem in this area.

The existing slopes are standing at 1.4(H):1(V). It is our understanding that new sliver fills will be constructed at 1.5:1 slopes. These slopes should be stable provided that the slopes are constructed of gravel borrow and hillside terraces as required under Section 2-03.3(14) in the Standard Specifications are used. We recommend that Method B compaction be used. The 1.5:1 slope is likely to experience surface erosion and possible shallow slope failures in the newly constructed face. As the slope is re-vegetated, the potential problem with surface erosion should diminish.

The second detention pipe site, between Stations 4+620 and 4+673, needs further geotechnical investigation. The existing test borings in the vicinity of the proposed pipe shows soft soils. Test hole TH-2A-97 was drilled at Station 4+670 (2.7 m Lt.). The existing fill consists of loose sandy silt that is approximately 2.4 m thick. The fill is underlain by up to 5.5 m of very loose silty sand and soft sandy silt. The pipe will be located behind Wall 2 in an area of soft foundation soils. Due to location just behind the wall, the pipe and wall may have potential overall stability problems. Settlement of the proposed wall could damage the detention pipe.

David L. Edwards/ Jim Davidson

December 20, 1999

Page 2

It is our understanding that this project will be built some time in the future. Money for additional investigation is not available at this time. Therefore, we recommend that the second detention pipe not be built at the proposed location. Another site away from the wall would be preferred from a geotechnical point of view.

Edited logs of test borings for the detention pipes located between Stations 3+170 and 3+380 are attached. We have also attached test hole TH-2A-97 in the vicinity of Station 4+670 with its laboratory test data. Additional test holes were drilled by NW Region Materials for Wall #2, TH-1-99 at Station 4+695 (6 m Lt.) and a Portable Penetrometer Hole at Station 4+650. Due to the time and budget constraints for this project the logs for these test borings have not been edited. The logs will be completed when the project comes back off the shelf.

If you have questions or require further information, please contact Donald A. Williams at (360)709-5457.

TMA:DAW  
Attachments

cc: T. M. Smith, MS- NB 82-29, NW Region Materials Engineer  
M. Palmer, MS- NB 82-138, NW Region Environmental Services



Date: June 11, 1998

From:   
T. M. Allen/D. G. Chadbourne  
OSC Materials Lab, 47365  
Geotechnical Branch

Phone: (360) 709-5456  
FAX (360) 709-5585

Subject: SR-203, OL-2263  
NE Stillwater Hill Road I/S  
MP 8.69 to MP 8.92  
Retaining Wall Recommendations

To: M. M. Lwin/K. N. Kirker  
OSC Bridge & Structures  
47340

As requested, we are providing recommendations for the retaining wall located to the right of SR-203, from approximately Station 3+245 to Station 3+343. The wall will retain a cut in the hillside for improvements made to the SR-203/Stillwater Hill Road Intersection. The wall will have a maximum exposed height of approximately 4 m. A private residence is located approximately 6 m behind the wall.

The analyses, conclusions, and recommendations presented in this memorandum are based on the project description and site conditions that existed at the time of the field exploration. We assume the test pit and exploratory borings represent the subsurface conditions throughout the project area. If different subsurface conditions are encountered or appear to be present, we should be contacted so that we can reevaluate our recommendations and assist you.

#### Field Investigation and Laboratory Testing

The existing slopes at the site vary from 39 to 45 degrees of inclination. The slopes are vegetated with berry bushes, trees and grass. Two test borings and one test pit were completed for the investigation of the wall. Appendix A contains a profile depicting subsurface conditions along the wall and showing the location of the test borings and test pit.

Test Borings TH-1-96 and TH-2-96 encountered very loose to medium dense, poorly graded sand and well graded gravel with sand, silt, cobbles and boulders. These soils are underlain by medium dense to very dense, well graded gravel with silt and sand, and very hard gravelly lean clay with cobbles. In general, Standard Penetration Tests (SPT) were performed at 1.5 m intervals in the test borings. No groundwater table was

encountered in the test borings, although samples in Test Boring TH-2-96 were described as wet. This is probably due to a drain field located behind the residence. Copies of the boring logs are included in Appendix B.

Test Pit No. 1 encountered poorly graded sand with gravel and cobbles and boulders underlain by well graded gravel with sand and cobbles. Minor seepage was observed while excavating.

Test Pit 1 was allowed to stand open for six days. At the end of six days minor sloughing and some seepage was observed in the excavation. The log of the test pit and pictures taken one day and six days after excavation are included in Appendix B.

Laboratory testing consisted of selecting disturbed samples from the SPT's and test pit for moisture content and gradation testing. The tests were conducted according to AASHTO T-265 and T-27 test specifications. After testing, the samples were classified using the Unified Soil Classification System. The results of the laboratory testing are included in Appendix C.

### **Design Recommendations**

Standard reinforced concrete, soldier pile and soil nail walls are feasible for this site. However, construction of a standard wall would require large temporary cuts or installation of a shoring system. Because the soils in the cut consist of sand and gravel and the test pit remained open with only minor sloughing, we recommend that a soil nail wall be used at this site. Soil nail walls are generally more cost effective than soldier pile walls in soil conditions favorable for soil nailing.

Our geotechnical design for a soil nail wall includes an evaluation of overall stability of the wall, minimum spacing and embedment requirements for the soil nails, and soil properties to be used for design. Bridge and Structures will provide all facing design and connection details. Since a soil nail wall is a non-standard design, the plan sheets and special provisions will be provided by the Bridge and Structures office.

We recommend that prior to excavation for the top row of nails, the slope at the back of the wall face be graded to ensure adequate surface drainage along the top of wall. A concrete gutter should be constructed along the top of the wall after the permanent facing is constructed. We recommend the top of wall profile have a minimum slope of approximately one percent.

An ultimate value of 130 kN was used for the punching shear strength of the facing in the wall design. The ultimate value was reduced by a factor of 0.67 to obtain the allowable value. The nail schedule for the wall is contained in Table 1. A profile of the wall face showing the layout of the nails is shown in Figure 1.

A permanent easement for the soil nails should be established a minimum of 8.5 m behind the wall face.

**Table 1: Nail Schedule**

Wall Segment (Station)	Minimum Nail Length (m)	Nail Declination (degrees)	Horizontal Spacing (m)	Bar Size	Design Load Transfer (kN/m)
A (3+245 to 3+253)	8.5	15	1.22	8	13.1
B (3+253 to 3+259.6)	(Row 1) 8.5	15	1.22	8	13.1
	(Row 2) 8.5	15	1.22	7	13.1
C (3+259.6 to 3+265.3)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9
	(Row 3) 8.5	15	1.22	7	13.1
D (3+265.3 to 3+325.3)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9
	(Row 3) 8.5	15	1.22	7	13.1
	(Row 4) 4.9	15	1.22	7	13.1
E (3+325.3 to 3+340.3)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9
	(Row 3) 8.5	15	1.22	7	13.1
F (3+340 to End of Wall)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9

**Construction Considerations**

The slope above the wall will require grading to ensure proper drainage. Grading will be required at approximately Station 3+270, where Test Boring TH-2-96 was located, and from Station 3+320 to 3+330. The top of wall profile should be graded to a minimum of one percent to drain toward either end of the wall. This grading should be performed before beginning excavation for the first row of soil nails.

We recommend that a prefabricated drainage material be placed between the nails at the excavation face. The drainage material should be connected to a 75 mm (3 inch) diameter weep hole that passes through the wall and the proposed jersey barrier. Additional drainage should be supplied in front of the wall.

Preproduction verification testing of the nails is required, and these nails should be considered sacrificial. The tests are needed to verify the contractor's installation methods, hole diameter, and design assumptions prior to the excavation for the soil nail wall. The nail diameter should be designed by the contractor. We require a minimum hole diameter of 125 mm (5 inches) to meet minimum grout cover around the reinforcing bar.

We recommend a minimum of three verification tests be performed. The tests should be performed at the following locations:

1. Station 3+255 to 3+260 - top row of nails
2. Station 3+305 to 3+315 - top row of nails
3. Station 3+305 to 3+315 - bottom row of nails

Because of temporary facing stability concerns during construction, all nails should be installed through a berm. The temporary cut face at both walls should be limited between nail levels. The excavation should be limited to a maximum of 0.6 m (2 ft) below the next row of nails.

The test borings encountered a very dense soil layer below the wall face. Because this soil layer likely slopes up with the hillside, the nail excavations will likely encounter difficult drilling. Caving conditions may be encountered in the loose layers above the very dense soils. Temporary casing may be required. Cobbles and boulders were encountered in the test pit excavation. The following statement should be added to the special provisions for the contract:

The Contractor is advised that cobbles and boulders were encountered in the test pit excavated at the site. The Contractor shall select drilling methods and equipment which are capable of penetrating the cobbles, boulders and very dense soils encountered at the site. Groundwater seepage may be encountered in the wall excavations and may cause caving at the face of the excavation. Loose soils were encountered in the test pit for the wall. Temporary berms or shotcrete flashing are required to maintain cut face stability during nail installation. Temporary casing may be required to prevent caving in the nail excavations.

Because of the steep slopes that the wall will be excavated on, the top rows of nails may have to be installed from a platform or a berm. This may require closing or restricting a lane. Because of the length of the nails, an additional lane closure may be required during the installation of the nails in the holes.

**Closure**

A profile depicting the subsurface conditions along the wall and the location of the test borings and test pit is located in Appendix A. The Logs of Test Borings, Logs of Test Pits and results of the lab testing are included in Appendices B and C. The Logs of Test Borings and Pits should be included in the contract documents.

If you have questions or require further information, please contact Don Chadbourne at (360) 709-5456 or Jim Cuthbertson at (360) 709-5452.

TMA:dgc

DGC

Attachment

cc: R. T. Shaefer, Bridge & Structures, 47340  
A. E. Stiles, NW Region Materials Engineer, NB82-29  
D. Edwards, NW Region Project Engineer, NB82-117  
J. Davidson, NW Region PEO, NB82-117

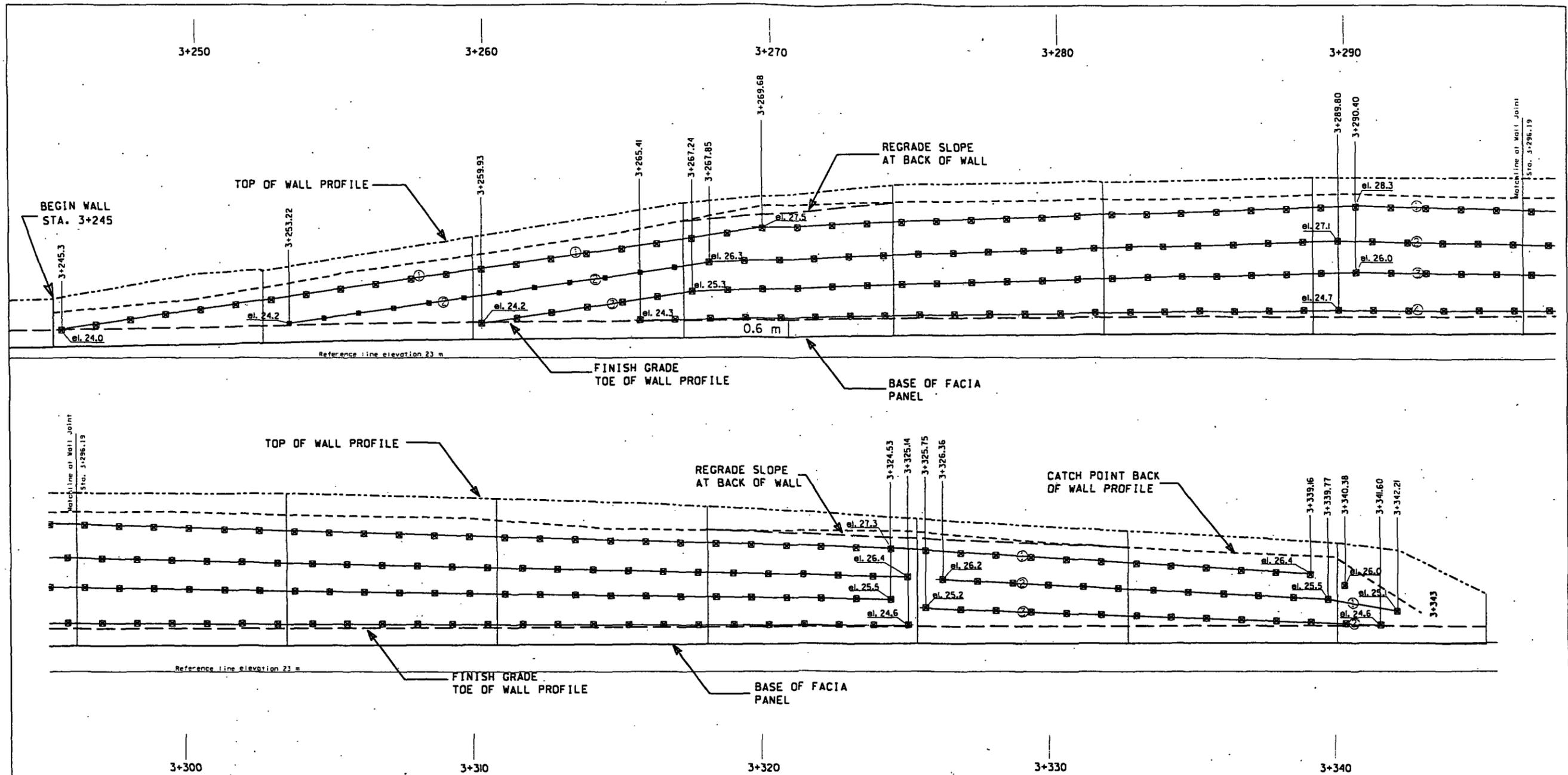
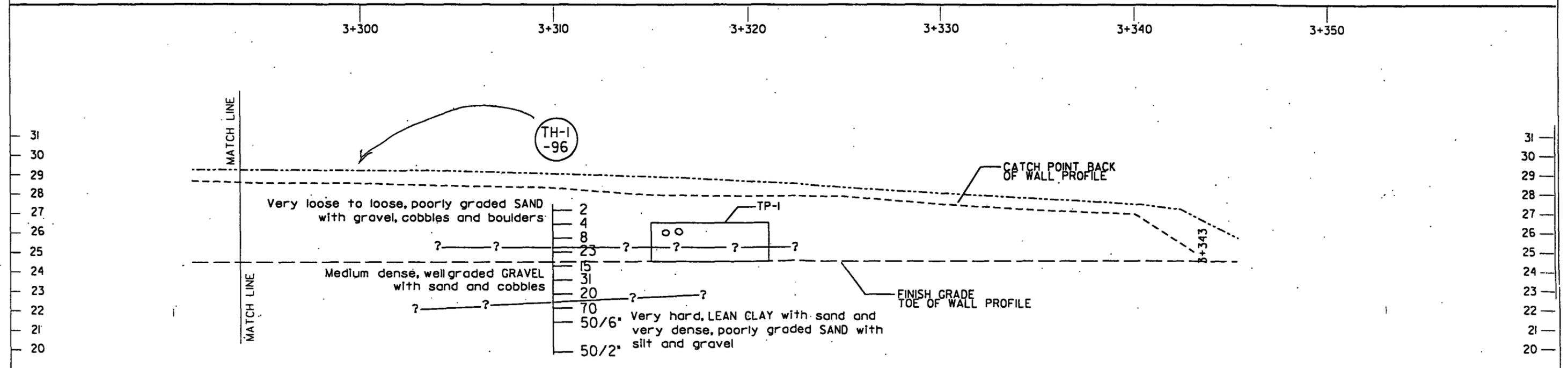
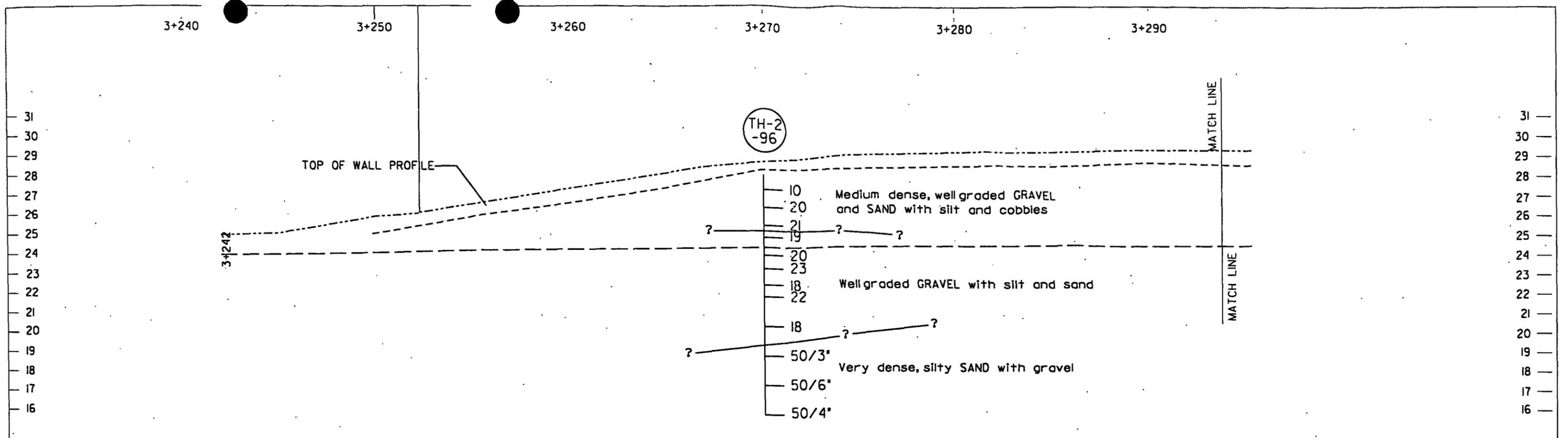


Figure 1:  
Soil Nail Layout

JOB <b>OL-2263</b> S.R. <b>203</b> C.S. _____ LAYOUT _____	
<b>NE Stillwater Hill Rd. Intersection</b>	
 WASHINGTON STATE TRANSPORTATION COMMISSION DEPARTMENT OF TRANSPORTATION MATERIALS BRANCH D. C. JACKSON MATERIALS ENGINEER	DATE <b>6/98</b> SCALE <b>1:150</b> VERT. <b>1:150</b> HORIZ. SHEET _____ OF _____ DRAWN BY <b>DWG</b>

**APPENDIX - A**

**Subsurface Profile**



SUBSURFACE PROFILE

JOB 01-2263 S.R. 203 C.S. 1750 LAYOUT

**N.E. STILLWATER HILL ROAD AND FAY ROAD INTERSECTION**

WASHINGTON STATE  
TRANSPORTATION COMMISSION  
DEPARTMENT OF TRANSPORTATION

MATERIALS BRANCH  
D. G. JACKSON MATERIALS ENGINEER

DATE JUNE 1998  
SCALE 1:200 VERT.  
1:200 HORZ.

SHEET \_\_\_ OF \_\_\_  
DRAWN BY DWG

**APPENDIX - B**

**Logs of Field Explorations**

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-5-00

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

S.R. 203

Station 3+540

Offset 9.7M Left

C.S. 1750

Equipment CME 850 w/ autohammer

Casing HW x 12 HQ x 27

Ground El ( m )

Method of Boring Wet Rotary

Start Date October 5, 2000

Completion Date October 6, 2000

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						9	D - 1	D - 1		Silty SAND with gravel, dense, brown, wet, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
						14							
5						(25)	D - 2	D - 2		Silty SAND with gravel, loose, brown, wet, Homogeneous, no HCl reaction Length Recovered 0.6 ft, Length Retained 0.6 ft			
						6							
2						3	D - 3	D - 3		Well graded GRAVEL with sand, subangular, dense, brown, wet, Homogeneous, no HCl reaction Length Recovered 0.4 ft, Length Retained 0.4 ft			
						3							
10						(6)	D - 4	D - 4		Well graded GRAVEL with sand, subangular, dense, grayish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft	10/06/2000		
						4							
3						17	D - 5	D - 5		Well graded GRAVEL with sand, subangular, dense, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft			
						22							
4						(39)	D - 6	D - 6		Well graded SAND with gravel, loose, brownish gray, wet, Homogeneous, no HCl reaction, NOTE - ( Loose area - 14.5' to - 16.0' ) Length Recovered 0.5 ft, Length Retained 0.5 ft			
						12							
5						3	S - 7	S - 7		No Recovery			
						4							
6						8	D - 8	D - 8		Well graded SAND with gravel, dense, brownish gray, moist, Homogeneous, no HCl reaction			
						11							

SOIL 0L-2263.GPJ SOIL.GDT 10/17/00 02:57:04 P10

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-5-00

Sheet 2 of 2

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

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						14 (25)	▲			Length Recovered 1.1 ft, Length Retained 1.1 ft			
25						14 18 19 (37)	▼	D - 9		Well graded GRAVEL with sand, subangular, dense, brownish gray, wet, Homogeneous, no HCl reaction, NOTE - ( Stations ,Offsets and elevations are estimates and were not surveyed.) Length Recovered 1.0 ft, Length Retained 1.0 ft			
8										End of test hole boring at 25.5 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.			
9													
30													
10													
35													
11													
40													
12													
45													
13													

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-6-00

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

10/01/300

S.R. 203

Station 4+670

Offset 7.8 m Lt.

C.S. 1750

Equipment CME 45 w/ cathead

Casing HQ

Ground El 0.0 (0.00 m)

Method of Boring Wet Rotary

Start Date October 2, 2000

Completion Date October 3, 2000

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												
0.5	0.5					1 2 2 (4)	D-1			Silty SAND with gravel, very loose, brown, dry, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
1.2	1.2					3 2 3 (5)	D-2			Silty SAND with gravel, loose, brown, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft			
2.0	2.0						S-3			Sandy SILT with gravel, with traces of organic materia, loose, gray, wet, Laminated, Fissured, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft			
3.7	3.7					1 1 1 (2)	D-4			SILT, with organic material, very loose, gray, wet, Homogeneous, no HCl reaction, Drilled through 1' diameter log at -7' Length Recovered 0.7 ft, Length Retained 0.7 ft			
4.4	4.4					12 9 8 (17)	D-5			Silty SAND with gravel, medium dense, gray, wet, Homogeneous, no HCl reaction, attempted to push a shelly tube at -11'. Met refusal Length Recovered 0.4 ft, Length Retained 0.4 ft			
4.6	4.6					6 2 2 (4)	D-6			Silty SAND with gravel, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.2 ft, Length Retained 0.2 ft			
5.0	5.0						S-7			Sandy SILT, loose, gray, wet, Homogeneous, no HCl reaction, shelly tube had sand in the tip. Length Recovered 2.0 ft, Length Retained 2.0 ft			
6.0	6.0					2 3 5 (8)	D-8			Silty SAND, sand is fine grained, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 0.9 ft, Length Retained 0.9 ft			
20	20												

SOIL 0L-2263.GPJ SOIL\_GDT 10/17/00 02:57:13 P10

LOG OF TEST BORING



HOLE No. TH-6-00

Sheet 2 of 2

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

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													

SOIL\_0L-2263.GPJ SOIL.GDT 10/17/00 02:57:14 P10

Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction  
Length Recovered 0.5 ft, Length Retained 0.5 ft

Well graded SAND with gravel, dense, gray, wet, Homogeneous, no HCl reaction  
Length Recovered 0.4 ft, Length Retained 0.4 ft

well graded GRAVEL with sand, subangular, dense, gray, wet, Homogeneous, no HCl reaction  
Length Recovered 0.6 ft, Length Retained 0.6 ft

Well graded GRAVEL with sand, subangular, very dense, gray, wet, Homogeneous, no HCl reaction  
Length Recovered 1.2 ft, Length Retained 1.2 ft

Well graded GRAVEL, angular, very dense, gray, wet, Homogeneous, no HCl reaction  
Length Recovered 0.2 ft, Length Retained 0.2 ft

End of test hole boring at 38.5 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.

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-7-00

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

S.R. 203

Station 4+700

Offset 10M Left

C.S. 1750

Equipment CME 45 w/ cathead

Casing HQ x 36

Ground El ( m )

Method of Boring Wet Rotary

Start Date September 27, 2000

Completion Date September 28, 2000

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													
0.7						4 3 3 (6)	D-1			Silty SAND with gravel, loose, brown, moist, Homogeneous, no HCl reaction Length Recovered 0.7 ft, Length Retained 0.7 ft			
1.5							S-2			Sandy SILT, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft			
2.0						5 10 8 (18)	D-3			Silty SAND, (fine), medium dense, gray, wet, Homogeneous, no HCl reaction, Note - Layer of gravel from - 7.5' to - 8.5'. Length Recovered 0.5 ft, Length Retained 0.5 ft			
3.0						1 2 3 (5)	D-4			Sandy SILT, with layers of fine silt SAND, loose, gray, wet, Laminated, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft			
4.0							S-5			Sandy SILT, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 2.0 ft, Length Retained 2.0 ft			
15						1 2 4 (6)	D-6			Silty SAND, (fine), loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft			
20							S-7			Silty SAND, (fine), loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 2.0 ft, Length Retained 2.0 ft			
20						2 6	D-8			Poorly graded SAND, medium dense, gray, wet, Homogeneous, no HCl reaction			

SOIL\_0L-2263.GPJ SOIL\_GDT\_10/17/00 02:57:21 P10

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. PP-3-99

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

S.R. 203

Station 3+220 Offset 13 M Lt.

C.S. 1750

Equipment Handtools Casing HQ

Ground El 0.0 (0.00 m)

Method of Boring Portable Penetrometer

Start Date October 28, 1999

Completion Date October 28, 1999

Sheet 1 of 1

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						1 2 2 (4)	D-1	D-1		Silty SAND, very loose, Brown, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 0.0 ft			
1						1 6 6 (12)	D-2	D-2		Silty SAND, medium dense, Brown, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 0.0 ft			
5										End of test hole boring at 4 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.			
2													
10													
4													
15													
5													
20													

SOIL\_0L-2263.GPJ SOIL\_GDT\_10/17/00 02:56:48 P10

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. PP-2-99

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

S.R. 203

Station 3+320 Offset 10 M Lt.

C.S. 1750

Equipment Handtools Casing HQ

Ground El 65.6 (19.99 m)

Method of Boring Portable Penetrometer

Start Date October 28, 1999 Completion Date October 28, 1999

Sheet 1 of 1

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												
0.5	0.5		◆										
1.0	1.0		◆										
1.0 - 1.5	1.0 - 1.5					2	◆	D-1		Silty SAND with gravel, medium dense, brown, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft			
1.5 - 2.0	1.5 - 2.0					5	◆						
2.0 - 2.5	2.0 - 2.5					6	◆						
2.5 - 3.0	2.5 - 3.0					(11)	◆	D-1		Silty SAND with gravel, medium dense, brown, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft			
3.0 - 3.5	3.0 - 3.5					5	◆						
3.5 - 4.0	3.5 - 4.0					6	◆						
4.0 - 4.5	4.0 - 4.5					6	◆						
4.5 - 5.0	4.5 - 5.0					(12)	◆						
5.0	5.0									End of test hole boring at 4 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.			
10	10												
15	15												
20	20												

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-3-99

PROJECT NE. Stillwater Hill Road to Fay Road.

Job No. 0L-2263

S.R. 203

Station 3+318

Offset 2 meters Lt.

C.S. 1750

Equipment Dietrich 25 w/ cathead

Casing HQ

Ground El 0.0 (0.00 m)

Method of Boring Wet Rotary

Start Date October 25, 1999

Completion Date October 25, 1999

Sheet 1 of 1

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						6 2 5 (7)	D-1			Well graded GRAVEL with sand, WITH ASPHALT, subrounded, loose, BROWN, moist, Homogeneous, no HCl reaction Length Recovered 0.1 ft, Length Retained 0.1 ft			
10						11 17 14 (31)	D-2			Well graded GRAVEL with sand, subrounded, dense, BROWN, moist, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft			
15						8 17 17 (34)	D-3			Well graded GRAVEL with sand, WITH OCC. COBBLE, subrounded, dense, BROWN, wet, Homogeneous, no HCl reaction Length Recovered 0.6 ft, Length Retained 0.6 ft End of test hole boring at 15 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.			
20													

SOIL 0L-2263.GPJ SOIL.GDT 10/17/00 12:56:59 P10

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2A-97

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station 4+670

Offset 2.7 m Lt

C.S. 1750

Equipment Diedrich D-25

Casing HQ Advancer

Ground El \* (m)

Method of Boring Rotary Drill

Start Date December 2, 1997

Completion Date December 2, 1997

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 ft.=0.3048 m. 0.3 ft Asphalt.			
1						2 3 3 (6)	D-1			Sandy SILT with gravel, angular and subangular, medium stiff, brown, wet, homogeneous. Recovered and retained 0.4 ft.			
5						4 5 6 (11)	D-2	GS MC AL		ML, M.C.=19%, PI=NP Sandy SILT with gravel, angular and subangular, stiff, brown, wet, homogeneous. Recovered and retained 1.0 ft.			
2						3 2 3 (5)	D-3	GS MC		SM, M.C.=16% Silty SAND, loose, brown, moist. Recovered and retained 0.6 ft.			
10						1 1 2 (3)	D-4	GS MC		SM, M.C.=22% Silty SAND, very loose, brown, wet. Recovered and retained 0.5 ft.			
4						1 1 2 (3)	D-5			Silty SAND, very loose, brown, wet. Recovered and retained 0.1 ft			
15						1 2 2 (4)	D-6	GS MC AL		ML, M.C.=25%, PI=NP Sandy SILT with some organics, soft, gray, wet, homogeneous. Recovered and retained 1.2 ft.			
5							S-7			Smashed tube. Sand and gravel. No recovery.			
20													

SOIL L2263.GPJ SOIL.GDT 12/2/99 10:51:44 A12

LOG OF TEST BORING



HOLE No. **TH-2A-97**

Sheet **2** of **2**  
Job No. **OL-2263**

PROJECT **N.E. Stillwater Hill Road and Fay Road I/S**

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							1	D-8	GS MC AL	ML, M.C.=31%, PI=NP Sandy SILT, soft, gray, wet, homogeneous. Recovered and retained 0.9 ft.			
							1 2 (3)						
								1	D-9	GS MC AL	ML, M.C.=44%, PI=NP SILT with some organics, medium stiff, gray, wet, homogeneous. Recovered and retained 0.8 ft.		
25							1 2 3 (5)						
8								S-10		SAND, wet. No recovery.			
9							2 3 14 (17)	D-11	GS MC	SM, M.C.=29% Silty SAND, medium dense, gray, wet, homogeneous. Recovered and retained 0.8 ft.			
30													
10							6 11 9 (20)	D-12		Silty SAND with gravel, subangular, medium dense, gray, wet, homogeneous. Recovered and retained 0.2 ft.			
35										End of test hole boring at 34.5 ft (10.5 m) below ground elevation. *Elevation of test boring same as centerline of roadway.			
11										This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.			
40													
12													
45													

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. H-2-97

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station 4+701

Offset 1 m Lt

C.S. 1750

Equipment CME 850 Auto Hammer

Casing HQ X 24.0'

Ground El \* (m)

Method of Boring Wet Rotary

Start Date November 4, 1997

Completion Date November 4, 1997

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									1 ft.=0.3048 m. Sand and gravel.			
1 - 5	0.3048 - 1.524					3 2 2 (4)	D-1	GS MC AL		CL-ML, M.C.=20%, PI=6 Gravelly, silty CLAY with sand, soft, light-brown, wet, stratified. Recovered and retained 0.8 ft.			
5 - 10	1.524 - 3.048						S-2			No recovery.			
10 - 15	3.048 - 4.572					2 2 2 (4)	D-3	GS MC AL		ML, M.C.= 25%, PI=NP SILT with sand and gravel, very loose, gray, wet, homogeneous. Recovered and retained 0.8 ft.			
15 - 20	4.572 - 6.096					3 3 3 (6)	D-5	GS MC AL		Sandy SILT with gravel, gray, wet. Recovered and retained 1.0 ft.			
20 - 25	6.096 - 7.620						S-4			ML, M.C.=47%, PI=10 SILT with sand and gravel and decayed wood, very loose, gray, wet, stratified. Recovered and retained 0.8 ft.			
25 - 30	7.620 - 9.144						S-6			No recovery.			



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. **TH-1-96**

PROJECT **N.E.Stillwater Hill Road and Fay Road I/S**

Job No. **OL-2263**

**M.P. 9.63**

S.R. **203**

Station **SR 203 3+300**

Offset **10.7 m Rt**

C.S. **1750**

Equipment **Diedrich 25**

Casing **HQ X 25'**

Ground El **90.2 (27.49 m)**

Method of Boring \_\_\_\_\_

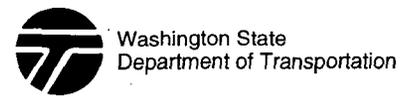
Start Date **June 12, 1996**

Completion Date **June 12, 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						1	D-1	GS MC	1 ft.=0.3048 m. GM, M.C.=4% Silty GRAVEL with sand and cobbles, very loose, brown, dry. Recovered 0.3 ft.			
1	1						2	D-2	GS MC	GW-GM, M.C.=2% Well graded GRAVEL with silt and sand, very loose, brown, moist. Recovered 0.3 ft.			
5	5						3	D-3		Well graded GRAVEL with silt and sand, loose, brown, moist. Recovered 0.1 ft.			
2	2						4	D-3					
							(8)						
							0	D-4	GS MC	GW-GM, M.C.=1% Well graded GRAVEL with silt and sand, medium dense, brown, moist. Recovered 0.4 ft.			
10	10						12						
							11						
						(23)							
						7	D-5		Well graded GRAVEL with silt and sand, medium dense, brown, moist. Recovered 0.2 ft.				
						8							
						8	D-6		Poorly graded SAND with silt and gravel, dense, brown, moist. No recovery.				
						10							
						21							
						(31)							
15	15					4	D-7	GS MC	GW, M.C.=1% Well graded GRAVEL with sand, medium dense, brown, moist. Recovered 0.4 ft.				
						8							
						12							
						(20)							
5	5					7	D-8	GS MC AL	CL, N.C.=2%, PI=8 Gravelly LEAN CLAY with sand, very hard, gray, moist. Recovered 1.0 ft.				
						30							
						40							
						(70)							
20	20												

LOG OF TEST BORING



HOLE No. TH-1-96

Sheet 2 of 2

PROJECT N.E. Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

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		[Dotted pattern]					50/6" (50/6")	D-9		Poorly graded SAND with silt and gravel, very dense, gray, moist. Recovered 0.2 ft.			
25							50/2" (50/2")	D-10		Poorly graded SAND with silt and gravel, very dense, gray, moist. No recovery.			
8										End of test hole boring at 25.2 ft (7.7 m) below ground elevation. Water table elevation not determined.			
9										This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.			
30													
10													
35													
11													
12													
40													
13													
45													

SOIL L2263.GPJ SOIL.GDT 12/2/99 10:51:38 A12



Memorandum

Date: June 11, 1998  
From: T. M Allen/D. G. Chadbourne  
OSC Materials Lab, 47365  
Geotechnical Branch  
Phone: (360) 709-5456  
FAX (360) 709-5585  
Subject: SR-203, OL-2263  
NE Stillwater Hill Road I/S  
MP 8.69 to MP 8.92  
Retaining Wall Recommendations  
To: M. M. Lwin/K. N. Kirker  
OSC Bridge & Structures  
47340

As requested, we are providing recommendations for the retaining wall located to the right of SR-203, from approximately Station 3+245 to Station 3+343. The wall will retain a cut in the hillside for improvements made to the SR-203/Stillwater Hill Road Intersection. The wall will have a maximum exposed height of approximately 4 m. A private residence is located approximately 6 m behind the wall.

The analyses, conclusions, and recommendations presented in this memorandum are based on the project description and site conditions that existed at the time of the field exploration. We assume the test pit and exploratory borings represent the subsurface conditions throughout the project area. If different subsurface conditions are encountered or appear to be present, we should be contacted so that we can reevaluate our recommendations and assist you.

Field Investigation and Laboratory Testing

The existing slopes at the site vary from 39 to 45 degrees of inclination. The slopes are vegetated with berry bushes, trees and grass. Two test borings and one test pit were completed for the investigation of the wall. Appendix A contains a profile depicting subsurface conditions along the wall and showing the location of the test borings and test pit.

Test Borings TH-1-96 and TH-2-96 encountered very loose to medium dense, poorly graded sand and well graded gravel with sand, silt, cobbles and boulders. These soils are underlain by medium dense to very dense, well graded gravel with silt and sand, and very hard gravelly lean clay with cobbles. In general, Standard Penetration Tests (SPT) were performed at 1.5 m intervals in the test borings. No groundwater table was

encountered in the test borings, although samples in Test Boring TH-2-96 were described as wet. This is probably due to a drain field located behind the residence. Copies of the boring logs are included in Appendix B.

Test Pit No. 1 encountered poorly graded sand with gravel and cobbles and boulders underlain by well graded gravel with sand and cobbles. Minor seepage was observed while excavating.

Test Pit 1 was allowed to stand open for six days. At the end of six days minor sloughing and some seepage was observed in the excavation. The log of the test pit and pictures taken one day and six days after excavation are included in Appendix B.

Laboratory testing consisted of selecting disturbed samples from the SPT's and test pit for moisture content and gradation testing. The tests were conducted according to AASHTO T-265 and T-27 test specifications. After testing, the samples were classified using the Unified Soil Classification System. The results of the laboratory testing are included in Appendix C.

### **Design Recommendations**

Standard reinforced concrete, soldier pile and soil nail walls are feasible for this site. However, construction of a standard wall would require large temporary cuts or installation of a shoring system. Because the soils in the cut consist of sand and gravel and the test pit remained open with only minor sloughing, we recommend that a soil nail wall be used at this site. Soil nail walls are generally more cost effective than soldier pile walls in soil conditions favorable for soil nailing.

Our geotechnical design for a soil nail wall includes an evaluation of overall stability of the wall, minimum spacing and embedment requirements for the soil nails, and soil properties to be used for design. Bridge and Structures will provide all facing design and connection details. Since a soil nail wall is a non-standard design, the plan sheets and special provisions will be provided by the Bridge and Structures office.

We recommend that prior to excavation for the top row of nails, the slope at the back of the wall face be graded to ensure adequate surface drainage along the top of wall. A concrete gutter should be constructed along the top of the wall after the permanent facing is constructed. We recommend the top of wall profile have a minimum slope of approximately one percent.

An ultimate value of 130 kN was used for the punching shear strength of the facing in the wall design. The ultimate value was reduced by a factor of 0.67 to obtain the allowable value. The nail schedule for the wall is contained in Table 1. A profile of the wall face showing the layout of the nails is shown in Figure 1.

A permanent easement for the soil nails should be established a minimum of 8.5 m behind the wall face.

**Table 1: Nail Schedule**

Wall Segment (Station)	Minimum Nail Length (m)	Nail Declination (degrees)	Horizontal Spacing (m)	Bar Size	Design Load Transfer (kN/m)
A (3+245 to 3+253)	8.5	15	1.22	8	13.1
B (3+253 to 3+259.6)	(Row 1) 8.5	15	1.22	8	13.1
	(Row 2) 8.5	15	1.22	7	13.1
C (3+259.6 to 3+265.3)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9
	(Row 3) 8.5	15	1.22	7	13.1
D (3+265.3 to 3+325.3)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9
	(Row 3) 8.5	15	1.22	7	13.1
	(Row 4) 4.9	15	1.22	7	13.1
E (3+325.3 to 3+340.3)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9
	(Row 3) 8.5	15	1.22	7	13.1
F (3+340 to End of Wall)	(Row 1) 8.5	15	1.22	8	10.9
	(Row 2) 8.5	15	1.22	7	10.9

**Construction Considerations**

The slope above the wall will require grading to ensure proper drainage. Grading will be required at approximately Station 3+270, where Test Boring TH-2-96 was located, and from Station 3+320 to 3+330. The top of wall profile should be graded to a minimum of one percent to drain toward either end of the wall. This grading should be performed before beginning excavation for the first row of soil nails.

We recommend that a prefabricated drainage material be placed between the nails at the excavation face. The drainage material should be connected to a 75 mm (3 inch) diameter weep hole that passes through the wall and the proposed jersey barrier. Additional drainage should be supplied in front of the wall.

Preproduction verification testing of the nails is required, and these nails should be considered sacrificial. The tests are needed to verify the contractor's installation methods, hole diameter, and design assumptions prior to the excavation for the soil nail wall. The nail diameter should be designed by the contractor. We require a minimum hole diameter of 125 mm (5 inches) to meet minimum grout cover around the reinforcing bar.

We recommend a minimum of three verification tests be performed. The tests should be performed at the following locations:

1. Station 3+255 to 3+260 - top row of nails
2. Station 3+305 to 3+315 - top row of nails
3. Station 3+305 to 3+315 - bottom row of nails

Because of temporary facing stability concerns during construction, all nails should be installed through a berm. The temporary cut face at both walls should be limited between nail levels. The excavation should be limited to a maximum of 0.6 m (2 ft) below the next row of nails.

The test borings encountered a very dense soil layer below the wall face. Because this soil layer likely slopes up with the hillside, the nail excavations will likely encounter difficult drilling. Caving conditions may be encountered in the loose layers above the very dense soils. Temporary casing may be required. Cobbles and boulders were encountered in the test pit excavation. The following statement should be added to the special provisions for the contract:

The Contractor is advised that cobbles and boulders were encountered in the test pit excavated at the site. The Contractor shall select drilling methods and equipment which are capable of penetrating the cobbles, boulders and very dense soils encountered at the site. Groundwater seepage may be encountered in the wall excavations and may cause caving at the face of the excavation. Loose soils were encountered in the test pit for the wall. Temporary berms or shotcrete flashing are required to maintain cut face stability during nail installation. Temporary casing may be required to prevent caving in the nail excavations.

Because of the steep slopes that the wall will be excavated on, the top rows of nails may have to be installed from a platform or a berm. This may require closing or restricting a lane. Because of the length of the nails, an additional lane closure may be required during the installation of the nails in the holes.

**Closure**

A profile depicting the subsurface conditions along the wall and the location of the test borings and test pit is located in Appendix A. The Logs of Test Borings, Logs of Test Pits and results of the lab testing are included in Appendices B and C. The Logs of Test Borings and Pits should be included in the contract documents.

If you have questions or require further information, please contact Don Chadbourne at (360) 709-5456 or Jim Cuthbertson at (360) 709-5452.

TMA:dgc

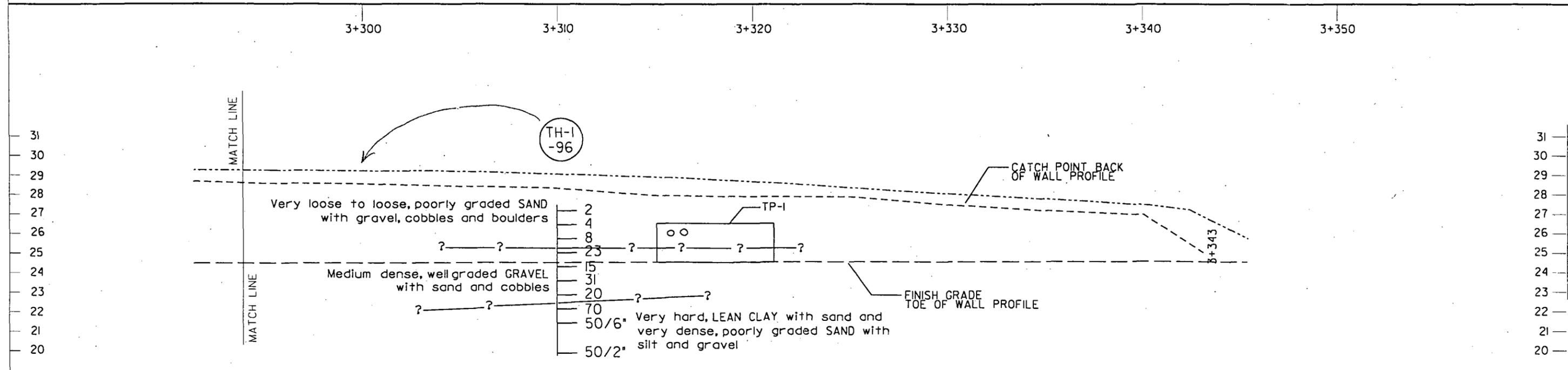
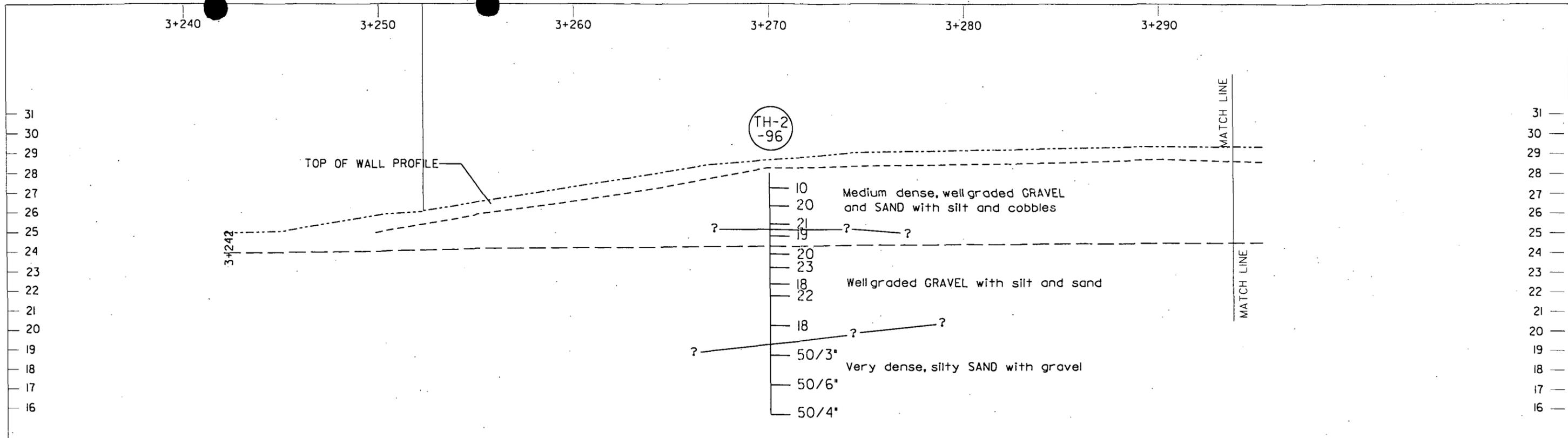
DGC

Attachment

cc: R. T. Shaefer, Bridge & Structures, 47340  
A. E. Stiles, NW Region Materials Engineer, NB82-29  
D. Edwards, NW Region Project Engineer, NB82-117  
J. Davidson, NW Region PEO, NB82-117

**APPENDIX - A**

**Subsurface Profile**



SUBSURFACE PROFILE

JOB OL-2263 S.R. 203 C.S. 1750 LAYOUT

**N.E. STILLWATER HILL ROAD AND FAY ROAD INTERSECTION**

WASHINGTON STATE  
TRANSPORTATION COMMISSION  
DEPARTMENT OF TRANSPORTATION

MATERIALS BRANCH  
D. C. JACKSON MATERIALS ENGINEER

DATE JUNE 1998  
SCALE 1:200 VERT.  
1:200 HORIZ.  
SHEET \_\_\_ OF \_\_\_  
DRAWN BY DWG

**APPENDIX - B**

**Logs of Field Explorations**

# LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-1-96

PROJECT N.E. Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station SR 203 3 + 300 Offset 10.7 m Rt

C.S. 1750

Equipment Diedrich 25 Casing HQ X 25'

Ground El 90.2 (27.49 m)

Method of Boring \_\_\_\_\_

Start Date June 12, 1996 Completion Date June 12, 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					1	D-1	D-1	GS MC	1 ft. = 0.3048 m. GM, M.C. = 4% Silty GRAVEL with sand and cobbles, very loose, brown, dry. Recovered 0.3 ft.			
						1 1 (2)							
1	1					2	D-2	D-2	GS MC	GW-GM, M.C. = 2% Well graded GRAVEL with silt and sand, very loose, brown, moist. Recovered 0.3 ft.			
						2 2 (4)							
5	2					3	D-3	D-3	GS MC	Well graded GRAVEL with silt and sand, loose, brown, moist. Recovered 0.1 ft.			
						4 4 (8)							
10	3					0	D-4	D-4	GS MC	GW-GM, M.C. = 1% Well graded GRAVEL with silt and sand, medium dense, brown, moist. Recovered 0.4 ft.			
						12 11 (23)							
15	4					7	D-5	D-5	GS MC	Well graded GRAVEL with silt and sand, medium dense, brown, moist. Recovered 0.2 ft.			
						8 7 (15)							
20	5					8	D-6	D-6	GS MC	Poorly graded SAND with silt and gravel, dense, brown, moist. No recovery.			
						10 21 (31)							
25	6					4	D-7	D-7	GS MC	GW, M.C. = 1% Well graded GRAVEL with sand, medium dense, brown, moist. Recovered 0.4 ft.			
						8 12 (20)							
30	7					7	D-8	D-8	GS MC AL	CL, N.C. = 2%, PI = 8 Gravelly LEAN CLAY with sand, very hard, gray, moist. Recovered 1.0 ft.			
						30 40 (70)							



LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2-96

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station 3 + 270

Offset 12 m Rt

C.S. 1750

Equipment Dietrich D-25

Casing HQ & BX Advancer

Ground El 91.9 (28.01 m)

Method of Boring Wash Boring

Start Date June 25, 1996

Completion Date June 25, 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										1 ft. = 0.3048 m.			
5										GW, M.C. = 1% Well graded GRAVEL with sand, subround, medium dense, brown, wet. Recovered and retained 0.5 ft.			
2										Silty SAND with gravel and wood (root), subround, medium dense, brown, moist. Recovered and retained 0.3 ft.			
3										SW-SM, M.C. = 5% Well graded SAND with silt and gravel, subround, medium dense, brown, wet. Recovered and retained 1.0 ft.			
10										GW-GM, M.C. = 1% Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 0.9 ft.			
4										Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 0.8 ft.			
15										GW, M.C. = 1% Well graded GRAVEL with sand and cobbles, angular to rounded, medium dense, gray, wet. Recovered and retained 0.5 ft.			
5										Well graded GRAVEL with sand and cobbles, angular to rounded, medium dense, gray, wet.			
20										Well graded GRAVEL with sand and cobbles, angular to rounded, medium dense, gray, wet.			

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2-96

Sheet 2 of 2

PROJECT N.E. Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

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				20			12 10 12 (22)	D-8	GS MC	GW-GM, M.C. = 3% Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 1.0 ft.			
25				25			9 9 9 (18)	D-9		Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 1.0 ft.			
30							44 50/3 (50/3")	D-10		Silty SAND with gravel, subangular, very dense, gray, wet. Recovered and retained 0.8 ft.			
35							30/50/6 (50/6")	D-11	GS MC	SM, M.C. = 10% Silty SAND with gravel subangular, very dense, gray, wet. Recovered and retained 0.8 ft.			
40						50/4" (50/4")	D-12			Silty SAND with gravel, subangular, very dense, gray, wet. Recovered and retained 1.0 ft. End of test hole boring at 40.4 ft (12.3 m) below ground elevation. Water table elevation not determined.			
45										This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.			

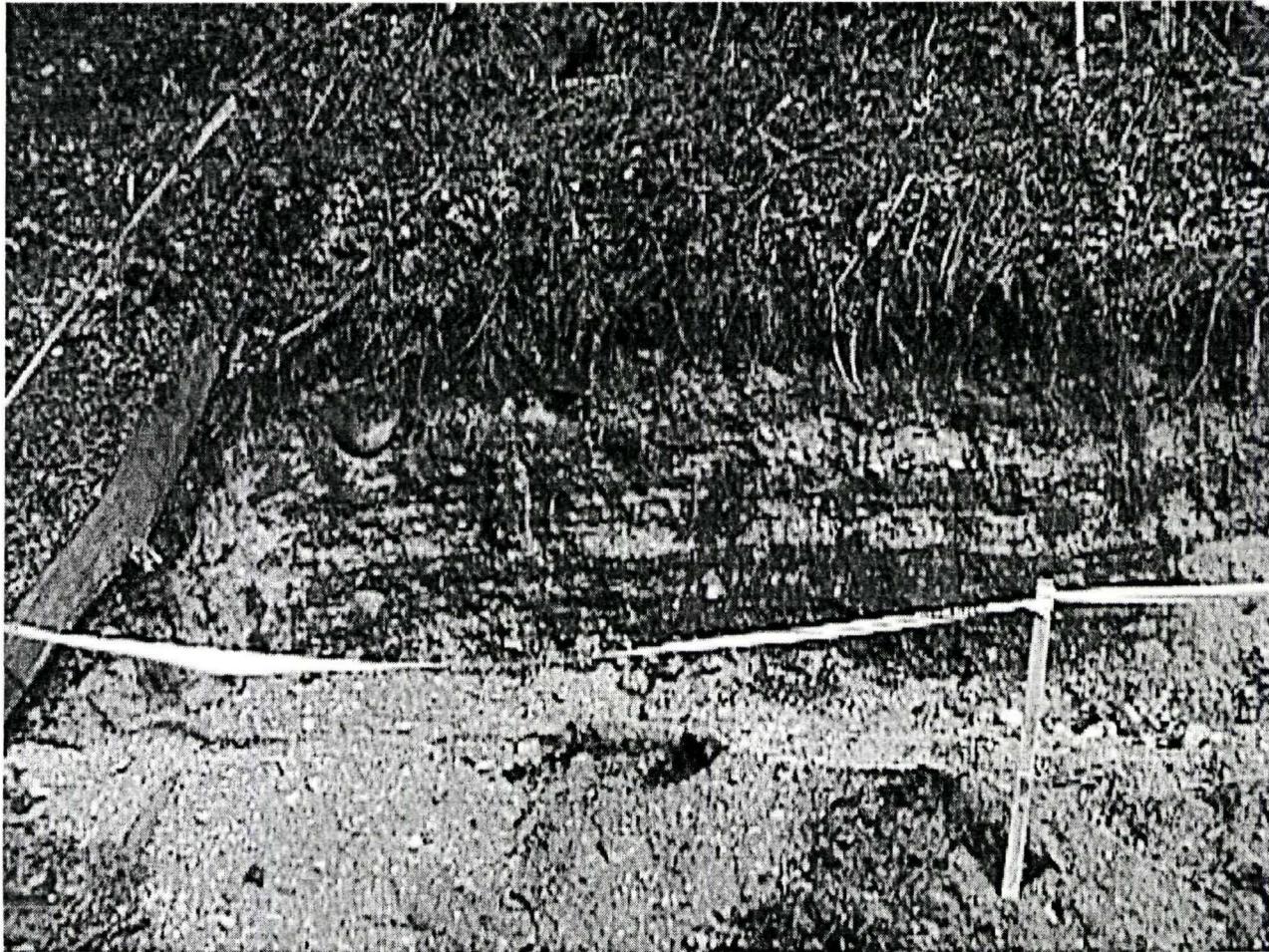


LOCATION Station 3+315	OFFSET	TEST PIT NUMBER TP-1
PROJECT NAME N.E. Stillwater Hill Road and Fay Road Intersection		PROJECT NUMBER OL-2263
EQUIPMENT	DATE STARTED	DATE COMPLETED

ELEV DEPTH	DESCRIPTION
0 m	<p>← 6 m →</p> <p>Poorly graded SAND with gravel, cobbles and boulders. Roots in top 0.6 m of pit. Minor seepage while excavating.</p> <p>Boulders</p> <p>Well graded GRAVEL with sand and cobbles.</p>
1 m	
2 m	



TP-1: March 11, 1998 - Right side - 1 day after excavation.



TP-1: March 11, 1998 - Left side - 1 day after excavation.



TP-1: March 16, 1998 - 7 days after excavation.

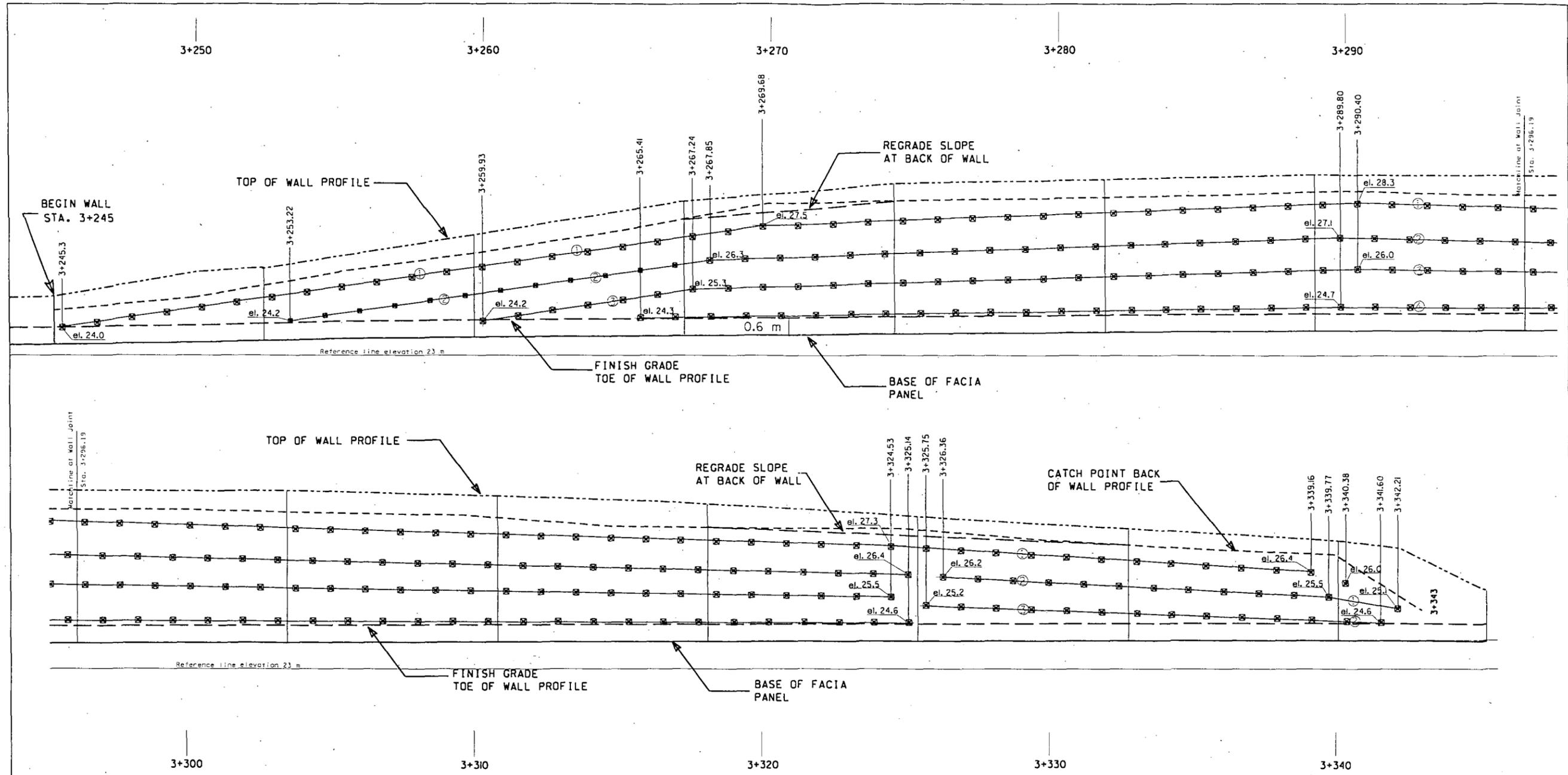


Figure 1:  
Soil Nail Layout

JOB QL-2263 S.R. 203 C.S. LAYOUT	
NE Stillwater Hill Rd. Intersection	
 WASHINGTON STATE TRANSPORTATION COMMISSION DEPARTMENT OF TRANSPORTATION MATERIALS BRANCH D. C. JACKSON MATERIALS ENGINEER	DATE 6/98 SCALE 1:150 VERT. 1:150 HORIZ. SHEET ___ OF ___ DRAWN BY DWG

APPENDIX - C

**Laboratory Test Data**

WASHINGTON STATE  
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

P.O Box 167, Olympia, WA 98504 ( Mailing Address )

1855 So. 2nd Ave.

Tumwater, Washington 98504 ( Shipping address )

Place SEATTLE

Date 7/2/96

Dear Sir :

I have forwarded by today's Delivery the following Foundation Samples.

Contract or Job No. OL-2263 Section N.E 40th ST. Vic. to Br. NO. 203\103  
SR No. 203 Sub-Section

Station & offset 3 + 270 12m Right. C/L Hole # TH - 2 - 96

Lab No.	Drive #	Depth	Tube pos. in sampler	Class.	Description
<i>F-1755</i>					
	D-1	2.0' to 3.5'	<i>MC = 170</i>	<i>GW</i>	<i>well graded GRAVEL w/sand</i>
	D-2	5.0' to 6.5'			<i>Use Log Description</i>
	D-3	8.0' to 9.5'	<i>MC = 570</i>	<i>BW-SM</i>	<i>well graded SAND with silt and gravel</i>
	D-4	10.0' to 11.5'	<i>MC = 170</i>	<i>BW-GM</i>	<i>well graded GRAVEL with silt and sand</i>
	D-5	13.0' to 14.5'			<i>Like D-4</i>
	D-6	15.0' to 16.5'	<i>MC = 170</i>	<i>GW</i>	<i>well graded GRAVEL w/sand</i>
	D-7	18.0' to 19.5'			<i>Like D-6</i>
	D-8	20.0' to 21.5'	<i>MC = 370</i>	<i>BW-GM</i>	<i>well graded GRAVEL w/silt and sand</i>
	D-9	25.0' to 26.5'			<i>Like D-8</i>

1 copy with samples    1 copy to addressee    Dist. 1 Mat. Lab.    Dist. 1 Materials Engineer    Allen E. Stiles, P.E



WASHINGTON STATE  
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

P.O. Box 167, Olympia, WA 98504 ( Mailing Address )

1855 So. 2nd Ave.

Tumwater, Washington 98504 ( Shipping address )

Place SEATTLE

Date \_\_\_\_\_

Dear Sir :

I have forwarded by today's Delivery the following Foundation Samples.

Contract or Section NE 40th st.vic. to Br. # 203/103  
Job No. OL2263 SR No. 203 Sub-Section

Station

& offset SR203 3+300 10.7 M RT.

Hole #

TH#1

PAGE ONE OF TWO

Lab No.	Drive #	Depth	Tube pos. in sampler	Class.	Description
<u>F-1754</u>					
	D-1	0.0' to 1.5'	<u>mc= 4%</u>	<u>✓GM</u>	<u>Silty GRAVEL w/sand</u>
	D-2	2.5' to 4.0'	<u>mc= 2%</u>	<u>GW-G</u>	<u>m well graded GRAVEL w/silt and sand</u>
	D-3	5.0' to 6.5'			<u>Like D-2</u>
	D-4	7.5' to 9.0'	<u>mc= 1%</u>	<u>GW-G</u>	<u>m well graded GRAVEL w/silt and sand</u>
	D-5	10.0' to 11.5'			<u>Like D-4</u>
	D-6	12.5' to 14.0'			<u>Not Received</u>
	D-7	15.0' to 16.5'	<u>mc= 1%</u>	<u>✓GW</u>	<u>well graded GRAVEL w/sand</u>
	D-8	17.5' to 19.0'	<u>mc= 2%</u>	<u>✓GL</u>	<u>Gravelly LEAN CLAY w/sand</u>
	D-9	20.0' to 20.5'			<u>use Log Description</u>

1 copy with samples

1 copy with addressee

Dist. 1 Mat. Lab.

Dist. 1 Materials Engineer

Allen E. Stiles, P.E



OL-2263 Job No

SR 203

Page 1 of 1



Washington State Department of Transportation

TP-1 Hole No.

Project NE Stillwater Hill Rd I/S

F-2439 Lab No.

Wall

3/10/88 Date

Drill Inspector Chadbourne

LABORATORY SAMPLE TRANSMITTAL  
OSC MATERIALS LABORATORY GEOTECHNICAL BRANCH

Sample No.	Depth		Undisturbed Tubes Retained							Lab Use Only Testing Requested							Comments	
	Depth Start	Side Stop	Shelby	A (TOP)	B	C	D	E	F (BTM)	GR	LL	PL	UU	CU	DS	CS		OTHER
1	2.5ft	RT																
2	2.5ft	LT								✓								SP mc = 7% Poorly graded SAND with gravel
3	4"	LT								✓								SP mc = 8% Poorly graded SAND with gravel
4	5"	M.d																
5	5"	LT								✓								Gw mc = 5% Well graded GRAVEL with sand
6	6	RT								✓								Gw mc = 5% Well graded GRAVEL with sand
7	6	M.d																

3/20 Due

Project Mngr. Chadbourne

Job No. **OL-2263**

Date **March 19, 1998**

Hole No. **TP-1**

Sheet **1 of 1**

Laboratory Summary



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

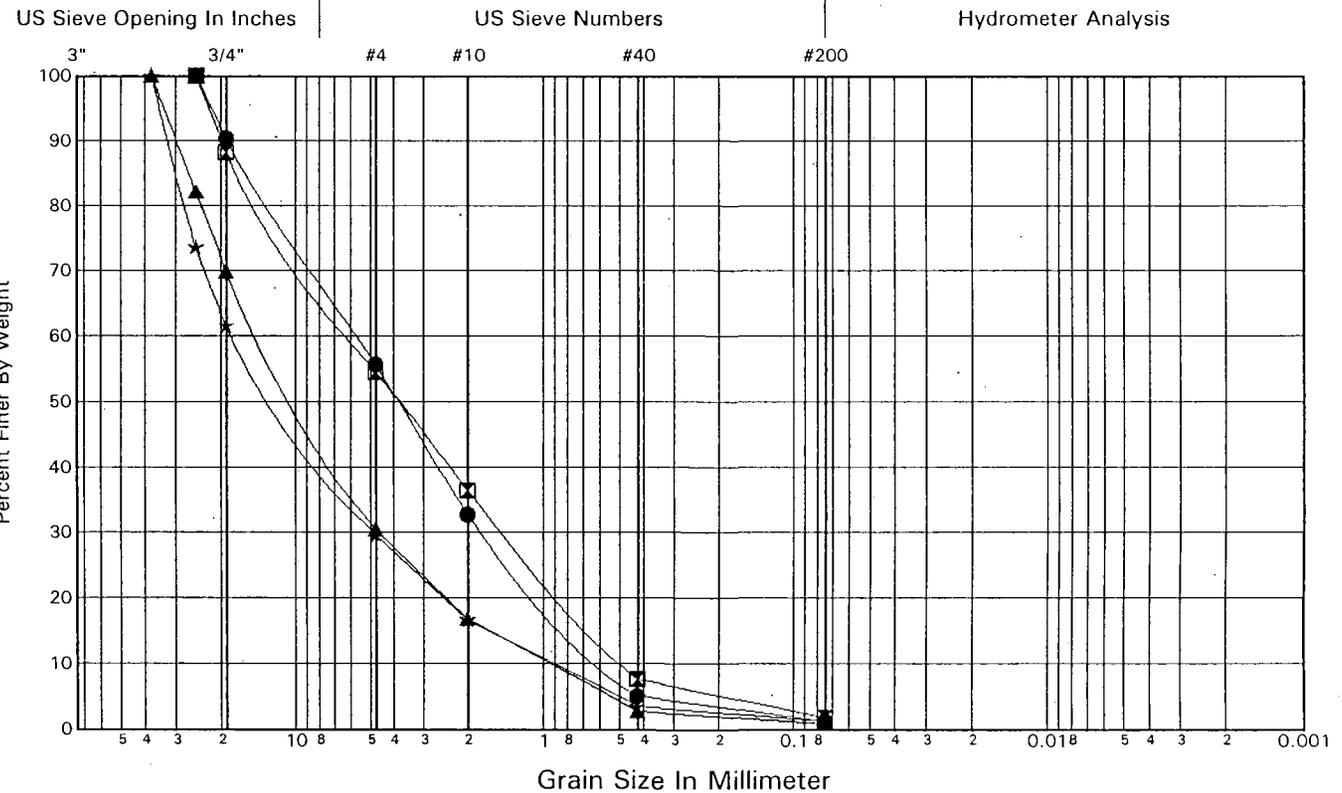
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	2.5	0.76	2	SP	SEE BORING LOG	POORLY GRADED SAND with GRAVEL	7	NP	NP	NP
☒	4.0	1.22	3	SP	SEE BORING LOG	POORLY GRADED SAND with GRAVEL	8	NP	NP	NP
▲	5.5	1.68	5	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	5	NP	NP	NP
★	6.0	1.83	6	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	5	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	44.3	54.4	1.3	0.9	10.1
☒	45.4	52.7	1.9	0.7	12.4
▲	69.5	29.6	0.9	1.7	14.3
★	70.3	28.5	1.2	1.4	19.6

GRADATION VALUES

	D60	D50	D30	D20	D10
●	5.64	3.83	1.71	0.98	0.56
☒	5.93	3.81	1.41	0.82	0.48
▲	13.41	9.43	4.60	2.44	0.94
★	17.72	11.48	4.81	2.48	0.91



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2263**

Date **February 5, 1998**

Hole No. **TH-2-96**

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

Laboratory Summary



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

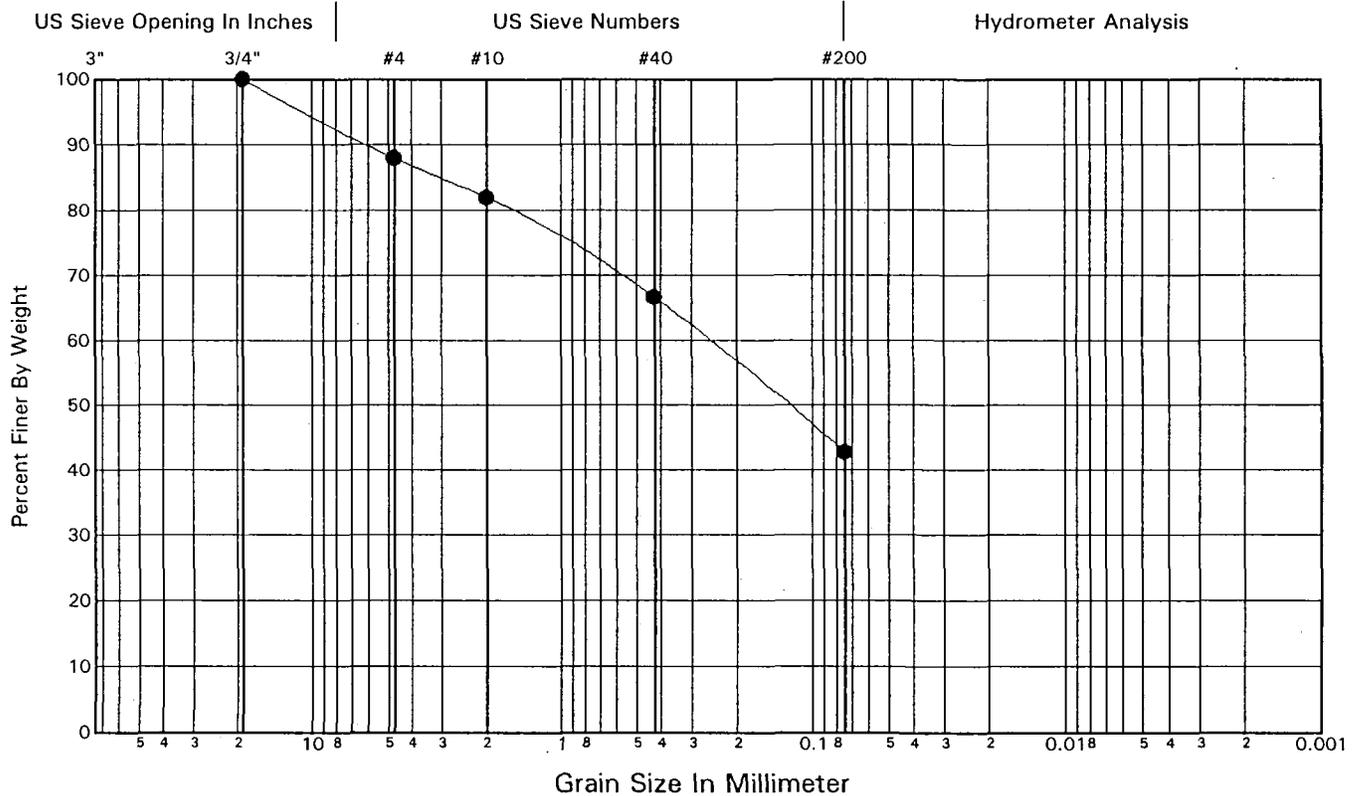
Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
● 35.0	10.67	D-11	SM	SEE BORING LOG	SILTY SAND	10	NP	NP	NP

GRADATION FRACTIONS

%Gravel	%Sand	%Fines	Cc	Cu
● 12.0	45.2	42.8		

GRADATION VALUES

D60	D50	D30	D20	D10
● 0.26	0.13			



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2263**

Date **February 5, 1998**

Hole No. **TH-2-96**

Sheet **1 of 2**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

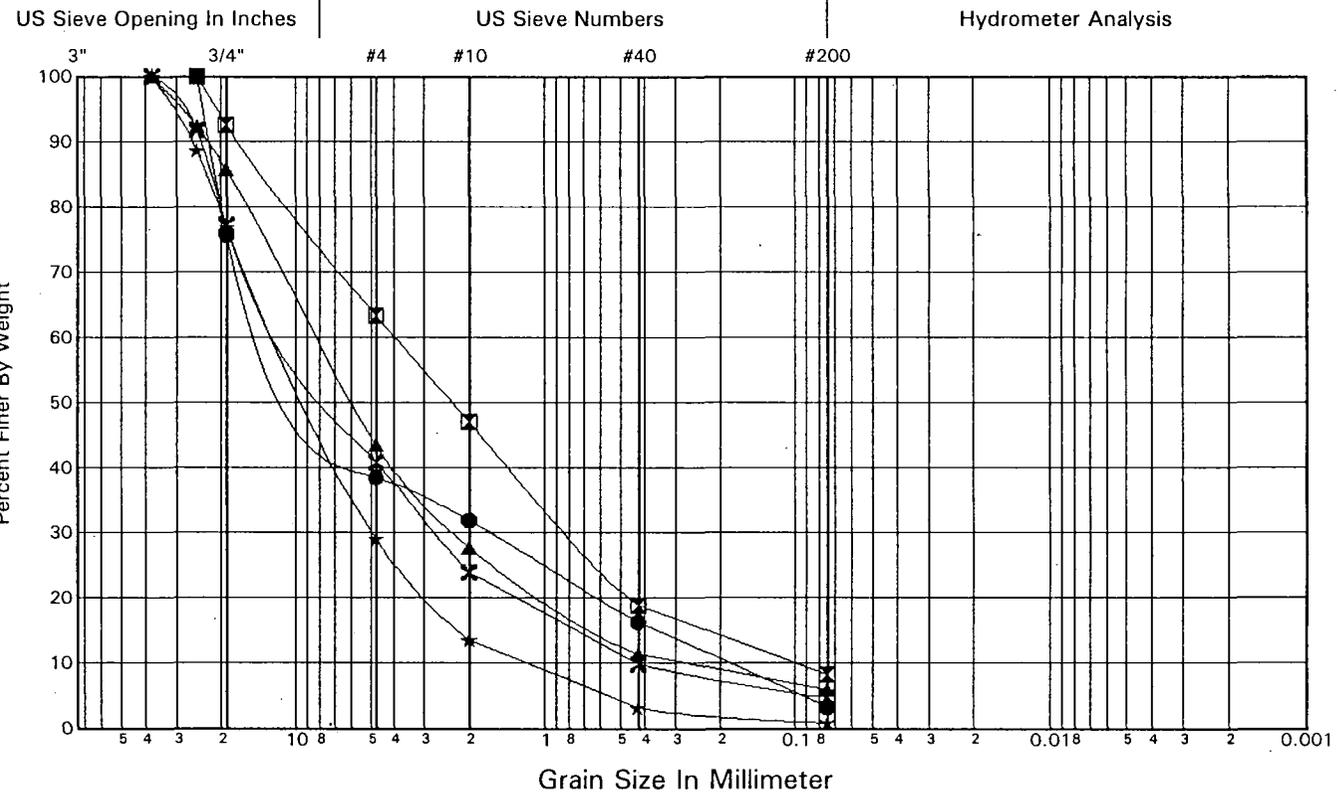
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	2.0	0.61	D-1	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	1	NP	NP	NP
☒	8.0	2.44	D-3	SW-SM	SEE BORING LOG	WELL GRADED SAND with SILT and GRAVEL	5	NP	NP	NP
▲	10.0	3.05	D-4	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	1	NP	NP	NP
★	15.0	4.57	D-6	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	1	NP	NP	NP
✕	20.0	6.10	D-8	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	3	NP	NP	NP

**GRADATION FRACTIONS**

	%Gravel	%Sand	%Fines	Cc	Cu
●	61.5	35.2	3.3	1.4	57.7
☒	36.6	55.2	8.2	1.5	39.4
▲	56.5	37.5	6.0	2.3	30.1
★	70.9	28.2	0.9	1.7	9.9
✕	59.1	36.2	4.7	1.8	22.9

**GRADATION VALUES**

	D60	D50	D30	D20	D10
●	10.58	7.29	1.66	0.61	0.18
☒	3.97	2.34	0.79	0.45	0.10
▲	8.17	5.88	2.27	0.96	0.27
★	11.64	8.71	4.88	2.86	1.17
✕	9.85	6.72	2.73	1.30	0.43



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-2263**

Date **February 5, 1998**

Hole No. **TH-1-96**

Sheet **1 of 1**

**Laboratory Summary**



Washington State  
Department of Transportation

Project **N.E. Stillwater Hill Road and Fay Road I/S**

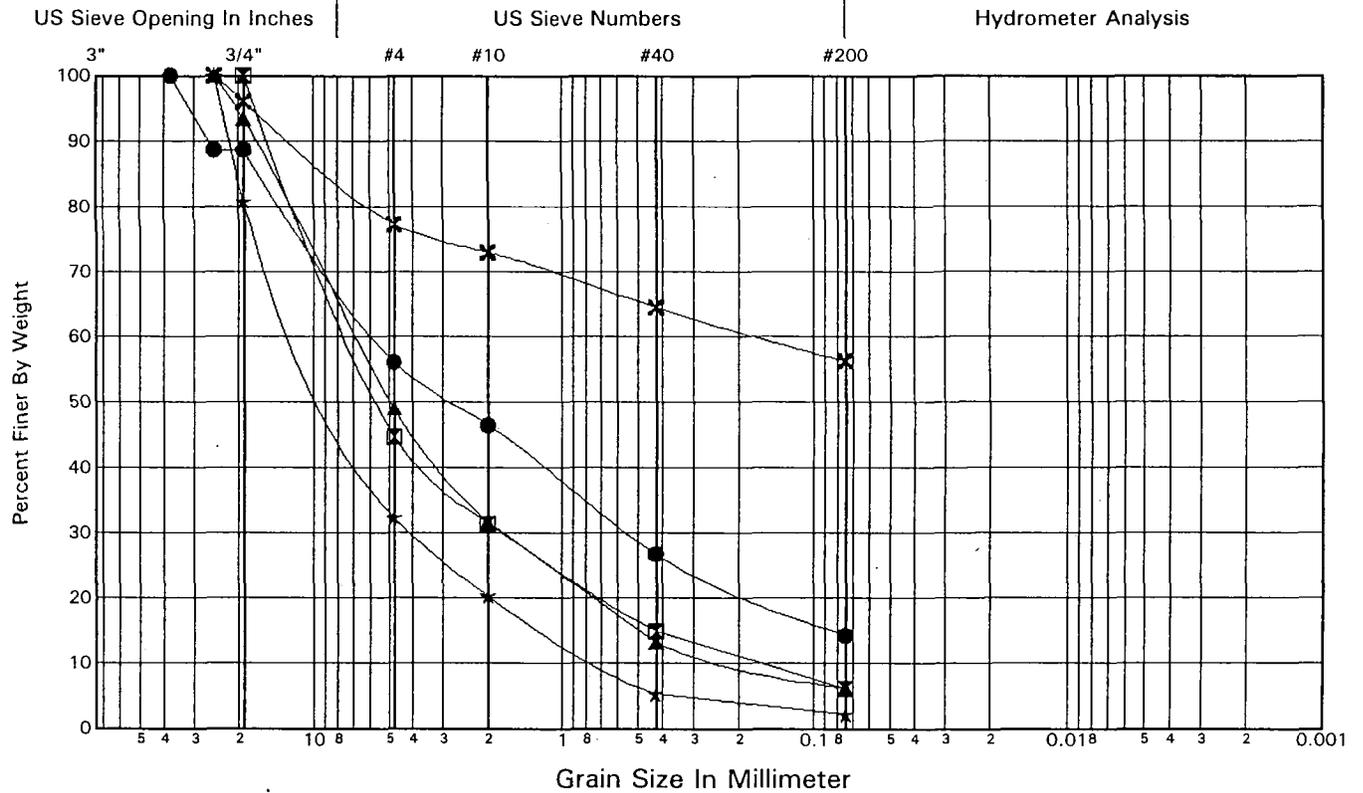
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	0.0	0.00	D-1	GM	SEE BORING LOG	SILTY GRAVEL with SAND	4	NP	NP	NP
☒	2.5	0.76	D-2	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	2	NP	NP	NP
▲	7.5	2.29	D-4	GW-GM	SEE BORING LOG	WELL GRADED GRAVEL with SILT and SAND	1	NP	NP	NP
★	15.0	4.57	D-7	GW	SEE BORING LOG	WELL GRADED GRAVEL with SAND	1	NP	NP	NP
✕	17.5	5.33	D-8	CL	SEE BORING LOG	GRAVELLY LEAN CLAY with SAND	2	29	21	8

**GRADATION FRACTIONS**

	%Gravel	%Sand	%Fines	Cc	Cu
●	43.9	41.8	14.3		
☒	55.2	38.7	6.1	2.7	43.4
▲	51.0	42.8	6.2	2.3	34.8
★	67.6	30.2	2.2	2.2	15.2
✕	22.7	21.1	56.2		

**GRADATION VALUES**

	D60	D50	D30	D20	D10
●	5.61	2.74	0.55	0.17	
☒	6.96	5.41	1.74	0.68	0.16
▲	6.70	4.90	1.74	0.75	0.19
★	10.47	7.86	4.00	1.94	0.69
✕	0.17				



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

LOG OF TEST BORING



Washington State  
Department of Transportation

HOLE No. TH-2-96

PROJECT N.E.Stillwater Hill Road and Fay Road I/S

Job No. OL-2263

M.P. 9.63

S.R. 203

Station 3+270

Offset 12 m Rt

C.S. 1750

Equipment Dietrich D-25

Casing HQ & BX Advancer

Ground El 91.9 (28.01 m)

Method of Boring Wash Boring

Start Date June 25, 1996

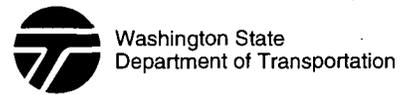
Completion Date June 25, 1996

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 ft.=0.3048 m.		
1							8 8 2 (10)	D-1	GS MC	GW, M.C.=1% Well graded GRAVEL with sand, subround, medium dense, brown, wet. Recovered and retained 0.5 ft.			
5							6 8 12 (20)	D-2		Silty SAND with gravel and wood (root), subround, medium dense, brown, moist. Recovered and retained 0.3 ft.			
10							7 9 12 (21)	D-3	GS MC	SW-SM, M.C.=5% Well graded SAND with silt and gravel, subround, medium dense, brown, wet. Recovered and retained 1.0 ft.			
15							8 9 10 (19)	D-4	GS MC	GW-GM, M.C.=1% Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 0.9 ft.			
20							7 10 10 (20)	D-5		Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 0.8 ft.			
25							9 10 13 (23)	D-6	GS MC	GW, M.C.=1% Well graded GRAVEL with sand and cobbles, angular to rounded, medium dense, gray, wet. Recovered and retained 0.5 ft.			
30							8 8 10 (18)	D-7		Well graded GRAVEL with sand and cobbles, angular to rounded, medium dense, gray, wet.			

SOIL L2263.GPJ SOIL.GDT 12/2/99 10:51:41 A12

LOG OF TEST BORING



HOLE No. **TH-2-96**

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

PROJECT **N.E.Stillwater Hill Road and Fay Road I/S**

Job No. **OL-2263**

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				20			12	D-8	GS MC	GW-GM, M.C.=3% Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 1.0 ft.			
						10							
25							12	D-9	GS MC	Well graded GRAVEL with silt and sand, angular to rounded, medium dense, gray, wet. Recovered and retained 1.0 ft.			
						9							
30						9	D-10	GS MC	Silty SAND with gravel, subangular, very dense, gray, wet. Recovered and retained 0.8 ft.				
					9								
35						44	D-11	GS MC	SM, M.C.=10% Silty SAND with gravel subangular, very dense, gray, wet. Recovered and retained 0.8 ft.				
					50/3								
40						50/3	D-12	GS MC	Silty SAND with gravel, subangular, very dense, gray, wet. Recovered and retained 1.0 ft.				
					50/4*								
45						50/4*				End of test hole boring at 40.4 ft (12.3 m) below ground elevation. Water table elevation not determined.			

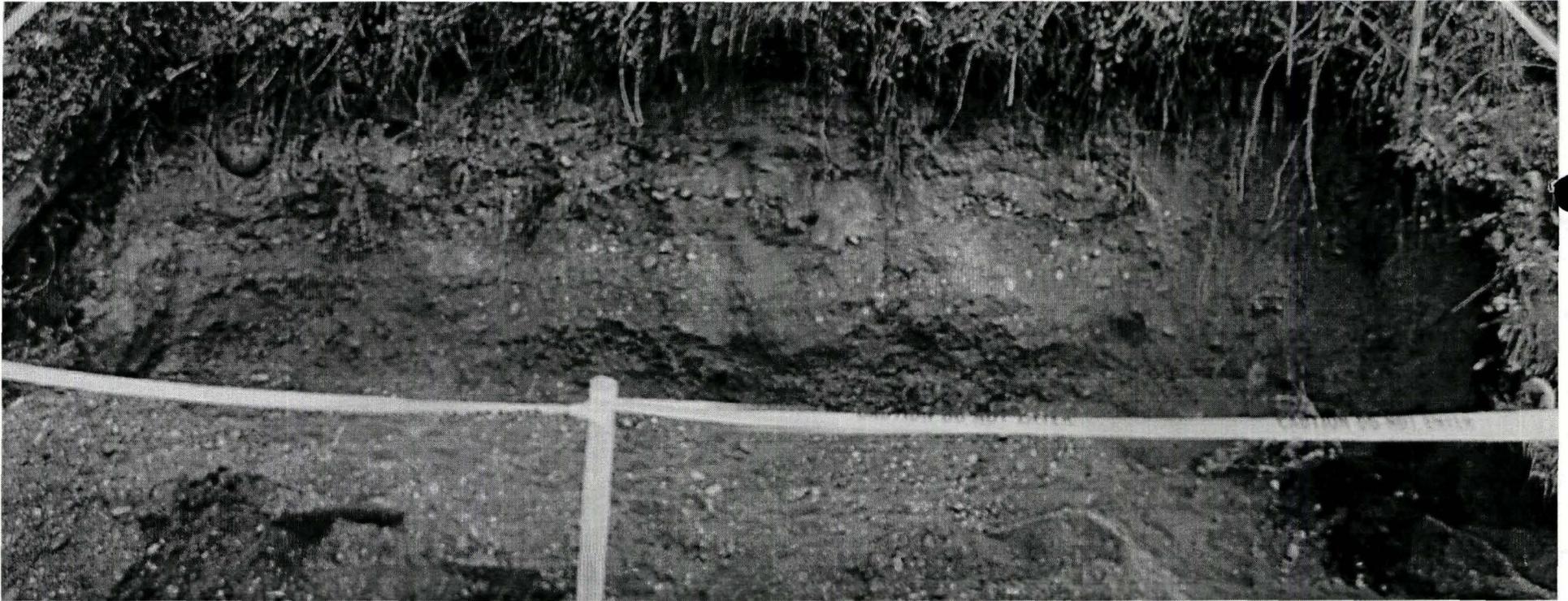
SOIL L2263.GPJ SOIL\_GDT 12/2/99 10:51:42 A12

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



LOCATION Station 3+315	OFFSET	TEST PIT NUMBER TP-1
PROJECT NAME N.E. Stillwater Hill Road and Fay Road Intersection	PROJECT NUMBER OL-2263	
EQUIPMENT	DATE STARTED	DATE COMPLETED

ELEV DEPTH	DESCRIPTION
0 m	<p>6 m</p> <p>Poorly graded SAND with gravel, cobbles and boulders. Roots in top 0.6 m of pit. Minor seepage while excavating.</p> <p>Boulders</p> <p>Well graded GRAVEL with sand and cobbles.</p>
1 m	
2 m	



Left Side

Right Side

TP-1: March 11, 1998 – 1 day after excavation