

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., 1 $\frac{3}{8}$ 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.

Table 2.1: 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

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
0.75 – 5.0 feet	Fill (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
0.75 – 5.0 feet	Fill (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

AASHTO	
A1	Gravel and Sand
A3	Fine Sand
A2	Silty or Clayey Gravel and Sand
A4	Silty Soil - Low Compressibility
A5	Silty Soil - Highly Compressible
A6	Clayey Soil - Low Compressibility
A7	Clayey Soil - Highly Compressible

ROCK QUALITY DESIGNATION

R.Q.D. (%)	ROCK DESCRIPTION
0-25	Very Poor
25 to 50	Poor
51 to 75	Fair
76 to 90	Good
90	Excellent

SHEAR STRENGTH

UNDRAINED SHEAR STRENGTH IN P.S.F.	CONSISTENCY
0-250	Very Soft
250-500	Soft
500-1000	Med. Stiff
1000-2000	Stiff
2000-4000	Very Stiff
4000	Hard

CORRELATION GUIDE OF "N" TO DENSITY/CONSISTENCY

DENSITY (GRANULAR SOILS)		CONSISTENCY (COHESIVE SOILS)	
N	DESCRIPTIVE TERM	N	DESCRIPTIVE TERM
0-5	Very Loose	0-2	Very Soft
5-10	Loose	2-4	Soft
11-24	Med. Dense	5-8	Med. Stiff
25-50	Dense	9-15	Stiff
50	Very Dense	16-30	Very Stiff
		31-60	Hard
		60	Very Hard

COMMONLY USED SYMBOLS

- ▼ Water Elevation
- ⊕ Standard Penetration Boring
- ⊕ Auger Boring
- ⊕ Rod Sounding
- S Sample
- N Standard Penetration Test
- Blow Count Per Foot For:
 - 2" O. D. Sampler
 - 1 3/8" I. D. Sampler
 - Hammer Weight Of 140 Lbs.
 - Hammer Fall Of 30"
- 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"
- BX Core Size 1 5/8"
- 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
- MTW Moist To Wet
- W Wet
- Sat Saturated
- Bo Boulder
- Gr Gravel
- Sa Sand
- Si Silt
- Cl Clay
- HP Hardpan
- Le Ledge
- 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
- ℄ Less Than
- ℄ Greater Than
- R Refusal (℄ 100)
- VTSPG NAD83 - See Note 7

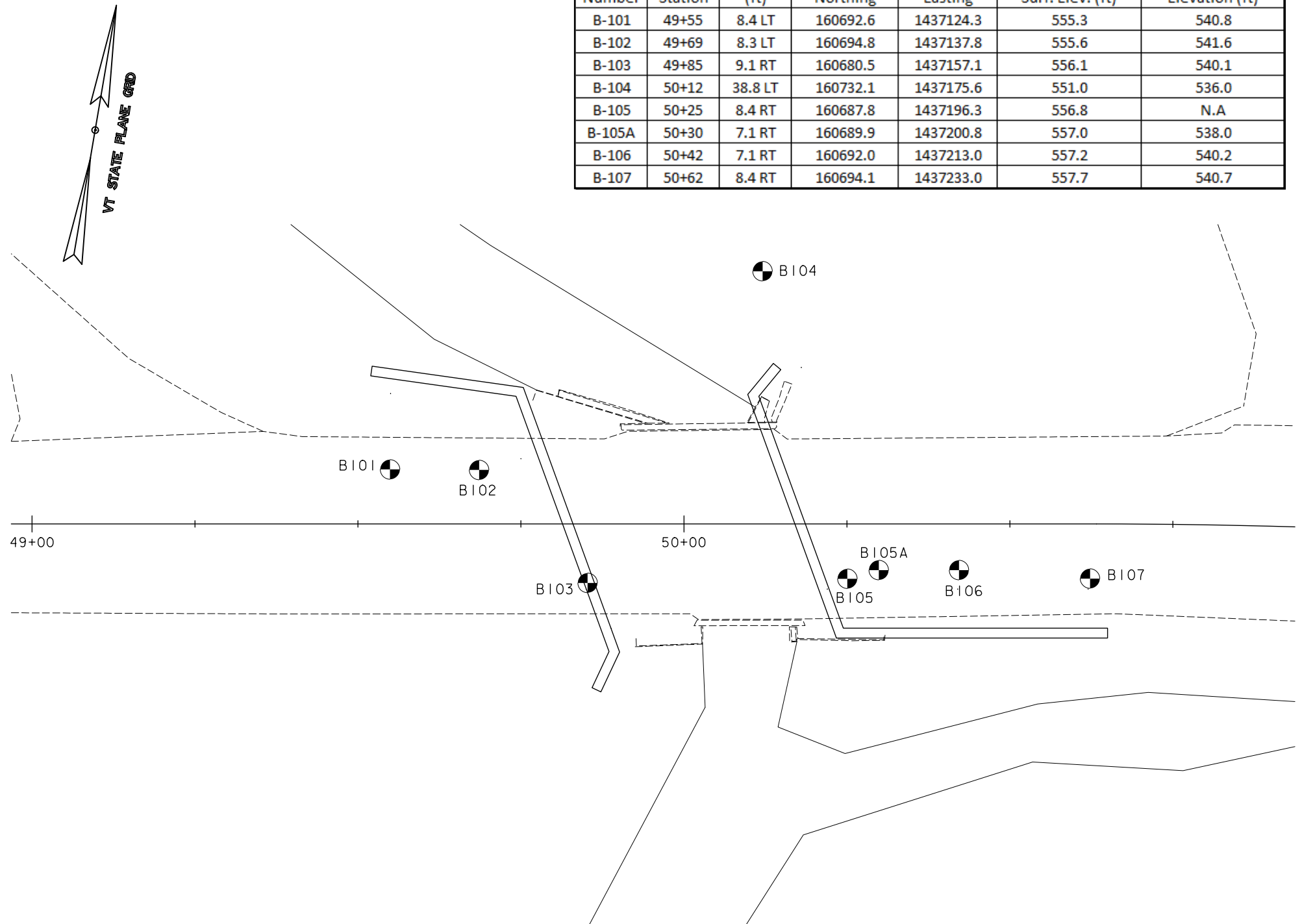
COLOR			
blk	Black	pnk	Pink
bl	Blue	pu	Purple
brn	Brown	rd	Red
dk	Dark	tn	Tan
gry	Gray	wh	White
gn	Green	yel	Yellow
lt	Light	mltc	Multicolored
or	Orange		

DEFINITIONS(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).
- SILT** - Soil ℄ 0.0029" (#200 sieve), non or slightly plastic and exhibits no strength when air-dried.
- CLAY** - Fine grained soil, exhibits plasticity when moist and considerable strength when air-dried.
- 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 saturated (loose) that it flows into drill casing during extraction of wash rod.
- STRIKE**- Angle from magnetic north to line of intersection of bed with a horizontal plane.
- DIP**- Inclination of bed with a horizontal plane.

SCALE 1" = 10'-0"

Boring Chart						
Boring Number	Baseline Station	Offset (ft)	Offset Point		Approx. Ground Surf. Elev. (ft)	Approx. Bedrock Elevation (ft)
			Northing	Easting		
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	N.A
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



GENERAL NOTES

- The subsurface explorations shown herein were made between February 17th and February 25th by HNTB.
- Soil and rock classifications, properties and descriptions are based on engineering interpretation from available subsurface information by the Agency and may not necessarily reflect actual variations in subsurface conditions that may be encountered between individual boring or sample locations.
- Observed water levels and/or conditions indicated are as recorded at the time of exploration and may vary according to the prevailing rainfall, methods of exploration and other factors.
- Engineering judgment was exercised in preparing the subsurface information presented herein. Analysis and interpretation of subsurface data was performed and interpreted for Agency design and estimating purposes. Presentation of the information in the Contract is intended to provide the Contractor access to the same data available to the Agency. The subsurface information is presented in good faith and is not intended as a substitute for personal investigation, independent interpretation, independent analysis or judgment by the Contractor.
- Pictorial structure details shown on the boring plan layout or soils profile are for illustrative purposes only and may not accurately portray final contract details.
- Terminology used on boring logs to describe the hardness, degree of weathering, and spacing of fractures, joints and other discontinuities in the bedrock is defined in the AASHTO Manual on Subsurface Investigations, 1988.
- Northing and Easting coordinates are shown in Vermont State Plane Grid North American Datum 1983 in meters and survey feet.

PROJECT NAME: SHAFTSBURY
 PROJECT NUMBER: STP 014-1(6)

FILE NAME: s16b083bor.dgn	PLOT DATE: \$\$\$DATE\$\$\$
PROJECT LEADER: S. MADDEN	DRAWN BY: M. BARAHONA
DESIGNED BY: M. RIEGEL	CHECKED BY: M. RIEGEL
BORING INFORMATION	SHEET \$\$\$ OF \$T*\$

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



STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
STP-014-1(6)

Boring No.: B-101
Page No.: 1 of 1
Pin No.: 16b083
Checked By: MEB

Boring Crew: Pat Schofield, Art Cummings
Date Started: 2/24/21 Date Finished: 2/24/21
VTSPG NAD83: N 160692.60 ft E 1437124.30 ft
Station: 49+55 Offset: 8.4 LT
Ground Elevation: 555.3 ft

Casing: WB Sampler: SS
Type: WB I.D.: 4 in 1.5 in
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: MOBILE B-48 C_E = 1.4

Groundwater Observations		
Date	Depth (ft)	Notes
02/24/21	7.1	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (ROD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.7		Asphalt Pavement, 0.0 ft - 0.7 ft							
	× × ×	Visual Description: Bk Slag, Moist, Rec. = 1.25 ft, Fill			34-60-55-50/2" (115)				
		Visual Description: A-1-B; Brn-Tn c(+)mf SAND, and(+) cmf(+) Gravel, trace Silt, Moist			28-18-17-7 (35)				
5		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			5-5-5-7 (10)				
		Classification: A-4; *Brn Silt, some c(+)mf Sand, some mf(+) Gravel, MTW, Rec. = 0.5 ft			5-5-6-6 (11)				
		Classification: A-1-B; *Brn c(+)mf Sand, some(+) mf(+) Gravel, little(+) Silt, Wet, Rec. = 0.58 ft			16-24-24-22 (48)				
10		Field Note: No Recovery; Cleaned out to 11 ft, Rec. = 0.0 ft			8-13-28-100/5" (41)				
		Visual Description: A-1-B; Dk Gry c(+)mf GRAVEL, some(+) cmf(+) Sand, little Silt; Residual Soil, Wet, Rec. = 1.08 ft			70/3" (70)				
		Visual Description: Dk Gry Decomposed Phyllite, Wet							
		Visual Description: Dk Gry Decomposed Phyllite, Wet, Rec. = 0.17 ft							
15		14.5 ft - 19.5 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-1 (25)	93 (0)					
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 @ 24.5 ft							
30		Remarks: Roller bit refusal at 14.5 ft Rock core jam at 17 ft Rock core jam at 22.5 ft							

BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
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.
4. * Indicates that soil description has been verified based upon laboratory results.



STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
STP-014-1(6)

Boring No.: B-102
Page No.: 1 of 1
Pin No.: 16b083
Checked By: MEB

Boring Crew: Pete Labossiere, Travis Clegg
Date Started: 2/17/21 Date Finished: 2/17/21
VTSPG NAD83: N 160694.80 ft E 1437137.80 ft
Station: 49+69 Offset: 8.3 LT
Ground Elevation: 555.6 ft

Casing: WB Sampler: SS
Type: WB I.D.: 4 in 1.5 in
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: STRATA STAR 15 C_E = 1.1

Groundwater Observations		
Date	Depth (ft)	Notes
02/17/21	8.6	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (ROD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.7		Asphalt Pavement, 0.0 ft - 0.7 ft							
0.7 - 1.42	XXX	Visual Description: Dk Gry Slag, Dry, Rec. = 1.42 ft, Fill			38-63-65-75 (128)				
1.42 - 1.5	XXX	Visual Description: A-1-B; Tn cmf Sand, and(+) cmf(+) Gravel, trace(+) Silt, Dry, Fill							
1.5 - 1.5	XXX	Visual Description: A-1-B; Brn-Blk cmf SAND, and(-) cmf(+) Gravel, trace(+) Silt, trace brick, MTW, Rec. = 1.5 ft, Fill			81-26-44-28 (70)				
1.5 - 0.42	XXX	Visual Description: A-1-A; Brn cmf(+) GRAVEL, some cmf Sand, trace Silt, MTW, Rec. = 0.42 ft			7-36-22-19 (58)				
0.42 - 1.17	XXX	Classification: A-1-B; *Brn mf(+) GRAVEL, some(+) cm(+)f Sand, little(-) Silt, MTW, Rec. = 1.17 ft			18-16-15-15 (31)				
1.17 - 0.42	XXX	Classification: A-2-4; *Dk Gry Silt, some(+) mf(+) Gravel, some c(+)mf Sand; Residual Soil, Wet, Rec. = 0.42 ft			14-9-12-15 (21)				
0.42 - 0.67	XXX	Classification: A-1-B; *Dk Gry c(+)mf Gravel, some(+) c(+)mf Sand, some Silt; Residual Soil, Wet, Rec. = 0.67 ft			16-10-10-14 (20)				
0.67 - 0.42	XXX	Visual Description: Dk Gry Decomposed Phyllite, Wet, Rec. = 0.42 ft			90-50/2" (50)				
0.42 - 15.0	XXX	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.. Very poor rock, NX, RMR=28	C-1 (25)	37 (0)	Top of Bedrock @ 15.0 ft				
15.0 - 25.0	XXX	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.. Poor rock, NX, RMR=33	C-2 (25)	100 (28)					
25.0 - 25.0		Hole stopped @ 25.0 ft							
25.0 - 30.0		Remarks: Rock core jam at 16 ft Rock core jam at 22.5 ft							

BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
 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.
 4. * Indicates that soil description has been verified based upon laboratory results.



STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
STP-014-1(6)

Boring No.: B-103
Page No.: 1 of 1
Pin No.: 16b083
Checked By: MEB

Boring Crew: Pat Schofield, Art Cummings
Date Started: 2/23/21 Date Finished: 2/23/21
VTSPG NAD83: N 160680.50 ft E 1437157.10 ft
Station: 49+85 Offset: 9.1 RT
Ground Elevation: 556.1 ft

Casing: WB Sampler: SS
Type: WB I.D.: 4 in 1.5 in
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: MOBILE B-48 $C_e = 1.4$

Groundwater Observations		
Date	Depth (ft)	Notes
02/23/21	9.1	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (ROD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.8		Asphalt Pavement, 0.0 ft - 0.8 ft							
0.8 - 1.0	XXX	Visual Classification, A-1-B; Brn c(+)mf Sand, and(+) cm(+)f Gravel, trace(+) Silt, trace slag, Moist, Rec. = 0.58 ft, Fill			107-95-84-70 (179)				
1.0 - 1.5	XXX	Visual Classification, A-1-B; Dk Brn c(+)mf Sand, and(+) cmf(+) Gravel, trace(+) Silt, trace slag, Moist, Rec. = 1.0 ft, Fill			17-11-8-10 (19)				
1.5 - 2.0	XXX	Visual Classification, A-1-B; Brn cm(+)f SAND, some(+) cmf Gravel, trace(+) Silt, Wet, Rec. = 0.17 ft			10-6-8-15 (14)				
2.0 - 2.5	XXX	Classification: A-1-B; *Brn m(+)f GRAVEL, some(+) cm(+)f Sand, little(-) Silt, Wet, Rec. = 0.75 ft			11-18-13-14 (31)				
2.5 - 3.0	XXX	Visual Classification, A-1-A; Brn c(+)mf Gravel, and(+) cm(+)f Sand, trace Silt, Wet, Rec. = 0.5 ft			12-14-12-15 (26)				
3.0 - 3.5	XXX	Classification: A-2-4; *Brn mf(+) Gravel, some(+) Silt, some c(+)mf Sand, Wet, Rec. = 0.92 ft, Sample Split; S-6A			9-9-7-8 (16)				
3.5 - 4.0	XXX	Visual Classification, A-2-4; Dk Gry cm(+)f SAND, and(-) cmf(+) Gravel, little(+) Clayey Silt; Residual Soil, Wet, Sample Split; S-6B							
4.0 - 4.5	XXX	Visual Classification, A-1-A; Dk Gry c(+)mf GRAVEL, some(+) cmf Sand, little(-) Silt; Decomposed Phyllite, Wet, Rec. = 1.0 ft			8-15-38-100/5" (43)				
16.0 - 21.0		16.0 ft - 21.0 ft, Bluish-gray, Fine grained PHYLLITE, extremely close to close joint spacing, weak to medium strong, slightly weathered, with layers of calcite.. Very poor rock, NX, RMR=28	C-1 (25)	90 (0)	Top of Bedrock @ 16.0 ft				
21.0 - 26.0		21.0 ft - 26.0 ft, Bluish-gray, Fine grained PHYLLITE, extremely close to close joint spacing, weak to medium strong, slightly weathered, with layers of calcite.. Very poor rock, NX, RMR=28	C-2 (25)	95 (0)					
Hole stopped @ 26.0 ft									
Remarks: Heavy rig chatter from 15.5 ft to 16 ft Rock core jam at 19.4 ft Rock core jam at 24 ft									

BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
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.
4. * Indicates that soil description has been verified based upon laboratory results.



STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
STP-014-1(6)

Boring No.: **B-104**

Page No.: 1 of 1

Pin No.: 16b083

Checked By: MEB

Boring Crew: Bub Thompson, Dave Balsamo
Date Started: 2/25/21 Date Finished: 2/25/21
VTSPG NAD83: N 160732.10 ft E 1437175.60 ft
Station: 50+12 Offset: 38.8 RT
Ground Elevation: 551.0 ft

Casing: WB Sampler: SS
Type: WB
I.D.: 4 in 1.5 in
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: MOBILE B-57 $C_e = 1.42$

Groundwater Observations		
Date	Depth (ft)	Notes
02/25/21	3.6	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
5		Topsoil, 0.0 ft - 0.2 ft			5-2-2-2 (4)				
		Visual Classification, A-1-B; Brn-Gry c(+)mf SAND, some(+) cmf(+) Gravel, trace Silt, Moist, Rec. = 0.5 ft			4-6-7-11 (13)				
		Visual Classification, A-1-B; Dk Brn cm(+)f SAND, little(+) cmf(+) Gravel, little Silt, MTW, Rec. = 0.75 ft			15-5-6-11 (11)				
		Classification: A-4; *Dk Gry m(+)f Gravel, and Silt, some(-) cm(+)f Sand; Residual Soil, Wet, Rec. = 0.5 ft			10-6-8-8 (14)				
		Visual Classification, A-2-6; Dk Gry cmf(+) Gravel, and Silty Clay, little cmf(+) Sand; Residual Soil, Wet, Rec. = 0.75 ft			8-8-15-19 (23)				
10		Classification: A-1-B; *Dk Gry c(+)mf Sand, some mf(+) Gravel, some Silt; Residual Soil, Wet, Rec. = 0.83 ft			29-22-18-14 (40)				
		Visual Classification, A-1-B; Dk Gry c(+)mf SAND, some cmf(+) Gravel, little Silt; Residual Soil, Wet, Rec. = 1.58 ft			60/2" (60)				
15		Visual Classification, Dk Gry Decomposed Phyllite, Rec. = 0.17 ft	C-1 (25)	87 (15)					
		15.0 ft - 20.0 ft, Bluish-gray, Fine grained PHYLLITE, extremely close to close joint spacing, weak to medium strong, slightly weathered, with layers of calcite.. Very poor rock, NX, RMR=28							
20		20.0 ft - 25.0 ft, Bluish-gray, Fine grained PHYLLITE, extremely close to close joint spacing, weak to medium strong, slightly weathered, with layers of calcite.. Fair rock, NX, RMR=38	C-2 (25)	93 (67)					
25		Hole stopped @ 25.0 ft							

BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
 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.
 4. * Indicates that soil description has been verified based upon laboratory results.



STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
STP-014-1(6)

Boring No.: B-105
Page No.: 1 of 1
Pin No.: 16b083
Checked By: MEB

Boring Crew: Pete Labossiere, Travis Clegg
Date Started: 2/18/21 Date Finished: 2/18/21
VTSPG NAD83: N 160687.80 ft E 1437196.30 ft
Station: 50+25 Offset: 8.4 RT
Ground Elevation: 556.8 ft

Type: WB Sampler SS
I.D.: 4 in 1.5 in
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: STRATA STAR 15 C_E = 1.1

Groundwater Observations		
Date	Depth (ft)	Notes

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.75		Asphalt Pavement, 0.0 ft - 0.75 ft					
0.75 - 1.25	XXX	Visual Classification, A-1-A; Brn cmf(+) GRAVEL, and cm(+)f Sand, trace Silt, Dry, Rec. = 1.5 ft, Fill	53-140-102-40 (242)				
1.25 - 1.75	XXX	Visual Classification, A-1-B; Brn c(+)mf Sand, and(+) cmf(+) Gravel, trace Silt, trace slag, Moist, Rec. = 1.25 ft, Fill	26-43-60-30 (103)				
1.75 - 2.25	XXX	Visual Classification, A-1-B; Brn cm(+)f Sand, and(+) cmf(+) Gravel, trace(+) Silt, Wet, Rec. = 0.25 ft	22-25-28-45 (53)				
2.25 - 2.67	XXX	Classification:, A-1-B; *Brn c(+)mf Sand, and(-) mf(+) Gravel, little Silt, Wet, Rec. = 0.42 ft	12-10-9-10 (19)				
2.67 - 3.15	XXX	Classification:, A-1-B; *Brn mf(+) GRAVEL, some cm(+)f Sand, little(-) Silt, Wet, Rec. = 0.58 ft	7-12-14-16 (26)				
3.15 - 3.67	XXX	Visual Classification, A-1-B; Dk Gry cm(+)f SAND, some cmf(+) Gravel, little(+) Silt; Residual Soil, Wet, Rec. = 0.67 ft	14-13-9-10 (22)				
3.67 - 4.0		Field Note:, No Recovery, Rec. = 0.0 ft	10-12-11-23 (23)				
4.0 - 15.0		Hole stopped @ 15.0 ft					
15.0 - 30.0		Remarks: 4" casing snapped by the threading approximately 7 ft down the hole 3" casing snapping by threading approximately 8 ft down the hole Hole abandoned. Offset to B-105A 5 ft east. Hole backfilled with spoils and grouted. Topped with asphalt cold patch.					

BORING LOG_VTRANS_SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
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.
4. * Indicates that soil description has been verified based upon laboratory results.



STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
STP-014-1(6)

Boring No.: **B-105A**

Page No.: 1 of 1

Pin No.: 16b083

Checked By: MEB

Boring Crew: Pat Schofield, Art Cummings
Date Started: 2/22/21 Date Finished: 2/22/21
VTSPG NAD83: N 160689.90 ft E 1437200.90 ft
Station: 50+30 Offset: 7.1 RT
Ground Elevation: 557.0 ft

Casing Sampler
Type: WB SS
I.D.: 4 in 1.5 in
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: MOBILE B-48 C_E = 1.4

Groundwater Observations		
Date	Depth (ft)	Notes
02/22/21	8.6	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (ROD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.75		Asphalt Pavement, 0.0 ft - 0.75 ft							
0.75 - 9.0		Advanced casing with no sampling from 0.75 - 9 ft. For soil information refer to soil boring B-105.							
9.0 - 10.0		Visual Classification, A-1-B; Tn c(+)mf GRAVEL, little(+) cmf Sand, trace Silt, Wet, Rec. = 0.17 ft			8-16-9-13 (25)				
10.0 - 12.0		Visual Classification, A-1-B; Dk Gry c(+)mf GRAVEL, some(+) cmf Sand, trace(+) Silt; Residual Soil, Wet, Rec. = 0.42 ft			12-13-11-12 (24)				
12.0 - 15.0		Field Note: No Recovery, Rec. = 0.0 ft			34-37-42-58 (79)				
15.0 - 19.0		Field Note: No Recovery, Rec. = 0.0 ft			50/0" (50)				
19.0 - 24.0		19.0 ft - 24.0 ft, Bluish-gray, Fine grained PHYLLITE, extremely close to close joint spacing, Quartz vein from 22.6 ft to 22.8 ft, weak to medium strong, slightly weathered, with layers of calcite.. Very poor rock, NX, RMR=28	C-1 (25)	80 (0)					
24.0 - 29.0		24.0 ft - 29.0 ft, Bluish-gray, Fine grained PHYLLITE, extremely close to close joint spacing, weak to medium strong, slightly weathered, with layers of calcite.. Poor rock, NX, RMR=33	C-2 (25)	73 (25)					
29.0 - 30.0		Hole stopped @ 29.0 ft							
30.0 - 31.0		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 wash tub Casing refusal at 17.5 ft							

BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
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.
4. * Indicates that soil description has been verified based upon laboratory results.



STATE OF VERMONT
 AGENCY OF TRANSPORTATION
 CONSTRUCTION AND
 MATERIALS BUREAU
 CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
 STP-014-1(6)

Boring No.: B-106
 Page No.: 1 of 1
 Pin No.: 16b083
 Checked By: MEB

Boring Crew: Pat Schofield, Art Cummings
 Date Started: 2/23/21 Date Finished: 2/23/21
 VTSPG NAD83: N 160692.00 ft E 1437213.00 ft
 Station: 50+42 Offset: 7.1 RT
 Ground Elevation: 557.3 ft

Casing: WB Sampler: SS
 I.D.: 4 in 1.5 in
 Hammer Wt: 140 lb. 140 lb.
 Hammer Fall: 30 in. 30 in.
 Hammer/Rod Type: Auto/AWJ
 Rig: MOBILE B-48 C_E = 1.4

Groundwater Observations		
Date	Depth (ft)	Notes
02/23/21	5.2	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 1.0 ft					
	X X X	Visual Classification, A-1-B; Brn cm(+)f GRAVEL, some(+) cmf Sand, little Silt, trace slag, MTW, Rec. = 1.0 ft, Fill	81-85-98-35 (183)				
5		Visual Classification, A-1-B; Brn c(+)mf SAND, some mf(+) Gravel, trace(+) Silt, MTW, Rec. = 0.42 ft	15-22-26-16 (48)				
		Classification:, A-1-B; *Brn m(+)f Gravel, some(+) cmf Sand, some(-) Silt, Wet, Rec. = 0.42 ft	7-17-16-7 (33)				
		Visual Classification, A-2-4; Dk Brn-Gry c(+)mf Sand, and(+) cmf(+) Gravel, little Clayey Silt, Wet, Rec. = 0.42 ft	6-3-2-10 (5)				
10		Visual Classification, A-1-B; Brn cmf(+) GRAVEL, and(-) cmf Sand, trace(+) Silt, Wet, Rec. = 0.25 ft, Possibly Wash	22-33-15-16 (48)				
		Classification:, A-1-B; *Brn mf(+) Gravel, some cm(+)f Sand, some(-) Silt, Wet, Rec. = 0.75 ft	20-30-39-40 (69)				
15		Classification:, A-2-4; *Dk Gry cm(+)f Sand, and(-) mf(+) Gravel, some Silt; Decomposed Phyllite, Wet, Rec. = 0.92 ft	13-41-76-50/1" (117)				
		Field Note:, No Recovery, Rec. = 0.0 ft	50/0" (50)				
		Hole stopped @ 17.0 ft					
20		Remarks: Roller bit refusal at 17 ft Split spoon refusal at 17 ft.					
25							
30							

BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
 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.
 4. * Indicates that soil description has been verified based upon laboratory results.



STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

SHAFTSBURY
STP-014-1(6)

Boring No.: B-107
Page No.: 1 of 1
Pin No.: 16b083
Checked By: MEB

Boring Crew: Pete Labossiere, Travis Clegg
Date Started: 2/18/21 Date Finished: 2/18/21
VTSPG NAD83: N 160694.10 ft E 1437233.00 ft
Station: 50+62 Offset: 8.4 RT
Ground Elevation: 557.7 ft

Type: WB Sampler SS
I.D.: 4 in 1.5 in
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: STRATA STAR 15 C_E = 1.1

Groundwater Observations		
Date	Depth (ft)	Notes
02/18/21	7.9	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (ROD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.75		Asphalt Pavement, 0.0 ft - 0.75 ft							
0.75 - 1.0	XXX	Visual Classification, A-1-B; Brn cmf(+) SAND, some(-) cmf(+) Gravel, trace(+) Silt, trace slag, Dry, Rec. = 2.0 ft, Fill			117-93-92-40 (185)				
1.0 - 1.5	XXX	Visual Classification, A-1-B; Brn c(+)mf Sand, and(+) cmf(+) Gravel, little(-) Silt, trace slag, trace brick, Moist, Rec. = 0.92 ft, Fill			43-64-40-27 (104)				
1.5 - 2.0	XXX	Classification:, A-1-B; *Brn c(+)mf Sand, some mf(+) Gravel, some Silt, Wet, Rec. = 0.92 ft, Sample Split; S-3A			4-3-4-2 (7)				
2.0 - 2.5	XXX	Classification:, A-4; *Dk Gry Silt, some(+) c(+)mf Sand, some mf(+) Gravel, trace wood, Wet, Sample Split; S-3B			5-5-4-20 (9)				
2.5 - 3.0	XXX	Field Note:, No Recovery, Rec. = 0.0 ft							
3.0 - 3.5		Visual Classification, A-1-B; Brn cmf(+) GRAVEL, some(-) cm(+)f Sand, trace Silt, Wet, Rec. = 0.58 ft			10-24-8-11 (32)				
3.5 - 4.0		Visual Classification, A-1-B; Gry c(+)mf GRAVEL, some(+) cmf Sand, trace(+) Silt; Residual Soil, Wet, Rec. = 0.92 ft			25-21-18-17 (39)				
4.0 - 4.5		Visual Classification, Dk Gry cmf(+) GRAVEL, some(+) Clayey Silt, little cmf(+) Sand; Residual Soil, Wet, Rec. = 1.25 ft			26-46-98-50/1" (144)				
4.5 - 5.0									
17.0 - 22.0		17.0 ft - 22.0 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, NXDC, RMR=28	C-1 (25)	83 (13)	Top of Bedrock @ 17.0 ft				
22.0 - 27.0		22.0 ft - 27.0 ft, Bluish-gray, Fine grained PHYLLITE, very close to close joint spacing, weak to medium strong, slightly weathered, with layers of calcite. Poor rock, NXDC, RMR=33	C-2 (25)	93 (35)					
27.0 - 30.0		Hole stopped @ 27.0 ft							

BORING LOG VTRANS SHAFTSBURY.GPJ VERMONT AOT.GDT 3/23/21

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_e is the hammer energy correction factor.
 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.
 4. * Indicates that soil description has been verified based upon laboratory results.

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)

Boring	Core Run	Sample Elevation (ft)	Geomechanical Classification of Rock Masses (Rock Mass Rating)															Rock Mass Rating ⁷	Rock Mass Rating ⁸
			Strength of Intact Rock					RQD		Space of Joints		Condition	Ground Water		Joint Orientation				
			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				
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	-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	3
576	4	16	5	5	7	30	20

Notes:

- 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).
- Intact Strength Rating is the lesser of Point Load Strength Rating and Uniaxial Compressive Strength Rating, when available.
- Each core run has several joint spacing distances, an approximate average of these distances was taken for each core run.
- 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 gouge > 0.2 in. thick, joints open > 0.2 in., continuous joints
- 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.
- 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
- 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.
- 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:

- AASHTO LRFD Bridge Design Specifications, 2012, Table 10.4.6.4-1,2,3
- AASHTO 2002 Standard Specifications for Highway Bridges, 17th Ed.
- 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.
- Bieniawski, Z.T. 1989. Engineering Rock Mass Classifications. New York: Wiley
- 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



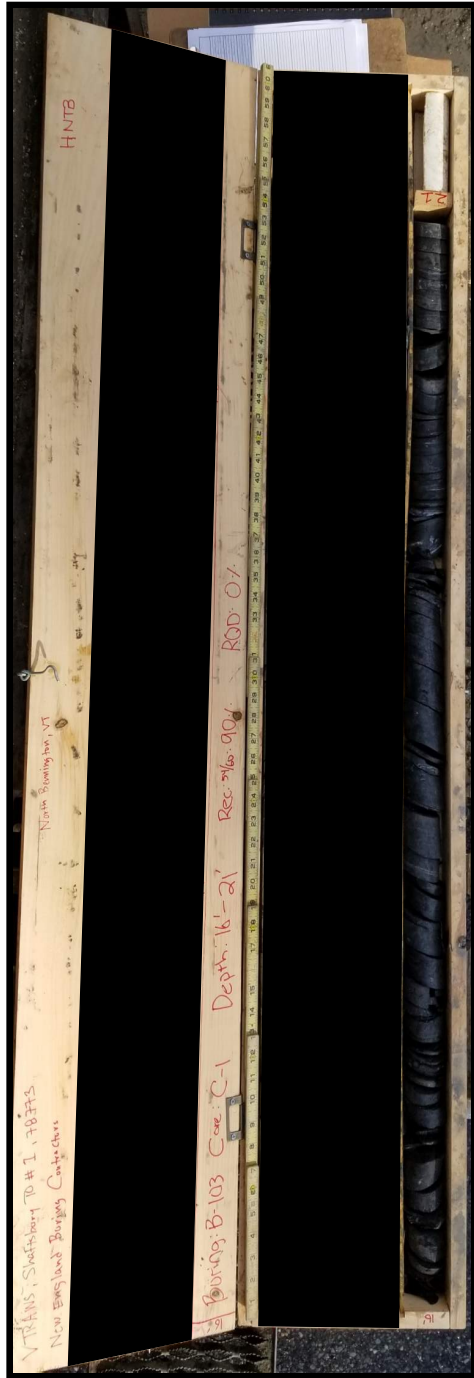
BORING B-101, ROCK CORES C-1 & C-2



BORING B-102, ROCK CORES C-1 & C-2

**ROCK CORE PHOTOS
 SHEET 1 OF 4**

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



BORING B-103, ROCK CORE C-1



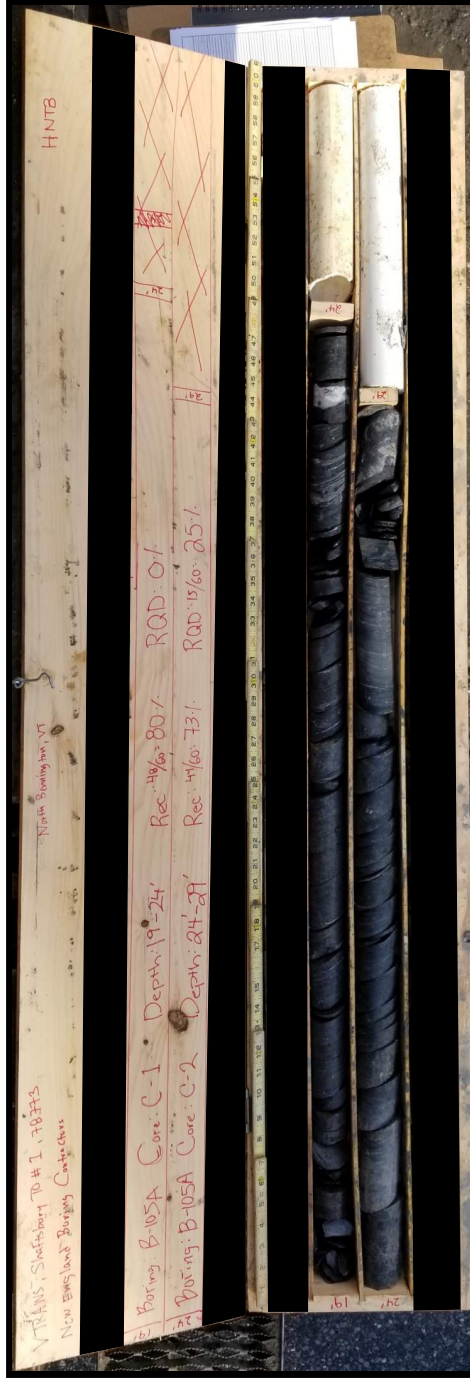
BORING B-103, ROCK CORE C-2

**ROCK CORE PHOTOS
SHEET 2 OF 4**

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



BORING B-104, ROCK CORES C-1 & C-2



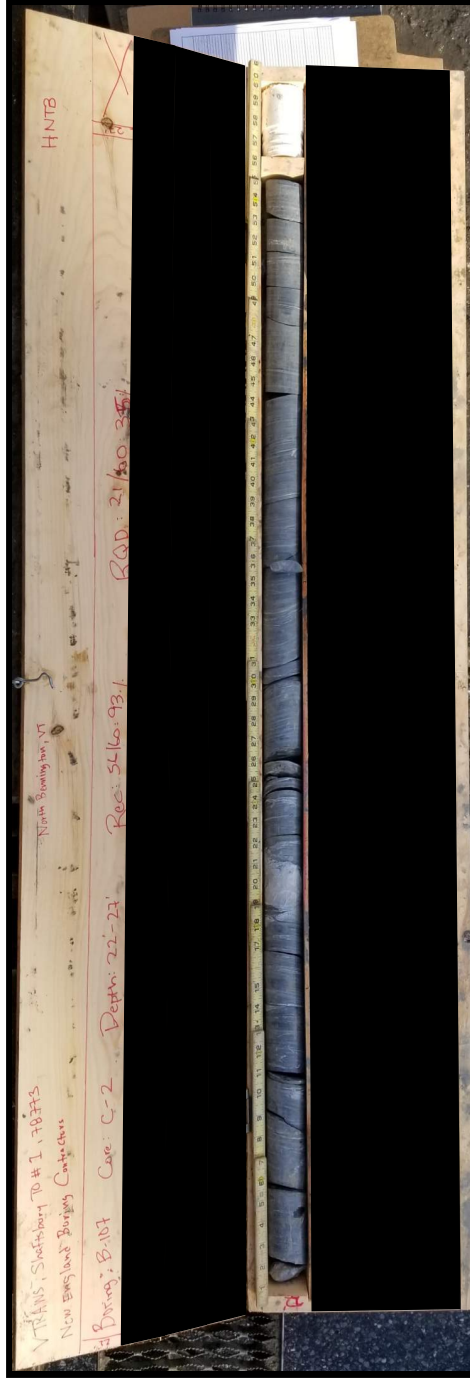
BORING B-105A, ROCK CORES C-1 & C-2

**ROCK CORE PHOTOS
SHEET 3 OF 4**

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



BORING B-107, ROCK CORE C-1



BORING B-107, ROCK CORE C-2

**ROCK CORE PHOTOS
SHEET 4 OF 4**

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