



187 St. Paul Street, Suite 201
Burlington, VT 05401

Stephen Madden
Vermont Agency of Transportation
2178 Airport Road Unit B
Berlin, VT 05641

May 17, 2023
File No. 5696.00

Re: Geotechnical Data Report
Topsham BF 031-1(13)
Bridge No. 23 Replacement
Topsham, Vermont

Dear Mr. Madden:

Enclosed is our Geotechnical Data Report for the Topsham BF 031-1(13) project in Topsham, VT. The report describes our subsurface exploration program, summarizes the subsurface conditions at the project site, and provides preliminary recommendations for pile foundations.

We trust this report meets the needs of the project. If you have any questions, please call Shawn Kelley at (802) 391-8514.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read "Shawn P. Kelley".

Shawn P. Kelley, Ph.D., P.E.
Project Director

JLK/SPK/MBV:spk

Encl. Geotechnical Data Report

P:\5600s\5696.00\Source Files\Geotechnical Data Report\20230517 Topsham VT Culvert, Cvr Ltr.docx



Geotechnical Data Report

Topsham BF 031-1(13)

BRIDGE NO. 23 REPLACEMENT

Vermont Route 25, Topsham, VT

Prepared for Vermont Agency of Transportation

File No. 5696.00

May 17, 2023

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	2
1.1 Site Description	2
1.2 Project Description	2
2.0 SUBSURFACE EXPLORATIONS	2
3.0 LABORATORY TESTING PROGRAM	3
4.0 SUBSURFACE CONDITIONS	3
4.1 Granular Fill	3
4.2 Sand & Gravel	4
4.3 Glacial Till	4
4.4 Bedrock	4
4.5 Groundwater	4
5.0 GEOTECHNICAL RECOMMENDATIONS	4
5.1 Primary Geotechnical Engineering Considerations	4
5.2 Foundation Design	5
5.2.1 H-Pile Design	5
5.2.2 Shallow Foundation Option	5
5.3 Construction Recommendations	5
6.0 CONCLUSION	6

FIGURES

- Figure 1 Locus Plan
Figure 2 Exploration Location Plan

APPENDICES

- Appendix A Limitations
Appendix B Subsurface Exploration Logs
Appendix C Laboratory Testing Results



EXECUTIVE SUMMARY

This geotechnical data report has been completed for the proposed culvert design and construction in Topsham, Vermont. Three (3) test borings were advanced to depths ranging from 21 to 66 feet below existing roadway. Based on the geotechnical data collected in these test borings, the following geotechnical considerations for design and construction were identified:

- Subsurface conditions below existing roadway (adjacent to the existing single span bridge) generally consist of 19 to 21 feet of granular backfill, underlain by 10 to 12 feet of natural sand and gravel, underlain by glacial till down to top of bedrock at a depth of approximately 55 feet, corresponding to elevation (El.) 1222.5 feet. Numerous cobbles (between 3 to 12-inches in diameter) and boulders (greater than 12-inches in diameter) were encountered in all three subsurface layers (creating difficult soil drilling conditions).
- The proposed culvert may be supported by H-piles driven to refusal in glacial till or to top of bedrock, whichever occurs first. Due to the dense glacial till with cobbles and boulders, pile driving shoes are recommended to maximize penetration into this layer and protect the tip of the pile from damage caused by cobbles/boulders.
- Selection of H-pile size will be governed by the structural load anticipated for the proposed culvert. In accordance with AASHTO we recommend a minimum center-to-center pile spacing of no less than 30-inches, or 2.5 times the maximum diameter of the H-pile, whichever is greater.
- Once an H-pile size has been selected, we recommend that a Wave Equation Analysis of Piles (WEAP) is conducted to properly size the pile hammer. Prior to production pile installation we recommend a dynamic test of at least one production pile using a Pile Driving Analyzer (PDA) with subsequent Case Pile Wave Analysis Program (CAPWAP) post processing analysis to confirm pile capacity and establish driving criteria.

This summary does not include all details pertaining to our geotechnical recommendations and should be used in conjunction with the entire report for design purposes.

1.0 INTRODUCTION

Sanborn, Head & Associates, Inc. (Sanborn Head) has prepared this geotechnical data report on behalf of the Vermont Agency of Transportation (VTrans) for the proposed Bridge No. 23 Replacement in Topsham, Vermont (Site). This report is subject to the Limitations included in Appendix A.

Subsurface explorations were conducted in general conformance with the Vermont Transportation Materials & Research Engineering Instructions published in 2011 (MREI 11-01). Foundation design recommendations and other information provided herein are intended to be in general conformance with AASHTO LRFD Bridge Design Specifications, 9th Edition (2020). Elevations provided in this report will be in reference to the North American Vertical Datum of 1988 (NAVD88).

1.1 Site Description

The Site comprises a section of Vermont Route 25 (VT-25) approximately 150 feet northwest of its intersection with Crossroad in the Town of Topsham, Vermont as shown on the Locus Plan in Figure 1. Bridge No. 23 is a single span concrete T-beam bridge that carries VT-25 over the Waits River which flows in the south direction. The VT-25 roadway consists of one lane in each direction with guardrails on either side and has an existing top of pavement elevation (El.) of about 1,278 feet (ft). The existing roadway is estimated to be on the order of 20 feet above Waits River.

Based on our review of available record drawings, the existing abutments and associated wingwalls are supported by spread footings bearing on soil. We understand that a site visit by others in April 2022 revealed a critical hole in the bridge deck which was covered with a temporary steel plate, as well as significant degradation of the top of abutment footings and spalling of existing wingwalls.

1.2 Project Description

The proposed project includes removal of the existing bridge and replacement with a new buried arch culvert along the same alignment. Preliminary bridge plans show an arch culvert with concrete footings supported by driven piles. It is understood that VTrans would like to consider the use of driven H-piles for support of the structure, therefore other pile types are not discussed further herein. Behind both sides of the culvert will consist of Granular Backfill for Structures, and above the culvert will be a section of Dense Graded Crushed Stone as subbase for the roadway. Bridge plans show that the bridge will be closed during construction and traffic will be detoured around the work site.

2.0 SUBSURFACE EXPLORATIONS

From March 7 to March 13, 2023, Sanborn Head observed the advancement of three (3) test borings by New England Boring Contractors (NEBC) of Derry, New Hampshire. Test borings designated SH-1, SH-2 and SH-2A were drilled on the shoulder side of each travel lane of VT-25 on either side of the existing bridge and were advanced with drive-and-wash drilling methods to depths between 21 and 66 feet below ground surface (bgs). Test boring locations were estimated based on field measurements from existing site features, and the approximate

locations are shown in the Exploration Location Plan attached to this report as Figure 2. VTrans subsequently surveyed the boring locations and the coordinates are in a table presented on Figure 2.

Standard Penetration Tests (SPT) were completed nearly continuously through the roadway fill, and subsequently at 5-foot intervals thereafter. Split spoon soil samples were obtained in general accordance with ASTM International Standard D1586 and MREI 11-01. The SPT consists of driving a 2-inch outside diameter (OD) split spoon sampler a minimum of 18 inches using a 140-pound hammer dropped from a height of 30 inches. The number of blows required to drive the sampler from 6 to 18 inches is the SPT index value (or N-value), which provides an indication of the in-place density, or consistency, of the soil. Soil samples were classified in the field based on Sanborn Head's "Description and Classification of Soil" which is included in Appendix B.

Bedrock was cored with a 2.15-inch inside diameter (ID) rock core bit (NX size) that was 5-feet in length. The percent recovery (REC) was calculated by dividing the recovered length by the penetration length, and rock quality designation (RQD) was calculated by dividing the sum of full diameter core stems over 4-inches in length by the penetration length. The recovered bedrock cores were classified in the field based on Sanborn Head's "Description and Classification of Bedrock" which is included in Appendix B.

The test borings were observed and logged by Sanborn Head personnel on a full-time basis. As stated above, upon completion of test borings, a VTrans survey crew collected coordinates (northing and easting) as well as elevations (in reference to NAVD88) which have been included on test boring logs provided in Appendix B.

3.0 LABORATORY TESTING PROGRAM

Sanborn Head transferred eighteen (18) representative soil samples from the test borings to VTrans of Berlin, Vermont on March 20, 2023 for geotechnical laboratory analysis. VTrans performed particle size analysis and moisture content analysis for all soil samples in general accordance with AASHTO T-88 and AASHTO T-265 standards, respectively. The laboratory testing results are provided in Appendix C.

4.0 SUBSURFACE CONDITIONS

The following sections describe the general subsurface conditions encountered below the existing approximately 6-inch thick asphaltic roadway section. In both soil borings, granular fill is underlain by a sand & gravel layer, that is underlain by a glacial till layer, that is underlain by bedrock.

4.1 Granular Fill

The depth to bottom of granular backfill ranged from approximately 19 to 21 feet bgs. The granular fill generally consisted of predominantly sand, between 18 to 43 percent gravel, between 3 and 20 percent silt and numerous cobbles/boulders. Uncorrected SPT N-values varied greatly between 2 and 32 blows-per-foot (bpf) due to the varying amounts of gravel encountered in each sample. Generally, the average SPT N-values indicate a relative density of loose to dense.

4.2 Sand & Gravel

Below granular roadway fill, each test boring encountered between 10 to 12 feet of natural sand and gravel with cobbles/boulders. This material was predominantly sand, between 22 to 47 percent gravel, between 8 to 16 percent silt, and numerous cobbles/boulders. Uncorrected SPT N-values were between 9 and 47 bpf which indicates a relative density of loose to dense. Some SPT samples in this layer have N-values above 47 bpf but these were due to apparent cobbles within layer.

4.3 Glacial Till

Test borings encountered top of glacial till at a depth of approximately 33 feet bgs. Glacial till consisted of primarily sand, between 30 and 44 percent gravel, between 11 and 26 percent silt, and numerous cobbles/boulders. Boulders up to about 2 feet in diameter were encountered in this layer, which made drilling conditions difficult and SH-2A was only able to advance to a depth of 39 feet bgs before being terminated. SPT N-values were generally above 50 bpf which indicates a relative density of very dense.

4.4 Bedrock

Test boring SH-1 encountered top of bedrock at 55 feet bgs (approximately El. 1222.5 feet) and obtained two (2) 5-foot rock cores from 56 to 66 feet bgs. Recovered bedrock cores generally consisted of a gray, medium hard Phyllite bedrock which was slightly weathered and moderately to slightly fractured. Bedrock recovery varied from 55 percent in the upper core to 70 percent in the lower core, and RQD values were between 34 percent (upper) and 53 percent (lower). These results indicate that the upper surface of the bedrock is slightly weathered.

4.5 Groundwater

Stabilized groundwater was observed in test boring SH-1 at a depth of approximately 21 feet bgs which was about equal to the elevation difference between the roadway and river level at the time of explorations. Wet soils were also observed in SH-1 at this approximate depth. It should be noted that groundwater levels will vary depending on seasonal variations in temperature, precipitation, and is primarily influenced by the river elevation at the time the measurements were made.

5.0 GEOTECHNICAL RECOMMENDATIONS

The following sections present our geotechnical engineering recommendations related to design of the proposed culvert foundation. Our conclusions and recommendations are based on our understanding of the current project and the available subsurface information.

5.1 Primary Geotechnical Engineering Considerations

Based on the subsurface information collected to date, we have identified the following primary geotechnical considerations for design of the culvert:

- **Driven H-pile Foundations:** The proposed culvert may be supported by H-piles driven to refusal in glacial till or top of bedrock, referred to in this report as “bearing material”. Due to the numerous cobbles and boulders encountered (see below) the piles will likely encounter refusal before top of bedrock. We recommend placing driving shoes at the tip of

the piles to improve penetration in the glacial till layer and protect the pile from damage. Piles and pile shoes shall conform to Section 730 of the VTrans Standard Specifications for Construction (2018).

- **Support of Excavation (SOE):** Based on drilling action, there are numerous cobbles and boulders in all subsurface layers with some up to 2 feet in diameter. Cobbles and boulders can damage the tip of steel H-piles during driving. Some cobbles and boulders were also encountered in the roadway fill which should be considered when selecting a support of excavation (SOE) method for construction.

5.2 Foundation Design

5.2.1 H-Pile Design

Selection of H-pile size will be governed by the maximum design load per pile determined by the structural engineer. Further, the geotechnical capacity of a single H-pile will be based predominately on the end bearing resistance driven to refusal in the bearing material. For preliminary design, a 100 kip end bearing pile is appropriate. Final pile design will require culvert loads. We recommend that structural calculations take into account a section loss due to corrosion, which can typically be estimated as a loss of 1/16-inches on all sides of the steel H-pile.

It is likely that H-piles will encounter refusal above bedrock in the dense glacial till with cobbles/boulders, so we recommend establishing a minimum embedment depth for piles before construction begins. The minimum embedment depth will be a function of the maximum design load per pile, the pile size selected, and the side/end resistance values used for design.

In accordance with AASHTO Section 10.7.1.2, we recommend a minimum center-to-center pile spacing of no less than 30-inches, or 2.5 times the maximum diameter of the H-pile, whichever is greater. The distance from the side of any pile to the nearest edge of the pile cap shall not be less than 9-inches.

5.2.2 Shallow Foundation Option

Given the in situ soil type (Sand & Gravel) and some of the cobbles and boulders that were encountered during the drilling program, it may be advantageous to evaluate the option of putting the arch culvert support on strip footing rather than a pile cap. This would require a redesign of the proposed arch culvert design (as based on the current design plans) as the shallow foundations would have to be set deeper for scour protection (minimum 6 feet below the existing riverbed). Setting the foundation support deeper will require the arch to be extended (based on Sheet 4 of 18 from the current design plans). This would also require a deeper excavation but would avoid potentially having to predrill for pile installation.

5.3 Construction Recommendations

Once an H-pile size has been selected and prior to the awarded contractor mobilizing to the site, we recommend that a Wave Equation Analysis of Piles (WEAP) is conducted by the contractor to properly size the pile hammer. Prior to the start of production pile installation, we recommend that the contractor perform a dynamic test of at least one production pile using a

Pile Driving Analyzer (PDA) with subsequent Case Pile Wave Analysis Program (CAPWAP) post processing analysis to confirm pile capacity, pile stresses and establish the driving criteria for the production piles. Dynamic pile testing shall be in conformance with Section 505 of the VTrans Standard Specifications for Construction (2018).

Due to the presence of cobbles and boulders, it is recommended that the contractor have equipment on-site for pre-drilling (or spudding) the holes if refusals above minimum embedment depth are encountered. For more information on pre-excavation of piles, see Section 546 of the VTrans Standard Specifications for Construction (2018). It should be noted that although the piles will be end bearing, pre-drilling will lead to less side friction developed by the piles which should be taken into account.

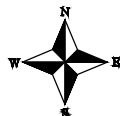
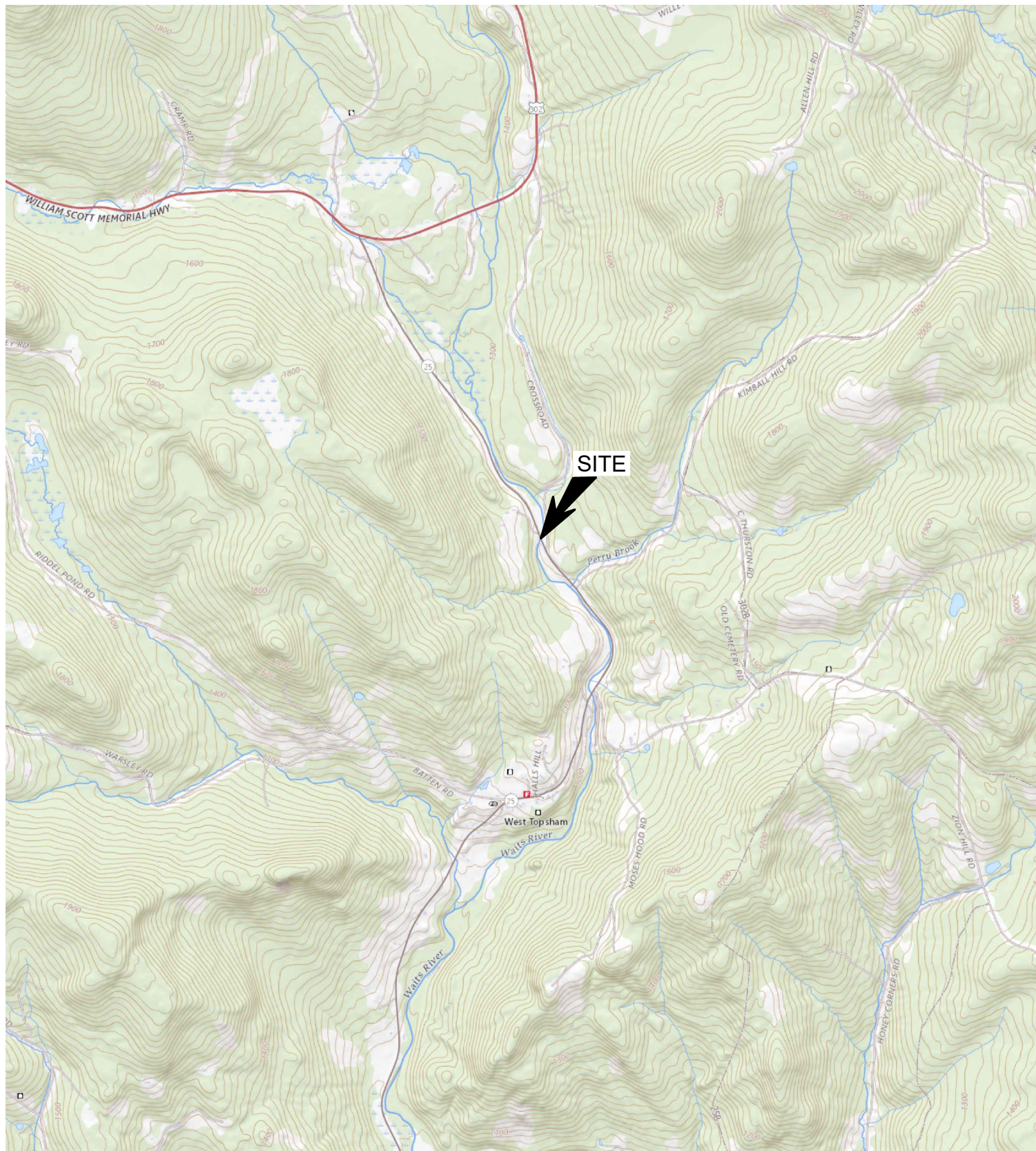
6.0 CONCLUSION

We recommend that Sanborn Head be provided the opportunity to review the design plans and specifications to see that the recommendations of this report have been properly incorporated. We further recommend that our firm be retained during construction to observe construction for compliance with the recommendations in this report and assist in the development of design changes should subsurface conditions differ from those anticipated prior to the start of construction.

P:\5600s\5696.00\Source Files\Geotechnical Data Report\20230517 Topsham VT Culvert Geotechnical Data Report.docx

FIGURES





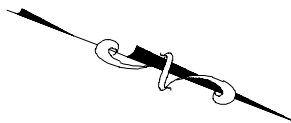
NOTES:
USGS Topo basemap provided by ESRI
through ArcGIS On-line.
Data refreshed October 2023.

Drawn By: D. Dombrowsky
Designed By: A. Lulias
Reviewed By: S. Kelley
Project No: 5696.00
Date: May 2023

SCALE: 1:25,000



Figure 1
Locus Plan
Geotechnical Engineering
Services
VT-25 Bridge Replacement
Town of Topsham, Vermont



BORING	STATION (FT)	OFFSET (FT)	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
SH-1	298+31	LT 8.7	593103.8	1690311.3	1277.5
SH-2	299+20	RT 6.9	593189.5	1690294.7	1278.4
SH-2A	299+25	RT 6.9	593193.8	1690293.5	1278.3

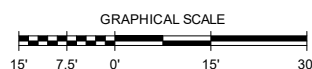


NOTES:

1. THE BASE MAP WAS DRAWN FROM GOOGLE EARTH. IMAGERY DATED 2014.
2. PROPOSED SITE FEATURES AND STATIONING SHOWN WERE TAKEN FROM A PLAN ENTITLED "BORING LAYOUT" PREPARED BY THE STATE OF VERMONT AGENCY OF TRANSPORTATION, OF TOPSHAM, VERMONT, DATED JUNE 30, 2022.
3. EXPLORATIONS DESIGNATED SH-1, SH-2 AND SH-2A WERE ADVANCED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE AND OBSERVED BY SANBORN HEAD BETWEEN MARCH 7 AND 13, 2023.
4. COORDINATES AND GROUND ELEVATIONS OF TEST BORING ARE BASED OFF DATA SENT BY VTRANS IN AN EMAIL DATED APRIL 5, 2023.

LEGEND:

SH-1  APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING
OBSERVED BY SANBORN HEAD (MARCH 2023)

[illegible]

DRAWN BY: D. DOMBROWSKY
DESIGNED BY: A. LULIAS
REVIEWED BY: J. KEOHANE
PROJECT MGR: D. THABAULT
PIC: S. KELLEY
DATE: MAY 2023

GEOTECHNICAL ENGINEERING SERVICES
VT-25 BRIDGE REPLACEMENT
TOWN OF TOPSHAM, VERMONT

EXPLORATION LOCATION PLAN

PROJECT NUMBER:

5696.00

FIGURE NUMBER:

2

APPENDIX A

LIMITATIONS



APPENDIX A LIMITATIONS

Explorations

1. The analyses, recommendations, and designs submitted in this report are based in part on the data obtained from subsurface explorations by Sanborn Head. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions may be more or less gradual than indicated. For specific information, refer to the test boring logs.
3. Water level readings have been made at the times and under the conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from those occurring at the time measurements were made.

Review

4. In the event that any changes in the nature, design, or location of the proposed culvert is planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Sanborn Head.

Construction

5. It is recommended that this firm be retained to provide soil engineering services during the excavation and earthwork construction phases of the work. This is to observe compliance with the design concepts, specifications, or recommendations and to allow for design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

6. This report has been prepared for the exclusive use of the Vermont Agency of Transportation for the Bridge No. 23 Replacement project in Topsham, VT in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
7. This geotechnical data report has been prepared for this project by Sanborn Head for design purposes only. Contractors using this report to prepare a bid for site work, acknowledge that its scope is limited to design considerations only.



APPENDIX B

SUBSURFACE EXPLORATION LOGS



Description and Classification of Soil

1. **Density or Consistency:** The density or consistency of a soil sample is based on the Standard Penetration Test N-value according to the following table:

Density of Granular Soil	SPT N-Value		Consistency of Cohesive Soil
Very Loose	0-4	<2	Very Soft
Loose	5-10	2-4	Soft
Medium Dense	11-30	5-8	Medium Stiff
Dense	31-50	9-15	Stiff
Very Dense	>50	16-30	Very Stiff
		>30	Hard

The Standard Penetration Resistance, or N-value in blows per foot, is the sum of the blows recorded over the second and third 6-inch interval.

A number followed by "/3" indicates the distance that the sampler advanced. For example "100/4" indicates that 100 blows of a 140 pound hammer falling 30 inches advanced the sampler 4 inches. "WOR/24" indicates the weight of the drilling rods without the hammer caused the sampler to advance 24 inches.

"WOH" indicates the static weight of the 140 pound hammer and the drilling rods attached to the split spoon sampler were sufficient to cause the sampler to advance.

"WOR" indicates the static weight of the drilling rods attached to the split spoon sampler was sufficient to cause the sampler to advance.

2. **Color:** The color of a soil sample is based on visual observation.

3. Soil Components

- A. **Description:** The components of a soil sample are described by visually estimating the percentage of each component by weight of the total sample using a Modified Burmister System.

- i. **Major Component:** The major soil component is written with upper case letters for granular soil (e.g., SAND, GRAVEL) and a combination of upper and lower case letters for fine grained soil (e.g., Silty CLAY, Clayey SILT).

- ii. **Minor Component:** The minor soil components are written with the first letter of each soil type in upper case, and the remaining letters in lower case (e.g., Gravel, Silt). The minor components are identified and prefaced in the description based on the following percentages:

Preface	Percentage
and	35-50
some	20-35
little	10-20
trace	0-10

- iii. **Note:** The actual percentages of gravel soil may differ from that measured when sampling with a standard split spoon sampler because of the relatively small sampler diameter. Also, it is not possible to identify the presence of boulders and cobbles using a standard split spoon sampler.

B. Definitions

- i. **Granular Soil:** A granular soil sample is defined by the following particle sizes as referenced to a standard sieve:

Material	Description	Standard Sieve Limit	
		Upper	Lower
Boulders	C-sized	--	36 inch
	B-sized	36 inch	24 inch
	A-sized	24 inch	12 inch
Cobbles	--	12 inch	3 inch
Gravel	coarse	3 inch	3/4 inch
	fine	3/4 inch	No. 4
Sand	coarse	No. 4	No. 10
	medium	No. 10	No. 40
	fine	No. 40	No. 200

- ii. **Fine Grained Soil:** The degree of plasticity of fine-grained soils is defined as follows:

Material	Degree of Plasticity	Plasticity Index (PI)	Smallest Thread Diameter (in.)
SILT	Non-Plastic	0	None
Clayey SILT	Slight	1 to 5	1/4
SILT & CLAY	Low	5 to 10	1/8
CLAY & SILT	Medium	10 to 20	1/16
Silty CLAY	High	20 to 40	1/32
CLAY	Very High	40+	1/64

- iii. **Organic Soil:** An organic soil sample is classified by observation of the sample structure as follows:

Material	Description
TOPSOIL	Surficial soils that support plant life and which contain organic matter.
SUBSOIL	Soil underlying the topsoil which may contain roots or plant fibers.
PEAT	Deposits of plant remains in which the original plant fibers or root structure are visible.
ORGANIC SILT	Deposit of plant remains in which the original plant fibers or root structure have decomposed.

- iv. **Non-Soil Constituents:** Non-soil constituents (artificial or anthropogenic material, organic materials, cobbles and boulders) are described as follows:

The following terminology is used to denote size ranges of non-soil constituents such as man-made objects or fill material:

Descriptive Term	Size Range	Comparative Term
Specks	< No. 200 Sieve	Silt and Clay fines
Particles	No. 200 Sieve to No. 4 Sieve	Sand
Fragments	No. 4 Sieve to 3 in.	Gravel
Pieces	3 in. to 12 in.	Cobbles
Blocks	> 12 in.	Boulders

The following terminology is used to describe the frequency that a non-soil constituent is observed by estimating the percentage of the constituent by weight of the total sample:

Descriptor	Percentage
very few	0-5
few	5-10
common	10-20
frequent	20-35
numerous	35-50

4. **Moisture Content:** The moisture content of a soil sample is based on the observable presence of water according to the following table:

Dry	Moisture is not apparent, dusty.
Moist	No visible water.
Wet	Visible free water.

5. **Other Pertinent Characteristics:** Pertinent characteristics observed in a soil sample should be noted according to the following table:

Soil Structure Produced by Deposition of Sediments	
Stratified	Random soil deposits of varying components of color.
Varved	Alternating soil deposits of varying thickness (i.e., clays or silts).
Stratum	Soil deposit > 12 inches thick.
Layer	Soil deposit 3 inches to 12 inches thick.
Seam	Soil deposit 1/8 inch to 3 inches thick.
Parting/Lens	Soil deposit <1/8 inch thick.

Description and Classification of Bedrock

Rock descriptions indicated on the test boring logs are based on visual-manual observation of the rock core samples obtained. Rock core is generally described and classified as illustrated in the following example:

Hard to Very Hard¹, slightly weathered², grey-green³, fine grained⁴, RHYOLITE⁵; with joints⁶ spaced 4 to 12" apart and dipping⁶ from near horizontal to approximately 60°, open crack⁶ in core at 14.4', moderately fractured⁷.
RQD = 58%.⁸

1. HARDNESS

VERY HARD:	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of a geologist's pick.
HARD:	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
MODERATELY HARD:	Can be scratched with knife or pick. Gauges or grooves to ¼-inch deep can be excavated by hard blow or a geologist's pick. Hand specimens can be detached by moderate blow.
MEDIUM HARD:	Can be grooved or gauged 1/16-inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-inch maximum size by hard blows of the point of a geologist's pick.
SOFT:	Can be gauged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
VERY SOFT:	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail. Can often be indented with moderate finger pressure.

2. WEATHERING CHARACTERISTICS:

COMPLETELY WEATHERED:	Rock reduced to soil. Rock "fabric" not discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.
VERY SEVERELY WEATHERED:	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
SEVERELY WEATHERED:	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. Some fragments of strong rock are usually left.
MODERATELY WEATHERED:	Significant portions of rock show discoloration and weathering effects. Rock has a dull sound under hammer and shows significant loss of strength as compared with fresh rock.
SLIGHTLY WEATHERED:	Rock generally fresh, joints stained and discoloration extends into rock up to 1 inch. Joints may contain clay.
VERY SLIGHTLY WEATHERED:	Rock generally fresh, joints stained, some joints may show thin clay coatings.
FRESH:	Rock fresh, crystals, bright, few joints may show slight staining. Rock rings under hammer if crystalline.

3. COLOR: VISUAL PERCEPTION.

4. TEXTURE

The description of the average or predominant mineralogic grain size diameter of igneous and metamorphic rocks and the constituent grain size diameter of sedimentary and metasedimentary rocks.

VERY FINE-GRAINED:	Too small to be seen with the unaided eye
FINE-GRAINED:	Visible with unaided eye to 1/16 inch diameter
MEDIUM-GRAINED:	1/16 inch to ¼ inch diameter
COARSE-GRAINED:	Greater than ¼ inch

5. ROCK TYPE

The geologic name for a rock processing a specific set of lithologic, compositional, and/or textured characteristics.

6. ROCK STRUCTURE

BEDDING:	Compositional and textural layering in sedimentary rocks; the term may be used with caution to describe layering in metamorphic and/or volcanic rocks (flow banding).
FOLIATION:	Any planar fabric homogeneously distributed throughout the rock mass at the scale of observation. Bedding is foliation (primary). Most foliation in rock is secondary. Joints and/or fractures usually are not foliation.
PARTING:	A plane or surface along which a rock is readily separated or is naturally divided into layers.
FRACTURE:	Any break in a rock, whether or not it is associated with displacement, due to mechanical failure by stress.
CRACK:	A partial or incomplete fracture.
JOINT:	A planar or near planar fracture occurring without displacement parallel to the fracture surfaces.
SHEAR:	A fracture occurring with minor displacement parallel to the adjacent fracture surfaces.
FAULT:	A fracture occurring with significant movement parallel to the adjacent fracture surfaces.
FAULT/SHEAR ZONE:	A zone containing numerous faults or shears.

Bedding Thickness and Joint Spacing

Bedding	Joints	Perpendicular Distance
Very Thin	Very Close	Less than 2 inches
Thin	Close	2 inches to 1 foot
Medium	Moderately Close	1 foot to 3 feet
Thick	Wide	3 feet to 10 feet
Massive	Very Wide	More than 10 feet

Bedding / Joint Angle

Description	Angle
Horizontal	0° to 5°
Shallow or Low Angle	5° to 35°
Moderately Dipping	35° to 55°
Steep or High Angle	55° to 85°
Vertical	85° to 90°

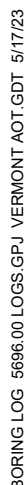
7. ROCK CONTINUITY

Any fracture in rock other than bedding plane partings.

EXTREMELY FRACTURED:	Drill core stem less than 1 inch
MODERATELY FRACTURED:	Drill core stem 1 inch to 4 inches
SLIGHTLY FRACTURED:	Drill core stem 4 inches to 8 inches
SOUND:	Drill core stem greater than 8 inches

8. ROCK QUALITY DESIGNATION (RQD)

A relative indication of the frequency of naturally occurring fractures observed along a specified length of rock core. RQD values are determined only for rock core 2 inches (N) in diameter. RQD is defined as the sum in inches of all pieces of rock core 4 inches or greater in length, divided by the length in inches of the core run. If the core is broken by handling or drilling procedures, the pieces are fitted together and counted as one piece, provided they constitute the required 4-inch length. Where the recovery for a core run is greater than 100 percent, RQD values are adjusted to account for the portion of the core left in the hole from the previous run. The length of the core sections is determined by measuring down the centerline of the core.





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

BORING LOG

TOPSHAM
BF 031-1(13)
Bridge No. 23 on VT Route 25

Boring No.: **SH-1**
Page No.: **2 of 3**
Pin No.: **19b210**
Checked By: **S. Kelley**

Boring Crew: **A. Lulias (Sanborn Head), P. Schofield (NEBC)**
Date Started: **3/07/23** Date Finished: **3/09/23**
VTSPG NAD83: **N 593103.8 ft E 1690311.3 ft**
Station: **298 + 32** Offset: **LT 8.7**
Ground Elevation: **1277.5 ft**

Casing Sampler
Type: **WASH BORE SS**
I.D.: **4 in 2 in**
Hammer Wt: **N.A. 140 lb.**
Hammer Fall: **N.A. 30 in.**
Hammer/Rod Type: **Auto**
Rig: **MOBILE B-48 TRUCK C_E = 1.3**

Groundwater Observations

Date	Depth (ft)	Notes
03/08/23	21.2	Stabilized 16 hours
03/09/23	21.4	Stabilized 16 hours

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
30		Field Note:; Difficulty advancing casing at approximately 28 ft bgs. Driller indicated apparent boulder from approximately 27.5 to 29 ft bgs. A-1-b, SaGr, gry, Wet, Rec. = 0.7 ft				8-13-12-17 (25)	7.7	46.7	37.1	16.2
35		Field Note:; Increase in drilling difficulty at approximately 33 ft bgs. A-2-4, SiGrSa, gry, Wet, Rec. = 0.8 ft, -TILL-				6-19-38-35 (57)	8.3	32.2	41.7	26.1
40		A-2-4, SiGrSa, gry, Moist, Rec. = 0.7 ft, -TILL-				73-84-100/2" (184)	8.0	29.6	45.7	24.7
45		Field Note:; Difficulty advancing roller bit at approximately 40.5 feet bgs. Advanced roller bit to approximately 41.5 ft bgs prior to coring. Core barrel advanced from approximately 41.5 to 46.5 ft bgs through apparent boulder and cobbly material.								
		Field Note:; Drillers advanced 3" diameter casing and roller bit through 4" casing (bottom 39 feet bgs) and through boulder.								
		Field Note:; Difficulty advancing 3" casing at approximately 48 feet bgs.								
50		A-1-b, GrSa pulverized rock, white, Moist, Rec. = 0.5 ft -TILL-				95-100/2"	10.6	44.1	44.3	11.6
		Field Note:; Advanced roller bit through apparent boulder at approximately 50.5 ft bgs.								

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. Soil descriptions are based on modified burmister system when no soil laboratory testing was performed. AASHTO classifications are included where soil laboratory testing was performed.



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

BORING LOG

TOPSHAM
BF 031-1(13)
Bridge No. 23 on VT Route 25

Boring No.: **SH-1**
Page No.: **3 of 3**
Pin No.: **19b210**
Checked By: **S. Kelley**

Boring Crew: **A. Lulias (Sanborn Head), P. Schofield (NEBC)**
Date Started: **3/07/23** Date Finished: **3/09/23**
VTSPG NAD83: **N 593103.8 ft E 1690311.3 ft**
Station: **298 + 32** Offset: **LT 8.7**
Ground Elevation: **1277.5 ft**

Casing Sampler
Type: **WASH BORE SS**
I.D.: **4 in 2 in**
Hammer Wt: **N.A. 140 lb.**
Hammer Fall: **N.A. 30 in.**
Hammer/Rod Type: **Auto**
Rig: **MOBILE B-48 TRUCK** $C_E = 1.3$

Groundwater Observations

Date	Depth (ft)	Notes
03/08/23	21.2	Stabilized 16 hours
03/09/23	21.4	Stabilized 16 hours

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
55		Field Note:., Drilling action indicates top of bedrock at approximately 55 ft bgs.								
60		56.0 ft - 61.0 ft, Gry, Fine-grained PHYLLITE, joints very close to close, shallow to moderately dipping. Moderately soft to moderately hard, Slightly to moderately weathered, Fair rock, moderately fractured to slightly fractured, RMR = 42	C-1	55 (34)	3 3 2.5 2.5 2.7					
65		61.0 ft - 66.0 ft, Gry, Fine-grained PHYLLITE, close joints, near horizontal to shallow. Moderately hard to hard, Fair rock, Moderately weathered to fresh, moderately fractured to slightly fractured, RMR = 50	C-2	70 (53)	5.5 5.5 4 5.2 5.1					
		Hole stopped @ 66.0 ft								
70										
75										

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. Soil descriptions are based on modified burmister system when no soil laboratory testing was performed. AASHTO classifications are included where soil laboratory testing was performed.



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

BORING LOG

TOPSHAM
BF 031-1(13)
Bridge No. 23 on VT Route 25

Boring No.: **SH-2**
Page No.: 1 of 1
Pin No.: 19b210
Checked By: S. Kelley

Boring Crew: A. Lulias (Sanborn Head), P. Schofield (NEBC)
Date Started: 3/09/23 Date Finished: 3/10/23
VTSPG NAD83: N 593189.5 ft E 1690294.7 ft
Station: 299 + 20 Offset: RT 6.9
Ground Elevation: 1278.4 ft

Casing Sampler
Type: WASH BORE SS
I.D.: 4 in 2 in
Hammer Wt: N.A. 140 lb.
Hammer Fall: N.A. 30 in.
Hammer/Rod Type: Auto
Rig: MOBILE B-48 TRUCK C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Notes
03/10/23	15.0	Wet samples

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Field Note:., Approximately 6 inches of ASPHALT					
5	× × × × × × × × × × × ×	A-1-b, SiGrSa, brn, Moist, Rec. = 0.7 ft, -FILL-	7-8-8-10 (16)	6.4	34.3	45.3	20.4
10	× × × × × × × × × × × ×	A-1-b, GrSa, gry-brn, Moist, Rec. = 0.8 ft, -FILL-	4-4-4-5 (8)	12.0	30.8	51.0	18.2
15		Field Note:., Casing bouncing at approximately 11.5 feet bgs. Driller indicated apparent boulder.					
	× × × × × × × × × × × ×	Visual Description:., Very loose GRAVEL, some Sand, trace Silt, gry, Moist, Rec. = 0.2 ft, -FILL-	3-1-1-4 (2)				
20		A-1-b, GrSa few organic fragments, gry, Wet, Rec. = 0.4 ft Field Note: Split-spoon sampler bent after sampling. High blow counts due to apparent cobble/boulder.	1-65-18-8 (83)	15.8	28.1	59.4	12.5
		Hole stopped @ 21.0 ft					
25		Remarks: Boring terminated due to broken casing as a result of an apparent boulder at approximately 19 feet.					

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. Soil descriptions are based on modified burmister system when no soil laboratory testing was performed. AASHTO classifications are included where soil laboratory testing was performed.



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

BORING LOG

TOPSHAM
BF 031-1(13)
Bridge No. 23 on VT Route 25

Boring No.: **SH-2A**
Page No.: 1 of 2
Pin No.: 19b210
Checked By: S. Kelley

Boring Crew: A. Lulias (Sanborn Head), P. Schofield (NEBC)
Date Started: 3/10/23 Date Finished: 3/13/23
VTSPG NAD83: N 593193.8 ft E 1690293.5 ft
Station: 299 + 25 Offset: RT 6.9
Ground Elevation: 1278.3 ft

Casing Sampler
Type: WASH BORE SS
I.D.: 5 in 2 in
Hammer Wt: N.A. 140 lb.
Hammer Fall: N.A. 30 in.
Hammer/Rod Type: Auto
Rig: MOBILE B-48 TRUCK C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Notes
03/10/23	19.0	Wet samples

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Approximately 6 inches of ASPHALT, 0.0 ft - 0.5 ft					
5		Field Note:., Roller bit and casing advanced to approximately 19 ft bgs.					
10		Field Note:., Difficulty advancing roller bit from approximately 9 to 11 feet bgs. Driller indicated apparent boulder.					
20		A-1-b, GrSa, gry, Moist, Rec. = 0.5 ft Field Note: Split-spoon sampler bent while collecting sample S-1. High blow counts due to apparent cobble/boulder.	69-41-7-4 (48)	15.9	24.7	66.1	9.2
		A-1-b, GrSa few Organic particles, gry-brn, MTW, Rec. = 0.9 ft	6-6-4-7 (10)	17.0	21.7	69.0	9.3
25		A-1-b, GrSa orange staining, gry-brn, Wet, Rec. = 1.4 ft	17-21-26-24 (47)	14.2	29.7	61.9	8.4

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. Soil descriptions are based on modified burmister system when no soil laboratory testing was performed. AASHTO classifications are included where soil laboratory testing was performed.



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

BORING LOG

TOPSHAM
BF 031-1(13)
Bridge No. 23 on VT Route 25

Boring No.: **SH-2A**
Page No.: 2 of 2
Pin No.: 19b210
Checked By: S. Kelley

Boring Crew: A. Lulias (Sanborn Head), P. Schofield (NEBC)

Date Started: 3/10/23 Date Finished: 3/13/23

VTSPG NAD83: N 593193.8 ft E 1690293.5 ft

Station: 299 + 25 Offset: RT 6.9

Ground Elevation: 1278.3 ft

Casing Sampler
Type: WASH BORE SS
I.D.: 5 in 2 in
Hammer Wt: N.A. 140 lb.
Hammer Fall: N.A. 30 in.
Hammer/Rod Type: Auto
Rig: MOBILE B-48 TRUCK $C_E = 1.3$

Groundwater Observations

Date	Depth (ft)	Notes
03/10/23	19.0	Wet samples

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
30		Field Note: No recovery. Field Note: Difficulty advancing roller bit from approximately 29 to 32 feet bgs, driller indicated probable boulder.	100/4" (100)				
35		Field Note: Difficulty advancing casing past approximately 36 ft bgs. Apparent boulder between approximately 36 to 37.5 feet bgs. Roller bit advanced to approximately 39 ft bgs, but practical refusal encountered due to casing being out of plumb.					
40		Hole stopped @ 39.0 ft Remarks: Boring terminated due to out of plumb casing as a result of apparent boulders.					
45							
50							

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. Soil descriptions are based on modified burmister system when no soil laboratory testing was performed. AASHTO classifications are included where soil laboratory testing was performed.

APPENDIX C

LABORATORY TESTING RESULTS





**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 77 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 0.5 ft to: 2 ft **Examined For:** Class

Field Description: SA, GR **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		453.5		
75mm	3in	0.0	453.5	100.0
37.5mm	1.5in	0.0	453.5	100.0
19mm	3/4in	49.6	403.9	89.1
9.5mm	3/8in	23.7	380.2	83.8
4.75mm	No.4	52.2	328.0	72.3
Reduced	4.75mm	232.3		
2.00mm	No.10	24.7	207.6	64.6
850um	No.20	31.1	176.5	55.0
425um	No.40	40.5	136.0	42.3
250um	No.60	34.1	101.9	31.7
150um	No.100	23.7	78.2	24.3
75um	No.200	27.7	50.5	15.7
<75um	<No.200			

Mass of can and WET SOIL: 768.50 g
Mass of can and DRY SOIL: 724.76 g
Mass of can: 271.22 g
Moisture content: 9.6 %

T-90 PL = PI = 0
T-89 LL =

Gr: 35.4 %
Sa: 48.9 %
Si: 15.7 %
 100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 78 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 4 ft **to:** 6 ft **Examined For:** Class

Field Description: SA **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		262.0		
75mm	3in	0.0	262.0	100.0
37.5mm	1.5in	0.0	262.0	100.0
19mm	3/4in	32.2	229.8	87.7
9.5mm	3/8in	42.4	187.4	71.5
4.75mm	No.4	19.5	167.9	64.1
Reduced	4.75mm	166.7		
2.00mm	No.10	18.4	148.3	57.0
850um	No.20	24.5	123.8	47.6
425um	No.40	28.9	94.9	36.5
250um	No.60	26.3	68.6	26.4
150um	No.100	22.0	46.6	17.9
75um	No.200	19.0	27.6	10.6
<75um	<No.200			

Mass of can and WET SOIL: 562.54 g
Mass of can and DRY SOIL: 535.21 g
Mass of can: 273.22 g
Moisture content: 10.4 %

T-90 PL = **PI =** 0
T-89 LL =

Gr: 43.0 %
Sa: 46.4 %
Si: 10.6 %
100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 79 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 6 ft to: 8 ft **Examined For:** Class

Field Description: SA **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		267.9		
75mm	3in	0.0	267.9	100.0
37.5mm	1.5in	0.0	267.9	100.0
19mm	3/4in	40.2	227.7	85.0
9.5mm	3/8in	0.0	227.7	85.0
4.75mm	No.4	18.5	209.2	78.1
Reduced	4.75mm	208.5		
2.00mm	No.10	52.4	156.1	58.5
850um	No.20	68.7	87.4	32.7
425um	No.40	42.2	45.2	16.9
250um	No.60	19.8	25.4	9.5
150um	No.100	9.2	16.2	6.1
75um	No.200	7.9	8.3	3.1
<75um	<No.200			

Mass of can and WET SOIL: 574.37 g

Mass of can and DRY SOIL: 538.32 g

Mass of can: 270.41 g

Moisture content: 13.5 %

T-90 PL = PI = 0

T-89 LL =

Gr: 41.5 %

Sa: 55.4 %

Si: 3.1 %

100.0 %

M145: AASHTO Class: A-1-b

D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 81 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 8 ft **to:** 10 ft **Examined For:** Class

Field Description: SA **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		233.0		
75mm	3in	0.0	233.0	100.0
37.5mm	1.5in	0.0	233.0	100.0
19mm	3/4in	15.8	217.2	93.2
9.5mm	3/8in	14.0	203.2	87.2
4.75mm	No.4	15.9	187.3	80.4
Reduced	4.75mm	186.1		
2.00mm	No.10	16.7	169.4	73.2
850um	No.20	21.5	147.9	63.9
425um	No.40	39.1	108.8	47.0
250um	No.60	43.0	65.8	28.4
150um	No.100	23.1	42.7	18.4
75um	No.200	17.8	24.9	10.8
<75um	<No.200			

Mass of can and WET SOIL: 533.85 g

Mass of can and DRY SOIL: 504.55 g

Mass of can: 271.58 g

Moisture content: 12.6 %

T-90 PL = PI = 0

T-89 LL =

Gr: 26.8 %

Sa: 62.4 %

Si: 10.8 %

100.0 %

M145: AASHTO Class: A-1-b

D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 80 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 10 ft to 12 ft **Examined For:** Class

Field Description: SA **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		447.2		
75mm	3in	0.0	447.2	100.0
37.5mm	1.5in	0.0	447.2	100.0
19mm	3/4in	0.0	447.2	100.0
9.5mm	3/8in	29.9	417.3	93.3
4.75mm	No.4	26.4	390.9	87.4
Reduced	4.75mm	270.6		
2.00mm	No.10	18.6	252.0	81.4
850um	No.20	33.3	218.7	70.6
425um	No.40	63.2	155.5	50.2
250um	No.60	68.1	87.4	28.2
150um	No.100	37.3	50.1	16.2
75um	No.200	20.5	29.6	9.6
<75um	<No.200			

Mass of can and WET SOIL: 784.96 g
Mass of can and DRY SOIL: 718.88 g
Mass of can: 271.69 g
Moisture content: 14.8 %

T-90 PL = PI = 0
T-89 LL =

Gr: 18.6 %
Sa: 71.8 %
Si: 9.6 %
100.0 %

M145: AASHTO Class: A-2-4
D2487: Soil Description: Sa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 82 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 16 ft to: 18 ft **Examined For:** Class

Field Description: SA **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		175.6		
75mm	3in	0.0	175.6	100.0
37.5mm	1.5in	0.0	175.6	100.0
19mm	3/4in	39.4	136.2	77.6
9.5mm	3/8in	7.5	128.7	73.3
4.75mm	No.4	10.1	118.6	67.5
Reduced	4.75mm	117.6		
2.00mm	No.10	9.7	107.9	62.0
850um	No.20	12.2	95.7	55.0
425um	No.40	21.9	73.8	42.4
250um	No.60	30.7	43.1	24.8
150um	No.100	23.2	19.9	11.4
75um	No.200	12.5	7.4	4.3
<75um	<No.200			

Mass of can and WET SOIL: 471.95 g
Mass of can and DRY SOIL: 446.82 g
Mass of can: 271.21 g
Moisture content: 14.3 %

T-90 PL = PI = 0
T-89 LL =

Gr: 38.0 %
Sa: 57.7 %
Si: 4.3 %
 100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 83 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 21 ft to: 23 ft **Examined For:** Class

Field Description: Sa, Si **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		307.5		
75mm	3in	0.0	307.5	100.0
37.5mm	1.5in	0.0	307.5	100.0
19mm	3/4in	0.0	307.5	100.0
9.5mm	3/8in	48.7	258.8	84.2
4.75mm	No.4	37.3	221.5	72.0
Reduced	4.75mm	220.3		
2.00mm	No.10	22.3	198.0	64.7
850um	No.20	38.3	159.7	52.2
425um	No.40	48.5	111.2	36.4
250um	No.60	34.8	76.4	25.0
150um	No.100	26.4	50.0	16.3
75um	No.200	24.9	25.1	8.2
<75um	<No.200			

Mass of can and WET SOIL: 627.62 g

Mass of can and DRY SOIL: 579.13 g

Mass of can: 271.64 g

Moisture content: 15.8 %

T-90 PL = PI = 0

T-89 LL =

Gr: 35.3 %

Sa: 56.5 %

Si: 8.2 %

100.0 %

M145: AASHTO Class: A-1-b

D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 84 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 24 ft to: 26 ft **Examined For:** Class

Field Description: Sa **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		459.5		
75mm	3in	0.0	459.5	100.0
37.5mm	1.5in	0.0	459.5	100.0
19mm	3/4in	13.8	445.7	97.0
9.5mm	3/8in	51.0	394.7	85.9
4.75mm	No.4	54.9	339.8	74.0
Reduced	4.75mm	251.0		
2.00mm	No.10	41.1	209.9	61.8
850um	No.20	37.5	172.4	50.8
425um	No.40	35.6	136.8	40.3
250um	No.60	34.0	102.8	30.3
150um	No.100	33.9	68.9	20.3
75um	No.200	28.2	40.7	12.0
<75um	<No.200			

Mass of can and WET SOIL: 783.69 g
Mass of can and DRY SOIL: 731.94 g
Mass of can: 272.42 g
Moisture content: 11.3 %

T-90 PL = PI = 0
T-89 LL =

Gr: 38.2 %
Sa: 49.9 %
Si: 12.0 %
100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 85 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 29 ft to: 31 ft **Examined For:** Class

Field Description: Sa **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		525.2		
75mm	3in	0.0	525.2	100.0
37.5mm	1.5in	0.0	525.2	100.0
19mm	3/4in	111.5	413.7	78.8
9.5mm	3/8in	44.3	369.4	70.3
4.75mm	No.4	48.6	320.8	61.1
Reduced	4.75mm	223.1		
2.00mm	No.10	28.5	194.6	53.3
850um	No.20	26.8	167.8	45.9
425um	No.40	27.9	139.9	38.3
250um	No.60	26.5	113.4	31.0
150um	No.100	23.7	89.7	24.6
75um	No.200	30.6	59.1	16.2
<75um	<No.200			

Mass of can and WET SOIL: 837.83 g
Mass of can and DRY SOIL: 797.51 g
Mass of can: 272.33 g
Moisture content: 7.7 %

T-90 PL = PI = 0
T-89 LL =

Gr: 46.7 %
Sa: 37.1 %
Si: 16.2 %
 100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: SaGr

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory

Report on Soil Sample

Lab Number: E21 86 Report Date: 4/5/2023
Project: Topsham BF 031-1 (13) Site: Tested By: B. Fletcher
Date Sampled: 3 / 7 / 23 Date Received: 3 / 20 / 2023 Date Tested: 3 / 23 / 2023
Station: 298 + 32 Offset: 8.71 Hole: SH-1 Depth: 34 ft to: 36 ft Examined For: Class
Field Description: Sa, Si Submitted By: Sanborn Head Sample Type: SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		564.9		
75mm	3in	0.0	564.9	100.0
37.5mm	1.5in	0.0	564.9	100.0
19mm	3/4in	27.1	537.8	95.2
9.5mm	3/8in	31.3	506.5	89.7
4.75mm	No.4	84.5	422.0	74.7
Reduced	4.75mm	198.9		
2.00mm	No.10	18.3	180.6	67.8
850um	No.20	18.9	161.7	60.7
425um	No.40	20.3	141.4	53.1
250um	No.60	21.1	120.3	45.2
150um	No.100	23.4	96.9	36.4
75um	No.200	27.4	69.5	26.1
<75um	<No.200			

Mass of can and WET SOIL: 722.59 g
Mass of can and DRY SOIL: 675.88 g
Mass of can: 110.94 g
Moisture content: 8.3 %
T-90 PL = PI = 0
T-89 LL =
Gr: 32.2 %
Sa: 41.7 %
Si: 26.1 %
100.0 %
M145: AASHTO Class: A-2-4
D2487: Soil Description: SiGrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 87 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 39 ft to: 41 ft **Examined For:** Class

Field Description: Sa, Si, GR **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		303.0		
75mm	3in	0.0	303.0	100.0
37.5mm	1.5in	0.0	303.0	100.0
19mm	3/4in	30.6	272.4	89.9
9.5mm	3/8in	19.2	253.2	83.6
4.75mm	No.4	21.3	231.9	76.5
Reduced	4.75mm	231.0		
2.00mm	No.10	18.5	212.5	70.4
850um	No.20	23.2	189.3	62.7
425um	No.40	27.8	161.5	53.5
250um	No.60	27.1	134.4	44.5
150um	No.100	26.3	108.1	35.8
75um	No.200	33.7	74.4	24.7
<75um	<No.200			

Mass of can and WET SOIL: 436.04 g

Mass of can and DRY SOIL: 411.82 g

Mass of can: 108.78 g

Moisture content: 8 %

T-90 PL = PI = 0

T-89 LL =

Gr: 29.6 %

Sa: 45.8 %

Si: 24.7 %

100.0 %

M145: AASHTO Class: A-2-4

D2487: Soil Description: SiGrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 88 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 7 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 298 + 32 **Offset:** 8.71 **Hole:** SH-1 **Depth:** 49 ft to: 51 ft **Examined For:** Class

Field Description: GR **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		229.0		
75mm	3in	0.0	229.0	100.0
37.5mm	1.5in	0.0	229.0	100.0
19mm	3/4in	22.5	206.5	90.2
9.5mm	3/8in	46.4	160.1	69.9
4.75mm	No.4	18.4	141.7	61.9
Reduced	4.75mm	140.7		
2.00mm	No.10	13.7	127.0	55.9
850um	No.20	15.9	111.1	48.9
425um	No.40	18.6	92.5	40.7
250um	No.60	20.5	72.0	31.7
150um	No.100	23.1	48.9	21.5
75um	No.200	22.5	26.4	11.6
<75um	<No.200			

Mass of can and WET SOIL: 522.63 g
Mass of can and DRY SOIL: 498.33 g
Mass of can: 269.33 g
Moisture content: 10.6 %

T-90 PL = PI = 0
T-89 LL =

Gr: 44.1 %
Sa: 44.2 %
Si: 11.6 %
100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 89 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 9 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 299 + 20 **Offset:** 6.9 **Hole:** SH-2 **Depth:** 4 ft to: 6 ft **Examined For:** Class

Field Description: Sa **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		469.7		
75mm	3in	0.0	469.7	100.0
37.5mm	1.5in	0.0	469.7	100.0
19mm	3/4in	19.3	450.4	95.9
9.5mm	3/8in	40.1	410.3	87.4
4.75mm	No.4	66.7	343.6	73.2
Reduced	4.75mm	243.9		
2.00mm	No.10	24.9	219.0	65.7
850um	No.20	26.7	192.3	57.7
425um	No.40	30.4	161.9	48.6
250um	No.60	29.4	132.5	39.7
150um	No.100	27.7	104.8	31.4
75um	No.200	36.8	68.0	20.4
<75um	<No.200			

Mass of can and WET SOIL: 769.98 g

Mass of can and DRY SOIL: 739.79 g

Mass of can: 270.05 g

Moisture content: 6.4 %

T-90 PL = PI = 0

T-89 LL =

Gr: 34.3 %

Sa: 45.3 %

Si: 20.4 %

100.0 %

M145: AASHTO Class: A-1-b

D2487: Soil Description: SiGrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 90 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 9 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 299 + 20 **Offset:** 6.9 **Hole:** SH-2 **Depth:** 9 ft to: 11 ft **Examined For:** Class

Field Description: Sa, Si **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		315.0		
75mm	3in	0.0	315.0	100.0
37.5mm	1.5in	0.0	315.0	100.0
19mm	3/4in	25.4	289.6	91.9
9.5mm	3/8in	13.7	275.9	87.6
4.75mm	No.4	36.8	239.1	75.9
Reduced	4.75mm	236.6		
2.00mm	No.10	20.9	215.7	69.2
850um	No.20	28.9	186.8	59.9
425um	No.40	34.5	152.3	48.9
250um	No.60	32.5	119.8	38.4
150um	No.100	32.0	87.8	28.2
75um	No.200	31.2	56.6	18.2
<75um	<No.200			

Mass of can and WET SOIL: 626.11 g

Mass of can and DRY SOIL: 588.31 g

Mass of can: 273.36 g

Moisture content: 12 %

T-90 PL = PI = 0

T-89 LL =

Gr: 30.8 %

Sa: 51.0 %

Si: 18.2 %

100.0 %

M145: AASHTO Class: A-1-b

D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 91 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 9 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 299 + 20 **Offset:** 6.9 **Hole:** SH-2 **Depth:** 19 ft to: 21 ft **Examined For:** Class

Field Description: Sa **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		228.8		
75mm	3in	0.0	228.8	100.0
37.5mm	1.5in	0.0	228.8	100.0
19mm	3/4in	0.0	228.8	100.0
9.5mm	3/8in	24.6	204.2	89.2
4.75mm	No.4	23.6	180.6	78.9
Reduced	4.75mm	179.2		
2.00mm	No.10	16.0	163.2	71.9
850um	No.20	26.9	136.3	60.0
425um	No.40	37.0	99.3	43.7
250um	No.60	27.5	71.8	31.6
150um	No.100	20.6	51.2	22.6
75um	No.200	22.8	28.4	12.5
<75um	<No.200			

Mass of can and WET SOIL: 536.69 g
Mass of can and DRY SOIL: 500.60 g
Mass of can: 271.78 g
Moisture content: 15.8 %

T-90 PL = PI = 0
T-89 LL =

Gr: 28.1 %
Sa: 59.4 %
Si: 12.5 %
100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 92 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 10 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 299 + 20 **Offset:** 6.9 **Hole:** SH-2A **Depth:** 19 ft to: 21 ft **Examined For:** Class

Field Description: Sa, Gr **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		411.5		
75mm	3in	0.0	411.5	100.0
37.5mm	1.5in	0.0	411.5	100.0
19mm	3/4in	16.1	395.4	96.1
9.5mm	3/8in	23.3	372.1	90.4
4.75mm	No.4	20.8	351.3	85.4
Reduced	4.75mm	250.5		
2.00mm	No.10	29.6	220.9	75.3
850um	No.20	56.9	164.0	55.9
425um	No.40	50.7	113.3	38.6
250um	No.60	34.1	79.2	27.0
150um	No.100	28.9	50.3	17.1
75um	No.200	23.4	26.9	9.2
<75um	<No.200			

Mass of can and WET SOIL: 746.09 g
Mass of can and DRY SOIL: 680.82 g
Mass of can: 269.34 g
Moisture content: 15.9 %

T-90 PL = PI = 0
T-89 LL =

Gr: 24.7 %
Sa: 66.1 %
Si: 9.2 %
100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 93 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 10 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 299 + 20 **Offset:** 6.9 **Hole:** SH-2A **Depth:** 22 ft **to:** 24 ft **Examined For:** Class

Field Description: Sa, **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		345.2		
75mm	3in	0.0	345.2	100.0
37.5mm	1.5in	0.0	345.2	100.0
19mm	3/4in	0.0	345.2	100.0
9.5mm	3/8in	26.2	319.0	92.4
4.75mm	No.4	19.1	299.9	86.9
Reduced	4.75mm	298.7		
2.00mm	No.10	29.4	269.3	78.3
850um	No.20	56.9	212.4	61.8
425um	No.40	73.7	138.7	40.3
250um	No.60	48.4	90.3	26.3
150um	No.100	29.5	60.8	17.7
75um	No.200	28.9	31.9	9.3
<75um	<No.200			

Mass of can and WET SOIL: 673.64 g
Mass of can and DRY SOIL: 615.12 g
Mass of can: 269.96 g
Moisture content: 17 %

T-90 PL = PI = 0

T-89 LL =

Gr: 21.7 %
Sa: 69.0 %
Si: 9.3 %
100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer



**State of Vermont
Agency of Transportation
Construction and Materials Bureau
Central Laboratory**

Report on Soil Sample

Lab Number: E21 94 **Report Date:** 4/5/2023

Project: Topsham BF 031-1 (13) **Site:** **Tested By:** B. Fletcher

Date Sampled: 3 / 10 / 23 **Date Received:** 3 / 20 / 2023 **Date Tested:** 3 / 23 / 2023

Station: 299 + 20 **Offset:** 6.9 **Hole:** SH-2A **Depth:** 24 ft to: 26 ft **Examined For:** Class

Field Description: Sa, **Submitted By:** Sanborn Head **Sample Type:** SS

Test Results

T-88 Sieve Analysis

T-265 Moisture Content

	TOTAL:	Wt Retained	Wt Passing	% Passing
		755.4		
75mm	3in	0.0	755.4	100.0
37.5mm	1.5in	0.0	755.4	100.0
19mm	3/4in	59.4	696.0	92.1
9.5mm	3/8in	34.0	662.0	87.6
4.75mm	No.4	54.3	607.7	80.4
Reduced	4.75mm	241.5		
2.00mm	No.10	30.6	210.9	70.3
850um	No.20	46.2	164.7	54.9
425um	No.40	55.3	109.4	36.4
250um	No.60	37.7	71.7	23.9
150um	No.100	25.9	45.8	15.3
75um	No.200	20.6	25.2	8.4
<75um	<No.200			

Mass of can and WET SOIL: 1135.20 g
Mass of can and DRY SOIL: 1027.71 g
Mass of can: 272.31 g
Moisture content: 14.2 %

T-90 PL = PI = 0
T-89 LL =

Gr: 29.7 %
Sa: 61.9 %
Si: 8.4 %
100.0 %

M145: AASHTO Class: A-1-b
D2487: Soil Description: GrSa

Comments: 0

Reviewed By: Stephen Madden, Geotechnical Engineer