GEOTECHNICAL ENGINEERING REPORT
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
BRIDGE NO. 01226, HARPERS FERRY ROAD OVER I-84
STATE PROJECT 151-273
WATERBURY, CONNECTICUT

by

Haley & Aldrich, Inc.
East Hartford, Connecticut

for

Berger, Lehman Associates, P.C.
Wethersfield, Connecticut

File 91313-100
Revised January 2003

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HALEY & ALDRICH

Revised 27 January 2003
25 January 2001
File 91313-100

Berger, Lehman Associates, P.C.
20-30 Beaver Road
Wethersfield, Connecticut 06109

Attention: Thomas J. Bulzak, P.E.

Subject: U.S. Interstate Route 84 Reconstruction
Bridge No. 01226, Harpers Ferry Road over I-84
State Project 151-273
Waterbury, Connecticut

Ladies and Gentlemen:

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for Bridge No. 01226, Harpers Ferry Road over I-84, for the I-84 reconstruction project. This work was conducted in accordance with our agreement dated 26 December 2000.

In summary, subsurface conditions consist of fill, glaciofluvial deposits, and glacial till over bedrock. Bridge No. 01226 is a two-span bridge supported by two abutments and a center pier. We recommend the structure be supported on spread footings bearing on undisturbed natural soils or on granular fill placed above existing fill after intensive surface compaction. Our detailed recommendations follow.

PROPOSED CONSTRUCTION

Bridge No. 01226 (formerly referred to as Structure 7) will be located about 75 m south of the existing Harpers Ferry Road Bridge over the realigned I-84 in Waterbury, Connecticut. See Figure 1, Project Locus.

Bridge No. 01226 consists of a multi-lane, two-span bridge with a welded steel plate girder structure, supported on two abutments and a center pier. Span lengths measured along the baseline will be 50.263 m and 43.372 m, from Station HFR 60+369 to HFR 60+463. The bridge deck width will be 23.1 m. U-wingwalls will extend from the abutments. Abutments and the pier will bear at EL. 115. The Harpers Ferry Road grade on the bridge will range from EL. 124.0 to 125.0; I-84 pavement grade beneath the bridge will be approximately EL. 117.

Elevations in this report are in meters and refer to NGVD 29. Elevations from previous exploration logs have been converted from english to metric units.

SITE CONDITIONS

Ground surface at Abutment 1 and Abutment 2 ranges from approximately EL. 120.0 to 123.5 and EL. 115.5 to 123.5, respectively. Ground surface at the center pier is between EL. 117.0 and 123.0. Harpers Ferry Road roadway grade at the proposed bridge is between EL. 124.0 to 125.0.

The site is located on the side of a hill with inclines ranging from 1V:1.5H to 1V:2.75H. From the site, the hill slopes down to the Mad River about 20 m to the west, and up to Harpers Ferry Road to the east. East of Harpers Ferry Road, ground surface continues to rise. The slope between Harpers Ferry Road and the river is covered with vegetation. East of Harpers Ferry Road the sloping ground is covered with large boulders.

A pump station is present a few meters west of Bridge No. 01226, and will be relocated. A bridge abutment for an I-84 off-ramp bridge over the Mad River is located about 15 m north of Abutment 2, and will be removed. The end of the western Abutment 2 wingwall is about 10 m south of the off ramp bridge abutment.

SUBSURFACE INVESTIGATIONS

Recent Explorations

Six borings (S7-1 through S7-6), two at each substructure, were drilled by General Borings, Inc. of Prospect, Connecticut, between 8 and 16 November 2000, and 19 through 29 December 2000. The test borings were drilled with 76 mm I.D. casing to depths ranging from 13.7 m to 22.9 m, including 6.1 m of rock coring. Bedrock was cored at each boring with a 55 mm I.D. NX core barrel. Standard Penetration Tests were conducted at maximum 1.5 m intervals in the overburden soil.

The boring locations are shown on Figure 2. Test boring logs are presented in Appendix A. As drilled locations and elevations were surveyed by A-I Engineering of Middletown, Connecticut.

Previous Explorations

Previous explorations include four borings drilled in 1991 for the relocation of an I-84 off-ramp (B-1, B2, 15, 16A), located near the proposed bridge. B-1 and B-2 were terminated in bedrock and B15 and 16A were terminated in glaciofluvial deposits. Borings were terminated

4.6 to 8.1 m below ground surface. The exploration locations are shown on Figure 2 and logs are included in Appendix B.

SUBSURFACE CONDITIONS

Subsurface conditions encountered in the recent borings drilled at the abutment and pier consist of fill, glaciofluvial deposits and glacial till overlying bedrock. Soil strata are described below, in order of increasing depth. Subsurface profiles for each substructure are shown in Figures 3A through 3C. Subsurface conditions are summarized on Table I.

Thickness (m)	Generalized Description
3.05 to 6.10	**Fill** - Medium dense to very dense brown, coarse to fine SAND, little to some gravel, trace to some silt. Medium dense to very dense SILT and fine SAND, trace gravel is present in S7-3, S7-4 and S7-6.
3.20 to 12.92	**Glaciofluvial Deposits** - Dense to very dense brown SAND and GRAVEL with numerous cobbles and boulders.
Up to 4.42	**Glacial Till** - Very dense brown, fine SAND, some silt, trace to some gravel with cobbles and boulders. The stratum is present in S7-1 and S7-5.

The gradation of the fill and its relatively high density suggests that it is a controlled fill that was placed in lifts and compacted.

Bedrock - Bedrock is described as hard, fresh to moderately weathered, granitic GNEISS, and is part of the Waterbury Gneiss formation. Bedrock present in recent borings is between EL. 103.4 to EL. 108.5. Elevations of the top of rock are listed in Table I and shown on the subsurface profiles.

Groundwater Conditions

Water was encountered in previous subsurface explorations between EL.112.8 to 119.8. Water was encountered in recent boring S7-1 at EL. 110.6 immediately after drilling, and may represent drilling water trapped in the borehole. Other borings did not encounter water. Groundwater levels will fluctuate with water levels in the Mad River, and with season, precipitation and nearby construction activity.

Laboratory Testing

Five grain size analyses (ASTM D422) were performed on representative soil samples to confirm visual classification and to aid in determining engineering properties. Laboratory testing results are included in Appendix C.

Two unconfined compression (UC) tests and two hardness series tests were conducted on representative bedrock core samples recovered from S9-3. Unconfined compressive strengths were 86 and 128 MPa. Total hardness determined using the proposed method by Tarkoy[1] are 74 to 81. A summary of laboratory test results is presented in Appendix C. A figure from the Tarkoy paper showing the range of total hardness for various rock types is also included in Appendix C.

GEOTECHNICAL ENGINEERING RECOMMENDATIONS

Foundation Type

Deep foundations were recommended in the preliminary report due to the presence of unsuitable soils in the available borings. However, the available test borings at the time of the preliminary report were at least 15 m from substructure locations, and the recent borings did not encounter unsuitable materials. Therefore, we recommend spread footings as the most technically feasible and cost effective alternative.

We recommend that the abutments, pier, and wingwalls be supported on spread footing foundations bearing on undisturbed dense glaciofluvial deposits, glacial till, or granular fill placed above existing fill after intensive surface compaction.

The existing fill consists of medium dense to dense sand and gravel, and is present at subgrade level for the Pier and Abutment 2. The fill is considered suitable for foundation support due to its density and consistency, provided that it is overexcavated to a depth of 1 m the subgrade at that depth densified with intensive surface compaction, and granular fill placed to structure subgrade level.

Foundation Design Criteria

Design foundations using the following criteria:

- Design footings bearing on soil for an allowable bearing pressure of 280 kPa.
- Design footings to bear a minimum 1.2 m below proposed exterior grade, for frost protection.

- Where existing fill is present at the footing bearing surface, over excavate the fill to a depth of 1 m, conduct intensive surface compaction of the subgrade at that depth, and place granular fill to structure subgrade level.

  Intensive surface compaction should consist of 6 to 8 passes of a 100 kN vibratory roller, operating at 30 Hz and a maximum speed of 0.5 m per sec. Portions of the fill observed to be soft or yielding during intensive surface compaction should be removed and replaced with granular fill. We will prepare a special provision for Intensive Surface Compaction.

- For footings designed for the recommended bearing pressure, we estimate total settlement will be less than 25 mm, with differential settlements between adjacent abutment and piers less than 12 mm. Settlement will occur as load is applied.

- Place granular fill to the lateral limits below footings as shown on Figure 5.

Abutment 1

The bearing elevation for Abutment 1 is El 115.0. Borings S7-5 and S7-6 indicate suitable bearing soils are between EL. 117.1 and EL. 117.4, 2.1 to 2.4 m above abutment subgrade level. Therefore, Abutment 1 will bear on glaciofluvial deposits.

Pier

The bearing elevation for the pier is EL. 115.0. Borings S7-3, S7-4 and B-16A indicate suitable bearing soils are between EL. 113.6 and EL. 122.7, 1.4 m below to 7.7 m above abutment subgrade level. As shown on Figure 3B, fill is below footing subgrade under the west side of the pier. Therefore, the pier will bear on glaciofluvial deposits or a 1 m thick layer of granular fill placed over existing fill after intensive surface compaction.

Abutment 2

The bearing elevation for Abutment 2 is El 115.0. Borings S7-1, S7-2 indicate suitable bearing soils are between EL. 112.2 and EL. 116.7, 2.8 m below to 1.7 m above abutment subgrade level. As shown on Figure 3B, fill is below footing subgrade under the west side of the pier. Therefore, Abutment 2 will bear on glaciofluvial deposits or a 1 m thick layer of granular fill placed over existing fill after intensive surface compaction.

Lateral Earth Pressures

Abutments and wingwalls should be designed for active earth pressure, traffic surcharge and seismic pressures as shown on Figure 4. Sliding and overturning criteria are also provided on

that figure.

Seismic Design

Soil Conditions at the site are defined as AASHTO Soil Profile Type I. A seismic soil coefficient, S, equal to 1.0 is recommended. The soils at the site are not considered to be liquefaction susceptible under the design earthquake event. Seismically induced settlement should not be significant.

Structure Backfill and Drainage

Pervious structure backfill should be placed behind the abutments and abutment wingwalls above a line defined by a 1V:1.5H slope extending up from the heel of the footing and extending to the bottom of subgrade. Pervious structure backfill should meet the requirements of CONNDOT Form 815 M.02.05.

We recommend the abutments and wingwalls be drained by 100 mm dia. weep holes installed according to CONNDOT specifications. Maximum spacing between weep holes should be 3 m.

Reuse of Excavated Soils

The existing soils to be excavated consist primarily of glaciofluvial deposits and fill. Based on the results of the sieve analyses, fill does not meet gradation requirements for pervious structure backfill or granular fill. Glaciofluvial deposits may meet gradation requirements for structure backfill or granular fill. Excavated fill and glaciofluvial deposits will generally be suitable for embankment fill.

CONSTRUCTION CONSIDERATIONS

This section provides comments related to foundation construction and other geotechnical aspects of the project. It will aid those responsible for preparation of contract plans and specifications and those involved with construction monitoring. Contractors should evaluate potential construction problems on the basis of their own knowledge and experience in the area and on the basis of similar localities, taking into account their own proposed equipment, construction methods and procedures.

Excavation and Temporary Lateral Support

Temporary excavations up to about 7.0 m high will be required to construct foundations for abutments and wingwalls. Temporary lateral support will be required to protect Harpers Ferry Road bypass and nearby utilities. Steel sheet piling is not considered feasible due to

boulders in the overburden. We anticipate that soldier piles and lagging will be feasible, although pre-excavation or rotary drilling may be required at some locations to penetrate boulders. Soil nail walls might also be feasible. However, vertical or near-vertical temporary slopes may not be stable in the coarse-grained site soils, and soil nail walls may need to be sloped, or construction procedures modified to compensate for the poor standup characteristics of the sandy soils.

Excavations will be in fill and glaciofluvial deposits. Conventional heavy construction equipment appears practical for excavation of overburden soils. Chiseling or mechanical splitting maybe necessary for removal of boulders.

Excavation geometry should conform to OSHA excavation regulations contained in 29 CFR Part 1926, latest edition. Temporary soil slopes of 1V:1H (Soil Profile Type B), or flatter, appear appropriate but should be confirmed during construction based on conditions at the time of excavation.

Dewatering

Based on water levels measured in borings, excavation dewatering is not anticipated. If needed, dewatering may be accomplished using filtered sumps. Surface water should be diverted for excavations.

Special Provisions

We will prepare the following special provision of specifications for Bridge No. 01226:

- Intensive Surface Compaction

CLOSURE

This report has been prepared for specific application to the I-84 Reconstruction project, as understood at this time, in accordance with generally accepted geotechnical engineering practice. In the event that changes in the nature, design or location of the project elements are planned, the conclusions and recommendations contained in this report should not be considered valid, unless the changes are reviewed by Haley & Aldrich, Inc. and the conclusions of this report modified or verified in writing.

The analyses and recommendations are based, in part, upon the data obtained from the referenced subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations then appear, it may be necessary to reevaluate the recommendations of this report.

We appreciate the opportunity to provide engineering services on this project. Please do not hesitate to call if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

Kurtis E. Amidon
Engineer

Nathan L. Whetten, P.E., C.G.
Senior Engineer

John P. Dugan, Jr., P.E.
Senior Vice President

Enclosures:

- Table I - Summary of Subsurface Data
- Figure 1 - Project Locus
- Figure 2 – Subsurface Exploration Plan
- Figure 3A – Abutment 1 Section
- Figure 3B –Pier Section
- Figure 3C –Abutment 2 Section
- Figure 4 – Recommended Lateral Loads on Unrestrained Abutments and Wingwalls
- Figure 5 – Limits of Granular Fill in Fill Subgrade Areas
- Appendix A – Recent Test Borings Logs
- Appendix B – Previous Explorations
- Appendix C – Results of Laboratory Testing

Reference:

Tarkoy, P.J. (1985), "Proposed Standard For Sampling And Determining Hardness Of Intact Rock Core Specimens", Prepared For ASTM Committee D-18.12.01

TABLE I
SUMMARY OF SUBSURFACE DATA
BRIDGE 01226, HARPERS FERRY ROAD OVER I-84
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

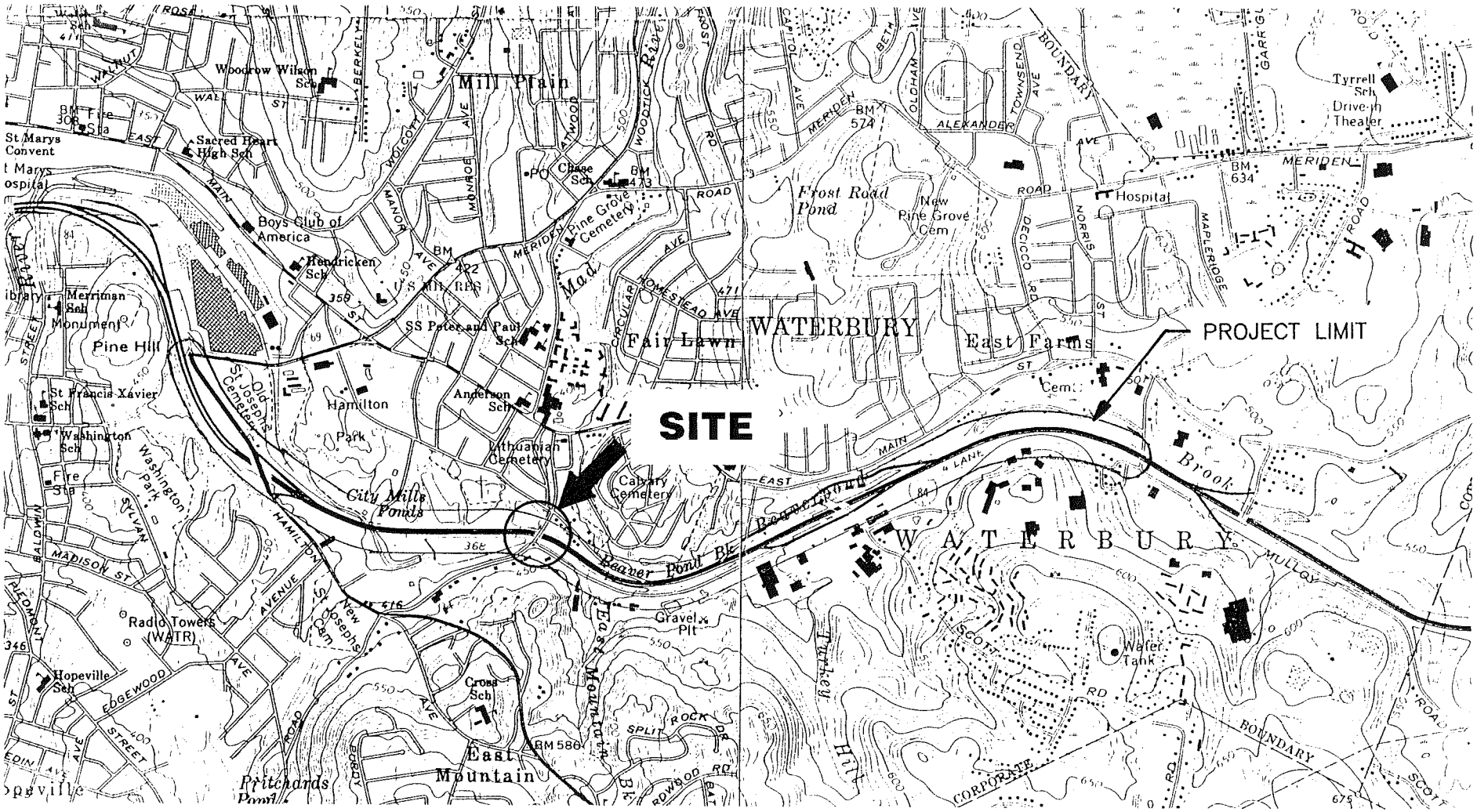
EXPLOR. NUMBER	ELEV. (m)	DEPTH (m)	THICKNESS OF SOIL STRATA (m)				BEDROCK LEVEL (m)		GROUNDWATER LEVEL (m)	
			FILL	ALLUVIAL	GLACIO-FLUVIAL	GLACIAL TILL	DEPTH	ELEV.	DEPTH	ELEV.
Recent										
S7-1	115.21	14.63	3.05	--	3.20	4.42	10.67	104.54	4.57(2)	110.64
S7-2	122.80	17.37	6.10	--	8.23	--	14.33	108.47	--	--
S7-3	117.59	21.34	4.00	--	10.17	--	14.17	103.42	--	--
S7-4	122.51	22.86	4.00	--	12.92	--	16.92	105.59	--	--
S7-5	120.16	13.72	3.05	--	4.57	3.05	10.67	109.49	--	--
S7-6	123.36	17.37	6.00	--	8.33	--	14.33	109.03	--	--
Previous										
B-1	115.48	7.92	2.74	1.22	2.44	--	6.40	109.08	2.74	112.74
B-2	[illegible]	8.08	2.44	--	4.11	--	6.55	108.95	2.44	113.06
B-15	[illegible]	[illegible]	1.52	--	>6.1	--	--	--	--	--
B-16A	[illegible]	[illegible]	[illegible].68	--	>2.9	--	--	--	--	--

NO[illegible]

Haley & Aldrich, Inc.

1. [illegible]
   "> [illegible]
2. Water leve[illegible] [illegible]y after coring rock.
3. Elevations are m[illegible] [illegible]fer to the NGVD 29.
4. Refer to boring logs [illegible] [illegible]ied soil and rock descriptions.

91313-100 A01



SITE COORDINATES: 041°32'22.49"N 073°00'35.22"W

U.S.G.S. QUADRANGLES: WATERBURY & SOUTHINGTON, CONNECTICUT

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UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

U.S. INTERSTATE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

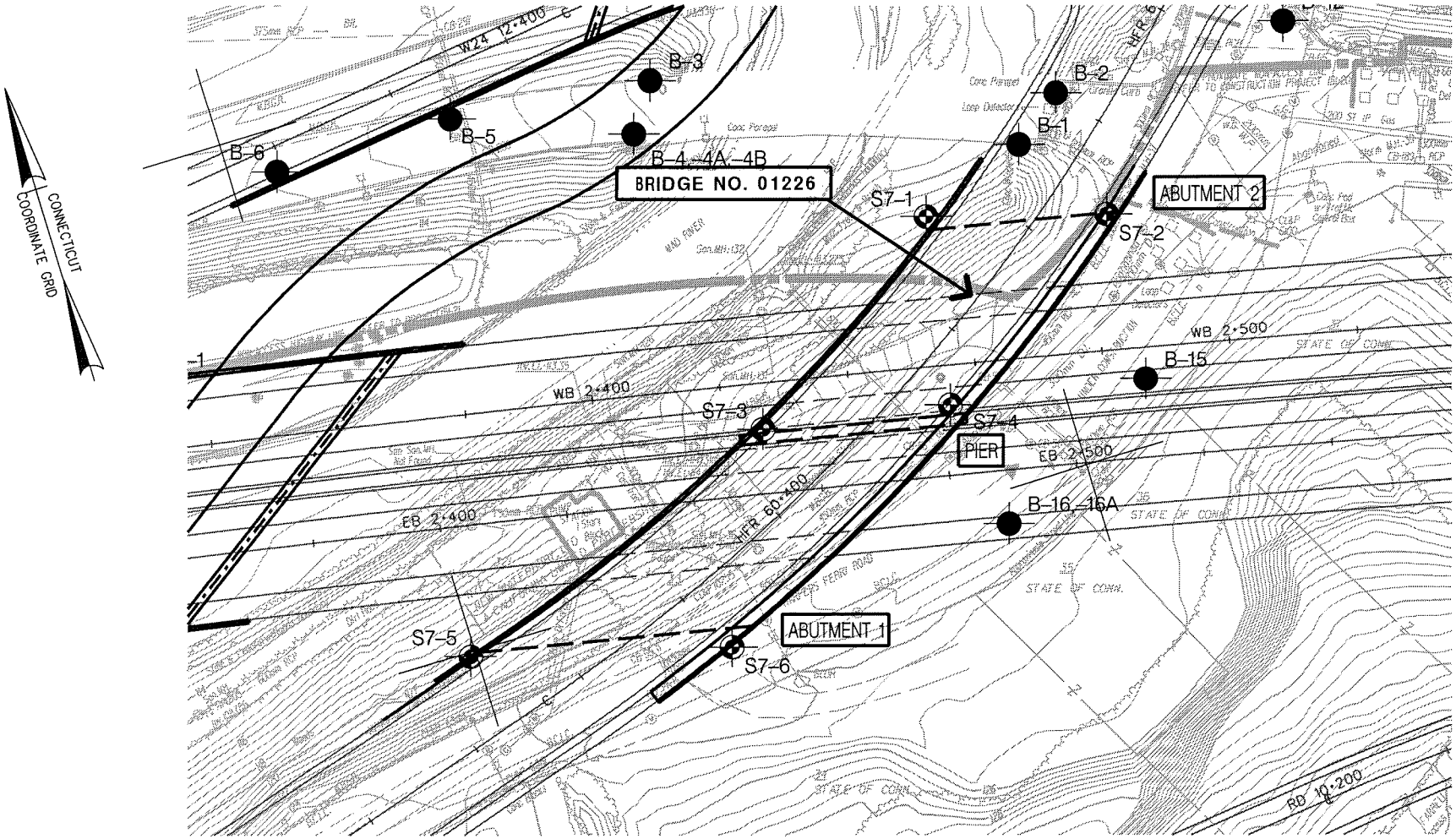
PROJECT LOCUS

HARPERS FERRY ROAD OVER I-84

SCALE: 1:24,000

JANUARY 2001

FIGURE 1



PLAN LEGEND

LOCATION OF RECENT TEST BORING DRILLED BY GENERAL BORINGS, INC. OF PROSPECT, CONNECTICUT.

LOCATION OF PREVIOUS TEST BORING

NOTES:

1. BASE PLAN PROVIDED BY BERGER, LEHMAN ASSOCIATES. BORING LOCATIONS WERE SURVEYED BY A-I ENGINEERS.
2. ELEVATIONS ARE IN METERS, REFER TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
3. REFER TO THE TEXT AND APPENDICES.

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

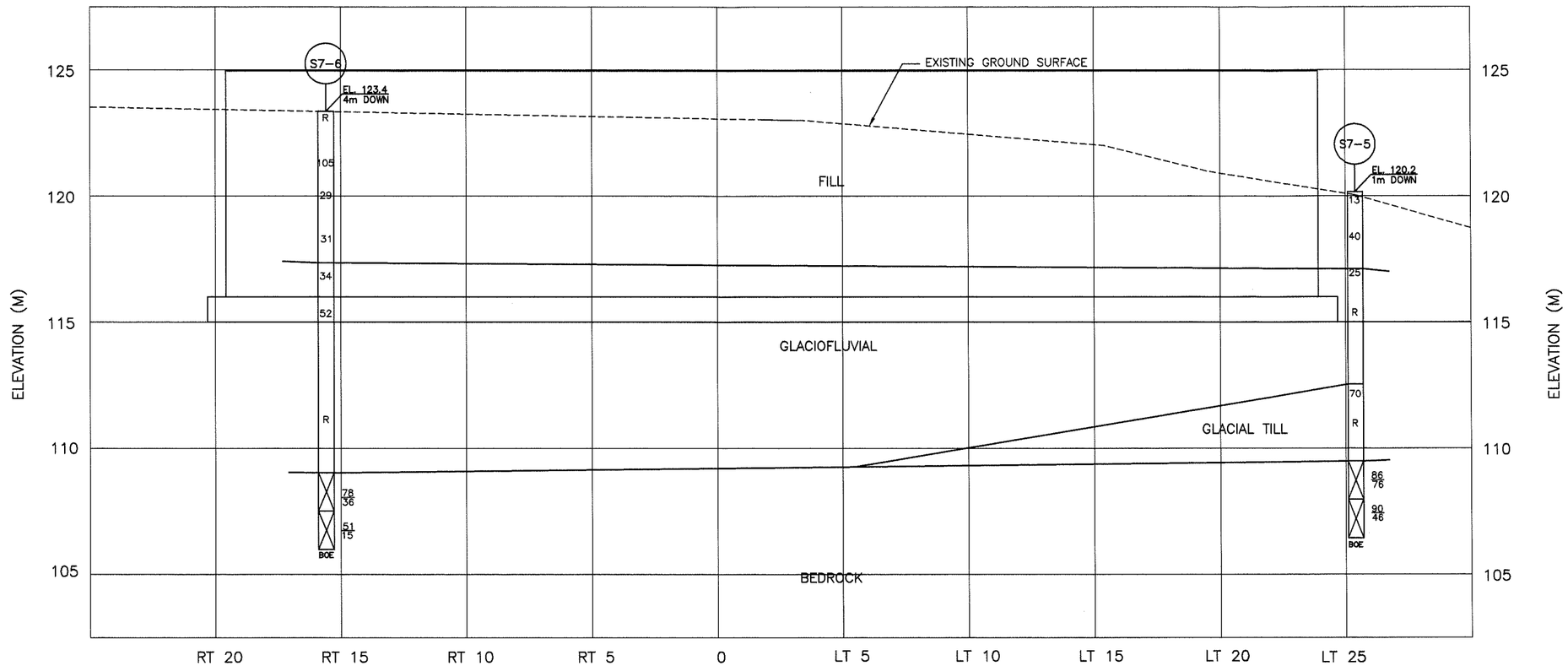
BRIDGE NO. 01226
HARPERS FERRY ROAD OVER I-84
SUBSURFACE EXPLORATION PLAN

SCALE: 1:1000

JANUARY 2001

91313-100

FIGURE 2



ABUTMENT NO. 1
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(LOOKING SOUTH)

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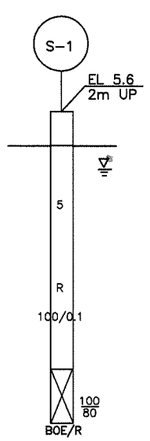

- APPROXIMATE GROUND SURFACE ELEVATION
  OFFSET DISTANCE AND DIRECTION FROM BASELINE
- MAJOR STRATUM BOUNDARY
- WATER LEVEL NOTED DURING OR SHORTLY AFTER DRILLING.
- LOCATION OF SAMPLE OBTAINED BY DRIVING A 50 mm O.D. SPLIT-SPOON SAMPLER WITH A 63.5 kg WEIGHT FALLING 762 mm. NUMBER INDICATES STANDARD PENETRATION RESISTANCE "N" VALUE, IN BLOWS PER 0.30 m.
- INDICATES SPLIT SPOON REFUSAL
- SAMPLER DRIVEN <0.30 m, FRACTION INDICATES: NUMBER BLOWS TO DRIVE SAMPLER / DEPTH SAMPLER WAS DRIVEN (m)
- CORE SAMPLE, 50 mm DIA., FRACTION INDICATES: % CORE RECOVERY / ROCK QUALITY DESIGNATION (%RQD)
- BOTTOM OF EXPLORATION/REFUSAL

NOTES:

1. SEE FIGURE 2, SUBSURFACE EXPLORATION PLAN, FOR TEST BORING AND FOUNDATION LOCATIONS.
2. FOR DETAILED DESCRIPTION OF SUBSURFACE MATERIAL REFER TO TEST BORING LOGS CONTAINED IN APPENDIX A AND B OF THIS REPORT.
3. LINES REPRESENTING CHANGES IN STRATA ARE BASED UPON INTERPOLATION BETWEEN SUBSURFACE EXPLORATIONS AND MAY NOT REPRESENT ACTUAL FIELD CONDITIONS AT OTHER THAN SPECIFIED EXPLORATION LOCATIONS.
4. THE STRATIFICATION LINES SHOWN ON THE GRAPHIC REPRESENTATION OF THE TEST BORINGS REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL OR ROCK TYPES. THE TRANSITION BETWEEN MATERIALS IS APPROXIMATE.

0 5 10
SCALE IN METERS

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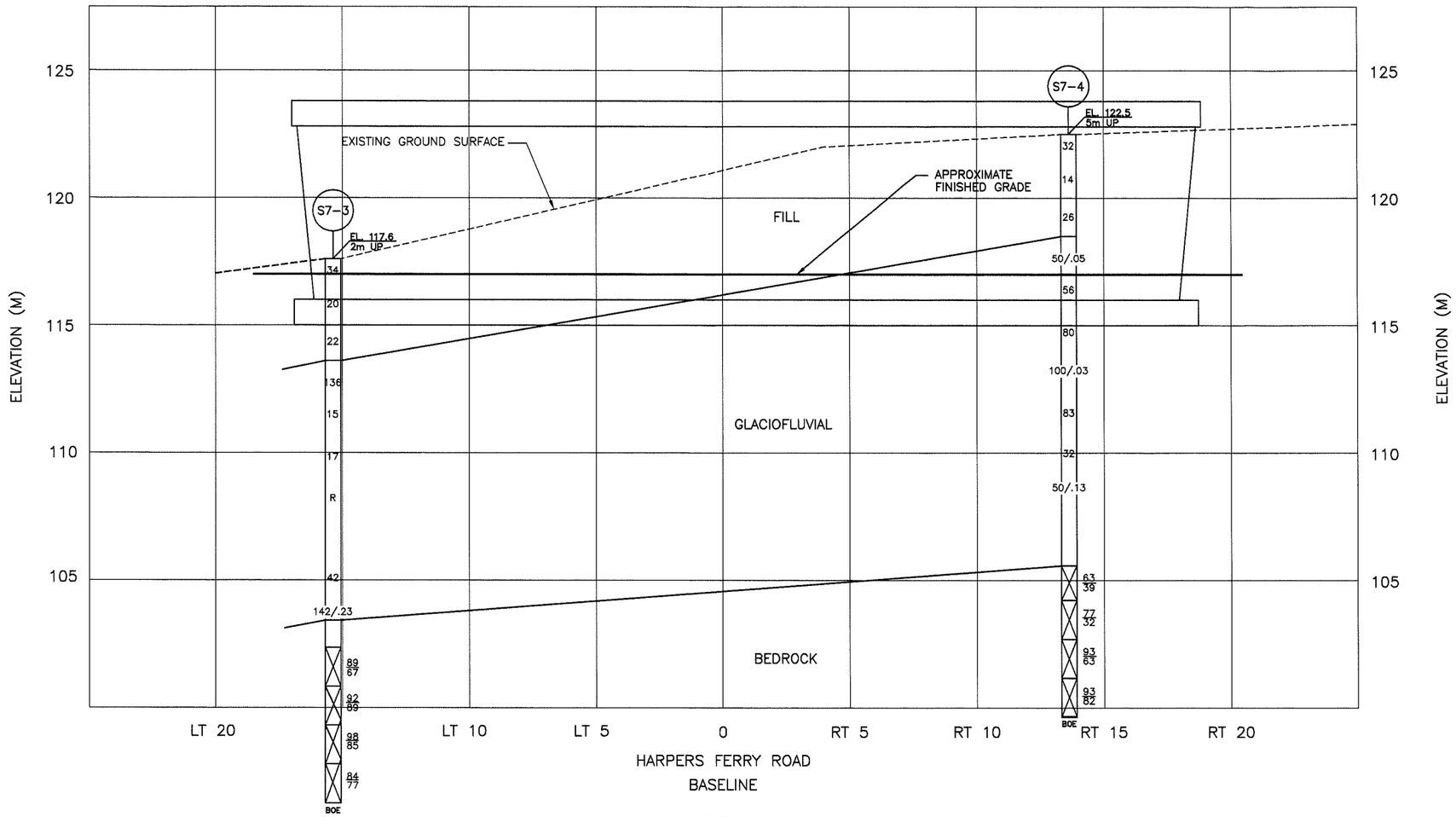
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

ABUTMENT NO. 1
BRIDGE NO. 01226
HARPERS FERRY ROAD OVER I-84

SCALE: AS SHOWN JANUARY 2001

91313-100 B07

FIGURE 3A



PIER
CENTER LINE STATION 60+419.29
(LOOKING NORTH)

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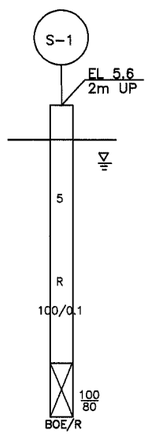

- EL 5.6 / 2m UP — APPROXIMATE GROUND SURFACE ELEVATION OFFSET DISTANCE AND DIRECTION FROM BASELINE
- MAJOR STRATUM BOUNDARY
- WATER LEVEL NOTED DURING OR SHORTLY AFTER DRILLING.
- 5 — LOCATION OF SAMPLE OBTAINED BY DRIVING A 50 mm O.D. SPLIT-SPOON SAMPLER WITH A 63.5 kg WEIGHT FALLING 762 mm. NUMBER INDICATES STANDARD PENETRATION RESISTANCE "N" VALUE, IN BLOWS PER 0.30 m.
- R — INDICATES SPLIT SPOON REFUSAL
- 100/0.1 — SAMPLER DRIVEN <0.30 m, FRACTION INDICATES: NUMBER BLOWS TO DRIVE SAMPLER / DEPTH SAMPLER WAS DRIVEN (m)
- 100/80 — CORE SAMPLE, 50 mm DIA., FRACTION INDICATES: % CORE RECOVERY / ROCK QUALITY DESIGNATION (%RQD)
- BOE/R — BOTTOM OF EXPLORATION/REFUSAL

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0 5 10
SCALE IN METERS

HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

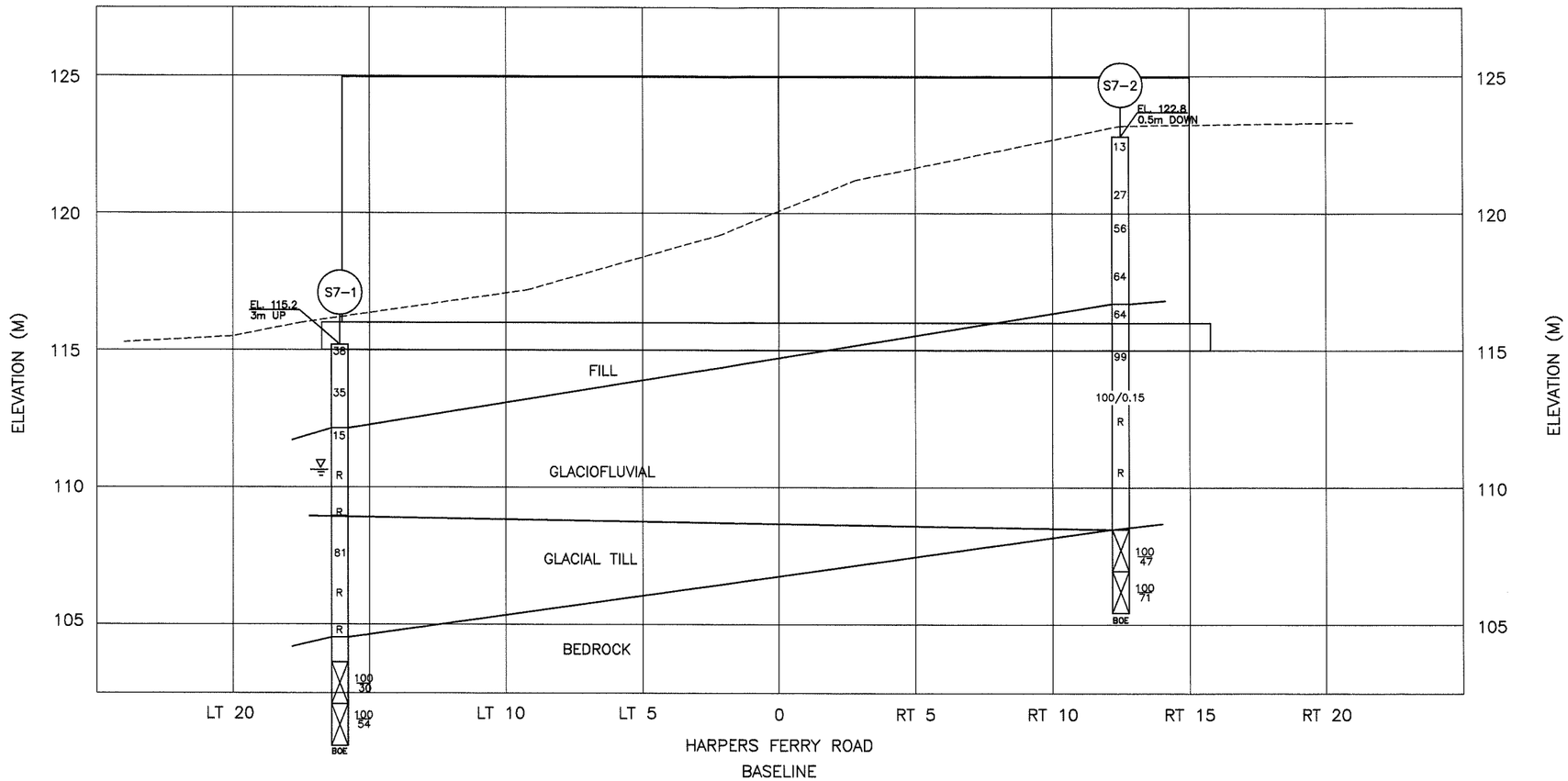
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

PIER
BRIDGE NO. 01226
HARPERS FERRY ROAD OVER I-84

SCALE: AS SHOWN
JANUARY 2001

91313-100 B07

FIGURE 3B



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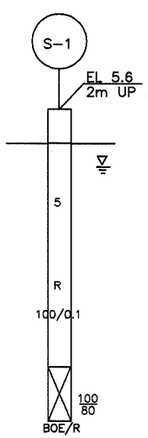

- EL 5.6 / 2m UP — APPROXIMATE GROUND SURFACE ELEVATION OFFSET DISTANCE AND DIRECTION FROM BASELINE
- MAJOR STRATUM BOUNDARY
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0 5 10
SCALE IN METERS

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UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

ABUTMENT NO. 2
BRIDGE NO. 01226
HARPERS FERRY ROAD OVER I-84

SCALE: AS SHOWN
JANUARY 2001

91313-100 B07

FIGURE 3C

APPENDIX A

Recent Test Borings Logs

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-1**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230844.98**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283087.44**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **115.21**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **13 November 2000**	Utilized		X						X					X
Date Finished: **13 November 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ **4.57** m after **coring** hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
	18	0.00-0.61	1	0.61	0.45	D	10	14	24	19		Dense brown coarse to fine SAND, some medium to fine gravel, trace silt
	23											
	45											
	32	1.52-2.13	2	0.61	0.15	D	10	18	17	13		Dense brown fine SAND, little coarse sand, medium to fine gravel, little silt
	31											
	39										112.16	-FILL-
	18	3.05-3.66	3	0.61	0.15	D	5	8	7	5	3.05	Medium dense brown fine SAND, little fine gravel, trace coarse sand, silt
	16											
	32											
5	86	4.57-4.72	4	0.15	0.10	D	100					Very dense brown coarse to fine GRAVEL, trace coarse to fine sand, silt
	113											
	175										108.96	
	39	6.10-6.25	5	0.15	0.00	D	100				6.25	No recovery. SSR @ 6.25. Rollerbit through boulder 6.25-6.86m.
	43											
	76											-GLACIOFLUVIAL DEPOSITS-
	37	7.62-8.23	6	0.61	0.30	D	15	26	55	23		Very dense brown fine SAND, some silt, little coarse sand, fine gravel, trace medium gravel
	60											
	106											
	81	9.14-9.29	7	0.15	0.15	D	125					Very dense brown fine SAND and medium to fine GRAVEL, some silt
10	168											
	243											-GLACIAL TILL-
											104.54	
		10.67-10.71	8	0.04	0.00	D	100/.04				10.67	No recovery
		11.58-13.10	1	1.52	1.52	C		[RQD = 30%]				C1: Hard, slightly to moderately weathered, gray and white, medium to fine grained Biotite orthoclase GNEISS. Foliation is vertical, extremely close. Joints are horizontal to vertical. Close, rough, undulating, discolored, open. Highly fractured zone from 12.5m to 12.9 m. Pyrite crystals and rust on joint surfaces. Core times in .5m/min. = 2.5, 2.5, 2.5.
		13.11-14.63	2	1.52	1.52	C		[RQD = 54%]				
15											100.58	C2: Same as C1 except joints are close to

Casing			Meters of	
Size	From	To	Earth	Rock
NW	**0.0**	**10.7**	**11.58** m	**3.05** m
			No. of Samples	
			8D, 2C	

NOTES: **Bomb mounted Diedrich D120 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-1**
Sheet **1** of **2**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-1**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230844.98**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283087.44**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **115.21**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **13 November 2000**	Utilized		X						X					X
Date Finished: **13 November 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ **4.57** m after **coring** hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
											14.63	moderate, and have healed fractures. Core times 2, 2.5, 2.5. -BEDROCK- BOTTOM OF EXPLORATION 14.63 m
20												
25												
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**10.7**	**11.58** m	**3.05** m
			No. of Samples	
			8D, 2C	

NOTES: **Bomb mounted Diedrich D120 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-1**
Sheet **2** of **2**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-2**
DRILLER	STATE OF CONNECTICUT	Line & Station
C. White	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230837.04**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283114.66**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **122.80**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **21 December 2000**	Utilized		X						X					X
Date Finished: **22 December 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ _____ m after _____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./ DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00-0.61	1	0.61	0.08	D	13	6	7	11		Medium dense brown medium to fine SAND, some silt, trace coarse gravel and roots
		1.52-2.13	2	0.61	0.00	D	12	13	14	11		No Recovery
		3.05-3.66	3	0.61	0.15	D	7	19	37	13		Very dense brown coarse to fine SAND, trace silt, trace fine gravel
5		4.57-5.18	74	0.61	0.15	D	15	28	36	54		Very dense brown coarse to fine SAND, some coarse to fine gravel, trace silt
											116.70	-FILL-
		6.10-6.71	5	0.61	0.30	D	20	28	36	54	6.10	Very dense light brown medium to fine SAND, little coarse to fine gravel
		7.62-8.23	6	0.61	0.45	D	26	36	63	71		Same as D5
10		9.14-9.44	7	0.30	0.15	D	47	100/.15				Very dense light brown coarse to fine SAND, little coarse to fine gravel, trace silt
		10.67-10.82	8	0.15	0.15	D	100					Same as D7
		12.19-12.19	9	0.00	0.00	D	100/0					No Recovery
											108.47	-GLACIOFLUVIAL DEPOSITS-
15		14.33-15.85	1	1.52	1.52	C		[RQD = 47%]			14.33	C1: Hard, slightly weathered, gray, medium to

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**14.3**	**14.33** m	**3.04** m
			No. of Samples	
			9D, 2C	

NOTES: **Bomb mounted Diedrich D-50 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-2**
Sheet **1** of **2**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-2**
DRILLER	STATE OF CONNECTICUT	Line & Station
C. White	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230837.04**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283114.66**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **122.80**	Utilized		X						X					X
Date Started: **21 December 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **22 December 2000**	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
@ _____ m after _____ hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		~~15.85-17.37~~	~~2~~	~~1.52~~	~~1.52~~	~~C~~		~~[RQD = 71%]~~				coarse grained GNEISS. Foliation is high angle, extremely close. Joints are low angle to high angle, close, rough, undulating, discolored, tight to open. C2: Very hard, slightly weathered, black and white, coarse to fine grained GNEISS. Foliation is high angle, extremely close. Joints are moderately dipping, close to moderate, rough, undulating, discolored, tight.
											105.43 / 17.37	-BEDROCK- Bottom of Exploration at 17.37 m.
20												
25												
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**14.3**	**14.33** m	**3.04** m
			No. of Samples	
			9D, 2C	

NOTES: **Bomb mounted Diedrich D-50 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-2**
Sheet **2** of **2**

J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-3**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230820.28**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283053.28**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **117.59**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **8 November 2000**	Utilized		X						X					X
Date Finished: **12 November 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ _____ m after _____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.15-0.76	1	0.61	0.38	D	17	19	15	18	0.15	Asphalt and road base Dense brown coarse to fine SAND, some medium to fine gravel
		1.52-2.13	2	0.61	0.25	D	5	7	13	28		Medium dense brown to dark brown coarse to fine SAND, little gravel, silt
		3.05-3.66	3	0.61	0.46	D	9	9	13	17	113.59	Medium dense light brown to orange brown SILT, and fine SAND, trace gravel, and sand
											4.00	-FILL-
5		4.57-5.02	4	0.45	0.20	D	27	36	100			Very dense brown coarse to fine GRAVEL, and coarse to fine sand, with boulders
		6.10-6.71	5	0.61		D	6	8	7	13		Medium dense brown fine SAND, trace coarse sand, silt
		7.62-8.23	6	0.61		D	7	7	10	14		Medium dense brown fine SAND, trace silt, trace coarse sand
10		9.14-9.29	7	0.15	0.00	D	100					On boulder no recovery
												Boulders from 10.36 m. to 11.89 m. (cored from 10.67 m. to 12.19 m.)
		12.19-12.80	8	0.61	0.10	D	15	19	23	38		Dense brown coarse to fine SAND, little coarse to fine gravel, trace silt
		13.72-14.25	9	0.53	0.13	D	37	42	100/.08		103.42 14.17	Very dense brown coarse to fine SAND, and coarse to fine gravel, trace silt
15												

Casing			Meters of	
Size	From	To	Earth	Rock
NW	**0.0**	**14.2**	**15.24** m	**6.08** m
			No. of Samples	
			9D, 4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-3**
Sheet **1** of **2**

J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-3**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230820.28**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283053.28**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **117.59**	Utilized		X						X					X
Date Started: **8 November 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **12 November 2000**	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
@ _____ m after _____ hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./ DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24-16.76	1	1.52	1.36	C		[RQD = 67%]				-GLACIOFLUVIAL DEPOSITS- T.O.R. at 14.17 m. (weathered) C1: Very hard, fresh, purple, gray and white, medium to fine grained GARNET BIOTITIE GNEISS. Foliation is high angle, extremely close. Joints are low angle to moderately dipping, very close to moderate, rough, undulating, to stepped, discolored, open to tight. Vertical joint from 15.70 m. to 15.79 m. C2: Same as C1, except joints are undulating, fresh, open. C3: Same as C2, except vertical joint from 18.59 m. to 18.70 m. C4: Same as C2, except foliation is extremely close to very close, joints are close to wide
		16.76-18.28	2	1.52	1.40	C		[RQD = 89%]				
		18.29-19.81	3	1.52	1.49	C		[RQD = 85%]				
20		19.81-21.33	4	1.52	1.28	C		[RQD = 77%]				
											96.25	-BEDROCK-
											21.34	Bottom of Exploration at 21.34 m.
25												
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**14.2**	**15.24** m	**6.08** m
			No. of Samples	
			9D, 4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-3**
Sheet **2** of **2**

F. Pelky/J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-4**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230815.40**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283083.24**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **122.51**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **13 November 2000**	Utilized		X						X					X
Date Finished: **16 November 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ _____ m after _____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00-0.61	1	0.61	0.15	D	12	12	20	24		Dense brown fine SAND, little medium gravel, trace silt, coarse sand
		1.52-2.13	2	0.61	0.20	D	8	5	9	5		Medium dense brown fine SAND, little fine gravel, trace medium gravel, coarse sand
		3.05-3.66	3	0.61	0.15	D	22	12	14	43		Medium dense brown coarse to fine SAND, little silt, trace gravel
											118.51 4.00	-FILL-
5		4.57-4.77	4	0.20	0.10	D	48	50/.05				Very dense brown coarse to fine SAND, some fine gravel, trace silt
		6.10-6.71	5	0.61	0.15	D	18	26	30	32		Very dense brown fine SAND, little silt
		7.62-8.23	6	0.61	0.20	D	22	32	48	60		Very dense brown coarse to fine SAND, some fine gravel, trace medium gravel, boulder from 8.23 m - 8.84 m
10		9.14-9.45	7	0.31	0.20	D	28	100				Very dense brown fine SAND, trace silt
		10.67-11.28	8	0.61	0.20	D	24	28	55	78		Very dense brown fine SAND, little medium to fine gravel, silt, trace coarse sand, boulder 11.58 m - 11.95 m
		12.19-12.80	9	0.61	0.15	D	16	17	15	20		Dense brown fine SAND, some silt, trace fine gravel with fine gravel and coarse sand layer with boulders
15		13.72-14.00	10	0.28	0.28	D	23	50/.13				Very dense gray brown coarse to fine SAND and coarse to fine gravel, little silt -GLACIOFLUVIAL DEPOSITS-

Casing			Meters of	
Size	From	To	Earth	Rock
NW	**0.0**	**5.8**	m	m
			No. of Samples	
			11D, 4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-4**
Sheet **1** of **2**

F. Pelky/J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-4**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230815.40**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283083.24**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **122.51**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **13 November 2000**	Utilized		X						X					X
Date Finished: **16 November 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ _____ m after _____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24	11			D						-GLACIOFLUVIAL DEPOSITS- Cored boulder 15.24 m - 16.0 m
		16.76-18.28	1	1.52	0.95	C		[RQD = 39%]			105.59 16.92	C1: Moderately hard, fresh to slightly weathered, gray to pink, coarse to fine grained, granitic GNEISS. Foliation is high angle to vertical, extremely close. Joints are parallel to foliation, high angle to vertical, spacing is indistinct, rough, undulating, decomposed to discolored, open. Secondary mineral growth on joint surfaces and of mica throughout core. C2: Same as C1 except joints are low angle to high angle, close to moderate. Fractured zone 18.54 m - 18.75 m C3: Hard, fresh, gray and white coarse to fine grained GNEISS. Foliation joints are low to high angle close, rough, undulating, discolored, open. Some secondary mineral growth on joint surfaces and of mica in core. C4: Same as C3
		18.29-19.81	2	1.52	1.17	C		[RQD = 32%]				
20		19.81-21.33	3	1.52	1.42	C		[RQD = 63%]				
		21.31-22.83	4	1.52	1.42	C		[RQD = 82%]				
											99.65 22.86	-BEDROCK- BOTTOM OF EXPLORATION 22.86 m
25												
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**5.8**	m	m
			No. of Samples	
			11D, 4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-4**
Sheet **2** of **2**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-5**
DRILLER	STATE OF CONNECTICUT	Line & Station
C. White	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230799.29**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282999.14**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **120.16**	Utilized		X						X					X
Date Started: **19 December 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **21 December 2000**	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
@ _____ m after _____ hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00-0.61	1	0.61	0.30	D	9	7	6	8		Medium dense brown coarse to fine SAND, some medium to fine gravel, some silt
		1.52-2.13	2	0.61	0.00	D	14	27	13	11		No Recovery
											117.11	-FILL-
		3.05-3.66	3	0.61	0.46	D	10	11	14	16	3.05	Medium dense brown coarse to fine SAND, little gravel, silt
5		4.57-4.57	4	0.00	0.00	D	50/0					Roller bit 5.8 m. to 6.1 m.
												Core boulder from 6.1 m. to 7.0 m.
											112.54	-GLACIOFLUVIAL DEPOSITS-
		7.62-8.23	5	0.61	0.45	D	13	29	41	53	7.62	Very dense brown medium to fine SAND and SILT, trace fine gravel (bottom 3 in. coarse gravel)
10		9.14-9.22	6	0.08	0.00	D	100/.08					No Recovery
											109.49	-GLACIAL TILL-
		10.67-12.19	1	1.52	1.30	C		[RQD = 76%]			10.67	C1- Very hard, slightly weathered, red, gray, GRANITIC GNEISS. Foliation is moderate to high angle, extremely close. Joints are moderately dipping, close to moderate, rough, undulating, discolored, tight.
		12.19-13.71	2	1.52	1.37	C		[RQD = 46%]				C2- Very hard, slightly weathered, gray, GRANITIC GNEISS. Foliation is high angle, extremely close. Joints are low to high angle dipping, close, tight to open.
											106.44	
											13.72	-BEDROCK-
15												Bottom of Exploration at 13.72 m.

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**10.6**	**10.67** m	**3.04** m
			No. of Samples	
			6D, 2C	

NOTES: **Bomb mounted Diedrich D-50 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-5**
Sheet **1** of **1**

J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-6**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230788.82**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283038.66**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **123.36**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **27 December 2000**	Utilized		X						X					
Date Finished: **29 December 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ _____ m after _____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./ DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.15-0.30	1	0.15	0.15	D	100/.15				0.15	Asphalt and road base Very dense brown SILT and coarse to fine SAND
		1.52-2.13	2	0.61	0.36	D	16	61	44	19		Very dense brown and white coarse to fine SAND and coarse to fine GRAVEL, trace silt
		3.05-3.66	3	0.61	0.30	D	14	13	16	20		Medium dense light brown fine SAND
5		4.57-5.18	4	0.61	0.41	D	16	13	18	21		Dense brown fine SAND and SILT, trace coarse sand
											117.36	-FILL-
		6.10-6.71	5	0.61	0.30	D	11	13	21	24	6.00	Dense brown coarse to fine SAND, trace fine gravel, silt
		7.62-8.23	6	0.61	0.23	D	19	27	25	36		Very dense brown coarse to fine SAND, and fine gravel
10												On boulder at 9.14 m. Cored boulder from 9.30 m. to 9.75 m.
												Cored boulder from 10.67 m. to 11.73 m.
		12.19-12.27	7	0.08	0.00	D	100/.08					No recovery
												Roller bit through cobble and boulders through 14.33 m.
											109.03	-GLACIOFLUVIAL DEPOSITS-
15		14.33-15.85	1	1.52	1.18	C		[RQD = 36%]			14.33	C1- Very hard, fresh to moderately weathered,

Casing			Meters of	
Size	From	To	Earth	Rock
NW	**0.0**	**12.2**	**14.35** m	**3.05** m
			No. of Samples	
			7D, 2C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-6**
Sheet **1** of **2**

J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S7-6**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230788.82**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283038.66**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **123.36**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **27 December 2000**	Utilized		X						X					
Date Finished: **29 December 2000**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ _____ m after _____ hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE ELEV./ DEPTH (FT)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		~~15.80-17.32~~	~~2~~	~~1.52~~	~~0.78~~	~~C~~		~~[RQD = 15%]~~				purple to white, coarse to fine grained GNEISS. Foliation is high angle to vertical, extremely close. Joints are low angle to vertical, close, rough, undulating, discolored, open. Fractured from 14.69 m. to 14.9 m. C2- Same as C1, except highly fractured from 16.1 m. to 16.61m.
											105.99	-BEDROCK-
											17.37	Bottom of Exploration at 17.37 m.
20												
25												
30												

Casing			Meters of	
Size	From	To	Earth	Rock
NW	**0.0**	**12.2**	**14.35** m	**3.05** m
			No. of Samples	
			7D, 2C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S7-6**
Sheet **2** of **2**

APPENDIX B
Previous Explorations

Gary Hill BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 1
Michelle Jackson INSPECTOR	TOWN Waterbury	LOCATION See Figure 2
		General Borings, Inc. BORING CONTRACTOR
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME Relocation I-84 Exit Ramp	A-N Consulting Engineers DESIGN ENGINEER
	PROJECT NO. 151-207	

LOCATION		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B-1
SURFACE ELEV. 378.9	TYPE		HW	D	NX	LINE & STATION 109+38 I84 Exit Ramp
DATE FINISHED 10/8/91	SIZE I.D.		4"	1-3/8"	1-5/8"	OFFSET 18R
GROUND WATER OBSERVATIONS	HAMMER WT.		300	140	BIT	N. COORDINATE 257,346
9 FT. AFTER 0 HRS.	HAMMER FALL		24	30"	Carbide	E. COORDINATE 528,692
FT. AFTER HRS.						

CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOILS REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
2	0-2.0'	1	24	15	D	2	3	4		1) Brown fine-coarse SAND, trace fine-medium gravel. Dry/Loose
2						5				
15										
20										
20	5.0'-7.0'	2	24	6	D	10	8	6		2) Brown fine-medium SAND, trace fine-medium gravel. Wet/Medium (FILL)
13						8				
16										
16									9.0'	
15										
10	10.0'-12.0'	3	24	18	D	5	3	2		3) Brown fine SAND, trace organic silt, wood and gravel. Wet/Loose
4						2				
4										
4									13.0'	
10										
20	15.0'-17.0'	4	24	18	D	20	20	55		4) Brown fine-coarse SAND, little fine-medium gravel. Wet/Very Dense
91						71				
131										
114										
60										
97	20.0'-21.0'	5	12	7	D	20	100	6"		5) Brown fine SAND, little silt, trace fine-medium gravel. Wet/Very Dense.
									21.0'	
								5		Run#1-Cored Rock 21.0'-26.0'
								5		Recovered 57" gray GNEISS.
								6		RQD = 95%
								6		
	21.0'-26.0'	1	60	57	C			6	26.0'	
										END OF BORING 26.0'

FROM GROUND SURFACE TO 20 FEET USED 4 INCH CASING THEN – INCH CASING FOR – FEET

FOOTAGE IN EARTH 21' FOOTAGE IN ROCK 5' NO. OF SAMPLES 5 HOLE NO. B-1

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

Gary Hill BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 1
Chris Harriman INSPECTOR	TOWN Waterbury	LOCATION See Figure 2
		General Borings, Inc. BORING CONTRACTOR
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME Relocation I-84 Exit Ramp PROJECT NO. 151-207	A-N Consulting Engineers DESIGN ENGINEER

LOCATION							
SURFACE ELEV. 379.0		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B-2
DATE FINISHED 10/8/91	TYPE		NW HW	D -	NX	LINE & STATION 109+54 I84 Exit Ram
GROUND WATER OBSERVATIONS	SIZE I.D.		3" 4"	1-3/8"	1-5/8"	OFFSET 10 L
T 8 FT. AFTER 0 HRS.	HAMMER WT.		300	140	BIT	N. COORDINATE 257,366
T FT. AFTER HRS.	HAMMER FALL		24"	30"	Carbide	E. COORDINATE 528,718

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	20	0'-2.0'	1	24	18	D	2	23	23	.2'	3" Topsoil
	37						7				1) Tan fine-coarse SAND, trace silt, trace fine-coarse gravel. Dry/Dense
	40										
	26										
5	30	5.0'-7.0'	2	24	18	D	15	12	10		2) Tan fine-coarse SAND, little coarse-fine gravel. Wet/Medium (FILL)
	20						11				
	24										
	26									8.0'	
	60										
10	100	10.0'-12.0'	3	24	15	D	42	39	19		3) Brown fine-coarse SAND, trace silt, trace fine-medium gravel. Wet/Very Dense
	65						15				
	50										HW Refusal @ 18'; Rollerbit to 19.5'; Spun NW to 21.5'.
	42										
	37										
15	50	15.0'-17.0'	4	24	10	D	30	75	30		4) Brown fine-coarse SAND and GRAVEL Wet/Very Dense
	43						19				
	96										
	300										
20											
										21.5'	
									15		Run#1-Cored Rock 21.5'-25.5' Recovered 48" gray GNEISS. RQD=95%
									16		
									17		
25		21.5'-25.5'	1	48	48	C			18	25.5'	
		25.5'-26.5'	2	12	7	C			17	26.5'	Run#2-Cored Rock 25.5'-26.5' Recovered 7" gray GNEISS, RQD=50%
											END OF BORING 26.5'
30											
35											

FROM GROUND SURFACE TO 18 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 3.5 FEET

FOOTAGE IN EARTH 21.5' FOOTAGE IN ROCK 5' NO. OF SAMPLES 4 HOLE NO. B-2

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

rik DelPriore BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 1
Sheila Gleason INSPECTOR	TOWN Waterbury	LOCATION See Figure 2
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME Relocation I-84 Exit Ramp PROJECT NO. 151-207	General Borings, Inc. BORING CONTRACTOR A-N Consulting Engineers DESIGN ENGINEER

OCATION

			AUGER	CASING	SAMPLER	CORE BAR	
ACE ELEV. 407.8							HOLE NO. B-15
E FINISHED 9/30/91		TYPE	HA	--	D		LINE & STATION 304+87 H.F. Road
GROUND WATER OBSERVATIONS		SIZE I.D.	3 3/4"		1-3/8"		OFFSET 35 R
None FT. AFTER 0 HRS.		HAMMER WT.			140	BIT	N. COORDINATE 257,211
FT. AFTER HRS.		HAMMER FALL			30"		E. COORDINATE 528,719

D F	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		.3'-2.5'	1	24	16	D	14	9	16	27 .3'	4" Blacktop
		2.5'-4.5'	2	24	12	D	18	9	13		1) Brown-orange fine-coarse SAND and fine-medium GRAVEL, little silt, trace coarse gravel, blacktop. -FILL- Dry/Medium-Dense
							18				
		5.0'-7.0'	3	24	12	D	37	15	18	5.0'	
							19				
										7.0'	2) Tan-orange fine-coarse SAND, some fine-medium gravel, trace silt, trace coarse gravel. Dry/Medium-Dense
										9.0'	
10		10.0'-12.0'	4	24	16	D	28	45	33		3) Tan-brown fine-medium SAND, little silt, little coarse SAND, trace fine gravel.
							32				
15		14.0'-16.5'	5	19	16	D	16	18	63	100/1"	4) Gray-brown fine-coarse GRAVEL and fine-coarse SAND, little silt. Dry/ Very Dense.
							100/1"			15.0'	
											Note: Augered through boulders and cobbles from 7'-9'
		20.0'-22.0'	6	24	18	D	7	19	21		5) Tan-brown fine-coarse SAND, trace silt, trace fine gravel. Dry/Very Dense
							16				
25										25.0'	6) Tan-brown fine-coarse SAND, trace silt, trace fine gravel. Dry/Dense
											Augered to 25.0'
											END OF BORING 25.0' Soil
35											

CM GROUND SURFACE TO 25.0 FEET USED 3 3/4" INCH CASING THEN - INCH CASING FOR - FEET

EDOTAGE IN EARTH 25.0' FOOTAGE IN ROCK 0 NO. OF SAMPLES 6 HOLE NO. B-15

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

Erik DelPriore BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 1
Sheila Gleason INSPECTOR	TOWN Waterbury	LOCATION See Figure 2
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME Relocation I-84 Exit Ramp	General Borings, Inc. BORING CONTRACTOR
	PROJECT NO. 151-207	A-N Consulting Engineers DESIGN ENGINEER

CATION		AUGER	CASING	SAMPLER	CORE BAR	
FACE ELEV. 408.0	TYPE	HA		D		HOLE NO. B-16.16A
E FINISHED 9/30/91	SIZE I.D.	3 3/4"		1-3/8"		LINE & STATION 303+93 H.F. Road
GROUND WATER OBSERVATIONS	HAMMER WT.			140	BIT	OFFSET 32 R
None FT. AFTER 0 HRS.	HAMMER FALL			30"		N. COORDINATE 257,160
FT. AFTER HRS.						E. COORDINATE 528,630

CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	0'-2.0'	1	24	8	D	2	3	2	.5'	6" Topsoil
						2				1) Brown fine-medium SAND, some silt, trace vegetation. Dry/Loose.
	5.0'-5.8'	2	9	8	D	28	100/3"		5.5'	2) Tan-brown fine-coarse SAND, some silt, trace fine gravel. Moist/ Very Dense PROBABLE FILL
	10.0'-12.0'	3	24	10	D	10	11	9		3) Tan fine-medium SAND, little silt. Dry/Medium-Dense Note: Auger refused at 5.0' Moved hole 5.0' Northeast.
						16				
	13.0'-15.0'	4	24	4	D	11	17	18	15.0'	4) (same as S-3) Dry/Dense
						20				END OF BORING 15.0' Soil

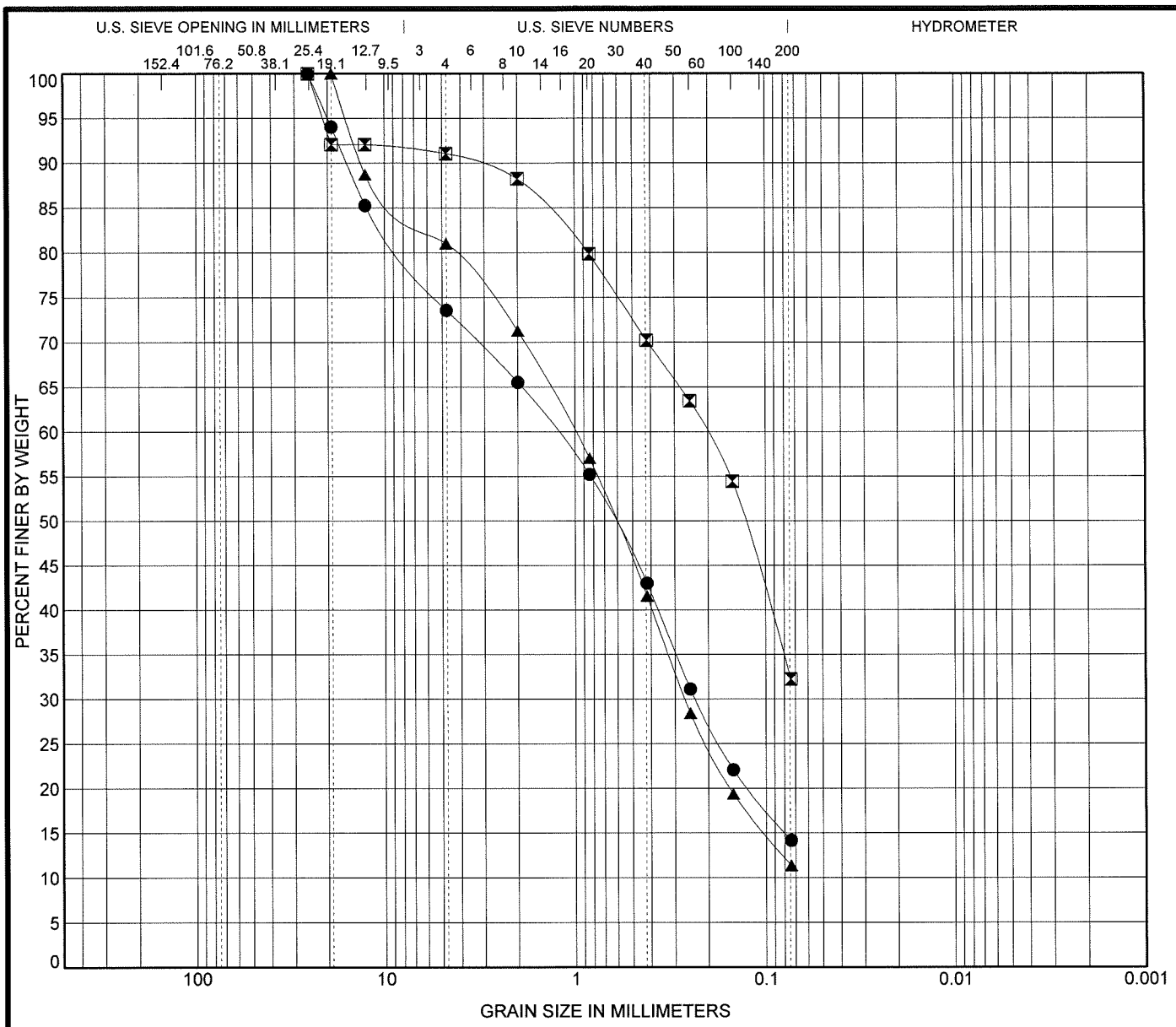
FROM GROUND SURFACE TO 13.0 FEET USED 3 3/4 INCH CASING THEN -- INCH CASING FOR -- FEET

FOOTAGE IN EARTH 20.0' FOOTAGE IN ROCK 0 NO. OF SAMPLES 4 HOLE NO. B-16.16A

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

APPENDIX C
Laboratory Results



	COBBLES	% GRAVEL			% SAND		% FINES	
		COARSE	MEDIUM	FINE	COARSE	FINE	% SILT	% CLAY
●	0.0	0.0	18.2	16.3	22.5	28.8	14.2	
⊠	0.0	0.0	8.2	3.5	18.0	38.0	32.2	
▲	0.0	0.0	13.6	15.2	29.7	30.2	11.4	

	Expl. No.	Sample No.	Depth (m)	LL	PL	PI	Water Content (%)	Cc	Cu
●	S7-1	D2	1.52-2.13				11.0		
⊠	S7-4	D3	3.05-3.66				17.3		
▲	S7-5	D3	3.05-3.66				6.5		

	Sample Description
●	**Coarse to fine SAND, some medium to fine gravel, little silt - FILL**
⊠	**Coarse to fine SAND, little silt, trace gravel - FILL**
▲	**Coarse to fine SAND, little gravel, little silt - GLACIAL TILL**

Remarks:

HALEY & ALDRICH
Glastonbury, Connecticut

U.S. Interstate Route 84 Reconstruction
Waterbury, Connecticut
State Project No.: 151-273

GRAIN SIZE DISTRIBUTION

Date: 1/4/2001 File No.: 91313-100

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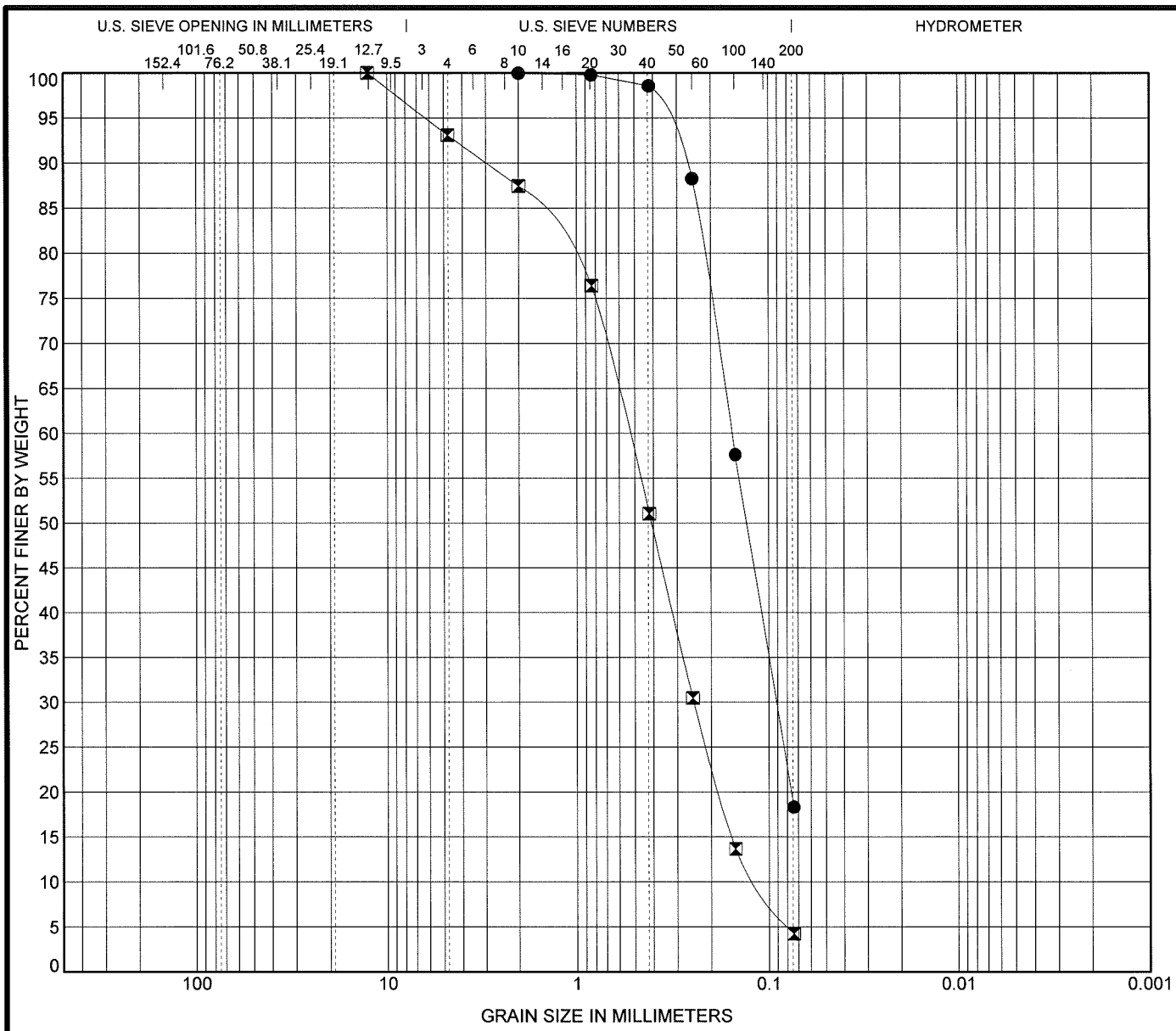

	COBBLES	% GRAVEL			% SAND		% FINES	
		COARSE	MEDIUM	FINE	COARSE	FINE	% SILT	% CLAY
●	0.0	0.0	0.0	0.0	1.4	80.3	18.3	
⊠	0.0	0.0	2.0	10.5	36.4	46.8	4.3	

	Expl. No.	Sample No.	Depth (m)	LL	PL	PI	Water Content (%)	Cc	Cu
●	S7-3	D5	6.1				6.71		
⊠	S7-6	D6	7.62-8.23				17.7	1.00	4.74

Sample Description

●	**Brown fine SAND, little silt**
⊠	**Brown coarse to fine SAND, trace fine gravel**

Remarks:

HALEY & ALDRICH
Glastonbury, Connecticut

I-84 Reconstruction
Waterbury, Connecticut
State Project No.: 151-273

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HALEY & ALDRICH, INC.
Geotechnical Engineers &
Environmental Consultants

GEOTECHNICAL LABORATORY ROCK TEST RESULTS

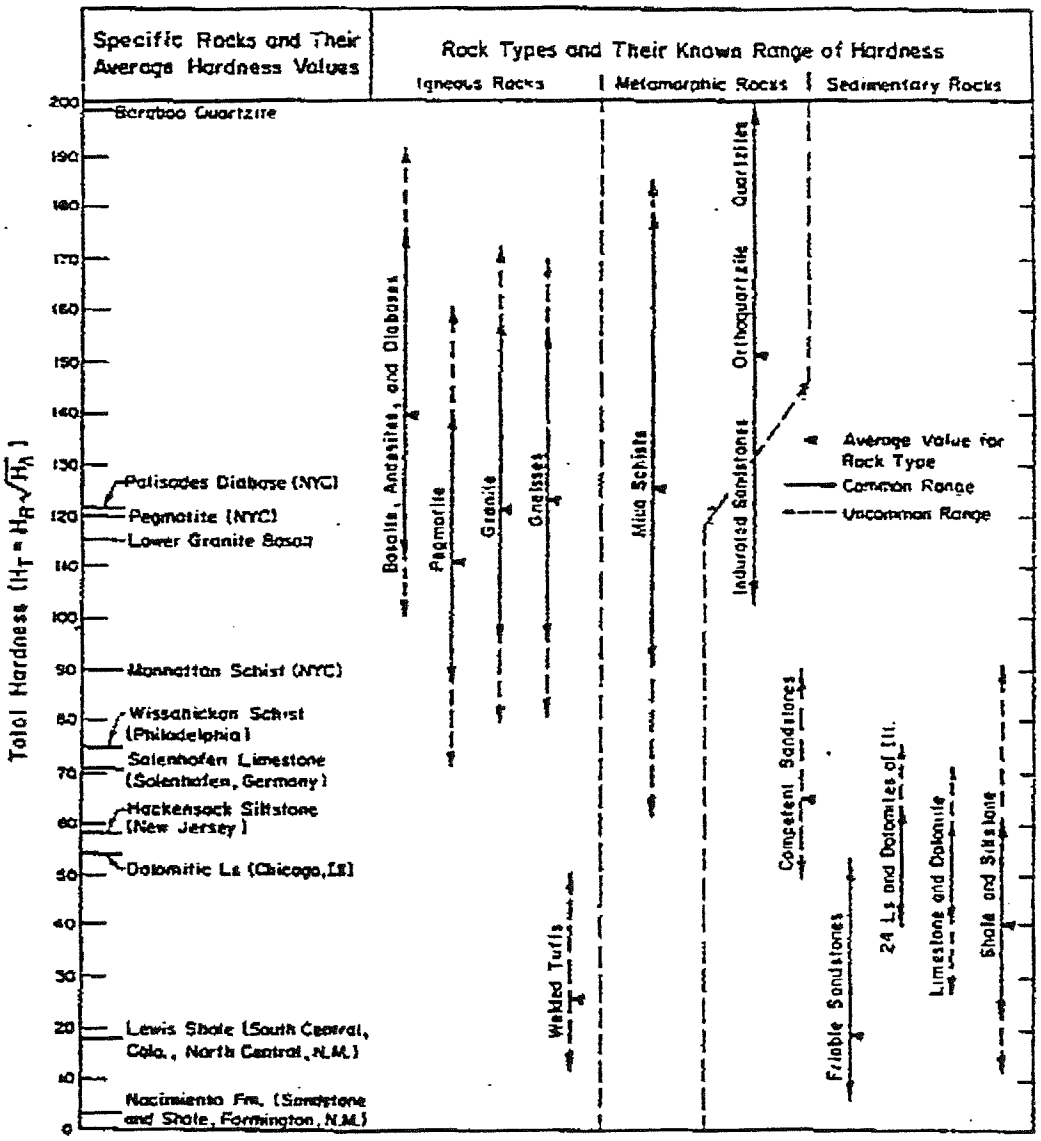
I-84 Widening, Waterbury,C, State Proj No. 151-273

Waterbury, CT

File No. 91313-100

Boring No.	Sample No.	Test	Description	Depth (ft)	Test Number	Hardness: Shore Hs	Hardness: Schmidt Hr	Hardness: Taber Abrasion Ha	Hardness: Total Hardness Ht	Unit Weight (pcf)	Unconf. Compr. Strength (psi)	Tan Mod @ 50% Ult Str (10^6 psi)	Remarks
S1,3-3	C02	Total Hardness		4.6 to 4.9		61.1	39.9	8.306	114.9				ALL DEPTHS IN METERS
		Unconfined Compression - Modulus		4.6 to 4.9	UCR001					163.4	22130.0	7.09	
S1,3-4	C01	Total Hardness		4.1 to 4.5		76.0	46.9	12.195	163.7				
		Unconfined Compression - Modulus		4.1 to 4.5	UCR002					165.4	30777.0	8.34	
S1,3-5	C02	Taber Abrasion		6.8 to 7.0				8.421					
		Unconfined Compression - Modulus		6.8 to 7.0	UCR003					167.6	20434.0	7.70	
	C03	Total Hardness		7.4 to 7.5		51.0	38.3	8.421	111.0				
S7-3	C01	Total Hardness		15.2 to 15.5		34.1	27.0	4.659	58.4				
		Unconfined Compression - Modulus		15.2 to 15.5	UCR004					177.6	9180.0	2.87	
S7-4	C02	Total Hardness		18.9 to 19.3		24.0	29.4	2.206	43.7				
		Unconfined Compression - Modulus		18.9 to 19.3	UCR005					182.2	8884.0	4.46	
S9-3	C01	Unconfined Compression - Modulus		4.5 to 4.6	UCR006					164.7	18501.0	7.45	
		Total Hardness		4.7 to 4.9		48.9	36.6	4.867	80.9				
	C02	Total Hardness		5.9 to 6.3		56.2	40.1	4.039	80.5				
		Unconfined Compression - Modulus		5.9 to 6.3	UCR007					178.5	12468.0	4.81	

FIGURE I-1: Range of H_T for Common Rock Types Bored by TBMs (Tarkoy, 1975a)



(FROM TARKOY, P.J., SEE REFERENCES)