

December 12, 2016

Freeman Project No.: 2014-1001

Prepared for:
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TABLE OF CONTENTS

1.0	INTRODUCTION	2
1.1	Summary	2
1.2	Scope of Work	2
1.3	Authorization	2
1.4	Project Vertical Datum	2
2.0	PROJECT AND SITE DESCRIPTION	
2.1	Project Description	
2.2	Site Description	3
3.0	EXPLORATIONS	
3.1	Recent Explorations	
3.2	Previous Subsurface Explorations	
3.3	Laboratory Testing	4
4.0	SUBSURFACE CONDITIONS	
4.1	Subsurface Conditions	
5.0	GEOTECHNICAL ENGINEERING RECOMMENDATIONS	5
5.1	Foundation Design Recommendations	
6.0	CONSTRUCTION CONSIDERATIONS	
6.1	Excavation	
6.2	Pile Cap Subgrade Preparation	
6.3	Pile Installation	
6.4	Expanded Shale Aggregate	
6.5	Temporary Lateral Support	8
6.6	Excavation Dewatering	
6.7	Reuse of Existing Soils	8
7.0	FLITURE SERVICES AND LIMITATIONS	8

ATTACHMENTS

Table

1. Summary of Subsurface Data

Figures

- 1. Site Location Map
- 2. Subsurface Exploration Location Plan
- 3. Summary of Varved Clay Properties, West of the Connecticut River
- 4. Subsurface Profiles
- 5. Lateral Earth Pressures Active

Appendices

- A. Recent Test Boring Logs
- B. Previous Test Boring Logs
- C. Results of Laboratory Testing
- D. Draft Special Provisions



1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for the proposed new bridge, I-91 NB to Route 5/15 NB Ramp over Route 5/15 SB, located in Hartford, Connecticut. The bridge will be an 880-foot-long, 5-span, trapezoidal box steel girder bridge, supported on two abutments and four piers. Abutments will be concrete cantilever with U-type wingwalls. Up to 36 feet of fill will be placed behind Abutment 1 and up to 22 feet of fill will be placed behind Abutment 2. No fill will be place in pier areas.

We recommend that abutments and piers be supported on steel H-Piles driven to refusal on bedrock, and pile tip reinforcement should be provided. Filling behind the abutments and wingwalls will result in settlement of subgrade soils and downdrag loads on piles supporting abutments will occur. We recommend that bitumen coatings be applied to piles supporting the abutments to reduce downdrag loads, or alternatively piles may be oversized to accommodate downdrag loads. Coated piles should be preaugered to the top of the lacustrine deposits to protect the coatings during installation.

Total settlement of fills placed behind abutments and wingwalls is expected to be approximately 2 inches. We recommend that abutments and wingwalls be backfilled with lightweight fill consisting of expanded shale aggregate to reduce settlement to less than 1 inch.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions.
- Conducted settlement evaluations.
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.



2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

A new two-lane bridge will carry the I-91 NB to Route 5/15 NB Ramp over Route 5/15 SB, as shown on Figure 1, Site Location Map, and Figure 2, Subsurface Exploration Location Plan. Proposed bridge elements are as follows:

Bridge Type: 5-span trapezoidal box steel girder

Length: 880 feet

Abutments: Two concrete cantilever abutments with U-type wingwalls

Bottom of Pile Cap:

Abutment 1: El. 14.0 Abutment 2: El. 31.4

Piers: Four Piers:

Piers 1, 3, 4: reinforced concrete hammer head piers

Pier 2: straddle bent cap supported by two reinforced concrete columns

Bottom of Pile Cap:

Pier 1: El. 9.5

Pier 2: El. 15.8 (West support); El. 14 (East support)

Pier 3: El. 20.0 Pier 4: El. 25.2

2.2 Site Description

Abutment 1 and Pier 1 will be located on the west side of Route 5/15 SB, south of the off ramp to I-91 SB. The area is grass-covered with some trees. The existing ground surface elevation is about El. 15.

Pier 2 will straddle Route 5/15 SB and the off-ramp to I-91 SB. The east side support will be located between the paved Route 5/15 NB and SB travel lanes and the west side support will be located in the grassy divide between Route 5/15 SB and the I-91 SB off ramp (ground surface approximately El. 21). The existing ground surface elevation is approximately El. 21).

Piers 3 and 4 and Abutment 2 will be located between the paved Route 5/15 NB and SB travel lanes. Ground surface elevations are approximately El. 27 (Pier 3), El. 33 (Pier 4), and El. 38 (Abutment 2).

3.0 EXPLORATIONS

3.1 Recent Explorations

Twelve test borings (S1-1 through S1-12) were drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut, near the proposed abutments and piers to depths ranging from 64 to 100 feet below ground surface. Standard Penetration Tests were completed at maximum 5 foot intervals within the test borings. Ten-foot-long NX-size rock cores were obtained from each boring. Explorations were backfilled with drill cuttings and a pavement patch was placed at ground surface.



A Freeman Companies engineer monitored the drilling, classified the soil samples, and prepared the test boring logs included in Appendix A, Recent Boring Logs. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

3.2 Previous Subsurface Explorations

A number of previous test borings were drilled in the vicinity of the new bridge and are considered applicable, including B-158, B-159, and B-188 to B-191. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan, and logs are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- 12 moisture content tests
- Three pH, electrical resistivity, and soluble sulfate tests
- Nine grain size analyses
- Three Constant Rate of Strain (CRS) Consolidation Tests
- Six Atterberg Limit Determinations
- One unconfined compression test on a rock core sample.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3, Summary of Varved Clay Properties, West of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine Deposits, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. Subsurface profiles at the abutments and piers are provided on Figures 4A through 4F, Subsurface Profile.

Thickness Range (ft.)	Stratum	Generalized Description
10 to 28	Fill	Very loose to very dense brown, c-f SAND, little m-f gravel, little to trace silt; to brown clayey SILT, little to some f sand, with wood, rubber, asphalt, and occasional obstructions (refusals) and voids. Occasional rock fragments, glass, and brick were noted in previous borings. Standard Penetration Test (SPT) N-Values ranged from 1 to more than 100 blows per foot (bpf).
22 to 37	Alluvium	Very loose to medium dense SILT, trace fine sand; to gray f SAND, trace to some silt, trace m-f gravel. SPT N-values ranged from 1 to 44 bpf.



Thickness Range (ft.)	Stratum	Generalized Description
12 to 20	Lacustrine	Varved red-brown CLAY and SILTY CLAY, in regular layers typically ¼ to ½ inch thick and up to 3 inches thick at some locations. Previous field and laboratory vanes indicate the deposit is medium stiff to stiff. The varved clay is typically less than about 15 feet thick south of Abutment 1, and more than about 20 feet thick at Abutment 2.
2 to 12	Glacial Till	Medium dense to very dense red-brown coarse to fine SAND, some silt, with coarse to fine gravel and clay. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values ranged from 16 to more than 100 bpf.
	Bedrock	Bedrock was described as brown ARKOSE, thinly to thickly layered at about 15 degrees, medium strong to strong with fractured zones. The top 0.5 to 5 feet of bedrock was typically weathered.

Groundwater – Water was encountered in the borings at depths ranging from 7 to 20 feet (El 3 to El 22). Groundwater levels were measured during drilling activities and may not represent static levels. Water levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – Corrosion testing was conducted on samples recovered from test borings S1-2 (Abutment 1), S1-5 (Pier 2), and S1-12 (Abutment 2). Results are summarized below:

S1-2		S1-5		S1-12
7.1		7.4		8.1
4,442		3,099		1,963
<30		57		< 50
	7.1 4,442	7.1 4,442	7.1 7.4 4,442 3,099	7.1 4,442 7.4 3,099

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Downdrag – The threshold settlement for downdrag loads on piles is commonly considered to be about 0.4 inches. Settlement evaluations were conducted at the proposed abutments to evaluate the magnitude of total settlement, and whether downdrag loads would occur on piles supporting the abutments due to settlement. Predicted total settlements calculated using the computer program Settle 3D (by RocScience) using normal and lightweight fill are as follows:

Normal Weight Fill: 1.5 inches south of abutment; 0.9 inches at abutment Expanded Shale: 0.9 inches south of the abutment; 0.5 inches at the abutment Geofoam: 3/4 inch south of the abutment; 0.2 inch at the abutment

Considering the uncertainties in assumptions and parameters, the significant height of fill, and the closeness of estimated geofoam settlement with the threshold settlement for downdrag, use of geofoam for downdrag mitigation is not considered appropriate. We recommend that coatings be applied to piles to reduce downdrag loads, or that piles be oversized to provide additional capacity for downdrag. A 90 percent reduction in downdrag loads is considered feasible using bitumen coatings, whereas a 33 percent reduction in downdrag has been reported for an epoxy coating referred to as *Slickcoat*. We recommend that bitumen coatings be considered for this project. We recommend that backfill at the abutments consist of expanded shale aggregate.



Corrosion – AASHTO Section 10.7.5 indicates that soils are considered corrosive if pH is less than 5.5, resistivity is less than 2,000 ohm-cm, and sulfate concentration is greater than 1,000 ppm. Based on these criteria, soils at the north abutment (S1-12) are marginally corrosive, and soils in other areas are not corrosive. Corrosion mitigation methods include designing piles with sacrificial steel to allow corrosion to occur, providing a protective coating, and other measures (AASHTO C10.7.5). The NCHRP report titled "Design and Construction Guidelines for Downdrag on Uncoated and Bitumen Coated Piles", Briaud and Tucker (1996, pg. 10) indicates that bitumen coatings provide corrosion resistance. We recommend the use of bitumen coating at the north bridge abutment to provide both corrosion protection and downdrag mitigation.

Pile Design

- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D, Stiff Soils. Assume peak ground acceleration (PGA) of 0.061g, a short-term acceleration coefficient S_s = 0.132g and long-term acceleration coefficient S_1 = 0.037g, respectively.
- Pile Type: HP12x74 with pile tip reinforcement driven to end bearing on bedrock, Grade 50 steel. Other H-Pile sections may also be considered.
- Service Limit: 125 tons, assumes a HP12x74 pile area equal to 21.76 square inches. Subtract an appropriate allowance for downdrag for piles supporting the abutments, as indicated below.
- Strength Limit: For end bearing piles, assume a strength limit equal to the structural capacity of the pile. Settlement of piles is expected to be equal to the elastic compression of the pile.
- Downdrag: Estimated downdrag loads are listed below:

Abutment 1:

50 tons (single piles, uncoated) or 5 tons (single pile with bitumen coating)

4.5 tons (corner pile in a group with bitumen coating)

4 tons (side pile in a group with bitumen coating)

2.5 tons (inside pile in a group with bitumen coating)

Abutment 2:

115 tons (single piles, uncoated), or 11.5 tons (single pile with bitumen coating)

10.5 tons (corner pile in a group with bitumen coating)

9 tons (side pile in a group with bitumen coating)

6 tons (inside pile in a group with bitumen coating)

- Load Tests: Minimum of 3 dynamic load tests with matching signal analysis (4 tests if 26 or more piles, and no less than 2% of the production piles, AASHTO Table 10.5.5.2.3-3).
- Test Piles: Recommend same piles and criteria as load tests (AASHTO 10.7.9)
- **Minimum Spacing:** Center to center spacing should be 2½ times the pile diameter (AASHTO 2012 10.7.1.2) and at least 30 inches. Minimum 9 inches to the nearest edge of the pile cap
- Lateral Resistance: Use the pile capacity in batter. Lateral load capacities in bending will be provided based on LPile analyses once pile loading is established.
- Subgrade Preparation Below Pile Cap: Minimum 12-inch thick layer of crushed stone (CTDOT Form 817 M.01.01 No. 6) overlying separation fabric (CTDOT Form 817 Sec. 7.55 M8.01-26) over the subgrade.
- Bottom of Structure and Estimated Pile Length:

Substructure	Bottom of Pile Cap Elevation	Estimated Pile Tip Elevation
Abutment 1	14.0	-40
Pier 1	9.5	-38
Pier 2	15.8 (west support) 14 (east support)	-39
Pier 3	20	-45
Pier 4	25.2	-43
Abutment 2	31.4	-47



Abutment Design

Backfill Material: Expanded Shale Aggregate within 200 feet of Abutment 1

Expanded Shale Aggregate for filling between Abutment 2 and Charter Oak Bridge

12-inch thick layer of compacted granular fill between top of Expanded Shale and Roadway Base

24-inch thick pavement section

• Est. Settlement: Less than 1-in. total settlement at Abutments 1 and 2

Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.

• Lateral Pressures: Refer to Figure 5 – Active Earth Pressures

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Proposed bottom of pile caps will be within the Fill and Alluvium strata. The alluvium and portions of the fill are highly susceptible to disturbance by construction equipment, and are expected to be wet due to shallow groundwater. Excavation to footing subgrade should be made using a smooth-bladed backhoe bucket. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Pile Cap Subgrade Preparation

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. We anticipate that working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment. A draft special provision is provided in Appendix D.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.3 Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Test piles and dynamic load testing should be conducted as indicated above. Vibrations from pile driving should not affect the structural integrity of adjacent structures. However, vibration and noise will likely be noticeable inside buildings 300 feet away, or more.

Where bitumen coats are required, coatings should be applied to the piles prior to transportation to the site. It should include a primer coat that may be sprayed or painted onto the piles, and a final coat. A draft special provision for bitumen coatings is provided in Appendix D.

Piles with bitumen coatings should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Piles should be preaugered through the existing fill and alluvial deposits (granular soils) to the top of lacustrine deposits. Additionally, the alluvium is expected to be susceptible to settlement from pile driving, and settlement of the alluvial deposits could effect nearby structures and utilities. The top of lacustrine deposits is typically about EI -20. Sand should be placed in the casing as the casing is extracted.



6.4 Expanded Shale Aggregate

Expanded shale aggregate should be placed in layers 1.5 to 2 feet thick, and compacted with self-propelled vibratory compaction equipment with static weight less than 6,600 lbs. The minimum number of passes should be limited to two and the maximum four, to avoid particle breakdown during compaction. A draft special provision is included in Appendix D.

6.5 Temporary Lateral Support

We estimate that excavations on the order of 5 to 8 feet deep will be required to reach pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.6 Excavation Dewatering

Excavation dewatering will be required to permit construction in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.7 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces
- Pile installation and load tests.
- Verify that soil conditions exposed in excavations are in general conformance with design assumptions, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

2014-1001 New Bridge - Route 5/15 over I-91 NB Contract CORE ID: 15DOT0148AA, State Project No. 63-703 Hartford, Connecticut

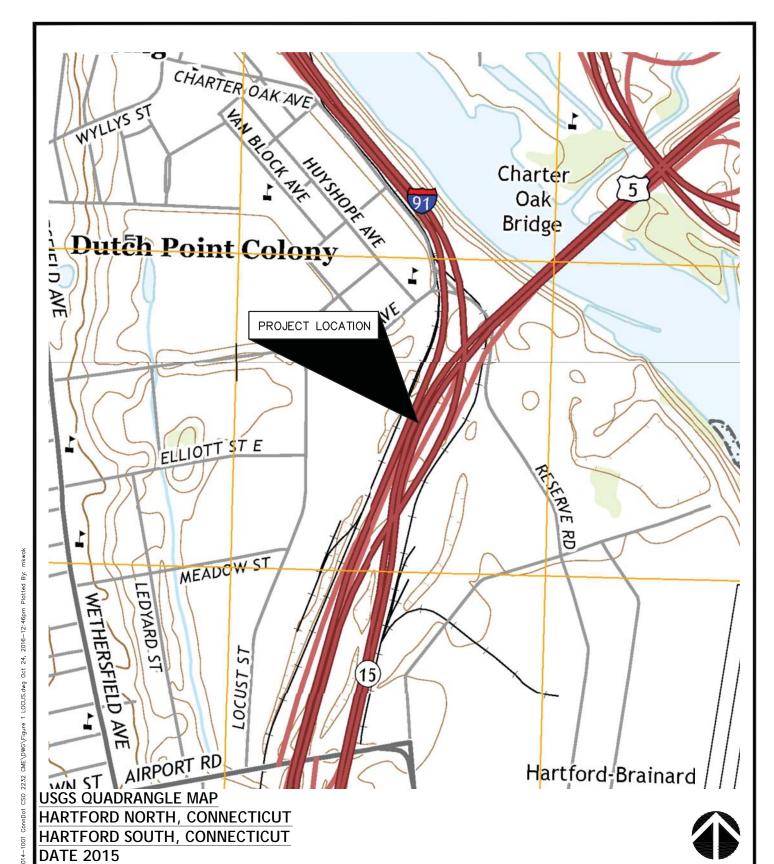
Table 1 Subsurface Data

	Ground Surface				Thickness (ft.)				Ground	dwater	Bed	rock
Boring No.	El.	Depth (ft.)	Pavement/Topsoil	Fill	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation
Recent Test Bo	orings_											
S1-1	16.5	65 C	0.3	9.7	28	12	3	3	10	6.5	52	-35.5
S1-2	14.7	64 C	0.4	13.6	24	12	3	1	7.1	7.6	53	-38.3
S1-3	16.8	64 C	0.5	9.5	29	12.5	1.5	1	9	7.8	53	-36.2
S1-4	22.1	66 C	1	14	22	16.5	2	0.5	19	3.1	55.5	-33.4
S1-5	21.8	69 C	1	14	29	12	1.5	2.5	18.5	3.3	57.5	-35.7
S1-6	25.6	72 C	1	12.5	27	12.5	9		NM	NM	62	-36.4
S1-7	27.5	80 C	1	12	37	13	3	4	15	12.5	66	-38.5
S1-8	26.6	81 C	1.2	18.8	28	16	7		18.2	8.4	71	-44.4
S1-9	38.7	85 C	1	24	28	15.5	4.5	2	20	18.7	73	-34.3
S1-10	37.5	90 C	1	24	26.5	16.5	7	5	17.5	20	75	-37.5
S1-11	37.7	89.5 C	1	25	32	15	11.5		18.5	19.2	84.5	-46.8
S1-12	40.7	95 C	1	27	27	19.5	6	4.5	19	21.7	80.5	-39.8
Previous Test I	<u>Borings</u>											
B-158		69 C	0.5	4.3	33.2	18	5	3	2		61	
B-159		65C	0.5	5.5	32	14	7	1	7.5		59	
B-188		67 C	0.7	12.3	30	11	4	4	6.5		58	
B-189		68 C	1	20	22	13	4	3	5.8		60	
B-190		72 C	0.3	3.2	34.5	19.5	7.5	2	7.5		65	
B-191		69 C	1	7	30	11.5	13.5	1	11.5		63	

Notes:

- 1. Ground surface elevations are at recent test borings were surveyed by CME Associates, Inc. Elevations at previous borings were shown on the logs and converted to NAVD-88.
- 2. Groundwater levels are approximate
- 3. Top of bedrock depth is inclusive of weathered bedrock.
- 4. ">" Greater Than "--" Not Encountered (C) Bedrock Core Taken "NM" Not Measured





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SITE LOCATION MAP

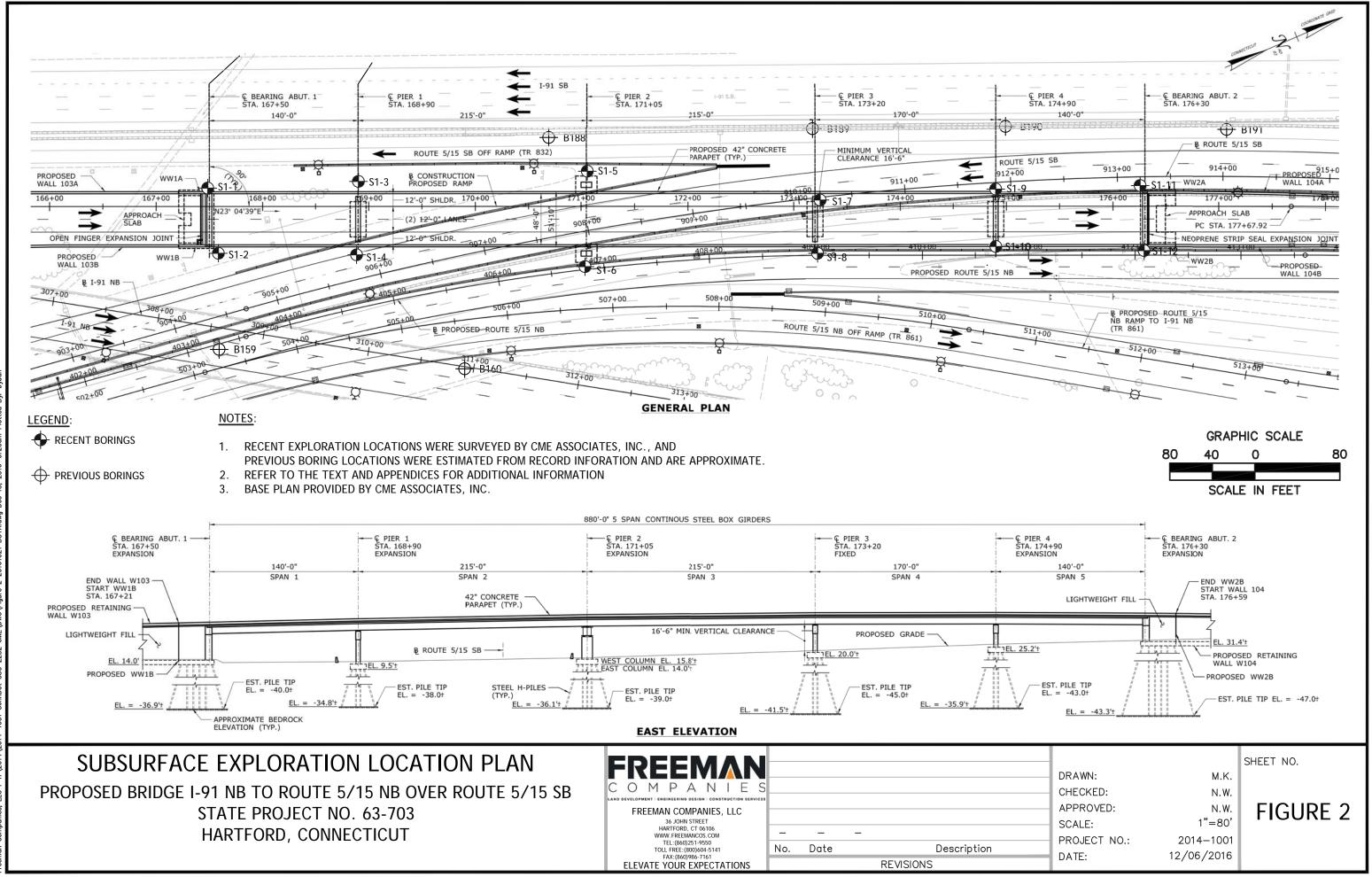
PROPOSED BRIDGE I-91 NB TO ROUTE 5/15 NB
OVER ROUTE 5/15 SB
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT

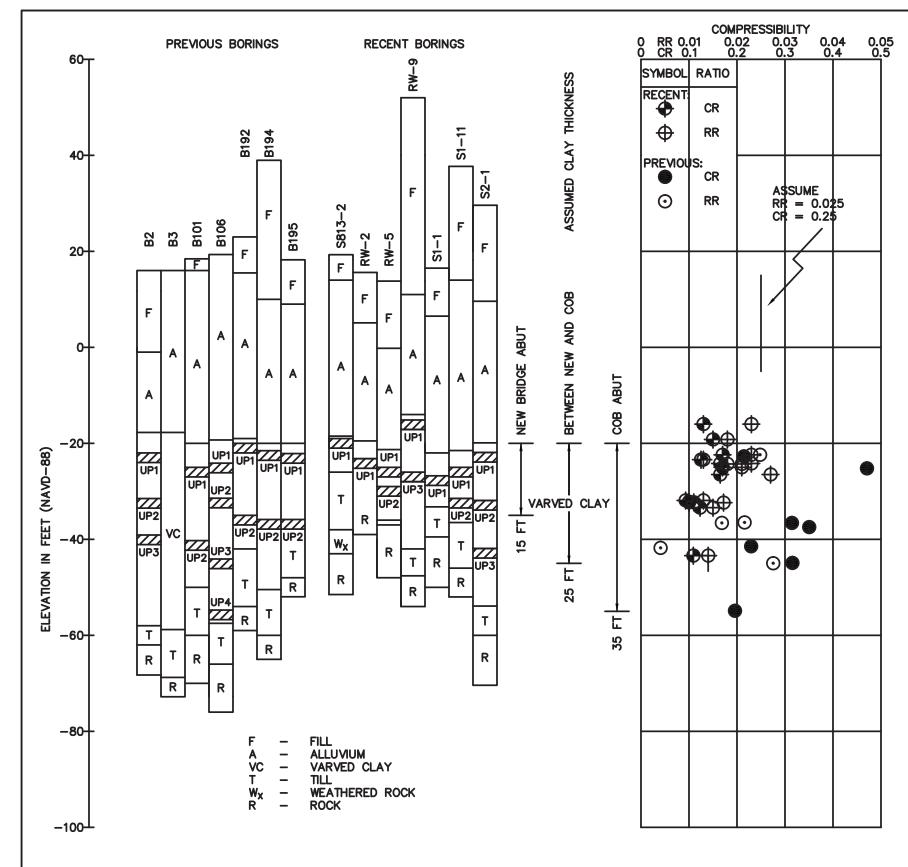
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N.W. N.W. 1"=1000' 2014-1001 10/21/2016

SHEET NO.

FIGURE 1





0	2	STRESS	HISTORY, σ'_{V0} , o		o 1	0	
,		•	4 6	•	<u> </u>		60
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	LAYER 1,2 LAYER 1,2 LAYER 1,2	SOL ,3 FILL ,3,4 AT	ITH & NORTH SI MIDDLE AREA COB	DE OF NEW BRID	GE		
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							0
				Ź			
SYMBOL	BORING NO.	GS. EL	4			LAYER 1	-20
RECENT:	RW-2	15.6]	O#T		LAYER 2	
	RW-5	13.8	_	_/	$\qquad \qquad $		
★	RW-9	52.0	<u> </u>	$\overline{\nabla}$		LAYER 3	-40
₹	S1-1	16.5	_	0	>		
♥	S1-11	37.7	•		\land		
❤	S813-2	16.8			\	LAYER 4	
	S2-1	29.6		•			
PREVIOUS:	B101	18.6			 		-60
	B101	19.0	d_ WEST O	F CT RIVER -	\vee		
	B100	23.2	OP WEST O	OI NIVER			
	B194	39.1					
Ŏ	B195	18.7					
	B2	15.4					-80
	B3	30.3					
		<u> </u>				I	-10

NOTES

- 1. PREVIOUS DATA WAS OBTAINED FROM THE REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD—EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
- 2. ELEVATIONS REFER TO NAVD-88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD-29.

DEFINITIONS

- CR COMPRESSION RATIO (= $\Delta \epsilon/\Delta L$ OG σ'_V) DURING VIRGIN COMPRESSION
- RR RECOMPRESSION RATIO (= $\Delta \epsilon / \text{LOG} \sigma'_{V}$) DURING RECOMPRESSION
- $\sigma'_{\mbox{ VO}}$ $\,$ IN SITU VERTICAL EFFECTIVE STRESS
- σ_P PRECONSOLIDATION STRESS



D DEVELOPMENT: ENGINEERING BESISN I CONSTRUCTION SERVICES

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ELEVATE YOUR EXPECTATIONS

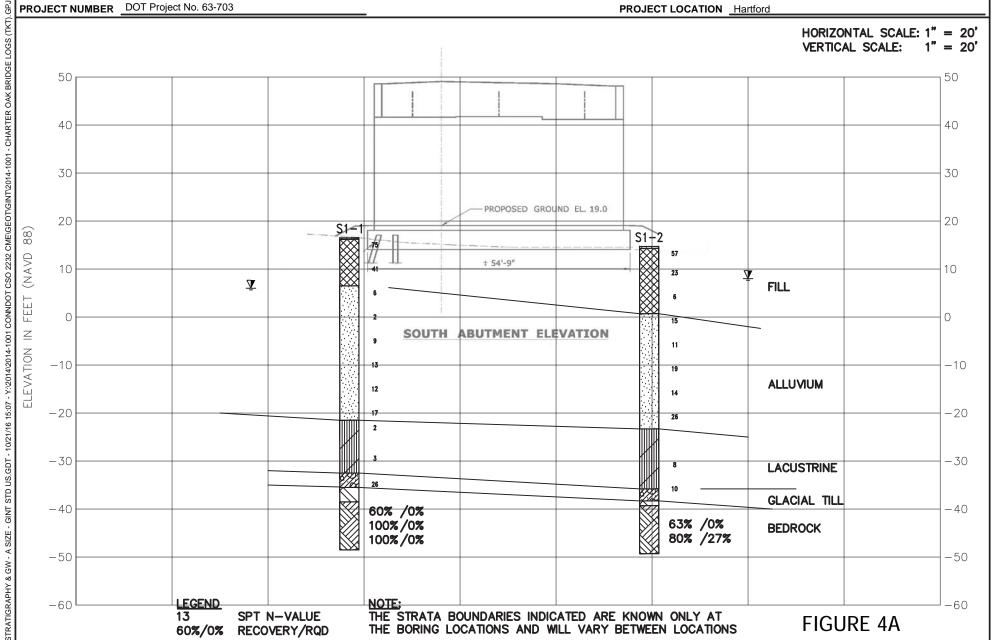
SUMMARY OF VARVED CLAY PROPERTIES
WEST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3A

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•	18 < 1	JRFA		1 11 /		/\ I\/I
-	JUSI	,,,,,	\sim \sim			\neg ıvı

PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford



SUBSURFACE DIAGRAM					
	CHID	?!!D <i>E!</i>			\ N.A
	3UD:	11 IR F 4	41.F II	11 A L 3 R 4	A IVI

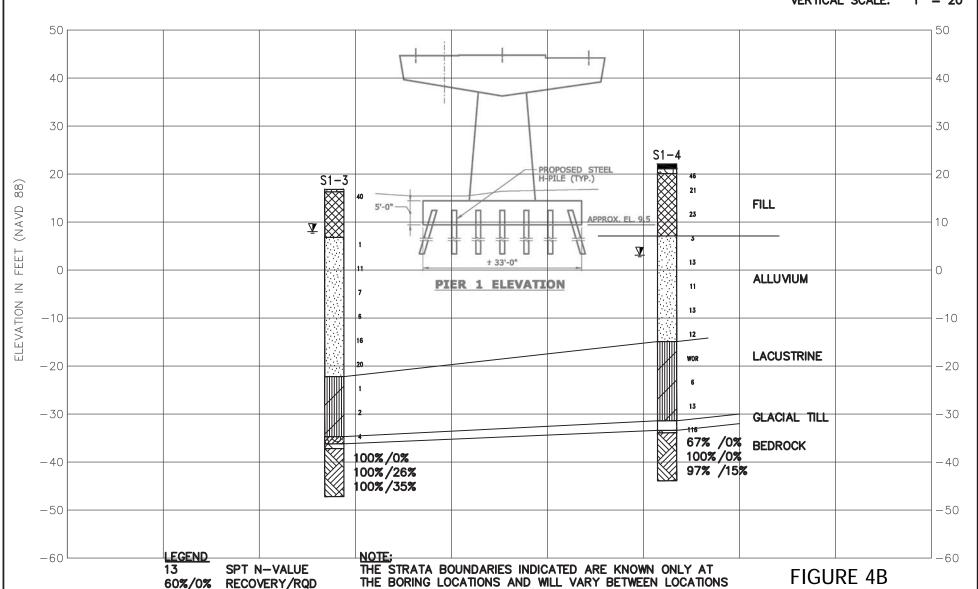
PROJECT NUMBER DOT Project No. 63-703

PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

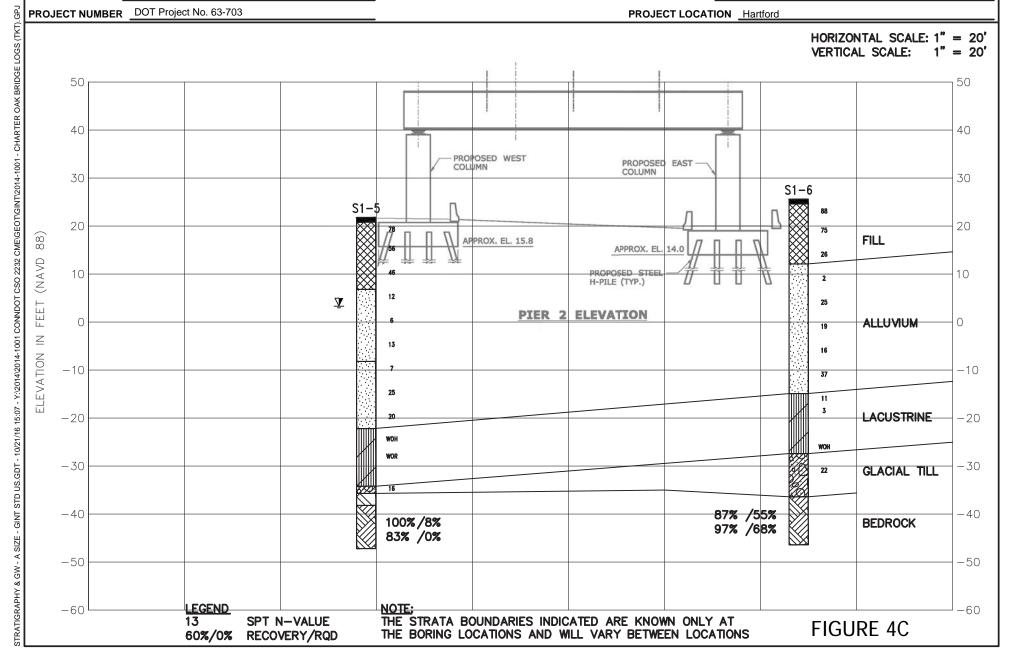
HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 20'



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PRIME DESIGNER CME

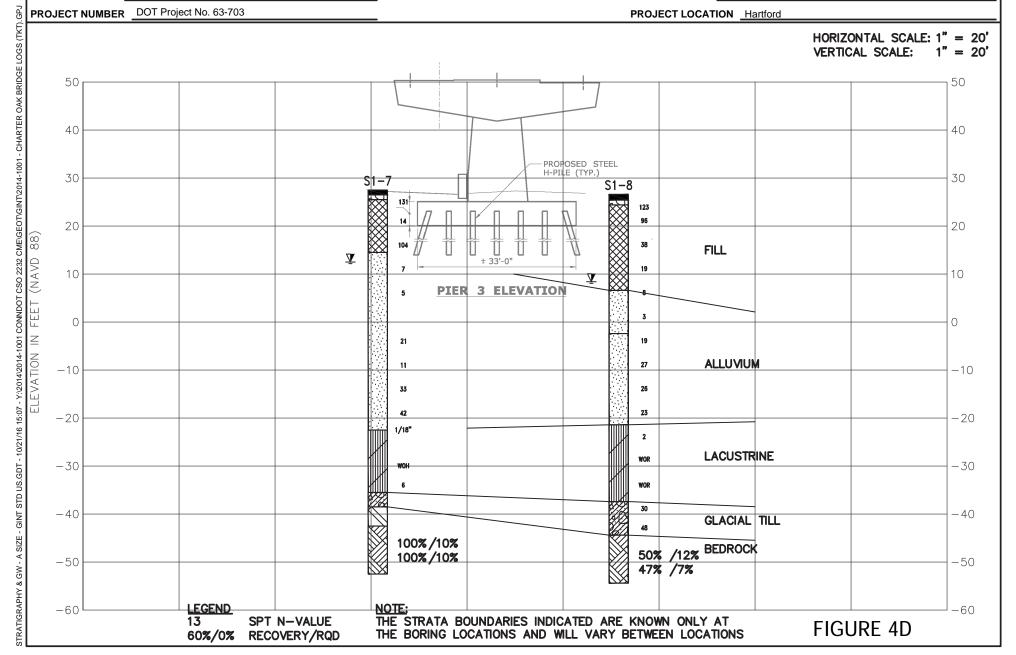
PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening



SUBSURFACE DIAGRAM					
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PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

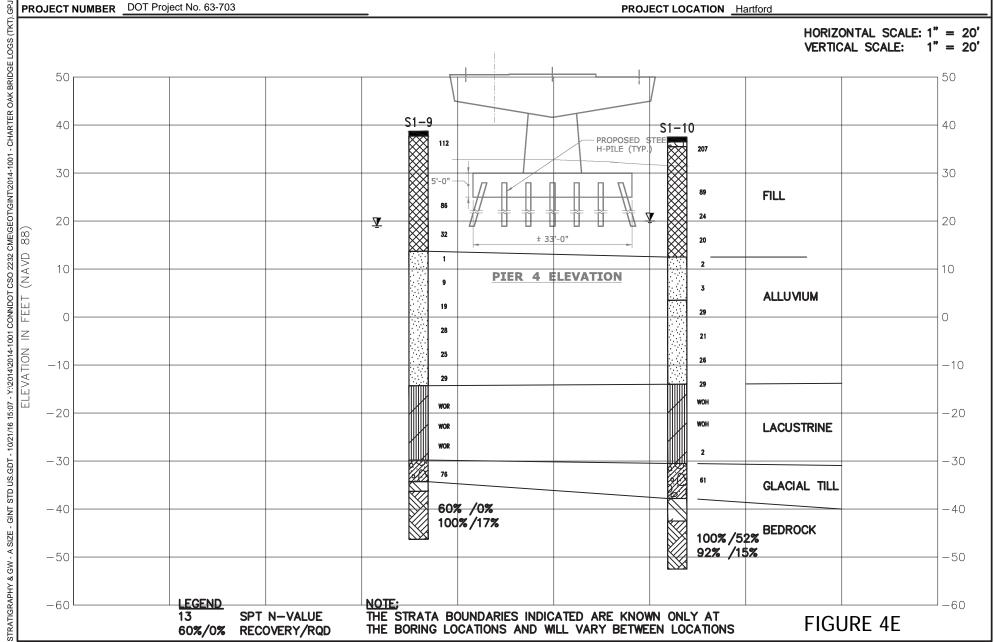


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PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

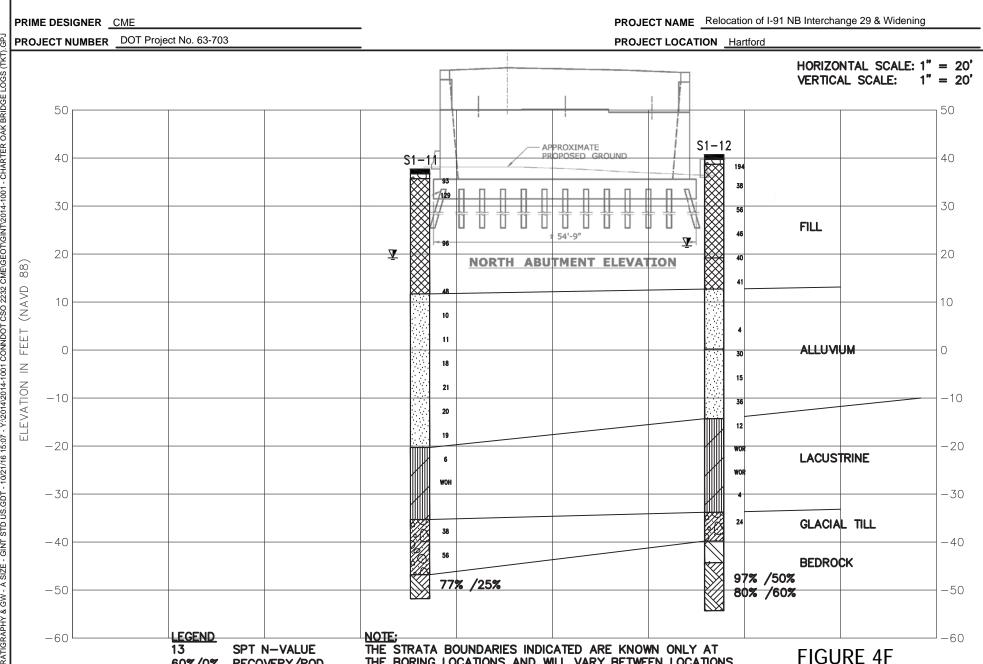


SUBSURFACE DIAGRAM

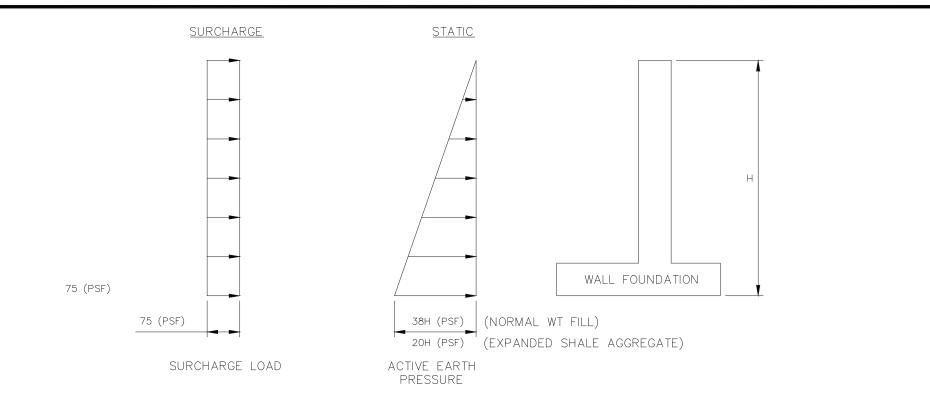
Freeman Companies, LLC 36 John Street Hartford, CT 06109

60%/0%

RECOVERY/RQD



THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS



NOTES:

- APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
- 2. H IS MEASURED IN FEET
- 3. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL (FORM 817 M.02.05) WITH A UNIT WEIGHT OF 125 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
- 4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
- 5. SLIDING:
 COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3-1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
- 6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.



FAX: (860)986-7161 ELEVATE YOUR EXPECTATIONS

ConnDot CSO 2232 CME\DWG\Figure 5 20161021.dwg Oct 24, 2016-12:51pm Plotted By

4-1001

LATERAL EARTH PRESSURES ACTIVE EARTH PRESSURES

PROPOSED BRIDGE I-91 NB TO ROUTE 5/15 NB OVER ROUTE 5/15 SB STATE PROJECT NO. 63-703 HARTFORD, CONNECTICUT

 DRAFTED:
 M.K.

 CHECKED:
 N.W.

 APPROVED:
 N.W.

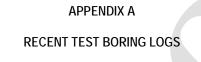
 SCALED:
 N.T.S.

 PROJECT NO.:
 2014-1001

 DATE:
 10/21/2016

FIG.

FIGURE 5



Driller:	P	. Labo	ssier	r		Co	onne	cticu	t DOT Borir	ng Report	Hole No.: S1-1	
Inspect	tor: T	. Ta			Т	own:		Hartfe	ord		Stat./Offset:	
Engine	er: N	I. Whe	tten		F	Project	No.:	DOT	Project No. 63	3-703	Northing: 832451.18	
Start D	ate: 5	-23-16	6		F	Route N	lo.:	15 SE	B / Exit 86 Off	Ramp	Easting: 1024244.72	
Finish I	Date: 5	-24-16	6		E	Bridge N	No.:				Surface Elevation: 16.5	
Project	Descript	tion: F	Reloc	ation	of I-9	1 NB I	Intercl	hange	e 29 & Widenir	ng		
Casing	Size/Typ	pe: 4-ir	n. Ca	sing	5	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 3	00lb	Fall:	30in	. F	lamme	r Wt.:	140lb	Fall: 30in.			
Ground	dwater O	bservat	tions:	@1	0.0' A	TD						
			5	SAMF	PLES				D			£.
£						·	·		Generalized Strata Description	Ma	storial Description	Elevation (ft)
) H	ble N			vs on opler		Ë	i.	%	era ta crip	IVIC	aterial Description and Notes	atic
Depth (ft)	Sample Type/No.	р	er 6			Pen. (in.)	Rec. (in.)	RQD	sen strat			<u> 6</u>
0-	0) F						IL.	<u> </u>				ш
_	S1	10	31	44	56	24	16		Topsoil	TOPSOIL (4")	, little m-f gravel, little silt	-
_	0.	.0	01	• • •	00				Fill	Brown c-r SAND	, little m-r graver, little siit	- 15
-												
_												
5-		1										_
_	S2	11	16	25	26	24	12			Brown c-f SAND	, little m-f gravel, trace silt	-10
_												-
_												-
10-		-							Alluvium			
-	S3	3	3	3	5	24	18		/ und vidin	Gray SILT, trace	fsand	-5
-		1										
												-
15-										Gray f SAND, so	umo cilt	-
_	S4	1	1	1	2	24	22			Glay I SAND, SO	onie siit	
-		-								Gray f SAND, litt	tle silt	-0
-												_
-												-
20-	S5	7	5	4	7	24	12			Croy of SAND	traca silt	-
_	33	_ ′	3	7	,	24	12			Gray c-f SAND,	trace siit	 -5
_												
-												
25-		1										
-	S6	3	4	9	9	24	10			Gray c-f SAND,	trace f gravel	10
												-
												-
30-		-										
_	S7	4	4	8	11	24	16			Gray c-f SAND,	trace silt	- 15
-		4										-15

Total Penetration in	NOTES:	Sheet 1 of 2
Earth: 55ft Rock: 10ft		1 01 2
No. of No. of		
Soil Samples: 13 Core Runs: 3		SM-001-M REV. 1/02

Driller:	Р	. Labossier	Co	onne	cticu	ıt DOT Boriı	ng Report Hole No.: S1-1	
Inspect		. Ta	Town:		Hartfe	ord	Stat./Offset:	
Engine	er: N	I. Whetten	Project	No.:	DOT	Project No. 63	8-703 Northing: 832451.18	
Start D	ate: 5	-23-16	Route N	lo.:	15 SE	B / Exit 86 Off	Ramp Easting: 1024244.72	
Finish I	Date: 5	-24-16	Bridge 1	No.:			Surface Elevation: 16.5	
Project	Descript	ion: Relocation of I	-91 NB	Interc	hange	e 29 & Widenir	ng	
Casing	Size/Typ	be: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID	Core Barrel Type: NX	
Hamme	er Wt.: 3	00lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.		
Ground	lwater Ob	oservations: @10.0'	ATD					
		SAMPLE	S			- o _		£
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35-						Alluvium (con't)		†
_	S8	4 7 10 15	24	10		(COIT!)	Gray c-f SAND, trace f gravel, trace silt	-
_							g. a. e., a. a. e. g. a. e., a. a. e. e	20
_						Lacustrine		
-								-
40-	S9	wor wor 2 2	24	24			Brown SILTY CLAY	-
_	- 00	WOI WOI Z Z	27				BIOWITSILTY CLAY	25
_	UP-1		30	30				
_								
45-	0.10		0.4	0.4				-
	S10	wor woh 3 5	24	24			Brown SILTY CLAY	30
_	LID 0		20	10				-
_	UP-2		30	12		Glacial Till	No recovery in tube at bottom 6", tip of tube bent	†
50-						Glaciai Tili	indicating glacial till	
_	S11	15 11 15 100/	3" 21	10			Brown c-f SAND, some silt, little c-f gravel	-35
_						Weathered	WEATHERED DEPROOF	-
						Rock	WEATHERED BEDROCK	-
55-						Podrock		
_						Bedrock		-40
_	C-1		60	36	0		Brown ARKOSE, highly fractured, medium	40
-							strong	-
60-								-
_	C-2		24	24	0		Brown ARKOSE, highly fractured, medium	-
_			-	- '			strong	45
-	C-3		36	36	0		Brown SANDSTONE, thickly banded, highly fractured, medium strong	

END OF BORING 65ft

-50

65

Total Penetration in	NOTES:	Sheet 2 of 2
Earth: 55ft Rock: 10ft		2 01 2
No. of No. of		
Soil Samples: 13 Core Runs: 3		SM-001-M REV. 1/02

Driller:	G	. Two	mbly			Co	nne	cticu	ıt DOT Boriı	ng Report	Hole No.: S1-2	
Inspect		. Ta			1	Town:		Hartfo	ord	-	Stat./Offset:	
Engine	er: N	. Whe	etten			Project I	No.:	DOT	Project No. 63	3-703	Northing: 832436.06	
Start D	ate: 5-	-10-16	3			Route N	lo.:	15 SE	B / Exit 86 Off	Ramp	Easting: 1024305.33	
Finish [Date: 5-	-10-16	3			Bridge N	lo.:				Surface Elevation: 14.7	
Project	Descript	ion: F	Reloc	ation	of I-9	91 NB I	nterc	hange	29 & Widenir	ng		
Casing	Size/Typ	e: 4-iı	n. Ca	sing	:	Sample	т Туре	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 30	00lb	Fall:	30in	.	Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	lwater Ob	serva					'.1 (24	4 hrs)	I	I		
				SAMF	PLES	3		1	- p _			£
(ft)	<u>ه ٥</u>		Blow	vs on			(in.)	%	alize	Ma	iterial Description	l G
Depth (ft)	npl Neα		San	npler		Pen. (in.)	. (i	0	nera ata scrij		and Notes	Elevation (ft)
Del	Sample Type/No.	p	er 6	inche	es .	Per	Rec.	RQD	Generalized Strata Description			E
0-									Topsoil	TOPSOIL (5")		
_	S1	5	25	32	28	24	22		Fill		, some c-f gravel, little silt	
_												
												_
5-	S2	8	8	15	14	24	14			Brown c-f SAND	, little silt, trace m-f gravel	-10
_											,, g	
_												
_												_
10-	S3	6	3	3	4	24	0			Brown to olive SI	LT, little f SAND, trace f grav	el, -5
-			J	J	7					12" recovery on s	second attempt using a 3" sp	oon
_												
_												
15-	S4	9	8	7	7	24	15		Alluvium		DANID to a self	-0
15-	34	9	0	,	1	24	15			Brown to gray c \$	SAND, trace slit	-
_												-
_												
	0.5	7	0	_	•	0.4	44					_ 5
20—	S5	7	6	5	6	24	11			Gray c-f SAND, t	race silt	-
_												-
_												
_												- 10
25—	S6	9	10	9	8	24	12			Gray c-f SAND, t	race silt	- 10
												-
-												-
-												-
30-	S7	7	6	8	13	24	8			Gray c-f SAND, t	race m-f gravel, trace silt	<u></u> 15
												-
			-	•							V = Vane Shear Test	
	F	Propo	rtions	Use	d: T	race =	1 - 10)%, I	Little = 10 - 20	%, Some = 20 -	35%, And = 35 - 50%	
Total P	enetratio	n in				NOT	ES:					Sheet
Earth:	53ft	Rock		:								1 of 2
No. of Soil Sa	mples: 1		o. of ore R	uns: 2	2						SW OU	1-M REV. 1/02
JUII Ja	inpies. I	, ,	OIG K	u113. 4							3101-00	1-1VI NL V. 1/UZ

Driller:	G	. Two	mbly			Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S1-2	
Inspect	or: T	. Ta				Town:		Hartfo	ord		Stat./Offset:	
Engine	er: N	l. Whe	tten			Project	No.:	DOT	Project No. 63	3-703	Northing: 832436.06	
Start D		-10-16				Route N	lo.:	15 SE	B / Exit 86 Off	Ramp	Easting: 1024305.33	
Finish I		-10-16				Bridge N					Surface Elevation: 14.7	
Project	Descript	ion: F	Reloc	ation	of I-	91 NB I	nterc	hange	29 & Widenii	ng		
Casing	Size/Typ	e: 4-ir	n. Ca	sing		Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 3	00lb	Fall:	30in.		Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	lwater Ol	oservat					7.1 (24	4 hrs)	T	T		
l				SAMF	LES	3			- p			(#)
(ft)	е <u>6</u>		Blow	vs on		n.)	(in.)	%	Generalized Strata Description	Ma	aterial Description	Elevation (ft)
Depth (ft)	mpl Se/N		San	npler		Pen. (in.)) ()	ner ata scri		and Notes	vat
De	Sample Type/No.	р	er 6	inche	S	Pel	Rec.	RQD	Str			Ele
									Alluvium			
35—	S8	16	15	11	14	24	7		(con't)	Gray c-f SAND,	trace silt	20
_		-										
												F
_		-							Lacustrine			F
40 —	S9	woh	woh	woh	4	24	24			Brown SILTY CI	LAY	
_												
												L
		-										-
45-	S10	3	4	4	4	24	24			Brown SILTY CI	LAY	-30
_												
_												
										ם מו אינדיי	011.7	-
50-	S11	5	5	5	10	24	2				SILT, trace f gravel SILT, little f gravel (change in	35
_		_							Glacial Till	stratum at botto	m 6 inches of spoon)	-
_												
_									Weathered	-		_
55—									Rock Bedrock	1		-40
_	C-1					60	38	0			ARKOSE, highly fractured, 2"	-
_	U-1					60	30	0		recovery with 1" similar to sands	being arkose and the other tone, strong	
_											•	-
60-												-45
_	0.0					60	40	0.7		Brown SANDY	ARKOSE, with highly fractured	F
_	C-2					60	48	27			angle fracture, strong	
_												
65 <i>-</i> -		1									10.046	
_										END OF BORIN	IG 64ft	F
_												
_		0.5.11	I. T			0-1:4 0) 		. \/ = \/an= Ob == T	
			•	•							N V = Vane Shear Test - 35%, And = 35 - 50%	
Total P	enetratio	n in				NOT	ES:					eet
Earth:	53ft	Rock	11ft	t							2 (of 2
No. of		No	o. of		`							
Soil Sa	mples: 1	1 C	ore R	uns: 2							SM-001-M	REV. 1/02

Driller:	C	. Dupis	3			Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S1-3	
Inspect	or: T	. Ta				Town:		Hartf	ord		Stat./Offset:	
Engine	er: N	l. Whet	ten			Project	No.:	DOT	Project No. 63	3-703	Northing: 832583.96	
Start D	ate: 5	-23-16				Route N	lo.:	15 SI	B / Exit 86 Off	Ramp	Easting: 1024294.25	
Finish I	Date: 5	-24-16				Bridge 1	No.:				Surface Elevation: 16.8	
Project	Descript	ion: R	eloc	ation	of I-	91 NB	nterc	hange	e 29 & Widenii	ng		
	Size/Typ						•		1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 3			30in.		Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	lwater Ol	oservati										
		1	•	SAMF	LES	<u> </u>			Generalized Strata Description			(#E)
(£)	e e		Blov	vs on		i.)	(in.)	%	aliz	Ma	aterial Description	Elevation (ft)
Depth (ft)	Sample Type/No.			npler		Pen. (in.)	Rec. (RQD (ata		and Notes	svat
De	Sa	pe	er 6	inche	S	Pe	8	R _C	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			
0-									Topsoil	TOPSOIL (6")		
-	S1	3	18	22	21	24	18		Fill		SAND, little m-f gravel, little silt	_ 15
_												_
5-										B COANID	Pale of control Pale 29 Pale	-
_	S2	1/12"	0	1/12"	0	24	2			wood and rubbe	, little c-f gravel, little silt, little r	- -10
		-										_ 10
												_
10-		-							Alluvium			-
-	S3	1/12"	0	1	2	24	14		Alluviulli	Gray SILT, some	e f sand	-
-		_										-5
_												
15-										Crovet CAND litt	tle cilt trace fine gravel	_
_	S4	3	5	6	10	24	8			Gray c-f SAND,	tle silt, trace fine gravel trace f gravel, trace silt	_
-												-0
-												
20-												_
	S5	3	3	4	6	24	6			Gray c-f SAND,	trace silt	_
_										City or or arts,	ardoo one	5
-												-
-												
25-	S6	3	2	4	2	24	3			Gray of SAND	trace f gravel, trace silt	_
_			_	7	_					Glay C-I SAND,	liace i gravei, liace siil	10
_												-
-												
30-	0.7	_	6	10	44	24	10					
	S7	5	6	10	11	24	10			Gray c-f SAND,	trace m-f gravel, trace silt	−-15
_												-
_		_			_							
			-	•							V = Vane Shear Test	
			tions	s Use	d: ¯			J%,	Little = 10 - 20	%, Some = 20	- 35%, And = 35 - 50%	
Total P	enetratio					ГОИ	ES:					eet of 2
Earth:	54ft	Rock:		t								'' '
No. of Soil Sa	mples: 1		of ore R	Runs: 3	3						SM-001-M	REV. 1/02
		. 00			-						OIVI-00 1-IVI	

Driller:	C	C. Dupis	s			Co	onne	cticu	ıt DOT Borir	ng Report	Hole No.: S1-3	
Inspec		. Ta	-		Т	own:		Hartfo	ord		Stat./Offset:	
Engine		I. Whe	tten			Project I			Project No. 63	3-703	Northing: 832583.96	
Start D		-23-16				Route N			B / Exit 86 Off		Easting: 1024294.25	
Finish		-24-16				Bridge N				'	Surface Elevation: 16.8	
Project	Descript	tion: R	eloc	ation				nange	e 29 & Widenir	ng		
Casing	Size/Typ	pe: 4-in	ı. Ca	sing	S	Sampler	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 3			30in		lamme	• •				,,,,,	
Ground	dwater O	bservati	ons:	@9	.0' AT	D						
			9	SAME	PLES				70			T =
h (ft)	ole /No.			vs on		(in.)	Rec. (in.)	%	Generalized Strata Description	Ma	terial Description and Notes	Elevation (ft)
Depth (ft)	Sample Type/No.			npler inche	es	Pen. (in.)	Rec.	RQD	Gene Strat Desc		and Notes	Eleva
35-									Alluvium			
35 -	S8	6	9	11	14	24	6		(con't)	Grav c-f SAND I	ittle m-f gravel, trace silt	-
-										City of Chird, i	ittle iii i giavei, tiaee oiit	20
_												-
- 40									Lacustrine			
40-	S9	woh/12	o" O	1	2	24	24			Brown SILTY CL	A.V.	
_	03	WOII/ 12	. 0	'	2					BIOWII SILIY CL	AT	25
-												-
-	-											
45-	S10	wor	1	1	2	24	24			D	A.V.	
	310	wor	- 1	'	2	24	24			Brown SILTY CL	AY	-30
_												-
-												-
50 —										Brown SILTY CL	AY	
_	S11	1	1	3	15	24	4		Glacial Till		SILT, little c-f sand, trace m-f	-35
										gravel		_
_									Weathered Rock	WEATHERED B		-
55-	C-1	-				12	12	0	Bedrock	fractured, very w	, highly weathered, highly eak	-
-												
-	C-2					48	48	26		fractured, mediur	, moderately weathered, highly m strrong	<u>40</u>
-										,	J	<u> </u>
60-												-
_	0.0						00	0.5			RKOSE, moderately weathered,	-
_	C-3					60	60	35		thinly banded, mo	oderately fractured, medium	45
_										Saony		
-												[
65-										END OF BORING	G 64ft	

Total Penetration in	NOTES:	Sheet
Earth: 54ft Rock: 10ft		2 of 2
Earth, 54tt Rock, 10tt		
No. of No. of		
Soil Samples: 11 Core Runs: 3		SM-001-M REV. 1/02

Driller:		G. Two	mbly	,		Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S1-4	
Inspect		Г. Та			Т	own:		Hartfo	ord		Stat./Offset:		
Engine	er: N	N. Whe	tten		F	Project	No.:	DOT	Project No. 63	3-703	Northing:	832555.23	
Start D	ate: 5	5-9-16			F	Route N	lo.:	15 SE	3		Easting:	1024357.32	
Finish [Date: 5	5-10-16	3		E	Bridge N	No.:				Surface Elev	ation: 22.1	
Project	Descrip	tion: F	Reloc	ation	of I-9	1 NB	Interc	hange	e 29 & Widenir	ng			
Casing	Size/Ty	pe: 4-iı	n. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel 7	Type: NX	
	er Wt.: 3			30in	. F	- Hamme	r Wt.:	140lb	Fall: 30in.				
Ground	lwater O	bserva	tions:	@1	9.0 a	after 2	4 hou	rs					
			(SAMI	PLES				- - -				F
£	o.		Б.			<u> </u>	<u> </u>		lize	Ma	iterial Descrip	ation) L
) H	ble N/e			vs on npler		<u>:</u>	i.	% (era ta crip	IVIC	and Notes	JUIOTT	atic
Depth (ft)	Sample Type/No.	р		inche	es	Pen. (in.)	Rec. (in.)	RQD	Generalized Strata Description				Elevation (ft)
0-	5					ш.	ш.						
									Asphalt	ASPHALT (12") GRAVEL BASE	(10")		
_	S1	25	25	21	24	24	13		Base Fill	Brown c-f SAND			-20
_									" "				-
				4.0	4=		4.0						-
5-	S2	9	11	10	15	24	12			Brown c-f SAND	, trace silt		
_													_ 15
_													- 10
_	2 14 12 11												-
10-	S3	14	12	11	11	24	13			Brown c-f SAND	, little silt		-
_													-
													_10
_													_
15-	S4	6	2	1	1	24	6		Alluvium	Brown f SAND a	nd SILT		-
-									7 414 114				-
_													-5
20-	S5	4	7	6	8	24	6			Brown c-f SAND	. little m-f grav	el. trace silt	_
_												·	-
_													-0
25-	S6	4	6	5	7	24	15			Gray c-f SAND, f	trace silt		
-		-	_	_	=					Ciay or onito,	ado dil		
_													5
-													
30-	S7	5	5	8	7	24	18			Croy of CAND	nomo faraccal		
	- 51		J	J	ı	_ 	10			Gray c-f SAND,	some i gravel		
_													10
_													-
-	<u> </u>	Sama	حا ما	mo:	S - S	Inlit Sn	100C	C = C	Core IID - II	disturbed Distan	\/ - \/opo 9	Shear Toot	
			-	•						ndisturbed Piston %, Some = 20 -			
Total P	enetratio	on in				NOT	ES:						Sheet
Earth:	55.5ft	Rock	: 10.5	5ft									1 of 2
No. of		N	o. of		<u> </u>								
Soli Sa	mples: 1	12 C	ore R	uns: .	<u>ی</u>							SM-00	1-M REV. 1/02

Driller:	G	. Two	mbly			Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S1-4	
Inspect		. Ta			-	Town:		Hartfo	ord		Stat./Offset:		
Engine	er: N	l. Whe	etten		ı	Project	No.:	DOT	Project No. 63	3-703	Northing:	832555.23	
Start D	ate: 5	-9-16				Route N	lo.:	15 SE	3		Easting:	1024357.32	
Finish I		-10-16				Bridge N					Surface Eleva	ation: 22.1	
Project	Descript	ion: F	Reloc	ation	of I-9	91 NB	Interc	hange	e 29 & Widenir	ng			
_	Size/Typ								1-3/4 inch ID		Core Barrel T	ype: NX	
	er Wt.: 3			30in		Hamme			Fall: 30in.				
Ground	dwater Ob	oserva					4 hou	rs					
				SAIVII	PLES				Generalized Strata Description				Elevation (ft)
Depth (ft)	Sample Type/No.			vs on		Pen. (in.)	(in.)	%	raliz I	Ma	iterial Descrip	otion	tion
l td	mb/be/		San er 6	npler		J.	Rec. (RQD	ene rata		and Notes		eva
۵	SS <u></u>		JCI U	IIICIIC	53	A A	X	쮼	20 20 20				
35-	S8	7	6	6	9	24	6		Alluvium (con't)	Gray c-f SAND,	some m-f grave	el	
_		1											15
_									Lacustrine				─-15 -
_													-
40-	S9	wor	woh	woh	woh	24	21			Brown SILTY CL	AY, trace f sar	nd	-
_													20
_													-
45-	S10		3	3	2	24	24			5 011 77/01	A.V.		-
45 -	310	wor	3	3	3	24	24			Brown SILTY CL	AY		
_													25
_													-
50-	S11	6	6	7	7	24	0			No Recovery			
_												from 541 to 501	-
_										Pushed second s Brown SILTY CL	AY (Recovery	= 16")	30
_									Glacial Till				
55-	S12	38	61	55	120/3'	" 21	8			Brown c-f SAND trace weathered		vel, some silt,	-
-	C-1					12	8	0	Weathered Rock	WEATHERED B	EDROCK	ad modium	- -
									Bedrock	Brown ARKOSE strong, loss of wa	, riigiliy iracture ater	ea, mealam	—-35 _
_	C-2					48	48	0		Brown ARKOSE	, highly fracture	ed, medium	
60-										strong, loss of wa	atei		-
		1											- 40
_	0.0							4.5		Brown ARKOSE	highly fracture	ed. medium	-40
_	C-3					60	58	15		strong, loss of wa		,•	-
65—													
_										END OF BORIN	G 66ft		 45
_			. –									· - ·	
			•	•						ndisturbed Piston %, Some = 20 -			
Total P	enetratio	n in				NOT	ES:						eet
Earth:	55.5ft	Rock		5ft								2 0	of 2
No. of Soil Sa	mples: 1		o. of ore R	uns: :	3							SM-001-M	REV. 1/02
	рісо. і		J. J I (J. 10. 1								O.WI-00 1-WI	

Driller:	F	. Labo	ssier	r		Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S1-5	
Inspect	or: T	. Ta			Т	own:		Hartfo	ord		Stat./Offset:		
Engine	er: N	I. Whe	tten		F	roject	No.:	DOT	Project No. 63	3-703	Northing:	832785.82	
Start D	ate: 5	-9-16			F	Route N	lo.:	15 SE	B / Exit 86 Off	Ramp	Easting:	1024369.56	
Finish I	Date: 5	-10-16	6		E	Bridge N	No.:				Surface Elev	ation: 21.8	
Project	Descrip	tion: F	Reloc	ation	of I-9	1 NB I	Interc	hange	29 & Widenir	ng			
Casing	Size/Ty	pe: 4-ir	n. Ca	sing	5	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Γγρε: NX	
	er Wt.: 3			30in		- lamme	• •						
Ground	lwater O	bservat	tions:	@1	8.5 a	after 2	4 hou	rs					
					PLES				70				t)
, Depth (ft)	Sample Type/No.	р		vs on npler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Descri _l and Notes		Elevation (ft)
0-									Asphalt	ASPHALT (12")			7
_	S1	52	43	35	38	24	14		Fill	Brown c-f SAND	, some silt, littl	e m-f gravel	-20
_		-											L
5 		-											-
_	S2	28	28	28	37	24	18			Brown c-f SAND	, little m-f grav	el, little silt	45
_		1											15
- 10- - - -	S3	25	26	20	16	24	12			Brown to red c-f	SAND, little m	-f gravel, little silt	- - - -10
15 <i>-</i>	S4	5	4	8	5	24	12		Alluvium	Brown to red c-f	SAND, some ı	m-f gravel, some	
-			·	Ū						silt			_5 _
20 <i>-</i> -													_
	S5	1	2	4	4	24	18			Brown to gray f S	SAND, some s	ilt	-
_		1											-0
_													-
25—	_	-											-
_	S6	5	5	8	9	24	14			Gray f SAND and	d SILT		_ 5
_													-
_													_
30 —	S7	2	3	4	7	24	22		Alluvium	Gray c-f SAND. I	little silt, 12" re	covery of wood in	
_	31		3	4	1	24	22			spoon	,	. ,	10
_													<u> </u>
-													

Gray c SAND, trace silt

16

11 11 14 21

S8

Total Penetration in	NOTES:	Sheet
Earth: 57.5ft Rock: 9ft		1 of 2
No. of No. of		
Soil Samples: 12 Core Runs: 2		SM-001-M REV. 1

Driller:	P	. Labossier	Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S1-5	
Inspect	or: T	. Ta	Town:		Hartfe	ord	Stat./Offset:		
Engine	er: N	. Whetten	Project	No.:	DOT	Project No. 6	3-703	Northing: 832785.82	
Start D	ate: 5	-9-16	Route N	10.:	Easting: 1024369.56				
Finish I	Date: 5	-10-16	Bridge I	No.:				Surface Elevation: 21.8	
Project	Descript	ion: Relocation of I	I-91 NB	Interc	hange	29 & Wideni	ng		
Casing	Size/Typ	e: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 30	00lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	lwater Ob	oservations: @18.5	after 2	4 hou	rs		1		
		SAMPLE	S			9 _			£
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	M	aterial Description and Notes	Elevation (ft)
-						Alluvium			
40-	S9	7 9 11 10	24	8		(con't)	Brown c SAND,	trace silt	_ 20
_						Lacustrine	_		-
45—	S10	wor woh woh 3	24	24		Lacastinic	Daniel Oll TV O	I AV 1:441 - f	
_	310	. Wor worr worr 3	24	24			Brown SILTY C	LAY, little f sand	25
-									
50 —		•							
_	S11	wor wor wor wo	r 24	24			Brown SILTY C	LAY	-
_									
_									-
55—	0.40							LAY, trace f gravel	
_	S12	wor 12 4 39	24	24		Glacial Till	Brown SILT, so	me f sand, trace f gravel	35
_						Weathered	WEATHERED	BEDROCK	
60-						Rock			
60 —						Bedrock			-
_	C-1		48	48	8		Brown ARKOSI strong, loss of v	E, highly fractured, medium	-40
_							oog, 1000 o		
65-									
_	C-2		60	50	0		Brown ARKOSI strong, loss of v	E, highly fractured, medium	- 45
_							Strong, loss or v	valei	-
-									
70 —							END OF BORIN	NG 69ft	
_									50
_									
75 <i>-</i> -									_
_									
_									—-55 —
								n V = Vane Shear Test - 35%, And = 35 - 50%	
Total P	enetratio	n in	NOT	ΓES:					eet
Earth:	57.5ft	Rock: 9ft						2 0	of 2
No. of	mplas: 4	No. of						014 004 14	IDEV 4/00
SOII SA	mples: 1	2 Core Runs: 2						SM-001-M	REV. 1/02

Driller:		P. Lab	ossie	r		Co	onne	Hole No.: S1-6					
Inspec	tor:	N. Wh	etten		٦	Γown:		Hartfo	ord	Stat./Offset:			
Engine	er:	N. Whe	etten		F	Project	No.:	DOT	Project No. 63	3-703	Northing: 832748.47		
Start D	6		F	Route N	lo.:	15 N	3		Easting: 1024451.53				
Finish	Date:	6-16-1	6		E	3ridge N	No.:				Surface Elevation: 25.6		
Project	Descri	ption: I	Reloc	ation	of I-9	91 NB I	Interc	hange	29 & Widenir	ng			
Casing	Size/T	ype: 4-i	n. Ca	sing	5	Sample	r Type	/Size:	1-3/8 inch ID		Core Barrel Type: NX		
Hamm	er Wt.:	300lb	Fall:	30in	. H	Hamme	r Wt.:	140lb	Fall: 30in.				
Ground	dwater (Observa	itions:										
				SAME	PLES				ס _			£	
Depth (ft)	Sampler per 6 inches				Rec. (in.)	RQD %	Generalized Strata Description	Ма	Elevation (ft)				
0-									Asphalt	12" Asphalt			
	S-1	35	40	48	50	24	14		Fill	Brown c-f SAND and c-f GRAVEL, trace silt			
_		_	.0	.0						DIOWITC-I SAIND	and c-i GIVAVEE, trace siit	-	
_	-												
5-								_ 20					
-	S-2	27	34	41	40	24	18			Brown c-f SAND	, trace silt	-	
10 — 	S-3	11	12	14	14	24	8			Red brown c-f S	prown c-f SAND, some c-f gravel, trace silt		
15—	S-4	1	1	1	1	24	22		Alluvium	Brown to gray f S	SAND, some silt	_ _ 10	
20-	S-5	9	13	12	11	24	12			Gray c-f SAND,	trace silt	- - - -5 -	
25 — - - -	S-6	7	8	11	8	24	12			Gray c-f SAND,	trace silt	- - - 0 - -	
30-		-										Γ,	

Gray f SAND, trace silt

Total Penetration in	NOTES:	Sheet
Earth: 62ft Rock: 10ft		1 of 3
No. of No. of		
Soil Samples: 13 Core Runs: 2		SM-001-M REV. 1/02

Driller:	F	P. Labossier	Co	onne	cticu	t DOT Borir	ng Report Hole No.: \$1-6		
Inspec		I. Whetten	Town:		Hartfo	ord	Stat./Offset:		
Engine		I. Whetten	Project	No.:	DOT	Project No. 63	8-703 Northing: 832748.47		
Start D	ate: 6	5-15-16	Route N	lo.:	15 NE	3	Easting: 1024451.53		
Finish	Date: 6	5-16-16	Bridge N	No.:			Surface Elevation: 25.6		
Project	t Descrip	tion: Relocation of I	-91 NB I	Interc	hange	29 & Widenir	ng		
Casing	Size/Ty	pe: 4-in. Casing	Sample	r Type	/Size:	1-3/8 inch ID	Core Barrel Type: NX		
Hamm	er Wt.: 3	00lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	dwater O	bservations:							
		SAMPLE	S			- O		ı.	
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.) Rec. (in.)			Generalized Strata Description	Material Description and Notes	Elevation (ft)	
35-	- S-8	10 17 20 20	24	12	Alluvium (con't) Gray c-f SAND, some c-f gravel, trace silt				
40-	S-9	9 8 3 6	24				Gray c-f SAND, some c-f gravel, trace silt Red brown SILTY CLAY, varved	_ _ 15 _	
45 — - - -	S-10	wor woh 3 1	24	24 24 Red brown SILTY CLAY, varved	Red brown SILTY CLAY, varved	_ 20 			
50 —	S-11	woh woh woh woh	า 24	24		Glacial Till	Red brown SILTY CLAY, varved	_ 25 	
55— - -	S-12	14 14 8 5	24	12		2.33.37 1	Red brown c-f SAND and c-f GRAVEL, some silt	_ 30 	
60-	S-13	22 33 100/5"	17	10		Bedrock	Red brown c-f SAND and SILT, little c-f gravel	- - 35 -	
65-	C-1		60	52	55		Brown ARKOSE, highly fractured, medium strong	_	

Total Penetration in	NOTES:	Sheet
Earth: 62ft Rock: 10ft		2 of 3
No. of No. of		
Soil Samples: 13 Core Runs: 2		SM-001-M REV. 1/02

Driller:	Р	. Labossier	Co	onne	Hole No.: S1-6				
Inspect		. Whetten	Town:		Stat./Offset:				
Engine	er: N	. Whetten	Project	No.:	18.47				
Start D	ate: 6-	-15-16	Route N	lo.:	451.53				
Finish [Date: 6-	-16-16	Bridge 1	No.:				Surface Elevation: 2	5.6
Project	Descript	ion: Relocation of I	-91 NB	Interc	hange	29 & Widenir	ng		
Casing	Size/Typ	e: 4-in. Casing	Sample	r Type	/Size:	1-3/8 inch ID		Core Barrel Type: N	X
Hamme	er Wt.: 30	00lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.			
Ground									
		SAMPLE	S						⊊
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.) Rec. (in.) Rec. (in.) Strata Description Description Description			terial Description and Notes	Elevation (ft)	
70-	C-2		60	58	68	Bedrock (con't)	Brown ARKOSE strong	highly fractured, med	lium _ 45
75—							END OF BORING	G 72ft	_ _ _ 50
_ _ _									
80—									- 55 -
85—									_ _ _ 60
									- - -
90-									_ 65 -
-									-
95— — —									70
100—									_ _ 75
Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%									
Total P	enetratio	n in	NOT	TES:					Sheet 3 of 3
Earth:	62ft	Rock: 10ft							3 01 3
No. of Soil Sa	mples: 1	No. of 3 Core Runs: 2							SM-001-M REV. 1/02

Driller:	ssier	r		Co	onne	cticu	ıt DOT Boriı	Hole No.: S1-7										
Inspecto				Town:		Hartfe	ord	Stat./Offset:										
Engine	er: N	. Whe	tten			Project	No.:	DOT	Project No. 63	3-703	Northing: 832976.78							
Start Da	ate: 5	-4-16				Route N	lo.:	15 SE	Easting: 1024480.59									
Finish D	Date: 5	-4-16				Bridge N	ridge No.: Surface Elevation: 27.5											
Project	Descript	ion: R	eloc	ation	of I-	91 NB I	11 NB Interchange 29 & Widening											
Casing	Size/Typ	e: 4-in	ı. Ca	sing		Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX							
	er Wt.: 3			30in			mmer Wt.: 140lb Fall: 30in.											
Ground	water Ob	oservati					4 hou	rs		I								
	SAMPLES											(#)						
(#)	е Э		Blow	vs on		n.)	(in.)	%	aliz	Ma	terial Description	Elevation (ft)						
Depth (ft)	mpl Ne√		San	npler		Pen. (in.)	.; .;	0	ner ata scri		and Notes	vat						
De	Sample Type/No.	р	er 6	inche	:S	Pel	Rec.	RQD	Generalized Strata Description			H E						
0									Asphalt	ASPHALT (12")								
+									Base	GRAVEL BASE								
	S1	61	71	60	81	24	18		Fill	Brown c-f SAND	, some c-f gravel, little silt	-25						
												-						
5—												-						
-	S2	4	4	10	75	24	12			Brown to red c-f	SAND, some silt, little c-f grave							
+												-20						
										Asphalt observed	d in wash cuttings	-						
10-												-						
"-	S3	33	55	49	46	24	16			Brown c-f SAND	, some c-f gravel, little silt	-						
+											, ,	_ 15						
-									Alluvium			10						
15												-						
	S4	6	3	4	5	24	12			Gray SILT, little f	f sand	-						
+																		- -10
-												10						
20												-						
20	S5	2	2	3	4	24	22			Gray SILT, some	f sand	-						
+										0.0, 0.1, 00		- -5						
-																		
25												-						
25	S6	1/12"		1	6	24	24			Gray to brown SI		-						
				•	J					Gray to brown f S	SAND, some silt							
-												-0						
												-						
30	S7	6	8	13	18	24	12			Gravif SAND 400	ace silt, faint organic smell	-						
1 4			Ü	10	10		12			Gray I SAND, IIa	ice siit, fairit organic smeii	<u> </u>						
-												 -5						
-		Sam=!	o T.	no:	c - '	Chlit C-		C = 0	Coro IID - II	dicturbed Dictor	V = Vana Chaar Taat							
			-	•							V = Vane Shear Test - 35%, And = 35 - 50%							
Total D			uons	088	u. I	NOT		J /0,		noot.								
	Total Penetration in											neet of 3						
Earth: 6	obit	Rock:	10ft o. of	•														
	mples: 1			uns: 2	2						SM-001-N	1 REV. 1/02						

Driller:	P	. Labo	ossier	•		Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.:	S1-7	
Inspect		. Ta			Т	own:		Hartfo	ord		Stat./Offset:		
Engine	er: N	I. Whe	etten		F	roject	No.:	DOT	Project No. 63	3-703	Northing:	832976.78	
Start D	ate: 5	-4-16			F	Route N	lo.:	15 SE	3		Easting:	1024480.59	
Finish [Date: 5	-4-16			E	Bridge N	No.:				Surface Elev	ation: 27.5	
Project	Descript	ion: F	Reloc	ation	of I-9	1 NB I	Interc	hange	e 29 & Widenii	ng			
Casing	Size/Typ	oe: 4-ir	n. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Type: NX	
Hamme	er Wt.: 3	00lb	Fall:	30in.	. H	łamme	r Wt.:	140lb	Fall: 30in.				
Ground	dwater Ol	oservat	tions:	@1	5.0 a	after 24	4 hou	rs					
			5	SAMF	PLES				ا ۾ ح				E E
Depth (ft)	Sample Type/No.	р		s on opler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Descri and Notes	ption	Elevation (ft)
_									Alluvium				
35— — —	S8	5	6	5	7	24	14		(con't)	Gray f SAND, tra	ace silt		_ _ 10
_													
40 —													
	S9	8	13	20	20	24	10			Gray c-f SAND,	trace silt		-
_	_												15
_	-												
45—		-											
_	S10	11	20	22	23	24	12			Gray c-f SAND,	trace silt		-
		1											20
_													-
50 —		-							Lacustrine				
_	S11		1/18"	1	3	24	24		Lacacamic				
_										Brown SILTY CL	.AY		25
_													-
55—													
_	S12	woh	woh	woh	4	24	24			Brown SILTY CL	.AY		
_													30
													-
60-													-
_	S13	wor	2	4	4	24	24			Brown SILTY CL	.AY		
_		1											—-35
									Glacial Till	Higher casing bl	ows		F
65 <i>-</i>	6 .									Brown c-f SAND		val some silt	-
-	S14	9	100/5	••		11	8		Weathered		_	voi, soilie siit	
_									Rock	WEATHERED B	SEDROCK		-40
			•	•						ndisturbed Piston %, Some = 20			
Total P	enetratio	n in				NOT	ES:						Sheet
Earth:	66ft	Rock	: 10ft									2	of 3
No. of		No	o. of		`	\neg							
SOII Sa	ımples: 1	4 C	ore R	uns: 2								SM-001	-M REV. 1/02

Driller:	F	P. Labossier	Co	onne	cticu	t DOT Borir	ng Report	Hole No.: S1-7	
Inspect		. Та	Town:		Hartfo	ord		Stat./Offset:	
Engine	er: N	I. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 8329	76.78
Start Da	ate: 5	5-4-16	Route N	lo.:	15 SE	3		Easting: 1024	480.59
Finish [Date: 5	i-4-16	Bridge I	No.:				Surface Elevation: 2	27.5
Project	Descrip	tion: Relocation of I	-91 NB	Interc	hange	29 & Widenir	ng		
Casing	Size/Ty	pe: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: N	1X
Hamme	er Wt.: 3	00lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	lwater O	bservations: @15.0	after 2	4 hou	rs				
		SAMPLE	S			ρ _			E
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Description and Notes	Elevation (ft)
_						Weathered			_
70-		_				Rock (con't) Bedrock			_
	C-1		60	60	10		Brown ARKOSE strong	, highly fractured, me	dium45
75-									_
_	C-2		60	60	10		Brown ARKOSE strong	, highly fractured, me	dium
80-							END OF BORIN	G 80ff	
_							LIND OF BOILIN	Goon	— —-55 —
85 —									_
_									_ 60
90-									_
									-
									-65
-									
95—									
									-
									-70
-									
100-									[
					L				
		Sample Type: S = Proportions Used:							
Total P	enetratio		NOT						Sheet
Earth: (66ft	Rock: 10ft							3 of 3
No. of	mples: 1	No. of							SM-001-M REV. 1/02

Driller:	G	. Two	mbly	,		Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S1-8	
Inspect	or: T	. Ta				Town:		Hartfe	ord		Stat./Offset:	
Engine	er: N	l. Whe	tten			Project	No.:	DOT	Project No. 63	3-703	Northing: 832954.99	
Start Da		-15-16				Route N	lo.:	15 NI	В		Easting: 1024525.91	
Finish [-16-16				Bridge I					Surface Elevation: 26.6	
Project	Descript	ion: F	Reloc	ation	of I-	91 NB	Interc	hange	e 29 & Wideni	ng		
Casing	Size/Typ	e: 4-iı							1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 3			30in		Hamme			Fall: 30in.			
Ground	water Ob	oserva					4 hou	rs		1		
			•	SAMF	LES	5			ed =			(ff
(#)	ө Э		Blov	vs on		n.	n.)	%	aliz ptic	M	laterial Description	Elevation (ft)
Depth (ft)	mpl oe/N		San	npler		Pen. (in.)	Rec. (in.)	0,	ner ata scri		and Notes	vat
De	Sample Type/No.	p	er 6	inche	es	Pel	Re	RQD	Generalized Strata Description			Ele
0-									Asphalt	ASPHALT (14"	\	
+		_							Base	GRAVEL BASE	•	
	S1	41	68	55	90	24	3		Fill		D, some silt, little c-f gravel	-
											•	-
5-	S2	52	51	45	38	24	12			Brown c-f SANI	D, some silt, little m-f gravel	-
-										2.0001.07.07.07	s, come out, itale in i graver	-
-												_20
-												
10-	S3	21	17	21	17	24	21			D. OLAVE	/ OU T	_
10 7			17	21	17	24	21			Brown CLAYEY	SILT, some f sand	
_												- 15
_												
+												
15—	S4	10	9	10	16	24	15			Gray f SAND a	nd SILT	_
												-10
_												
-		-										
20 —	S5	3	4	4	3	24	18		Alluvium	Gray f SAND a	nd SILT	
												-5
												-
_		-										
25 —	S6	1	1	2	1	24	23			Olive f SAND a	nd SILT	
+		-										_0
7												F .
										_		-
30-	S7	11	9	10	8	24	12		Alluvium	Brown c SAND	. trace silt	_
+				-	•					2.5 5 67 (14)	,	_
_												<u> </u>
+												
		Samn	le Tv	ne.	S =	Split Sr	oon	C = C	Core UP = Ui	ndisturbed Pisto	n V = Vane Shear Test	
			-								- 35%, And = 35 - 50%	
Total P	enetratio						TES:	• ,				neet
Earth:		Rock	. 1∩f4			1401	_0.					of 3
Earui. No. of	1111		. 1011 0. of			\dashv						
	mples: 1			uns: 2	2						SM-001-N	/I REV. 1/02

Inspector T. Ta	Driller:	G	3. Two	mbly			Co	nne	cticu	ıt DOT Bori	ng Report	Hole No.:	S1-8	
Start Date: 5-15-16						Т	Γown:		Hartfe	ord		Stat./Offset:		
Finish Date: 5-16-16 Bridge No.: Surface Elevation: 28.6	Engine	er: N	I. Whe	tten		F	Project l	No.:	DOT	Project No. 63	3-703	Northing:	832954.99	
Project Description: Relocation of I-91 NB Interchange 29 & Widening	Start Da	ate: 5	-15-16)		F	Route N	lo.:	15 NI	В		Easting:	1024525.91	
Casing Size/Type: 4-in. Casing Sampler Type/Size: 1-3/4 inch ID Core Barrel Type: NX	Finish [Date: 5	-16-16)		E	Bridge N	۱o.:				Surface Eleva	ation: 26.6	
Hammer Wt.: 300lb Falt: 30in. Hammer Wt.: 140lb Falt: 30in. Groundwater Observations: @18.2 after 24 hours	Project	Descript	tion: F	Reloc	ation	of I-9)1 NB I	nterc	hange	e 29 & Widenii	ng			
SAMPLES	Casing	Size/Ty	pe: 4-ir				Sample	г Туре	/Size:	1-3/4 inch ID		Core Barrel T	ype: NX	
SAMPLES SAMPLES Sampler Samp										Fall: 30in.				
Sample S	Ground	water O	bservat					4 hou	rs	1	Г			
S8					SAMI	PLES	1			- 0 -				(#)
Second S	Depth (ft)	Sample Type/No.	р	San	npler		Pen. (in.)	Rec. (in.)	RQD %	Generalize Strata Descriptio	Ма		tion	Elevation
45	35 — _	S8	16	15	12	11	24	11			Gray c-f SAND, t	trace f gravel, t	race silt	_ _ _ 10
Description Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50% Sheet 2 of 3	40-	S9	12	14	12	13	24	13			Gray c-f SAND, t	trace f gravel, t	race silt	- - -
Since Sinc	45— - -	S10	24	11	12	15	24	3			Gray c SAND, lit	tle m-f gravel, t	race silt	
Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50% Sheet 2 of 3	50 — -	S11	1	1	1	1	24	24		Lacustrine	Brown SILTY CL sand within the c	AY, 4" seam or enter portion o	f orange coarse f the spoon	_ _ _ 25
Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50% Sheet 2 of 3	55— - -	S12	wor	wor	woh	woh	24	22			Brown SILTY CL	AY		- - - 30
Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50% NOTES: Sheet 2 of 3	60-	S13	wor	wor	wor	wor	24	24			Brown SILTY CL	AY		_ _ _ _ 35
Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50% Total Penetration in NOTES: Sheet 2 of 3	65 —	S14	18	16	14	35	24	6		Glacial Till	Brown c-f SAND	, some silt, little	e m-f gravel	- - - 40
2 of 3			Propo	•	•		race =	1 - 10					= 35 - 50%	<u></u>
Earth: 71ft Rock: 10ft	Total P	enetratio	n in				TON	ES:						
		71ft					_						20	1 3
No. of No. of Soil Samples: 15 Core Runs: 2 SM-001-M REV. 1/0	No. of Soil Sa	mnlee. 1			ııne. '	2							SM-001-M	RE\/ 1/02

Driller:	G	3. Twoml	bly		Co	onne	cticu	t DOT Borii	ng Report	Hole No.:	S1-8	
Inspect		. Ta		Т	own:		Hartfo	ord		Stat./Offset:		
Engine	er: N	I. Whette	en	F	Project I	No.:	DOT	Project No. 63	3-703	Northing:	832954.99	
Start Da	ate: 5	-15-16		F	Route N	lo.:	15 NE	3		Easting:	1024525.91	
Finish D	Date: 5	-16-16		В	Bridge N	No.:				Surface Elev	ation: 26.6	
Project	Descript	tion: Re	location	of I-9	1 NB I	nterc	hange	29 & Widenir	ng			
Casing	Size/Typ	oe: 4-in.	Casing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Гуре: NX	
Hamme	er Wt.: 3	00lb F	all: 30ir	ո. ⊢	łamme	r Wt.:	140lb	Fall: 30in.				
Ground	lwater Ol	bservatio	ns: @	18.2 a	after 24	4 hou	rs					
_			SAM	PLES		ı		. .				E E
Depth (ft)	Sample Type/No.	S	lows or Sampler 6 inch	-	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	iterial Descri and Notes	ption	Elevation (ft)
70-	S15	21 2	23 25	21	24	11		Glacial Till (con't)	Brown c-f SAND	, some m-f gra	avel, some silt	-
+		1						Bedrock				-45
- - 75-	C-1				60	30	12		Brown ARKOSE fractured, mediu		veathered, highly	-
_		_							ADKOOF made		and bimbb.	- 50
- 80 —	C-2				60	28	7		ARKOSE, mode fractured, mediu		ea, nigniy	
_									END OF BORIN	G 81ft		
85— - -												- - 60
90-												_ _ _ _
95—												_ _ _ _
100-												- - - - 75
		Proportio			race =	1 - 10			ndisturbed Piston %, Some = 20 -		= 35 - 50%	_ -
Earth:	enetratio	Rock: 1			NOT	ES:						eet of 3
No. of Soil Sai	mples: 1	No. 5 Core	e Runs:	2							SM-001-M	REV. 1/02

Driller:	P	. Labo	ssier	•		Co	onne	cticu	t DOT Bori	ng Report	Hole No.:	S1-9	
Inspect		l. Whe			Т	own:		Hartfo	ord	<u> </u>	Stat./Offset:		
Engine		l. Whe	tten		F	Project	No.:	DOT	Project No. 63	3-703	Northing:	833132.71	
Start Da		-16-16				Route N		15 SE			Easting:	1024536.09	
Finish [Date: 6	-16-16	;		Е	Bridge N	No.:				Surface Elev	ation: 38.7	
Project	Descript	ion: R	Reloc	ation				hange	29 & Wideni	ng			
Casing	Size/Typ	e: 4-ir	n. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Гуре: NX	
	er Wt.: 3			30in									
Ground	water Ob	oservat	ions:	@2	0.0' A	TD							
			5	SAMF	PLES				70				(t)
Depth (ft)	Sample Type/No.		Sam	s on opler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	iterial Descrip and Notes		Elevation (ft)
0-									Asphalt	ASPHALT (12")			
	S1	36	57	55	50	24	12		Fill	Brown c-f SAND	, little m-f grav	el, little silt	
5 - -	S2	100/4'	"			4	4			Brown c-f SAND	, some m-f gra	avel, some silt	-35 - - - -
10-	S3	79 ⁻	100/2'	"		8	0			No Recovery. W little gravel, little	ash consists o silt	of brown c-f SAND,	-30 - - -
										Encountered voi	d from 13' to 1	4'	-25
15— — —	S4	31	43	43	39	24	16			Brown c-f SAND	, little m-f grav	el, little silt	- - -
20-	S5	23	18	14	14	24	14			Brown SILT, son	ne f sand		-20 - - -
25— —	S6	wor	wor	1	1	24	20		Alluvium	Brown to gray f S	SAND and SIL	Т	15
30-	S7	6	5	4	7	24	10			Brown to gray f S	SAND, some s	ilt	10
Total Po		Propor	•	•		race =	1 - 10)%, I	Little = 10 - 20	ndisturbed Piston %, Some = 20 -	- 35%, And		5 et
Earth: 7		Rock:	10ft				ruction		J. 5. 5. 100til, 1		10 01001	1 of	
No. of Soil Sai	mples: 1		o. of ore Ri	uns: 2	2							SM-001-M F	REV. 1/02

Inspector: N. Whetten Town: Hartford	d roject No. 63-703	Hole No.: S1-9 Stat./Offset:	
Engineer: N. Whetten Project No.: DOT Project No.: 15 SB	roject No. 63-703		
Start Date: 6-16-16 Route No.: 15 SB	. 0,000 . 10. 00 . 00	Northing: 833132.71	
		Easting: 1024536.09	
Tillish bate. 0-10-10 bhage No		Surface Elevation: 38.7	
Project Description: Relocation of I-91 NB Interchange 2	20 & Widening	Guilace Lievation. 66.7	
Casing Size/Type: 4-in. Casing Sampler Type/Size: 1-		Core Barrel Type: NX	
Hammer Wt.: 300lb Fall: 30in. Hammer Wt.: 140lb	Fall: 30in.		
Groundwater Observations: @20.0' ATD	1		
SAMPLES	р, _С		Œ
(±) ω Θ Blows on C C C S	otio	Material Description) uc
	Generalized Strata Description	and Notes	Elevation (ft)
Sampler Sample	Sen Stra Ses		<u> e</u>
	0000		Ш
	Alluvium		_
- S8 6 8 11 17 24 12	<i>(con't)</i> Gray f SAND,	little eilt	_
	Glay I SAND,	iittie siit	_
		-	_
_		-	-0
40		-	_
- S9 9 12 16 16 24 12	Gray c SAND	, little m-f gravel, trace silt	_
+			_
-			- 5
45			
45			_
S10 5 9 16 20 24 10	Gray c-f SAN	J, trace silt	_
			_
			10
50		-	_
- S11 11 15 14 17 24 10	Gray c-f SANI	D, trace silt	_
		<u> </u>	_
- -	_acustrine		_ 15
-			15 -
55			_
- S12 wor wor wor 24 24	Brown SILTY	CLAY	_
		_	_
		_	20
60		-	_
- S13 wor wor wor 4 24 24	Brown SILTY	CLAY	_
			_
-			-
		ļ	−-25
65			_
- S14 wor wor wor 24 24	Brown SILTY	CLAY	_
			_
Sample Type: S = Split Spoon C = Co	re IIP = Undisturbed Piet	on V = Vane Shear Tost	
Proportions Used: Trace = 1 - 10%, Litt			
· · · · · · · · · · · · · · · · · · ·			
Total Penetration in NOTES: Broke roll obstruction	ller bit tooth, moved boring 4'	south to clear Sheet 2 of 3	

Total Penetration in	NOTES: Broke roller bit tooth, moved boring 4' south to clear	Sneet
Earth: 75ft Rock: 10ft	obstruction	2 of 3
No. of No. of		
Soil Samples: 15 Core Runs: 2		SM-001-M REV. 1/02

Driller:	F	P. Labossier	С	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S1-9	 	
Inspecto		N. Whetten	Town:		Hartfe			Stat./Offset:		
Engine		N. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 8331	32.71	
Start Da	ate: 6	6-16-16	Route N	No.:	15 SE	3		Easting: 1024	536.09	
Finish D	Date: 6	6-16-16	Bridge I	No.:				Surface Elevation:	38.7	
Project	Descrip	tion: Relocation of	I-91 NB	Interc	hange	29 & Widenii	ng			
Casing	Size/Ty	pe: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: N	٧X	
_	er Wt.: 3	·	Hamme	•				,		
Ground	water O	bservations: @20.0	ATD							
		SAMPLE	S			ی ج				_€
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	terial Description and Notes		Elevation (ft)
ă	Š ←	per o moneo	A A	ď	Ĭ.	0 to 0				
						Glacial Till				30
70						Sidolal Till				-
	S15	40 46 30 63	3 24	14			Brown c-f SAND	and SILT, some c-f (gravel	_
-						Weathered	_			- 35
75						Rock				33
75						Bedrock				-
-	C-1		60	26			ARKOSE, fine, the	ninly bedded, modera	ately	
-	C-1		60	36	0			y fractured, medium xtremely weathered		- 40
								,		40
80										
							ARKOSE, fine, the	ninly bedded, modera	ately	-
-	C-2		60	60	17		fractured to highl bedding angle	y fractured, medium	strong, 15°	├ <u>.</u>
-							beduing angle			−-45
85		_								
							END OF BORIN	G 85ft		-
										-
-										-50
90-										
										-
										-55
95—										
										<u> </u>
										60
100-										-
-										[
		Sample Type: S = Proportions Used:] -
Total D									_)t
Total Pe				TES: I truction		oner bit tooth, r	moved boring 4' sou	uu to ciear	Shee 3 of	
Earth: 7	TIC v	Rock: 10ft No. of								
Soil Sar	mples: 1								SM-001-M R	EV. 1/02

Driller:	Р	. Labo	ssier	•		Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S1-10	
Inspect		. Ta			Т	own:		Hartfe	ord		Stat./Offset:	
Engine		. Whe	tten		Р	roject	No.:	DOT	Project No. 63	3-703	Northing: 833111.71	
Start D	ate: 5-	-15-16	6		R	Route N	lo.:	15 NI	3		Easting: 1024585.74	
Finish I	Date: 5-	-16-16	6		В	Bridge N	No.:				Surface Elevation: 37.5	
Project	Descript	ion: F	Reloc	ation	of I-9	1 NB I	ntercl	hange	e 29 & Widenir	ng		
Casing	Size/Typ	e: 4-ir	ո. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 30	00lb	Fall:	30in	. Н	lamme	r Wt.:	140lb	Fall: 30in.			
Ground	dwater Ob	servat	ions:	@1	7.5 a	after 24	4 houi	rs				
				SAME	PLES				, p _			£
Depth (ft)	Sample Type/No.	g		s on		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Description and Notes	Elevation (ft)
	ω _⊢					Δ.	<u>~</u>	2	000			Ш
0-									Asphalt	ASPHALT (12")		_
_	S1	76	100	107	58	24	16		Base	GRAVEL BASE	little of everyal little cit	-
-			.00						Fill	Brown C-I SAND	, little c-f gravel, little silt	-35 -
5-	S2	60	100			12	10			Brown c-f SAND	, some silt, little m-f gravel	_
-												-30
10-	-											
	- S3	37	44	45	55	24	18			Brown c-f SAND	, some silt, little m-f gravel	-
_										Obstruction at 13	3', possible former road	-25 -
15-	S4	15	12	12	8	24	12			Brown to gray c-	f SAND, some silt, little c-f	_
_												-20 -
20-												_
_	S5	24	11	9	11	24	0			Brown c-f SAND	, some silt, little c-f gravel	_ 15
-												
25-	S6	woh	1	1	1	24	18		Alluvium	Gray f SAND and	d SILT	
_										-		-10
_												
30-	S7	1	2	1	1	24	24			Drown to are: f	CAND and SILT	-
_	31	'	۷	1	1	24	<u> </u>			Brown to gray f S	SAND AND SILI	- 5
-	-											'

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES:	Sheet 1 of 3
Earth: 75.3ft Rock: 14.7ft		1 01 3
No. of No. of		
Soil Samples: 16 Core Runs: 2		SM-001-M REV. 1/02

Driller:	P	. Labo	ssier	•		Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S1-10	
Inspect	tor: T	. Ta			Т	own:		Hartfo	ord		Stat./Offset:		
Engine	er: N	. Whe	tten		F	roject l	No.:	DOT	Project No. 63	3-703	Northing:	833111.71	
Start D	ate: 5	-15-16			F	Route N	lo.:	15 N	3		Easting:	1024585.74	
Finish [Date: 5	-16-16			Е	Bridge N	No.:				Surface Elev	vation: 37.5	
Project	Descript	ion: R	eloc	ation	of I-9	1 NB I	nterc	hange	e 29 & Widenir	ng	•		
Casing	Size/Typ	e: 4-ir	ı. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Type: NX	
	er Wt.: 3			30in.		lamme	• •					71	
Ground	lwater Ob	servat	ions:	@17	7.5 a	after 24	4 hou	rs			-		
				SAMF					70				t)
Depth (ft)	Sample Type/No.		San	s on opler inche	S	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Descri and Notes	ption	Elevation (ft)
_									Alluvium				_
35— - - -	- S8	16	15	14	17	24	12			Brown c SAND,	little m-f grave	l, trace silt	_ _ _ 0
40 — — —	S9	13	9	12	12	24	12			Gray c-f SAND,	trace silt, trace	e wood	_ _ _ 5
45— - -	S10	10	10	16	19	24	12			Brown c-f SAND	, trace silt		- - - 10
50 — -	S11	15	17	12	7	24	14		Lacustrine	Brown c-f SAND			- - -
- - 55-									Lacustinie	Brown SILTY CL			
- - -	S12	wor	woh	woh	3	24	24			silty clay	AT, U.T. SIIL V	arve between the	- 20
60 —	S13	wor	woh	woh	4	24	24			Brown SILTY CL	.AY		_ _ 25
65— - -	S14	wor	wor	2	2	24	24			Brown SILTY CL	AY		_ _ _ 30
Table	I	Propor	-	•		race =	1 - 10			ndisturbed Piston %, Some = 20 -		= 35 - 50%	
	enetratio					NOT	ES:					She 2 o	
Earth:	75.3ft	Rock:		7ft		4							. •
No. of Soil Sa	mples: 1	6 Co	o. of ore R	uns: 2	2							SM-001-M	REV. 1/02

Driller: P. Labossier	Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S1-10	
Inspector: T. Ta	Town:		Hartfo			Stat./Offset:	
Engineer: N. Whetten	Project	No.:		Project No. 63	3-703	Northing: 833111.71	
Start Date: 5-15-16	Route N		15 N			Easting: 1024585.74	
Finish Date: 5-16-16	Bridge N					Surface Elevation: 37.5	
Project Description: Relocation of			hange	e 29 & Widenir	ng		
Casing Size/Type: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hammer Wt.: 300lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.			
Groundwater Observations: @17.5		4 hou	rs	1	1		
SAMPLE	S		1	, p, c			₽ I
Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Description and Notes	Elevation (ft)
-				Glacial Till	Change in drilling	g action - dense material	
							_
70 — S15 25 29 32 33	3 24	12			Brown c-f SAND	, some silt, little m-f gravel	_ _ 35
75 100/4"	4	4		Weathered Rock	Brown c-f SAND	, some m-f gravel, some silt	_
-				NOCK			40
80				Bedrock			_
C-1	60	60	52			, moderately weathered, ured, medium strong	- 45 - -
	60	54	15		Brown ARKOSE fractured, mediu	, moderately weathered, highly m strong	 50
90 —					END OF BORIN	G 90ft	
							─-55 -
95—							-
							-
							60
							
100—							-
							\bot
						N V = Vane Shear Test - 35%, And = 35 - 50%	
Total Penetration in	ПОИ	ΓES:				She	
Earth: 75.3ft Rock: 14.7ft						3 0	13
No. of No. of Soil Samples: 16 Core Runs: 2						SM-001-M	REV. 1/02

Driller:		G. Two	mbly			Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S1-11	
Inspect		T. Ta				Town:		Hartfo	ord		Stat./Offset:	
Engine	er:	N. Whe	tten			Project	No.:	DOT	Project No. 63	3-703	Northing: 833258.98	
Start D	ate:	5-2-16				Route N	lo.:	15 SE	3		Easting: 1024586.35	
Finish I	Date:	5-5-16				Bridge I	No.:				Surface Elevation: 37.7	
Project	Descri	ption: F	Reloc	ation	of I-	91 NB	Interc	hange	e 29 & Widenir	ng		
Casing	Size/T	ype: 3-ir	n. Ca	sing		Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type:	
Hamme				30in		Hamme					7.	
Ground	dwater (Observat	ions:	@1	8.5	after 2	4 hou	rs				
				SAMF					7			t)
Depth (ft)	Sample Type/No.	; р	San	s on pler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Description and Notes	Elevation (ft)
0-									Asphalt	ASPHALT (12")		
	S1	31	38	55	51	24	16		Base	GRAVEL BASE		-
_	31	_	30	55	31	24	10		Fill	Brown c-i SAND	, little c-f gravel, little silt	-35
_		_										-
5-	S2	38	48	81	99	24	10			Brown c-f SAND	, some c-f gravel, little silt	
- - -	S3	120/5				5	4			Brown c-f SAND	, some c-f gravel, little silt	_ _30 _
10-	. 33						·			BIOWIT C-1 GAIND	, some on graver, intio sin	- - - -25
15— - - -	S4	37	41	55	53	24	8			Brown m-f GRA\	VEL, little c-f sand, trace silt	- - - -20
20-	S5	12	120/3	"		9	4				and m-f GRAVEL, trace silt ered obstruction at 20.5'. Difficult	_ _ _ _ _ 15
25— - - -	S6	7	21	27	21	24	7		Alluvium	Brown c-f SAND	, little c-f gravel, trace silt	_ _ _ _ _ _10
30-	S7	6	5	5	9	24	14			Gray f SAND, litt	tle silt	-

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES: Core barrel jammed up three different attempts. Water would	Sheet
Earth: 84.5ft Rock: 5ft	not flow out of the core barrel bottom preventing furthur coring. Boring Terminated at 89.5 feet.	1 of 3
No. of No. of		
Soil Samples: 20 Core Runs: 1		SM-001-M REV. 1/02

Driller:	C	3. Two	mbly	,		Co	onne	cticu	t DOT Bori	ng Report	Hole No.:	S1-11	
Inspect	tor: T	. Ta			Т	own:		Hartfo	ord		Stat./Offset:		
Engine	er: N	I. Whe	etten		F	roject	No.:	DOT	Project No. 63	3-703	Northing:	833258.98	
Start D	ate: 5	-2-16			F	Route N	lo.:	15 SE	3		Easting:	1024586.35	
Finish [Date: 5	-5-16			Е	Bridge N	No.:				Surface Elev	vation: 37.7	
Project	Descript	tion: F	Reloc	ation	of I-9	1 NB I	nterc	hange	29 & Widenii	ng			
Casing	Size/Ty	pe: 3-ii	n. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Туре:	
	er Wt.: 3			30in.	. F	lamme	r Wt.:	140lb	Fall: 30in.				
Ground	dwater O	bserva	tions:	@1	8.5 a	after 2	4 hou	rs					
				SAMF	PLES				- 0				l e
Œ			Б.			·	·		Generalized Strata Description	Ma	torial Dogori	ntion	Elevation (ft)
Depth (ft)	Sample Type/No.			vs on npler		Pen. (in.)	Rec. (in.)	%	eral :a :rip:	IVIa	terial Descri and Notes		======================================
ept	am	p		inche	:S	en.	ec.	RQD	trat esc		u		<u> </u>
	o ⊢	·					~	<u>~</u>	000				Ш
35 —	S8	6	6	5	6	24	15		Alluvium	0 (0.41)	*114		1
35 —	30	0	0	5	O	24	15		(con't)	Gray f SAND, tra	ice siit		-
_													+
_													-0
-		-											
40 —	S9	6	7	11	11	24	18			Brown to gray c-	SAND, trace	silt	
_													
													5
_													_
45-	45 S10 6 9 12			12	12	24	12			Brown to gray c-	SAND, trace	silt	-
_		-									07.11.12, 11.000	····	-
_													
_													<u>10</u>
-	044	40	40	40	40	0.4							
50 —	S11	10	10	10	10	24	8			Gray c-f SAND, t	race silt		-
_													H
_													-15
_		-											
55 —	S12	10	7	12	13	24	8			Gray c-f SAND, t	race silt		
_													
_													20
									Lacustrine				-
60-	S13	3	3	3	4	24	8			Brown SILTY CL	ΔΥ		F
-		1	-	-							•		-
_	UP-1					30	30			Brown SILTY CI	AY (TV = 0.2	tsf, PP = 0.25 tsf)	0.5
_		-									,	,	−-2 5
- 65	040	.,,,,,,	ماميين	ط میں	4	24	24			D	A \ /		L
65 -	S13	won	won	woh	4	24	24			Brown SILTY CL	ΑY		-
	UP-2					30	30			D C!! T/ C!	A)//T)/ 0.05	75 to 1 DD	-
_												75 tsf, PP = 0.5 tsf	30
			-	•						ndisturbed Piston 1%, Some = 20 -			
 Γotal P	enetratio									three different att			et
	84.5ft	Rock	. 5ft			not f	low or	it of the	e core barrel bo	ottom preventing fu			
No. of	∪ 4 .JIL		o. of			Tern	ninate	d at 89	.5 feet.				
	mples: 2			uns: 1	1							SM-001-M F	REV. 1

Driller:	G	G. Two	mhly	,		Co	onne	cticu	t DOT Borii	na Report	Hole No.:	S1-11	
Inspec		. Ta	ПОТУ		Т	own:		Hartfo			Stat./Offset:	01-11	
Engine		l. Whe	tten			Project	No.:		Project No. 63	3-703	Northing:	833258.98	
Start D		-2-16				Route N		15 SE			Easting:	1024586.35	
Finish		-5-16			_	Bridge N					Surface Elev		
			eloc	ation				hange	29 & Widenir	ng			
	Size/Typ								1-3/4 inch ID		Core Barrel	Typo:	
	er Wt.: 3			30in		Hamme	•				Cole Ballel	туре.	
	lwater Ob								1 all. 3011.				
Oround	water or	Joci vat			PLES	aitoi Z	+ 110u						
Depth (ft)	Sample Type/No.		Blov	vs on		Pen. (in.)	Rec. (in.)	% (Generalized Strata Description	Ma	aterial Descri and Notes		Elevation (ft)
Dept	Sam Type	р		inche		Pen.	Rec.	RQD					Elev
_									Lacustrine (con't)				-
70 — -	UP-3					30	30		(con i)	Brown SILTY CL	AY (TV = 0.3	tsf, PP = 0.75 tsf)	-
_													_ 35
_									Glacial Till				
75-	S14	14	17	21	16	24	5			Brown c-f SAND	some c-f gra	vel. some silt	
-		-								B.0 0 1 07 11 12	, como o r gra	voi, como om	-
_													- 40
-													40
80-	S15	51	32	24	31	24	21			Brown c-f SAND	, some silt, litt	le m-f gravel	_
_													- 45
85 <i>-</i>	S16	120/0'	•			6	4		Bedrock	Brown c-f SAND	, some c-f gra	vel, little silt	
- - -	C-1					60	46	25		Brown ARKOSE moderately fracti	, moderately v ured, medium	veathered, strong	_ 50
90-										END OF BORIN	G 89.5ft		+
_													-
-													-55
_													
95-													_
_													-
_													-60
-													
100-													
-													
_		•	-	•						ndisturbed Piston %, Some = 20			_
Total D	enetratio				· · · · · · ·								ot .
			F 51			not f	low or	it of the	e core barrel bo	three different att attom preventing fu			
Earth:	04.5π	Rock:	5π o. of			Terr	ninate	d at 89	.5 feet.	,	-		
		140	. 01			1							

No. of Soil Samples: 20 No. of Core Runs: 1 SM-001-M REV. 1/02

Driller:	P	. Labo	ssier	r		Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S1-12	
Inspect	tor: T	. Ta				Town:		Hartfe	ord		Stat./Offset:	
Engine	er: N	l. Whe	tten			Project	No.:	DOT	Project No. 63	3-703	Northing: 833238.29	
Start D	ate: 5	-16-16	3			Route N	lo.:	15 NI	В		Easting: 1024644.04	
Finish I	Date: 5	-17-16	3			Bridge N	No.:				Surface Elevation: 40.7	
Project	Descript	ion: F	Reloc	ation	of I-	91 NB I	nterc	hange	e 29 & Widenii	ng		
Casing	Size/Typ	oe: 4-iı	n. Ca	sing		Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 3			30in		Hamme			Fall: 30in.			
Ground	water Ol	oserva					4 hou	rs	1	Ι		
				SAME	PLES	3		T	- 0 -			€
Depth (ft)	Sample Type/No.	р	San	vs on apler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	М	aterial Description and Notes	Elevation (ft)
0-									Asphalt	ASPHALT (12")	<u> </u>	40
-		† _			_				Base	GRAVEL BASE		-40
_	S1	57	85	109	25	24	18		Fill	Brown c-f SAND), little c-f gravel, little silt	_
_												-
5— - -	- S2	17	18	20	16	24	18			Brown c-f SANE	D, some m-f gravel, little silt I in wash water	- 35 -
_												
10-	00	-	00	07	00		40					_ 30
- - -	S3	20	29	27	29	24	16			Brown c-f SANL), little m-f gravel, little silt	-
15 <i>-</i> -	S4	24	24	22	22	24	12			Brown to gray c	-f SAND, little f gravel, little silt	_ _ 25
-										1' void from 17'	_	-
20 —	S5	13	15	25	28	24	18			Brown c-f SANI	D, some f gravel, little silt	_ 20
-									Fill	Gray f SAND, s		Ė
25 -	S6	14	19	22	18	24	14			Gravif SAND o	ome silt, trace wood	_ 15
-			.0		.0				Alluvium	Gray I GAND, 3	ome siit, trace wood	-
_									, wavium			
30 <i>-</i>	S7	wor	woh	5	5	24	22			Brown to gray f	SAND and SILT	10
_												
_			-								N V = Vane Shear Test - 35%, And = 35 - 50%	1
Total P	enetratio	n in				NOT	ES:					Sheet
Earth:	80.5ft	Rock	: 14.5	5ft							1	of 3
No. of	mples: 1	N	o. of	uns: 2	2						SM-001	-M REV. 1/02
_ J OU					•						5 001	

Driller:	P	. Labo	ssier	ſ		Co	onne	cticu	t DOT Bori	ng Report	Hole No.:	S1-12	
Inspec	tor: T	. Ta			-	Town:		Hartfo	ord		Stat./Offset:		
Engine	er: N	I. Whe	tten		F	Project I	No.:	DOT	Project No. 63	3-703	Northing:	833238.29	
Start D	ate: 5	-16-16	6		F	Route N	lo.:	15 N	3		Easting:	1024644.04	
Finish	Date: 5	-17-16	6		E	Bridge N	lo.:				Surface Eleva	tion: 40.7	
Project	Descript	ion: F	Reloc	ation	of I-9	91 NB I	nterc	hange	29 & Widenii	ng			
Casing	Size/Typ	oe: 4-ir	ո. Ca	sing	5	Sample	г Туре	/Size:	1-3/4 inch ID		Core Barrel Ty	ype: NX	
Hamm	er Wt.: 3	00lb	Fall:	30in.	ŀ	Hamme	r Wt.:	140lb	Fall: 30in.				
Ground	dwater Ol	oservat	ions:	@19	9.0	after 24	4 hou	rs					
				SAMP	PLES				. p. c				₩ ₩
Depth (ft)	Sample Type/No.	р	San	vs on npler inche	S	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	iterial Descrip and Notes	tion	Elevation (ft)
-									Alluvium				
35 — - - -	S8	5 2 2 6 24 (con't) Brown to gray f S							SAND and SILT		-5 - -		
_													
40 —	S9	8	15	15	19	24	16		Alluvium	Gray f SAND and Gray c SAND, tra			<u> </u>
_	39		15	15	19	24	10		, and vidin	Gray C SAND, III	ace siit		-
_	-												
-	_												
45—	C10	810 8 6 9			11	24	10				***		5
_	510	0	О	9	11	24	10			Gray c-f SAND,	trace silt		-
_	-												
_	_												
50 —	011	10	40	40	17	24	40			Gray f SAND, tra	ace silt. 4" seam	of orange	10
_	S11	10	18	18	17	24	12			coarse sand	,	. or orange	_
_	_												-
_	1												
55—	0.40	_	_	_					Lacustrine	Brown c-f SAND	and m-f GRAV	El gravel from	- 15
_	S12	7	5	7	8	24	4			wash pushed do			10
_													-
_	_												
60 —	6.1-	1			_								20
_	S13	wor	wor	woh	0	24	24			Brown SILTY CL	ΑY		20
_													+
_	-												+
65-		1											- 25
_	S14	wor	wor	woh	3	24	24			Brown SILTY CL	AY		-25
_													
			-	•						ndisturbed Piston 1%, Some = 20 -			
Total P	enetratio	n in				NOT	ES:					She 2 o	
Earth:	80.5ft	Rock:		5ft								2 0	ıδ
No. of	mples: 1		o. of ore R	uns: 2)							SM-001-M	REV/ 1/02
JUII J0	iiipica. I	, 0	JI 0 11	u113. Z	•							OIVI-00 1-IVI	1.L v. 1/UZ

Driller:	P	. Labossier	Co	onne	cticu	t DOT Borii	ng Report	Hole No.: S1-12	
Inspect		. Ta	Town:		Hartfo			Stat./Offset:	
Engine		. Whetten	Project	No.:		Project No. 63	3-703	Northing: 833238.29	
Start D		-16-16	Route N		15 NE			Easting: 1024644.04	
Finish [Date: 5	-17-16	Bridge I	No.:				Surface Elevation: 40.7	
Project	Descript	ion: Relocation of I			hange	29 & Widenir	ng		
Casing	Size/Typ	e: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 3	00lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	lwater Ob	oservations: @19.0		4 hou	rs	T			
		SAMPLE	S		1	ی ر			₽
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Description and Notes	Elevation (ft)
_						Lacustrine			
70-						(con't)			
_	S15	wor woh 4 4	24	24			Brown SILTY CL	AY	-30
_									
75-						Glacial Till			_
_	S16	15 11 13 35	24	4			Brown c-f SAND	and SILT, little m-f gravel	-35
_									
80-	S17	66 100/2"	8	4			Brown c-f SAND	, some m-f gravel, little silt, trace	
_	517	00 100/2	0	4		Weathered	rock fragments	3 · · · 3 · · · · · · · · · · · · · · · · · · ·	-40
-						Rock			
									-
85-						Bedrock			
_						Dedrock			45
_	C-1		60	58	50			, Moderately weathered,	
							moderately fracti	ured, medium strong	
90-									-
_									-50
_	C-2		60	48	60		Brown ARKOSE	, moderately weathered, slightly	
							fractured, mediu	m strong	
95-									+
_							END OF BORIN	G 95ft	-55
_									
100-									-
-									-60
_		Comple Type: C	Chlit O		C = 0	Poro IID - II	diaturbad Dieter	V = Vono Chaor Tast	
								V = Vane Shear Test - 35%, And = 35 - 50%	
Total P	enetratio	n in	NOT	TES:				She	
Earth:	80.5ft	Rock: 14.5ft						3 of	3
No. of	mples: 1	No. of 7 Core Runs: 2						CM 004 M F	DEV 1/02
SOII Sa	mpies: I	i Core Runs: Z						SM-001-M F	KEV. 1/02

APPENDIX B PREVIOUS TEST BORING LOGS



SHEET FORM SM-1 REV. 8/83 STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS Mason BORING CREW LEADER LOCATION Structure No. 3 GUILD DRILLING CO., INC. C. Harriman BORING CONTRACTOR TOWN HARTFORD-EAST HARTFURD, CI **HUSSPECTUR** STEINMAN "BORGOSTOS"> CHARTER OAK BRIDGE PROJECT NAME HALEY & ALDRICH, INC. DESIGN ENGINEER 63-384 PROJECT NO. SOILS ENGINEER LOCATION HARTFORD HOLE NO. CORE BAR SAMPLER AUGER CASING SURFACE ELEV. N14-2 LINE & STATION MW. WH TYPE Brozer6 DATE FINISHED OFFSET SIZE I.D. GROUND WATER OBSERVATIONS N. COORDINATE BİT 14015 HAMMER WT. 300 16 AFTER O HRS. E. COORDINATE 24 30 AIQ HRS. HAMMER FALI AFTER FT. AT SAMPLE **BLOWS** D STRATA PER 6 INCHES DEPTHS FIELD IDENTIFICATION OF SOIL Ε CHANGE REC. PEN. ON REMARKS (INCL. COLOR, LOSS OF CASING IN FEET DEPTH BLOWS PER TYPE NCH INCH SAMPLER WASH WATER, SEAMS IN ROCK, ETC.) NO. T ELEV. FROM TO 0-6 6-12 12-18 H **FOOT** CENT. JAND SILL, Fr. OF MATEU M. dense; Drance 0.5 31 MED, DENSE REDDISK BRIN 60 M- & SAND" SHTRACE GRAVEL 100 45 4.75 13 11 VERY STIFF GREY SILT + FIVE SAND 18 D 6 14 23 58 49 34 26 soft grayish brown, sit, little (me sond, trace day. 14 2 9-10.5 3 18 20 21 20 24 VERY SOFT, GROUNSH BROWN, SILT 16 14 - 15.5 18 61776 & fine sand. - ALLUVIUM -18.0 MED. DENSE; brown, fine SAND, LITTLE SILT, tr. Medium sound and 14 6 8 19-20.5 18 ںک med. fine quarel 46 60 medium duse brown medium to fine, 18 D 24 - 25.5 117 28 SAND, trace course said and sil S.6 58 57 Med to fine, SAND 8 16 14 16 18 55 29 - 29 5 30 COARSE SAND, LITTLE 69 81 - ALLUVIUM -95 MED DENSE, gray brown , 8 15 34 -35.5 18 63 Med to fine small, LITTLE 60 69 COARSE SAND, TRACE GRAVEL 38.0 S Soft, red brown VARVED CLAY and SILTY CLAY. 9 PUSH 39.0-40.5 18 18 PEET INCH CASING FOR INCH CASING THEN FROM GROUND SURFACE TO 39 FEET USED HOLE NO. 3 /58 NO. OF SAMPLES FOOTAGE IN ROCK 61 FOOTAGE IN EARTH V=VANE TEST UP=UNDISTURBED, PISTON A=AUGER C=CORE D=DRIVE SAMPLE TYPE CODING:

PROPORTIONS USED:

TRACE=1-10% LITTLE=10-20%

SOME = 20-35%

AND = 35-50%

	BC	Mason PRING CREW LEADS PARCIMAN	3R				STA PARTN BU	ATE O MENT IREAU	F COM OF THE	REV. 8 NNECT RANSP HIGHW EPORT	ICUT ORTAT AYS	TION		SHEET 2. LOCATION GUILD DRI BORI		2 (e No.3 ., INC.	
		Y & ALDRICH, INC.		Pf		T NAM	E/ CH			BRÍDG				STEINMAN. DES	IGN ENGI		
U	ATION FACE E	<i>HARTFOR</i> LEV. HED 12-3-8		Ty	/PE		AUG	ER	CAS	ING	SAMPL		———	HOLE NO.	<i>B 15</i>	8	
		WATER OBSERVATE	ONS HRS.	SIZ . HA	ZE I.D.	WT.			4/" 300	3"	13/	16	BIT	OFFSET N. COORDINAT E. COORDINAT			
NT D		DEDTUS	HRS.	. HA	MMER	FALL		LOWS 6 INC	<i>24</i> HES	STR/	30 NTA		DIA				د بارد د بارد
EPTH	CASING BLOWS PER FOOT	IN FEET FROM - TO	NO. II		REC. INCH	TYPE	SA	ON MPLE 6-12	R	CHAI DEP ELE	TH		REM	D IDENTIFICA VRKS (INCL. CO WATER, SEAMS	LOR, LOSS	OF	
10	迷											*	MSENG (BLOWS NOT	OBTA V CLAY	INED, WAS	win.
15		44 - 46 ' 44,5 - 46,5'	W1		24	UP UP							TE! UP	1 - 0" R I (SECOND	ecove as	FAILED	
		48.5	¥1			V								ANE SHE			
<i>60</i>		51-52,5	/0	24	18	<u>ρ</u>		_				V. 3	SOFT RED SILTY (BROWN	VARVED	CLAY AN	
_		55.0-56.0 56.0-57.0	11 A			UP				.56	6.0			S D10)		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
fa.											1		FINE	TO VERY	5/47	Some	
Ø		59-60.5'	12	18	14	D	20	20	2.5	64	0,0		TO FIN	RED BROW LITTLE (E GRAVEL	CLAY,	TRACE ME	D.
		64.0- 69.0	7 6	60 RO	58 0=3	C 7 /***)			9 7	. •		- Dec	LACIAL TI	1 Bedr	ock .	
						10						500 C10	Med to dy SILT se, join cathered	moderately STONE Jo is moderat	hard, r ints ve ely frou	ry close t	ine D htly
												\	Botton	1943 to m	oration	69.0	fi.
																• *	
1.													ailed to	IIA and IIB be sample.	taken (iganilik
		OUND SURFACE TO					NCH C	asing 8	THEN		NO. 0		PLES /			10. <i>B</i> 158	
SA	MPLE T	IN EARTH 6/ YPE CODING: ONS USED:		DRI'		С	= COR	E	-	\= AUG = 20 -{	ER	UP		BED, PISTON	V=AV	NE TEST	

					·			Mao	CM 1	DEV (/92			SHEET 1	0F	2				
	A),	DRING CREW LEADI					ST	ATE C	F CO	REV. ((ICUT	TION				RE # 3				
		HARRIMA			•		BI	JREAU	J OF I	HIGHV	PORTA' VAYS	IION	:		LLING CO.,					
S		INSPECTOR	· V	─ ₁	OWN H	ARTFO	RD-EA	ST HA	RIFOR	EPOR	T				ING CONTRAC	TOR				
i	ALEY	& ALDRICH, INC.								BRIDG					SIGN ENGINE	26b				
		SOILS ENGINEER			ROJEC			-384			· · · · ·			DE	SION ENGINE	EK				
	ATION	STRUCTURE	{	<u>=3</u>	Hor	460		<u>T2</u>	046	1210	CAMPI	I SP CO	RE BAR	HOLE NO.	3 159					
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BORING CREW LEADER LOCATION RETWALLING Z DEPARTMENT OF TRANSPORTATION SUREAU OF HIGHWAYS GUILD DRILLING CO., INC. C. HARRIMAN TOWN HARTFORD-EAST HARTFORD, CT. STEINMAN BARAGE PROJECT NAME CHARTER OAK BRIDGE MALEY & ALDRICH, INC. State State Parties DESIGN ENGINEER SOILS ENGINEER PROJECT NO. 63-384 B Cherry Back MATION RET. WALL TOZ AUGER CARRO SAMPLER CORE BAR HOLE NO. URFACE ELEV. B 188 NY II LINE & STATION TYPE MATE PROMISED /-/3-27 HANNIN 4",3" GROUND WATER OBSERVATIONS EZE I.D. 13/2" 2 " OFFIET ST 6.5 FT. HAMMER WT. 30016 14016 WIT M. COORDINATE AFTER O HANGER FALL HRS. 2y " AFTER 30" DIA AI FT. E. COORDINATE BAMPLE BLOSS. DEPTHS STRATA PER 6 MICHES REC CARRE MA. PIELD IDENTIFICATION OF SOIL CHANGE OW. IN PEET T-EX REMARKS (MCL. COLOR, LOSS OF DEPTH MCH TYPE 敝 BRICH SAMPLER PROM - TO WASH WATER, SEAMS IN ROCK, ETC.) ELEV. 0-6 |6-12 |2-18 0-1.5 18 15 MED. DENSE BLK F. SAND, SEME ORGAN PUSH 0.7 AUS W ATTER , TRACE SILT - TOPSOIL -4 12 2 18 14 D 12 17 15 4-55' . 14 MID. DEWSE CED BEN LIFE JAND 21 TRUCE LITTLE, M-F GEAULL, SILT, TRA CLAY 54 - FILL -PUSH 9-10-51 18 /2 D 3 8 10 MED DENSE C-F GENEL, Some TILT & E. SAND , TRACE C-M SAN. 13.0 MED DOUSE OLIVE BRAY TO GRAY FINE 14-15.5' ¥ 18 12 D 3 SAND AND SILT 19-20.51 5 18 12 D 4 4 LOOSE OLIVE BRN TO GRAY FINE SAND & TILT, TRACE C. SAND - ALLUVIUM -240 24-25.5/6 18/2 26 MED DENSE GRAY METSAND, **1** Trees of little BILT 20 21 m 33 29 - 30.5 7 18 15 D MED DENSE GRAY M.F. SAND, FRACE. 57 T. SOKE, TRACE SILT 62 75 - ALLUVIUM -8 18 14 D B 82-39-35.5 8 13 MED DENSE GRAY C-F SAND, 50 TRACE M-F GRACE 24 Frau Alt material (wowo chips), 65 73 ROM GROUND SURFACE TO 44 FEET USED 4 INCH CASING THEM INCH CASING FOR 62 PEET HTRAS IN SANTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. & 186 SAMPLE TYPE CODING: D=DRIVE C=CORE A= ALIGER UP = UNDISTURBED, PISTOR V=VANE TEST PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% \$CME = 20 - 88% AND = 25-50

STATE OF CONNECTICUT

FORM SM-1 REV. S/83 STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS LOCATION Ret. Wall No. 102 TO MODELL GUILD DRILLING CO., INC. C Harriman BUREAU CONTRACTION TORR MARTFORD-EAST MARTFURD, CT. STELLMAN 4-0-5-0 PROJECT NAME CHARTER DAK BRIDGE WALEY & ALDRICH, INC. 63-384 BELL ENGHALER PROJECT NO. SATIS urface elev. LINE & STATION DATE PHENED OFFIET MZE LD. THE ATTER CONTROL OF H. COORDINATE HRE MASSIER WT. AFTER E. COORDINATE HRE. MANNER FALL AFTER AT STRATA PER 6 INCHES BEPTHS PIELD IDENTIFICATION OF SOIL CHANGE REC. 08 REMARKS (MICL_COLOR, LOSS OF IN PEET HTTSO PER MICH TYPE SAMPLER MASH MATER SEASE IN ROCK, ETC.) ELEV. PROM - TO 0-6 6-12 12-18 MED. DENSE GRAY G-F TAND, 18 14 39 - 40,5 - ALLUVIUM -TRACE SINT 43.0' 63 51 65 45 ASH 44-43.5 10 18 18 D SOFT RED BAN VARVED AND BILTY CLAY SAME AS DYIO 11 18 18 0 50 54.0 HARD RED BRN SKT SOME C-F SANS TRACE CLAY LAND EST GRAVEL 12 18 12 D 29 63 100 0 -GLACIAL TILL -58.0 Decomposed Bedrock D 100/10" Note: Roller Bit from 59.0-62.0 ft. DRX RATE (MIN/A) 62.6 MOD HARD RED BAN F. GRAINE 60 53 C 8 sondy SILTSTONE, with inter-62-67' 6 (RQD= 0:1.) G millent fine sandstone beds. 10 Joints very close to close, shallow dipping, occas high angle soint, Bedding very thin. Rock slightly weathered, extremely to moderately 70 fractured. 62.5#-2 mch clay & gravel seam Bottom of Exploration at 67.0 At 15 PES. MCM CASING FOR INCH CASING THER FEET USED 10M GROUND SURFACE TO 44 1 18 JS 186 NO. OF SAMPLES POOTAGE IN ROCK 60 POOTAGE IN EASTH Y=YANE TEST LIP = LINDISTURBED, PRITOR A=AUGER C=CORE D-DRIVE SMIPLE TYPE CODING: AD=第-656 TRACE-1-18% LITTLE= 10-20% **数据=20-概** PROPORTIONS USED:

BORING CREW LEADER STATE OF CONNECTICUT LOCATION RetauningWally02 DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS GUILD DRILLING CO. INC MARRIMAN SOIGHT CENTRACTOR TOWN HARTFORD-EAST HARTFORD, CT • • • • • STEINMANNE PROJECT MANSE CHARTER OAK BRIDGE MALEY & ALDRICH, INC. DOSKON DAGINGOR SHILL ENGINEER PROJECT NO. 63-384 MATION RETERMINED TO THE 102 BANFLER CORE BAR HOLE NO. CASHE AUGER URFACE ELEV. NVI LINE & STATION HW,NW 22 30 DEC 86 TYPE DATE PINESPED 47,34 13/2 OFFEET GROUND WATER ORSERVATIONS M. COORDINATE 30016 140 % HANDER WT. AT J. 63FT. Nº AFTER /6 MRS. 24" DIA Jo " E. COORDINATE 4.67FT. SA AFTER O HRS. MAMMER FALL SAMPLE BLOWS STRATA DEPTHS PER 6 INCHES FIELD IDENTIFICATION OF SOIL. CHANGE REC CASHK PER. IN FEET REMARKS (MICL COLOR, LOSS OF DEPTH 殿 NCH MCH TYPE SAMPLER WASH WATER, SEAMS IN ROCK, ETC.) ELEV. FROM . 10 0-6 6-12 12-18 POOT 9" BLK TOP , 2" TAMP ROCK YE-E SAND 1.0 D 7 17 MED DENSE, RED BRAY, C. TO PINE 1.0- 2.5 1 18 1.4 SAND, title silf. = , Truce MED. 18 B FINE GRAVEL 16 18 17 D 20 24 122 28 40-5.5 VERY DOUGE, RED BRU,: C_ Fine 38 SAND, WHILE SIH, track cravel 40 35 27 4 9.0-10.5 14 2 6 3 18 MED DOWSE RED BRN IC: to FINE 19 21 SAND, LITTLE SALT 28 - ALLENOM -27 1110 30 13 D 18 MED DOWSE RED BRN NO TO FINE 17 140-15.5 12 SAND, -Trace silt. 24 - FILL-28 30 SAME AS DA4 18 15 D 5 7 194 20.5 16 5 21.0 22 29 36 14 D 3 5 MED DENSE LIGHT BAN FINE SAND 31 84-25.5 6 18 骜 : and sur. 56 - ALLUVIUM-67 28.0 80 MID. DEUSE GRAY TO BRAJ COARSE TO 77 18-14 2 5 9 11 45 290305 FINE SEND, TRACE SILT. 65 - ALLUVIUM -320 87 3 1 35.5 8 18 18 D 6 8 10 33 MED DENSE GRAY COARSE TO FINE 57 sand, Trace fugravel, silt. 61 68 27 - ALLUVIUM -42 FROM OROUND SURFACE TO 44 FEET USED 4 INCH CASING THEN PEET INCH CASING FOR HOLE 100. 2 189 NO. OF SAMPLES POOTAGE HI EARTH 63 FOOTAGE IN ROCK 5.0 C=CORE V=VARE TEST D=DRIVE A=AUGER UP=UNDISTURSED, PISTON SAMPLE TYPE CODING: TRACE=1-10% LITTLE=10-20% AND = 35-50% 10ME = 20-ME PROPORTIONS USED:

POSM SM-1 REV. 8/83 DONNO CREW LEADER STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS LOCATION RET WALL 102 GUILD DRILLING CO., INC. HARRIMAN STATES CONTRACTOR TOWN HARTFORD-EASP MARTFORD, CT. STEIRMAN F CHARTER OAK BRIDGE PROJECT NAME HALEY & ALDRICH, INC. DESKON ENGINEER 63-384 PROJECT NO. STILL ENGINEER LOCATION 1257 WALE VOTE LAMPLER CORE BAR HOLE NO. CASING AUGER SURFACE ELEV. LINE & STATION NYZ 23 HW MW TYPE 90 DEC - 86 DATE FINISHED 3" 2" OFFSET SIZE I.D. GROUND WATER ORSERVATIONS M. COORDINATE 18016 BIT 3006 ATTER /K HRS. HAMMER UT. E. COORDINATE 24 ' DIA HAMMER FALL 3011 RT 84"AFTER C HRS. AT SAMPLE BLOWS 0 STRATA PER 6 INCHES CEPTHS FIELD IDENTIFICATION OF SOIL CHANGE REC. ON 78. CASH REMARKS (MCL. COLOR, LOSS OF IN FEET DEPTH PER MCH SAMPLER BASH WATER, SEAMS M ROCK, ETC.) HICH ELEV. FROM . TO 0-6 6-12 12-18 POOT MED DENSE GRAY CORRSE TO FINE V 18 16 D 9 16 39-40.5 SAND TRACE SILT F. GRAVEL AND OF GARL Making (wood hips)_ALLUNIUM 43.0 2 18 10 18 444 455' SOFT RED BRN VARVED CLAY AND 45 ZILTY CLAY (SAME AS D . 10) 11 18 18 D 49250.5 50 (SAME AS D. 10) 572555 12 18 BID 1 56.0 HAND RED BRN SILT, SOME C-F SPACE TRACE CLAY AND EINE GRAVEL -GLACIAL TILL -VERY BOTHERED BEN CORNEL, SOME SILT 12 12 D 32 64 185/0: 60.0 591-60.5 15 60 MIGHEY WPATHERED ROCK Decomposed Bedrock Hote; Willer 6:1 43.0 1 60 30 63.0-6R.0 Med Hord, red brown, Enegraned Sondy CRQD = 0% SILTSTONE, Joints v. cluse to close, shallow dipping, accomply dipping. Bolderey very thin, lock shightly weather moderately fractured. Q 65 . منه NOTE: 1) LOST HALF OF RETURN WATER WHILE CORING 70 2) ONLY 30" RETURN DUE TO BAD COME LIFTER (S ATTEMPTS WERE MADE) Bottom of Exploration at G&Ift. 75 INCH CASING FOR 68 PEET INCH CASING THEN ROM GROUND SURFACE TO 44 FEET USED 7 NOLE NO. & PS NO. OF SAMPLES FOOTAGE IN ROCK FOOTAGE IN EARTH VEVAME TEST UP = UNDISTURBED, PISTON A= AUGER D-DRIVE C=CORE SAMPLE TYPE CODING: AND = 25-45 ... TRACE=1-10% LITTLE= 10-20% 刘峰=20-6% PROPORTIONS USED:

STEET

196. MASON STATE OF CONNECTICUT LOCATION RET. WALLETOZ ECUNI CLEW LEADER DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS GUILD DRILLING CO., INC. C. MARRIMAN TORR HARTFORD-EAST HARTFURD, CT SUMME CONTINUE TO 9 91 STEIRMAN BANVA/B. PROJECT MARKE CHARTER OAK BRIDGE WALEY & ALDRICH, INC. छ न्युरंक्ष व्यक्तिसम्बद्ध PROJECT NO. 63-384 SOILS ENGINEER WATION RETAINING WALL 102 TANGLER COME BAR MOLE NO. 2 ALMORR BURFACE ELEV. NULT LINE & STATION HW, NW DATE FIMSHED /-アータア TYPE 2.. 4",3" 13/8" CFFRET HZE LD. RECURS WATER OFFERVATIONS 14016 IR. COORDINATE 30015 7.5 FT. EV AFTER O HAMMER WT. E. COORDINATE 24" 30" DIA HRS. MARRIER FALL AFTER PLOSS. STRATA PER 6 INCHES DEPTHS PIELD IDENTIFICATION OF SOIL CHANGE REC. REMARKS (MCL_COLOR, LOSS OF IN PEET DEPTH MCH NCH SAMPLER WASH WATER, SEAMS IN ROCK, ETC.) PER ELEV. FROM - TO 0-6 6-12 22-18 POOT min 4" BLACK TOP 29 DENSE RED BRN COGGETS FINE SAND 13 D 12 17 24 18 10-2.5 TRACE SILT ! little fine grower . 11 2,5 10 MED DOWSE AND BRN FINE SAND, 2 18 14 D 6 8 40-5.5 Littles SAT, Frate MED SAND, clary 17 25 40 48 MED DENSE REBT. CONTED TO FINE SANT 18 14 D 3 8 113 34 9,-10.5 trace gravel, sitt 46 54 - - ALLUVIUM-13.0 60 38 M. DENSE gray BRN FINE SAND 18 16 D 5 7 140-15.5 30 Some SILT 56 50 53 42 (SAME AS D44) 9 \$ 194-20.51 2 18 18 D 28 26 - ALLUVIUM -26 <u>23.0°</u> 30 33 18 12 D 14 12 14 6 242-25.5 M. DENSE GRAY BRN FINE JAND, SOME SILT AND CLAY , LITTLE !! G-Ma. soul 49 - ALLUVIUM -29.0 9 7 17 14 2 8 26 291-30,5 MED DENSE GRAY MED TO FINE SAND 46 TRACE FILT, c.sonb. 51 57 7 IU 340-35,5 8 18 16 D 10 40 MED. DEUSE GRAY MID TO FINE That I Track gravel, c. sond ford (1) 65 当件二 -AZLUVIUM -P. 0 70 RON GROUND SURFACE TO 39 FEET USED Y INCH CASING THEN PEET INCH CASING FOR 67 NOLE NO. B 190 NO. OF SAMPLES 14 POOTAGE IN EASTH 67 FOOTAGE IN ROCK V=VARE TEST A=AUGER UP = UNDISTURBED, PISTON D*DRIVE C=CORE SAMPLE TYPE CODING: TRACE=1-10% LITTLE=10-20% AND = 25-50% SOME = 20-85% PROPORTIONS USED:

ANNAS CHEW LEADER STATE OF CONNECTICAT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HICHWAYS LOCATION Ret, Well No. 102 GUILD DRILLING CO., INC. C. Hammon TOWN HARTFORD-EAST TARTFURD, CT. STREET CLATTER TON STELLINGS SEEDS PROJECT NAME CHARTER OAK BRIDGE MALEY & ALDRICH, INC. to a nonatomination in a 63-384 PROJECT NO. SULL ENGINEER CATION AMERICA COME MAN INOLE NO. Allega nimpace elev. LINE & STATION 1-7-87 OFFICE OLDED WATER ORSERVATIONS MZE I.D. N. COORDINATE HAMMER UT. AFTER E. COORDHIATE MRS. MANGER FALL AFTER AT STRATA PER 6 INCHES CEPTIS. PIELD IDENTIFICATION OF SOIL CHANGE PEN REC. COL IN PERT REMARKS (MICL COLOR, LOSS OF HTTSO WICH TYPE SAMPLER WASH WATER, SEAMS IN ROCK, ETC.) ELEV. PROM - TO 0-6 6-12 12-18 SOFT RED BRN VARYED SILTY CLRY 18 18 D 390-41.6 TRACE FINE SAND AND F. GRAVEL 44.6 SORT RID RRW VARVED CLAY AND 44-45.5 10 19 18 0 42 SILTY CLAY (SAME AS DIO) 18 D W.a 21 18 495 50.5 50 W.O. ROD 1 12 18 18 3 542-55.5 Very soft, red brown, VARVED CLAY and SILTY CLAY. 57.5 HARD RED BRN SUT, SOME C-F 13 18 16 D 18 27 38 59-60.5 60 SAND, LITTLE M- F GRAVEL , TRACE CLAY. - GLASIAL TILL -14 12 12 2 27 38 100 SAMP AS D-/3 641-65.5 65.0 5 wes Note: Roller bit from 05.0 - UN.O St Decomposed Bedrock 44 10 har - (4) 67.0 67.0-72.0 6015810 mod Hord, redishown, fine grained (ROD=2.7.) sandy SILTSTUNG with occas, Ane 70 sandstone bedding, Joints very cose to close, shallow dipping, occas, sleeply dipping. Bedding very thin, Rock slightly weathered, moderately fractived. 75 Battern of Explanation at 72.0 ft PEET THE GROUND BURFACE TO 39 FEET USED 4 INCH CARING THEN 1.7 MICH CASHS FOR MOLE 10. 12 /90 _14 IG, OF SAMPLE PROTAGE IN ROCK POOTAGE IN EASTH 67 V=VAME TEST UP = UNDISTURBED, PRITCH A=AUGER D-DRIVE C=CORE SAMPLE TYPE COMME **解的 = 第-4章** 2000 = 29-655 TRACE-I-NE LITTLE = 10-26 PROPORTIONS (SEE:

FORM SM-1 REV. S/EJ

STATE OF CONNECTICUT LOCATION RET MALL MO.10 2 DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS GUILD DRILLING CO., INC. C. MARRIMAN TOWN HARTFORD-EAST HARTFORD. CT. STEINMAN B.E. & B. PROJECT MARKE CHARTER DAK BRIDGE MALEY & ALDRICH, INC. DESIGN ENGINEER STALS ENGINEER PROJECT NO. 63-384 MATERIA SALE LES CORE MAR HOLE NO. ALICE S erface elev. NVZ LIME & STATION 22 HW NN MATE PI開発化の ノキ アーテア TYPE 132" U 4.3 " OFFIEL EZE I.D. GROUND WATER BEIEFFYATERS EL COORDINATE 14016 要! MANDER WT. 200 /6 ST 11.5 PT. S ATTER O MISS. E. COORDINATE DIA HRS. MANDRER FALL 24" AFTER **BLOSS** Ð STRATA PER & MICHES EPTHS. PIELD IDENTIFICATION OF SOIL. CHANCE REC. OM IN FEET REMARKS (MCL_COLOR, LOSS OF DEPTH NCH MICH TYPE SAMPLER WASH WATER, SEAMS IN ROCK, ETC.) ELEV. FROM . TO 0-8 6-12 12-18 FOOT YAN BLACK TOP 1.0 4 D 24 19 11 2.5 9 MED DENSE RED BRN PART STAND, 14 TRACE C - 1 SAND AND FINE GRAVEL 2 24 24 D 11 13 40-6.0 (SAME AS D-1) - FILL -80 LOOSE, GRAY BRN, FINE SAND, 24 24 D 4 5 90- 11.0 M 50ME 5167 (SAME AS D-3) 4 24 24 D 2 3 142-16.0 (SAME AS D. 3) 19.4 21.0 5 24 EY D 4 4 - ALLUVIUM -5 F CASIN & PUSHED ENTIRE DATH 230 OF BORE HOLE 24 20 D 9 11 11 24,026.0 6 MED. DENSE GRAY, MED TO FINE 16 SAND, trausit 9 11 173 14 295-31.0 7 24 14 D (SAME AS D. 6) - ALLUVIUM -Medium 75 /6 8 24 12 D 10 13 SEASES, GRAY MED TO FINE SAND 34-36.0 鬈 title e sono traceme GRAVEL 16 38.0 INCH CASING FOR 64 PEET F INCH CASING THEN ROM GROUND SURFACE TO 39 FEET USED HOLE NO. 8 /9/ NO. OF SAMPLES POOTAGE IN EARTH 64 FOUTAGE IN ROCK V=VAME TEST UP = UNDISTURBED, PISTON C=CORE A=AUGER SAMPLE TYPE CODERG: D=DRIVE TRACE-1-16% LITTLE= 10-20% AND = 35-50 SOME = 20-365 PROPORTIONS USED:

D. HOlley STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HICHWAYS LOCATION RET WALL NO. 102 STATES LEADER GUILD DRILLING CO., INC. C. Harriman. CORNER CONTINUE TO TOWN HARTFORD-EAST WARTFORD, CT STEIRMAN B.G. & B.
DESIGN ENGINEER PROJECT NAME CHARTER DAK BRIDGE HALEY & ALDRICH, INC. SULS ENGINEER PROJECT NO. 63-384 DOATION MISTER COME MAR HOLE NO. 2 /9/ Allegen urface elev. LINE & STATION CHEST STA OFFEET RZE LD. COURS PATER DESIGNATION R. COORDINATE HAMMER WT. WE. AFTER E. COORDINATE HAL MANNER FALL AFTER BLOWS STRATA PER 6 INCHES BEPTIS FIELD IDENTIFICATION OF SOIL CHANGE REC. CON REMARKS (MCL. COLOR, LOSS OF IN PERT BEPTH MACH. SAMPLER wash water sease in rock, etc.) ELEV. - 1000 000 0-6 | 6-12 B2-H V. SOFT RED BOW VARVED CLAY 24 24 3 80-41.0 AND SICTY CLAY W. D. HAM. SAME AS D-9 440-46.0 10 24 24 D 49.5 HARD RED BRN SILT AND CLAY, 24 24 D 37 49.0-51.0 50 title: C-E SANDI trae gravet 48 Compagnition of the HARD RED BEN SILT, SOME C-F SAND, LITTLE M- & GRAVEL, TRAC CLAY 151 12 24 24 D 12 31 37 542-56.0 101 HARD RED GEN SILT, SOME C-E 13 29 24 20 37 41 67 72 \$9.0-61.0 SAND AND C-EGRAVEL, TRACE 78 CLAY - GLACIAL TILL-CT0 Decomposed Bedrock DOILL AME 64.0 10% 1 0 0 CUID @/ 60 60 C 4.4 64.0-69.0 4.5 (ROD = 45%) MOD NARD RID BAN FINE GROWNER 4.5 soundy 51278 rowe, joints close, 4.5 occasionally very close, shallow 4.5 0 dispine occasionally steeply Bodding very thin. Rock shightly weathered, moderate to sughtly frectured. to sughting 75 Bottom, of Exploration at 69.0 ft. MICH CASHED FOR PEET 604 INCH CASING THER TOM STOURD SUMPACE TO 39 FEET USED HOLE KIL R 191 NO. OF MANTLES POOTAGE IN PARTY 64 POOTAGE IN ROCK VEVAIR TEST LP = UNDISTURBED, PRITCH A = AUGER C=CORE D-DRIVE SAMPLE TYPE COMMS: TRACE-1-145 LITTLE = 10-202 AID = 图-图 50MZ = 20-855 PROPORTIONS USED:

PORM SM-1 REV. L/63

APPENDIX C
RESULTS OF LABORATORY TESTING





Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: md
Sample ID: --- Test Date: 07/01/16 Checked By: emm

Depth: --- Test Id: 382158

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
RW-9	UP- 1 - Top	67-69	Moist, reddish brown clay	52.9
RW-9	UP- 1 - Top middle	67-69	Moist, reddish brown clay	47.4
RW-9	UP- 1 - Bottom middle	67-69	Moist, reddish brown clay	45.9
RW-9	UP- 1 - Bottom	67-69	Moist, reddish brown clay	50.8
S1-11	UP- 1 - Top	61-63	Moist, reddish brown clay	40.4
S1-11	UP- 1 - Top middle	61-63	Moist, reddish brown clay	46.0
S1-11	UP- 1 - Bottom middle	61-63	Moist, reddish brown clay	62.6
S1-11	UP- 1 - Bottom	61-63	Moist, reddish brown clay	57.1

Notes: Temperature of Drying: 110° Celsius



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: GA
Sample ID: --- Test Date: 07/01/16 Checked By: emm

Depth: --- Test Id: 382146

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%	
S1-1	UP- 1 - Top	42-44	Moist, reddish brown clay	44.5	
S1-1	UP- 1 - Top middle	42-44	Moist, reddish brown clay	39.4	
S1-1	UP- 1 - Bottom middle	42-44	Moist, reddish brown clay	37.2	
S1-1	UP- 1 - Bottom	42-44	Wet, reddish brown clay	47.0	
RW-2	UP- 1 - Top	37-39	Moist, reddish brown clay	45.4	
RW-2	UP- 1 - Top middle	37-39	Moist, reddish brown clay	51.1	
RW-2	UP- 1 - Bottom middle	37-39	Moist, reddish brown clay	55.4	
RW-2	UP- 1 - Bottom	37-39	Moist, reddish brown clay	49.5	

Notes: Temperature of Drying: 110° Celsius



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: md
Sample ID: --- Test Date: 07/01/16 Checked By: emm

Depth: --- Test Id: 382102

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
RW-9	UP- 3 - Top	76-78	Moist, reddish brown clay	68.9
RW-9	UP- 3 - Top middle	76-78	Moist, reddish brown clay	46.2
RW-9	UP- 3 - Bottom middle	76-78	Moist, reddish brown clay	46.8
RW-9	UP- 3 - Bottom	76-78	Wet, reddish brown clay	53.8
S1-11	UP- 3 - Top	69-71	Moist, reddish brown clay	44.9
S1-11	UP- 3 - Top middle	69-71	Moist, red clay	45.8
S1-11	UP- 3 - Bottom middle	69-71	Moist, reddish brown clay	36.6
S1-11	UP- 3 - Bottom	69-71	Moist, reddish brown clay	36.5

Notes: Temperature of Drying: 110° Celsius



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: jbr Sample ID: --- Test Date: 07/26/16 Checked By: emm

Depth: --- Test Id: 384878

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride	
S1-2	S-2	4-6 ft	Moist, red sand with gravel	7.1	6.5	
S1-5	S-3	10-12 ft	Moist, reddish brown silt with gravel	7.4	6.2	
S1-S12	S-2	5-7 ft	Moist, reddish brown silt with gravel	8.1	7.2	
S2-1	S-4	15-17 ft	Moist, reddish brown silt with gravel	6.8	6.6	
S2-3	S-2	5-7 ft	Moist, reddish brown clay	7.5	7.3	
S-0480-1	S-5	14-16 ft	Moist, olive brown silt	4.5	4.3	
S-0480-2	S-3	9-11 ft	Moist, olive brown silt	6.3	6.0	
S-06043-1	S-2	5-7 ft	Moist, brown sand	7.5	6.8	

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

GTX#: 304831

Test Date: 07/26/16

Tested By: jbr Checked By: emm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹	
S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04	
S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04	
S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04	
S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04	
S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03	
S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04	
S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04	
S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05	

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box

Water added to sample to create a thick slurry prior to testing (saturated condition). Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)

Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.



6100 HILLCROFT PHONE (713) 369-5400

REPORTED TO:

HOUSTON, TEXAS 77081 FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE

REPORT DATE:

08-01-16

(GTX 304831)

CLIENT NUMBER: JOB NUMBER:

04.1115-0003

FOR: GEOTESTING EXPRESS, INC.

ETHAN MARRO

REPORT NUMBER: DATE SAMPLED:

04.1110

125 NAGOG PARK ACTION, MA 01720

TIME SAMPLED:

SAMPLED BY:

CLIENT

DATE RECEIVED:

TIME RECEIVED: RECEIVED BY:

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
_					
S1-S, S-2, 4 – 6'	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12'	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7'	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17'	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7'	297 *	mg/kg	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16'	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11'	355 *	mg/kg	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7'	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio Chemist

SD

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

^{**} WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-1 Sample Type: jar Tested By: GA
Sample ID: S-3 Test Date: 08/03/16 Checked By: emm

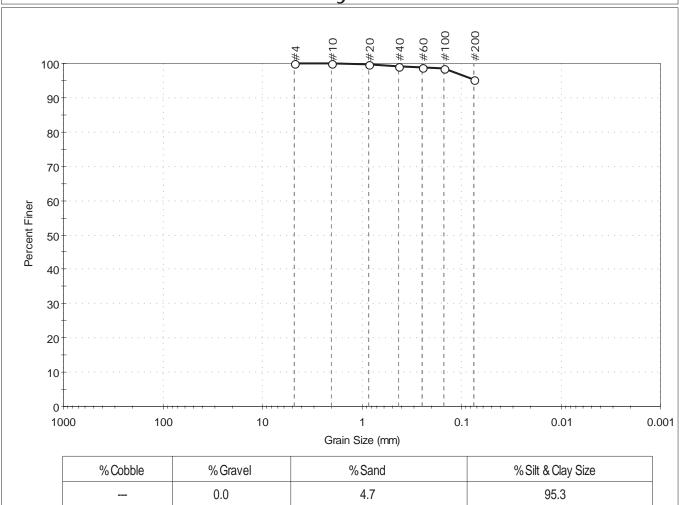
Depth: 10-12 ft Test Id: 384947

Test Comment: ---

Visual Description: Moist, olive gray clay

Sample Comment: ---

Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	98		
#200	0.075	95		

	<u>Coefficients</u>
D ₈₅ = N/A	$D_{30} = N/A$
D ₆₀ = N/A	$D_{15} = N/A$
D ₅₀ = N/A	$D_{10} = N/A$
$C_u = N/A$	$C_{C} = N/A$

GTX-304831

ASTM N/A Classification
AASHTO Silty Soils (A-4 (0))

Sample/Test Description
Sand/Gravel Particle Shape: ---

Sand/Gravel Hardness : ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-2 Sample Type: jar Tested By: GA Test Date: 08/03/16 Checked By: Sample ID: S-3 emm

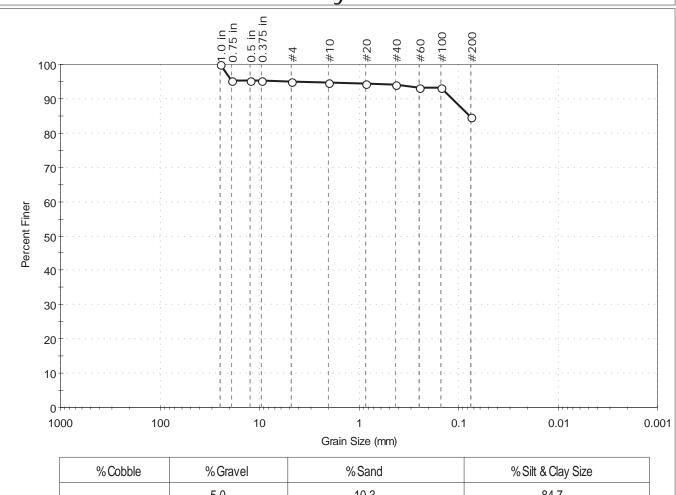
9-11 ft Depth: Test Id: 384936

Test Comment:

Visual Description: Moist, olive silt with sand

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
	5.0	10.3	84.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.0 in	25.00	100		
0.75 in	19.00	95		
0.5 in	12.50	95		
0.375 in	9.50	95		
#4	4.75	95		
#10	2.00	95		
#20	0.85	94		
#40	0.42	94		
#60	0.25	93		
#100	0.15	93		
#200	0.075	85		

<u>Coeff</u>	<u>iicients</u>
$D_{85} = 0.0764 \text{ mm}$	$D_{30} = N/A$
$D_{60} = N/A$	$D_{15} = N/A$
$D_{50} = N/A$	$D_{10} = N/A$
$C_u = N/A$	$C_C = N/A$

GTX-304831

Classification N/A <u>ASTM</u> AASHTO Silty Soils (A-4 (0))

Sample/Test Description Sand/Gravel Particle Shape: ---

Sand/Gravel Hardness: ---

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Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-3 Sample Type: jar Tested By: GA Test Date: Checked By: Sample ID: S-4 08/02/16 emm

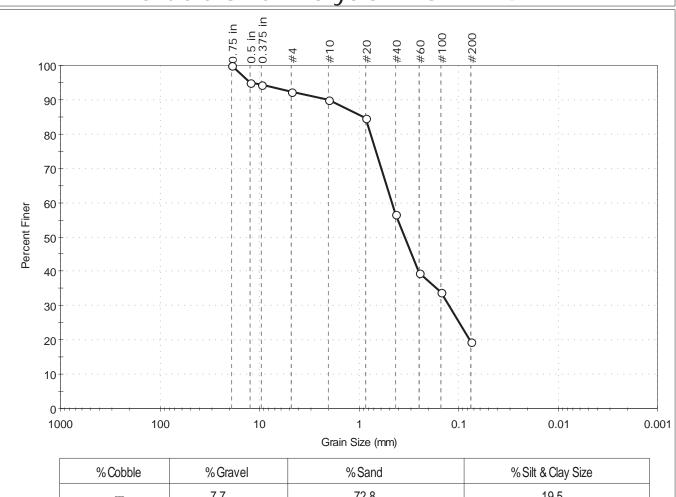
15-17 ft Test Id: 384948 Depth:

Test Comment:

Visual Description: Moist, dark olive gray clayey sand

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
	7.7	72.8	19.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	95		
0.375 in	9.50	94		
#4	4.75	92		
#10	2.00	90		
#20	0.85	85		
#40	0.42	57		
#60	0.25	40		
#100	0.15	34		
#200	0.075	20		

Coeff	<u>icients</u>
D ₈₅ = 0.8815 mm	$D_{30} = 0.1246 \text{ mm}$
D ₆₀ = 0.4623 mm	$D_{15} = N/A$
D ₅₀ = 0.3464 mm	$D_{10} = N/A$
$C_u = N/A$	$C_C = N/A$

GTX-304831

Classification N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR

Sand/Gravel Hardness: HARD

<u>ASTM</u>



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S1-5 Sample Type: jar Tested By: GA Test Date: 08/02/16 Checked By: Sample ID: S-6 emm

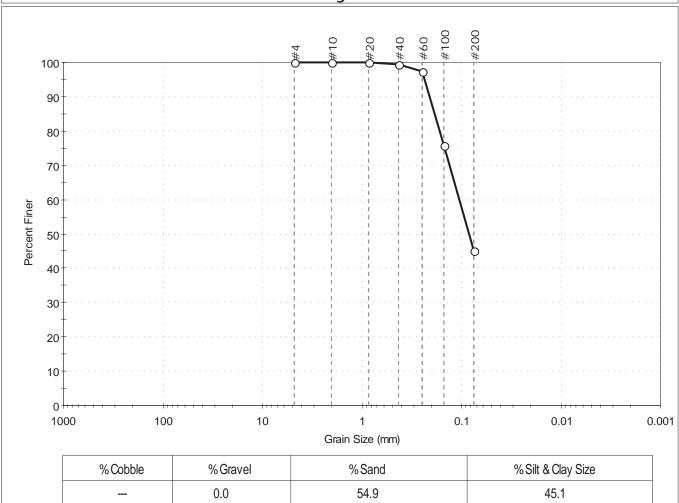
25-27 ft Depth: Test Id: 384949

Test Comment:

Visual Description: Moist, very dark gray clayey sand

Sample Comment:

Particle Size Analysis - ASTM D422



ieve Name	Sieve Size, mm Per	ercent Finer	Spec. Percent	Complies			Coefficients	
		•						
			0.0		54.9		45.1	
	% Cobble		% Gravel		%Sand		% Silt & Clay Size	

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	97		
#100	0.15	76		
#200	0.075	45		

$D_{85} = 0.1870 \text{ mm}$ $D_{30} = N/A$
D85 = 0. 1670 Hilli D30 = N/A
$D_{60} = 0.1051 \text{ mm}$ $D_{15} = N/A$
$D_{50} = 0.0838 \text{ mm}$ $D_{10} = N/A$
$C_u = N/A$ $C_c = N/A$

Project No:

GTX-304831

<u>ASTM</u>	Classification N/A
<u>AASHTO</u>	Silty Soils (A-4 (0))

<u>Sample/Test Description</u> Sand/Gravel Particle Shape : ---Sand/Gravel Hardness: ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S1-6 Sample Type: jar Tested By: GΑ Test Date: Sample ID: S-3 08/02/16 Checked By: emm

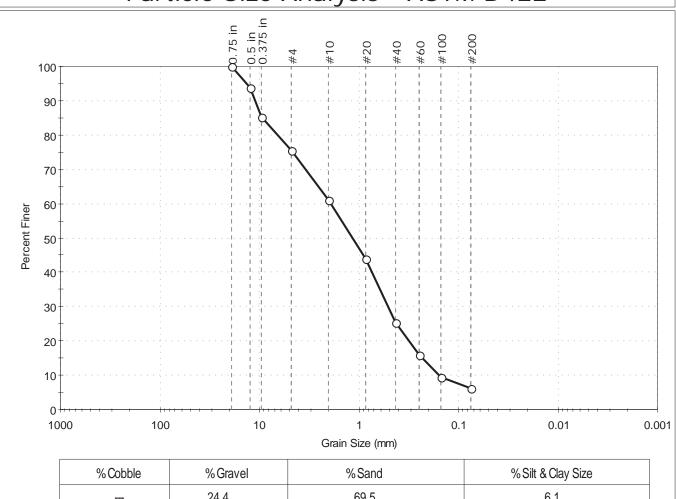
10-12 ft Test Id: 384937 Depth:

Test Comment:

Moist, reddish brown sand with silt and gravel Visual Description:

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
	24.4	69.5	6.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	94		
0.375 in	9.50	85		
#4	4.75	76		
#10	2.00	61		
#20	0.85	44		
#40	0.42	25		
#60	0.25	16		
#100	0.15	9		
#200	0.075	6.1		

<u>Coefficients</u>			
D ₈₅ = 9.2613 mm	$D_{30} = 0.5060 \text{ mm}$		
$D_{60} = 1.9037 \text{ mm}$	$D_{15} = 0.2346 \text{ mm}$		
D ₅₀ = 1.1486 mm	$D_{10} = 0.1580 \text{ mm}$		
$C_u = 12.049$	$C_c = 0.851$		

Project No:

GTX-304831

Classification N/A <u>ASTM</u> <u>AASHTO</u> Stone Fragments, Gravel and Sand

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR

Sand/Gravel Hardness: HARD

(A-1-b(1))



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-7 Sample Type: jar Tested By: GA
Sample ID: S-4 Test Date: 08/02/16 Checked By: emm

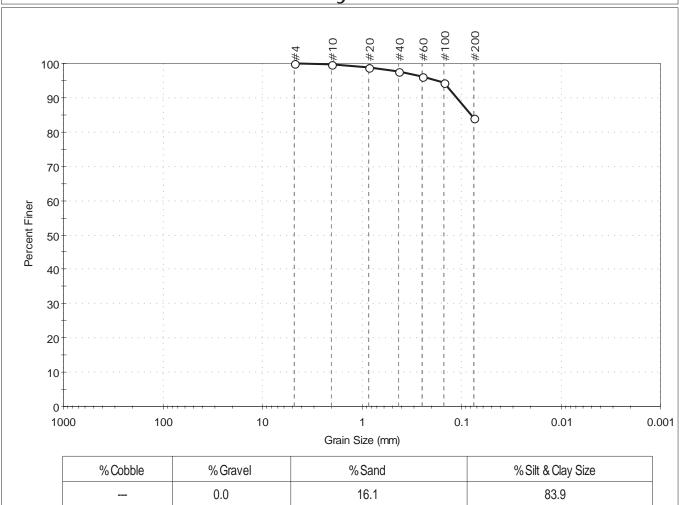
Depth: 15-17 ft Test Id: 384950

Test Comment: ---

Visual Description: Moist, dark gray clay with sand

Sample Comment: ---

Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	98		
#60	0.25	96		
#100	0.15	94		
#200	0.075	84		

<u>Coefficients</u>			
$D_{85} = 0.0805 \text{ mm}$	$D_{30} = N/A$		
$D_{60} = N/A$	$D_{15} = N/A$		
$D_{50} = N/A$	$D_{10} = N/A$		
$C_u = N/A$	C _c =N/A		

GTX-304831

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-9 Sample Type: jar Tested By: GA
Sample ID: S-5 Test Date: 08/03/16 Checked By: emm

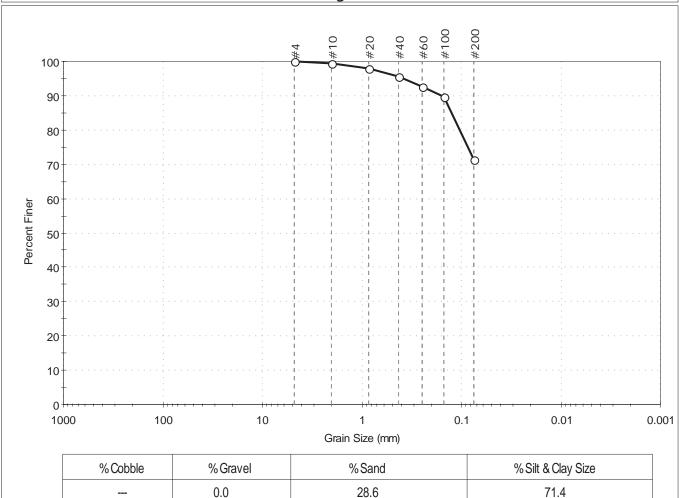
Depth: 20-22 ft Test Id: 384938

Test Comment: ---

Visual Description: Moist, dark gray silt with sand

Sample Comment: ---

Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	98		
#40	0.42	95		
#60	0.25	93		
#100	0.15	90		
#200	0.075	71		

<u>Coefficients</u>				
$D_{85} = 0.1262 \text{ mm}$	$D_{30} = N/A$			
$D_{60} = N/A$	$D_{15} = N/A$			
$D_{50} = N/A$	$D_{10} = N/A$			
$C_u = N/A$	C _c =N/A			

GTX-304831

ASTM N/A Classification

AASHTO Silty Soils (A-4 (0))

Sample/Test Description
Sand/Gravel Particle Shape : --Sand/Gravel Hardness : ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S1-9 Sample Type: jar Tested By: GA
Sample ID: S-7 Test Date: 08/02/16 Checked By: emm

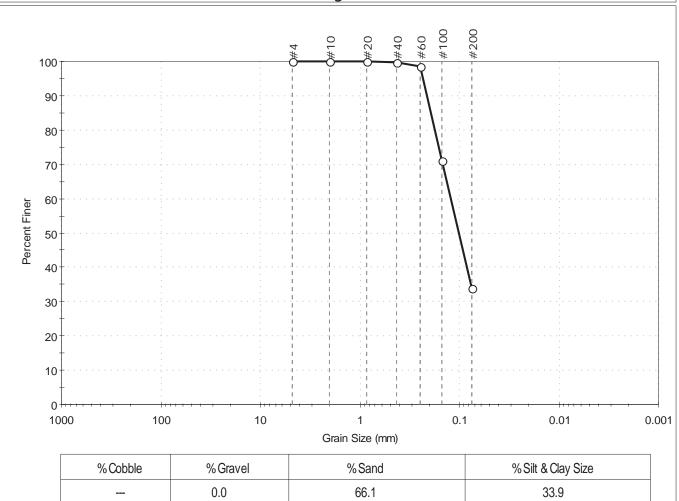
Depth: 30-32 ft Test Id: 384951

Test Comment: ---

Visual Description: Moist, olive silty sand

Sample Comment: ---

Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	98		
#100	0.15	71		
#200	0.075	34		

<u>Coefficients</u>				
$D_{85} = 0.1946 \text{ mm}$	$D_{30} = N/A$			
$D_{60} = 0.1220 \text{ mm}$	$D_{15} = N/A$			
$D_{50} = 0.1012 \text{ mm}$	$D_{10} = N/A$			
$C_u = N/A$	$C_C = N/A$			

Project No:

GTX-304831

ASTM N/A Classification

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-11 Sample Type: jar Tested By: GΑ Sample ID: S-4 Test Date: 08/03/16 Checked By: emm

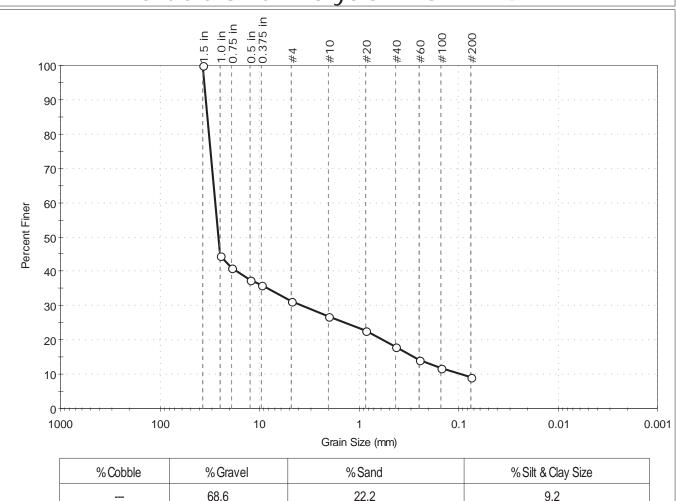
14-16 ft 384939 Depth: Test Id:

Test Comment:

Moist, reddish brown gravel with clay and sand Visual Description:

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	%Silt &Clay Size
	68.6	22.2	9.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1.0 in	25.00	45		
0.75 in	19.00	41		
0.5 in	12.50	38		
0.375 in	9.50	36		
#4	4.75	31		
#10	2.00	27		
#20	0.85	23		
#40	0.42	18		
#60	0.25	14		
#100	0.15	12		
#200	0.075	9.2		

<u>Coefficients</u>					
$D_{85} = 33.6033 \text{ mm}$	$D_{30} = 3.6264 \text{ mm}$				
$D_{60} = 27.9877 \text{ mm}$	$D_{15} = 0.2793 \text{ mm}$				
$D_{50} = 26.0136 \text{ mm}$	$D_{10} = 0.0945 \text{ mm}$				
$C_u = 296.166$	$C_{c} = 4.972$				

GTX-304831

Classification N/A

<u>AASHTO</u> Stone Fragments, Gravel and Sand (A-1-a(1))

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR

Sand/Gravel Hardness: HARD

<u>ASTM</u>



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-1 Sample Type: tube Tested By: GA
Sample ID: UP-1 - Top middle Test Date: 07/14/16 Checked By: emm

GTX-304831

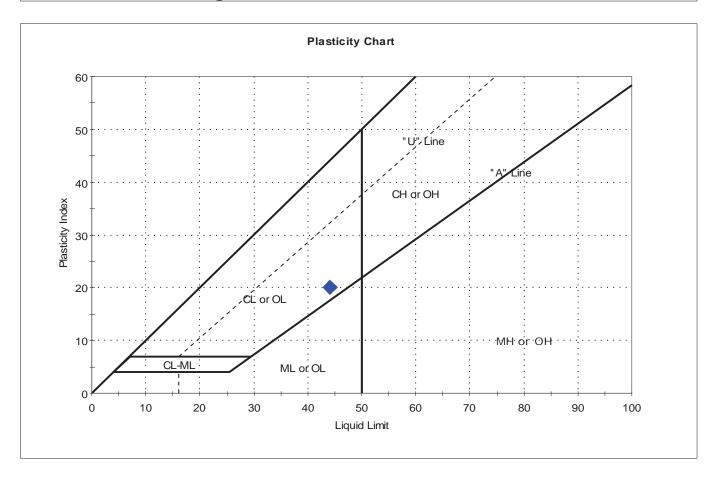
Depth: 42-44 Test Id: 382153

Test Comment: ---

Visual Description: Moist, reddish brown clay

Sample Comment: ----

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Top middle	S1-1	42-44	39	44	24	20	0.8	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW
Toughness: MEDIUM



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-1 Sample Type: tube Tested By: GA
Sample ID: UP-1 - Bottom Test Date: 07/13/16 Checked By: emm

GTX-304831

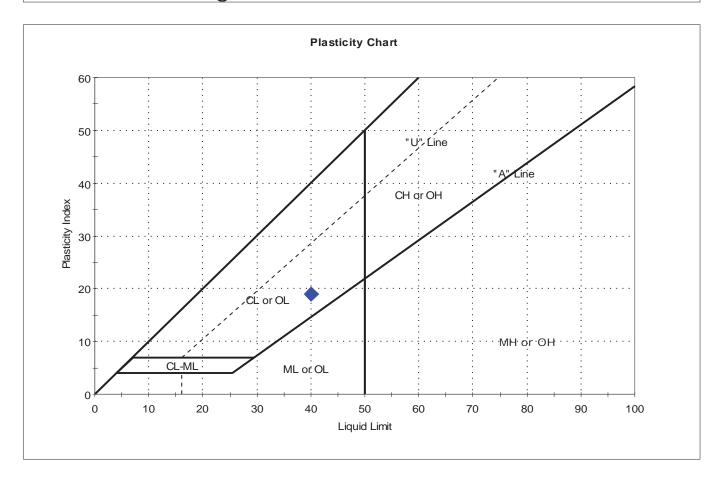
Depth: 42-44 Test Id: 382151

Test Comment: ---

Visual Description: Wet, reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Bottom	S1-1	42-44	47	40	21	19	1.4	

Sample Prepared using the WET method

Dry Strength: HIGH Dilatancy: NONE Toughness: MEDIUM



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-11 Sample Type: tube Tested By: GA
Sample ID: UP-1 - Top middle Test Date: 07/14/16 Checked By: emm

GTX-304831

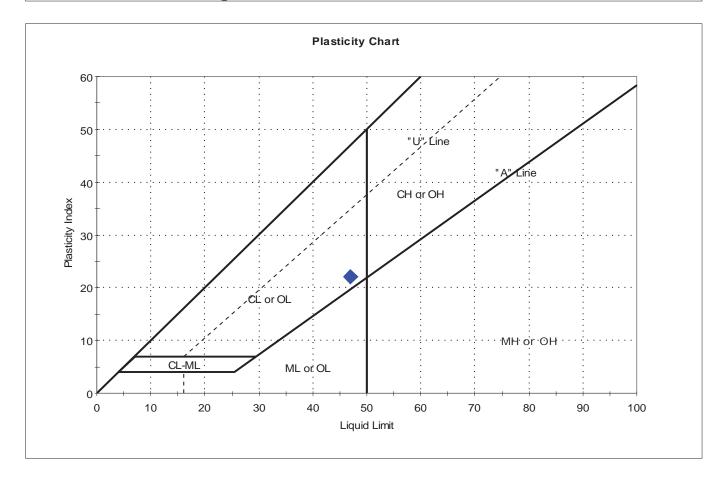
Depth: 61-63 Test Id: 382159

Test Comment: ---

Visual Description: Moist, reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Top middle	S1-11	61-63	46	47	25	22	1	

Sample Prepared using the WET method

Dry Strength: HIGH Dilatancy: SLOW Toughness: MEDIUM



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S1-11 Sample Type: tube Tested By: GA
Sample ID: UP-1 - Bottom Test Date: 07/13/16 Checked By: emm

GTX-304831

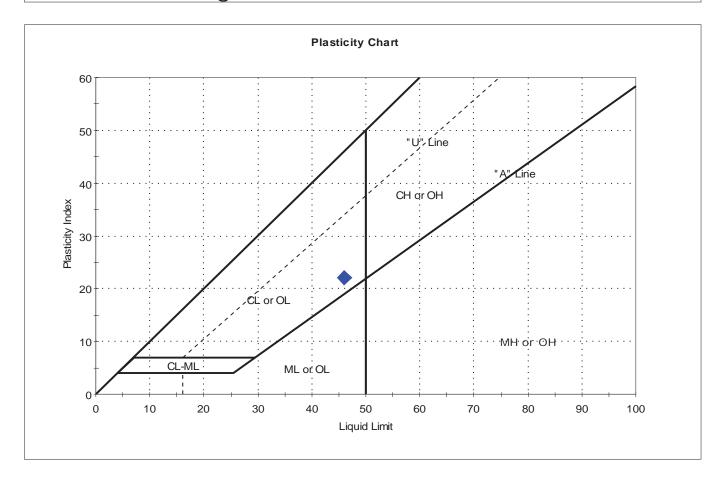
Depth: 61-63 Test Id: 382157

Test Comment: ---

Visual Description: Moist, reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Bottom	S1-11	61-63	57	46	24	22	1.5	

Sample Prepared using the WET method

Dry Strength: HIGH Dilatancy: NONE Toughness: MEDIUM



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S1-11 Sample Type: tube Tested By: GA
Sample ID: UP-3 - Top middle Test Date: 07/14/16 Checked By: emm

Project No:

GTX-304831

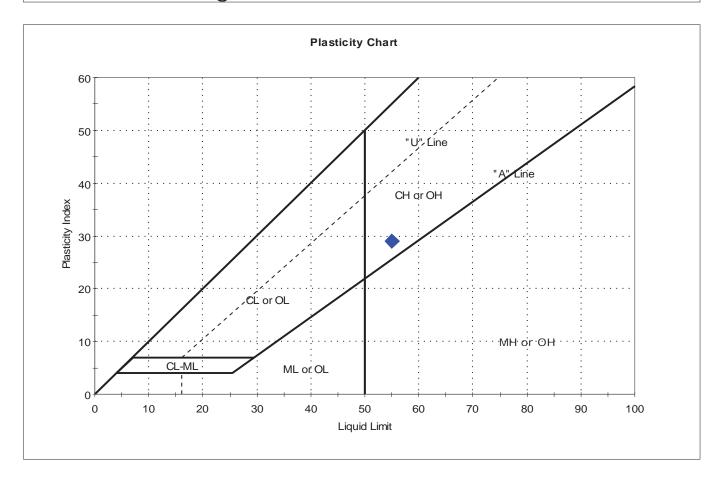
Depth: 69-71 Test Id: 382105

Test Comment: ---

Visual Description: Moist, red clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-3 - Top middle	S1-11	69-71	46	55	26	29	0.7	

Sample Prepared using the WET method

Dry Strength: HIGH Dilatancy: SLOW Toughness: MEDIUM



Project: Reconstruction of Exit Charter Oak Bridge

Location:Hartford, CTProject No:GTX-304831Boring ID:S1-11Sample Type: tubeTested By:GA

Boring ID: S1-11 Sample Type: tube Tested By: GA
Sample ID: UP-3 - Bottom Test Date: 07/13/16 Checked By: emm

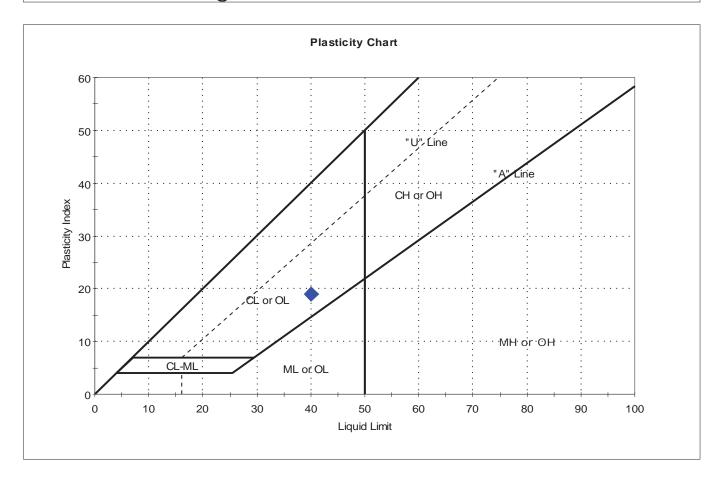
Depth: 69-71 Test Id: 382101

Test Comment: ---

Visual Description: Moist, reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-3 - Bottom	S1-11	69-71	37	40	21	19	0.8	

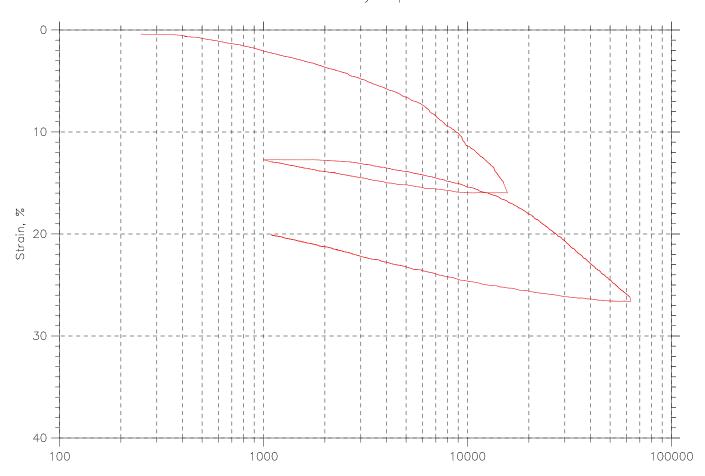
Sample Prepared using the WET method

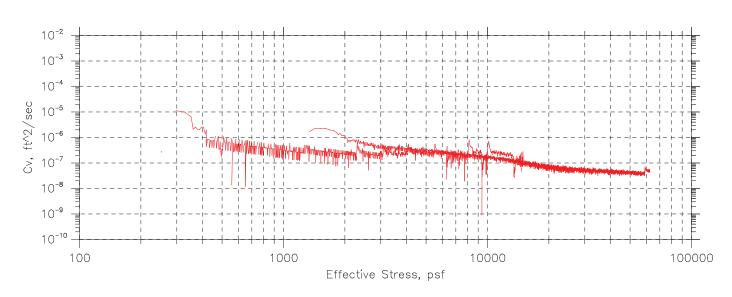
Dry Strength: HIGH Dilatancy: NONE Toughness: MEDIUM



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



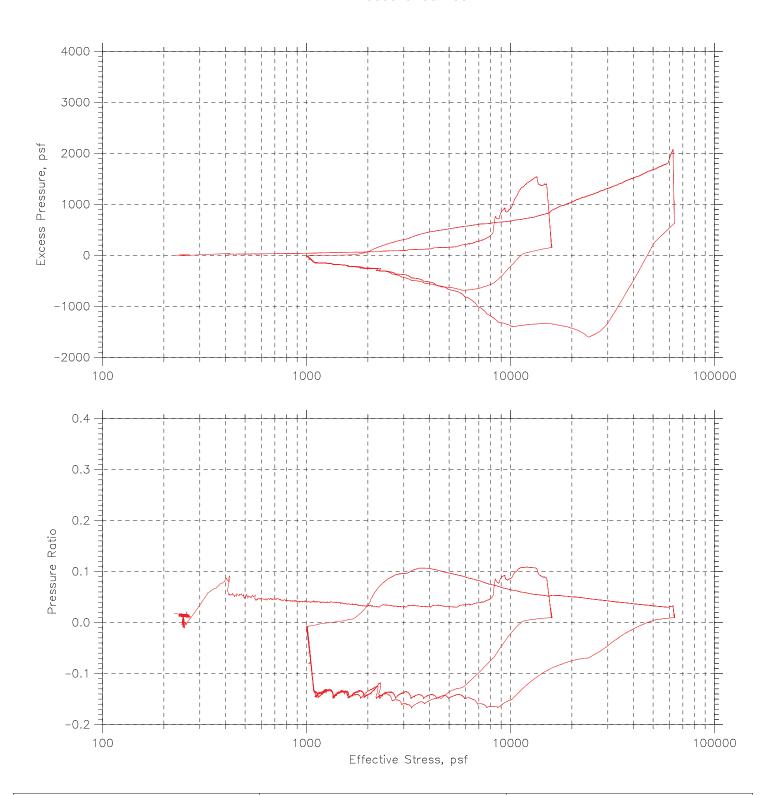


Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 42-44 ft
Test No.: CRC-6	Sample Type: intact	Elevation:
Description: Moist, reddish brown clo	ıy	
Remarks: System X		
		Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 42-44 ft
Test No.: CRC-6	Sample Type: intact	Elevation:
Description: Moist, reddish brown clay		
Remarks: System X		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S1-1 Sample No.: UP-1 Test No.: CRC-6

Location: Hartford, CT Tested By: md Test Date: 06/07/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 42-44 ft Elevation: ---

Soil Description: Moist, reddish brown clay

Remarks: System X

Estimated Specific Gravity: 2.82 Liquid Limit: 40
Initial Void Ratio: 1.34 Plastic Limit: 21
Final Void Ratio: 0.897 Plasticity Index: 19

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.81 in

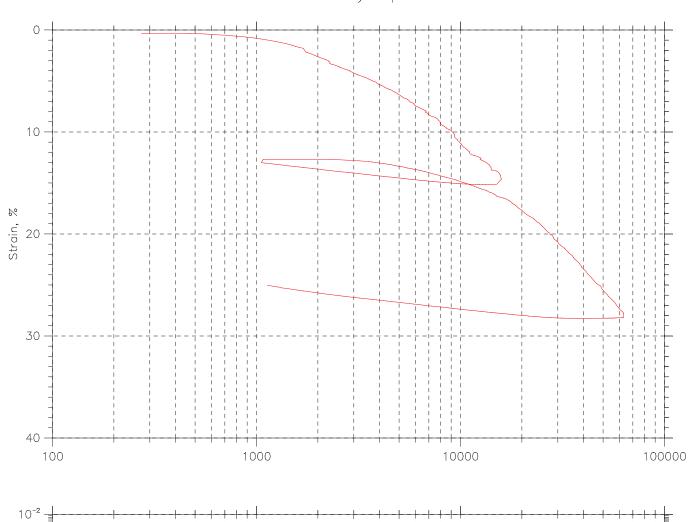
	Before Co	onsolidation Specimen+Ring	After Consol Specimen+Ring	idation Trimmings
	111111111111111111111111111111111111111	Specimen+King	Specimentking	IIIIIIIIIII
Container ID	B-205	RING		a400
Wt. Container + Wet Soil, gm	362.36	251.18	236.65	136.74
Wt. Container + Dry Soil, gm	249.29	205.84	205.84	105.76
Wt. Container, gm	8.4700	109.10	109.10	8.4900
Wt. Dry Soil, gm	240.82	96.739	96.739	97.270
Water Content, %	46.95	46.87	31.85	31.85
Void Ratio		1.34	0.897	
Degree of Saturation, %		98.37	100.00	
Dry Unit Weight, pcf		75.078	92.688	

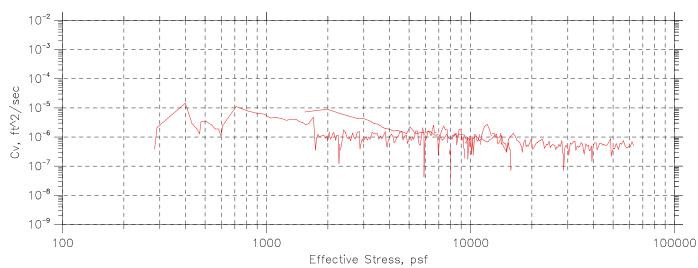
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



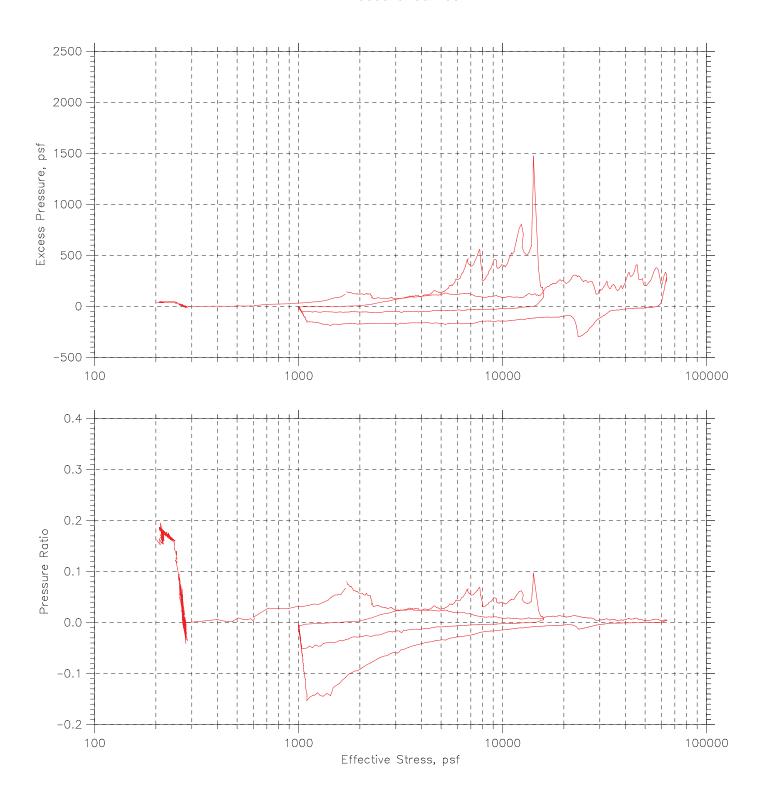


Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 07/13/16	Depth: 61-63 ft
Test No.: CRC-12B	Sample Type: intact	Elevation:
Description: Moist, reddish brown cl	ay	
Remarks: System F		
		Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 07/13/16	Depth: 61-63 ft
Test No.: CRC-12B	Sample Type: intact	Elevation:
Description: Moist, reddish brown clay		
Remarks: System F		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S1-11 Sample No.: UP-1 Test No.: CRC-12B

Location: Hartford, CT Tested By: md Test Date: 07/13/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 61-63 ft Elevation: ---

Soil Description: Moist, reddish brown clay

Remarks: System F

Estimated Specific Gravity: 2.78 Liquid Limit: 46
Initial Void Ratio: 1.22 Plastic Limit: 24
Final Void Ratio: 0.731 Plasticity Index: 22

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.78 in

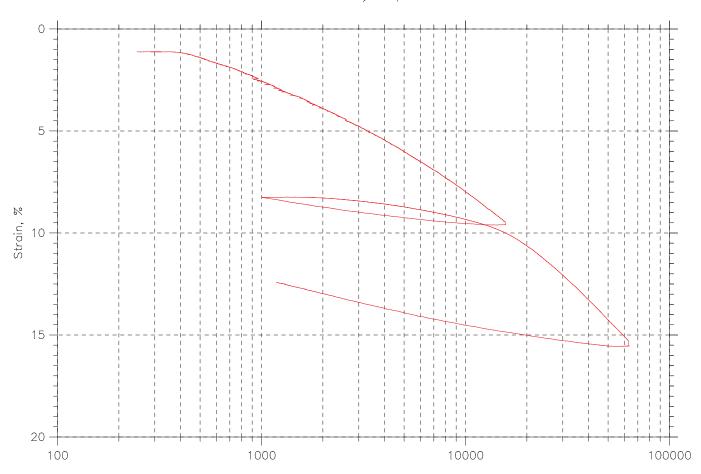
	Before Co	onsolidation Specimen+Ring	After Consol Specimen+Ring	idation Trimmings
	5	1		
Container ID	C-1289	RING		B-591
Wt. Container + Wet Soil, gm	176.32	254.92	237.24	127.03
Wt. Container + Dry Soil, gm	115.26	210.74	210.74	102.25
Wt. Container, gm	8.3700	109.85	109.85	7.9000
Wt. Dry Soil, gm	106.89	100.89	100.89	94.350
Water Content, %	57.12	43.79	26.26	26.26
Void Ratio		1.22	0.731	
Degree of Saturation, %		99.96	100.00	
Dry Unit Weight, pcf		78.300	100.39	

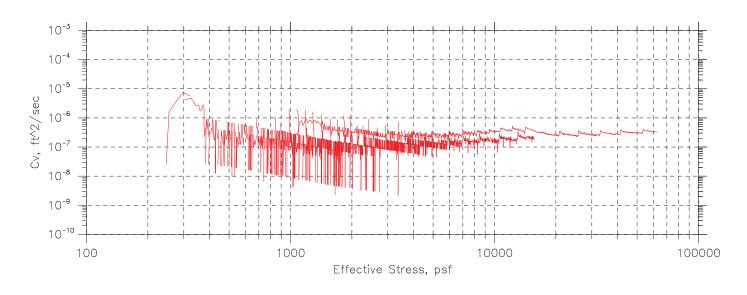
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



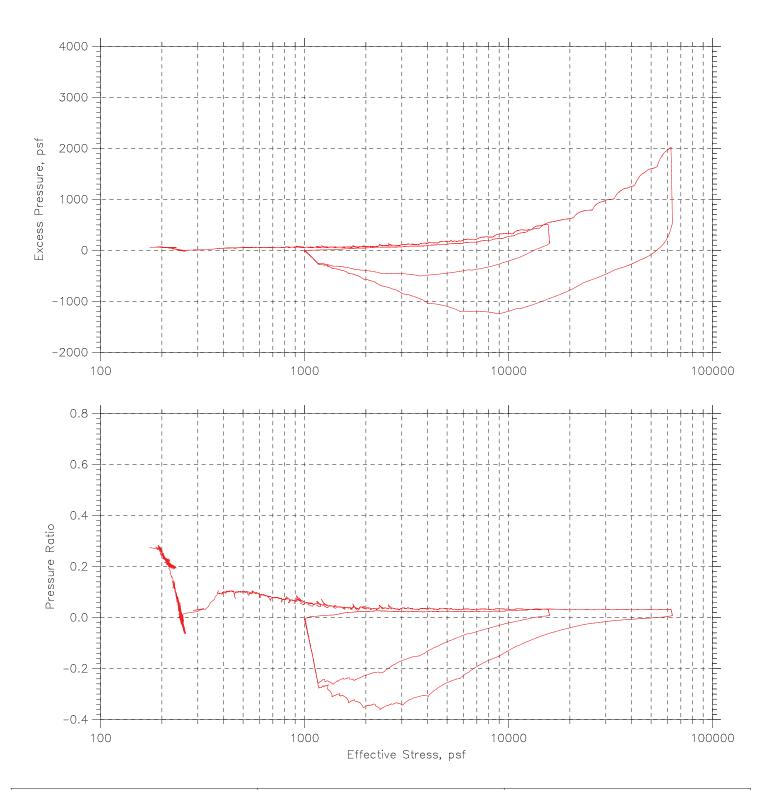


Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-3	Test Date: 06/06/16	Depth: 69-71 ft
Test No.: CRC-3	Sample Type: intact	Elevation:
Description: Moist, reddish brown cl	ay	
Remarks: System F		
		Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-3	Test Date: 06/06/16	Depth: 69-71 ft
Test No.: CRC-3	Sample Type: intact	Elevation:
Description: Moist, reddish brown clay		
Remarks: System F		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S1-11 Sample No.: UP-3 Test No.: CRC-3

Location: Hartford, CT Tested By: md Test Date: 06/06/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 69-71 ft Elevation: ---

Soil Description: Moist, reddish brown clay

Remarks: System F

Estimated Specific Gravity: 2.86 Liquid Limit: 40
Initial Void Ratio: 1.02 Plastic Limit: 21
Final Void Ratio: 0.834 Plasticity Index: 19

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.91 in

	Before Co	nsolidation	After Consol	idation
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	A-583	RING		B572
Wt. Container + Wet Soil, gm	171.15	263.65	256.58	156.03
Wt. Container + Dry Soil, gm	127.59	223.28	223.28	122.78
Wt. Container, gm	8.3600	109.19	109.19	8.8500
Wt. Dry Soil, gm	119.23	114.09	114.09	113.93
Water Content, %	36.53	35.38	29.18	29.18
Void Ratio		1.02	0.834	
Degree of Saturation, %		99.58	100.00	
Dry Unit Weight, pcf		88.545	97.302	

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Project:

Depth:

Reconstruction of Exit Charter Oak Bridge Location: Hartford, CT

Boring ID: ---Sample Type: ---Tested By: daa Sample ID: ---Test Date: Checked By: 06/27/16 Test Id:

Project No:

381989

GTX-304831

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density,	Compressive strength,	Failure Type	Meets ASTM D4543	Note(s)
			рсі	μsi			
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*
S1466-1	C2	49.5-50 ft	160	8511	3	Yes	
S2-1	C2	98.5-99 ft	164	7103	3	Yes	
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*

Density determined on core samples by measuring dimensions and weight and then calculating. Notes:

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

- 1: Best effort end preparation. See Tolerance report for details.
- 2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
- 3: Specimen L/D < 2.
- 4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
- 5: Specimen diameter is less than 10 times maximum particle size.
- 6: Specimen diameter is less than 6 times maximum particle size.

^{*}Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

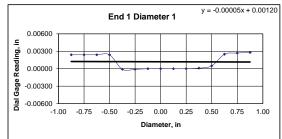


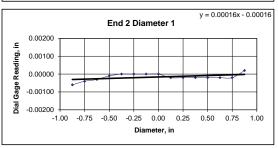
Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	ric
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S1-12		
Sample ID:	C1		
Depth:	112.5-113 ft		
Visual Description:	See photographs		

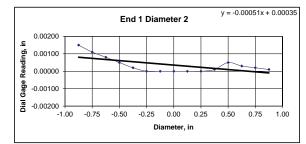
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

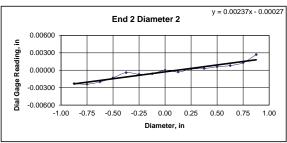
BULK DENSITY					DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average			
Specimen Length, in:	4.47	4.47	4.47		Maximum gap between side of core and reference surface plate:	
Specimen Diameter, in:	1.98	1.99	1.99		Is the maximum gap ≤ 0.02 in.? YES	
Specimen Mass, g:	598.58					
Bulk Density, lb/ft3	165	Minimum Diameter Tolerence Me	et?	YES	Maximum difference must be < 0.020 in.	
Length to Diameter Ratio:	2.3	Length to Diameter Ratio Tolerar	nce Met?	YES	Straightness Tolerance Met? YES	

END FLATNESS AND PARALL	ELISM (Proced	lure FP1)													
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00240	0.00240	0.00240	0.00240	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00050	0.00250	0.00270	0.00280
Diameter 2, in (rotated 90°)	0.00150	0.00110	0.00080	0.00050	0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00050	0.00030	0.00020	0.00010
											Difference between	en max and m	in readings, in:		
											0° =	0.00290	90° =	0.00150	
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00060	-0.00040	-0.00030	-0.00010	0.00000	0.00000	0.00000	0.00000	-0.00020	-0.00020	-0.00020	-0.00020	-0.00020	-0.00020	0.00020
Diameter 2, in (rotated 90°)	-0.00230	-0.00240	-0.00200	-0.00130	-0.00040	-0.00070	-0.00060	0.00000	-0.00030	0.00020	0.00030	0.00060	0.00080	0.00130	0.00270
											Difference between	en max and m	in readings, in:		
											0° =	0.0008	90° =	0.0051	
											Maximum differe	ence must be <	0.0020 in.	Difference = +	0.00255









DIAMETER 1			
Fnd 1:			
Liid 1.	Slope of Best Fit Line	0.00005	
	Angle of Best Fit Line:	0.00286	
End 2:			
	Slope of Best Fit Line	0.00051	
	Angle of Best Fit Line:	0.02922	
Maximum Ang	ular Difference:	0.02636	
	Parallelism Tolerance Met? Spherically Seated	NO	
DIAMETER 2		NO	
	Spherically Seated	NO	
DIAMETER 2 End 1:	Spherically Seated		
	Spherically Seated		
	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line:	0.00016	
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line	0.00016 0.00917 0.00237	
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line:	0.00016 0.00917	
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line	0.00016 0.00917 0.00237	

Flatness Tolerance Met? NO

PERPENDICULARITY (Proced						
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be $\leq 0.25^{\circ}$
Diameter 1, in	0.00290	1.985	0.00146	0.084	YES	
Diameter 2, in (rotated 90°)	0.00150	1.985	0.00076	0.043	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00080	1.985	0.00040	0.023	YES	
Diameter 2, in (rotated 90°)	0.00510	1.985	0.00257	0.147	YES	



Client:	Freeman Companies, LLC	Test Date: 6/24/2016
Project Name: Project Location:	Reconstruction of Exit Charter Oak Bridge Hartford, CT	Tested By: rlc Checked By: jsc
GTX #:	304831	
Boring ID:	S1-12	Tolerance measurements were performed using
Sample ID:	C1	a machinist straightedge and feeler gauges to ASTM specifications.
Depth:	112.5-113 ft	no twi specifications.
Visual Description:	See photographs	

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1 Is the maximum gap $\leq \pm 0.001$ in.? YES Diameter 2 (rotated 90°) Is the maximum gap $\leq \pm 0.001$ in.? YES

END 2

Diameter 1 Is the maximum gap $\leq \pm 0.001$ in.? YES Diameter 2 (rotated 90°) Is the maximum gap $\leq \pm 0.001$ in.? YES

End Flatness Tolerance Met? YES



Client: Freeman Companies, LLC Project Name: Reconstruction of Exit Charter Oak Bridge Project Location: Hartford, CT GTX #: 304831 Test Date: 6/25/2016 Tested By: daa Checked By: jsc Boring ID: S1-12 Sample ID: C1 Depth, ft: 112.5-113



After cutting and grinding



After break

APPENDIX D DRAFT SPECIAL PROVISIONS



ITEM #0203xxxA - EQUIPMENT WORKING PAD

Description:

Form 817, Section 203, Structure Excavation shall apply with the following amendments:

Article 2.03.03 – Construction Methods: Insert the following provisions at the end of Item 2, Preparation of Foundations:

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. Working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment.

ITEM #0702081A- BITUMINOUS COATING FOR STEELPILES

Description: Work under this item shall consist of furnishing and applying bituminous coating to steel piles. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This work shall also include field applied touch ups to coating damaged during shipping and handling.

Materials: Provide bituminous coating for all piles. Bituminous coating shall consist of canal liner bituminous in accordance with ASTM D 2521. It shall have a softening point of 190°F to 200°F a penetration of 56 to 61 at 77°F and a ductility in excess of 1.38 in. at 77°F. Primer shall be in accordance with AASHTO M 116.

Construction Methods:

- A. All surfaces to be coated with bituminous shall be dry and thoroughly cleaned of dust and loose materials.
- B. Primer or bituminous shall not be applied in wet weather, nor when the ambient temperature is below 65°F.
- C. Application of the prime coat shall be with a brush or other approved means and in a manner which thoroughly coats the surface of the piling with a continuous film of primer. The primer shall have set thoroughly before the bituminous coating is applied. The bituminous shall be heated to 300°F and applied at a temperature between 200° and 300°F by means of one or more mop coats or other approved means.
- D. The average coating thickness shall be 1/16".
- E. Whitewashing of the coating may be required during hot weather as directed to prevent running or sagging of the asphalt coating prior to driving of the pile.
- F. Bituminous coated piles shall be protected from sunlight or heat immediately after the coating is applied.
- G. The bituminous coating shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bituminous coating has been applied, dragging the piles on the ground or the use of cable wraps around the piles during handling will not be permitted. Pad eyes, or other suitable devices, shall be attached to the piles to be used for lifting and handling.
- H. Where Field splices are required the bituminous coating shall be removed in the splice area. After completing the field splice, the splice area shall be brush coated or mop coated with a minimum of one coat of bituminous material as directed.

Method of Measurement: Bituminous coating will be measured per linear foot of pile coated.

Basis of Payment: Payment shall be made at the contract unit price per linear foot of pile coated. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete

ITEM #0702109A- PRE-AUGERING OF PILES

ITEM #0702111A- DRIVING STEEL PILES

Work under this item shall conform to the requirements of Section 7.02 of Form 817 as replaced by the special provision for Section 7.02 in this contract, amended as follows:

7.02.01- Description: Add the following:

Work under this Item includes pre-augering for piles as indicated on the Plans or as ordered by the Engineer.

7.02.03.2(a) - Construction Methods - Pile Driving Equipment - Hammers: Replace the second paragraph with the following:

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for hammers used shall be 26,000-foot pounds (35,000 joules) for driving steel piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

7.02.03.2(7) - Construction Methods - Pile Driving Equipment - Pre-Augering: Add the following:

The following apply when pre-auguring is done for piles with bituminous and epoxy coating:

The pre-augered hole is to continue to the top of the clay layer or to the depths shown on the plans or as directed by the Engineer. The pre-augered hole diameter shall be at least the diagonal dimension of the pile, or as directed by the Engineer. All obstructions which could interfere with the driving of piles within the depth of pre-augering are to be removed as part of the pre-auguring work.

The Contractor shall provide temporary casing to maintain the pre-augured dimension of the hole. Upon completion of pile driving, the annulus between the pile and outer hole diameter shall be filled with clean sand and any temporary casing will be removed.

30

7.02.05.11 - Basis of Payment - Pre-Augering of Piles: Add the following:

This work shall also include obstruction removal, casing, and sand backfill

ITEM #0207150A - LIGHTWEIGHT FILL

Description: Work shall consist of furnishing and placing lightweight fill in the formation of embankments or as backfill in front of and behind structures. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This item shall also consist of furnishing and placing crushed stone or gravel in burlap bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.

Materials: Lightweight fill shall be a rotary kiln expanded shale aggregate meeting the requirements of ASTM C 330. No by-product slags, cinders or by-products of coal combustion shall be permitted. The aggregate shall consist of tough, durable, non-corrosive particles with the following gradation:

Square Mesh Sieve	Percent Passing by Weight
1 inch	100
¾ inch	90 - 100
3/8 inch	10 - 50
No. 4	0 - 15

The dry loose unit weight shall be less than 50 pounds per cubic feet (pcf). The lightweight aggregate supplier shall submit verification of an in-place compacted total unit weight (by methods defined in AASHTO T99) of less than 65 pcf. For purposes of this specification, the total unit weight is defined as the maximum dry density multiplied by one plus the moisture content (as a decimal). For example, if the maximum dry density is 45 pcf and the moisture content is 9%, the total unit weight is 49 pcf.

The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10 percent (ASTM C 88). The maximum Los Angeles Abrasion loss when tested in accordance with ASTM C 131 (B grading) shall be 40 percent.

The lightweight aggregate producer shall submit verification that the angle of internal friction is equal to or greater than 40 degrees when measured in a triaxial compression test on a laboratory sample with a minimum diameter of 250mm.

The materials for bagged stone shall conform to the following requirements: the crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both; the bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

ITEM #0702150A 0042-0304 191 Construction Methods: When applicable and except where noted below, lightweight fill placement shall conform to the requirements of Sections 2.02.03 and 2.16.03 of the Standard Specifications, Form 817.

The lightweight fill shall be placed in layers of a thickness of 1.5 ft to a maximum of 2.0 ft. Each layer shall be compacted by the use of self-propelled vibratory compaction equipment with static mass (weight) less than 6,600 lbs. The minimum number of passes shall be two (2) and the maximum four (4). The actual lift thickness and exact number of passes shall be determined by the Engineer depending on the type of compaction equipment. The contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for compaction, shall not be operated on the exposed lightweight fill.

Where weep holes are installed within the limits of the lightweight fill, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the lightweight fill material into the weep hole. Approximately one cubic foot of crushed stone or gravel shall be enclosed in each of the burlap bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time lightweight fill material is placed around them and bags which are broken or burst prior to or during the placing of the lightweight fill material shall be replaced at the expense of the contractor.

Method of Measurement: Lightweight fill shall be measured in place after compaction, including allowances for settlement. There shall be no direct payment for bagged stone, but the cost thereof shall be considered as included in the cost of the work for "Lightweight Fill".

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "Lightweight Fill", complete in place, which price shall include all materials, transportation, tools, equipment and labor incidental thereto.

 $\begin{array}{ccc} \textbf{Pay Item} & \textbf{Pay Unit} \\ \textbf{Lightweight Fill} & \textbf{c.y.} \end{array}$

ITEM #0702150A 0042-0304 192



Geotechnical Report
Bridge 00480, I-91 over Airport Road
Relocation of I-91 NB Interchange 29 and Widening of I-91 NB and Rt. 15 and I-84 EB
State Project No. 63-703
Hartford, Connecticut

December 28, 2016

Freeman Project No.: 2014-1001

Prepared for:
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TABLE OF CONTENTS

1.0	INTRODUCTION	2
1.1	Summary	2
1.2	Scope of Work	2
1.3	Authorization	2
1.4	Project Vertical Datum	2
2.0	SITE AND PROJECT DESCRIPTION	2
2.1	Site Description	
2.2	Existing Bridge	
2.3	Proposed Modifications	3
3.0	EXPLORATIONS	3
3.1	Recent Explorations	
3.2	Previous Subsurface Explorations	4
3.3	Laboratory Testing	4
4.0	SUBSURFACE CONDITIONS	4
4.1	Subsurface Conditions	
5.0	GEOTECHNICAL ENGINEERING RECOMMENDATIONS	5
5.1	Recommended Soil Properties	5
5.2	Foundation Design Recommendations	6
6.0	CONSTRUCTION CONSIDERATIONS	7
6.1	Excavation	7
6.2	Micropile Installation	7
6.3	Pile Cap Bearing Surface Preparation	7
6.4	Temporary Lateral Support	7
6.5	Excavation Dewatering	
6.6	Reuse of Existing Soils	
7.0	FUTURE SERVICES AND LIMITATIONS	

ATTACHMENTS

Table

1. Summary of Subsurface Data

Figures

- Site Location Map
 Subsurface Exploration Location Plan
- 3. Subsurface Profiles
- 4. Lateral Earth Pressures Active

Appendices

- A. Recent Exploration LogsB. Previous Test Boring Logs
- C. Results of Laboratory Testing
- D. Results of L-Pile Analyses



1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for the proposed improvements to Bridge 00480. The bridge carries Interstate 91 over Airport Road in Hartford, Connecticut.

The proposed improvements include widening the bridge on the northbound (east) side by 14 feet. We recommend that the bridge be supported on drilled micropiles socketed into bedrock to avoid critical utilities located within the proposed widening. Our detailed foundation design recommendations follow.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions and prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88. Contract documents for the existing bridge reference NGVD-29. To convert elevations in NGVD-29 to NAVD-88, subtract 0.86 feet.

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site Description

Bridge 00480 carries I-91 over Airport Road. I-91 Northbound has three travel lanes with breakdown lanes on each side. I-91 Southbound has three travel lanes, a right side off-ramp, and breakdown lanes on each side. Airport Road has two travel lanes in each direction. Bridge grade is about El. 31; Airport Road grade is about El. 14.

Several utilities are located close to the bridge. Two 68-inch by 106-inch elliptical RCP pipes extend southwest toward the bridge from a drainage ditch (wetland) located northeast of the bridge, and are carried beneath the bridge above a water line in a junction box. A 36-inch diameter water main runs beneath the bridge parallel to Airport Road. Telephone and electrical utilities are also present.



2.2 Existing Bridge

Existing bridge parameters are as follows:

Type: Single span composite steel bridge

Length/Width: 109 feet long, 139 feet wide

Support: Two abutments with U-type wingwalls

Bottom of Structure: North Abutment El. 4.8 (west side) to 7.7 (east side)

South Abutment El. 2.7 (west side) to 6.3 (east side)

Foundations: 12BP53 Steel H-Piles, approximately 50% battered 1H:3V

2.3 Proposed Modifications

Bridge 00480 will be widened by 14 feet on the Northbound (east) side. The proposed widening will provide a fourth travel lane. Abutments will be extended on the Northbound side to support the widened bridge. The proposed widening must avoid the various utilities that run beneath the bridge.

The proposed widening will require approach embankment fills on the Northbound side. Proposed slopes range from 2 horizontal to 1 vertical (2H:1V) in areas where there is sufficient space to place embankment fill, to 1.5H:1V due to wetlands at the toe of slope or limited Right-of-Way. Embankment slopes are discussed in a separate report.

3.0 EXPLORATIONS

3.1 Recent Explorations

Recent explorations included two test borings (S-480-1, S-480-2) and one Cone Penetrometer Test (CPT480-1) conducted May 9 to 10, 2016, and on June 13, 2016, respectively. The test borings were drilled by New England Boring Contractors, Inc., of Glastonbury, Connecticut, and the Cone Penetrometer Test (CPT) was conducted by ConeTec, of West Berlin, New Jersey. Test borings were drilled adjacent to the north and south abutments on the east side; the CPT was drilled in the median of Airport Road on the east side of the bridge. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

Test borings S-480-1 and S-480-2-OW were drilled to depths of 59 to 59.5 feet below ground surface. Standard Penetration Tests were conducted at maximum 5 foot intervals and two five-foot-long NX-size rock core samples were recovered from each boring. Boring S-480-1 was backfilled with drill cuttings. Boring S-480-2 OW was backfilled with well materials and a roadway box was placed at ground surface to protect the installation.

CPT-480-1 was drilled to a depth of 42.5 feet below ground surface. The CPT was advanced using standard CPT push techniques, and the subsurface data was recorded continuously by a piezocone mounted on the tip.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Exploration Logs. The CPT log prepared by ConeTec is also included in Appendix A.



3.2 Previous Subsurface Explorations

Several previous test borings, B-22 through B-25 were drilled for Bridge 00480, and are applicable to the proposed widening. Boring logs are shown in profile on the contact drawings in Appendix B, Previous Explorations.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Two pH tests, two electrical resistivity tests, and two soluble sulfate tests
- One grain size analysis
- One unconfined compression test on a rock core sample.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Results of Laboratory Testing.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered generally consist of sand and silt, Varved Clay, and Glacial Till overlying bedrock as described below. A subsurface profile along the proposed structure is shown on Figure 3, Subsurface Profile. Subsurface data are summarized on Table I included at the end of the report.

THICKNESS (FT)	STRATUM	GENERALIZED DESCRIPTION
7 to 14	Fill	Loose to very dense, brown to gray c-f SAND, some silt, little c-f gravel, trace brick and wood. Standard Penetration Test N-Values typically ranged from 9 to 63 blows per foot (bpf).
6 to 12	Alluvium	Very loose to medium dense gray clayey SILT, to gray f SAND, some silt, trace f gravel. SPT N-Values ranged from about 1 to 20 bpf.
4 to 7	Lacustrine	Soft to medium stiff brown CLAY, trace fine sand. SPT N-Values ranged from 3 to 4 bpf.
4 to 17	Glacial Till	Very dense, red to brown, SILT and f GRAVEL, some f sand, some silt, with rock fragments. Red-brown, c-f SAND, some clayey silt, some c-f gravel. SPT N-Values ranged from 56 to more than 100 bpf.
	Bedrock	Red-brown, fresh to slightly weathered, strong ARKOSE, with low angle bedding joints and occasional fractured zones. Results of an unconfined compression test indicated an unconfined compression strength of 8,063 pounds per square inch.



Groundwater – Water was encountered in the borings at depths ranging from 0 to 13 feet, corresponding to El 2 to El. 10. However, groundwater levels were measured during drilling activities and may not represent static levels. Observation well S-480-2 OW was dry at 13.7 feet (El. 1.1) five months after the well was installed. This measurement was made following a period of relatively dry weather. Water levels will vary with season, water levels in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – Corrosion testing was conducted on samples recovered from test borings S-480-1 (Abutment 1) and S-480-2 OW (Abutment 2). Results are summarized below:

Test parameter	S-480-1, 14'-16'	S-480-2 OW, 9'-11'
Ph	4.5	6.3
Electrical Resistivity (ohm-cm)	3,099	1,892
Sulfates (ppm)	543	355

Soil with a pH value lower than 5.5, or soil with electrical resistivity less than 2,000 ohm-cm, or sulfates greater than 1,000 ppm is considered to be a "potential pile deterioration or corrosion situation" per AASHTO 10.7.5.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Recommended Soil Properties

STRATUM	TOTAL UNIT	DRAINED S		UNDI	RAINED STRENGTH PARAMETERS
	WEIGHT (PCF)	PARAMI	ETERS		
		Friction	Cohesion	Friction	Cohesion (psf)
		Angle (deg)	(psf)	Angle (deg)	Concaton (par)
New Fill – Pervious	125	34	0		
Structure Backfill or Pavement Section					
Existing Fill	115	30	0		
Alluvium	115	30	0		
Varved Clay	115			0	Triaxial: Su = 0.21 x OCR^0.7 x Eff Stress (1) DSS: Su = 0.16 x OCR^0.7 x Eff Stress (1) 1,000 (minimum)
Glacial Till	130	35	0		

⁽¹⁾ Undrained strength relationships were determined by laboratory testing in a previous report prepared by Haley & Aldrich titled "Geotechnical Laboratory Data Report, Charter Oak Bridge and Approaches, Hartford-East Hartford, Connecticut, State Project No. 63-384", dated May 1987.

Bedrock is assumed to have a total unit weight of 160 pounds per cubic foot and an unconfined compression strength of 8,000 pounds per square inch based on the results of laboratory testing.



5.2 Foundation Design Recommendations

The existing bridge is supported on Steel H-Piles. Considering the various utilities in the vicinity of the proposed widening, we recommend that the bridge widening be supported on micropiles drilled into bedrock. Design recommendations are provided below:

- Footings or Pile Cap Foundation Depth: Minimum of 4 feet below the lowest adjacent ground surface.
- Backfill Material: Pervious Structure Backfill (CTDOT Form 817 M.02.05) behind the abutments and abutment wingwalls. Place above a line defined by a 1V:1.5H slope extending up from the heel of the footing to grade.
- Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.
- Lateral Earth Pressures: Refer to Figure 4 Active Earth Pressures
- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D, Stiff Soils.
- **Micropile Design:** Design micropiles with a 10-inch diameter bonded zone socketed into bedrock. Design Micropiles as Type A.
- **Corrosion Protection:** Soils are considered corrosive per AASHTO 10.7.5. Provide double corrosion protection (bar surrounded by grout covered by plastic sheath surrounded by grout).
- Strength Limit Axial Compression: 576 kips assuming a grout-to-rock bond strength of 11 ksf, and a 20-foot-long bonded length in rock. The low estimated bond strength reflects the low RQD values in the rock cores. Other capacities can be obtained by shortening or lengthening the bonded length
- Service Limit (Allowable) Axial Compression: 290 kips, assuming a grout-to-rock bond strength of 11 ksf, a 20-foot-long bonded length in rock, and a resistance factor of 0.5 (AASHTO Table 10.5.5.2.5-1)
- Minimum Spacing: Minimum 30 inches or 3 times the pile diameter, whichever is greater (AASHTO 10.9.1.2)
- Settlement: Maximum total settlement of micropile is estimated at less than ¼ inch. This settlement will occur during construction. Settlement due to filling behind the widened abutment is also expected to result in less than ¼ inch. This settlement is not sufficient to trigger downdrag loads on piles.
- Load Tests: We recommend that a minimum of two load tests be required for this project, one at each abutment.
- Lateral Resistance: Install micropiles in batter where needed to resist lateral loads. Additional lateral loading in bending will be provided once pile loading has been established. For a micropile with a 9.625-inch O.D. outer casing and a No. 28 central rebar, the following lateral loads and deflections were calculated using the computer program L-Pile. Results are presented in Appendix D.

Head Condition	Lateral Load (kips)	Deflection At Top (Inch)
Fixed Head	24	1
Fixed Head	15	1/2
Free Head	7	1

- Drilling: Use casing through soil.
- Subgrade Preparation Below Pile Cap: Recommend minimum 12-inch thick layer of crushed stone overlying separation fabric over the subgrade.
- Approach Slab: Recommended to reduce abrupt transition from earth to pile support.
- Estimated Pile Length: Estimated lengths are provided in the table below:

Substructure	Bottom of Structure El.	Estimated Pile Length* (Ft.)
North Abutment	7.7	60
East Wingwall	7.7 to 20.6	60 to 73
South Abutment	6.3	61
East Wingwall	6.3 to 22.3	61 to 77
* Includes 20-foot-long bonded length	h in rock.	



6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Conventional excavation equipment appears practical for excavation. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Micropile Installation

We recommend that micropiles be drilled with a temporary casing. Micropile drilling equipment must be capable of drilling through the overburden which includes glacial till, and be capable of penetrating through fractured and intact bedrock. Drilling techniques should limit loss of ground. During casing removal, the casing should remain full of grout to limit the potential for drill hole collapse. Contractors should expect that tremie placement of grout will be required.

6.3 Pile Cap Bearing Surface Preparation

Excavated subgrades for the pile cap should be covered with separation fabric and crushed stone placed over the fabric, and then proofrolled with a vibratory plate compactor. If the subgrade beneath the crushed stone is found to be excessively soft or yielding, it may be necessary to overexcavate the soft material and place additional crushed stone over fabric. If vibratory proof compaction of the subgrade proves detrimental due to the presence of groundwater, static rolling may be allowed at the discretion of the Engineer.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.4 Temporary Lateral Support

We estimate that excavations will be required to reach the pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.5 Excavation Dewatering

Excavation dewatering will be required to permit construction in in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.6 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However, the silty soils are difficult to properly compact when wet, and may need to be



dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces
- Pile installation and load tests
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.







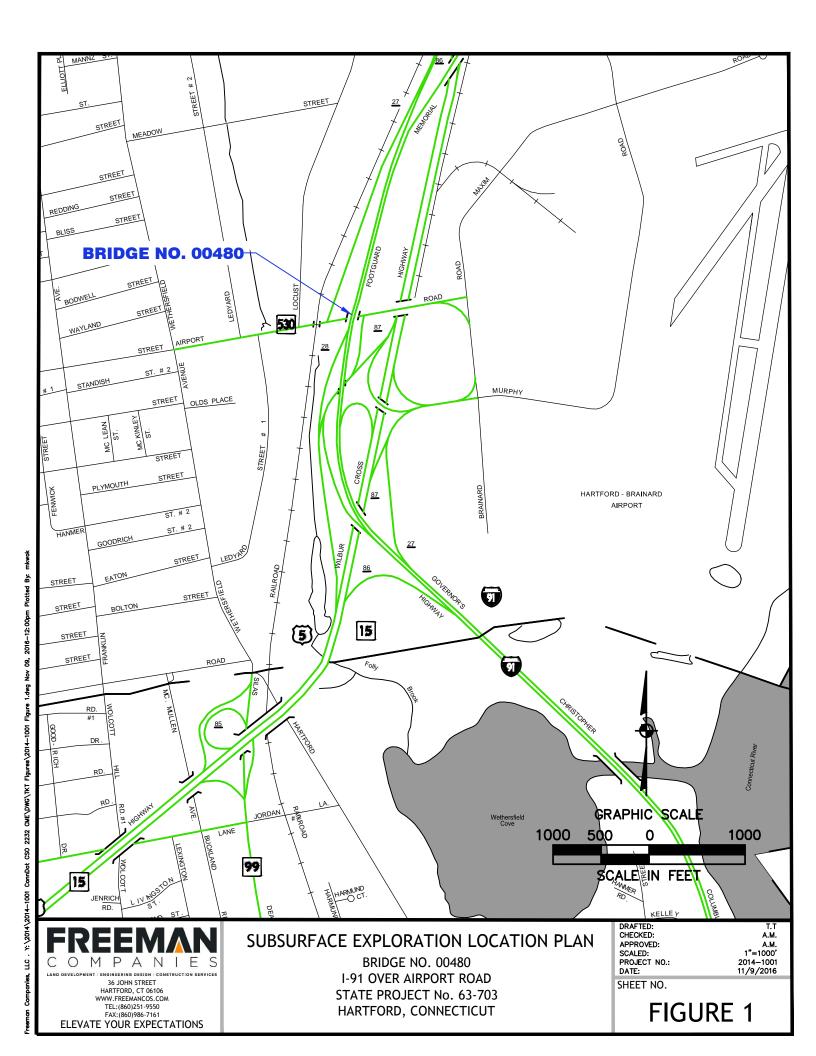
2014-1001 Rehabilitation of Bridge 00480, I-91 over Airport Road Contract CORE ID: 15DOT0148AA, State Project No. 63-703 Hartford, Connecticut

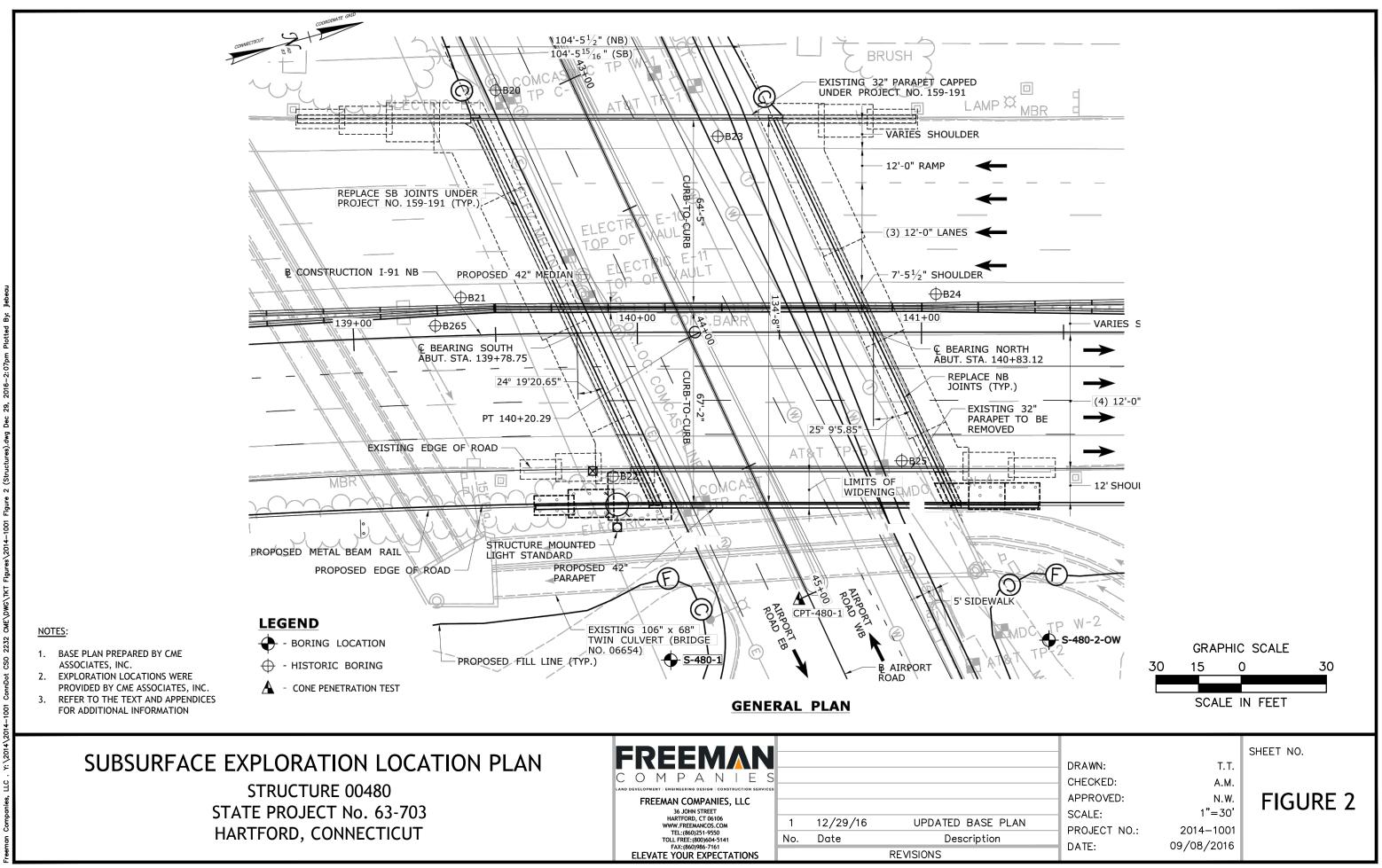
Table 1 Subsurface Data

					Thickness (ft.)				Ground	lwater	Bed	lrock	
Boring No.	Ground Surface El.	Depth (ft.)	Pavement/Topsoil	Fill	Alluvium	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation	
Recent Test Bo	orings												
S480-1	15.4	59.5 C	0.5	7.5	20	5	16.5	0.5	NM		49.5	-34.1	
S480-2 OW	14.9	59 C		14	15	4	14	2	Dry at 13.75'	Below 11	47	-32.1	
Recent Cone P	enetration Test												
CPT480-1	14.6	40.5		9	21	7	4		13	1.6			
Previous Test I	Borings												
B-20	10.2	27.5		13	7	3	4.5		0	10.2			
B-21	10.1	35		9.5	12	3.5	4		4	6.1	29	-18.9	
B-22	11.1	55		4.5	20.5	4	16		4.5	6.6	45	-31.9	
B-23	10.1	41		12	6		9		3.5	6.6	27	-15.9	14
B-24	10.6	43		12	12		13		0.5	10.1	37	-26.4	
B-25	9.1	53		12	11		20		2.5	6.6	43	-33.9	
B-260		17		7	10				7				
B-264		17		17					NE	NE			
B-265		17		17					NE	NE			

Notes:

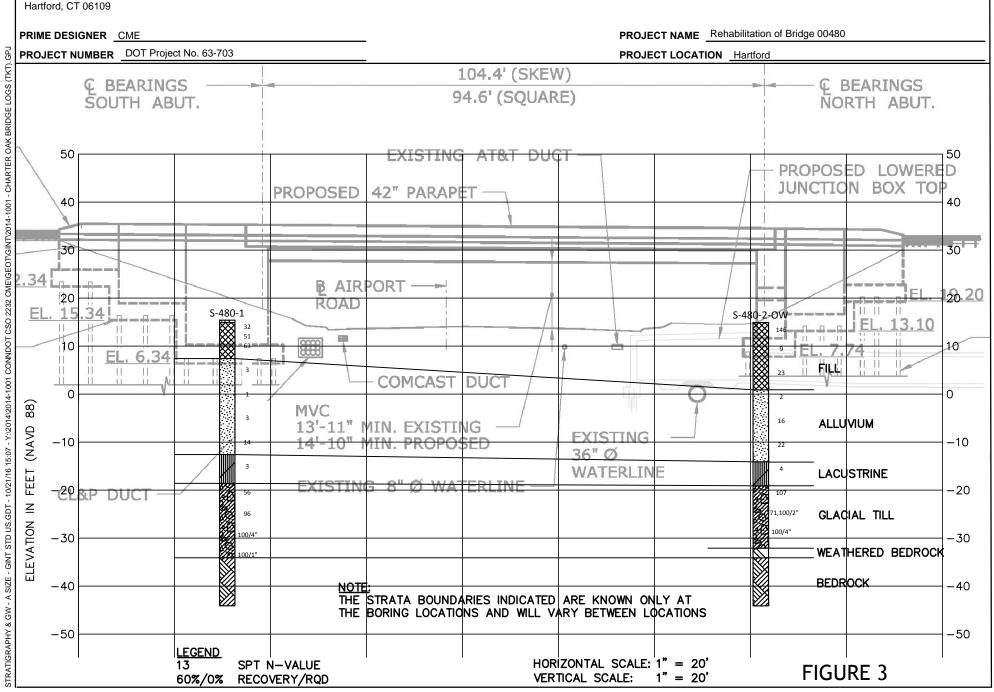
- 1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevation at previous borings were shown on the logs and corrected to NAVD-88 on this table.
- 2. Groundwater levels are approximate.
- 3. Top of bedrock depth is inclusive of weathered bedrock.
- 4. ">" Greater Than "--" Not Encountered (C) Bedrock Core Taken (R) Terminated at Refusal "NM" Not Measured





SUBSURFACE DIAGRAM

Freeman Companies, LLC 36 John Street Hartford, CT 06109



STATIC

NOTES:

SURCHARGE

- APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
- 2. H IS MEASURED IN FEET
- 3. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL (FORM 817 M.02.05) WITH A UNIT WEIGHT OF 125 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
- 4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
- 5. SLIDING:
 - COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3-1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
- 6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.



ELEVATE YOUR EXPECTATIONS

LATERAL EARTH PRESSURES ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 00480 I-91 OVER AIRPORT ROAD STATE PROJECT NO. 63-703 HARTFORD, CONNECTICUT
 DRAFTED:
 M.K.

 CHECKED:
 N.W.

 APPROVED:
 N.W.

 SCALED:
 N.T.S.

 PROJECT NO.:
 2014—1001

 DATE:
 11/07/2016

FIG.

FIGURE 4





						<u></u>	\nnc	otio	t DOT Paris	na Danast		
Driller:		. Labo		•			mile		t DOT Borii	ig Report	Hole No.: S-480-1	
Inspect		Herp				own:		Hartfo		. =00	Stat./Offset:	
Engine		. Whe	tten			roject			Project No. 63		Northing: 829822.82	
Start D		-9-16				loute N			NB over Airpor	t Road	Easting: 1023472.02	
Finish I		-10-16				ridge N		00480			Surface Elevation: 15.4	
Project	Descript	ion: F	Reloca	ation	of I-9	1 NB I	nterc	hange	29 & Widenir	ng		
Casing	Size/Typ	e: 4-ir	า. Ca	sing	S	ample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 1	40lb	Fall:	30in	. Н	lamme	r Wt.:	140lb	Fall: 30in.			
Ground	dwater Ob	oservat										
		1	5	SAMI	PLES				ی ر			₽
Œ	a. o		Blow	,a an		<u></u>			Generalized Strata Description	Ma	aterial Description	Elevation (ft)
‡	ge Se			npler		<u> </u>	E	% (era ta crip	IVIC	and Notes	atic
Depth (ft)	Sample Type/No.	р	er 6 i			Pen. (in.)	Rec. (in.)	Rab	Sen Stra Ses			<u> </u>
0-	07 -					<u> </u>		<u> </u>				
_	S1	3	14	18	21	24	14		Topsoil Fill	TOPSOIL (6")	, some silt, little f gravel	- 15
_			• •	. •					[
_	S2	16	27	24	31	24	14			Brown to gray c- gravel	f SAND, some silt, little c-f	F
5-	S3	44	39	24	13	24	12				f SAND, some silt, little c-f	- -10
-										gravel		
_												-
_									Alluvium			-
10-	S4	1	1	2	2	24	12			Cray Cl AV sam	as f sound	-
10 -	34	'	'	2	2	24	12			Gray CLAY, som	ne i sand	-5
_												
_												
-												
15—	S5	wor	wor	1	1	24	24			Gray SILT and f	SAND	-0
_												-
_												-
20-	S6	1	1	2	3	24	22			Gray SILT and f	SAND	_
_										Oray Oran and T	C/ 11 12	- -5
_												
_												L
_		_	_	_	_							F
25 —	S7	7	6	8	7	24	12			Gray c-f SAND,	little silt	10
_												-
_												
_									Lacustrine			
30-	S8	wor	1	2	2	24	24			Brown CLAY, tra	ace f sand	_ 15

Glacial Till

Total Penetration in	NOTES:	Sheet
Earth: 49.5ft Rock: 10ft		1 of 2
No. of No. of		
Soil Samples: 12 Core Runs: 2		SM-001-M REV. 1/02

Driller:	Р	. Labossier	Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S-480-1	
Inspect	or: J.	Herpich	Town: Hartford S				Stat./Offset:		
Engine	er: N	. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 829822.82	
Start D	ate: 5	-9-16	Route No.: I-91			NB over Airpor	t Road	Easting: 1023472.02	
Finish I	Date: 5	-10-16	Bridge I	No.:	0048	0		Surface Elevation: 15.4	
Project	Descript	ion: Relocation of I	-91 NB	Interc	hange	e 29 & Widenir	ng		
Casing	Size/Typ	e: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
Hamme	er Wt.: 1	40lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.			
Ground	lwater Ob	oservations:							
		SAMPLE	S			0			f.
£	o.	Discorran	<u> </u>	<u> </u>		Generalized Strata Description	Ma	iterial Description	Elevation (ft)
() (H	l de N	Blows on Sampler	<u>:</u>	E	% (era ta crip	IVIO	and Notes	atic
Depth (ft)	Sample Type/No.	per 6 inches	Pen. (in.)	Rec. (in.)	RQD	stra Stra Jes			<u> </u>
	07 -								
35-	S9	10 16 40 55	24	24		Glacial Till (con't)	Brown SILT and	f GRAVEL, some c-f sand	20
_						(00.1.9)			<u>20</u>
_									_
_									_
40-	S10	38 54 42 41	24	14			Prown to rod of	SAND and f GRAVEL, some silt	-
_	0.10	00 04 42 41	-	'-			Brown to red c-r	SAND and I GRAVEL, Some sin	25
_									
-									_
-	S11	41 100/4"	10	8			Brown to red c-f	SAND and SILT, some f gravel	-
45-									30
_									
_									
_	0.10	100/1"	1	1					
50 —	S12					Bedrock	B. H foot	and a Park III and a Research and a second	35
_	C 1		60	58	17		Red-brown, fresh ARKOSE, nume	n to slightly weathered, strong rous fractured zones that appear	-
_	C-1		60	50	17		to be a combinat	ion of low angle bedding joints	-
_							and high angle jo	oints.	
55—									-40
_								n to slightly weathered, strong	-40
_	C-2		60	60	38			rous fractured zones that appear ion of low angle bedding joints	-
_							and high angle jo		-
60-									+
							END OF BORIN	G 59.5ft	 -45
_									
_									L
									F
65—									50
									-

Total Penetration in	NOTES:	Sheet 2 of 2
Earth: 49.5ft Rock: 10ft		2 01 2
No. of No. of		
Soil Samples: 12 Core Runs: 2		SM-001-M REV. 1/02

Driller:	P	. Labo	ssier			Co	nne	cticu	t DOT Borii	ng Report	Hole No.:	S-480-2 OW	
nspecto		Herpi			Т	Γown:		Hartfo	ord		Stat./Offset:		
Enginee		. Whe			F	Project I	No.:	DOT	Project No. 63	3-703	Northing:	829934.23	
Start Da	te: 5-	-10-16			F	Route N	lo.:		NB over Airpor		Easting:	1023486.2	
Finish D	ate: 5-	-10-16			E	Bridge N	lo.:	00480)		Surface Elev	/ation: 14.9	
Project [Descripti	ion: R	eloca	ation	of I-9	91 NB I	nterc	hange	29 & Widenir	ng	'		
Casing S	Size/Typ	e: 4-ir	ı. Ca	sina	5	Sample	r Type	e/Size:	1-3/4 inch ID		Core Barrel	Type: NX	
	r Wt.: 30			30in		Hamme	•					- 7	
	vater Ob												
					PLES								
Depth (ft)	Sample Type/No.		Sam	s on pler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Descri and Notes		Elevation (ft)
0 -	S1	39	100	46	29	24	12		Fill	4" Compressed some sand Gray to red c-f S		-	
5—	S2	5	5	4	4	24	5			Brown to red c-f	SAND, little si	ilt, trace f gravel	- -10
10-	S3	11	13	10	7	24	6			Gray SILT, some brick and wood	e c-f gravel, so	ome c-f sand, trace	_ _ _ _5 _
15-	S4	wor	1	1	2	24	24		Alluvium	Gray CLAYEY S	SILT, trace f sa	nd	_ 0
20-	S5	9	9	7	8	24	10			Gray f SAND, so	ome silt, trace	f gravel	- - 5 -
25-	S6	9	9	13	17	24	11			Gray f SAND, so	ome silt		- - 10
30-	S7	12	2	2	4	24	18		Lacustrine	Red CLAY, som	e f sand		_ _ _ 15

Glacial Till

Total Penetration in	NOTES: Observation well installed. Screen from 10 to 20 feet	Sheet
Earth: 49.5ft Rock: 10ft	backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	1 of 2
No. of No. of	1 9	
Soil Samples: 10 Core Runs: 2		SM-001-M REV. 1/02

riller:	Р	. Labossier	C	onne	cticu	it DOT Bori	ng Report	Hole No.: S-480-2 OW	
spect		Herpich	Town:		Hartfo	ord		Stat./Offset:	
ngine		. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 829934.23	
tart D		-10-16	Route N			NB over Airpor		Easting: 1023486.2	
inish I	Date: 5-	-10-16	Bridge	No.:	00480	0		Surface Elevation: 14.9	
roject	Descript	ion: Relocation of	I-91 NB	Interc	hange	29 & Widenii	ng		
asing	Size/Tvn	be: 4-in. Casing	Sample	r Type	e/Size:	1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 30		Hamme					, and a second s	
		oservations: @dry a							
		SAMPLE							1 2
Œ						Generalized Strata Description			Elevation (#)
Depth (ft)	Sample Type/No.	Blows on	Pen. (in.)	Rec. (in.)	%	erali a rript	N	Material Description and Notes	<u> </u>
ept	am) ype	Sampler per 6 inches	en.	ec.	RQD	ene trat esc		and Notes	2
	S	F		<u>~</u>	<u>~</u>	000			L
35-	S8	6 32 75 60	0 24	5		Glacial Till	Red CLAY, so	me c-f sand, some c-f gravel,	_ 2
-		0 32 75 00	24	3		(con't)	some silt	, ,	'
_									F
_									H
-	S9	100 71 100/2"	14	8			Red CLAY and	d c-f GRAVEL, some f sand, some	Ι.
40 —	- 00	100 71 100/2	'-				silt, trace rock		2
_									-
_	S10 /	100/4"	4	3			Brown c-f GRA	AVEL, some silt, some c-f sand	F
45—							Biowiro i oru	tvee, come one, come or cana	-3
_									F
_						Weathered	-		
_						Rock			
50-						Bedrock			3
_	0.4		00		00			esh to slightly weathered, strong, stly low angle joints parallel to	F
_	C-1		60	56	28		bedding, with o	occasional fractured zones and	-
_							moderately dip	pping (45 degree) joints.	F
-									4
55 — _								esh to slightly weathered, strong,	4
_	C-2		60	57	48			stly low angle joints parallel to occasional fractured zones and	-
_								pping (45 degree), stained joints.	F
_									+
60 —							END OF BORI	ING 59ft	-4

Total Penetration in	NOTES: Observation well installed. Screen from 10 to 20 feet	Sheet
Earth: 49.5ft Rock: 10ft	backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	2 of 2
No. of No. of	1 9	
Soil Samples: 10 Core Runs: 2		SM-001-M REV. 1/02



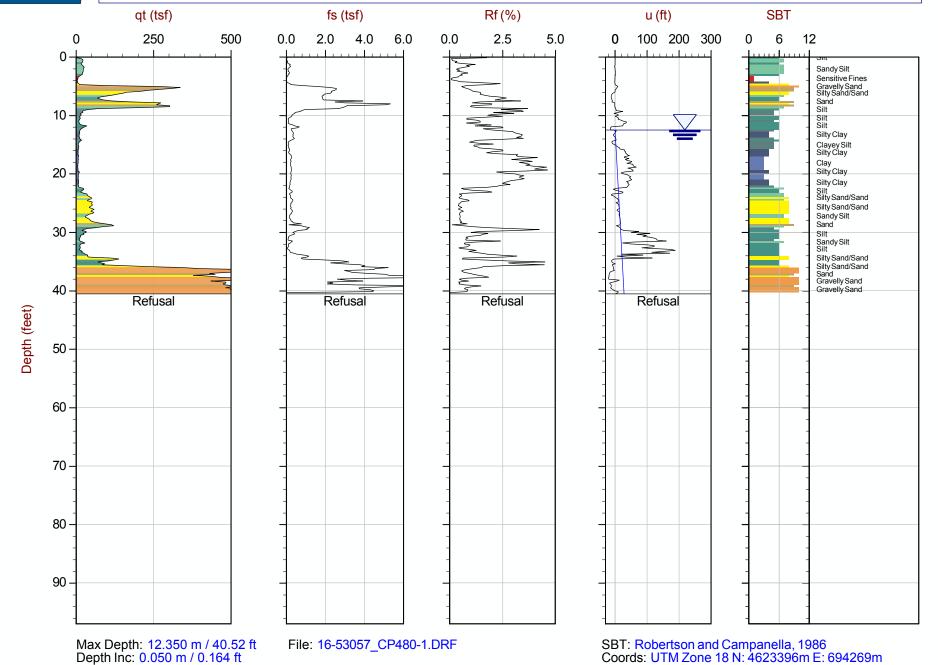
Freeman Companies

Job No: 16-53057 Date: 06:13:16 21:08

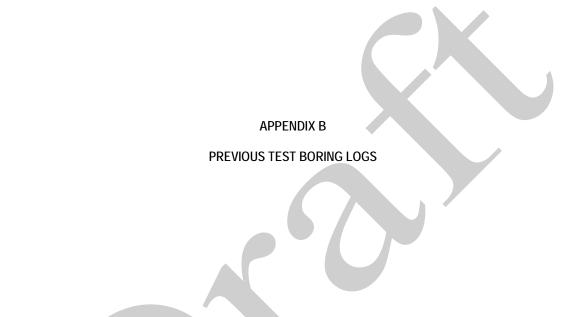
Site: I-91 Interchange 29, Hartford, CT

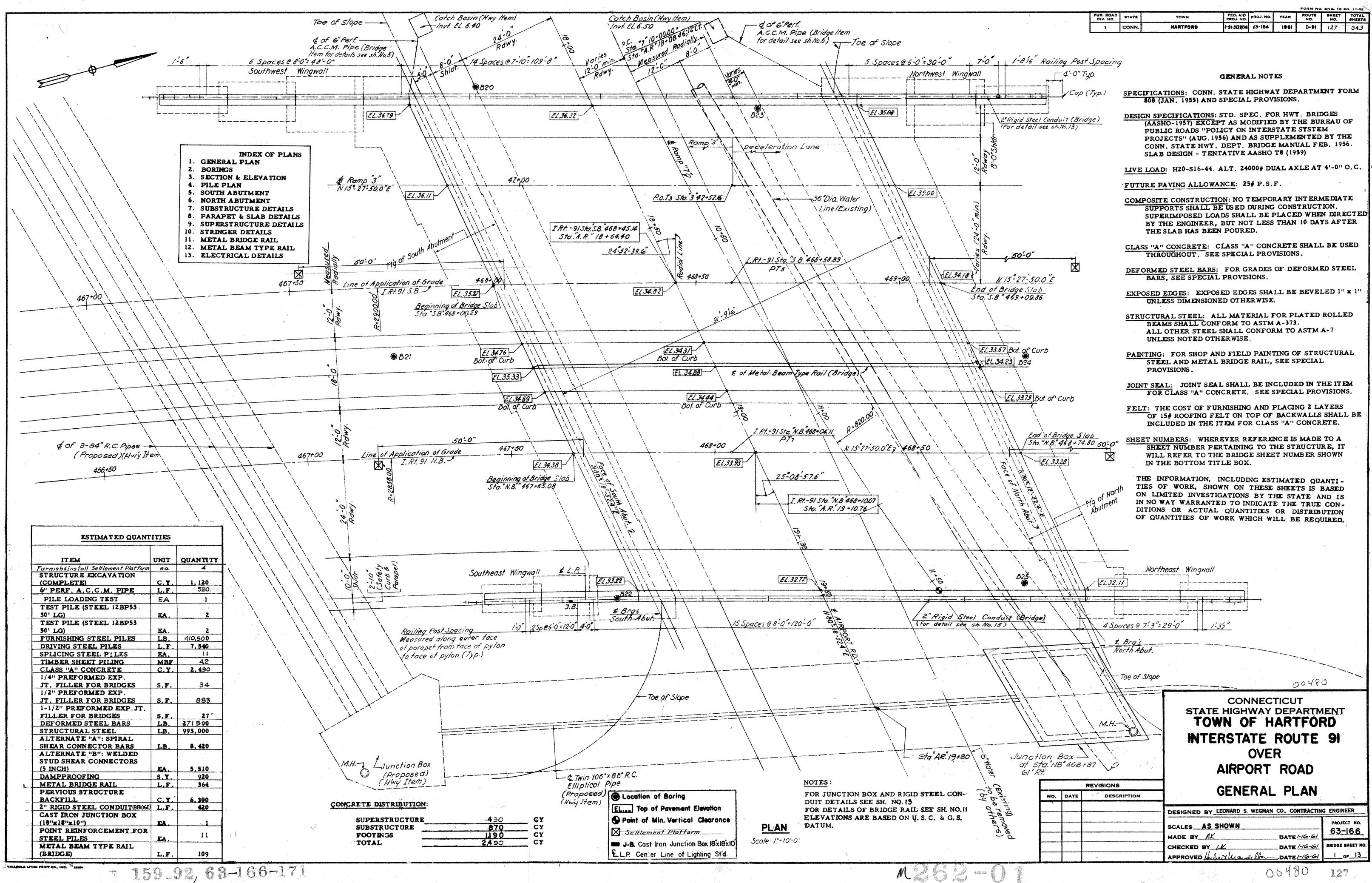
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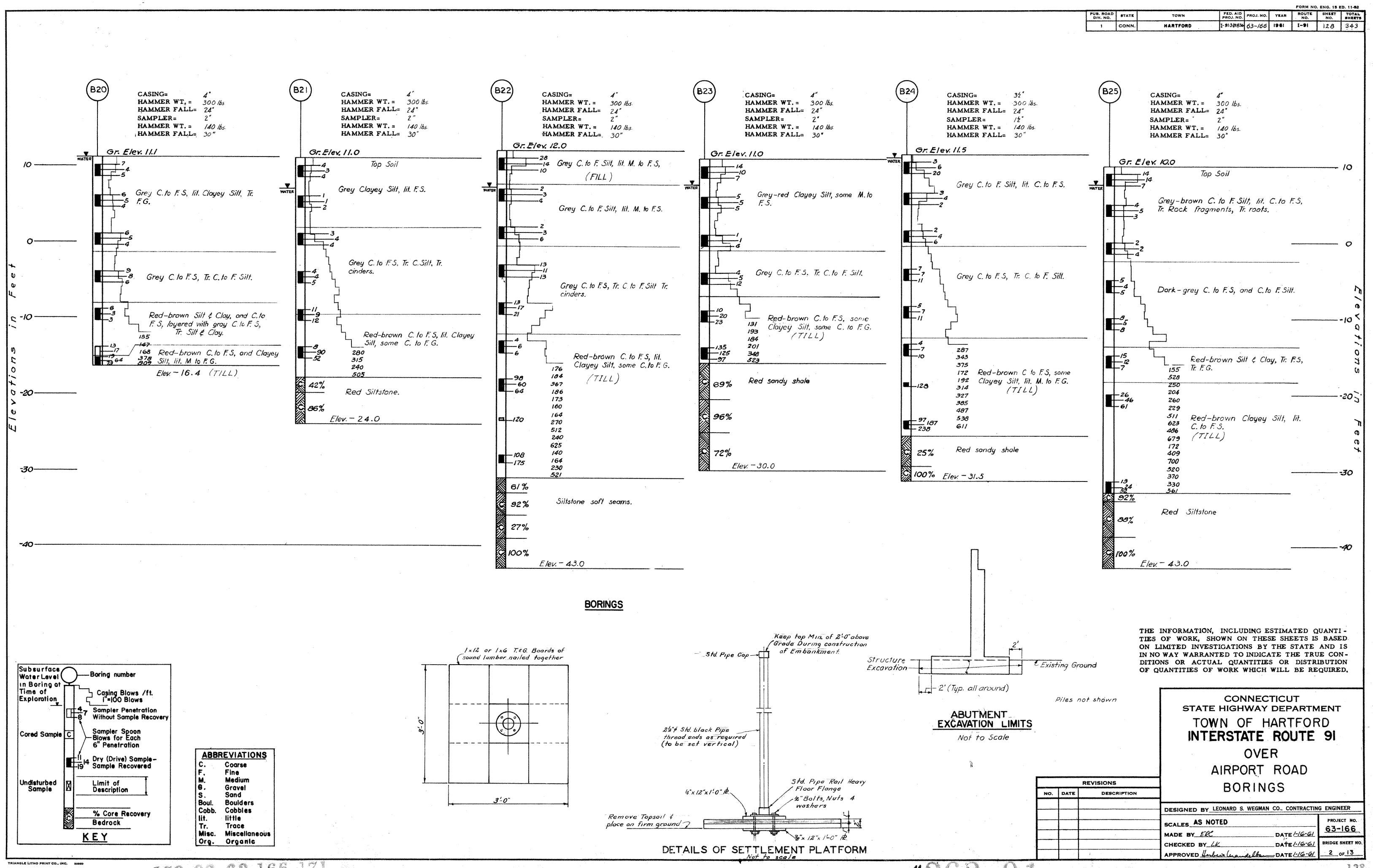
Cone: 419:T1500F15U500











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202-01

128

· •	. :	S. Ramsdell RING CREW LEAD G. Ozark			DE	ST. PART	ATE C MENT JREAU	OF T	HIGHW	ICUT ORTATION	ON	The same of the sa	SHEET 1 OF 1 LOCATION RAMP 5S-A GENERAL ROBLINGS LINC	
HALEY & ALDRICH, INC.					TOWN HARTFORD . CHORING REPORT						GENERAL BORINGS, INC.			
_		SOILS ENGINEER		P	ROJEC	T NO.	6.	3-384				E .	HEI 1.	STEINMAN MARA DESIGN ENGINEER
3	ATION FACE E	U.S. ROUTE 5	& 1	5 S :	(A 0)	IRPOR	T RO	DAD ((RAMI	? 5 <u>s</u> -	A)	200	The State of the S	86.6
_		HED 2/17/87			YPE		HS		CAS	ING	SAMPLE	R	CORE BAR	HOLE NO. B260
	OEOU!	WATER OBSERVATH	ONS		ZE I.D		4-1		-		SS 1-3/8	<u> 11 </u>	No. 1	LINE & STATION OFFSET
. —		AFTER 0		t5. H.	AMMER	WT.					140 1		· BIT	N. COORDINATE
T		FT. AFTER	HI WPLE	15. PH	MAKER	FALL	_		L		30"			E. COORDINATE
		DEPTHS						BLOWS t 6 INC		STR/	ATA .			
	Casing Blows	IN FEET		1	REC.	1		ON		CHA				D IDENTIFICATION OF SOIL
Ň	PER	FROM - TO	MO.	MCH	PINCH	TYPE		6-12		DEP				water, seams in rock, etc.)
		0.0 - 2.0	1	24	18	D ·	6	7	9		-			
		2.0							10		- 1	M	edium de	ense, red-brown coarse-fine
		2.0 - 4.0	2	24	13	D.	8	6	7					ne silt, trace gravel.
5		4.0 - 6.0	3	24	10	D	3	2	3		ŀ	(Same as	D1), trace cinder FILL
									2					n to gray SILT, some fine
		6.0 - 8.0	4	24	20	D	4	4	4	7.0	1			ttle coarse-medium sand.
		8.0 - 10.0	5	24	22	D	2	· 3	4		Ī			iff, gray SILT, trace fine
ſO									3				and.	
	`		-	-	3							(Same as	194.)
		·												· .
15														
		15.0 - 17.0	6	2/	24	ח	1	7						OTTE 1.51 DAY
							-1		2			Ð	ort, gra	ay SILT and fine SAND ALLUVIUM -
			-									. B	ottom of	Exploration at 17.0 Feet
20														
25														
30											İ			
טי														
											ł			
35														
1									V					
								1						
40	W 555	UND PARTAGE TO												
	UTO	UND SURFACE TO	F	EET U	SED	[]	HCH C	ASING	THEN		INC	H C	ASING FOR	FEET
PO	TAGE	NEARTH 17.01	F	OOTAG	E IN I	ROCK					NO. OF S	AMP	LES 6	HOLE NO. B260
		TPE CODING: DNS USED:		D=DR{! CE=1-1	_	C:	= COR = 10-2	_		= AUGI			UNDISTURE 36-60\$	DED, PISTON V=VANE TEST

S. Ramsdell FORM SM-1 REV. 8/83 SHEET BORING CREW LEADER STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS LOCATION I-91 NB . G. Ozark GENERAL BORINGS, INC. BORING CONTRACTOR INSPECTOR CHORING REPORT TOWN HARTFORD, HALEY & ALDRICH, INC. PROJECT NAME CHARTER OAK BRIDGE STEINMAN SOILS ENGINEER PROJECT NO. DESIGN ENGINEER 63-384 I-91 NB OCATION URFACE ELEV. AUGER CASING SAMPLER CORE BAR HOLE NO. B264 DATE FINISHED 2/18/87 TYPE HSA SS LINE & STATION 411 GROUND WATER OBSERVATIONS SIZE I.D. 1-3/8" OFFSET AT NE FT. AFTER HAMMER WT. HRS. 140 1ъ BIT N. COORDINATE <u>AT</u> FT. AFTER HRS. HAMMER FALL 30" E. COORDINATE SAMPLE D **BLOWS** DEPTHS STRATA PER 6 INCHES CASING PEN. REC. IN FEET CHANGE FIELD IDENTIFICATION OF SOIL, & BLOWS PER ENCH INCH TYPE DEPTH NO. REMARKS (INCL. COLOR, LOSS OF SAMPLER FROM -TO ELEV. FOOT WASH WATER, SEAMS IN ROCK, ETC.) 0-6 6-12 12-18 0.5 feet ASPHALT 0.5 - 2.519 40 34 Very dense red-brown, coarse-fine 24 SAND, some gravel, little silt. 2.5 - 4.52 24 16 D 17 12 12 Medium dense, red-brown, fine SAND and SILT, trace coarse-medium sand. 5 - 6 5 3 20 D 6 9 Medium dense, red-brown fine SAND, 9 some silt, trace coarse-medium sand. 6.5 - 8.54 24 20 D 13 19 17 Dense, red-brown medium-fine SAND, 17 trace gravel, trace silt. 10 8.5 - 10.55 ħ 13 14 Medium dense, (Same as D4.) 18 - FILL -15 15.0 - 17.06 16 D 4 Loose, red-brown medium-fine SAND, 3 trace coarse sand, silt. Bottom of Exploration at 17.0 Feet 20 25 35 FROM GROUND SURFACE TO **FEET USED** INCH CASING THEN **INCH CASING FOR** FEET FOOTAGE IN EARTH 17.01 **FOOTAGE IN ROCK** 01 NO. OF SAMPLES 6 HOLE NO. B264 SAMPLE TYPE CODING: D=DRIVE C=CORE

PROPORTIONS USED:

A= AUGER

UP=UNDISTURBED, PISTON

AND = 35-50%

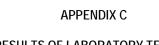
V=VANE TEST

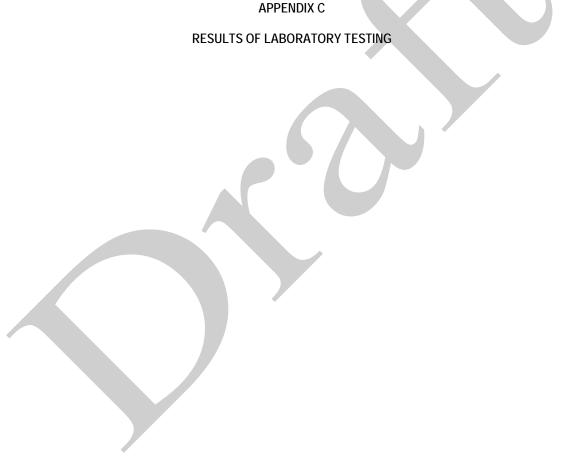
TRACE=1-10% LITTLE=10-20%

SOME = 20 -35%

S. Ramsdell FORM SM-1 REV. 8/83 SHEET OF STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS **BORING CREW LEADER** LOCATION I-91 NB G. Ozark GENERAL BORINGS, INC BORING CONTRACTOR BORING REPORT INSPECTOR TOWN HARTFORD. PROJECT NAME HALEY & ALDRICH, INC. CHARTER OAK BRIDGE STEINMAN SOILS ENGINEER DESIGN ENGINEER PROJECT NO. 63-384 OCATION I-91 NB SURFACE ELEV. AUGER CASING SAMPLER CORE BAR HOLE NO. B265 DATE FINISHED 2/18/87 TYPE HSA SS LINE & STATION **GROUND WATER OBSERVATIONS** 41/211 -3/811 SIZE I.D. OFFSET AT NE FT. HAMMER WT. AFTER 0 HRS. 140 1ь BIT N. COORDINATE FT. **AFTER** HRS. HAMMER FALL 30" E. COORDINATE SAMPLE BLOWS DEPTHS STRATA PER 6 INCHES E CASING PEN. REC. OH CHANGE FIELD IDENTIFICATION OF SOIL. IN FEET BLOWS PER REMARKS (INCL. COLOR, LOSS OF DEPTH NO. INCH IINCH ITYPE SAMPLER FROM . TO ELEV. WASH WATER, SEAMS IN ROCK, ETC.) FOOT 0-6 6-12 12-18 0.5 feet ASPHALT 0.5 - 2.51 24 Very dense, red-brown coarse-fine 16 12 43 20 13 SAND, little silt, gravel. 2.5 - 4.52 24 14 14 10 D 11 - FILL -12 Medium dense, (Same as Dl.) 4.5 - 6.524 14 מ 3 5 Loose, red-brown medium-fine SAND, 4 little silt. 4 24 18 D 3 3 5 Loose, red-brown medium-fine SAND, 10 trace gravel, silt. 10 8.5 - 10.524 15 D 14 16 15 Dense, red-brown, medium-fine SAND, 18 trace gravel, silt. 15 15.0 - 17.024 15 10 6 D 20 25 Dense, red-brown medium-fine SAND, 32 little fine gravel, trace coarse sand, silt. Bottom of Exploration at 17.0 Feet 20 25 FROM GROUND SURFACE TO **FEET USED** INCH CASING THEN INCH CASING FOR FEET FOOTAGE IN EARTH 17.0 **FOOTAGE IN ROCK** 0 NO. OF SAMPLES 6 **HOLE NO.** B265 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%









Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

GTX#: 304831

Test Date: 07/26/16

Tested By: jbr Checked By: emm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

	Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹	
	S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04	
	S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04	
	S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04	
	S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04	
	S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03	
Г	S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04	
	S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04	
	S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05	

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box

Water added to sample to create a thick slurry prior to testing (saturated condition). Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)

Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.



6100 HILLCROFT PHONE (713) 369-5400

REPORTED TO:

HOUSTON, TEXAS 77081 FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE

REPORT DATE:

GE

08-01-16

(GTX 304831)

CLIENT NUMBER: JOB NUMBER:

04.1115-0003

FOR: GEOTESTING EXPRESS, INC.

REPORT NUMBER:

04.1110

125 NAGOG PARK ACTION, MA 01720

DATE SAMPLED: TIME SAMPLED:

SAMPLED BY:

CLIENT

ETHAN MARRO

DATE RECEIVED:

TIME RECEIVED: RECEIVED BY:

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
S1-S, S-2, 4 – 6'	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12'	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7'	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17'	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7'	297 *	ma/ka	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16'	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11'	355 *	mg/kg	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7'	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio Chemist

SD

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

^{**} WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S-480-2 Sample Type: jar Tested By: GA Test Date: 08/02/16 Checked By: Sample ID: S-2 emm

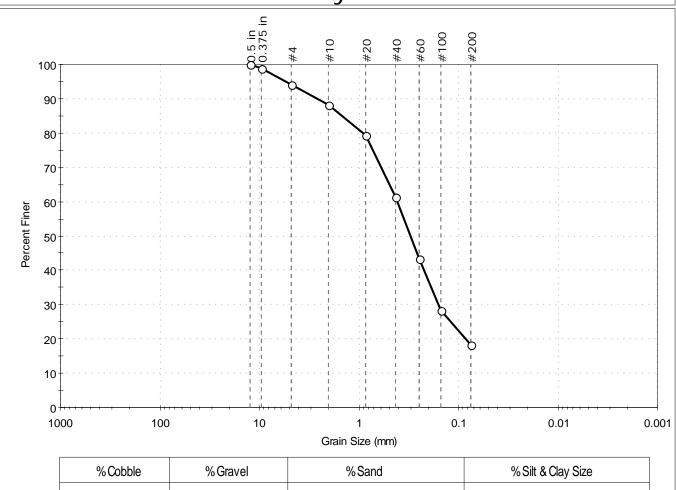
4-6 ft Test Id: 384941 Depth:

Test Comment:

Visual Description: Moist, reddish brown silty sand

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
	6.0	75.6	18.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	94		
#10	2.00	88		
#20	0.85	79		
#40	0.42	61		
#60	0.25	43		
#100	0.15	28		
#200	0.075	18		

<u>Coefficients</u>							
D ₈₅ = 1.4847 mm	$D_{30} = 0.1587 \text{ mm}$						
D ₆₀ = 0.4095 mm	$D_{15} = N/A$						
D ₅₀ = 0.3044 mm	$D_{10} = N/A$						
$C_u = N/A$	$C_C = N/A$						

Project No:

GTX-304831

Classification N/A <u>ASTM</u> AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR Sand/Gravel Hardness: HARD



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Project No: Boring ID: ---Sample Type: ---Tested By: daa Sample ID: ---Test Date: Checked By: 06/27/16

GTX-304831

Depth: Test Id: 381989

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)	
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*	
S1466-1	C2	49.5-50 ft	160	8511	3	Yes		
S2-1	C2	98.5-99 ft	164	7103	3	Yes		
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*	
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*	

Density determined on core samples by measuring dimensions and weight and then calculating. Notes:

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

- 1: Best effort end preparation. See Tolerance report for details.
- 2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
- 3: Specimen L/D < 2.
- 4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
- 5: Specimen diameter is less than 10 times maximum particle size.
- 6: Specimen diameter is less than 6 times maximum particle size.

^{*}Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

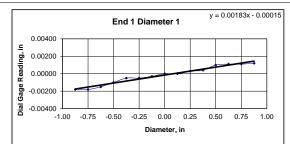


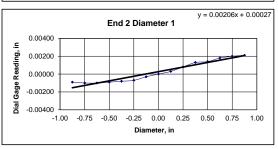
Client:	Freeman Companies, LLC	Test Date: 6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By: rlc
Project Location:	Hartford, CT	Checked By: jsc
GTX #:	304831	
Boring ID:	S480-1	
Sample ID:	C2	
Depth:	54.5-55 ft	
Visual Description:	See photographs	

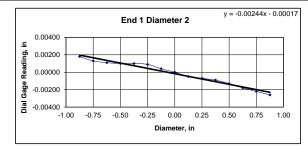
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

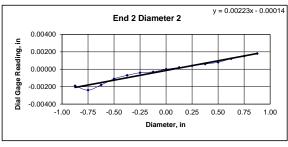
BULK DENSITY					DEVIATION FROM STRAIGHTNESS (Procedure S1)
	1	2	Average		
Specimen Length, in:	4.37	4.38	4.38		Maximum gap between side of core and reference surface plate:
Specimen Diameter, in:	1.97	1.97	1.97		Is the maximum gap ≤ 0.02 in.? YES
Specimen Mass, g:	575.14				
Bulk Density, lb/ft3	164	Minimum Diameter Tolerence Me	et?	ES	Maximum difference must be < 0.020 in.
Length to Diameter Ratio:	2.2	Length to Diameter Ratio Tolerar	nce Met?	ES	Straightness Tolerance Met? YES

END FLATNESS AND PARALI	LELISM (Proced	dure FP1)													
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00180	-0.00180	-0.00150	-0.00100	-0.00050	-0.00050	-0.00030	0.00000	0.00000	0.00030	0.00040	0.00100	0.00110	0.00110	0.00120
Diameter 2, in (rotated 90°)	0.00180	0.00130	0.00110	0.00100	0.00100	0.00090	0.00040	0.00000	-0.00050	-0.00070	-0.00090	-0.00130	-0.00180	-0.00220	-0.00260
											Difference between	en max and m	in readings, in:		
											0° =	0.00300	90° =	0.00440	
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00090	-0.00100	-0.00100	-0.00090	-0.00080	-0.00070	-0.00030	0.00000	0.00030	0.00080	0.00130	0.00140	0.00180	0.00200	0.00210
Diameter 2, in (rotated 90°)	-0.00190	-0.00240	-0.00180	-0.00110	-0.00070	-0.00040	-0.00030	0.00000	0.00020	0.00040	0.00060	0.00080	0.00120	0.00150	0.00180
											Difference between	en max and m	in readings, in:		
											0° =	0.0031	90° =	0.0042	
											Maximum differe	ence must be <	0.0020 in.	Difference = +	0.00220









	Flatness Tolerance Met?	NO
		•
DIAMETER 1		
End 1:		
	Slope of Best Fit Line	0.00183
	Angle of Best Fit Line:	0.10485
End 2:		
LIIU 2.	Slope of Best Fit Line	0.00206
	Angle of Best Fit Line:	0.11803
	. 5:5	0.04040
Maximum Ang	ular Difference:	0.01318
		NO
	Parallelism Tolerance Met? Spherically Seated	NO
	Parallelism Tolerance Met? Spherically Seated	NO
		NO
DIAMETER 2		
	Spherically Seated	
DIAMETER 2 End 1:	Spherically Seated	
	Spherically Seated Slope of Best Fit Line	0.00244
	Spherically Seated	
	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line:	0.00244 0.13980
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line	0.00244 0.13980 0.00223
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line:	0.00244 0.13980
End 2:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line	0.00244 0.13980 0.00223
End 1:	Siope of Best Fit Line Angle of Best Fit Line Siope of Best Fit Line Angle of Best Fit Line	0.00244 0.13980 0.00223 0.12777
End 1:	Siope of Best Fit Line Angle of Best Fit Line Siope of Best Fit Line Angle of Best Fit Line	0.00244 0.13980 0.00223 0.12777 0.01203
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line angle of Best Fit Line: ular Difference:	0.00244 0.13980 0.00223 0.12777 0.01203

PERPENDICULARITY (Procedu	ure P1) (Calculated from End Flatness	and Parallelism m	easurements a	bove)		
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be ≤ 0.25°
Diameter 1, in	0.00300	1.970	0.00152	0.087	YES	
Diameter 2, in (rotated 90°)	0.00440	1.970	0.00223	0.128	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00310	1.970	0.00157	0.090	YES	
Diameter 2, in (rotated 90°)	0.00420	1.970	0.00213	0.122	YES	



Client:	Freeman Companies, LLC	Test Date: 6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By: rlc
Project Location:	Hartford, CT	Checked By: jsc
GTX #:	304831	
Boring ID:	S480-1	Tolerance measurements were performed using
Sample ID:	C2	a machinist straightedge and feeler gauges to ASTM specifications.
Depth:	54.5-55 ft	No TWI Specifications.
Visual Description:	See photographs	

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1 Is the maximum gap $\leq \pm 0.001$ in.? YES Diameter 2 (rotated 90°) Is the maximum gap $\leq \pm 0.001$ in.? YES

END 2

Diameter 1 Is the maximum gap $\leq \pm 0.001$ in.? YES Diameter 2 (rotated 90°) Is the maximum gap $\leq \pm 0.001$ in.? YES

End Flatness Tolerance Met? YES



Client: Freeman Companies, LLC Project Name: Reconstruction of Exit Charter Oak Bridge Project Location: Hartford, CT GTX #: 304831 Test Date: 6/27/2016 Tested By: daa Checked By: jsc Boring ID: S480-1 Sample ID: C2 Depth, ft: 54.5-55



After cutting and grinding



After break



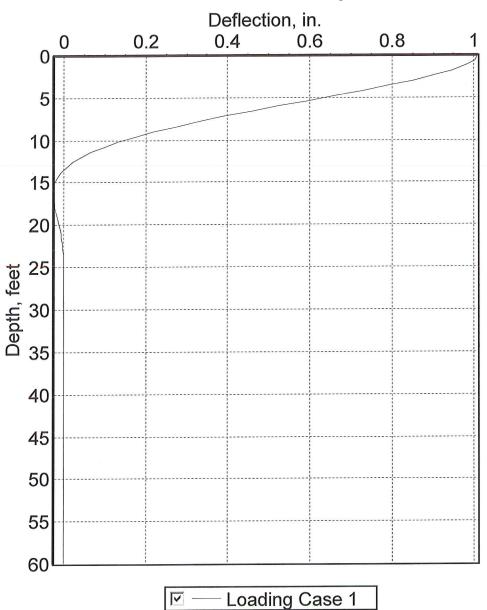
APPENDIX D RESULTS OF L-PILE ANALYSES



9.625 in 0,D. CASING 0.545 in THICK NO 28 REBAR

FIXED HEAD 24 KIPS LATERAL 300 KIPS VERTICAL

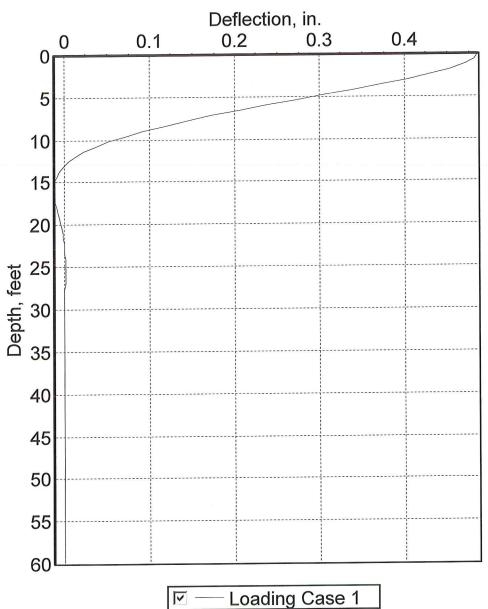
Lateral Deflection vs. Depth



LPile 2012.6.30, © 2012 by Ensoft, Inc.

9.625 in OD CASING 0.545 in THICK NO 28 REBAR FIXED HEAD 15 KIPS LATERAL 300 KIPS YERTICAL

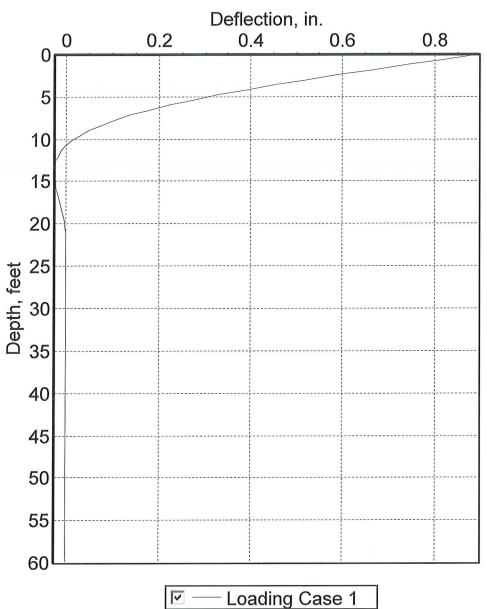
Lateral Deflection vs. Depth



LPile 2012.6.30, © 2012 by Ensoft, Inc.

9.625 in OD CASING 0.545 in thick No 28 Rebar FREE HEAD 7 KIPS LATERAL 300 KIPS VERTICAL

Lateral Deflection vs. Depth



LPile 2012.6.30, © 2012 by Ensoft, Inc.



Geotechnical Report Rehabilitation of Bridge 05796 Route 15 NB over Silver Lane State Project No. 63-703 East Hartford, Connecticut

December 12, 2016

Freeman Project No.: 2014-1001

Prepared for:
CME Associates, Inc.
333 East River Drive, Suite 400
East Hartford, CT 06108

Prepared by:

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> Nathan L. Whetten, P.E., D.GE. Vice President of Geotechnical Services



TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Summary	1
1.2	Scope of Work	1
1.3	Authorization	1
1.4	Project Vertical Datum	1
2.0	PROJECT AND SITE DESCRIPTION	1
2.1	Project Description	1
2.2	Site Description	1
3.0	EXPLORATIONS	2
3.1	Recent Explorations	2
3.2	Previous Subsurface Explorations	
3.3	Laboratory Testing	2
4.0	SUBSURFACE CONDITIONS	3
4.1	Subsurface Conditions	3
5.0	GEOTECHNICAL ENGINEERING RECOMMENDATIONS	
5.1	Foundation Design Recommendations	3
6.0	CONSTRUCTION CONSIDERATIONS	
6.1	Excavation	4
6.2	Abutment Bearing Surface Preparation	
6.3	Temporary Lateral Support	
6.4	Excavation Dewatering	5
6.5	Reuse of Existing Soils	5
7.0	FUTURE SERVICES AND LIMITATIONS	5

ATTACHMENTS

Table

1. Summary of Subsurface Data

Figures

- Site Location Map
 Subsurface Exploration Location Plan
- Summary of Varved Clay Properties, East of Connecticut River
 Subsurface Profile
- 5. Lateral Earth Pressures Active

Appendices

- A. Recent Exploration Logs
- B. Previous Test Boring Logs
- C. Results of Laboratory Testing



1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for rehabilitation of Bridge 05796, Route 15 over Silver Lane in East Hartford. Rehabilitation consists of widening the northbound (south) side of the bridge by 12 feet to accommodate an additional travel lane. The existing bridge is a single-span bridge supported on two full height abutments, which will be extended to the east. New U-type wingwalls will be provided.

We recommend that the widened portion of the abutments be supported on spread footings bearing on a layer of compacted granular fill placed over the native alluvial deposits. Bridge abutment loading will result in up to about 1.4 inches of settlement.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions.
- Conducted settlement evaluations.
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

The bridge will be widened by 12 feet by extending Abutments 1 and 2 on the east side. New U-type wingwalls will be provided.

2.2 Site Description

The site is located on the south side of the Route 15 NB Bridge over Silver Lane, as shown on Figure 1, Site Location Map. The bridge is a single-span bridge supported on two full-height abutments. Silver Lane has two westbound travel



lanes and one eastbound lane, and sidewalks on each side. Ground surface south of the wingwalls consists of grass and shrubs.

Bridge grade is about El. 58 and Silver Lane grade below the bridge is about El. 33. The bridge abutments (existing and proposed) bear at El. 30; existing grade at the abutments is about El. 34.

3.0 EXPLORATIONS

3.1 Recent Explorations

Recent explorations included one Cone Penetrometer Test (CPT-5796-1) and one test boring (S-5796-1) conducted on June 14, 2016 and from May 9 to 13, 2016, respectively. The Cone Penetrometer Test (CPT) was conducted by ConeTec, of West Berlin, New Jersey, and the test boring was drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut. CPT-5796-1 was located southeast of Abutment 1 and S-5796-1 was located southeast of Abutment 2.

CPT-5796-1 was drilled to a depth of 222.3 feet below ground surface using standard CPT push techniques, and the subsurface data was recorded continuously by a piezocone mounted on the tip. The CPT was terminated at the maximum push capacity of the rig, referred to on the log as "refusal". This refusal indicates that friction on the cone exceeded the capacity to push, and does not reflect the presence of a hard soil stratum.

Test boring S5796-1 was drilled to a depth of 319 feet below ground surface and was terminated at refusal. Standard Penetration Tests were conducted at maximum 5-foot-intervals and undisturbed tube samples of the lacustrine deposits were recovered from the boring. The completed borehole was backfilled with drill cuttings.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Exploration Logs. The CPT log prepared by ConeTec is also included in Appendix A. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

3.2 Previous Subsurface Explorations

Six previous test borings were drilled for the bridge, including B-10, and B-164 to B-168. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan. Previous exploration logs and cross-sections of the previous explorations are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Eight moisture content tests,
- One grain size analysis,
- Two Constant Rate of Strain (CRS) Consolidation Tests,
- Four Atterberg Limit Determinations.



Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3 Summary of Varved Clay Properties, East of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. A subsurface profile through Abutment 2 is provided on Figure 4.

Thickness Range (ft.)	Stratum	Generalized Description
4 to 20	Fill	Very dense c-f SAND, some silt, trace c-f gravel. The Standard Penetration Test (SPT) N-Value was 54 blows per foot (bpf).
32 to 56	Alluvium	Medium dense to very dense, brown c-f SAND, some to trace c-f gravel, little to some silt. SPT N-values ranged from 13 to 77 bpf.
228	Lacustrine	Soft to medium stiff varved red-brown CLAY and SILT, with regular 1/8 to 1/16-inch gray and reddish gray silt varves.
31	Glacial Till	Very dense red-brown c-f SAND, some silt and gravel. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values were typically more than 100 bpf

Groundwater – Water was encountered in boring S5796-1 at a depth of 8 feet and in CPT5796-1 at a depth of 15 feet, corresponding to El. 28 and El. 21, respectively. However, these measurements were made during or shortly after drilling, and may not reflect stabilized groundwater. Groundwater levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Settlement - The proposed bridge widening will consist of extending the existing abutments, which are supported on spread footings. Settlement evaluations were conducted to determine the magnitude of anticipated settlement of the alluvial deposits and consolidation of the thick lacustrine deposits. The top of the lacustrine deposits is at approximately El. -24 (60 feet below ground surface), and the bottom is at El. -252 (288 feet below ground surface). Consolidation settlement is estimated to be about 1.4 inches in 50 years.

The compressible soils at a depth of 60 feet allows the consolidation settlement to be relatively uniform. Settlement will occur beneath both the new and existing portions of the bridge and approach embankments. Some of the settlement is ongoing settlement from the original construction.



This magnitude of settlement is more than the customary one inch of settlement commonly considered for design. However, we believe it is acceptable for this application. Other options to further mitigate settlement are either ineffective (e.g., use of lightweight fill does not significantly reduce settlement due to the depth of the clay), or too costly and difficult (e.g., pile foundations driven to refusal (319 feet in S5796-1)).

We recommend that the proposed abutments be supported on conventional spread footing foundations.

Foundation Design Criteria

- Footings Foundation Depth: Minimum of 4 feet below the lowest adjacent ground surface.
- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D.
- Backfill Material: Place Pervious Structure Backfill (CTDOT Form 817 M.02.05) behind the abutments and abutment wingwalls above a line defined by a 1V:1.5H slope extending up from the heel of the footing to grade.
- Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.
- Lateral Earth Pressures: Refer to Figure 5 Active Earth Pressures
- Subgrade Preparation Below Abutments: Minimum 12-inch thick layer of crushed stone (CTDOT Form 817 M.01.01 No. 6) overlying separation fabric (CTDOT Form 817 Sec. 7.55 M8.01-26) over the subgrade.
- Service Limit Bearing: 6,000 pounds per square foot (psf).
- Strength Limit Bearing: Nominal Bearing Resistance 20,000 psf, calculated using AASHTO Equation 10.6.3.1.3.
- Settlement at Recommended Bearing Pressure: Estimated total settlement approximately 1.4 inches; differential less than ¾- inch. Place a control joint at the connection between the existing and new portions of the abutments.
- Coefficient of Friction (tan δ) Along Bottom: 0.50 (AASHTO Table 3.11.5.3-1); Resistance factor 0.8 (AASHTO Table 10.5.5.2.2-1).
- Global Stability: We estimate a maximum resistance factor of 0.58 for the abutments for global stability (minimum factor of safety of 1.7). This is consistent with a load factor of 1.0 and a maximum resistance of 0.65 (AASHTO 11.6.2.3).

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Conventional excavation equipment appears practical for excavation. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Abutment Bearing Surface Preparation

Excavated subgrades for the abutments should be covered with geotextile separation fabric and crushed stone placed over the fabric, and then proofrolled with a vibratory plate compactor. If the subgrade beneath the crushed stone is found to be excessively soft or yielding, it may be necessary to overexcavate the soft material and place additional crushed stone over fabric.



Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.3 Temporary Lateral Support

Temporary lateral support of excavations will be required to maintain and protect traffic flow and nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.4 Excavation Dewatering

Excavation dewatering will be required to permit construction in-the-dry. Pumping from sumps located at the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.5 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces.
- Pile installation and load tests.
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, expressed or implied, is made.

2014-1001
Rehabilitation of Route 15 over Silver Lane
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
East Hartford, Connecticut

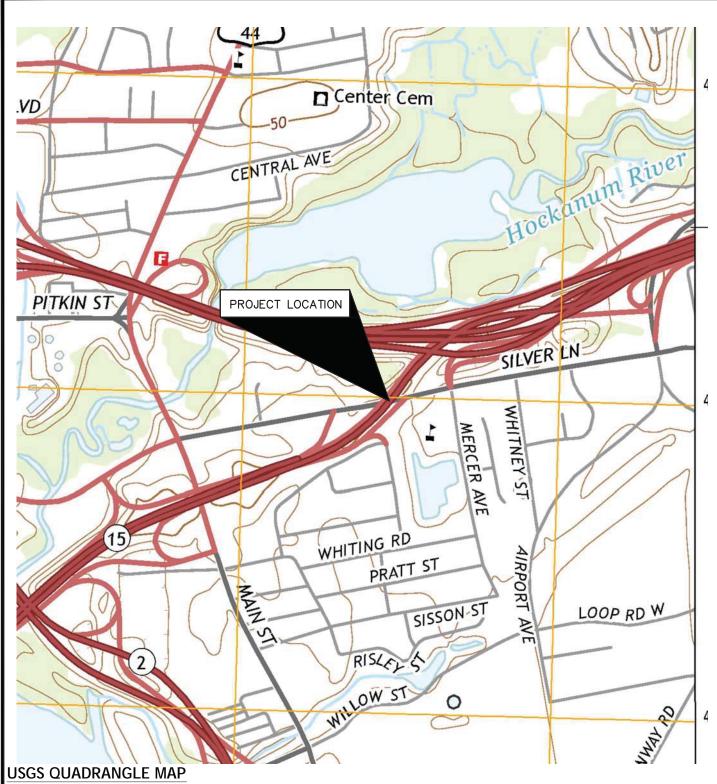
Table 1 Subsurface Data

	Ground Surface				Thickness (ft.)			Ground	water		Bedrock	
Boring No.	El.	Depth (ft.)	Pavement/Topsoil	Fill	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Depth (ft.)	Elevation	Depth (t.) Elevation	
Recent Test Bo	rings											
S5796-1	36.1	319 R	0.5	3.5	56	228	31	8	28.1	319	-282.9	
Recent Cone Po	enetration Test											
CPT5796-1	35.8	222.3		19.5	31.5	>171.3		15	20.8			
Previous Test E	Borings .											
B-15	56.4	91.5		50.5	13.5	>27.5		36	20.4			
B-16	36.7	260		13	33.5*	>213.5		14	22.7			
L-501	57.1	76.5		44	19	>13.5		25	32.1			
L-502	38.3	56.5		43.5	4.5	>8.5		19.2	19.1			
L-506	54.6	56.5		49	1*	6.5		33	21.6			

Notes:

- 1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevation at previous borings were shown on the logs and corrected to NAVD-88 on this table.
- 2. Groundwater levels are approximate.
- 3. ">" Greater Than "--" Not Encountered (C) Bedrock Core Taken (R) Terminated at Refusal "NM" Not Measured





USGS QUADRANGLE MAP
HARTFORD NORTH, CONNECTICUT
HARTFORD SOUTH, CONNECTICUT
DATE 2015



FREEMAN

AND DEVELOPMENT ENGINEERING DESIGN CONSTRUCTION SERVICES

36 JOHN STREET
HARTFORD, CT 06106
WWW.FREEMANCOS, COM
TEL:(860)251-9550
FAX:(860)986-7161

ELEVATE YOUR EXPECTATIONS

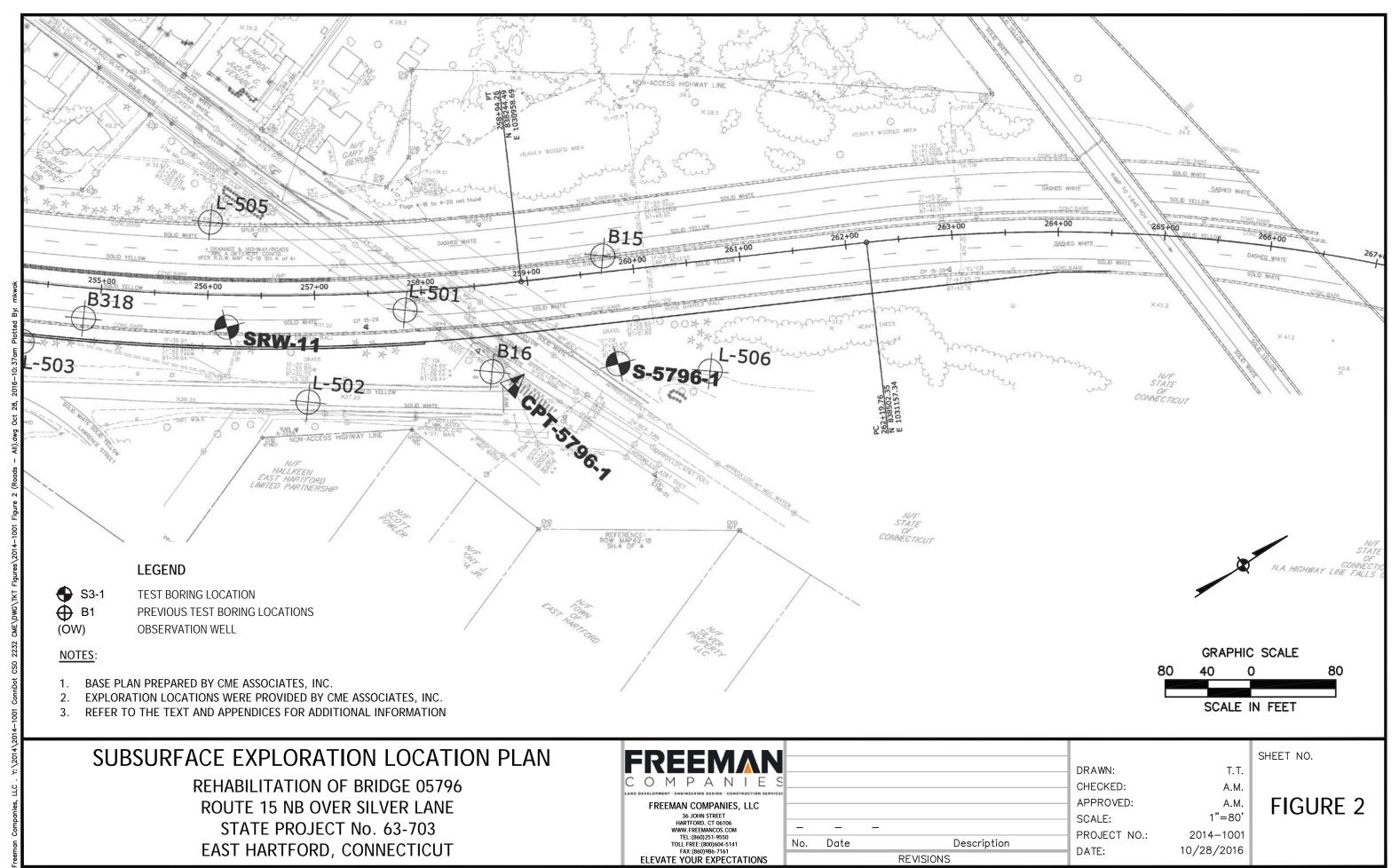
SITE LOCATION MAP

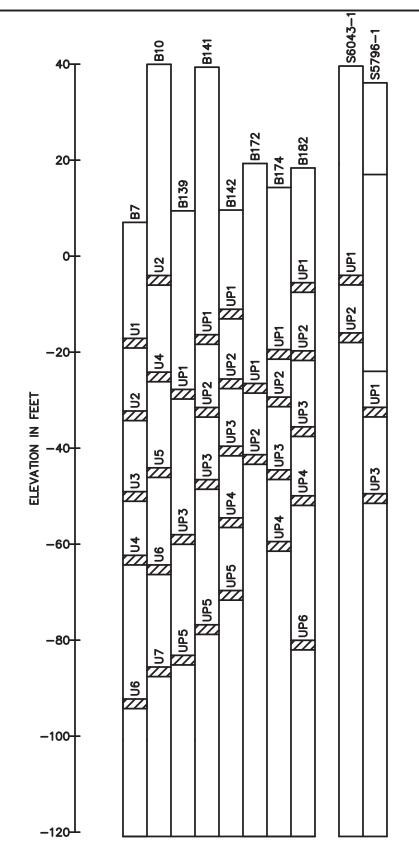
REHABILITATION OF BRIDGE 05796 ROUTE 15 NB OVER SILVER LANE STATE PROJECT NO. 63-703 EAST HARTFORD, CONNECTICUT DRAFTED: CHECKED: APPROVED: SCALED: PROJECT NO.: DATE:

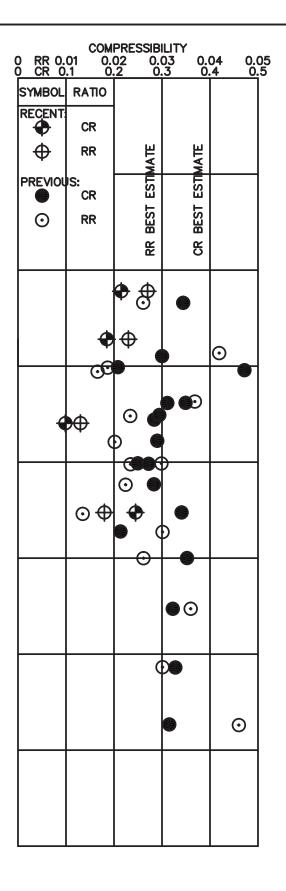
N.W. N.W. 1"=1000' 2014-1001 10/27/2016

SHEET NO.

FIGURE 1







		STRE	ESS HISTORY, &	νο, σ' _P (Ι	KSF)			
0	2	GS.	4 6	3		B 1	0 I	⁴⁰
SYMBOL	BORING NO.	GS. EL						
RECENT:	S5796-1	36.1						
₩	S6043-1	39.6						
PREVIOUS:								20
Ŏ	B139 B142	8.5 7.6						
	B142 B172	19.1						
	B174	14.1						
70	B182	18.4						
	B139	6.7						0
ľ	B139	39.5	abla		#			
$\overline{\diamond}$	B139	42.1						
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			04	·/	$\overline{}$			-20
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NOTES

- 1. PREVIOUS DATA WAS OBTAINED FROM THE RECORD REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD-EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
- 2. ELEVATIONS REFER TO NAVD-88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD-29.

DEFINITIONS

- CR COMPRESSION RATIO (= $\Delta \epsilon/\Delta L$ OG σ'_V) DURING VIRGIN COMPRESSION
- RR RECOMPRESSION RATIO (= $\Delta \epsilon / \text{LOG} \sigma'_{V}$) DURING RECOMPRESSION
- σ'_{VO} IN SITU VERTICAL EFFECTIVE STRESS
- 7- PRECONSOLIDATION STRESS



OMPANES

36 JOHN STREET

HARTFORD, CT 06106

WWW.FREEMANCOS. COM

TEL:(860)251-9550

FAX:(860)986-7161

ELEVATE YOUR EXPECTATIONS

SUMMARY OF VARVED CLAY PROPERTIES
EAST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3B

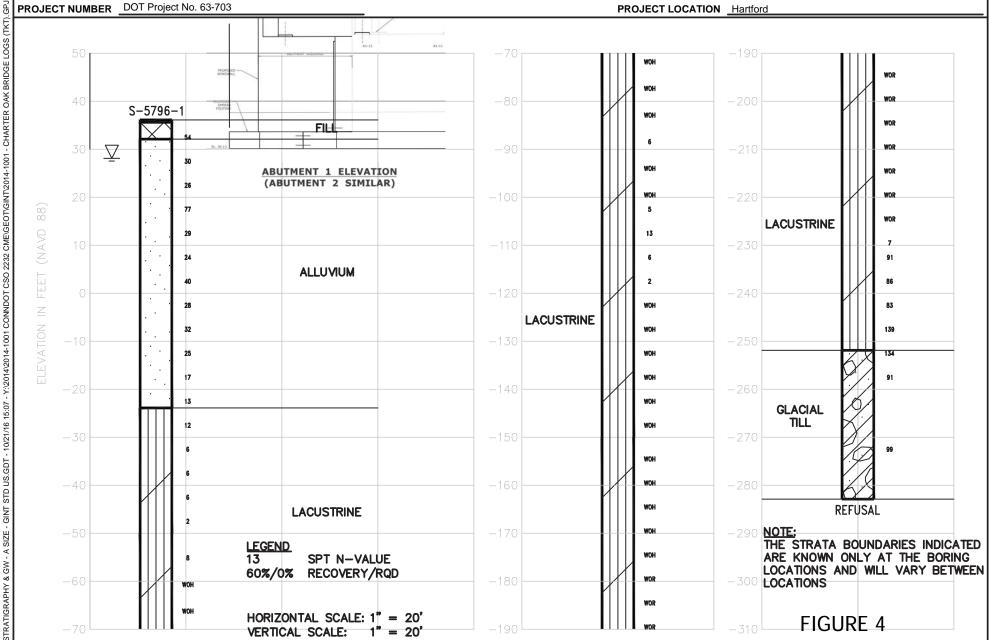
SUBSURFACE DIAGRAM

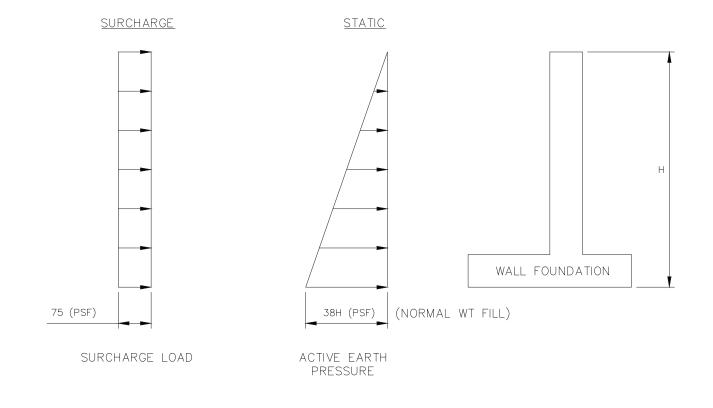
Freeman Companies, LLC 36 John Street Hartford, CT 06109

PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford





NOTES:

- 1. APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
- 2. H IS MEASURED IN FEET
- 3. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL (FORM 817 M.02.05) WITH A UNIT WEIGHT OF 125 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
- 4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
- 5. SLIDING:
 COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3-1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
- 6. IGNORE PÁSSIVE RESISTANCE IN FRONT OF FOOTING.



ELEVATE YOUR EXPECTATIONS

LATERAL EARTH PRESSURES ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 05796 ROUTE 15 NB OVER SILVER LANE STATE PROJECT NO. 63-703 EAST HARTFORD, CONNECTICUT
 DRAFTED:
 M.K.

 CHECKED:
 N.W.

 APPROVED:
 N.W.

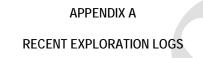
 SCALED:
 N.T.S.

 PROJECT NO.:
 2014—1001

 DATE:
 10/27/2016

FIG.

FIGURE 5



Driller:	P	P. Labo	ssier	r		Co	onne	cticu	t DOT Borir	ng Report	Hole No.:	S-5796-1	
Inspect		B. Cote		'	Т	own:		Hartfo		0 .	Stat./Offset:		
Engine		I. Whe				Project			Project No. 63	3-703	Northing:	838256.16	
Start D		-9-16				Route N			Lane		Easting:	1031077.32	
		-13-16	6			Bridge N		05796			Surface Elev		
Project	Descript	tion: F	Reloc	ation				hange	29 & Widenir	ng	1		
Casing	Size/Typ	ne: 4-ir	n. Ca	sina	5	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Type:	
	er Wt.: 3			30in		lamme						- 7	
Frounc	dwater Ol	bservat	ions:	@8		ter AD							
					PLES				70				T c
Depth (ft)	Sample Type/No.	р	San	vs on npler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Descri and Notes		Elevation (ft)
0-	S1	8	26	28	16	24	24		Topsoil Fill	Brown c-f SAND moist	, some silt, tra	ice c-f gravel,	-35 -
5— 5—	S2	31	16	14	21	24	24		Alluvium	Brown c-f SAND moist	, some silt, so	me c-f gravel,	-30
10— - -	S3	18	13	13	14	24	10			Brown c-f SAND	, some c-f gra	vel, little silt, wet	_ _ 25 _
15— - -	S4	28	34	43	32	24	12			Brown c-f SAND	, some silt, litt	le c-f gravel	- - -20 -
20-	S5	12	13	16	17	24	11			Brown c-f SAND	, little silt, trac	e f gravel	- - -15 -
25— - - -	S6	8	9	15	17	24	16			Brown c-f SAND	, some silt, tra	ace f gravel	_ _ 10
30-	S7	19	19	21	27	24	18			Gray f SAND and	d SILT		_ _ _5 _

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES:	Sheet
Earth: 319ft Rock: 0ft		1 of 10
No. of No. of		
Soil Samples: 59 Core Runs: 0		SM-001-M REV. 1/02

Driller:	P	. Labo	ssier	<u> </u>		Co	onne	cticu	t DOT Borii	ng Report	Hole No.:	S-5796-1	
Inspect		. Cote		1	-	Γown:		Hartfo			Stat./Offset:	0 0700 1	
Engine		. Whe				Project			Project No. 63	3-703	Northing:	838256.16	;
Start D		-9-16			F	Route N			Lane		Easting:	1031077.3	2
Finish [Date: 5-	-13-16)		E	3ridge N	No.:	0579	6		Surface Elev	ation: 36.1	
Project	Descript	ion: R	Reloc	ation	of I-9	91 NB	Interc	hange	29 & Widenir	ng			
Casing	Size/Typ	e: 4-ir	n. Ca	sing		Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Гуре:	
Hamme	er Wt.: 30	00lb	Fall:	30in	. H	Hamme	r Wt.:	140lb	Fall: 30in.				
Ground	lwater Ob	servat					T hou	ırs	T				
				SAMF	PLES		1	1	р, _С				(#)
(#)	a		Blow	vs on			<u>.</u>	%	alize	Ma	aterial Descrip	otion	Elevation (ft)
Depth (ft)	Sample Type/No.		Sam	npler		Pen. (in.)	Rec. (in.)	° Q	nera ata scrij		and Notes		vati
De	Sal	р	er 6	inche	es	Material Description Description October 1975 October 1975 October 2975 October 29						Ele	
_									Alluvium				
35-	00	40	40	40	4.5	0.4	40		(con't)				-
	S8	16	12	16	15	24	12			Gray f SAND an	d SILT		_0
_													_
-													-
40-			4-	4-	0.4		4.0						-
	S9	14	15	17	24	24	18			Gray f SAND, some silt			 -5
_													
-													-
45—	0.40	0 44 44 47					4.0						-
	S10	9 11 14 17				24	18			Gray f SAND and SILT			- -10
_													
-													-
50 —	0.1.1												-
	S11	13	9	8	11	24	24			Gray SILT, some	e f sand		15
_													
-													-
55—	0.10	_		_	_								-
	S12	7	6	7	8	24	18			Gray SILT, little	fsand		20
_													
_													-
60-	0.10	_	•	_	-				Lacustrine				-
	S13	5	6	6	5	24	24			Gray SILT and C	CLAY, little f sa	nd	
_													-
65-	64:	_	_	_	_								-
	S14	3	3	3	3	24	24			Gray silty CLAY,	trace f sand		30
		Samp	Іе Ту	pe:	S = S	Split Sp	oon	C = C	Core UP = Ur	ndisturbed Piston	V = Vane S	Shear Test	
	F	Propor	tions	Use	d: T	race =	1 - 10	0%, I	_ittle = 10 - 20	%, Some = 20	- 35%, And	= 35 - 50%	
Total P	enetratio	n in				NOT	ES:						Sheet
Earth:	319ft	Rock:											2 of 10
No. of Soil Sa	mples: 5		o. of ore R	uns: ()							SM-0	01-M REV. 1/02
	p.00. U	5 00	11	J. 10. 1	-							OIVI-0	J. WINEV. 1/02

Driller:	P	. Laboss	ier		Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S-5796-1	
Inspect	_	. Cote	-	-	Town:		Hartfo		- •	Stat./Offset:		
Engine	er: N	l. Whette	en	ı	Project	No.:	DOT	Project No. 63	3-703	Northing:	838256.16	
Start Da	ate: 5	-9-16		ı	Route N	lo.:	Sllve	r Lane		Easting:	1031077.32	
Finish [Date: 5	-13-16		E	Bridge N	No.:	0579	6		Surface Elev	ation: 36.1	
Project	Descript	ion: Rel	ocatior	of I-9	91 NB	nterc	hange	29 & Widenir	ng			
Casing	Size/Typ	oe: 4-in. (Casing		Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel	Гуре:	
Hamme	er Wt.: 3	00lb Fa	all: 30ir	1. I	Hamme	r Wt.:	140lb	Fall: 30in.				
Ground	lwater Ob	oservation				T hou	ırs	Ī	I			
			SAM	PLES	<u> </u>		T	_ p ₀				(#E)
Depth (ft)	Sample Type/No.	S	ows or ampler 6 inch		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Descri and Notes	otion	Elevation (ft)
	UP-1				24	24		Lacustrine	Gray silty CLAY			-
70-	S15	woh :	3 3	3	24	24		(con't)	Gray silty CLAY,	trace f sand		- - 35
_												F
75 - -	S16	woh :	3 3	3	24	24			Gray silty CLAY,	trace f sand		- 40
-	UP-2				24	24			Gray silty CLAY			_
80-	S17	woh	1 1	2	24	24			Gray silty CLAY,	trace f sand,	with red lenses	_ _ 45
- - 85												-
-	UP-3				24	24			Gray silty CLAY			-50
	S18	woh w	oh 8	5	24	24			Gray silty CLAY,	trace f sand		-
90-												_ _ 55
95—	S19	woh w	oh woh	2	24	24			Gray silty CLAY,	trace f sand		
- 100 - -	S20	woh w	oh woh	3	24	24			Gray silty CLAY,	trace f sand		_ _ 65
		•	٠.						ndisturbed Piston %, Some = 20			
Total D	enetratio	· .		1		ES:	- ,0, 1		,,, сопто до	3070, 711IU		neet
Earth:		Rock: 0	ft		1401	20.						of 10
No. of	ושונ	No. o			\dashv							
	mples: 5		Runs:	0							SM-001-N	1 REV. 1/02

Driller:	P	P. Labossier	Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S-579	6-1
Inspect	tor: B	3. Cote	Town:		Hartf	ord		Stat./Offset:	
Engine	er: N	I. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 83825	6.16
Start D	ate: 5	-9-16	Route N	lo.:	Sllve	r Lane		Easting: 10310	77.32
Finish I	Date: 5	-13-16	Bridge 1	No.:	0579	6		Surface Elevation: 3	6.1
Project	Descript	tion: Relocation of	I-91 NB	Interc	hange	29 & Wideni	ng		
		oe: 4-in. Casing				1-3/4 inch ID		Core Barrel Type:	
	er Wt.: 3		Hamme			Fall: 30in.			
Ground	dwater Ol	bservations: @8.0		T hou	ırs				
Depth (ft)	Sample Type/No.	SAMPLE Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Description and Notes	Elevation (ft)
_						Lacustrine			_
- 105 <i>-</i> -						(con't)			-
- - -	S21	woh woh woh wo	h 24	24			Gray silty CLAY	trace f sand	
110 - -	S22	woh woh woh 1	24	24			Gray silty CLAY	trace f sand	- - 75
- - 115-									-
	S23	woh woh woh 2	24	24			Gray silty CLAY	trace f sand	80
120 <i>-</i> -	S24	woh 3 3 4	24	24			Gray silty CLAY	trace f sand	- - 85
- - -									- - -
125— - -	S25	woh woh woh 4	24	24			Gray silty CLAY	trace f sand	- 90 -
- 130 <i>-</i> -	S26	woh woh woh 2	24	24			Gray and red sil	y CLAY, varved	- - - 95
- - 135- -									- - -
		Proportions Used:	Trace =	1 - 10				V = Vane Shear T - 35%, And = 35 - 5	50%
	enetratio		TON	ΓES:					Sheet 4 of 10
Earth:	319ft	Rock: Oft No. of							· · •
	mples: 5								SM-001-M REV. 1/02

Driller:	Р	. Labossier	Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S-5796-1	
Inspecto	or: B	. Cote	Town:		Hartfe	ord		Stat./Offset:	
Enginee		. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 838256.16	
Start Da		-9-16	Route N			r Lane		Easting: 1031077.32	
Finish D		-13-16	Bridge I		0579			Surface Elevation: 36.1	
Project	Descript	ion: Relocation of I	-91 NB	Interc	hange	e 29 & Widenir	ng		
		e: 4-in. Casing	Sample		Core Barrel Type:				
-	r Wt.: 30		Hamme						
Ground	water Ob	servations: @8.0 SAMPLE) I hou	ırs				
_		SAIVIPLE				Generalized Strata Description			(ff)
Depth (ft)	Sample Type/No.	Blows on	Pen. (in.)	(in.)	%	raliz T	Ma	iterial Description	Elevation (ft)
eptr	amp /pe/	Sampler per 6 inches	J.	Rec.	RQD	ene rata escr		and Notes	eva
	Sã	per o menes	P	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	X	0 20 0			
	S27	woh 2 3 3	24	24		Lacustrine	Gray and red silt	y CLAY, varved	100
						(con't)			
									_
140									- 1
	S28	woh 6 7 8	24	24			No Recovery		—-105
145									-
	S29	9 woh 3 3 4 24 24 Gray and red silty CLAY, varved							110
									-
150									-
	S30	woh woh 2 3	24	24			Gray and red silt	y CLAY, little c gravel, varved	115
+									-
155									
-	S31	woh woh 2 2	24	24			Gray and red silt	y CLAY, varved	120
+									-
160									
	S32	woh woh woh 4	24	24			Gray and red silt	y CLAY, varved	−-125
+							-		- 1
-									
165									
	S33	woh woh woh 5	24	24			Gray and red silt	y CLAY, varved	130
+								•	-
-									-
170									
170		Sample Type: S =	Split Sp	oon	C = C	Core UP = Ur	ndisturbed Piston	V = Vane Shear Test	
								- 35%, And = 35 - 50%	
Total Pe	enetratio	n in	NOT	ΓES:					heet
Earth: 3	319ft	Rock: 0ft						5 (of 10
No. of		No. of							
Soil Sar	mples: 5	9 Core Runs: 0						SM-001-N	M REV. 1/02

Driller:	P	P. Labossier	C	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S-5796-1	
Inspect	tor: B	B. Cote	Town:		Hartfe	ord		Stat./Offset:		
Engine	er: N	I. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing:	838256.16	
Start D	ate: 5	-9-16	Route N	lo.:	Sllve	r Lane		Easting:	1031077.32	
Finish [Date: 5	-13-16	Bridge	No.:	0579	6		Surface Elev	ation: 36.1	
Project	Descript	tion: Relocation of	l-91 NB	Interc	hange	e 29 & Widenir	ng	•		
Casing	Size/Ty	pe: 4-in. Casing	Sample	r Type	e/Size:	1-3/4 inch ID		Core Barrel	 Γγρε:	
	er Wt.: 3		Hamme						71	
Ground	dwater O	bservations: @8.0	after AD	T hou	urs			-		
		SAMPLE	S			70				t
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Descri and Notes	otion	Elevation (ft)
170 <i>-</i> -	S34	woh woh woh 2	24	24		Lacustrine (con't)	Gray and red silt	y CLAY, varve	ed	
- 175— -	S35	woh woh woh 5	24	24			Gray and red silt	y CLAY, varve	ed	_ _ _ _ 140
180— - - -	S36	woh woh woh 4	24	24			Gray and red silt	y CLAY, varve	ed	_ _ _ 145 _
 185 - - -	S37	woh woh woh 4	24	24			Gray and red silt	y CLAY, varve	ed	- - 150 -
190— - - -	S38	woh woh woh 3	24	24			Red brown silty (CLAY, varved		- - 155 -
- 195 <i>-</i> - -	S39	woh woh woh 4	24	24			Red brown silty (CLAY, varved		_ _ 160 _
200 — - - -	S40	woh woh woh 3	24	24			Red brown silty (CLAY, varved		_ _ 165 _ _
_		Sample Type: S = Proportions Used:	Trace =	1 - 10					= 35 - 50%	
Total P	enetratio	on in	NO	ΓES:						neet
Earth:	319ft	Rock: Oft							60	of 10
No. of	mnles: F	No. of							014.004.1	LDEV 4/22
SUII Sa	mples: 5	59 Core Runs: 0							SIVI-001-IV	I REV. 1/02

Driller: P. Labossier	Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S-579	96-1	
Inspector: B. Cote	Town:	I	Hartfo	ord		Stat./Offset:		
Engineer: N. Whetten	Project I	No.: I	DOT	Project No. 63	3-703	Northing: 83825	56.16	
Start Date: 5-9-16	Route N	lo.: S	SIIve	r Lane		Easting: 10310	077.32	
Finish Date: 5-13-16	Bridge N	No.: (0579	6		Surface Elevation: 3	86.1	
Project Description: Relocation of	I-91 NB I	nterch	nange	e 29 & Widenir	ng			
Casing Size/Type: 4-in. Casing	Sampler	r Type/	Size:	1-3/4 inch ID		Core Barrel Type:		
Hammer Wt.: 300lb Fall: 30in.	Hamme	r Wt.: ′	140lb	Fall: 30in.				
Groundwater Observations: @8.0		T hou	rs	1	1			
SAMPLI	ES			ی ر				æ
Elows on	(·	(in.)	. 0	Generalized Strata Description	Ma	terial Description		Elevation (ft)
Sampler per 6 inches	Pen. (in.)	<u>:</u>	%	nera ata ccrip		and Notes		/atj
Sampler Sempler per 6 inches	Per	Rec.	RQD	Ger Stra Des				<u>E</u>
205				Lacustrine (con't)				-
S41 woh woh woh	2 24	24			Red brown silty 0	CLAY, varved		170
 								-
								-
210								_
S42 wor wor wor w	or 24	24				CLAY, varved, TV 0.2	tsf PP 0.5	175
 					tsf			-
-								-
215								-
S43 wor wor wor w	or 24	24			Red brown silty (NAV varved		- 180
	. 2.				Trea brown sitty c	JEAT, Valveu		- 100
_								-
								-
220	24	24				N. A.V.		- 405
S44 wor wor wor w	or 24	24			Red brown silty (CLAY, varved		185 -
								_
-								-
225								-
S45 wor wor w	or 24	24			Red brown claye	y SILT, varved		190
								-
								_
230								-
S46 wor wor w	or 24	24			Red brown claye	y SILT, varved		195
+								-
							-	-
235								_
S47 wor wor wor w	or 24	24			Brown to red clay	ey SILT, varved	-	200
+						, , , , , , , , , , , , , , , , , , , ,	-	-
Comple Time: O	- Crollit C		C - C	Poro IID - II	diaturbad Diata-	\/ = \/ana Chaa: 3		
1						V = Vane Shear T 35%, And = 35 - 9		
·			/U, I		70, GOITIE - 20 -	5570, Alia = 55 - 3		
Total Penetration in	NOT	⊏5:					Sheet 7 of 1	
Earth: 319ft Rock: Oft No. of No. of								
,								

Driller:	Р	. Labo	ssier	ſ		Co	onne	cticu	t DOT Bori	ng Report	Hole No.:	S-5796-1		
Inspector: B. Cote To						Town: Hartford					Stat./Offset:			
Engine	er: N	I. Whe	tten		F	Project No.: DOT Project No. 63-703 North					Northing:	Northing: 838256.16		
						Route No.: Sllver Lane Easting:					1031077.32			
Finish Date: 5-13-16 Bri							ridge No.: 05796 Surface Elevation:							
Project	Descript	tion: R	eloc	ation	of I-9	1 NB I	nterc	hange	29 & Wideni	ng				
Casing	Size/Typ					Sample	г Туре	/Size:	1-3/4 inch ID		Core Barrel T	ype:		
	er Wt.: 3			30in		lamme			Fall: 30in.					
Ground	lwater Ol	oservat				ter AD	T hou	ırs		1				
Depth (ft)	SAMPLES Blows on Sampler per 6 inches		Pen. (in.)	Rec. (in.)	RQD % Generalized Strata Description		Material Description and Notes		Elevation (ft)					
	07					<u> </u>								
240 <i>-</i> -	S48	wor	wor	wor	wor	24	24		Lacustrine (con't)	Brown to red cla	yey SILT, varve	ed	- - 205	
- - 245-	0.40						0.4						-	
- - -	S49	wor	wor	wor	wor	24	24			Brown to red cla	yey SILT, varve	ed	210 - - -	
250— - - -	S50	wor	wor	wor	wor	24	24			Brown to red cla	yey SILT, varve	ed	- 215 -	
- 255 — - -	S51	wor	wor	wor	wor	24	24			Brown to red cla TV 0.3tsf	yey SILT, varve	ed, PP 0.75 tsf	- - 220	
260— — —	S52	wor	wor	7	10	24	24			Red silty CLAY			_ _ 225 _	
- 265— - -	S53	wor	35	56	70	24	20			Red clayey SILT	, varved		- - 230	
270— 	S54	wor	40	46	61	24	15			Red clayey SILT	, varved			
		Propor	•	•		race =	1 - 10			ndisturbed Piston		= 35 - 50%		
	Total Penetration in						ES:						neet of 10	
Earth: 319ft Rock: 0ft													10	
No. of Soil Samples: 59 No. of Core Runs: 0													SM-001-M REV. 1/02	

Driller:	F	P. Labo	ssier			Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.:	S-5796-1	
Inspector: B. Cote					Т	own:		Hartfo	ord	Stat./Offset:	Stat./Offset:		
Engine	er: N	I. Whe	tten		F	Project No.: DOT Project No. 63-703 Northing						rthing: 838256.16	
Start Date: 5-9-16					F	Route No.: Sllver Lane Easting:						1031077.32	
Finish [Date: 5	5-13-16	6		В	Bridge 1	No.:	0579	6		Surface Eleva	ation: 36.1	
Project	Project Description: Relocation of I-91 NB Interchange 29 & Widening												
Casing	Size/Ty	pe: 4-ir	า. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel T	уре:	
Hamme	er Wt.: 3	00lb	Fall:	30in	. F	łamme	r Wt.:	140lb	Fall: 30in.				
Ground	Groundwater Observations: @8.0 after ADT hours												
	SAMPLES										£		
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches			Pen. (in.) Rec. (in.) RQD %		Generalized Strata Description	M	Material Description and Notes		Elevation (ft)		
_									Lacustrine				_
_									(con't)				-
275—	S55	35	38	45	56	24	18			Red clayey SIL	T varued		- 240
_			00	40	00		10			Red clayey SIL	i, vaiveu		-240
_													-
_													-
280 —	S56	60	61	78	07	24	18			D-40UT			045
	330	- 60	01	70	97	24	10			Red SILT			─-245 _
_													
_													-
285—													-
	S57	58	63	71	91	24	16			Red SILT			
_									Olasial Till				
_									Glacial Till				_
290 —		-											-
_	S58	40	42	49	68	24	16			Red c-f SAND,	little silt		255
		1											
_													
295-													-
_													260
_													
300-													-
-													-265
-													
305-		-											
_						=					.,	–	
Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%													
Total P	enetratio	on in				ПОЛ	ES:						heet
Earth:	319ft	Rock:										9	of 10
No. of Soil Sa	No. of No. of Soil Samples: 59 Core Runs: 0 SM-001-M REV									M REV. 1/02			

Driller:	F	P. Labossier	C	onne	cticu	t DOT Borii	ng Report	Hole No.: S-57	96-1	
Inspect	or: E	3. Cote							at./Offset:	
Engine	er: 1	N. Whetten	Project No.: DOT Project No. 63-703 Northing:						ng: 838256.16	
Start Da	ate: 5	5-9-16							077.32	
Finish [5-13-16		Bridge No.: 05796 Surface Elevation: 36.1						
Project Description: Relocation of I-91 NB Interchange 29 & Widening										
	•	pe: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID Core Barrel Type							
	Hammer Wt.: 300lb Fall: 30in. Hammer Wt.: 140lb Fall: 30in.									
Groundwater Observations: @8.0 after ADT hours SAMPLES										
		SAIVIFLE				. Ged			(#)	
(ff)	Se So.	Blows on	in.)	(in.)	%	Generalized Strata Description	Ma	terial Description	tion	
Depth (ft)	Sample Type/No.	Sampler per 6 inches	Pen. (in.)	Pen. (Rec. (RQD	enel rata		and Notes	Elevation (ft)	
ă	ığ <u>√</u>	per o mones	P	&	X	9229				
-	S59	56 45 54 59	24	16		Glacial Till	Red c-f SAND, li	ttle silt	270	
						(con't)				
_										
310-									_	
_										
_										
315—							Rig chatter at 31	5 ft, roller bit to 319 ft		
_									-280	
_							A	1 - 1 0 4 0 1 1 1	H 1-21	
320 —							action	ck at 319' based on ro	ollar bit	
_									-285	
							END OF BORIN	G 319ft		
_										
325—									_	
_									-290	
_										
330-									-	
-									295	
335—										
-									300	
340										
	Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%									
Total P	enetratio	on in	NO	ΓES:					Sheet	
Earth: 3	319ft	Rock: Oft							10 of 10	
No. of Soil Sa	mples:	No. of 59 Core Runs: 0							SM-001-M REV. 1/02	



0

50

100 -

150 -

200 -

250

Depth (feet)

Freeman Companies

150

fs (tsf)

0.0 0.5 1.0 1.5 2.0

Hand Augered

qt (tsf)

Hand Augered

100

Job No: 16-53057 Date: 06:14:16 21:29

0.0

Site: I-91 Interchange 29, Hartford, CT Rf (%)

2.5

Hand Augered

5.0

Sounding: CPT16-5796-1 Cone: 419:T1500F15U500 u (ft) **SBTn** 400 800 0 3 6 9 Hand Augered Sand Mixtures Sands Silt Mixtures Sands Sand Mixtures Silt Mixtures Sand Mixtures Silt Mixtures Silt Mixtures Silt Mixtures Silt Mixtures Clays Clays Clays Sensitive, Fine Grained Clays Sensitive, Fine Grained Refusal

Max Depth: 67.750 m / 222.27 ft Depth Inc: 0.050 m / 0.164 ft

Refusal

File: 16-53057_CP5796-1.DRF

Refusal

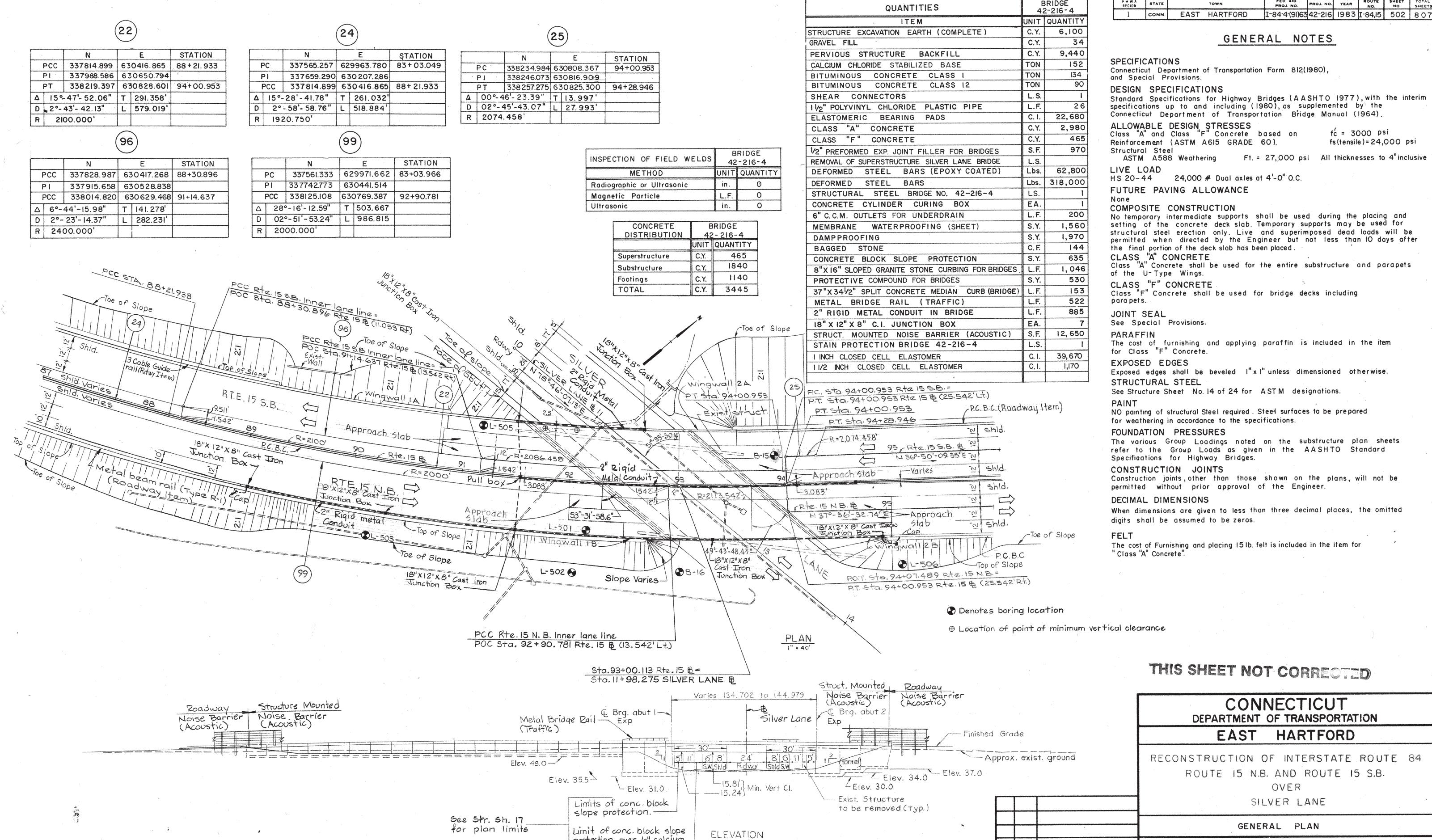
SBT: Robertson, 1990 Coords: UTM Zone 18 N: 4625982m E: 696494m

Refusal

APPENDIX B PREVIOUS TEST BORING LOGS







protection over 6" calcium

chloride stabilized base

1"=40

CHECKER RHC

DATE 9-8-81

HAYDEN, HARDING AND BUCHANAN INC.

DRAFTER

Haylun

ENGINEER

APPROVED

DESIGNER MAK

STRUCTURE NO. 42-216-4

QUANTITIES OF WORK WHICH WILL BE REQUIRED.

THE INFORMATION, INCLUDING ESTIMATED QUANITIES OF WORK

NO. DATE

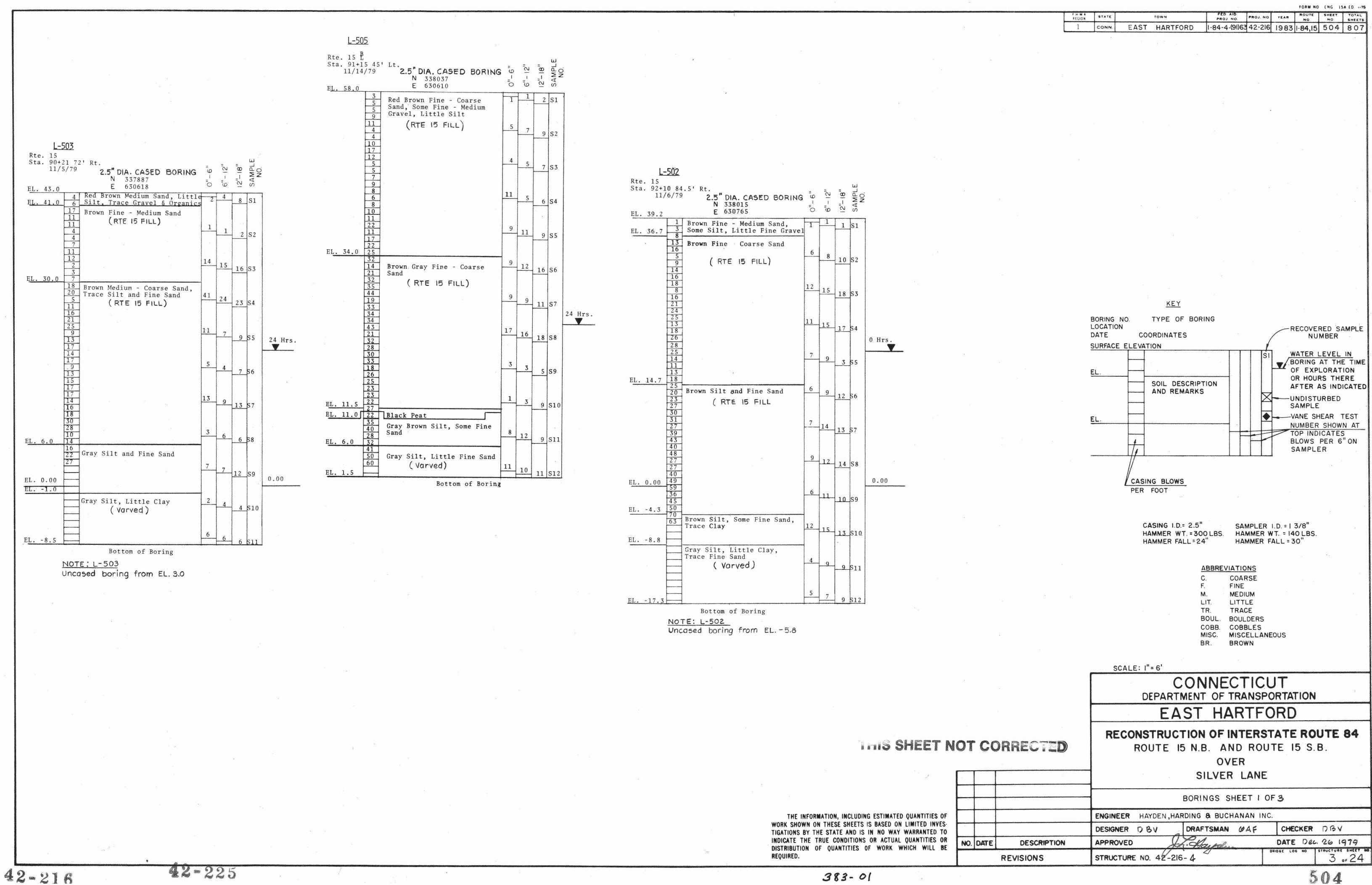
DESCRIPTION

REVISIONS

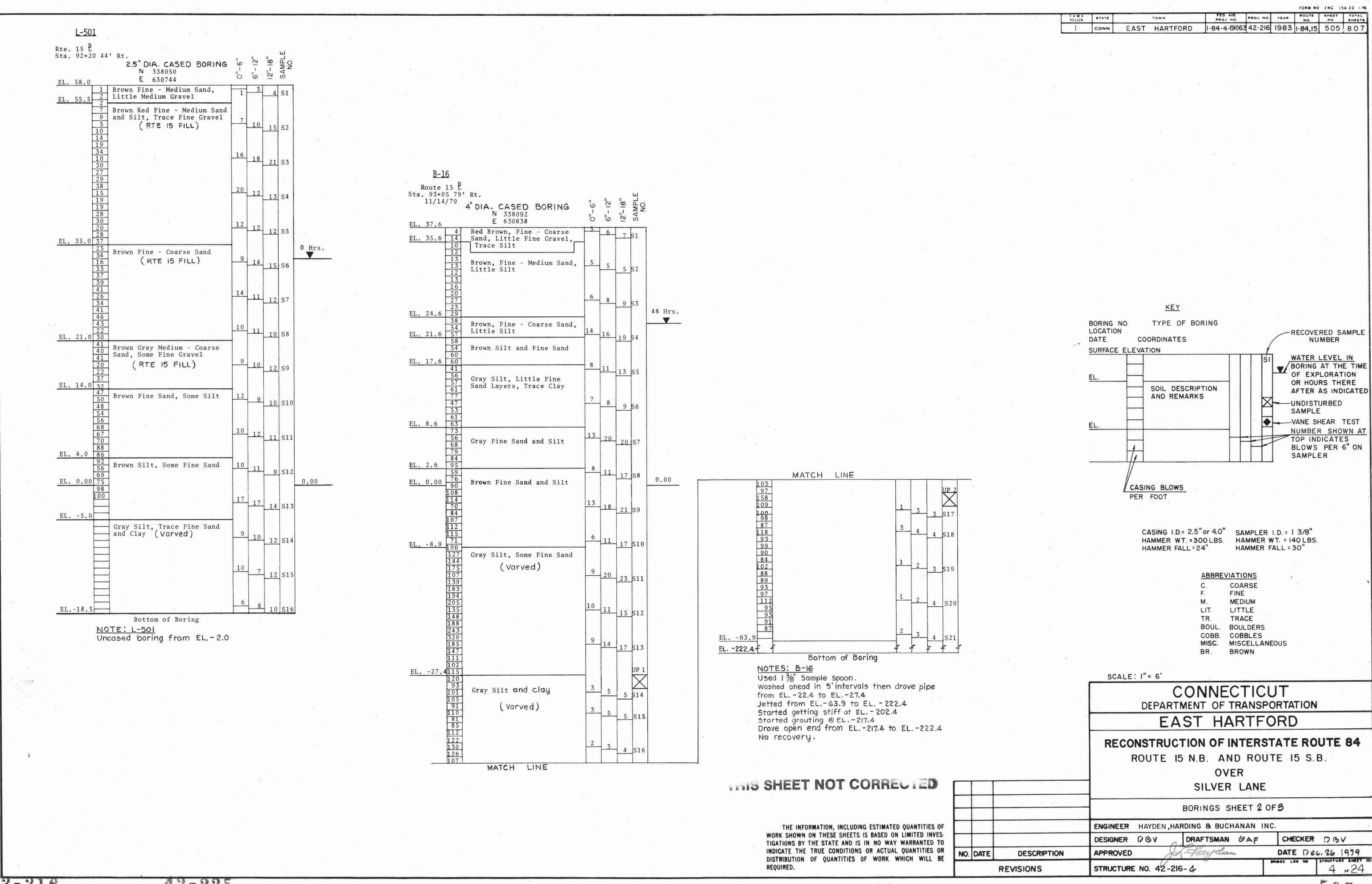
SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS

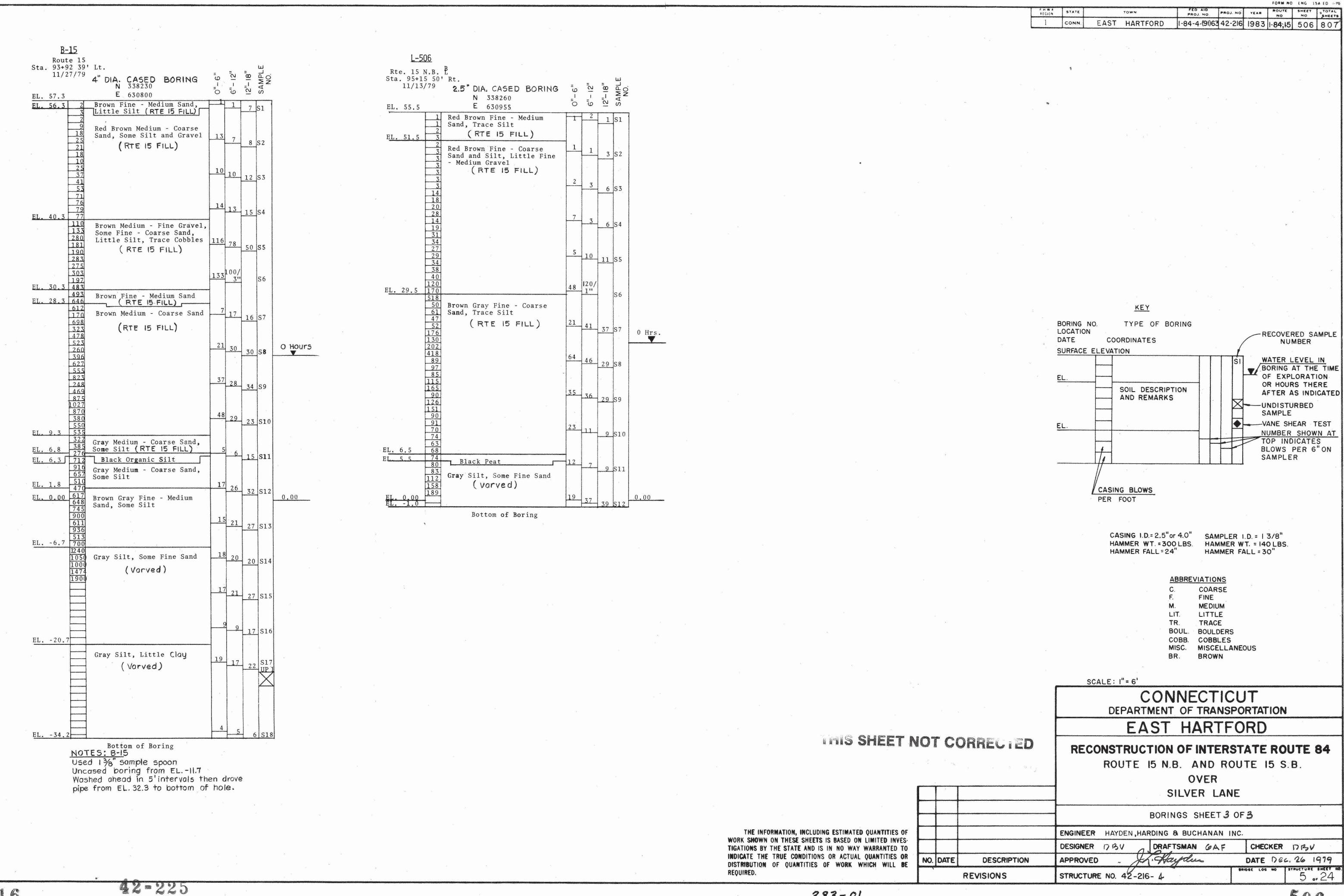
BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE

TRUE CONDITIONS OR ACTUAL QUANTITIES OR DISTRIBUTION OF



383-01





383-01

42-216

APPENDIX C
RESULTS OF LABORATORY TESTING





Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: GA
Sample ID: --- Test Date: 07/01/16 Checked By: emm

Depth: --- Test Id: 382122

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
S5796-1	UP- 1 - Top	67-69	Moist, gray clay	45.6
S5796-1	UP- 1 - Top middle	67-69	Wet, gray clay	40.1
S5796-1	UP- 1 - Bottom middle	67-69	Moist, greenish gray clay	43.3
S5796-1	UP- 1 - Bottom	67-69	Wet, greenish gray clay	43.4
S6043-1	UP- 2 - Top	53-55	Moist, gray clay	58.9
S6043-1	UP- 2 - Top middle	53-55	Moist, gray clay	51.3
S6043-1	UP- 2 - Bottom middle	53-55	Moist, greenish gray clay	52.2
S6043-1	UP- 2 - Bottom	53-55	Moist, greenish gray clay	53.3

Notes: Temperature of Drying: 110° Celsius



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: --- Sample Type: --- Tested By: md
Sample ID: --- Test Date: 06/24/16 Checked By: emm

GTX-304831

Depth: --- Test Id: 382024

Moisture Content of Soil and Rock - AASHTO T 265

	Boring ID	Sample ID	Depth	Description	Moisture Content,%	
	S5796-1	UP- 3 - Top	85-87	Moist, greenish gray clay	51.3	
	S5796-1	UP- 3 - Top middle	85-87	Moist, greenish gray clay	51.8	
	S5796-1	UP- 3 - Bottom middle	85-87	Moist, gray clay	42.9	
L	S5796-1	UP- 3 - Bottom	85-87	Moist, gray clay	53.4	
	S-8132	Tube 1 - Top	35-37	Moist, reddish brown clay	36.9	
	S-8132	Tube 1 - Top middle	35-37	Wet, reddish brown clay	43.5	
	S-8132	Tube 1 - Bottom middle	35-37	Moist, dark reddish brown silt	31.9	
	S-8132	Tube 1 - Bottom	35-37	Wet, dark reddish brown silt	44.6	

Notes: Temperature of Drying: 110° Celsius



Client: Freeman Companies, LLC

Project:

Reconstruction of Exit Charter Oak Bridge Location: Hartford, CT

Boring ID: S-5796-1 Sample Type: jar Tested By: GΑ Sample ID: S-3 Test Date: 08/02/16 Checked By: emm

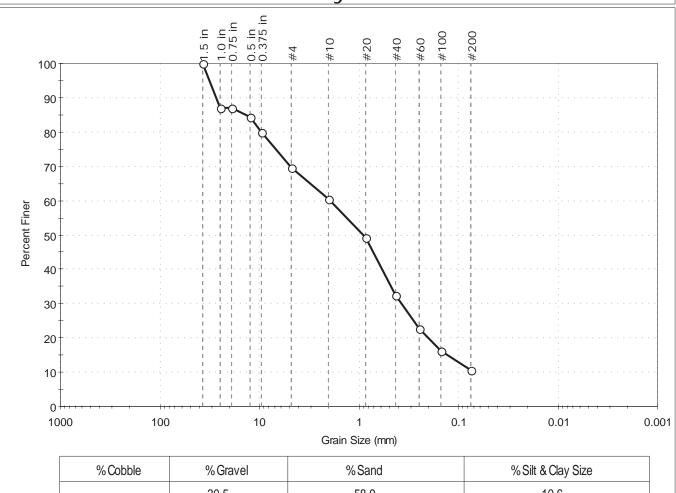
10-12 ft 384944 Depth: Test Id:

Test Comment:

Visual Description: Moist, red sand with silt and gravel

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
	30.5	58.9	10.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1.0 in	25.00	87		
0.75 in	19.00	87		
0.5 in	12.50	84		
0.375 in	9.50	80		
#4	4.75	70		
#10	2.00	60		
#20	0.85	49		
#40	0.42	32		
#60	0.25	23		
#100	0.15	16		
#200	0.075	11		

<u>Coefficients</u>							
$D_{85} = 13.9597 \text{ mm}$	$D_{30} = 0.3715 \text{ mm}$						
$D_{60} = 1.9405 \text{ mm}$	$D_{15} = 0.1303 \text{ mm}$						
$D_{50} = 0.9090 \text{ mm}$	$D_{10} = N/A$						
$C_u = N/A$	C _C =N/A						

Project No:

GTX-304831

Classification <u>ASTM</u> N/A <u>AASHTO</u> Stone Fragments, Gravel and Sand (A-1-b(0))

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR

Sand/Gravel Hardness: HARD



Client: Freeman Companies, LLC

Project:

Reconstruction of Exit Charter Oak Bridge Location: Hartford, CT

Boring ID: S5796-1 Sample Type: tube GA Tested By: Sample ID: UP-1 - Top middle Test Date: 07/13/16 Checked By: emm

Project No:

GTX-304831

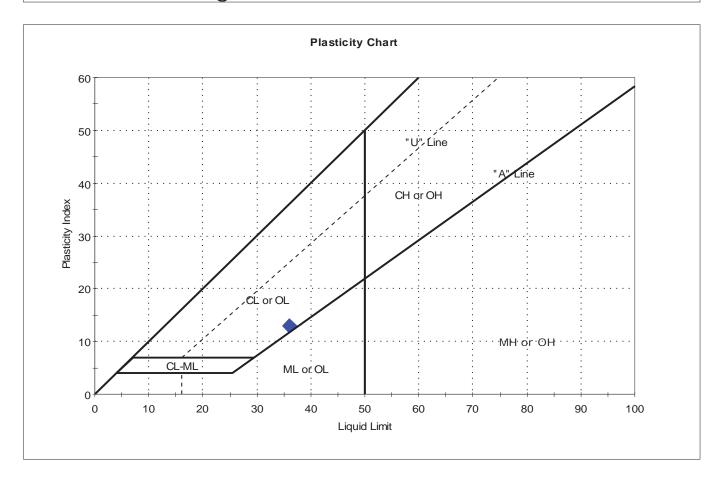
Depth: 67-69 Test Id: 382132

Test Comment:

Visual Description: Wet, gray clay

Sample Comment:

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Top middle	S5796-1	67-69	40	36	23	13	1.3	

Sample Prepared using the WET method

Dry Strength: MEDIUM Dilatancy: RAPID Toughness: MEDIUM



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S5796-1 Sample Type: tube Tested By: GA
Sample ID: UP-1 - Bottom Test Date: 07/13/16 Checked By: emm

GTX-304831

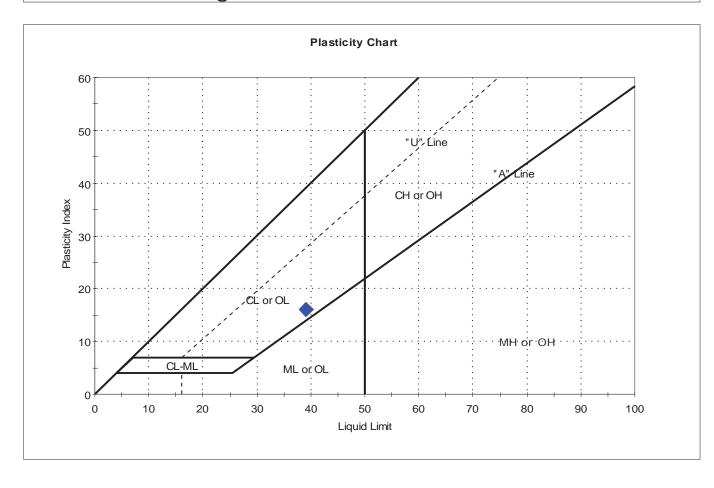
Depth: 67-69 Test Id: 382127

Test Comment: ---

Visual Description: Wet, greenish gray clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Bottom	S5796-1	67-69	43	39	23	16	1.3	

Sample Prepared using the WET method

Dry Strength: HIGH Dilatancy: NONE Toughness: MEDIUM



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location:Hartford, CTProject No:GTX-304831Boring ID:S5796-1Sample Type: tubeTested By:GA

emm

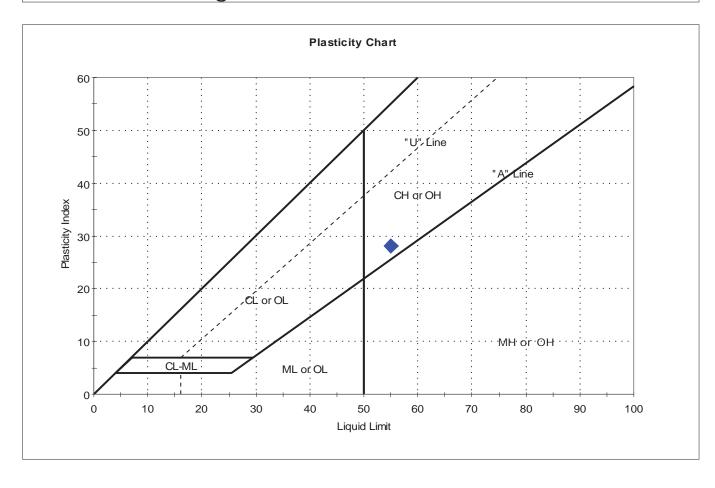
Sample ID: UP-3 - Top middle Test Date: 07/14/16 Checked By: Depth: 85-87 Test Id: 382094

Test Comment: ---

Visual Description: Moist, greenish gray clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-3 - Top middle	S5796-1	85-87	52	55	27	28	0.9	

Sample Prepared using the WET method

Dry Strength: HIGH Dilatancy: SLOW Toughness: MEDIUM



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S5796-1 Sample Type: tube Tested By: GA
Sample ID: UP-3 - Bottom Test Date: 07/13/16 Checked By: emm

GTX-304831

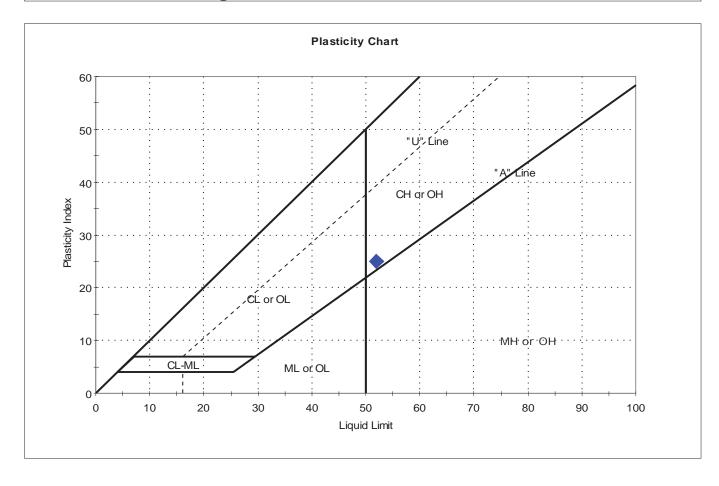
Depth: 85-87 Test Id: 382089

Test Comment: ---

Visual Description: Moist, gray clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-3 - Bottom	S5796-1	85-87	53	52	27	25	1.1	

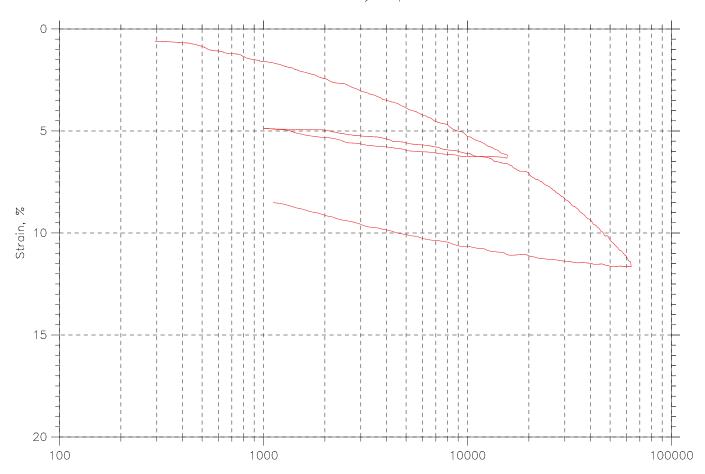
Sample Prepared using the WET method

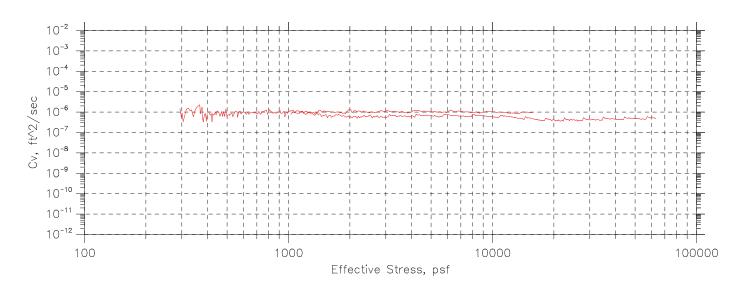
Dry Strength: MEDIUM
Dilatancy: NONE
Toughness: MEDIUM



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



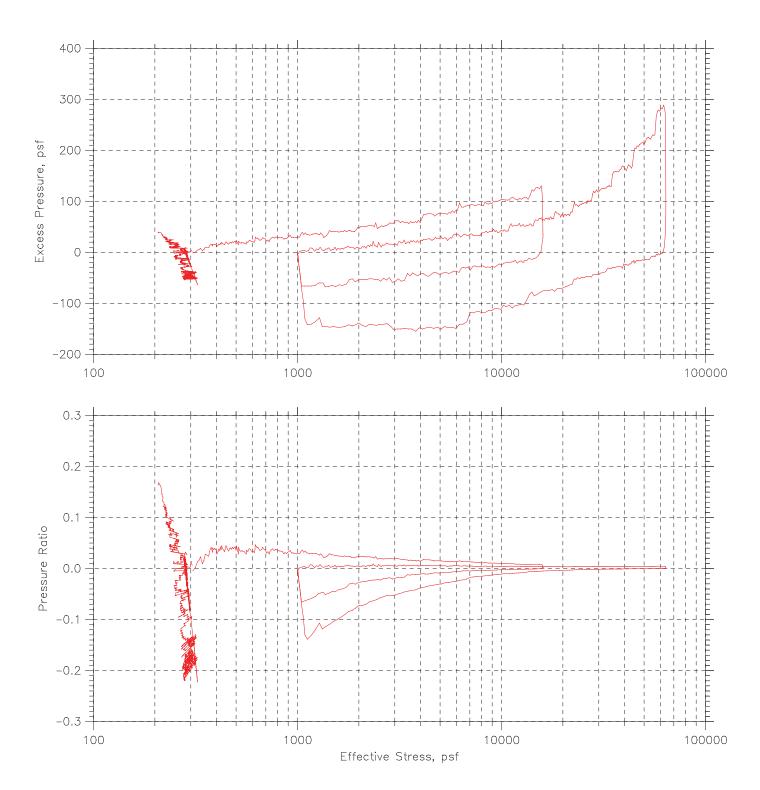


Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S5796-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/09/16	Depth: 67-69 ft
Test No.: CRC-11	Sample Type: intact	Elevation:
Description: Moist, greenish gray cla	у по по по по по по по по по по по по по	
Remarks: System v		
		Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S5796-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/09/16	Depth: 67-69 ft
Test No.: CRC-11	Sample Type: intact	Elevation:
Description: Moist, greenish gray clay	,	
Remarks: System v		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S5796-1 Sample No.: UP-1 Test No.: CRC-11

Location: Hartford, CT Tested By: md Test Date: 06/09/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 67-69 ft Elevation: ---

Soil Description: Moist, greenish gray clay Remarks: System v

Estimated Specific Gravity: 2.82 Liquid Limit: 39
Initial Void Ratio: 1.03 Plastic Limit: 23
Final Void Ratio: 0.847 Plasticity Index: 16

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.91 in

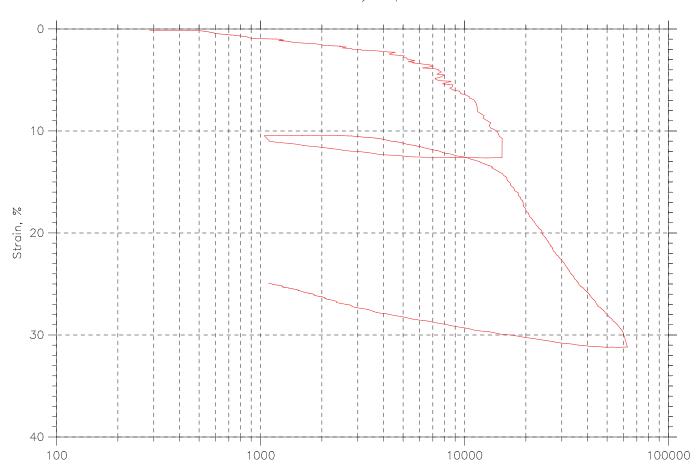
	Before Co	onsolidation	After Consol	idation
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	C-1254	RING		16941
Wt. Container + Wet Soil, gm	215.83	261.53	254.34	156.75
Wt. Container + Dry Soil, gm	152.99	220.78	220.78	122.57
Wt. Container, gm	8.3600	109.11	109.11	8.8300
Wt. Dry Soil, gm	144.63	111.67	111.67	113.74
Water Content, %	43.45	36.49	30.05	30.05
Void Ratio		1.03	0.847	
Degree of Saturation, %		99.88	100.00	
Dry Unit Weight, pcf		86.666	95.238	

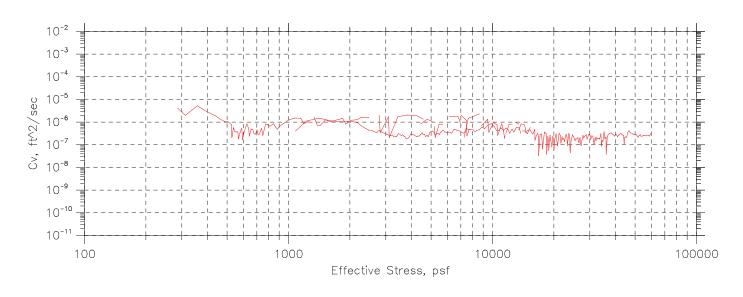
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



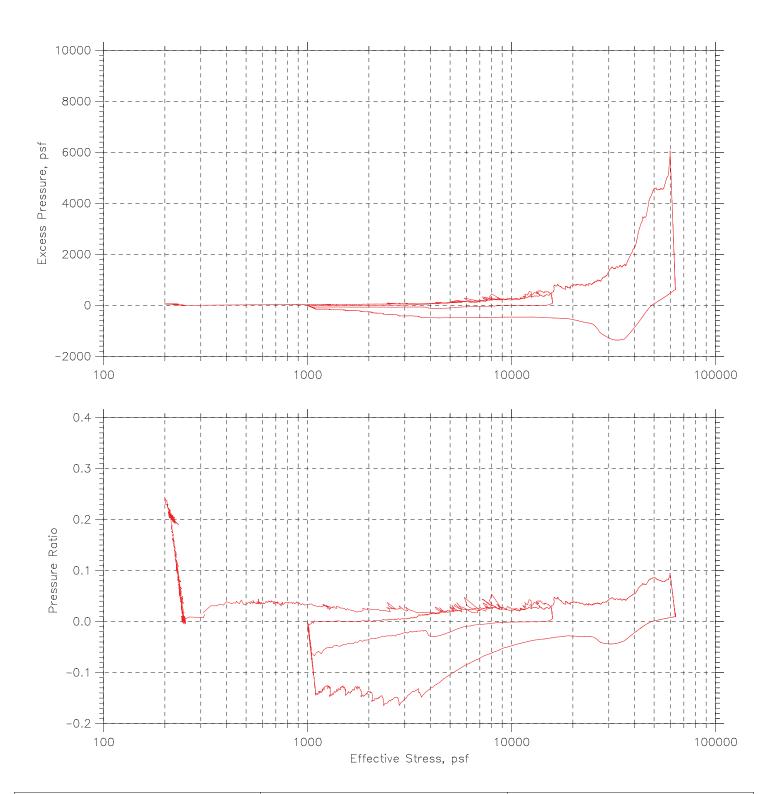


Project: reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S5796-1	Tested By: md	Checked By: njh
Sample No.: UP-3	Test Date: 06/28/16	Depth: 85-87 ft
Test No.: CRC-4A	Sample Type: intact	Elevation:
Description: Moist, gray clay	,	
Remarks: System 0		
		Page 1 of 3Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



		Page 2 of 3Page 2 of 3
Remarks: System 0		
Description: Moist, gray clay		
Test No.: CRC-4A	Sample Type: intact	Elevation:
Sample No.: UP-3	Test Date: 06/28/16	Depth: 85-87 ft
Boring No.: S5796-1	Tested By: md	Checked By: njh
Project: reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831



CRC TEST DATA

Location: Hartford, CT

Project: reconstruction of Exit Boring No.: S5796-1 Sample No.: UP-3 Test No.: CRC-4A

Tested By: md Test Date: 06/28/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 85-87 ft Elevation: ---

Soil Description: Moist, gray clay

Remarks: System O

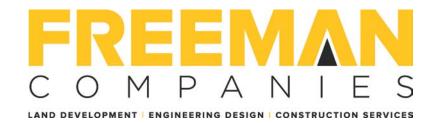
Estimated Specific Gravity: 2.75 Initial Void Ratio: 1.44 Final Void Ratio: 0.882

Liquid Limit: 52 Plastic Limit: 27 Plasticity Index: 25

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.77 in

	Before Co	nsolidation	After Consol	idation
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	C-1428	RING		B-453
Wt. Container + Wet Soil, gm	111.98	247.53	229.51	126.48
Wt. Container + Dry Soil, gm	75.790	200.49	200.49	97.840
Wt. Container, gm	8.0300	109.81	109.81	8.3600
Wt. Dry Soil, gm	67.760	90.677	90.677	89.480
Water Content, %	53.41	51.88	32.01	32.01
Void Ratio		1.44	0.882	
Degree of Saturation, %		98.99	100.00	
Dry Unit Weight, pcf		70.373	91.393	

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



February 14, 2017

Freeman Project No.: 2014-1001

Prepared for:
CME Associates, Inc.
333 East River Drive, Suite 400
East Hartford, CT 06108

Prepared by:

Freeman Companies, LLC 36 John Street Hartford, CT 06106

> Nathan L. Whetten, P.E., D.GE. Vice President of Geotechnical Services



TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Summary	1
1.2	Scope of Work	1
1.3	Authorization	1
1.4	Project Vertical Datum	1
2.0	PROJECT AND SITE DESCRIPTION	1
2.1	Project Description	1
2.2	Site Description	2
3.0	EXPLORATIONS	
3.1	Recent Explorations	2
3.2	Previous Subsurface Explorations	2
3.3	Laboratory Testing	2
4.0	SUBSURFACE CONDITIONS	
4.1	Subsurface Conditions	3
5.0	GEOTECHNICAL ENGINEERING RECOMMENDATIONS	4
5.1	Foundation Design Recommendations	4
6.0	CONSTRUCTION CONSIDERATIONS	5
6.1	Excavation	5
6.2	Pile Cap Subgrade Preparation	6
6.3	Pile Installation	6
6.4	Expanded Shale Aggregate	6
6.5	Temporary Lateral Support	6
6.6	Excavation Dewatering	
6.7	Reuse of Existing Soils	7
7.0	FUTURE SERVICES AND LIMITATIONS	

ATTACHMENTS

Table

1. Summary of Subsurface Data

Figures

- 1. Site Location Map
- 2. Subsurface Exploration Location Plan
- 3. Summary of Varved Clay Properties, West of Connecticut River
- 4. Subsurface Profiles
- 5. Lateral Earth Pressures Active

Appendices

- A. Recent Test Boring Logs
- B. Previous Test Boring Logs
- C. Results of Laboratory Testing
- D. Draft Special Provisions



1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for rehabilitation of Bridge 06000A, Route 5/15 NB over I-91 NB, Reserve Road, Route 2, CT River, and Railroad. Abutment 1 and Piers 1, 2, and 3 will be widened to accommodate two additional travel lanes.

We recommend that the widened abutments and piers be supported on steel H-Piles driven to refusal on bedrock, and pile tip reinforcement should be provided. Filling behind the Abutment 1 and wingwall will result in settlement of subgrade soils and downdrag loads on abutment piles will occur. Additionally, soils at Abutment 1 and at the piers were found to be corrosive. We recommend that bitumen coatings be applied to piles supporting Abutment 1 and the piers to provide protection against corrosion, and to reduce downdrag at Abutment 1. Preaugering will be required to protect the coatings.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions
- Conducted settlement evaluations
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

Abutment 1 will be widened by 33 feet on the east side, and Piers 1, 2, and 3 will be widened by an average of about 21 feet to accommodate the additional travel lanes. The pile cap supporting Abutment 1 will be enlarged to support the widened abutment. The widened portions of Piers 1, 2, and 3 will be supported on new pile cap foundations constructed adjacent to the existing foundations.



2.2 Site Description

Abutment 1 will be widened on the southeast side, between the existing abutment and the on-ramp from Route 5/15 to I-91 NB. The area slopes downward to the southeast to the on-ramp, and is grass-covered with some trees. Ground surface is about El. 67 at bridge grade, and slopes from approximately El. 46 to 34 in the area of the abutment widening.

Piers 1 and 2 are located north of I-91 NB and south of Reserve Road and railroad tracks. Pier 3 is located north of Reserve Road. Ground surface is gravel covered and at about El. 48 at Pier 1, El. 36 at Pier 2, and El. 35 at Pier 3.

3.0 EXPLORATIONS

3.1 Recent Explorations

Four test borings (S2-1 through S2-4) were drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut. Boring S2-1 was drilled Abutment 1, and borings S2-2, S2-3, and S2-4 were drilled near Piers 1, 2, and 3. Borings were drilled to depths ranging from 64 to 100 feet below ground surface. Standard Penetration Tests were completed at maximum 5 foot intervals within the test borings. Ten-foot-long NX-size rock cores were obtained from each boring. Explorations were backfilled with drill cuttings. A groundwater monitoring well was installed in boring S2-3 OW to measure groundwater levels. A roadway box was placed at ground surface to protect the installation.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Boring Logs. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

3.2 Previous Subsurface Explorations

Several previous test borings were drilled in the vicinity of the new bridge and are considered applicable, including B-103, B-104, B-107, B-109, B-111, B-114, and B117A. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan, and logs are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Twelve moisture content tests
- Two pH tests, two electrical resistivity tests, and two soluble sulfate tests
- Five grain size analyses
- Three Constant Rate of Strain (CRS) Consolidation Tests
- Six Atterberg Limit Determinations
- One unconfined compression test on a rock core sample.



Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3 Summary of Varved Clay Properties, West of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. Subsurface profiles at the abutments and piers are provided on Figures 4A through 4D, Subsurface Profiles.

Thickness Range (ft.)	Stratum	Generalized Description
2 to 19	Fill	Loose to dense brown, c-f SAND, trace to some c-f gravel, trace to some silt, trace brick, wood, glass, rubble, cement, organic material, petroleum-like odor noted in S2-3, strong odor detected in S2-4. Standard Penetration Test (SPT) N-Values ranged from 5 to 55 blows per foot (bpf).
25 to 42	Alluvium	Very loose to medium dense gray SILT and f SAND; to gray c-f SAND, trace f gravel, trace silt. SPT N-values ranged from 1 to 44 bpf.
12.5 to 38	Lacustrine	Varved red-brown CLAY and SILTY CLAY, in regular layers typically ¼ to ½ inch thick and up to 3 inches thick at some locations. SPT N-values typically range from 0 to 4 bpf, however the deposit is typically medium stiff.
1.5 to 14.5	Glacial Till	Medium dense to very dense red-brown c-f SAND, some coarse to fine gravel, some silt. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values ranged from 15 to more than 100 bpf.
	Bedrock	Bedrock was described as brown ARKOSE, medium strong to strong with fractured zones. The top 0 to 5.5 feet of bedrock was weathered.

Groundwater – Water was encountered in the borings at depths ranging from 6 to 18 feet (El 4 to El 18). Groundwater was measured in the observation well S2-3 (OW) at El. 7.6, nine months after the well was installed. Groundwater levels were measured during drilling activities and may not represent static levels, except at observation wells. Water levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – Corrosion testing was conducted on samples recovered from test borings S1-2 (Abutment 1), S1-5 (Pier 2), and S1-12 (Abutment 2). Results are summarized below:

Test parameter	S2-1, 15'-17' (Abut 1)	S2-3, 5'-7' (Pier 2)
pH	6.8	7.5
Electrical Resistivity (ohm-cm)	1,343	486
Sulfates (ppm)	<50	297



5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Downdrag – The threshold settlement for downdrag loads on piles is commonly considered to be 0.4 inches. Settlement evaluations were conducted at the proposed abutments to estimate the magnitude of total settlement, and whether settlement would cause downdrag at the existing and proposed piles. Predicted total settlement calculated using the computer program Settle 3D (by RocScience) is as follows:

Normal Weight Fill: 2½ inches south of abutment; 1¼ inches at abutment (incl. ½ inch on-going secondary)

Expanded Shale: 1½ inches south of the abutment; 1 inch at the abutment (incl. ½ inch secondary)

3/4 inch south of the abutment; ½ inch at the abutment (incl. 0.4 inch secondary)

These settlements will result in downdrag loads on the abutment piles. We recommend that coatings be applied to piles to reduce downdrag loads at the abutments, or that piles be oversized to allow for downdrag. A 90 percent reduction in downdrag loads is considered feasible using bitumen coatings, whereas a 33 percent reduction in downdrag has been reported for an epoxy coating referred to as *Slickcoat*. We recommend that bitumen coatings be considered for this project. We recommend that backfill consist of expanded shale aggregate.

Corrosion – AASHTO Section 10.7.5 indicates that soils are corrosive if pH is less than 5.5, resistivity is less than 2,000 ohm-cm, or sulfate concentration is greater than 1,000 ppm. Based on these criteria, soils at the Abutment 1 and the piers are considered corrosive. Corrosion mitigation methods typically include providing a protective coating (AASHTO C10.7.5). The NCHRP report titled "Design and Construction Guidelines for Downdrag on Uncoated and Bitumen Coated Piles", Briaud and Tucker, 1996, pg. 10, indicates that bitumen coatings provide corrosion resistance.

We recommend that bitumen coatings be applied to piles at Abutment 1, to provide both corrosion protection and downdrag mitigation. Bitumen coating should also be applied to piles at the piers to provide corrosion resistance. Alternatively, epoxy-coated piles may be considered for corrosion protection at the piers.

Pile Design

- **Seismic Design:** Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class E. Assume peak ground acceleration (PGA) of 0.061g, a short-term acceleration coefficient S_s= 0.132g and long-term acceleration coefficient S₁ = 0.037g, respectively.
- Pile Type: HP12x74 with pile tip reinforcement driven to end bearing on bedrock, Grade 50 steel. Other H-Pile sections may also be considered.
- Service Limit: 125 tons, assumes a HP12x74 pile area equal to 21.76 square inches. Subtract an appropriate allowance for downdrag for piles supporting the abutments, as indicated below.
- Strength Limit: For end bearing piles, assume a strength limit equal to the structural capacity of the pile. Settlement of piles is expected to be equal to the elastic compression of the pile.



Downdrag: Estimated downdrag loads are listed below:

Abutment 1:

160 tons (single piles, uncoated) or 16 tons (single pile with bitumen coating)

14.5 tons (corner pile in a group with bitumen coating)

13 tons (side pile in a group with bitumen coating)

8 tons (inside pile in a group with bitumen coating)

- Load Tests: Minimum of 3 dynamic load tests with matching signal analysis (4 tests if 26 or more piles, and no less than 2% of the production piles, AASHTO Table 10.5.5.2.3-3).
- Test Piles: Recommend same piles and criteria as load tests (AASHTO 10.7.9)
- Minimum Spacing: Center to center spacing should be 2½ times the pile diameter (AASHTO 2012 10.7.1.2) and at least 30 inches. Minimum 9 inches to the nearest edge of the pile cap
- Lateral Resistance: Use the pile capacity in batter. Additional lateral load capacities in bending will be provided based on LPile analyses once pile loading is established.
- Subgrade Preparation Below Pile Cap: Pile cap subgrades are expected to occur within silty soils that can easily be disturbed and become unstable. We recommend a minimum 12-inch thick layer of crushed stone (CTDOT Form 817 M.01.01 No. 6) overlying separation fabric (CTDOT Form 817 Sec. 7.55 M8.01-26) over the subgrade.
- Bottom of Structure and Estimated Pile Length:

Substructure	Bottom of Pile Cap Elevation	Estimated Pile Tip Elevation
Abutment 1	26.1	-61
Pier 1	9.5	-62
Pier 2	15.8 (west support) 14 (east	-56
	support)	
Pier 3	20	-51

Abutment Design

Backfill Material:

Expanded Shale Aggregate between Abutment 1 and Abutment 2 of New Bridge

Provide a 12-inch thick layer of compacted granular fill between top of Expanded Shale and

Roadway Base

Assumes a 24-inch thick pavement section

• Est. Settlement: Up to 1-in. total settlement at Abutment 1

Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.

Lateral Pressures: Refer to Figure 5 – Active Earth Pressures

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Proposed bottom of pile caps will be within the Fill and Alluvium strata. The alluvium and portions of the fill are highly susceptible to disturbance by construction equipment, and are expected to be wet due to shallow groundwater. Excavation to footing subgrade should be made using a smooth-bladed backhoe bucket. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.



6.2 Pile Cap Subgrade Preparation

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. We anticipate that working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment. A draft special provision is provided in Appendix D.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.3 Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Test piles and dynamic load testing should be conducted as indicated above. Vibrations from pile driving should not affect the structural integrity of adjacent structures. However, vibration and noise will likely be noticeable inside buildings 300 feet away, or more.

Coatings should be applied to the piles prior to transportation to the site. It should include a primer coat that may be sprayed or painted onto the piles, and a final coat.

Piles with bitumen or epoxy coatings should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Piles should be preaugered through the existing fill and alluvial deposits (granular soils) to the top of lacustrine deposits. Additionally, the alluvium is expected to be susceptible to settlement from pile driving, and settlement of the alluvial deposits could affect nearby structures and utilities. The top of lacustrine deposits is typically about EI -20. Sand should be placed in the casing as the casing is extracted.

Draft special provisions are provided in Appendix D.

6.4 Expanded Shale Aggregate

Expanded shale aggregate should be placed in layers 1.5 to 2 feet thick, and compacted with self-propelled vibratory compaction equipment with static weight less than 6,600 lbs. The minimum number of passes should be limited to two and the maximum four, to avoid particle breakdown during compaction. A draft special provision is included in Appendix D.

6.5 Temporary Lateral Support

We estimate that excavations will be required to reach the pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.



6.6 Excavation Dewatering

Excavation dewatering will be required to permit construction in in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.7 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces
- Pile installation and load tests
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

2014-1001
Bridge 06000A Rt 15 SB over I-91 NB Rt. 2 & CT River & RR
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
Hartford, Connecticut

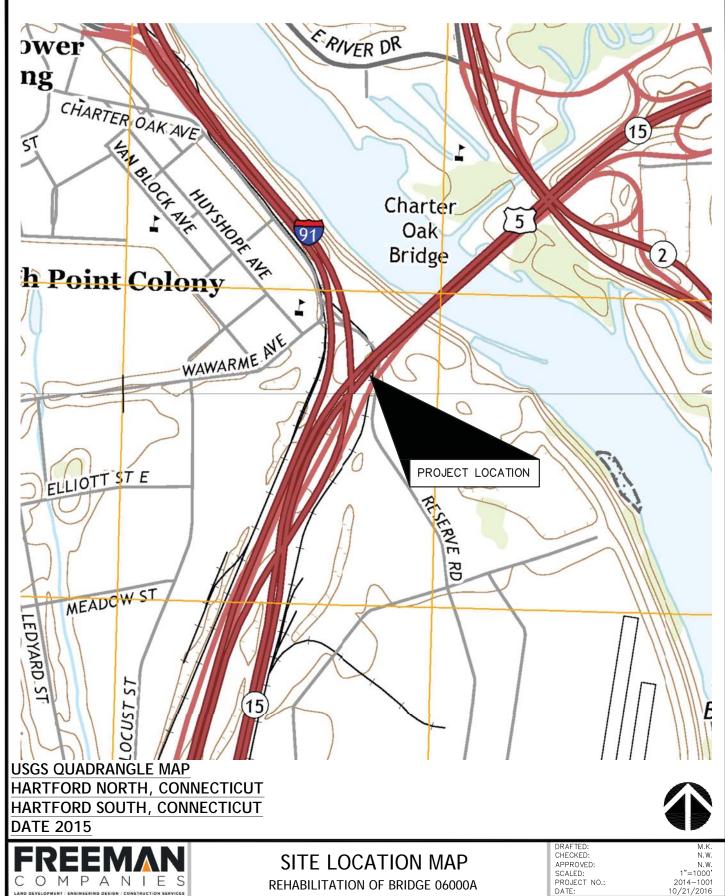
Table 1 Subsurface Data

	Ground Surface				Thickness (ft.)				Ground	dwater	Bed	drock
Boring No.	El.	Depth (ft.)	Pavement/Topsoil	Fill	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation
Recent Test Bo	rings											
S2-1	29.6	100 C	1	19	29	35	3	3	11.5	18.1	87	-57.4
S2-2	17.5	89.5 C	0.2	8.8	25	30	10	5.5	NM	NM	74	-56.5
S2-3 (OW)	22.8	64 C	0.5	9.5	29	12.5	1.5	1	15.2	7.6	53	-30.2
S2-4	22.8	85 C	0.5	8	35	20	8.5	3	19	3.8	72	-49.2
Previous Test B	<u>Borings</u>											
B-104	25.6	84 C	0	6	42	10.5	14.5	1	17.5	8.1	73	-47.4
B-107	15.2	86 C	0	4	30	38	4	0	8.5	6.7	76	-60.8
B-111	19.5	95 C	0	3	36	30	12	4	NM	NM	81	-61.5
B-114	17.4	84 C	0	3.5	33.5	27	9	1	6.2	11.2	73	-55.6
B-117A	29.5	90 C	0	13	36.5	23.5	7	0	NM	NM	80	-50.5

Notes:

- 1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevations at previous borings were shown on the logs and corrected to NAVD-88 in this table.
- 2. Groundwater levels are approximate
- 3. Top of bedrock is inclusive of weathered rock
- 4. ">" Greater Than "--" Not Encountered (C) Bedrock Core Taken "NM" Not Measured





STATE PROJECT NO. 63-703

HARTFORD, CONNECTICUT

SHEET NO.

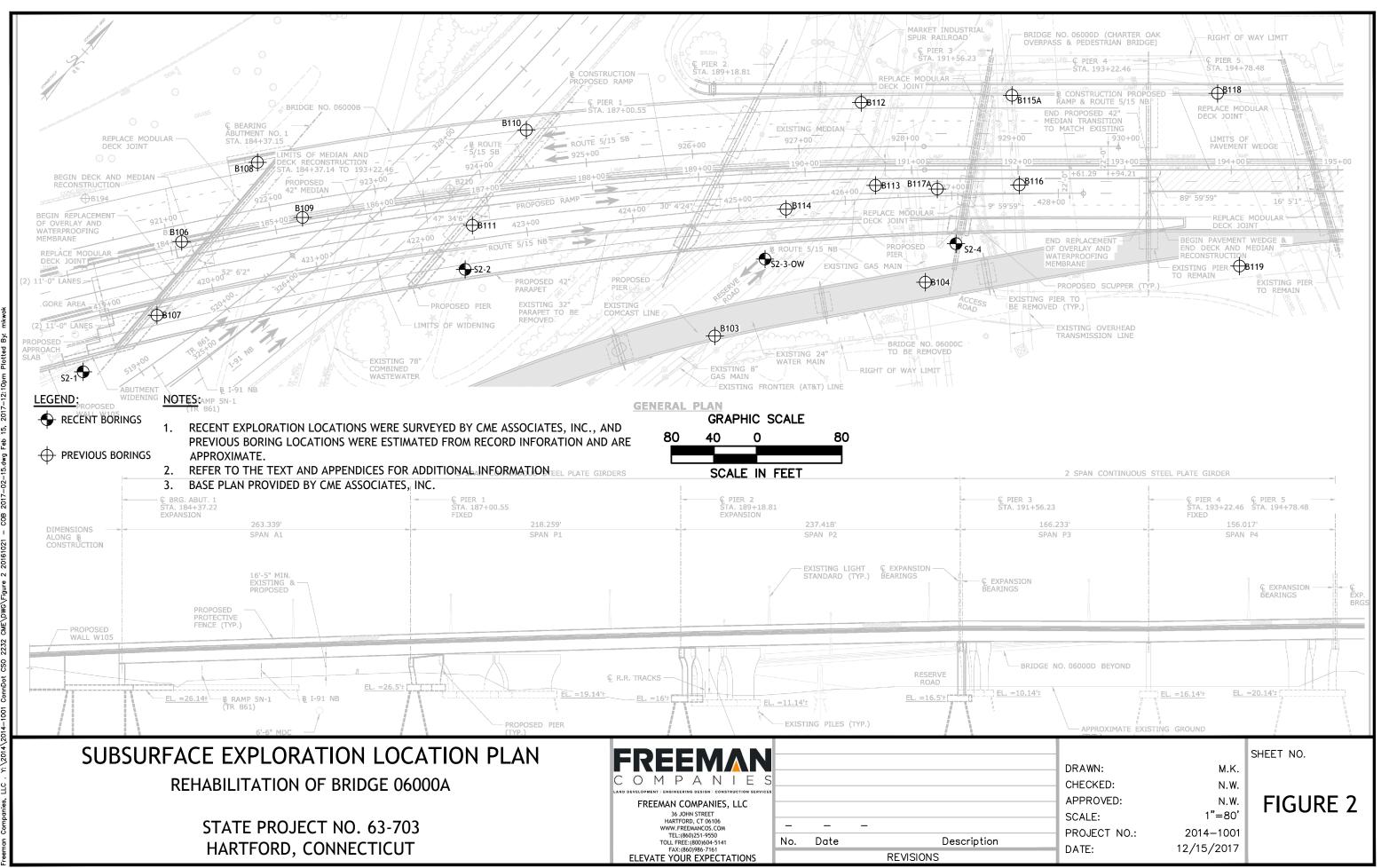
FIGURE 1

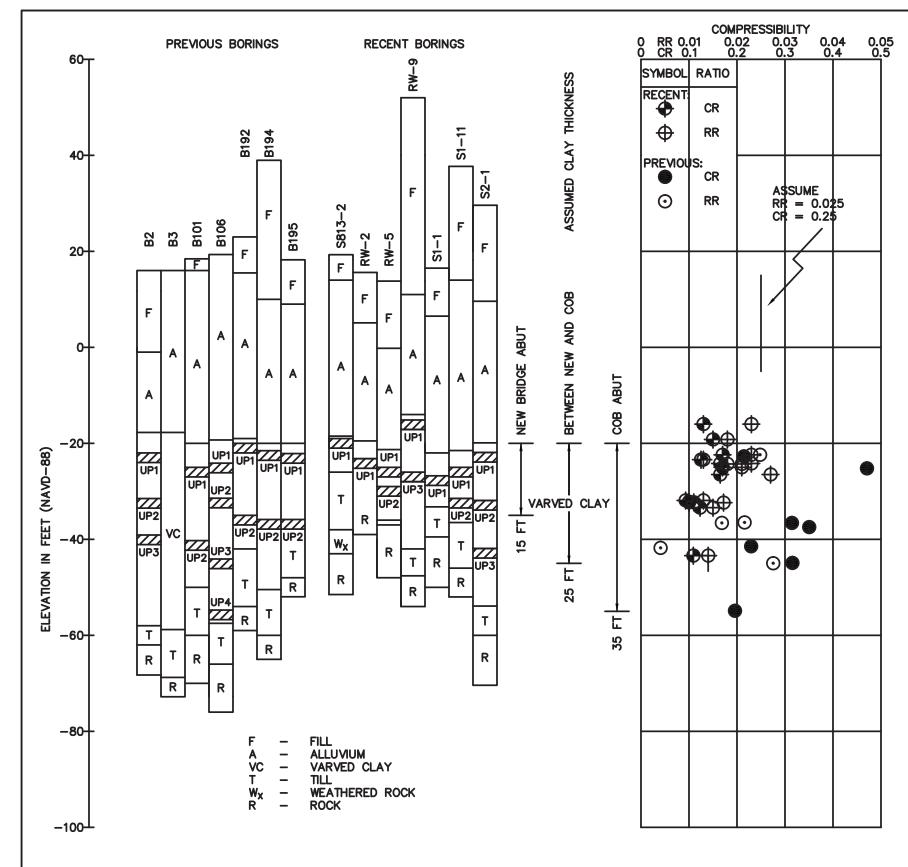
Freeman Companies, LLC . Y:\2014\2014-1001 ConnDot CSO 2232 CME\DWG\Figure 1 LOCUS - COB.dwg Oct 28, 2016-9:37am Plotted By: mikwok

36 JOHN STREET

HARTFORD, CT 06106 WWW.FREEMANCOS.COM

TEL:(860)251-9550 FAX:(860)986-7161 ELEVATE YOUR EXPECTATIONS





0	2	STRESS	HISTORY, σ'_{V0} , o		o 1	0	
,		•	4 6	•	<u> </u>		60
							40
	LAYER 1,2 LAYER 1,2 LAYER 1,2	SOL ,3 FILL ,3,4 AT	ITH & NORTH SI MIDDLE AREA COB	DE OF NEW BRID	GE		
							20
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	<u>Z</u>					
							0
				Ź			
SYMBOL	BORING NO.	GS. EL	4			LAYER 1	-20
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	RW-5	13.8	_	_/	$\qquad \qquad $		
★	RW-9	52.0	<u> </u>	$\overline{\nabla}$		LAYER 3	-40
₹	S1-1	16.5	_	0	>		
♥	S1-11	37.7	•		\land		
❤	S813-2	16.8			\	LAYER 4	
	S2-1	29.6		•			
PREVIOUS:	B101	18.6			 		-60
	B101	19.0	d_ WEST O	F CT RIVER -	\vee		
	B100	23.2	OP WEST O	OI NIVER			
	B194	39.1					
Ŏ	B195	18.7					
	B2	15.4					-80
	B3	30.3					
		<u> </u>				I	-10

NOTES

- 1. PREVIOUS DATA WAS OBTAINED FROM THE REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD—EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
- 2. ELEVATIONS REFER TO NAVD-88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD-29.

DEFINITIONS

- CR COMPRESSION RATIO (= $\Delta \epsilon/\Delta L$ OG σ'_V) DURING VIRGIN COMPRESSION
- RR RECOMPRESSION RATIO (= $\Delta \epsilon / \text{LOG} \sigma'_{V}$) DURING RECOMPRESSION
- $\sigma'_{\mbox{ VO}}$ $\,$ IN SITU VERTICAL EFFECTIVE STRESS
- σ_P PRECONSOLIDATION STRESS



D DEVELOPMENT: ENGINEERING BESISN I CONSTRUCTION SERVICES

36. JOHN STREET
HARTFORD, CT 06106
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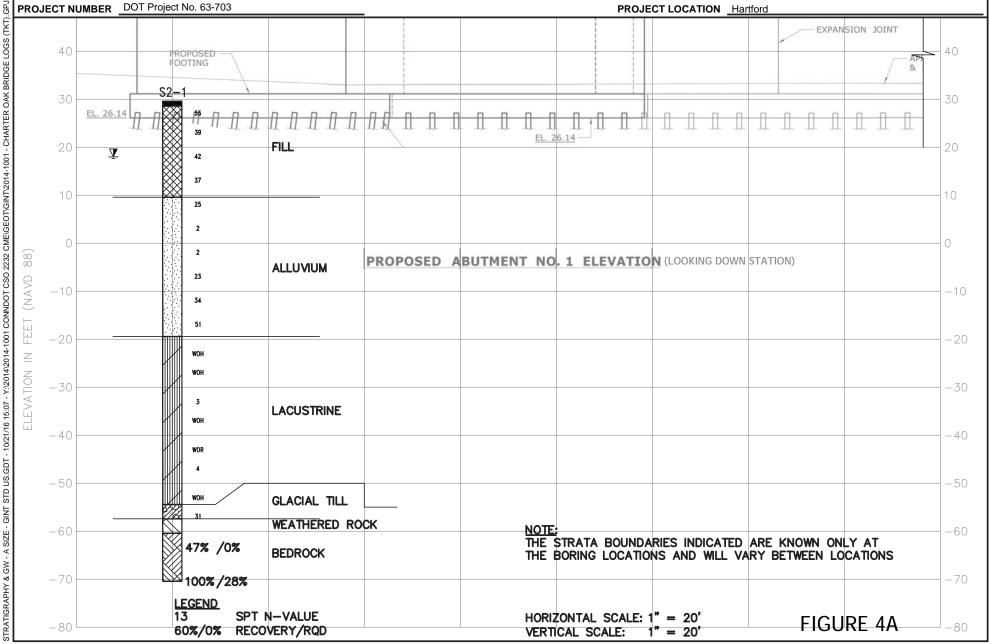
ELEVATE YOUR EXPECTATIONS

SUMMARY OF VARVED CLAY PROPERTIES
WEST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3A

SUBSURFACE DIAGRAM

Freeman Companies, LLC 36 John Street Hartford, CT 06109

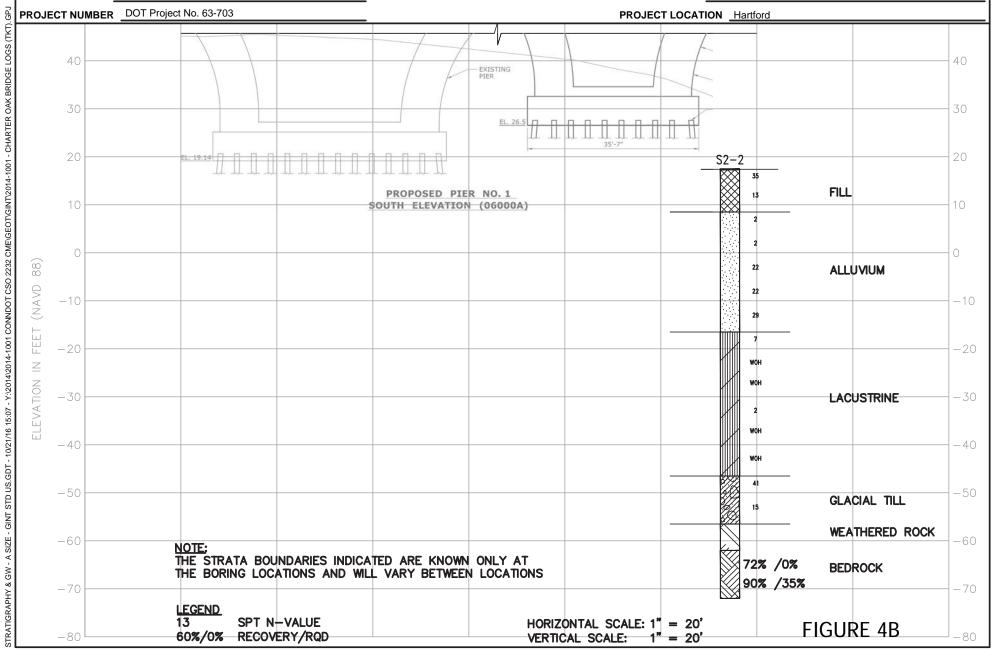
PRIME DESIGNER CME Relocation of I-91 NB Interchange 29 & Widening



SUBSURFACE DIAGRAM

Freeman Companies, LLC 36 John Street Hartford, CT 06109

PRIME DESIGNER CME PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening



SUBSURFACE DIAGRAM

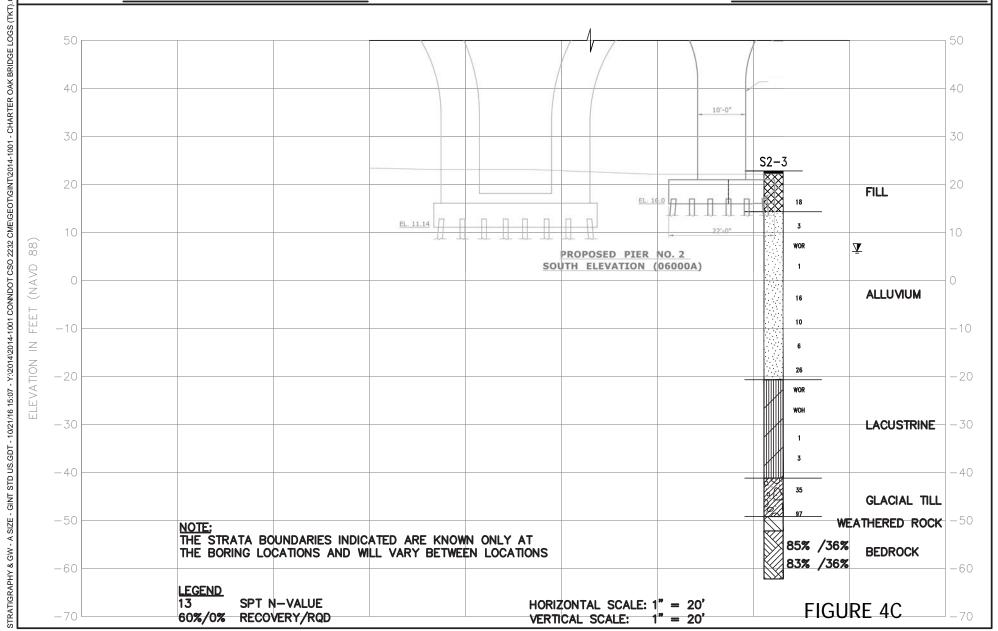
Freeman Companies, LLC 36 John Street Hartford, CT 06109

PROJECT NUMBER DOT Project No. 63-703

PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

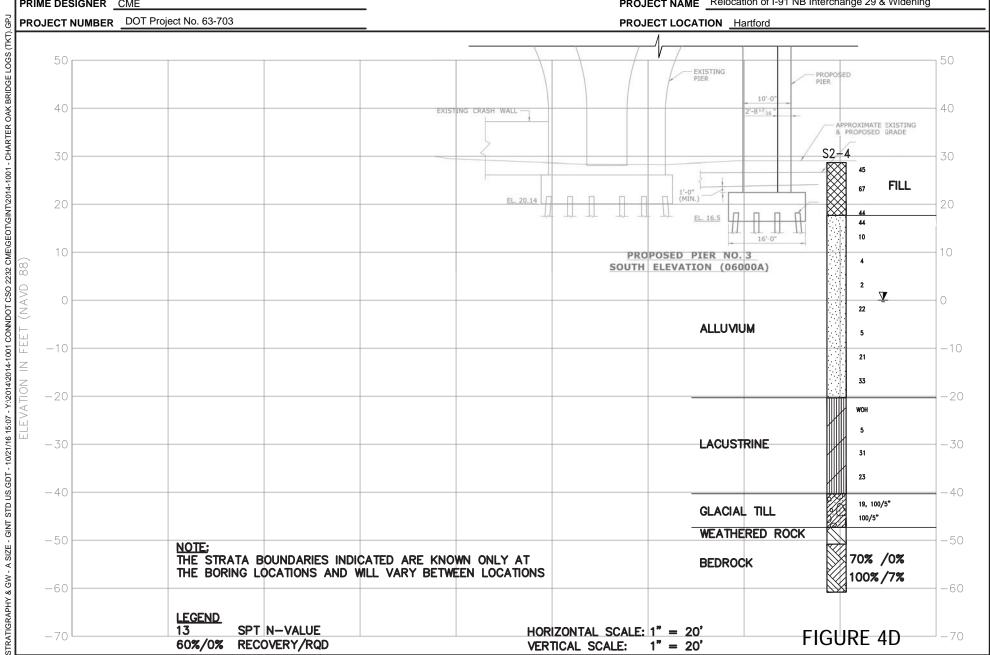


CI.	IDQI	IDE	ACE	DIV	CDA	NЛ
JU	JOSL	JKF	AUE	DIA	URA	IVI

Freeman Companies, LLC 36 John Street Hartford, CT 06109

PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening



NOTES:

- APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
- 2. H IS MEASURED IN FEET
- 3. THE WALL SHOULD BE DRAINED BY EXPANDED SHALE AGGREGATE WITH A UNIT WEIGHT OF 65 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
- 4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
- 5. SLIDING:
 COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3-1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
- 6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.



FAX: (860)986-7161
ELEVATE YOUR EXPECTATIONS

LATERAL EARTH PRESSURES ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 06000A STATE PROJECT NO. 63-703 HARTFORD, CONNECTICUT
 DRAFTED:
 M.K.

 CHECKED:
 N.W.

 APPROVED:
 N.W.

 SCALED:
 N.T.S.

 PROJECT NO.:
 2014—1001

 DATE:
 02/13/2017

FIG.

FIGURE 5

APPENDIX A RECENT TEST BORING LOGS

Driller:	Р	. Labo	ssier	-		Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.: S2-1	
Inspect		. Ta			Т	own:		Hartfo	ord		Stat./Offset: 182+91.50/91.	43 RT
Engine	er: N	. Whe	tten		Р	roject	No.:	DOT	Project No. 63	3-703	Northing: 833791.48	
Start Da	ate: 6	-1-16			R	Route N	lo.:	US 5	/ RTE 15 NB		Easting: 1024985.35	
inish [Date: 6	-6-16			В	ridge I	No.:	0600	0A		Surface Elevation: 29.6	
roject	Descript	ion: F	Reloc	ation	of I-9	1 NB	Interc	hange	e 29 & Wideni	ng		
Casing	Size/Typ	e: 4-iı	ո. Ca	sing	S	ample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 30			30in		Iamme	• •				,	
Ground	lwater Ob	serva	ions:	@1	1.5' A	TD						
			5	SAMF	PLES							£
£	. 0		Diam			<u> </u>	<u> </u>		Generalized Strata Description		Material Description	Flevation (ft)
th (e) N			s on		i.	i.	% (era ta crip	l '	and Notes	<u>7</u>
Depth (ft)	Sample Type/No.	р		inche	es	Pen. (in.)	Rec. (in.)	RQD	Gen Stra Oes			<u>4</u>
0-	07 [-											
_									Asphalt Fill	ASPHALT (12		F
_	S1	23	24	31	33	24	16		FIII	Brown c-f SAN	ID, little m-f gravel, little silt	
-												
_												-25
5— _	S2	9	19	20	14	24	10			Province f SAN	ID, some silt, little m-f gravel	F
_			10	20	• •		10			BIOWIT C-1 SAIN	ib, some siit, iittie m-i gravei	F
_												
-												-20
10 —	S3	13	23	19	11	24	12			5 (04)	ID 1 (ODA)/EI 111	-
	- 53	13	23	19	11	24	12			Brown c-f SAN	ID and m-f GRAVEL, some silt	-
_												-
_												
15 —												- 15
_	S4	28	19	18	16	24	16			Brown c-f SAN	ID, little m-f gravel, little silt	L
												F
_												F
20 —									Alluvium	_		10
-	S5	10	12	13	12	24	16		Allavialli	Gray f SAND a	and SILT	
												<u> </u>
												F
25												-5
	S6	3	1	1	2	24	18			Brown to grav	f SAND, some silt	_
_												

Brown SILT and f SAND

Total Penetration in	NOTES: 4" casing to 55', telescoped 3"	Sheet 1 of 3
Earth: 90ft Rock: 10ft		1 01 3
No. of No. of		
Soil Samples: 21 Core Runs: 2		SM-001-M REV. 1/02

Driller:	Р	. Labo	ssier	r		Co	onne	cticu	t DOT Bori	ng Report	Hole No.: S2-1	
nspec	tor: T	. Ta			Т	own:		Hartfo	ord		Stat./Offset: 182+91.50/91.4	3 RT
Engine	er: N	. Whe	tten		F	roject	No.:	DOT	Project No. 63	3-703	Northing: 833791.48	
Start D	ate: 6	-1-16			F	Route N	lo.:	US 5	/ RTE 15 NB		Easting: 1024985.35	
inish	Date: 6	-6-16			E	Bridge 1	No.:	06000	OA AC		Surface Elevation: 29.6	
roject	Descript	ion: F	Reloc	ation	of I-9	1 NB	Interc	hange	29 & Widenii	ng		
asing	Size/Typ	e: 4-ir	n. Ca	sing	S	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
lamm	er Wt.: 3	00lb	Fall:	30in	.	łamme	r Wt.:	140lb	Fall: 30in.			
Ground	dwater Ob	oservat				TD			<u> </u>			
				SAME	PLES				و ر			€
Œ	0.0		Rlow	vs on		<u>-</u>	<u>-</u>		alize		Material Description	Flevation (ft)
Depth (ft)	l ple			npler		Pen. (in.)	Rec. (in.)	% 0	nera ata scrip		and Notes	į,
Dep	Sample Type/No.	р	er 6	inche	es	Per	Rec	RQD	Generalized Strata Description			<u>a</u>
									Alluvium			+
35-									(con't)			-5
-	S8	9	10	13	14	24	12			Gray c-f SAND	, trace silt	
_												-
_												-
40 —												1
-	S9	12	15	19	17	24	8			Gray c-f SAND	, trace f gravel, trace silt	
_												_
_												\vdash
45-												1
_	S10	16	25	26	26	24	12			Gray c-f SAND	, trace silt	
_												L
_												-
50 —									Lacustrine			2
-	S11	woh	woh	woh	4	24	24			Brown SILTY (CLAY	
-										D. Oll TV	NAV (salala ta sat Tasasas as d	
_	UP-1					30	30			Pocket Pen. m	CLAY (unable to get Torvane and easurments)	-
55 —											,	2
_	S12	wor	wor	woh	woh	24	24			Brown SILTY (CLAY	-
-												
-												
60-												3
_	S13	wor	wor	3	2	24	24			Brown SILTY (CLAY	-
_												
	1	İ										

30

28

24

UP-2

S14

wor wor woh woh

Brown SILTY CLAY (Torvane = 0.25 tsf and Pocket Pen. = 0.75 tsf)

Brown SILTY CLAY

--35

Total Penetration in	NOTES: 4" casing to 55', telescoped 3"	Sheet
Earth: 90ft Rock: 10ft		2 of 3
No. of No. of		
Soil Samples: 21 Core Runs: 2		SM-001-M REV. 1/02

Driller:	Р	P. Labossier	C	onne	cticu	t DOT Borir	ng Report Hole No.: S2-1	Hole No.: S2-1	
Inspect		Ta	Town:		Hartfo	ord	Stat./Offset: 182+91.50/91.4	13 RT	
Engine	er: N	I. Whetten	Project	No.:	DOT	Project No. 63	3-703 Northing: 833791.48		
Start D		-1-16	Route N			/ RTE 15 NB	Easting: 1024985.35		
Finish I	Date: 6	-6-16	Bridge	No.:	06000	0A	Surface Elevation: 29.6		
Project	Descript	tion: Relocation of I	I-91 NB	Interc	hange	29 & Widenir	ng		
Casing	Size/Typ	be: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID	Core Barrel Type: NX		
	er Wt.: 3		Hammer Wt.: 140lb						
Ground	dwater Ol	bservations: @11.5'	ATD						
		SAMPLE	S			70		Elevation (ft)	
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes		
						Lacustrine (con't)			
70 —		_						-40	
_	S15	wor wor wor wo	r 24	24			Brown SILTY CLAY		
							Brown SILTY CLAY (Torvane = 0.275 tsf and	-	
_	UP-3		30	30			Pocket Pen. = 0.9 tsf)	-	
75-		-						45	
_	S16	wor wor 4 6	24	24			Brown SILTY CLAY		
-		-							
								_	
80-		_						-50	
_	S17	wor wor woh 2	24	24			Brown SILTY CLAY		
_		_							
-									
-						Glacial Till		55	
85—	S18	7 19 12 43	3 24	8			Drown of CAND, some of groupl, some silt	_	
_	310	1 19 12 43	, 24			NA/ 11 1	Brown c-f SAND, some c-f gravel, some silt	-	
_						Weathered Rock	WEATHERED BEDROCK		
_								60	
90 —		-				Bedrock		-00	
_								L	
	C-1		60	28	0		Brown ARKOSE, highly weathered, medium banded, highly fractured, medium strong.	-	
_							bandou, mgmy madarou, modum onong.	-	
95—		_						-65	
_									
-	C-2		60	60	28		Brown ARKOSE, medium banded, moderately		
_							fractured, medium strong.	-	
100-								70	
								-	

END OF BORING 100ft

Total Penetration in	NOTES: 4" casing to 55', telescoped 3"	Sheet 3 of 3
Earth: 90ft Rock: 10ft		3 01 3
No. of No. of		
Soil Samples: 21 Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier						С	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S2-2	
Inspector: J. Herpich											Stat./Offset: 186+70.98/64.84 RT		84 RT
					Project No.: DOT			Project No. 63	3-703	Northing:	833972.97		
Start D	ate:	5-19-16				<u> </u>			/ RTE 15 NB		Easting:	1025134.84	
Finish [Date:	5-19-16				Bridge	No.:	0600	0A		Surface Eleva	ation: 17.5	
Project	Descrip	otion: R	eloc	ation	of I-	91 NB	Interc	hange	e 29 & Widenir	ng			
Casing	Size/Ty	ype: 4-ir	n. Ca	sing		Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel T	ype: NX	
Hamme	er Wt.:	300lb	Fall:	30in		Hamme	er Wt.:	140lb	Fall: 30in.				
Groundwater Observations:													
			5	SAMF	PLES	3			- - -				Elevation (ft)
Depth (ft)	Sample Type/No.	р	San	vs on npler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	Material Description and Notes		
0-	S1	7	18	17	16	24	12		Topsoil	TOPSOIL (2")	. P(0) 1 - P)	m 20	-
_		'	10	"	10	2-	12		Fill	Brown c-f SAND	, little gravel, li	ttie siit	- 15
_													_15
_													
5-	S2	5	7	6	4	24	6			Brown f SAND and SILT			- 1
													-
_													-10
_									Alluvium				
10-	S3	2	1	1	3	24	24			Brown SILT and	f SAND		-
													-
_													-5
_													
15-	S4	woh	1	1	1	24	24			Brown SILT and	f SAND		
_													- 1
													-0
_													<u> </u>
20-	S5	10	10	12	11	24	10			Brown to gray c-	f SAND, trace	silt	
_													
_													5
													-
25-	S6	8	9	13	13	24	24			Gray c-f SAND,	trace silt		
-		\dashv								, , , , , , , , , , , , , , , , , , , ,			
-													10
-													-
30-	S7	8	13	16	22	24	12			Gray c-f SAND,	trace silt		F
_			. •	. •						Sidy of OAND,	adoc ont		F

Total Penetration in	NOTES:	Sheet 1 of 3
Earth: 79.5ft Rock: 10ft		1 01 3
No. of No. of		
Soil Samples: 16 Core Runs: 2		SM-001-M REV. 1/02

						4 DOT David	an Danard			
Driller:		. Labossier	+	onne		t DOT Borii	Hole No.: S2-2			
Inspect		. Herpich	Town: Hartford					Stat./Offset: 186+70.98/64.8	84 RT	
Engine		I. Whetten	Project No.: DOT Project No. 63-703					Northing: 833972.97		
Start Da		-19-16	Route			/ RTE 15 NB		Easting: 1025134.84		
Finish [-19-16	Bridge		06000			Surface Elevation: 17.5		
Project	Descript	ion: Relocation of	I-91 NB	Interc	hange	29 & Widenir	ng			
Casing	Size/Typ	oe: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX		
Hamme	er Wt.: 30	00lb Fall: 30in.	Hamme	er Wt.:	140lb	Fall: 30in.				
Ground	water Ob	oservations:								
	SAMPLES									
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Description and Notes	Elevation (ft)	
35 — —	S8	3 4 3 4	24	24		Lacustrine	Brown CLAY			
40—	S9	woh woh woh 3	24	24			Brown CLAY, 1/	16" silt varves	20 -	
- - 45- -	S10	woh woh woh 2	24	24			Brown CLAY, Si	ilt varves less than 1/32"		
50-	S11	wor woh 2 4	24	24			Brown SILTY CI	LAY	30 - - - - 35	
55— - -	S12	woh woh woh wo	oh 24	24			Brown SILTY CI	LAY	- - - 40	
60-	S13	woh woh woh wo	oh 24	24			Brown SILTY CI	LAY	-	
65 —	S14	4 11 30 2	3 24	24		Glacial Till	Brown CLAYEY	SILT, little gravel	45 	

Total Penetration in	NOTES:	Sheet
Earth: 79.5ft Rock: 10ft		2 of 3
No. of No. of		
Soil Samples: 16 Core Runs: 2		SM-001-M REV. 1/02

Driller:	P	. Labossier	С	onne	ecticu	ıt DOT Borir	ng Report	Hole No.: S2-2	
Inspect		. Herpich	Town:		Hartfe		<u> </u>	Stat./Offset: 186+70.98/64.8	4 RT
Engine		I. Whetten	Projec	t No.:		Project No. 63	3-703	Northing: 833972.97	
Start D		-19-16	Route			/ RTE 15 NB		Easting: 1025134.84	
Finish I	Date: 5	-19-16	Bridge	No.:	0600	0A		Surface Elevation: 17.5	
Project	Descript	ion: Relocation of	I-91 NB	Interd	hange	29 & Widenir	ng	1	
Casing	Size/Tvr	be: 4-in. Casing	Sampl	er Type	e/Size:	1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 3		<u> </u>	er Wt.:				осто делист турст тип	
Ground	lwater Ob	oservations:							
		SAMPLE	S			D			Elevation (ft)
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes		
70—	S15	8 10 5 9	24	12		Glacial Till (con't)	Brown to red SIL	.T, some f sand, little f gravel	- - - -
- - 75-	S16	73 100/2"	8	3		Weathered Rock	Rock fragments,	likely weathered bedrock	- 55 - -
- - -							WEATHERED B	BEDROCK	_ 60 _
80— - - -	C-1		60	43	0	Bedrock		h to slightly weathered, strong, near-horizontal joints parallel to	_ _ 65
85— - - -	C-2		60	54	35		ARKOSE, open	h to slightly weathered, strong, near-horizontal joints parallel to one open near-vertical joint.	_ _ _ 70
90-							END OF BORIN	G 89.5ft	_ _ 75
95— - -									_ _ _
100-									_
_	<u> </u>	Sample Type: S =	Split S	poon	C = (Core UP = Ur	ndisturbed Piston	V = Vane Shear Test	_
				•				- 35%, And = 35 - 50%	
Total P	enetratio			TES:				She	et

Total Penetration in	NOTES:	Sheet
Earth: 79.5ft Rock: 10ft		3 of 3
No. of No. of		
Soil Samples: 16 Core Runs: 2		SM-001-M REV. 1

Driller:	F	. Labo	ssier	<u> </u>		Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S2-3-OW	
Inspect		I. Whe		<u> </u>	Т	own:		Hartfo	ord		Stat./Offset:		9 RT
Engine		I. Whe	tten		F	roject	No.:	DOT	Project No. 63	3-703	Northing:	834301.21	
Start Da		-21-16				Route N			/ RTE 15 NB		Easting:	1025386.89	
Finish [Date: 6	-23-16			Е	Bridge N	No.:	0600	0A		Surface Eleva	ation: 22.8	
Project	Descript	tion: R	eloc	ation				hange	e 29 & Widenir	ng	·		
Casing	Size/Typ	be: 4-ir	n. Ca	sing	S	Sample	r Type	/Size:	1-3/8 inch ID		Core Barrel T	ype: NX	
	er Wt.: 3			30in		lamme						71	
Ground	lwater O	bservat	ions:	@1	4.6' A	TD, @)16.7'	on 9/	20/2016, @15	.2' on 2/13/2017			
			9	SAMF	PLES				T)				Elevation (ft)
Depth (ft)	Sampler Sampler per 6 inches					Pen. (in.) Rec. (in.) RQD %			Generalized Strata Description	Ма	Material Description and Notes		
0-		50/0"				0	0		Asphalt	ASPHALT (6")			
- - - 5-	S-1	00/0							Fill		ent	3 to 4 inch stone	- -20 -
- - -	S-2	16	11	7	6	24	18			Brown to black c gravel, trace bric			_ _ 15
-									Alluvium				
10 - - -	S-3	4	2	1	1	24	18			Gray SILT, little t	f sand, with bla	_ _ 10	
- 15- - -	S-4	wor	wor	wor	wor	24	20			Gray SILT, some	e f sand		- - -
20 - -	S-5	1/12"		1	2	24	20			Brown to gray SI	LT, little f sand	I	-5 - - - -
- 25- - -	S-6	5	8	8	8	24	16			Gray SILT, little t	f sand		-0 - - - - 5
30 — - - -	S-7	5	4	6	7	24	12			Gray c-f SAND, t	trace f gravel, t	trace silt	_ _ _ _
Total P	enetratio	Propor	•	•		race =	1 - 10	0%, I	Little = 10 - 20	ndisturbed Piston %, Some = 20 -	- 35%, And :		
Earth:		Rock:	13ft o. of			back	cfilled '		ter sand. Bento	nite seal from 1 to			
	mples: 1			uns: 2	2							SM-001-M	REV. 1/0

Driller:	 Р	. Labo	ssier	<u> </u>		Co	onne	cticu	ıt DOT Bori	ng Report	Hole No.:	S2-3-OW	
Inspect	tor: N	. Whe	tten		Т	own:		Hartfo	ord		Stat./Offset:	189+58.56/80.09	9 RT
Engine	er: N	. Whe	tten		Р	roject l	No.:	DOT	Project No. 63	3-703	Northing:	834301.21	
Start D	ate: 6	-21-16	6		R	Route N	lo.:	US 5	/ RTE 15 NB		Easting:	1025386.89	
Finish [Date: 6	-23-16	6		В	ridge N	No.:	0600	0A		Surface Eleva	ation: 22.8	
Project	Descript	ion: F	Reloc	ation	of I-9	1 NB I	nterc	hange	e 29 & Widenii	ng			
Casing	Size/Typ	e: 4-ir	า. Ca	sina	S	amplei	r Tvpe	/Size:	1-3/8 inch ID		Core Barrel T	vpe: NX	
	er Wt.: 3			30in		lamme						J1	
Ground	dwater Ob	servat	ions:	@1	4.6' A	TD, @	16.7	on 9/	20/2016, @15	5.2' on 2/13/2017			
					PLES								
Depth (ft)	Blows on Sampler per 6 inches					Pen. (in.)	Rec. (in.)	RQD % Generalized Strata Description			terial Descrip and Notes	otion	Elevation (ft)
35— — —	S-8	3	3	3	5	24	8		Alluvium (con't)	Brown c-f SAND	, little c-f grave	I, trace silt	_ _ _ _ 15
40-	S-9	11	13	13	18	24	14			Gray to brown c-	f SAND, little c	-f gravel, trace silt	_ _ _ _ 20
45— - - -	S-10	wor	wor	wor	2	24	24		Lacustrine	Brown SILTY CL and 1/2" gray silt		2" red silty clay	_ _ _ _ 25
50— — —	S-11	wor	wor	woh	woh	24	24			Red-brown, SILT gray silt varves 1	Y CLAY, Clay /4"	varves 1/4" and	_ _ _ 30
55— — —	S-12	wor	wor	1	2	24	24			Red-brown, SILT gray silt varves 1		varves 1/8" and	_ _ _ 35
60-	S-13	wor	woh	3	6	24	10			Red-brown, SILT gravel	and fine SAN	D, trace fine	_ _ _ 40
_	-								Glacial Till	Change in drill a	ction noted at 6	64 feet	
65 — _ _	S-14	8	15	20	39	24	12			Red-brown, clayer			- - - 45
_	I	⊃ropoi	•	•		ace =	1 - 10	0%, I	Little = 10 - 20	ndisturbed Piston %, Some = 20 -	35%, And =	= 35 - 50%	
Total P Earth: No. of	enetratio 72ft	Rock:	13ft			back	filled '		ter sand. Bento	lled. Screen from onite seal from 1 to		y box She	
	mples: 1			uns: 2	2							SM-001-M F	REV. 1/0

Oriller:	F	P. Labo	ssier		Co	nne	cticu	t DOT Borir	ng Report	Hole No.:	S2-3-OW	
nspect		V. Whe		-	Town:		Hartfo	ord		Stat./Offset:		09 RT
 Engine		N. Whe	tten		Project I	No.:	DOT	Project No. 63	-703	Northing:	834301.21	
Start D		6-21-16			Route N			/ RTE 15 NB		Easting:	1025386.89	
inish [Date: 6	6-23-16		1	Bridge N	lo.:	06000)A		Surface Elev	ation: 22.8	
roject	Descrip	tion: R	elocation	of I-9	91 NB I	ntercl	hange	29 & Widenir	ıg			
asing	Size/Tvi	pe: 4-in	ı. Casing		Sample	r Type	/Size:	1-3/8 inch ID		Core Barrel 7	Type: NX	
	er Wt.: 3	-	Fall: 30in.		Hamme						7,500	
Fround	lwater O	bservati	ions: @1	4.6' <i>A</i>	ATD, @	16.7'	on 9/2	20/2016, @15	.2' on 2/13/2017	,		
			SAMF									9
Depth (ft)	Sample Type/No.		Blows on Sampler er 6 inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Descrip and Notes	otion	Flevation (ft)
								Glacial Till (con't)				_
70 — — —	S-15	15	36 61	87	24	18		Weathered Bedrock	Red-brown, SIL medium gravel (angular)	•	- - - 50
- 75-								Bedrock				
	C-1				60	51	36		Red, slightly to r strong, ARKOSI		tured, fresh,	_
80—	C-2				60	49.5	36		Red, slightly to r strong, ARKOSI sandstone at 83	 Transition fr 	tured, fresh, om siltstone to	_ _ 60
85— - - -									END OF BORIN	IG 85ft		
90-												-
- 95-												
_												- - 7!

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

100-

Total Departmention in	NOTEC: Observation well installed. Careen from 40 to 20 feet	Chast
Total Penetration in	NOTES: Observation well installed. Screen from 10 to 20 feet	Sheet
Earth: 72ft Rock: 13ft	backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	3 of 3
No. of No. of	3	
Soil Samples: 15 Core Runs: 2		SM-001-M REV. 1/02

Driller:		P. La	bos	ssier				Co	nne	cticu	t DOT Borir	ng Report	Hole No.:	S2-4	
Inspect		J. He					Towi	n:		Hartfo	ord		Stat./Offset:	191+41.78/69.	08 RT
Engine		N. W					Proje	ect N	No.:	DOT	Project No. 63	3-703	Northing:	834432.89	
Start D	ate:	5-12-	16				Rout	te N	0.:	US 5	/ RTE 15 NB		Easting:	1025509.68	
inish [Date:	5-16-	16				Bridg	ge N	lo.:	06000)A		Surface Elev	ation: 28.7	
Project	Descri	ption:	R	eloca	ation	of I-	-91 N	NB I	ntercl	nange	29 & Widenir	ng			
Casing	Size/T	vpe: 4	-in	. Ca	sing		Sam	pler	Type	/Size:	1-3/4 inch ID		Core Barrel 7	Type: NX	
	er Wt.:	•			30in			-		140lb				71	
Ground	lwater (Observ	/ati	ons:	@2	8.5'	ATD)							
				S	SAMF	PLES	S				T				t)
Depth (ft)	Sample Type/No.	,		Sam	s on pler nche			Pen. (In.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	aterial Descrip and Notes	otion	Elevation (ft)
0-	S1	9)	22	23	20	2	24	24		Fill	Brown SILT, and	d c-f sand, trace	e asphalt	
5— 5—	S2		ļ	20	47	8	2	24	5			Brown SILT, trac strong odor	ce wood and gl	ass, detected	-25 - - -
10-	S3	2	0	24	20	15	2	24	0			No recovery			20
_	S4	2	0	24	20	15	2	24	24		Alluvium	Gray SILT and f	SAND, little f g	gravel	_ _ 15
15— — —	S5	- 8	3	7	3	5	2	24	12			Gray SILT and f	SAND		-
20— -	S6	1	l	2	2	1	2	24	9			Gray SILT and f	SAND		- -10 - -
25—	S7		2	1	1	1	2	24	24			Brown to gray f	SAND and SIL ⁻	Т	- -5 -
- - 30-	S8		3	11	11	14	2	24	12			Brown c-f SAND	little f gravel		- - -0 -

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES:	Sheet 1 of 3
Earth: 79.5ft Rock: 10ft		1 01 3
No. of No. of		
Soil Samples: 17 Core Runs: 2		SM-001-M REV. 1/02

Driller:	Р	. Labossier	C	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S2-4		
Inspect		. Herpich	Town:		Hartfe	ord	<u> </u>	Stat./Offset: 191+41.78/69.08 RT		
Engine		. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 834432.89		
Start Da		-12-16	Route N			/ RTE 15 NB				
Finish D	Date: 5-	-16-16	Bridge		0600			Surface Elevation: 28.7		
Project	Descript	ion: Relocation of	I-91 NB	Interc	hange	29 & Widenir	ng			
Casing	Size/Tyr	be: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: NX		
	er Wt.: 30		Hamme					уренти		
		oservations: @28.5	-							
		SAMPLE				-				
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ma	aterial Description and Notes	Elevation (ft)	
35— —	S9	3 2 3 5	24	6		Alluvium (con't)	Gray c-f SAND,	little m-f gravel, little silt		
40 —	S10	8 10 11 7	24	8			Gray c-f SAND,	some m-f gravel, little silt	 10 	
45-	S11	17 14 19 2 ⁻	1 24	8			Gray c-f SAND,	some silt, little f gravel		
50-	S12	wor woh woh 4	24	24		Lacustrine	Brown SILTY CL	.AY		
55— -	S13	woh woh 5 6	24	24			Red SILTY CLA	Υ	- 25 - -	
60-	S14	14 16 15 2 ⁷	1 24	1			Red SILTY CLA	Y	- 30 - -	
65—	S15	12 11 12 15	5 24	12			Red SILTY CLA	Υ	_ 35 - -	

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES:	Sheet
Earth: 79.5ft Rock: 10ft		2 of 3
No. of No. of		
Soil Samples: 17 Core Runs: 2		SM-001-M REV. 1/02

Driller:	P	. Labossier	Co	onne	cticu	ıt DOT Boriı	ng Report	Hole No.:	S2-4	
Inspect		Herpich	Town:		Hartfe	ord		Stat./Offset:		08 RT
Engine		. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing:	834432.89	
Start D	ate: 5-	-12-16	Route N	lo.:	US 5	/ RTE 15 NB		Easting:	1025509.68	
Finish [Date: 5-	-16-16	Bridge I	No.:	0600	0A		Surface Elev	ation: 28.7	
Project	Descript	ion: Relocation of I	-91 NB	Interc	hange	e 29 & Widenir	 າg			
Casing	Size/Tvr	e: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel 7	Type: NX	
	er Wt.: 30		Hamme						, ypo. 101	
		oservations: @28.5'								
		SAMPLE								<u> </u>
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes			Elevation (ft)
70-	S16	9 19 100/5"	17	10		Lacustrine (con't) Glacial Till	Red CLAYEY S sand	SILT, some c-f g	ravel, little c-f	
75—	S17	35 100/5"	11	8		Weathered	Red CLAYEY S sand	SILT and c-f GR.	AVEL, some c-f	- 45 - -
80-						Rock	WEATHERED	BEDROCK		_ 50 _
- - - 85-	C-1		60	42	0		Red-brown, fres numerous open occasional fract	low-angle bedo	OSE, with ding joints,	- - - 55
- - -	C-2		60	60	7		Red-brown, fres numerous open			_ _ _ 60
90-							END OF BORIN	NG 89.5ft		
95— - -										65
100-										70
	F	Sample Type: S = Proportions Used:	Trace =	1 - 10					= 35 - 50%	
Total P	enetratio	n in	NOT	TES:						eet
Earth:	79.5ft	Rock: 10ft							3 0	ı J
No. of Soil Sa	mples: 1	No. of 7 Core Runs: 2							SM-001-M	REV. 1/02

APPENDIX B PREVIOUS TEST BORING LOGS



H	BO E ALEY	A. Mason RING CREW LEADE . Henderson INSPECTOR & ALDRICH, INC.		Pf										SHEET 1 OF 3 LOCATION Pier 3 R GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER		
	ATION	West Side of the Court Side of	of Co					for		ING	SAMPL			HOLE NO. B 104		
DAT	E FINIS GROUND	HED 11/24/86 WATER OBSERVATION	NS.	SIZ	PE ZE I.D.	-			HW - 4" 300	3"	S/S 1-3/ 140	811	NV II BIT	LINE & STATION IN-5 21+81.0 OFFSET 7.7L N. COORDINATE 334276.36		
ΑT	17.5 F	T. AFTER			HAMMER WT. HAMMER FALL					ir ir	30			E. COORDINATE 625315.83		
Ţ	CASING BLOWS PER FOOT	DEPTHS	PEN. INCH		TYPE	PER 6 INC ON SAMPLEI		HES R	STRATA CHANGE DEPTH ELEV.		FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)					
	P U S	0'-1,5'	1	18	14	D	1	1	1			san	d, roots	Brown SILT, little fine s, trace of coarse sand, l, rubble		
5	H E D	4'-5.5'	2	18	14	D	3	2	3	6	•	Sof san	t, Brown d, trace	n SILT, little medium to fi e of gravel -FILL-		
10		9'-10.5'	3	18.	18	D	1	2	2					-Brown fine SAND and SILT, um sand.		
15		14'-15.5'	4	18	18	D	1	1	1					ery soft, Gray Green SILT, ine sand -ALLUVIUM-		
20		19'-20.5'	5	18	18	D	2	2	4	1	9 '	Loo	se, Gra	y fine SAND, some silt		
25		24*-25.5*	6	18	18	D.	2	6	4	2	7'			-ALLUVIUM- ny STLT, little fine sand, nod chips		
30	85 85 57 68	29'-30,5'	7	18	16	D	11	1.7	20				ce of c	ny medium to fine SAND, coarse sand and gravel,		
35	61 65 59 61	34'-35.5'	8	18	14	D	3	5	4			Loose, Dark Gray, medium to fine SANI trace of coarse sand, silt -ALLUVIUM-				
	63 64 75 47	39'-40.5'	9		15		12	18			ĮM	of		ay medium to fine SAND, trace and and gravel, silt		
		OUND SURFACE TO		EET (ROCK	INCH C	ASING	THEN		NO. OF			HOLE NO. B 104		
SA	MPLE T	YPE CODING: ONS USED:		D=DRI	IVE	Ċ	= COR			\= AUG = 20 -	ER,	UP=		RBED, PISTON V=VANE TEST		

~,									01.4.4	2014	0.400			SHEET 2 OF 3
_		A. Mason RING CREW LEAD	ĖD				ST	ATE O	F COL	REV. I	ICUT			
			LK			DE	PART!	MENT	OF T	RANSI HIGHV	PORTAT	NOL		GUILD DRILLING CO., INC.
	E.	Henderson INSPECTOR		-	OWN -		DC	BOR	ING. P	EPOR	RD_C	·.		BORING CONTRACTOR
71	AT ESF	& ALDRICH, IN	i.c	_	ROJEC						BRID			STEINMAN
		SOILS ENGINEER	iU e		ROJEC	P		63-		OZZIC	DRED	J.		DESIGN ENGINEER
~~	·	West Side	of C							÷_	•			
-	ATION FACE E		OI (,01111	, I/T	/CI	AUG		CAS		SAMPL	.ER	CORE BAR	HOLE NO. B 104
_	E FINIS				YPE		T							LINE & STATION
_		WATER OBSERVATI	ONS		ZE I.D									OFFSET
Т		T. AFTER	HF		AMMER								BIT	N. COORDINATE
Ť		T. AFTER			AMMER		_							E. COORDINATE
			MPLE					BLOWS						
D		DEPTHS					PEF	6 INC	HES	STR				
E o	CASING	IN FEET			REC.	1 .		ON		CHA DEP				D IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF
•	BLOWS PER	FROM - TO	NO.	INCH	INCH	TYPE		MPLE		EL				WATER, SEAMS IN ROCK, ETC.)
H	F00T	11011	\downarrow				0-6	6-12	12-18					
	80	<u></u>	-	<u> </u>	_		—	 						
<u> </u>	83		+		-	_			$\vdash \vdash$					
	90		-		1	-	\vdash	-				14-	 14 1	an Compar modium to fine
	90 49	44'-45.5'	10	18	17	ת	10	11	14		-			se, Gray medium to fine e of coarse sand, silt
5	55	44 -43.3	110	10	1 1/	n n	70	1 1	14			OH	an, crace	
	68		†		 									-ALLUVIUM-
	72		†	1				 		4	8	: :		
	75													
0		49'-50.5'	11	18	18	D	1	1	1			Ve	ry soft,	Red-Brown VARVED CLAY
•												and	d SILTY (CLAY
				<u> </u>							1			
		-71 -21	110	10	10		7	7	0			0 - 4	C4 D-1 I	Transport MADITED OF AN CO. 1
5		54'-55.5'	12	18	18	D	1	1	2		- 1		rt, ked-i LTY CLAY	Brown VARVED CLAY and
				 								DII	HII CHAI	
			+	-	-		H							
				-						_58	.5'			
0		59'-60.5'	13	18	14	D	24	36	29			Han	d, Red-H	Brown SILT, some medium to
U												fir	ne sand,	trace of coarse sand and
												fir	ne grave:	l
		C11 C= = 1			1.0							T.		The GART
5		64'-65.5'	14	18	12	D.	18	22	32		İ			Brown fine SAND, some silt,
				 				$\vdash \vdash \vdash$			İ			rse to medium sand and
											1	шес	լոսա 60 1	fine gravel
			1			H								
0		69'-70'	15	12	12	D	27	51			.	Hai	d, Red-I	Brown SILT, some coarse to
ď		@ 70'	-	0	0	D		/o''						d, little medium to fine
												gra	evel	-GLACIAL TILL-
•								ll R	ate	7;	31			
			lacksquare				Mi	n/Ft		7/	<u>+ '</u>	N	Deco	omposed Bedrock
5		741-791	1		56			3			ł			hard, Red-Brown fine sandy Joints very close to
		·		(KQ)=46°	6)		4			Į			to very thinly bedded,
T.	\vdash			 	 	\vdash		5			ł		ightly we	
		<u> </u>				\vdash		6			1		-0	
ż	\Box			 				6						
FR	OM GRO	UND SURFACE TO	F	EET t	ISED		NCH C	ASING	THEN		IN	сн с	ASING FOR	FEET
FO	OTAGE	N EARTH	F	OOTA	GE IN	ROCK					NO. OF	SAMI	PLES	HOLE NO. B 104
		/PE CODING:		D=DRI			=cor			= AUG				BED, PISTON V=VANE TEST
-KI	UPURTIC	ONS USED:	TRA	CE=I-I	0% L	HLE	- 10-2	20%	20ME	= 20 -3	1076 /	นเก =	=35-50%	<u> </u>

4	С	RING C Harr INSPE	Mason REW LEAD LIMAN COTOR ORICH, IN		Р	ROJEC		ST. PARTI BU FORT	ATE OMENT JREAU BOR -EAS CHA	F CON OF THE OF H ING R	HIGHW EPOR RIFO	ICUT ORTA	T.		GUILD I	Pier 3 RILLING NG CONTRA STEINMAN SIGN ENGIN	CO. INC.
1.00	CATION		st Side	of (onn.	Riv	er -	Har			t.						
	FACE E	LEV.						AUC	ER	CAS	ING	SAMPL	ER	CORE BAR		В	L04
DA"	E FINIS	HED			T	YPE		<u> </u>							LINE & STATI	ON	·
	GROUNI	WATER	OBSERVATI	ONS	SI	ZE 1.D									OFFSET		
λT			AFTER		RS. H	AMMER	WT.							BIT	N. COORDINA	TE	
AT	1	FT.	AFTER	HF	RS. H	AMMER	FALL								E. COORDINA	TE	
T _D				MPLE					BLOWS								
E P T	CASING BLOWS PER	IN	FEET	NO.	PEN.	REC.	ė i		6 INC ON AMPLE		STRA CHAI DEP ELE	NGE TH		REM/	D IDENTIFICARKS (INCL. CO	DLOR, LOSS)F
I H	FOOT		• T0					0-6	6-12	12-18							
		79	-84'	2	60	60	C		6						as Run 1	-	lightly
1					(RQ	5=35	(4)		6				πo	re sound	l than Rur	11.	
Ļ				_				<u> </u>	6	\square							
				 		ļ	ļ		6						C = -		7.1
85														Bottom o	of Explora	ttion @ 8	4.
	<u> </u>			-	-												
Na Caronina	└			-	-	-				-							
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FI	KOM GRO	UND SUF	RFACE TO	,∨ F	EET L	SED	귝	NUM C	ASING	INEN	ر	11/1	UN U	ASING PUR	/+	reel	
FC	OTAGE	N EART	н 74	F	OOTA	GE IN	ROCK		10			NO. OF	SAME	PLES	1.5	HOLE NO	в 104
			· · · · · · · · · · · · · · · · · · ·														
		YPE COD ONS USEC		•	D=DRI CE=1-I			= COR = 10-2			= AUG! = 20 - 3			= UNDISTURE = 35 - 50%	BED, PISTON	V=VANE	TEST

							1470	CMA	DEM (1/02			SHEET 1	0F 3	
	McDonough	ADER				STA	ATE O	F CO	REV. S	ICUT			LOCATION Wes		
	M. Germano	ADER			DE				RANSI HIGHV	'ORTA' 'AYS	ΠON			LLING CO.	
<u> </u>	INSPECTOR		┵	OWN		JQ >m	BOB	ING R	EPOR	Rn. C	er.		BORING	CONTRACTO	R THU.
MATEV	& ALDRICH,	TNC.					-EAS	L HA	OAR	BRID	VCE.			'EINMAN	•
	SOILS ENGINEER		_	ROJEC ROJEC				384	UAIN	DICTL	<i>/</i> G.11		DESIG	N ENGINEER	
	West Ban				_										
CATION		C OT CO.	1111	KIVE.		AUC		CAS		SAMPI	FR	CORE BAR	HOLE NO.	В 107	
RFACE E		786		YPE		1			-NW	s/		NV II	LINE & STATION		±68_8
TE FINIS				ZE I.D.				<u> </u>	3"	1-3		117 11	OFFSET	57.8R	. +00.0
-	WATER OBSERV			AMMER				30			<u>/∪</u> 0#	ВІТ	N. COORDINATE		56
-		48 HR	_	AMMER		-			411		011	511	E. COORDINATE		
	T. AFTER	HR SAMPLE	3. m/	4MMC1	FALL			-			Ť	i	E. COCKDIII/(12	024004.	- 4
0	DEPTHS	SAMPLE					BLOWS		STR	ATA					
CASING			PEN	REC.		rer	ON	HE3		NGE		FIEL	D IDENTIFICAT	ION OF SOIL	
BLOWS	IN FEET	NO	ı	INCH	TYPE		MPLE	D	DEP				ARKS (INCL. COL	•	
PER]	FROM - TO) 10.	INCH	111011	, , , , _		6-12		ELI	EV.	·	WASH	WATER, SEAMS IN	ROCK,ETC.)	
F00T	0'-1.5'	1A	18	18	<u> </u>	6		15	- 0	٠- ' - ' - '	Lo	ose, Brow	wn fine SAN	, trace	of coars
43	0 -1.07	1B	10	10	<u> </u>		رد			\			sand, roots		
44		TD	-										se, Brown f		
55			<u> </u>							· •	1	•	e of coarse	to mediu	n sand,
5 33	4'-5,5'	2	18	18	D	5	5	7			fi	ne grave.	l -FILL-		<u>.</u>
5 23	7 282			 ~~		Ť	<u> </u>			,	St	iff. Gra	y Brown SIL	r and fine	SAND.
18								\vdash		7 î			edium sand		
15											1				
14 Very loose, Brown fine SAND.															
20	9'-10.5'	3	18	18	D	1	1	2			Ve	ry loose	, Brown fin	e SAND,	
18											son	ne silt		-	
18]				
18													•		
17													4		
5 37	14'-15.5'	4	18	18	ת	1	2	2		,	۷e:	ry loose.	, Gray fine	SAND, son	ne
30	27 23.3												e of wood f		
31												- •	-ALLUVIUM		
39									18	31		·			
45															
20 44	19'-20.5'	5	18	18	D	1	2	2		•	۷e:	ry loose	, Gray medi	um to fine	e SAND,
40											tra	ace of co	oarse sand,	fine gra	√el,
43						·					si	lt			
53													-ALLUVIU	M -	
54									24	, "	- ا		_ — -		
5 28	24'-25.5'	6	18	18	D	2	2	5		;			y fine SAND		silt,
34											tra	ace of me	edium sand a	and wood	
36			<u> </u>						-						
50			<u> </u>												
65							1.	1,					0 0*	0437-	
30 <u>48</u>	29'-30.5'	7	18	18	D	5	12	16					se, Gray fil		race
58			<u> </u>				ļ				or	medium 8	sand, silt,		
85			<u> </u>										-ALLUVIU	<u>M</u> -	
67			_						0.	. 1					
80	0/1 0= =:		7.0	7.0		774		70-	34	, 1	77-	cof-	Do.J. Descript 1	TADTIES OF	V and
35	34'-35.5'	- 8	18	18	D	W.C.	of	jam.				-	Red-Brown	VARVED CLA	re and
<u> </u>			 	_				$\vdash \vdash \vdash$			2T1	LTY CLAY			
·			-					\vdash							
											Med	lium stii	ff, Red-Brow	vn VARVED	CLAY
	39'-40.5'	9	18	18	ת	2	2	3				SILTY (•		. —
EDOM ODG	<u> </u>							THEN		11		ASING FOR		FEET	
NUM GITT	OUND SURFACE T	υ Γ	EET	,JEU			., .51174			. , ,1					
FOOTAGE	IN EARTH	F	OOTA	GE IN	ROCK					NO. OF	SAM	PLES	· · · · · · · · · · · · · · · · · · ·	HOLE NO.	107
COTAGE	IN CARTE	F	301A	JE 111								· ***			
AMPLE T	YPE CODING:	1	D=DRI	VE	С	=cor	E	Α	= AUG	ER	UP	=UNDISTURE	BED, PISTON	V=VANE TE	ST .
	ONS USED:			0% L					= 20 -3			= 35 -50%	•		
		1 75141	~~ i-1	-10			10			-1-	-	•			

Property of the second	во М.	McDonough DRING CREW LEAD Germano INSPECTOR & ALDRICH, II SOILS ENGINEER		ı	TOWN PROJEC	HART	ST PART B FORI	ATE (MENT UREAL BOR CHA	OF CC OF T U OF UNG	REV. 8 DINNECT FRANSP HIGHW REPOR ARTFOR	ICUT ORTA (AYS	or.		SHEET 2 OF 3 LOCATION West Abutment 3, E. GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER
1.00	ATION	301E3 ENGINEER		1.	KODE	GI NO.		0.0-	304					DOIGH ENGINEER
-	FACE E	LEV.					AU	GER	CA	SING	SAMP	LER	CORE BAR	HOLE NO. B 107
AT	E FINIS	HED		T	YPE									LINE & STATION
	GROUN	WATER OBSERVAT	IONS	S	IZE I.C).								OFFSET
\T		T. AFTER	-	-	AMME		╀		 				BIT	N. COORDINATE -
<u>\T</u>	<u> </u>	T. AFTER	HI AMPLE	RS. H	AMME	RFALL	Ť T				····			E. COORDINATE
DEPTH.	CASING BLOWS PER FOOT	DEPTHS		1	. REC.	1	PE S	BLOWS R 6 INC ON AMPLE 6-12	HES R	STRA CHAN DEP ELE	IGE TH		REMA	D IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF WATER, SEAMS IN ROCK, ETC.)
	P													
l l	U				+-	-	<u> </u>	-		1				
	S H		+-	-		 	├─	-	\vdash	1				
-5	E	44'-45.5'	10	18	18	D	2	2	3	1		Med	lium stif	ff, Red-Brown VARVED CLAY
ا دءِ	D									1			SILTY C	-
										Į				
				 	-			 	-	Į.		Vor	y soft,	
اً ا		49'-50.5'	11	18	18	D	Wt.	of 1	lam.	1		AET	-	e as D10)
50		49 ~30*3	+++	110	10	ון	W.L.	OT 1	fam.				(Same	as Dio)
				1						1				
]				
				<u> </u>								Ver	y soft,	
55		54'-55.5'	12	18	18	D	2	2	2				(same	e as D10)
			+						 				* *	
1			+											
							. r. - r- 1			1		Sof	t,	
60		59'-60.5'	13	18	18	D	2	2	2				(same	e as p10)
Portion .			<u> </u>		<u> </u>									
			+	-										
													~	
55		64'-65.5'	14	18	18	D	2	2	3			Med	ium stif	f.
"														ne as D10)
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<u>,</u>		69'-70.5'	15	18	18	D	3	3	3			Med	ium stif	f.
70			1	<u> </u>					_					ne as p10)
		;;====================================								72	'		·	
'														Red-Brown SILT and fine
		74'-75.5'	16	18	18	<u></u>	65	L00/4						e coarse sand, fine gravel,
75		14 7/3.3	10	ΤΟ	10	D	65 50/		75*	76	, [FT.q	ce of cl	-GLACIAL TILL-
		76' - 81'	I	60	34	C	501	10		11 Ra		Mod	erately	hard, Brown-Red fine graine
1				(RQ)=35°	ه)		10		lin/F	TR.	SIL	TSTONE,	slightly weathered, very
								8						closely jointed. Rock very
	04.000	IND PHOPLOT TO	لبا				NOU C	7	Oct inc.				nly bedd	
rK	UM GRU	UND SURFACE TO	F	EET (ASING s 30		eight			ASING FOR	FEET
FO	OTAGE I	N EARTH	F	OOTA	GE IN F				- 11		10. OF			HOLE NO. B 107
SAN	IPLE TY	PE CODING:	Ē)=DRI	VE	C:	= COR			= AUGE	R	UP=	UNDISTURB	
3		NS USED:	TRÂC	CE=1-1	0% LI					= 20 -35			35-50%	

	37 - 37 1						.O.D.) (G) ()	DEX. 0	103	_		- Court	ET 3	-		
*	M. McDonough					ST	ATE O	F CO	REV. 8	ICUT						3	
	ORING CREW LEAD	ÆK			DE	PART	MENT	OF T	RANSP	ORTAT	NOL			CATION We			
	M. Germano		_			В	JREAU ROR	JOF E	HIGHW	AYS Γ		01	¥ (GUILD DE	RILLIN	G CO.	, INC
· · · · · · · · · · · · · · · · · · ·	INSPECTOR		I	OWN	HART	FORI	EAS	THA	EPOR RIFO	RD C	T.		a diam		G CONT		ł ·
HALEY	& ALDRICH, I	NC.		ROJEC			CHA	RTER	OAK	BRID	GE		٠				
	SOILS ENGINEER		Р	ROJEC	T NO.		63-	384						DES	GN ENG	INEER	
CATION																-	
RFACE E	LEV.					AUC	SER	CAS	ING	SAMPL	ER.	CORE BAR	_	LE NO.		107	
TE FINIS	SHED		T	YPE		<u>L</u>							LIN	E & STATIC	N		
GROUN	D WATER OBSERVAT	IONS	SI	ZE I.D		<u> </u>							_	FSET			
•	FT. AFTER	HF	RS. H	AMMER	WT.			L				BIT	N. (COORDINAT	E		
,	FT. AFTER	HF	RS. H	AMMER	FALL								E. (COORDINAT	Έ		
		MPLE					BLOWS										
	DEPTH\$					PEF	R 6 INC	HES	STRA	\$							
CASING	IN FEET		PEN.	REC.			ON		CHA					DENTIFICA (INCL. CO			
BLOWS PER	FROM - TO	NO.	INCH	INCH	TYPE		AMPLE		DEP ELE					ER,SEAMS			
FOOT	FROM - 10					0-6	6-12	12-18									
							8										
	81'-83'	2	24	24	С		9				((Runs 2	_	3 - sai	me des	cript	ion
				<u>550</u>			8					as Run	1)				
	83'-86'	3	36	36			8										
5			(RQ	b=39	(6)		10		}								
							8			1							
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NOW GIRL	JUNU SURFACE 19 3	<i>)-</i> } }	CC 1 U	SED	чт I	HOR C	-Maille	THEN	ر	114	J.1 U.			70			
OUTAGE	IN EARTH 76		OOTA	SE IN C	SUCK		10			NO. OF	SAME	PLES	16		HOLE	10. T	3 107
1 VAC	THE POPULATION OF THE POPULATI		JUIN	- It I	,,,,,,						=ns		~~				
MPIFT	YPE CODING:	ı	D=DRI	VE	C	=cor	E	Δ:	= AUGE	R	UP=	=UNDISTUR	BFN	PISTON	V=VA	NE TEST	r.
	··· w www.	•			0		-	- 4			A		,				

E	R. Eastwood ORING CREW LEAD Henderson INSPECTOR & ALDRICH, IN	····	P	ROJEC	HART T NAM	ST. PARTI BU FORD	JREAU BOR EAS CHA	F COL OF T OF I ING R T HA RTER	NNECT RANSI HIGHV EPOR RTFO	ICUT PORTAT VAYS	 T.		SHEET 1 OF 3 LOCATION Pier No.1 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER
OCATION	SOILS ENGINEER	·	Р	ROJEC	T NO.	<u>-</u>	63-	384	·				DESIGN ENGINEER
JRFACE	ELEV. 20.4					AUC	GER	CAS		SAMPL S/S		NV II	HOLE NO. B 111 LINE & STATION RT15 544+52.8
ATE FIN	ISHED 12/1/8 ND WATER OBSERVATION			YPE ZE I.D		\vdash			-NW 3"	1-3/8		NA TT	OFFSET 26.9R
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ir	FT. AFTER	HF MPLE	RS. H	AMMER	FALL			-	111	301			E. COORDINATE 625031.26
E CASIN T BLOW PER H FOOT	DEPTHS G IN FEET S FROM - TO		i	REC.	TYPE	PEF S/	BLOWS R 6 INC ON AMPLE 6-12	HES R	STR. CHA DEP ELI	NGE		REMA WASH	D IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF WATER, SEAMS IN ROCK, ETC.)
	0'-2'	1	24	19	D	PU	HED		3	t	tra	ace of gr	, Brown medium to fine SAN ravel, silt, occasional etcFILL-
5	4*-6*	2	24	24	D	6	8	7				iff, Gree	en Brown SILT, some fine
10	9'-11'	24.	24	D	5	4.	4 5			Мес	· ·	ff, Green Brown SILT, sand	
15	14'-16' 4				D	1	1	part.				ry soft t ne sand	to soft, Brown SILT, some
20	19'-21'	5	24	20	D	1	1	1			i	ry soft t me fine s	to soft, Green Brown SILT, sand
25	24'-26'	6	24	18	D	Wt.	of	lam.		27'	Vei		Brown SILT, some fine sar
	29'-31'	7	24	16	5	5	6	7		- /	Med	lium dens	se, Gray medium to fine
30			2-1	10				10					e of coarse sand and ace of silt -ALLUVIUM-
35	341-361	8	24	12	D	6	10	12 10			SAN	D, littl	se, Gray fine to medium le coarse sand, trace of l, trace of silt -ALLUVIUM-
									The second second)'			ff, Red-Brown VARVED CLAY
EBON OF	39'-41'	9	24	24 SED	D	2 NCH C	3 ASING	3 THEN	2	IN		SILTY C	CLAY FEET
CRUM GH	OUND SURFACE TO	r	EET U	シ Eレ		HOH C	AJIITG.	, inch				FIGURE ON	
SAMPLE "	E IN EARTH TYPE CODING: TONS USED:	I	D=DRI	SE IN F VE 0% LI	С	= COR			= AUG = 20 -3		UP=		HOLE NO. B 111 BED, PISTON V=VANE TEST

		R. Eastwood						FORM	SM-1	REV. 8	/83			SHEET 2 OF 3
	ВС	RING CREW LEAD	ER	\dashv		D.F.	ST	ATE C	F CO	NNECT		TON!		LOCATION Pier No. 1
ľ	E.	. Henderson					В	UREAU	J OF	HIGHW	AYS	ION		GUILD DRILLING CO., INC.
1		INSPECTOR			TOWN	навт	FORT	BOR	APG.F	KTFO	ໂກີ ແ	r _		BORING CONTRACTOR
I	IALEY	& ALDRICH, IN	₹C.		ROJEC			CHA	RTER	OAK	BRID			STEINMAN
ı —		SOILS ENGINEER		-	ROJEC			63-	384					DESIGN ENGINEER
LOC	ATION													
UR	FACE E	LEV.					AU	GER	CAS	ING	SAMPL	ER	CORE BAR	HOLE NO. B 111
A1ر	TE FINIS	HED		T	YPE									LINE & STATION
	GROUN	WATER OBSERVAT	IONS	S	IZE I.D									OFFSET
I	f	T. AFTER	HI	RS. H	AMMER	WT.	<u> </u>						BIT	N. COORDINATE
<u> </u>	f	T. AFTER		RS. H	AMMER	FALL								E. COORDINATE
D			MPLE		·			BLOWS						
E	L	DEPTH\$	1	DEN	REC.		PE	R 6 INC	HES	STRA			EIEI	D IDENTIFICATION OF SOIL
٩	CASING BLOWS	IN FEET		1	1			ON	_	DEP				ARKS (INCL. COLOR, LOSS OF
H	PER	FROM - TO	NU.	INCH	INCH	I THE		AMPLE		i Ete				WATER, SEAMS IN ROCK, ETC.)
<u> </u>	FOOT		+	-	+		0-0	6-12	1Z-18	.				
The state of the s	 		+	+	+		-	 			1			
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1	-		+	+	1	-		 			- 1		•	
_		44 -46	10	24	24	D	1	1	1			Ve	ry soft.	Red-Brown VARVED CLAY
5			T	T	T				1				d SILTY	
1					L						ı			
	i			-							- 1		•	
1													-	- 4 0
50		49'-51'	11	24	24	D	Wt.	of R	ods				(sa	me as D10)
											1			
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			↓	ļ	ļ									*
•		54'-56'	12	- 07	07		TT.1-		Do Is				10	ame as D10)
5		34 -36	1 12	24	24	D	Wt.	OI	Rods				(5	ane as pro)
			+	-										
			 											
60		59'-61	13	24	24	D	Wt.	of F	ods				(s	ame as D10)
IOU														
			Τ											
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5		64 -66	14	24	24	D	Wt.	of I	ods				(s	ame as D10)
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١, ١		<u> </u>	-	 	 				-					
			+	-						69	9'			
امحا		69'-71'	15	24	1.7	D	8	12	16			Med	jium sti	ff, Red-Brown SILT, little
70			1			~			21					fine sand, trace of gravel,
												cla		
١, ١													st =	-111 - Warmer 1 D-1
'5		74'-76'	16	24	12*	D	30	43	59					obble, Very dense, Red
								ļ	70		•	. 1		ND, trace of gravel, silt
				<u> </u>	$\vdash \vdash \vdash$								-(GLACIAL TILL-
					 				-			Ήяγ	rd_ Rod-lb	Brown SILT, little coarse to
		79'-81'	177	24	13	D	43	66	94	122	-			trace of gravel
FR	OM GRO	UND SURFACE TO	<u></u>	EET U				ASING			INC		ASING FOR	FEET
	J GIVO	2:.0 00:11 706 10		0		<u>``</u>	· · · · · ·							
FO	OTAGE I	N EARTH	F	OOTA	GE IN F	ROCK				١	10. OF S	AMP	LE\$	HOLE NO. B 111
1		PE CODING:)=DRI			=COR			= AUGE				ED, PISTON V=VANE TEST
PRO	PORTIC	NS USED:	TRAC	CE=1-1	0% LI	TLE	= 10-2	0%	SOME:	= 20 -35	% Al	HD=	35-50%	·
													· · · · · · · · · · · · · · · · · · ·	

V Comment of the Comment		R. Eastwood DRING CREW LEAD	ER				ST	ATE C	F CO	REV. 8 NNECI	ICUT			SHEET 3	of 3 Pier No. 1
		. Henderson	-21				BI	IREAL	J OF	`RANSP HIGHW	/AYS			GUILD DE	RILLING CO., INC.
		INSPECTOR		τ	OWN	HART	FORT	-BOR	ING I	REPORT	RD.	CT		BORIN	IG CONTRACTOR
1		& ALDRICH, II	NC.	P	ROJEC	T NAM	AE	CHA	RTE	R OAK					STEINMAN GN ENGINEER
<u> </u>		SOILS ENGINEER		Р	ROJEC	T NO.		63-	-384					DES	ON ENGINEER
-	ATION	3 EV					AUC	FR	CAS	ing	SAMP	LFR	CORE BAR	HOLE NO.	В 111
	FACE E				YPE		1		T		OF ALLE		OUNE DAIN	LINE & STATIC	
-		WATER OBSERVAT	IONS		ZE I.D									OFFSET	
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T	F	FT. AFTER	HF	RS. H	AMMER	FALL								E. COORDINAT	E
DEP	CASING	DEPTHS	MPLE	PEN.	REC.		TE .	BLOWS 6 INC ON		STRA CHAI	NGE			D IDENTIFICA	
T	BLOWS PER	FROM - TO	NO.	INCH	INCH	TYPE		MPLE		DEP				ARKS (INCL. COI WATER, SEAMS I	
<u>H</u>	F00T	11000 10	 			<u> </u>	0-6	6-12	12-18						
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			+	-	 	-			 	ł		(No			rough to 85')
1	 		+		 	 	 		 			1	Decom	posed Bedr	cock
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55		85'-88.5'	1	42	17										ard, Red-Brown
i ,				(R	D=0%	4)						8			and interbedded
And the same of th			-			_							-		oints close, Rock
1		88.5'-93.5'	2	60	56	C									moderately fracture ard, Red Brown
190		00.5 -55.5	 		D=10										Joints very
				- (100	10 20	787									k slightly
												we	athered,	moderatel	y to slightly
1															.5', 91.5' to
€		93.51-951	3	18											4 extremely
ľ			 	(RC	D=07	D									me as Run 2)
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FF	OM GRO	UND SURFACE TO	39 F	EET U	ISED	4	NCH C	ASING	THEN	9	3 IN	ICH C	ASING FOR	81	FEET
FO	OTAGE	IN EARTH 81	F	OOTA	GE IN F	ROCK		10		1	NO. OF	SAMP	LES	17	HOLE NO. B 111
I SAI	MPLE TY	YPE CODING:		D=DRI	VE	C:	=core	E	Α	= AUGE	R	UP=	UNDISTURB	ED, PISTON	V=VANE TEST
		ONS USED:					= 10-2			= 20 -35			35-50%		

SHEET FORM SM-1 REV. 8/83 R. Eastwood STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS LOCATION Pier No. 2 BORING CREW LEADER GUILD DRILLING CO. INC. E. Henderson TOWN HARTFORD -EAST HARTFORD BORING CONTRACTOR INSPECTOR STEINMAN CHARTER OAK BRIDGE HALEY & ALDRICH, INC. PROJECT NAME DESIGN ENGINEER 63-384 SOILS ENGINEER PROJECT NO. Pier No. 16 OCATION SAMPLER CORE BAR HOLE NO. B 114 CASING AUGER RFACE ELEV. 18.3 LINE & STATION RT15 546+51.6 s/s NV II HW -NW 11/18/86 TYPE DATE FINISHED 32.2R OFFSET 411 311 1-3/8" SIZE I.D. **GROUND WATER OBSERVATIONS** 334240.60 N. COORDINATE 300# 140# BIT 20 Days HAMMER WT. 6.2 FT. **AFTER** 24" 625167.39 30" E. COORDINATE HRS. HAMMER FALL 0 8.5 FT. AFTER SAMPLE BLOWS **STRATA** DEPTHS PER 6 INCHES FIELD IDENTIFICATION OF SOIL. CHANGE REC. PEN. ON CASING REMARKS (INCL. COLOR, LOSS OF IN FEET DEPTH BLOWS PER INCH TYPE SAMPLER NO. INCH WASH WATER.SEAMS IN ROCK, ETC.) ELEV. FROM - TO 0-6 6-12 12-18 F00T Very loose, Brown fine SAND, little PUSTED * 0'-2' 24 24 D silt, trace organic material -TOPSOIL-(* Driller sampled ahead of casing) 3.5 Stiff, Green-Brown SILT, little fine 4 3 41-61 2 24 24 D 5 sand 5 Soft, Gray-Brown SILT, little fine 9'-11' 3 24 24 2 D 10 2 sand 2 14'-16' 24 19 (same as D3) D 5 -ALLUVIUM-19' Medium dense, Gray-Brown fine SAND. 19'-21' 24 16 ח 20 1.0 little silt, trace of medium sand Medium dense, Gray medium to fine SAND 24 - 26 6 24 15 ח 25 trace of coarse sand, fine gravel and 13 silt Medium dense, Gray medium to fine 12 29¹-31¹ 24 14 6 30 SAND, trace of coarse sand, silt 15 16 (same as D7) 10 34'-36' 24 14 lπ 35 -ALLUVIUM-37**¹** Very soft, Red-Brown VARVED CLAY and SILTY CLAY 24 24 39'-41' INCH CASING FOR FEET INCH CASING THEN **FEET USED** FROM GROUND SURFACE TO HOLE NO. B 114 NO. OF SAMPLES **FOOTAGE IN ROCK** FOOTAGE IN EARTH V=VANE TEST A=AUGER UP=UNDISTURBED, PISTON D=DRIVE C=CORE SAMPLE TYPE CODING: SOME = 20-35% AND = 35-50% TRACE=1-10% LITTLE=10-20% PROPORTIONS USED:

	_	R. Eastwood		_			F	ORM	SM-1	REV. 8 NNECT	3/83 TCUT			SHEET 2 OF 3
		RING CREW LEADS	:R			DEI	PARTN	MENT	OF T	RANSF	ORTA	TION		GUILD DRILLING CO., INC.
	1	INSPECTOR		<u> </u>	O11152		BU 	BOR	i of i	iighw EPOR RTFO	L L LA IS	T)		GUILD DRILLING CO., INC. BORING CONTRACTOR
	ATTME		a					EAS	PTER	OAK OAK	RD C BRID			STEINMAN
- !		& ALDRICH, IN SOILS ENGINEER	٠,		ROJEC	T NAM	<u> </u>	63-		Oziic	DICE	<u></u>		DESIGN ENGINEER
		THE PROPERTY		1, ,	.0,20									
	ATION FACE E	LEV.					AUG	ÉR	ÇAS	ING	SAMPL	ER	CORE BAR	HOLE NO. B 114
	E FINIS			TY	/PE									LINE & STATION
		WATER OBSERVATION	ONS	SIZ	ZE I.D.									OFFSET
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A	F	T. AFTER	HR	S. HA	MMER	FALL			<u> </u>					E. COORDINATE
D			APLE .					BLOWS		STR	ATA:			
		DEPTHS		DEN	REC.		PER	6 INC	HES	CHA			FIEL	D IDENTIFICATION OF SOIL.
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Н	BLOWS PER FOOT	FROM - TO	NO.	ноп	INCII			6-12		ELE	EV.		WASH	WATER, SEAMS IN ROCK, ETC.)
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60									2			SI	LTY CLAY	
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STATE OF THE PERSON		64'-66'	1/.	27.	16	20	29	50	86	64	!	Ho.	rd Doder	Brown SILT, some coarse to
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7 0		69'-70.5'	15	18	13	D	84	132		,			(:	same as D14)
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	-								$\vdash \vdash$		1	\vdash	Deco	omposed Bedrock
_		74'-79'	1	60	60	C					-	Мо		hard, Red-Brown fine sandy
5			-)=20°						!	SI	LTSTONE.	Joints very close to close
												sh	allow dip	oping, occasional steeply
}														edding very thin, Weathering
	ļ	701 0/1		60	60							s1:	ight	Journa markamina sile ssen
		79'-84'	4			<u> </u>	MON O	ACINIO	THEFT				.9'-75' E	Severe weathering silt seam FEET
-1	COM GRC	OUND SURFACE TO	- F	EET L	シモリ	l	NCH C	MSING	INEN		- 11	TOIT I	NOT DECOM	2 to the 4
-0	OTAGE	IN EARTH	F	OOTA	GE IN	ROCK					NO. OF	SAM	IPLES	HOLE NO. B 114
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A	MPLE T	YPE CODING:	· . E)=DRI	VE	C	= COR	E	A	= AUG				BED, PISTON V=VANE TEST
R	OPORTI	ONS USED:	TRAC	CE=1-1	0% L	ITTLE	= 10-2	20%	SOME	=20-	35%	AND	=35-50%	
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1		R. Eastwood		T			F	ORM :	SM-1 1	REV. 8	/83			SHEET 3	
-	ВО	RING CREW LEAD	ER	7		DEI	STA	TE O	F CON	NECT	ICU I ORTAT	ION		LOCATION	Pier No. 2
I		E. Henderson					RI!	REAL	OF F	IIGHW	'AYS			GUILD DE	RILLING CO., INC.
	-	INSPECTOR		710	OWN	HART	FORD	-PAR	NG R T HA	EPOR RTF0	RD. C	T			IG CONTRACTOR
	HALEY	& ALDRICH, I	NC.			T NAM		СНА	RTER	OAK	BRID	GE			STEINMAN
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	FACE E	LEV.		Т			AUG	ER	CAS	NG	SAMPL	.ER	CORE BAR		В 114
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			AMPLE				E	LOWS							
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F	OOTAGE	IN EARTH 74	F	OOTA	GE IN	ROCK		10	0		NO. OF	SAM	PLES	1.5	HOLE NO. B 114
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S	AMPLE T	YPE CODING:	D	=DRI	VE	C	= COR	E	A	=AUG	ER	UP	=UNDISTU	RBED, PISTON	V=VANE TEST
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		K. Allen								REV. 8				SHEET 1 OF 3	
		RING CREW LEAD	ER			DE	PART	MENT	OF T		ORTAT	NOF		LOCATION Pier No. 3	
	E	. Henderson					BL	REAU	OF I	HIGHW	/AYS			GUILD DRILLING CO., INC.	
	-	INSPECTOR	_	I	OWN	HART	FORD	<u>-EXS</u>	T HA	RTTO	n C	Τ		BORING CONTRACTOR STEINMAN	
H	ALEY	& ALDRICH, IN	C.		ROJEC			CHA	RTER	OAK	BŘID	GE		<u> </u>	
[;]		SOILS ENGINEER		Р	ROJEC	T NO.		63-	384					DESIGN ENGINEER	
OC	ATION														
	FACE E	LEV. 30.4					AUG	ER	CAS	ING			CORE BAR	HOLE NO. B 117A	
IDAT	E FINIS	HED 11/18/86		T,	YPE					-NW	S/S		NV II	LINE & STATION RT15 548+61_2	
	GROUNE	WATER OBSERVATI	ONS	SI	ZE I.D				<u> </u>	311	1-3,			OFFSET 13.9R	
T		T. AFTER	HR	is. H	AMMER	WT.			300		14(BIT	N. COORDINATE 334400.45	
T		T. AFTER	HF	s. H	AMMER	FALL			24	4 ri	3()"		E. COORDINATE 625302.05	
		SAI	MPLE					BLOWS							
D		DEPTHS					PER	6 INC	HES	STR/				- 155171510 171011 05 1011	
	CASING	IN FEET		1	REC.			ON		CHAI DEP				D IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF	
	BLOWS	FROM - TO	NO.	INCH	INCH	TYPE		MPLE		ELF				WATER, SEAMS IN ROCK, ETC.)	
Н	FOOT							6-12							
	P	0'-1.5'	1	18	12	D	2	1	3					n SILT, trace of coarse to	
	U				ļ	igspace		<u> </u>						Gravel, some organic	
	S		<u> </u>						L			ma	terial -	TOPSOIL and FILL-	
************	H						<u> </u>								
. 5	E	4'-5.5'	2	18	12	D	7	12	1					se, Brown SILT, trace of	
	D		 		1		<u> </u>	<u> </u>						fine sand, little gravel,	
1	L		<u> </u>	<u> </u>	ļ			ļ	<u> </u>			gı	ass chip	s, organic material	
	<u></u>		1	1	—			<u> </u>						:	
1	9'-10.5' 3 18 12 D 10 4 1 Loose, Brown coarse to fine SAND,														
10 9'-10.5' 3 18 12 D 10 4 1 Loose, Brown coarse to 11 ttle gravel, trace															
			 		 			 			·				
1	16		-	 		\vdash		—		1.	31	βŢ	ass, org	anic material -FILL-	
	17		+		-		<u> </u>		-	┝━┷	J			_	
-		7/1 15 51	1.	10	15	<u></u>	15	12	Ω			MΛ	dium dos	se Brown-Cray fine SAND	
15	30														
	35 14'-15.5' 4 18 15 D 15 13 8 Medium dense, Brown-Gray fine SAND and SILT, trace of fine gravel														
	P		+					L						·	
	Ü		+-					-							
	S	191-20 51	5	12	18	D	2	1	1			VΑ	rv soft	Gray-Green SILT, little	
20		19'-20.5'	╁	10	1 10	ע							ne sand	carry carries carries assessed	
	E		+		\vdash	H						^ -	THE DATE	A T T TYPETTO	
	D		 	-	 									_ALLUVIUM-	
١, .	 		 	1								So	ft to me	dium stiff, Gray-Green SILT,	
05	 	24'-25.5'	6	18	12	ח	5	2	2	2	51		ttle fin		
25 L			1	1		-								, Green-Brown fine SAND,	
													ttle sil		
	l														
30		29'-30.5'	7	18	18	D	3	1	2				(s	ame as D6)	
1													_	ALLUVIUM-	
													_,		
ľ														•	
1,	40				<u></u>				ļ			םת	nee Cma	y fine SAND, little silt,	
35	42	34'-35.5'	8	18	14	D	9	14	20					edium sand	
ľ	38				<u> </u>						_,	السا	OT H	enterm parit	
١, ١	33		1	<u> </u>	—	ļ			_	3	7'	١,, ٠		No 12 was 62 mg GANT	
1	28		+	—			<u> </u>	<u> </u>	 					se, Medium to fine SAND,	
1	38	39'-40.5'	10	10	10	- P	9	9	7			l cr	ace of C	oarse sand, silt	
-	41		19	18	-					<u> </u>	18	ICH (CASING FOR	-ALLUVIOM-	
F	COM GRO	OUND SURFACE TO	<u> </u>	EET t	いいとり	-	MUH L	ASING	וחבת		15	TOIT (JAJING FUR	1 55.	
	OTAGE	IM CADTU		COTA	CE IN	אטטס					NO. OF	SAM	PLES	HOLE NO. B 117A	
1	UTAGE	IN EARTH	}	OOTA	GE IN	NUUN		<u>:-</u>			110. 01	V/WII			
E CA	MPIFT	YPE CODING:	1	D=DRI	VE	r	= cor	E		\= AUG	ER	UP	=UNDISTUR	BED, PISTON V=VANE TEST	
}		ONS USED:		CE=1-1						= 20 -3			=35-50%	,	
I'rK	OF OR II	ONS USED:	IKA	ĆE:−1-I	U70 -		. — , , , , ,		JOHL	4v-0				· ·	

	BO E ALEY	K. Allen RING CREW LEADE Henderson INSPECTOR & ALDRICH, INC SOILS ENGINEER		P	OWN] ROJEC ROJEC	HART T NAM	STA PARTI BU FORD IE	ATE O MENT JREAU BOR -FAS	F COM OF THE OF HANG R THAN RTER	HIGHW EPOR RTFO	ICUT PORTAT VAYS	т.		SHEET 2 OF 3 LOCATION Pier No. 3 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER
量 海	ATION FACE E	LFV.		\top			AUG	ER	CAS	ING	SAMPL	LER CO	ORE BAR	HOLE NO. B 117A
	E FINIS			T'	YPE									LINE & STATION
	GROUNE	WATER OBSERVATION	ON\$		ZE I.D		ļ	-						OFFSET N. COORDINATE
1 -		T. AFTER	·		AMMER AMMER		<u> </u>	·····						E. COORDINATE
A. J	, , , , , , , , , , , , , , , , , , ,	FT. AFTER SAM	APLE	3. jii/	MANLIN	IACE	,	BLOWS						
D T H	CASING BLOWS PER FOOT	DEPTHS IN FEET FROM - TO	NO.	ŀ	REC.	1 1	PER SA	6 INC ON MPLE 6-12	HES R	STR/ CHAI DEP ELI	NGE TH		REMA	D IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF WATER, SEAMS IN ROCK, ETC.)
ž.								-					:_ •	- Decora Caraca modificant to
ر یا		44'-45.5'	10	18	12	D	7	9	11			fine	um dens SAND, silt	se, Brown-Gray medium to trace of gravel, coarse
•-					ļ							l	•	-ALLUVIUM-
										/ 0	-1	trac	e of gr	wn-Gray medium to fine SAND, ravel, coarse sand, silt,
50		49'-49.5'	11A		6	D	8			49.	.5'	1		o silty clay ff, Red-Brown VARVED CLAY
		49.5'-50.5'	11B	12	8	D		5	4				SILTY O	
: }														
		55'-56.5'	12	18	12	D	2	3	2				(same	e as D11B)
60		59'-60.5'	13	18	18	D	Wt.	of	Rods			Very SILT	soft,	Red-Brown VARVED CLAY and
i														
,		64'-65.5'	14	18	18	D ·	Wt.	of	Rods				(sar	me as D13)
,														-
		69'-70.5'	15	18	18	D	Wt.	of	Rods		:		(sai	me as p13)
70		09 -70.5	1.7	10	10	ע	71	UL					•	
										. 7	3†			
i i												Hard	, Red-	Brown SILT, some coarse to
. 5		74'-75.5'	16	18	14	D	17	32	25			fine	sand,	little coarse to fine ace of clay
. 3					-							_	-	-GLACIAL TILL-
												Hard	l, Red-	Brown SILT, some coarse to trace of gravel, weathered
		79'-80'	17	12	10	<u>~</u>	ΔÑ	105/	311 6	0/3"			e sand, cock	rrace or graver, wearnered
TE	OM GRO	OUND SURFACE TO		EET L					THEN				SING FOR	FEET
											NO 07		E¢	HOLE NO. B 117A
FO	OTAGE	IN EARTH	F	OOTA	GE IN	ROCK					NO. OF	SAMPL	22	NOLE NO. B 11/A
1 1		YPE CODING: ONS USED:		D=DRI CE=1-1	VE 0% L		= COR = 10-2			= AUG = 20-3		UP=L		BED, PISTON V=VANE TEST

ì

SAMPLE T	YPE CODING:		=DRI		С	=cor			= AUG		UP		EED, PISTON	HOLE NO. B 117A
FROM GRO	OUND SURFACE TO		EET U	JSED	4	NCH C		THEN						
.15	DUND SURFACE TO	50 FE	ET U	USED	4	NCH C	ASING	THEN		3 in	ен с	CASING FOR	80	FEET
05											-			
00														
95														
90							7						to fi	
85	85'-90'			58 =0%)	С		9 9 7 7			:	8 8	30.2 ¹ -80. 32.0 ¹ -82.	2' weath 7' extre	d. mely fractured ering pits mely fractured es sandier (medium
H FOOT	80 ¹ -85 ¹	1		58 =0%	c)	0-6	6-12 9 9	12-18	Dri1	1 Rat n/Ft	е	Moderate sandy SI to close	ly hard, LTSTONE.	Red-Brown fine Joints very close very thin, rock
D E CASING	T. AFTER SA DEPTHS	HRS MPLE NO.	PEN.	REC.		PER SA	BLOWS 6 INC ON	HES	STRA CHA DEP ELI	NGE TH		REMA	ARKS (INCL. CO	TE ATION OF SOIL DLOR, LOSS OF IN ROCK,ETC.)
	HED) WATER OBSERVAT T. AFTER	IONS HRS	SI	YPE ZE I.D. AMMER		·						BIT	LINE & STATI OFFSET N. COORDINA	
OCATION URFACE E						AUG		CAS	ING	SAMPL	ER	CORE BAR	HOLE NO.	в 117А
	inspector & ALDRICH, I SOILS ENGINEER	NC.	P	OWN ROJEC ROJEC	T NAM	E	CHA	т на rter 384	RTFO OAK	RD. (T. XGE			STEINMAN IGN ENGINEER
	K. Allen RING CREW LEAD . Henderson	DER				ST/ PARTI RI	ATE O MENT IREAU	F COM OF T	HIGHY	ICUT PORTAT AYS				

APPENDIX C
RESULTS OF LABORATORY TESTING





Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: md
Sample ID: --- Test Date: 06/24/16 Checked By: emm

Depth: --- Test Id: 382021

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
RW-5	UP- 3 - Top	45-47	Moist, reddish brown clay	55.2
RW-5	UP- 3 - Top middle	45-47	Moist, reddish brown clay	40.9
RW-5	UP- 3 - Bottom middle	45-47	Moist, reddish brown silt	36.1
RW-5	UP- 3 - Bottom	45-47	Wet, reddish brown silt	40.4
S2-1	Tube 1 - Top	52-54	Moist, dark reddish gray clay	44.4
S2-1	Tube 1 - Top middle	52-54	Moist, dark reddish gray clay	52.7
S2-1	Tube 1 - Bottom middle	52-54	Moist, dark reddish brown clay	39.2
S2-1	Tube 1 - Bottom	52-54	Moist, dark reddish brown clay	38.8

Notes: Temperature of Drying: 110° Celsius



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: --- Sample Type: --- Tested By: md
Sample ID: --- Test Date: 06/24/16 Checked By: emm

GTX-304831

Depth: --- Test Id: 382023

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
S2-1	Tube 2 - Top	62-64	Moist, dark reddish brown clay	43.8
S2-1	Tube 2 - Top middle	62-64	Moist, dark reddish brown clay	51.0
S2-1	Tube 2 - Bottom middle	62-64	Moist, dark reddish brown clay	44.0
S2-1	Tube 2 - Bottom	62-64	Moist, dark reddish brown clay	41.9
S2-1	Tube 3 - Top	72-74	Moist, dark reddish brown clay	38.5
S2-1	Tube 3 - Top middle	72-74	Moist, dark reddish brown clay	47.4
S2-1	Tube 3 - Bottom middle	72-74	Moist, reddish brown clay	39.4
S2-1	Tube 3 - Bottom	72-74	Moist, reddish brown clay	45.3

Notes: Temperature of Drying: 110° Celsius



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: jbr Sample ID: --- Test Date: 07/26/16 Checked By: emm

Depth: --- Test Id: 384878

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
S1-2	S-2	4-6 ft	Moist, red sand with gravel	7.1	6.5
S1-5	S-3	10-12 ft	Moist, reddish brown silt with gravel	7.4	6.2
S1-S12	S-2	5-7 ft	Moist, reddish brown silt with gravel	8.1	7.2
S2-1	S-4	15-17 ft	Moist, reddish brown silt with gravel	6.8	6.6
S2-3	S-2	5-7 ft	Moist, reddish brown clay	7.5	7.3
S-0480-1	S-5	14-16 ft	Moist, olive brown silt	4.5	4.3
S-0480-2	S-3	9-11 ft	Moist, olive brown silt	6.3	6.0
S-06043-1	S-2	5-7 ft	Moist, brown sand	7.5	6.8

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

GTX#: 304831

Test Date: 07/26/16

Tested By: jbr Checked By: emm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹	
S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04	
S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04	
S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04	
S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04	
S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03	
S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04	
S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04	
S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05	

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box

Water added to sample to create a thick slurry prior to testing (saturated condition). Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)

Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.



6100 HILLCROFT PHONE (713) 369-5400

REPORTED TO:

HOUSTON, TEXAS 77081 FAX (713) 369-5518

RESULTS OF TESTS

RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE PROJECT:

REPORT DATE:

08-01-16

(GTX 304831)

CLIENT NUMBER: JOB NUMBER:

04.1115-0003

FOR: **GEOTESTING EXPRESS, INC.**

ETHAN MARRO

REPORT NUMBER:

125 NAGOG PARK ACTION, MA 01720

DATE SAMPLED: TIME SAMPLED:

SAMPLED BY:

DATE RECEIVED:

CLIENT

TIME RECEIVED: **RECEIVED BY:**

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
S1-S, S-2, 4 – 6'	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12'	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7'	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17'	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7'	297 *	mg/kg	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16°	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11'	355 *	mg/kg	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7'	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio Chemist

SD

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE. THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

^{**} WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S2-1 Sample Type: jar Tested By: GA Test Date: 08/02/16 Sample ID: S-3 Checked By: emm

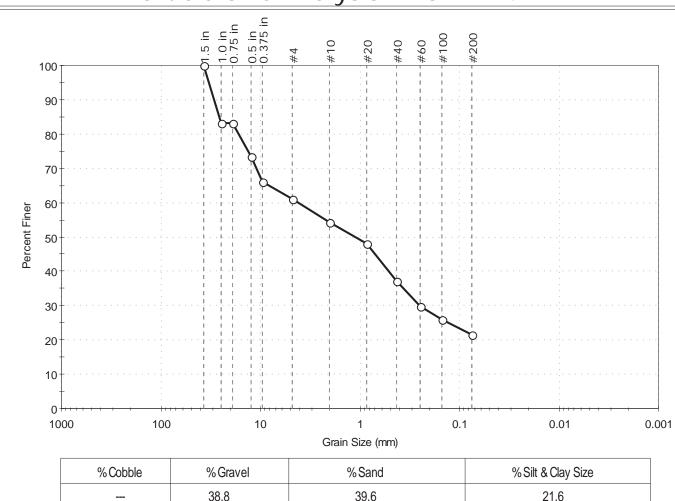
384940 10-12 ft Test Id: Depth:

Test Comment:

Moist, dark reddish brown clayey sand with gravel Visual Description:

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
	38.8	39.6	21.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1.0 in	25.00	83		
0.75 in	19.00	83		
0.5 in	12.50	73		
0.375 in	9.50	66		
#4	4.75	61		
#10	2.00	54		
#20	0.85	48		
#40	0.42	37		
#60	0.25	30		
#100	0.15	26		
#200	0.075	22		

<u>Coefficients</u>				
$D_{85} = 26.1716 \text{ mm}$	$D_{30} = 0.2527 \text{ mm}$			
$D_{60} = 4.1015 \text{ mm}$	$D_{15} = N/A$			
$D_{50} = 1.0976 \text{ mm}$	$D_{10} = N/A$			
$C_u = N/A$	$C_c = N/A$			

GTX-304831

<u>ASTM</u>	Classification N/A
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR Sand/Gravel Hardness: HARD



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S2-3 Sample Type: jar Tested By: GA Test Date: 08/02/16 Checked By: Sample ID: S-4 emm

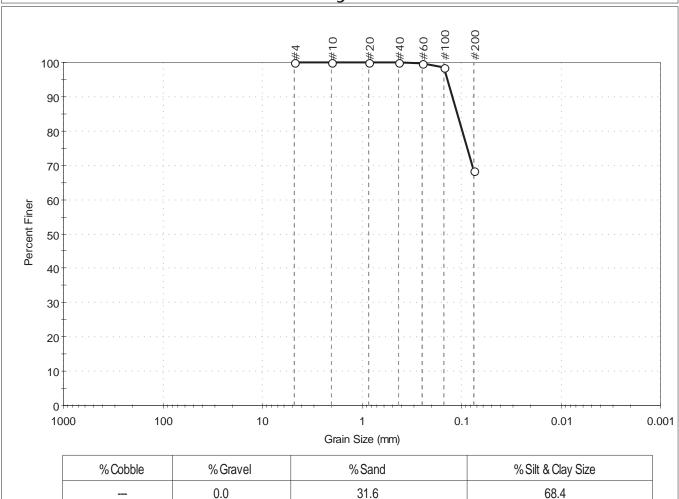
384952 15-17 ft Test Id: Depth:

Test Comment:

Visual Description: Moist, olive gray sandy silt

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	%Silt &Clay Size	
	0.0	31.6	68.4	

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	98		
#200	0.075	68		

	Coefficients	
D ₈₅ = 0.1101 mm	$D_{30} = N/A$	
$D_{60} = N/A$	$D_{15} = N/A$	
$D_{50} = N/A$	$D_{10} = N/A$	
$C_u = N/A$	$C_c = N/A$	

Project No:

GTX-304831

Classification N/A <u>ASTM</u> AASHTO Silty Soils (A-4 (0))

<u>Sample/Test Description</u> Sand/Gravel Particle Shape : ---Sand/Gravel Hardness: ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S2-3 Sample Type: jar Tested By: GA Test Date: 08/02/16 Checked By: Sample ID: S-7 emm

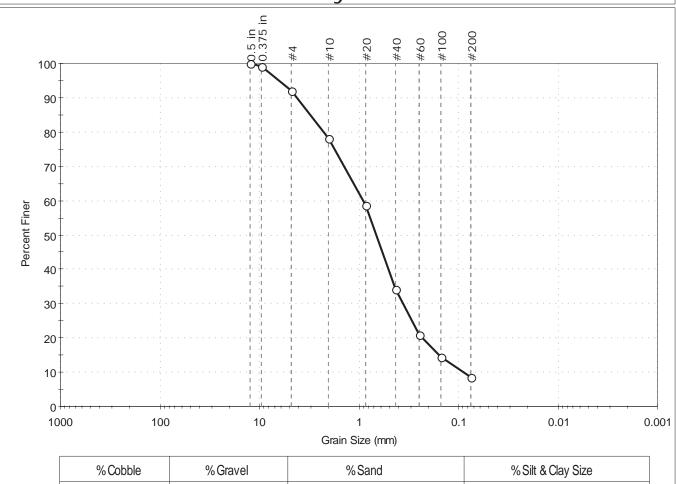
30-32 ft Test Id: Depth: 384953

Test Comment:

Visual Description: Moist, dark gray sand with silt

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble		% Gravel	% Sand	% Silt & Clay Size
		8.0	83.5	8.5

Sieve Name Sieve Size, mm I		Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	92		
#10	2.00	78		
#20	0.85	59		
#40	0.42	34		
#60	0.25	21		
#100	0.15	14		
#200	0.075	8.5		

<u>Coefficients</u>							
$D_{85} = 3.0762 \text{ mm}$	$D_{30} = 0.3585 \text{ mm}$						
D ₆₀ = 0.8990 mm	$D_{15} = 0.1567 \text{ mm}$						
D ₅₀ = 0.6639 mm	$D_{10} = 0.0895 \text{ mm}$						
$C_u = 10.045$	$C_c = 1.597$						

GTX-304831

Classification N/A <u>ASTM</u> <u>AASHTO</u> Stone Fragments, Gravel and Sand (A-1-b(1))

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR

Sand/Gravel Hardness: HARD



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S2-4 Sample Type: jar Tested By: GA
Sample ID: S-7 Test Date: 08/03/16 Checked By: emm

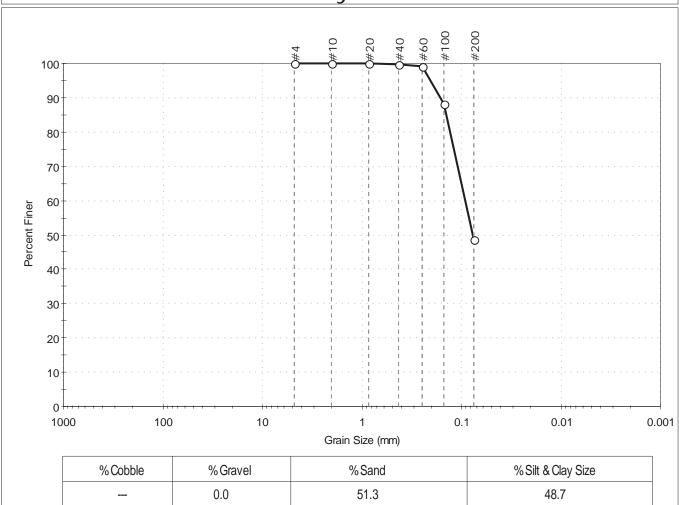
Depth: 24-26 ft Test Id: 384954

Test Comment: ---

Visual Description: Moist, olive brown silty sand

Sample Comment: ---

Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	88		
#200	0.075	49		

<u>Coefficients</u>							
D ₈₅ = 0.1420 mm	$D_{30} = N/A$						
D ₆₀ = 0.0915 mm	$D_{15} = N/A$						
D ₅₀ = 0.0767 mm	$D_{10} = N/A$						
$C_u = N/A$	$C_C = N/A$						

Project No:

GTX-304831

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description
Sand/Gravel Particle Shape : --Sand/Gravel Hardness : ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: S2-4 Sample Type: jar Tested By: GA Sample ID: S-9 Test Date: Checked By: 08/03/16 emm

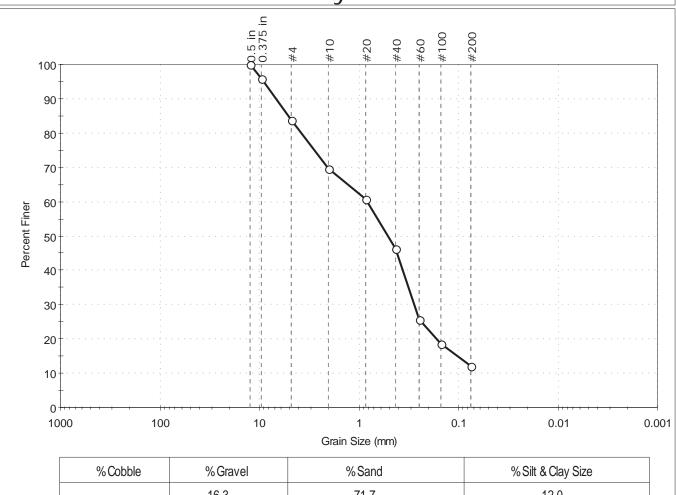
Depth: 34-36 ft Test Id: 384955

Test Comment:

Visual Description: Moist, dark gray sand with silt and gravel

Sample Comment:

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
	16.3	71.7	12.0

Sieve Name Sieve Size, mm P		Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	96		
#4	4.75	84		
#10	2.00	70		
#20	0.85	61		
#40	0.42	46		
#60	0.25	26		
#100	0.15	19		
#200	0.075	12		

<u>Coefficients</u>							
$D_{85} = 5.1349 \text{ mm}$	$D_{30} = 0.2802 \text{ mm}$						
$D_{60} = 0.8209 \text{ mm}$	$D_{15} = 0.1028 \text{ mm}$						
$D_{50} = 0.5069 \text{ mm}$	$D_{10} = N/A$						
$C_u = N/A$	$C_c = N/A$						

Project No:

GTX-304831

<u>ASTM</u>	Classification N/A
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description
Sand/Gravel Particle Shape: ANGULAR Sand/Gravel Hardness: HARD

printed 8/3/2016 3:52:38 PM



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: S2-1 Sample Type: tube Tested By: cam
Sample ID: Tube 1 - Top middle Test Date: 06/28/16 Checked By: emm

382075

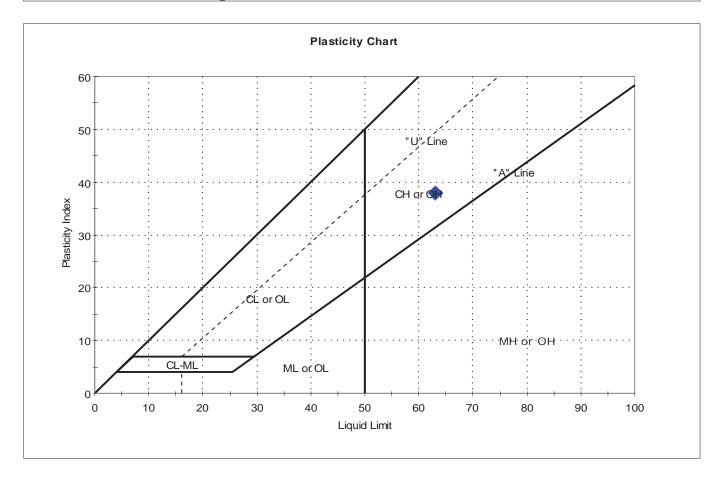
Depth: 52-54 Test Id:

Visual Description: Moist, dark reddish gray clay

Sample Comment: ---

Test Comment:

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	Tube 1 - Top middle	S2-1	52-54	53	63	25	38	0.7	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW Toughness: LOW



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Porting ID: S2.1

Sample Type: tube Tested By:

Boring ID: S2-1 Sample Type: tube Tested By: cam
Sample ID: Tube 1 - Bottom Test Date: 06/29/16 Checked By: emm

GTX-304831

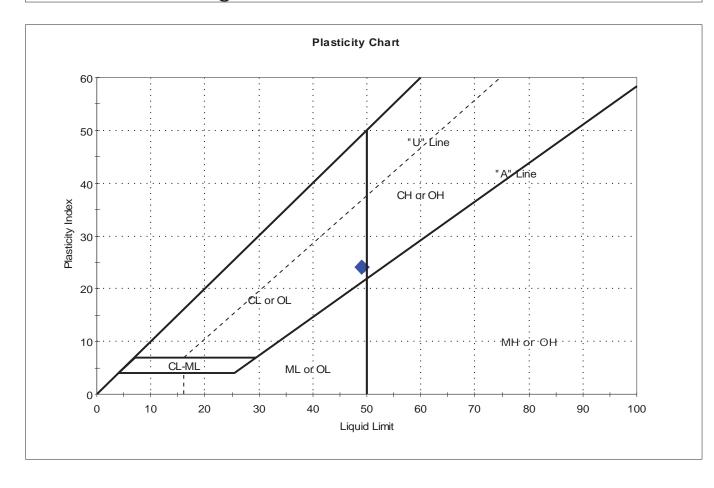
Depth: 52-54 Test Id: 382001

Test Comment: ---

Visual Description: Moist, dark reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	Tube 1 - Bottom	S2-1	52-54	39	49	25	24	0.6	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW Toughness: LOW



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S2-1 Sample Type: tube Tested By: cam Sample ID: Tube 2 - Top middle Test Date: 06/28/16 Checked By: emm

GTX-304831

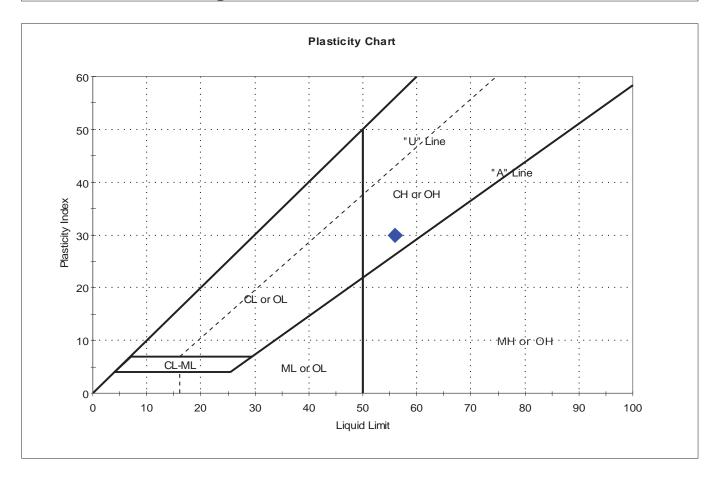
Depth: 62-64 Test Id: 382076

Test Comment: ---

Visual Description: Moist, dark reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	Tube 2 - Top middle	S2-1	62-64	51	56	26	30	0.8	

Sample Prepared using the WET method

Dry Strength: VERY HIGH



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S2-1 Sample Type: tube Tested By: cam
Sample ID: Tube 2 - Bottom Test Date: 06/28/16 Checked By: emm

GTX-304831

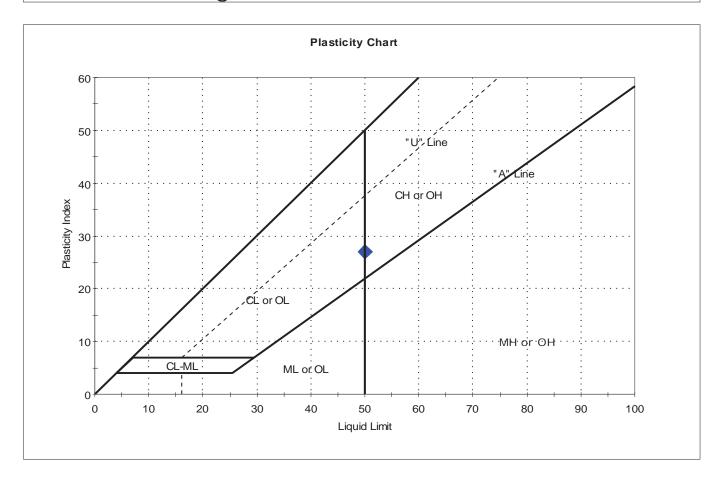
Depth: 62-64 Test Id: 382002

Test Comment: ---

Visual Description: Moist, dark reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



5	Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
	•	Tube 2 - Bottom	S2-1	62-64	42	50	23	27	0.7	

Sample Prepared using the WET method

Dry Strength: VERY HIGH



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

382080

Boring ID: S2-1 Sample Type: tube Tested By: cam Sample ID: Tube 3 - Top middle Test Date: 06/28/16 Checked By: emm Test Id:

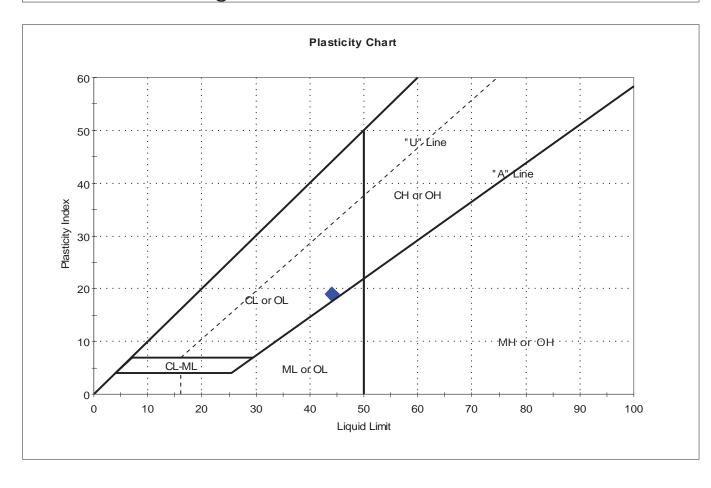
Depth: 72-74

Visual Description: Moist, dark reddish brown clay

Sample Comment:

Test Comment:

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	Tube 3 - Top middle	S2-1	72-74	47	44	25	19	1.2	

Sample Prepared using the WET method

Dry Strength: VERY HIGH



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: S2-1 Sample Type: tube Tested By: cam
Sample ID: Tube 3 - Bottom Test Date: 06/28/16 Checked By: emm

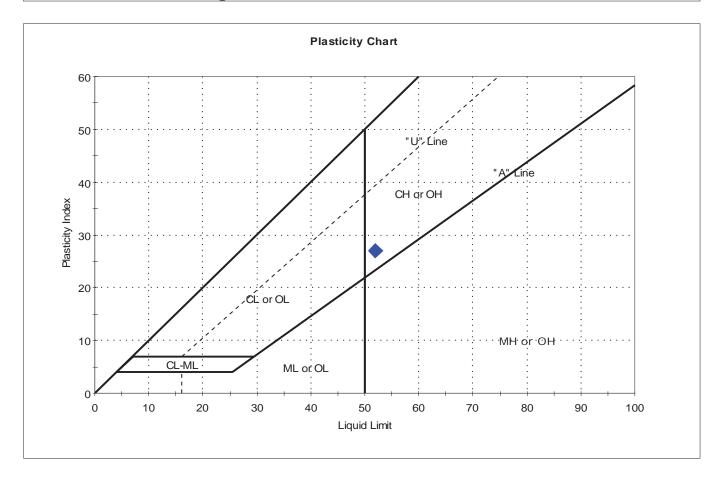
Depth: 72-74 Test Id: 382003

Test Comment: ---

Visual Description: Moist, reddish brown clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	Tube 3 - Bottom	S2-1	72-74	45	52	25	27	0.8	

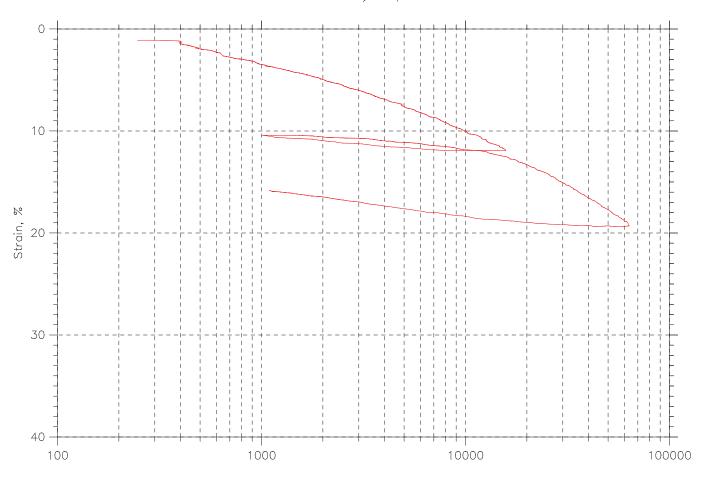
Sample Prepared using the WET method

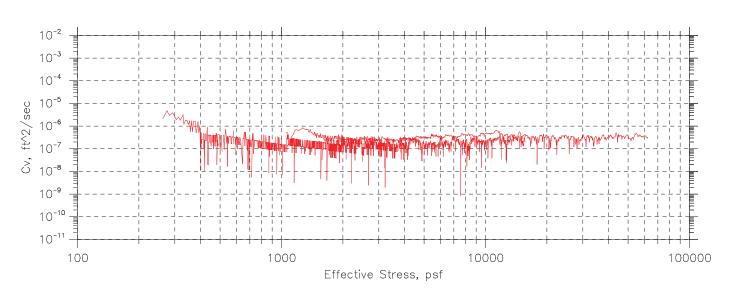
Dry Strength: VERY HIGH



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report





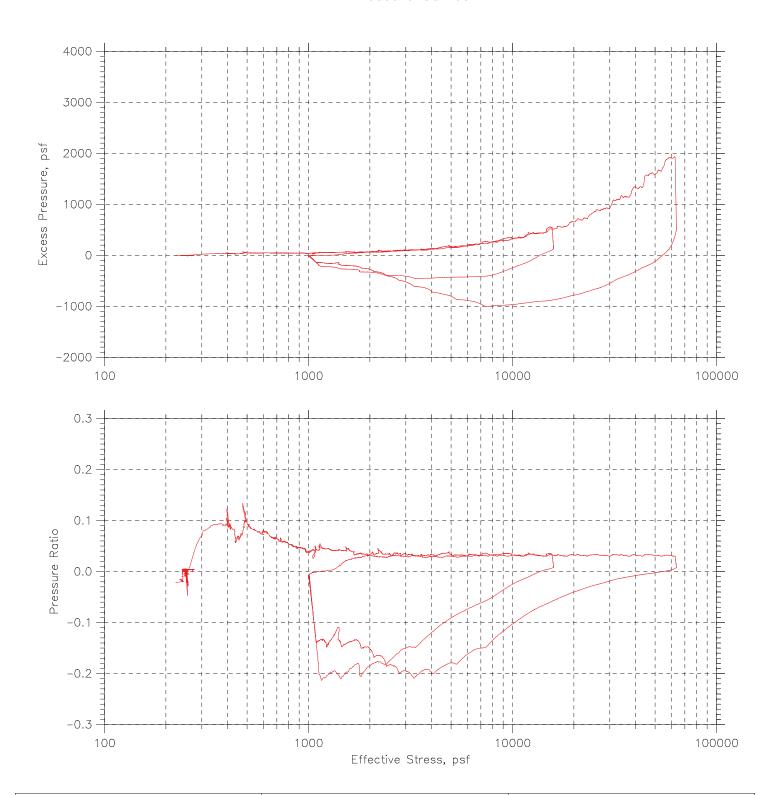
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831				
Boring No.: S2-1	Tested By: md	Checked By: njh				
Sample No.: Tube-1 Bott	Test Date: 06/27/16	Depth: 52-54 ft				
Test No.: CRC-14	Sample Type: intact	Elevation:				
Description: Moist, dark reddish brown clay						
Remarks: System Y						

Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-1 Bott	Test Date: 06/27/16	Depth: 52-54 ft
Test No.: CRC-14	Sample Type: intact	Elevation:
Description: Moist, dark reddish bro	own clay	
Remarks: System Y		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S2-1 Sample No.: Tube-1 Bott Test No.: CRC-14

Location: Hartford, CT Tested By: md
Test Date: 06/27/16
Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 52-54 ft Elevation: ---

Soil Description: Moist, dark reddish brown clay

Remarks: System Y

Estimated Specific Gravity: 2.83 Liquid Limit: 49
Initial Void Ratio: 1.12 Plastic Limit: 25
Final Void Ratio: 0.927 Plasticity Index: 24

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.91 in

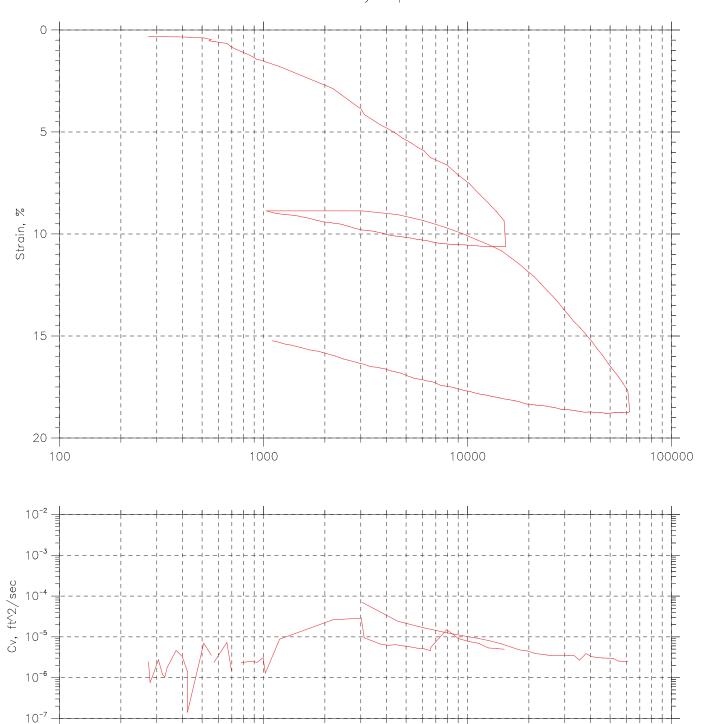
	Before Consolidation		After Consol	idation
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	16961	RING		c1561
Wt. Container + Wet Soil, gm	117.49	259.01	252.04	149.79
Wt. Container + Dry Soil, gm	86.960	216.82	216.82	114.93
Wt. Container, gm	8.3300	109.18	109.18	8.3800
Wt. Dry Soil, gm	78.630	107.64	107.64	106.55
Water Content, %	38.83	39.19	32.72	32.72
Void Ratio		1.12	0.927	
Degree of Saturation, %		99.37	100.00	
Dry Unit Weight, pcf		83.540	91.802	

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-2 Bott	Test Date: 06/27/16	Depth: 62-64 ft
Test No.: CRC-16	Sample Type: intact	Elevation:
Description: Moist, dark reddish bro	wn clay	
Remarks: System 0		
		Page 1 of 3

Effective Stress, psf

10000

100000

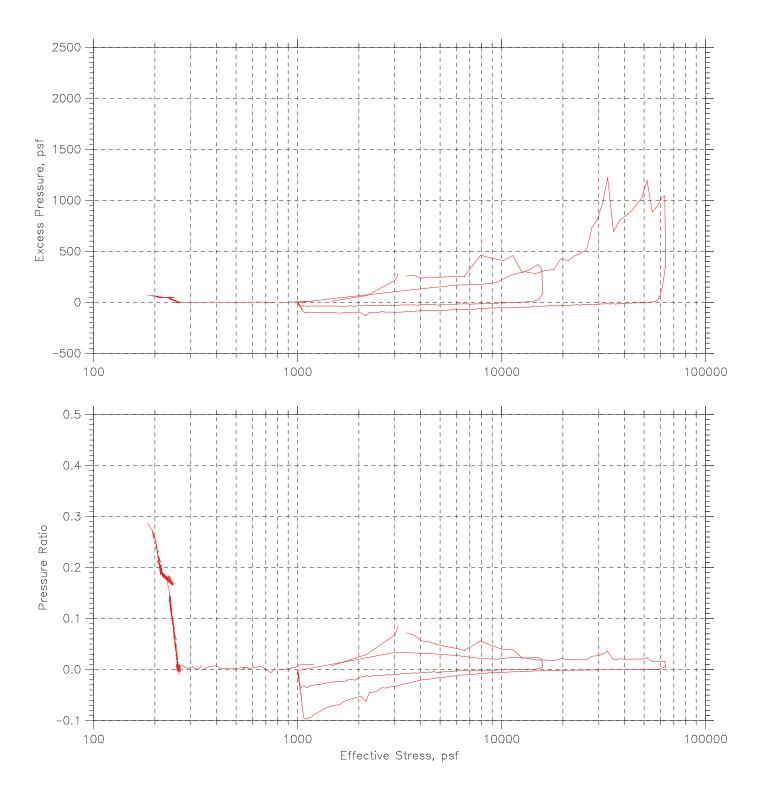
1000

100



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-2 Bott	Test Date: 06/27/16	Depth: 62-64 ft
Test No.: CRC-16	Sample Type: intact	Elevation:
Description: Moist, dark reddish bro	wn clay	
Remarks: System 0		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S2-1 Sample No.: Tube-2 Bott Test No.: CRC-16

Location: Hartford, CT Tested By: md
Test Date: 06/27/16
Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 62-64 ft Elevation: ---

Soil Description: Moist, dark reddish brown clay

Remarks: System 0

Estimated Specific Gravity: 2.85 Liquid Limit: 50
Initial Void Ratio: 1.18 Plastic Limit: 23
Final Void Ratio: 0.859 Plasticity Index: 27

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.85 in

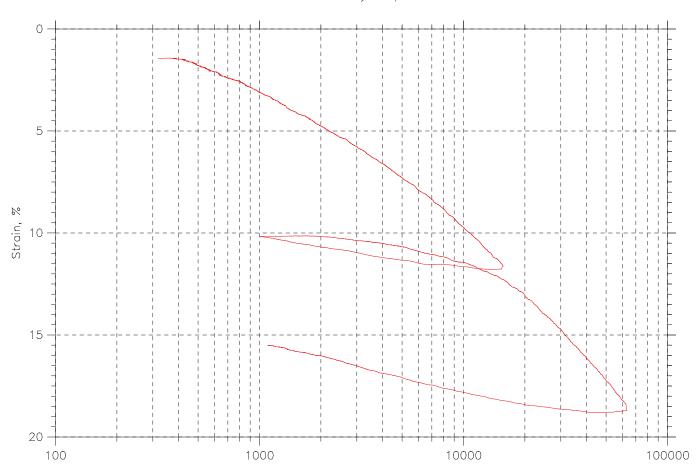
	Before Consolidation		After Consolidation		
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings	
Container ID	A-828	RING		b505	
Wt. Container + Wet Soil, gm	130.43	257.90	246.74	145.38	
Wt. Container + Dry Soil, gm	94.470	215.01	215.01	113.52	
Wt. Container, gm	8.5800	109.85	109.85	7.9300	
Wt. Dry Soil, gm	85.890	105.16	105.16	105.59	
Water Content, %	41.87	40.79	30.17	30.17	
Void Ratio		1.18	0.859		
Degree of Saturation, %		98.61	100.00		
Dry Unit Weight, pcf		81.613	95.592		

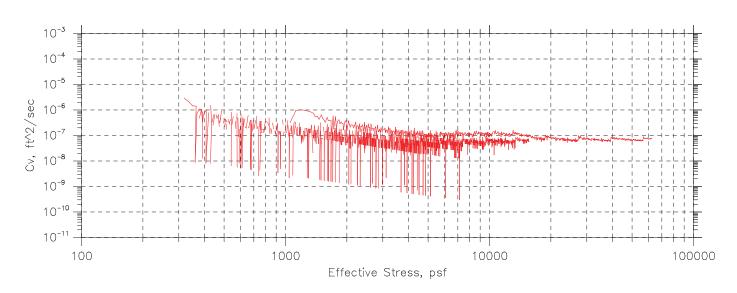
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



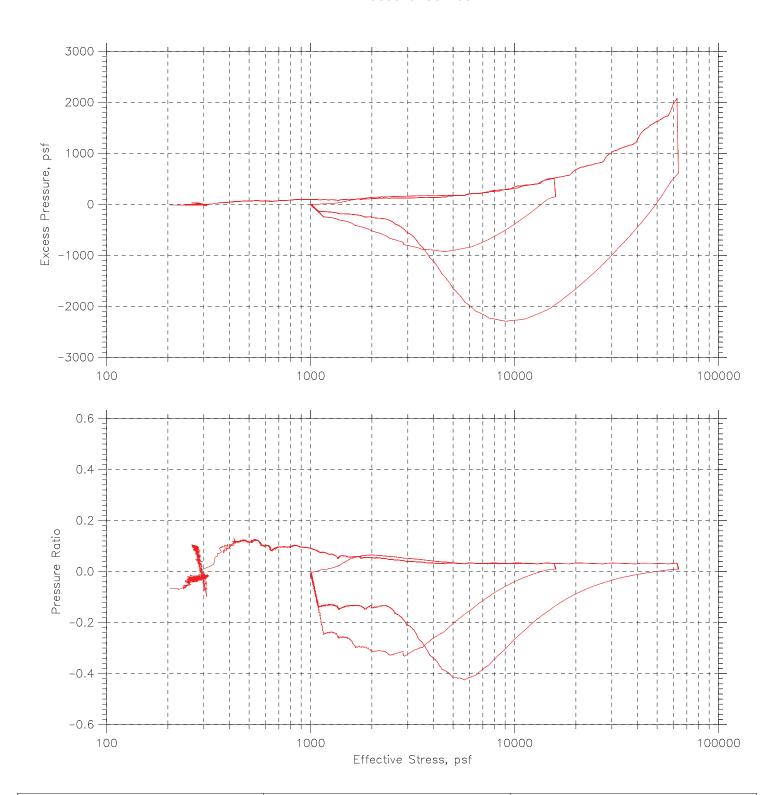


Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-3 Bott	Test Date: 06/27/16	Depth: 72-74 ft
Test No.: CRC-15	Sample Type: intact	Elevation:
Description: Moist, reddish brown cla	y	
Remarks: System R		
		Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-3 Bott	Test Date: 06/27/16	Depth: 72-74 ft
Test No.: CRC-15	Sample Type: intact	Elevation:
Description: Moist, reddish brown c	lay	
Remarks: System R		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S2-1 Sample No.: Tube-3 Bott Test No.: CRC-15

Location: Hartford, CT Tested By: md Test Date: 06/27/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 72-74 ft Elevation: ---

Soil Description: Moist, reddish brown clay

Remarks: System R

Estimated Specific Gravity: 2.81 Liquid Limit: 52
Initial Void Ratio: 1.20 Plastic Limit: 25
Final Void Ratio: 0.956 Plasticity Index: 27

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.89 in

	Before Co	onsolidation	After Consol	idation
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	A-844	RING		B-660
Wt. Container + Wet Soil, gm	205.53	253.92	245.71	148.46
Wt. Container + Dry Soil, gm	144.23	210.71	210.71	112.79
Wt. Container, gm	8.8000	107.92	107.92	8.0300
Wt. Dry Soil, gm	135.43	102.79	102.79	104.76
Water Content, %	45.26	42.04	34.05	34.05
Void Ratio		1.20	0.956	
Degree of Saturation, %		98.54	100.00	
Dry Unit Weight, pcf		79.774	89.634	

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Client: Freeman Companies, LLC

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Boring ID: ---Sample Type: ---Tested By: daa Sample ID: ---Test Date: Checked By: 06/27/16

Project No:

GTX-304831

Depth: Test Id: 381989

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*
S1466-1	C2	49.5-50 ft	160	8511	3	Yes	
S2-1	C2	98.5-99 ft	164	7103	3	Yes	
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*

Density determined on core samples by measuring dimensions and weight and then calculating. Notes:

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

- 1: Best effort end preparation. See Tolerance report for details.
- 2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
- 3: Specimen L/D < 2.
- 4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
- 5: Specimen diameter is less than 10 times maximum particle size.
- 6: Specimen diameter is less than 6 times maximum particle size.

^{*}Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

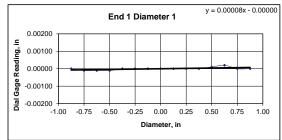


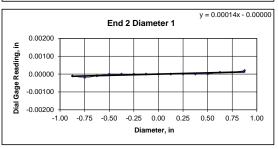
Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S2-1		
Sample ID:	C2		
Depth:	98.5-99 ft		
Visual Description:	See photographs		

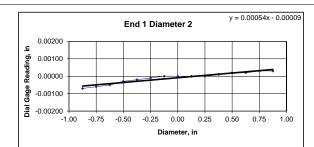
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

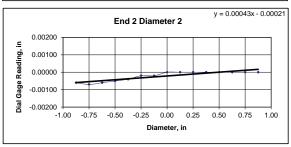
BULK DENSITY					DEVIATION FROM STRAIGHTNESS (Procedure S1)
	1	2	Average		
Specimen Length, in:	4.47	4.47	4.47		Maximum gap between side of core and reference surface plate:
Specimen Diameter, in:	1.98	1.99	1.99		Is the maximum gap ≤ 0.02 in.? YES
Specimen Mass, g:	597.27				
Bulk Density, lb/ft3	164	Minimum Diameter Tolerence Me	et?	YES	Maximum difference must be < 0.020 in.
Length to Diameter Ratio:	2.3	Length to Diameter Ratio Tolera	nce Met?	YES	Straightness Tolerance Met? YES

END FLATNESS AND PARALL	ELISM (Proced	lure FP1)													
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00000	0.00000
Diameter 2, in (rotated 90°)	-0.00070	-0.00060	-0.00050	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00020	0.00030	0.00030
											Difference between	een max and m	in readings, in:		
											0° =	0.00030	90° =	0.00100	
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00010	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00020
Diameter 2, in (rotated 90°)	-0.00060	-0.00070	-0.00060	-0.00050	-0.00040	-0.00020	-0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
											Difference between	een max and m	in readings, in:		
											0° =	0.0004	90° =	0.0007	
											Maximum differe	ence must be <	0.0020 in.	Difference = +	0.00050









DIAMETER 1			
End 1:			
	Slope of Best Fit Line Angle of Best Fit Line:	0.00008 0.00458	
End 2:			
	Slope of Best Fit Line Angle of Best Fit Line:	0.00014 0.00802	
Maximum Angu	ılar Difference:	0.00344	
	Parallelism Tolerance Met?	YES	
	Spherically Seated		
DIAMETER 2	Spherically Seated		
DIAMETER 2 End 1:			
		0.00031 0.01776	
	Slope of Best Fit Line		
End 1:	Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line	0.01776	
End 1:	Slope of Best Fit Line Angle of Best Fit Line:	0.01776	
End 1:	Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line:	0.01776	

Flatness Tolerance Met?

PERPENDICULARITY (Procedure	e P1) (Calculated from End Flatness	and Parallelism m	easurements a	bove)		
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be ≤ 0.25°
Diameter 1, in	0.00030	1.985	0.00015	0.009	YES	
Diameter 2, in (rotated 90°)	0.00100	1.985	0.00050	0.029	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00040	1.985	0.00020	0.012	YES	
Diameter 2, in (rotated 90°)	0.00070	1.985	0.00035	0.020	YES	



Client: Freeman Companies, LLC Project Name: Reconstruction of Exit Charter Oak Bridge Project Location: Hartford, CT GTX #: 304831 Test Date: 6/27/2016 Tested By: daa Checked By: jsc Boring ID: S2-1 Sample ID: C2 Depth, ft: 98.5-99



After cutting and grinding



After break

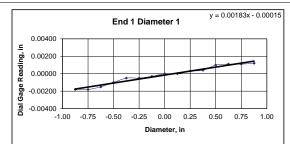


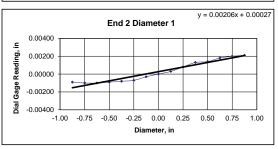
Client:	Freeman Companies, LLC	Test Date: 6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By: rlc
Project Location:	Hartford, CT	Checked By: jsc
GTX #:	304831	
Boring ID:	S480-1	
Sample ID:	C2	
Depth:	54.5-55 ft	
Visual Description:	See photographs	

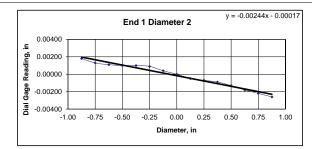
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

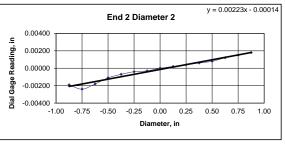
BULK DENSITY					DEVIATION FROM STRAIGHTNESS (Procedure S1)
	1	2	Average		
Specimen Length, in:	4.37	4.38	4.38		Maximum gap between side of core and reference surface plate:
Specimen Diameter, in:	1.97	1.97	1.97		Is the maximum gap ≤ 0.02 in.? YES
Specimen Mass, g:	575.14				
Bulk Density, lb/ft3	164	Minimum Diameter Tolerence Me	et?	YES	Maximum difference must be < 0.020 in.
Length to Diameter Ratio:	2.2	Length to Diameter Ratio Tolerar	nce Met?	YES	Straightness Tolerance Met? YES

END FLATNESS AND PARALL	ELISM (Proced	lure FP1)													
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00180	-0.00180	-0.00150	-0.00100	-0.00050	-0.00050	-0.00030	0.00000	0.00000	0.00030	0.00040	0.00100	0.00110	0.00110	0.00120
Diameter 2, in (rotated 90°)	0.00180	0.00130	0.00110	0.00100	0.00100	0.00090	0.00040	0.00000	-0.00050	-0.00070	-0.00090	-0.00130	-0.00180	-0.00220	-0.00260
											Difference between	en max and m	in readings, in:		
											0° =	0.00300	90° =	0.00440	
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00090	-0.00100	-0.00100	-0.00090	-0.00080	-0.00070	-0.00030	0.00000	0.00030	0.00080	0.00130	0.00140	0.00180	0.00200	0.00210
Diameter 2, in (rotated 90°)	-0.00190	-0.00240	-0.00180	-0.00110	-0.00070	-0.00040	-0.00030	0.00000	0.00020	0.00040	0.00060	0.00080	0.00120	0.00150	0.00180
											Difference between	een max and m	in readings, in:		
											0° =	0.0031	90° =	0.0042	
											Maximum differe	ence must be <	0.0020 in.	Difference = \pm	0.00220









DIAMETER 1		
Fnd 1:		
	Slope of Best Fit Line	0.00183
,	Angle of Best Fit Line:	0.10485
End 2:		
	Slope of Best Fit Line	
,	Angle of Best Fit Line:	0.11803
Maximum Angula	ar Difference:	0.01318
	Parallelism Tolerance Met? Spherically Seated	NO
DIAMETER 2		
DIAMETER 2 End 1:		
End 1:	Slope of Best Fit Line	
End 1:		0.00244 0.13980
End 1:	Angle of Best Fit Line:	0.13980
End 1:	Angle of Best Fit Line: Slope of Best Fit Line	0.13980
End 1:	Angle of Best Fit Line: Slope of Best Fit Line	0.13980
End 1:	Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line:	0.13980
End 1: 5 End 2: 5 Maximum Angula	Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line: ar Difference:	0.13980 0.00223 0.12777 0.01203
End 1: 6 7 End 2: 9 Maximum Angula	Angle of Best Fit Line: Slope of Best Fit Line: Angle of Best Fit Line: ar Difference: Parallelism Tolerance Met?	0.13980 0.00223 0.12777 0.01203
End 1: 6 8 End 2: 9 Maximum Angula	Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line: ar Difference:	0.13980 0.00223 0.12777 0.01203

Flatness Tolerance Met?

PERPENDICULARITY (Proced	ure P1) (Calculated from End Flatness	and Parallelism m	easurements a	bove)		
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be $\leq 0.25^{\circ}$
Diameter 1, in	0.00300	1.970	0.00152	0.087	YES	
Diameter 2, in (rotated 90°)	0.00440	1.970	0.00223	0.128	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00310	1.970	0.00157	0.090	YES	
Diameter 2, in (rotated 90°)	0.00420	1.970	0.00213	0.122	YES	

APPENDIX D DRAFT SPECIAL PROVISIONS



ITEM #0203xxxA - EQUIPMENT WORKING PAD

Description:

Form 817, Section 203, Structure Excavation shall apply with the following amendments:

Article 2.03.03 – Construction Methods: Insert the following provisions at the end of Item 2, Preparation of Foundations:

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. Working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment.

ITEM #0702081A- BITUMINOUS COATING FOR STEELPILES

Description: Work under this item shall consist of furnishing and applying bituminous coating to steel piles. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This work shall also include field applied touch ups to coating damaged during shipping and handling.

Materials: Provide bituminous coating for all piles. Bituminous coating shall consist of canal liner bituminous in accordance with ASTM D 2521. It shall have a softening point of 190°F to 200°F a penetration of 56 to 61 at 77°F and a ductility in excess of 1.38 in. at 77°F. Primer shall be in accordance with AASHTO M 116.

Construction Methods:

- A. All surfaces to be coated with bituminous shall be dry and thoroughly cleaned of dust and loose materials.
- B. Primer or bituminous shall not be applied in wet weather, nor when the ambient temperature is below 65°F.
- C. Application of the prime coat shall be with a brush or other approved means and in a manner which thoroughly coats the surface of the piling with a continuous film of primer. The primer shall have set thoroughly before the bituminous coating is applied. The bituminous shall be heated to 300°F and applied at a temperature between 200° and 300°F by means of one or more mop coats or other approved means.
- D. The average coating thickness shall be 1/16".
- E. Whitewashing of the coating may be required during hot weather as directed to prevent running or sagging of the asphalt coating prior to driving of the pile.
- F. Bituminous coated piles shall be protected from sunlight or heat immediately after the coating is applied.
- G. The bituminous coating shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bituminous coating has been applied, dragging the piles on the ground or the use of cable wraps around the piles during handling will not be permitted. Pad eyes, or other suitable devices, shall be attached to the piles to be used for lifting and handling.
- H. Where Field splices are required the bituminous coating shall be removed in the splice area. After completing the field splice, the splice area shall be brush coated or mop coated with a minimum of one coat of bituminous material as directed.

Method of Measurement: Bituminous coating will be measured per linear foot of pile coated.

Basis of Payment: Payment shall be made at the contract unit price per linear foot of pile coated. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete

ITEM #0702109A- PRE-AUGERING OF PILES

ITEM #0702111A- DRIVING STEEL PILES

Work under this item shall conform to the requirements of Section 7.02 of Form 817 as replaced by the special provision for Section 7.02 in this contract, amended as follows:

7.02.01- Description: Add the following:

Work under this Item includes pre-augering for piles as indicated on the Plans or as ordered by the Engineer.

7.02.03.2(a) - Construction Methods - Pile Driving Equipment - Hammers: Replace the second paragraph with the following:

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for hammers used shall be 26,000-foot pounds (35,000 joules) for driving steel piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

7.02.03.2(7) - Construction Methods - Pile Driving Equipment - Pre-Augering: Add the following:

The following apply when pre-auguring is done for piles with bituminous and epoxy coating:

The pre-augered hole is to continue to the top of the clay layer or to the depths shown on the plans or as directed by the Engineer. The pre-augered hole diameter shall be at least the diagonal dimension of the pile, or as directed by the Engineer. All obstructions which could interfere with the driving of piles within the depth of pre-augering are to be removed as part of the pre-auguring work.

The Contractor shall provide temporary casing to maintain the pre-augured dimension of the hole. Upon completion of pile driving, the annulus between the pile and outer hole diameter shall be filled with clean sand and any temporary casing will be removed.

7.02.05.11 - Basis of Payment - Pre-Augering of Piles: Add the following:

This work shall also include obstruction removal, casing, and sand backfill

ITEM #0207150A - LIGHTWEIGHT FILL

Description: Work shall consist of furnishing and placing lightweight fill in the formation of embankments or as backfill in front of and behind structures. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This item shall also consist of furnishing and placing crushed stone or gravel in burlap bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.

Materials: Lightweight fill shall be a rotary kiln expanded shale aggregate meeting the requirements of ASTM C 330. No by-product slags, cinders or by-products of coal combustion shall be permitted. The aggregate shall consist of tough, durable, non-corrosive particles with the following gradation:

Square Mesh Sieve	Percent Passing by Weight				
1 inch	100				
¾ inch	90 - 100				
3/8 inch	10 - 50				
No. 4	0 - 15				

The dry loose unit weight shall be less than 50 pounds per cubic feet (pcf). The lightweight aggregate supplier shall submit verification of an in-place compacted total unit weight (by methods defined in AASHTO T99) of less than 65 pcf. For purposes of this specification, the total unit weight is defined as the maximum dry density multiplied by one plus the moisture content (as a decimal). For example, if the maximum dry density is 45 pcf and the moisture content is 9%, the total unit weight is 49 pcf.

The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10 percent (ASTM C 88). The maximum Los Angeles Abrasion loss when tested in accordance with ASTM C 131 (B grading) shall be 40 percent.

The lightweight aggregate producer shall submit verification that the angle of internal friction is equal to or greater than 40 degrees when measured in a triaxial compression test on a laboratory sample with a minimum diameter of 250mm.

The materials for bagged stone shall conform to the following requirements: the crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both; the bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

ITEM #0702150A 0042-0304 191 Construction Methods: When applicable and except where noted below, lightweight fill placement shall conform to the requirements of Sections 2.02.03 and 2.16.03 of the Standard Specifications, Form 817.

The lightweight fill shall be placed in layers of a thickness of 1.5 ft to a maximum of 2.0 ft. Each layer shall be compacted by the use of self-propelled vibratory compaction equipment with static mass (weight) less than 6,600 lbs. The minimum number of passes shall be two (2) and the maximum four (4). The actual lift thickness and exact number of passes shall be determined by the Engineer depending on the type of compaction equipment. The contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for compaction, shall not be operated on the exposed lightweight fill.

Where weep holes are installed within the limits of the lightweight fill, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the lightweight fill material into the weep hole. Approximately one cubic foot of crushed stone or gravel shall be enclosed in each of the burlap bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time lightweight fill material is placed around them and bags which are broken or burst prior to or during the placing of the lightweight fill material shall be replaced at the expense of the contractor.

Method of Measurement: Lightweight fill shall be measured in place after compaction, including allowances for settlement. There shall be no direct payment for bagged stone, but the cost thereof shall be considered as included in the cost of the work for "Lightweight Fill".

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "Lightweight Fill", complete in place, which price shall include all materials, transportation, tools, equipment and labor incidental thereto.

 $\begin{array}{ccc} \textbf{Pay Item} & \textbf{Pay Unit} \\ \textbf{Lightweight Fill} & & \textbf{C.y.} \end{array}$

ITEM #0702150A 0042-0304 192



December 22, 2016

Freeman Project No.: 2014-1001

Prepared for:
CME Associates, Inc.
333 East River Drive, Suite 400
East Hartford, CT 06108

Prepared by:

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> Nathan L. Whetten, P.E., D.GE. Vice President of Geotechnical Services



TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Summary	1
1.2	Scope of Work	1
1.3	Authorization	1
1.4	Project Vertical Datum	1
2.0	PROJECT AND SITE DESCRIPTION	1
2.1	Project Description	1
2.2	Site Description	2
3.0	EXPLORATIONS	2
3.1	Recent Explorations	2
3.2	Previous Subsurface Explorations	3
3.3	Laboratory Testing	3
4.0	SUBSURFACE CONDITIONS	
4.1	Subsurface Conditions	3
5.0	GEOTECHNICAL ENGINEERING RECOMMENDATIONS	
5.1	Foundation Design Recommendations	4
6.0	CONSTRUCTION CONSIDERATIONS	
6.1	Excavation	6
6.2	Pile Installation	
6.3	Pile Cap Bearing Surface Preparation	6
6.4	Expanded Shale Aggregate	
6.5	Temporary Lateral Support	6
6.6	Excavation Dewatering	7
6.7	Reuse of Existing Soils	7
7.0	FUTURE SERVICES AND LIMITATIONS	7

ATTACHMENTS

Table

1. Summary of Subsurface Data

Figures

- 1. Site Location Map
- 2. Subsurface Exploration Location Plan
- 3. Summary of Varved Clay Properties, East of Connecticut River
- 4. Subsurface Profile
- 5. Lateral Earth Pressures Active

Appendices

- A. Recent Exploration Logs
- B. Previous Test Boring LogsC. Results of Laboratory Testing
- D. Draft Special Provisions



1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for rehabilitation of Bridge 06043, Route 15 over Main Steet in East Hartford. Rehabilitation consists of widening the northbound (south) side of the bridge by 12 feet to accommodate an additional travel lane. The existing bridge is a single-span bridge supported on two stub abutments, which will be extended to the south. New U-type wingwalls will be provided.

We recommend that the widened abutments be supported on steel H-Piles driven to refusal on bedrock, and pile tip reinforcement should be provided. Filling behind the abutments and new wingwalls will result in settlement of subgrade soils, and downdrag loads on abutment piles will occur. We recommend that bitumen coatings be applied to piles supporting the widened abutment to reduce downdrag loads. Preaugering will be required to protect the coatings.

Abutments should be backfilled with lightweight fill (expanded shale aggregate), consistent with backfill recommended in the original design documents against the existing bridge abutments, to reduce the magnitude of total and differential settlement.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions
- Conducted settlement evaluations
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

The bridge will be widened by 12 feet by extending Abutments 1 and 2 on the south side. New U-type wingwalls will be provided.



The existing bridge is supported on steel H-piles. Design documents for the existing bridge recommended that bitumen coatings be applied to reduce downdrag. Lightweight fill was recommended within 75 feet of the abutments to limit settlement.

2.2 Site Description

The site is located on the south side of the Route 15 NB Bridge over Main Street, as shown on Figure 1, Site Location Map. The bridge is a single-span bridge supported on stub abutments. Main Street has three travel lanes in each direction and concrete sidewalks on each side. The slope between the stub abutments and sidewalks is paved with concrete pavers. Ground surface south of the wingwalls consists of grass and shrubs.

Bridge grade is about El. 61, Main Street grade below the bridge is about El. 37, and bottom of pile cap (existing and proposed) is at El. 43.

3.0 EXPLORATIONS

3.1 Recent Explorations

Recent explorations included one Cone Penetrometer Test (CPT6043-1) and one test boring (S6043-1 OW) conducted on June 15, 2016 and from May 21 to 24, 2016, respectively. The Cone Penetrometer Test (CPT) was conducted by ConeTec, of West Berlin, New Jersey, and the test boring was drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut. CPT6043-1 was located south of Abutment 1 and S6043-1 was located south of Abutment 2.

CPT6043-1 was drilled to a depth of 164.4 feet (CPT6043-1) below ground surface. The CPT was advanced using standard CPT push techniques, and the subsurface data was recorded continuously by a piezocone mounted on the tip.

Test boring S6043-1 was drilled to a depth of 189 feet below ground surface. Standard Penetration Tests at maximum 5 foot intervals, undisturbed tube samples of the lacustrine deposits, and two five-foot-long NX-size rock core samples were recovered from the boring. The completed borehole was backfilled with drill cuttings. A groundwater observation well was installed in a test boring immediately adjacent to S6043-1 drilled to a depth of 20 feet. A slotted PVC screen backfilled with filter sand was placed from 10 to 20 feet. The installation was protected with a roadway box.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Exploration Logs. The CPT log prepared by ConeTec is also included in Appendix A. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.



3.2 Previous Subsurface Explorations

Six previous test borings were drilled for the bridge, including B-10, and B-164 to B-168. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan. Previous exploration logs and cross-sections of the previous explorations are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Eight moisture content tests
- One pH test, one electrical resistivity test, and one soluble sulfate test
- One grain size analysis
- Two Constant Rate of Strain (CRS) Consolidation Tests
- Four Atterberg Limit Determinations
- One unconfined compression test on a rock core sample.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3 Summary of Varved Clay Properties, East of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. A subsurface profile through Abutment 2 is provided on Figure 4.

Thickness Range (ft.)	Stratum	Generalized Description							
4 to 9	Fill	Medium dense to very dense, c-f SAND, little gravel, trace silt, brick, roots. Standard Penetration Test (SPT) N-Values ranged from 28 to 66 blows per foot (bpf).							
10 to 14	Alluvium	Loose to medium dense red to brown c-f SAND, trace silt. SPT N-values ranged from 6 to 12 bpf.							
139 to 151	Lacustrine	Stiff to very stiff varved red-brown CLAY and SILT, with regular 1/8 to 1/16-inch gray and reddish gray silt varves. Results of undisturbed field vane shear strengths tests conducted in previous borings ranged from 957 psf to 3038 psf (undisturbed); remolded field vane test shear strengths ranged from 188 psf to 1362 psf (remolded).							
7.5	Glacial Till	Very dense red-brown c-f SAND, some silt, little clay and gravel. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values in previous borings ranged from 76 to more than 100 bpf							
	Bedrock	Brown ARKOSE, medium strong to strong with fractured zones. The top 0 to 3 feet of bedrock was weathered.							



Groundwater – Water was encountered in the borings at depths ranging from 11 to 20 feet (El 21 to El. 29) during or shortly after drilling. Groundwater was measured in observation well S6043-1 OW at 10.6 feet (El. 29) 4 months after the well was installed, following a relatively dry period of weather. Groundwater levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – One series of corrosion tests was conducted on a sample from boring S6043-1. Results of testing are summarized below:

Test parameter	S6043-1, 5'-7'
pH (in distilled water)	7.5
Electrical Resistivity (ohm-cm)	15,496
Sulfates (ppm)	<30

Results of testing indicate the sample is non-corrosive based on guidance provided in AASHTO Section 10.7.5.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Downdrag – Settlement evaluations were conducted at the proposed abutments to estimate the magnitude of total settlement, and whether settlement would cause downdrag at the existing and proposed piles. Estimated total settlement calculated at the abutments assuming various weights of fill, calculated using the computer program Settle 3D (by RocScience), is summarized as follows:

Normal Weight Fill: 3 inches, includes 1¼ inch secondary compression Expanded Shale: 2½ inches, includes 1¼ inch secondary compression 2 inches, includes 1¼ inch secondary compression

Results of the evaluation indicate that there is on-going settlement of the existing embankment from the original embankment fill loads, both consolidation settlement and secondary compression. Additional fill loads using either normal weight fill or a super-lightweight material such as geofoam have a limited impact on the magnitude of settlement.

The threshold settlement for downdrag loads on piles is commonly considered to be 0.4 inches. The estimated settlements will result in downdrag loads on the abutment piles. We recommend that bitumen coatings be applied to piles to reduce downdrag loads. A 90 percent reduction in downdrag loads can be achieved using bitumen coatings, provided that coatings are protected from damage during pile installation. Coated piles should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Sand should be placed around the pile as the casing is withdrawn.

Settlement evaluations indicate that there is not a significant reduction in settlement by using geofoam. The original design recommendations called for lightweight backfill (expanded shale aggregate) within 75 feet of the bridge abutment. We recommend that backfill adjacent to the widened portions of the bridge also consist of expanded shale aggregate, consistent with the original design recommendations, to reduce the magnitude of differential settlement.



Pile Design

- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D, Stiff Soils.
- Pile Type: HP12x74 with pile tip reinforcement driven to end bearing on bedrock, Grade 50 steel. Other H-Pile sections may also be considered.
- Service Limit: 125 tons, assumes a HP12x74 pile area equal to 21.76 square inches. Reduce the capacity to account for downdrag loads on piles supporting the abutments, as indicated below.
- Strength Limit: For end bearing piles, assume a strength limit equal to the structural capacity of the pile. Settlement of piles is expected to be equal to the elastic compression of the pile.
- **Downdrag:** Estimated downdrag loads are listed below:
 - 350 tons (single piles, uncoated) or 35 tons (single pile with bitumen coating)
 - 31.5 tons (corner pile in a group with bitumen coating)
 - 28 tons (side pile in a group with bitumen coating)
 - 17.5 tons (inside pile in a group with bitumen coating)
- Load Tests: Minimum of 3 dynamic load tests with matching signal analysis (4 tests if 26 or more piles, and no less than 2% of the production piles, AASHTO Table 10.5.5.2.3-3).
- Test Piles: Recommend same piles and criteria as load tests (AASHTO 10.7.9)
- Minimum Spacing: Center to center spacing should be 2½ times the pile diameter (AASHTO 2012 10.7.1.2) and at least 30 inches. Minimum 9 inches to the nearest edge of the pile cap
- Lateral Resistance: Use the pile capacity in batter. Additional lateral load capacities in bending will be provided based on LPile analyses once pile loading is established.
- Subgrade Preparation Below Pile Cap: Minimum 12-inch thick layer of Granular Fill (CTDOT Form 817 M.02.01) over the subgrade.
- Bottom of Structure and Estimated Pile Tip Elevations:

Substructure	Bottom of Pile Cap Elevation	Estimated Pile Tip Elevation		
Abutment 1	43	-139		
Abutment 2	43	-139		

Abutment Design

• Backfill Material: Expanded Shale Aggregate

Provide a 12-inch thick layer of compacted granular fill between top of Expanded Shale

and Roadway Base

Assumes a 24-inch thick pavement section

• Est. Settlement: 2½ inches of total settlement, of which 1¼ inch represents secondary compression.

This indicates that most of the predicted settlement is on-going from the original filling.

• Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, per CTDOT specifications.

• Lateral Pressures: Refer to Figure 5 – Active Earth Pressures



6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Conventional excavation equipment appears practical for excavation. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Test piles and dynamic load testing should be conducted as indicated above. Vibrations from pile driving should not affect the structural integrity of adjacent structures. However, vibration and noise will likely be noticeable inside buildings 300 feet away, or more.

Where bitumen coats are required, coatings should be applied to the piles prior to transportation to the site. It should include a primer coat that may be sprayed or painted onto the piles, and a final coat.

Piles with bitumen should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Piles should be preaugered through the existing fill and alluvial deposits (granular soils) to the top of lacustrine deposits. The top of lacustrine deposits is typically about El 20. Sand should be placed inside the casing as the casing is extracted. Draft special provisions are provided in Appendix D.

6.3 Pile Cap Bearing Surface Preparation

Excavated subgrades for the pile cap should be covered with Granular Fill and then proofrolled with a vibratory plate compactor. If the subgrade beneath the Granular Fill is found to be excessively soft or yielding, it may be necessary to overexcavate the soft material and place additional Granular Fill or crushed stone over separation fabric. If vibratory proof compaction of the subgrade proves detrimental due to the presence of groundwater, static rolling may be allowed at the discretion of the Engineer.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.4 Expanded Shale Aggregate

Expanded shale aggregate should be placed in layers 1.5 to 2 feet thick, and compacted with self-propelled vibratory compaction equipment with static weight less than 6,600 lbs. The minimum number of passes should be limited to two and the maximum four, to avoid particle breakdown during compaction. A draft special provision is included in Appendix D.

6.5 Temporary Lateral Support

We estimate that excavations will be required to reach the pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or



soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.6 Excavation Dewatering

Excavation dewatering will be required to permit construction in in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.7 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces.
- Pile installation and load tests.
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, expressed or implied, is made.

2014-1001
Rehabilitation of Route 15 over Main Street
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
East Hartford, Connecticut

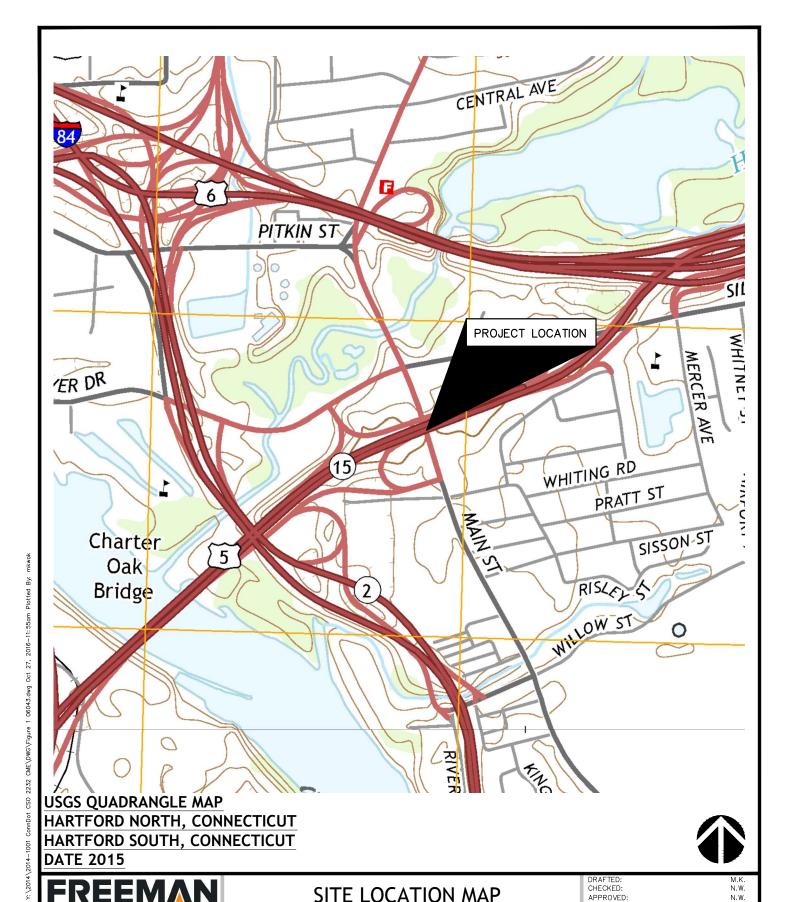
Table 1
Subsurface Data

Depth (ft.)	Pavement/Topsoil 0.1	Fill 8.4	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation
	0.1	8.4	10							<u>.</u>
	0.1	8.4	10							
				150.5	7.5	2.5	10.6	29	176.5	-136.9
164.4 R		4	14	139	7.4		15	24.9		
167 C		4	20	133	5		8.7	30.8	162	-122.5
167 C		11	15	137	3	1	23	16.5	166	-126.5
172 C	1	17	12	135	2		17.5	20.8	167	-128.7
167 C		3	19.5	139	0.5	3	19.5	20.5	162	-122
165 C	2.5		14.5	139	1	3	NM	NM	157	-118.4
25.5	0.9	4.6	13.5	>6.5			17	22.5		
	167 C 167 C 172 C 167 C 165 C	167 C 167 C 172 C 1 167 C 165 C 2.5	167 C 4 167 C 11 172 C 1 17 167 C 3 165 C 2.5	167 C 4 20 167 C 11 15 172 C 1 17 12 167 C 3 19.5 165 C 2.5 14.5	167 C 4 20 133 167 C 11 15 137 172 C 1 17 12 135 167 C 3 19.5 139 165 C 2.5 14.5 139	167 C 4 20 133 5 167 C 11 15 137 3 172 C 1 17 12 135 2 167 C 3 19.5 139 0.5 165 C 2.5 14.5 139 1	167 C 4 20 133 5 167 C 11 15 137 3 1 172 C 1 17 12 135 2 167 C 3 19.5 139 0.5 3 165 C 2.5 14.5 139 1 3	167 C 4 20 133 5 8.7 167 C 11 15 137 3 1 23 172 C 1 177 12 135 2 17.5 167 C 3 19.5 139 0.5 3 19.5 165 C 2.5 14.5 139 1 3 NM	167 C 4 20 133 5 8.7 30.8 167 C 11 15 137 3 1 23 16.5 172 C 1 177 12 135 2 17.5 20.8 167 C 3 19.5 139 0.5 3 19.5 20.5 165 C 2.5 14.5 139 1 3 NM NM	167 C 4 20 133 5 8.7 30.8 162 167 C 11 15 137 3 1 23 16.5 166 172 C 1 177 12 135 2 17.5 20.8 167 167 C 3 19.5 139 0.5 3 19.5 20.5 162 165 C 2.5 14.5 139 1 3 NM NM NM

Notes:

- 1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevation at previous borings were shown on the logs and corrected to NAVD-88 on this table.
- 2. Groundwater levels are approximate. See S6043-1 OW log for date of water level measurement in observation well.
- 3. Top of bedrock is inclusive of weathered rock
- 4. ">" Greater Than "--" Not Encountered (C) Bedrock Core Taken (R) Terminated at Refusal "NM" Not Measured







36 JOHN STREET HARTFORD, CT 06106 WWW.FREEMANCOS.COM TEL:(860)251-9550 FAX:(860)986-7161 ELEVATE YOUR EXPECTATIONS

SITE LOCATION MAP

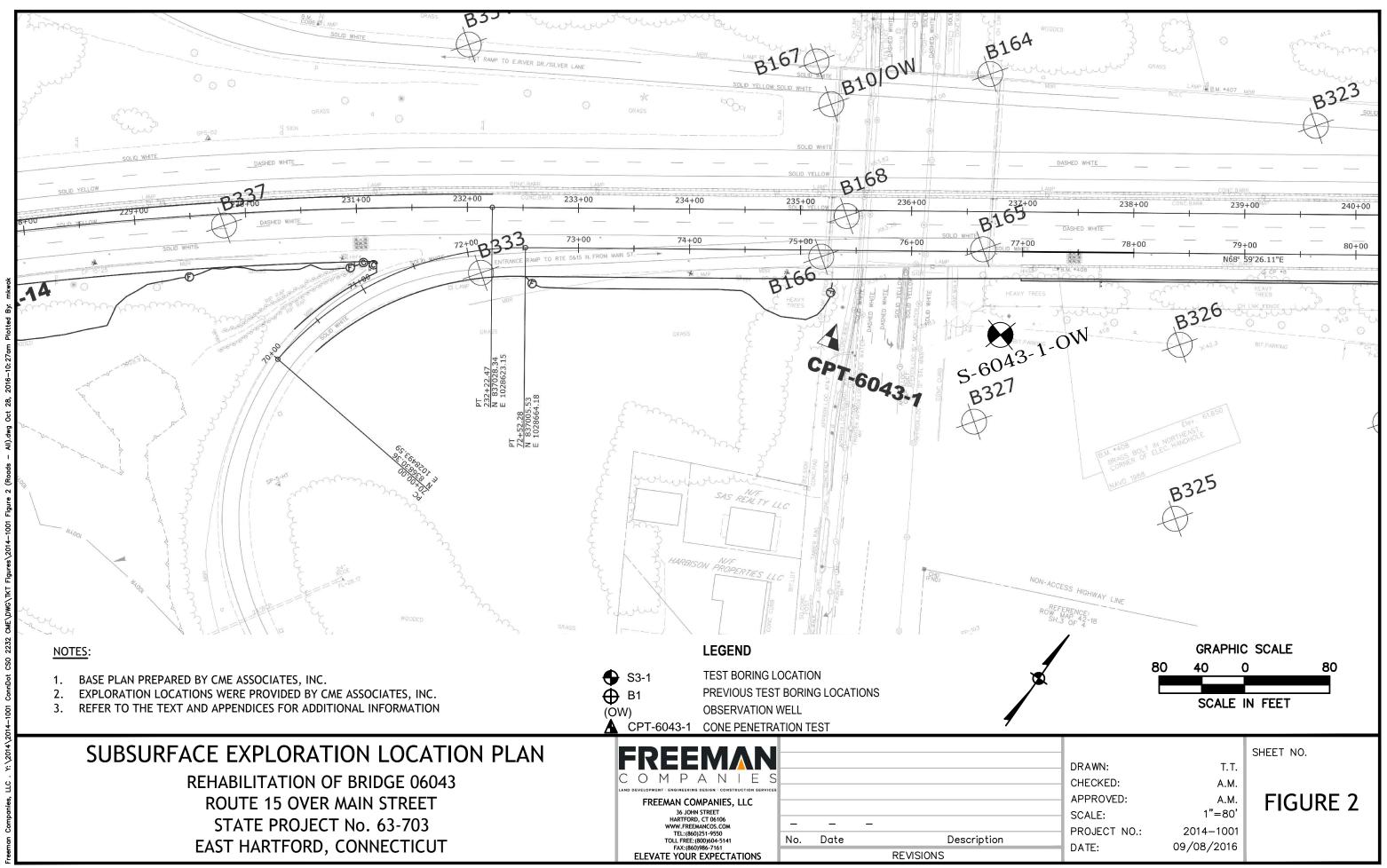
REHABILITATION OF BRIDGE 06043 ROUTE 15 NB OVER MAIN ST STATE PROJECT NO. 63-703 EAST HARTFORD, CONNECTICUT

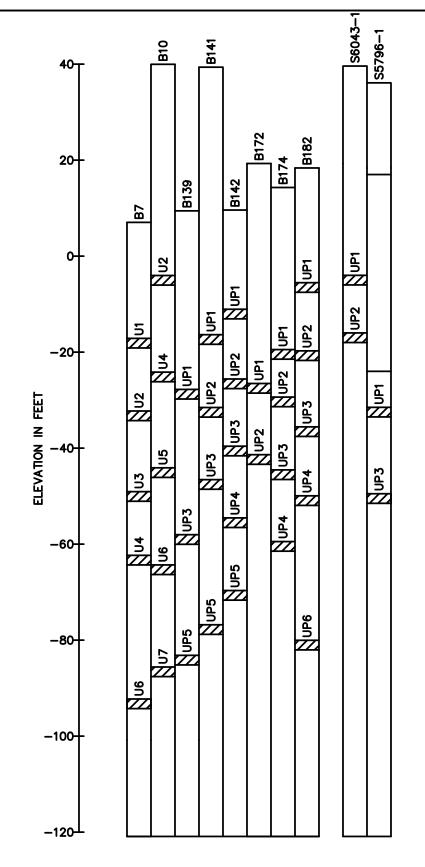
DRAFTED: CHECKED: APPROVED: SCALED: PROJECT NO.: DATE:

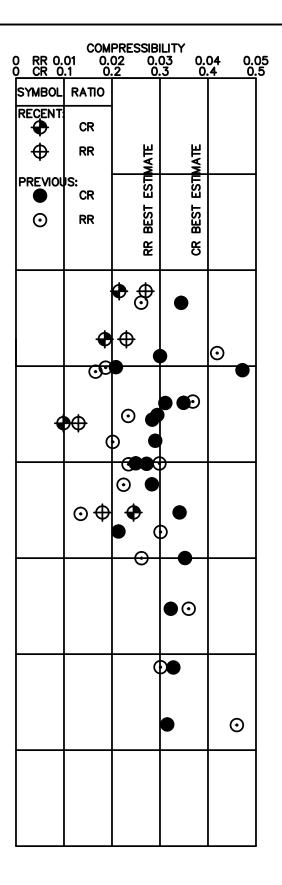
N.W. 1"=1000' 2014-1001 10/27/2016

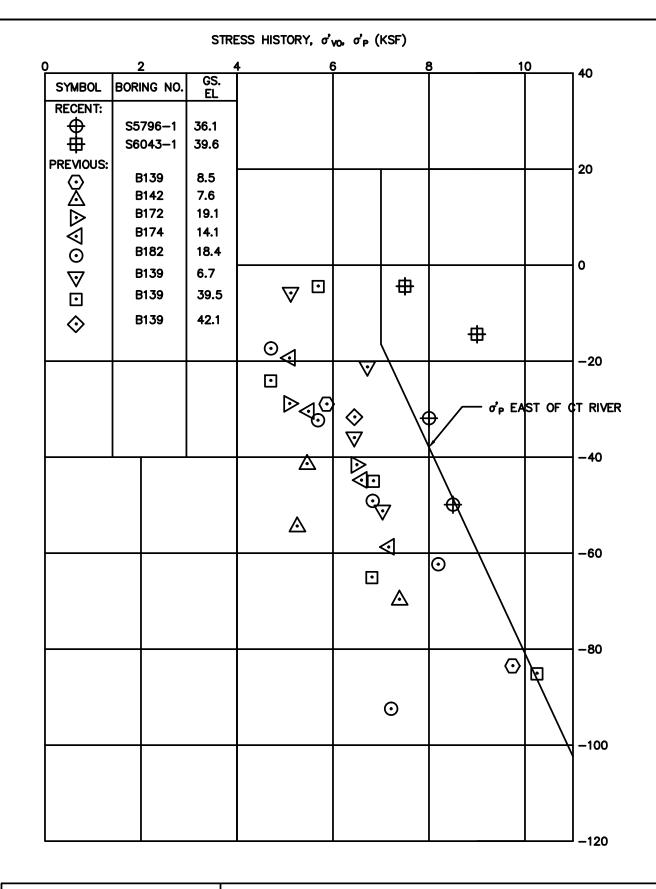
SHEET NO.

FIGURE 1









NOTES

- 1. PREVIOUS DATA WAS OBTAINED FROM THE RECORD REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD-EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
- 2. ELEVATIONS REFER TO NAVD-88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD-29.

DEFINITIONS

- CR COMPRESSION RATIO (=Δε/ΔLOG σ'v) DURING VIRGIN COMPRESSION
- RR RECOMPRESSION RATIO (= $\Delta \epsilon / \text{LOG} \sigma'_{V}$) DURING RECOMPRESSION
- σ'_{VO} IN SITU VERTICAL EFFECTIVE STRESS
- FP PRECONSOLIDATION STRESS



ELEVATE YOUR EXPECTATIONS

SUMMARY OF VARVED CLAY PROPERTIES
EAST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3B

CHECK	IDEA	c = c		RЛ
SUBSL	JRFA	C-LI	IAUTRA	IVI

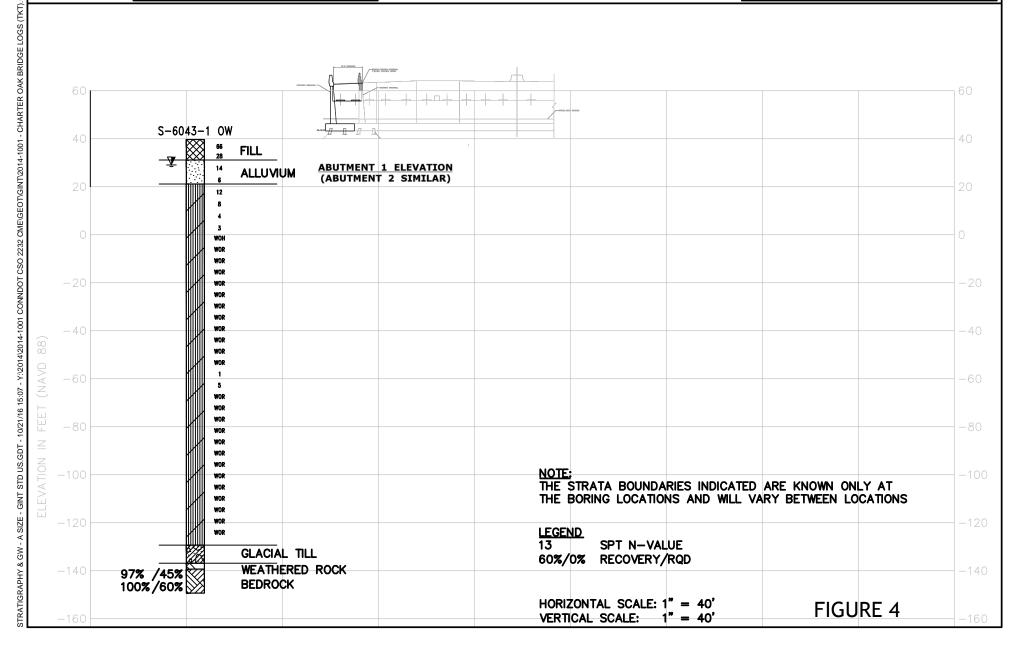
Freeman Companies, LLC 36 John Street Hartford, CT 06109

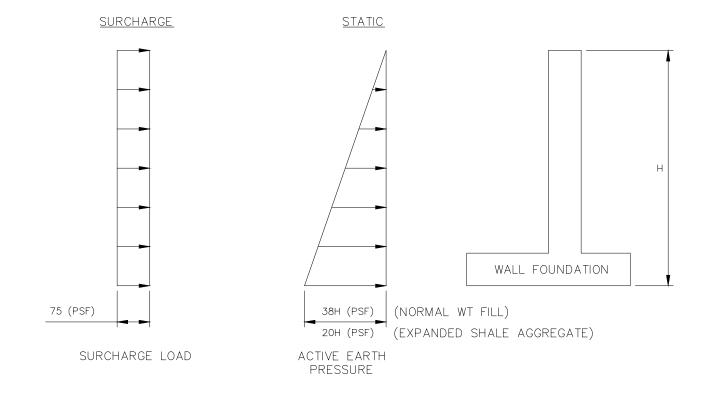
PROJECT NUMBER DOT Project No. 63-703

PRIME DESIGNER CME

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford





NOTES:

- APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
- 2. H IS MEASURED IN FEET
- 3. THE WALL SHOULD BE DRAINED BY EXPANDED SHALE AGGREGATE WITH A UNIT WEIGHT OF 65 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
- 4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
- 5. SLIDING:
 COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3-1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
- 6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.



ELEVATE YOUR EXPECTATIONS

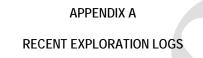
LATERAL EARTH PRESSURES ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 06043 ROUTE 15 NB OVER MAIN STREET STATE PROJECT NO. 63-703 EAST HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	N.T.S.
PROJECT NO.:	2014-1001
DATE:	10/27/2016

FIG.

FIGURE 5



Driller:	F	. Labo	ssier	-		Co	onne	cticu	it DOT Borin	ng Report	Hole No.: S-6043-1 OW	
Inspect		. Herp			Т	own:		Hartfo	ord		Stat./Offset:	
Engine	er: N	l. Whe	tten		F	Project	No.:	DOT	Project No. 63	3-703	Northing: 837092.58	
Start D	ate: 5	5-21-16	3		F	Route N	lo.:	15 N	3 over Rt 5		Easting: 1029049.01	
Finish I	Date: 5	5-24-16	3		Е	Bridge N	No.:	0604	3		Surface Elevation: 39.6	
Project	Descrip	tion: F	Reloc	ation	of I-9	1 NB I	ntercl	hange	29 & Widenir	ng		
Casing	Size/Ty	pe: 4-ir	ո. Ca	sina	S	Sample	r Tvpe	/Size:	1-3/4 inch ID		Core Barrel Type: NX	
	er Wt.: 3	•	Fall:	_		lamme					71	
Ground	lwater O	bservat	tions:	@1	0.6' o	n 9/20	/2016					
					PLES				-			E
Depth (ft)	Sample Type/No.	р		s on pler inche		Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Ма	terial Description and Notes	Elevation (ft)
0-									FILL	ASPHALT (1")		
_	04	00	20	00	04	0.4	40			GRAVEL BASE (<u> </u>
	S1	83	38	28	21	24	12			Red to Brown c-f	SAND, little gravel, trace silt	- 1
_												- 1
5-		_										-35
_	S2	11	11	17	23	24	20			Red to brown c-f	SAND, trace silt	
_		-										
_									ALLUVIUM			<u> </u>
10-									ALLOVION			-30
10	S3	10	7	7	8	24	12			Red to brown c-f	SAND trace silt	
_		-								red to brown or	Critical and Cont	
_												
												-25
15-	C 4		2	2	2	24	10				04115 ()	-
	S4	°	3	3	2	24	18			Red to brown c-f	SAND, trace silt	-
_												-
_									LACUSTRINE			
20 —		+										_20
_	S5	6	6	6	7	24	18			Gray to brown SI	LT and CLAY	
		1										- 1
												-
25-		4										-15
_	S6	4	3	5	3	24	16			Gray SILT and C	LAY, gray silt varves of 1/16"	
_		-								-		
-												
30-												-10
	S7	2	2	2	3	24	24			Gray SILT and C	LAY, gray silt varves of 1/16"	
_									1	· -	- -	

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES: Observation well installed. Screen from 10 to 20 feet	Sheet
	backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box	1 of 6
Earth: 179ft Rock: 10ft	1	1 01 0
Earth. 1791t Rock. Toll	」at ground surface.	
No. of No. of	, and the second	
Soil Samples: 34 Core Runs: 2		SM-001-M REV. 1/02

riller:	Р	. Labossier	Co	onne	cticu	t DOT Borir	ng Report Hole	e No.:	S-6043-1 OW	
spec	tor: J	. Herpich	Town:		Hartfo	ord	Stat	t./Offset:		
ngine		I. Whetten	Project	No.:	DOT	Project No. 63	-703 Nort	thing:	837092.58	
Start D		-21-16	Route N			3 over Rt 5		sting:	1029049.01	
inish	Date: 5	-24-16	Bridge I	No.:	06043	3			ation: 39.6	
rojec	Descript	tion: Relocation of			hange	29 & Widenir	ng			
asino	. Size/Tyr	pe: 4-in. Casing	Sample	r Tyne	A/Size	1-3/4 inch ID	Core	e Barrel T	vne: NX	
	er Wt.: 3		Hamme				Con	C Darrer 1	урс. 1470	
		bservations: @10.6					L			
		SAMPLE			-					
$\overline{}$						Generalized Strata Description				
Depth (ft)	Sample Type/No.	Blows on	Pen. (in.)	Rec. (in.)	%	rali. a ripti		l Descrip	tion	
eptl	amk /pe/	Sampler per 6 inches	<u>.</u>	ပ္ပ	RQD	ene rata esc	and	d Notes		
Ŏ	ÿ ←	PO. 0 11101103	l g	ď	Ř	তুজুতু				
-						LACUSTRINE				
35-	- S8	wor 2 1 1	24	24		(con't)	Crow Cll T and OLAY	aras cit	(OT) (OC CE 4/40"	
_	30	WOI	24	4			Gray SILT and CLAY,	, gray slit v	raives of 1/16"	-
-	-									+
-	_									Ι,
40-		_					Crov CILT and CLAV	arov oilt v	on too of 1/0" to	
-	S9	woh woh woh 1	24	24			Gray SILT and CLAY, 1/16"	, gray siit v	rarves or 1/8 to	L
-		-								-
_	UP-1		24	24						+
45-		_	- '							-
-	S10	wor wor wor wo	r 24	24			Brown SILT and CLAY silt	Y, 1/16" va	arved gray to red	T
-		_					Siit			
-	1									L
50-										
-	S11	wor wor wor 3	24	24			Gray SILT and CLAY,	, 1/16" var	ved gray to red	+
-		-		- '			silt			+
-		-								
	UP-2		24	24						<u> </u>
55-	040	 	. 04	24			Gray SILT and CLAY,	. 1/16" var	ved aray to red	
_	S12	wor wor wor wo	r 24	24			silt	, o vai		+
_	_									+
-	-									+
60-		-					000.	4/40"		<u> </u>
-	S13	wor wor wor wo	r 24	24			Gray SILT and CLAY, silt	, 1/16" var	ved gray to red	
-		-					Jt			1
-]									-
65-										
-	S14	wor wor wor wo	r 24	24			Gray SILT and CLAY,	, 1/16" var	ved gray to red	+
-	1						silt			+

<u>'</u>		
Total Penetration in	NOTES: Observation well installed. Screen from 10 to 20 feet	Sheet
Earth: 179ft Rock: 10ft	backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	2 of 6
No. of No. of		
Soil Samples: 34 Core Runs: 2		SM-001-M REV. 1/02

Driller:	P. Labossier	Co	nne	cticu	t DOT Borir	ng Report	Hole No.: S	S-6043-1 OW	
Inspector:	J. Herpich	Town:		Hartfo	ord		Stat./Offset:		
Engineer:	N. Whetten	Project N			Project No. 63	3-703	+	37092.58	
Start Date:	5-21-16	Route No			3 over Rt 5			029049.01	
Finish Date:		Bridge N		06043			Surface Elevati	on: 39.6	
Project Des	cription: Relocation of			hange	29 & Widenir	ng	1		
Casing Size	/Type: 4-in. Casing	Sampler	Tyne	/Size·	1-3/4 inch ID		Core Barrel Typ	ne. NX	
Hammer Wt	_ · · ·	Hammer	-				Solo Ballol Typ		
	r Observations: @10.6'								
	SAMPLE				75				£
l æ	<u>.</u>	·	$\overline{}$		Generalized Strata Description	D. 4.			Elevation (ft)
h (f	Blows on Sampler	Ë	Ë	%	eral :a :ript	IVI	aterial Description	on	atio
Depth (ft)	per 6 inches	Pen. (in.)	Rec. (in.)	RQD	sene trat		and Hotos		lev:
	- '		Ľ.	I.C.					Ш
					LACUSTRINE (con't)				_
70					(COIT!)				30
- S1	5 wor wor wo	r 24	24			Gray SILT and 0 silt	CLAY, 1/16" varve	ed gray to red	
+						Siit			
									-
75									35
S1	6 wor wor woh wo	h 24	24				CLAY, 1/16" varve	ed gray to red	-
-						silt			
00									40
80 - S1	7 wor wor wor wo	r 24	24			Gray SILT and 0	CLAY, 1/16" varve	ed gray to red	-
	Wol wol wol wo	27	27			silt			-
									-
-									_ 45
85			0.4			Grav SILT and (CLAY, 1/16" varve	ed gray to red	_
S1	8 wor wor wor wo	r 24	24			silt	<i>22.</i> (1, 11, 10, 10, 10, 10, 10, 10, 10, 10, 1	ou gruy to rou	-
									-
90						Cray CIL T and C	N AV 4/46" years	- d = = = d	50
	9 wor wor wo	r 24	24			silt	CLAY, 1/16" varve	ed gray to red	_
									-
									-
95									55
- S2	20 wor wor 1 3	24	4			Gray SILT and 0 silt	CLAY, 1/16" varve	ed gray to red	
+						5			
									-
100									60
- S2	21 wor wor 5 3	24	4				CLAY, 1/16" varve	ed gray to red	
	0 T	0:-!!! 0)	silt		T	
	Sample Type: S = Proportions Used:								
Total Peneti	ation in					led. Screen from			eet
Earth: 179f	t Rock: 10ft			with filt surface		nite seal from 1 to	3 feet; roadway	oox 3 o	f 6
No. of Soil Sample	No. of	at git	Juliu S	Juliact	. .			SM-001-M	DEV 1/02
Con Gample	o. on onciruita. Z							JIVI-00 1-IVI	11LV. 1/UZ

Driller:		P. Labossier	Co	onne	cticu	t DOT Borir	ng Report Hole No.: S-6043-1 OW	
Inspect		J. Herpich	Town:		Hartfo	ord	Stat./Offset:	
Engine		N. Whetten	Project	No.:	DOT	Project No. 63	-703 Northing: 837092.58	
Start D		5-21-16	Route N			3 over Rt 5	Easting: 1029049.01	
Finish I	Date:	5-24-16	Bridge N	No.:	06043	3	Surface Elevation: 39.6	
Project	Descri	ption: Relocation of I-	-91 NB	Interc	hange	29 & Widenir	ng	
Casing	Size/T	ype: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID	Core Barrel Type: NX	
Hamme	er Wt.:	300lb Fall: 30in.	Hamme	r Wt.:	140lb	Fall: 30in.		
Ground	dwater (Observations: @10.6'	on 9/20	/2016	i			
		SAMPLES	S			ر م		£
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
_						LACUSTRINE	_	
						(con't)	_	
105-							 	65
_	S22	wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red	
_		_					silt	
_	<u> </u>							
-	1							70
110-	S23	Wor wor wor wor	. 24	24			Gray SILT and CLAY, 1/16" varved gray to red	
_	323	wor wor wor	24	24			silt –	
_	-						-	
_	-						<u> </u>	-
115—								75
_	S24	wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
_							_	
							_	
120-							 	80
_	S25	wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red	
_		_					silt	
_	-							
465	†							85
125—	S26	Wor wer wer	r 24	24			Gray SILT and CLAY, 1/16" varved gray to red	
	320	wor wor wor	24	24			silt _	
_							-	
_	-						<u> </u>	
130-		\dashv						90
_	S27	wor wor wor	r 24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
_								
_	1							

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

-95

Gray SILT and CLAY, 1/16" varved gray to red

Total Penetration in	NOTES: Observation well installed. Screen from 10 to 20 feet	Sheet
Earth: 179ft Rock: 10ft	backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	4 of 6
No. of No. of		
Soil Samples: 34 Core Runs: 2		SM-001-M REV. 1/02

Driller:	Р.	. Labos	sier		C	onne	cticu	t DOT Borii	ng Report	Hole No.: S-60	43-1 OW	
Inspecto		Herpicl			Town:		Hartfo	ord		Stat./Offset:		
Engineer	r: N.	. Whette	en		Project	No.:	DOT	Project No. 63	3-703	Northing: 8370	92.58	
Start Dat	te: 5-	21-16			Route N	lo.:	15 NE	3 over Rt 5		Easting: 1029	049.01	
Finish Da	ate: 5-	24-16			Bridge I	No.:	06043	3		Surface Elevation: 3	39.6	
Project D	Descripti	on: Re	locatio	n of I	-91 NB	Interc	hange	29 & Widenir	ng			
Casing S	Size/Typ	e: 4-in.	Casing	9	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: N	1X	
Hammer	r Wt.: 30	00lb F	all: 30i	n.	Hamme	r Wt.:	140lb	Fall: 30in.				
Groundw	vater Ob	servatio				/2016	i	I				
			SAN	1PLE	<u>S</u>	<u> </u>		ا ۾				£
E	<u>ه ه</u>	R	slows o	n	- -	- -		alize	Ma	iterial Description		Elevation (ft)
Depth (ft)	nple e/N	S	Sample	r	Pen. (in.)	Rec. (in.)	% D	nera ata scrip		and Notes		vati
Dep	Sample Type/No.	per	r 6 inch	nes	Per	Rec	RQD	Generalized Strata Description				│
-	S28	Wor W	vor wo	r WO	24	24		LACUSTRINE	silt			_
	020	VVOI V	voi vvo	ı woı	24			(con't)	Siit			
140												100
140	S29	wor w	vor wo	r wor	. 24	24			Gray SILT and C	LAY, 1/16" varved gr	ay to red	-
1 +		*****	10. 110		- '	- '			silt			-
												†
												105
145									Gray SILT and C	CLAY, 1/16" varved gr	ay to red	-105
	S30	wor v	vor wo	r wor	24	24			silt	Litti, iii lo valvea gi	ay to rea	-
												-
												-
150												110
	S31	wor v	vor wo	r wor	24	24			Gray SILT and C	CLAY, 1/16" varved gr	ay to red	
+												-
												-
155												115
	S32	wor v	vor wo	r wor	24	24				LAY, 1/16" varved gr	ay to red	-
+									silt			
160												120
160	S33	wor w	vor wo	r wo	. 24	24			Gray SILT and C	LAY, 1/16" varved gr	ay to red	F
				. •••		-			silt	·		F
												
												- 125
165									Gray SII T and C	LAY, 1/16" varved gr	ay to red	-123
	S34	wor v	vor wo	r wor	24	24			silt	Litt, ii io vaiveu gi	ay to reu	F
												F
												F
170									•	ase in drilling resistan		130
		•	٠.							V = Vane Shear		
	F	Proportion	ons Us	ed:						- 35%, And = 35 -	50%	
Total Pe	netration	n in							led. Screen from		She	
Earth: 1	79ft	Rock: 1					with filt surface		inte seal from 1 to	3 feet; roadway box	5 0	ו ס
No. of Soil Sam	nnlos: 2	No.	of e Runs:	2							SM 004 M4	DEV/ 1/00
Sun Sam	ipies: 3	+ Core	c Runs:								SM-001-M	KEV. 1/02

Driller:	P	. Labossier	C	onne	cticu	ıt DOT Boriı	ng Report	Hole No.: S-604	3-1 OW	
Inspect	or: J	. Herpich	Town:		Hartfo	ord		Stat./Offset:		
Engine	er: N	I. Whetten	Project	No.:	DOT	Project No. 63	3-703	Northing: 83709	92.58	
Start D	ate: 5	-21-16	Route N	lo.:	15 N	3 over Rt 5		Easting: 10290	049.01	
Finish [Date: 5	-24-16	Bridge I	No.:	0604	3		Surface Elevation: 3	9.6	
Project	Descript	tion: Relocation of I	-91 NB	Interc	hange	29 & Widenir	ng			
Casing	Size/Typ	oe: 4-in. Casing	Sample	r Type	/Size:	1-3/4 inch ID		Core Barrel Type: N	X	
	er Wt.: 3		Hamme			Fall: 30in.				
Ground	lwater Ol	oservations: @10.6'		/2016	i					
		SAMPLE	S			- 0 -				(#)
Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Mat	erial Description and Notes		Elevation (ft)
170-						GLACIAL	indicates Glacial	ГІІІ		₺
_ _ _						TILL (con't)				- - -
175—										—-135 _
						WEATHERED				-
_						BEDROCK	WEATHERED BE	EDROCK		
_						BEDROCK				-140
180-							Dod brown slight	ly weathered, strong,	ADKOSE	- 140
	C-1		60	58	45		bedding joints par with occasional fra	allel to bedding at 15	degrees,	_
- 185-										145
	C-2		60	60	60		Red-brown, slight bedding joints par with occasional fra	ly weathered, strong, allel to bedding at 15 actured zones	ARKOSE, degrees,	- - -
190 <i>—</i>							END OF BORING	6 189ft		150
_										
										-
_										<u>. </u>
195—										<u></u> 155
_										L
										-
										-
200-										-160
_										
_										
										<u> </u>
		Sample Type: S = Proportions Used:	Trace =	1 - 10	O%, I	Little = 10 - 20	%, Some = 20 -	35%, And = 35 - 5	50%	
	enetratio		bacl	kfilled '	with filt	ter sand. Bento	lled. Screen from 1 on the seal from 1 to 3		Shee 6 of	
Earth:	17911	Rock: 10ft No. of	at g	round	surface	Э.		-		
	mples: 3								SM-001-M R	EV. 1/02



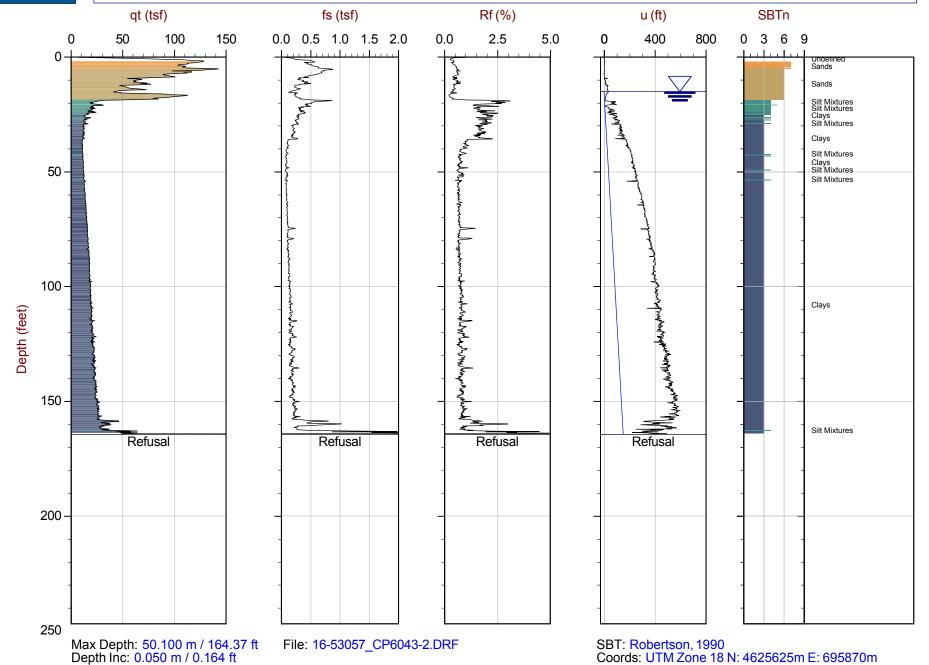
Freeman Companies

Job No: 16-53057 Date: 06:15:16 12:12

Site: I-91 Interchange 29, Hartford, CT

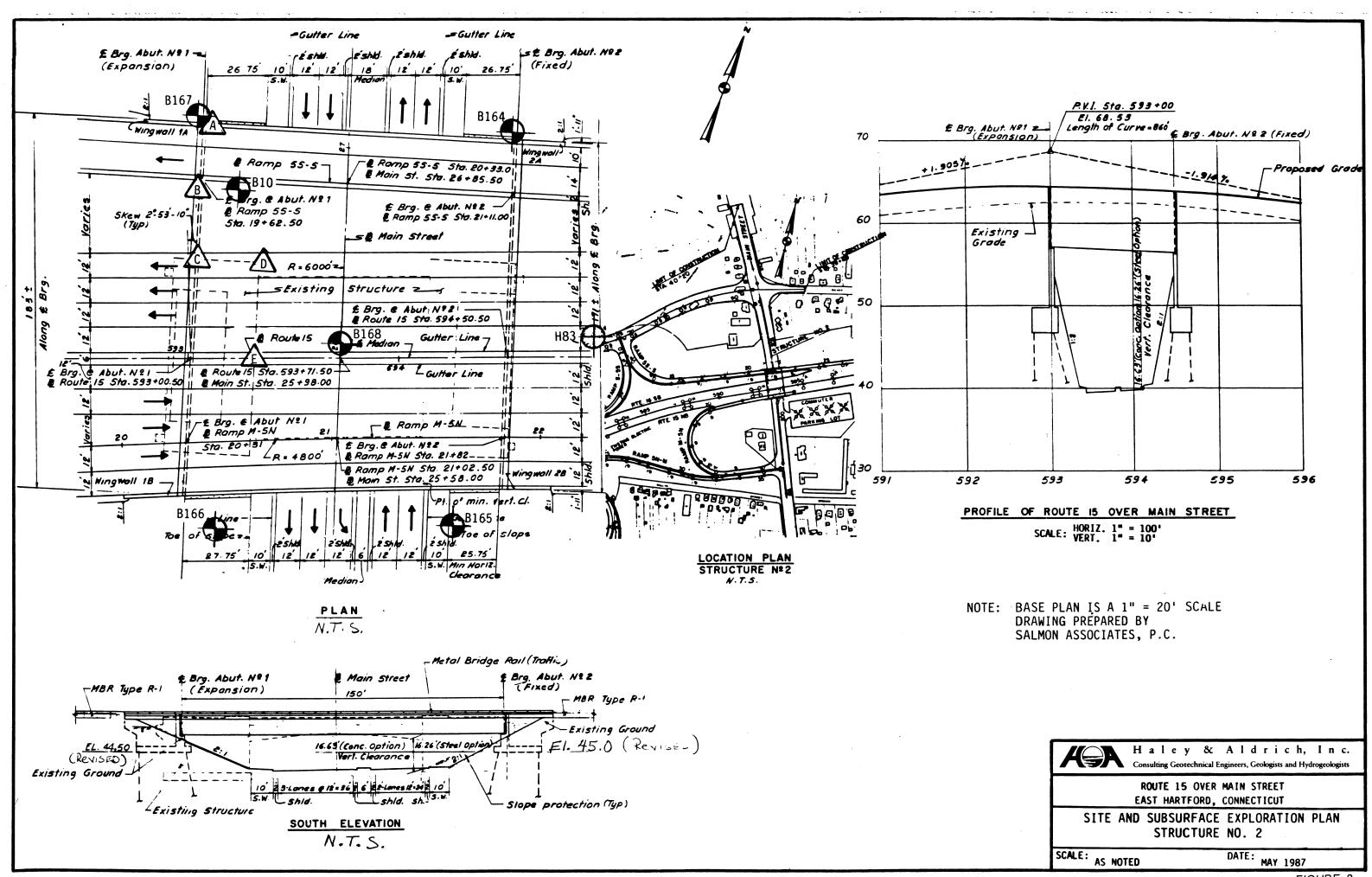
Sounding: CPT16-6043-2

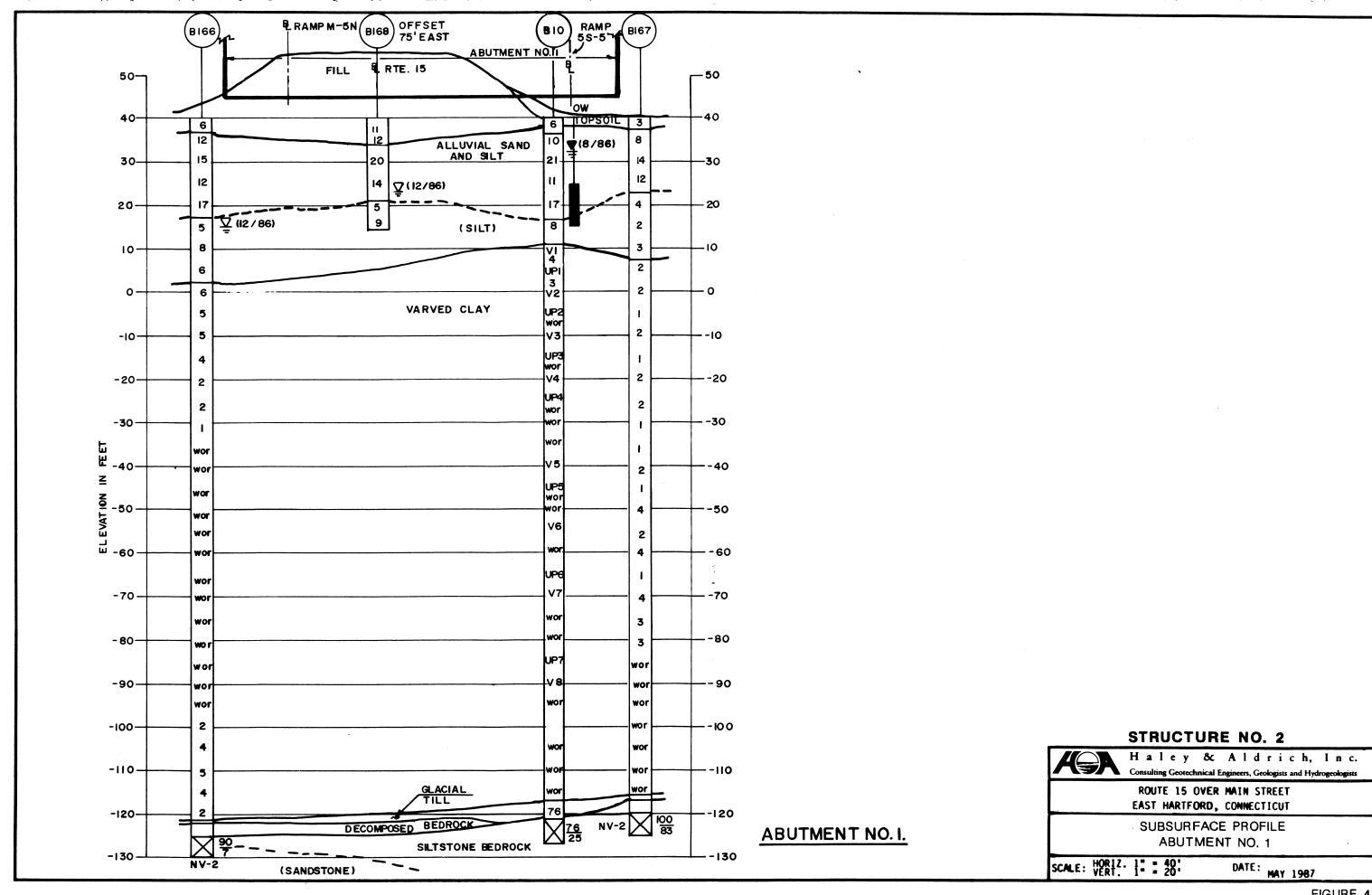
Cone: 419:T1500F15U500

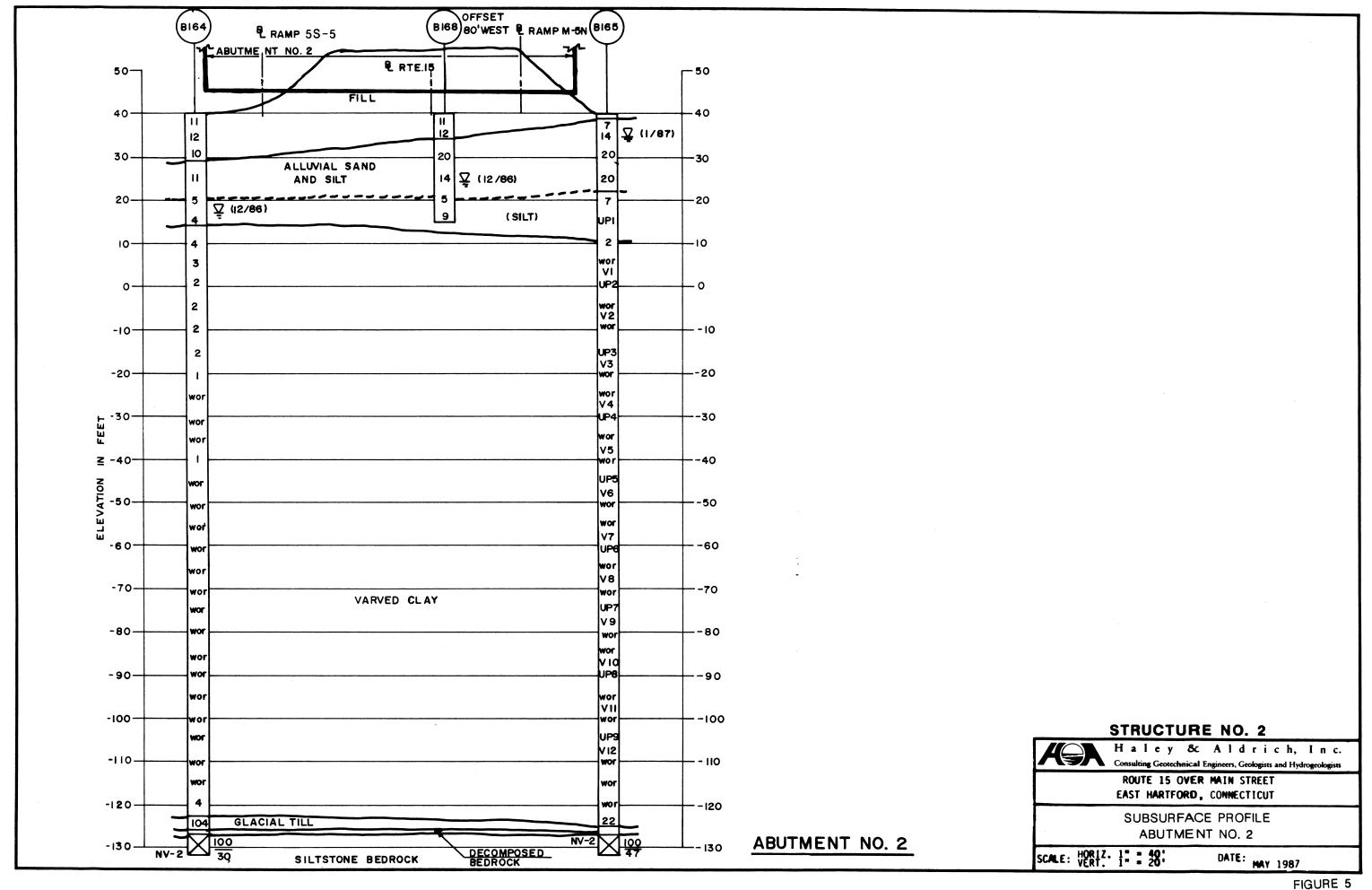


APPENDIX B PREVIOUS TEST BORING LOGS









		A. Mason					F	ORM	SM-1 1	REV.	/83			SHEET 1 OF 5
	ВО	RING CREW LEAD				DE	ST/ PARTI	AIE O MENT	r CON	NNECT	ICUT ORTAT	TON		LOCATION Structure No. 2
		C. Harriman					BU	JREAU	OF F	HOIL	AYS			GUILD DRILLING CO., INC
		INSPECTOR		7	OWN	HART	FORD	-EAS	ING R	RIFO	{D_C	Т.		BORING CONTRACTOR
H	ALEY	& ALDRICH, IN	ic.			T NAN					BRID			Steinman
		SOILS ENGINEER		P	ROJEC	T NO.		63-	384					DESIGN ENGINEER
oc	ATION	Structure No	. 2	(Rt	. 15	/ Ma	iin S	3+.)						
	FACE E						AUC		CAS	ING	SAMPL	ER	CORE BAR	HOLE NO. B 164
_	E FINIS				YPE		T		HW-		s/s		NV II	LINE & STATION
_		WATER OBSERVAT			ZE I.D		1-		4"		1-3/			OFFSET
	23	T. AFTER 1			AMMER		 		300	_	140		BIT	
	24.5					FALL	} -		24		30		BII	N. COORDINATE 337265.45 E. COORDINATE 628877.57
4	24.5		MPLE	(3. In/	AMMEN	FALL	 				30	_		E. COORDINATE 020077.37
D		DEPTHS	T	T	Τ	_		BLOWS		STR	ATA			
Ε	CASING		1	PEN	REC.		PER	6 INC	HE2	CHA			FIFI	D IDENTIFICATION OF SOIL.
	BLOWS	IN FEET	l.,			TYPE	_	ON	_	DEP				ARKS (INCL. COLOR, LOSS OF
нI	PER	FROM - TO	NO.	INCH	INCH	ITTE		MPLE		ELI				WATER, SEAMS IN ROCK, ETC.)
	FOOT	AT 1 51	 -	1.0	1,-			6-12				1/2	12	
	P	0'-1.5'	₽_	118	17	D	2	 '	4					se, Brown medium to fine
	u		╀	<u> </u>	-							SA	ND, trac	e of silt, brick, roots
	s		-	 	 		<u> </u>							
	h	/	+	1	 	<u> </u>		 	┝┯┩					
5	e	4'-5.5'	2	18	14	D	4	6	6					se, Brown medium to fine
	đ		∔—	↓	 		ļ					SA	ND, trac	e of silt, brick
			+	ــــ	 	 	ļ							-FILL-
	4"		4	_		1	<u> </u>					l		
	<u> </u>		+	 	↓	 		 	lacksquare			١.		
10	С	9'-10.5'	13_	18.	16	_ת	4	4	6_			Lo	ose, Bro	wn medium to fine SAND,
	а	<u> </u>	 		<u> </u>		<u> </u>	ļ			<u>'</u>	Er	ace of s	ilt, brick
	8		-		<u> </u>		ļ		Щ	l		ĺ		
	1		1	1		ļ			لـــــا					
	n	<u> </u>	1	<u> </u>	_		L	<u> </u>		l		1		
15	g	14'-15.5'	4	18	12	D	3	5	6			Me	dium den	se, Brown medium to fine
														e of silt and coarse sand
	t			<u> </u>	<u> </u>		L			l				•
	0		1	<u> </u>	<u> </u>		L				- •			-ALLUVIUM-
			1	1						$-\frac{1}{2}$	9'			
20	24	19'-20.5'	5	18	18	מ	2	2	3	l		Me	dium sti	ff, Gray SILT, trace of
			ļ							l			ay	-
										1			•	-ALLUVIUM-
							L							• • • • • • • • • • • • • • • • • • •
										j				
25		24'-25.5'	6	18	18	ما	1	2	2	1		1		(same as D5)
										2	6 '	L .		
•										l				
					·					1				
30		29'-30.5'	7	18	18	D	1	2	2			Me	dium sti	lff to soft, Gray SILT,
]			me clay	• •
										1		1	•	
]		I		
												l		
35		34'-35.5'	8	18	18	D	1	1	2]		So	ft, Gray	VARVED CLAY, some silt
										1		I		
]	- •	I		
										3	8'	1.		
]				
										<u> </u>				
FF	ROM GRO	OUND SURFACE TO	F	EET L	JSED		INCH (CASING	THEN	(II.	NCH	CASING FOR	PEET PEET
FO	OTAGE	IN EARTH	F	OOTA	GE IN	ROCK					NO. 01	F SAA	APLES	HOLE NO. B 164
CA	MPLE T	YPE CODING:	1	D=DRI	VE	C	= COR	E		N=AUG	ER	UF	= UNDISTUR	RBED, PISTON V=VANE TEST
,,,														

L

	ВС	A. Mason PRING CREW LEAD C. Harriman INSPECTOR			roun		ST PART BI	ATE (MENT UREAL	OF COLUMN	REV. INNECT	ICUT PORTATI VAYS		SHEET 2 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR
H		& ALDRICH, II	NC.		PROJEC	CT NA	AE	CHA			RD, CT BŘIDG		STEINMAN DESIGN ENGINEER
	ATION						A.1.	20	646	100	A4451 5	D 0005 D4	
	FACE E			╌┼	YPE		T	BER	CAS	ING	SAMPLE	R CORE BA	LINE & STATION
		WATER OBSERVAT			IZE I.C	_							OFFSET
AT_ AT		FT. AFTER			AMME		┼─		 			BIT	N. COORDINATE E. COORDINATE
D			MPLE		7.11011 C1	1176	/	BLOWS			T		E. GOORDINATE
E	CASING BLOWS PER FOOT	DEPTHS IN FEET FROM • TO	NO.	4	REC.		S	ON MPLE		STRA CHAI DEP ELI	NGE TH	RI	ELD IDENTIFICATION OF SOIL. EMARKS (INCL. COLOR, LOSS OF SH WATER, SEAMS IN ROCK, ETC.)
		39'-40.5'	9	18	18	D	1	1	1			Very sof	t, Gray VARVED CLAY and
												SIMI CD	ni.
4 5		44'-45.5'	10	18	18	D	1	1	1				(same as D9)
			_										
			士								l		
50		49'-50.5'	11	18	18	D	WOR	1	1				(same as D9)
			\pm										
			-	_	ļ								
55		54'-55.5'	12	18	18	D	WOR	1	1		ı		(same as D9)
			Ţ										-
		59'-60.5'	13	18	18	2	W+	Rod					(same as D9)
50							,,,,,,	NOG					(Same as D)
			┼—	 	-								
55		64'-65.5'	14	18	18	D	Wt.	of	Rods			•	(same as D9)
	 		-										
70		69'-70.5'	15	18	18	A	Wt.	of	Rods		},	Very sof	t, Gray to Red-Brown VARVED
			-	<u> </u>									SILTY CLAY
											ł		
,,		74'-75,5'	16	18	18	7	W+	of	2030		ł		(same as D15)
75				10	10	ע	# C.	OI	VOQ8				(same as DID)
FP	OM GBO	UND SURFACE TO		EET U	SED		NCH C	ASINO	THEN			H CASING FO)P
							VOR C	ASING	INEN		INC	n CASING PL	
FO	OTAGE I	N EARTH	F	OOTA	GE IN F	ROCK					NO. OF S	AMPLES	HOLE NO. B 164
		PE CODING: ONS USED:		D=DRI'	VE 19% LI		= CORI = 10-2			= AUGI = 20 -3		uP = undisti iD = 35 - 50%	URBED, PISTON V=VANE TEST

_	_		A. Mason			V		F	ORM	SM-1 I	REV. 8	/83		SHEET 3 OF 5
-		ВО	RING CREW LEADE	R			DE	STA	TE O	F CON	NECT		ON	LOCATION Structure No. 2
1			C. Harriman					BU	REAU	OF H	WHDII	/AYS		GUILD DRILLING CO., INC.
			INSPECTOR	_					-FAS	AH'T	RTFO	Rn CI		BORING CONTRACTOR STEINMAN
L	H		& ALDRICH, INC	3 <u>.</u>	_	ROJEC					OAK	BRIDG	E	DESIGN ENGINEER
L	_		SOILS ENGINEER			ROJEC	T NO.		63-	384				
		ATION FACE E	EV					AUG	ER	CASI	NG	SAMPLE	R CORE BAR	HOLE NO. B 164
_	_	E FINIS			一卡	YPE		T		<u> </u>				LINE & STATION
۳			WATER OBSERVATIO	NS	_	ZE I.D.								OFFSET
A	T		T. AFTER	HR	RS. H/	AMMER	WT.						BIT	N. COORDINATE
A	T	F	T. AFTER	HR	RS. H/	AMMER	FALL							E. COORDINATE
	0			PLE	·	r			LOWS		STR			
	E	CASING	DEPTHS		PEN	REC.		PER	6 INC	HE2	CHA		FIEL	D IDENTIFICATION OF SOIL.
		BLOWS PER	IN ILLI	NO.	INCH		TYPE	SA	MPLE	R	DEP	тн		ARKS (INCL. COLOR, LOSS OF
1	Н	FOOT	FROM - TO						6-12		ELI	EV.	WASH	WATER, SEAMS IN ROCK, ETC.)
r			79'-80.5'	17	18	18	D		Rod					Gray to Red-Brown VARVED
											'		CLAY and S	SILTY CLAY
ı												1		
			84'-85.5'	10	18	10	-	1.74	C.f	Rods			1 a	same as p17)
18	35		04 -05,5	10	1-0	1 10	D	WC.	OT.	VOQ3			(3	, 40 Dail
					1	<u> </u>						1		
												1		
									<u> </u>					
9	0		89'-90.5'	19	18	18	D	Wt.	of	Rods			(٤	same as D17)
1		<u> </u>			┼	 	 		├	\vdash		ı		
ı		}			┼──	+	 							
ı					1	+-						İ		
I	95		94'-95.5'	20	18	18	D	Wt.	of	Rods		Į	(8	same as D17)
1												l		
١					<u> </u>	-			 			1		
ı					┼	├ ──	├	├		-		1		
1.	00		99'-100.5'	21	18	18	n	Wt.	of	Rods		1	(:	same as D17)
ť	00		33 200.5		1	1					ŀ	- 1	•	
1											l	1		
١											l	l		
١			10/1 107 7	-	1.	1	1_	-	-	<u> </u>	ł	1	,	same as 21.7\
1	05	<u> </u>	104'-105.5'	22	118	18	 D _	Wto	ot	Rods	1			same as D17)
İ				 	${\dagger}$	1-	\vdash	 	1	\vdash	1			
١	•			l .	<u>t </u>						1	1		
						·					1	l		
1	10		109'-110.5'	23	18	18	D	Wt.	of	Rods	1	j	(same as D17)
					+-	┼	-	├─		-	ł	i		
١		-			1-	+-	+	 	 	+	1			
١					1						1			
1	15		114'-115.5'	24	18	18	D	Wt.	of	Rods	1	ı		(same as D17)
ſ										<u> </u>	1	I		
ı					╂	 	├ ─	├	-	├	ł	1		
		 			\vdash	+	+-	\vdash	1	\vdash	i			
1		 	1	1		T	 				<u> </u>			
	F	ROM GR	OUND SURFACE TO	ſ	FEET	USED		INCH (CASING	THEN	4	IN	CH CASING FO	R FEET
F					-00-	05 :::	2001					NO 05	CAMPI EC	HOLE NO. B 164
ł	F(JOTAGE	IN EARTH	<u>F</u>	FOOTA	GE IN	RUCK					NU. UF	SAMPLES	HOLE NO. D 104
	SA	WPLE T	YPE CODING:	1	D=DR	IVE	c	= COF	RE		A=AU	GER	UP=UNDISTU	RBED, PISTON V=VANE TEST
			IONS USED:	TRA	CE=I-	10% L	JTTL	E= 10-	20%	SOM	E = 20 ·	-35%	and = 35 -50%	
L														

FORM SM-1 REV. 8/83
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS A. Mason SHEET OF BORING CREW LEADER LOCATION Structure No. C. Harriman GUILD DRILLING CO.
BORING CONTRACTOR INC. TOWN HARTFORD-EAST HARTFORD, CT. INSPECTOR STEINMAN HALEY & ALDRICH, INC. CHARTER OAK BRIDGE PROJECT NAME DESIGN ENGINEER SOILS ENGINEER 63-384 PROJECT NO. LOCATION AUGER CASING SAMPLER CORE BAR HOLE NO. B 164 SURFACE ELEV. LINE & STATION TYPE DATE FINISHED **OFFSET** SIZE I.D. GROUND WATER OBSERVATIONS BIT N. COORDINATE HAMMER WT. HRS. FT. AFTER HAMMER FALL E. COORDINATE HRS. AT FT. AFTER SAMPLE **BLOWS** D **STRATA** DEPTHS PER 6 INCHES E PEN REC. CHANGE FIELD IDENTIFICATION OF SOIL CASING ON IN FEET REMARKS (INCL. COLOR, LOSS OF BLOWS PER DEPTH NCH INCH TYPE NO. SAMPLER ELEV. WASH WATER, SEAMS IN ROCK, ETC.) FROM • H 0-6 6-12 12-18 **FOOT** 18 Wt. of Rods 18 119'-120.5' Very soft, Gray to Red-Brown VARVED CLAY and SILTY CLAY 124'-125.5 26 18 18 Wt. D of Rods Very soft, Red-Brown VARVED CLAY 12 and SILTY CLAY 129'-130.5 27 18 18 Wt. 13 of (same as D26) 134'-135.5' 28 18 WŁ 18 13 Rods (same as D26) 139'-140.5' 29 18 18 D Wt. of Rods (same as D26) 140 144'-145.5 30 18 18 Wt. of Rods 14 (same as D26) 149'-150.5 31 18 18 Wt. D of Rods (same as D26) 150 154'-155.5' 32 18 18 15 Wt. of Hods (same as D26) FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET B 164 NO. OF SAMPLES HOLE NO. FOOTAGE IN EARTH FOOTAGE IN ROCK 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%

		R. Eastwood					F	ORM ATE O	SM-1	REV.	/83 ICUT			SHEET 5	OF 5
		RING CREW LEAD	ER			DE	PARTI	MENT	OF T	RANSP	OKTAT	10N			tructure No. 2 LING CO., INC.
		C. Harriman		ᆜ_		MADTE	JB ODD C	ASP H	MACK I OF I	EPOR	Ļ			BORING	CONTRACTOR
1	UAI E	Y & ALDRICH, INC.		1	POLEC	TNAN	F CH	ASTER	OAK	BRIDG	E				INMAN
_		SOILS ENGINEER		_		T NO.		-384						DESIG	ON ENGINEER
LOC	ATION														= 1//
	FACE E	LEV.					AUG	ER	CAS	NG	SAMPL	ER	CORE BAR	HOLE NO. LINE & STATIO	в 164
	E FINIS			_	YPE		<u> </u>		<u> </u>					OFFSET	
		WATER OBSERVATION	ONS		ZE 1.D		-				ļ		BIT	N. COORDINATE	
AT.		T. AFTER		15. H		FALL	 		 					E. COORDINATE	
			APLE	13. 11/		· · · · · ·		BLOWS	<u> </u>						
0	1 1	DEPTHS		Ī	T			6 INC		STR					
E	CASING	IN FEET			REC.			ON		CHA			FIEL	D IDENTIFICAT ARKS (INCL. COL	OR OF SOIL. OR, LOSS OF
Ţ	BLOWS PER	FROM - TO	NO.	NCH	INCH	TYPE		MPLE		ELI				WATER, SEAMS I	
Ľ	FOOT		20	1.0	-			6-12				-	fa Dai	Description MADIN	En CIAV and
l		160'-161.5'	33	18	18	P	WOR	2	2				LTY CLAY		ED CLAY and
l				╁	 	-				16	31				
l			1	1	†							Ha	rd, Red-	Brown coar	se to fine SAND,
16		164'-165.5'	34	18	14	D	31				.	80			ay and gravel
1								II R		16				GLACIAL TI	
		167'-172'	-	60	60		M	ln/F	-	16	<u>/</u> `	Mo		composed Be	-Brown fine
	 	10/ -1/2	 		D=30			8	\vdash						ONE, joints
١,,			 	1	1	100		8				ve	ry close	e to close,	shallow dipping,
17								9				Ве	dding ve	ery thin, r	ock slightly
								9							from 171-172,
				<u> </u>	 							mc	derately	fractured	ion at 172
١													Roffom (or Explorat	10h at 1/2
17	<u> </u>			-	-										
				 											
			-	-	 										
					ļ										
1				-	-	\vdash									
												1			
															
	┝─┤				 	\vdash						1			
l															
												1			
FF	ROM GRO	NUND SURFACE TO 2	4 F	EET U	SED	4-	NCH C	ASING	THEN	3		ICH	CASING FOR	167	FEET
Ľ															
FO	OTAGE	IN EARTH 167	F	OOTA	GE IN	ROCK		5			NO. OF	SAN	IPLES	34	HOLE NO. B 164
l		YPE CODING: ONS USED:		D=DRI CE=1-1		C ITTLE	= COR = 10-2			= AUG = 20 -	_		= Undistur = 35 - 50%	RBED, PISTON	V=VANE TEST

and the second of the second o

		D. Holley		-			1	FORM	SM-I	REV.	V83		SHEET 1 OF 5
	BC	RING CREW LEA	DER			DE	ST. Part	ATE C MENT	OF T	NNECT RANSF	ICUT PORTAT	TON	LOCATION Structure No. 2
		H. Ernst					BI	UREAL	JOF	HIGHY	VAYS		GUILD DRILLING CO., INC.
Ħ	ALEY	& ALDRICH, 1	NC.	1	OWN	HART	FORD				RD_C		BORING CONTRACTOR STEINMAN
-		SOILS ENGINEER				T NO.			384	UAK	BRID	GE	DESIGN ENGINEER
LOC	ATION	Structure	No. 2	_				St.)					JOSEPH ENGINEER
	FACE E							GER		ING	SAMPL	ER CORE BAR	HOLE NO. B 165
DAT	E FINIS		7		YPE					WM-N	s/s		
		WATER OBSERVA			ZE 1.0					311	1-3/		OFFSET
AT AT		T. AFTER		RS. H.	AMMER)0 // 24''	140 30		N. COORDINATE 337080.51
			AMPLE	кз. п	AMME	TALL	 				30		E. COORDINATE 628915.74
D E		DEPTHS-		T	Т	T		BLOWS R 6 INC		STR	ATA		
P	CASING BLOWS	IN FEET	- 1	PEN.	REC.			ON		CHA			LD IDENTIFICATION OF SOIL
4	PER	FROM - TO	NO.	NCH	INCH	TYPE		AMPLE		DEP			MARKS (INCL. COLOR, LOSS OF H WATER, SEAMS IN ROCK, ETC.)
-	FOOT	0'-2'		12%	17.	_		6-12					
		02.	1	24	14	D	2	3	5	1		-TOPSOIL-	
			+-	+-	+	 		-	 	ł			ght Brown medium to fine ce of silt, coarse sand
			\top	1	 	 				1		July CLA	or orre, coarse sand
5		4'-6'	2	24	12	ם	5_	6	8	1		Medium de	nse, Light Brown medium to
									9			fine SAND	, trace of silt, coarse sand
				 	₩								•
				├	 				-				
10		9'-11'	3	24	14	D	3	9	11				(same as D2)
									15				(built us DZ)
				ļ							·		
15		14'-16'	4	24	17		_	<u> </u>	-				
פו		14 -10	+-	24	17	19	5.	8	12 15				(same as D2)
									12				
										_18	8'		-ALLUVIUM-
		19'-21'	- 5	24	19		3	3	—				• • • • • • • • • • • • • • • • • • • •
20		17 -21	+-	24	19	ע	3	3	<u>4</u>			Medium st	iff, Brown-Gray SILT, little ce of fine sand
												cray, cra	ce of line sand
		2/1 2/1		0.	<u>, </u>								
25		24'-26'	1	24	24	UP							
			1										
'													
		001 01	1,										
30		29'-31'	6	24	24	D	1	1	1	30	2'		
			+-	 					1				, Gray VARVED CLAY and
			+	\vdash								SILTY CLA	Y
											I		
35		34'-36'	7	24	24	D	Wt.	of	lam.				(same as D6)
			_				-						
		37.5'	V1									(See Wee	ne Shear Report V1)
			† <u>-</u> -								1	(See Va	we pwear vehore AT)
FR	OM GRO	UND SURFACE TO	F	EET U	SED		NCH C	ASING	THEN		IN	CH CASING FO	R FEET
FO	TAGE I	N EARTH	F	OOTAG	E IN F	ROCK					NO. OF	SAMPLES	HOLE NO. B 165
											- -		
		PE CODING: INS USED:)=DRI\ CE=1-1(= CORI = 10-2	_		= AUGI = 20 -3		UP = UNDISTU AND = 35 -50%	RBED, PISTON V=VANE TEST

the second of the second of the second

		D. Holley								REV. 8/			SHEET 2	OF 5
	ВО	RING CREW LEADE	ER	ı		DE	PART	MENT	OF T		RTATION	ı		ructure No. 2
		C. Harriman INSPECTOR		_			BU	JREAU BOR	JOF H	HIGHWA	YS			LING CO., INC.
••			_							RTFOR				CONTRACTOR INMAN
Н		& ALDRICH, INC SOILS ENGINEER	C.		ROJEC			63-		OAK I	BŘIDGE			ENGINEER
~		SOILS ENGINEER			ROJEC	11 NU.		63-	304				DESIGN	ENGINEER
	FACE E	FV.					AUC	ER	CAS	ING S	AMPLER	CORE BAR	HOLE NO.	в 165
_	E FINIS			┪	YPE		T		T	T		T	LINE & STATION	<u> </u>
-		WATER OBSERVATION	ONS		ZE I.D		1						OFFSET	
ī		T. AFTER		₹\$. H	AMMER	WT.						BIT	N. COORDINATE	
T	P	T. AFTER		RS. H	AMMER	FALL	1						E. COORDINATE	
D			PLE	Ţ				SLOWS						
E		DEPTHS	1	DEN.	REC.		PEF	6 INC	HES	STRAT		EIE!	D IDENTIFICATIO	N 05 001
P	CASING BLOWS	IN FEET	.		INCH	i		ON	_	DEPT			ARKS (INCL. COLO	
H	BLOWS PER FOOT	FROM - TO	NO.	INCH	INCH	I The		MPLE 6-12		ELEV			WATER, SEAMS IN	
-	P001	39'-41'	2	24	24	UP	10-0	6-12	12-18					
		37 42	┝	+	+=-	101		 -						
				1	†						ı			
											۱.		G	
+5		44'-46'	8	24	24	D	Wt.	of 1	tods		•	-	Gray VARVE	D CLAY and
												ILTY CLAY		
				<u> </u>								_		
		47.5' (Tip)	V2	<u> </u>	<u> </u>	<u> </u>		<u> </u>				(See Va	ne Shear Rep	ort V2)
		(OL 51)	_	0/	1	<u> </u>	-							
50		49'-51'	9	24	24	P	WE.	OI	kods			(sa	me as D8)	
			-	╁─╴	╁──	-			-					
					1	 	-							
				Ì										
55		54'-56'	3	24	24	UP								
											ı			
		67 El (m)	***	 	-							40	a. -	0>
		57.5' (Tip)	<u>v3</u>	├—	┼	ļ			-			(See Va	ne Shear Rep	ort V3)
		59'-61'	10	24	24	D	Wt.	of	Rods			(sa	me as D8)	
50				 	1	_	"	<u> </u>	(OU3			(54)	ac as poy	
											, I	erv soft	, Brown VARV	En CLAY and
55		64'-66'	11	24	24	D_	Wt.	of	Rods			ILTY CLA		
				 	-						1			•
		67.5' (Tip)	V 4	-		 			\vdash		1	(See 170	ne Shear Rep	ort 17/1
		~,•> (11p)	-	 								(See Va	ne anear Keb	OLC V4)
70		69'-71'	4	24	24	UP					1			
. ၂											1			
											1			
											1			
				<u> </u>	 						1,	lery enft	Brown to P	ed-Brown VARVE
75		74'-76'	12	24	24	A	Wt.	of	Rods		1 7	LAY and	SILTY CLAY	ed-promit AWKAF
				├	\vdash		 				1			
		77.5' (Tip)	V 5	 	\vdash				-		1	(See Va	ne Shear Rep	ort V5)
		(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	J Kop	10,
											1			
FR	OM GRO	UND SURFACE TO	F	EET	JSED		NCH C	ASING	THEN		INCH	CASING FOR		FEET
FO	OTAGE I	N EARTH	F	OOTA	GE IN I	ROCK				N	O. OF SA	MPLES		HOLE NO. B 165
SAL	MPLF TY	PE CODING:	r	D=DRI	VE	r	= COR	F	_	= AUGE		P= IIMDICTIIP	BED, PISTON	V=VANE TEST

State of the state

		D. Holley					F	ORM	SM-1	REV.	V83		SHEET 3 OF 5
		DRING CREW LEAD! C. Harriman	ER			DF	PARTI	MENT		RANSF	PORTATION	N	LOCATION Structure No. 2
 -	<u>`</u>	INSPECTOR			rown	HART			U OF F				GUILD DRILLING CO., INC. BORING CONTRACTOR
L!		& ALDRICH, IN	IC.	P	PROJEC	CT NAM	ME	CHA	ARTER		BRIDGE		STEINMAN
<u> </u>		SOILS ENGINEER		P	ROJEC	CT NO.		63-	-384				DESIGN ENGINEER
	ATION FACE EI	I FV.		_			AUG	2FR	CAS	ING	SAMPLER	CORE BAR	HOLE NO. B 165
	E FINISI			士	YPE		T	I to 1	T			1	LINE & STATION
		NATER OBSERVATION		_	IZE I.D		二		二				OFFSET
AT		FT. AFTER FT. AFTER			AMMER		+		—			BIT	N. COORDINATE
AT			MPLE		AMMEN	R FALL	/	BLOWS	,—		<u> </u>		E. COORDINATE
DE		DEPTHS		T			1	R 6 INC		STR			
P	CASING BLOWS PER	IN FEET	NO.		REC.	TYPE	. .	ON	/	CHA			LD IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF
i	PER FOOT	FROM - TO	NO.	Inch	Inco	I TITE		6-12	_	ELI			WATER, SEAMS IN ROCK, ETC.)
		79'-81'	13	24	24	D			Rods		7	ery soft	, Brown to Red-Brown VARVED
			<u> </u>	I_						l			SILTY CLAY
		 	+-	+	₩	 '	 	 	├ ─				ļ
85		841-861	5	24	24	UP	 						
			二	二	二								
		87.5' (Tip)	V6	+-	┼	 '	 	 	├ ─┤			ICON VA	Obser Baront W6)
				<u> </u>	匸							(See va	ne Shear Report V6)
90		89'-91'	14	24	24	D	Wt.	of	Rods	İ	I	(sa	me as p13)
		 	┼	+-	┼─	 '			├ ─┤				
			<u> </u>	+	 	+		<u> </u>		l	1		
			1	二	二					i	I		
95		94'-96'	15	24	24	D	Wt.	of	Rods			(sa	me as D13)
1			 	 		 		<u> </u>	-		l		
		97.5' (Tip)	V7							l	I	(See Va	ne Shear Report V7)
100		99'-101'	6	24	24	UP		<u> </u>	 	l	I	*	
ľ		33 -101	۳_	147	47	1		<u> </u>			l		•
										l			
	 	 '	 	₩		├ ─-/				l			1
105		104'-106'	16	24	24	<u> </u>	Wt.	of_	Rods	İ			, Red Brown to Brown VARVED
										i	- 1	LAY and	SILTY CLAY
$ \cdot $	 	107.5' (Tip)	TVR	 	 -	₩	 	 				/500 Va	Chan Banant WO
		10/03 (12/)	1	+	 _			 		i	1	(See va	ne Shear Report V8)
10		109'-111'	17	24	24	D	Wt.	of	Rods	l	l	(s	ame as D16)
	 	<u> </u>	 '	 	-				[l	1		
					 	1			-	l			
		4474 4421								i	I		
115		114'-116'	╨	24	24	UP	\vdash			ł	1		
		117.5' (Tip)	v9							l		(See Va	ne Shear Report V9)
1		 	 	+-	 -		\vdash			l			
FR	OM GRO	OUND SURFACE TO	<u></u>	FEET U	ISED		NCH C	ASING	THEN		INCH	CASING FOR	FEET
<u></u>													
FO	TAGE I	IN EARTH	F	FOOTA	GE IN	ROCK					NO. OF SA	MPLES	HOLE NO. B 165
f		YPE CODING: ONS USED:		D=DRI		C: JTTLE	= COR	_		\= AUG E = 20 -{		P= UNDISTUR D = 35 -50%	RBED, PISTON V=VANE TEST

	ВО	D. Holley RING CREW LEADE Harriman INSPECTOR	·R],	OWN		ST/ PARTN BU	ATE O MENT IREAU	F CON OF TI	iichw	ICUT ORTATIO		SHEET 4 OF 5 LOCATION Structure No. 2- GUILD DRILLING CO., INC. BORING CONTRACTOR
	HALEY	& ALBRICH, II	TC.	_	ROJEC			CHA	RTER		BRIDGE		STEINMAN
		SOILS ENGINEER		Р	ROJEC	T NO.		63-	384				design engineer
	ATION						A116		CAS	NO	CAMPI ES	CORE BAR	HOLE NO. B 165
_	FACE E				YPE		AUG	EK	L/AS	NG	SAMPLEN	COREBAN	LINE & STATION
	E FINIS				ZE I.D		├		 -				OFFSET
I		WATER OBSERVATION	HF		AMMER		 					BIT	N. COORDINATE
T		T. AFTER			AMMER								E. COORDINATE
			IPLE					SLOWS					
DEPTH	CASING BLOWS PER	DEPTHS IN FEET FROM - TO	NO.		REC.	TYPE	SA	6 INC ON WPLE 6-12	R	STR/ CHAI DEP ELI	NGE TH	REMA	D IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF WATER, SEAMS IN ROCK, ETC.)
-	FOOT	119'-121'	18	24	24	D	Wt.		lods			Very soft	, Red-Brown VARVED CLAY
												and SILTY	CLAY
2		124'-126'	19	24	24	D	Wt.	of	Rods			(s	ame as D18)
		127.5' (Tip)	V10									(See Va	ne Shear Report V10)
.3		129'-131'	8	24	24	UP							
13		134'-136'	20	24	24	D	Wt.	of	Rods			(8	ame as D18)
		137.5' (Tip)										•	nne Shear Report V11)
14		139'-141'	21	24	24	D	Wt.	of	Rods			and SILTY	, Red-Brown VARVED CLAY CLAY
L4		144'-146'	9	24	24	UP						•	
		147.5' (Tip)	V12									•	ane Shear Report V12)
15		149'-151'	22	24	24	D	Wt.	of	Rods			(8	same as D21)
15		154'-156'	23	24	24	D_	Wt.	of	Rođs			(8	same as D21)
-	POW CO	OUND SURFACE TO		EET	ISED		INCH (ASING	THE	<u> </u>	INC	H CASING FOR	R FEET
		IN EARTH			GE IN					•	NO. OF S		HOLE NO. B 165
S	AMPLE T	YPE CODING:	1	D=DR		C	= COR			N= AU(E = 20 -	BER		RBED, PISTON V=VANE TEST

		n. Ho	llev					FT	ORM	SM-1	REV. I	V83			SHEET	5 OF	5
		RING CREV	W LEADI	ER	ł		DE	DADT	MENT	OFT	RANSF	ORTAT	NOF			ILLING CO.	e No. 2
	С.	Harrima INSPECT	n		ᆜ_		MADTE	BU P⊸nen:	ABOR		EPOR	T.			BOR	ING CONTRA	CTOR
	UAI E	Y & ALDRIC									BRIDG					TEINMAN	
-		SOILS ENGIN					T NO.		-384	. 0,					DE	SIGN ENGIN	veer
LOC	ATION																
	FACE E	LEV.						AUC	BER	CAS	ING	SAMPL	ER	CORE BAR		B 165	5
	E FINIS					YPE		 		<u> </u>					LINE & STAT	IUN	
		WATER OB				ZE 1.D		 		├—				BIT	OFFSET N. COORDINA	TF	
AT			TER TER			AMMER	FALL	╁─╴		 				D1 1	E. COORDINA		
AT		T. AF		APLE	13. 11/	- Man C I	TACE		BLOWS	L			T				
0		DEPT		T	Π				R 6 INC		STR	ATA					
E	CASING	IN FI	EET	l		REC.			ON		CHA				D IDENTIFIC ARKS (INCL. C		
TH	BLOWS PER	FROM .	TO	NO.	NCH	INCH	TYPE		MPLE		DEP				WATER, SEAM		
	FOOT			L		-			6-12				77.0	- coft	, Red-Brow	m VADVE	D CYAV
		159'-16	<u>1 '</u>	24	24	24	D	WC.	of F	ogs				nd SILTY	•	WIL VARVE	D CLIKI
				-		 	-						۵.	d prpri	02.1		
				 	-		1										
16		164'-16	6'	25	24	24	D	1	2	20	16	51	He	rd, Red	-Brown SI	LT, some	coarse to
1										142							ravel and
		1/81 4	21	 	ZA	60	اجا	ļ	 	 	16	57'	<u>c]</u>	lay	-GLACIAL	TILL-	rown fine
		167'-17	7.	-		D=47							21	rained s	andv SIIT	STONE. 1	oints very
				-	1100	7	/0/								close, sh		
17																	derate to
															weathered	, modera	tely
													L£1	ractured	of Explor		. 1701
				-										Roccom	or Explor	ation at	. 1/2
17																	
									-								
							\dashv	-	\dashv								
				\vdash													
FR	OM GRO	UND SURFAC	E TO 14	44 FI	EET U	SED	4 1	NCH C	ASING	THEN	3	IN	ICH C	ASING FOR	167	FEE	7
FO	OTAGE	IN EARTH	167	F	OOTAG	E IN F	ROCK			5		NO. OF	SAM	PLES	25	HOLE N	0. B 165
ŀ		YPE CODING: ONS USED:	:		=DRI\ :E=1-1(_	= CORI = 10-2			= AUG = 20 -3	_		= UNDISTUR = 35 -50%	BED, PISTON	V=VAN	IE TEST

		A. Mason								REV. 8			SHEET 1 OF 5
	BO	RING CREW LEAD				DE				NNECT RANSP	ICUT ORTATI	ON	LOCATION Structure No. 2
		E. Henderson					BU	IREAU	OF F	IIGHW	/AYS	=	GUILD DRILLING CO., INC. BORING CONTRACTOR
		INSPECTOR		T	OWN	HART	FORD	-FAS	ል _ት ግ	RPP8	D CT		
H	ALEY	& ALDRICH, IN	C.	P	ROJEC	T NAM	E	CHA	RTER	OAK	BŘIDG	E	STEINMAN
		SOILS ENGINEER		P	ROJEC	T NO.		63-	384				DESIGN ENGINEER
.00	ATION	Structure N	0.2	(Rt.	15 /			.)				
UR	FACE E						AUG	ĘR	CAS	ING	SAMPLE		HOLE NO. B 166
DAT	E FINIS	HED 12/22/8	6	T	YPE					-NW	s/s	NV II	LINE & STATION
	GROUNE	WATER OBSERVAT		<u></u>	ZE I.D		L				1-3/8		OFFSET
_	4.25				MMER		<u> </u>		300		140#		N. COORDINATE 337036.45
<u>\T]</u>	9.5			RS. H	AMMER	FALL			24	4"	30"		E. COORDINATE 628813.51
D			MPLE				_	BLOWS		STR			
E	CASING	DEPTHS	1	DEN	REC.		PER	6 INC	HES	CHA		FIFE	LD IDENTIFICATION OF SOIL.
P	BLOWS PER	IN FEET	1	INCH		TVE		ON UMPLE		DEP			ARKS (INCL. COLOR, LOSS OF
H	PER	FROM - TO	MO.	Inch	inch	, ,,,		6-12		ELI	EV.	WASH	I WATER, SEAMS IN ROCK, ETC.)
-	P	0'-1.5'	1-	18	15	D	1	2	4			Loose, Rr	own fine SAND, some silt,
	U	~ <u>-</u> 1.,	+	╁╩╴	 	"	-	┢	-		1		gravel, organic material,
	s		1	 	1			†		3	•	Black Top	
	H		†	1	1						1		
5		4'-5.5'	2	18	16	D	4	6	6		1		ense; Brown medium to fine
•											J	SAND, som	ne silt
	17										1		
	22									l	l		
	16		1	<u> </u>						l		-	
10		9'-10.5'	3	18	18	D	12	7	8	ł	I		ense, Brown medium to fine
	19		╀—		 			 		l	1		tle coarse sand and fine
	21		┼—	┼	 			 		ł	I	gravel, t	crace of silt
	24 23	 	╂	┼─	 	-	 	 	-	ł	ı		
10	16	14'-15.5'	4	18	12	<u> </u>	6	6	6	ł		Medium de	ense, Brown medium to fine
15	20	1 TT -17.7	+ - -	1 40	+**	Н	۳	1	۲	1			ace of coarse sand, silt
	30		1		1					1	1	J. 4. 2. 9	value sand, value
	36									1			
	39									1			
20		19'-20.5'	5	18	14	D	7	8	9	ł	1	(8	same as D4)
	25		 	 	 	ļ	<u> </u>			ł		-A	ALLUVIUM-
	27		+-	┼─	┼—	 		_	┼─	_22	.5'		
	19 18		+-	+	+			 	 				
25		24'-25.5'	6	18	18	D	2	3	2	1	I	Medium st	tiff, Gray VARVED SILT
23	P	1	Ť	Ť	T.				1	1	1	and CLAY	
	U]	ı	<u>.</u>	
	S]	1		
	H	*******	1	1				ļ, .	ļ.	1	1		
30	E	29'-30.5'	17	118	18	D	3	4	4	ł		(1	same as D6)
	P		 	╂	₩	 		-	┼—	1	l		
			+	+	+	 		 	┼	ł	i		
	-		+-	+	+	 			+	1	I		
35		34'-35.5'	8	18	18	D	2	3	3	1			same as D6)
33		33.3	 	1	† *	۲		 	1	1		``	
										1			
]			
]			tiff, Gray VARVED CLAY
_		39'-40,5'	9	18		D	2	3	3	<u> </u>		and SILT	
F	ROM GR	OUND SURFACE TO		FEET (JSED		INCH (CASING	THE	<u> </u>	IN	ICH CASING FO	R FEET
E1	OTACE	IN EARTH		FOOTA	GE IM	BUCK					NO OF	SAMPLES	HOLE NO. B 166
	JUIAGE	IN CARIT		OUTA	OE IN	NUCK					NO. UF	JAMI LLJ	HOLE NO. B 100
S/	WPLE T	YPE CODING:		D=DR	IVE	C	= COR	E		A=AUG	GER	UP=UNDISTU	IRBED, PISTON V=VANE TEST
		IONS USED:	TRA	CE=1-	10% L					E = 20 -		AND = 35 -50%	
	UR 11		1 11 1	- L- I-	ייי סקט:	~	,0-	-V/II	JUMI	20.	- OJA		

		· .								ببب					
	PO	A. ME			-		_	F ST	FORM ATE O	SM-I	REV. E	1/83 CICIT		SHEET 2 OF 5	
			CREW LEA	DEK			DE	PARTI	MENT	OF T	RANSP	PORTATIO	M	LOCATION Structure No. 2	
<u> </u>			derson ECTOR		 _			BU	JREAU	J OF F	HIGHW	VAYS		GUILD DRILLING CO., INC.	
١,,	A T THE											RD CT		STEINMAN	
			RICH, I	INC.			CT NAM		63-3		UAK	BRIDGE	<u> </u>	DESIGN ENGINEER	
<u> </u>	_	301 L3 E	NUINEER			KOJEC	JT NU.		03-	304				, DESIGN ENGINEER	
	ATION FACE E	- EV			_			AUG	~ED	CAS	ING	CAMPI FI	R CORE BAR	HOLE NO. B 166	
	E FINIS				+	YPE			161	T	ING	374117	T CONE OF	LINE & STATION	
			OBSERVA.	TIONS		IZE I.D		+		 				OFFSET	
		T.	OBSERVA AFTER			AMMER		+-		 			BIT	N. COORDINATE	
AT AT		FT.	AFTER		_		R FALL	 		 			+	E. COORDINATE	
	j	``		SAMPLE	************			 				<u> </u>		a. 000	
D		D	EPTHS			T	T	•	BLOWS R 6 INC		STR	ATA'			
	CASING	IN	FEET	1	PEN.	REC.	,	'	ON	`` `	CHA	NGE		ELD IDENTIFICATION OF SOIL.	
T	BLOWS PER	FROM		NO.	NCH	INCH	TYPE	l s/	AMPLE	R	DEP			MARKS (INCL. COLOR, LOSS OF H WATER, SEAMS IN ROCK, ETC.)	
	FOOT	PRUM	• TO		<u> </u>		<u></u> '		6-12		ELI	·v	WA	M WATER, SEAMS IN NOUN, ETC.,	
											İ				
											i	l			
1											i	I.			
45		44 -	45.5'	10	18	18	Ω	2	2	3				tiff, Gray VARVED CLAY	
					—	—	igspace				i	1	and SILT	Y CLAY	
1		<u> </u>			↓		igspace				l	ı			
		<u> </u>			 	↓	—↓				i	ı			
		1-201	FX FT	 '	1.	1	لــــــــــــــــــــــــــــــــــــــ	<u> </u>	ليا	<u> </u>	i	1		-10	
50	49'-50.5' 11 18 18 D 2 2 3 (same as D10)														
		 		 '	—	┼	↓ /	-			l	1			
					₩	┼	├ ─┤			\vdash	l	l		1	
					├─	+	₩	-			i	1			
55		541.	-55.5'	12	18	18	D	1	2	2	i	1	Coft Br	own Gray VARVED CLAY and	
ادوا			7700	+==		+	1	 	-	-	i		SILTY CL		
				1	 	 	\vdash				l	ı	OTHIT OF	NI .	
											l			•	
											l	1			
60		59'-	60.5	13	18	18	D	1	1	1	l	1	Soft, Gr	ay VARVED CLAY and SILTY	
											İ		CLAY		
											l	1			
		<u> </u>									i	1		l de la companya de la companya de la companya de la companya de la companya de la companya de la companya de	
				 -'	<u> </u>	↓ '	igspace				l	1			
65		64'-	-65.5'	114'	18	18	D.	WOR	1	1_	l	- 1		(same as D13)	
1				 -'		 '	├ ─┤	 		 	l				
		 				├ ──'		 		-	l				
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1_0		691	-70 . 5	15	118	18	1	7.7 4-	Rod	 -	l	1	** aof	the Desire Orace OTAY and	
70		05	70.5	+	10	+-	╨┵	WLO	Koa		i		-	t, Brown-Gray CLAY and	
				+	\vdash	 	-		-		l		SILTY CL	AY	
		 		+	\vdash	+	 	\vdash			l	1			
		 		+	\vdash	-	-			-	i	1			
75		74'-	75.51	16	18	18	n	Wt.	of	Rods	l	1		(same as p15)	
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				\Box											
FR	OM GRO	UND SUI	RFACE TO	F	EET U	JSED		NCH C	ASING	THEN		INC	H CASING FO	R FEET	
FO	DTAGE	IN EART	H	F	OOTA	GE IN I	ROCK					NO. OF S	AMPLES	HOLE NO. B 166	
١	-· - - .			_		_									
		YPE COD ONS USFI			D=DRI			= COR	E OOL		\= AUG := 20 -:		UP = UNDISTU ND = 35 -50%	JRBED, PISTON V=VANE TEST	

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_		A 2/0.00					F	OPM	SM-1 I	PV 1	/83		SHEET 3 OF 5
	ВО	A. Mason RING CREW LEADE	R	\dashv			STA	TE O	F CON	INECT	ICUT	NA.I	LOCATION Structure No. 2
		C. Harriman					BU	REAU	OF H	IIGHW	ORTATIO VAYS		GUILD DRILLING CO., INC.
		INSPECTOR	_	T	OWN	HART	FORD	-FAS	NG R	RPP8	RD CT	<u> </u>	BORING CONTRACTOR
		& ALDRICH, IN	<u>c.</u>	_	ROJEC		E			OAK	BRIDG	E	STEINMAN Design engineer
		SOILS ENGINEER		<u> P</u>	ROJEC	T NO.		<u>63-</u>	384				DESIGN ENGINEER
	ATION						AUG	E D	CASI	NO	CAMPI E	R CORE BAR	HOLE NO. B 166
	FACE E			-	YPE		1	EN		110	3700. CC.	TOUR DAIL	LINE & STATION
		WATER OBSERVATION	WS.		ZE I.D		\vdash						OFFSET
		T. AFTER			AMMER							BIT	N. COORDINATE
AT AT		T. AFTER	HR	rs. H	AMMER	FALL							E. COORDINATE
D			PLE				8	LOWS					
E		DEPTH\$		DEN	REC.		PER	6 INC	HES	STR	NGE	FIFI	D IDENTIFICATION OF SOIL
P	CASING BLOWS PER	IN FEET	NO.		INCH	TVE		ON MPLE		DEP	TH	REM	ARKS (INCL. COLOR, LOSS OF
H	PER FOOT	FROM - TO						6-12		ELI	EV.	WASH	WATER, SEAMS IN ROCK, ETC.)
┢		79'-80.5'	17	18	18	D	Wt.		Rods			Very soft	, Gray to Brown VARVED
1											1	CLAY and	SILTY CLAY
			<u> </u>		<u> </u>								
l		0/1 05 51	-	 	1	_							ac p17\
85		84'-85.5'	18	18	18	D_	Wt.	OI	Rođe			(;	same as D17)
l			_	 	 						1		- :
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]											1		
90		89'-90.5'	19	18	18	D	Wt.	of	Rods			(1	same as D17)
l			├	├	 								
ı		<u> </u>	-	 	 								
											ł		
95		94'-95.5'	20	18	18	9	Wt.	of	Rods		1	(same as D17)
	<u></u>			 									
1				╁	 								
l				†	<u> </u>						1		
loc		99'-100.5'	21	18	18	D	Wt.	of	Rods			(same as D17)
1													
1	<u> </u>			┼	 			-			1		
ı		<u> </u>	 	-	+-			-					
Los		104'-105.5'	22	18	18	D	Wt.	of	Rods			Very sof	t, Gray to Red-Brown VARVED
•												CLAY and	SILTY CLAY
١.	<u></u>	·	 	<u> </u>	↓						l		
1					-								
110	J	109'-110.5'	23	18	18	<u> </u>	Wt.	of	Rods		1		(same as D22)
1											1		
ļ											1		,
			 		 		 	 	-	l	1		
l		114'-115.5'	24	18	18	1	Wt.	Cf	Rods	1	1		(same as D22)
11	1	* *** -**?*?		1.0	1.0	۳-	75	"	vas	1	1		(
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1	ROM CIP	OUND SURFACE TO	<u> </u>	EET	USFD		INCH (CASING	THEN	<u></u>	IN	CH CASING FO	R FEET
Ė													
F	OOTAGE	IN EARTH		OOTA	GE IN	ROCK					NO. OF	SAMPLES	HOLĖ NO. B 166
				D-D-		_							DOTA NOTAL VEVANS TEST
1		YPE CODING: ONS USED:		D=DRI CE=1.	10% L	_	= COR			N= AU E = 20 ·		UP=UNDISTU ND=35 <i>-</i> 50%	RBED, PISTON V=VANE TEST
1''	· · · · · · · · · ·	JIIJ UJED.	. ~~		· - 0		10-			- 44.	- HOP		

_		A. Mason RING CREW LEADI . Harriman INSPECTOR	ER		OWN		ST/ PART! BL	MENT	OF F	NNECT RANSI HIGHV	ICUT PORTATION	N	SHEET 4 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC., BORING CONTRACTOR
		& ALDRICH, I	NC.	P	ROJEC	T NAN	E	CHA			BRIDGE		STE INMAN DESIGN ENGINEER
oc	ATION	SOLS ENGINEER			NOJEC	i ko.		03-					
_	FACE E				YPE		AUG	ER	CAS	ING	SAMPLER	CORE BAR	HOLE NO. B 166
_	E FINISI	WATER OBSERVATION	ONS	_	ZE I.D		†						OFFSET
I		T. AFTER	HR		MMER							BIT	N. COORDINATE
_		T. AFTER	HR APLE	rs. H	AMMER	FALL	/		<u> </u>		<u> </u>	1	E. COORDINATE
D E P T H	CASING BLOWS PER FOOT	DEPTHS IN FEET FROM - TO			REC.		PER S/	SLOWS 6 INC ON MPLE 6-12	HES	STR. CHA DEF EL	NGE	REM	D IDENTIFICATION OF SOIL. ARKS (INCL. COLOR, LOSS OF WATER, SEAMS IN ROCK, ETC.)
		119'-120.5'	25	18	12	ת			Rods			Very soft	, Red-Brown VARVED CLAY CLAY
25		124'-125.5'	26	18	18	n	Wt.	of	Rođs			(8	ame as D25)
30		129'-130.5'	27	18	18	D	Wt.	of	रेव्ते ड			(s	ame as D25)
3		134'-135.5'	28	18	18	D	Wt.	of	Rođs			(8	ame as D25)
4(139'-140.5'	29	18	14	D	Wt,	Rod	з 2			(same as D25)
45		144'-145.5'	30	18	15	D	WOR	2	2			Soft, Red SILTY CLA	-Brown VARVED CLAY and Y
59		149'-150.5'	31	18	18	D	1	2	3				iff, Red-Brown VARVED
5:	· 	154'-155.5'	32	18	18	D	1	2	2			Soft. Red	-Brown VARVED CLAY and
J :			<i>y</i>									SILTY CLA	
FF	ROM GRO	UND SURFACE TO	F	EET	SED		INCH (CASING	THEN		INC	H CASING FOR	FEET
FO	OTAGE	IN EARTH	F	ATOO	GE IN	ROCK					NO. OF SA	AMPLES	HOLE NO. B 166
SA	MPLE T	YPE CODING: ONS USED:		D=DRI		C	= COR			N = AU	GER L		RBED, PISTON V=VANE TEST

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FORM SM-1 REV. 8/83
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS OF 5 SHEET Mason Structure No. LOCATION BORING CREW LEADER GUILD DRILLING CO., INC.
BORING CONTRACTOR C. Harriman TOWN HARTFORD-EAST HARTFURD TT NSPECTOR STEINMAN CHARTER OAK BRIDGE PROJECT NAME HALEY & ALDRICH, INC. DESIGN ENGINEER 63-384 PROJECT NO. SOILS ENGINEER LOCATION SAMPLER CORE BAR HOLE NO. B 166 CASING AUGER SURFACE ELEV. LINE & STATION TYPE DATE FINISHED OFFSET GROUND WATER OBSERVATIONS SIZE I.D. BIT N. COORDINATE HAMMER WT. HRS. AFTER AT E. COORDINATE HAMMER FALL HRS. AFTER AT SAMPLE BLOWS D STRATA PER 6 INCHES DEPTHS FIELD IDENTIFICATION OF SOIL E CHANGE PEN. REC. ON REMARKS (INCL. COLOR, LOSS OF CASING IN FEET P DEPTH NCH HNCH SAMPLER T WASH WATER, SEAMS IN ROCK, ETC.) ELEV. FROM 0-6 6-12 12-18 FOOT Red Drown VARVED CLAY and SULTY CLAY of Rods Wt. 159'-160.5' 12 18 161.5' 162' GLACIAL TILL-Decomposed Bedrock rill Rate 165 Mih/Ft Moderately hard, Red-Brown fine 165 60 | 54 C 8 165'-170' grained sandy SILTSTONE. Joints 167' 8 (ROD=7% very close to close, shallow dipping, 8 occasionally steeply dipping, bedding 9 very thin, rock slightly weathered, 9 moderately fractured Moderately hard, Red-Brown fine grained sandy SILTSTONE and coarse to fine grained SANDSTONE, extremely fractured, moderate to slightly weathered Bottom of Exploration at 170' FEET 165 INCH CASING FOR 4 INCH CASING THEN FROM GROUND SURFACE TO 29 FEET USED 33 **HOLE NO.** B 166 NO. OF SAMPLES FOOTAGE IN EARTH 165 FOOTAGE IN ROCK V=VANE TEST C=CORE A=AUGER UP = UNDISTURBED, PISTON D=DRIVE SAMPLE TYPE CODING: TRACE=1-10% LITTLE= 10-20% AND = 35 -50% SOME = 20 -35% PROPORTIONS USED:

		A. Mason RING CREW LEAD . Henderson	ER			DE	ST.	ATE O	F CON	REV. 8 NNECT RANSP HIGHW	ICUT ORTATIO	N	SHEET 1 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC.		
н	ALEY	INSPECTOR & ALDRICH, IN SOILS ENGINEER	c.	Р	OWN ROJEC	T NAM	FORD	-BOR	NO R THA RTER		BORING CONTRACTOR STEINMAN DESIGN ENGINEER				
oc	ATION						St.								
	FACE E	LEV. 39.5				AUC		CAS	NG	SAMPLER	CORE BAR	HOLE NO. B 167			
AT	E FINIS	HED 12/12/8		YPE				8877	-NW	s/s	NV II	LINE & STATION			
		WATER OBSERVATI		ZE 1.D		ļ	30		3" 1-3/8 0# 140#			N. COORDINATE 337223.09			
I_ T		T. Collapsed		AMMER AMMER					411	30"	BIT	E. COORDINATE 537223.09			
			MPLE	13. 111	710841 C 11	TALL	_	LOWS					21 000.0		
DEPTHS PET NO. INC.					REC.	TYPE	PER S/	6 INC ON UMPLE	HES R	CHANGE DEPTH ELEV.		FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)			
_	FOOT		 	1.0	1	_		6-12				S C1 D			
		0'-1,5'	┼┸	118	16	P	1	2	1			Soft, Bro trace of	wn SILT, little fine sand, roots -TOPSOIL-		
			+-		1		 	\vdash		_2,	5'	CLACE UI	FOCES -IOLDOID-		
5		4'-5.5'	2	18	18	D	3	4	4		1	Loose, Orange-Brown medium to fine SAND, little silt, trace of coarse sand			
		9'-10.5'	3	18	17		4	6	8			Wadium da	ense, Brown coarse to fine		
0		y -10,5			-			0	•				ice of silt		
15		14'-15.5'	4	18	14	D	3	5	7	13			ense, Brown medium SAND, se to fine sand, trace -ALLUVIUM-		
20		19'-20.5'	5	18	18	D.	1	2	2			Soft, Gra	y SILT, some clay		
25		24'-25.5'	6	18	18	D	1	1	1			Very soft	., Gray SILT, some clay		
30		29'-30.5'	 	18	. 18	D	1	1	2			((same as D5)		
										3:	3'	`	•		
3 5		34'-35.5'	8	18	18	D	1	1	1			Very soft	Gray VARVED CLAY and		
		201 /0 61		10	10		770=		1			Very soft	t, Gray CLAY and SILTY CLAY		
F	ROM CE	39'-40.5'	19	18 EET L			WOR	ASING	THEN		INC	H CASING FOR	FEET		
<u></u> -	.cm um	SUMD SURFACE TO			,,,,,,				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	•	11101				
FC	OTAGE	IN EARTH	F	OOTA	GE IN	ROCK					NO. OF S	AMPLES	HOLE NO. B 167		
SA	MPLE T	YPE CODING: ONS USED:		D=DRI CE=1-1			= COR			\= AUG		up = undistui id = 35 -50%	RBED, PISTON V=VANE TEST		

		A. M RING CI E. Hen				ST. PARTI BU	ATE C MENT JREAU	SM-1 OF COI OF T	SHEET 2 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC.						
H	ALEY		CTOR RICH, IN	ic.		OWN					BORING CONTRACTOR STEINMAN				
		SOILS EN				PROJECT NAME CHARTER OAK BRIDG PROJECT NO. 63-384								DESIGN ENGINEER	
	ATION							A114	50	046	100	44401.50	0005.040	Luci s no 2 167	
_	FACE E			-	YPE		AUC	JEK_	CAS	ING	SAMPLER	CORE BAR	HOLE NO. B 167 LINE & STATION		
_			OBSERVAT	ONS	_	ZE I.D								OFFSET	
I	f		AFTER			AMMER							BIT	N. COORDINATE	
\T		т	AFTER	MPLE	RS. H	AMMER	FALL			<u> </u>	r	<u> </u>	<u> </u>	E. COORDINATE	
0		DE	PTHS	T		T	T		BLOWS R 6 INC		STR	ATA'			
E CASING T BLOWS PER FOOT		IN FEET		NO.		REC. INCH		ON			DEF	NGE PTH EV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)		
				-	-										
		7/// 1-	45.5	10	18	18	-	WOR	ļ <u>.</u>	12"		l,		Chan CIAV on 1 CIIIII CIAV	
5		444	43.3	110	1.0	10	D	WUK	-	12		very soit		; Gray CLAY and SILTY CLAY	
				╁	-	├				-					
0		49'-	50.5'	11	18	18	D	ī	1	1			(same as plo)	
													`		
				┼—	_	-		 	 	-					
55		54'-	55.5'	12	18	18	D	WOR	1 -	12'			((same as D10)	
	-			╁	ļ	-	-			-					
		501	60.5	12	10	10		100							
60		39 -	6U.5	13	18	18	P-	WOR.	1	1			((same as D10)	
				-											
55		64'-	65.5	14	18	18	D	WOR	1	1			((same as D10)	
•			************	-	-	-									
						$\overline{}$									
70		69'-	70,5'	15	18	18	D	Wt.	Rod	s 1				, Brown-Gray VARVED CLAY	
						$\vdash \vdash$	-			-			and SILTY	CLAY	
, _		74'-	75.5'	16	18	18	D	₩OR	7 -	12"		1		(same as D15)	
75							ע	VOR	-				•	Counc do DIJ)	
												1			
				\vdash						-	'				
			80.5	17	18	18	D	VOR	1	1			((same as D15)	
FR	OM GRO	UND SUR	FACE TO	F	EET U	SED			ASING	THEN		INCH	CASING FOR		
FO	OTAGE (N EARTH	1	F	00TA	GE IN F	ROCK					NO. OF SA	MPLES	HOLE NO. B 167	
SAI	MPLE TY	PE CODE	NG:	E)=DRI		С	= COR			= AUG	ER U		RBED, PISTON V=VANE TEST	

Mason SHEET FORM SM-1 REV. 8/83 STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS BORING CREW LEADER LOCATION Structure No. E. Henderson GUILD DRILLING CO., BORING CONTRACTOR TOWN HARTFORD-FAST HARTFORD INSPECTOR STEINMAN HALEY & ALDRICH, INC. PROJECT NAME CHARTER OAK BRIDGE DESIGN ENGINEER SOILS ENGINEER PROJECT NO. 63-384 LOCATION AUGER CASING SAMPLER CORE BAR HOLE NO. В 167 SURFACE ELEV. TYPE LINE & STATION DATE FINISHED OFFSET SIZE I.D. **GROUND WATER OBSERVATIONS** N. COORDINATE HAMMER WT. BIT AFTER FT. HAMMER FALL E. COORDINATE FT. **AFTER** AT SAMPLE BLOWS D DEPTHS STRATA PER 6 INCHES FIELD IDENTIFICATION OF SOIL. PEN. REC. CHANGE CASING ON IN FEET REMARKS (INCL. COLOR, LOSS OF DEPTH BLOWS PER INCH INCH TYPE T SAMPLER ELEV. WASH WATER, SEAMS IN ROCK, ETC.) FROM - TO H FOOT 0-6 6-12 12-18 84'-85.5' 18 18 18 Wt. Very soft, Brown-Gray VARVED CLAY Rods 85 and SILTY CLAY 89'-90.5' 19 18 18 2 D Soft, Brown-Gray VARVED CLAY and 90 SILTY CLAY 20 | 18 | 18 | D 94'-95.5' WOR (same as D18) 95 21 99'-100.5' 18 18 Soft, Gray and Red-Brown VARVED 00 CLAY and SILTY CLAY 104'-105.5' 22 | 18 | 18 | D WOR 1 Very soft, Gray and Red-Brown VARVED .05 CLAY and SILTY CLAY 109'-110.5' 23 18 18 Soft, Gray and Red-Brown VARVED SILT 10 and CLAY 114'-115.5' 24 18 18 D WOR 1 2 Soft, Red-Brown VARVED CLAY and SILTY CLAY (same as D24) 119'-120.5' 25 | 18 | 18 | D WOR 1 FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET HOLE NO. B 167 FOOTAGE IN EARTH **FOOTAGE IN ROCK** NO. OF SAMPLES 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%

FORM SM-1 REV. 8/83
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS A. Mason SHEET 4 0F BORING CREW LEADER LOCATION Structure No. E. Henderson GUILD DRILLING CO. BORING CONTRACTOR TOWN HARTFORD - EAST HARTFORD, CT INSPECTOR STE INMAN HALEY & ALDRICH, INC. CHARTER OAK BRIDGE PROJECT NAME DESIGN ENGINEER SOILS ENGINEER 63-384 PROJECT NO. LOCATION CASING SAMPLER CORE BAR HOLE NO. AUGER B 167 SURFACE ELEV. LINE & STATION TYPE DATE FINISHED **GROUND WATER OBSERVATIONS** SIZE I.D. OFFSET HAMMER WT. BIT N. COORDINATE **AFTER** HRS. AT HAMMER FALL E. COORDINATE HRS. AT FT. **AFTER** SAMPLE **BLOWS** D STRATA DEPTHS PER 6 INCHES CASING PEN. REC. CHANGE FIELD IDENTIFICATION OF SOIL ON IN FEET REMARKS (INCL. COLOR, LOSS OF DEPTH BLOWS PER NO. INCH INCH TYPE T SAMPLER WASH WATER, SEAMS IN ROCK, ETC.) ELEV. FROM - TO H **FOOT** 0-6 6-12 12-18 124'-125.5' 26 18 18 Wt. D of Rods Very soft, Red-Brown VARVED CLAY 12 and SILTY CLAY 129'-130.5' 27 18 18 Wt. of Very soft, Red-Brown SILT and CLAY 130 134'-135.5' 28 18 Wt. of Rods 18 (same as D26) D 13 139'-140.5' 29 18 of 18 Wt. Rods (same as D26) 140 144'-145<u>.5'</u> מ | 18 | 18 | מ 14 (same as D26) 149'-150.5' 31 18 18 D of Rods Wt. 150 (same as D26) 154'-155.5' 32 18 18 Wt. of 15 (same as D26) 156' Brown coarse to fine SAND and SILT, 157' -GLACIAL TILLtrace gravel (observed from wash) Not coller Bit Decomposed Bedrock 160' to 160 FROM GROUND SURFACE TO **FEET USED** INCH CASING THEN INCH CASING FOR NO. OF SAMPLES HOLE NO. в 167 FOOTAGE IN EARTH FOOTAGE IN ROCK SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP = UNDISTURBED, PISTON V=VANE TEST PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% AND = 35 -50% SOME = 20 -35%

		Α.	Mason		-			F	ORM S	SM-1	REV.	/83_			SHEET 5	
	ВО	RING C	REW LEAD	DER	\neg		DE	DARTS	4FNT	OF T	NNECT RANSF		Structure No. 2 LING CO., INC.			
		-	enderson	_			BU	IREAU	OF I	EPOR	BORIN	G CONTRACTOR				
			ECTOR	_	1	OWN	HARTE	ORD-E	ADTER	OAK	BRIDG		EINMAN			
	HALE	POLI S E	DRICH, INC	• •		ROJEC			-384	UAK	UNIOU	DESI	ON ENGINEER			
. ~	ATION	301 L	NOMELN													
	FACE E	LEV.					AUGER CASING SAM						ER	CORE BAR	HOLE NO. LINE & STATIO	B 16/
DAT	DATE FINISHED														OFFSET	
	GROUND WATER OBSERVATIONS					ZE I.D. AMMER		├					BIT		N. COORDINATI	E
AT.		т т.	AFTER AFTER			AMMER								E. COORDINATI	E	
AT		1.		AMPLE				BLOWS								
DE		0	EPTHS					PER	6 INC	HES	STR	ATA NGE	l	FIFI	n IDENTIFICAT	TION OF SOIL.
P	CASING BLOWS	IN	FEET .	.	1	N. REC.		ON		_	DEP		FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF			LOR, LOSS OF
TH	PER	FROM	. TO	NO.	INCH	INCH	I TPE		MPLE 6-12		ELI	EV.	l		WATER, SEAMS	
Ë	FOOT	160	'-165'	+ 7	60	60	С	-	9	.2 .0		1	Mod	Jerately	hard, Red	-Brown fine graine
		100	-105			=837	_		9		Dril Rat		saı	ndy SILT	STONE. Jos	Ints very close to
ŀ									10		Min		clo	ose, sha	llow dippid	ng, bedding very
1							ļ		8		•				slightly v	
16					 	├	 		9		ł		mo	gerately	fractured	tion at 165'
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F	ROM GR	OUND SU	JRFACE TO	65	FEET	USED	4	INCH (ASING	THE	N .	3 1	NCH	CASING FOR	160	FEET
匚						OF ***	000"		5			NO 0	E CA	MPLES	32	HOLE NO. B 167
۴	DOTAGE	IN EAR	TH 160	U I	-UUTA	GE IN	MUCK					NU. U	. 3/	m: LLJ		
1	AMPLE T				D=DR CE=1-	IVE 10% L		:= COR E= 10-			A= AU E = 20 ·			P= UNDISTU) = 35 -50%	RBED, PISTON	V=VANE TEST

_		A. Mason					ORM :		SHEET 1 OF 1						
	ВО	RING CREW LEAD	7		DE	PARTI	NTE O	OF T	LOCATION Structure No. 2						
		H. Ernst			_		BL	IREAU	OF I	GUILD DRILLING CO., INC. BORING CONTRACTOR					
11	ATEV	INSPECTOR & ALDRICH, IN					BOR EAS	<u>' YA</u>	STEINMAN						
-		SOILS ENGINEER			T NAM		63-	RTER 384	DESIGN ENGINEER						
~	ATION	Structure			15 /		n St								
	FACE E		NO.	-	Vr.	17 /	AUG		CAS	ING	SAMPLE	R CORE BAR	HOLE NO. B 168		
•	E FINIS	37.1	T	YPE				М	Ā	s/s		LINE & STATION			
GROUND WATER OBSERVATIONS					ZE I.D				3	ij	1-3/8		OFFSET		
				25. H/	MMER	WT.				0#	140#		N. COORDINATE 337142.37		
T FT. AFTER HRS.				RS. H	HAMMER FALL					4"	30"		E. COORDINATE 628834.30		
)		SA			r	_	BLOWS		STR/						
	CASING	DEPTHS	.		REC.		PER	6 INC ON	HES	CHA		FIE	LD IDENTIFICATION OF SOIL.		
•	BLOWS	IN FEET	NO.	NCH		TYPE		WPLE		DEP	TH	REM	IARKS (INCL. COLOR, LOSS OF		
•	PER FOOT	FROM - TO	"				0-6 6-12			ELE	v.	WASH	WATER, SEAMS IN ROCK, ETC.)		
-			+				_	-		0,	9'	Asphalt			
		1'-2.5'	1	18	14	D	3	6	5			Medium dense, Brown medium to fine SAND, trace of silt, coarse sand,			
											1				
			1	1							- 1	fine grav	vel		
5		4'-5.5'	2	18	16	ם	5	5	7	5.	ς, Ι		(same as D1) -FILL-		
	<u> </u>		+	┼		_	<u> </u>	<u> </u>	-	۔۔۔	- 				
			+	+	├─	-		-		l	1				
	 	 	+-	 	 	 	 	 							
0		9'-10.5'	13	18	18	D	8	9	11		1	Medium de	ense, Brown medium to fine		
													ace of silt, coarse sand		
											1	•	-		
		 	1.	1	1.				<u> </u>		1		4.5		
15		14'-15.5'	4	118	18	P	5	7_	7_		1		(same as D3)		
		<u> </u>	+	 	+			-			1				
	 		+-	†	 	 	 -	-	 		1		-ALLUVIUM-		
			1				.			19	9'				
20		19'-20.5'	5	18	18	D	2	2	3			Medium s	tiff, Green-Gray VARVED CLA		
											- 1	and SILT	Y CLAY		
			ļ	1									•		
	<u></u>		 	╀	₩		 	 	 		1	0.5	and transfer or any and a second		
		24'-25.5'	6	10	18	-	1	2	2			•	ay VARVED CLAY and SILTY		
25		24 -23.3	+	+-0	1.0	-	 	-	+		1	CLAY			
	 	 	1	 	1	1					1	Bottom	of Exploration at 25.5'		
•			1								1				
					Ŀ						1				
30															
	<u> </u>		4	-	 	—	<u> </u>	 		l	1				
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_	PO:: 65	OUND SURFACE TO	20 -		1555	3	NC::	2461210	745	<u> </u>	101	CH CASING FO	R FEET		
_	NUM GR	DUNU SUKFACE TO	20	EET	ושפני	٠	inch (CASING	INE	1	111	UN UASING FU	n FEEI		
F(OTAGE	IN EARTH 25.5	5 •	FOOTA	GE IN	ROCK		0			NO. OF	SAMPLES	6 HOLE NO. B 168		
		YPE CODING:		D=DRI		_	= COR			\= AUG			IRBED, PISTON V=VANE TEST		
ř	OPORTI	ONS USED:	TRA	CE=1-1	10% L	ITTLE	= 10-	20%	SOME	E = 20 -	35%	and = 35 -50%			

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_														
	n:	C. Holley Boring Foreman		_			ST.	ATE O	F CON	1 ED. 1	UT			SHEET 1 OF 5
						DE	PART	MENT	OF TR	ANSPO	RTATIO	N		LOCATION See Plan
_	G	. R. May		<u> </u>				BORI	NG R	IIGHWA' EPOR	T			Guild Drilling Co., Inc.
	•• - •		•	-	OWN					Har				BORING CONTRACTOR S. B. G. & B.
		ey & Aldrich,	Inc.			TNAN		Ch		r Oal	<u> Bri</u>	dge		-
		SOILS ENGINEER				T NO.				-384				CONTRACTING ENGINEER
	ATION		te l	.5 @	Main	Str	eet	- Ea	st H	artfo				
SUR	FACE E						AUG	ER	CAS			LER CORE BAR		HOLE NO. B 10
DAT	E FINIS	HED 4/4/86			YPE				PW	HW	s/	s	NX	LINE & STATION
	GROUNE	WATER OBSERVATION	ONS	SI	ZE 1.0				5"	4"	1-3/	8''	2"	OFFSET
AT	37 F	T, AFTER O	HF	RS. H	AMMER	WT.				0#	140	#	BIT	N. COORDINATE 337194
AT	8.7 F	T. AFTER 2	HF	RS. H	MMER	FALL			2	4"	30	"	Dia.	E. COORDINATE 628763
٥		SAN	APLE					SLOWS						
F		DEPTHS	i					6 INC		STRA	TA			
Р	CASING		l	PEN.	REC.			ON		CHAN				D INDENTIFICATION OF SOIL.
•	BLOWS PER		NO.	NCH	INCH	TYPE	SA	MPLE	R	DEP				ARKS (INCL. COLOR, LOSS OF
н	FOOT	FROM - TO	1	1			0-6	6-12	12-18	ELE	٧.		WASH	WATER, SEAMS IN ROCK, ETC.)
	3	0'-1.5'	1	18"	17"	D	2	2	4	1		Med	dium sti	ff Gray SILT, little fine
	6									Ì				e of roots and grass
	9			1						1			7,	
	12		1	1	1-	\vdash	\vdash		t	-41				
5	12			1	1	\vdash					36.4			
,	15	5'-6.5'	2	18"	14"	D	3	5	5	•		Loc	ose Red	medium SAND, some silt
	20		 	1	Ť	T-	<u> </u>	<u> </u>	<u> </u>	1			4	
	37		 		 	-		-						
l	40		1	 	 			_	-	l				
٠.,	35	9'-10.5'	3	18"	16!"	D	7	10	11	l		Ma.	dium den	se Brown coarse to fine
10	47	7 10.3	-	+	-	1	-			ł			ND, litt	
	53		 	†	 	-				ł		0.3	ND, IIIC	ic biic
l	44		 	 	 				-	l				
1	37		-	 						1				
15		14'-15.5'	4	18"	14"	D	3	5	6	1		Mar	dium dan	ase Brown coarse to fine
l '°	57		 	-		-	-	-	 -	ł				e of silt
1	51		 	1	 					ł		SAL	ND, CIAC	e or sire
	70		1	 	 	-			-	ł				
i	140		_	 	 				-	1				
	98	19'-20.5'	5	18"	16"	D	6	8	9	1		Ma	44 don	se Brown coarse to medium
20	92	20.5	 	1	1	۳	<u> </u>	_	-	ł			7	e of fine sand
	108		_	 	 	-			-	1		SAL	ND, LIAC	e of time sand
l	111		_	}	 	_			-	1				
	83		 		-					24		İ		
٦.		24'-25.5'	6	18"	16"	D	4	4	4			Va.	14	ff Omer CTIM come along
25	110		Ť	ᢡ	٣	۳-	Ϊ	-	 	,	±U•4	Lie(áram stj	ff Gray SILT, some clay
1	70		 	1	-			 		1				
1	74		 	1	 	-	 -	 	 	ł		l		
	78		 	+	 			 		29	, •	l		•
			 	 	 	-		 	}		11.4			
30		21 51 254-1	771	+	 	-		 		1 "	TT • *	ł	(See We	ne Shear Report)
	}	31.5' (tip)	1 1	 				 		ł		f	(see va	me suear Keborr)
1		31:5'-33'	7	1011	18"	١		-	<u> </u>	1		80	ft Crev	SILT and CLAY
l	 	31.07 -32	 '	110	10	D	2	2	2	ł				ng ½" to ½" seams of gray
		34'-36'	7777	2/11	2/11					ļ		(4)	recinary	red gray silt)
35	 	J4 -J0	OLI	24"	24"	UP	ļ		ļ	Į		6,		
		36'-37.5'	-	100	1 5 11	┝ <u></u>	-			ł		0.4		arved CLAY-
		20 -21.2	8	12	15"	ρ	1	2	1	1				varved CLAY (same as S7)
	* Casing blows not obtained, washing													
l		10 51 6:4		-		_	ļi	ļ	<u> </u>	Į				of casing in clay strata
-	لـــــا	40.5' (tip)			<u>. </u>	لـــــا			<u> </u>	<u> </u>				ne Shear Report)
F F	ROW GRO	OUND SURFACE TO 2	29 F	EET	SED	5 1	NCH C	ASING	THEN	1 4	11	NCH C	CASING FOR	115 FEET
<u> </u>														
FO	STAGE	IN EARTH 162	F	OOTA	GE IN	ROCK	5 ^T	TYPE	N.	X	NO. OF	SAM	PLES	23 HOLE NO. B 10
' A	PLE T	YPE CODING:		D = DR			= COR	_	-	A = AUG	ER	UP	= UNDISTUR	RBED, PISTON V=VANE TEST
5.R	OPORTIO	ONS USED:	TRAC	E = 0 -1	0% L	ITTLE	= 10-	20%	SOME	E = 20 -3	15%	AND:	= 35 -50%	

NSPECTOR	-	E		T STATE OF CONNECTICUT								SHEET 2 OF 5 LOCATION									
SOILS ENGINEER PROJECT NAME Charter Oak Bridge SOILS ENGINEER PROJECT NO. 6-3-384 CONTRACTING ENGINEER COCATION REFACE ELV. 19 AUGER CASING SAMPLER CORE BAR HOLE NO. B 10 LINE & STATION CROUND WATER OBSERVATIONS SZE LD. 1 STRATA CROUND WATER OBSERVATIONS SZE LD. 1 STRATA CROUND WATER OBSERVATIONS SZE LD. 1 STRATA CROUND WATER OBSERVATIONS SZE LD. 1 STRATA CROUND WATER OBSERVATIONS SZE LD. 1 STRATA CROUND WATER OBSERVATIONS SZE LD. 1 STRATA CROUND WATER OBSERVATIONS SZE LD. 1 STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF FEEL STRATA CROUND WATER OBSERVATIONS OF STRATA CROUND WATER OBSERVATIONS OF STRATA CROUND WATER OBSERVATIONS OF STRATA CROUND WATER OBSERVATIONS OF STRATA CROUND WATER OBSERVATIONS OF STRATA CROUND WATER OBSERVATIONS OF STRATA CROUND WATER OBSERVATIONS OF STRATA CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSERVATIONS CROUND WATER OBSER			INSP	ECTOR		1	OWN	Hart	ford	BORL	NG RI	POR	j ford, (Conn.	ŀ	BORING CONTRACTOR					
SOLS ENGINEER PROJECT NO. 63-384 CONTRACTING ENGINEER ORACIO CATION WREACE ELEV. AUGER CASING SAMPLER CORE BAN HOLE NO. B 10 NET ETHINSTED GROUND WATER OBSERVATIONS SELID. IT FT. AFTER HRS. HAMMER MY. IT FT. AFTER HRS. HAMMER FAIL DEPTHS PER. REC. O-4 6-7 12-16 FOOT FROM TO NO. NICH NICH TYPE SAMPLER FOOT FROM TO NO. NICH NICH TYPE SAMPLER FOOT SOLS THAT THE SAME WAS COME SAME WAS WASH WATER, SEANS IN ROCK, ETC.) WE SAMPLER SOLS SAMPLE BLOWS FROM TO NICH NICH TYPE SAMPLER BLOWS FEEL ONCOUNTATE BLOWS FEEL ONCOUNTATE CHANGE CHANGE STRATA CONTRACTING ENGINEER FEEL ONCOUNTATE BLOWS FROM TO NO. NICH NICH TYPE SAMPLER CHANGE CASING FROM TO NICH NICH TYPE SAMPLER CHANGE CASING STRATA CONTRACTING ENGINEER OFFEST TO COPOUNTATE BLOWS STRATA CHANGE FIELD INDENTIFICATION OF SOIL REMARKS (INCL. COLON, LOSS OF REMARKS (IN															ヿ						
Note Note			SOILS E	NGINEER		P	ROJEC	T NO.				63-	384		\Box	CONTRACTING ENGINEER					
AFT E PRINSED			. P.J						4116		246		224401 61	2005.04	= T						
Second S						+	/DE		T	ER	CASI	NG	SAMPLE	CURE BA	_						
Tr. AFTER MSS. MANMER FALL				OBSERVATION	ONS.				┼─		-				_						
FT. AFTER HRS. MANNEE MRS. MANNEE MRS.	AT													BIT	_						
DEPTHS ASSING DEPTHS PEN, REC. PEN	AT	F	:T.			/S. H/	MMER	FALL							-						
Part Part	0				IPLE				_												
1 SLOWS FROM		CASING	_	EPINS		PEN.	REC.		PER		HES			FI	FLC	INDENTIFICATION OF SOIL					
# FOOT FROM - 10 0-6 6-77 12-15 ELEV. WASH WATER, EARS IN NOCK, ETC.) 1		BLOWS		/	NO.		1	TYPE	١,,			DEP	TH	RE	EMA	RKS (INCL. COLOR, LOSS OF					
Very soft Gray varved CLAY (same as S7) 44'-46' UP2 24" 22" UP 46'-47,5' 9 18" 14" D Wt, of Rods 50 50,5' (tip) V3	н		FROM	- TO								ELE	iv.	WA	SH 1	NATER, SEAMS IN ROCK, ETC.)					
46'-47.5' 9 18" 14" D Wt. of Rods 50.5' (tip) V3	\neg																				
46'-47.5' 9 18" 14" D Wt. of Rods 50.5' (tip) V3																					
46'-47.5' 9 18" 14" D Wt. of Rods 50.5' (tip) V3	•	 			 	<u> </u>							1								
46'-47.5' 9 18" 14" D Wt. of Rods 50.5' (tip) V3		 	1.41	1.41	11772	241	221			 			1		٠.						
### See Vane Shear Report See Vane Shear Report ### See Vane Shear Report ### See Vane Shear Report ### See Vane Shear Report ### See Vane Shear Report ### See Vane Shear Report ### Very soft Gray varved CLAY (same as S7) ### See Vane Shear Report ### See Vane Shear Report ### Very soft Gray varved CLAY (same as S7) ### See Vane Shear Report ### Very soft gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ### Very soft Gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ### Very soft Gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ### Very soft Gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ### Very soft Gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ### Very soft gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) #### Very soft gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) #### Very soft gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ##### Very soft gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ########## Very soft gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick) ###################################	45	 	44	-40	UEL	24	44	UP			-										
### Social Property See Vane Shear Report #### Social Property See Vane Shear Report #### Social Property See Vane Shear Report #### Social Property See Vane Shear Report #### Social Property See Vane Shear Report #### Very soft Gray varved CLAY (same as S7) See Vane Shear Report Very soft Gray varved CLAY (same as S7) See Vane Shear Report Very soft Gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then %" thick, re	!		461	-47.5	9	18"	14"	<u></u>	Wt.	of	Rods		1	(00	ame	: 48 5/)					
See Vane Shear Report	- 1												I								
See Vane Shear Report	, 1													.							
Solution Solution	50		50.	5' (tip)	<u>v3</u>									& ee	٧٤	ine Shear Report)					
Solution Solution	- 1	 			├ ──	 '	 														
Solution Solution	,	 	 		┝─┤	 	-	 		-	-		I								
Solution Solution	. !				$\vdash \vdash \vdash$	-				\vdash	\vdash		- 1								
Solution Solution	5 5		541	-56'	UP3	24"	22"	UP			\vdash		- 1								
(Same as S7) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (Same as S11) (Same as S11) (Same as S11) (See Vane Shear Report)													1								
(Same as S7) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (Same as S11) (Same as S11) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report) (See Vane Shear Report)	. !		56'	-57.5'	10	18"	18"	D	Wt.	of	Rods										
Solution Solution	'		<u> </u>		 								- 1								
Solution Solution	40			-1/-2-1	 ,,,	 -			\vdash		\vdash		1	1000		· ·					
Very soft gray varved CIAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then ½" thick) No 69'-70.5' 12 18" 18" D Wt. of Rods To 1" thick, red layers less then ½" thick) Very soft Gray varved CIAY (same as S11) S5 74'-75.5' 13 18" 18" D Wt. of Rods (Same as S 11) FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET FO TAGE IN EARTH FOOTAGE IN ROCK TYPE NO. OF SAMPLES HOLE NO. B 10 'AMPLE TYPE CODING: D=DRY C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST	2 0		60-	2.(E10)	A4-	 	-		-			į	1	(See	γè	ine Shear Report)					
Very soft gray varved CIAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then ½" thick) No 69'-70.5' 12 18" 18" D Wt. of Rods To 1" thick, red layers less then ½" thick) Very soft Gray varved CIAY (same as S11) S5 74'-75.5' 13 18" 18" D Wt. of Rods (Same as S 11) FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET FO TAGE IN EARTH FOOTAGE IN ROCK TYPE NO. OF SAMPLES HOLE NO. B 10 'AMPLE TYPE CODING: D=DRY C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST	1					<u> </u>	<u> </u>	 			-		1								
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Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then to 1" thick, red layers less then to 1" thick) 70 69'-70.5' 12 18" 18" D Wt. of Rods 80.5' (tip) V5	'		661	-K7 51	1	18"	1211	1	TJ+) of	2010	l	1								
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Very soft Gray varved CLAY (same as S11) Some as S11	i '												1			k, red layers less then					
(Same as S11) Same as S11	70		69'	-70.5 '	12	18"	18"	D	Wt.	of	Rods		1	•	•	7					
So.5' (tip) V5			<u> </u>		igspace								1								
80.5" (tip) V5 (See Vane Shear Report) FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET FOOTAGE IN EARTH FOOTAGE IN ROCK TYPE NO. OF SAMPLES HOLE NO. B 10 'AMPLE TYPE CODING: D=DRY C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST	Γ^{-1}		 		$\vdash \vdash \vdash \vdash$	 					 	İ	1	(54)	me	as SII)					
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E	BORING FOREMAN INSPECTOR					OWN		PAR	ATE O MENT NURFA	HOFM	NECTI ANSPO	CUT	ORR	SHEET 3 OF 5 LOCATION BORING CONTRACTOR			
					P	ROJE	T NA	AE	Char	ter	Oak :	Bridge	JIII .	BORING CONTRACTOR			
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		86'-	87.5	14	18"	18"	n	Wt.	of	lods			rery soit	Gray Red varved CLAY, Red fine sand laminae			
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				1	-				<u> </u>				trace sil	t laminae, varves g in thickness, red			
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E/3	TACE .	N FAR-	ш		0071	· E 14: -	200:										
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		INSP	FOREMAN ECTOR	_	FORM NO. SM-1 ED. 1/71 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN Hartford - East Hartford, Conn. PROJECT NAME Charter Oak Bridge								SHEET 4 OF 5 LOCATION BORING CONTRACTOR		
		SOILS E	NGINEER		P	ROJEC	T NO.				63-	-384			CONTRACTING ENGINEER
	FACE E	LFV.			_	-		AUG	ER	CASI	NG	SAMPLE	ER CORE	BAR	HOLE NO. B-10
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	157' E1116.6 Very dense Red GRAVEL, some silt,														
		†		t^-	T^{-}	1	t	1			Γ-:				coarse to fine sand -Till-
			-160.5		18"				19						,
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F	OUTAGE	IN FAR	TH		FOOTA	GE IN	ROCK		TYPE			NO. OF	SAMPLES	-	HOLE NO. B-10
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1	AMPLE T				D = DR E = 0 -			= COR E = 10-	_		A = AU E = 20		UP = UNI AND = 35 -		RBED, PISTON V=VANE TEST

_		BORING FOREMAN				TATE OF CONNECTICUT							SHEET 5 LOCATION	OF 5		
			INSPECTOR			OWN	Har	for	PORI	NG RI	EPOR Hart	ford,	, Coı	nn .	BORING	CONTRACTOR
			SOILS ENGINEER			KOJEC.					53-38		<i>1</i> 90		CONTRAC	TING ENGINEER
	00	ATION														
		FACE EL	LEV.		T			AUG	ER	CAS	NG	SAMPL	ER C	ORE BAR	HOLE NO.	в 10
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			WATER OBSERVATION	ONS .	_	ZE I.D.									OFFSET	
	AT		T. AFTER	HR	S. HA	MMER	WT.						BIT		N. COORDINATE	
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			162'-167'	C1	60"	46"	С				E1.	-121.		Red SANI	OSTONE and S	SILTSTONE
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	l												В	ottom of	f Exploration	on at 167'
	170												No	te: Se	observation	on Well Report
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								INCH (CASING FOR		FEET
FOOTAGE IN EARTH FOOTAGE IN ROCK							TYPE			NO. 01	FSAM	PLES		HOLE NO. B 10		
						DRY C = CORE 0-10% LITTLE = 10-20%				A = AUGER UP = UNDISTUR SOME = 20 -35% AND = 35 -50%				RBED, PISTON	V=VANE TEST	

STRUCTURE NO. 2 ROUTE 15 OVER MAIN STREET

TABLE I SUMMARY OF FIELD VANE SHEAR TEST RESULTS

		Ground Surface	:	Test	(1)	(1)	(2)
Test	(3)	Elev.	Depth	Elev.	Undisturbed		Sensi-
No.	Vane	(ft.)	(ft.)	(ft.)	Su (psf)	Su (psf)	<u>tivity</u>
							<u> </u>
B10/2	E	40.4	40.0	0.4	957	188	5.1
B10/3	E	40.4	50.0	-9.6	1084	166	6.5
B10/4	E	40.4	60.0	-19.6	1327	232	5.7
B10/5	F	40.4	80.0	-39.6	1187	432	2.7
B10/6	F	40.4	95.0	-54.6	1500	585	2.6
B10/7	F	40.4	109.5	-69.1	1755	739	2.3
B10/8	F	40.4	130.0	-89.6	2161	940	2.3
B165/1	0	39.2	37.5	1.7	1100	175	6.3
B165/2	0	39.2	47.5	-8.3	1275	244	5.2
B165/3	0	39.2	57.5	-18.3	1432	454	3.2
B165/4	0	39.2	67.5	-28.3	1519	471	3.2
B165/5	0	39.2	77.5	-38.3	1606	419	3.8
B165/6	0	39.2	87.5	-48.3	1868	594	3.2
B165/7	0	39.2	97.5	-58.3	1571	602	2.6
B165/8	0	39.2	107.5	-68.3	2174	681	3.2
B165/9	0	39.2	117.5	-78.3	1860	367	5.1
B165/10	0	39.2	127.5	-88.3	1781	1074	1.7
B165/11	0	39.2	137.5	-98.3	2540	655	3.9
B165/12	0	39.2	147.5	-108.3	3038	1362	2.2

Notes:

- (1) Su = Shear Strength(2) Sensitivity = Undisturbed/molded shear strength(3) See Table II for Vane Dimensions

APPENDIX C
RESULTS OF LABORATORY TESTING





Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: md
Sample ID: --- Test Date: 07/01/16 Checked By: emm

Depth: --- Test Id: 382134

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
S6043-1	UP- 1 - Top	43-45	Moist, gray clay	50.1
S6043-1	UP- 1 - Top middle	43-45	Moist, gray clay	49.3
S6043-1	UP- 1 - Bottom middle	43-45	Moist, dark gray clay	51.1
S6043-1	UP- 1 - Bottom	43-45	Moist, dark gray clay	47.7
RW-5	UP- 1 - Top	37-39	Moist, reddish brown clay	44.1
RW-5	UP- 1 - Top middle	37-39	Moist, reddish brown clay	48.2
RW-5	UP- 1 - Bottom middle	37-39	Moist, reddish brown clay	52.0
RW-5	UP- 1 - Bottom	37-39	Moist, reddish brown clay	50.2

Notes: Temperature of Drying : 110° Celsius



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: GA
Sample ID: --- Test Date: 07/01/16 Checked By: emm

Depth: --- Test Id: 382122

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
S5796-1	UP- 1 - Top	67-69	Moist, gray clay	45.6
S5796-1	UP- 1 - Top middle	67-69	Wet, gray clay	40.1
S5796-1	UP- 1 - Bottom middle	67-69	Moist, greenish gray clay	43.3
S5796-1	UP- 1 - Bottom	67-69	Wet, greenish gray clay	43.4
S6043-1	UP- 2 - Top	53-55	Moist, gray clay	58.9
S6043-1	UP- 2 - Top middle	53-55	Moist, gray clay	51.3
S6043-1	UP- 2 - Bottom middle	53-55	Moist, greenish gray clay	52.2
S6043-1	UP- 2 - Bottom	53-55	Moist, greenish gray clay	53.3

Notes: Temperature of Drying : 110° Celsius



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: --- Sample Type: --- Tested By: jbr Sample ID: --- Test Date: 07/26/16 Checked By: emm

Depth: --- Test Id: 384878

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
S1-2	S-2	4-6 ft	Moist, red sand with gravel	7.1	6.5
S1-5	S-3	10-12 ft	Moist, reddish brown silt with gravel	7.4	6.2
S1-S12	S-2	5-7 ft	Moist, reddish brown silt with gravel	8.1	7.2
S2-1	S-4	15-17 ft	Moist, reddish brown silt with gravel	6.8	6.6
S2-3	S-2	5-7 ft	Moist, reddish brown clay	7.5	7.3
S-0480-1	S-5	14-16 ft	Moist, olive brown silt	4.5	4.3
S-0480-2	S-3	9-11 ft	Moist, olive brown silt	6.3	6.0
S-06043-1	S-2	5-7 ft	Moist, brown sand	7.5	6.8

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used



emm

Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

GTX#: 304831 Test Date: 07/26/16

Tested By: jbr Checked By:

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) ⁻¹
S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04
S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04
S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04
S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04
S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03
S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04
S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04
S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box

> Water added to sample to create a thick slurry prior to testing (saturated condition). Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)

Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.



6100 HILLCROFT PHONE (713) 369-5400

REPORTED TO:

HOUSTON, TEXAS 77081 FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE

REPORT DATE:

08-01-16

(GTX 304831)

CLIENT NUMBER: JOB NUMBER:

04.1115-0003

FOR: GEOTESTING EXPRESS, INC.

REPORT NUMBER:

04.1115-000

125 NAGOG PARK ACTION, MA 01720

DATE SAMPLED:

TIME SAMPLED: SAMPLED BY:

CLIENT

ETHAN MARRO

DATE RECEIVED:

TIME RECEIVED: RECEIVED BY:

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
S1-S, S-2, 4 – 6'	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12'	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7'	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17'	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7'	297 *	mg/kg	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16'	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11'	355 *	ma/ka	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7'	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio Chemist

SD

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

^{**} WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.



Project:

Reconstruction of Exit Charter Oak Bridge Location: Hartford, CT

Boring ID: S-6043-1 Sample Type: jar Tested By: GA Test Date: Sample ID: S-5 08/03/16 Checked By: emm

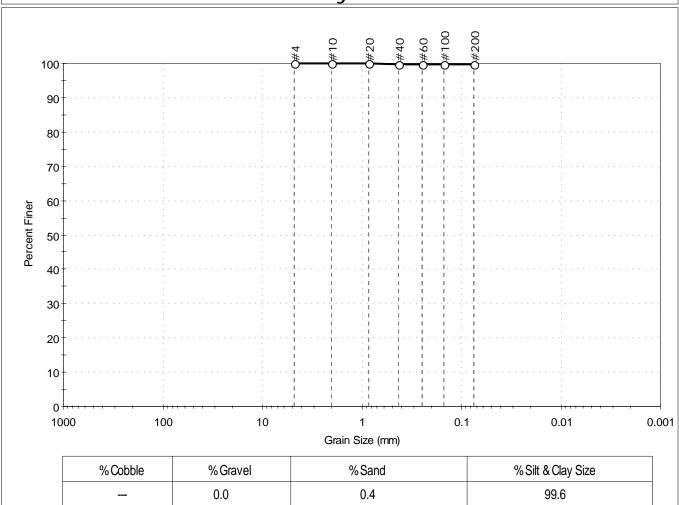
384959 20-21 ft Test Id: Depth:

Test Comment:

Visual Description: Moist, olive gray clay

Sample Comment:

Particle Size Analysis - ASTM D422



Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#200	0.075	100		

	<u>Coefficients</u>						
D ₈₅ = N/A	$D_{30} = N/A$						
$D_{60} = N/A$	$D_{15} = N/A$						
D ₅₀ = N/A	$D_{10} = N/A$						
$C_u = N/A$	$C_{c} = N/A$						

Project No:

GTX-304831

Classification N/A <u>ASTM</u> AASHTO Silty Soils (A-4 (0))

<u>Sample/Test Description</u> Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S6043-1 Sample Type: tube Tested By: GA
Sample ID: UP-1 - Top middle Test Date: 07/12/16 Checked By: emm

GTX-304831

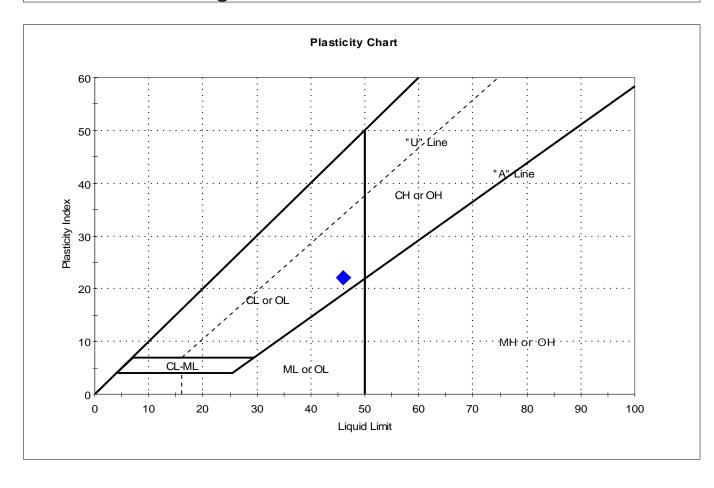
Depth: 43-45 Test Id: 382141

Test Comment: ---

Visual Description: Moist, gray clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Top middle	S6043-1	43-45	49	46	24	22	1.2	

Sample Prepared using the WET method



Project:

Reconstruction of Exit Charter Oak Bridge Location: Hartford, CT

Boring ID: S6043-1 Sample Type: tube GA Tested By: Sample ID: UP-1 - Bottom Test Date: 07/12/16 Checked By: emm

Project No:

GTX-304831

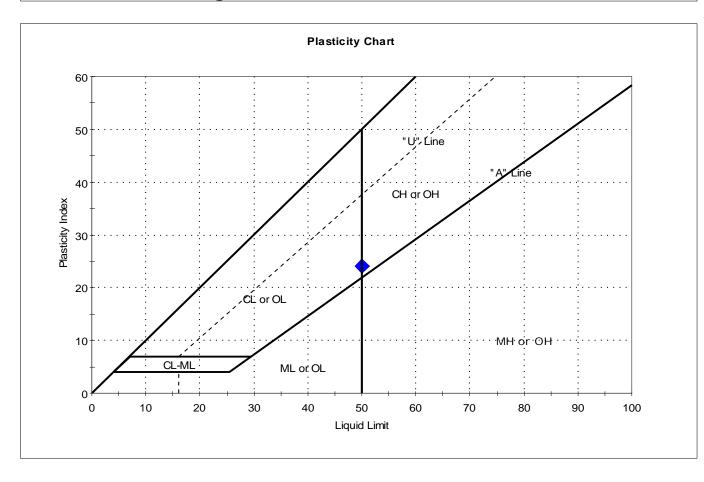
Depth: 43-45 Test Id: 382139

Test Comment:

Visual Description: Moist, dark gray clay

Sample Comment:

Atterberg Limits - AASHTO T 89 and T 90



Symb	ol Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-1 - Bottom	S6043-1	43-45	48	50	26	24	0.9	

Sample Prepared using the WET method



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No: GTX-304831

Boring ID: S6043-1 Sample Type: tube Tested By: GA Sample ID: UP-2 - Top middle Test Date: 07/11/16 Checked By: emm

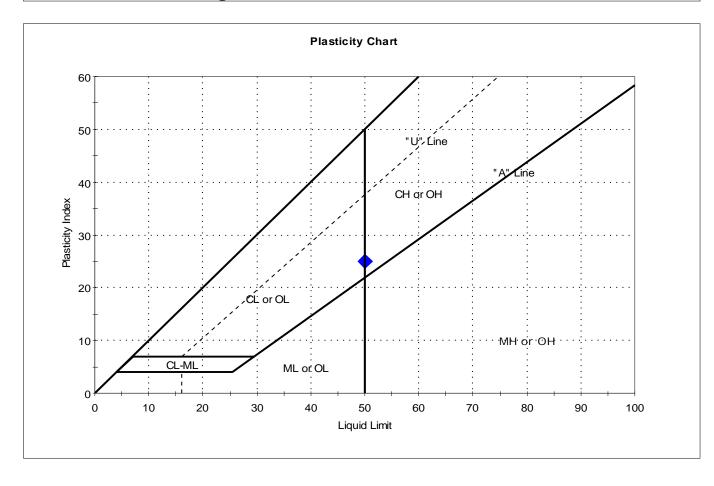
Depth: 53-55 Test Id: 382123

Test Comment: ---

Visual Description: Moist, gray clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
•	UP-2 - Top middle	S6043-1	53-55	51	50	25	25	1.1	

Sample Prepared using the WET method



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT Project No:

Boring ID: S6043-1 Sample Type: tube Tested By: GA
Sample ID: UP-2 - Bottom Test Date: 07/12/16 Checked By: emm

GTX-304831

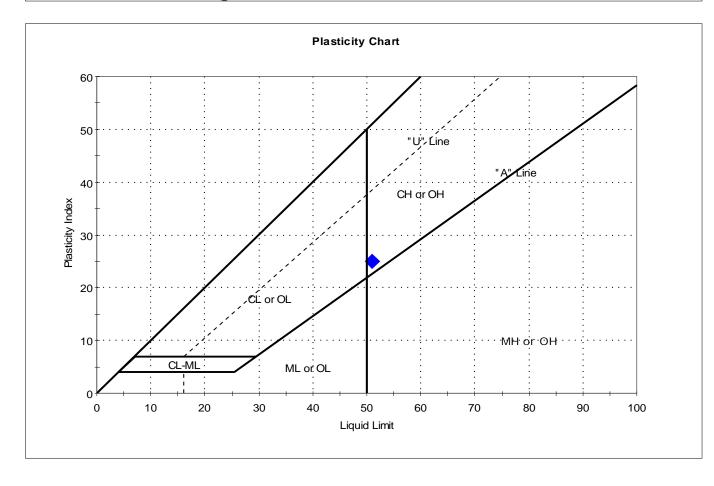
Depth: 53-55 Test Id: 382121

Test Comment: ---

Visual Description: Moist, greenish gray clay

Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



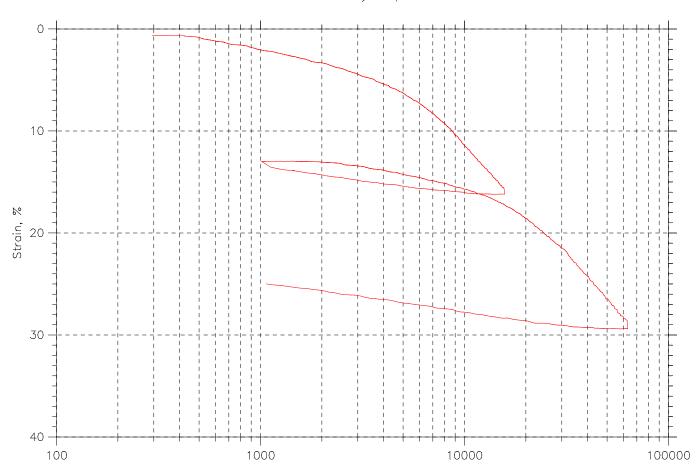
S	ymbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
	•	UP-2 - Bottom	S6043-1	53-55	53	51	26	25	1.1	

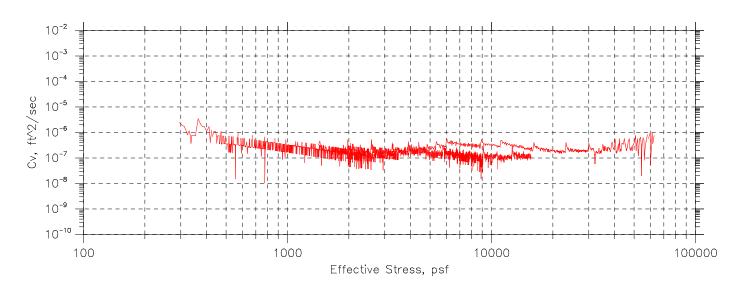
Sample Prepared using the WET method



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



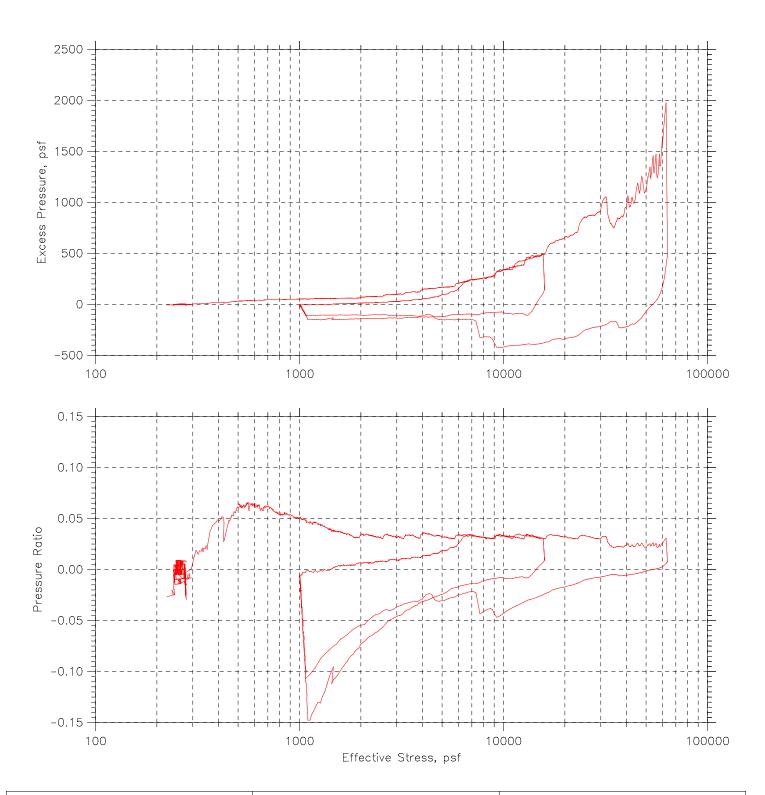


		Page 1 of 3
Remarks: System Y		
Description: Moist, dark gray clay		
Test No.: CRC-7	Sample Type: intact	Elevation:
Sample No.: UP-1	Test Date: 06/07/16	Depth: 43-45 ft
Boring No.: S6043-1	Tested By: md	Checked By: njh
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



		Page 2 of 3
Remarks: System Y		
Description: Moist, dark gray clay		
Test No.: CRC-7	Sample Type: intact	Elevation:
Sample No.: UP-1	Test Date: 06/07/16	Depth: 43-45 ft
Boring No.: S6043-1	Tested By: md	Checked By: njh
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S6043-1 Sample No.: UP-1 Test No.: CRC-7

Location: Hartford, CT Tested By: md Test Date: 06/07/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 43-45 ft Elevation: ---

Soil Description: Moist, dark gray clay

Remarks: System Y

Estimated Specific Gravity: 2.76 Initial Void Ratio: 1.50 Final Void Ratio: 0.976

Liquid Limit: 50 Plastic Limit: 26 Plasticity Index: 24

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.79 in

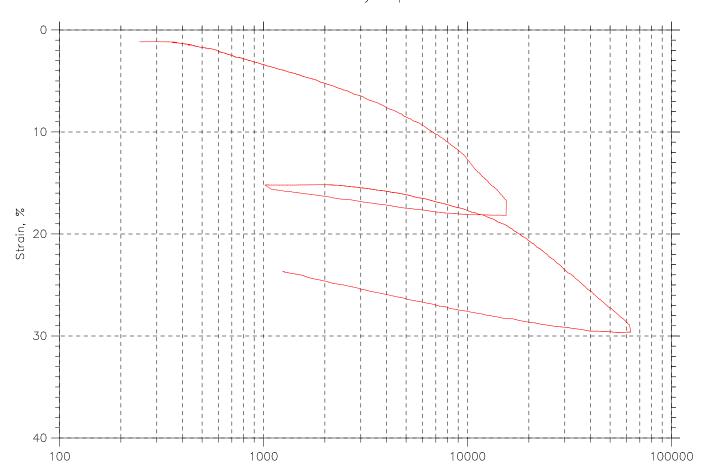
	Before Co	onsolidation	After Consol	lidation
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	16196	RING		a1070
Wt. Container + Wet Soil, gm	186.99	246.76	229.91	126.58
Wt. Container + Dry Soil, gm	129.28	198.52	198.52	95.870
Wt. Container, gm	8.3800	109.80	109.80	9.0900
Wt. Dry Soil, gm	120.90	88.715	88.715	86.780
Water Content, %	47.73	54.38	35.39	35.39
Void Ratio		1.50	0.976	
Degree of Saturation, %		99.91	100.00	
Dry Unit Weight, pcf		68.850	87.152	

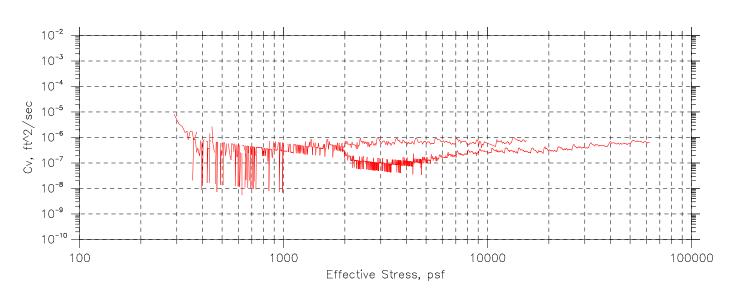
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186 Summary Report



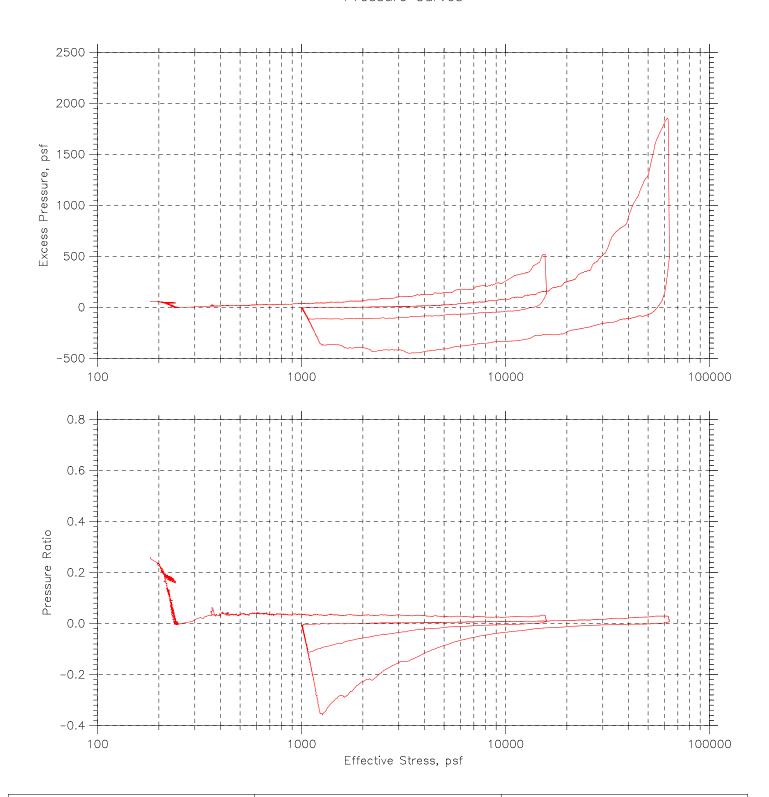


Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-2	Test Date: 06/06/16	Depth: 53-55 ft
Test No.: CRC-2	Sample Type: intact	Elevation:
Description: Moist, greenish gray clay	,	
Remarks: System 0		
		Page 1 of 3



Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186
Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-2	Test Date: 06/06/16	Depth: 53-55 ft
Test No.: CRC-2	Sample Type: intact	Elevation:
Description: Moist, greenish gray clay	·	·
Remarks: System 0		
		Page 2 of 3



CRC TEST DATA

Project: Reconstruction of Exit Boring No.: S6043-1 Sample No.: UP-2 Test No.: CRC-2

Location: Hartford, CT Tested By: md Test Date: 06/06/16 Sample Type: intact

Project No.: GTX-304831 Checked By: njh Depth: 53-55 ft Elevation: ---

Soil Description: Moist, greenish gray clay

Remarks: System 0

Estimated Specific Gravity: 2.84 Liquid Limit: 51
Initial Void Ratio: 1.63 Plastic Limit: 26
Final Void Ratio: 1.10 Plasticity Index: 25

Specimen Diameter: 2.50 in Initial Height: 1.00 in Final Height: 0.80 in

	Before Co	nsolidation	After Consol	lidation
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	B-613	RING		16776
Wt. Container + Wet Soil, gm	381.11	246.12	230.24	130.15
Wt. Container + Dry Soil, gm	251.42	196.53	196.53	96.240
Wt. Container, gm	7.9400	109.52	109.52	8.7100
Wt. Dry Soil, gm	243.48	87.011	87.011	87.530
Water Content, %	53.27	56.99	38.74	38.74
Void Ratio		1.63	1.10	
Degree of Saturation, %		99.58	100.00	
Dry Unit Weight, pcf		67.528	84.410	

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.



Project: Reconstruction of Exit Charter Oak Bridge

Location: Hartford, CT

Project No: Boring ID: ---Sample Type: ---Tested By: daa Sample ID: ---Test Date: Checked By: 06/27/16

GTX-304831

Depth: Test Id: 381989

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*
S1466-1	C2	49.5-50 ft	160	8511	3	Yes	
S2-1	C2	98.5-99 ft	164	7103	3	Yes	
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*

Density determined on core samples by measuring dimensions and weight and then calculating. Notes:

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

- 1: Best effort end preparation. See Tolerance report for details.
- 2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
- 3: Specimen L/D < 2.
- 4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
- 5: Specimen diameter is less than 10 times maximum particle size.
- 6: Specimen diameter is less than 6 times maximum particle size.

^{*}Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

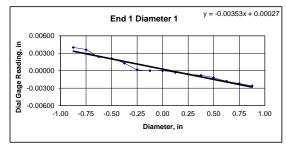


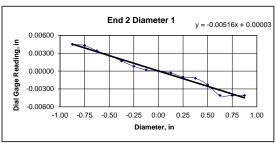
Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S6043-1		
Sample ID:	C2		
Depth:	184-184.5 ft		
Visual Description:	See photographs		

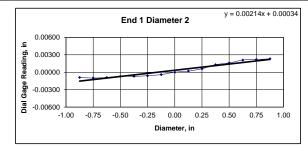
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

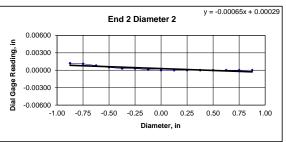
				DEVIATION FROM STRAIGHTNESS (Procedure S1)
1	2	Average		
4.24	4.25	4.25		Maximum gap between side of core and reference surface plate:
1.99	1.99	1.99		Is the maximum gap ≤ 0.02 in.? YES
569.78				
164	Minimum Diameter Tolerence Me	et?	YES	Maximum difference must be < 0.020 in.
2.1	Length to Diameter Ratio Tolerar	nce Met?	YES	Straightness Tolerance Met? YES
	1.99 569.78	1.99 1.99 569.78 164 Minimum Diameter Tolerence M e	4.24 4.25 4.25 1.99 1.99 1.99 569.78	4.24 4.25 4.25 1.99 1.99 1.99 569.78 164 Minimum Diameter Tolerence Met? YES

END FLATNESS AND PARALL	ELISM (Proced	lure FP1)													
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00400	0.00360	0.00240	0.00210	0.00130	0.00020	0.00000	0.00000	-0.00030	-0.00060	-0.00080	-0.00120	-0.00180	-0.00220	-0.00260
Diameter 2, in (rotated 90°)	-0.00090	-0.00100	-0.00090	-0.00070	-0.00070	-0.00060	-0.00040	0.00000	0.00020	0.00060	0.00130	0.00160	0.00210	0.00220	0.00230
											Difference between	een max and m	in readings, in:		
											O° =	0.00660	90° =	0.00330	
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00450	0.00430	0.00340	0.00260	0.00170	0.00080	0.00020	0.00000	-0.00030	-0.00100	-0.00120	-0.00230	-0.00410	-0.00410	-0.00410
Diameter 2, in (rotated 90°)	0.00120	0.00110	0.00080	0.00050	0.00030	0.00030	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
											Difference between	een max and m	in readings, in:		
											0° =	0.0086	90° =	0.0012	
											Maximum differe	ence must be <	0.0020 in.	Difference = +	0.00430









DIAMETER 1			
End 1:			
	Slope of Best Fit Line Angle of Best Fit Line:	0.00353	
	Angle of Best Fit Line.	0.20225	
End 2:		0.00547	
	Slope of Best Fit Line Angle of Best Fit Line:	0.00516 0.29564	
Maximum Angi	ular Difference:	0.09339	
	Parallelism Tolerance Met?	NO	
	Spherically Seated		
DIAMETER 2			
DIAMETER 2 End 1:	Spherically Seated		
	Spherically Seated Slope of Best Fit Line	0.00214	
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line:	0.00214 0.12261	
	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line:	0.12261	
End 1:	Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line		
End 1: End 2:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line:	0.12261 0.00065 0.03724	
End 1:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line:	0.12261	
End 1: End 2:	Siope of Best Fit Line Angle of Best Fit Line: Siope of Best Fit Line Angle of Best Fit Line angle of Best Fit Line Angle of Best Fit Line: alar Difference:	0.12261 0.00065 0.03724 0.08537	
End 1: End 2:	Spherically Seated Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line Angle of Best Fit Line:	0.12261 0.00065 0.03724 0.08537	

Flatness Tolerance Met?

PERPENDICULARITY (Procedu	ure P1) (Calculated from End Flatness	and Parallelism m	easurements a	ibove)		
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be $\leq 0.25^{\circ}$
Diameter 1, in	0.00660	1.990	0.00332	0.190	YES	
Diameter 2, in (rotated 90°)	0.00330	1.990	0.00166	0.095	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00860	1.990	0.00432	0.248	YES	
Diameter 2, in (rotated 90°)	0.00120	1.990	0.00060	0.035	YES	



Client:	Freeman Companies, LLC	Test Date: 06/24/16
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By: rlc
Project Location:	Hartford, CT	Checked By: jsc
GTX #:	304831	
Boring ID:	S6043-1	Tolerance measurements were performed using
Sample ID:	C2	a machinist straightedge and feeler gauges to ASTM specifications.
Depth:	184-184.5	ASTW Specifications.
Visual Description:	See photographs	

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1 Is the maximum gap $\leq \pm 0.001$ in.? YES Diameter 2 (rotated 90°) Is the maximum gap $\leq \pm 0.001$ in.? YES

END 2

Diameter 1 Is the maximum gap $\leq \pm 0.001$ in.? YES Diameter 2 (rotated 90°) Is the maximum gap $\leq \pm 0.001$ in.? YES

End Flatness Tolerance Met? YES



Client: Freeman Companies, LLC Project Name: Reconstruction of Exit Charter Oak Bridge Project Location: Hartford, CT GTX #: 304831 Test Date: 6/27/2016 Tested By: daa Checked By: jsc Boring ID: S6043-1 Sample ID: C2 Depth, ft: 184-184.5



After cutting and grinding



After break

APPENDIX D DRAFT SPECIAL PROVISIONS



ITEM #0702081A- BITUMINOUS COATING FOR STEELPILES

Description: Work under this item shall consist of furnishing and applying bituminous coating to steel piles. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This work shall also include field applied touch ups to coating damaged during shipping and handling.

Materials: Provide bituminous coating for all piles. Bituminous coating shall consist of canal liner bituminous in accordance with ASTM D 2521. It shall have a softening point of 190°F to 200°F a penetration of 56 to 61 at 77°F and a ductility in excess of 1.38 in. at 77°F. Primer shall be in accordance with AASHTO M 116.

Construction Methods:

- A. All surfaces to be coated with bituminous shall be dry and thoroughly cleaned of dust and loose materials.
- B. Primer or bituminous shall not be applied in wet weather, nor when the ambient temperature is below 65°F.
- C. Application of the prime coat shall be with a brush or other approved means and in a manner which thoroughly coats the surface of the piling with a continuous film of primer. The primer shall have set thoroughly before the bituminous coating is applied. The bituminous shall be heated to 300°F and applied at a temperature between 200° and 300°F by means of one or more mop coats or other approved means.
- D. The average coating thickness shall be 1/16".
- E. Whitewashing of the coating may be required during hot weather as directed to prevent running or sagging of the asphalt coating prior to driving of the pile.
- F. Bituminous coated piles shall be protected from sunlight or heat immediately after the coating is applied.
- G. The bituminous coating shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bituminous coating has been applied, dragging the piles on the ground or the use of cable wraps around the piles during handling will not be permitted. Pad eyes, or other suitable devices, shall be attached to the piles to be used for lifting and handling.
- H. Where Field splices are required the bituminous coating shall be removed in the splice area. After completing the field splice, the splice area shall be brush coated or mop coated with a minimum of one coat of bituminous material as directed.

Method of Measurement: Bituminous coating will be measured per linear foot of pile coated.

Basis of Payment: Payment shall be made at the contract unit price per linear foot of pile coated. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete

ITEM #0702109A- PRE-AUGERING OF PILES

ITEM #0702111A- DRIVING STEEL PILES

Work under this item shall conform to the requirements of Section 7.02 of Form 817 as replaced by the special provision for Section 7.02 in this contract, amended as follows:

7.02.01- Description: Add the following:

Work under this Item includes pre-augering for piles as indicated on the Plans or as ordered by the Engineer.

7.02.03.2(a) - Construction Methods - Pile Driving Equipment - Hammers: Replace the second paragraph with the following:

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for hammers used shall be 26,000-foot pounds (35,000 joules) for driving steel piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

7.02.03.2(7) - Construction Methods - Pile Driving Equipment - Pre-Augering: Add the following:

The following apply when pre-auguring is done for piles with bituminous and epoxy coating:

The pre-augered hole is to continue to the top of the clay layer or to the depths shown on the plans or as directed by the Engineer. The pre-augered hole diameter shall be at least the diagonal dimension of the pile, or as directed by the Engineer. All obstructions which could interfere with the driving of piles within the depth of pre-augering are to be removed as part of the pre-auguring work.

The Contractor shall provide temporary casing to maintain the pre-augured dimension of the hole. Upon completion of pile driving, the annulus between the pile and outer hole diameter shall be filled with clean sand and any temporary casing will be removed.

30

7.02.05.11 - Basis of Payment - Pre-Augering of Piles: Add the following:

This work shall also include obstruction removal, casing, and sand backfill

ITEM #0207150A - LIGHTWEIGHT FILL

Description: Work shall consist of furnishing and placing lightweight fill in the formation of embankments or as backfill in front of and behind structures. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This item shall also consist of furnishing and placing crushed stone or gravel in burlap bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.

Materials: Lightweight fill shall be a rotary kiln expanded shale aggregate meeting the requirements of ASTM C 330. No by-product slags, cinders or by-products of coal combustion shall be permitted. The aggregate shall consist of tough, durable, non-corrosive particles with the following gradation:

Square Mesh Sieve	Percent Passing by Weight
1 inch	100
¾ inch	90 - 100
3/8 inch	10 - 50
No. 4	0 - 15

The dry loose unit weight shall be less than 50 pounds per cubic feet (pcf). The lightweight aggregate supplier shall submit verification of an in-place compacted total unit weight (by methods defined in AASHTO T99) of less than 65 pcf. For purposes of this specification, the total unit weight is defined as the maximum dry density multiplied by one plus the moisture content (as a decimal). For example, if the maximum dry density is 45 pcf and the moisture content is 9%, the total unit weight is 49 pcf.

The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10 percent (ASTM C 88). The maximum Los Angeles Abrasion loss when tested in accordance with ASTM C 131 (B grading) shall be 40 percent.

The lightweight aggregate producer shall submit verification that the angle of internal friction is equal to or greater than 40 degrees when measured in a triaxial compression test on a laboratory sample with a minimum diameter of 250mm.

The materials for bagged stone shall conform to the following requirements: the crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both; the bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

ITEM #0702150A 0042-0304 191 Construction Methods: When applicable and except where noted below, lightweight fill placement shall conform to the requirements of Sections 2.02.03 and 2.16.03 of the Standard Specifications, Form 817.

The lightweight fill shall be placed in layers of a thickness of 1.5 ft to a maximum of 2.0 ft. Each layer shall be compacted by the use of self-propelled vibratory compaction equipment with static mass (weight) less than 6,600 lbs. The minimum number of passes shall be two (2) and the maximum four (4). The actual lift thickness and exact number of passes shall be determined by the Engineer depending on the type of compaction equipment. The contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for compaction, shall not be operated on the exposed lightweight fill.

Where weep holes are installed within the limits of the lightweight fill, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the lightweight fill material into the weep hole. Approximately one cubic foot of crushed stone or gravel shall be enclosed in each of the burlap bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time lightweight fill material is placed around them and bags which are broken or burst prior to or during the placing of the lightweight fill material shall be replaced at the expense of the contractor.

Method of Measurement: Lightweight fill shall be measured in place after compaction, including allowances for settlement. There shall be no direct payment for bagged stone, but the cost thereof shall be considered as included in the cost of the work for "Lightweight Fill".

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "Lightweight Fill", complete in place, which price shall include all materials, transportation, tools, equipment and labor incidental thereto.

 $\begin{array}{ccc} \textbf{Pay Item} & \textbf{Pay Unit} \\ \textbf{Lightweight Fill} & \textbf{c.y.} \end{array}$

ITEM #0702150A 0042-0304 192