GEOTECHNICAL EVALUATION REPORT
MOUNTAIN DIVISION RAILROAD BRIDGE
10.32 OVER MALLISON FALLS ROAD
MAINE DOT PIN 017860.01
WINDHAM, MAINE

PREPARED FOR:
T.Y. Lin International
Falmouth, Maine

PREPARED BY:
GZA GeoEnvironmental, Inc.
Portland, Maine

March 2012
File No. 09.0025701.00

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GZA
GeoEnvironmental, Inc.

Engineers and Scientists

March 30, 2012

File No. 09.0025701.00
Maine DOT PIN 017860.01

Mr. Richard Hebert, P.E.
T.Y. Lin International
12 Northbrook Drive
Falmouth, Maine 04105

Re: Geotechnical Evaluation Report
Mountain Division Railroad Bridge 10.32 over Mallison Falls Rd
Windham, Maine

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Dear Richard:

GZA GeoEnvironmental, Inc. (GZA) is pleased to provide you with this Geotechnical Report for the Mountain Division Railroad Bridge 10.32 over Mallison Falls Road in Windham, Maine. Our work was completed in accordance with GZA's proposal dated September 28, 2011.

It has been a pleasure serving you on this project. If you have any questions regarding the report, or if we can provide further assistance, please do not hesitate to contact the undersigned.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

STATE OF MAINE
JENNIFER R. BARON
No. 11694
LICENSED
PROFESSIONAL ENGINEER
3/30/12

Christopher L. Snow, P.E.
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Assistant Project Manager

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p:\09 jobs\0025700s\09.0025701.00 mt div rr bridge windham\report\final 25701 mtn div rail rpt 033012.docx

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1.0 INTRODUCTION

This report presents the results of GZA's subsurface exploration and geotechnical evaluation at Bridge 10.32 on the Mountain Division Line in Windham, Maine. Our services were provided in accordance with the proposal date September 28, 2011 and the attached Limitations contained in **Appendix A** of the report.

1.1 OBJECTIVES AND SCOPE OF SERVICES

The objectives of our work were to evaluate subsurface conditions and provide geotechnical engineering recommendations for the proposed Mountain Division Bridge 10.32 replacement, including assessment of subsurface conditions and extents of the existing masonry abutments for use in evaluating alternatives for improving under-clearance and returning the bridge to freight rail service. To meet these objectives, GZA completed the following Scope of Services:

- Conducted a site visit to observe surficial conditions; and mapped surficial and bedrock geology of the site;
- Coordinated and observed a subsurface exploration program consisting of four test borings, and eight probes;
- Conducted a laboratory testing program to evaluate engineering properties of the site soils and bedrock;
- Conducted geotechnical engineering analyses to assess the existing abutment foundations;
- Developed geotechnical engineering recommendations and assessed abutment modification alternatives; and
- Prepared this report summarizing our findings and design recommendations.

1.2 BACKGROUND

The existing bridge is a 29-foot-long, single-span, steel girder, timber deck design, supported on stone masonry abutments and straight (180-degree) wing walls along the northern abutment and along the eastern side of the southern abutment. The western side of the southern abutment angles back at an approximate 45-degree angle. Reinforced concrete bridge seats were cast atop the masonry at both abutments to support the original bridge. The bridge was removed from railroad service in 2009 and modifications were made to improve the under-clearance on Mallison Falls Road. The modifications included casting 2-foot-high blocks to raise each bridge seat by approximately 2 feet, and improve the under-clearance from approximately 12'-3" to 14'-3". The raised bridge served a pedestrian and ATV trail but was no in railroad service. The bridge location is shown on **Figure 1, Site Locus**.

Maine Department of Transportation (Maine DOT) is currently evaluating the reestablishment of rail service on the Mountain Division. T.Y. Lin International plans to assess several alternatives for supporting the bridge span under reestablished railroad loading. Alternatives include raising approach embankment grades and maintaining the current abutments and bridge seat levels, removing the 2-foot-high bridge seat blocks and lowering the deck to its original elevation, lowering the roadway grade by as much as 2 feet, or a combination of these approaches.

2.0 SUBSURFACE EXPLORATIONS

GZA completed a subsurface exploration program consisting of four test borings and eight probes. The borings were drilled to total depths ranging from 5 to 30.1 feet below ground surface. Rock cores were drilled at two of the boring locations to assess the top of bedrock. Maine Test Boring, Inc. of Hermon, Maine coordinated utility clearance and provided drilling services. Their work was completed on November 2, 2011 and November 3, 2011.

Borings B-1 and B-3 were drilled using drive and wash drilling techniques, 4-inch casing, and 3-inch HQ wire-line rock coring equipment. Boring B-1 was drilled through the existing abutment masonry wall and into the underlying bedrock. Due to overhead clearance issues, boring B-3 could not be drilled within the limits of the masonry, but instead was drilled beyond the estimated back limit of the masonry and terminated after coring bedrock.

Borings B-2 and B-4 were drilled using 4.25-inch hollow stem augers and were terminated upon refusal without coring. Standard penetration testing (SPT) and split-spoon sampling were performed at 5-foot typical intervals in the borings using a rope and cathead and a safety hammer.

The probes were drilled to assess the limits of the existing masonry structures. Probe drilling was completed using 3.25-inch solid augers, with no soil or rock sampling. The probes were terminated when the augers encountered a refusal surface. Based on drilling performance, the auger refusal surfaces were interpreted to represent either stone masonry or bedrock.

All of the test borings and probes were drilled using a track-mounted drill rig on the rail bed. The location of the test borings and probes were determined and a temporary elevation benchmark was set by Northeast Civil Solutions using survey techniques. Ground surface elevations at the explorations were surveyed by GZA using a laser level based on the temporary elevation benchmark. The boring locations are shown on **Figure 2, Exploration Location Plan.** GZA personnel monitored the drilling work, recorded refusal depths of the probes, and prepared logs of each boring that are included in **Appendix B**. Probe and boring results are shown in **Figure 3, Interpretive Subsurface Profile.**

3.0 LABORATORY TESTING

GZA completed a laboratory soil testing program to confirm visual soil classifications, evaluate frost classifications, and estimate the engineering properties of the soils. The program included five gradation analysis/AASHTO Classification/Frost Classification assessments on soil samples. Results of the testing are included in **Appendix C**.

4.0 SUBSURFACE CONDITIONS

4.1 SURFICIAL AND BEDROCK GEOLOGY

Based on available literature, surficial geologic units mapped in the Mountain Division Railroad Bridge 10.32 area include Presumpscot Formation marine deposits and Glacial Till deposits overlying bedrock. The following are brief descriptions of the units.

- The Presumpscot Formation deposits are described as massive to laminated, gray to bluish-gray silt and clay, which weathers to brownish or greenish-gray. This deposit locally may include minor amounts of sand and gravel and occurs as a blanket deposit over bedrock and older glacial sediments. These sediments were deposited on the sea floor during late-glacial marine submergence.
- The Glacial Till deposits are described as gray to gray-brown, poorly sorted mixtures of silt, sand, pebbles, cobbles, and boulders. The deposit is generally a blanket deposit directly over bedrock.
- Bedrock at the site is mapped as the Hutchins Corner Formation. The Hutchins Corner Formation, consists of flaggy, bluish to purplish-gray, biotite-quartz-plagioclase Granofels with thin interbeds of greenish-gray calc-silicate Granofels.

4.2 SUBSURFACE SOILS

Three primary soil units, Fill, Marine Deposits, and Glacial Till were encountered at the test borings and probes. Stone Masonry/Rubble was also encountered in the borings drilled within the limits of the abutment masonry (locations B-1 and B-3). The encountered thicknesses and generalized descriptions of the soil units, including the stone masonry, are summarized in the following table. Detailed descriptions of the materials encountered at specific locations are provided in the boring logs included in **Appendix B**. The soil units are also shown in relation to the bridge on **Figure 3, Interpretive Subsurface Profile**.

GENERALIZED SUBSURFACE CONDITIONS		
Strata Designation	**Encountered Thickness (ft)**	**Generalized Description**
Fill	9 to 20	Variable brown, loose to medium dense, fine to coarse, SAND, some to trace Gravel, little to trace Silt.
Marine Deposits	4.3 to 6	Brown-gray, medium stiff to stiff, SILT and CLAY, little to trace fine Sand, trace Gravel.
Glacial Till	0.8 to 3.5	Gray, medium dense, fine to coarse SAND, some Silt, little Gravel.
Stone Masonry	9.1	Gray, Granite and Granofels blocks with cement mortared joints, 2'x 2'x 6' typical dimensions.
Top of Bedrock	Elevation 98.6 to 104.7	

Based on grain-size analysis tests performed, the AASHTO classification for the abutment fill soils are A-1-a and A-1-b.

Below the south abutment, the existing masonry abutment appears to be bearing directly on rock. It appears a thin layer of cement mortar, on the order of 0.1 feet thick, was used between the block and the bedrock surface. Coring through the existing stone masonry of the north abutment was not practical due to the location of overhead power lines at the abutment. Sampling behind the northern abutment was completed with a 5-foot core run of the underlying bedrock.

4.3 BEDROCK

Bedrock was cored in two test borings. The primary rock type encountered was very hard, fresh, aphanitic, gray, GRANOFELS. Joints were extremely close to moderately spaced, low angle to moderately dipping, planar, rough, fresh, and tight to partly open, with slight iron staining on joint faces and occasional silt infilling.

The Rock Quality Designation (RQD) of the encountered bedrock material ranged from 38 to 78 percent, with an average RQD of 57 percent.

4.4 GROUNDWATER

Groundwater was not observed in any of the test borings or probes during drilling.

5.0 ENGINEERING EVALUATIONS AND DESIGN RECOMMENDATIONS

GZA completed geotechnical engineering evaluations based on currently available subsurface exploration data, bridge inspection and modification plans, mapped surficial geology, and observation of visible conditions during a November 2011 site visit.

Several alternatives assessing the re-use of the existing abutments are being considered, including raising approach embankment grades and maintaining the current abutments and bridge seat levels, removing the 2-foot-high bridge seat blocks and lowering the deck to its original elevation, lowering the roadway grade by as much as 2 feet, or a combination of these approaches.

GZA evaluated the existing stone masonry abutments for settlement and bearing capacity based on an anticipated Cooper E80 railroad loading condition. The abutments were analyzed for two options: (1) maintaining the bridge deck at its current elevation and (2) restoring the bridge seat height to its original elevation. The alternative of lowering the Mallison Falls Road profile was eliminated because the steep slope and tight vertical curve of the east approach would probably result in significant soil and rock cuts.

5.1 EXISTING STONE MASONRY ABUTMENTS

GZA's Chris Snow, P.E. visited the site on November 2, 2011 to observe drilling operations and assess conditions of the stone masonry abutments. Exposed portions of the masonry blocks were in very good condition. Approximately 50 to 70 percent of the cement mortar needs pointing-up due to degradation and popout. Joints appeared dry, except at the base, where drilling water was observed to be draining out. Typical block size was 2 feet by 2 feet by 6 feet. The wall face showed the blocks were laid in a pattern alternating between longitudinal (2 feet by 2 feet exposed) and transverse (2 feet by 6 feet exposed).

There are no available construction or as-built records of the stone masonry. Based on the proximity of the bedrock to the bottom of the Granite Block and the presence of mortared shim stones between the base of the Blocks and the top of bedrock, it is our opinion that the bedrock surface was cleaned of loose material, leveled using cement mortar and shim stones, then cement mortar was placed on the shim stones to bed the first course of Granite Blocks.

Reinforced concrete bridge seats were cast atop the masonry at both abutments to support the original bridge. The original abutments were modified in 2009 to accommodate a 2-foot increase in the under-clearance on Mallison Falls Road. To achieve this height adjustment, the modifications included casting reinforced concrete blocks to raise each bridge seat by approximately 2 feet.

GZA's subsurface investigation confirmed the south abutment bears directly on bedrock, with what appears to be a granite shimming block (on the order of 0.2 feet thick) and a thin layer of cement mortar at the base of the abutment. Based on typical block sizes and the boring and probe results, GZA has interpreted the approximate limits of the buried portion of the abutments as shown on **Figure 3**.

5.2 GEOTECHNICAL RECOMMENDATIONS FOR ABUTMENT EVALUATIONS

GZA developed a design subsurface profile, including masonry wall properties, for use in evaluating the abutments. The following summarizes the soil and masonry material properties surcharge and lateral earth pressure parameters recommended for use in the evaluations.

5.2.1 Recommended Soil and Rock Properties

In accordance with AREMA, the existing fill soils at the abutments are classified as a Type 1 Backfill. Soil properties recommended for use in evaluations were based on AREMA recommendations, test boring data, and laboratory test results, and are as follows:

- Internal Angle of Friction of Soil = 33°
- Soil Total Unit Weight = 120 pounds per cubic foot (pcf)
- Coefficient of Friction, tan δ (Mortar to Bedrock) = 0.60
- Coefficient of Active Earth Pressure, $K_a = 0.29$
- Surcharge Pressure 1882 pounds per square foot (psf) (Cooper E80, 8.5' ties)
- Boussinesq distribution applied to surcharge pressure
- Rock Unit Weight = 165 psf

The masonry wall configuration developed for use in evaluations is shown on **Figure 3**. The limits and configuration of the south abutment were interpreted based on subsurface exploration results. The configuration of the north masonry abutment was assumed similar to the south abutment, with one additional row of granite block.

5.2.2 Footing Bearing Resistance

The existing stone masonry abutments are interpreted to bear on intact bedrock. The abutments should be evaluated based on a nominal bearing pressure of 45 tons per square foot maximum allowable (gross) contact pressure of 15 tons per square foot (tsf).

5.2.3 External Stability

External stability checks should be made for sliding and eccentricity in accordance with AREMA requirements. The minimum factor of safety against sliding should be at least 1.5. AREMA does not specify a safety factor against overturning. AREMA requires the resultant reaction on the base of the foundation to be in the middle 1/2 of the foundation for abutments bearing on bedrock.

5.2.4 Abutment Settlement

The existing abutments do not show visible signs of previous excessive settlement or overloading of the stone masonry (no significant cracks or major block movements were observed). Given that the abutments consist of stone masonry bearing on bedrock, we anticipate that foundation settlements will be negligible when the bridge is put back in service.

6.0 CONSTRUCTION CONSIDERATIONS

Construction considerations are intended to provide a basis for design development and to identify significant issues that may impact project construction. These items are provided in the paragraphs that follow.

6.1 EXCAVATION

We anticipate that excavations needed to make abutment modifications would be relatively shallow, and can be achieved using sloped open cut techniques.

6.2 DEWATERING

Groundwater levels are expected to below excavation levels. We anticipate that infiltration and precipitation entering excavations can be handled by open pumping from sumps installed at the bottom of excavations.

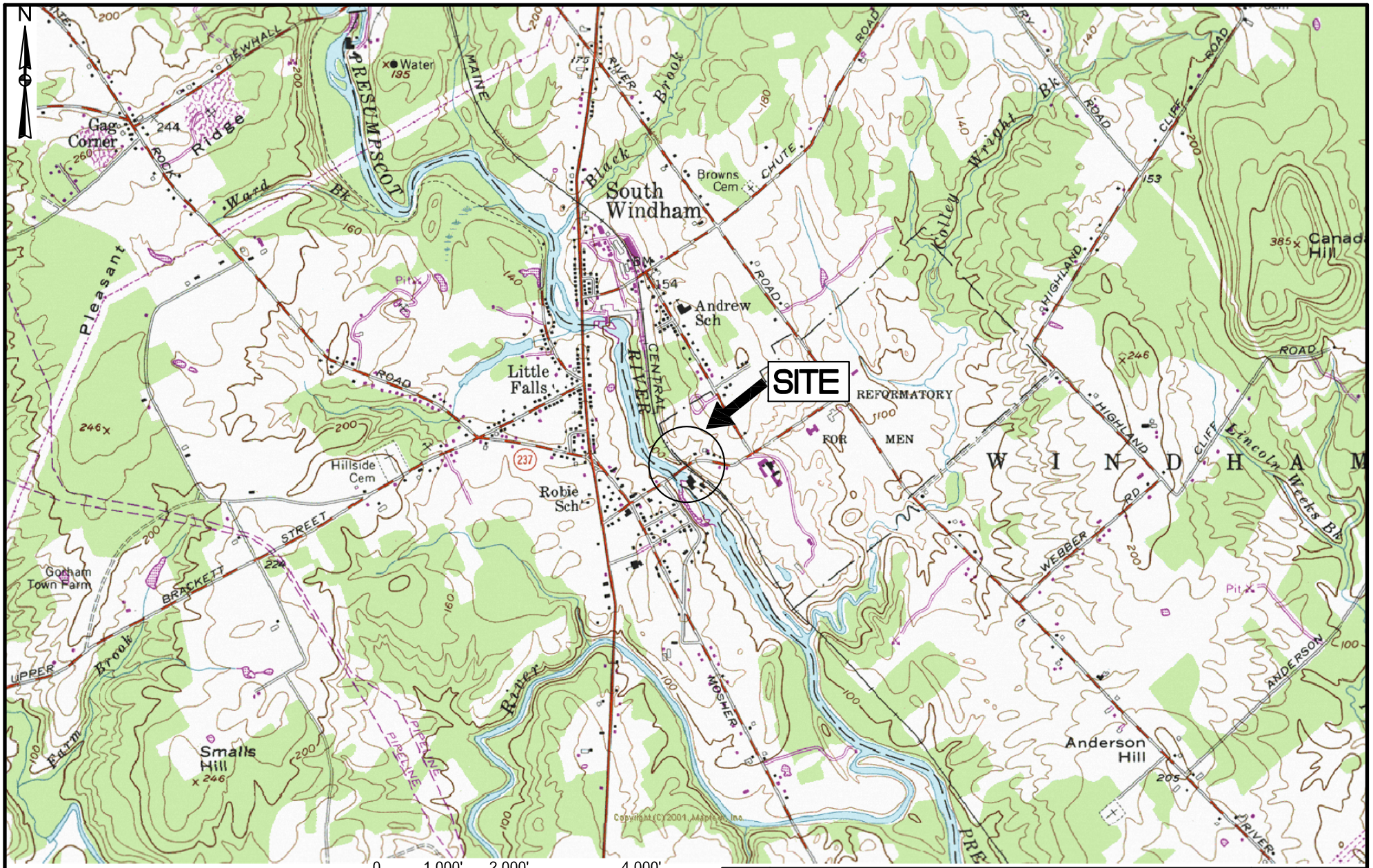
The contractor should be responsible for controlling groundwater, surface runoff, infiltration and water from all other sources by methods that preserve the undisturbed condition of the subgrade and permit foundation construction in-the-dry. Discharge of pumped groundwater should comply with all local, State, and federal regulations.

6.3 REUSE OF EXISTING EMBANKMENT FILL

Based on the results of gradation analyses performed on selected samples, the existing embankment fill is suitable for re-use for embankment fill. The existing fill meets the gradation requirements of Maine DOT Standard Specification Section 703.19 Granular Borrow for Embankment Construction.

FIGURES

© 2011 – GZA GeoEnvironmental, Inc. GZA–P:\09 Jobs\0025700s\09.0025701.00\Figures–CAD\LOCUS.dwg [LOCUS] December 13, 2011 – 1:31pm Eric.Baron



NO.	ISSUE/DESCRIPTION	BY	DATE

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists, 4 FREE STREET, PORTLAND, MAINE 04101, (207) 879-9190

PREPARED FOR: MAINE DEPARTMENT OF TRANSPORTATION

MOUNTAIN DIVISION RAILROAD
BRIDGE OVER MALLISON FALLS ROAD
BRIDGE 10.32
WINDHAM, MAINE

LOCUS PLAN

PROJ MGR:	CLS
DESIGNED BY:	MJD
REVIEWED BY:	CLS
DRAWN BY:	MJD
CHECKED BY:	ARB
SCALE:	AS NOTED

DATE: DECEMBER 2011
PROJECT NO.: 09.0025701.00
REVISION NO.
FIGURE: 1
SHEET NO.

NOTES:

1) BASE MAP DEVELOPED FROM ELECTRONIC AUTOCAD FILES PROVIDED BY DANIEL MYERS OF THE T.Y. LIN INTERNATIONAL, TRANSMITTED VIA EMAIL ON JANUARY 20, 2012 (FILES INCLUDED 32945.DWG).

2) THE LOCATION AND ELEVATION OF THE BORINGS WERE LOCATED USING TAPED MEASUREMENTS FROM SITE FEATURES AND A LASER LEVEL AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED.

3) BORINGS WERE PERFORMED BY MAINE TEST BORINGS, INC OF HERMON, MAINE BETWEEN NOVEMBER 2, 2011 AND NOVEMBER 3, 2011 AND OBSERVED BY GZA PERSONNEL.

4) UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LEGEND:

B4 — BORING LOCATION (DRILLED BY MTB)

P-8 — PROBE LOCATION (DRILLED BY MTB)

0 2.5 5 10 15

SCALE IN FEET

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

–

PIN
017860.01

BRIDGE PLANS

SIGNATURE

P.E. NUMBER

DATE

	BY	DATE
PROJ. MANAGER	DGE	
DESIGN–DETAILED	MJD	–
CHECKED–REVIEWED	CLS	–
DESIGN2–DETAILED2		–
DESIGN3–DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

MOUNTAIN DIVISION RAILROAD BRIDGE 10.32
OVER MALLISON FALLS ROAD
WINDHAM

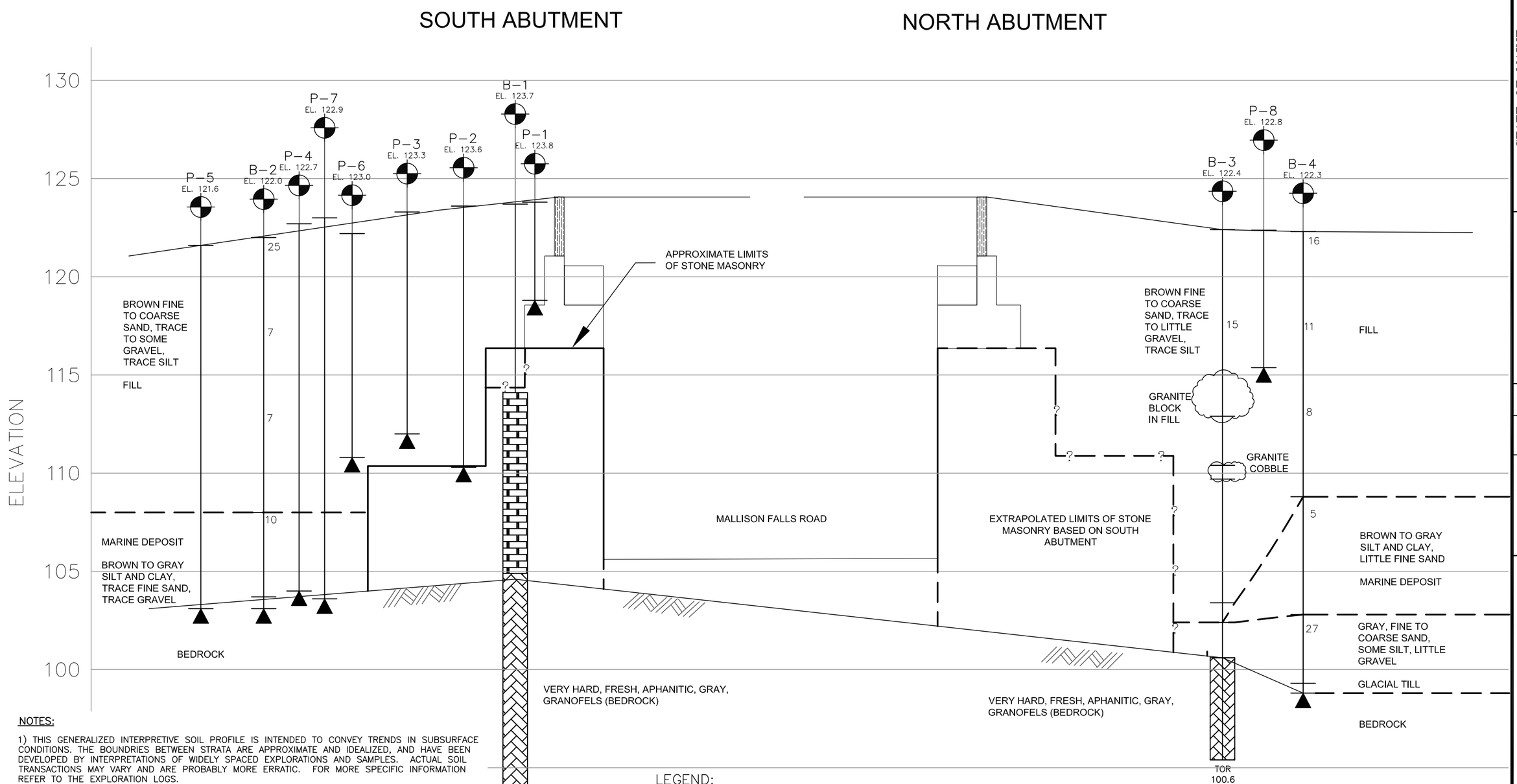
BORING LOCATION PLAN

SHEET NUMBER

2

OF 3

GZA-P:\09 Jobs\0025700\09.0025701.00\Figures-CAD\site plan.dwg [Site Plan 1] February 01, 2012 - 11:41am michael.devold



NOTES:

1) THIS GENERALIZED INTERPRETIVE SOIL PROFILE IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDRIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED, AND HAVE BEEN DEVELOPED BY INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS AND SAMPLES. ACTUAL SOIL TRANSACTIONS MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE EXPLORATION LOGS.

2) THE LOCATION AND ELEVATION OF THE BORINGS WERE LOCATED USING TAPED MEASUREMENTS FROM SITE FEATURES AND A LASER LEVEL AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED.

3) BORINGS WERE PERFORMED BY MAINE TEST BORINGS, INC OF HERMON, MAINE BETWEEN NOVEMBER 2, 2011 AND NOVEMBER 3, 2011 AND OBSERVED BY GZA PERSONNEL.

4) UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LEGEND:

P-1
EL. 123.8 —INDICATES BOREHOLE DESIGNATION
—INDICATES APPROXIMATE GROUND SURFACE ELEVATION

15 —INDICATES STANDARD PENETRATION TEST (SPT) VALUE

—INDICATES REFUSAL

—STONE MASONRY BLOCKS

—ROCK CORE

TOR 100.6 —INDICATES APPROXIMATE ELEVATION OF TOP OF BEDROCK

0 5 10 15
SCALE IN FEET (HORIZ. AND VERT.)

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

–

PIN 017860.01

BRIDGE PLANS

		BY	DATE
PROJ. MANAGER	DGE		
DESIGN-DETAILED	MJD	–	–
CHECKED-REVIEWED	CLS	–	–
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

MOUNTAIN DIVISION RAILROAD BRIDGE 10.32
OVER MALLISON FALLS ROAD
WINDHAM

INTERPRETIVE SUBSURFACE PROFILE

SHEET NUMBER
3
OF 3

GZA-P:\09 Jobs\0025700s\09.0025701.00\Figures-CAD\PROF 2.dwg [Boring Location Plan 1] December 13, 2011 – 1:28pm Eric.Baron

APPENDIX A

LIMITATIONS

LIMITATIONS

Explorations

1. The analyses and recommendations in this report are based in part upon the data obtained from subsurface explorations. 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 interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

3. Water level readings have been made in the drill holes at times and under conditions stated on the boring 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 occurring since the time measurements were made.

Review

4. In the event that any changes in the nature, design or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by GZA GeoEnvironmental, Inc. It is recommended that this firm be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

Construction

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

Use of Report

6. This soil and foundation engineering report has been prepared for this project by GZA GeoEnvironmental, Inc. This report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. This report has been prepared for this project by GZA GeoEnvironmental, Inc. for the exclusive use of T.Y. Lin International and their project team for specific application to the Mountain Division Railroad Bridge 10.32 over Mallison Falls Road in Windham, Maine in accordance with generally accepted soil and foundation engineering practices. No Warranty, express or implied, is made.

APPENDIX B

BORING LOGS AND PROBE REFUSAL DATA

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Mountain Division RR Bridge 10.32
Location: Windham, Maine

Boring No.: B-1
PIN: _____

Driller:	Maine Test Boring	**Elevation (ft.)**	123.7	**Auger ID/OD:**	
Operator:	Richard Leonard	**Datum:**	NAVD 1988	**Sampler:**	Split Spoon
Logged By:	Mike Devoid	**Rig Type:**	Mobile Drill Rig, B-53	**Hammer Wt./Fall:**	140/30"
Date Start/Finish:	11/2/11 - 11/2/11	**Drilling Method:**	Drive & Wash	**Core Barrel:**	HQ Wire Line
Boring Location:	-	**Casing ID/OD:**	4" HQ	**Water Level*:**	
Hammer Efficiency Factor:	0.6	**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☒		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR = weight of rods
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0									Brown, fine to coarse SAND some Gravel, trace Silt. - FILL -	
5										
								116.7	Darker brown FILL — 7.0	
	R1	64/53	9.8 - 15.1					114.1	9.6	
10								113.7	Gray, Granite Block (lines denote mortared joint)	
								113.1	10.0	
									Gray, Granofels Block	
								112.1	10.6	
									Gray, Granite Blocks	
									11.6	
								110.6	13.1	
15								108.7	15.0	
	R2	60/52	15.1 - 20.1					108.0	15.7	
								107.2	16.5	
								106.4	17.3	
								105.0	18.7	
								104.9	Cement Mortar	
								104.7	18.8	
20	R3	60/57	20.1 - 25.1	RQD = 55%					Granofels Block (cement mortar on base) — 19.0	
									Top of Bedrock Very hard, fresh, aphanitic, gray, GRANOFELS. Joints are very close to moderately spaced, low angle to moderately dipping, planar, rough, fresh, tight, slight iron staining on joint faces.	
25	R4	60/61	25.1 - 30.1	RQD = 78%					Similar to R3 but Granite intrusion at 26.5'-26.8' and 27.7'-28.9'.	
30								93.6	30.1	
									Bottom of Exploration at 30.10 feet below ground surface.	

Remarks:

1. Sample taken from auger cuttings. (0 to 5 feet)
2. Casing tip kicking away from wall at 8.5'. Possible edge of masonry block.
3. Noted change in wash water color to darker brown at 7.0'.
4. Advanced roller bit 9.6' to 9.8' and noted Granite chips in wash (rolling into Granite block).
5. At approximately 13', 1"-2" seam possible block joint.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Mountain Division RR Bridge 10.32
Location: Windham, Maine

Boring No.: B-2
PIN: _____

Driller:	Maine Test Boring	**Elevation (ft.)**	122.0	**Auger ID/OD:**	4.25"
Operator:	Richard Leonard	**Datum:**	NAVD 1988	**Sampler:**	Split Spoon
Logged By:	Mike Devoid	**Rig Type:**	Mobile Drill Rig, B-53	**Hammer Wt./Fall:**	140/30"
Date Start/Finish:	11/3/11 - 11/3/11	**Drilling Method:**	Hollow Stem Augers	**Core Barrel:**	-
Boring Location:	-	**Casing ID/OD:**		**Water Level*:**	
Hammer Efficiency Factor:	0.6	**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☒		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR = weight of rods
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/7	0.0 - 2.0	5-7-18-14	25	25			Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt, dry. -FILL-	
								118.0	4.0	
5	2D	24/14	5.0 - 7.0	3-3-4-4	7	7			Loose, light brown, fine to coarse SAND, trace silt, dry. -FILL-	
10	3D	24/8	10.0 - 12.0	4-3-4-3	7	7			Loose, light brown, fine to coarse SAND, trace silt, dry.	
								108.0	14.0	
15	4D	24/9	15.0 - 17.0	4-4-6-7	10	10			Stiff, brown-gray, SILT & CLAY, trace fine Sand, trace Gravel, damp. -MARINE DEPOSIT-	
								103.7	18.3	
								102.9	Possible Glacial Till or Weathered Bedrock	
20									Possible Bedrock	
									19.1	
									Bottom of Exploration at 19.10 feet below ground surface.	
25										
30										

Remarks:

1. Observed lighter brown cuttings at 4' bgs.
2. Noted change in drill performance at 14' bgs.
3. Drill resistance increased at 18.3' and increased more at 18.9'- possible Glacial Till or Weathered Bedrock.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Mountain Division RR Bridge 10.32
Location: Windham, Maine

Boring No.: B-3
PIN:

Driller:	Maine Test Boring	**Elevation (ft.)**	122.4	**Auger ID/OD:**	
Operator:	Richard Leonard	**Datum:**	NAVD 1988	**Sampler:**	Split Spoon
Logged By:	Mike Devoid	**Rig Type:**	Mobile Drill Rig, B-53	**Hammer Wt./Fall:**	140/30"
Date Start/Finish:	11/3/11 - 11/3/11	**Drilling Method:**	Drive & Wash	**Core Barrel:**	HQ Wire Line
Boring Location:	-	**Casing ID/OD:**	4" HQ	**Water Level*:**	
Hammer Efficiency Factor:	0.6	**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☒		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR = weight of rods
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0									-FILL-	
5	1D	24/12	5.0 - 7.0		15	15			Medium Dense, brown, fine to coarse SAND, trace Gravel, trace Silt, dry.	
	R1	60/23	7.4 - 12.4					115.0	7.4 Gray, Granite Block	
								112.9	9.5 -FILL-	
10								110.4	12.0 Gray, Granite Cobble	
	R2	66/6	12.4 - 17.9					109.7	12.7 Sand with gravel and wood	
15									-FILL-	
	R3	47/10	17.9 - 21.8							
								103.4	19.0 Sand	
20								102.4	-FILL- 20.0 -GLACIAL TILL-	
	R4	62/62	21.8 - 27.0	RQD=38%				100.6	21.8 Top of Bedrock Very hard, fresh, dark gray, aphanitic GRANOFELS. Joints are extremely close to close, low to moderately angle, planar, rough, fresh, tight to partially open, with silt infilling and rust staining on joint surfaces.	
25								95.4	27.0 **Bottom of Exploration at 27.00 feet below ground surface.**	
30										

Remarks:

1. Broke through block, fast drilling from 9.5' to 12.0' then hard drilling through a block from 12.0' to 12.7'.
2. Advanced NQ core barrel from 12.4' to 17.9'. Drilling alternately difficult then easier. Possible cobbles in Glacial Till or portions of stone masonry wall and soil.
3. Cored through horizontal piece of wood between 12.7 and 19' and clean fine to coarse Sand from 19' to 20'.
4. Cored through Glacial Till 20.0' to 21.8'.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Mountain Division RR Bridge 10.32
Location: Windham, Maine

Boring No.: B-4
PIN: _____

Driller:	Maine Test Boring	**Elevation (ft.)**	122.3	**Auger ID/OD:**	4.25" HSA
Operator:	Richard Leonard	**Datum:**	NAVD 1988	**Sampler:**	Split Spoon
Logged By:	Mike Devoid	**Rig Type:**	Mobile Drill Rig, B-53	**Hammer Wt./Fall:**	140/30"
Date Start/Finish:	11/3/11 - 11/3/11	**Drilling Method:**	Hollow Stem Augers	**Core Barrel:**	-
Boring Location:	-	**Casing ID/OD:**		**Water Level*:**	
Hammer Efficiency Factor:	0.6	**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☒		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR = weight of rods
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/8	0.0 - 2.0	2-8-8-9	16	16			Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt, dry.	
									-FILL-	
5	2D	24/10	5.0 - 7.0	3-5-6-11	11	11			Medium Dense, brown, fine to coarse SAND, trace Gravel, trace Silt, dry.	
									-FILL-	
10	3D	24/7	10.0 - 12.0	5-4-4-4	8	8			Loose, brown, fine to coarse SAND trace Gravel, trace Silt, dry.	
								108.8	13.5	
15	4D	24/14	15.0 - 17.0	2-2-3-4	5	5			Medium stiff, brown-gray, SILT and CLAY, little fine Sand.	
									-MARINE DEPOSIT-	
								102.8	19.5	
20	5D	24/3	20.0 - 22.0	8-13-14-15	27	27			Medium dense, gray, fine to coarse SAND, some Silt, little Gravel.	
									-GLACIAL TILL-	
								99.3	23.0	
								98.6	-WEATHERED BEDROCK-	
									-Possible Bedrock-	
25									23.7	
									Bottom of Exploration at 23.70 feet below ground surface.	
30										

Remarks:

1. Noted change in cuttings at 13.5'- more plastic and slightly darker.
2. Noted change cutting speed at 19.5'- slightly denser material.
3. Noted grinding at 23.0'- possible coarse Gravel.
4. advanced augers with difficulty 23.5' to 23.7', hard grinding, possible Bedrock.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

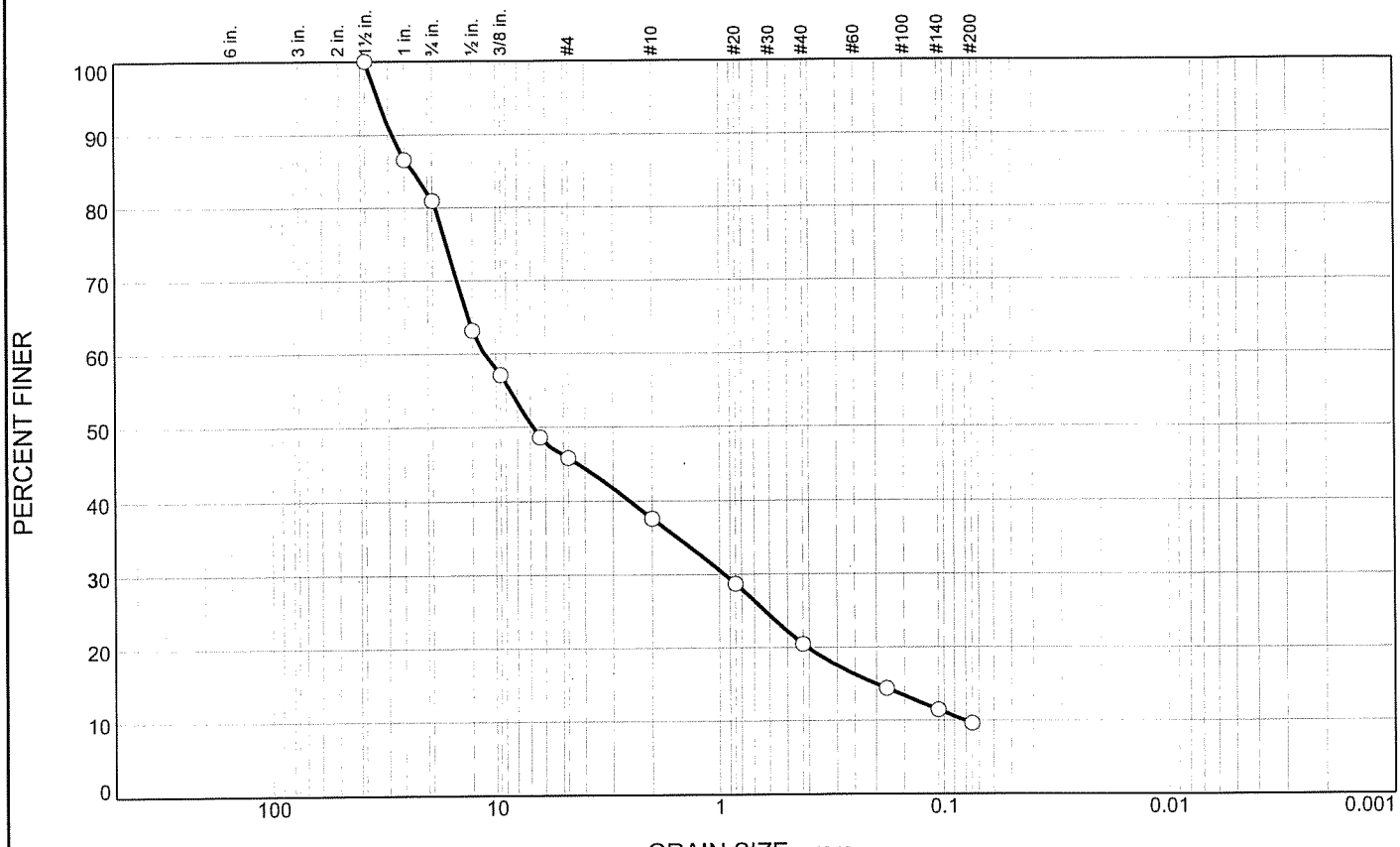
Mountain Division Railroad Bridge 10.32 09.0025701.00
Over Mallison Falls Road PIN: 017860.01
Windham, Maine

TEST BORING AND PROBE REFUSAL DATA			
Location	Depth to Refusal	EL GS	EL Refusal
South Abutment			
P-1	5	123.76	118.76
P-2	13.3	123.61	110.31
P-3	11.3	123.31	112.01
P-4	18.7	122.66	103.96
P-5	18.5	121.56	103.06
P-6	11.4	123.02	111.62
P-7	19.4	122.87	103.47
B-1a	15 NR	123.66	NR
B-1	19.8	123.71	103.91
B-2	18.3	121.98	103.68
North Abutment			
P-8	7	122.81	115.81
B-3	21.8	122.42	100.62
B-4	23.5	122.29	98.79

APPENDIX C

LABORATORY TESTING RESULTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	19.0	35.2	8.2	17.1	10.9	9.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	86.6		
3/4"	81.0		
1/2"	63.2		
3/8"	57.1		
1/4"	48.7		
#4	45.8		
#10	37.6		
#20	28.7		
#40	20.5		
#80	14.4		
#140	11.4		
#200	9.6		

* (no specification provided)

Soil Description

Brown, gravel and fine to coarse sand, trace to silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 23.1614 D_{60}= 11.2328 D_{50}= 6.8482
D_{30}= 0.9493 D_{15}= 0.2009 D_{10}= 0.0811
C_u= 138.59 C_c= 0.99

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

Moisture Content: 3.9%

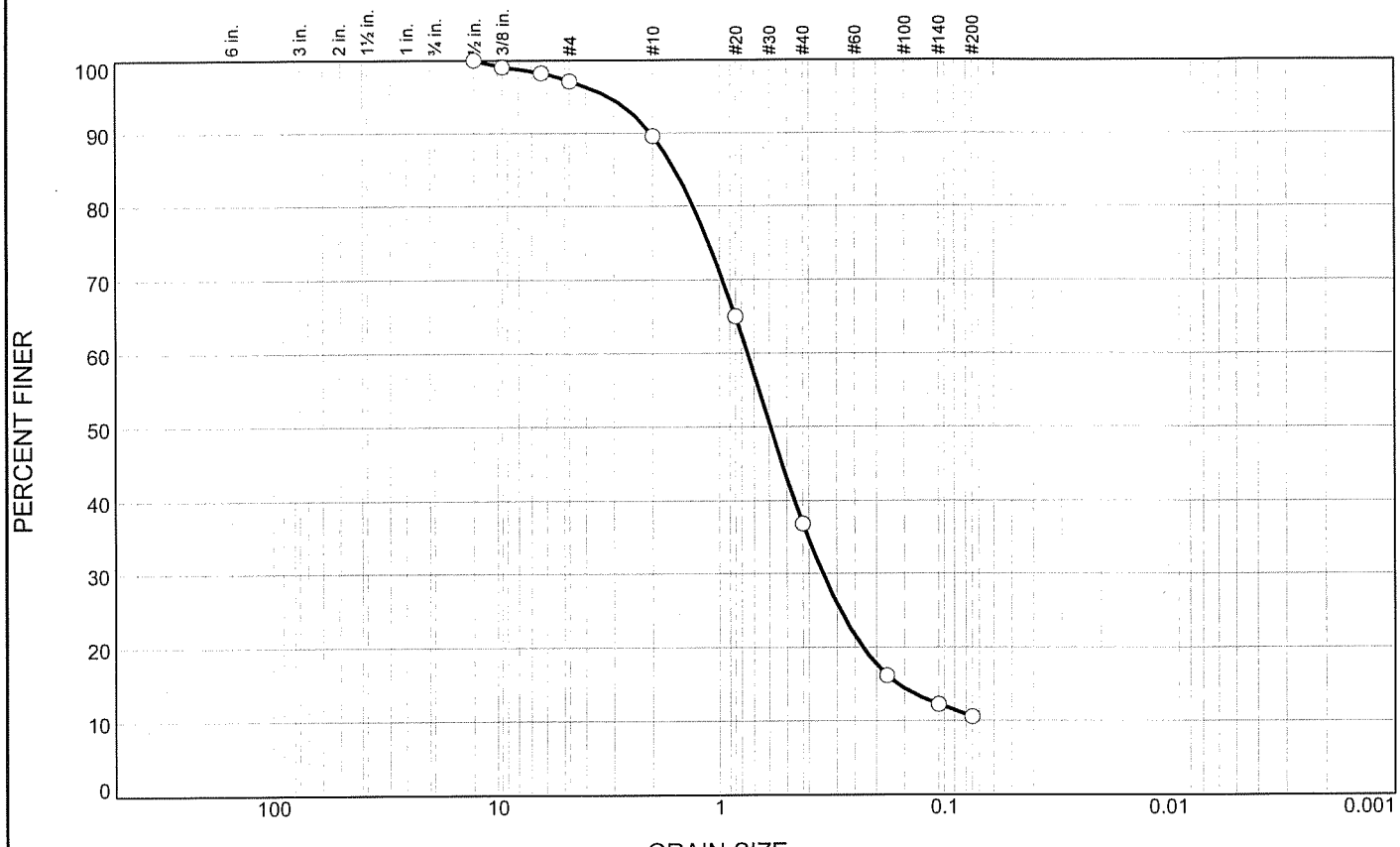
Sample No.: S-1 **Source of Sample:** Mt. Division Railroad - Windham, ME **Date:** 12/6/2011
Location: B-2 **Elev./Depth:** 0-2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: GZA GeoEnvironmental, Inc.
Project: Misc. Testing 2011 - 09.0025701.00
Project No: 0876-009 **Lab No.** 12218a

Tested By: DCH/GSM **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.9	7.5	52.8	26.2	10.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.1		
1/4"	98.2		
#4	97.1		
#10	89.6		
#20	65.0		
#40	36.8		
#80	16.2		
#140	12.2		
#200	10.6		

* (no specification provided)

Soil Description

Brown, fine to coarse snad, little silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.5953 D_{60}= 0.7500 D_{50}= 0.5911
D_{30}= 0.3462 D_{15}= 0.1616 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture Content: 10.0%

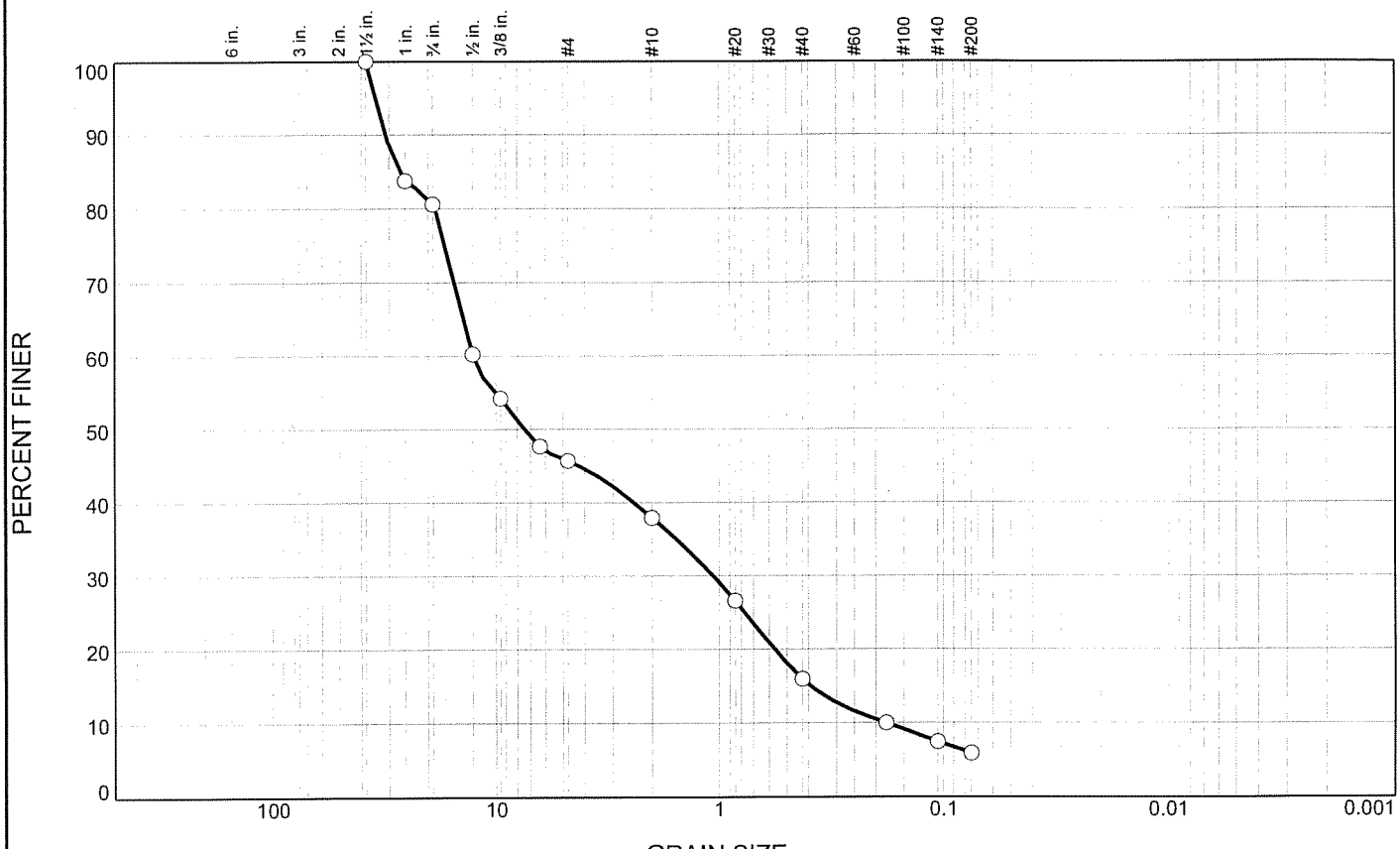
Sample No.: S-2 **Source of Sample:** Mt. Division Railroad - Windham, ME **Date:** 12/6/2011
Location: B-2 **Elev./Depth:** 5'-7'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: GZA GeoEnvironmental, Inc.
Project: Misc. Testing 2011 - 09.0025701.00
Project No: 0876-009 **Lab No.** 12218b

Tested By: DCH/GSM **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	19.4	34.9	7.8	22.0	10.0	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	83.8		
3/4"	80.6		
1/2"	60.3		
3/8"	54.2		
1/4"	47.7		
#4	45.7		
#10	37.9		
#20	26.6		
#40	15.9		
#80	10.0		
#140	7.4		
#200	5.9		

* (no specification provided)

Soil Description

Brown, gravel and fine to coarse sand, trace silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 26.9503 D_{60}= 12.6123 D_{50}= 7.4303
D_{30}= 1.0651 D_{15}= 0.3910 D_{10}= 0.1803
C_u= 69.97 C_c= 0.50

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

Moisture Content: 3.9%

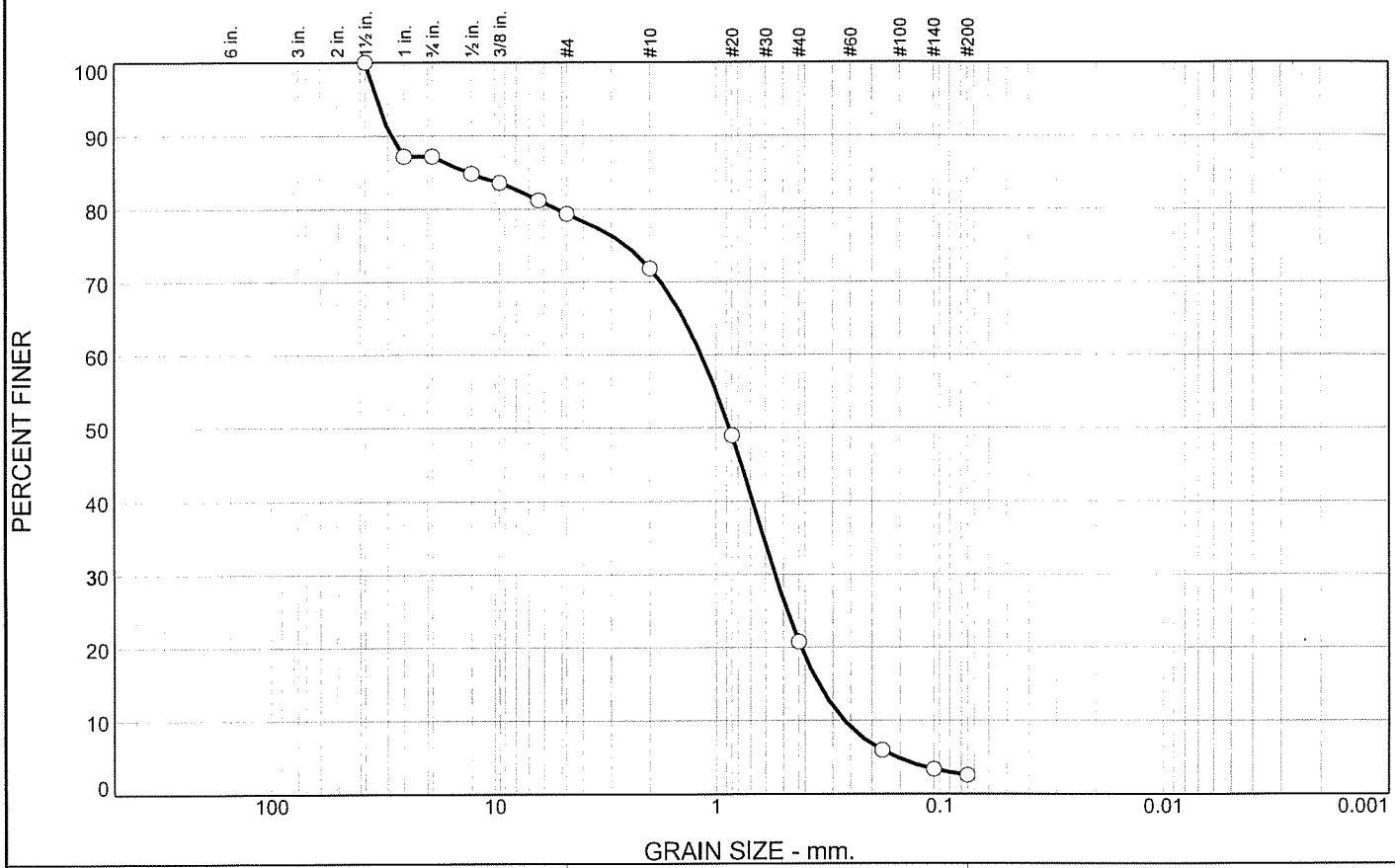
Sample No.: S-1 **Source of Sample:** Mt. Division Railroad - Windham, ME **Date:** 12/6/2011
Location: B-4 **Elev./Depth:** 0-2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: GZA GeoEnvironmental, Inc.
Project: Misc. Testing 2011 - 09.0025701.00
Project No: 0876-009 **Lab No.** 12218c

Tested By: DCH/GSM **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.8	7.8	7.5	51.2	18.1	2.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	87.2		
3/4"	87.2		
1/2"	84.9		
3/8"	83.6		
1/4"	81.2		
#4	79.4		
#10	71.9		
#20	49.0		
#40	20.7		
#80	6.0		
#140	3.4		
#200	2.6		

* (no specification provided)

Soil Description

Brown, fine to coarse sand, some gravel, trace silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.9962 D_{60}= 1.1718 D_{50}= 0.8724
D_{30}= 0.5428 D_{15}= 0.3466 D_{10}= 0.2660
C_u= 4.40 C_c= 0.95

Classification

USCS= SP AASHTO=

Remarks

Moisture Content: 4.5%

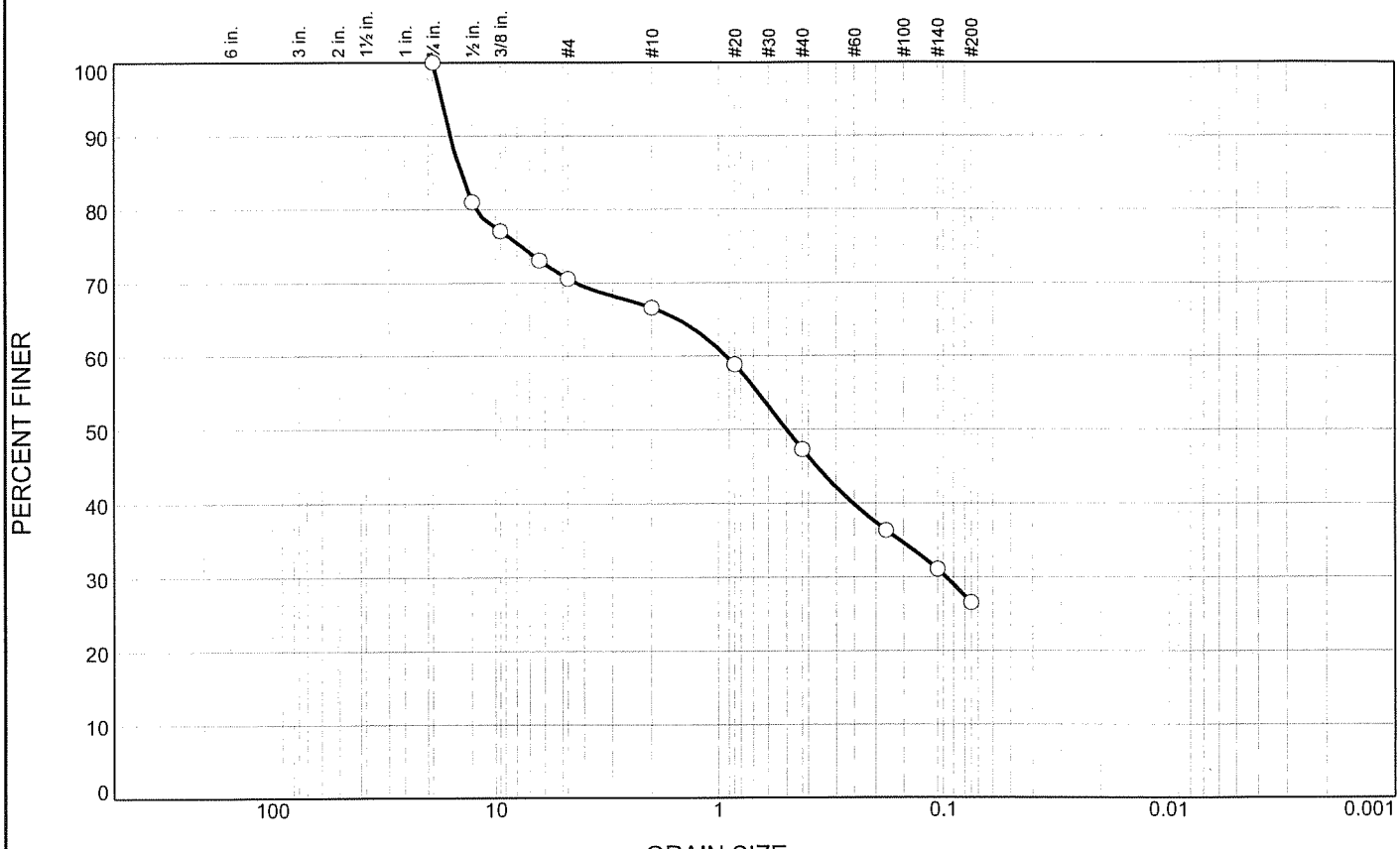
Sample No.: S-3 **Source of Sample:** Mt. Division Railroad - Windham, ME **Date:** 12/6/2011
Location: B-4 **Elev./Depth:** 10'-12'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: GZA GeoEnvironmental, Inc.
Project: Misc. Testing 2011 - 09.0025701.00
Project No: 0876-009 **Lab No.** 12218d

Tested By: DCH/GSM **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	29.4	4.0	19.3	20.7	26.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	81.0		
3/8"	77.1		
1/4"	73.1		
#4	70.6		
#10	66.6		
#20	58.8		
#40	47.3		
#80	36.3		
#140	31.1		
#200	26.6		

* (no specification provided)

Soil Description

Gray, fine to coarse sand, some gravel, some silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 14.2487 D_{60}= 0.9252 D_{50}= 0.4989
D_{30}= 0.0971 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content: 9.9%

Sample No.: S-5 **Source of Sample:** Mt. Division Railroad - Windham, ME **Date:** 12/6/2011
Location: B-4 **Elev./Depth:** 20'-22'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: GZA GeoEnvironmental, Inc.
Project: Misc. Testing 2011 - 09.0025701.00
Project No: 0876-009 **Lab No.** 12218e

Tested By: DCH/GSM **Checked By:** MTG MTG