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Earth and Environmental Technologies

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Hart Crowser, Inc.
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J-1639-27

August 9, 1993

Mr. David South, P.E.
Washington State Department of Ecology
3190 - 160th Avenue SE
Bellevue, Washington 98008-5452

Re: Additional Subsurface Exploration and Engineering at Hot Spot U-1
PACCAR, Renton Site

Dear Mr. South:

This letter presents information about the results of our recent exploration and analytical testing program for the U-1 area at the PACCAR Renton Site. A separate letter report will be submitted at a later date discussing possible future actions for this area.

Fifteen soil borings were completed and two monitoring wells were installed at the U-1 area between May 26 and June 7, 1993. For the purposes of this letter, the U-1 area extends from south of Building 17 (Foundry Building) into Garden Avenue and north approximately 200 feet. Figure 1 shows the borings and monitoring well locations. The TPH analytical results for the soil and groundwater are presented in Table 1 and Table 2, respectively. Attachment A presents the boring and monitoring well installation logs. Our initial findings are summarized below.





- ▶ TPH (diesel) was detected in the soil samples collected from several borings and both monitoring wells along Garden Avenue;
- ▶ The TPH (diesel) along Garden Avenue appears to be bounded to the north by soil borings U1-B11, U1-B13, U1-B15, and U1-W3, and to the south by U1-W and U1-B7;
- ▶ The highest concentrations of TPH (diesel) along Garden Avenue were detected in soil samples from borings U1-W2, U1-B4, U1-B8, and U1-B9;
- ▶ TPH (diesel) was detected in soil samples collected from four borings (U1-BF1, U1-BF2, U1-BF3, and U1-BF4) beneath the Foundry Building;
- ▶ Oil was detected in soil samples from only four borings (U1-B10, U1-B11, U1-BF1, and U1-BF3); and
- ▶ TPH was detected in groundwater collected from both monitoring wells, U1-W2 and U1-W3, at concentrations of 50 and 8 mg/L, respectively.

We are presently reviewing options for remediation which will address the difficulties in excavating this soil due to utilities, traffic, and other factors.

LIMITATIONS

Work for this project was performed, and this letter report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities at the time the work was performed. It is intended for the exclusive use of PACCAR Inc for the specific application to the referenced property. No other warranty, express or implied, is made.

Any questions regarding our work and this letter report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned.



Washington State Department of Ecology
August 9, 1993

J-1639-27
Page 3

We trust this letter meets your needs. Please call if you have any further questions.

Sincerely,

HART CROWSER, INC.

MARY CATHERINE KILEY
Project Environmental Chemist

JAMES H. KLEPPE, P.E.
Principal

U1summ.lr

Attachments:

Table 1 - TPH Results for Soil Borings and Monitoring Wells
Table 2 - Groundwater TPH Results
Figure 1 - Site and Exploration Plan
A - Soil Boring and Monitoring Well Installation Logs

cc: (w/Attachments)
Robert Butler, PACCAR, Bellevue
Claus Hackenberger, PACCAR, Renton
Greg Zimmerman, City of Renton

Table 1 - TPH Results for Soil Borings and Monitoring Wells

Sample	Date	Depth below Surface in Feet	TPH Concentration in mg/kg	
U1-B4-S-1	5/26/93	3-5	13,000	Diesel
U1-B4-S-3	5/26/93	7-9	110	Diesel
U1-B4-S-5	5/26/93	11-13	5,800	Diesel
U1-B4-S-7	5/26/93	15-17	1,600	Diesel
U1-B4-S-8	5/26/93	17-19	ND	
U1-B5-S-1	5/26/93	3-5	9,200	Diesel
U1-B5-S-3	5/26/93	7-9	22,000	Diesel
U1-B5-S-4	5/26/93	9-11	34	Diesel
U1-B5-S-6	5/26/93	13-15	ND	
U1-B5-S-7	5/26/93	15-17	67	Diesel
U1-B5-S-8	5/26/93	17-19	ND	
U1-B6-S-1	5/28/93	3-5	168	Diesel
U1-B6-S-2	5/28/93	5-7	30	Diesel
U1-B6-S-3	5/28/93	7-9	430	Diesel
U1-B6-S-5	5/28/93	11-13	ND	
U1-B6-S-6	5/28/93	13-14	ND	
U1-B6-S-9	5/28/93	17-19	ND	
U1-B7-S-1	5/27/93	3-5	ND	
U1-B7-S-2	5/27/93	5-7	ND	
U1-B7-S-3	5/27/93	7-9	ND	
U1-B7-S-4	5/27/93	9-11	ND	
U1-B7-S-5	5/27/93	11-13	2,900	Diesel
U1-B7-S-6	5/27/93	13-15	77	Diesel
U1-B7-S-7	5/27/93	15-17	21	Diesel
U1-B7-S-8	5/27/93	17-19	26	Diesel
U1-B8-S-1	5/27/93	5-7	10,000	Diesel
U1-B8-S-3	5/27/93	9-11	70	Diesel
U1-B8-S-4	5/27/93	11-13	37,000	Diesel
U1-B8-S-5	5/27/93	13-15	1,300	Diesel
U1-B8-S-6	5/27/93	15-17	140	Diesel
U1-B8-S-7	5/27/93	17-19	150	Diesel
U1-B9-S-1	5/27/93	3-5	14,000	Diesel
U1-B9-S-2	5/27/93	5-7	12,000	Diesel
U1-B9-S-3	5/27/93	7-9	62	Diesel
U1-B9-S-4	5/27/93	9-11	ND	
U1-B9-S-5	5/27/93	11-13	12,000	Diesel
U1-B9-S-7	5/27/93	15-17	80	Diesel
U1-B9-S-8	5/27/93	17-19	ND	

Table 1 - TPH Results for Soil Borings and Monitoring Wells (Continued)

Sample	Date	Depth below Surface in Feet	TPH Concentration in mg/kg
U1-B10-S-1	6/01/93	3-5	610 Oil
U1-B10-S-3	6/01/93	7-9	ND
U1-B10-S-4	6/01/93	9-11	ND
U1-B10-S-5	6/01/93	11-13	ND
U1-B10-S-6	6/01/93	13-15	ND
U1-B10-S-8	6/01/93	17-19	ND
U1-B11-S-1	6/01/93	3-5	399 Oil and Diesel (1)
U1-B11-S-2	6/01/93	5-7	139 Oil and Diesel (1)
U1-B11-S-3	6/01/93	7-9	ND
U1-B11-S-5	6/01/93	11-13	ND
U1-B11-S-6	6/01/93	13-15	ND
U1-B11-S-8	6/01/93	17-19	ND
U1-B12-S-1	6/02/93	3-5	270 Diesel
U1-B12-S-2	6/02/93	5-7	310 Diesel
U1-B12-S-3	6/02/93	7-9	ND
U1-B12-S-5	6/02/93	11-13	ND
U1-B12-S-7	6/02/93	15-17	ND
U1-B12-S-8	6/02/93	17-19	ND
U1-B13-S-1	6/02/93	3-5	ND
U1-B13-S-2	6/02/93	5-7	140 Diesel
U1-B13-S-3	6/02/93	9-11	ND
U1-B13-S-5	6/02/93	13-15	ND
U1-B13-S-7	6/02/93	17-19	ND
U1-B15-S-1	6/08/93	3-5	ND
U1-B15-S-3	6/08/93	7-9	ND
U1-B15-S-5	6/08/93	11-13	ND
U1-B15-S-7	6/08/93	15-17	ND
U1-B15-S-8	6/08/93	17-19	ND
U1-BF1-S-1	6/07/93	3-5	820 Diesel
U1-BF1-S-3	6/07/93	7-9	580 Diesel and Oil (1)
U1-BF1-S-4	6/07/93	9-11	170 Diesel
U1-BF1-S-5	6/07/93	11-13	31 Diesel
U1-BF1-S-7	6/07/93	15-17	ND
U1-BF1-S-8	6/07/93	17-19	ND

Table 1 - TPH Results for Soil Borings and Monitoring Wells (Continued)

Sample	Date	Depth below Surface in Feet	TPH Concentration in mg/kg	
U1-BF2-S-1	6/07/93	3-5	6,100	Diesel
U1-BF2-S-3	6/07/93	7-9	1,200	Diesel
U1-BF2-S-4	6/07/93	9-11	4,100	Diesel
U1-BF2-S-5	6/07/93	11-13	1,900	Diesel
U1-BF2-S-7	6/07/93	15-17	830	Diesel
U1-BF2-S-8	6/07/93	17-19	450	Diesel
U1-BF3-S-1	6/07/93	3-5	1,300	Diesel
U1-BF3-S-2	6/07/93	5-7	4,000	Diesel
U1-BF3-S-3	6/07/93	7-9	530	Diesel and Oil (1)
U1-BF3-S-5	6/07/93	11-13	7,400	Diesel
U1-BF3-S-7	6/07/93	15-17	200	Diesel
U1-BF3-S-8	6/07/93	17-19	ND	
U1-BF4-S-1	6/07/93	3-5	41,000	Diesel
U1-BF4-S-3	6/07/93	7-9	690	Diesel
U1-BF4-S-4	6/07/93	9-11	360	Diesel
U1-BF4-S-5	6/07/93	11-13	290	Diesel
U1-BF4-S-6	6/07/93	13-15	31	Diesel
U1-BF4-S-7	6/07/93	15-17	60	Diesel
U1-BF4-S-8	6/07/93	17-19	78	Diesel
U1-W2-S-1	5/28/93	3-5	19,000	Diesel
U1-W2-S-2	5/28/93	5-7	8,400	Diesel
U1-W2-S-3	5/28/93	7-9	980	Diesel
U1-W2-S-4	5/28/93	9-11	8,800	Diesel
U1-W2-S-5	5/28/93	11-13	55	Diesel
U1-W2-S-6	5/28/93	13-15	180	Diesel
U1-W2-S-8	5/28/93	17-19	ND	
U1-W3-S-1	6/08/93	3-5	53	Diesel
U1-W3-S-3	6/08/93	7-9	110	Diesel
U1-W3-S-4	6/08/93	9-11	ND	
U1-W3-S-6	6/08/93	13-15	ND	
U1-W3-S-7	6/08/93	15-17	35	Diesel
U1-W3-S-8	6/08/93	17-19	ND	

(1) In results showing concentrations of both diesel and oil, the substance of greater concentration is listed first.

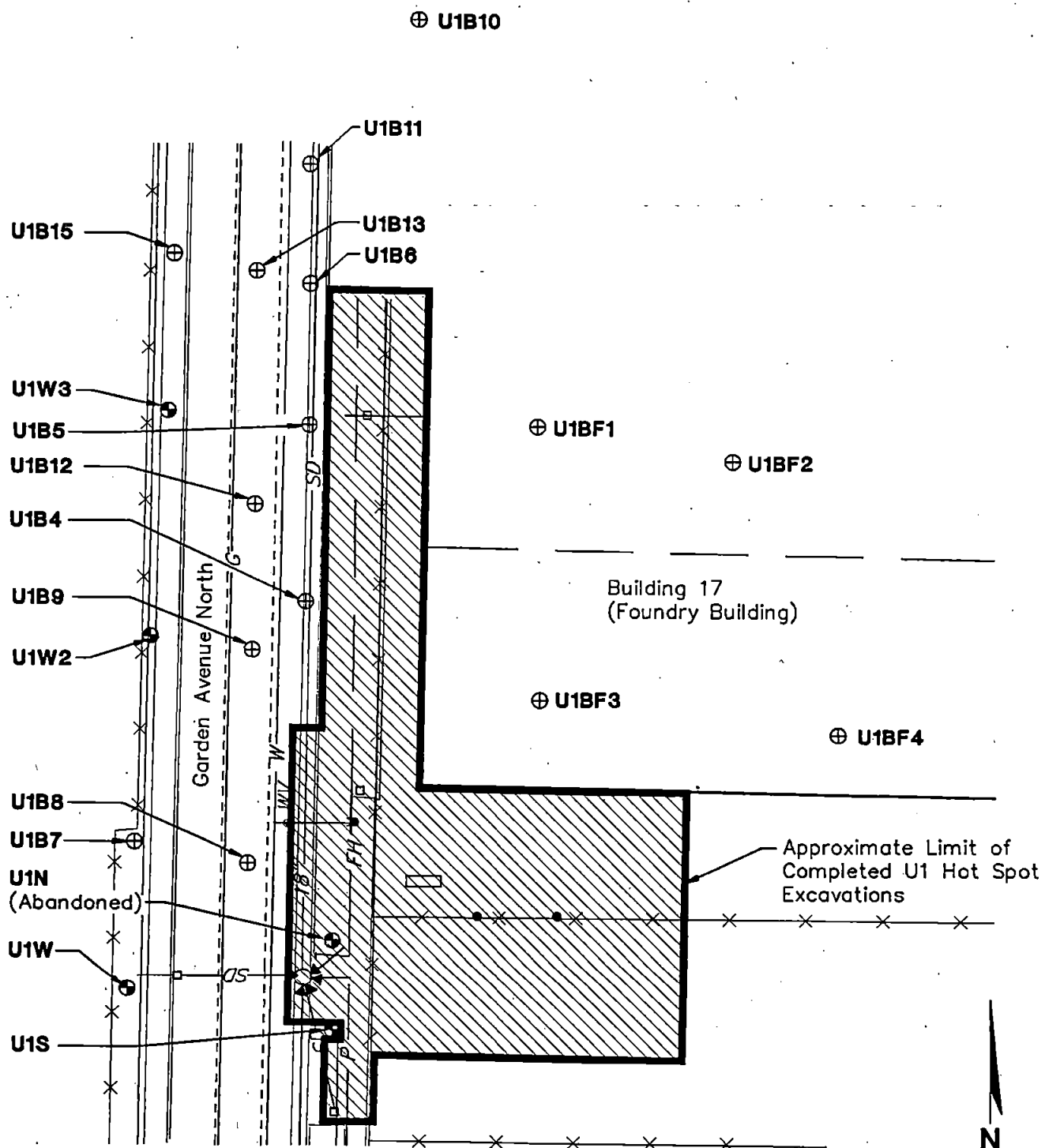
ND = Not detected in sample.

Table 2 - Groundwater TPH Results

Sample	Date	TPH Concentration in mg/L
U1-W-2	6/03/93	50 Diesel
U1-W-3	6/24/93	8 Diesel

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Site and Exploration Plan



U1S ⊕ Monitoring Well
 Location and Number
U1B ⊕ Soil Boring
 Location and Number

0 40 80
 Approximate Scale in Feet


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 Figure 1

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ATTACHMENT A
SOIL BORING AND MONITORING WELL INSTALLATION LOGS

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:

Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.

Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Density		Consistency		
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents




Estimated Percentage

Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 80

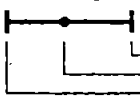
Legends

Sampling Test Symbols

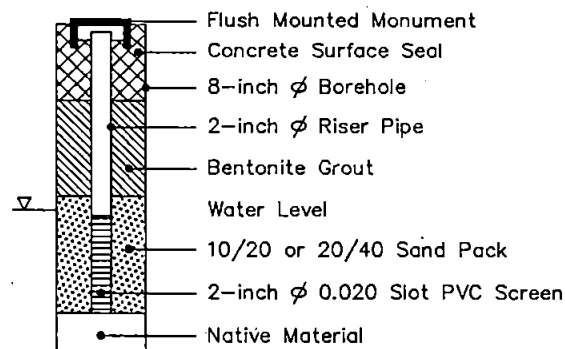
BORING SAMPLES

	Split Spoon
	Shelby Tube
	Cuttings
*	No Sample Recovery
P	Tube Pushed, Not Driven

Test Symbols

GS	Grain Size Classification
CN	Consolidation
TUU	Triaxial Unconsolidated Undrained
TCU	Triaxial Consolidated Undrained
TCD	Triaxial Consolidated Drained
QU	QU
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits
	 Water Content in Percent
PID	Photoionization Reading
CA	Chemical Analysis

Groundwater Observations



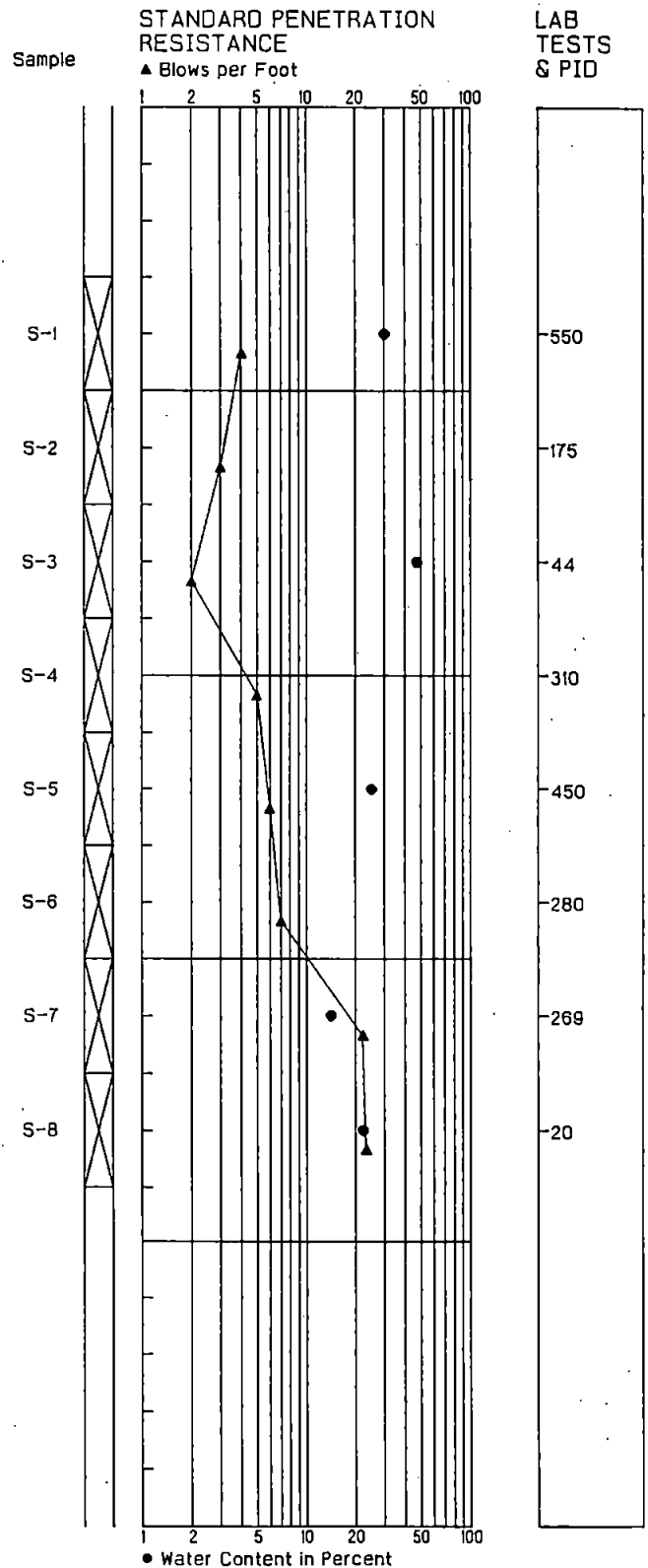
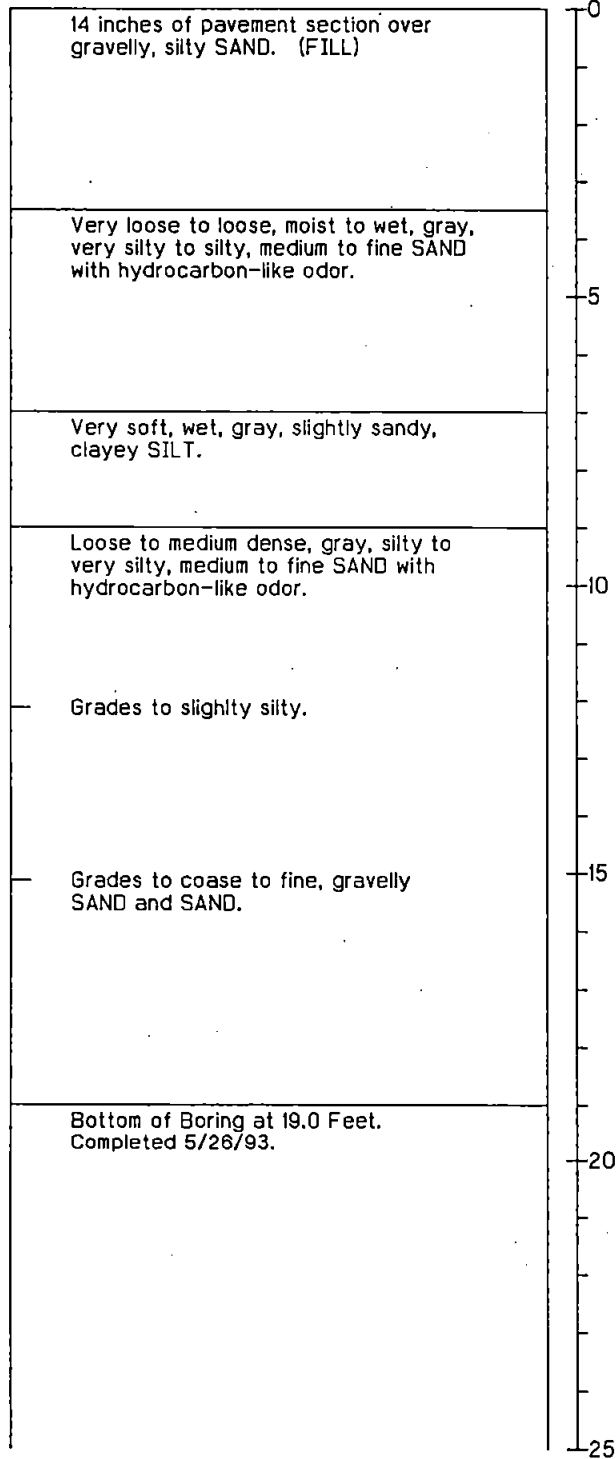
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J-1639-27 8/93

Figure A-1

Boring Log U-1B4

Soil Descriptions

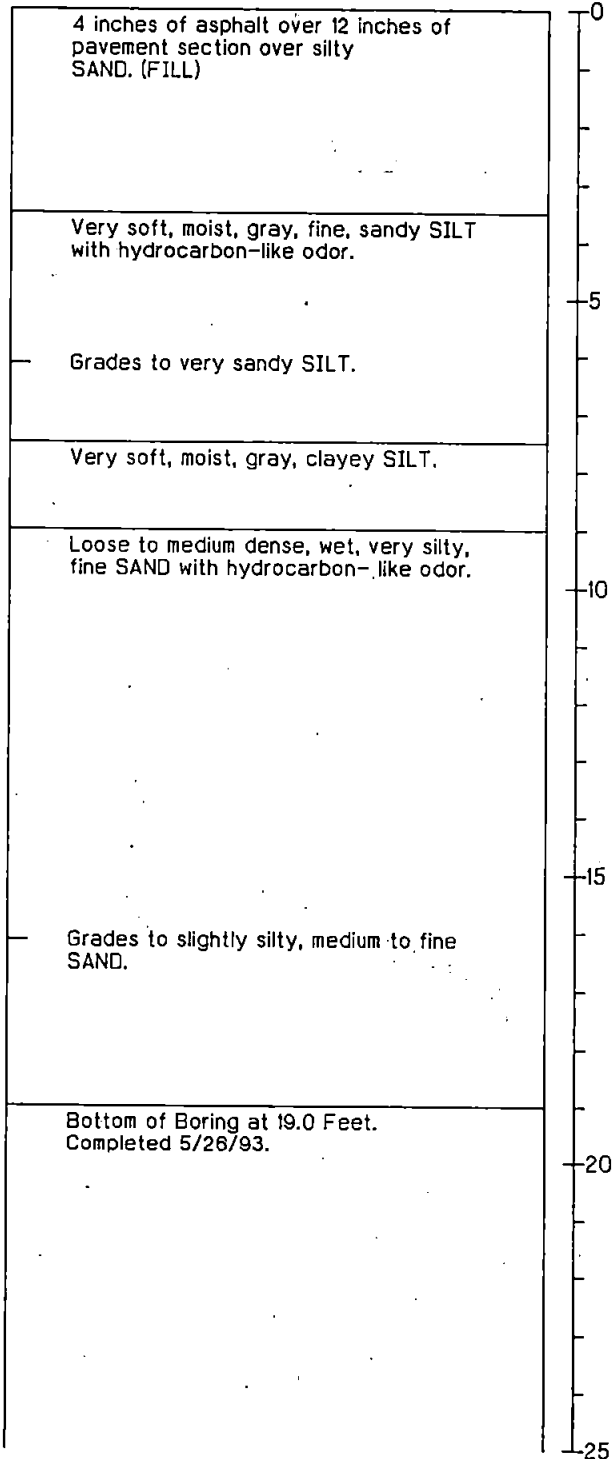


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log U-1B5

Soil Descriptions

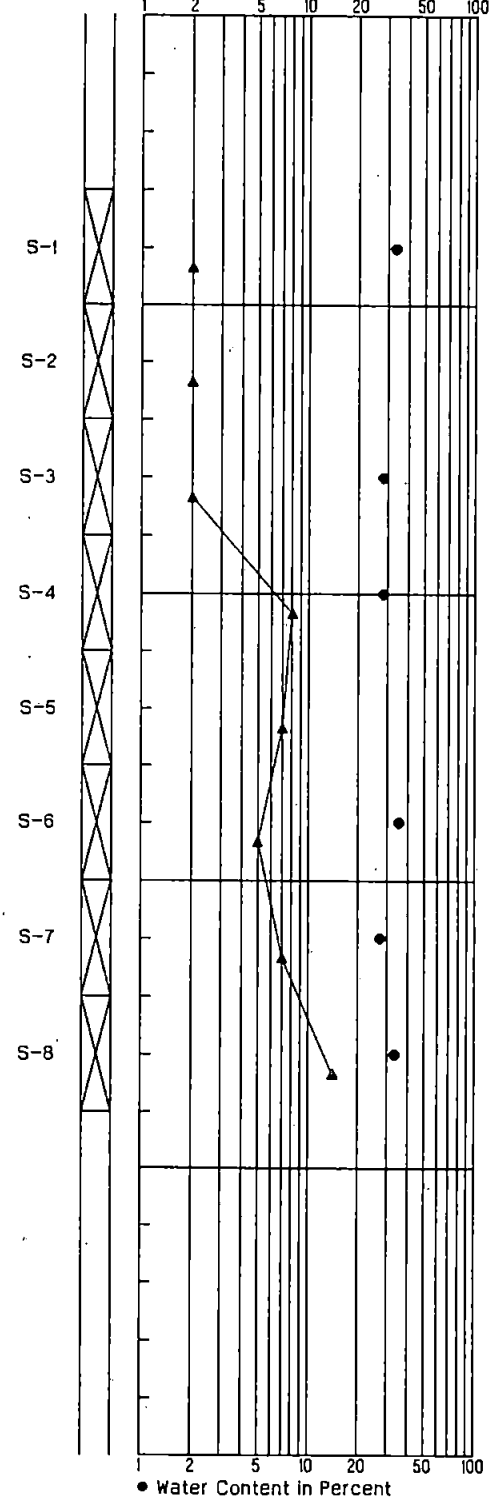
Depth
in Feet



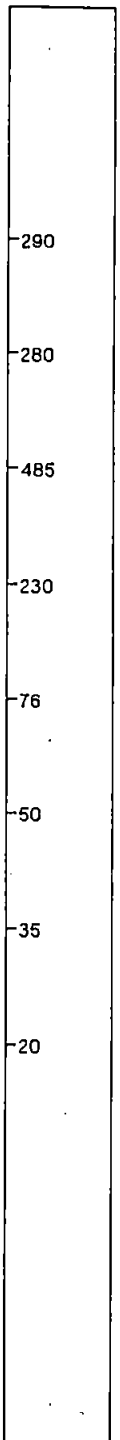
STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

Sample



LAB
TESTS
& PID



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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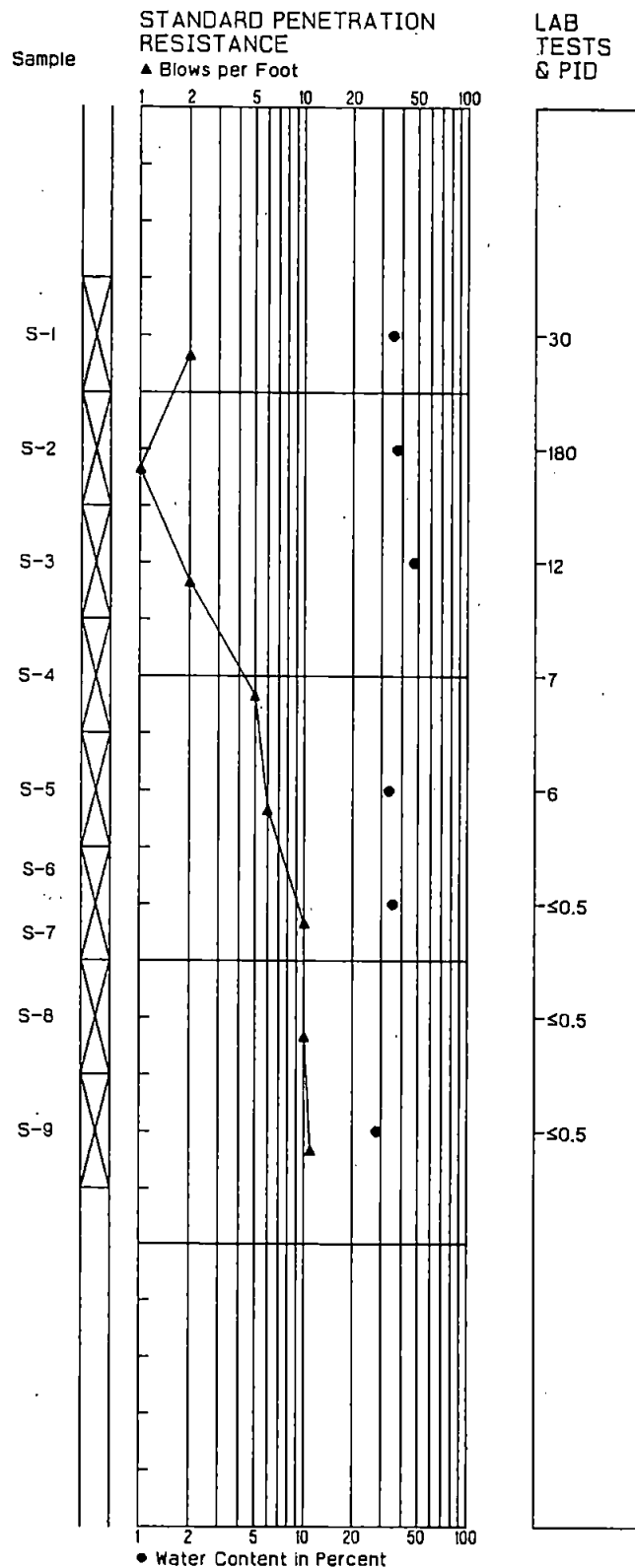
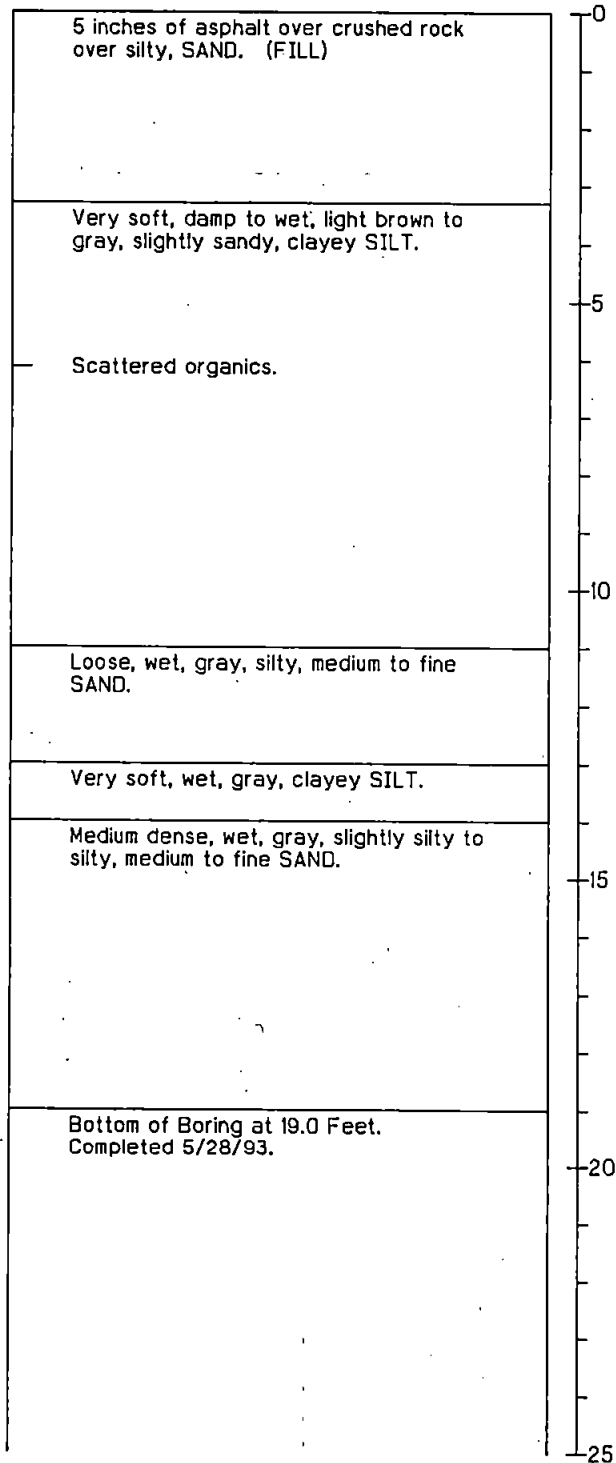
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5/93

Figure A-3

Boring Log U-1L

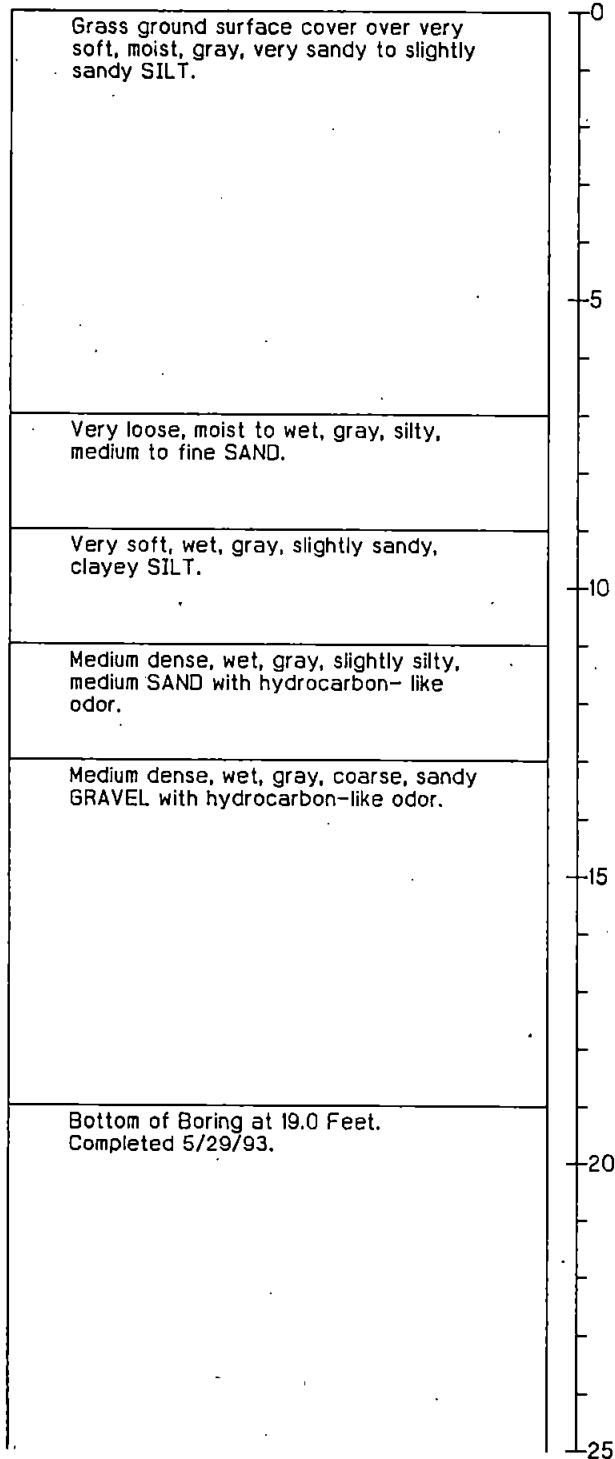
Soil Descriptions



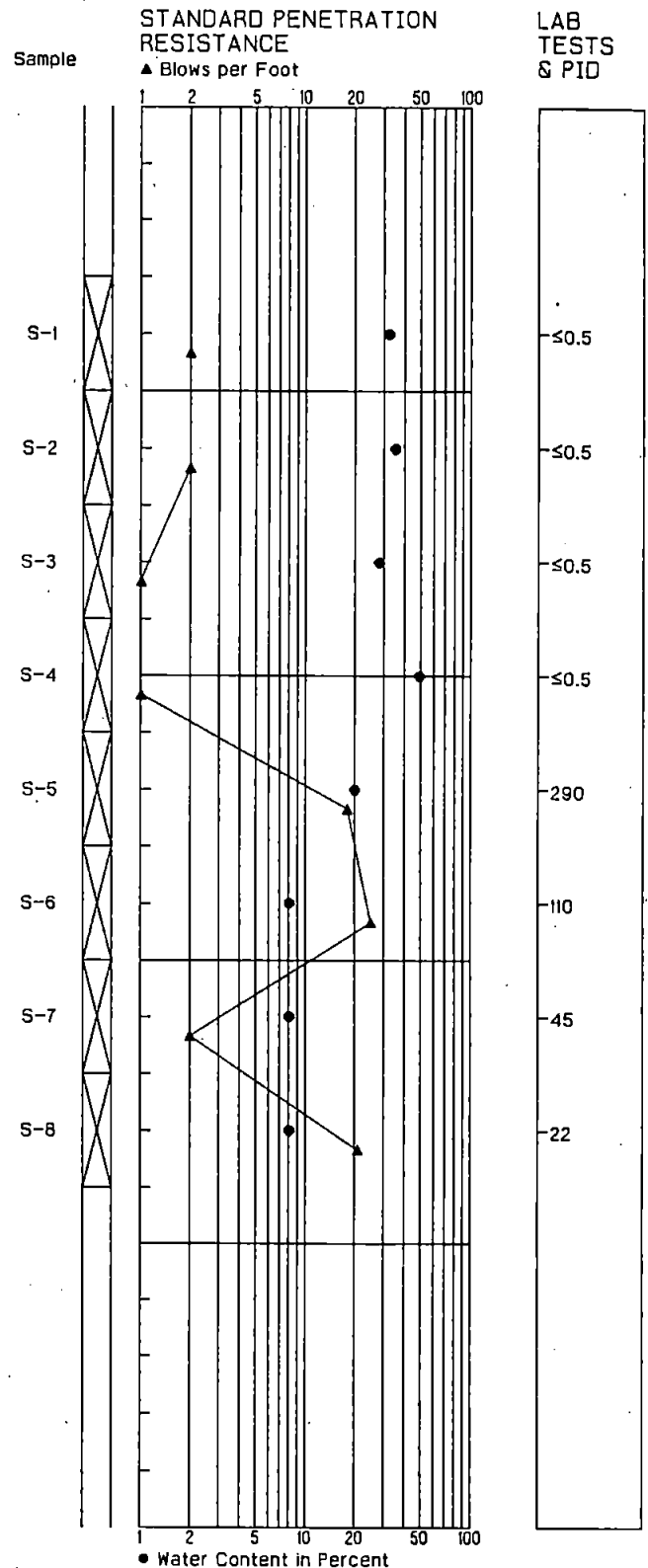
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log U-1b,

Soil Descriptions



▽
ATD



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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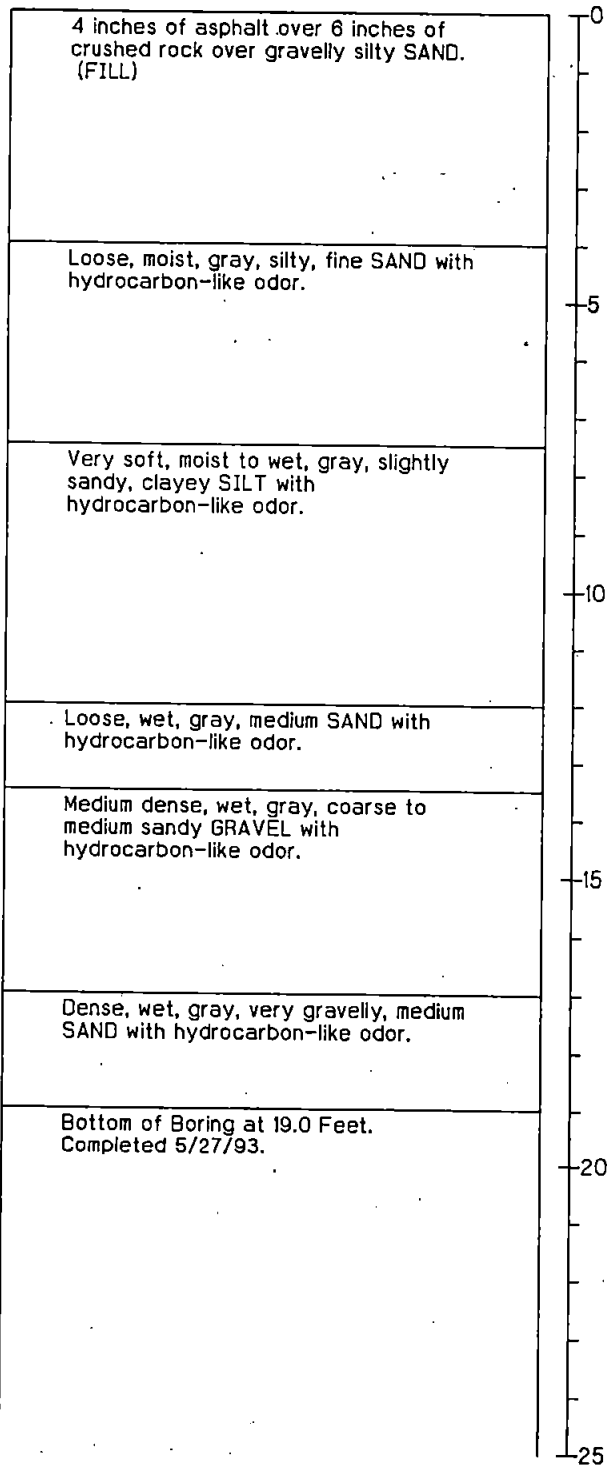
5/93

Figure A-5

Boring Log U-100

Soil Descriptions

Depth
in Feet

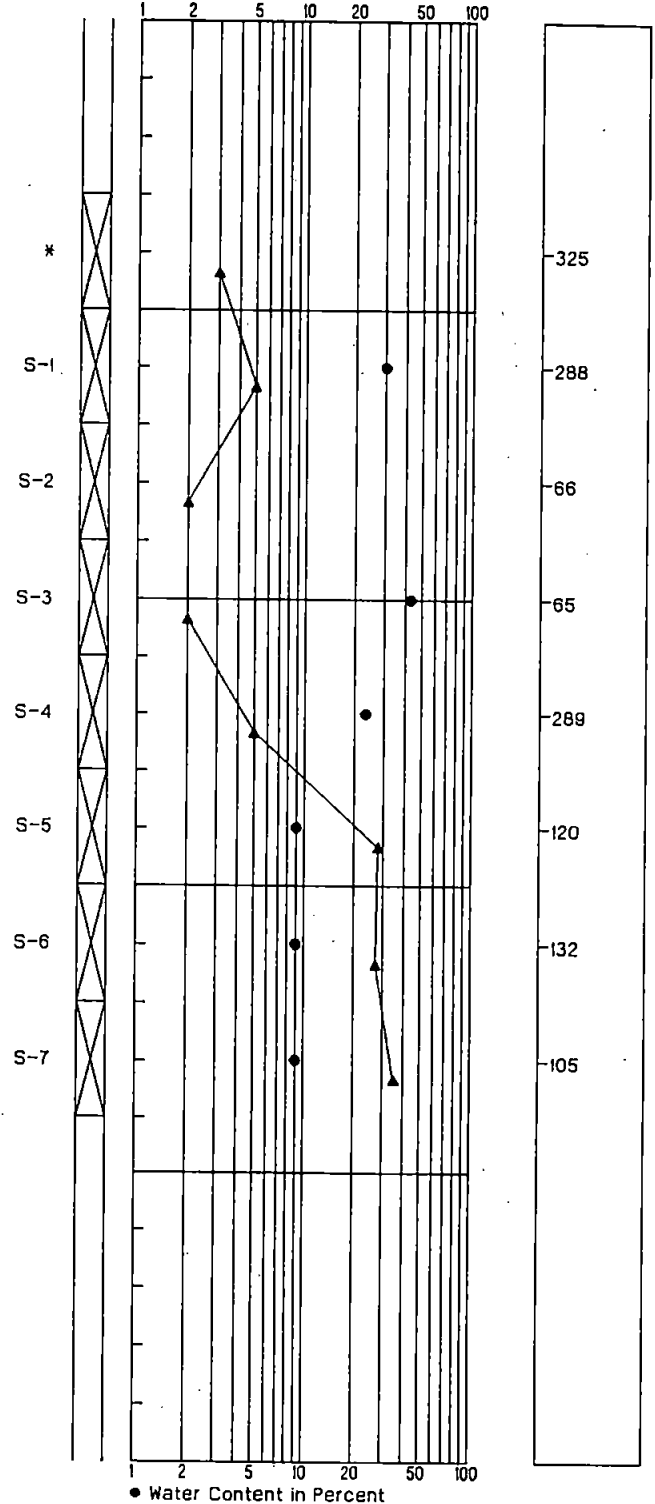


STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

LAB
TESTS
& PID

Sample



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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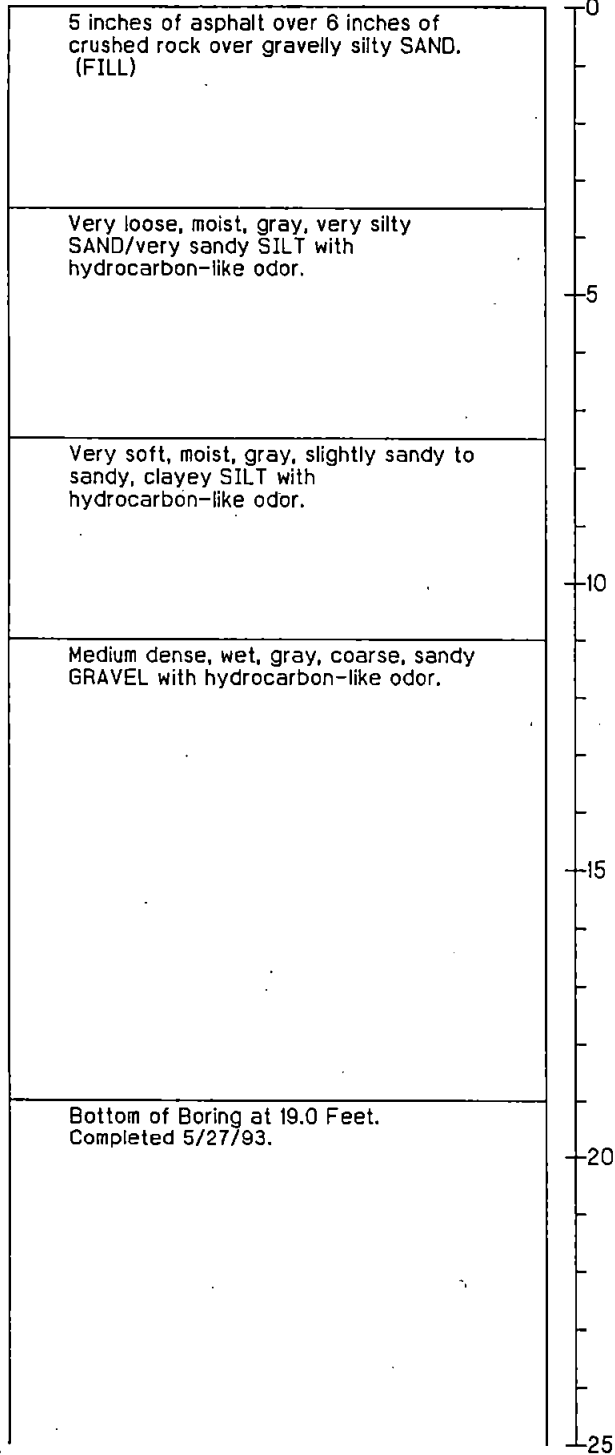
5/93

Figure A-6

Boring Log U-1B9

Soil Descriptions

Depth
in Feet



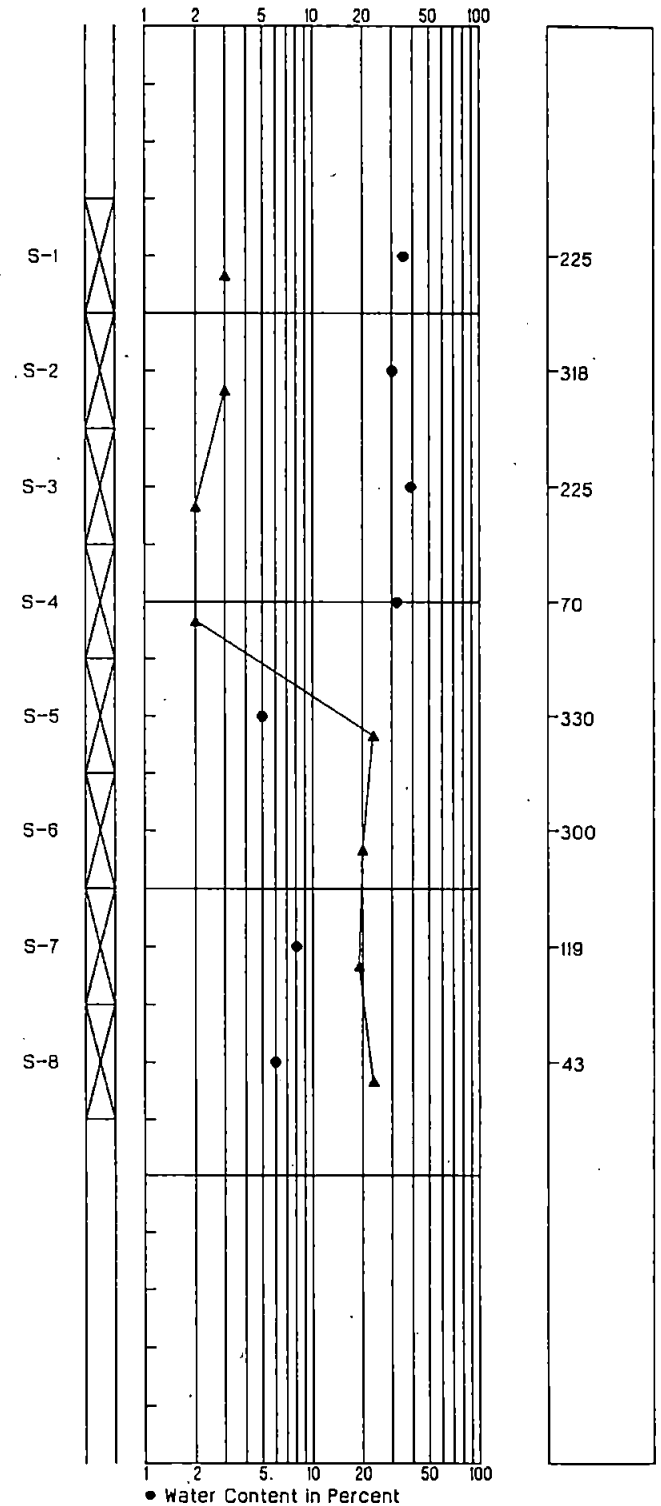
▽
ATD

Sample

STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

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1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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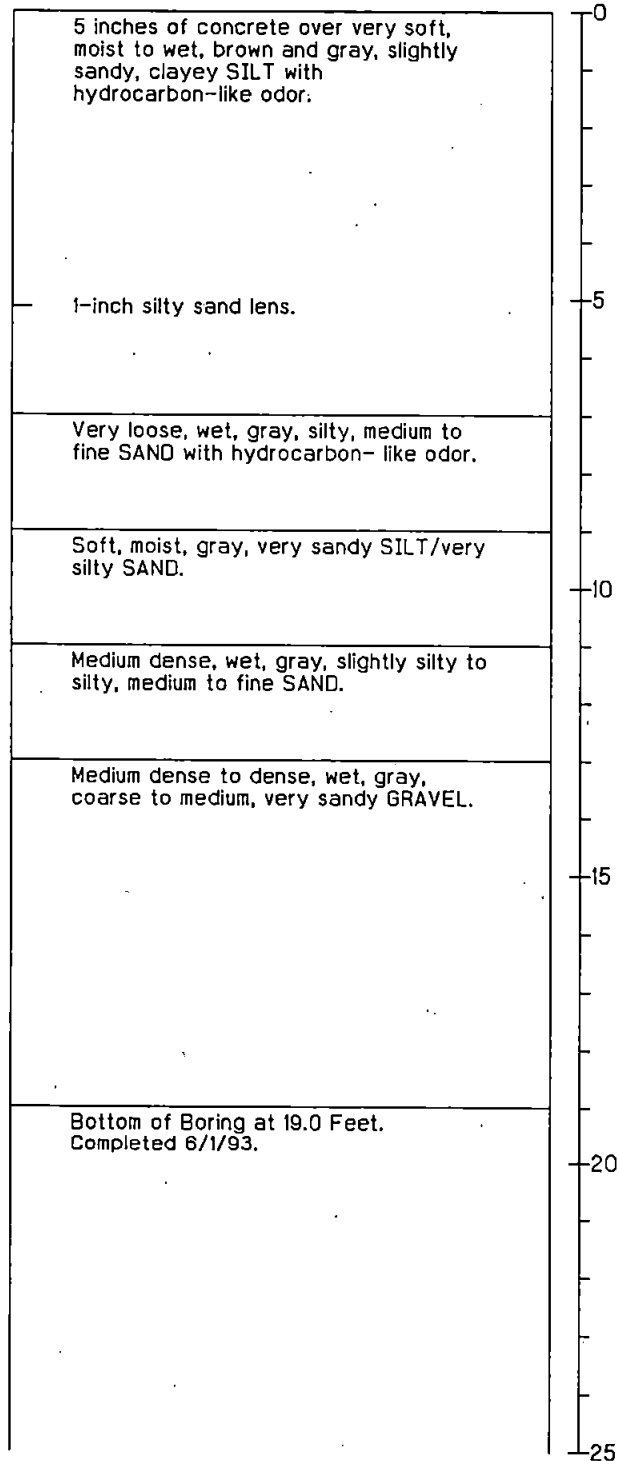
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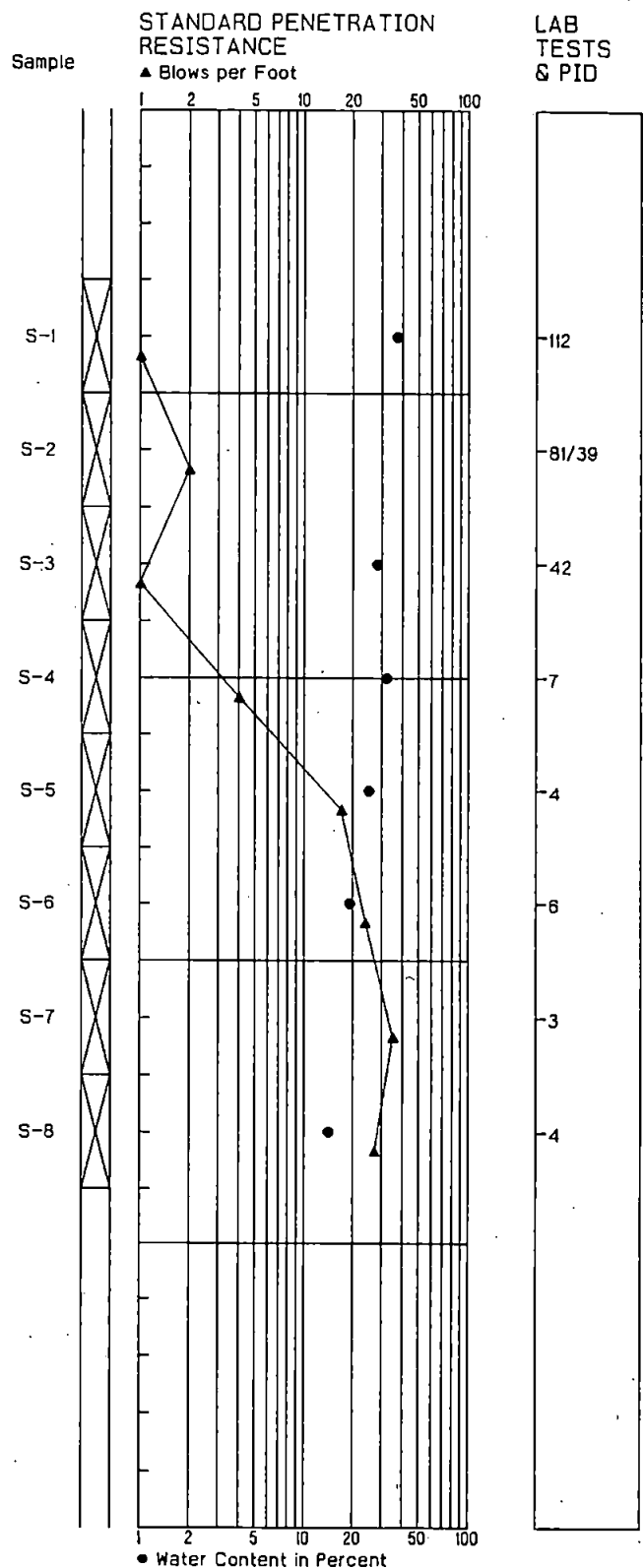
Figure A-7

Boring Log U-1B10

Soil Descriptions



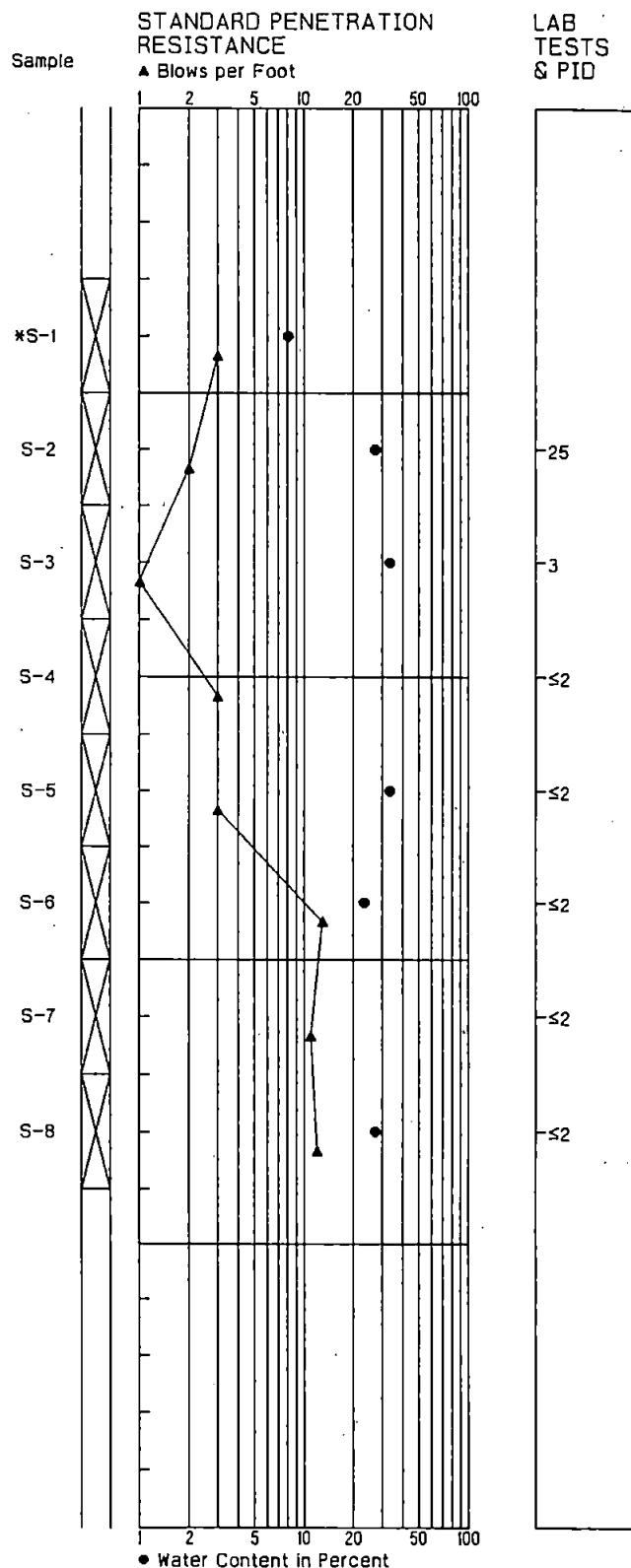
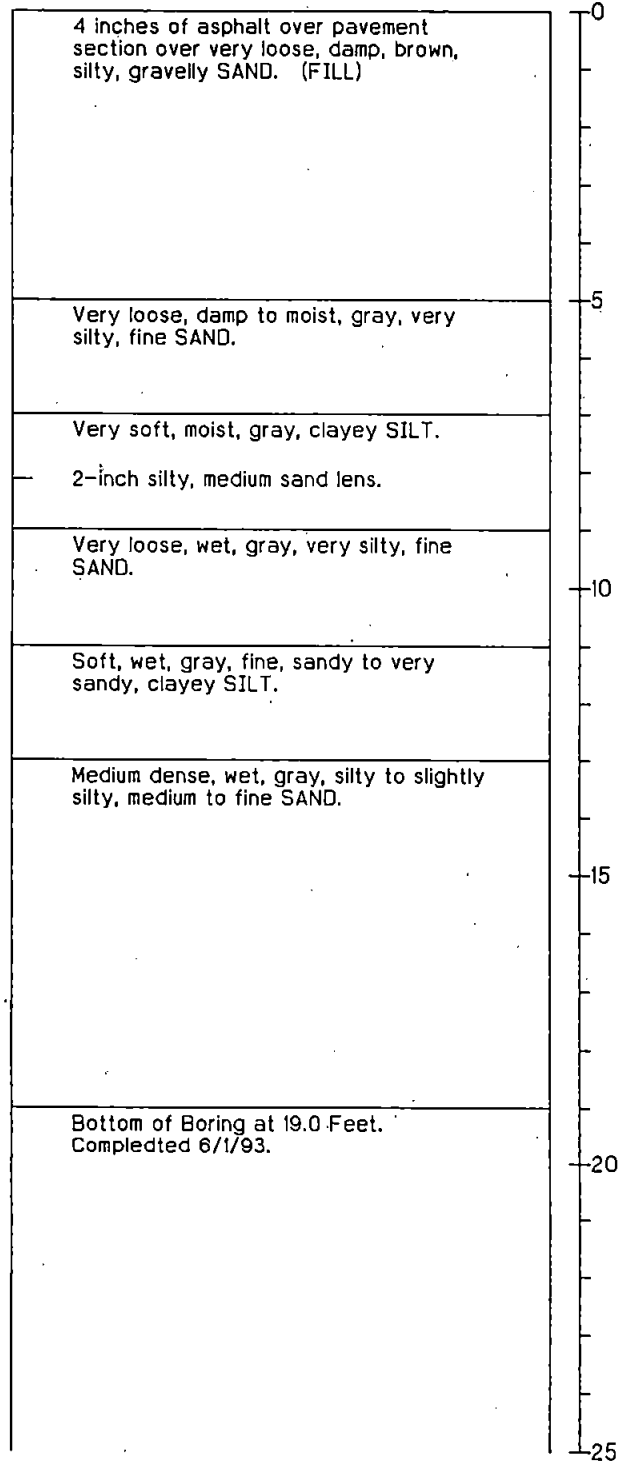
$\frac{V}{ATD}$



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log U-1011

Soil Descriptions

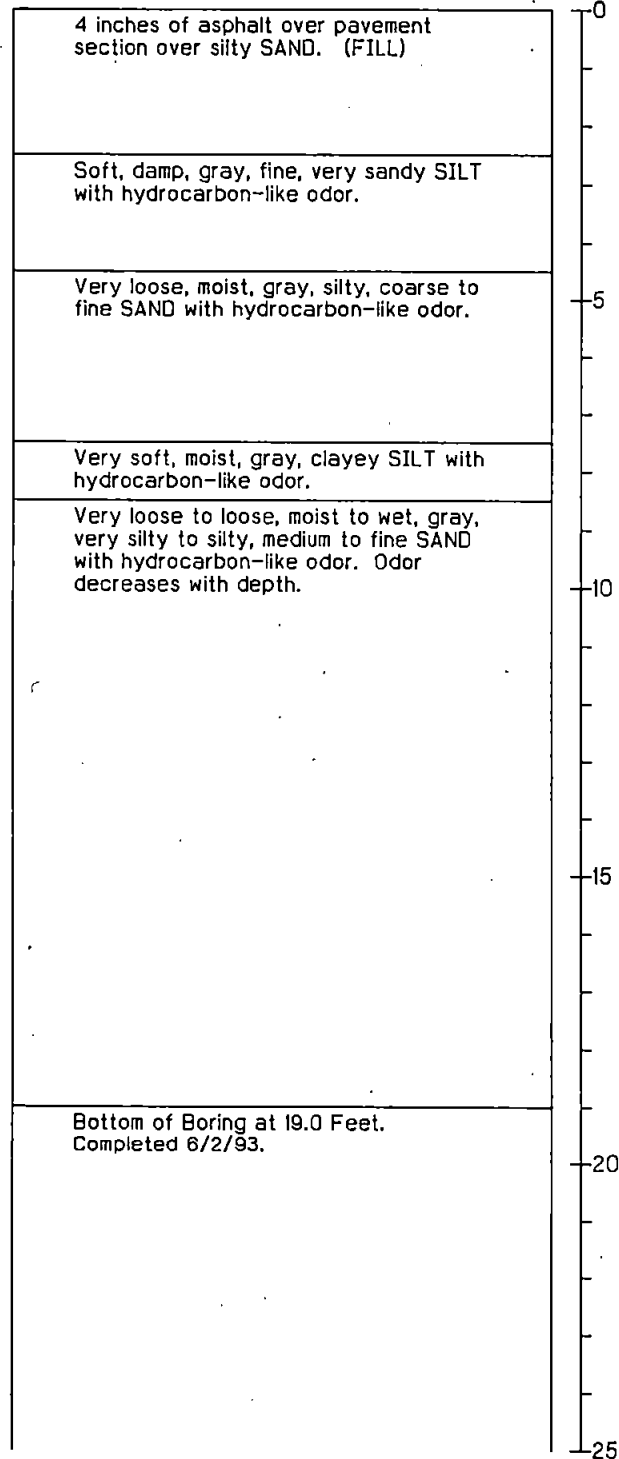


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log U-1b12

Soil Descriptions

Depth
in Feet

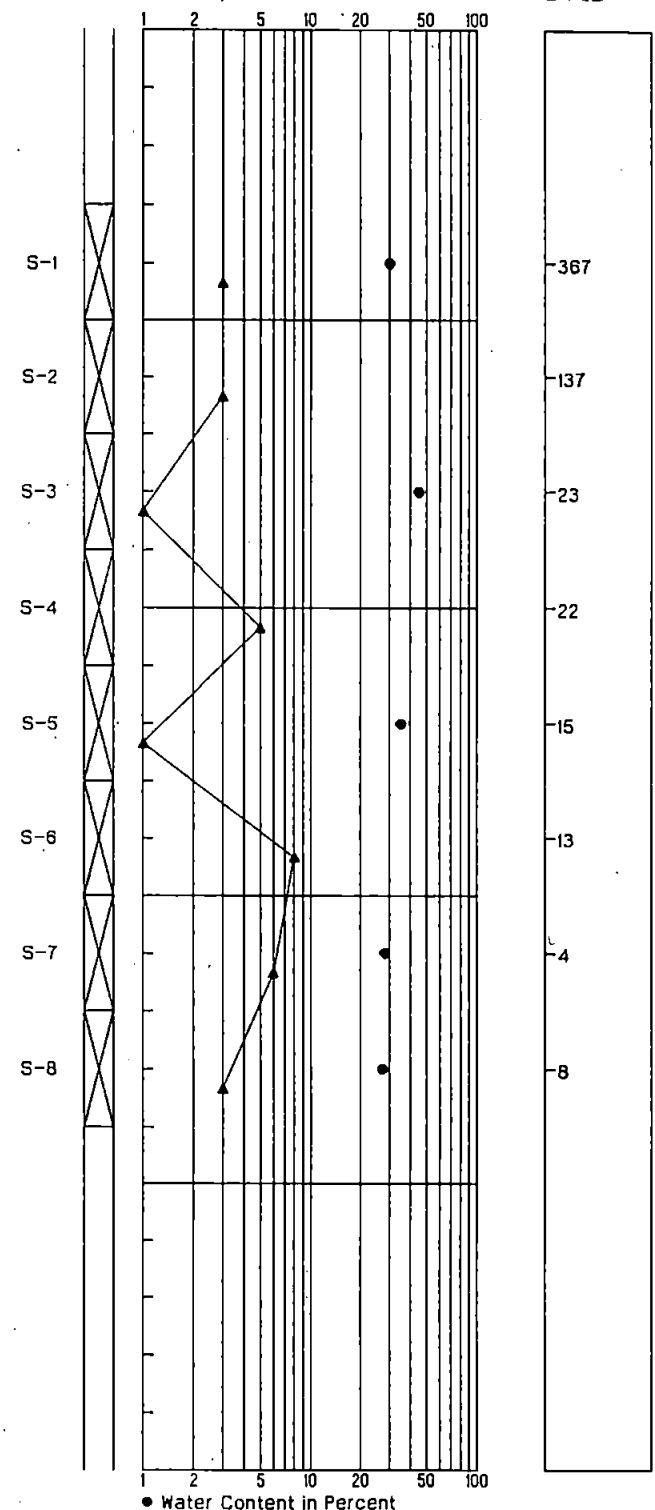


STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

LAB
TESTS
& PID

Sample



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2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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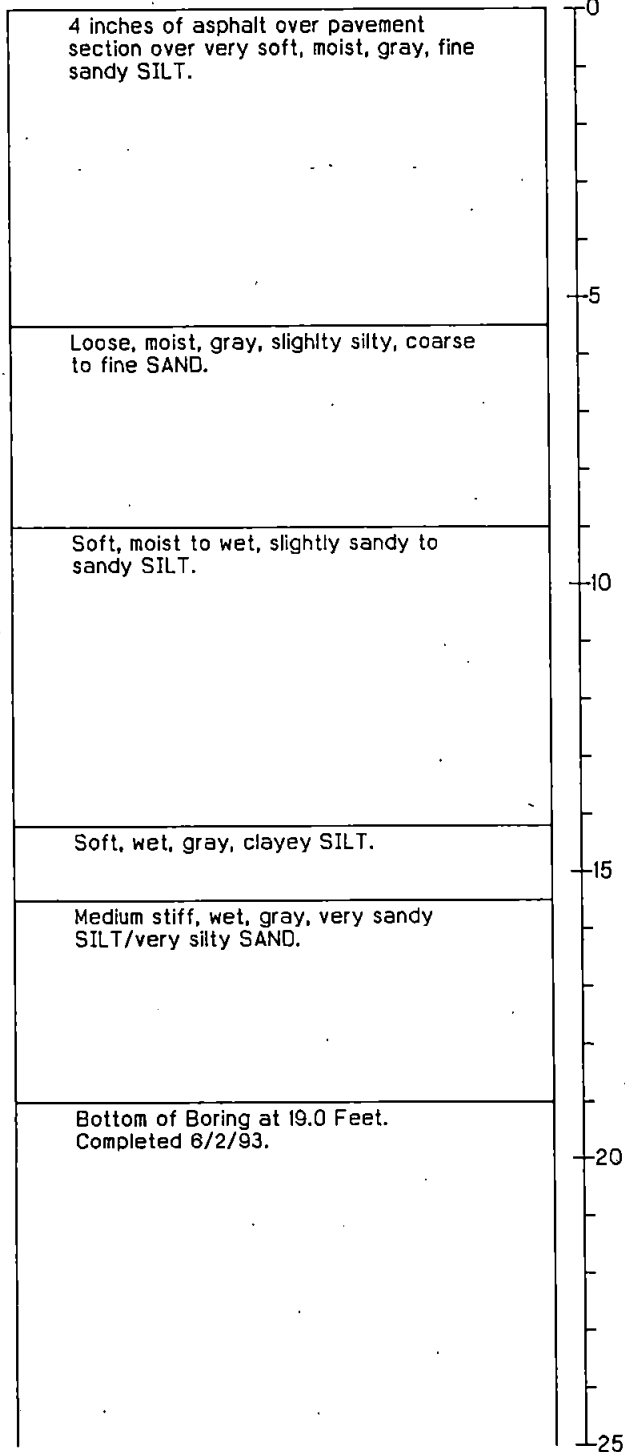
J-1638-9-27 8/93

Figure A-10

Boring Log U-1B13

Soil Descriptions

Depth
in Feet

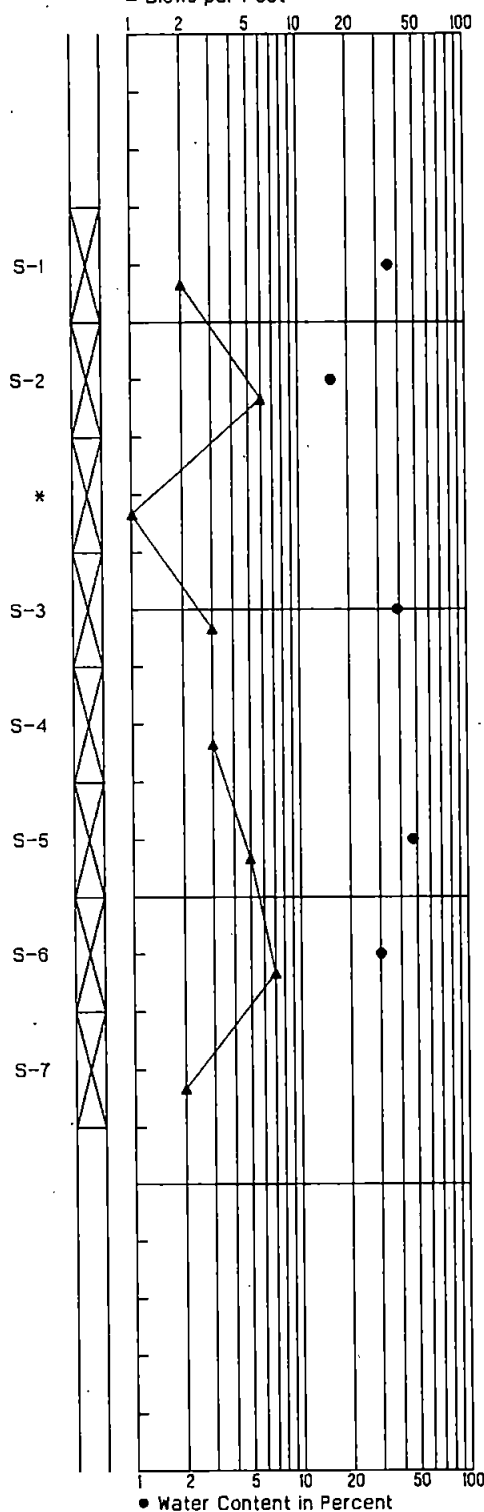


▽
ATD

STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

Sample



LAB TESTS & PID

1. Refer to Figure A-1 for explanation of descriptions and symbols.
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3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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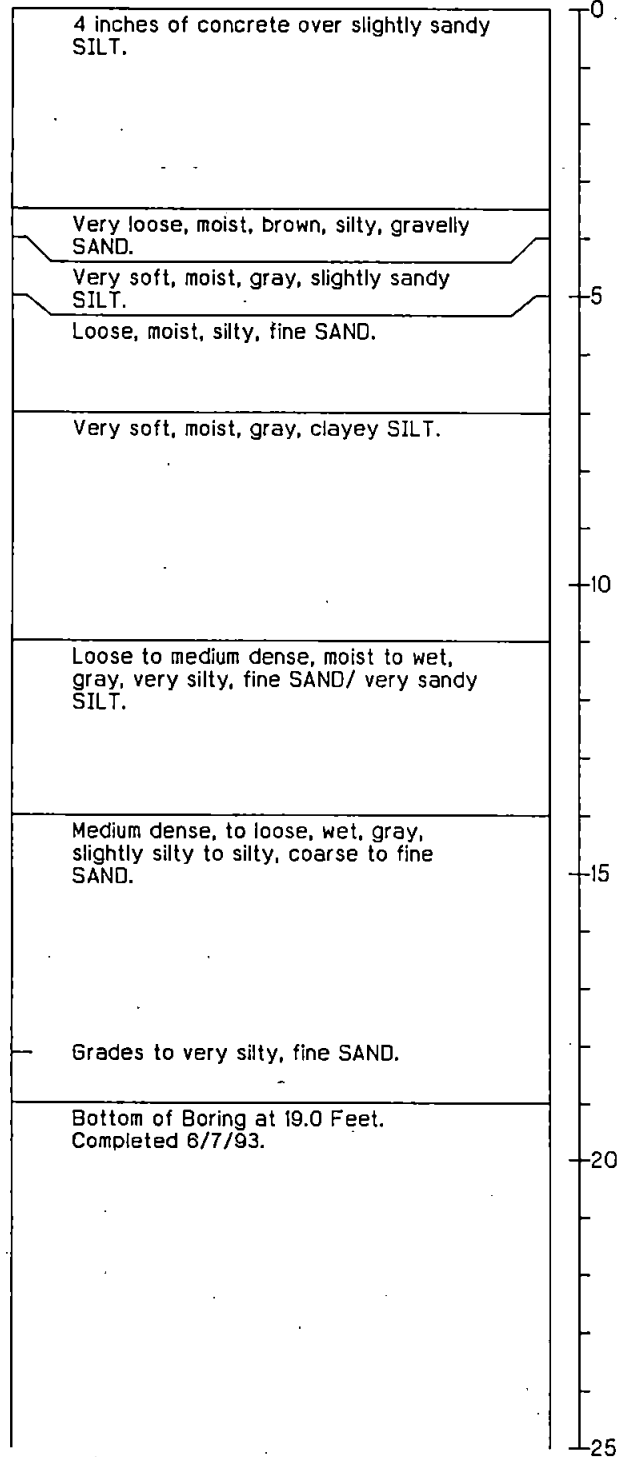
6/93

Figure A-11

Boring Log U-1b.5

Soil Descriptions

Depth
in Feet

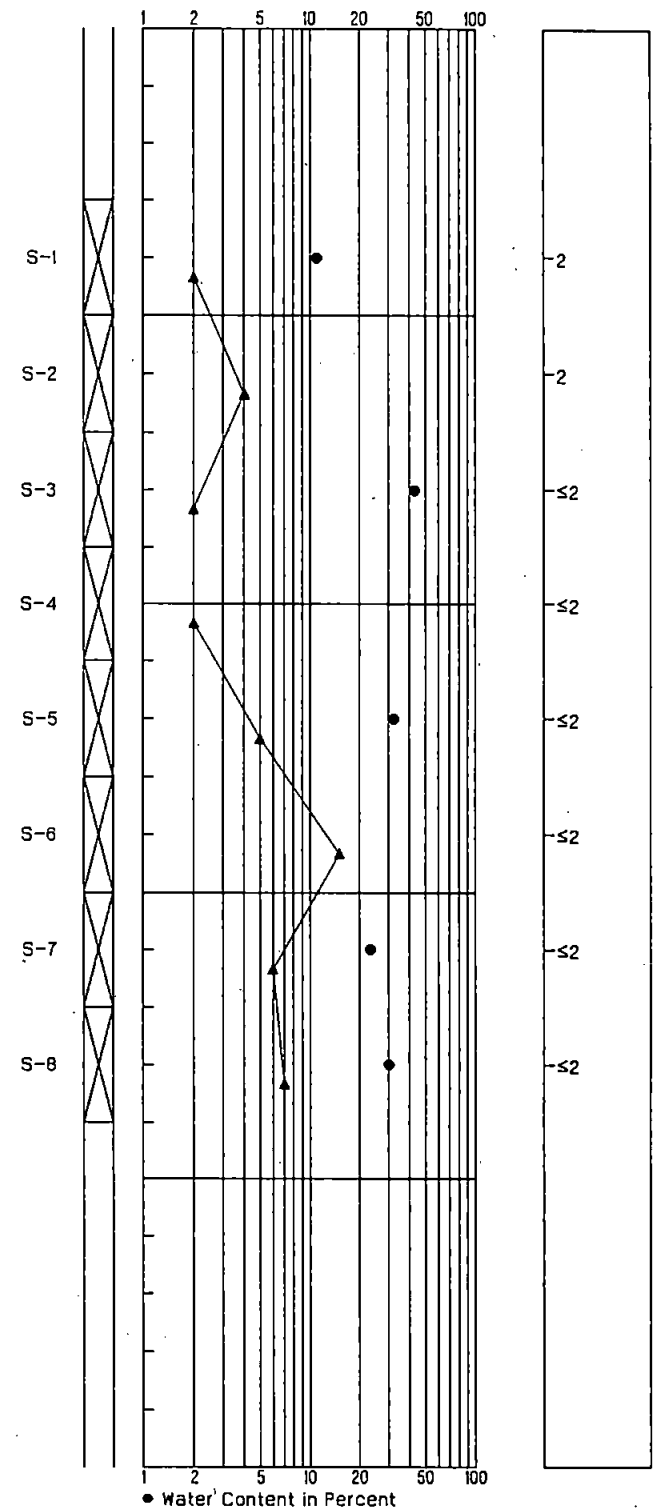


STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

LAB
TESTS
& PID

Sample



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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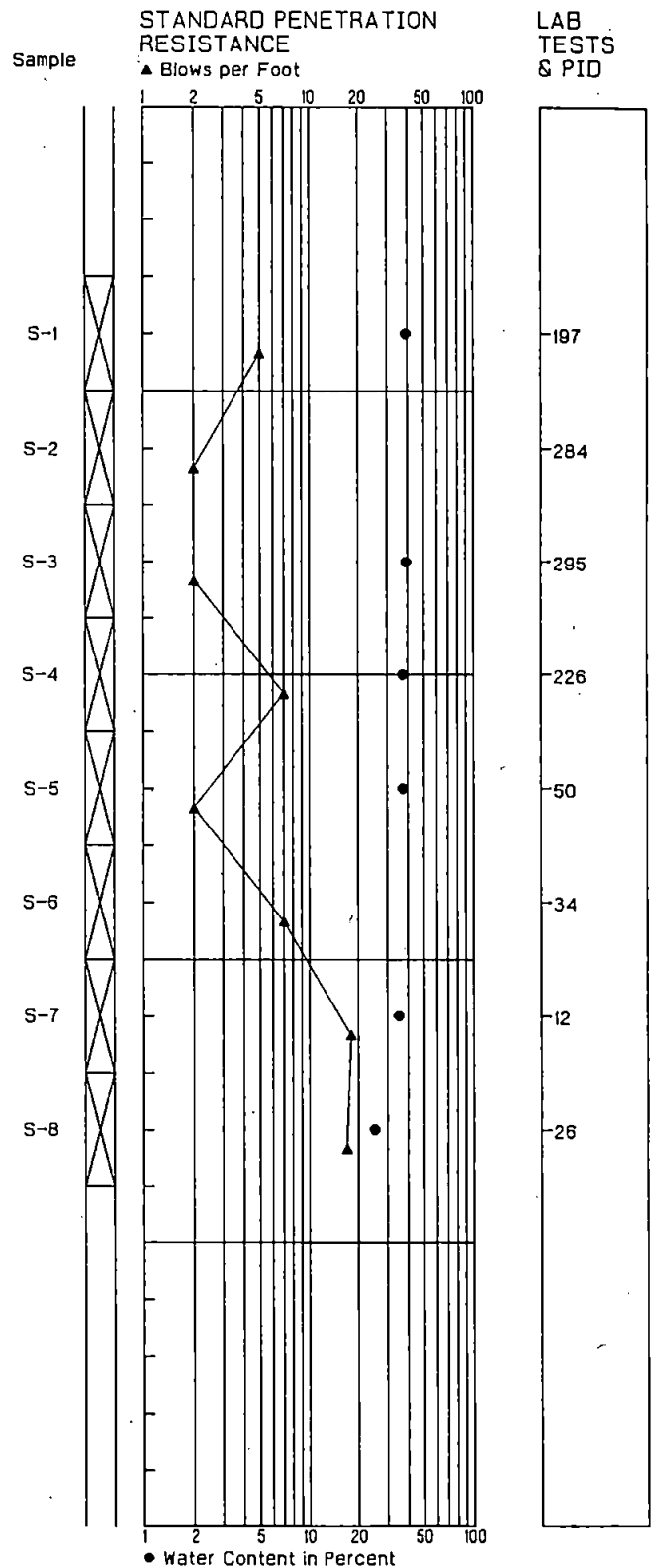
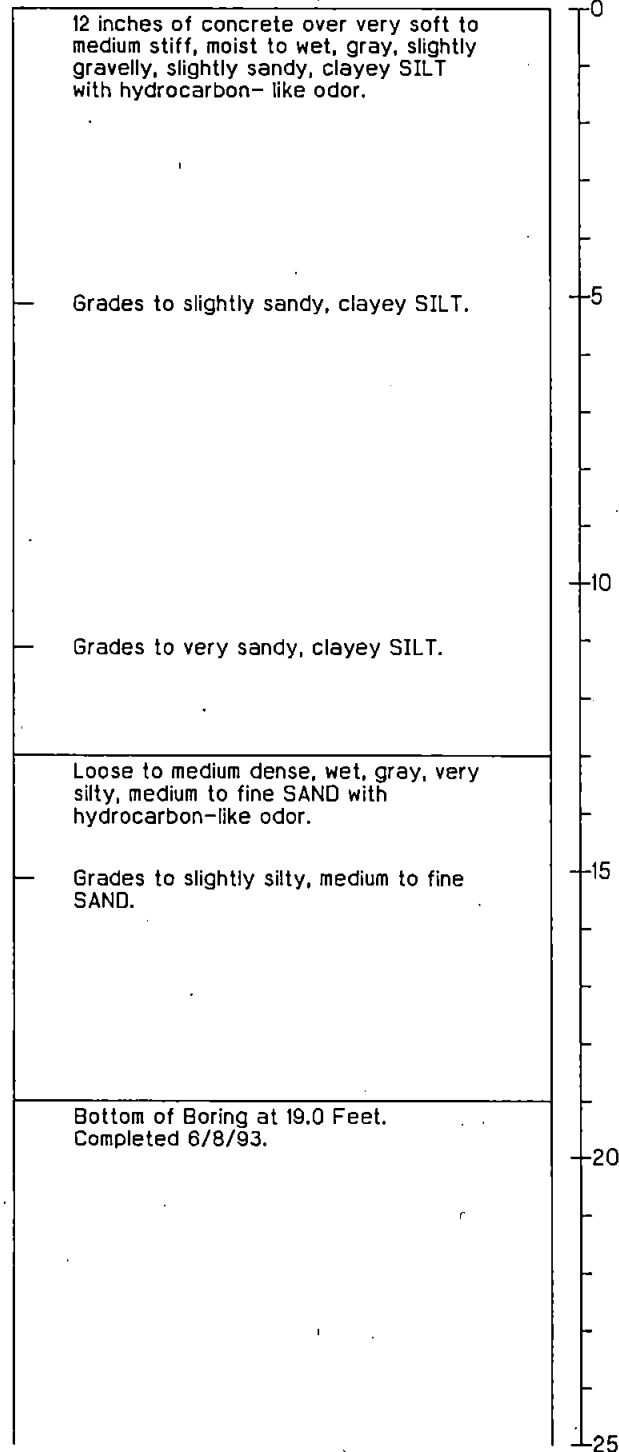
J-1639-27

6/93

Figure A-12

Boring Log U-1L-1

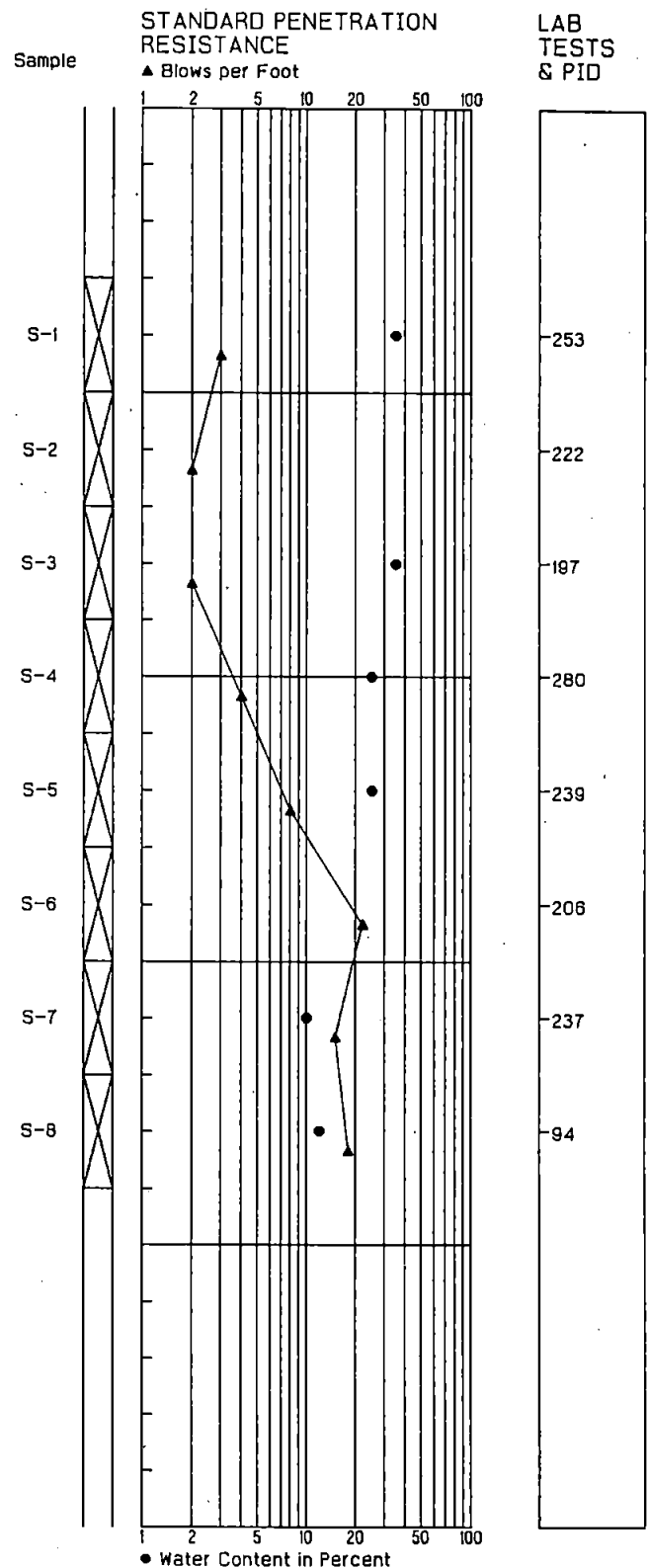
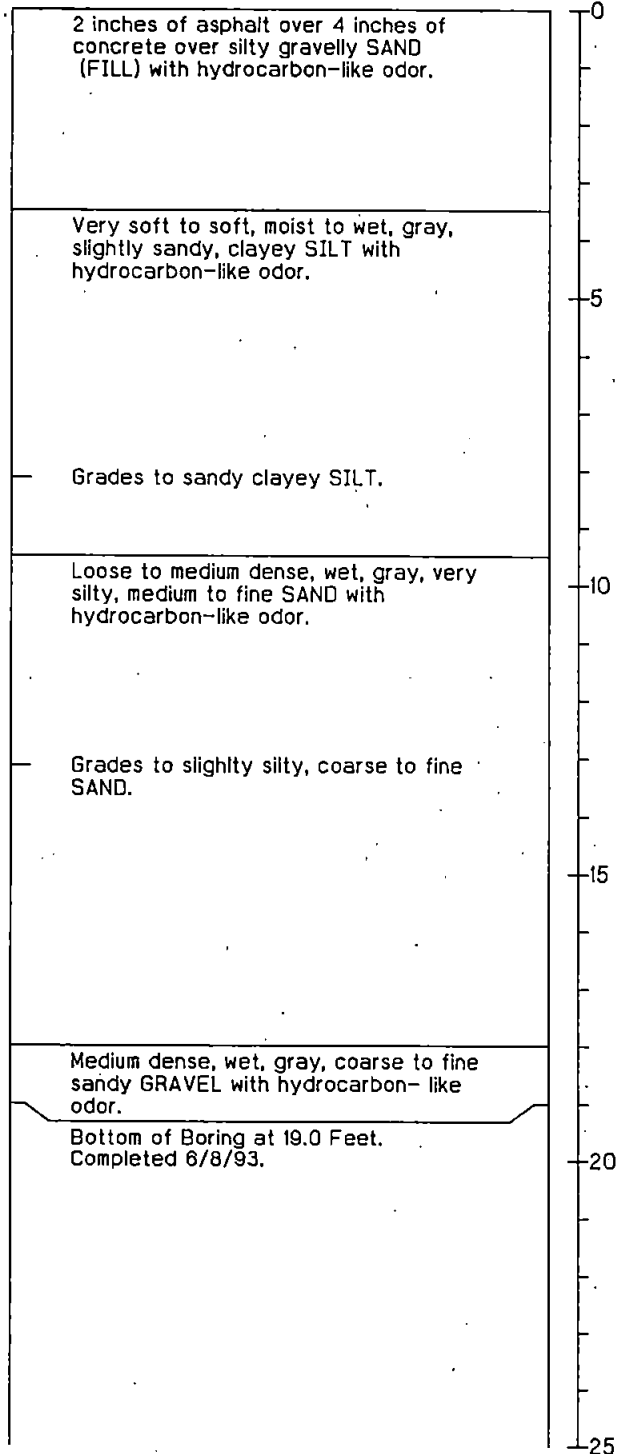
Soil Descriptions



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log U-1br'2

Soil Descriptions



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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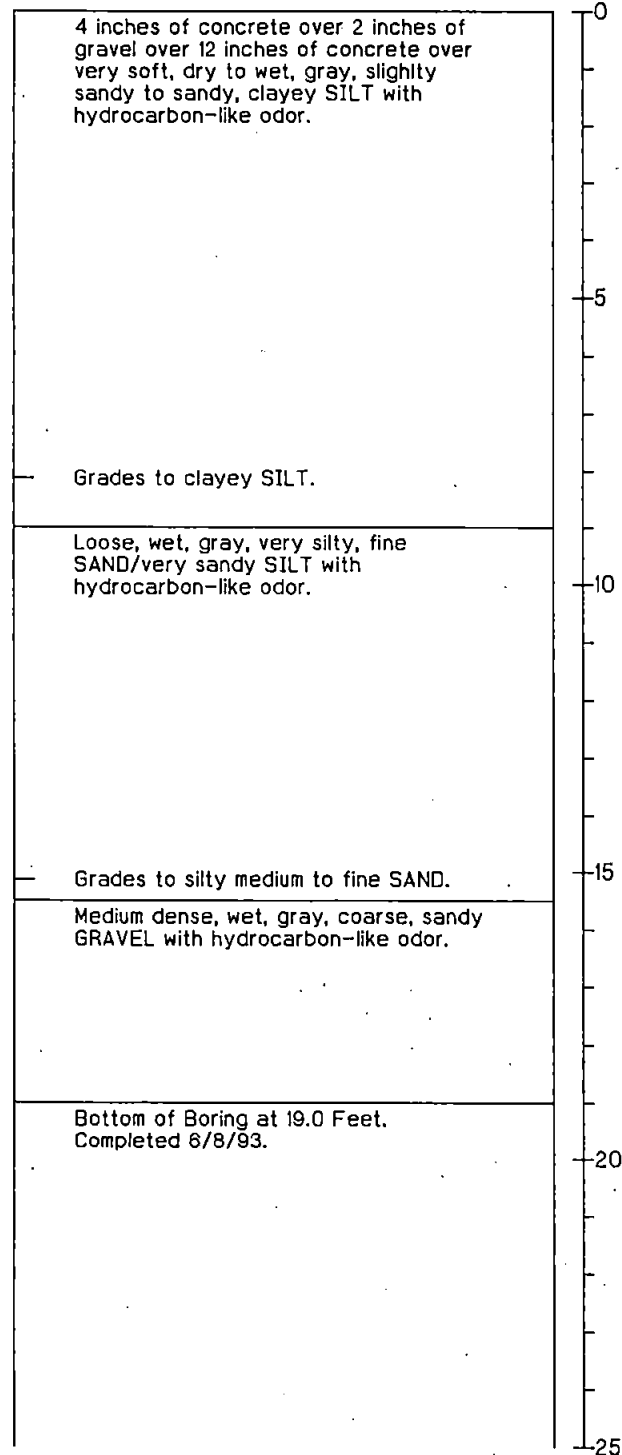
6/93

Figure A-14

Boring Log U-1b-3

Soil Descriptions

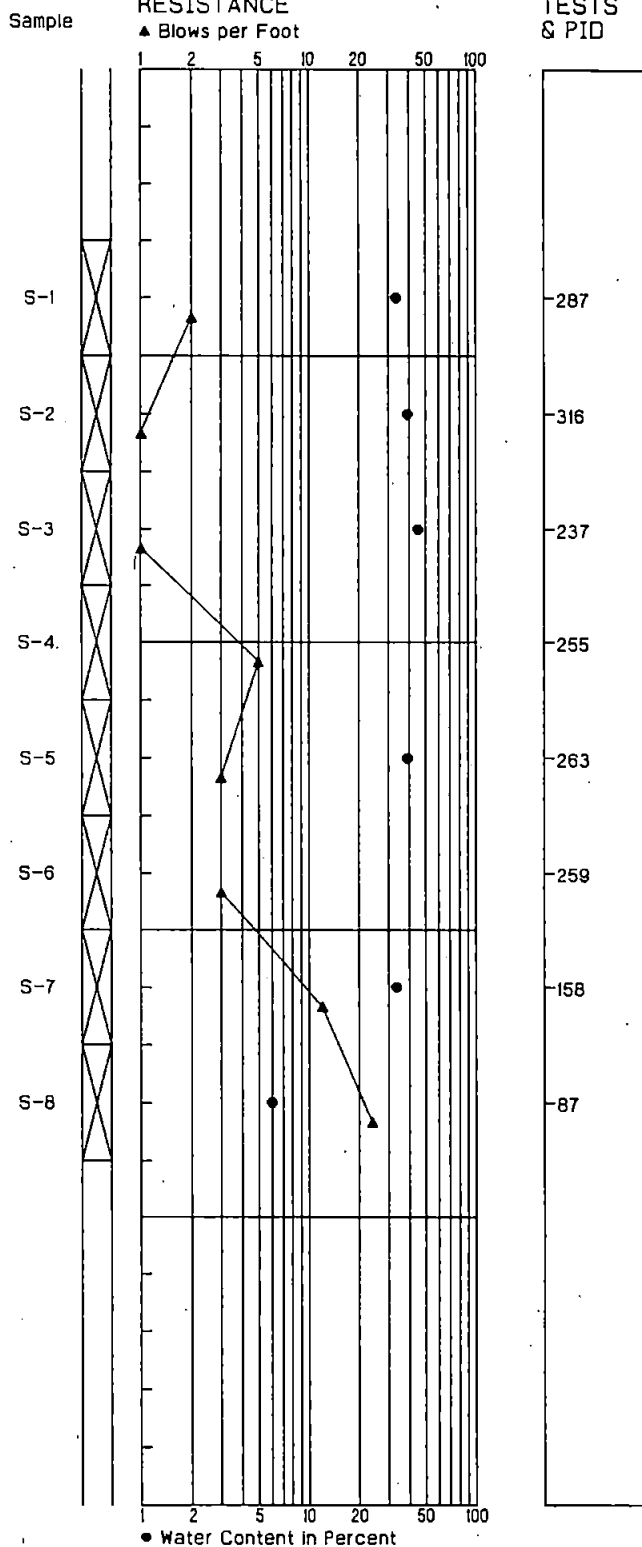
Depth
in Feet



STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

LAB TESTS & PID



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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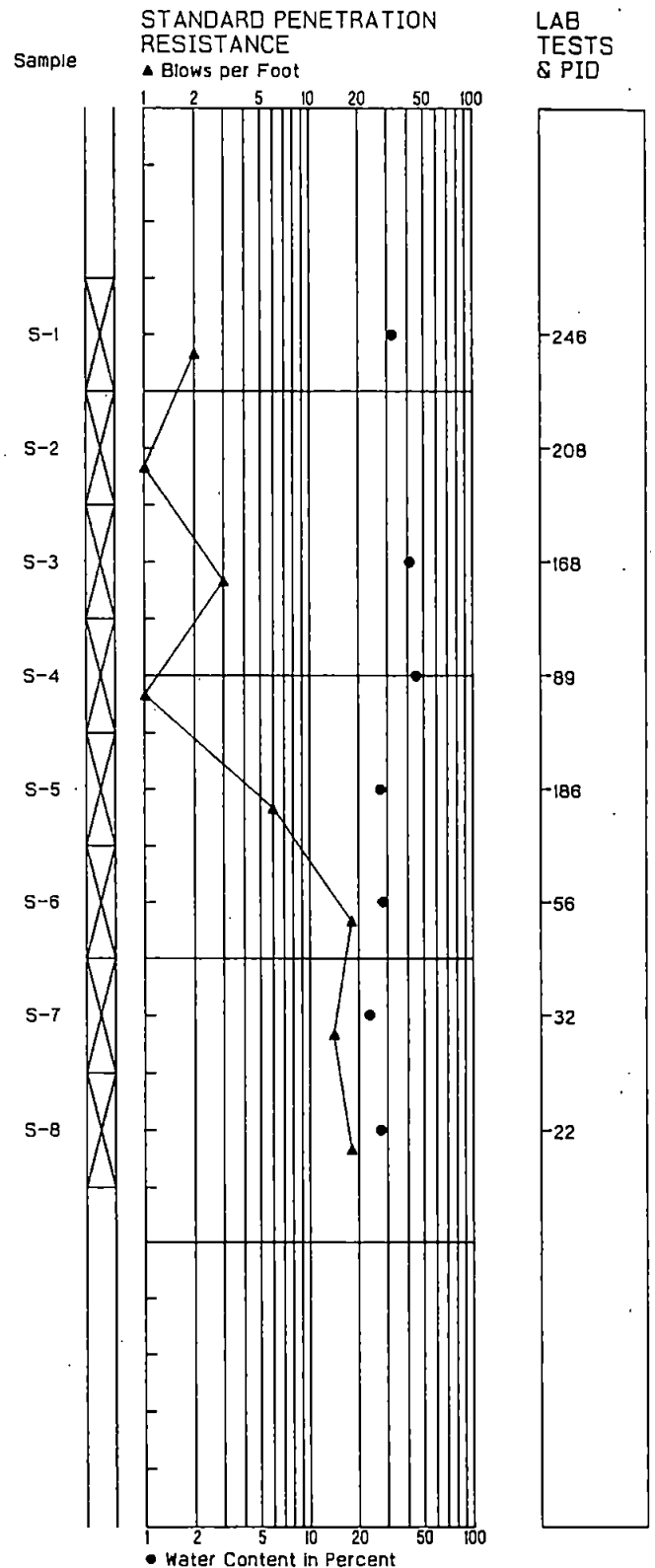
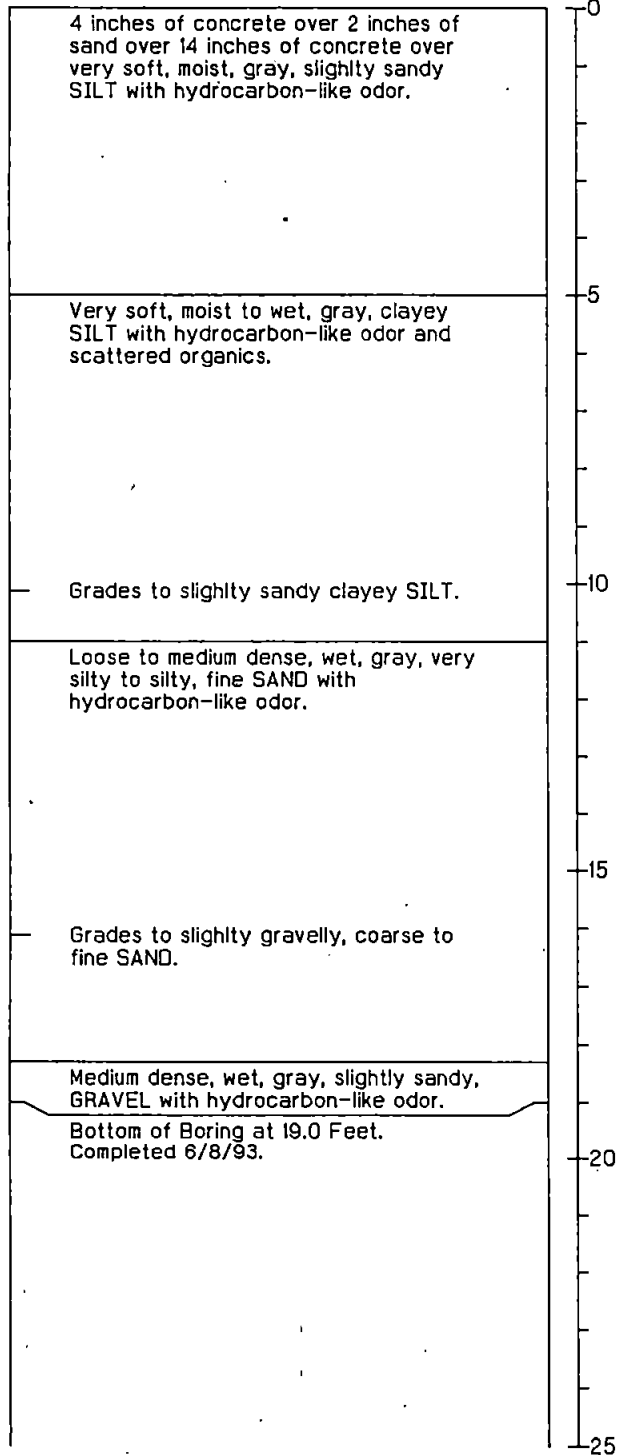
J-1839-27

6/93

Figure A-15

Boring Log U-10r-4

Soil Descriptions



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



HARTCROWSER

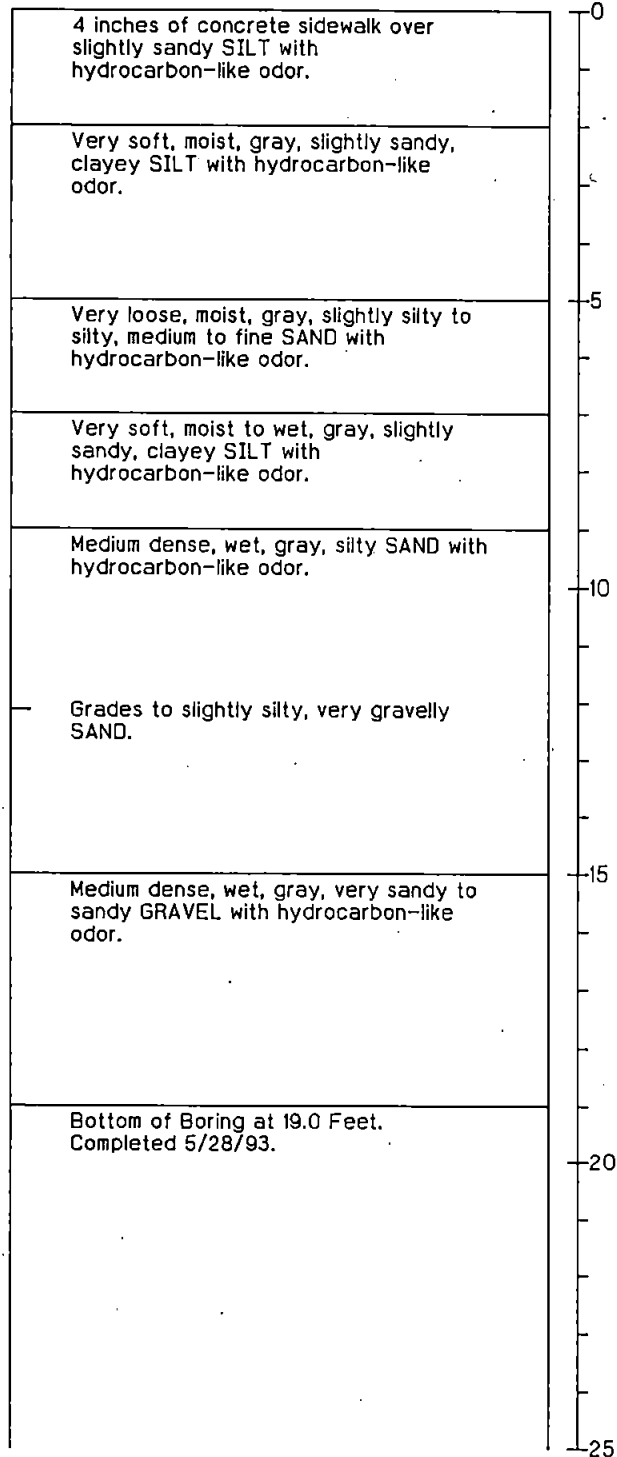
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6/93

Figure A-18

Boring Log U-1...

Soil Descriptions



Depth in Feet

ATD

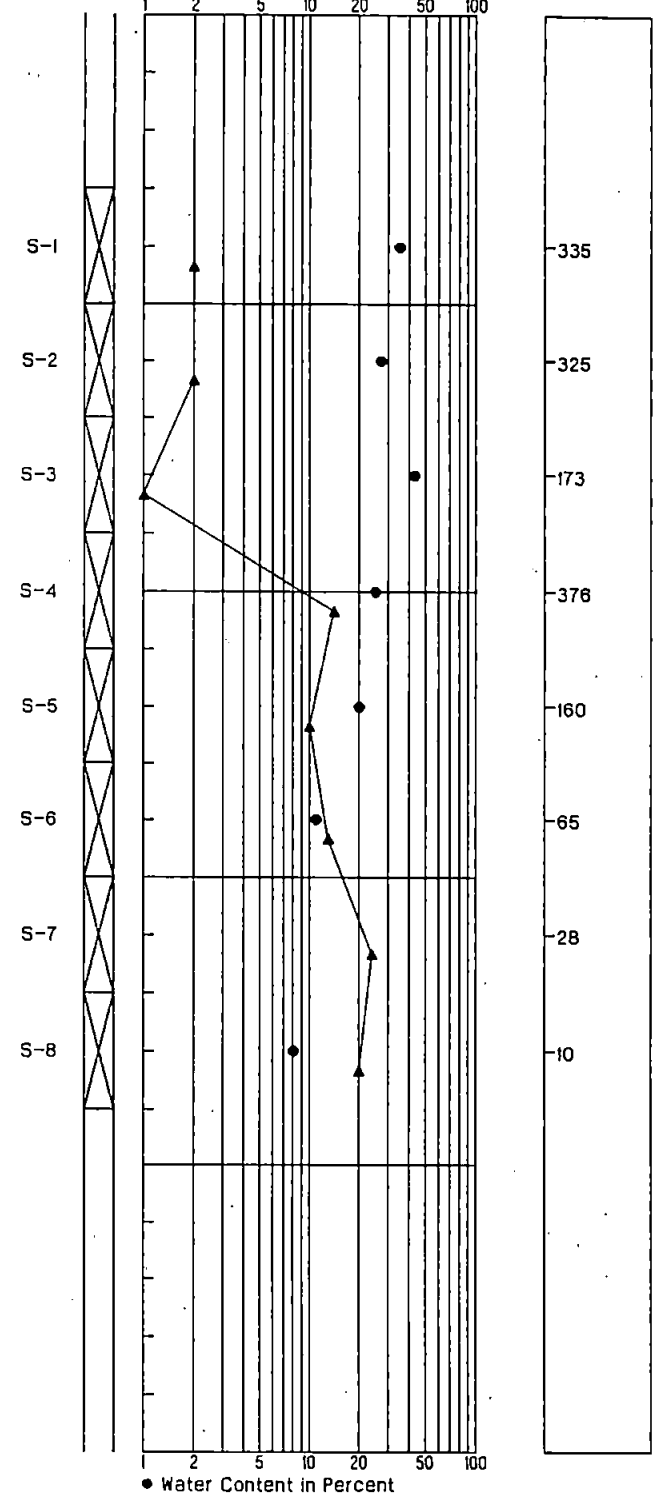
Sample

STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

1 2 5 10 20 50 100

LAB TESTS & PID



● Water Content in Percent

1. Refer to Figure A-1 for explanation of descriptions and symbols.
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3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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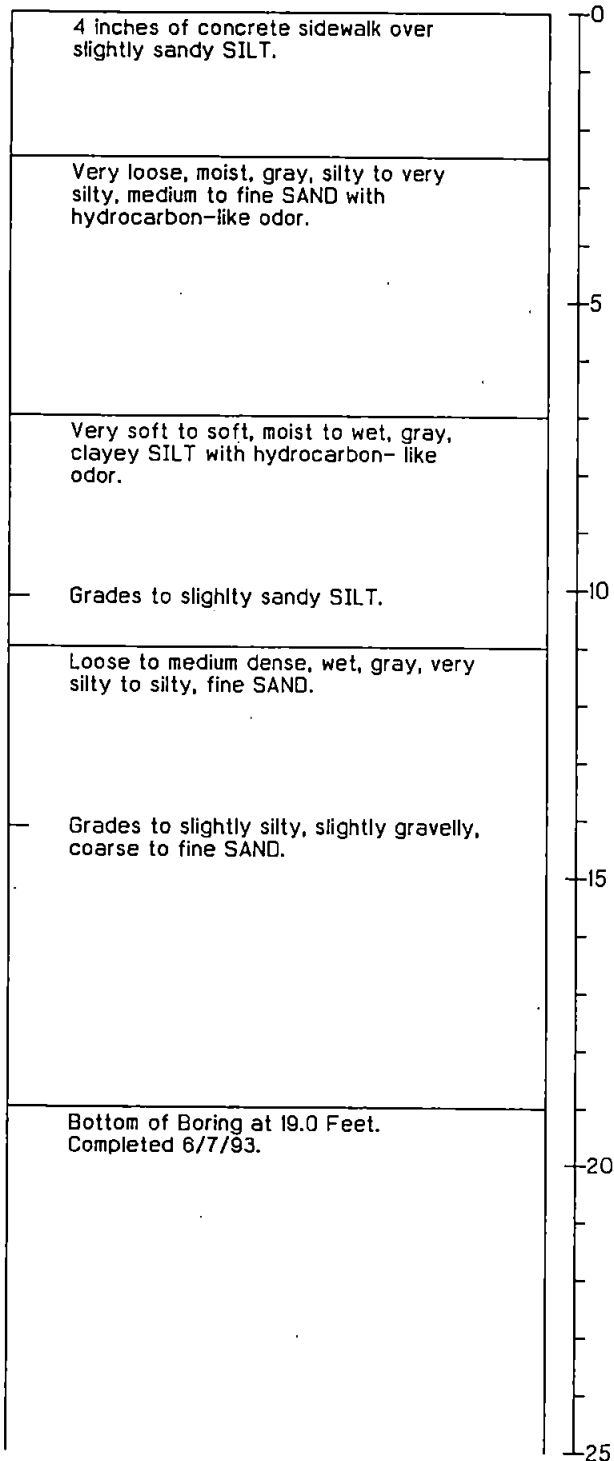
J-1639-27

5/93

Figure A-17

Boring Log U-1

Soil Descriptions



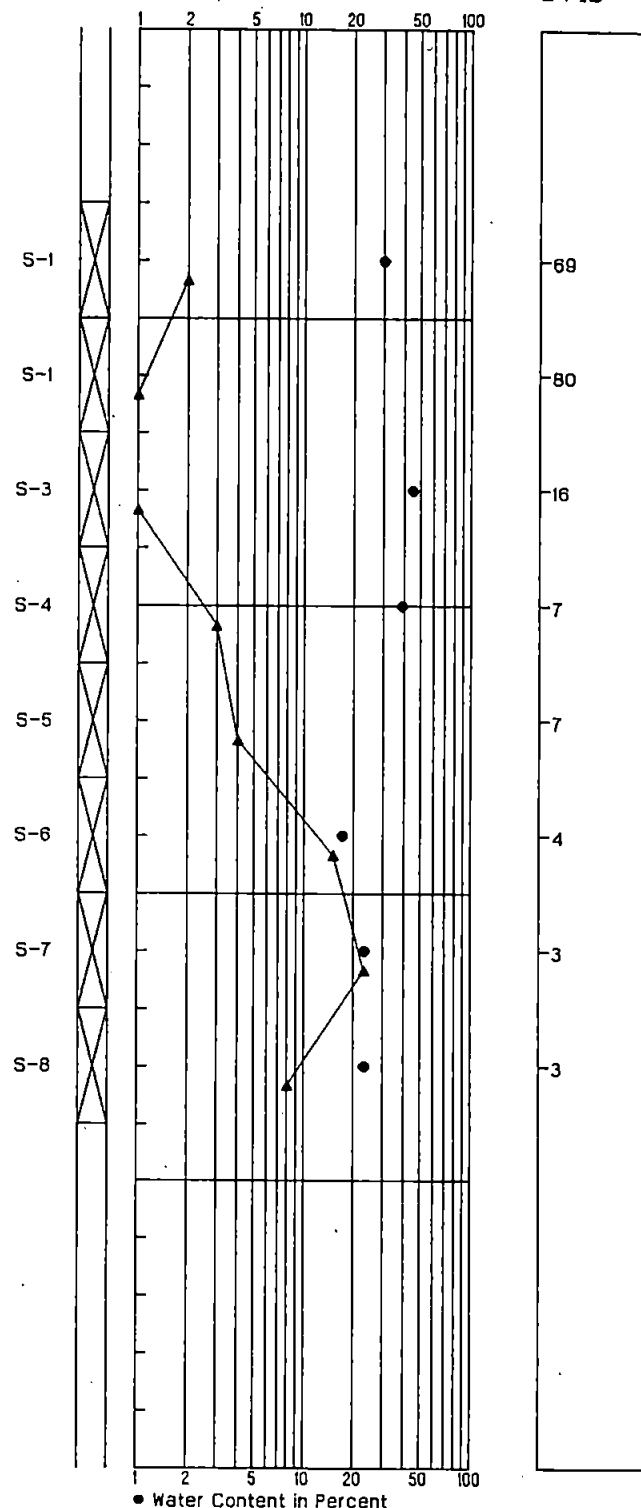
Depth
in Feet

Sample

STANDARD PENETRATION RESISTANCE

▲ Blows per Foot

LAB
TESTS
& PID



• Water Content in Percent

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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J-1639-27

6/93

Figure A-18