Washington State Department of Transportation

Memorandum

October 14, 1994

FROM: T. M Allen/H. Gertje
Headquarters Materials Laboratory, 7365
Phone: 664-8229 *SCAN* 366-8229

TO: Demich, G. F./D. E. Erickson
Olympic Region, 7440

RE: SR-109, CS 1433, XL-0398
Jct. SR-101 to Broadway Street
Station 176+00 to 190+00 Vicinity

This memorandum provides geotechnical recommendations and special provisions for design and construction of a roadway realignment located on SR-109 in the vicinity of milepost 8.2. The site is 5 kilometers (3 miles) west of Hoquiam adjacent to Grays Harbor. A vicinity map is provided in Figure 1.

The analyses, conclusions and recommendations contained in this report are based upon the project description and soil conditions encountered in the test borings. If unanticipated conditions are encountered during construction, we should be advised immediately so that we may reevaluate our recommendations and assist you.

Description of Realignment

The realignment will consist of replacing an existing curve of approximately 75 m (250 ft) radius with a 150 m (500 ft) radius curve along a 400 m (1400 ft) segment. The work will also require raising the grade of Harborview Court to match the new grade of SR-109. Both the existing and proposed roadways consist of low embankments placed over highly variable subsurface conditions which include deep, very soft organic soils. The new embankment will range from 0 to 2.5 m (0 to 8 feet) in height and have a maximum superelevation of 8 percent. Side slopes will be 4H to 1V or flatter in the soft soil areas, and 1.75H to 1V along Greys Harbor where soil conditions are less critical.

Subsurface Investigation

Ten test holes were drilled at the site. Three were drilled in May of 1991 (C1, C2, and C3), three in January 1993 (H4, H5 and H6), three in September 1993 (H1, H2 and H3) and one in September 1994 (H-7). The locations of these holes are illustrated in Figure 2. In the 1991 test holes, Standard Penetrometer Tests (SPT) were performed at 5-foot intervals throughout the borings. In the 1993 test holes, undisturbed samplers were advanced continuously throughout the depth range of very soft organic soils. The very soft and fibrous nature of these deposits resulted in poor sample recovery in most areas. All recovered

samples were submitted to the Materials Office Geotechnical Branch Laboratory for identification and testing. Appendix A provides copies of all edited test hole logs.

Laboratory Testing

Samples from the test borings were classified in the laboratory using the WSDOT Soil Classification Guidelines, and are based on the Unified Soil Classification System. Selected samples were tested to determine moisture content, grain size distribution, Atterberg Limits (plasticity), and one-dimensional consolidation characteristics. Six very soft organic soil samples were tested in two three-point consolidated undrained triaxial tests (CU test) to evaluate the shear strength behavior of the materials under a range of loading conditions.

SITE SUBSURFACE CONDITIONS

General Description and Site History

The site is located where SR-109 curves northward and inland of Greys Harbor. The curve lies within a depression formed between hills on three sides, and an abandoned rail road embankment to the south. The outside portion of the curve was occupied for several decades by small buildings, driveways and storage areas used in the operations of an abandoned cedar shake mill. Some foundations and buildings remain on the site.

Most of the area is underlain by embankment or a thin crust of granular fill and silt. The entire site is underlain by very soft, fibrous organic peat and organic silt. A contour plan illustrating the thickness of the organic deposits is provided in Figure 3. A total of six soil units have been identified at the site as follows:

Soil Unit 1: **Granular fill,** medium to dense sandy, silty, well-graded gravel. Typically 0.6 to 1.0 m (2 to 3 ft) thick outside the existing embankment areas.
Soil Unit 2: **Sandy Gravelly Silt,** medium to loose. With Unit 1, this unit forms a thin crust over most of the site.
Soil Unit 3: **Peat,** very soft to medium stiff, fibrous, contains varying amounts of inorganic and organic silt. The bottom of this soil unit lies at approximately elevation -1.5 m (-5 ft). In places, this material is difficult to distinguish from wood fiber fill, which may have been placed during mill operations. Recovery of this soil type was poor during sampling, and its variability is not well defined.
Soil Unit 4: **Organic Silt,** very soft to medium stiff, contains varying amounts of peat, sand and inorganic silt. The depth of this soil unit varies widely across the site.
Soil Unit 5: **Silty, Sandy Gravel,** loose to medium dense.
Soil Unit 6: **Possible Glacial Soil.** Consists of silt sand and gravel.

The soil conditions beneath the filled areas contrast sharply with the minor areas of exposed, relatively undisturbed native soils. To address this variety of conditions, we have subdivided the mainline alignment into four segments. Each segment is discussed in separate sections below. A subsurface profile of the main alignment is provided in Figure 4.

Mainline Station 176+00 to 180+50

The alignment closely parallels an abandoned railroad grade along this segment. The roadway prism of the new curve will begin on this segment and will depart from the existing roadway prism and railroad embankment near Station 180+50. The existing ground surface is paved and blanketed with rip rap. A low cliff is present along the right side of the alignment, tapering to zero near Station 179+50. The maximum height of new fill along this segment will be 3 m (10 ft) measured above the existing drainage ditch. Generally, the new fill will be less than 1.8 m (6 ft) high, with a maximum slope of 1.75H:1V.

The soils underlying the embankment consist of soil Unit 2 to 2 m (6 ft) in depth, underlain by Unit 3 to 3.5 m (11 ft) in depth, underlain by Unit 4 to approximately 6m (20 ft) in depth, underlain by Unit 5.

Mainline Station 180+50 to 181+40

This segment will form a critical part of the new curve. The new fill will range to a maximum height of 3 m (10 ft) above the existing ditch. Generally, the maximum height will be 2.4 m (8 ft). A new 24-inch diameter culvert will be placed across the alignment at Station 181+40.

Outside the existing roadway, the area is vegetated by saplings and mature alder trees ranging to 12 inches in diameter. Part of the new embankment will be placed over a triangular-shaped depression with very soft organic soil exposed at the surface. The depression is bounded by the abandoned railroad embankment on the south, the existing roadway embankment on the east and a heap of waste logs are on the west. Airphotos taken in the 1960's indicate that a building once stood in the vicinity of Station 181+30, 40'L.

Test holes H-1 and C-2 indicate this area is mostly blanketed by granular fill (Unit 1), generally less than 1 m in thickness. The fill is underlain by very soft fibrous peat (Unit 3) to 4.5 m (15 ft) in depth underlain by organic silt (Unit 4) ranging to 9 m (30 ft) maximum in depth (Unit 3). The organic soils are underlain by Unit 5 extending to at least 18 m (60 ft) in depth. The seasonal high groundwater surface is interpreted to be equivalent to standing water in the depression and appears to be affected by tidal conditions.

Station 181+40 to 186+00

With the exception of the drainage ditch, this alignment segment lies entirely over ground modified by the abandoned cedar shake mill. Essentially all of this area has been blanketed by granular fill placed over the native organic soils. Some areas are currently paved with asphalt, and most of the area was trafficked by heavy equipment. In some areas, it appears that wasted wood fibre is mixed with soil Unit 2. Tree stumps form bumps beneath the pavement in several areas due to settlement of the surrounding ground. A large building once occupied the area between Station 184+50 and 185+10. Foundation parts remain in this area.

The ground surface is underlain by approximately 0.6 to 2 m (2 to 7 ft) of Unit 1, overlying 0.6 to 1.5 m (2 to 5 ft) of (Unit 2), underlain by a variable thickness of Unit 3 ranging from 9 m to 18 m (30 to 60 ft) in depth. As illustrated in Figures 3 and 4, the thickness of Unit 3 in

this area is limited to a narrow trough oriented perpendicularly to the mainline and nearly parallel to Harborview Court (Station 182+50). Unit 3 is underlain by Units 4 and 5 extending to depths greater than 25 m (70 feet).

Station 186+00 to 190+00

The new roadway prism will transition onto the existing roadway along this segment. The maximum height of new embankment will be 2 m (6 ft). Beginning near Station 187+00, the paved area of the shake mill ends and the ground surface outside the existing roadway appears to have been less modified by human activity. This area is vegetated by saplings, brush and wetland plants. The existing SR-109 pavement exhibits indications of moderate differential settlement, including dips, minor ruts and pavement cracking.

The ground surface is underlain by soil Unit 2 to a depth of 3.6 m (12 ft), underlain by soil Unit 3 to a depth of 8.7 m (29 ft), underlain by Unit 4 to 14 m (48 ft), underlain by Unit 5 to greater than 20 m (65 ft). Along this segment, Units 3 and 4 are medium stiff.

Harborview Court

To match grades of the realignment, Harborview Court will be raised by approximately 1.3 m (4.0 ft), with side slopes of 2H to 1V. The roadway alignment will not be changed. The new embankment area will be placed entirely over an existing paved area. The area is underlain by a mixed soil profile of Soil Units 1 and 2 ranging from 2 to 2.5 m (6 to 8 ft) in depth, underlain by Unit 3 to a maximum depth of (78 ft), underlain by Unit 5.

RECOMMENDATIONS

To achieve a quality roadway along the realignment, the potential for post construction differential settlements must be mitigated. We recommend this be accomplished by stage constructing a gravel borrow embankment with a surcharge. Geosynthetic reinforcement will be needed in one segment to maintain stability during construction.

Alternative construction methods such as overexcavation and light weight fill were evaluated by the Geotechnical Branch and the Project Office and found unsatisfactory. The organic soils extend too deeply to attempt their removal. The nature of this site and the proposed fill geometry severely limit the potential use of lightweight embankment materials. Shredded rubber tire or wood fibre light weight fill would have a limited application because this material cannot be placed below the water table and must also have a substantial thickness of cover beneath the pavement.

We discussed surcharging concepts with your office on September 19, 1994. At that time, we received detailed ground surface data and began working with your designers to develop a surcharge geometry and construction sequence. We concluded that traffic should be maintained on the existing roadway during the presettlement period. To maintain a safe roadway geometry, temporary fill and probably temporary pavement will be needed to taper away from the surcharge. The surcharge and temporary fills are not expected to encroach on wetlands beyond the design embankment limits. The surcharge design is intended to limit the profile grade to 2 percent and the superelevation to 8 percent. The total duration for

embankment construction and presettlement delay has been limited to 4 months to accomplish construction within one year.

To address the variability of existing site conditions and the proposed range of fill heights, the realignment is subdivided into 4 separate segments, plus Harborview Court. A detailed discussion of conclusions and recommendations is provided for each segment below. Critical cross sections illustrating the proposed embankment and surcharging are provided in Figures 5 through 9.

Mainline Station 176+00 to 180+50

We recommend the embankment be placed to design elevation without surcharging, followed by an initial delay period of two weeks. After two weeks, this segment should be regraded if required and temporarily paved to design elevation. Final paving of this segment should be delayed up to four months, at which time final paving may be accomplished concurrent to the remainder of the realignment. We estimate a maximum of 150 mm (6 inches) of settlement will occur beneath the centerline of this segment, with most occurring during the two-week initial delay period. Post construction settlement is expected to be 1.5 inches or less.

Ground preparation and fill construction for this segment should be performed according to Standard Specification procedures outlined in Sections 2-02 and 2-03. The ditch line between the existing roadway and railroad embankments should cleared of unsuitable materials, if present. If organic matter is encountered below 1.2 m (4 feet) in depth, deeper excavation should not be attempted. Instead, a layer of Geotextile for Soil Stabilization should be placed at the ditch bottom, overlain by quarry spalls or shoulder ballast if standing water is present. Above standing water, gravel borrow fill may be placed from original ground to design fill elevation.

Ground settlement should be monitored using survey hubs placed securely onto the top of the embankment. Recommended locations are listed in attached Table 2. Two monuments should be installed on the left shoulder at completion of the initial filling operation and surveyed once per week. An additional monument should be placed on centerline after temporary paving and surveyed every two weeks.

Mainline Station 180+50 to 181+40

To construct this segment within reasonable time and without embankment failure will require careful site preparation, geotextile reinforcement and stage filling. Figure 5 provides a typical section for construction of this embankment segment. This embankment segment must be constructed in two stages over approximately one month to achieve full surcharge height. A maximum delay period of 3 additional months will then be required before final grading and paving. Geotechnical instrumentation, including two pore pressure devices and a liquid settlement indicating device should be installed as indicated in Table 2 at least one week prior to construction of the embankment.

The existing embankment area should be prepared according to the Standard Specifications. The left edge of the new embankment, however, will be placed over an area of very soft organic soil with irregular topography. This area should be cleared of vegetation without

disturbing the underlying fibrous mat. In the lowest and softest areas, an extensive volume of fill is likely to push through the ground surface into the underlying organic soil with very little effort. In these areas, High Strength Construction Geotextile for Soil Stabilization should be blanketed over the area to provide separation as shown in Figure 5. The basal geotextile layer should then be overlain by quarry spalls or shoulder ballast if below standing water, overlain by gravel borrow.

The first stage of fill should be placed no higher than the design roadway grade, as illustrated in Figure 5. The initial fill stage must contain a layer of High Strength Geotextile for Soil Stabilization, placed horizontally within the fill approximately 0.3 m (1.0 ft) above the existing roadway elevation. The machine direction should be placed perpendicular to the embankment centerline. All seams should be sewn. No seams should be allowed parallel to the embankment centerline. A minimum cover of 0.5 m (1.5 ft) should be assured above the fabric during this stage of filling. The attached special provision for High Strength Construction Geotextile for Soil Stabilization should be included in the contract provisions. As indicated, the following geotextile properties should be specified for this geotextile:

AOS:	0.60 mm
Water Permittivity:	0.02 cm/sec
Tensile Strength, min:	Machine direction :1000 lb, x-machine direction: 500 lb, min
Secant Modulus at 10% strain:	10,000 lb/in min
Seam Breaking Strength:	250 lb min.
Puncture Resistance:	110 lb min
Tear Strength Trapezoidal:	75 lb min.

After approximately one month delay, the second stage of fill comprising the surcharge may be placed as illustrated in Figures 5 through 7. The maximum height of the embankment plus surcharge will be approximately 5 m (16 ft). The surcharge will range to a maximum height of 1.5 m (5 ft) above the design embankment and may taper to zero near Station 180+50. The existing roadway area must be temporarily filled above design grade during the surcharge stage to prevent differential settlement across the roadway. All slopes on the surcharge should not exceed 2H to 1V at the minimum surcharge heights.

We estimate the maximum settlement beneath this embankment segment under surcharge loading will be 360 mm (14 in) near the new and existing centerline, and approximately 1.1 m (3.6 ft) along the new left shoulder. Approximately 75 percent of this settlement is expected to occur by the time full surcharge elevations are achieved. Post-delay settlements are expected to be less than 25 mm (1 in).

Station 181+40 to 186+00

Most of this segment is underlain by a thin surficial fill layer, underlain by soft to very soft organic soil. To assure stability of the embankment during construction, the fill layer must be left intact as much as possible. We therefore recommend that extensive grubbing *not* be

allowed. The ground surface should be cleared of vegetation and the pavement broken to facilitate drainage. Foundations and tree stumps should be neatly removed to a *maximum* depth of 1.2 m (4 ft). In low areas such as the ditch and foundation holes, a layer of construction geotextile should blanket the area. Quarry spalls or shoulder ballast should be placed above this level if standing water is present to create a base for the embankment.

We recommend the surcharge along this segment equal at least 0.75 times the height of the new fill as illustrated in Figures 7, 8 and 9 and kept in place for a maximum presettlement period of 3.5 months. This will result in a maximum fill height of approximately 3.7 m (12 ft) during the surcharge period. As a precaution against embankment failure, we recommend the embankment construction be delayed a maximum of two weeks after achieving design grade, prior to placing the surcharge. Settlement should be monitored during the presettlement period, as indicated in the attached instrumentation table. Up to 660 mm (26 in) of settlement is expected during the delay period under surcharge loading near the new centerline and left shoulder areas. Post construction settlement beneath the new roadway is expected to be 70 mm (3 in) or less. The long term settlement is expected to be deep-seated and therefore result in differential settlements of less 35 mm (1.5 in), over a period of at least 20 years.

The new fill and surcharge for Harborview Court must be placed above the existing roadway along this segment of the mainline. This will require placement of temporary fill and pavement on the existing SR-109 roadway upstation of the intersection. We anticipate the temporary fill height will be approximately 2 m (6 ft) above existing grade and result in a maximum settlement of approximately 600 mm (24 in) during the delay period. We therefore recommend that an interim grading revision be included in the contract provisions for this segment to maintain a safe roadway condition during the delay period. Settlement should be monitored as indicated in Table 2 to determine appropriate grade adjustments.

Station 186+00 to 190+00

We recommend a surcharge be placed above proposed grade equal to 1.2 times the height of the new fill and kept in place for a maximum presettlement period of 4 months. This will result in a maximum fill height of approximately 2.5 m (8 ft) during the surcharge period. To allow traffic to remain on the existing alignment, the surcharge may be tapered lower as illustrated in the cross section in Figures 10 and 11, resulting in a minimum of 0.5 m (1.5 ft) fill and temporary pavement above the existing alignment. Stage construction of this segment is not recommended. The ground surface should be prepared as described for the embankment segments from Station 180+50 to 186+00.

Settlement should be monitored as indicated in attached Table 2. Up to 230 mm (9 in) of settlement is expected near the existing left shoulder and future centerline areas during the delay. Settlement at the existing centerline is expected to be 75 mm (3 in) or less. Post construction settlement is expected to be 25 mm (1.0 inch) or less.

Harborview Court

The new and existing alignments of Harborview Court will be the same, with only a rise in grade of 1.3 m (4 ft) or less. Site preparation of the existing pavement should be performed

as recommended above. Stage construction of the new fill will not be necessary. We recommend a surcharge be placed above proposed grade equal to the height of the new fill and kept in place for a maximum presettlement period of 4 months. This will require the fill be placed concurrently with the mainline surcharges and adjusted to meet the elevations shown on the cross section illustrated in Figure 8. The maximum surcharge height will be 1.3 m (4.0 ft), and the maximum presettlement fill height will be approximately 2.0 m (6.5 ft). The surcharge should taper from 1.0 H to zero between Station 12+50 and 13+00. To prevent the surcharge from encroaching onto the adjacent wetland, we recommend that oversteepened side slopes not exceed 1H to 1V where the fill height is below 1.3 m (4 ft), nor 1.5H to 1V for greater fill heights.

Settlement during the delay period is expected to be 0.6 m (2 ft) or less beneath this alignment. Post construction settlement is expected to be 4 inches or less and occur gradually over a period of 20 years or more. We expect this settlement will be deep-seated and result in negligible differential settlements. Settlement monitoring is recommended only at the existing SR-109 intersection by survey hub, as previously described.

CONSTRUCTION CONSIDERATIONS

In general, construction considerations have been provided for each alignment segment in the recommendations sections above. Those considerations not discussed are as follows:

1) The layout of the proposed culvert at Station 180+40 has been designed to avoid conflict with the geotextile-reinforced embankment section immediately upstation. The Project Office prefers to place the culvert at design flow line elevations following the presettlement delay period. Care must be taken to ensure the geotextile does not encroach into the pipe excavation area, and that during excavation, the fabric is not excavated.

2) All embankment and surcharge should be gravel borrow placed according to Method B compaction. In soft soil areas, particularly left of Station 180+50 to 181+40, this standard may not be achievable in the bottom 2 feet. Method A compaction is therefore acceptable in these areas.

3) The delay periods discussed in this report are the maximum recommended durations. An evaluation of the settlement data may allow a reduction in the delay period. We recommend the Geotechnical Branch assist the project office with evaluation of the settlement data.

CLOSURE

Special provisions for geotechnical instrumentation, stage construction and High Strength Construction Geotextile for Soil Stabilization are provided in Appendix C. These are available for quick inclusion into the contract provisions through word processor files, available upon request. Should you have any questions related to this project, please contact Henry Gertje at SCAN 366-8229 or Bob Kimmerling at SCAN 321-7659.

TMA:hg
HG

cc: J. Aspaas, HQ Construction, 7354
J. Hart, Olympic Region, Aberdeen PEO, WA-48

Table 1
Summary of Stage Construction & Presettlement Delays

Alignment Segment	Stage Construction Requirements	Delay Period
Sta 176+00 to 180+50	None	2 weeks delay at design grade prior to temporary paving, four months total prior to final paving
Sta 180+50 to 181+40	2 Stages: one month delay at design grade, then fill to surcharge grade. Embankment must be reinforced.	3 months after achieving surcharge grade.
Sta 181+40 to 186+00	2 Stages: 2 week delay at design grade, then fill to surcharge grade.	3.5 months after achieving surcharge grade.
Sta 186+00 to 190+00	None	4 months at surcharge grade
Harborview Court	None	4 months at surcharge grade

Table 2
Recommended Geotechnical Instrumentation
Sheet 1 of 2

Alignment Segment	Instrument Type	Station/Offset/ Installation Depth	Station Range (Zone of Influence)	Reading Schedule	Remarks
Sta 176+00 to 180+50	SH	179+00/18'L	176+00 to 179+00	Weekly	
	SH	180+35/32'L	Same	Weekly	Place on crest of surcharge.
	SH	180+35/CL	Same	Weekly	Place after 2 week delay onto temporary pavement
Sta 180+50 to 181+40	PP	181+00/28'L/10'	180+50 to 181+40	Daily	Read daily during filling. Read 2x per week during stage delay.
	PP	181+10/28'L/10'	180+50 to 181+40	Daily	Same as for other PP
	LSI	181+20/25'L/0'	same as PP	Daily	Same as for PP
	SH	181+20/20'L	same	Weekly	Place on crest of surcharge.
	SH	181+20/CL	same	Weekly	Set in temporary pavement.

Notes: 1) All stationing is referenced to the proposed SR-109 centerline.

2) Instrument Definintions: SH: Settlement Hub (monitored by elevation surveys)

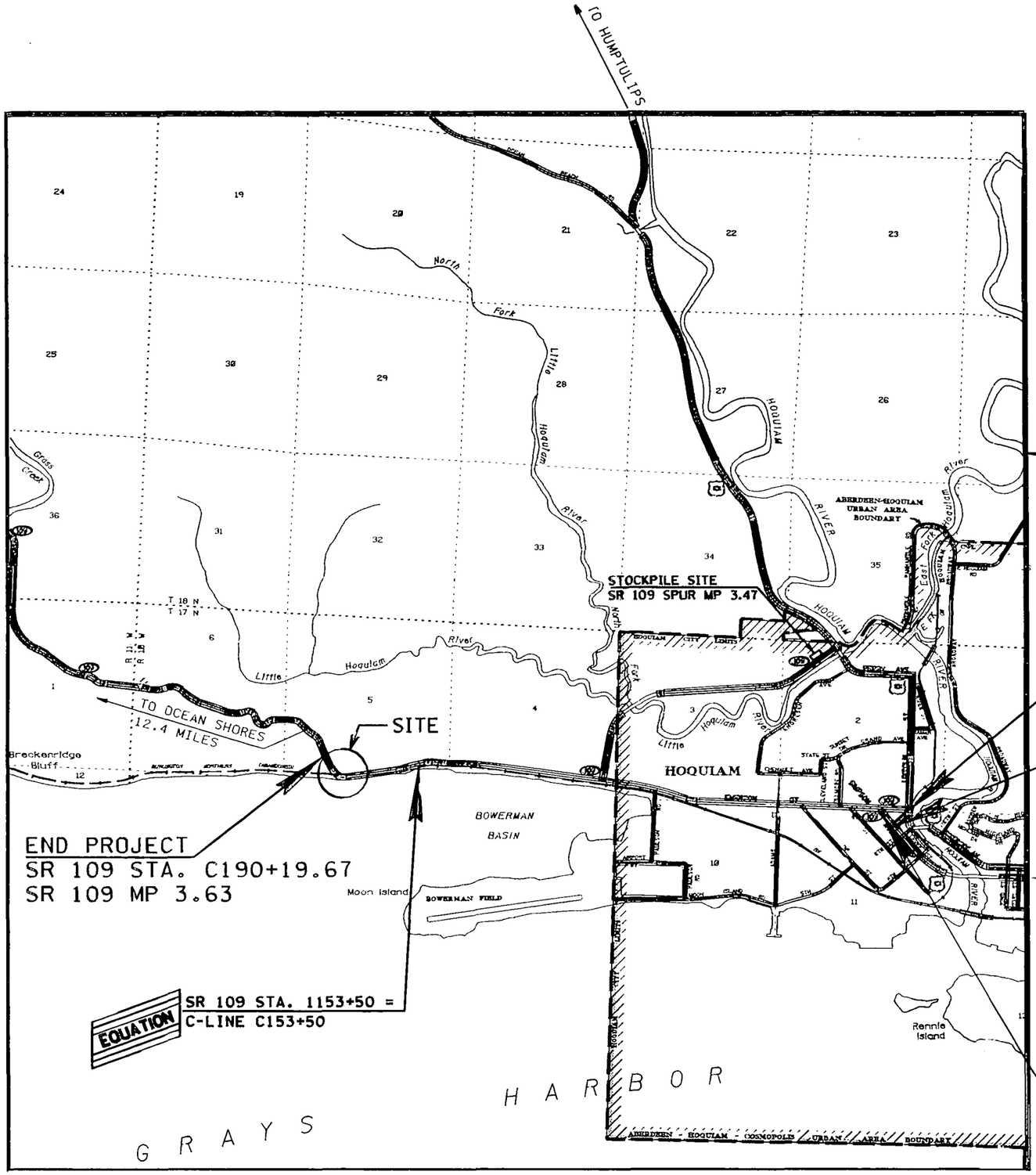
PP: Pore Pressure Indicating Device. (see attached special provision)

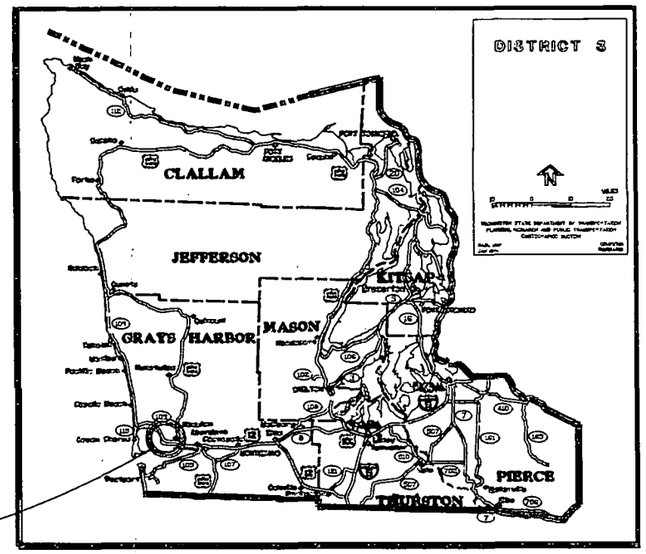
LSI: Liquid settlement indicating Device. (see attached special provision)

3) Refer to text for further clarification.

Recommended Geotechnical Instrumentation
Sheet 2 of 2

Alignment Segment	Instrument Type	Station/Offset/ Installation Depth	Station Range (Zone of Influence)	Reading Schedule	Remarks
Sta 181+40 to 186+00	PP	181+50/15'L/18'	181+40 to 183+50	Daily	Read daily during filling.
	PP	181+55/15'L/18'	same	Daily	Same
	LSI	181+60/12'L/0'	same	Weekly	
	SH	181+50/15'L	same	Weekly	Place on crest of surcharge.
	SH	181+50/15'R	same	Weekly	Monitor existing roadway settlement, temporary pavement.
	LSI	184+60/CL	183+50 to 186+00	Weekly	
	SH	183+60/70'R	same	Weekly	Monitor existing roadway settlement, temporary pavementt
Sta 186+00 to 190+00	LSI	187+80/CL/0'	186+00 to 190+00	Weekly	
	SH	187+80/CL	Same	Weekly	
	SH	188+00/20'R	Same	Weekly	Monitor existing roadway settlement, temporary pavement





JOB XL-0398 S.P. 109 C.S. 1433 LAYOUT

JCT. SR 101 TO VICINITY BROADWAY STREET
FIGURE 1 - VICINITY MAP

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
R. G. FINKLE MATERIALS ENGINEER

DATE: AUG. 1994
SCALE N.S. VERT. 1"=4000' HORIZ.
SHEET ___ OF ___
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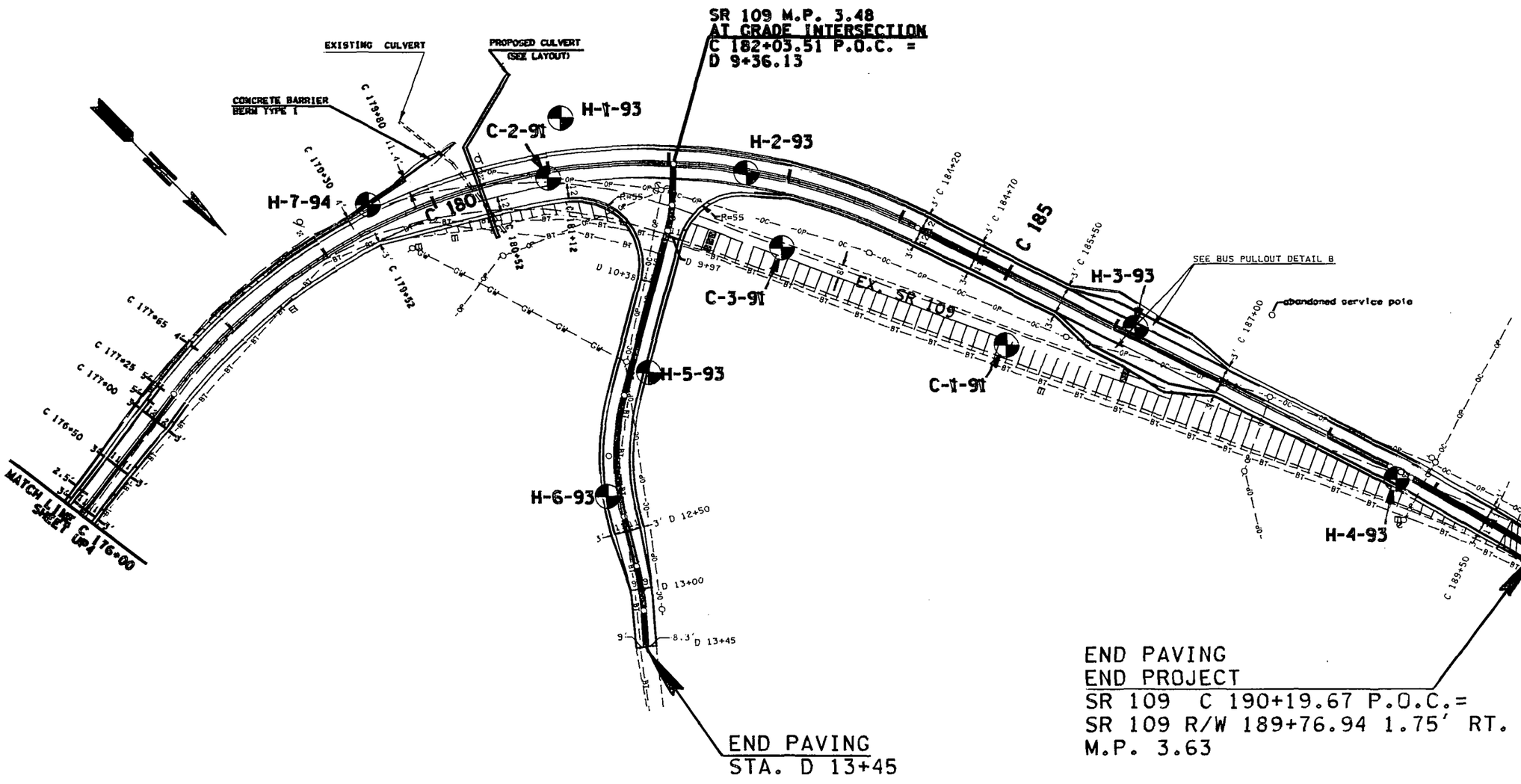

FIGURE 2: TEST HOLE PLAN

JOB XL-0398 S.R. 109 C.S. 1433 LAYOUT

JCT. S.R. - 101 TO VICINITY
BROADWAY STREET

WASHINGTON STATE
TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
P. G. FINKLE MATERIALS ENGINEER

DATE: SEPT 1994
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1"=100' HORIZ.
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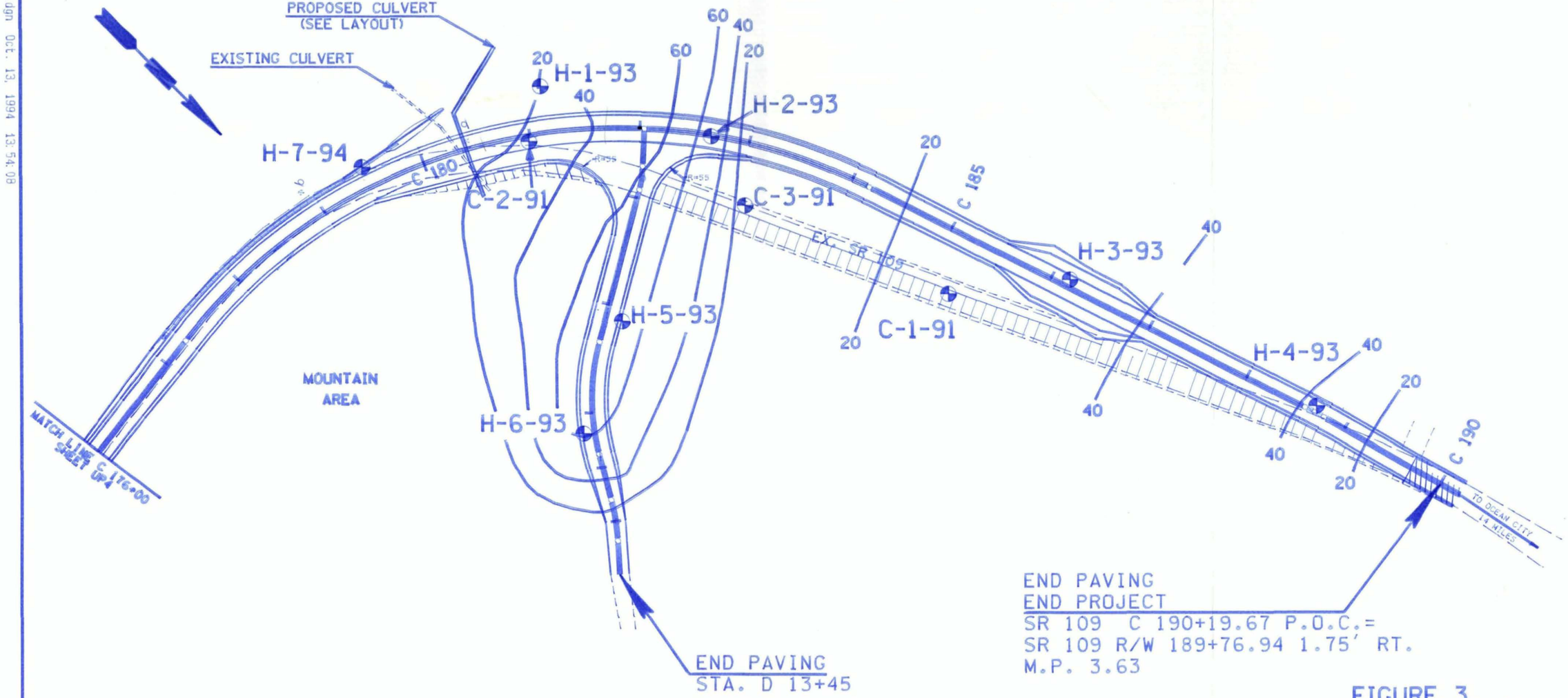

FIGURE 3: SOFT ORGANIC SOIL THICKNESS CONTOURS (IN FEET)

FIGURE 3

JOB XL-0398 S.R. 109 C.S. 1433 LAYOUT

JCT. S.R. - 101 TO VICINITY
BROADWAY STREET

WASHINGTON STATE
TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
R. G. FINKLE MATERIALS ENGINEER

DATE SEPT 1994
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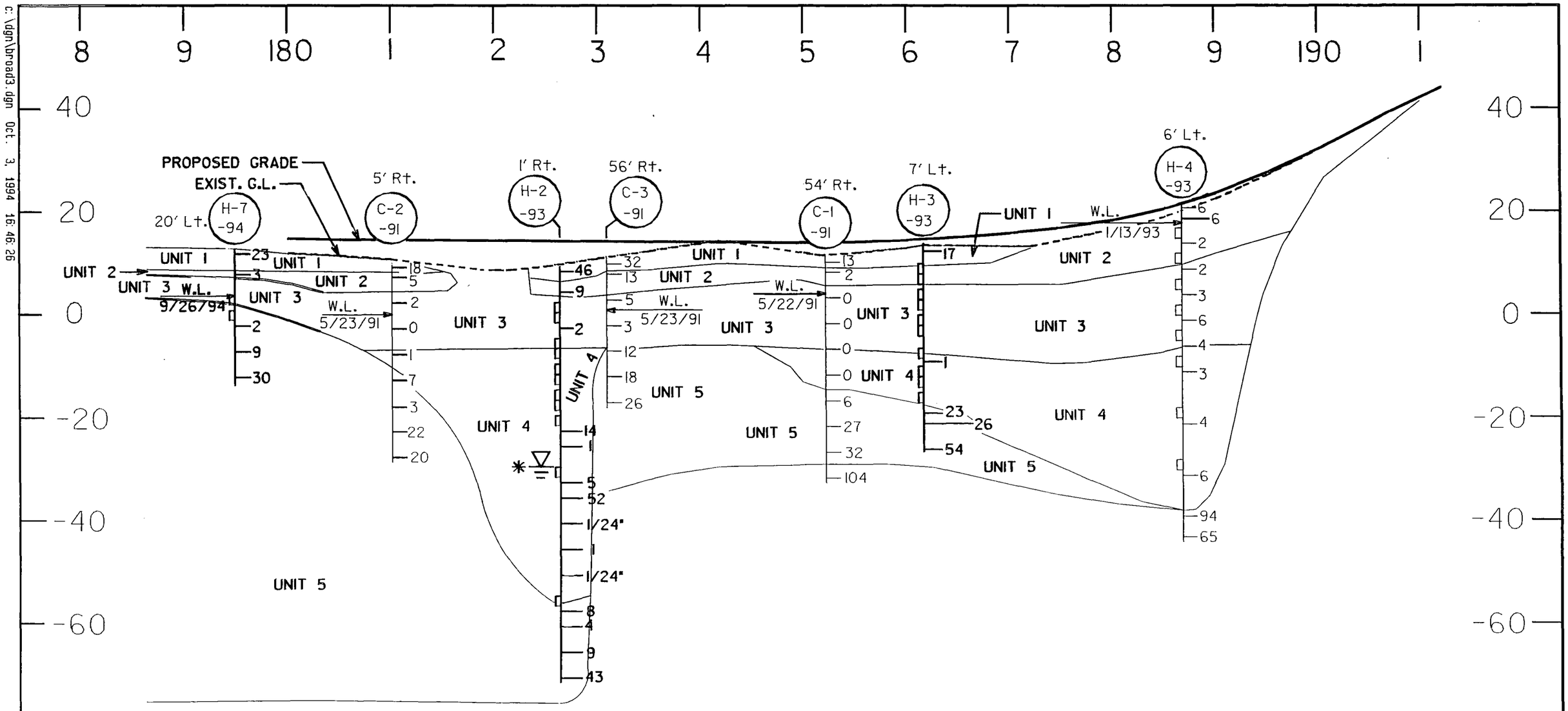

SOIL DESCRIPTIONS

UNIT 1: GRANULAR FILL-Loose to dense; consists mainly of coarse to fine gravel.

UNIT 2: INORGANIC SILT-Stiff to medium stiff; contains sand and gravel in varying amounts; also fill materials from UNIT 1.

UNIT 3: Very soft PEAT; contains organic silt, inorganic silt; in places consists of wood fibre waste.

UNIT 4: Very soft to medium stiff, organic SILT; contains peat, sand and inorganic silt.

UNIT 5: Loose to medium dense GRAVEL, SAND, and sandy SILT with some organics.

UNIT 6: Dense GLACIAL SOIL.

• ARTESIAN WATER CONDITIONS

TEST HOLE LEGEND

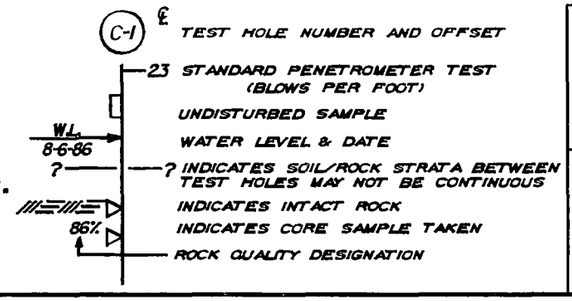

FIGURE 4: SUBSURFACE PROFILE

JOB XL-0398 S.R. 109 C.S. 1433 LAYOUT

JCT. S.R. - 101 TO VIC. BROADWAY STREET

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
R. G. FINKLE MATERIALS ENGINEER

DATE SEPT 1994
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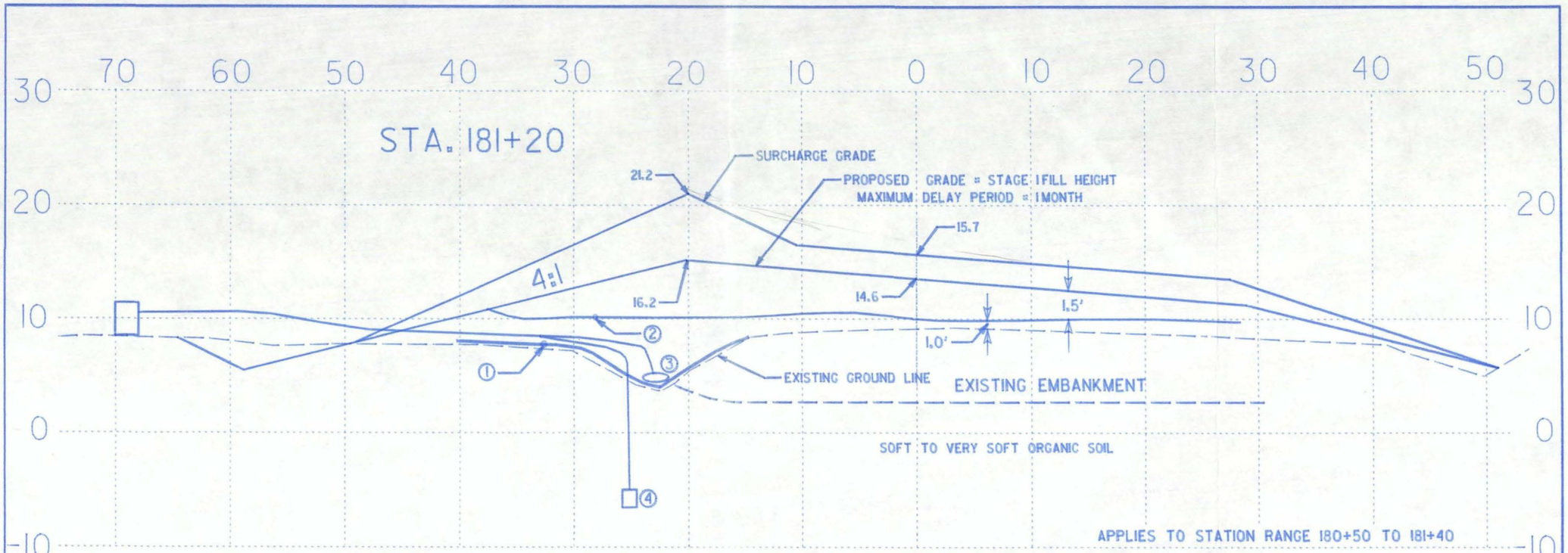


NOTES:
1. CONSTRUCTION GEOTEXTILE FOR SOIL STABILIZATION.
2. HIGH STRENGTH CONSTRUCTION GEOTEXTILE FOR SOIL STABILIZATION.
3. LIQUID SETTLEMENT INDICATING DEVICE.
4. PORE PRESSURE INDICATING DEVICE.
5. TAPER SURCHARGE TO ZERO BY STATION 180+50.
6. TAPER SURCHARGE TO MATCH MINIMUM SURCHARGE SHOWN AT STATION 181+60, FIGURE 7.
7. REFER TO TEXT AND SPECIAL PROVISIONS FOR GEOTEXTILES AND GEOTECHNICAL INSTRUMENTATION.

FIGURE 5 - RECOMMENDED MINIMUM SURCHARGE, STAGE CONSTRUCTION AND SOIL REINFORCEMENT DETAILS

FIGURE 5

JOB XL-0398 S.R. 109 C.S. 1433 LAYOUT

JCT. SR-101 TO VICINITY BROADWAY STREET

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
R. C. FINKLE MATERIALS ENGINEER

DATE: OCT. 1994
SCALE 1"=10' VERT.
1"=10' HORIZ.
SHEET ___ OF ___
DRAWN BY PAA

c: \dgn\broad4\sh4.dgn Oct. 13, 1994 13.27.55

c:\dgn\broad4\sh3.dgn Oct. 6, 1994 13:10:08

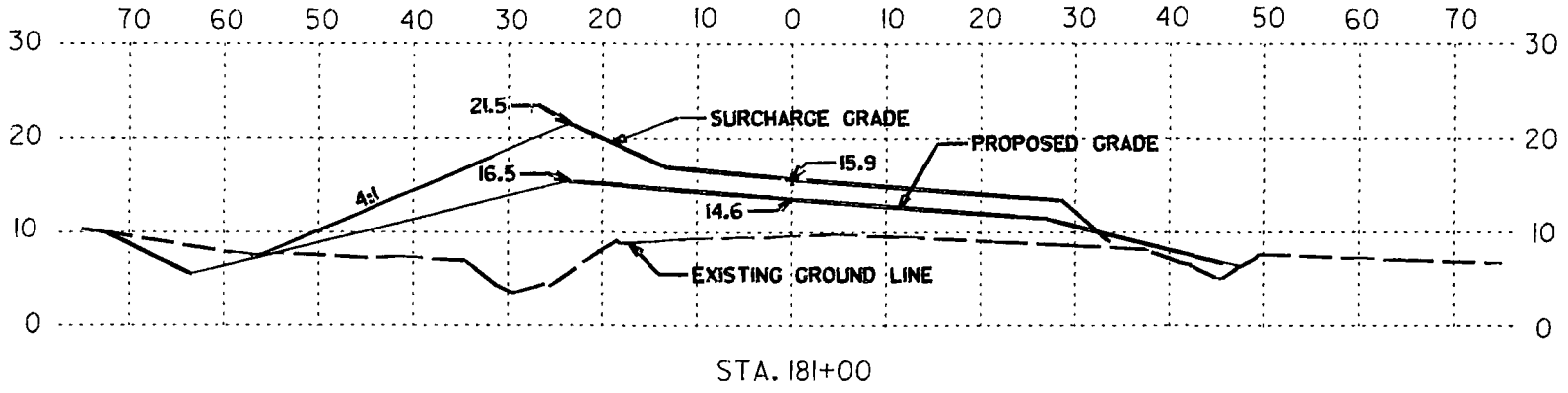
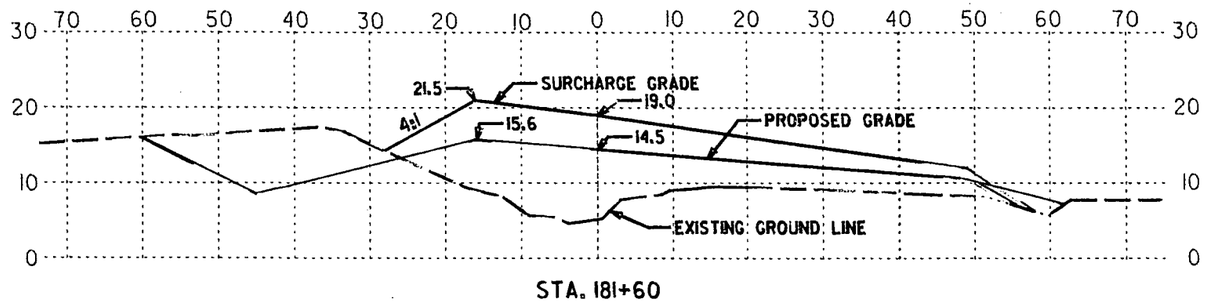


FIGURE 6 - RECOMMENDED MINIMUM SURCHARGE

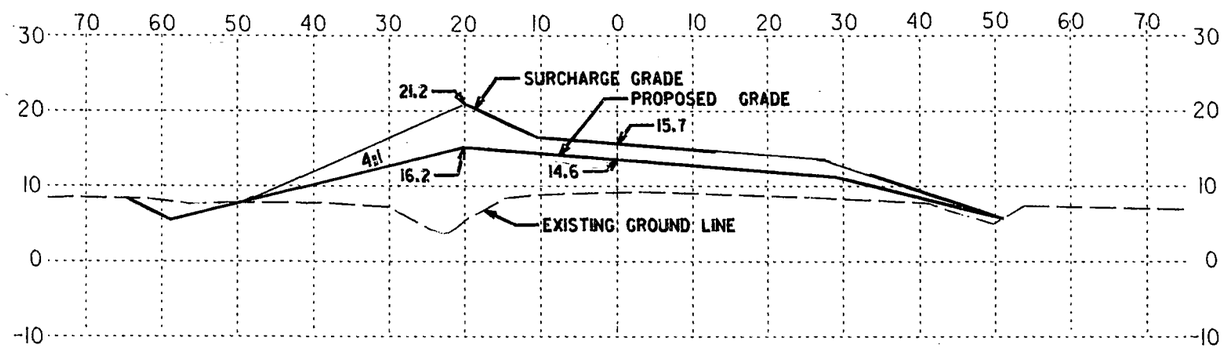
JCT. SR-101 TO VIC. BROADWAY STREET

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH

DATE: OCT. 1994
SCALE 1"=20' VERT.
1"=20' HORIZ.
DRAWN BY PAA



STA. 181+60



STA. 181+20

FIGURE 7 - RECOMMENDED MINIMUM SURCHARGE

FIGURE 7

JOB XL-0398 S.R. 109 C.S. 1433 LAYOUT

JCT. SR-101 TO VICINITY
BROADWAY STREET

WASHINGTON STATE
TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
R. G. FOGLE MATERIALS ENGINEER

DATE: OCT. 1994
SCALE 1"=20' VERT.
1"=20' HORIZ.
SHEET ___ OF ___
DRAWN BY PAA

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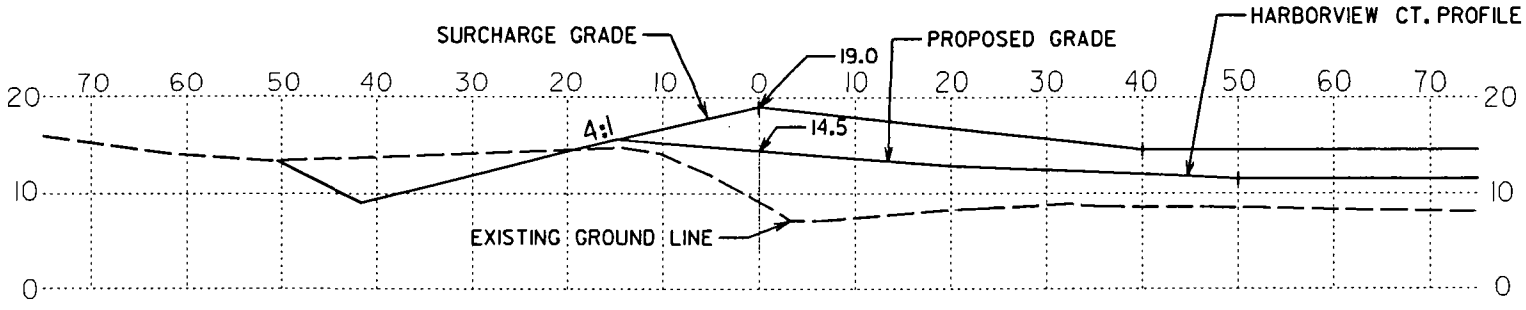

STA. 182+04

FIGURE 8 - RECOMMENDED MINIMUM SURCHARGE

JOB XL-0398 S.R. 109 C.S. 1433 LAYOUT

JCT. SR-101 TO VIC. BROADWAY STREET

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
R. G. FINKLE MATERIALS ENGINEER

DATE: OCT. 1994
SCALE 1"=20' VERT.
1"=20' HORIZ.
SHEET ___ OF ___
DRAWN BY PAA

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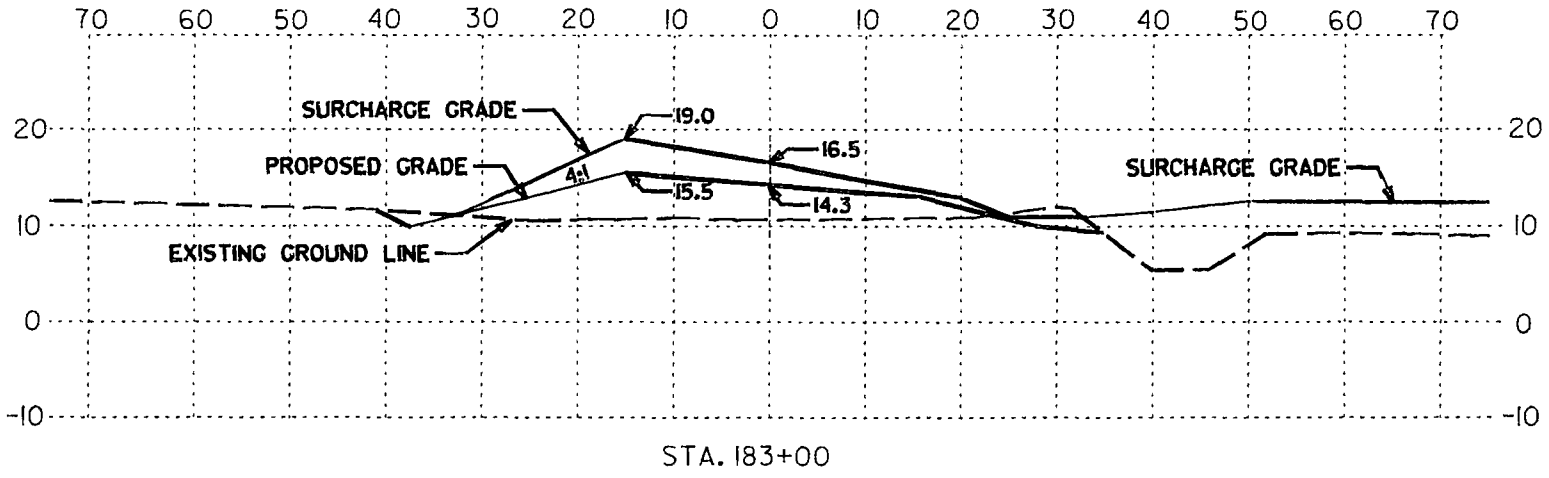

FIGURE 9 - RECOMMENDED MINIMUM SURCHARGE

JCT. SR-101 TO VIC. BROADWAY STREET

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH

DATE: OCT. 1994
SCALE 1"=20' VERT.
1"=20' HORIZ.
SHEET ___ OF ___
DRAWN BY PAA

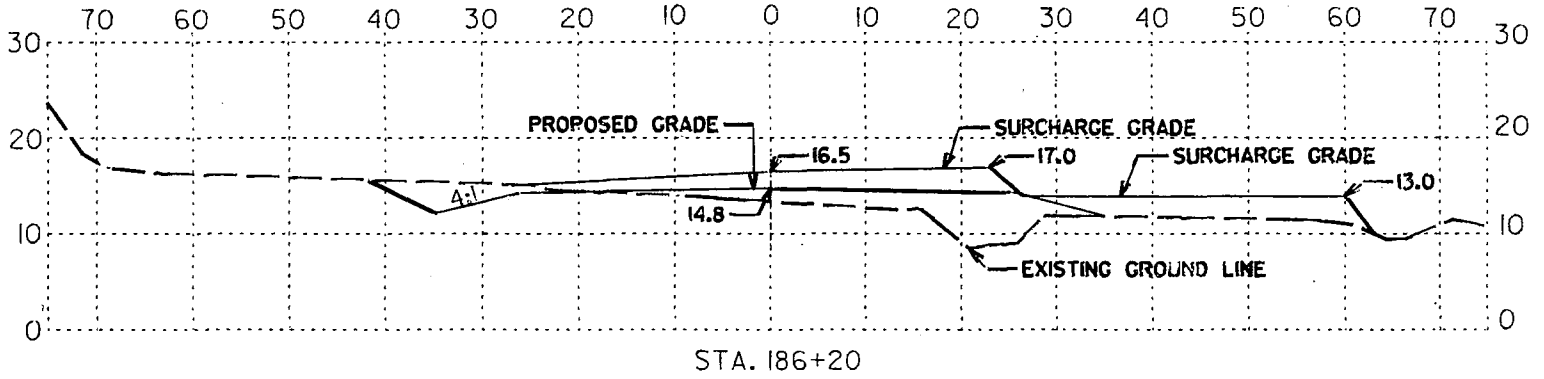

FIGURE 10 - RECOMMENDED MINIMUM SURCHARGE

JOB XL-0398 S.R. 109 C.S. 1433 LAYOUT

JCT. SR-101 TO VIC. BROADWAY STREET

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
R. G. FINKLE MATERIALS ENGINEER

DATE: OCT. 1994
SCALE 1"=20' VERT.
1"=20' HORIZ.
SHEET ___ OF ___
DRAWN BY PAA

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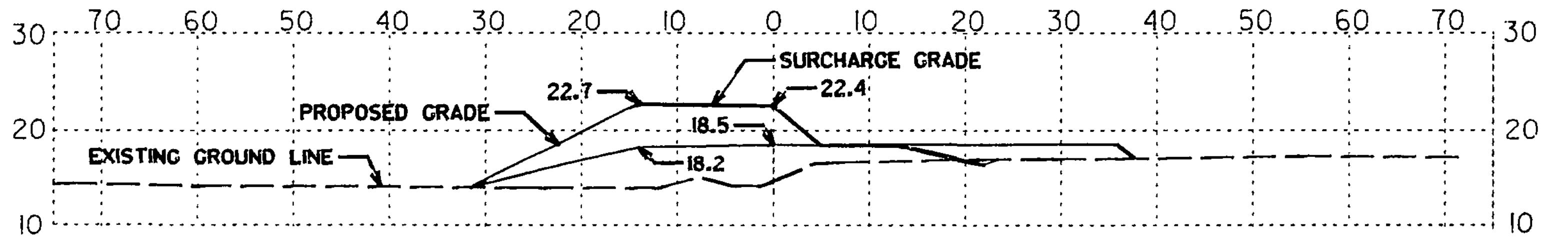
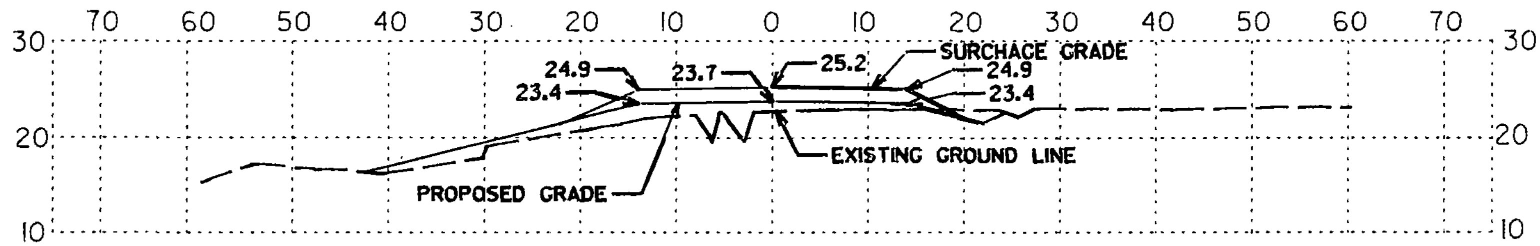


STA. 188+00



STA. 189+00

FIGURE II - RECOMMENDED MINIMUM SURCHARGE

JCT. SR-101 TO VIC. BROADWAY STREET

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH

DATE: OCT. 1994
SCALE 1"=20' VERT. 1"=20' HORZ.
SHEET ___ OF ___
DRAWN BY PAA

Appendix A

Test Boring Logs

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-1-93**

PROJECT **Junction SR-101 to Vicinity Broadway St.** Job No. **L-0398**

S.R. **109**

Station **181+06** Offset **65' Lt.** C.S. **1433**

Equipment _____ Casing **HW to 39'** Ground El **9.0 (2.74 m)**

Method of Boring **HW Rotary**

Start Date **September 14, 1993** Completion Date **September 14, 1993** Sheet **1** of **2**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				2 1 1 1 (2)		D-1		Very loose, brown, dry, silty, sandy GRAVEL (Fill). Retained 0.5 ft.		
						S-2		9-14-93 Soft, dark brown, wet, fibrous PEAT and organic SILT. Retained 0.6 ft.	▽	
	1					S-3		No recovery.		
5						S-4		Soft, dark brown, wet, fibrous PEAT and organic SILT. (Visual ID in lab) Retained 0.8 ft.		
	2					S-5		No recovery.		
10	3					S-6		Soft, dark brown, wet, fibrous PEAT and organic SILT.		
								Dark gray, wet, slightly silty, sandy GRAVEL. Retained 0.8 ft.		
	4					S-7		Dark gray, wet, silty, sandy GRAVEL. Retained 0.8 ft.		
15										
	5			1 2 3 2 (5)		D-8		Loose, dark gray, wet, silty, sandy GRAVEL with pieces of wood. Retained 0.7 ft.		
				3 3		D-9		Loose, dark gray, wet, slightly silty, sandy GRAVEL.		
20	6									

LOG OF TEST BORING

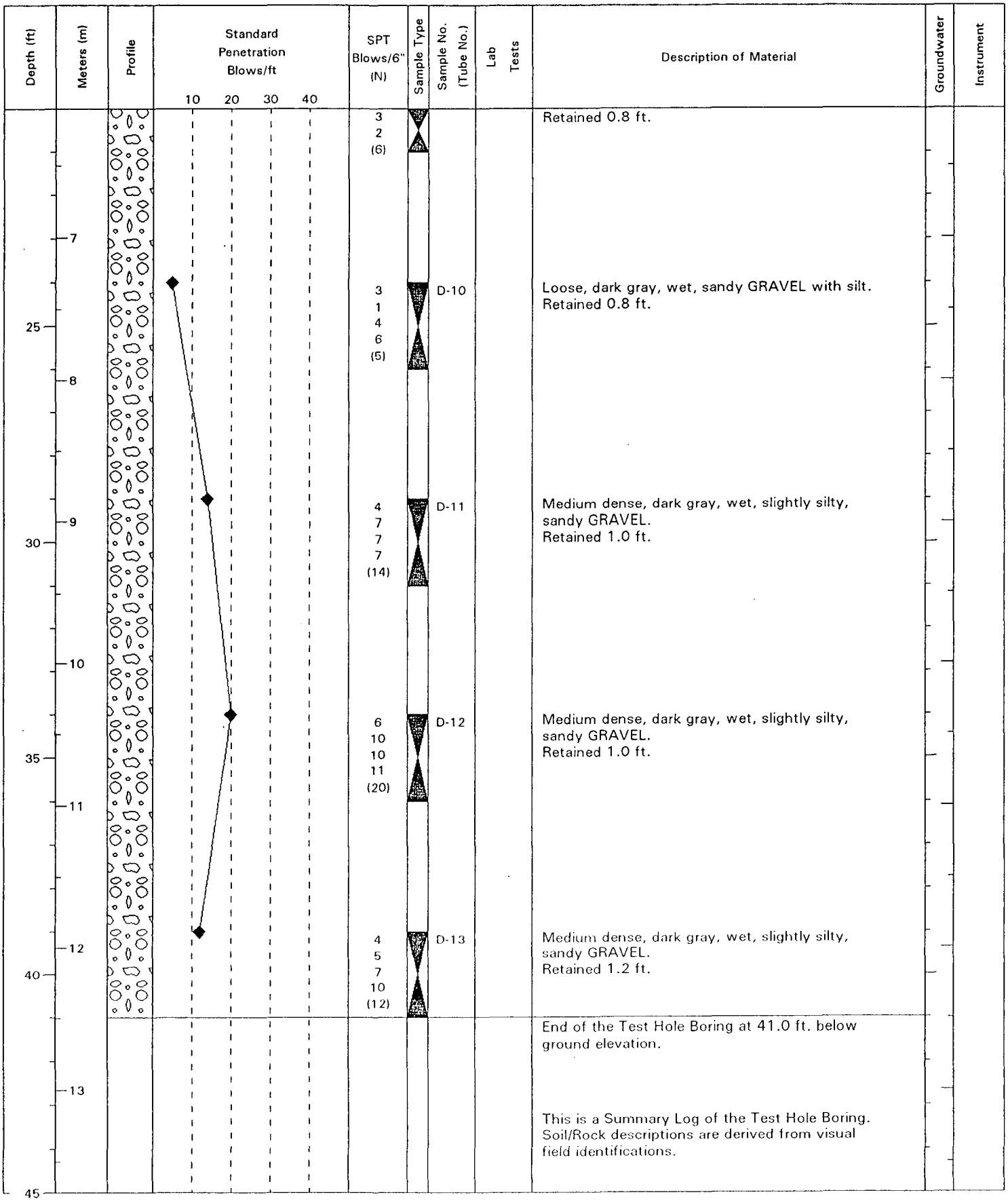
Washington State Department of Transportation

HOLE No. **H-1-93**

Sheet 2 of 2

PROJECT **Junction SR-101 to Vicinity Broadway St.**

Job No. **L-0398**



LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-2-93**

PROJECT **Junction SR-101 to Vicinity Broadway St.** Job No. **L-0398**

S.R. **109**

Station **182+50** Offset **60' Lt.** C.S. **1433**

Equipment _____ Casing **HW** Ground El **9.3 (2.83 m)**

Method of Boring **HW Rotary**

Start Date **September 8, 1993** Completion Date **September 8, 1993** Sheet **1** of **4**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				10 11 35 (46)		D-1		Dense, gray, dry, fine to coarse sandy GRAVEL with a trace of wood fragments (Basalt rock fill). Retained 1.0 ft.		
5	1			6 5 4 4 (9)		D-2		Loose, brown, wet, gravelly, clayey, silty, fine to coarse SAND (Probable fill). Retained 1.2 ft.		
	2					S-3		Greyish olive green, wet, silty GRAVEL (top 10 inches) to Soft, dark brown, wet, decomposed, fibrous PEAT and organic SILT (bottom 14 inches). (Visual ID in lab) Retained 2.0 ft.		
10	3					S-4		Soft, dark brown, wet, fibrous PEAT and organic SILT. Retained 2.0 ft.		
				2 1 1 1 (2)		D-5		Very soft, dark brown, wet, fibrous PEAT and organic SILT with pieces of wood. Retained 2.0 ft.		
	4					S-6		Soft, dark brown, wet, fibrous PEAT and organic SILT with a trace of gravel. Bottom 3 inches is fibrous PEAT with 60% wood fibers. (Visual ID in lab) Retained 1.0 ft.		
15	5					S-7		Dark brown, wet, fibrous PEAT and organic SILT with pieces of wood and a trace of gravel. Retained 1.2 ft.		
						S-8		No recovery.		
20	6									

LOG OF TEST BORING

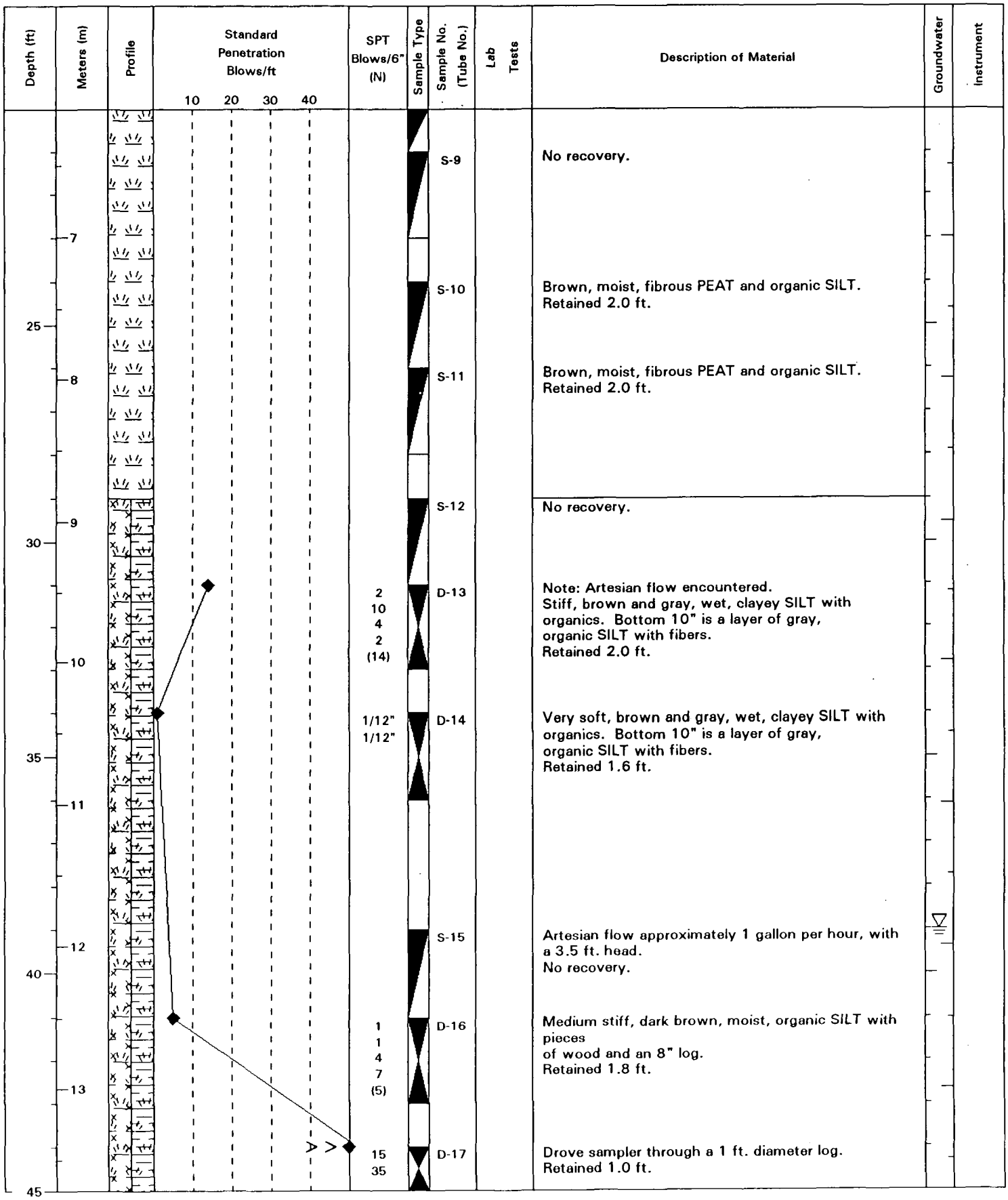
Washington State Department of Transportation

HOLE No. H-2-93

Sheet 2 of 4

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398



LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-2-93

Sheet 3 of 4

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				17 (52)						
	14									
	15			1/24"		D-18		Very soft, dark brown, moist to wet, organic SILT with pieces of wood. Retained 0.3 ft.		
50										
	16									
				1/12" 1/12"		D-19		Very soft, gray, wet, organic SILT with pieces of wood. Retained 1.0 ft.		
55										
	17									
	18			1/24"		D-20		Very soft, dark brown, wet, highly organic SILT with pieces of wood. Retained 1.0 ft.		
60										
	19									
						S-21		No recovery.		
65										
	20			3 4 4 5 (8)		D-22		Loose, dark green, wet, slightly silty, sandy GRAVEL with some pieces of wood. Retained 0.7 ft.		
	21			2 2		D-23		Very loose, brown, wet, silty, sandy GRAVEL. Retained 0.5 ft.		
70										

LOG OF TEST BORING

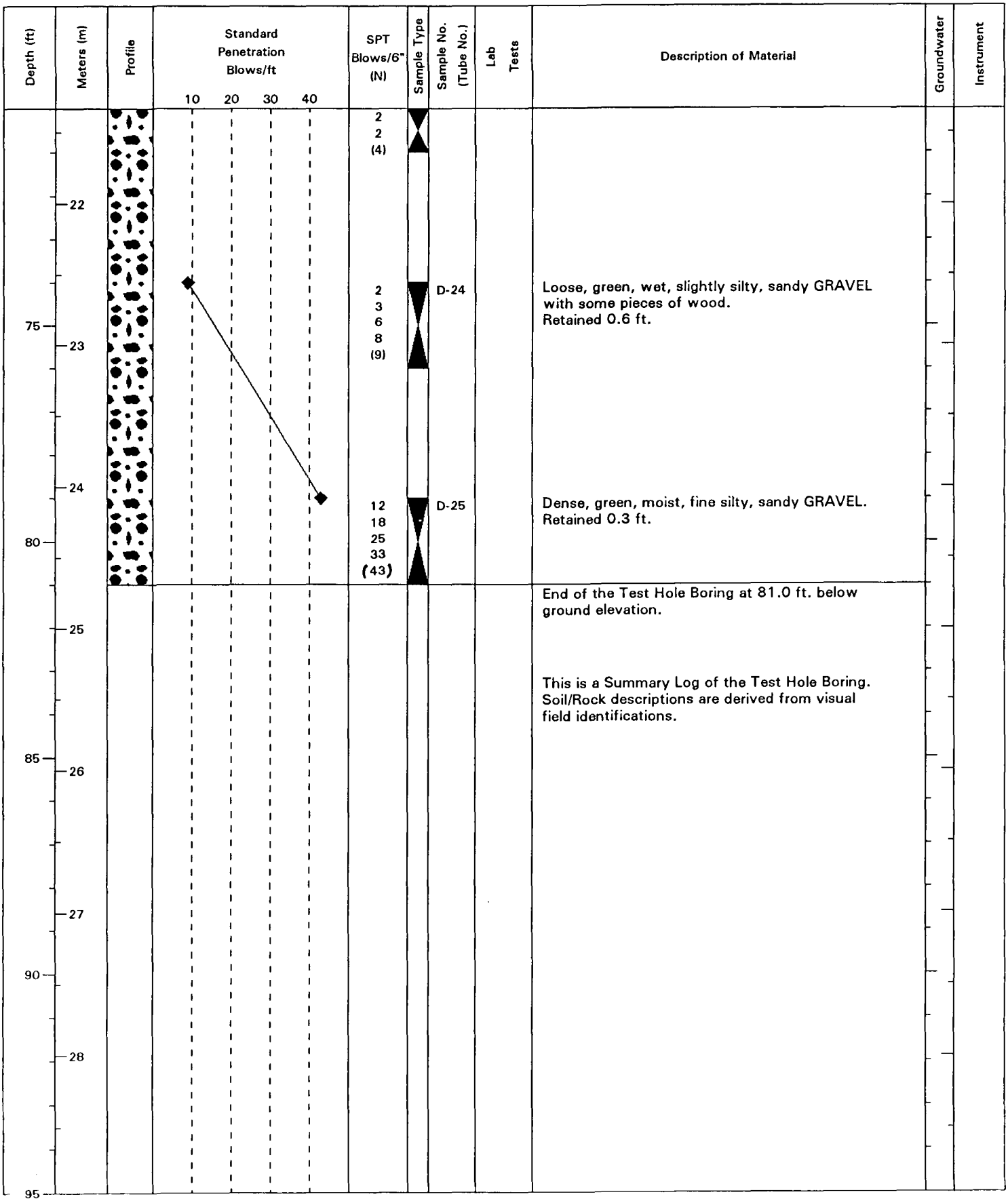
Washington State Department of Transportation

HOLE No. H-2-93

Sheet 4 of 4

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398



LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-3-93

PROJECT Junction SR-101 to Vicinity Broadway St. Job No. L-0398

S.R. 109

Station ~186 Offset 50' Lt. C.S. 1433

Equipment Casing HW Ground El 13.9 (4.24 m)

Method of Boring HW Rotary

Start Date September 2, 1993 Completion Date September 2, 1993 Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			◆	17 13 4 6 (17)		D-1A		0.4 ft of Asphaltic Concrete Pavement. Medium dense, gray, moist, silty, sandy GRAVEL (Fill). Retained 1.0 ft.		
	1								9/2/93	
						S-1		No recovery.		
5										
	2					S-2		Wet, well rounded GRAVEL intermixed with dark brown, peaty SILT. (Visual ID in lab) Retained 0.5 ft.		
						S-3		No recovery.		
10	3									
						S-4		Soft, dark brown, wet, peaty SILT with wood fibers. (Visual ID in lab) Retained 1.2 ft.		
	4									
						S-5		No recovery.		
15										
	5					S-6		Soft, dark brown, wet, fibrous SILT with coarse sand and gravel. Retained 0.7 ft.		
						S-7		Dark brown, wet, highly organic SILT with pieces of wood.		
	6									
20										

LOG OF TEST BORING

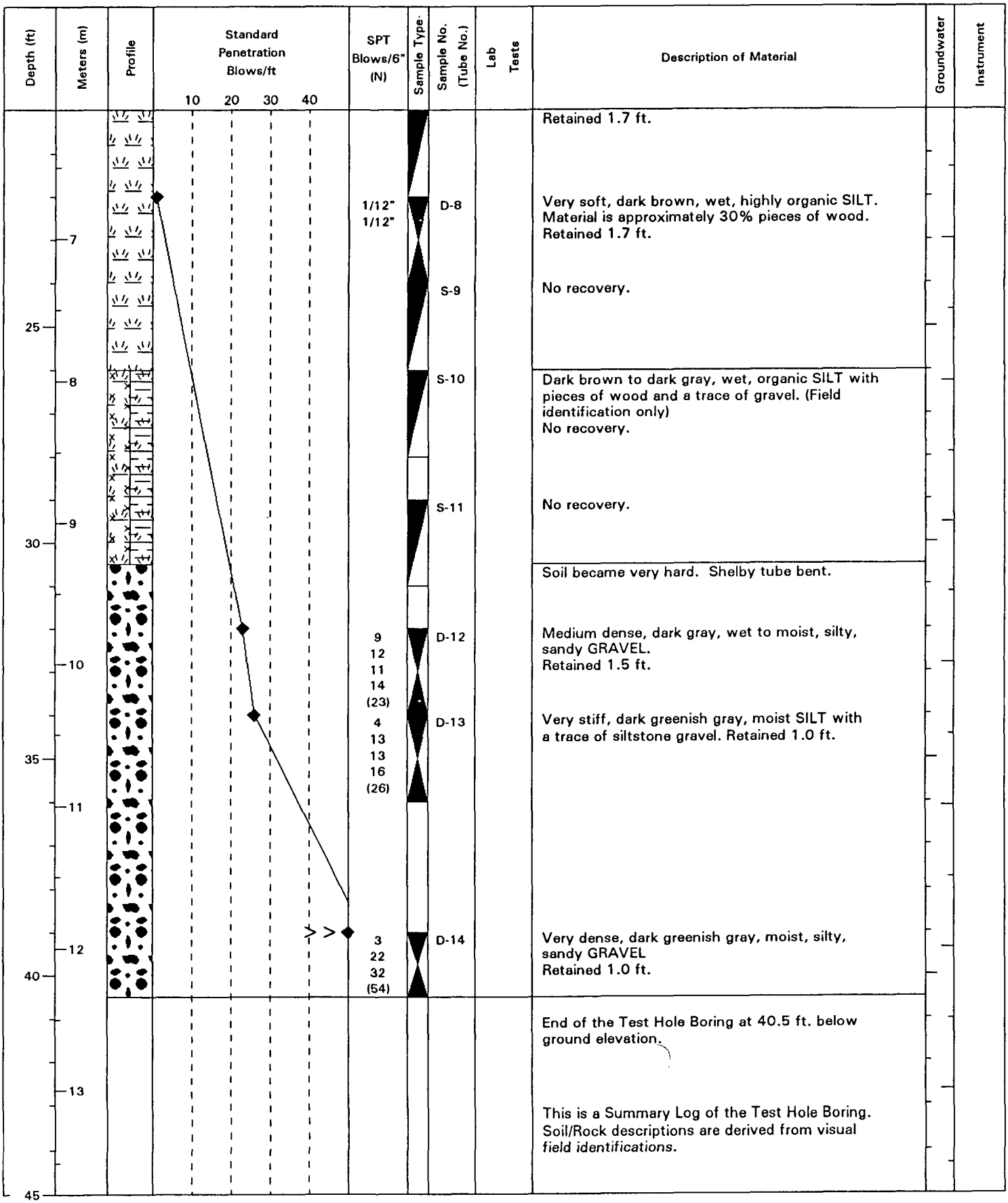
Washington State Department of Transportation

HOLE No. H-3-93

Sheet 2 of 2

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398



LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-4-93**

PROJECT **Junction SR-101 to Vicinity Broadway St.** Job No. **L-0398**

S.R. **109**

Station **188+50** Offset **20' Lt.** C.S. **1433**

Equipment Casing **3" Augers to 65'** Ground El **21.7 (6.61 m)**

Method of Boring **Hollow Core Augers**

Start Date **January 13, 1993** Completion Date **January 13, 1993** Sheet **1** of **3**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				2 2 4 2 (6)		D-1		Loose, light brown, moist, gravelly, inorganic SILT (Fill?). Retained 2.0 ft.		
				2 3 3 4 (6)		D-2		Loose, light brown, moist, gravelly, inorganic SILT with a 2" layer of gravel (Fill?). Retained 0.5 ft.		
5	1					S-3		1/13/93 Retained 0.8 ft.	▽	
	2			1 1 1 1 (2)		D-4		Loose, light brown, moist, gravelly, inorganic SILT (Fill?). Retained 1.0 ft.		
10	3			A		U-5		Yellowish brown and gray, wet, silty GRAVEL. Retained 0.3 ft.		
				1 1 1 1 (2)		D-6	MC	M.C. = 73.8% Soft, brown and gray, saturated, peaty SILT with a 1" piece of wood. Retained 1.5 ft.		
15	4 5					S-7	MC CU	OL, M.C. = 109.7%, 96.5%, 103.7% Soft, dark brown, saturated, peaty SILT. Retained 1.5 ft.		
				1 2 1 2 (3)		D-8	MC GS AL	ML, M.C. = 158.8% Soft, dark brown, saturated, peaty SILT. Retained 1.5 ft.		
20	6									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-4-93

Sheet 2 of 3

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
						S-9		Retained 0.9 ft.		
				3 3 3 2 (6)		D-10		Medium stiff, dark brown, wet, peaty SILT. Retained 1.5 ft.		
25	7					S-11		Retained 2.0 ft.		
	8			2 2 2 2 (4)		D-12		Soft, dark brown, wet, peaty SILT. Retained 2.0 ft.		
30	9					S-13	MC GS AL CN	ML, M.C. = 108.6% Dark gray, saturated, fine to medium sandy SILT with fibrous organic material. Retained 1.9 ft.		
	10			1 2 1 2 (3)		D-14		Soft, dark brown, wet, peaty SILT. Retained 2.0 ft.		
35	11									
	12									
40						S-15		Retained 2.0 ft.		
	13			2 2 2 2 (4)		D-16		Soft, dark brown and gray, wet to moist, peaty SILT. Retained 2.0 ft.		
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-4-93

Sheet 3 of 3

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
	14									
	15									
50						S-17	MC GS AL CN	SM, M.C. = 79% Very dark gray, saturated, gravelly, very silty, fine to coarse SAND with wood fragments and fibrous organic material. Retained 0.9 ft.		
	16			2 3 3 3 (6)		D-18		Medium stiff, dark brown and gray, wet, peaty SILT with sand and gravel. Retained 2.0 ft.		
55										
	17									
	18									
60			> >	18 44 50/4"		D-19		Very dense, gray, wet, sandy, silty GRAVEL. Retained 0.8 ft.		
	19									
65				15 50 (50/6")		D-20		Very dense, gray, wet to moist, sandy, silty GRAVEL. Retained 1.0 ft.		
	20									
								End of the Test Hole Boring at 66.0 ft. below ground elevation.		
	21									
								This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-5-93**

PROJECT **Junction SR-101 to Vicinity Broadway St.** Job No. **L-0398**

S.R. **109**

Station **11+13** Offset **9' Lt.** C.S. **1433**

Equipment _____ Casing **3" Augers to 86'** Ground El **7.6 (2.32 m)**

Method of Boring **Hollow Core Augers**

Start Date **January 14, 1993** Completion Date **January 14, 1993** Sheet **1** of **4**

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				5 5 8 8 (13)		D-1		Medium dense, brown and gray, wet, silty, sandy GRAVEL. Retained 0.5 ft.		
				10 10 8 7 (18)		D-2		Medium dense, gray, wet, sandy GRAVEL. Retained 0.4 ft.		
5	1									
	2			A B C		U-3		No recovery.	▽	
								1-14-93		
				2 2 1 1 (3)		D-4		Soft, dark brown, wet, fibrous PEAT and organic SILT with some gravel. Retained 0.2 ft.		
10	3									
				A B C		U-5		Dark brown, wet, highly organic SILT and fibrous PEAT.		
	4			1 1 1 1 (2)		D-6	MC	M.C. = 272.6% Soft, dark brown, wet PEAT. Retained 1.0 ft.		
15										
	5					S-7		Retained 1.8 ft.		
				1 1 1 2 (2)		D-8		Soft, dark brown, wet fibrous PEAT with pieces of wood. Retained 1.5 ft.		
20	6									

LOG OF TEST BORING

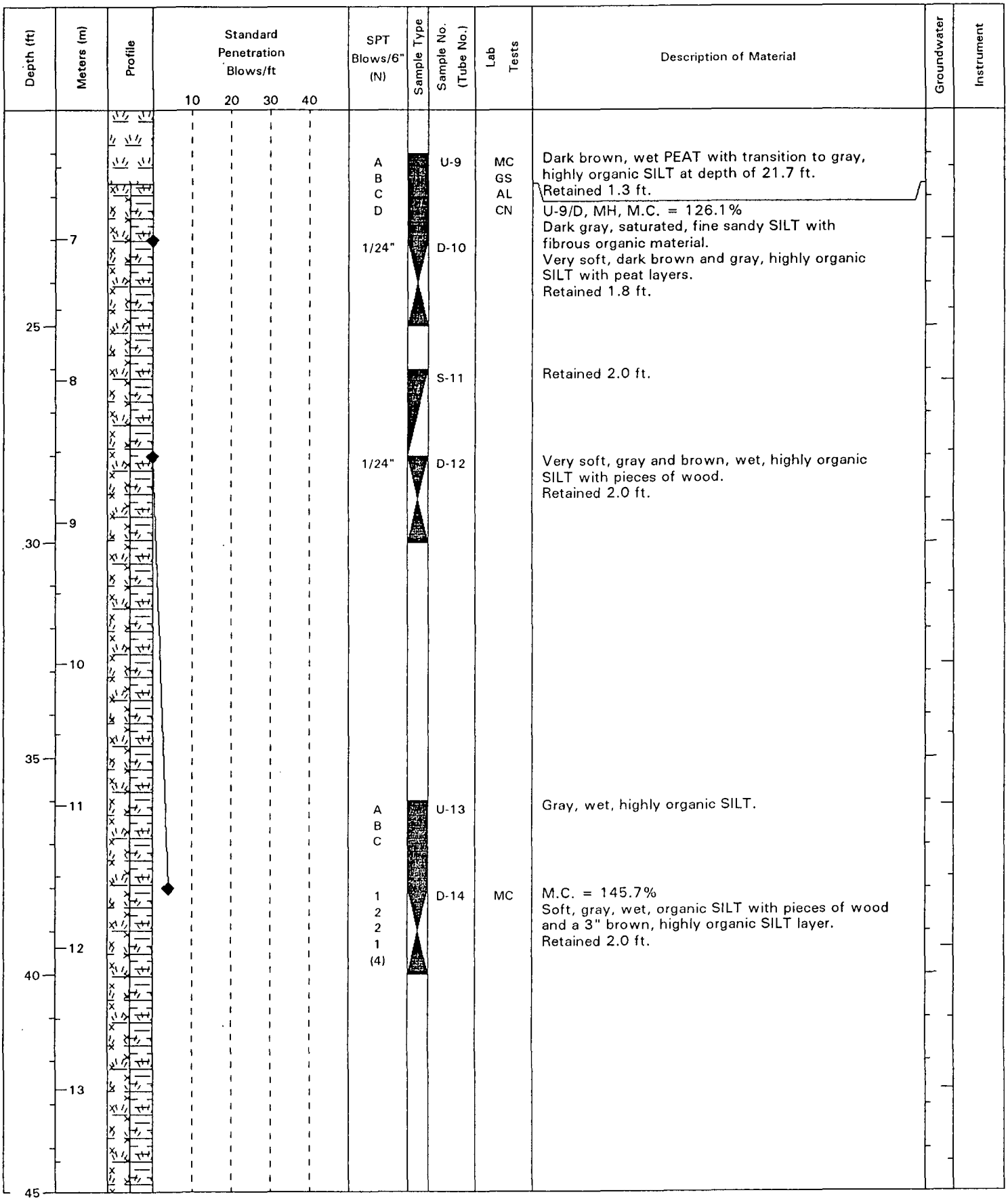
Washington State Department of Transportation

HOLE No. H-5-93

Sheet 2 of 4

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398



Depth (ft)	Meters (m)	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			A B C D		U-9	MC GS AL CN	Dark brown, wet PEAT with transition to gray, highly organic SILT at depth of 21.7 ft. Retained 1.3 ft. U-9/D, MH, M.C. = 126.1%		
	7		1/24"		D-10		Dark gray, saturated, fine sandy SILT with fibrous organic material. Very soft, dark brown and gray, highly organic SILT with peat layers. Retained 1.8 ft.		
25									
	8				S-11		Retained 2.0 ft.		
			1/24"		D-12		Very soft, gray and brown, wet, highly organic SILT with pieces of wood. Retained 2.0 ft.		
	9								
30									
	10								
35									
	11		A B C		U-13		Gray, wet, highly organic SILT.		
			1 2 2 1 (4)		D-14	MC	M.C. = 145.7% Soft, gray, wet, organic SILT with pieces of wood and a 3" brown, highly organic SILT layer. Retained 2.0 ft.		
	12								
40									
	13								
45									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-5-93

Sheet 3 of 4

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
	14			A B C		U-15		Gray, wet, organic SILT with a 4" PEAT layer.		
				2 2 2 2 (4)		D-16	MC	M.C. = 288.5% Soft, dark brown, moist to wet, highly organic SILT. Retained 2.0 ft.		
50	15									
	16									
55										
	17			A B C		U-17		Gray, wet, organic SILT with pieces of wood.		
				1 1 1 1 (2)		D-18		Soft, gray, wet, organic SILT with pieces of wood. Retained 2.0 ft.		
	18									
60										
	19									
65										
	20			B		U-19	MC	M.C. = 162.6% Gray and dark brown, wet, silty PEAT with a 1 ft. layer of wood.		
				1 1 1 1 (2)		D-20		Soft, gray and brown, wet, organic SILT with pieces of wood. Retained 2.0 ft.		
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-5-93

Sheet 4 of 4

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
75	22									
	23			A		U-21		Gray and brown, wet, organic SILT with a 3" piece of wood.		
				8		D-22		Medium dense, gray, wet, silty, sandy GRAVEL. Retained 0.7 ft.		
	24			11						
80				8						
				8						
				(19)						
	25									
85										
	26			2		D-23		Medium stiff, gray and brown, wet, organic SILT with pieces of wood and some gravel. Retained 2.0 ft.		
				4						
				4						
				5						
				(8)						
	27							End of the Test Hole Boring at 88.0 ft. below ground elevation.		
90										
								This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
	28									
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-6-93

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

S.R. 109

Station 12+17

Offset 20' Rt.

C.S. 1433

Equipment

Casing 3" Augers to 62'

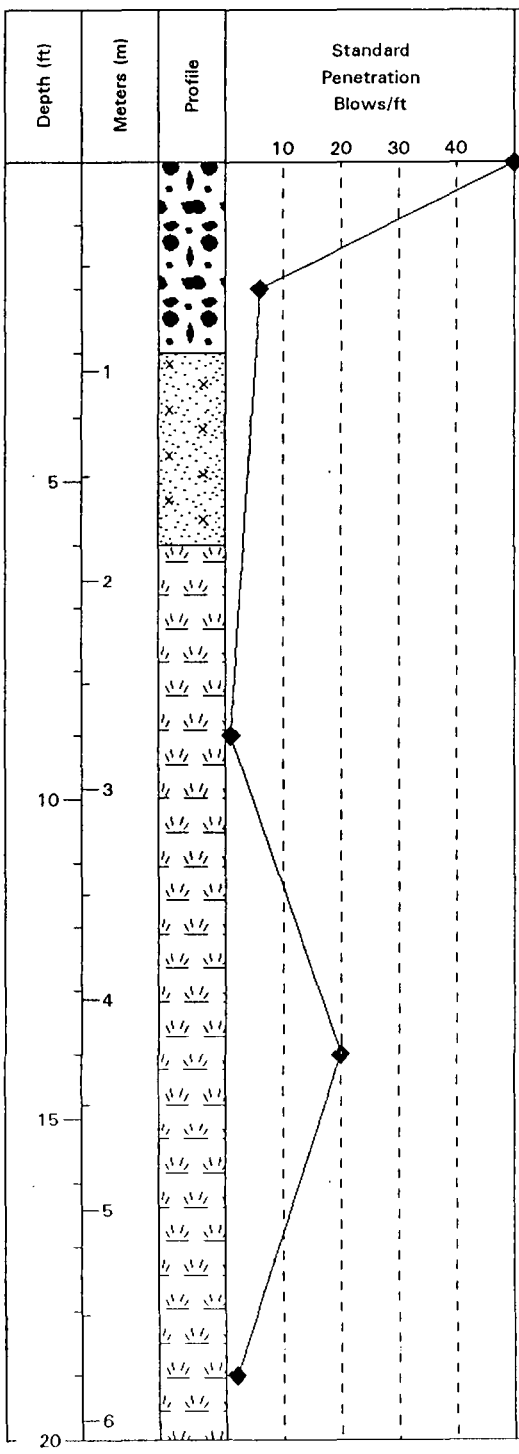
Ground El 10.0 (3.05 m)

Method of Boring Hollow Core Augers

Start Date January 12, 1993

Completion Date January 12, 1993

Sheet 1 of 3



SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
18 50 (50/6")		D-1		Very dense, brown, moist, silty, gravelly SAND. Retained 0.7 ft.		
12 4 2 2 (6)		D-2		Loose, brown, moist, silty, gravelly SAND. Retained 0.3 ft.		
				1-12-93	▽	
A		U-3		Gray, moist to wet, sandy SILT with some gravel. Retained 0.3 ft.		
		U-4		Brown, wet PEAT with wood chunks. No recovery, Field identification only.		
1/18" 1/18"		D-5		Very soft, dark brown, wet PEAT with wood chunks. Retained 0.5 ft.		
A B C		U-6	MC CU	PT (Visual ID in lab) Dark brown, saturated, fine to coarse sandy PEAT with wood chips. U-6/C, PT, M.C. = 137.7% Dark brown, saturated PEAT with wood. Retained 1.0 ft.		
4 16 4 50/2"		D-7		Medium stiff, dark brown, wet PEAT with a 3" piece of wood. Retained 0.8 ft.		
A		U-8	MC	M.C. = 531.4% Black, saturated, woody PEAT. Retained 0.3 ft.		
1 1		D-9	MC GS	SM, M.C. = 206.2% Very loose, dark gray and dark greenish gray,		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-6-93

Sheet 2 of 3

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				1 1 (2)				saturated, fine to coarse sandy SILT with wood fragments and fibrous organic material. Retained 1.5 ft.		
				A		U-10	MC CU	U-10/A, PT, M.C. = 235.9% Dark brown, saturated PEAT. Retained 0.3 ft.		
	7									
				1 1 1 1 (2)		D-11		Very loose, dark brown, wet, gravelly, fine to coarse sandy SILT. Retained 2.0 ft.		
25										
	8									
				A B C		U-12	MC CU	U-12/A, PT, M.C. = 196.6% Dark brown, saturated PEAT. Retained 1.0 ft.		
				1/18" 1/18"		D-13	MC GS AL	MH, M.C. = 118.3%, PI = 20.3 Very loose, gray and dark gray, saturated, gravelly, fine to coarse sandy SILT. Retained 2.0 ft.		
30	9									
				A B		U-14		Dark brown and gray, wet, highly organic SILT. Retained 0.7 ft.		
	10									
				1 1 1 1 (2)		D-15	MC GS AL	ML, M.C. = 90.9% Soft, gray and brown, saturated, fine sandy SILT with fibrous organic material. Retained 1.0 ft.		
35										
	11									
				A B		U-16	MC GS AL CN	U-16/A, ML, M.C. = 116.7% Gray and brown, saturated, fine sandy SILT with fibrous organic material. Retained 0.7 ft.		
				1 1 2 2 (3)		D-17		Soft, gray and brown, wet, fine sandy SILT with fibrous organic material, wood chunks, and siltstone. Retained 2.0 ft.		
40	12									
				A		U-18		Gray and brown, wet, organic SILT with pieces of wood and siltstone. Retained 0.3 ft.		
	13									
				1 2		D-19		Soft, gray and brown, fine sandy SILT with fibrous organic material, pieces of wood and a trace of		
45										

LOG OF TEST BORING

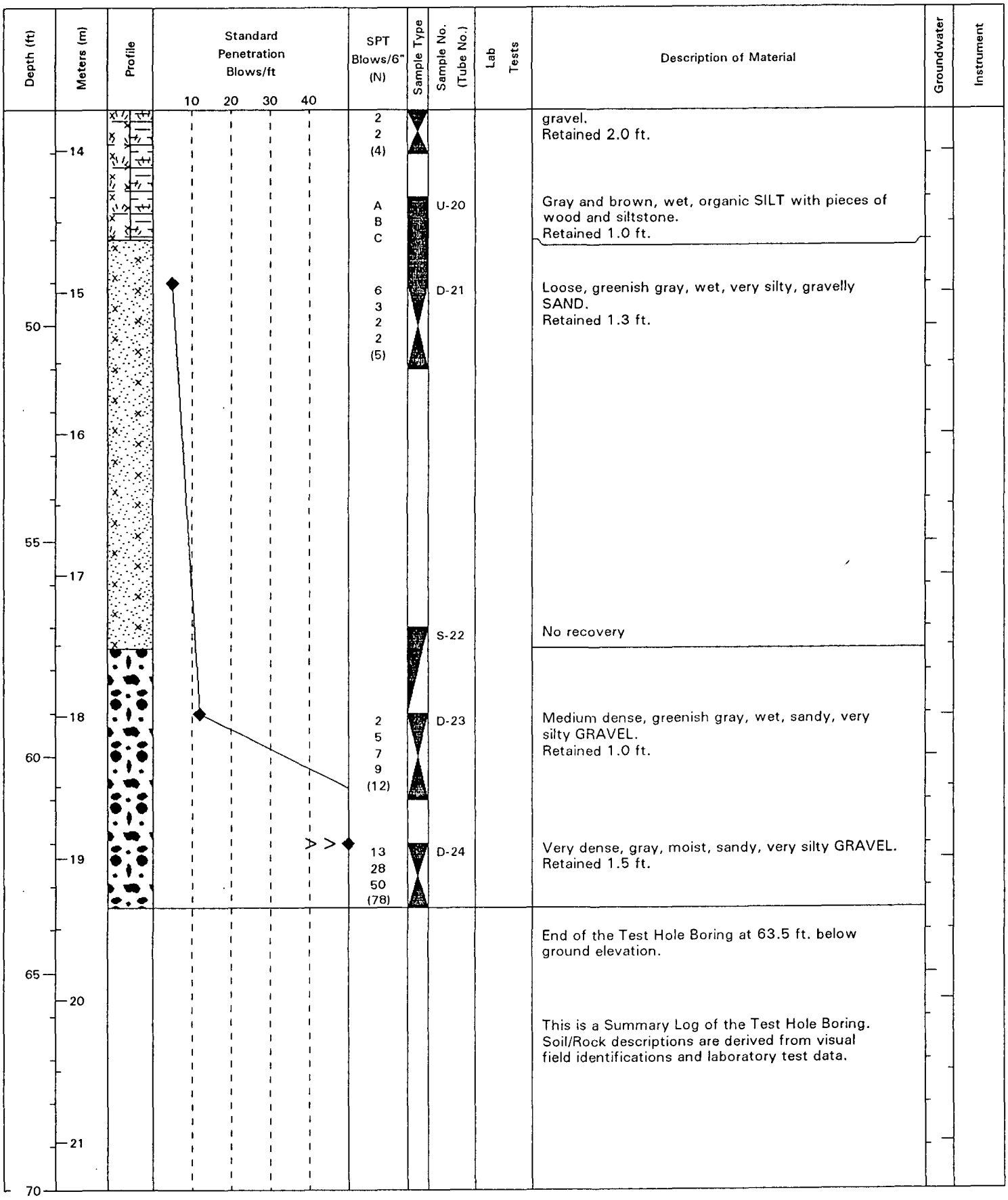
Washington State Department of Transportation

HOLE No. H-6-93

Sheet 3 of 3

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398



LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-7-94

PROJECT Junction SR-101 to Vicinity Broadway St. Job No. L-0398

S.R. 109

Station 179+50 Offset 20' Lt. C.S. 1433

Equipment Casing 4" AUGERS TO 24' Ground El 12.8 (3.90 m)

Method of Boring H.C. AUGERS

Start Date September 26, 1994 Completion Date September 26, 1994 Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				9 13 10 8 (23)		D-1		GW, well graded GRAVEL with sand, subangular, medium density, dark grey, dry, disrupted. Recovered 1.5 ft. Retained 1.5 ft.		
	1									
5				2 2 1 1 (3)		D-2		SM, silty SAND, very loose, brown, moist, disrupted. Recovered 0.5 ft. Retained 0.5 ft.		
	2							Inspector's Note: By what was on the outside of D-2 after drilling down to a depth of 11'; the material from depth of 6' to 11' should be organic soil.		
						U-3		No recovery. 9/26/94	▽	
10	3									
						U-4		GM, silty GRAVEL with sand, gray, moist, homogeneous (Visual ID only). Recovered 0.3 ft. Retained 0.3 ft.		
	4			1/12" 1 1 (2)		D-5		SM, silty SAND, very loose, gray, wet, homogeneous. Recovered 0.7 ft.		
15										
	5									
				1 3		D-6		SM, silty SAND with gravel, loose, gray, wet, homogeneous.		
	6									
20										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-7-94

Sheet 2 of 2

PROJECT Junction SR-101 to Vicinity Broadway St.

Job No. L-0398

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				6 4				Recovered 0.9 ft. Retained 0.9 ft.		
	7									
				9 10 20 23 (30)		D-7		ML, SILT, very stiff, gray, moist, homogeneous. Recovered 2.0 ft. Retained 1.5 ft.		
25	8							End of the Test Hole Boring at 26.0 ft. below ground elevation. This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.		
30	9									
	10									
35	11									
	12									
40										
	13									
45										

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-1-91 Sub Section Cont. Sec. 1433

Station ~185+00 Offset Centerline Ground El. 11.0

Type of Boring Hollow Core Augers Casing 3" Augers to 42' W.T. El. 3.5'

Inspector Date May 22, 1991 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	13		STD 12 PEN 8 1 5 3	Medium dense, gray, moist, silty, sandy GRAVEL. Retained 0.8 ft.
	2		STD 1 PEN 1 2 1 2	Soft, gray, wet, slightly organic SILT. Retained 0.8 ft.
5				
	0		STD 0/24" PEN 3	▽ Very soft, dark brown, wet, woody PEAT. Retained 1.0 ft. 5-22-91
10				
	0		STD 0/24" PEN 4	Very soft, dark brown, wet, woody PEAT. Retained 0.8 ft.
15				
	0		STD 0/24" PEN 5	Very soft, dark gray, wet, organic SILT with pieces of wood and siltstone. Retained 2.0 ft.
20				

Continued Next Page

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-1-91 Sub Section Cont. Sec. 1433

Station ~185+00 Offset Centerline Ground El. 11.0

Type of Boring Hollow Core Augers Casing 3" Augers to 42' W.T. El. 3.5'

Inspector Date May 22, 1991 Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.		DESCRIPTION OF MATERIAL
	0		STD PEN 6	0/24"	Very soft, dark gray, wet, slightly organic SILT with pieces of siltstone and wood. Retained 2.0 ft.
25					
	6		STD PEN 7	2 3 3 3	Loose, gray, wet, silty, sandy GRAVEL. Retained 0.8 ft.
30					
	27		STD PEN 8	4 11 16 25	Very stiff, gray, dry SILT with a trace of sand. Retained 1.7 ft.
35					
	32		STD PEN 9	9 14 18 22	Hard, gray, moist to dry, SILT with siltstone pieces. Retained 1.2 ft.
40					

Continued Next Page

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-1-91 Sub Section Cont. Sec. 1433

Station ~185+00 Offset Centerline Ground El. 11.0

Type of Boring Hollow Core Augers Casing 3" Augers to 42' W.T. El. 3.5'

Inspector Date May 22, 1991 Sheet 3 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.			DESCRIPTION OF MATERIAL
	104		STD		20	Very dense, gray, moist to dry, silty, sandy GRAVEL. Gravel is siltstone pieces. Retained 0.8 ft.
			PEN		44	
			10		60	
					55	
45						End of the Test Hole Boring at 44.0 ft. below ground elevation.
						This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.
50						
55						
60						

DOT FORM 351-003 REVISED 12/79

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-2-91 Sub Section Cont. Sec. 1433

Station ~181+00 Offset 15' Left Ground El. 10.0

Type of Boring Hollow Core Augers Casing 3" augers to 37 ft. W.T. El. 0'

Inspector Date May 23, 1991 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	18		STD 11 PEN 11 1 7 6	Medium dense, gray, moist, silty, sandy GRAVEL. Retained 1.0 ft.
	5		STD 3 PEN 3 2 2 2	Medium stiff, gray, moist to wet, slightly organic SILT. Retained 0.2 ft.
5				
	2		STD 1 PEN 1 3 1	Very soft, brown, moist PEAT with some highly organic silt. Retained 1.7 ft.
10				▽ 5-23-91
	0		STD 0/24" PEN 4	Very soft, brown, moist to wet, woody PEAT. Retained 1.9 ft.
15				
	1		STD 1/12" PEN 1/12" 5	Very soft, gray and brown, wet, highly organic SILT with pieces of wood. Retained 2.0 ft.
20				

Continued Next Page

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-2-91 Sub Section Cont. Sec. 1433

Station ~181+00 Offset 15' Left Ground El. 10.0

Type of Boring Hollow Core Augers Casing 3" augers to 37 ft. W.T. El. 0'

Inspector Date May 23, 1991 Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	7		STD PEN 6: 1, 3, 4, 5	Loose, gray, wet, sandy GRAVEL with a trace of silt. Retained 0.7 ft.
25				
	3		STD PEN 7: 1, 1, 2, 3	Very loose, gray, wet, organic, silty, sandy GRAVEL with pieces of wood. Retained 0.9 ft.
30				
	22		STD PEN 8: 5, 11, 11, 8	(5' heave) Medium dense, gray, wet, silty, sandy GRAVEL with a piece of wood. Retained 0.9 ft.
35				
	20		STD PEN 9: 8, 10, 10, 11	(2.5 ' heave) Medium dense, gray, wet, silty, sandy GRAVEL. Retained 1.1 ft.
40				End of the Test Hole Boring at 39.0 ft. below ground elevation.

Continued Next Page

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-2-91 Sub Section Cont. Sec. 1433

Station ~181+00 Offset 15' Left Ground El. 10.0

Type of Boring Hollow Core Augers Casing 3" augers to 37 ft. W.T. El. 0'

Inspector Date May 23, 1991 Sheet 3 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.
45				
50				
55				
60				

DOT FORM 351-003 REVISED 12/79

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-3-91 Sub Section Cont. Sec. 1433

Station ~183+00 Offset 12' Left Ground El. 10.5

Type of Boring Hollow Core Augers Casing 3" augers to 27' W.T. El. 0.5'

Inspector Date May 23, 1991 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	32		STD 8 PEN 12 1 20 16	Dense, gray, dry, pieces of BASALT rock, with some silt. Retained 0.8 ft.
	13		STD 4 PEN 6 2 7 7	Stiff, brown, moist SILT Retained 0.8 ft.
5				
	5		STD 1 PEN 2 3 3 3	Medium stiff, brown, wet, rotten wood with a 3" organic silt layer. Retained 0.8 ft.
10				▽ 5-23-91
	3		STD 2 PEN 1 4 2 2	Soft, wet, brown, rotten wood with a 2" silt layer. Retained 0.5 ft.
15				
	12		STD 3 PEN 5 5 7 11	Medium dense, gray, wet, silty, sandy GRAVEL. Retained 1.1 ft.
20				

Continued Next Page

LOG OF TEST BORING

Washington State Department of Transportation

S.R. 109 SECTION Hoquiam to Grays Harbor City Job No. XL-0398

Hole No. C-3-91 Sub Section Cont. Sec. 1433

Station ~183+00 Offset 12' Left Ground El. 10.5

Type of Boring Hollow Core Augers Casing 3" augers to 27' W.T. El. 0.5'

Inspector Date May 23, 1991 Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.			DESCRIPTION OF MATERIAL
	18		STD PEN 6		7 9 9 6	Very stiff, gray, moist to dry SILT with a trace of sand and gravel. Retained 1.2 ft.
25						
	26		STD PEN 7		7 13 13 12	Very stiff, gray, moist SILT with a 4" silty, sandy, gravel layer. Retained 1.0 ft.
30						End of the Test Hole Boring at 29.0 ft. below ground elevation.
						This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.
35						
40						

DOT FORM 351-003 REVISED 12/79

Appendix B

Laboratory Testing Data

Job No. **L-0398** Date **September 29, 1994**

Hole No. **H-1-93** Sheet **1** of **1**

Project **Junction SR-101 to Vicinity Broadway St.**

Laboratory Summary

Washington State Department of Transportation

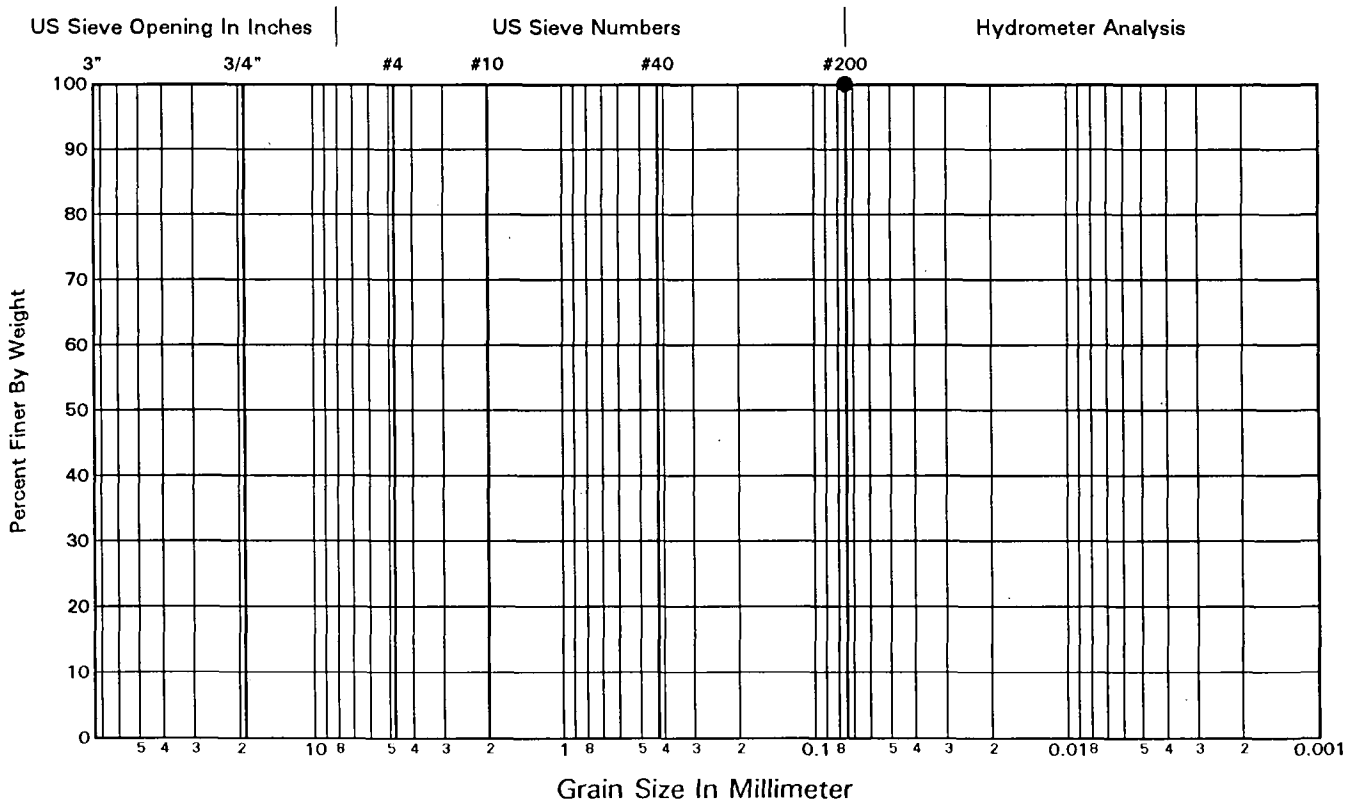
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	7.0	2.13	S-4	PT/OL	BLACK	DCOMPOSED WOOD WASTE-PEATY- & ORGANIC SILT	270	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cu	Cc
●					

GRADATION VALUES

	D60	D50	D30	D20	D10
●					



Job No. **L-0398** Date **September 30, 1994**

Hole No. **H-2-93** Sheet **1** of **1**

Project **Junction SR-101 to Vicinity Broadway St.**

Laboratory Summary

Washington State Department of Transportation

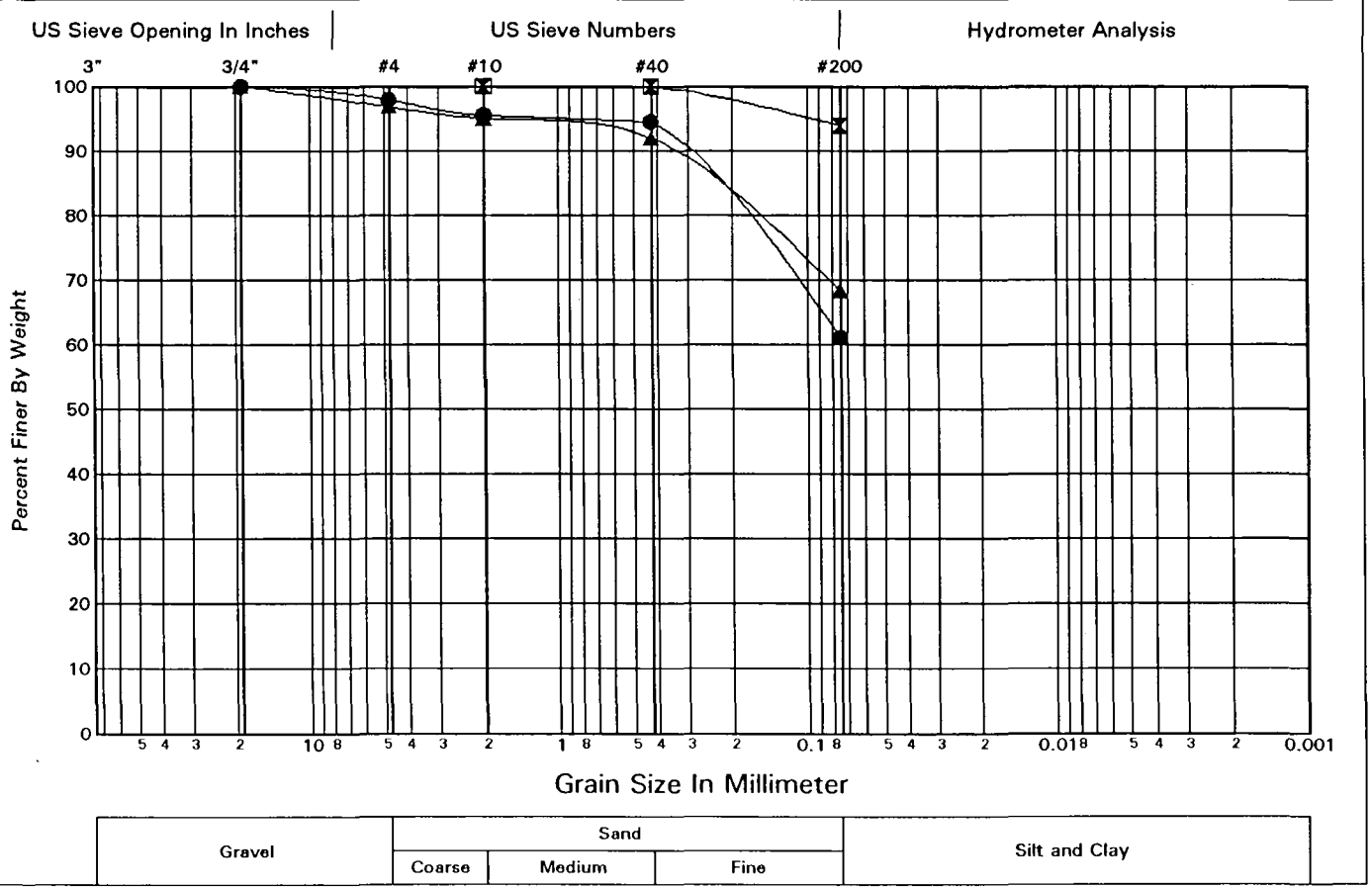
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	17.0	5.18	S-7	PT/OL	DARK BROWN	SANDY SILTY PEAT AND ORGANIC SILT	185	NP	NP	NP
⊠	25.0	7.62	S-10	MH	GRAY	ELASTIC SILT	13	62	40	22
▲	27.0	8.23	S-11	ML	OLIVE GRAY	SANDY SILT w/fibrous organic silt	275	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cu	Cc
●	2.1	36.8	61.1		
⊠	0.0	6.1	93.9		
▲	3.2	28.5	68.3		

GRADATION VALUES

	D60	D50	D30	D20	D10
●					
⊠					
▲					



CONSOLIDATION TEST DATA

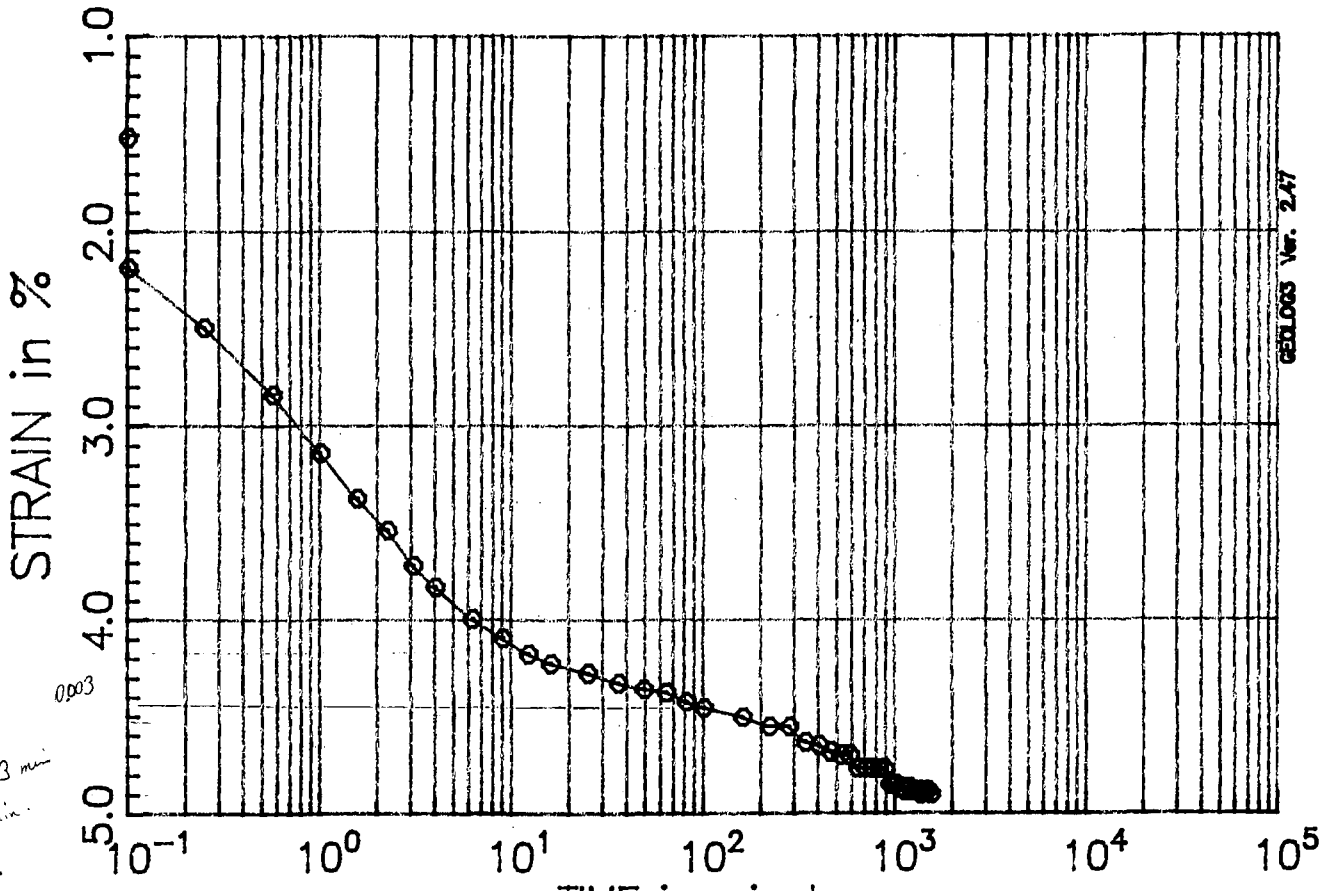
SOIL SAMPLE: DARK BROWN WET PEAT
LOCATION: 182+50 60'LT
BORING NO: H-2-93
SAMPLE NO: S-7 DEPTH: 17'

SPECIFIC GRAVITY OF SOLIDS: 2.65
HEIGHT OF SOLIDS: 0.0925 in.
SAMPLE DIAMETER: 1.91 in.
CALIBRATION FACTOR: .10544
INITIAL DISP. READING: 9.599999E-01

	TRIMMINGS	SPECIMEN + RING BEFORE	SPECIMEN + RING AFTER	AFTER
CONTAINER NO		RING	RING	
WT CONTAINER + WET SOIL gm	307.300	449.300	440.100	62.600
WT CONTAINER + DRY SOIL gm	161.100	426.600	426.600	49.100
WT CONTAINER gm	82.000	415.100	415.100	37.600
WT DRY SOIL gm	79.100	11.500	11.500	11.500
WATER CONTENT %	184.829	197.391	117.391	117.391
VOID RATIO	----------	5.759	5.299	----------
DEGREE OF SATURATION %	----------	90.828	58.712	----------

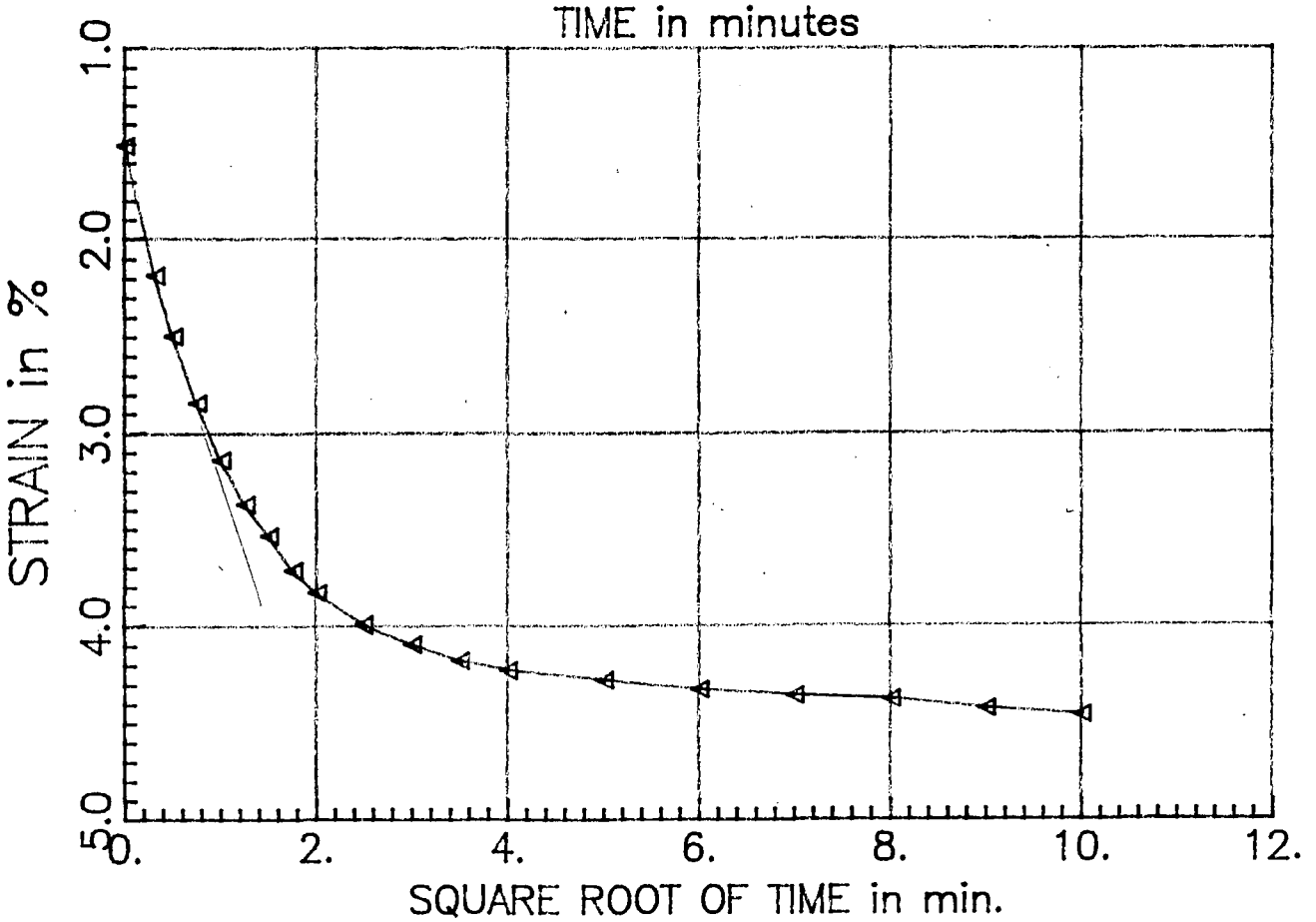
PROJECT: JCT SR-101 TO BROADWAY ST
FILE NO.: XL-0398 TEST NO.: F0666-7
DATE: 8-3-94
TESTED BY: LHB
CHECKED BY: KWT

WASHINGTON STATE DOT



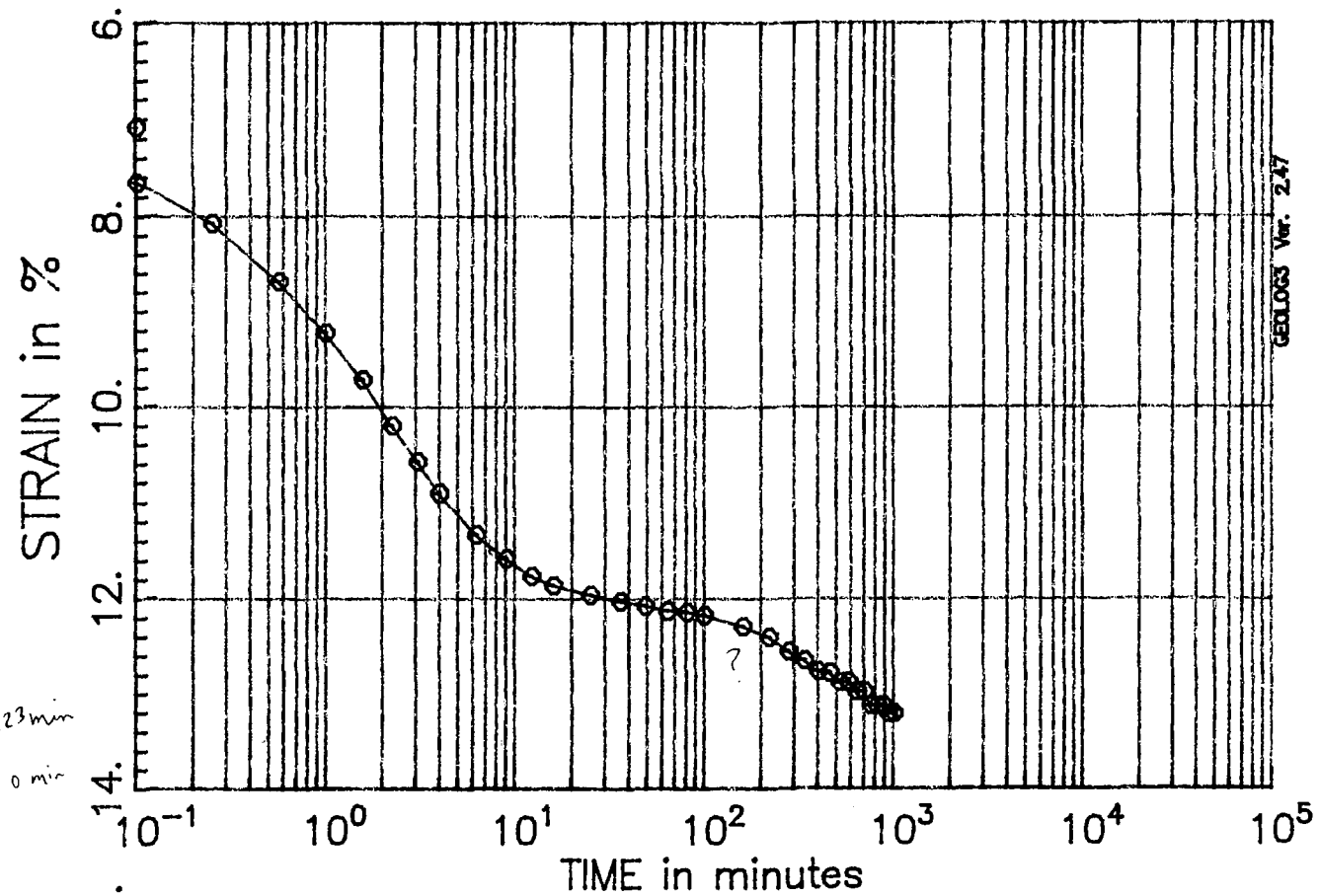
0.003

$t_{50} = 0.23$ min
$t_{90} = 1.0$ min



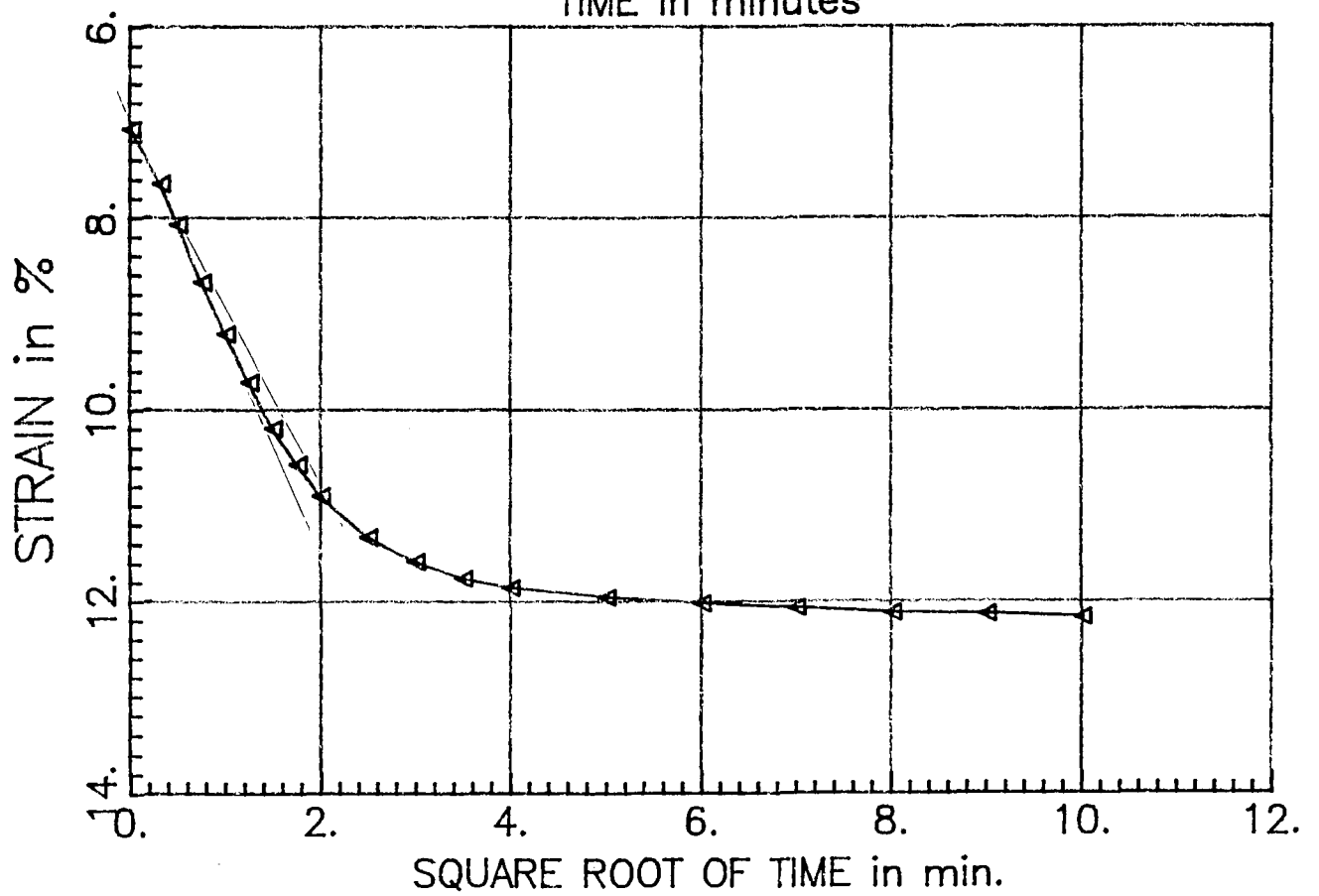
PRESSURE INCREMENT
FROM 0.00 TSF TO 0.25 TSF

Test No: F0666-7
Testname: F0666-9



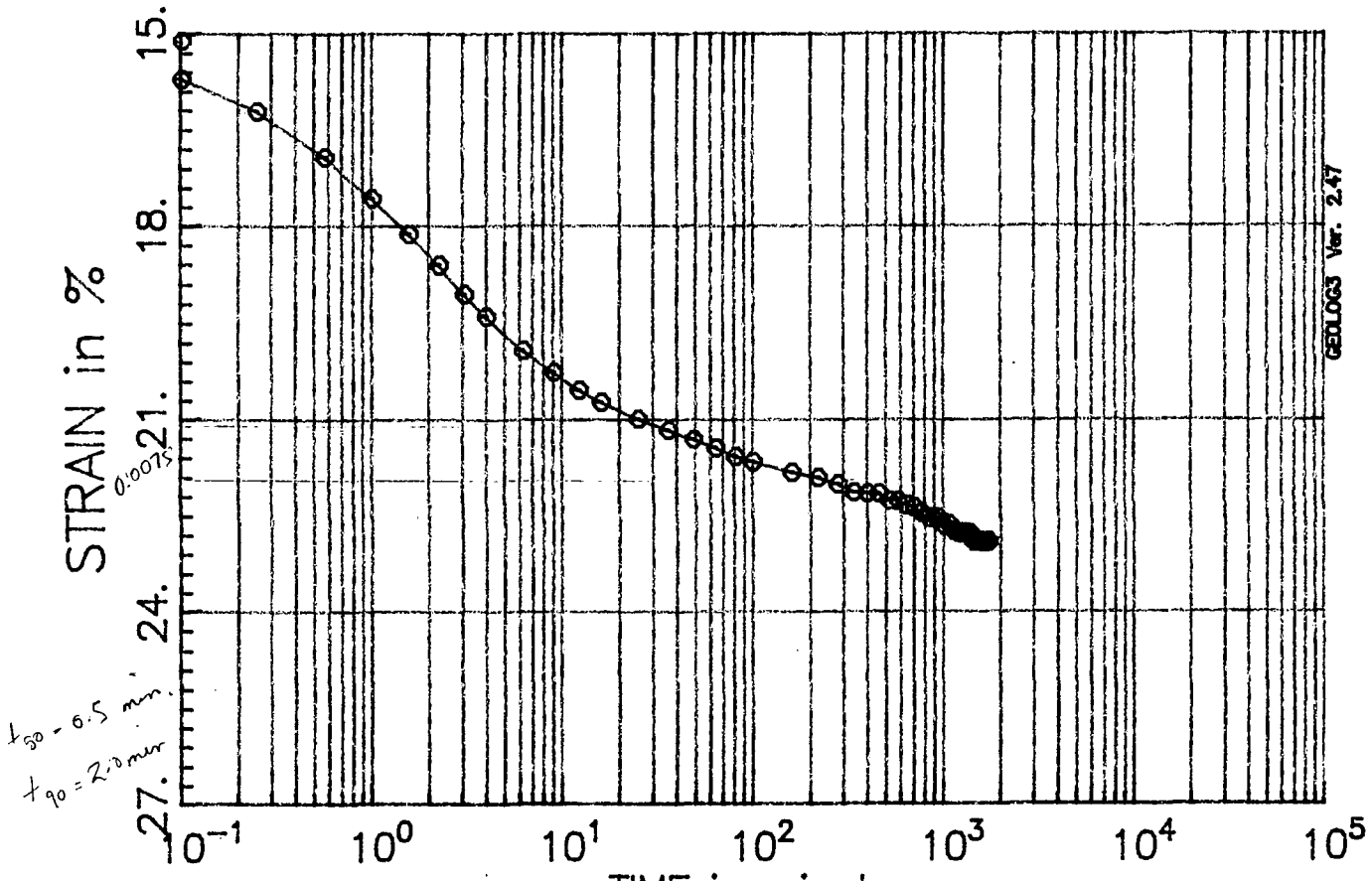
$t_{50} = 0.23$ min

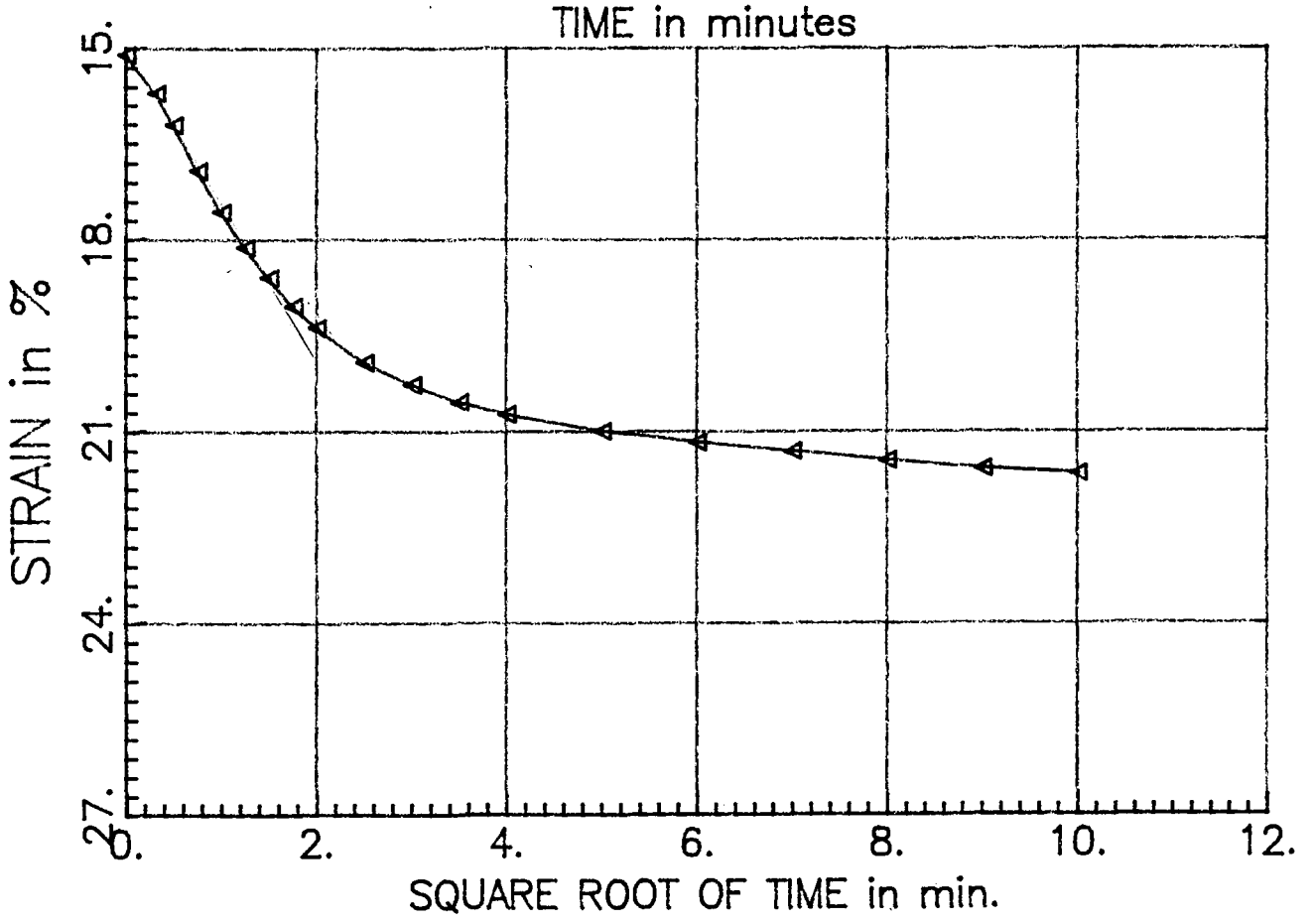
$t_{90} = 1.0$ min



PRESSURE INCREMENT
FROM 0.25 TSF TO 0.50 TSF

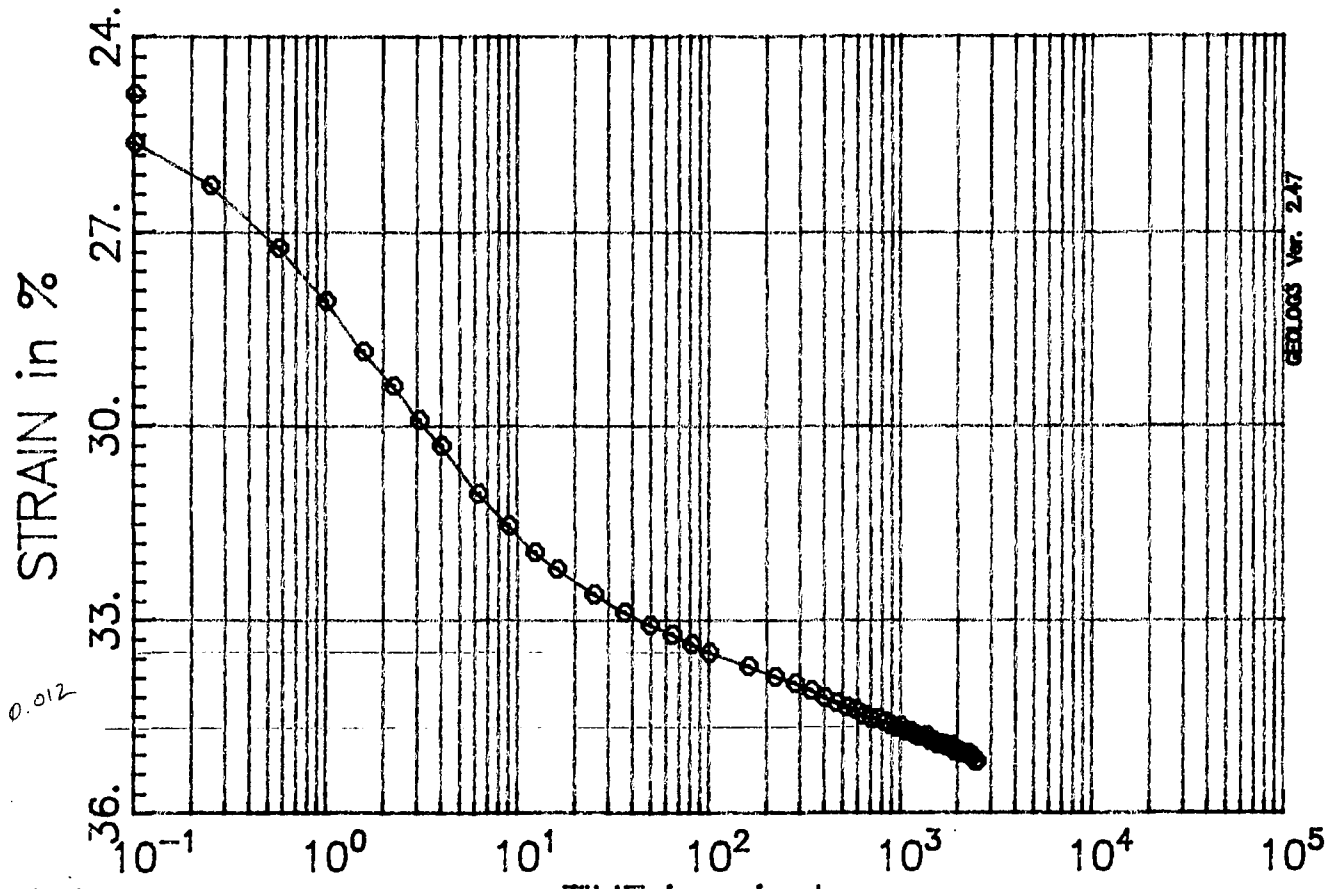
Test No: F0666-7
Testname: F0666-9





PRESSURE INCREMENT
FROM 0.50 TSF TO 1.00 TSF

Test No: F0666-7
Testname: F0666-9



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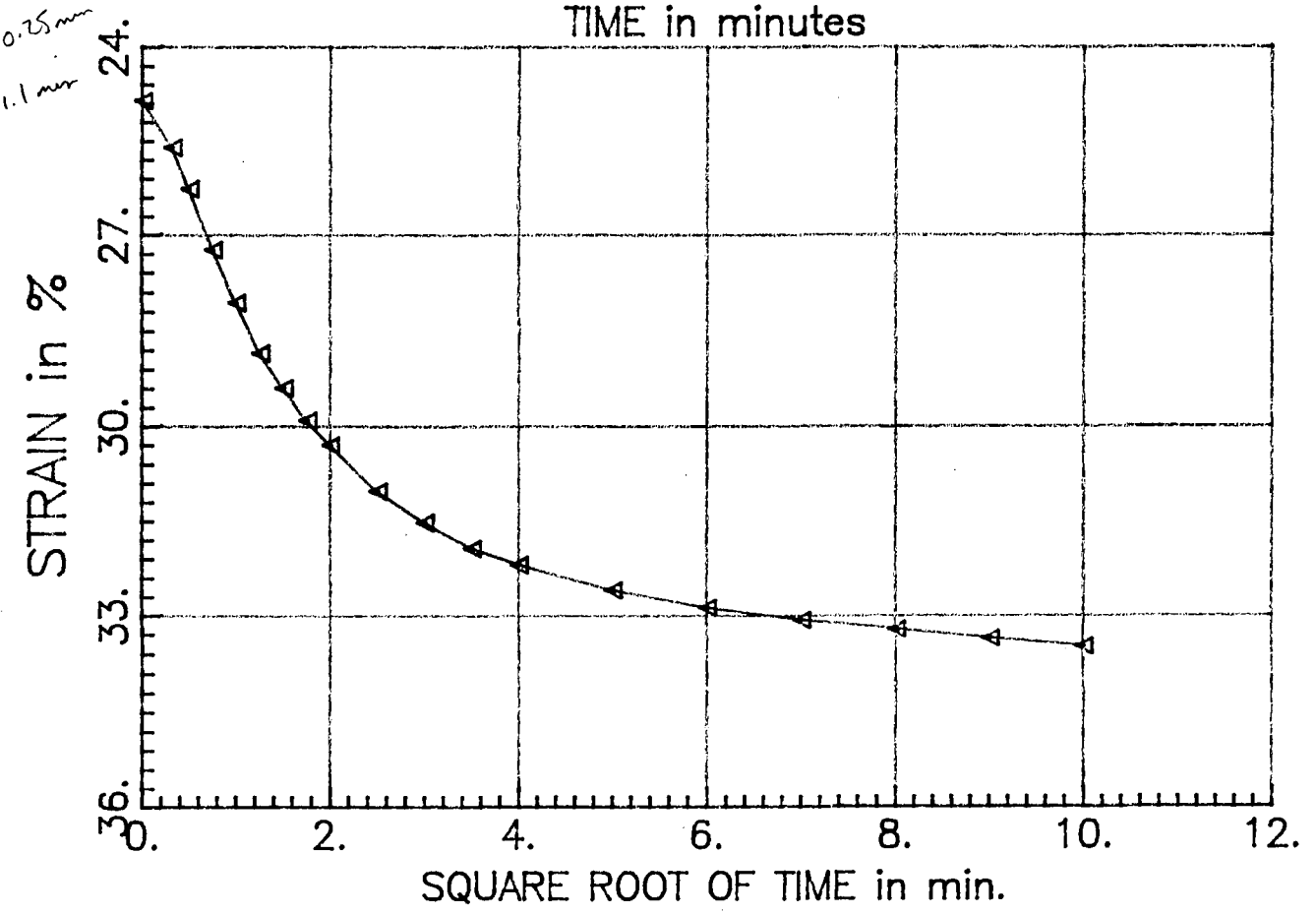


$t_{50} = 0.25$ mm

$t_{90} = 1.1$ mm

PRESSURE INCREMENT
FROM 1.00 TSF TO 2.00 TSF

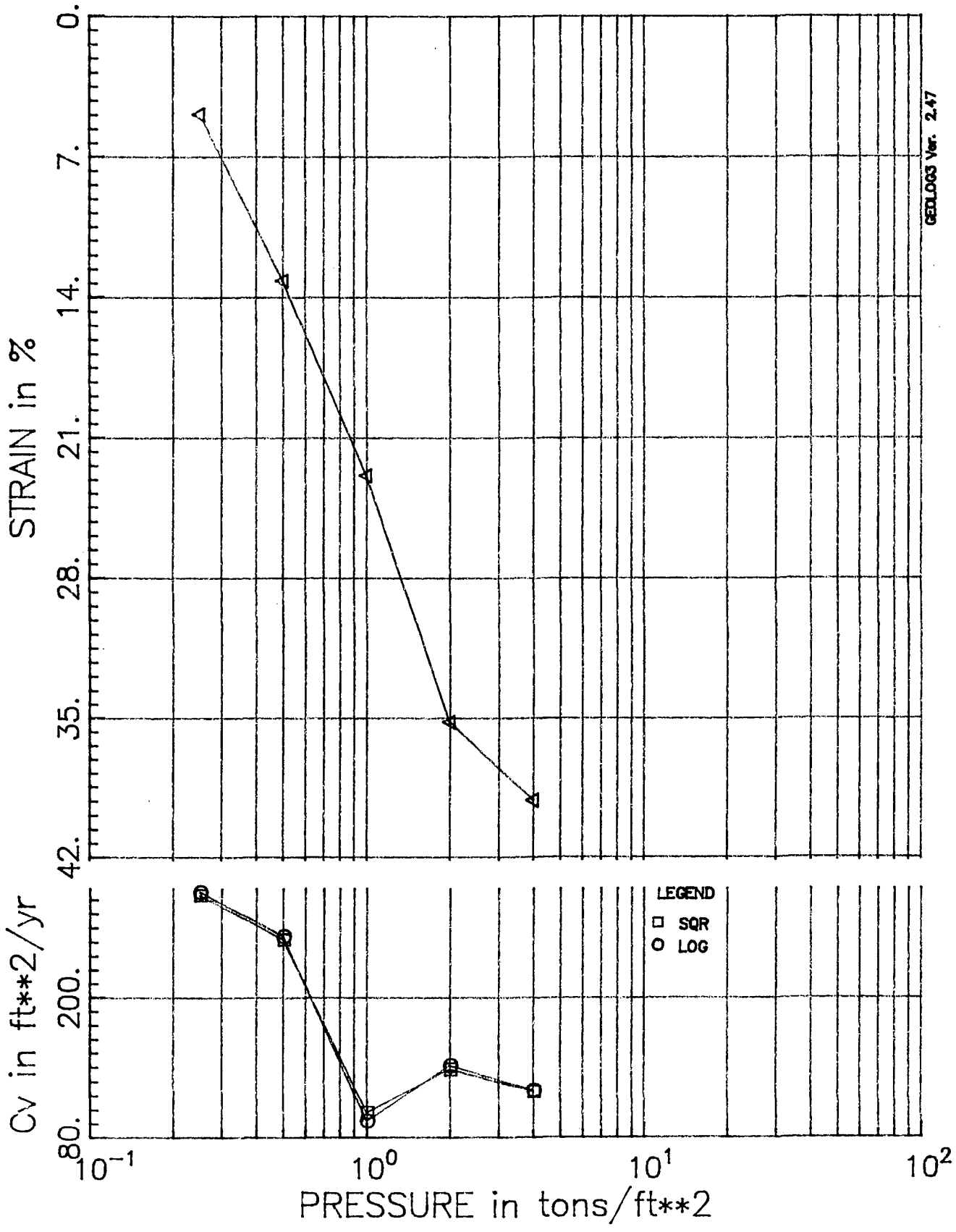
Test No: F0666-7
Testname: F0666-9

CONSOLIDATION TEST SUMMARY

APPLIED PRESSURE in tsf	FINAL DISP. in in.	STRAIN AT END in %	FITTING TIME in min SQ.RT. T90	FITTING TIME in min LOG T50	COEF. OF CONSOLIDATION in sq. ft. per yr SQ.RT.	COEF. OF CONSOLIDATION in sq. ft. per yr LOG	COEF. OF CONSOLIDATION in sq. ft. per yr AVE.
0.25	.03065	4.905	1.00	0.23	287.62	290.51	289.07
0.50	.08260	13.217	1.00	0.23	249.97	252.48	251.23
1.00	.14319	22.911	2.00	0.50	101.46	94.28	97.87
2.00	.22014	35.222	1.10	0.25	138.26	141.33	139.79
4.00	.24503	39.205	1.00	0.23	119.16	120.35	119.76

TEST NAME: F0666-9
PROJECT: JCT SR-101 TO
BROADWAY ST
FILE NO.: XL-0398
TEST NO.: F0666-7
DATE: 8-3-94
TESTED BY: LHB
CHECKED BY:KWT

WASHINGTON STATE DOT



SOIL DESCRIPTION: DARK BROWN WET PEAT

BORING: H-2-93 SAMPLE: S-6 DEPTH: 17'

WATER CONTENT
NATURAL: 1.97
AFTER TEST: 1.17

INITIAL VOID RATIO: 5.76

PROJECT: JCT SR-101 TO BROADWAY ST
FILE NO: XL-0398
DATE: 8-3-94

CONSOLIDATION TEST NO: F0666-7
Testname: F0666-9
WASHINGTON STATE DOT

Job No. **L-0398** Date **October 2, 1994**

Hole No. **H-4-93** Sheet **1** of **1**

Project **Junction SR-101 to Vicinity Broadway St.**

Laboratory Summary

Washington State Department of Transportation

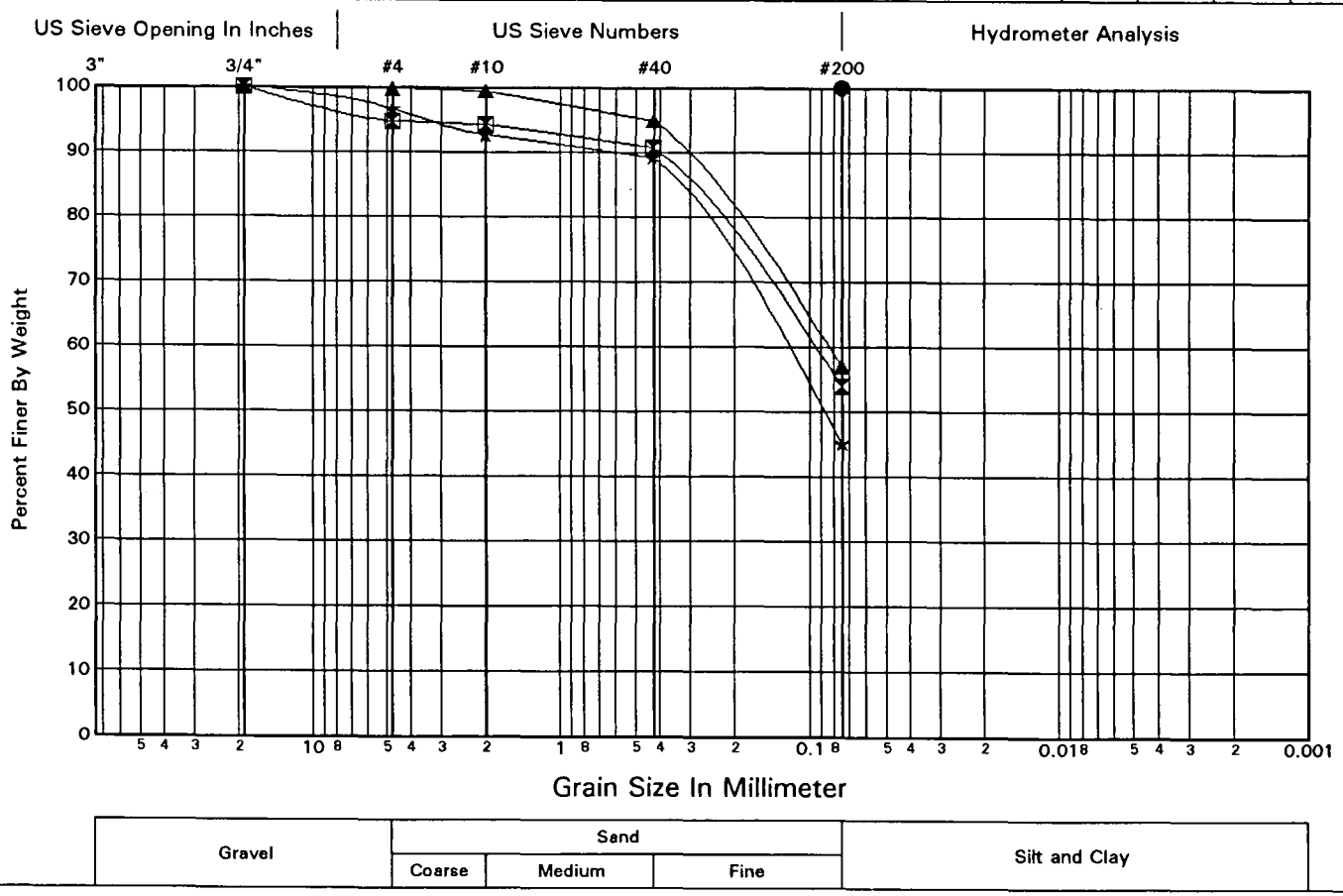
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	12.0	3.66	D-6		UNKNOWN	MOISTURE CONTENT ONLY	74	NP	NP	NP
⊠	17.0	5.18	D-8	ML	DARK GRAYISH BROWN	SANDY SILT w/peat	159	NP	NP	NP
▲	31.0	9.45	S-13	ML	DARK GRAY	SANDY SILT w/fibrous organic silt	125	NP	NP	NP
★	50.5	15.39	S-17	SM	VERY DARK GRAY	SILTY SAND w/wood fragments & fibrous organic material	79	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cu	Cc
●	0.0		100.0		
⊠	5.4	40.6	54.0		
▲	0.3	42.7	57.0		
★	3.4	51.4	45.2		

GRADATION VALUES

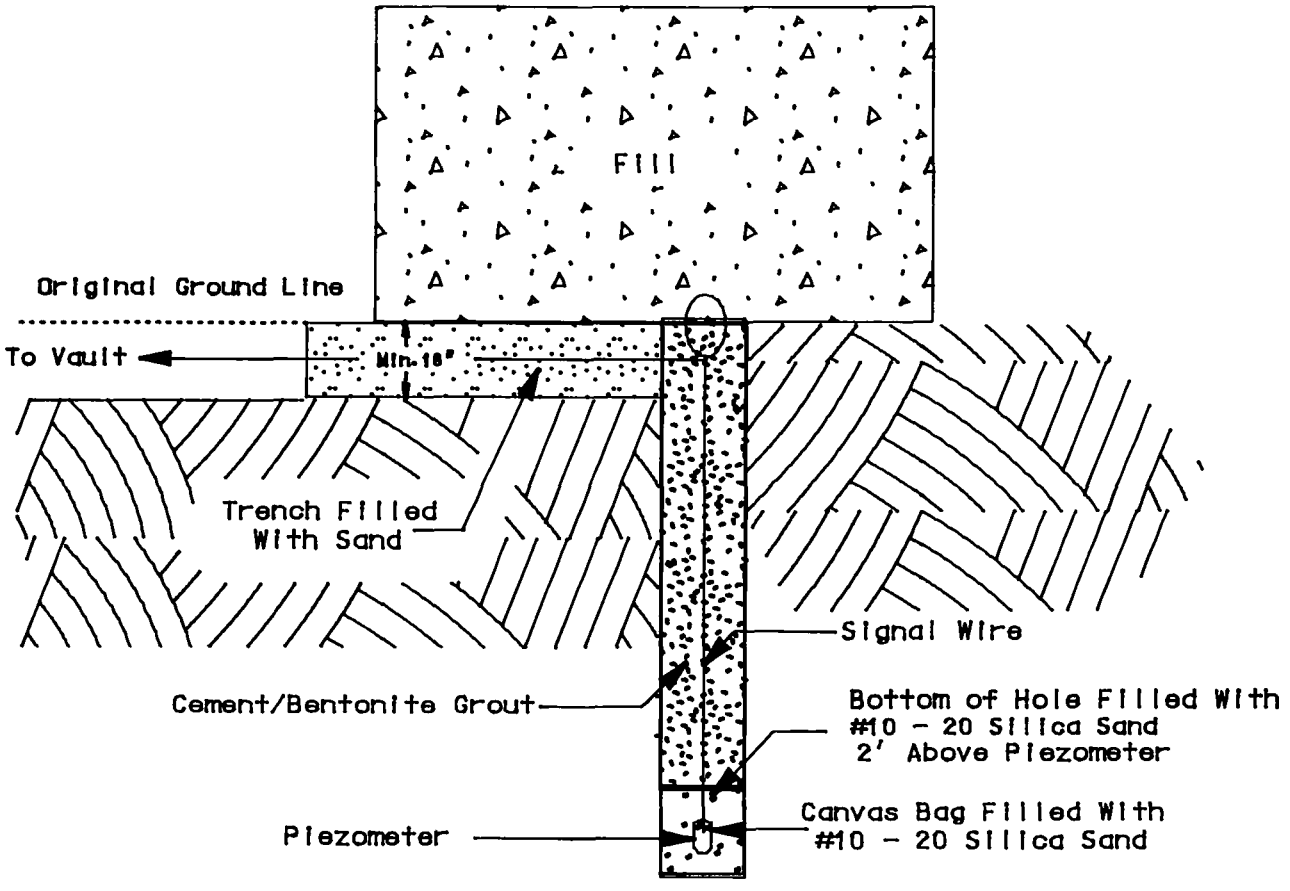
	D60	D50	D30	D20	D10
●					
⊠	0.10				
▲	0.09				
★	0.13	0.09			



Appendix C

Special Provisions:

Liquid Settlement Indicating Device
Pore Pressure Indicating Device
High Strength Construction Geotextile for Soil Stabilization



Pore Pressure Detection Device

Not to Scale

Figure D - 1

Special Provision for
PORE PRESSURE DETECTION DEVICE

The Contractor shall furnish and install sealed gauge resistive-type pore pressure devices such as the Standard Pressure Transducer Assembly 0 to 15 psi range modified for the RST Data Logger as distributed by Jim's Electronics, 418 Grand View Drive, Stevensville Montana, 59870, (406) 243-6653 or the 4 to 20 milliampere pressure transducers distributed by Carlson/RST Instruments Inc., 241 Lynch Road, Yakima, Washington; or a approved devices that are equal. All piezometers shall be calibrated and the calibration curves submitted prior to delivery.

The pore pressure indicating devices shall be compatible with the State's furnished Data Trapper/Datalogger readout unit as distributed by Carlson/RST Instruments. The Contractor shall provide and install one weather-proof locking vault for protection of the data logger. All piezometers shall be connected to the datalogger in one vault. The vault and setup location shall be approved by the Engineer prior to installation.

Installation of Pore Pressure Devices

The Contractor shall install pore pressure devices in accordance with these special provisions at the following approximate locations:

Station	Offset	Depth	Zone of Influence
181+00	28' (9 m) L	10' (3.2 m)	180+50 to 181+40
181+10	28' (9 m) L	10' (3.2 m)	180+50 to 181+ 40
181+50	15' (5 m) L	18' (6.0 m)	181+40 to 183+50
187+60	CL	14' (3.2 m)	186+00 to 190+00

The pore pressure devices shall be installed and fully operative a minimum of one week before embankment construction will be permitted within their zones of influence. After installation, the devices shall be tested under the supervision of the Engineer to ensure proper operation. The Contractor shall take all precautions necessary to protect the settlement device from any disturbance or damage during construction. The pore pressure transducer shall be installed in accordance with the plans and the steps listed below:

1. The pore pressure indicating device shall be installed by a licensed well drilling contractor that has been certified by Washington State Department of Ecology. The Contractor shall notify the Washington State Department of Ecology 48 hours prior to starting drilling by filing a "NOTICE OF INTENT TO BEGIN WELL CONSTRUCTION" and shall file a "RESOURCE PROTECTION WELL REPORT" upon completion of drilling.

2. Install casing, without drive shoe, to 1 foot (0.3 meters) below elevation of the bottom of pore pressure transducer or standpipe piezometer. A standpipe for the open standpipe piezometer shall be a minimum of 1 inch (2.5 cm) diameter PVC Pipe.

3. Pull casing 1 foot (0.3 meters), pour 1 foot (0.3 meters) of sand in bottom of hole and lower transducer or porous tip into hole to top of sand.

4. Pull casing 1 foot (0.3 meters), pour 1 foot (0.3 meters) of sand. Repeat this step until sand and casing are within 3 feet (0.9 meters) of the ground surface.

5. Pull casing 1 foot (0.3 meters), form bentonite pellet seal, using tamping hammer to insure pellets are in place, but not tamping to drive them into soil. Repeat this step until 3 foot (0.9 meters) of seal is formed.

6. Add moisture to bentonite placed in top 6 inches (0.15 meters) to form a slurry.

Controlled Embankment Construction

Data obtained from the pore pressure device will be employed to determine when a critical situation with respect to foundation stability occurs. When a critical situation exists, the Contractor shall discontinue embankment construction within the zone of influence of the device. Resumption of work and the rate of embankment construction will be governed by the Engineer's interpretation of the pore pressure data.

In the event of damage to any settlement indicating device installation, the Contractor shall immediately cease embankment construction within the zone of influence of the damaged unit until repairs have been made, or if repairs cannot be made, until another installation has been completed adjacent to the damaged unit. Repair or replacement of damaged units shall be at the Contractor's expense.

The State will not allow an extension of time or extra compensation for delay or expense incurred by the Contractor as a result of damage to, repair of, or replacement of any settlement indicating device installation.

Payment

The unit contract price per each for "Pore Pressure Detection Device" shall be full compensation for furnishing all labor, tools, equipment and materials for installing, repairing, or replacing damaged installations, and maintaining each pore pressure device in operating condition for the life of the contract.

SETTLEMENT INDICATING DEVICE

Description

The Contractor shall furnish and install a liquid settlement indicating device such as Model 54030 distributed by Slope Indicator Company, 3668 Albion Place North, Seattle Washington; Liquid Settlements Transducer Model SP-105 as distributed by Petur Instrument Company, 11300 25th Avenue NE, Seattle, Washington; Settlement System S-6010 as distributed by Terra Technology Corp., 3018 Western Avenue, Seattle, Washington, or an approved device that is equal. The settlement indicating device shall be supplied with all necessary adapters to make it compatible with the State's furnished Model 51411-A readout unit as distributed by the Slope Indicator Company.

The settlement indicating device shall be capable of producing a settlement system accuracy of 0.3 inch when used with the State;s readout unit, and shall be capable of measuring a total settlement of at least five feet.

Construction Requirements

The Contractor shall install settlement indicating devices in accordance with these Special Provisions at the following locations:

Station	Offset	Zone of Influence
181+20	25.0 ft, left	180+50 to 181+40
181+60	15.0 ft left	181+40 to 183+50
184+60	CL	183+50 to 186+00
187+80	CL	186+00 to 190+00

The sensors and interconnecting tubing shall be installed in trenches a minimum of 18 inches below a sand drainage blanket. The tubing shall be coiled to allow sufficient slack for horizontal or differential settlements.

The reservoir terminal installation shall be an easily accessible location safely away from the work areas and on stable ground. The exact location of the trench and the reservoir terminal shall be as staked by the Engineer.

After the initial installation has been completed, the settlement indicating system shall be tested. After the installation is approved by the Engineer, the trench shall be backfilled with clean sand (100% passing No. 10 sieve).

The settlement system shall be operable prior to beginning any embankment construction within the zone of influence.

In the event of damage to any settlement indicating device installation, the Contractor shall immediately cease embankment construction with the zone of influence of the damaged unit until repairs have been made, or if repairs cannot be made, until another installation has been completed adjacent to the damaged unit. Repair or replacement of damaged units shall be at the Contractor's expense.

The state will not allow an extension of time or extra compensation for delay or expense incurred by the Contractor as a result of damage to, repair of, or replacement of any settlement indicating device installation.

Measurement

Settlement indicating devices will be measured by the unit for each system installed.

Payment

The unit contract price per each for "Settlement indicating Device" shall be full pay for furnishing, installing, repairing, and replacing damaged installations, and maintaining in operation, for the life of the contract, each settlement indicating device.

PLANS FOR GEOTEXTILE REINFORCED EMBANKMENT

HIGH STRENGTH GEOTEXTILE FOR SOIL STABILIZATION

Description

This work shall consist of furnishing and placing construction geotextile in accordance with the details shown in the plans.

Materials

Geotextile and Thread for Sewing

The material shall be a woven geotextile consisting only of long chain polymeric filaments or yarns formed into a stable network such that the filaments or yarns retain their position relative to each other during handling, placement, and design service life. At least 95 percent by weight of the long chain polymers shall be polyesters. The material shall be free from defects or tears. The geotextile shall conform to the properties as indicated below. The geotextile shall be free of any treatment or coating which might adversely alter its physical properties after installation.

Thread used shall be high strength polypropylene, polyester, or Kevlar thread. Nylon threads will not be allowed.

Geotextile Properties

Property	Test Method1	Geotextile Property Requirements
AOS	ASTM D4751	.60 mm max. (#30 sieve)
Water Permittivity	ASTM D4491	.02/Sec. min.
Tensile Strength, min. in machine direction	ASTM D4595	1000 lbs/in. min.
In x-machine direction		500 lbs/in. min.
Secant Modulus at 10% strain		10,000 lbs/in. min.
Seam Breaking Strength	ASTM D4884	200 lbs. min.
Puncture Resistance	ASTM D4833	110 lbs. min.
Tear Strength Trapezoidal	ASTM D4533	75 lbs. min.

1 The test procedures are essentially in conformance with the most recently approved ASTM geotextile test procedures, except geotextile sampling and specimen conditioning, which are in accordance with WSDOT Test Methods 914 an 915, respectively. Copes of these test methods are available at the Headquarters Materials Laboratory in Tumwater, Washington.

All geotextile properties listed above are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values listed).

Geotextile Approval

Source Approval

The contractor shall submit to the Engineer the following information regarding the geotextile proposed for use:

Manufacturer's name and current address,
Full product name, and
Proposed geotextile use(s).

If the manufacturer of the proposed geotextile has not previously submitted a geotextile for initial source approval for the proposed use and obtained approval, a sample of each proposed geotextile shall be submitted to and approved by the Headquarters Materials Laboratory in Tumwater. After the sample and required information for each geotextile type have arrived at the Headquarters Materials Laboratory in Tumwater, a maximum of 14 calendar days will be required for this testing. Source approval will be based on conformance to the applicable values as listed. Each sample shall have minimum dimensions of 1.5 yards by the full roll width of the geotextile. A minimum of 6 square yards of geotextile shall be submitted to the Engineer for testing. The geotextile machine direction shall be marked clearly on each sample submitted for testing. The machine direction is defined as the direction perpendicular to the axis of the geotextile roll.

The geotextile samples shall be cut from the geotextile roll with scissors, sharp knife, or other suitable method which produces a smooth geotextile edge and does not cause geotextile ripping or tearing. The samples shall not be taken from the outer wrap of the geotextile roll nor the inner wrap of the core.

Acceptance Samples

Samples will be randomly taken by the Engineer at the job site to confirm that the geotextile meets the property values specified.

Approval will be based on testing of samples from each lot. A "lot" shall be defined for the purposes of this specification as all geotextile rolls within the consignment (i.e., all rolls sent to the project site) which were produced by the same manufacturer, and have the same product name. After the sample and manufacturer's certificate of compliance have arrived at the Headquarters Materials Laboratory in Tumwater, a maximum of 14 calendar days will be required for this testing. If the results of the testing show that a geotextile lot, as defined, does not meet the properties required for the specified use, the roll or rolls which were sampled will be rejected. Two additional rolls from the lot previously tested will then be selected at random by the Engineer for sampling and retesting. If the retesting shows that either or both rolls do not meet the required properties, the entire lot will be rejected. All geotextile which has defects, deterioration, or damage, as determined by the Engineer, will also be rejected. All rejected geotextile shall be replaced at no cost to the State.

Acceptance will be by manufacturer's certificate of compliance without sampling if the geotextile samples previously tested for the purpose of source approval came from the same geotextile lot as defined which is proposed for use at the project site, provided that the number of samples submitted and tested meet the requirements of WSDOT Test Method 914 "Practice for Sampling of Geotextiles for Testing".

The manufacturer's certificate of compliance shall include the following information about each geotextile roll to be used:

Manufacturer's name and current address,
Full product name,
Geotextile roll number,
Proposed geotextile use(s), and
Certified test results.

Approval of Seams

If the geotextile seams are to be sewn in the field, the Contractor shall provide a section of sewn seam before the geotextile is installed which can be sampled by the Engineer.

The seam sewn for sampling shall be sewn using the same equipment and procedures as will be used to sew the production seams. The Contractor must provide sewn seams for sampling which are oriented in the machine direction. The seams sewn for sampling must be at least 2 yards in length. If the seams are sewn in the factory, the Engineer will obtain samples of the factory seam at random from any of the rolls to be used. The seam assembly description shall be submitted by the Contractor to the Engineer and will be included with the seam sample obtained for testing. This description shall include the seam type, seam allowance, stitch type, sewing thread tex ticket number(s) and type(s), stitch density, and stitch gauge.

Construction Requirements

Shipment and Storage

During periods of shipment and storage, the geotextile shall be kept dry at all times and shall be stored off the ground. Under no circumstances, either during shipment or storage, shall the material be exposed to sunlight, or other form of light which contains ultraviolet rays, for more than five calendar days.

General Construction Requirements

The area to be covered by the geotextile shall be graded to a smooth, uniform condition free from ruts, potholes, and protruding objects such as rocks or sticks. The Contractor may construct a working platform, up to 2 ft. in thickness, in lieu of grading the existing ground surface. A working platform is required where stumps or other protruding objects which cannot be removed without excessively disturbing the subgrade are present. All stumps shall be cut flush with the ground surface and covered with at least 6 inches of fill before placement of the first geotextile layer. The geotextile shall be spread immediately ahead of the covering operation. The geotextile shall be laid in a continuous piece with the machine direction perpendicular or parallel to centerline as shown in Plans. Perpendicular and parallel directions shall alternate. All seams shall be sewn. Seams to connect the geotextile strips end to end, as shown in the Plans, will not be allowed. The geotextile shall not be left exposed to sunlight during installation for a total of more than five calendar days. The geotextile shall be laid smooth without excessive wrinkles. Under no circumstances shall the geotextile be dragged through mud or over sharp objects which could damage the geotextile. The cover material shall be placed on the geotextile in such a manner that a minimum of 8 inches of material will be between the equipment tires or tracks and the geotextile at all times. Construction vehicles shall be limited in size and weight such that rutting in the initial lift above the geotextile is not greater than 3 inches deep, to prevent overstressing the geotextile. Turning of vehicles on the first lift above the geotextile will not be permitted. Compaction of the first lift above the geotextile shall be limited to routing of placement and spreading equipment only. No vibratory compaction will be allowed on the first lift.

Pegs, pins, or the manufacturer's recommended method shall be used as needed to hold the geotextile in place until the specified cover material is placed.

Should the geotextile be torn or punctured or the sewn joints disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or roadbed distortion, the backfill around the damaged or displaced area shall be removed and the damaged area repaired or replaced by the Contractor at no cost to the State. The repair shall consist of a patch of the same type of geotextile placed over the damaged area. The patch shall be sewn at all edges.

If geotextile seams are to be sewn in the field or at the factory, the seams shall consist of two parallel rows of stitching. The two rows of stitching shall be 0.5 inch apart with a tolerance of $\pm$0.25 inch and shall not cross, except for restitching. The stitching shall be a lock-type stitch. The minimum seam allowance, i.e., the minimum distance from the geotextile edge to the stitch

HIGH STRENGTH GEOTEXTILE FOR SOIL STABILIZATION

Description

This work shall consist of furnishing and placing construction geotextile in accordance with the details shown in the plans.

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The material shall be a woven geotextile consisting only of long chain polymeric filaments or yarns formed into a stable network such that the filaments or yarns retain their position relative to each other during handling, placement, and design service life. At least 95 percent by weight of the long chain polymers shall be polyesters. The material shall be free from defects or tears. The geotextile shall conform to the properties as indicated below. The geotextile shall be free of any treatment or coating which might adversely alter its physical properties after installation.

Thread used shall be high strength polypropylene, polyester, or Kevlar thread. Nylon threads will not be allowed.

Geotextile Properties

Property	Test Method1	Geotextile Property Requirements
AOS	ASTM D4751	.60 mm max. (#30 sieve)
Water Permittivity	ASTM D4491	.02/Sec. min.
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Puncture Resistance	ASTM D4833	110 lbs. min.
Tear Strength Trapezoidal	ASTM D4533	75 lbs. min.

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Source Approval

The contractor shall submit to the Engineer the following information regarding the geotextile proposed for use:

Manufacturer's name and current address,
Full product name, and
Proposed geotextile use(s).

If the manufacturer of the proposed geotextile has not previously submitted a geotextile for initial source approval for the proposed use and obtained approval, a sample of each proposed geotextile shall be submitted to and approved by the Headquarters Materials Laboratory in Tumwater. After the sample and required information for each geotextile type have arrived at the Headquarters Materials Laboratory in Tumwater, a maximum of 14 calendar days will be required for this testing. Source approval will be based on conformance to the applicable values as listed. Each sample shall have minimum dimensions of 1.5 yards by the full roll width of the geotextile. A minimum of 6 square yards of geotextile shall be submitted to the Engineer for testing. The geotextile machine direction shall be marked clearly on each sample submitted for testing. The machine direction is defined as the direction perpendicular to the axis of the geotextile roll.

The geotextile samples shall be cut from the geotextile roll with scissors, sharp knife, or other suitable method which produces a smooth geotextile edge and does not cause geotextile ripping or tearing. The samples shall not be taken from the outer wrap of the geotextile roll nor the inner wrap of the core.

Acceptance Samples

Samples will be randomly taken by the Engineer at the job site to confirm that the geotextile meets the property values specified.

Approval will be based on testing of samples from each lot. A "lot" shall be defined for the purposes of this specification as all geotextile rolls within the consignment (i.e., all rolls sent to the project site) which were produced by the same manufacturer, and have the same product name. After the sample and manufacturer's certificate of compliance have arrived at the Headquarters Materials Laboratory in Tumwater, a maximum of 14 calendar days will be required for this testing. If the results of the testing show that a geotextile lot, as defined, does not meet the properties required for the specified use, the roll or rolls which were sampled will be rejected. Two additional rolls from the lot previously tested will then be selected at random by the Engineer for sampling and retesting. If the retesting shows that either or both rolls do not meet the required properties, the entire lot will be rejected. All geotextile which has defects, deterioration, or damage, as determined by the Engineer, will also be rejected. All rejected geotextile shall be replaced at no cost to the State.

Acceptance will be by manufacturer's certificate of compliance without sampling if the geotextile samples previously tested for the purpose of source approval came from the same geotextile lot as defined which is proposed for use at the project site, provided that the number of samples submitted and tested meet the requirements of WSDOT Test Method 914 "Practice for Sampling of Geotextiles for Testing".

The manufacturer's certificate of compliance shall include the following information about each geotextile roll to be used:

Manufacturer's name and current address,
Full product name,
Geotextile roll number,
Proposed geotextile use(s), and
Certified test results.

Approval of Seams

If the geotextile seams are to be sewn in the field, the Contractor shall provide a section of sewn seam before the geotextile is installed which can be sampled by the Engineer.

The seam sewn for sampling shall be sewn using the same equipment and procedures as will be used to sew the production seams. The Contractor must provide sewn seams for sampling which are oriented in the machine direction. The seams sewn for sampling must be at least 2 yards in length. If the seams are sewn in the factory, the Engineer will obtain samples of the factory seam at random from any of the rolls to be used. The seam assembly description shall be submitted by the Contractor to the Engineer and will be included with the seam sample obtained for testing. This description shall include the seam type, seam allowance, stitch type, sewing thread tex ticket number(s) and type(s), stitch density, and stitch gauge.

Construction Requirements

Shipment and Storage

During periods of shipment and storage, the geotextile shall be kept dry at all times and shall be stored off the ground. Under no circumstances, either during shipment or storage, shall the material be exposed to sunlight, or other form of light which contains ultraviolet rays, for more than five calendar days.

General Construction Requirements

The area to be covered by the geotextile shall be graded to a smooth, uniform condition free from ruts, potholes, and protruding objects such as rocks or sticks. The Contractor may construct a working platform, up to 2 ft. in thickness, in lieu of grading the existing ground surface. A working platform is required where stumps or other protruding objects which cannot be removed without excessively disturbing the subgrade are present. All stumps shall be cut flush with the ground surface and covered with at least 6 inches of fill before placement of the first geotextile layer. The geotextile shall be spread immediately ahead of the covering operation. The geotextile shall be laid in a continuous piece with the machine direction perpendicular or parallel to centerline as shown in Plans. Perpendicular and parallel directions shall alternate. All seams shall be sewn. Seams to connect the geotextile strips end to end, as shown in the Plans, will not be allowed. The geotextile shall not be left exposed to sunlight during installation for a total of more than five calendar days. The geotextile shall be laid smooth without excessive wrinkles. Under no circumstances shall the geotextile be dragged through mud or over sharp objects which could damage the geotextile. The cover material shall be placed on the geotextile in such a manner that a minimum of 8 inches of material will be between the equipment tires or tracks and the geotextile at all times. Construction vehicles shall be limited in size and weight such that rutting in the initial lift above the geotextile is not greater than 3 inches deep, to prevent overstressing the geotextile. Turning of vehicles on the first lift above the geotextile will not be permitted. Compaction of the first lift above the geotextile shall be limited to routing of placement and spreading equipment only. No vibratory compaction will be allowed on the first lift.

Pegs, pins, or the manufacturer's recommended method shall be used as needed to hold the geotextile in place until the specified cover material is placed.

Should the geotextile be torn or punctured or the sewn joints disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or roadbed distortion, the backfill around the damaged or displaced area shall be removed and the damaged area repaired or replaced by the Contractor at no cost to the State. The repair shall consist of a patch of the same type of geotextile placed over the damaged area. The patch shall be sewn at all edges.

If geotextile seams are to be sewn in the field or at the factory, the seams shall consist of two parallel rows of stitching. The two rows of stitching shall be 0.5 inch apart with a tolerance of $\pm$0.25 inch and shall not cross, except for restitching. The stitching shall be a lock-type stitch. The minimum seam allowance, i.e., the minimum distance from the geotextile edge to the stitch

line nearest to that edge, shall be 1.5 inches if a flat or prayer seam, Type SSa-2, is used. The minimum seam allowance for all other seam types shall be 1.0 inch. The seam, stitch type, and the equipment used to perform the stitching shall be as recommended by the manufacturer of the geotextile and as approved by the Engineer.

The seams shall be sewn in such a manner that the seam can be inspected readily by the Engineer or his representative. The seam strength will be tested and shall meet the requirements stated in this Special Provision.

Embankment construction shall be kept symmetrical at all times to prevent localized bearing capacity failures beneath the embankment or lateral tipping or sliding of the embankment. Any fill placed directly on the geotextile shall be spread immediately. Stockpiling of fill on the geotextile will not be allowed.

The embankment shall be compacted using Method B of Section 2-03.3(14)C. Vibratory or sheepsfoot rollers shall not be used to compact the fill until at least 1.5 feet of fill is covering the bottom geotextile layer and until at least 1.0 foot of fill is covering each subsequent geotextile layer above the bottom layer.

The geotextile shall be pretensioned during installation using either Method 1 or Method 2 as described in these Special Provisions. The method selected will depend on whether or not a mudwave forms during placement of the first one or two lifts. If a mudwave forms as fill is pushed onto the first layer of geotextile, Method 1 shall be used. Method 1 shall continue to be used until the mudwave ceases to form as fill is placed and spread. Once mudwave formation ceases, Method 2 shall be used until the uppermost geotextile layer is covered with a minimum of 1.0 foot of fill. These special construction methods are not needed for fill construction above this level. If a mudwave does not form as fill is pushed onto the first layer of geotextile, then Method 2 shall be used initially and until the uppermost geotextile layer is covered with at least 1.0 foot of fill.

Method 1

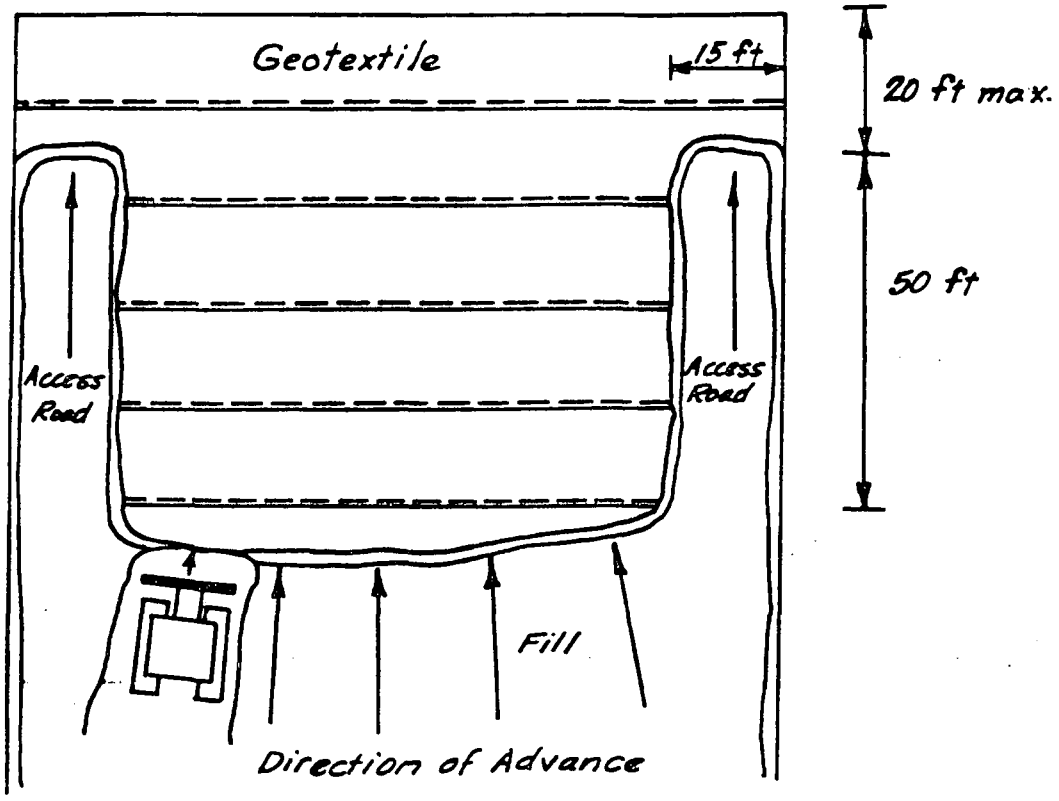
After the working platform, if needed, has been constructed, the first layer of geotextile shall be laid in continuous transverse strips and the joints sewn together. The geotextile shall be stretched manually to ensure that no wrinkles are present in the geotextile. The fill shall be end-dumped and spread from the edge of the geotextile. The fill shall first be placed along the outside edges of the geotextile to form access roads. These access roads will serve three purposes: to lock the edges of the geotextile in place, to contain the mudwave, and to provide access as needed to place fill in the center of the embankment, these access roads shall be a minimum of 15 feet wide. The access roads at the edges of the geotextile shall have a height of 2.0 feet when completed. Once the access roads are approximately 50 feet in length, fill shall be kept ahead of the filling operation, and the access roads shall be kept 50 feet ahead of this filling operation as shown in the Plans. Keeping the mudwave ahead of this filling operation and keeping the edges of the geotextile from moving by use of the access roads will effectively pre-tension the geotextile. The geotextile shall be laid out no more than 20 feet ahead of the end of the access roads at any time to prevent overstressing of the geotextile seams.

Method 2

After the working platform, if needed, has been constructed, the first layer of geotextile shall be laid and sewn as in Method 1. The first lift of material shall be spread from the edge of the geotextile, keeping the center of the advancing fill lift ahead of the outside edges of the lift as shown in the Plans. The geotextile shall be manually pulled taut prior to fill placement. The embankment shall be continued to be constructed in this manner in subsequent lifts until the uppermost geotextile layer is completely covered with 1.0 foot of compacted fill.

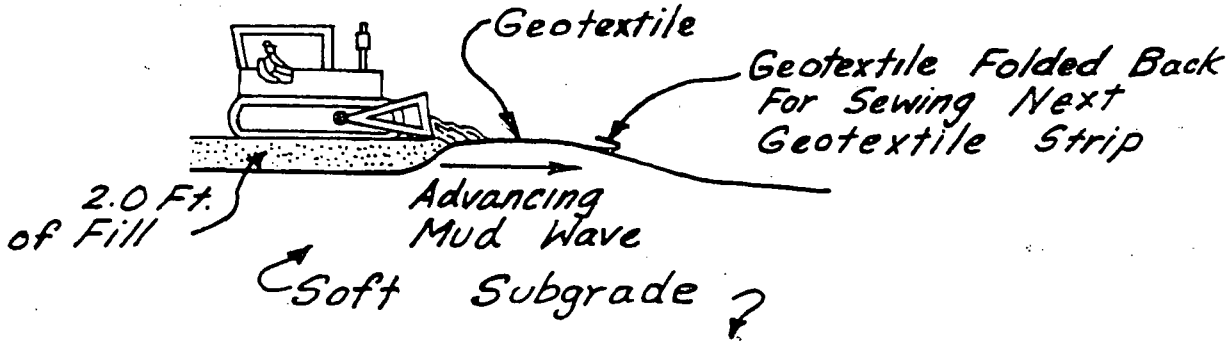
Measurement
High strength geotextile for soil stabilization will be measured by the square yard for the ground surface area actually covered.

Payment
The unit contract price per square yard for "High Strength Geotextile For Soil Stabilization", shall be full pay to complete the work as specified.



(a) Plan

(b) Cross-Section



(c) Illustration of Mud Wave Formation in a Geotextile-Reinforced Embankment

Figure 1: Fill construction using Method 1.

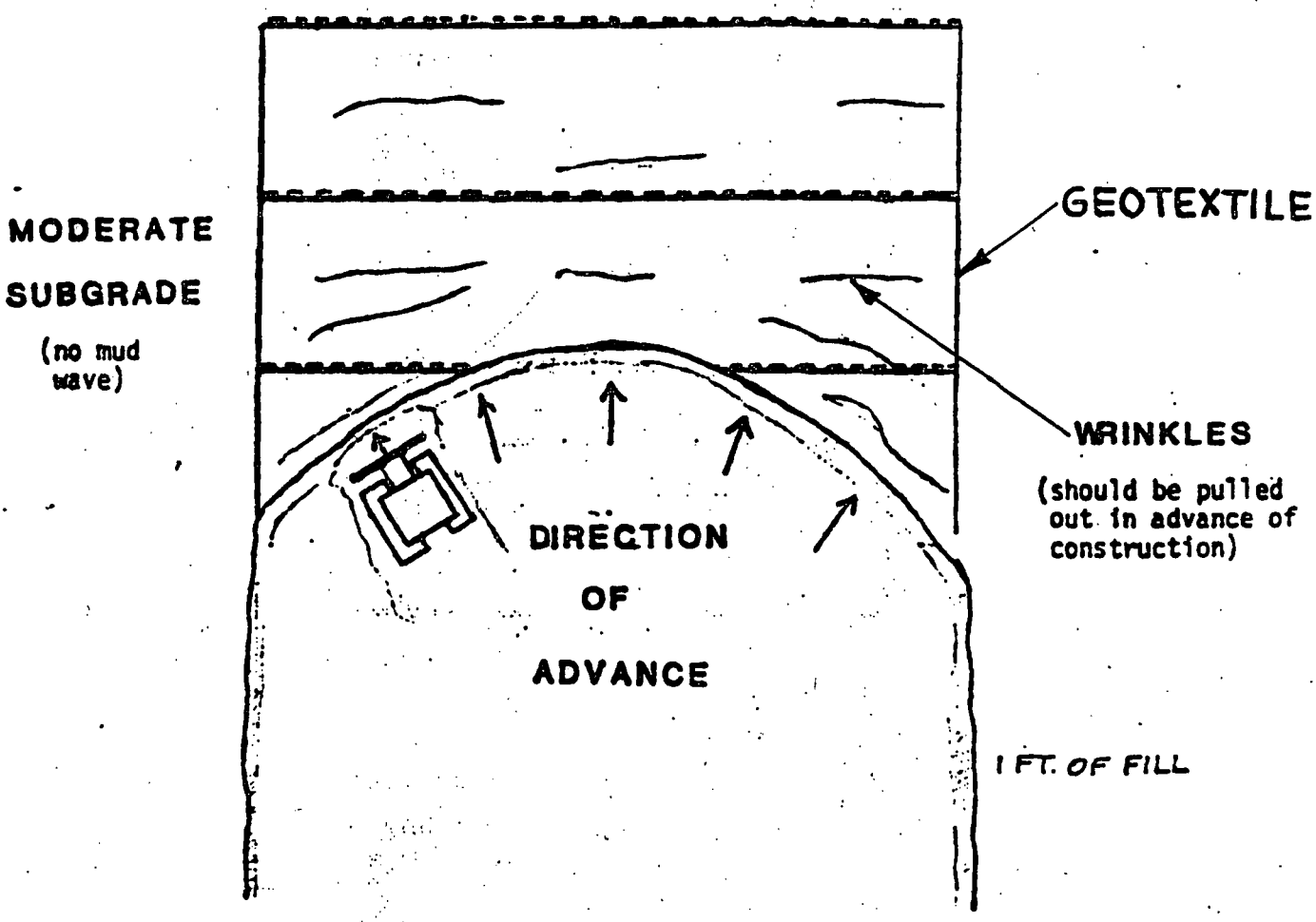


Figure 2: Placement of First Lift to Tension Each Geotextile Layer Using Method 2.

line nearest to that edge, shall be 1.5 inches if a flat or prayer seam, Type SSa-2, is used. The minimum seam allowance for all other seam types shall be 1.0 inch. The seam, stitch type, and the equipment used to perform the stitching shall be as recommended by the manufacturer of the geotextile and as approved by the Engineer.

The seams shall be sewn in such a manner that the seam can be inspected readily by the Engineer or his representative. The seam strength will be tested and shall meet the requirements stated in this Special Provision.

Embankment construction shall be kept symmetrical at all times to prevent localized bearing capacity failures beneath the embankment or lateral tipping or sliding of the embankment. Any fill placed directly on the geotextile shall be spread immediately. Stockpiling of fill on the geotextile will not be allowed.

The embankment shall be compacted using Method B of Section 2-03.3(14)C. Vibratory or sheepsfoot rollers shall not be used to compact the fill until at least 1.5 feet of fill is covering the bottom geotextile layer and until at least 1.0 foot of fill is covering each subsequent geotextile layer above the bottom layer.

The geotextile shall be pretensioned during installation using either Method 1 or Method 2 as described in these Special Provisions. The method selected will depend on whether or not a mudwave forms during placement of the first one or two lifts. If a mudwave forms as fill is pushed onto the first layer of geotextile, Method 1 shall be used. Method 1 shall continue to be used until the mudwave ceases to form as fill is placed and spread. Once mudwave formation ceases, Method 2 shall be used until the uppermost geotextile layer is covered with a minimum of 1.0 foot of fill. These special construction methods are not needed for fill construction above this level. If a mudwave does not form as fill is pushed onto the first layer of geotextile, then Method 2 shall be used initially and until the uppermost geotextile layer is covered with at least 1.0 foot of fill.

Method 1

After the working platform, if needed, has been constructed, the first layer of geotextile shall be laid in continuous transverse strips and the joints sewn together. The geotextile shall be stretched manually to ensure that no wrinkles are present in the geotextile. The fill shall be end-dumped and spread from the edge of the geotextile. The fill shall first be placed along the outside edges of the geotextile to form access roads. These access roads will serve three purposes: to lock the edges of the geotextile in place, to contain the mudwave, and to provide access as needed to place fill in the center of the embankment, these access roads shall be a minimum of 15 feet wide. The access roads at the edges of the geotextile shall have a height of 2.0 feet when completed. Once the access roads are approximately 50 feet in length, fill shall be kept ahead of the filling operation, and the access roads shall be kept 50 feet ahead of this filling operation as shown in the Plans. Keeping the mudwave ahead of this filling operation and keeping the edges of the geotextile from moving by use of the access roads will effectively pre-tension the geotextile. The geotextile shall be laid out no more than 20 feet ahead of the end of the access roads at any time to prevent overstressing of the geotextile seams.

Method 2

After the working platform, if needed, has been constructed, the first layer of geotextile shall be laid and sewn as in Method 1. The first lift of material shall be spread from the edge of the geotextile, keeping the center of the advancing fill lift ahead of the outside edges of the lift as shown in the Plans. The geotextile shall be manually pulled taut prior to fill placement. The embankment shall be continued to be constructed in this manner in subsequent lifts until the uppermost geotextile layer is completely covered with 1.0 foot of compacted fill.

Measurement
High strength geotextile for soil stabilization will be measured by the square yard for the ground surface area actually covered.

Payment
The unit contract price per square yard for "High Strength Geotextile For Soil Stabilization", shall be full pay to complete the work as specified.