To:	Stephen Madden, Geotechnical Engineer, Lead Project Engineer
From:	Matthew Riegel, Geotechnical Engineer, P. E., Geotechnical Task Lead
Date:	March 26, 2021
Subject:	Shaftsbury STP 014-1(6) Geotechnical Data Report

1.0 INTRODUCTION

As requested by the Vermont Agency of Transportation (VTrans), HNTB has completed a geotechnical and geological subsurface investigation for the Shaftsbury STP 014-1(6) project. This project consists of the replacement of Bridge No. 1 located on Vermont Route 67 W over the Cold Spring Brook which leads to the Walloomsac River in Shaftsbury, VT. The project site is approximately 0.96 miles east of the New York border and 3.4 miles west of the junction of Vermont Route 67 and Vermont Route 7A. The subject project consists of the replacement of the existing structure: a single span, concrete slab, cast-in-place concrete deck bridge on concrete abutments. Geotechnical borings were performed to evaluate the subsurface profile for design and construction of the proposed replacement structure. Results of the field sampling and all subsequent boring logs are contained herein. The laboratory results for the soil samples have been included in the boring logs provided in **Appendix II**.

2.0 FIELD INVESTIGATION

The subsurface exploration performed for this study includes eight geotechnical borings, designated as B-101 through B-107, and were advanced from the existing ground surface to depths ranging from 1 foot to 29 feet below existing grade. The borings were advanced using mud rotary drilling procedures in general accordance with VTrans MREI 11-01 and the AASHTO T 206, *Standard Method of Test for Penetration Test and Split-Barrel Sampling of Soils*. The borings were drilled with a Strata Star 15, Mobile Drill B-48, and a Mobile Drill B-57 rig. The subsurface exploration program was performed by New England Boring Contractors of Derry, NH between February 17, 2021, and February 25, 2021. Oversight and quality control services for the field work were provided by HNTB.

The values for the Northings and Eastings are based on the Vermont State Plane Grid Coordinate System NAD83, and were initially field located using nearby features depicted on the base mapping provided and later verified by VTrans survey forces. Elevations for the borings were initially estimated using VT Route 67 profile drawings provided by VTrans and later verified by VTrans survey forces. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used to determine them. See **Table 2.1** for a summary of the as-drilled boring locations.

Borings performed on the roadway were sampled continuously below the asphalt pavement to a depth of 13 feet, and every five feet thereafter. Boring B-104 was sampled continuously to a depth of 12 feet below ground surface, and every five feet thereafter. Standard Penetration Testing (SPTs) were performed at each boring location. Soil samples were retrieved by driving





a 24-inch split-spoon sampler (2-inch O.D., 1³/₈ inch I.D.) using a 140-lb hammer free falling 30 inches. An automatic hammer was utilized for sampling purposes as denoted on each boring log. Each sample was photographed, removed from the sampler in the field, and classified using the Burmister and AASHTO Soil Classification Systems. Representative portions of each sample were collected and delivered to the VTrans Central Laboratory located in Berlin, VT for additional testing.

Rock cores were obtained with an NX-size, double tube core barrel and were classified according to their geologic origin and in conformance with the International Society of Rock Mechanics (ISRM) – Basic Geotechnical Description of Rock Masses. The rock cores were assigned a recovery and rock quality designation (RQD).

The as-drilled boring locations from the current exploration are shown on the As-Drilled Boring Location Plan provided in **Appendix I**. The boring logs are provided in **Appendix II**. **Table 2.1**, below, presents a summary of the boring locations.

Boring Number	Station	Offset (ft)	Northing (ft)	Easting (ft)	Approximate Ground Elev. (ft)	Approximate Bedrock Elev. (ft)		
B-101	49+55	8.4 LT	160692.6	1437124.3	555.3	540.8		
B-102	49+69	8.3 LT	160694.8	1437137.8	555.6	541.6		
B-103	49+85	9.1 RT	160680.5	1437157.1	556.1	540.1		
B-104	50+12	38.8 LT	160732.1	1437175.6	551.0	536.0		
B-105	50+25	8.4 RT	160687.8	1437196.3	556.8	NA		
B-105A	50+30	7.1 RT	160689.9	1437200.8	557.0	538.0		
B-106	50+42	7.1 RT	160692.0	1437213.0	557.2	540.2		
B-107	50+62	8.4 RT	160694.1	1437233.0	557.7	540.7		

Table 2.1: Boring Locations	
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3.0 FIELD AND LABORATORY TESTS

The standard penetration resistance of the in-situ soil is calculated as the number of blows required to drive a 2-inch outside diameter (OD) split-barrel sampler 24 inches into the soil by a 140-pound hammer dropped from a height of 30 inches, in accordance with procedures specified in AASHTO T206. The number of blows required to drive the sampler each 6-inch increment is recorded and the Standard Penetration Resistance (N-Value) is calculated as the sum of the blows over the second and third 6-inch intervals.

The SPT N-value is commonly used with established correlations to estimate several soil parameters, particularly the shear strength and density of cohesionless soils. The N-values provided on the boring logs are raw values and have not been corrected for energy, borehole diameter, rod length, or overburden pressure. For borings B-101, B-103, B-105A, and B-106, a Mobile B-48 was used with a calibrated hammer energy correction factor of 1.4. For borings B-102, B-105, and B-107, a Strata Star 15 was used with a calibrated hammer energy correction factor of 1.1. For boring B-104, a Mobile Drill B-57 was used with a calibrated hammer energy correction factor of 1.42.

Geotechnical laboratory tests were performed on select representative samples to assist with soil classification and to evaluate engineering properties of the soil. Grain size analyses was performed on select soil samples in accordance with AASHTO T 88, *Standard Method of Test for Particle Size Analysis of Soils*.

Detailed descriptions of the rock cores are presented on the attached boring logs, including run length, drill times, recovery, and Rock Quality Designation (RQD). Recovery is defined as the length of core obtained expressed as a percentage of the total length cored. In accordance with ASTM D6032, RQD is the total length of core pieces, 4 inches or greater in length, expressed as a percentage of the total length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seam, jointing, and bending planes. The Rock Mass Rating (RMR) is also included on the logs. RMR is AASHTO's (LRFD Bridge Design Specifications) recommended method of classifying rock and is based on five different parameters that all have relative ratings which combine to form the RMR. These parameters include rock strength, RQD, joint spacing, joint condition, and groundwater (AASHTO Section 10.4.6.4).





4.0 SOIL PROFILE

The following soil strata have been identified based on our review of the existing subsurface information. It should be noted that groundwater elevations are subject to change given the fact that boreholes were generally left open for a short period of time. Because groundwater elevations can fluctuate seasonally and are affected by temperature and precipitation, groundwater may be encountered during construction when not previously noted on the logs.

4.1 B-101: The ground surface elevation at B-101 was 555.3 ft. Groundwater was measured after drilling operations on February 24, 2021 at depth of 7.1 ft below the ground surface which corresponds to an approximate elevation of 548.2 ft.

Depth (Below Ground Surface)	Soil Profile
0.0 - 0.7 feet	Asphalt Pavement
0.7 – 1.5 feet	Fill (Dense to Very Dense Sand and Gravel)
1.5 – 5.0 feet	Medium Dense to Dense Gravelly Silty Sand
5.0-7.0 feet	Loose Sand and Gravelly Silt
7.0 – 11.0 feet	Medium Dense to Dense Gravelly Silty Sand
11.0 – 12.5 feet	Residual Soil (Dense Silty Sandy Gravel)
12.5 – 14.5 feet	Decomposed Phyllite
>14.5 feet	Bedrock (Phyllite)





4.2 B-102: The ground surface elevation at B-102 was 555.6 ft. Groundwater was measured during drilling operations on February 17, 2021 at a depth of 8.6 ft below the ground surface corresponding to an approximate elevation of 547.0 ft.

Depth (Below Ground Surface)	Soil Profile				
0.0 - 0.7 feet	Asphalt Pavement				
0.7 – 5.0 feet	Fill (Very Dense Silty Sand and Gravel)				
5.0 – 7.0 feet	Very Dense Sandy Gravel/Gravelly Sand				
7.0-9.0 feet	Medium Dense to Dense Gravelly Silty Sand				
9.0 – 14.0 feet	Residual Soil (Medium Dense Silty/Clayey Gravel and Sand)				
14.0 – 15.0 feet	Decomposed Phyllite				
>15.0 feet	Bedrock (Phyllite)				





4.3 B-103: The ground surface elevation at B-103 was 556.1 ft. Groundwater was measured during drilling operations on February 23, 2021 at a depth of 9.1 ft below the ground surface which corresponds to an approximate elevation of 547.0 ft.

Depth (Below Ground Surface)	Soil Profile				
0.0 - 0.8 feet	Asphalt Pavement				
0.8 – 5.0 feet	Fill (Medium Dense to Very Dense Silty Sand and Gravel)				
5.0 – 11.0 feet	Medium Dense to Dense Silty Sand and Gravel				
11.0 – 14.0 feet	Residual Soil (Medium Dense Silty/Clayey Gravel and Sand)				
14.0 – 16.0 feet	Decomposed Phyllite				
>16.0 feet	Bedrock (Phyllite)				

4.4 B-104: The ground surface elevation at B-104 was 551.0 ft. Groundwater was measured during drilling operations on February 25, 2021 at a depth of 3.6 ft below the ground surface which corresponds to an approximate elevation of 547.4 ft.

Depth (Below Ground Surface)	Soil Profile			
0.0 - 0.2 feet	Topsoil			
0.2 – 4.0 feet	Medium Dense to Dense Gravelly Sand / Clayey Silty Sand & Gravel			
4.0 – 14.0 feet	Residual Soil (Loose to Medium Dense Silty Sand and Gravel)			
14.0 – 15.0 feet	Decomposed Phyllite			
>15.0 feet	Bedrock (Phyllite)			





4.5 B-105: The ground surface elevation at B-105 was 556.8 ft. Groundwater was not measured during drilling operations.

Depth (Below Ground Surface)	Soil Profile				
0.0 - 0.75 feet	Asphalt Pavement				
	Fill				
0.75 - 5.0 feet	(Very Dense Sand and Gravel)				
5.0 – 11.0 feet	Medium Dense to Very Dense Gravelly Silty Sand				
11.0 – 13.0 feet	Residual Soil (Medium Dense Gravelly Silty Sand)				

Note that boring was abandoned due to 3 inch casing snapping in B-105. NEBC could not retrieve casing. Boring B-105 offset 5 feet to the east to B-105A.

4.6 B-105A: The ground surface elevation at B-105A was 557.0 ft. Groundwater was measured during drilling operations on February 22, 2021 at a depth of 8.6 ft below the ground surface which corresponds to an approximate elevation of 548.4 ft.

Depth (Below Ground Surface)	Soil Profile
0.0 - 0.75 feet	Asphalt Pavement
0.75 – 9.0 feet	No Sampling was Conducted. See B-105
9.0 – 11.0 feet	Medium Dense to Very Dense Gravelly Silty Sand
11.0 – 13.0 feet	Residual Soil (Medium Dense Silty Sandy Gravel)
14.0 – 19.0 feet	No Recovery in split spoon for samples S-3 and S-4
>19.0 feet	Bedrock (Phyllite)





4.7 B-106: The ground surface elevation at B-106 was 557.2 ft. Groundwater was measured during drilling operations on February 23, 2021 at a depth of 5.2 ft below the ground surface which corresponds to an approximate elevation of 552.0 ft.

Depth (Below Ground Surface)	Soil Profile				
0 - 1.0 feet	Asphalt Pavement				
1.0 - 3.0 feet	Fill				
	(Very Dense Silty Sand and Gravel)				
3.0 - 7.0 feet	Dense Silty Sand and Gravel				
7.0-9.0 feet	Loose Silty Gravelly Sand				
9.0 – 14.0 feet	Medium Dense to Very Dense Silty Sand and Gravel				
14.0 – 17.0 feet	Decomposed Phyllite				





4.8 B-107: The ground surface elevation at B-107 was 557.7 ft. Groundwater was measured during drilling operations on February 18, 2021 at a depth of 7.9 ft below the ground surface which corresponds to an approximate elevation of 549.8 ft.

Depth (Below Ground Surface)	Soil Profile					
0 - 0.75 feet	Asphalt Pavement					
	Fill					
0.75 – 5.0 feet	(Very Dense Silty Sand and Gravel)					
5.0 – 6.0 feet	Loose Silty Sand and Gravel					
6.0 – 7.0 feet	Loose Gravelly/Sandy Silt					
7.0–9.0 feet	No Recovery in split spoon for S-4					
9.0 – 11.0 feet	Very Dense Sandy Gravel					
11.0 – 16.0 feet	Residual Soil (Very Dense Silty/Clayey Gravel and Sand)					
>16.0 feet	Bedrock (Phyllite)					

5.0 CONCLUSION

The information included in this document is intended to provide information related to the subsurface investigation and subsequent laboratory test program for the Shaftsbury STP 014-1(6) project. We trust that this geotechnical evaluation is satisfactory to VTrans. If you have any questions or would like to discuss this report, please contact Matt Riegel by phone at (973) 434-3100 EXT 53109 or by email at mdriegel@HNTB.com.

Enclosures: Appendix I - Boring Location Plan (1 Page) Appendix II - Boring Logs, RMR, and Rock Core Photos (13 Pages)





Appendix I – As-Drilled Boring Location Plan

SOIL CLASSIFICATION <u>AASHTO</u> A1 Gravel and Sand A3 Fine Sand A2 Silty or Clayey Gravel and Sand	COMMONLY USED SYMBOLS ▼ Water Elevation ● Standard Penetration Boring ⊕ Auger Boring ○ Rod Sounding			Number 9	Baseline Station 49+55	Offset (ft) 8.4 LT	B Offset Northing 160692.6	oring Chart Point Easting 1437124.3	Approx. Ground Surf. Elev. (ft) 555.3	Approx. Bedrock Elevation (ft) 540.8
A4 Siltý Soil – Low Compressibility A5 Silty Soil – Highly Compressible A6 Clayey Soil – Low Compressibility A7 Clayey Soil – Highly Compressible	S Sample N Standard Penetration Test Blow Count Per Foot For: 2" O. D. Sampler 1 3%" I. D. Sampler Hammer Weight Of 140 Lbs. Hammer Fall Of 30"			B-103 B-104 B-105	49+69 49+85 50+12 50+25 50+30	8.3 LT 9.1 RT 38.8 LT 8.4 RT 7.1 RT	160694.8 160680.5 160732.1 160687.8 160689.9	1437137.8 1437157.1 1437175.6 1437196.3 1437200.8	555.6 556.1 551.0 556.8 557.0	541.6 540.1 536.0 N.A 538.0
ROCK QUALITY DESIGNATION R.Q.D. (%) Q25 Very Poor	VS Field Vane Shear Test US Undisturbed Soil Sample B Blast DC Diamond Core MD Mud Drill WA Wash Ahead HSA Hollow Stem Auger AX Core Size 1 1/8"			B-106	50+30 50+42 50+62	7.1 RT 8.4 RT	160692.0 160694.1	1437200.8 1437213.0 1437233.0	557.2 557.7	540.2 540.7
25 to 50 Poor 51 to 75 Fair 76 to 90 Good ₽90 Excellent	BX Core Size 1 %" NX Core Size 2 1/8" M Double Tube Core Barrel Used LL Liquid Limit PL Plastic Limit PI Plasticity Index NP Non Plastic W Moisture Content (Dry Wgt. Basis) D Dry M Moist					⊕ B	104			
<u>SHEAR STRENGTH</u> UNDRAINED SHEAR STRENGTH <u>IN P.S.F.</u> <u>CONSISTENCY</u> <u>Q250</u> Very Soft 250-500 Soft 500-1000 Med. Stiff 1000-2000 Stiff 2000-4000 Very Stiff	MTW Moist To Wet W Wet Sat Saturated Bo Boulder Gr Gravel Sa Sand Si Silt Cl Clay HP Hardpan Le Ledge		BIOI S BIO2							
®4000 Hard Correlation guide of "N"	NLTD No Ledge To Depth CNPF Can Not Penetrate Further TLOB Top of Ledge Or Boulder NR No Recovery Rec. Recovery %Rec. Percent Recovery RQD Rock Quality Designation CBR California Bearing Ratio Q Less Than B Greater Than		BI03	L	50+00		B105	A B106	BIO	
TO DENSITY/CONSISTENCY DENSITY CONSISTENCY (GRANULAR SOILS) (COHESIVE SOILS) DESCRIPTIVE DESCRIPTIVE N TERM Q5 Very Loose 5-10 Loose 11-24 Med. Dense 5-8 Med. Stiff	R Refusal (M2 100) VTSPG NAD83 - See Note 7 <u>COLOR</u> blk Black pnk Pink bl Blue pu Purple brn Brown rd Red									
25-50 Dense 9-15 Stiff 更50 Very Dense 16-30 Very Stiff 31-60 Hard 更60 Very Hard	dk Dark tn Tan gry Gray wh White gn Green yel Yellow It Light mltc Multicolored or Orange					/				
		SCALE " = 10'-0"								
DEFINIT	[ONS(AASHTO)									
 BEDROCK (LEDGE)- Rock in its native location of indefinite thickness. BOULDER - A rock fragment with an average dimension £ 12 inches. COBBLE - Rock fragments with an average dimension between 3 and 12 inches. GRAVEL - Rounded particles of rock £ 3" and £ 0.0787" (#10 sieve). SAND - Particles of rock £ 0.0787" (#10 sieve) and £ 0.0029" (#200 sieve), not site the series of th	 VARVED - Alternate layers of silt and clay. HARDPAN - Extremely dense soil, cemented layer, not softened when wet. MUCK - Soft organic soil (containing £ 10% organic material. MOISTURE CONTENT - Weight of water divided by dry weight of soil. FLOWING SAND - Granular soil so ieve). saturated (loose) that it flows on into drill casing during extraction 	 The subsurface explorations shown herein were made between February 17th and February 25th by HNTB. Soil and rock classifications, proper- ties and descriptions are based on engineering interpretation from available subsurface information by the Agency and may not necessarily reflect actual variations in sub- surface conditions that may be encountered between individual 	<u>GENERAL NOTES</u> 4. Engineering judgment was exercised in preparing the subsur- face information presented herein. Analysis and interpretation of sub- surface data was performed and interpreted for Agency design and estimating purposes. Presentation of the information in the Contract is intended to provide the Contractor	the be profile only a portro descri weath fracto discon	oring pla e are for and may r ay final hology us ibe the h ering, an ures, joir htinuities	n layout o r illustra- not accur contract ed on bor nardness, id spacing nts and c	tive purposes ately t details. ring logs to degree of g of other edrock is			
or slightly plastic and exhibits no strength when air-dried.	of wash rod. STRIKE - Angle from magnetic north to line of intersection of bed	boring or sample locations. 3. Observed water levels and/or	access to the same data available to the Agency. The subsurface informa- tion is presented in good faith and is not intended as a substitute for	300801		vestigatio Easting co	ons, 1988. oordinates	PROJECT NAME PROJECT NUMB	SHAFTSBUF Ber: STP 014-1	
CLAY - Fine grained soil, exhibits plasticity when moist and consider able strength when air-dried.	• • • • • • •	conditions indicated are as record- ed at the time of exploration and may vary according to the prevail- ing rainfall, methods of exploration and other factors.	personal investigation, independent interpretation, independent or judgment by the Contractor.	Grid N	North Ame		State Plane tum 1983 in t.	FILE NAME:s16 PROJECT LEAD DESIGNED BY: BORING INFORM	ER:S. MADDEN M. RIEGEL	PLOT DATE: \$\$\$\$DAT DRAWN BY: M. BARAH CHECKED BY:M. RIEGE SHEET \$S*\$ OF \$T4

shown on oils purposes y tails. logs to ree of		
ck is		
al on 1988. Inates	project name: SHAFTSBURY project number: STP 014-1(6)	
e Plane 1983 in	FILE NAMEss16b083bor.dgn PROJECT LEADER:S. MADDEN DESIGNED BY: M. RIEGEL BORING INFORMATION	PLOT DATE: \$\$\$\$DATE\$\$\$ DRAWN BY: M. BARAHONA CHECKED BY:M. RIEGEL SHEET \$S*\$ OF \$T*\$

Appendix II – Boring Logs, RMR, & Rock Core Photos

		STATE OF VERMONT		BORI	NG	LOG		E	Boring	No.:	B-1	01				
	Trange	AGENCY OF TRANSPORTATIO	NC		SHAF	TSE	BURY		F	age N	o.:	1 of	1			
	11 2115	MATERIALS BUREAU			STP-	-014-	-1(6)		F	in No.	: _	16b08	3			
		CENTRAL LABORATORY							C	hecke	ed By:	M	EB			
Boring	g Crew:	Pat Schofield, Art Cummings			Casing		mpler		Ground	lwater	Observ	ations/				
	Started:	2/24/21 Date Finished: 2/24/21	Type:		WB		SS 	Dat		epth		Notes				
			I.D.: Hamme	⊃r \N/t·	<u>4 in</u> 140 lb.		. <u>5 in</u> 10 lb.			(ft)						
	PG NAD83:	<u>N 160692.60 ft E 1437124.30 ft</u>	Hamme		30 in.		0 in.	02/24	/21 7	.1	W.T. a	fter dril	ling			
Statio		9+55 Offset: <u>8.4 LT</u>	Hamme	er/Rod T	ype: Au	to/AV	NJ									
Grour	nd Elevation	: <u>555.3 ft</u>	Rig: _	MOBI	LE B-48	_C _F	= 1.4									
Depth (ft)	Strata (1)	CLASSIFICATION OF MA (Description)	TERIALS				Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6" (N Value)	Moisture	Gravel %	Sand %	Fines %			
		Asphalt Pavement, 0.0 ft - 0.7 ft														
	$- \times \times \times$	Visual Description:, Bk Slag, Moist, Rec. = 1.25							34-60-55 50/2"	5-						
	[0, 0, 0, 0]	Visual Description:, A-1-B; Brn-Tn c(+)mf SAND Silt, Moist		. ,					(115)							
		Visual Description:, A-1-B; Brn cm(+)f SAND, and(-) cmf(+) Gravel, little(-) Silt; Cleaned out casing to 3 ft, Moist, Rec. = 1.08 ft									18-17- 7 (35)					
5 -		Classification:, A-4; *Brn Silt, some c(+)mf Sand, some mf(+) Gravel, MTW, Rec. = 0.5 ft														
		Classification:, A-1-B; *Brn c(+)mf Sand, some(+ Wet, Rec. = 0.58 ft				5-5-6-6 (11)										
10 -	-	Field Note:, No Recovery; Cleaned out to 11 ft, F	Rec. = 0.0) ft		16-24-24 22 (48)	-									
	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	Visual Description:, A-1-B; Dk Gry c(+)mf GRAV little Silt; Residual Soil, Wet, Rec. = 1.08 ft Visual Description:, Dk Gry Decomposed Phyllite		e(+) cmf	(+) Sand,				8-13-28 100/5" (41)	-						
]		,													
		Visual Description:, Dk Gry Decomposed Phyllite				\nearrow			70/3" (70			0.115				
15 -		14.5 ft - 19.5 ft, Bluish-gray, Fine grained PHYLI spacing, weak to medium strong, slightly weathe poor rock, NX, RMR=28	LITE, ver red, with	y close t layers o	o close joint f calcite. Very	y	C-1 (25)	93 (0)	Ic			@ 14.5				
20 -		19.5 ft - 24.5 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong, slightly weathered, with layers of calcite. Very poor rock, NX, RMR=28 C-2 (25) 100 (15)														
25 -	-	Hole stopped @ 24.8	5 ft													
BORING LOG VTRANS SHAFTSBURY GPJ VERMONT A0T GDT 3/23/21 00 - 52 - 52 - 52 - 52 - 52 - 52 - 52 - 52	-	Remarks: Roller bit refusal at 14.5 ft Rock core jam at 17 ft Rock core jam at 22.5 ft														
DOT DNINO Notes:	2. N Values 3. Water lev	ion lines represent approximate boundary between material type have not been corrected for hammer energy. $C_{\rm E}$ is the hammer el readings have been made at times and under conditions state s that soil description has been verified based upon laboratory r	energy corr ed. Fluctuat	ection fac	tor.	ier fac	tors than	those pre	esent at the	time m	easurem	ents were	e made.			

View Production ASENCY COP TRANSPORTATION DATESTICATION AND DATESTICATION AND DATESTICATION DATESTICATION AND DATESTICATION AND DATESTICATION DATESTICATION AND DATESTICATION DATESTICATION DATESTICATION DATESTICATION DATESTICATION DATESTICATION DA			STATE OF VERMONT			NG LOO	3		Borin	g No	.:	B-10)2	
MATERIAL SUBJECTOPPOINTINGCONTROL LABGRATORYCasing Sampler Labossiere, Travis Clegg Date Started:Casing Sampler Labossiere, Travis Clegg Labossiere, Travis Clegg Labossiere, Travis Clegg Date Started:Casing Sampler Labossiere, Travis Clegg Labossiere, Travis Clegg Labossiere, Travis Clegg Labossiere, Travis Clegg Date Started:Casing Sampler Labossiere, Travis Clegg Labossiere, Travis Clegge Labossiere, Travis Clegge, Travis Clegge, Travis Clegge, Travis Clegge, Travis C		T		NC		SHAF	TSBURY			Page	No.:	_	1 of	1
Boring Crew: Pete Labossies, Travis Clegg Chains Sampler Consort Water Date Started: 21721 Date Finished: 21721 Date Finished: 21721 VISPE (NADS3: M 15094 80 ft E 1437137.80 ft Main more Yit: 140 ftb 240 ftb Statos:			MATERIALS BUREAU			STP-	014-1(6)			Pin N	lo.:		16b08	3
Borng Crev:Pete Labosaner, Iravis Clegg Date Started:Type:WB 4 inSis 15 inDate Started:2/17/21Date Finished:2/17/21Date Finished:2/17/21VTSPG NADB3:N 100594.80 ft E 1437137.80 ft Hammer Kot Type:MBSS 100Date 140 lb.Date 140 lb.Ground Elevation:			CENTRAL LABORATORY							Chec	ked l	By:	ME	B
Date Started:21/7/21 21/7/21Date Finished:21/7/21 21/7/21Date Finished:21/7/21 21/7/21DateDepthNotesVTSPG NAD83:N 160694.80 ftE 1437137.80 ft Hammer Kit:140 lb.140 lb.140 lb.00 <td>Borin</td> <td>a Crow:</td> <td>Pete Labossiere, Travis Clegg</td> <td></td> <td></td> <td>Casing</td> <td>Sampler</td> <td></td> <td>Grou</td> <td>undwat</td> <td>er Ol</td> <td>bserva</td> <td>tions</td> <td></td>	Borin	a Crow:	Pete Labossiere, Travis Clegg			Casing	Sampler		Grou	undwat	er Ol	bserva	tions	
Data Startes: 21721 VTSPG NA083: 0127721 N 160694.80 ft. E 1437137.80 ft. $1D.:$ $41n$ mmer fail: $30.n$ 30 in. $02/17/21$ 8.6W.T. after drillingStation: $49+69$ Offset: $8.1T$ Cround Elevation: 555.6 ft. $30.n$ (Description) $30.n$ Rig STRATA STAR 15 $02/17/21$ 8.6W.T. after drilling $\frac{6}{90}$ <		• _						Da	te	Depth		N	otes	
Station:UP 11/218.6W.1. atter dninningStation:Station:Station:Station:Station:Station:Station:Auto/AWJGround Elevation:S55.6 ftCLASSIFICATION OF MATERIALSCLASSIFICATION OF MATERIALSGroupStation:Station:Station:Station:Station:Station:Station:Asphalt Pavement, 0.0 ft - 0.7 ftAsphalt Pavement, 0.0 ft - 0.7 ftStation: <th< td=""><td></td><td></td><td></td><td></td><td>or \A/+.</td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>					or \A/+.		-							
Station:								02/17	7/21	8.6	W	/.T. aft	er drill	ing
$\frac{1}{\frac{1}{2}} = \frac{1}{2} \frac{1}{\frac{1}{2}} \frac{1}$	Statio	on: <u>4</u> 9	9+69 Offset: <u>8.3 LT</u>	Hamme	er/Rod Ty									
$ \frac{1}{20} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}} \underbrace{\frac{1}{2}}{\frac{1}{2}} \underbrace{\frac{1}{2}} \underbrace{\frac{1}{2}}$	Grou	nd Elevation	:555.6 ft	Rig: S	STRATA	STAR 15	C _F = 1.1	_						
1 1	Depth (ft)	Strata (1)		TERIALS	i		Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6"	(N Value) Moietura	Content %	Gravel %	Sand %	Fines %
1 1							_							
Visual Description:, A-1-B; Tn cmf Sand, and(+) cmf(+) Gravel, trace(+) Silt, Dry, Fill Dry, Fill Dry, Fill Dry, Fill Dry, Fill B1-26-44- 27 × 7 × 5 Visual Description:, A-1-B; Brn Bik cmf SAND, and(-) cmf(+) Gravel, trace(+) Silt, trace brick, MTW, Rec. = 1.5 ft, Fill B1-26-44- 28 (70) B1-26-44- 28 (70) 5 Visual Description:, A-1-A; Brn cmf(+) GRAVEL, some cmf Sand, trace Silt, MTW, Rec. = 0.42 ft 7-36-22- 19 (58) 10 Classification:, A-1-B; "Brn mf(+) GRAVEL, some(+) cm(+)f Sand, little(-) Silt, MTW, Rec. = 0.42 ft 18-16-15- 15 (31) 10 Classification:, A-1-B; "Dk Gry c(+)mf Gravel, some(+) c(+)mf Sand, some Silt; Newsdual Soil, Wet, Rec. = 0.42 ft 14-9-12- 15 (21) 15 Visual Description:, Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft 90-50/2* 15 Visual Description:, Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft 90-50/2* 15 Visual Description:, Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft 90-50/2* 15 Visual Description:, Dk Gry Decomposed PhylLitTE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-1 37 (0) 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 (25) 100 (25) (26) <td></td> <td></td> <td>Visual Description:, Dk Gry Slag, Dry, Rec. = 1.4</td> <td>2 ft, Fill</td> <td></td> <td></td> <td></td> <td></td> <td>75</td> <td>5</td> <td></td> <td></td> <td></td> <td></td>			Visual Description:, Dk Gry Slag, Dry, Rec. = 1.4	2 ft, Fill					75	5				
Visual Description:, A-1-B; Brn-Bik crift SAND, and(-) crift(+) Gravel, trace(+) 28 Visual Description:, A-1-B; Brn crift(+) GRAVEL, some cmf Sand, trace Silt, 7-36-22- MTW, Rec. = 0.42 ft 7-36-22- MTW, Rec. = 1.17 ft (68) Classification:, A-1-B; "Brn mf(+) GRAVEL, some(+) cm(+)f Sand, little(-) Silt, 18-16-15- MTW, Rec. = 1.17 ft (21) Classification:, A-24; "Dk Gry Silt, some(+) mf(+) Gravel, some c(+)mf Sand; 18-16-15- Residual Soil, Wet, Rec. = 0.42 ft (21) Classification:, A-1-B; "Dk Gry c(+)mf Gravel, some(+) c(+)mf Sand, some Silt; 90-50/2" Classification:, Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft 90-50/2" Visual Description:, Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft 90-50/2" 15 Visual Description:, Dk Gry Decomposed Phyllite, wet, Rec. = 0.42 ft 90-50/2" 15 Visual Description:, Dk Gry Decomposed Phyllite, wet, Rec. = 0.42 ft 90-50/2" 15 Visual Description:, Dk Gry Decomposed Phyllite, wet, Rec. = 0.42 ft 90-50/2" 16 10-0.0 14-9-12- 150 ft 15 Visual Description:, Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft 90-50/2" 16 100 (25) Top of Bedrock @ 15.0 ft		* * *	¬Dry, Fill	. ,			7							
10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5		Visual Description:, A-1-B; Brn-Bik Cmt SAND, and(-) Cmt(+) Gravel, trace(+)											
10 10 15 15 15 10 10 14-9-12- 15 15 14-9-12- 15 10 10 15 15- 12 14-9-12- 15 15 10 10 15 15- 12 14-9-12- 15 15- 12 11 15 15- 15 15- 15 16-10-10- 14 (20) 16-10-10- 14 (20) 15 15.0 ft - 20.0 ft, Bluish-gray, Fine grained PHylLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-1 37 (0) Top of Bedrock @ 15.0 ft 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 (25) 100 (28) 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 (25) 100 (28)			Visual Description:, A-1-A; Brn cmf(+) GRAVEL, MTW, Rec. = 0.42 ft	some cn	nf Sand,	trace Silt,			19	9				
10 Residual Soil, Wet, Rec. = 0.42 ft 15 10 Classification:, A-1-B; *Dk Gry c(+)mf Gravel, some(+) c(+)mf Sand, some Silt; 16-10-10-14 14 (20) 15.0 ft - 20.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite 90-50/2" 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100				e(+) cm(·	+)f Sand,	little(-) Silt,			15	5				
15 Visual Description:, Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft 90-50/2" 15 15.0 ft - 20.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-1 37 Top of Bedrock @ 15.0 ft 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 100 20 20.0 ft - 25.0 ft, Bluish-gray, Fin	10	0	Classification:, A-2-4; *Dk Gry Silt, some(+) mf(+ Residual Soil, Wet, Rec. = 0.42 ft	⊦) Gravel,	some c(+)mf Sand;			15	5				
15 15.0 ft - 20.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-1 (25) (0) 37 (0) Top of Bedrock @ 15.0 ft 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 (25) (28) 100 (28) 20 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite C-2 (25) (28) 100 (28)		0.0.0 0.000	Classification:, A-1-B; *Dk Gry c(+)mf Gravel, so Residual Soil, Wet, Rec. = 0.67 ft	ome(+) c(-	+)mf San	d, some Silt	;		14	1				
20 - 20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite (25) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0	15	5 5							(50))				
20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong rock, slightly weathered, with layers of calcite (25) (28) Poor rock, NX, RMR=33			spacing, weak to medium strong rock, slightly we	LITE, vergeathered,	y close tc with laye	close joint rs of calcite.	. (25)	-		Top of	Bed	rock @	0 15.0	ft
25 Hole stopped @ 25.0 ft - Remarks: Rock core jam at 16 ft Rock core jam at 22.5 ft 30 - - Remarks: Rock core jam at 22.5 ft 30 - - - <			spacing, weak to medium strong rock, slightly we											
Votes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. 2. Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. 2. Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made	0 25 ·		Hole stopped @ 25.0) ft					1					I
Image: Second	RANS SHAFTSBURY GPJ VERMONT AC	-	Remarks: Rock core jam at 16 ft											
O 20 0 20 0 20 0 20 0 20 0 20 0 20 0 20	E> ()	-												
	Notes:	2. N Values 3. Water lev	have not been corrected for hammer energy. $\rm C_E$ is the hammer el readings have been made at times and under conditions state	energy corr ed. Fluctuat	ection facto	or.	er factors tha	n those pr	esent at	the time	meas	suremer	nts were	made.

	STATE OF VERMONT BOF							E	Boring	No.:	B-1	03
		AGENCY OF TRANSPORTATIO	N	SH		SBURY		F	Page N	o.:	1 of	1
		Interface CONSTRUCTION AND Matterials MATERIALS BUREAU		-		14-1(6)		F	Pin No.	: _	16b08	3
		CENTRAL LABORATORY							Checke	d By:	M	ΞB
Porir	ng Crew:	Pat Schofield, Art Cummings		Casing	y S	Sampler		Ground	dwater	Observ	/ations	
	• <u> </u>		Type:	WB		SS	Dat	e D	epth		Notes	
	Started:		I.D.:	<u>4 in</u>		1.5 in			(ft)			
	PG NAD83:	<u>N 160680.50 ft</u> E 1437157.10 ft	Hamme			<u>140 lb.</u> 30 in.	02/23	/21 9).1	W.T. a	after dril	ling
Stati	on:4	9+85 Offset: 9.1 RT				/AWJ						
Grou	Ind Elevation	: <u>556.1 ft</u>	Rig:	MOBILE B-48		C _F = 1.4						
Depth (ft)	Strata (1)	CLASSIFICATION OF MA (Description)	TERIALS	i		Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6" (N Value)	Moisture	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 0.8 ft										
	* * * * * * * * *	Visual Classification, A-1-B; Brn c(+)mf Sand, ar Silt, trace slag, Moist, Rec. = 0.58 ft, Fill			+)			107-95 84-70 (179) 17-11-8				
5	\swarrow \swarrow \checkmark \checkmark \checkmark Visual Classification, A-1-B; Dk Brn c(+)mf Sand, and(+) cmf(+) Gravel, \checkmark \checkmark \checkmark \checkmark Visual Classification, A-1-B; Dk Brn c(+)mf Sand, and(+) cmf(+) Gravel, trace(+) Silt, trace slag, Moist, Rec. = 1.0 ft, Fill											
		Visual Classification, A-1-B; Brn cm(+)f SAND, s Silt, Wet, Rec. = 0.17 ft			10-6-8-1 (14)	5						
	0.000 0.000 0.000	Classification:, A-1-B; *Brn m(+)f GRAVEL, som Wet, Rec. = 0.75 ft	e(+) cm(·	+)f Sand, little(-) S	silt,			11-18-13 14 (31)	3-			
10		Visual Classification, A-1-A; Brn c(+)mf Gravel, a Wet, Rec. = 0.5 ft	and(+) cn	n(+)f Sand, trace S	Silt,			12-14-12 15 (26)	2-			
		Classification:, A-2-4; *Brn mf(+) Gravel, some(+ Wet, Rec. = 0.92 ft, Sample Split; S-6A Visual Classification, A-2-4; Dk Gry cm(+)f SANI	·	. ,	/	-		9-9-7-8 (16)				
		little(+) Clayey Silt; Residual Soil, Wet, Sample S Visual Classification, A-1-A; Dk Gry c(+)mf GRA	plit; S-6E	3		-		8-15-38	-			
15		little(-) Silt; Decomposed Phyllite, Wet, Rec. = 1.		emely close to clo	se	C-1	90	100/5" (43) To	p of B	edrock	@ 16.0	ft
20		joint spacing, weak to medium strong, slightly we Very poor rock, NX, RMR=28	athered,	with layers of calc	ite	(25)	(0)					
BORING LOG VTRANS SHAFTSBURY GPJ VERMONT AOT GDT 3/23/21 00 00 05 05 05 05 05 05		21.0 ft - 26.0 ft, Bluish-gray, Fine grained PHYLL joint spacing, weak to medium strong, slightly we Very poor rock, NX, RMR=28				C-2 (25)	95 (0)					
AT AC		Hole stopped @ 26.0) ft			1	1					I
RMOL	-											
L VEF	-	Demerker										
BURY.GPJ 30	-	Remarks: Heavy rig chatter from 15.5 ft to 16 ft Rock core jam at 19.4 ft Rock core jam at 24 ft										
S SHAFTS	-											
G VTRAN	-											
		on lines represent approximate boundary between material type										
Notes	3. Water lev	have not been corrected for hammer energy. C _E is the hammer el readings have been made at times and under conditions state s that soil description has been verified based upon laboratory re	ed. Fluctuat		other	factors than	those pre	esent at the	e time m	easurem	ents were	e made.

	STATE OF VERMONT BC						NG L	.OG			Boring	g No	.: _	B-10)4
	V	Г	AGENCY OF TRANSPORTATIO	NC		SHAF	TSBU	IRY			Page	No.:	_	1 of ⁻	1
	V.	I rans#	CONSTRUCTION AND MATERIALS BUREAU				-014-1				Pin N	o.:		16b083	3
			CENTRAL LABORATORY					. ,			Checl	ked F		ME	
F						Casing	Sam	pler		Grou	ndwate				
	Boring	g Crew:	Bub Thompson, Dave Balsamo	Type:		WB	S	S	Dat	-	Depth				
	Date S	Started:	2/25/21 Date Finished: 2/25/21	I.D.:		4 in	1.5	in			(ft)		IN	otes	
	VTSP	g nad83:	N 160732.10 ft E 1437175.60 ft	Hamme		<u>140 lb.</u>	140		02/25	/21	3.6	W	/.T. aft	er drill	ing
	Statio	n: <u>5</u> 0	0+12 Offset: <u>38.8 RT</u>	Hamme	er ⊢all: er/Rod T	30 in.	to/AW	in.							
	Groun	d Elevation	551.0 ft	Rig:		_E B-57	C _F =								
F									%(~			
	Depth (ft)	Strata (1)	CLASSIFICATION OF MA	TERIALS				deg	Zec. D %	'8/s'	sture	ent	Gravel %	% pi	% se
	D D D	Stra	(Description)				1	Kun (Dip deg.)	Core Rec. % (RQD %)	Blows/6" // //aiia/	Moi	Content %	Grav	Sand ⁶	Fines ⁶
┝			`∖Topsoil, 0.0 ft - 0.2 ft						Ŭ			-			
	-	$[0, \bigcirc 0]$	Visual Classification, A-1-B; Brn-Gry c(+)mf SAN	ND, some	(+) cmf(+) Gravel,				5-2-2 (4)					
	-		trace Silt, Moist, Rec. = 0.5 ft							4-6-7-	11				
	-		Visual Classification, A-1-B; Dk Brn cm(+)f SANI Silt, MTW, Rec. = 0.75 ft	D, little(+)) cmf(+)	Gravel, little				4-6-7-					
	-	Po D. Og													
	5 -		Classification:, A-4; *Dk Gry m(+)f Gravel, and S Residual Soil, Wet, Rec. = 0.5 ft	ilt, some(-) cm(+)f Sand;				15-5-6 (11					
	5	////									, 				
	-	29//	Visual Classification, A-2-6; Dk Gry cmf(+) Grave	el, and Si	lty Clay,	little cmf(+)				10-6- (14					
	-		Sand; Residual Soil, Wet, Rec. = 0.75 ft							(/				
	-		Classification:, A-1-B; *Dk Gry c(+)mf Sand, som	ne mf(+)	Gravel, s	some Silt;				8-8-15					
	-		Residual Soil, Wet, Rec. = 0.83 ft							(23)				
	10 -	o.Q.Q.o.∮	Visual Classification, A-1-B; Dk Gry c(+)mf SAN	D. some	cmf(+) (Gravel, little				29-22-	18-				
	-	0	Silt; Residual Soil, Wet, Rec. = 1.58 ft	,		- ,				14 (40					
	-	$\begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $								X -	,				
	-	-													
	-	22	Visual Classification, Dk Gry Decomposed Phylli	to Poo -	- 0 17 ft					60/2	,				
	15 -							0.4	07	(60)	Deal	na ala G	15.0	<u>с</u>
	-		15.0 ft - 20.0 ft, Bluish-gray, Fine grained PHYLI joint spacing, weak to medium strong, slightly we					C-1 (25)	87 (15)		Top of	Beai	FOCK (C	15.0	π
	-		Very poor rock, NX, RMR=28												
	-														
	-														
	20	KIXA													
	20 -		20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLL joint spacing, weak to medium strong, slightly we					C-2 (25)	93 (67)		T				
	-		Fair rock, NX, RMR=38	all lei eu,	with laye			(23)	(07)						
	-														
23/2	-														
DT 3/	-														
JT.GI	25 -		Hole stopped @ 25.0) ft					I	l					l
BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21	-														
MOM	-														
VER	-	-													
GPJ	-	-													
URY.	30 -														
TSB	-	-													
SHAF	-	-													
ANS	-														
VTR,	-														
00															
DNG	Notes:	2. N Values I	on lines represent approximate boundary between material type have not been corrected for hammer energy. C_E is the hammer have not been bare between mode at times end under an at the second seco	energy corr	ection fac	tor.	an f- 1		ihas -		h a 4"	-		44.1-1	ا م
BOR			el readings have been made at times and under conditions state s that soil description has been verified based upon laboratory re		ions may	occur due to oth	iei iactoi	is inan 1	nose pre	sent at 1	ine ume	meas	suremer	ns were	made.

	STATE OF VERMONT BORING LOG							Boring No.: B-105					
	Trong	AGENCY OF TRANSPORTATIO	NC		SHAI	FTSBURY		Pa	ge No	.: _	1 of	1	
					STP	-014-1(6)		Pii	n No.:		16b08	3	
		CENTRAL LABORATORY						Cł	ecked	By:	ME	B	
Borin	g Crew:	Pete Labossiere, Travis Clegg			Casing	Sampler		Groundv	vater C	bserva	tions		
			Type:		<u>WB</u>	SS	Dat	te De	oth	N	otes		
		2/18/21 Date Finished: 2/18/21	I.D.: Hamm	or \N/t·	4 in 140 lb.	<u>1.5 in</u> 140 lb.		(f	:)				
	PG NAD83:	N 160687.80 ft E 1437196.30 ft	Hamm		30 in.	30 in.							
Statio		0+25 Offset: <u>8.4 RT</u>	Hamm	er/Rod T		ito/AWJ							
Grou	nd Elevation	:556.8 ft	Rig:	STRATA	STAR 15	C _F = 1.1					-	-	
Depth (ft)	Strata (1)	CLASSIFICATION (Descri		ERIALS				Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %	
		Asphalt Pavement, 0.0 ft - 0.75 ft											
		Visual Classification, A-1-A; Brn cmf(+) GRAVE ft, Fill	L, and cn	n(+)f San	d, trace Silt	, Dry, Rec. =	1.5	53-140- 102-40 (242)					
	× × × × × ×	Visual Classification, A-1-B; Brn c(+)mf Sand, an Moist, Rec. = 1.25 ft, Fill	, trace slag,		26-43-60- 30 (103)								
5 -	0.00.00 0.00 0.00 0.00	Visual Classification, A-1-B; Brn cm(+)f Sand, ar 0.25 ft	c. =	22-25-28- 45 (53)									
	0.0.0.0 0.0.0	Classification:, A-1-B; *Brn c(+)mf Sand, and(-)		12-10-9- 10 (19)									
10 -		Classification:, A-1-B; *Brn mf(+) GRAVEL, som	B; *Brn mf(+) GRAVEL, some cm(+)f Sand, little(-) Silt, Wet, Rec. = 0.58										
		Visual Classification, A-1-B; Dk Gry cm(+)f SAN Soil, Wet, Rec. = 0.67 ft	ual	14-13-9- 10 (22)									
		Field Note:, No Recovery, Rec. = 0.0 ft						10-12-11- 23 (23)					
15 -	-	Hole stopped	1@150	ft				(20)					
20 -	-	Remarks: 4" casing snapped by the threading approximately 3"casing snapping by threading approximately 8 ft Hole abandoned. Offset to B-105A 5 ft east. Hole	7 ft dowr down the backfilled	the hole hole with spo	e bils and grou	uted. Topped	with a	sphalt cold	patch				
BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT A01.GDT 3/23/21 00 00 00	-												
SRING LOG VTRANS SHAFTSB	2. N Values 3. Water lev	ion lines represent approximate boundary between material typ have not been corrected for hammer energy. C _E is the hammer el readings have been made at times and under conditions stat	energy corr ed. Fluctuat	ection fact	or.	ner factors than t	hose pro	esent at the t	me mea	asuremei	nts were	made.	
ы	4. ^ Indicates	s that soil description has been verified based upon laboratory r	esuits.										

	STATE OF VERMONT BO								Boring	g No.	: _	B-10	5A
	T	AGENCY OF TRANSPORTATIO	NC		SHAF	TSBURY			Page	No.:		1 of 1	1
		MATERIALS BUREAU				-014-1(6)			Pin N	o.:		16b083	3
		CENTRAL LABORATORY							Checl	ked E	By:	ME	В
Borin	g Crew:	Pat Schofield, Art Cummings			Casing	Sampler		Grou	Indwate	er Ob	serva	tions	
	Started:		Type:		WB	SS	Da	te	Depth		N	otes	
	PG NAD83:	N 160689.90 ft E 1437200.90 ft	I.D.: Hamme	er Wt:	<u>4 in</u> 140 lb.	<u>1.5 in</u> 140 lb.			(ft)				
Statio		0+30 Offset: 7.1 RT	Hamme	er Fall:	30 in.	30 in.	02/22	2/21	8.6	VV	. I. aft	er drilli	ing
	nd Elevation		Hamme Rig:	er/Rod T	ype: <u>Au</u> _E B-48	$\frac{to/AWJ}{C} = 1.4$				+-			
			riy	WOBIL	L D-40	C _F = 1.4	. % _						
Depth (ft)	Strata (1)	CLASSIFICATION OF MA (Description)	TERIALS			Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6" //airie/	Moisture	Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 0.75 ft											
5 -	-	Advanced casing with no sampling from 0.75 information refer to soil boring B-105.	- 9 ft. Foi	⁻ soil									
10 -		Visual Classification, A-1-B; Tn c(+)mf GRAVEL Wet, Rec. = 0.17 ft	, little(+)	cmf San	d, trace Silt,			8-16-9 (25					
	0.0.0.00	Visual Classification, A-1-B; Dk Gry c(+)mf GRA trace(+) Silt; Residual Soil, Wet, Rec. = 0.42 ft	VEL, son	ne(+) cm	nf Sand,			12-13- 12 (24					
15 -	-	Field Note:, No Recovery, Rec. = 0.0 ft						34-37- 58 (79					
	-	Field Note:, No Recovery, Rec. = 0.0 ft				_		50/0 (50)				
20 -		19.0 ft - 24.0 ft, Bluish-gray, Fine grained PHYLI joint spacing, Quartz vein from 22.6 ft to 22.8 ft, slightly weathered, with layers of calcite Very po	weak to r	nedium	strong,	C-1 (25)	80 (0)		Top of	Bedr	ock @	y 19.0	π
- 55		24.0 ft - 29.0 ft, Bluish-gray, Fine grained PHYLI joint spacing, weak to medium strong, slightly we Poor rock, NX, RMR=33					73 (25)						
5. .∠		Hole stopped @ 29.0	0 ft					•	I				
20 - 1KANS SHAFT SBUK	-	Remarks: See log B-105 for soil profile from 1 ft to 9 ft Heavy rig chatter at 15 ft. Color change to gray in Casing refusal at 17.5 ft	wash tub										
Notes:	2. N Values 3. Water lev	ion lines represent approximate boundary between material type have not been corrected for hammer energy. $C_{\rm E}$ is the hammer el readings have been made at times and under conditions state s that soil description has been verified based upon laboratory r	energy corr ed. Fluctuat	ection fact	or.	ner factors than	those pr	esent at t	the time	meas	uremen	its were	made

		STATE OF VERMONT			BOR	ING LOG		Boring No.: B-106)6
	T	AGENCY OF TRANSPORTATIO	NC		SHAI	FTSBURY		P	age No	o.: _	1 of '	1
	ILAU2	MATERIALS BUREAU				-014-1(6)		P	n No.:		16b083	3
		CENTRAL LABORATORY						c	hecke	d By:	ME	B
Borin	g Crew:	Pat Schofield, Art Cummings			Casing	Sampler		Ground	water	Observa	ations	
			Type:		WB	SS	Dat	te De	pth	Ν	lotes	
	Started:		I.D.: Hamme	× \//+·	<u>4 in</u> 140 lb.	<u>1.5 in</u> 140 lb.		(t)			
	PG NAD83:	N 160692.00 ft E 1437213.00 ft	Hamme		30 in.	30 in.	02/23	/21 5.	2	W.T. af	ter drill	ing
Static		0+42 Offset: 7.1 RT	Hamme	er/Rod T		ito/AWJ						
Grou	nd Elevation	:557.3 ft	Rig: _	MOBIL	E B-48	C _F = 1.4						-
Depth (ft)	Strata (1)	CLASSIFICATION (Descri		ERIALS				Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 1.0 ft										
	* * *	Visual Classification, A-1-B; Brn cm(+)f GRAVE MTW, Rec. = 1.0 ft, Fill	L, some(-	-) cmf Sa	and, little Sil	t, trace slag,		81-85-98 35 (183)	-			
	0.000 0.000 0.000	Visual Classification, A-1-B; Brn c(+)mf SAND, s 0.42 ft	some mf(+) Grave	el, trace(+) S	ilt, MTW, Re	c. =	15-22-26 16 (48)				
5 -	0.0.0.0 0.00 0.00	Classification:, A-1-B; *Brn m(+)f Gravel, some(-	et, Rec. = 0.4	2 ft	7-17-16-7 (33)	,						
		Visual Classification, A-2-4; Dk Brn-Gry c(+)mf S Wet, Rec. = 0.42 ft	ilt,	6-3-2-10 (5)								
10 -		Visual Classification, A-1-B; Brn cmf(+) GRAVE 0.25 ft, Possibly Wash	Silt, Wet, Rec	. =	22-33-15 16 (48)	-						
		Classification:, A-1-B; *Brn mf(+) Gravel, some o	cm(+)f Sa	nd, som	e(-) Silt, We	et, Rec. = 0.7	5 ft	20-30-39 40 (69)	-			
15 -	0:.,0:.,	Classification:, A-2-4; *Dk Gry cm(+)f Sand, and Phyllite, Wet, Rec. = 0.92 ft	(-) mf(+)	Gravel, s	some Silt; D	ecomposed		13-41-76 50/1" (117)	-			
	1	Field Note:, No Recovery, Rec. = 0.0 ft						50/0"				
		Hole stopped	d @ 17.0	ft				(50)				
20 -	-	Remarks: Roller bit refusal at 17 ft Split spoon refusal at 17 ft.										
ERMONT A0T.GDT 3/2: - 52	-											
BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT A01.GDT 3/23/21 00 ::	-											
Notes:	2. N Values 3. Water leve	on lines represent approximate boundary between material type have not been corrected for hammer energy. $C_{\rm E}$ is the hammer el readings have been made at times and under conditions state that soil description has been verified based upon laboratory r	energy corr ed. Fluctuat	ection fact	or.	ner factors than t	those pre	esent at the	time me	asureme	nts were	made.

Γ	STATE OF VERMONT BORI				N	GLOG			Borir	ng No).:	B-10)7		
	(V	Т	AGENCY OF TRANSPORTATION	NC		SHAF	-т	SBURY			Page	e No.:	_	1 of <i>'</i>	1
	V	I rans.	CONSTRUCTION AND MATERIALS BUREAU			_		4-1(6)			Pin I	No.:		16b083	3
			CENTRAL LABORATORY								Che	cked	By:	ME	B
	Dorino	Crown	Data Laboraiara, Travia Class			Casing	S	Sampler		Grou	ndwa	ter O	bserva	tions	
		g Crew:	Pete Labossiere, Travis Clegg	Type:		WB		SS	Dat	e	Depth	n	N	otes	
		Started:	<u>2/18/21</u> Date Finished: <u>2/18/21</u>	I.D.:		4 in	_	<u>1.5 in</u>			(ft)				
	VTSP	g nad83:	<u>N 160694.10 ft</u> E 1437233.00 ft	Hamm		<u>140 lb.</u> 30 in.	_	<u>140 lb.</u> 30 in.	02/18	/21	7.9	N	/.T. af	ter drill	ing
	Statio	n: <u>5</u> 0	0+62 Offset: <u>8.4 RT</u>		er/Rod T			AWJ							
	Groun	nd Elevation	:557.7 ft	Rig:	STRATA	STAR 15	(C _F = 1.1							
Γ		,						(;	. % ()	5		e%	%	%	%
	Depth (ft)	Strata (1)	CLASSIFICATION OF MA	TERIALS	i			Run (Dip deg.)	Rec 2D %	Blows/6"		istur tent	Gravel ⁶	Sand %	Fines %
	Δ	Stra	(Description)					, <u>G</u>	Core Rec. % (RQD %)	Blo		Moisture Content %	Gra	Sa	Fin
F			Asphalt Pavement, 0.0 ft - 0.75 ft												
	-	\star \star \star	Visual Classification, A-1-B; Brn cmf(+) SAND, s	some(-) c	mf(+) G	ravel,				117-9					
	-	\star \star \star	trace(+) Silt, trace slag, Dry, Rec. = 2.0 ft, Fill							92-4 (18					
	-	\star \star \star		- 1(-)				-		40.04	10				
	-	\star \star \star	Visual Classification, A-1-B; Brn c(+)mf Sand, ar Silt, trace slag, trace brick, Moist, Rec. = 0.92 ft,	nd(+) cmi Fill	(+) Grav	vel, little(-)				43-64 27					
	5 -	\times \times \times								(104	·				
	U	0	Classification:, A-1-B; *Brn c(+)mf Sand, some n \neg Rec. = 0.92 ft, Sample Split; S-3A	nf(+) Gra	vel, som	ne Silt, Wet,				4-3-4					
	-		Classification:, A-4; *Dk Gry Silt, some(+) c(+)m	f Sand. s	ome mf(+) Gravel.									
	-		\trace wood, Wet, Sample Split; S-3B	,		, , - ,		1		5-5-4 (9)					
	-		Field Note:, No Recovery, Rec. = 0.0 ft							(9)					
	-	<u>ڣڹڹڹ</u> ڹ؋	Visual Classification, A-1-B; Brn cmf(+) GRAVE	_, some(-	·) cm(+)	f Sand, trace		1		10-24					
	10 -	$[0, \bigcup_{i=1}^{n}, \bigcup_{i=1}^{n},$	Silt, Wet, Rec. = 0.58 ft		, , ,					11 (32					
	-	a.O. (). a.	Visual Classification, A-1-B; Gry c(+)mf GRAVE	some(+) cmf S	and trace(+)	<u> </u>	-		25-21					
	-	و کې د د د د د د د د د د د د د د د د د د	Silt; Residual Soil, Wet, Rec. = 0.92 ft	L, 001110(,			17 (39	-				
	-	$\overline{\mathbf{D}}$						-			<i>′</i>				
	-	~ ~		(1) (-		00.40	~				
	15 -	2 2 2	Visual Classification, Dk Gry cmf(+) GRAVEL, se Sand; Residual Soil, Wet, Rec. = 1.25 ft	ome(+) C	layey Si	it, little cmf(+	-)			26-46 50/	"				
	-	5'3								(144	+)				
	_														
			17.0 ft - 22.0 ft, Bluish-gray, Fine grained PHYLI spacing, weak to medium strong, slightly weathe	_ITE, ver	y close t	o close joint		C-1 (25)	83 (13)		Top o	f Bed	rock @	ງ 17.0 	ft
			poor rock, NXDC, RMR=28	ieu, with	layers o		у	(23)							
	20 -														
	-														
	-		22.0 ft - 27.0 ft, Bluish-gray, Fine grained PHYLI	_ITE, ver	y close t	o close joint		C-2	93		-+				
3/21	-	KIXO	spacing, weak to medium strong, slightly weathe	red, with	, layers o	f calcite. Poo	or	(25)	(35)						
3/2:	-		rock, NXDC, RMR=33												
GDI	25 -														
AOT	-														
ONT	-														
ERM	_		Hole stopped @ 27.0) ft											
2 <															
₹ Z.G	-														
SBUF	30 -]													
IAFT:	-	1													
S SH	-														
RAN	-														
BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21	-														
Ĭ		1. Stratificati	on lines represent approximate boundary between material type	es. Transitio	on may be	gradual.									
N N	lotes:	2. N Values 3. Water lev	have not been corrected for hammer energy. $C_{\rm E}$ is the hammer el readings have been made at times and under conditions state	energy corr ed. Fluctuat	ection fac	tor.	ner f	actors than	those pre	esent at	the time	e mea	suremei	nts were	made.
ß			s that soil description has been verified based upon laboratory r		,										

For:	VTRANS, Shaftsbury T.O #1	Job Number:	78773	Sheet No.	1 of 1	
By:	MEB	Check By:	BTF	Check By:		
Date:	3/23/2021	Date:	3/23/2021	Date:		

Geomechanical Classification of Rock Masses (Rock Mass Rating)

							Geome	chanical Class	ification of I	Rock Mass	es (Rock N	Aass Rating)					
				Streng	th of Intact Ro	ck		RC	D	Space o	of Joints	Condition	Ground V	Vater	Joint Orientation		
Boring	Core Run	Sample Elevation (ft)	Presumptive Uniaxial Compressive Strength ¹ (ksf)	Uniaxial Compressive Strength Rating	Laboratory Uniaxial Compressive Strength ¹ (ksf)	Uniaxial Compressive Strength Rating	Intact Strength Rating ²	Rock Quality Designation (%)	Rock Quality Rating	Joint Spacing ³ (in)	Joint Spacing Rating	Joint Condition Rating ⁴	General Conditions ⁵	Ground Water Rating	Strike and Dip Orientations Rating ⁶	Rock Mass Rating ⁷	Rock Mass Rating ⁸
101	C - 1	540.8 - 535.8	576	4		N/A	4	0	3	1.0	5	6	m	7	-7	28	18
101	C - 2	535.8 - 530.8	576	4		N/A	4	15	3	1.0	5	6	m	7	-7	28	18
102	C - 1	540.6 - 535.6	576	4		N/A	4	0	3	1.0	5	6	m	7	-7	28	18
102	C - 2	535.6 - 530.6	576	4		N/A	4	28	8	1.0	5	6	m	7	-7	33	23
103	C - 1	540.1 - 535.1	576	4		N/A	4	0	3	1.0	5	6	m		-7	28	18
103	C - 2	535.1 - 530.1	576	4		N/A	4	0	3	1.0	5	6	m	7	-7	28	18
104	C - 1	536.0 531.0	576	4		N/A	4	15	3	1.0	5	6	m	7	-7	28	18
104	C - 2	531.0 526.0	576	4		N/A	4	67	13	1.0	5	6	m	7	-7	38	28
105A	C - 1	538.0 - 533.0	576	4		N/A	4	0	3	1.0	5	6	m	7	-7	28	18
105A	C - 2	533.0 - 528.0	576	4		N/A	4	25	8	1.0	5	6	m	7	-7	33	23
107	C - 1	540.7 - 535.7	576	4		N/A	4	13	3	1.0	5	6	m	7	-7	28	18
107	C - 2	535.7 - 530.7	576	4		N/A	4	25	8	1.0	5	6	m	7	-7	33	23
			576				4	67	13		5			7		38	28
			576				4	0	3		5			7		28	18
			0				0	67	10		0			0		10	10
			0				0	20	3		0		0				3
			576				4	16	5		5			7		30	20

Notes:

1. The presumptive uniaxial compressive strength was assumed to be 4,000 psi based on field observations (hardness testing). Typical value ranges for Phyllite are described in Ref. 2, Table 4.4.8.1.2B (500 ksf - 5,000 ksf).

2. Intact Strength Rating is the lesser of Point Load Strength Rating and Uniaxial Compressive Strength Rating, when available.

3. Each core run has several joint spacing distances, an approximate average of these distances was taken for each core run.

4. Joint Condition Rating based on Ref. 1, Table 10.4.6.4-1

		-	
	25	- Very rough surfaces, not continuous, no separation, hard joint wall rock	
	20	- Slightly rough surfaces, separation < 0.05 in., hard joint wall	
	12	- Slightly rough surfaces, separation < 0.05 in., soft joint wall	
	6	- Slick-sided surfaces or gouge < 0.2 in. thick, joints open 0.05 - 0.2 in., continuous joints	
	0	- Soft gauge > 0.2 in. thick, joints open > 0.2 in., continuous joints	
5.	Ground Water: "C"	for Completely Dry Rating = 10, "M" for Moist Only Rating = 7, "P" for Moderate Pressure Rating = 4, "S" for Severe Problem	Rating = 0, Ref. 1, Table 10.4.6.4.

6. Joint Orientation Rating based on Ref. 1, Table 10.4.6.4-2

Joint Orientation	Very Favorable	Favorable	Fair	Unfavorable	Very Unfavorable
Tunnels	0	-2	-5	-10	-12
Foundations	0	-2	-7	-15	-25
Slopes	0	-5	-25	-50	-60

7. RMR provided has Ground Water Rating = 10 and Joint Orientation Rating = 0 so that formulas of Ref. 3, page 37 and Ref. 5 are applicable, not necessarily because these are representative conditions.

8. RMR provided includes realistic Ground Water Rating and Joint Orientation Rating in accordance with Ref. 1, Table 10.4.6.4-1 and Ref. 4.

References:

1. AASHTO LRFD Bridge Design Specifications, 2012, Table 10.4.6.4-1,2,3

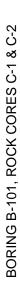
2. AASHTO 2002 Standard Specifications for Highway Bridges, 17th Ed.

3. Hoek, E. and Brown, E.T. The Hoek-Brown Failure Criterion - A 1988 Update. Proceeding from the 15th Canadian Rock Mechanics Symposium (Ed. J.H. Curran). pp. 31-38. Civil Engineering Department, University of Toronto. 1988.

4. Bieniawski, Z.T. 1989. Engineering Rock Mass Classifications. New York: Wiley

5. Bieniawski, Z.T. 1974. Geomechanics Classification of Rock Masses and its Application in Tunnelling. Proc. 3rd Congr. Int. Soc. Rock Mech., Denver 2, Part A, 27-32









ROCK CORE PHOTOS SHEET 1 OF 4

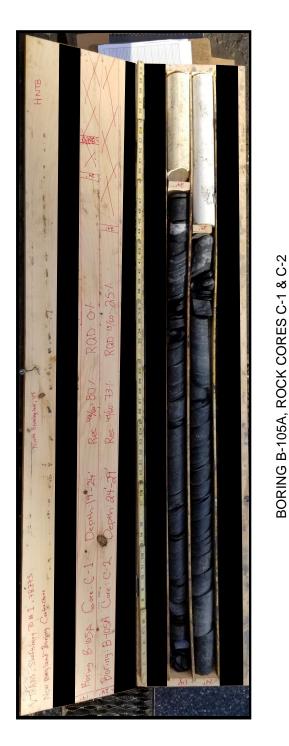
VTRANS PROJECT NO. STP 014-1(6) SHAFTSBURY NORTH BENNINGTON, VERMONT



SHAFTSBURY NORTH BENNINGTON, VERMONT

HNTB

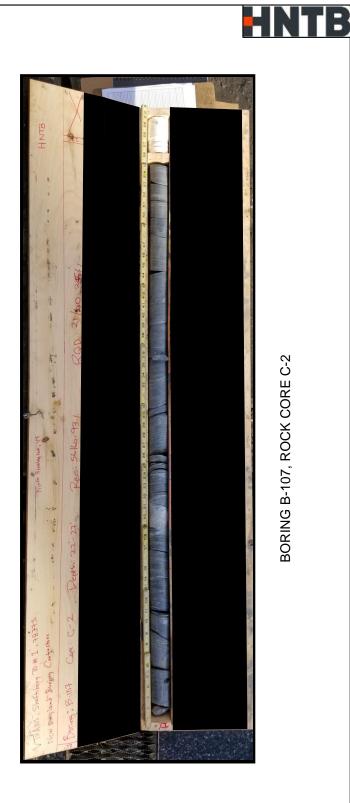




ROCK CORE PHOTOS SHEET 3 OF 4

VTRANS PROJECT NO. STP 014-1(6) SHAFTSBURY NORTH BENNINGTON, VERMONT

HNTB





BORING B-107, ROCK CORE C-1

ROCK CORE PHOTOS SHEET 4 OF 4

VTRANS PROJECT NO. STP 014-1(6) SHAFTSBURY NORTH BENNINGTON, VERMONT