



GEOTECHNICAL DESIGN REPORT GRAY INTERCHANGE RECONSTRUCTION MAINE TURNPIKE MILE 63.3 GRAY, MAINE

Proactive By Design.
Our Company Commitment

Prepared for:
Vanesse Hangen Brustlin, Inc.
Bedford, New Hampshire

December 2015
09.0025829.02

Prepared by:
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VIA EMAIL

December 11, 2015
File No. 09.0025829.02

Mr. Peter Clary, P.E.
Vanesse Hangen Brustlin, Inc.
2 Bedford Farms Drive
Suite 200
Bedford, New Hampshire 03110

Re: Final Geotechnical Design Report
Gray Interchange Reconstruction, Exit 63, Maine Turnpike
Gray, Maine

Dear Peter:

GZA GeoEnvironmental, Inc. (GZA) is pleased to provide you with this Final Geotechnical Design Report prepared for the Exit 63 Gray Interchange Reconstruction project. Our services were provided in accordance with our executed contract dated March 30, 2015, our executed contract amendments dated September 21, 2015 and November 5, 2015 and the attached Limitations included in **Appendix A**.

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.

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1.0 INTRODUCTION

This report presents the results of GZA's geotechnical evaluation for the proposed Exit 63 Gray Interchange Reconstruction Project, along the Maine Turnpike in Gray, Maine. Our services were provided in accordance with our executed contract dated March 30, 2015, our executed contract amendments dated September 21, 2015 and November 5, 2015, and the attached Limitations included in **Appendix A**.

GZA is providing geotechnical engineering services as a Subconsultant to Vanasse Hangen Brustlin, Inc. (VHB), who is under contract with the Maine Turnpike Authority (MTA) for design of the proposed interchange improvements.

1.1 OBJECTIVES AND SCOPE OF SERVICES

The objectives of our work were to evaluate subsurface conditions and to provide geotechnical engineering recommendations for the proposed Exit 63 Interchange project. To meet these objectives, GZA completed the following Scope of Services:

- Conducted a site visit to observe surficial conditions and reviewed existing interchange plans, and mapped surficial and bedrock geology of the site;
- Coordinated and observed a subsurface exploration program consisting of 39 test borings completed in November/December 2014, 27 hand probes completed in May 2015, and two supplemental test borings completed in September 2015;
- Conducted a laboratory testing program to evaluate engineering properties of the site soils and bedrock;
- Conducted geotechnical engineering analyses to evaluate toll plaza foundations, sign structure foundations, embankment settlement and stability, and pavement requirements;
- Developed geotechnical engineering recommendations including foundation alternatives and foundation design recommendations for the preferred foundation type; and
- Prepared this report summarizing our findings and design recommendations.

1.2 BACKGROUND

The project consists of reconstruction of the Exit 63 interchange for the Maine Turnpike in Gray, Maine. The existing interchange includes northbound (NB) and southbound (SB) on- and off-ramps that pass through a single toll plaza to a signalized intersection with Route 202 on the east side of the Turnpike. The general project area is shown on **Figure 1**. The SB on- and off-ramps are carried from the west side of the Turnpike to the toll plaza on the east by an overpass bridge. The SB ramp overpass bridge crosses the Turnpike approximately 1,000 feet south of the Route 202 overpass bridge. GZA's understanding of the project is based on our review of the 60 percent plans developed by VHB, dated June 1, 2015.

1.2.1 Proposed Roadways

Project plans call for removal of the SB ramp overpass bridge and construction of new SB on- and off-ramps that connect to Route 202 and the Route 26A Gray Bypass, and a new park and ride facility



adjacent to Route 26A on the west side of the Turnpike. The plans include approximately 3,000 lineal feet of new embankments to carry the SB ramps. The embankment heights are on the order of 20 feet or less above existing grade. The ramp work also includes reuse/widening of portions of the existing SB ramp embankments, widening of the roadway and embankments along portions of Route 202 east and west of the Turnpike and along the Gray Bypass, and widening and regrading the existing toll plaza and NB ramps. Recommendations pertaining to the new park and ride were submitted in January 2015 under separate cover and are included in **Appendix B**.

The proposed SB on- and off-ramps will each consist of a single lane with two shoulders. Construction of the new SB ramps will include both excavation of the existing ramps and new fill areas. Maximum cut depths and fill heights required to construct each ramp at the proposed grade are summarized in the following table:

Ramp	Approximate Length (ft)	Maximum Fill (ft)	Maximum Cut (ft)
SB On-Ramp	1900	20	19
SB Off-Ramp	1700	20	NA

Based on GZA's review of the 60 percent cross sections, cut and fill slopes will be constructed with a 2 horizontal to 1 vertical (2H:1V) or flatter slope inclination for slopes along the proposed ramp embankments.

In order to construct the SB on-ramp a temporary ramp will be constructed in front of the existing SB ramp overpass to allow for the demolition of the bridge abutment and removal of the approach embankment.

1.2.2 Proposed Structures

Proposed structures associated with the interchange project include a new SB toll plaza and administration building west of the Turnpike; new toll gantries and an overhead sign at the NB toll plaza east of the turnpike, cantilever and bridge type sign supports along the NB and SB ramps and Route 202; and new traffic signals at the NB and SB ramp intersections with Route 202. We understand that VHB is responsible for Plans, Specifications, and Estimates for all the proposed interchange improvements except the toll plaza improvements and administration building. HNTB has been tasked with the toll plaza / administration building design.

The plans also include a rip rap faced, steepened slope, to allow northerly widening of Route 202 west of the Turnpike. The slope was designed with a 1.5 horizontal to 1 vertical (1.5H:1V) slope.

2.0 SUBSURFACE EXPLORATIONS

GZA completed a subsurface investigation program consisting of 41 test borings, including

- Two (2) test borings for the proposed Park and Ride;
- Three (3) test borings along Route 26A;
- Fifteen (15) test borings along Route 202;



- Two (2) test borings for the NB ramps;
- Thirteen (13) test borings along the proposed SB on-ramp;
- Four (4) test borings along the proposed SB off-ramp; and
- Two (2) supplemental test borings along Route 202 to address a relocated sign structure.

The proposed exploration locations were surveyed by VHB prior to the start of drilling. Adjustments made in the field to surveyed exploration locations were estimated by taking tape-ties to prominent site features or using hand-held GPS. For relocated explorations, the ground surface elevations¹ were estimated to the nearest 0.5-foot by interpolating between contours presented on the site base plan provided by VHB. Boring locations are shown on **Figures 2** through **12** and are summarized in **Table 1 - Summary of Subsurface Conditions**.

Test borings were drilled to depths of approximately 10 to 109 feet below ground surface. New England Boring Contractors of Hermon, Maine coordinated utility clearance and provided drilling services. Initial drilling was completed between November 6, 2014 and December 12, 2014. The two supplemental test borings were drilled on September 21, 2015. GZA personnel monitored the drilling work and prepared logs of each boring. The boring logs are included in **Appendix C**.

The borings were drilled using 3- and 4-inch casing and drive-and-wash drilling techniques, 2.25-inch inside diameter hollow stem augers, and 3.5-inch solid stem augers, as noted on the boring logs. Typically, Standard Penetration Testing (SPT) and split-spoon sampling were performed continuously in the upper 6 feet, then at 5-foot intervals thereafter, using a 24-inch long, 1-3/8-inch inside diameter sampler.

In-situ vane shear tests were conducted in five of the deep borings to assess shear strength of clay. Shear vane tests were conducted at ten-foot typical depth intervals in these borings (GZ-106, GZ-109, GZ-114, GZ-137, and GZ-138). Two shear vane tests were completed at each test interval. Thin-wall tube sampling was conducted in two selected borings (GZ-114 and GZ-138) to provide samples for use in laboratory compressibility testing. A total of three thin-walled tube samples were collected.

Two-inch diameter bedrock cores were obtained at two boring locations (GZ-122 and GZ-124). Core lengths ranged from 5 to 13 feet.

Groundwater monitoring wells were installed in three of the test borings (GZ-114, GZ-119, and GZ-121) to measure stabilized groundwater levels. The wells consisted of 2-inch diameter, 0.010-inch slotted plastic screen and solid riser pipe set in the completed drill holes and backfilled with filter sand surrounding the screen and bentonite surface seals.

GZA also completed 27 hand probes to access unsuitable/muck thickness within the preload limits for the proposed SB ramp alignments. The hand probes were completed on May 7, 2015 to depths of approximately 0.5 to 4 feet below ground surface. Probes were located approximately in the field using a hand-held GPS unit and are included in **Table 2 – Summary of Hand Probes**.

¹ Elevations referenced in this report are in feet and refer to North American Vertical Datum of 1988 (NAVD 1988).



3.0 LABORATORY TESTING

GZA completed a laboratory soil testing program at the Thielsch Engineering in Cranston, Rhode Island to review visual soil classifications and estimate engineering properties of the soils. The program included 16 gradation analysis / Maine Department of Transportation (MaineDOT) Frost Classification / Unified Soil Classification System (USCS) assessments, 17 sets of Atterberg Limits, 41 moisture content tests and 3 one-dimensional consolidation tests on soil samples taken from the explorations. Results of the testing are included in **Appendix D**.

4.0 SUBSURFACE CONDITIONS

4.1 OVERBURDEN MATERIALS

Seven subsurface units were encountered above bedrock at the site: Topsoil, Muck/Unsuitables, Fill, Sand, Silty Clay, Glacial Till, and Weathered Rock. Asphalt pavement was encountered at the ground surface at three boring locations (GZ-106, GZ-127A, and GZ-128). The encountered thicknesses, generalized descriptions and engineering properties of the units encountered, in descending order from ground surface, are summarized in the following table. Detailed descriptions of the materials encountered at specific locations are provided in the boring logs in **Appendix C** and in the attached **Tables 1** and **2**.

Soil Unit	Approximate Encountered Thickness (ft)	Generalized Description
Topsoil	0.2 to 3	Very loose to medium dense, dark brown, fine to coarse SAND, with varying amounts of Silt and Gravel, traces of roots and leaves (USCS: SM, ML). <i>Encountered in 29 borings; all except GZ-106, -118, -119, -127A, -128, -129, -130, -138, -140, and -143</i>
Muck/Unsuitables	0.5 to 4	Very Soft, dark brown, organic SILT and SAND, with roots and leaves. <i>Encountered in lowland areas accessed only by hand probe, including 10 hand probes from Station 125+50 to 127+50; 8 hand probes from Station 204+00 to 206+00; 9 hand probes from Station 212+00 to 213+00. Probes were conducted along centerline and at 50 foot offsets.</i>
Fill	2 to 16	Loose to very dense, brown, fine to coarse SAND, some to trace Gravel, little to trace Silt (USCS: SP, SP-SM, SW, SW-SM, SM). MaineDOT Frost Classification = 0 - II <i>Encountered in borings GZ-105, -106, -112, -114 through -120, -120A, -127A, -128, -136 through -140, and -143.</i>
Sand	1 to 15	Very loose to dense, brown and gray, fine to medium SAND, some to trace Silt. (USCS: SP, SM, SP-SM) MaineDOT Frost Classification = 0- II <i>Encountered in borings GZ-105, -106, -109, -114, -115, -118, -119, 120A, -122, -124 through -127, -129, -130, -133, -134, -136, -139, and -142.</i>
Silty Clay	>1 to 75	Upper 2-8 feet: Medium stiff to very stiff, gray and brown, Silty CLAY to CLAY and SILT, little to trace fine Sand (USCS: CL); overlying Soft to medium stiff, gray, Silty CLAY, occasional trace fine Sand (USCS: CL). Sand frequently observed as lenses, seams and partings throughout deposit. MaineDOT Frost Classification = IV <i>Encountered in all borings except GZ-116, -123, -127, and -127A.</i>



Soil Unit	Approximate Encountered Thickness (ft)	Generalized Description
Glacial Till	2 to >32	Medium dense to very dense, brown to gray, fine to coarse SAND, some to little Gravel, some to trace Silt (USCS: SM, SW-SM) MaineDOT Frost Classification = 0 - II <i>Encountered in borings GZ-102, -105, -106, -109, -112, -114, -119 through -131 -138, -140, -142, and -143.</i>
Weathered Bedrock	1 to 6	Dense to very dense, black and gray, GRAVEL and fine to coarse Sand, some to trace Silt. (USCS: GM, GP-GM, SM). MaineDOT Frost Classification = 0 - I <i>Encountered in borings GZ-109, -121, 122, -124, -128, -132, -138, -142, and -143.</i>
Top of Bedrock Elevation	<u>Encountered Top of Rock:</u> Approx. El. 208 to El. 247	

4.2 BEDROCK

The top of bedrock elevation was evaluated based on split spoon, roller bit, auger/casing, or probe refusals, drilling conditions, and/or rock coring results. Bedrock was cored in two of the test borings (GZ-122 and GZ-124) and was classified as Granite. The bedrock was generally described as gray, medium hard to hard, slightly weathered, and fine grained. The joints were typically very close to widely spaced, moderately dipping, undulating, rough, discolored with partially open to moderately wide spacing. The Rock Quality Designation (RQD) ranged from 17 to 85 percent, with an average RQD of 57 percent.

4.3 GROUNDWATER

Groundwater was encountered in approximately 50 percent of explorations at depths between 1.3 and 35 feet below ground surface at the time of the explorations, corresponding to approximately El. 228 to El. 268. Groundwater levels in the borings were taken during or immediately after drilling and may have been affected by drilling procedures, which included introduction of water for drilling purposes. Groundwater levels measured at the time of our borings are presented in **Table 1**.

Groundwater monitoring wells were installed at the completion of drilling at boring locations GZ-114, GZ-119, and GZ-121. Water levels were measured in the observation wells between December 5 and December 8, 2014, at the completion of our drilling program; and again on March 17, 2015, approximately three months after well installation. The measured groundwater levels, relative to existing grades, are summarized in **Table 3 – Summary of Groundwater Measurements**.

The groundwater observations were made at the times and under the conditions stated in the borings logs. Fluctuations in groundwater level occur due to variations in season, precipitation, and construction activities in the area. Consequently, water levels during construction are likely to vary from those encountered at the time the observations were made.



4.4 UNSUITABLES/MUCK

Hand probes were completed in low-lying areas of the proposed SB ramp alignments that were not accessible with the drill rig during the initial subsurface exploration program. A total of 27 hand probes were completed in the following areas:

- Eighteen hand probes were completed between the SB toll plaza and the existing park and ride between Station 125+50 and Station 127+50 and between Station 204+00 and 206+00; and
- Nine hand probes were completed along the proposed SB off-ramp between Station 212+00 and 213+00.

Probes were conducted at the centerline and at 50-foot offsets in each direction (left and right of centerline). The thickness of muck was typically 2.5 feet or less between the SB toll plaza and the existing park and ride; and approximately 1.75 to 4 feet along the SB off-ramp. Hand probe locations are shown on **Figures 13** and **14** and are summarized in **Table 2**.

5.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS

5.1 GENERAL

GZA conducted geotechnical engineering evaluations in accordance with 2012 AASHTO LRFD Bridge Design Specifications, 6th Edition (herein referred to as LRFD) the MaineDOT Bridge Design Guide, 2003 Edition – March 2014 Updates (MaineDOT BDG), and the MaineDOT Highway Design Guide, February 2015 Edition (MaineDOT HDG). The sections that follow describe the evaluations made and the geotechnical basis for evaluation of each element.

5.2 INTERPRETATION OF MARINE CLAY PROPERTIES

The marine clay profile encountered at the site includes a heavily overconsolidated upper clay crust overlying moderately overconsolidated soft to medium stiff silty clay. As a result of this overconsolidation, the material is less compressible, and tends to compress more rapidly than normally consolidated clay. Based on the laboratory and in-situ testing results and our experience with similar Presumpscott clay deposits in the area, GZA has interpreted the marine clay deposit properties as follows:

- The modified recompression ratio (RR) is approximately 0.014;
- The modified compression ratio (CR) is approximately 0.18;
- The typical OCR ranges from approximately 2 to 3.8;
- Consolidation Coefficient varies from approximately 1 to 0.1 sq. ft. / day, depending if the clay is in recompression or virgin compression, respectively; and
- Double-drainage conditions are present.

5.3 APPROACH EMBANKMENTS

At the SB on- and SB off-ramps, the subsurface conditions include a typical profile of approximately 8 to 12 feet of stiff marine clay, and where present, up to 22 feet of soft to medium stiff marine clay overlying glacial till and bedrock. New fill along the proposed SB on- and off-ramps will result in grade



raises of approximately 7 to 20 feet and lesser amounts over the remainder of the ramps. Maximum fills are anticipated from approximately Sta. 203+50 to Sta. 213+50 on the SB off-ramp, and from approximately Sta. 121+00 to 128+00 on the SB on-ramp.

Settlement from the new embankment loads will result from primary consolidation and secondary compression. Settlement along the proposed SB ramps will vary based on variation in the clay thickness and the fill thickness. A preliminary settlement analysis was completed using a design life of 50 years and a maximum proposed fill height of 20 feet placed on a 15-foot thick layer of clay, located in the vicinity of Station 125+50. Preliminary maximum total settlement was estimated to be on the order of 13 inches. The estimated time to complete primary consolidation beneath the proposed SB ramp embankment fills was approximately 5 to 8 months. Approximately 3 inches of settlement was anticipated to occur as secondary compression, beginning approximately 5 to 8 months after fill placement. The stress history used in our preliminary estimate was based on interpreted laboratory results from borings GZ-114 and GZ-138.

Based on the results of preliminary settlement analysis, and given the potential for post-construction settlement at the tolling plaza and differential settlement along the SB ramps where new fills abut existing embankments that have been in place for 50-plus years, a preload program was implemented along the proposed SB ramp fill areas in July and August 2015.

Preload material was placed to a minimum height equal to the proposed finish grade plus 5 feet. Ten settlement plates were installed along the SB ramps and toll plaza area in July and August 2015. The settlement plates will continue to be monitored through the winter and early spring of 2016 to evaluate the progress of the clay compression and assess when the surcharge should be removed.

GZA completed additional settlement analyses to assess conditions of variable fill thickness and variable clay thickness along the SB ramps. These analyses resulted in revised total settlement estimates for a 50-year design life, ranging from approximately 0 to 11-½ inches. It is anticipated that settlement during the preload will range from negligible to approximately 8 inches; and that post-preload settlements will be on the order of 4 inches or less. Settlements of this magnitude are considered suitable for support of highway ramps.

In the area of the SB toll plaza post-construction settlements of ½ inch or less are anticipated. Based on input from the toll plaza designer, HNTB, settlements of this magnitude are unacceptable for the performance of the toll facilities, therefore pile foundations will be used to support the SB toll plaza.

5.3.1 Steepened Slope along Route 202

A riprap-faced, 1.5 horizontal to 1 vertical (1.5H:1V) slope is proposed along an approximately 200 foot long section of the north side slope of Route 202. The slope should be designed in accordance with the MaineDOT BDG using a 3-foot thick Plain Riprap facing. In areas where the slope angle is 2H:1V or flatter, the surface treatment may consist of loam and seed.

GZA completed a global stability analysis for the proposed 1:5H:1V steepened slope. The results indicate that the proposed slope will have an adequate factor of safety against rotational failure, based on AASHTO design criteria (minimum FS equal to 1.3 for embankments that do not support structures).



The new embankment fill will increase stresses in the clay soils and result in settlement of the embankment and existing utilities, unless they are relocated. We estimate the maximum settlements will be on the order of 4 to 6 inches for the east end of the slope where the fill thickness is the greatest, and on the order of 2 inches or less where the slope flattens to 2H:1V on the west.

Based on conversations with VHB, we understand that the existing water main located beneath the slope will be relocated prior to construction and thereby eliminate potential impacts due to embankment settlement. The existing telephone pole located within this portion of the alignment is also planned to be relocated. The pole currently connects to an underground telephone conduit. We assume that the conduit will also be relocated away from the embankment. If the conduit is to remain in place, the utility owner should assess its ability to tolerate the aforementioned settlements.

5.4 FOUNDATION DESIGN CONSIDERATIONS

Structures requiring foundations on this project include: new toll gantries, toll plazas, an associated single story masonry structure at the SB toll plaza, and cantilever and overhead signs. Foundation subgrade conditions vary across the site but include fill, sand and/or marine deposits overlying glacial till and bedrock.

The fill, sand marine clay and glacial till deposits are considered suitable for support of drilled shaft or pile foundations. Sand and embankment fill materials may be suitable for support of individual structures on spread footings. The sections that follow describe foundation considerations at specific structure locations.

5.4.1 Proposed Toll Facilities – NB Plaza

The proposed NB toll gantry/overhead sign structure will have a span of approximately 110 feet. No grade changes are anticipated along the NB ramps or at the NB toll plaza. Plans indicate the sign structure and toll gantry will be founded on a combined footing bearing on existing embankment fill.

Subsurface materials at the NB toll gantry/sign structure consist of approximately 16 feet of existing embankment fill overlying approximately 19 feet of soft to medium stiff silty clay with fine to medium sand seams up to 2-feet thick, glacial till, and bedrock. The new structures are not anticipated to induce significant, sustained, vertical loads, and associated settlements. Consequently, we anticipate that spread footing foundations bearing on existing embankment fill are suitable to support the proposed toll plaza gantry and overhead sign structure. Alternatively, a single, larger diameter drilled shaft or a pair of drilled shafts could be utilized at each foundation location.

5.4.2 Proposed Toll Facilities – SB Plaza

The new SB toll plaza will consist of three lane toll plaza structure with two on-ramp lanes and a single off-ramp lane separated by a raised island. A single-story, masonry toll plaza administration building, with an approximate footprint of 20 feet by 30 feet, a parking area, and generator and propane tank pads are also proposed at the SB toll plaza. An underground septic system is proposed beneath the employee parking area.

Subsurface materials at the proposed SB toll plaza consists of approximately 8 to 14 feet of new fill; 4 to 7 feet of stiff marine clay; and 0 to 4 feet of soft to medium stiff marine clay overlying glacial till and bedrock. A generalized subsurface profile along the centerline of the proposed SB toll plaza is presented in **Figure 15**.



We estimated that the total settlement of embankments and supported foundations at the SB toll plaza would be on the order of 2 to 4 inches. However, the area is within the limits of the preload. We estimate the post construction settlement after removal of the preload will be ½-inch or less.

As previously noted, HNTB has indicated that the toll plaza slab has an allowable post construction settlement of zero due to the sensitivity of the tolling electronics and sensors that will be embedded in the slab. In order to meet the stated settlement criteria, the SB toll plaza is being designed to be supported on steel H-piles.

Spread footing foundations bearing on compacted embankment fill are considered suitable to support the proposed single story, toll plaza administration building provided that it can tolerate up to ½-inch of post construction differential settlement.

5.4.3 Overhead Sign Structures/Signals

The Gray Interchange reconstruction project includes the construction of two new cantilever guide sign structures, four overhead guide sign structures, and eight mast arm signal structures. The cantilever arms on the proposed sign structures range in length from 35 to 50 feet. The overhead guide sign structures will have spans ranging from 110 to 115 feet. The proposed signal structures will have mast arm lengths ranging from 25 to 60 feet. Recommendations were provided in the previous section for the overhead guide sign structure proposed for the NB toll plaza.

For the remaining sign structures, foundations may consist of drilled shafts designed using the MaineDOT Section 626 drilled shaft design tables. Preliminary loading data developed by VHB indicate that the longitudinal overturning force will typically control the sign foundations design at this site. Where the proposed loads exceed the load levels identified on the design tables, alternative engineered foundation systems such as H-piles, spread footings, paired drilled shafts, or larger-diameter drilled shafts were considered.

GZA assessed the feasibility of using H-pile-supported sign foundations at the site. Due to relatively shallow overburden conditions, the piles would have limited embedment and limited uplift resistance. Unless the foundations could be designed to eliminate tensile loading, it is our opinion that they are not a practical foundation type for use at this site.

GZA considered the use of a spread footing foundations for the full overhead and cantilever sign locations. While technically feasible, spread footings may not be practical because the footing dimensions are anticipated to be as large as approximately 14 feet by 24 feet.

GZA also assessed the feasibility of using either a single, larger diameter drilled shaft or a pair of drilled shafts to support sign foundations. Our preliminary evaluations indicate that these are feasible foundation alternatives for sign support foundations at the site. At locations where the loads exceed the limits of the Section 626 design tables, evaluation of these drilled shafts may be completed using other design approaches, such as L-Pile® for the single shafts; or Group® or FBPIer® for the paired shafts.



5.5 SEISMIC DESIGN CONSIDERATIONS

Seismic site class was determined in general accordance with LRFD Table C3.10.3.1 using the average SPT N-value from the soil materials encountered in the borings. LRFD allows the assumption that rock within the upper 100 feet of the profile has an N-value equal to 100. N-bar is defined as the average, corrected SPT value for the upper 100 feet of the soil profile.

For the proposed SB toll plaza structures, the N-bar value fell between 15 and 50 bpf; therefore, the site should be assigned to Site Class D.

For the NB toll plaza structures, N-bar is lower than 15 blows per foot (bpf); therefore, the site should be assigned to Site Class E.

The United States Geological Survey software Seismic Design Parameters Version 2.10 was used to develop seismic parameters for design. Based on the site location and the Site Classes D and E, the recommended AASHTO Response Spectrum for a 7 percent probability of exceedance in 75 years is as follows:

Site Class D - $F_{pga} = 1.6$, $F_a = 1.6$, $F_v = 2.4$
 Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.143	As, Site Class D
0.2	0.285	SDs, Site Class D
1.0	0.111	SD1, Site Class D

Site Class E – $F_{pga} = 2.5$, $F_a = 2.5$, $F_v = 3.5$
 Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.224	As, Site Class E
0.2	0.446	SDs, Site Class E
1.0	0.161	SD1, Site Class E

The test boring data indicates that the natural materials encountered at the site are sufficiently dense that the potential for liquefaction is very low.

5.6 FROST AND SUBGRADE CONSIDERATIONS

Based on the MaineDOT HDG, the Design Freezing Index for the site is approximately 1350. Therefore, in accordance with Figure 13-3 of the HDG, considering primarily granular subgrade materials, the estimated depth of frost penetration is about 72 inches.

5.7 SHALLOW FOUNDATIONS DESIGN RECOMMENDATIONS

Spread footings are a technically-feasible foundation option for sign support structures, structures at the NB and SB toll plazas, including the SB administration building, and excluding the tolling plaza slabs,



where medium dense fill, stiff silty clay, or dense glacial till is present at the anticipated foundation bearing elevation.

5.7.1 LRFD Resistance Factors

Recommended LRFD resistance factors for strength limit state design of spread footing foundations, from LRFD Table 10.5.5.2.2-1, are presented in the following table.

RESISTANCE FACTORS – STRENGTH LIMIT STATE		
Foundation Resistance Type	Method/Condition	Resistance Factor (ϕ)
Bearing	Theoretical method, in sand	0.45
Bearing	Theoretical method, in clay	0.50
Sliding	Cast-in-Place Concrete on soil	0.80

Resistance factors for service and extreme limit state design (earthquake) should be taken as 1.0.

5.7.2 Footing Bearing Resistance

Footings bearing on medium dense embankment fill, or dense glacial till should be designed for a nominal bearing resistance, q_n , of 16 kips per square foot (ksf). At the strength limit state, footings should be designed for a maximum factored bearing resistance of 7 ksf. In order to limit post-construction settlements to approximately ½ inch or less, a bearing resistance of 5 ksf should be used for service limit state design.

Footings bearing on stiff silty clay should be designed for a nominal bearing resistance, q_n , of 5 ksf. At the strength limit state, footings should be designed for a maximum factored bearing resistance of 2 ksf. In order to limit post-construction settlements to approximately ½ inch or less, a bearing resistance of 2 ksf should be used for service limit state design.

5.7.3 Recommendations for Shallow foundations

- The pavement, topsoil, loose fill, peat, and soft silty clay soils are considered unsuitable for support of spread footing foundations. These unsuitable materials should be removed beneath foundations, and replaced with compacted Structural Fill, as outlined in **Section 6** of this report.
- Spread footings foundation designs should be checked for eccentricity. AASHTO specifies the resultant of the reaction should be located within the middle 1/3 of the footing.
- For shallow foundations cast directly on soil, the lateral loads may be resisted by friction between the footing bottoms and the soil. The base resistance against sliding was estimated using NAVFAC DM7.02-63, Table 1. The table below summarizes the recommended nominal and factored sliding resistance coefficients ($\tan \delta$) for the anticipated subgrade soils at the site.



SLIDING RESISTANCE COEFFICIENT		
Subgrade Soil	Nominal Sliding Resistance Coefficient	Factored Sliding Resistance Coefficient (Strength)
Granular Embankment Fill	0.55	0.44
Stiff Silty Clay or Dense Glacial Till	0.30	0.24

- Spread footing foundations should be founded a minimum of 6 feet below the lowest adjacent ground surface to provide frost protection.

5.8 PILE DESIGN RECOMMENDATIONS

It is our understanding that HNTB has opted to utilize steel H-piles to support the toll plaza structure, given the settlement restrictions associated with the tolling electronics and sensors at this location.

Based on correspondence with HNTB, we understand the top of slab to be at El. 255.8 and that the pile cut off elevation will be at El. 253.8. It is our understanding that two pile sizes are being considered in foundation design. The proposed pile sections and the maximum factored loads (excluding downdrag) were provided by HNTB and are presented below.

Pile Section	Maximum Factored Pile Loads (per HNTB correspondence)
HP14x73	221 kips (Service) 323 kips (Strength I)
HP14x117	310 kips (Service) 480 kips (Strength I)

The proposed toll plaza may be supported on ASTM A572, Grade 50 (50 ksi yield stress) steel HP-section piles (HP14x73 or HP14x117) driven to bearing on or near the bedrock surface. Top of rock elevations in the vicinity of the SB toll plaza are presented on **Figure 16**. Based on this subsurface data and the proposed cutoff elevations, pile lengths of approximately 15 to 35 feet are anticipated.

A preload instrumentation program is underway at the site. The results are incomplete at this time. Until the results are available and analyzed by GZA, it should be assumed that downdrag forces will occur on the foundation piles due to differential settlement between the ground and the piles. We recommend a downdrag load of 38 kips per pile be used in evaluation of the piles.

We recommend that the pile driving criteria be established based on wave equation analysis, and dynamic pile testing with signal matching analysis. The piles should be driven to a nominal resistance calculated by dividing the maximum factored pile load by a resistance factor of 0.65, per LRFD Table 10.5.5.2.3-1. The table below summarizes the recommended factored loads and the required nominal resistance for the piles.

Pile Section	Maximum Factored Pile Load (kips)	Maximum Factored Pile Load (including downdrag) (kips)	Required Nominal Resistance (kips)
HP14x73	323 kips (Strength I)	391	602
HP14x117	480 kips (Strength I)	518	797



Structural resistance of the piles at the strength limit state should be based on hard driving conditions, with a resistance factor of 0.50, per LRFD Section 10.7.3.2.3.

5.9 DRILLED SHAFT DESIGN RECOMMENDATIONS

Overhead sign structures may be supported on drilled shaft foundations. Where possible, the foundations should be designed using the MaineDOT design tables.

5.9.1 Mast Arm Sign Foundations

Mast arm sign foundations can be designed using MaineDOT Standard Specifications 626 and 643. Required embedment length and shaft diameter should be determined in accordance with the MaineDOT Standard Detail Section 626 based on the recommendations provided in GZA **Table 4 – Design Recommendations for Mast Arm Signal Structures**. **Table 4** summarizes the generalized subsurface conditions at each location, the recommended design profile and recommended soil properties (friction angle or undrained shear strength) for use in the design.

5.9.2 Full Overhead and Cantilever Sign Structures

Where possible, overhead and cantilever sign support structure foundations should be designed using MaineDOT Standard Specifications 626 and 643. Where the loading exceeds the maximum loadings given on the MaineDOT Section 626 Design Tables, the foundations may be supported on foundations consisting of either a single, larger diameter drilled shaft or a pair of drilled shafts. Evaluation of these drilled shafts should be completed using other design approaches, such as L-Pile® for the single shafts; or Group® or FBpier® for the paired shafts.

Recommendations for nominal unit side resistance and strength state resistance factors for drilled shaft design are provided in the table below.

Drilled Shaft Design Parameters		
Subsurface Profile	Nominal Unit Side Resistance	LRFD Resistance Factor for Strength Limit State
Fill or Sand	0.64 ksf	0.55
		0.45 (tension)
Clay	0.25 ksf	0.45
		0.35 (tension)

The input parameters for shaft analysis should be based on the structure-specific subsurface conditions, and the layer-specific geotechnical input parameters that follow. Recommended soil profiles are provided for each sign location in **Table 5 - Design Soil Stratification for Use in Sign Structure Design**.

Recommended geotechnical parameters for use in lateral analyses are provided in the table below.



Stratum	Soil Model	k (pci) / E ₅₀	φ' (deg) / S _u (psf)	Effective Unit Weight γ _e (pci) Above GW / below GW
Fill (above water table)	Reese Sand	90	32	0.075 / NA
Sand (above water table)	Reese Sand	90	32	0.069 / NA
Sand (submerged)	Reese Sand	60	32	NA / 0.033
Clay (crust)	Stiff Clay	E ₅₀ = 0.005	1000 psf	0.065 / 0.029
Soft Clay	Soft Clay	E ₅₀ = 0.02	400 psf	0.065 / 0.029
Glacial Till	Reese Sand	125	34	NA / 0.039

5.10 PAVEMENT DESIGN

5.10.1 Frost Considerations for Pavement Design

To limit frost heaving, materials not susceptible to frost-heaving should be provided in the upper 72 inches beneath the paved surface in new embankments. Where this is not possible, the pavement design should allow for the presence of frost-susceptible material within the depth of freezing.

Where roadways will be constructed in cut, or at grade locations, the frost-susceptibility of the local subgrade material should be considered in design of the new pavement section.

5.10.2 Pavement Design Basis

Using traffic data, provided by VHB, GZA estimated the following 20-year 18-kip ESAL equivalents for each portion of the project.

Roadway	2017 AADT (vehicle per day)	20-year 18-kip ESAL
Route 202	20,500	8,194,717
Route 26A	11,800	4,716,959
SB Ramps	7,925	3,167,958
NB Ramps	8,675	3,467,764

GZA performed pavement design analysis in accordance with the MaineDOT HDG to check if the proposed NB/SB ramp pavement section is acceptable for the encountered subgrade conditions. Our evaluations assumed that new pavement section will typically be founded on at least one to two feet of granular material (i.e. existing or newly placed fill).

The following inputs were selected in accordance with the MaineDOT HDG.

Pavement Design Input	Value
Serviceability Loss (ΔPSI)	2.0
Reliability Factor	95%
Overall Standard Deviation	0.45



GZA calculated the minimum required SN values for the roadway segments, based on the AADT values provided by VHB, and the anticipated subgrade materials. It is anticipated that subgrade materials will consist of existing embankment fill, Sand, Silty Clay or imported granular fill. The recommended soil support S-value and subgrade resilient modulus values used in section analysis are presented below:

Material	Maine Frost Classification	Recommended Soil Support S-Value	Recommended Subgrade Resilient Modulus, Mr (psi)
Existing Fill / Sand / New Clean Granular Fill	0 – II	4.5	5,100
Silty Clay	IV	3	2,800

Based on these assumptions, the minimum required SN for each pavement sections placed over in-situ Silty Clay, Sand, existing fill, or imported granular fill is presented below.

Material	Minimum Required SN	Proposed Section SN S-Value
Existing Fill / Sand / New Clean Granular Fill	4.5	4.91
Silty Clay	5.1	

5.10.3 Recommended Pavement Sections

The following tables summarize the two proposed pavement sections for the interchange project. Recommendations pertaining to the new park and ride were submitted in a January 2015 GZA memorandum and are included in **Appendix B**. The pavement section proposed for the Route 202, SB ramps, and NB ramps will provide a Structural Number (SN) equal to 4.91.

Route 202, SB and NB Ramps					
Layer	Struct. Coeff	Drain Coeff	Thickness (inches)	SN	Estimated Design Life
HMA Grading 12.5mm (Surface)	0.44	1	3.5	1.54	20 years
HMA Grading 19.0mm	0.34	1	2.5	0.85	
Base Course Type A	0.12	1	12	1.44	
Subbase Course Gravel Type D	0.09	1	12	1.08	
		Sum	30	4.91	



The section proposed for the Route 26A improvements will provide a SN equal to 4.86.

Route 26A					
Layer	Struct. Coeff	Drain Coeff	Thickness (inches)	SN	Estimated Design Life
HMA Grading 12.5mm (Surface)	0.44	1	3	1.32	20 years
HMA Grading 19.0mm	0.34	1	3	1.02	
Base Course Type A	0.12	1	12	1.44	
Subbase Course Gravel Type D	0.09	1	12	1.08	
		Sum	30	4.86	

We recommend that the pavement sections for widened sections of Route 202 and Route 26A match the existing pavement sections.

Muck or unsuitable subgrade materials exposed in new embankment and widened embankment areas should be excavated and replaced with compacted embankment fill to provide adequate support for the proposed pavement sections. At those locations, we recommend overexcavating to a depth of at least 6 inches and replacing the unsuitable material with compacted Subbase Course Gravel Type D.

5.10.4 Temporary Pavement – SB On-Ramp

A temporary SB on-ramp will be constructed in front of the existing SB ramps overpass to allow for the demolition of the bridge abutment and removal of the approach embankment. The temporary ramp will be constructed in cut, at grade and fill areas, with anticipated total grade raises on the order of 5 feet (60 inches) or less above existing ground elevation for the majority of the alignment.

GZA performed pavement design analysis in accordance with the MaineDOT HDG to develop a temporary pavement section for the encountered subgrade conditions. Traffic data, provided by VHB indicated an AADT for the temporary SB on-ramp of 9,800 (vehicle per day). Based on this, GZA estimated a 1-year 18-kip ESAL equivalent of 169,013. The following assumptions were also made in accordance with the MaineDOT HDG, with considerations related to the short-term nature of the ramp surface.

Pavement Design Input	Value
Serviceability Loss (Δ PSI)	2.0
Reliability Factor	85%
Overall Standard Deviation	0.45

It is anticipated that subgrade materials for the temporary ramp will consist of existing fill, Sand, Silty Clay or imported granular fill. The recommended soil support S-value and recommended subgrade resilient modulus values used in section analysis are presented below:



Material	Maine Frost Classification	Recommended Soil Support S-Value	Recommended Subgrade Resilient Modulus, Mr (psi)
Existing Fill / Sand / New Clean Granular Fill	0 – II	4.5	5,100
Silty Clay	IV	3	2,800

Based on these assumptions, the minimum required SN for each pavement sections placed over in-situ Silty Clay, Sand, existing fill, or imported granular fill is 3.9.

Material	Minimum Required SN	Proposed Section SN S-Value
Existing Fill / Sand / New Clean Granular Fill	2.6	3.9
Silty Clay	3.6	

The following table summarizes the proposed temporary pavement section for temporary SB on-ramp, which will provide a SN equal to 3.9.

Temporary Southbound On-Ramp					
Layer	Struct. Coeff	Drain Coeff	Thickness (inches)	SN	Estimated Design Life
HMA Grading 12.5mm (Surface)	0.44	1			1 year
HMA Grading 19.0mm	0.34	1	4	1.36	
Base Course Type A	0.12	1	12	1.44	
Subbase Course Gravel Type D	0.09	1	12	1.08	
		Sum	30	3.9	

The proposed section, as tabulated above, will provide an adequate SN for either Silty Clay or Existing Fill/Sand/New Clean Fill subgrades. Should very soft marine silty clay, organics or other unsuitable material be present at the bottom of pavement section elevation, we recommend overexcavating to a depth of at least 6 inches, and replacing the unsuitable material with compacted Subbase Course Gravel Type D.

5.10.5 Pavement Drainage Considerations

Pavement drainage details should be developed that promote subsurface water removal beneath the pavement section. Due to the low permeability of silty clay, there is potential for perched water to accumulate adjacent to the pavement, when founded on silty clay, and provide a source of water for possible frost action beneath pavement. To promote drainage of the pavement section, ditches should be provided on either side of the roadway alignment, and the bottom of the ditches should be at least 12 inches below the bottom of the subbase layer of the proposed pavement sections. Where exposed, the clay subgrade should be graded to drain toward the ditches.



6.0 CONSTRUCTION CONSIDERATIONS

6.1 FOUNDATION SUBGRADE PREPARATION

Excavation to footing subgrade should be performed using a smooth-edged bucket in order to limit disturbance of soil subgrades. Exposed granular surfaces should be densified with a minimum of six passes with a dual-drum, walk-behind roller. If granular bearing surfaces become disturbed, they should be re-densified using a minimum of six additional passes with a dual-drum, walk-behind roller. If clay subgrade becomes disturbed by construction activities, the disturbed material should be excavated and replaced with compacted structural fill.

6.2 PILE INSTALLATION CONTROL

We recommend that the pile installation be controlled using wave equation analysis and field logging of the pile installation and that final penetration resistance be based on dynamic pile testing with signal matching analysis. We recommend that two dynamic pile tests with signal matching be performed at each substructure at the end of initial drive and again at the beginning of restrrike 24 hours later.

6.3 EXCAVATION AND DEWATERING

It is anticipated that excavations may be made using sloped open cut techniques, and that static groundwater levels will typically be deeper than the bottom of excavation level. However, temporary dewatering may be required to control limited groundwater inflow in excavations or surface water runoff into excavations. We anticipate that any accumulated water can be handled by open pumping from sumps installed at the bottom of excavations. Sumps should be fitted with geotextile or sand filters to prevent loss of subgrade fines during pumping. Dewatering discharge should be managed in accordance with the contractor's Stormwater Prevention Plan and MaineDOT BMPs.

The contractor should be responsible for controlling groundwater, surface runoff, infiltration and water from all other sources by methods which preserve the undisturbed condition of the subgrade and permit foundation construction in-the-dry.

6.4 REUSE OF ON-SITE MATERIALS

We anticipate that the excavated Marine Deposit may be suitable for reuse as Common Borrow in accordance with MaineDOT Standard Specification Section 703.18, provided that it can be moisture-conditioned to within 2 percent of optimum moisture content to allow for recompaction of the material. We caution that this material is typically difficult to moisture-condition, and compact.

We anticipate that existing fill and Glacial Till may be suitable for reuse as Granular Borrow, MaineDOT 703.19. If the contractor wishes to reuse excavated material as embankment fill, we recommend that the proposed material be stockpiled and tested for grain size distribution. Stockpiled materials meeting the appropriate MaineDOT specifications may be reused on the project.



TABLES

TABLE 1
SUMMARY OF GZA TEST BORINGS
 Maine Turnpike Authority - Gray Interchange (Exit 63)
 Gray, Maine

Boring Number	Station	Offset	Northing	Easting	Structure	Ground Surface Elev. +/- (ft.)	Boring Depth (ft)	Groundwater ^{3,4}		Asphalt	Thickness of Deposit ⁵ (ft)					Top of Bedrock ⁶ (ft)		
								Depth to (ft)	Elev. of (ft)		Topsoil	Fill	Sand	Silt & Clay	Glacial Till	Weathered Rock	Depth to (ft)	Elev. of (ft)
PARK & RIDE																		
GZ-101	21+79	75' LT	384192.05	993504.81	PNR	244.0	21.0	8.5	235.5	NE	0.5	NE	NE	20.5	NE	NE	NE	NE
GZ-102	20+79	31' RT	384070.13	993425.00	PNR	242.5	82.0	11.5	231.0	NE	0.5	NE	NE	74.5	7.0	NE	NE	NE
ROUTE 26A																		
GZ-133	703+50	51' RT	382957.07	993705.72	OHSS	248.0	21.0	1.5	246.5	NE	1.0	NE	4.5	15.5	NE	NE	NE	NE
GZ-134	703+50	80' LT	382897.78	993588.91	OHSS	248.0	23.0	6.0	242.0	NE	2.0	NE	8.0	13.0	NE	NE	NE	NE
GZ-105	705+00	44' LT	383047.84	993553.13	RDWY	244.5	70.0	NM	NM	NE	0.5	3.5	2.0	55.0	9.0	NE	NE	NE
ROUTE 202																		
GZ-106	606+00	40' RT	382436.17	993261.57	RDWY	246.0	109.0	NM	NM	0.3	NE	2.7	6.0	68.0	32.0	NE	NE	NE
GZ-135	608+40	77' RT	382458.25	993503.40	OHSS	247.5	71.9	NM	NM	NE	2.0	NE	6.0	60.0	9.9	NE	NE	NE
GZ-136	608+40	41' LT	382572.75	993474.89	OHSS	247.0	22.0	4.7	242.3	NE	0.3	3.7	2.0	16.0	NE	NE	NE	NE
GZ-108	610+62	60' LT	382644.82	993685.73	SIGNAL	246.0	12.0	NM	NM	NE	2.0	NE	NE	10.0	NE	NE	NE	NE
GZ-109	610+82	110' RT	382484.69	993746.20	SIGNAL	242.0	33.0	NM	NM	NE	0.5	NE	4.5	22.0	2.5	3.5	33.0	209.0
GZ-111	611+92	95' LT	382710.19	993803.42	SIGNAL	245.0	12.0	7.4	237.6	NE	1.0	NE	NE	11.0	NE	NE	NE	NE
GZ-112	612+10	60' RT	382564.13	993858.33	SIGNAL	247.5	38.6	6.2	241.3	NE	2.0	6.0	NE	12.5	18.1	NE	38.6	208.9
GZ-137	614+15	51' RT	382622.39	994055.09	OHSS	252.0	44.0	1.3	250.7	NE	0.3	1.7	NE	37.0	4.0	NE	44.0	208.0
GZ-138	614+15	49' LT	382719.43	994030.93	OHSS/RET WALL	250.0	62.0	NM	NM	NE	NE	10.0	NE	45.3	6.7	NE	NE	NE
GZ-114	616+00	53' LT	382768.00	994209.48	RET WALL	250.0	76.5	4.0	246.0	NE	3.0	7.0	19.5	45.5	1.5	NE	NE	NE
GZ-115	625+22	38' LT	382982.62	995105.81	SIGNAL	271.5	12.0	NM	NM	NE	2.0	4.0	5.0	1.0	NE	NE	NE	NE
GZ-116	625+28	90' RT	382860.19	995143.65	SIGNAL	272.0	12.0	NM	NM	NE	0.3	11.7	NE	NE	NE	NE	NE	NE
GZ-117	626+14	36' LT	383003.70	995195.39	SIGNAL	273.0	12.0	NE	NM	NE	0.2	5.8	NE	6.0	NE	NE	NE	NE
GZ-118	626+50	70' RT	382910.08	995256.77	SIGNAL	273.0	12.0	NM	NM	NE	NE	4.0	2.0	6.0	NE	NE	NE	NE
GZ-139	627+87	35' LT	383049.18	995358.62	OHSS	278.0	22.0	10.0	268.0	NE	0.4	3.6	NE	7.0	11.0	NE	NE	NE
GZ-201	628+19	40' RT	-	-	OHSS	282.0	37.0	35.0	247.0	NE	0.4	NE	34.6	NE	2.0	NE	NE	NE
GZ-202	628+17	37' LT	-	-	OHSS	280.0	31.1	27.5	252.5	NE	NE	10.0	20.9	NE	0.2	NE	NE	NE
NB RAMPS																		
GZ-140	305+64	40' RT	382412.80	995223.14	OHSS	261.0	31.5	NM	NM	NE	NE	4.8	NE	15.2	11.5	NE	31.5	229.5
GZ-119	417+50	31' RT	382603.44	995322.58	TOLL GANTRY	263.0	57.5	11.0	252.0	NE	NE	16.3	10.0	16.7	7.0	NE	50.0	213.0
SB ON RAMP																		
GZ-120	119+23	8' LT	381901.31	994429.13	RDWY	252.0	28.3	NM	NM	NE	0.3	1.7	NE	10.0	15.7	NE	27.7	224.3
GZ-120A	116+79	3' RT	381808.33	994654.18	RDWY	257.5	30.0	10.9	246.6	NE	0.3	10.4	4.3	5.0	10.0	NE	30.0	227.5
GZ-142	125+65	70' LT	382146.85	993805.53	OHSS	235.0	24.5	7.2	227.8	NE	0.3	NE	5.0	14.7	NE	3.5	23.5	211.5
GZ-143	203+95	25' LT	382301.62	993924.59	OHSS	236.0	27.0	NM	NM	NE	NE	6.0	NE	14.0	2.5	4.5	27.0	209.0
GZ-121	122+80	28' RT	381997.01	994084.53	TOLL FACILITY	251.0	12.0	Dry	Dry	NE	2.5	NE	NE	7.5	1.5	0.5	12.0	239.0
GZ-122	122+25	100' RT	382100.59	994177.69	TOLL FACILITY	241.5	39.5	4.5	237.0	NE	0.2	NE	3.8	4.0	12.0	6.3	26.3	215.2
GZ-123	122+25	58' LT	382060.81	994164.22	TOLL FACILITY	245.0	10.0	6.7	238.3	NE	0.3	NE	NE	NE	7.7	NE	8.0	237.0
GZ-124	122+25	5' LT	382001.14	994144.00	TOLL FACILITY	246.5	26.7	8.3	238.2	NE	0.3	NE	3.7	7.0	4.0	6.2	21.2	225.3
GZ-125	122+25	56' LT	381952.84	994127.64	TOLL FACILITY	248.0	25.7	8.8	239.2	NE	0.2	NE	3.8	6.0	15.7	NE	25.7	222.3
GZ-126	122+10	28' LT	381974.55	994150.83	TOLL FACILITY	246.5	19.5	8.2	238.3	NE	0.5	NE	3.5	7.5	8.0	NE	19.5	227.0
GZ-127	114+00	CL	381631.40	994868.71	RDWY	259.0	15.0	3.5	255.5	NE	0.3	NE	6.2	NE	8.5	NE	15.0	244.0
GZ-127A	108+63	4' LT	381169.89	995135.08	RDWY	257.0	11.9	NM	NM	0.6	NE	4.0	NE	NE	7.3	NE	11.9	245.1
GZ-128	104+00	CL	380746.70	995323.03	RDWY	259.0	13.3	7.0	252.0	0.5	NE	5.0	NE	4.5	1.5	0.8	12.3	246.7
SB OFF RAMP																		
GZ-129	215+00	CL	382447.88	994546.52	RDWY	245.5	42.0	NM	NM	NE	NE	NE	2.0	33.0	7.0	NE	NE	NE
GZ-130	212+50	CL	382202.56	994575.08	RDWY	239.0	27.5	5.0	234.0	NE	NE	NE	2.0	13.0	12.5	NE	27.5	211.5
GZ-131	210+50	CL	382054.14	994450.43	RDWY	245.0	26.6	NM	NM	NE	0.3	NE	NE	11.7	14.6	NE	26.6	218.4
GZ-132	205+12	24' RT	-	-	RDWY	234.5	22.0	NM	NM	NE	1.0	NE	NE	18.5	2.5	NE	22.0	212.5

NOTES:

1. Refer to Appendix C for test boring logs.
2. "NM" indicates not measured; "NE" indicates not encountered.
3. Groundwater measurements taken during the drilling process and should not be considered stabilized.
4. Ground surface elevations estimated by interpolating from contours of existing ground surface shown on the existing conditions plan.
5. The order that strata were encountered in the test borings may vary from the order shown on this table. Refer to the boring logs for detailed descriptions of the materials encountered at specific locations.
6. Bedrock was confirmed at boring locations GZ-122 and GZ-124. Depth to bedrock at all other locations is based on drilling behavior and/or auger, casing, probe or split spoon refusal.

TABLE 2
SUMMARY OF GZA HAND PROBES
Maine Turnpike Authority - Gray Interchange (Exit 63)
Gray, Maine

	Probe ID	Latitude	Longitude	Easting	Northing	Thickness of Unsuitable Material (ft)
South of Existing Park and Ride	PP-125+50 CL	43.881824	-70.338501	993873.7093	382168.3236	0.50
	PP-125+50 L	43.881757	-70.338670	993829.1040	382143.8221	1.25
	PP-126+00 CL	43.881945	-70.338589	993850.5892	382212.5769	1.50
	PP-126+00 L	43.881902	-70.338746	993809.0954	382196.6288	2.75
	PP-126+50 CL	43.882075	-70.338650	993834.4138	382259.9108	2.00
	PP-126+50 L	43.882041	-70.338802	993794.3025	382247.4577	1.50
	PP-127+00 CL	43.882206	-70.338706	993819.5887	382307.6624	1.50
	PP-127+00 L	43.882174	-70.338847	993782.3425	382296.0988	1.00
	PP-127+50 CL	43.882337	-70.338762	993804.7636	382355.4140	1.00
	PP-127+50 L	43.882310	-70.338885	993772.2925	382345.3329	1.00
	PP-204+00 CL	43.882155	-70.338390	993902.8045	382289.2009	1.50
	PP-204+00 L	43.882194	-70.338220	993947.6910	382303.1365	1.50
	PP-204+50 CL	43.882027	-70.338328	993919.3665	382242.3517	1.25
	PP-204+50 L	43.882076	-70.338167	993961.8068	382260.3650	2.50
	PP-205+00 CL	43.881909	-70.338230	993945.1905	382199.3690	0.50
PP-205+00 L	43.881983	-70.338089	993982.4109	382226.3946	1.00	
PP-205+50 L	43.881904	-70.337984	994009.9519	382197.4896	1.00	
PP-206+00 L	43.881841	-70.337856	994043.7940	382174.7451	0.50	
Southbound Off Ramp	PP-212+00 CL	43.881789	-70.335910	994556.8526	382156.1055	2.50
	PP-212+00 L	43.881821	-70.335999	994533.4729	382167.4926	2.50
	PP-212+00 R	43.881747	-70.335791	994588.3130	382140.7799	2.00
	PP-212+50 CL	43.881917	-70.335841	994575.0798	382202.5560	2.75
	PP-212+50 L	43.881938	-70.335966	994541.9729	382210.4110	2.50
	PP-212+50 R	43.881877	-70.335608	994636.3557	382188.0304	2.50
	PP-213+00 CL	43.882052	-70.335811	994582.8998	382251.8442	2.75
	PP-213+00 L	43.882054	-70.335936	994549.8572	382252.5771	4.00
PP-213+00 R	43.882049	-70.335614	994634.8364	382250.6975	1.75	

Notes:

1. Hand probes were completed by GZA on May 7, 2015. Probe locations were located in the field using a hand-held GPS unit.

TABLE 3
SUMMARY OF GROUNDWATER LEVELS
 Maine Turnpike Authority - Gray Interchange (Exit 63)
 Gray, Maine

Boring Number	Station	Offset	Ground Surface Elev. +/- (ft.)	Groundwater ^{3,4}				Depth of Well (ft)
				December 5-8, 2014		March 17, 2015		
				Depth to (ft)	Elev. of (ft)	Depth to (ft)	Elev. of (ft)	
GZ-114	616+00	53' LT	250.0	4.5	245.5	*	*	20.0
GZ-119	417+50	31' RT	263.0	11.0	252.0	8.9	254.1	20.0
GZ-121	122+80	28' RT	251.0	Dry	Dry	Dry	Dry	10.0

NOTES:

1. Refer to Appendix C for test boring logs.
2. Groundwater measurements recorded in December 2014 were taken during the drilling process and should not be considered stabilized.
3. Ground surface elevations estimated by interpolating from contours of existing ground surface shown on the existing conditions plan.
4. * - indicates GZ-114 was buried under a snow bank at the time of site visit.

TABLE 4
DESIGN RECOMMENDATIONS FOR MAST ARM SIGNAL STRUCTURES
 Maine Turnpike Authority - Gray Interchange (Exit 63)
 Gray, Maine

Structure Type	Approximate Station/Offset (ft)	Boring No.	Approx. Ground Surface Elev. (ft)	Generalized Subsurface Conditions	Recommended Design Profile	Recommended Friction Angle (ϕ°) or Su (psf)
			Existing (Proposed)			
Mast Arm Signal Structures	610+51 45LT	GZ-108	246 (same)	12' CLAY crust	Med Stiff Clay	800 psf
	128+89 20LT	GZ-109	242 (246)	4' New FILL 5' SAND 7' CLAY crust	Fill/Sand	32°
	700+91 50RT	GZ-111	245 (same)	12' CLAY crust	Med Stiff Clay	800 psf
	612+11 55RT	GZ-112	248 (same)	8' FILL 8' CLAY crust 4' soft CLAY	Med Stiff Clay	800 psf
	625+13 35LT	GZ-115	271 (same)	6' FILL 5' SAND 1' CLAY crust	Fill/Sand	32°
	300+96 25RT	GZ-116	272 (same)	12' FILL	Fill	32°
	626+09 35LT	GZ-117	273 (same)	6' FILL 6' CLAY crust	Med Stiff Clay	800 psf
	420+62 45RT	GZ-118	273 (same)	4' FILL 2' SAND 6' CLAY crust	Med Stiff Clay	800 psf

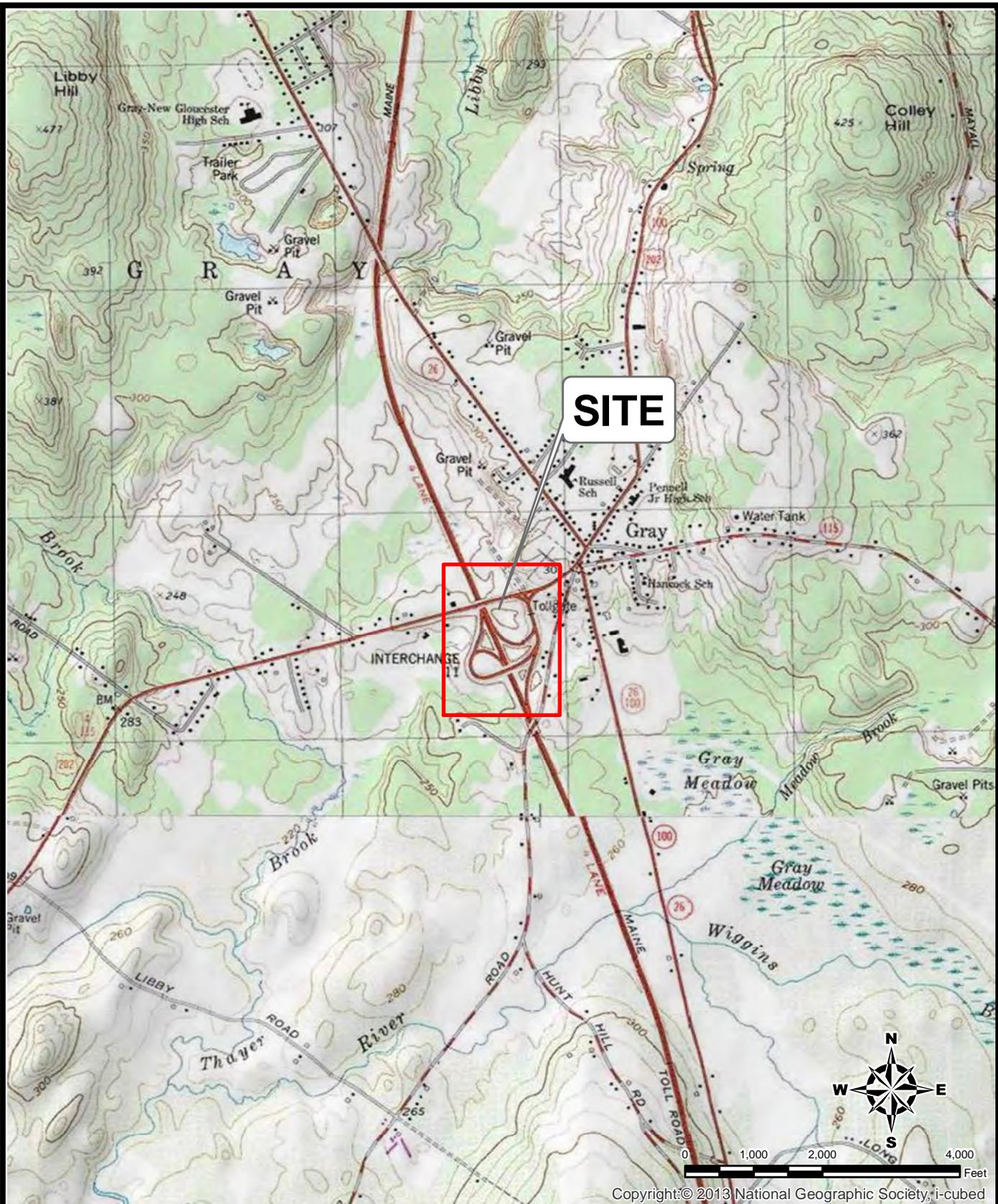
TABLE 5
DESIGN SOIL STRATIFICATION FOR USE IN SIGN STRUCTURE DESIGN
 Maine Turnpike Authority - Gray Interchange (Exit 63)
 Gray, Maine

Structure Type	Approximate Station/Offset (ft)	Boring No.	Planned Ground El. (ft)	Interpreted Groundwater El. (ft)	Interpreted Soil Stratification
Cantilever Sign Structures	704+05 72 LT	GZ-134	245	242	7' SAND 35' soft CLAY >5' GLACIAL TILL
	608+15 60 RT	GZ-135	247.5	242	7' CLAY crust 55' soft CLAY >10' GLACIAL TILL
Overhead Sign Structures	628+19 40 RT and 628+17 37 LT	GZ-201	282	247	35' SAND >2' GLACIAL TILL
		GZ-202	280	252	10' FILL 21' SAND >1' GLACIAL TILL
	613+60 55LT and 613+60 50RT	GZ-138	250	249	10' FILL 45' soft CLAY >6' GLACIAL TILL
		GZ-137	252	251	2' FILL 10' CLAY crust 27' soft CLAY >5' GLACIAL TILL
	304+30 27 RT and 417+00 29 RT	GZ-140	261	250	5' FILL 7' CLAY crust 8' soft CLAY 11.5' GLACIAL TILL
		GZ-119	263	252	16' FILL 19' soft CLAY 8' SAND 7' GLACIAL TILL
	126+50 18 LT and 204+10 22 LT	GZ-142	246	228	14' New FILL 5' CLAY crust 10' soft CLAY 5' SAND 3.5' GLACIAL TILL (W. ROCK)
		GZ-143 / GZ-132	245	228	13' New FILL 6' FILL 14' soft CLAY 7' GLACIAL TILL (W. ROCK)



FIGURES

© 2015 - GZA GeoEnvironmental Inc. C:\GIS\MTA\Exit 63\Figure 1 - Locus Plan.mxd, 12/6/2015, 10:57:20 AM, aimee.mountain



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SOURCE: THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCGIS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS

MAINE TURNPIKE EXIT 63 INTERCHANGE IMPROVEMENTS GRAY, MAINE	
LOCUS PLAN	

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: VHB	
PROJ MGR: JRB DESIGNED BY: JRB DATE: 12/06/2015	REVIEWED BY: CLS DRAWN BY: ADM PROJECT NO. 09.0025829.01	CHECKED BY: RJM SCALE: 1 in = 2,000 ft REVISION NO.	FIGURE 1

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) TEST BORING GZ-103 WAS NOT DRILLED.
- 5) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.

GZ-143



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GRAY INTERCHANGE EXIT 63 GRAY, MAINE			
BORING LOCATION PLAN PARK AND RIDE			
PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: VHB	
PROJ MGR: JRB	DESIGNED BY: ETL	REVIEWED BY: JRB	CHECKED BY: CLS
DATE: DECEMBER 2015	DRAWN BY: ETL	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'
			FIG OR DWG 2
			REVISION NO.: --
			SHEET NO. 1 OF 11

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.



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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
BORING LOCATION PLAN ROUTE 202/SOUTH BOUND RAMP					
PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.: --	4	
				SHEET NO. 3 OF 11	

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.

GZ-143



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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
BORING LOCATION PLAN ROUTE 202					
PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.: --	5	
				SHEET NO. 4 OF 11	

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3 AND 5. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM
- 5) THE OFFSET FOR GZ-132 WAS FIELD LOCATED AND IS CONSIDERED APPROXIMATE.

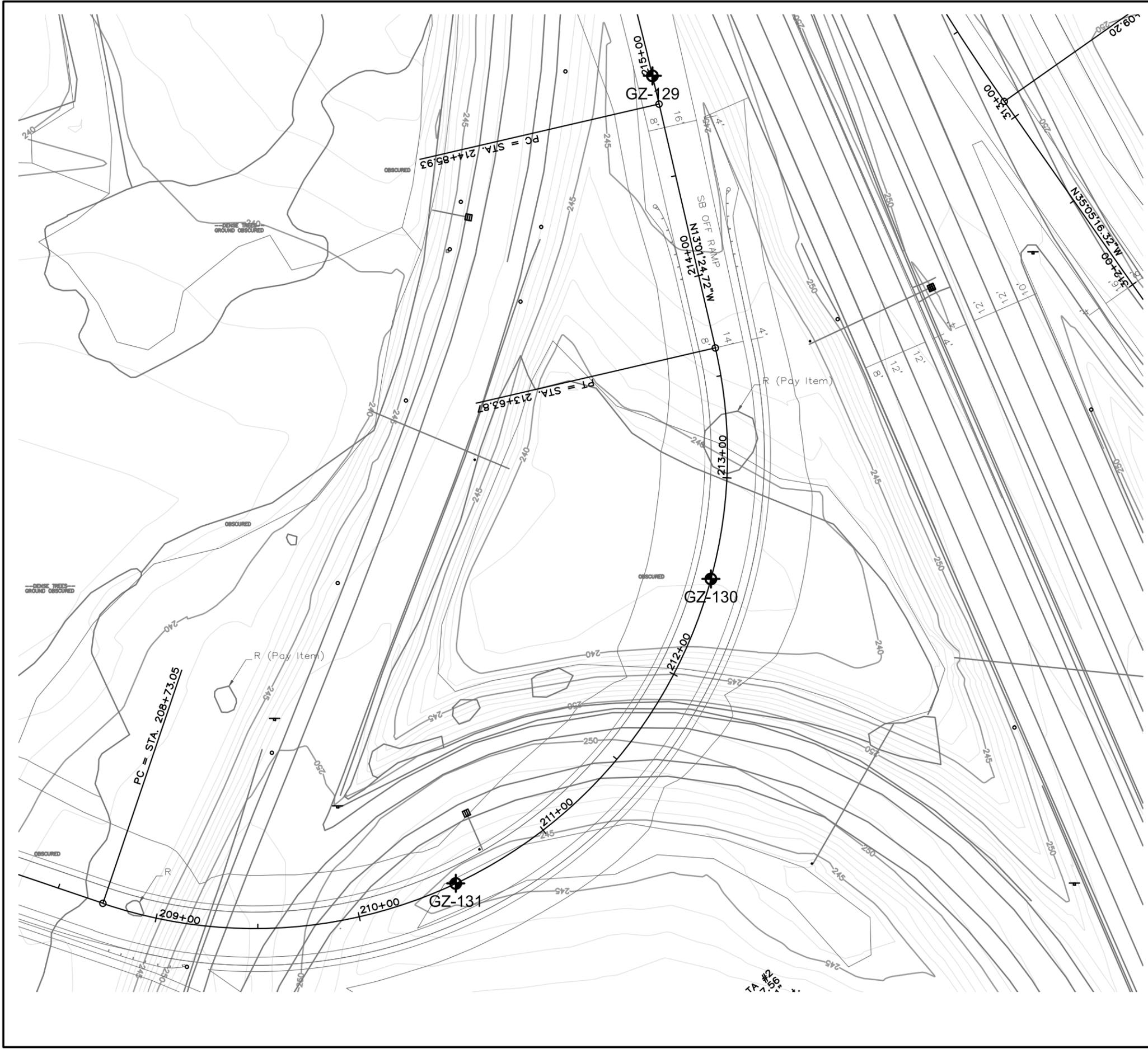
LEGEND:

TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.



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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
BORING LOCATION PLAN SOUTH BOUND TOLL PLAZA					
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.:	6	
				SHEET NO. 5 OF 11	

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

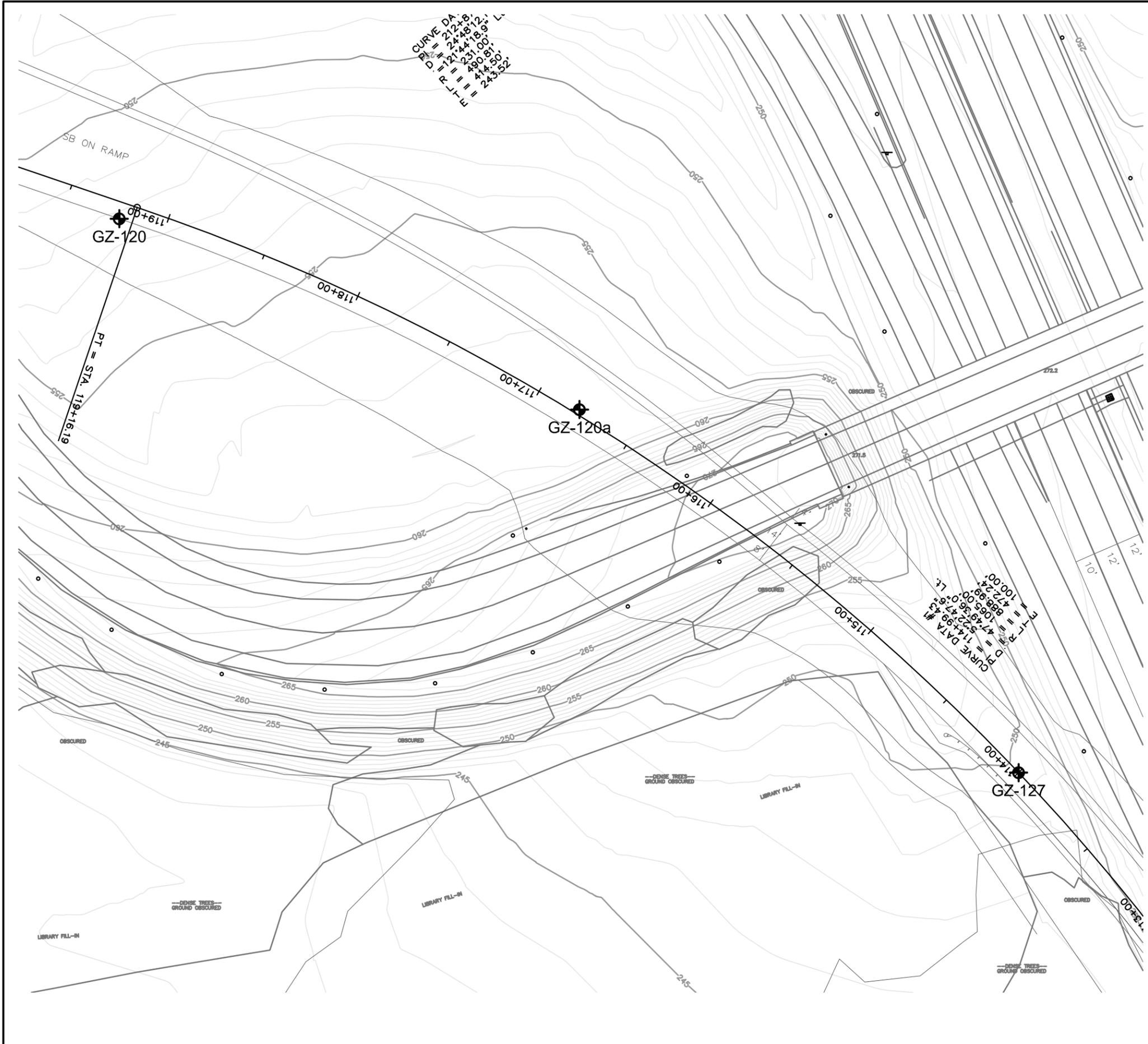
 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.

GZ-143



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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
BORING LOCATION PLAN SOUTH BOUND OFF RAMP					
PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.: --	7	
				SHEET NO. 6 OF 11	

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.



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**GRAY INTERCHANGE
EXIT 63
GRAY, MAINE**

**BORING LOCATION PLAN
SOUTH BOUND ON RAMP**

PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: VHB	
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS
DATE: DECEMBER 2015	PROJECT NO: 09.0025829.02	SCALE: 1" = 50'	FIG OR DWG: 8
REVISION NO: --			SHEET NO. 7 OF 11

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CURVE DATA #22 Rt.
 P1 = 103+39.22
 P2 = 103+39.22
 STA. 103+39.22

NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.

GZ-143



NO.		ISSUE/DESCRIPTION		BY	DATE
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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
BORING LOCATION PLAN SOUTH BOUND ON RAMP					
PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO: 09.0025829.02	SCALE: 1" = 50'	REVISION NO: --	9	
				SHEET NO. 8 OF 11	

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CURVE DATA #1
 PI = 318+81.16
 PD = 22°44'11.1" Rt.
 LR = 160°02'08.1" Rt.
 LT = 252.00'
 RT = 703.87'
 E = 1431.76'
 T = 1201.77'

NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

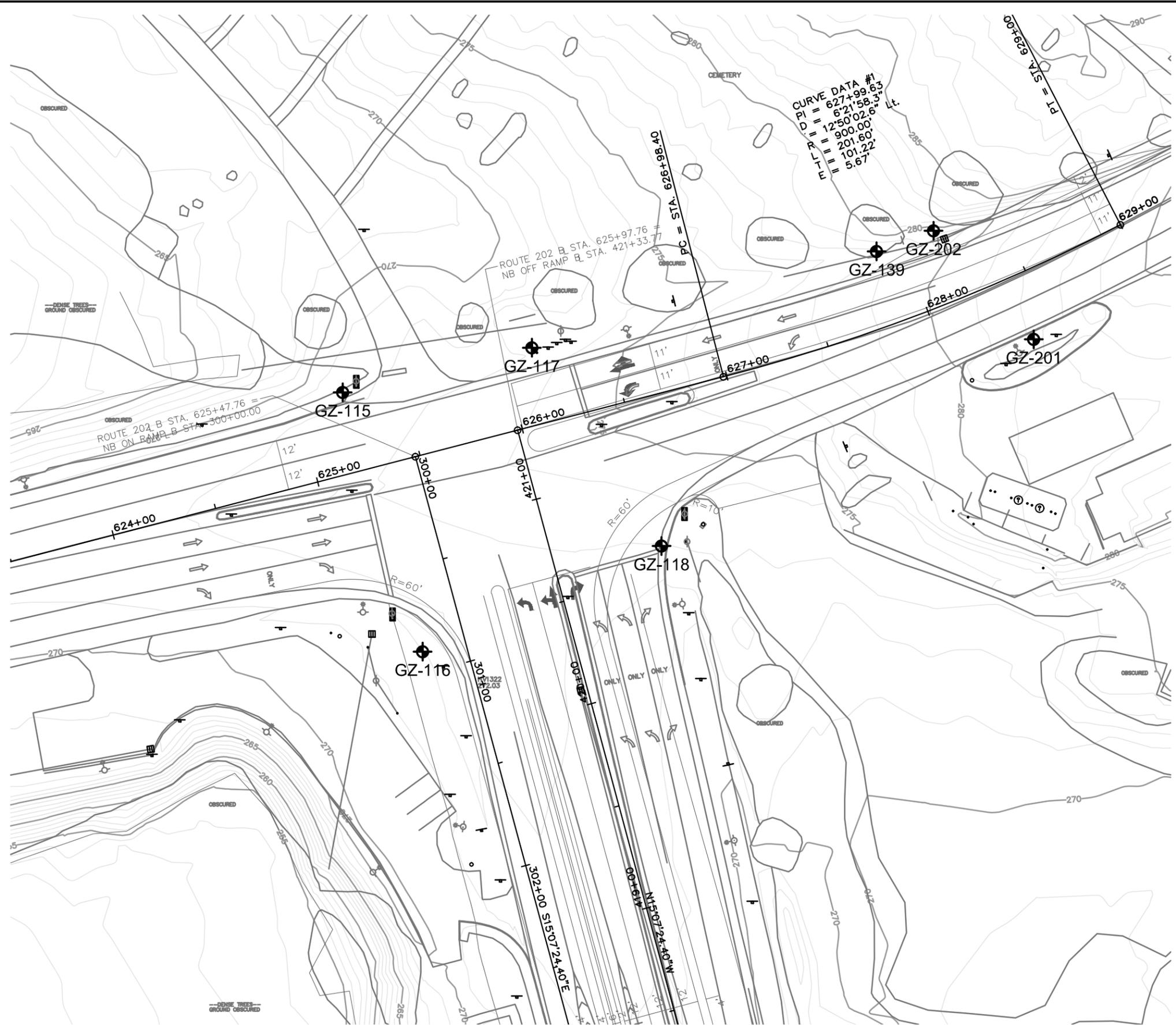
LEGEND:

TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.



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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
BORING LOCATION PLAN NORTH BOUND TOLL PLAZA					
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.: --	10	
				SHEET NO. 9 OF 11	

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.

GZ-143



NO.	ISSUE/DESCRIPTION	BY	DATE

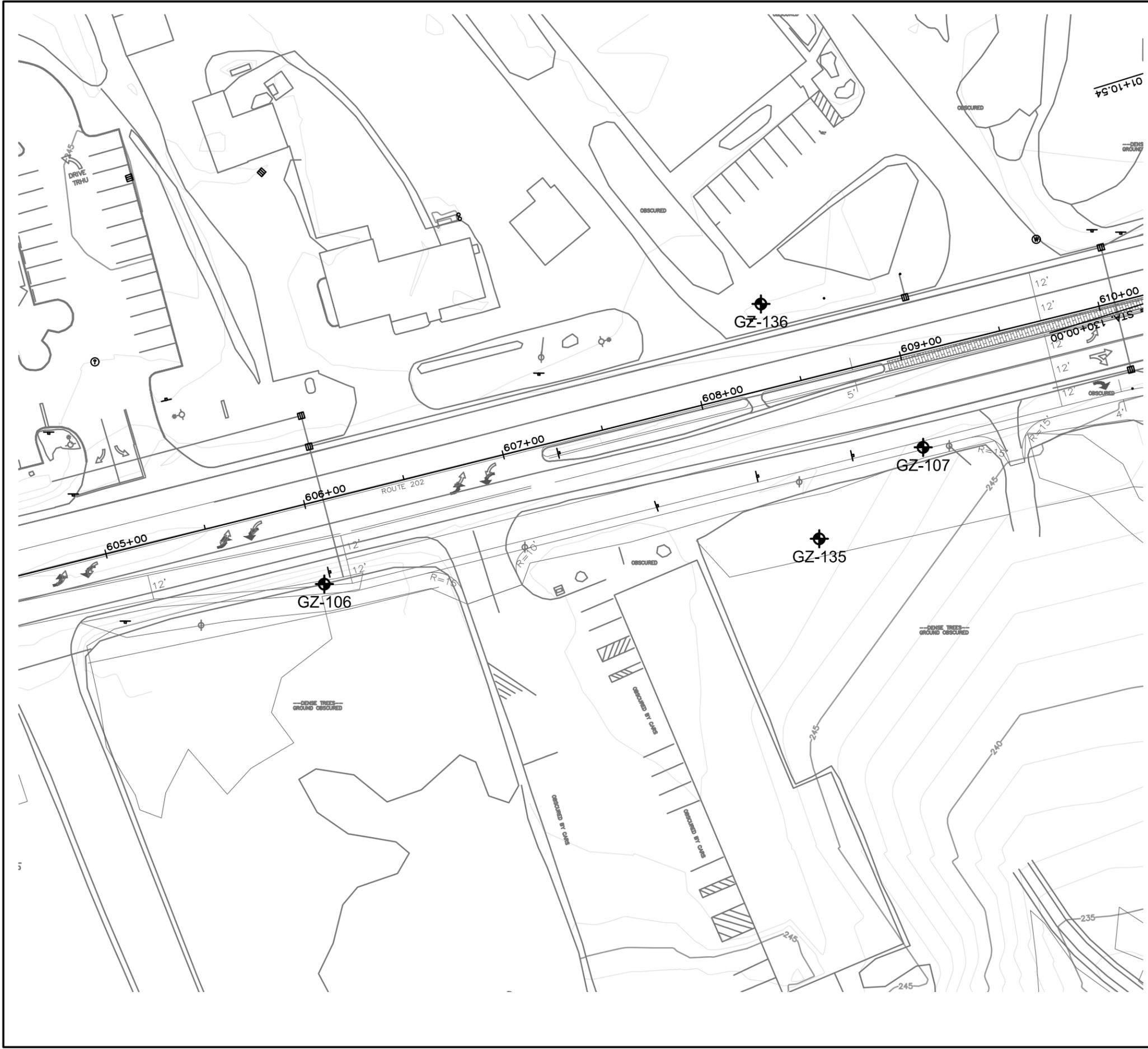
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE 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.

**GRAY INTERCHANGE
EXIT 63
GRAY, MAINE**

**BORING LOCATION PLAN
ROUTE 202/NORTH BOUND RAMPS**

PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: VHB	
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.: --
FIG OR DWG 11			FIG OR DWG 11
SHEET NO. 10 OF 11			

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) THE LOCATIONS OF TEST BORINGS GZ-120, 120A, 127A, 140, 142, AND 143 WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

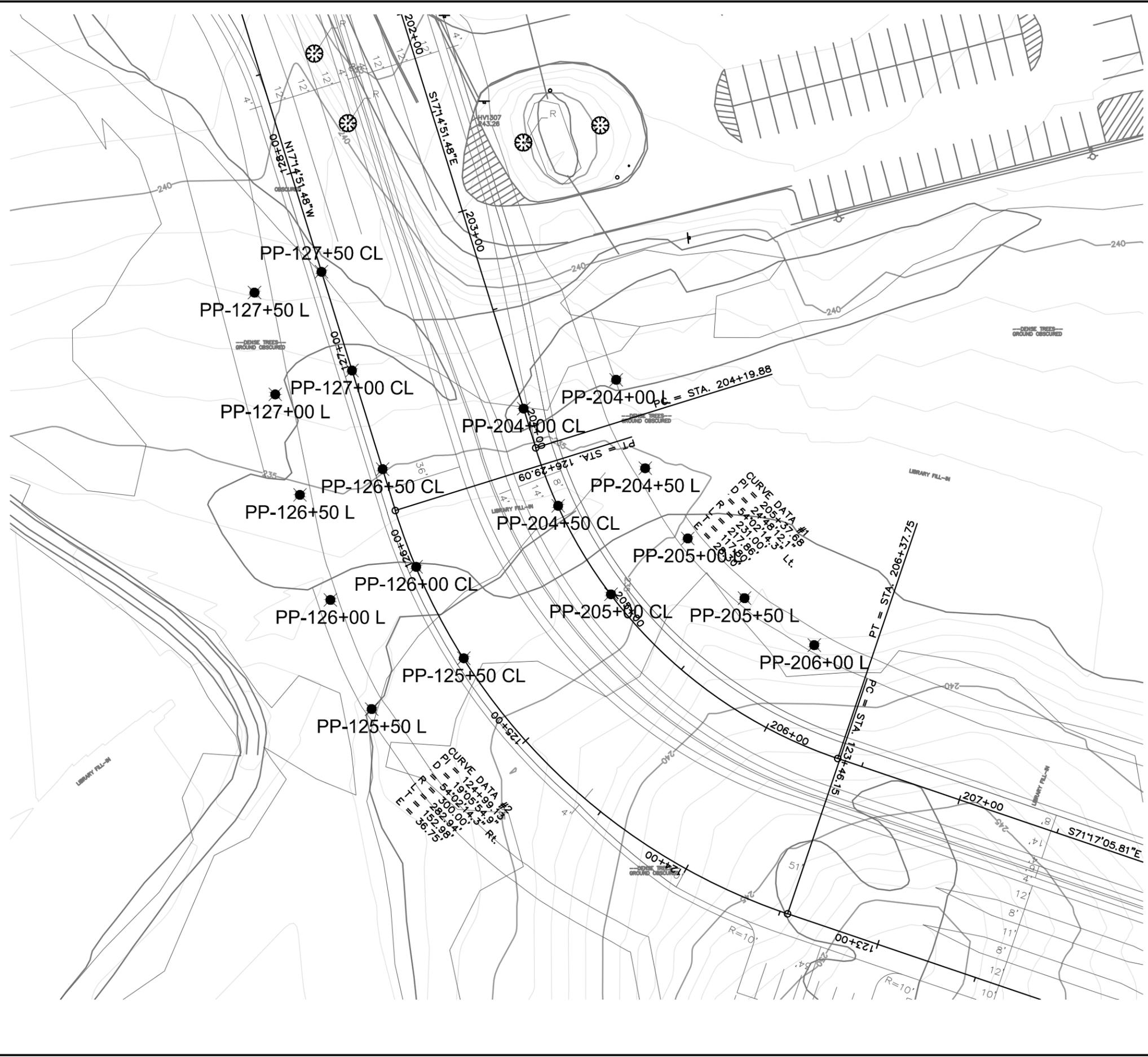
LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.



NO.		ISSUE/DESCRIPTION		BY	DATE
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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
BORING LOCATION PLAN ROUTE 202					
PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.: --	12	
				SHEET NO. 11 OF 11	

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATIONS OF THE HAND PROBES WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

LEGEND:

HAND PROBES WERE PERFORMED BY GZA PERSONNEL ON MAY 7, 2015.
 PP-213+00 CL



NO.	ISSUE/DESCRIPTION	BY	DATE

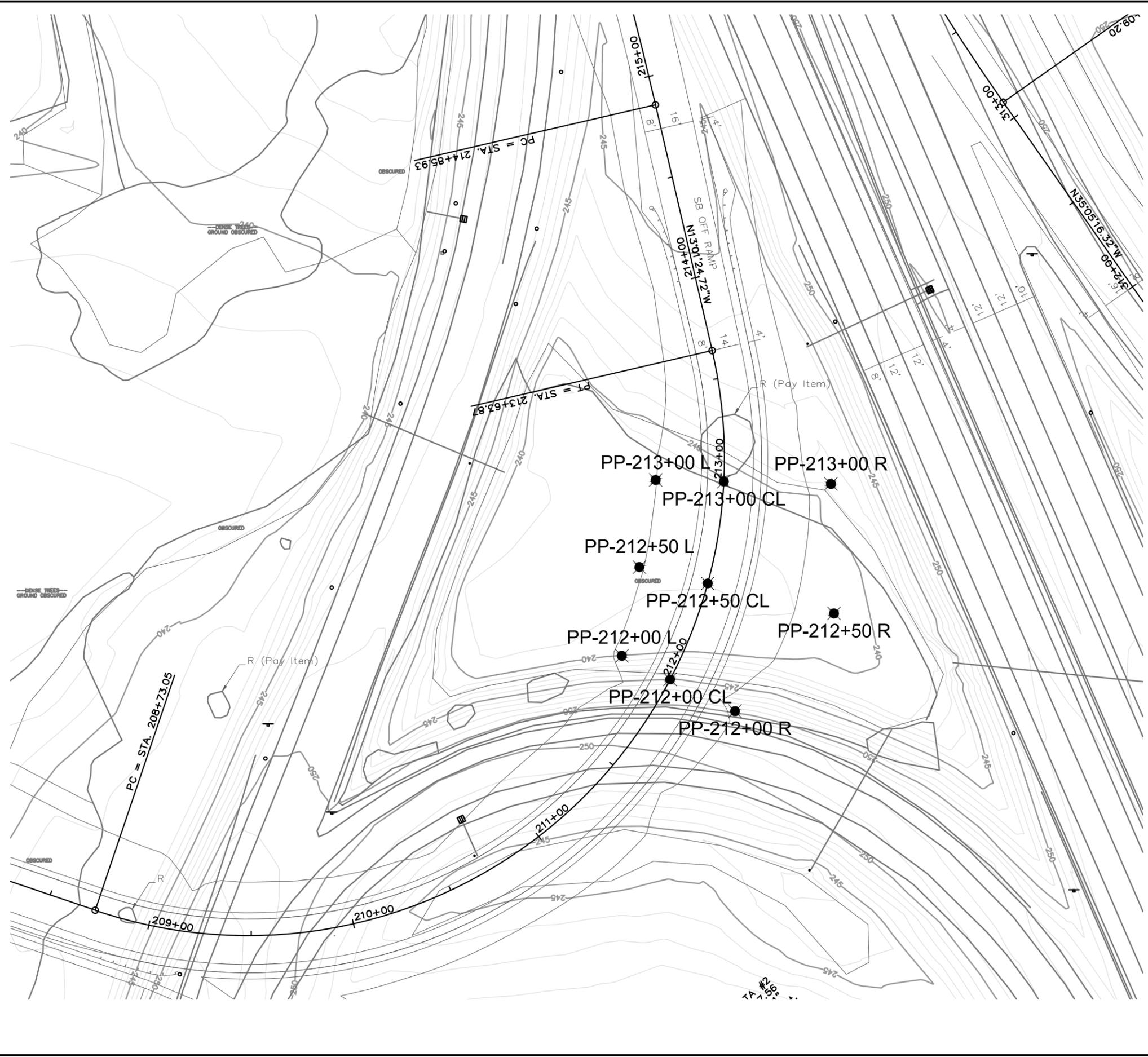
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE 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.

**GRAY INTERCHANGE
 EXIT 63
 GRAY, MAINE**

**HAND PROBE LOCATION PLAN
 NORTH OF SOUTH BOUND TOLL PLAZA**

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	PREPARED FOR: VHB		
PROJ MGR: JRB DESIGNED BY: BMC	REVIEWED BY: JRB DRAWN BY: BMC	CHECKED BY: CLS SCALE: 1" = 50'	FIG OR DWG 13 SHEET NO. 1 OF 2
DATE: DECEMBER 2015	PROJECT NO. 09.0025829.02	REVISION NO. --	

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NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "BORINGS.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATIONS OF THE HAND PROBES WERE DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM

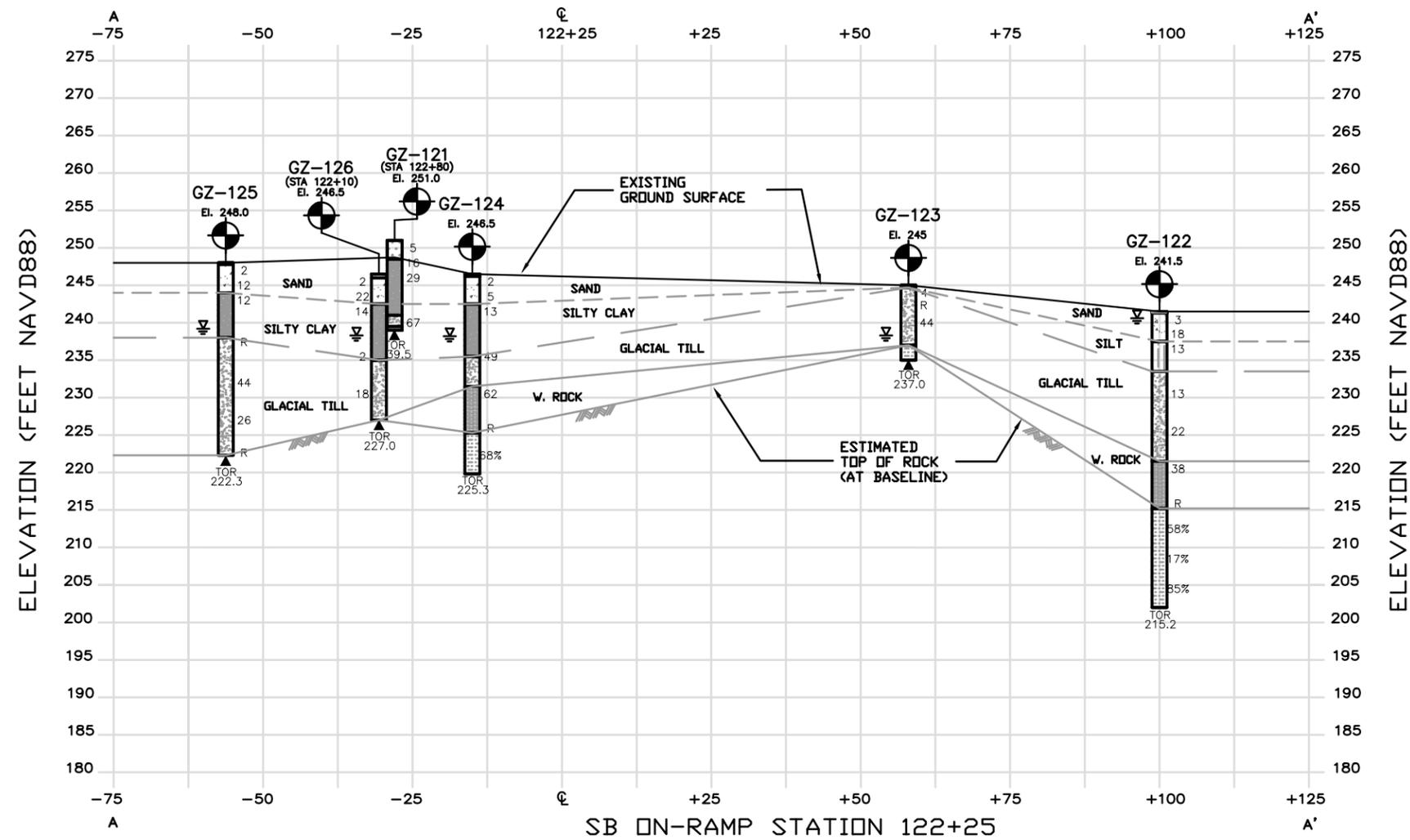
LEGEND:

 HAND PROBES WERE PERFORMED BY GZA PERSONNEL ON MAY 7, 2015.
 PP-213+00 CL

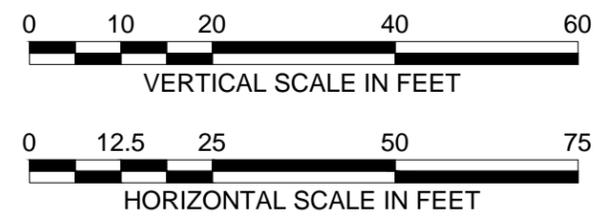


NO.		ISSUE/DESCRIPTION		BY	DATE
<small>UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND 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.</small>					
GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
HAND PROBE LOCATION PLAN SOUTH BOUND OFF RAMP					
PREPARED BY:  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	DRAWN BY: BMC	CHECKED BY: CLS	FIG OR DWG
DATE: DECEMBER 2015	PROJECT NO.: 09.0025829.02	SCALE: 1" = 50'	REVISION NO.:		14
					SHEET NO. 2 OF 2

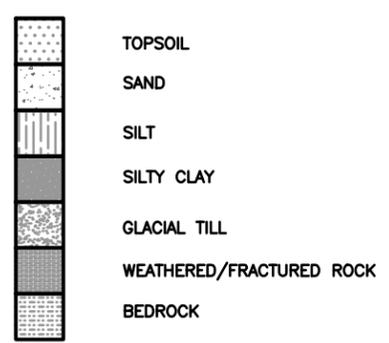
© 2013 - GZA GeoEnvironmental, Inc. GZA-P:\09 Jobs\0025829\09.0025829.00 - Gray Interchange\09.0025829.01 - Final Design\Figures-CAD\Figures-CAD_25829 Gray South Bound Plaza TOR and subsurface profile.dwg [Subsurface profile] December 10, 2015 - 3:01pm Blaine.cordall



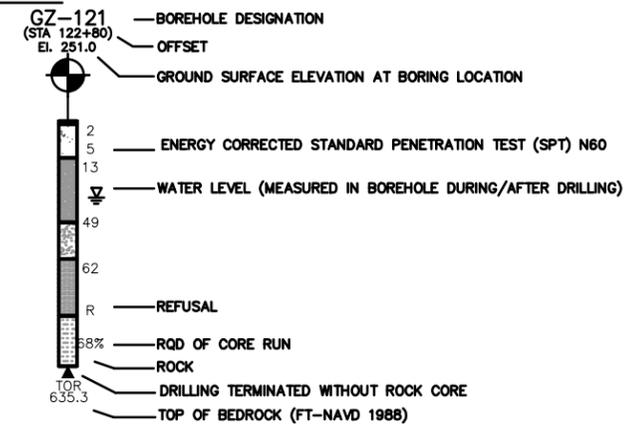
- NOTES:**
- 1) BASELINE PROFILE DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
 - 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
 - 3) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM
 - 4) TOP OF ROCK (TOR) IS DEFINED USING EITHER SPLIT SPOON REFUSAL AT THE BOTTOM OF A TEST BORING, SPLIT SPOON REFUSAL PRIOR TO IDENTIFICATION OF BEDROCK BY ROLLER BIT OR AUGER REFUSAL OR CORING, AND/OR TERMINATION OF A BORING IN MATERIAL IDENTIFIED AS WEATHERED ROCK.
 - 5) THIS GENERALIZED INTERPRETIVE SOIL PROFILE 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 MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE EXPLORATION LOGS.



BORING STICK HATCH LEGEND:

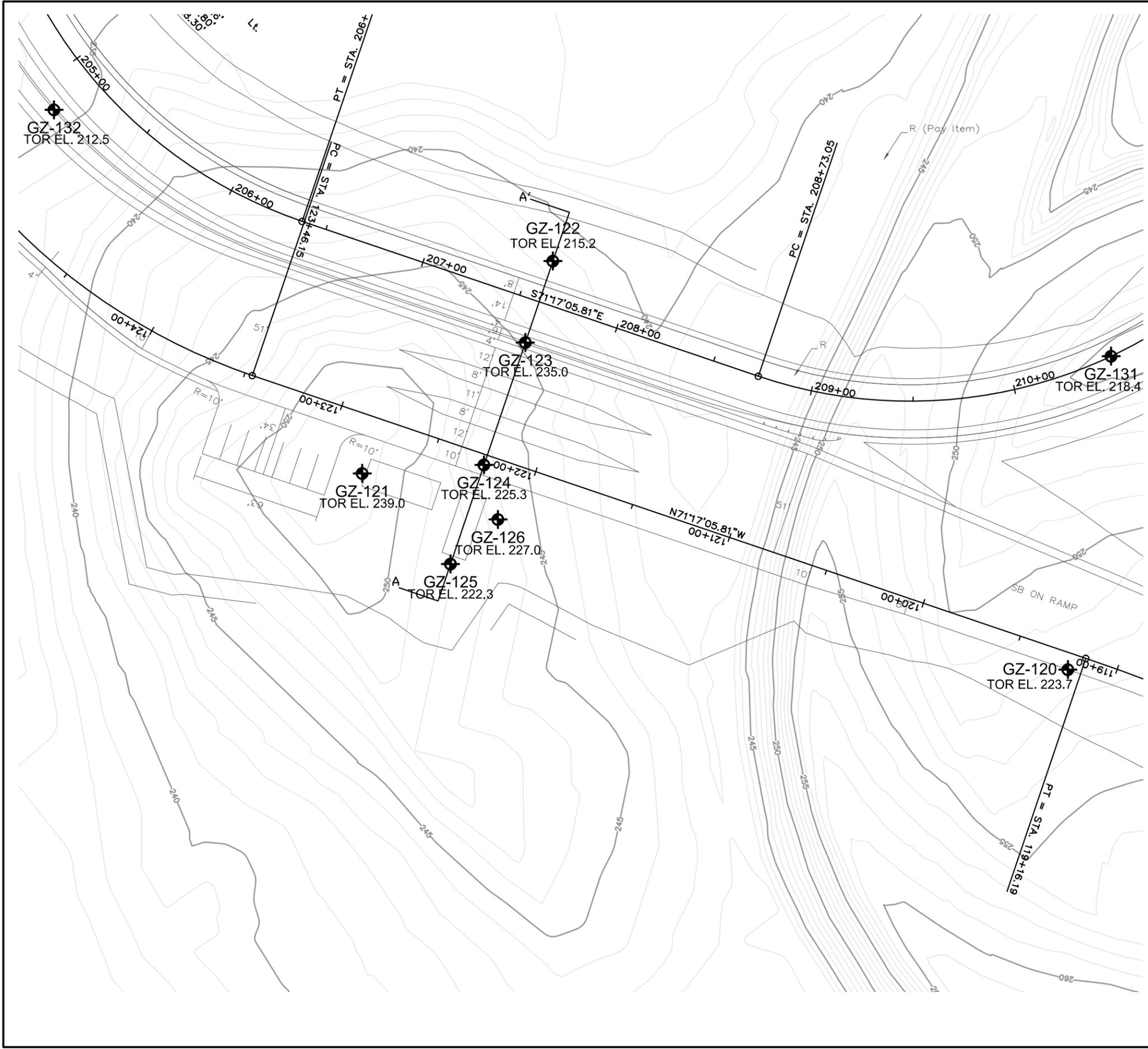


LEGEND:



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GRAY INTERCHANGE EXIT 63 GRAY, MAINE			
SUBSURFACE PROFILE SOUTHBOUND TOLL PLAZA (STA. 122+25)			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: VHB	
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS
DATE: DECEMBER 2015	PROJECT NO: 09.0025829.02	DRAWN BY: BMC	SCALE: AS SHOWN
			FIG OR DWG 15 SHEET NO. 1 OF 1

© 2013 - GZA GeoEnvironmental, Inc. GZA-P:\09 Jobs\0025829\09.0025829.00 - Gray Interchange\09.0025829.01 - Final Design\Figures-CAD\25829 Gray South Bound Plaza TOR and subsurface profile.dwg [South Bound Plaza TOR] December 10, 2015 - 3:01pm Blake.Candall



- NOTES:**
- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
 - 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY EXCEPT FOR THOSE LISTED IN NOTE 3 AND 5. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
 - 3) THE LOCATION OF TEST BORING GZ-120 WAS DETERMINED BY A HANDHELD GPS UNIT. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
 - 4) ELEVATIONS ARE IN FEET AND REFER TO NAVD88 DATUM
 - 5) THE OFFSET FOR GZ-132 WAS FIELD LOCATED AND IS CONSIDERED APPROXIMATE.

- LEGEND:**
- ◆ TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.
 - ◆ GZ-132 TOR EL. 212.5
 - TOP OF ROCK (TOR)



NO.		ISSUE/DESCRIPTION		BY	DATE
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GRAY INTERCHANGE EXIT 63 GRAY, MAINE					
TOP OF BEDROCK ELEVATION PLAN SOUTH BOUND TOLL PLAZA					
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com			PREPARED FOR: VHB		
PROJ MGR: JRB	DESIGNED BY: BMC	REVIEWED BY: JRB	CHECKED BY: CLS	FIG OR DWG	
DATE: DECEMBER 2015	PROJECT NO: 09.0025829.02	SCALE: 1" = 50'	REVISION NO: --	16	
				SHEET NO. 1 OF 1	



APPENDIX A

LIMITATIONS



GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions .
3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.
4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.
6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.



7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.
8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.
9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Cost Estimates

11. Unless otherwise stated, our cost estimates are only for comparative and general planning purposes. These estimates may involve approximate quantity evaluations. Note that these quantity estimates are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no control over either when the work will take place or the labor and material costs required to plan and execute the anticipated work, our cost estimates were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

Additional Services

12. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.



APPENDIX B

PARK AND RIDE PAVEMENT DESIGN BASIS MEMORANDUM

MEMORANDUM



TO: Peter Clary, P.E.
Vanasse Hangen Brustlin, Inc.

FROM: Jennifer R. Baron, P.E.
Christopher L. Snow, P.E.
Russell J. Morgan

DATE: January 23, 2015

FILE NO.: 09.0025829.00

SUBJECT: Preliminary Pavement Design Basis
Gray Park and Ride, Exit 63
Gray, Maine

477 Congress Street
Suite 700
Portland, Maine
04101-3926
207-879-9190
FAX 879-0099
www.gza.com

GZA GeoEnvironmental, Inc. (GZA) has prepared this preliminary geotechnical data summary and preliminary pavement design basis evaluation for the proposed Park and Ride at Exit 63 in Gray, Maine. Our services were provided in accordance with our Subconsultant Agreement with Vanasse Hangen Brustlin, Inc. (VHB) dated November 11, 2013 and January 8, 2015, and the attached Limitations included in **Appendix A**.

The memorandum summarizes the results of subsurface explorations and subsurface conditions for the proposed park and ride and preliminary pavement design evaluations completed to date. Preliminary test boring logs and laboratory test results for the park and ride borings are provided herein; however, these data are still undergoing quality control review and may change prior to issuance of our final geotechnical design report for the project.

If necessary, this memorandum will be revised when review of the subsurface data is complete.

BACKGROUND

The project consists of reconstruction of the Exit 63 interchange for the Maine Turnpike in Gray, Maine, as shown on **Figure 1**. The existing interchange includes northbound (NB) and southbound (SB) on and off ramps that pass through a toll plaza to a signalized intersection with Route 202 on the east side of the Turnpike. The southbound (SB) on and off ramps are carried from the west side of the Turnpike to the toll plaza on the east by an overpass bridge. The SB ramp overpass bridge crosses the Turnpike approximately 1,000 feet south of the Route 202 overpass bridge.

The proposed park and ride lot is proposed approximately 1,000 feet north of Route 202 on the east side of Route 26A.

SUBSURFACE EXPLORATIONS

GZA completed a subsurface investigation program consisting of 39 test borings for the project. The park and ride test borings (GZ-101 and GZ-102) were drilled to depths of approximately 21 to 82 feet below ground surface (bgs). The boring locations and ground surface elevations¹ were surveyed by VHB prior to drilling. The test borings associated with the proposed park and ride lot are shown on **Figure 2**.



New England Boring Contractors of Hermon, Maine coordinated utility clearance and provided drilling services. The drilling was completed on November 6, 2014. GZA personnel monitored the drilling work and prepared logs of each boring. Preliminary boring logs are included in **Appendix B**.

The borings were drilled using 2.25-inch inside diameter hollow stem augers, as noted on the boring logs. Boring GZ-101 was terminated at the proposed boring depth, with Standard Penetration Testing (SPT) and split-spoon sampling performed continuously in the upper 6 feet, then at 5-foot intervals thereafter, using a 24-inch long, 1-3/8-inch inside diameter sampler. Boring GZ-102 was advanced to greater depth to determine the overall thickness of soft, compressible soils, with SPT and split-spoon sampling was performed at 5-foot intervals to a depth of 36 feet. An AW-rod probe was then driven using a 140 pound hammer with a 30-inch drop to a total depth of 82 feet. Resistance was documented on the logs in blows per foot. The recorded resistances are an indication of variation in the density of the encountered deposits, but are not representative of the SPT N-values. Increased resistance below approximately 75 feet is judged to represent a sand or glacial till layer beneath the silty clay.

LABORATORY TESTING

GZA completed a laboratory soil testing program at the Thielsch Engineering in Cranston, Rhode Island to review visual soil classification and estimate engineering properties of the soils. The park and ride portion of the testing program included one gradation analysis / MaineDOT Frost Classification / Unified Soil Classification System (USCS) assessment and two sets of Atterberg Limits on soil samples taken from the explorations. Preliminary results of the testing are included in **Appendix C**.

SUBSURFACE CONDITIONS

Three subsurface units were encountered at the proposed park and ride site: Topsoil, Silty Clay, and possible Glacial Till. Detailed descriptions of the materials encountered at specific locations are provided in the boring logs in **Appendix B**. The encountered thicknesses, generalized descriptions and engineering properties of the units encountered, in descending order from ground surface, are summarized in the following table.

¹ Elevations referenced in this report are in feet and refer to North American Vertical Datum of 1988 (NAVD 1988).



Soil Unit	Approximate Encountered Thickness (ft)	Generalized Description
Topsoil	0.5	Very loose, dark brown, fine to medium SAND and Clayey Silt, traces of roots and leaves (USCS: SM).
Silty Clay (Stiff Crust)	5.5	Medium stiff to very stiff, gray, Clayey SILT to Silty CLAY, little to trace fine Sand (USCS: ML, CL). Occasional fine sand seams noted, up to 1/8-inch in thickness. MaineDOT Frost Classification = IV
Silty Clay (Soft)	>15 to 70	Soft to medium stiff, gray, Silty CLAY, occasional trace fine sand (USCS: CL). MaineDOT Frost Classification = IV
Possible Sand or Glacial Till	7 +	Denser material was encountered beneath the soft Silty CLAY based on effort required to advance AW rod probe at boring GZ-102.

BEDROCK

Based on the probe in boring GZ-102, bedrock is at least 82 feet bgs.

GROUNDWATER

Groundwater was measured at the park and ride boring locations at depths between 8.5 and 11.5 feet bgs at the time of the explorations (approximately El. 231.5 to El. 237.5), corresponding to groundwater depths on the order of 12 to 16 feet below proposed finish pavement grades.

The groundwater observations were made at the times and under the conditions stated in the borings logs. Fluctuations in groundwater level occur due to variations in season, precipitation, and construction activities in the area. Consequently, water levels during construction are likely to vary from those encountered at the time the observations were made.

CONCLUSIONS AND RECOMMENDATIONS

GZA has conducted preliminary evaluations of geotechnical considerations relevant to pavement design at the proposed park and ride lot location, as presented below. The findings presented below may be updated in our GDR following more detailed review of the data.

FROST AND SUBGRADE CONDITIONS FOR PAVEMENT DESIGN

- The new park and ride lot will be constructed in a fill area, with anticipated total grade raises on the order of 5 feet (60 inches) or less above existing ground elevation.
- Based on the MaineDOT Highway Design Guide (HDG), the Design Freezing Index for the site is approximately 1350. Therefore, in accordance with Figure 13-3 of the HDG, considering primarily granular subgrade materials, the estimated depth of frost penetration is about 72 inches.
- In order to prevent frost-heaving of the pavement subgrade, it would be necessary to remove the frost susceptible materials to the full frost penetration depth. If a moderate amount of seasonal movement is considered acceptable, this thickness may be reduced from 6 feet to 4 to 5 feet.



- Due to the low permeability of the silty clay subgrade materials, there is potential for perched water to accumulate adjacent to the pavement and provide a source of water for possible frost action beneath pavement. To promote drainage of the pavement section, ditches should be provided on all sides of the pavement, and the bottom of the ditches should be at least 12 inches below the bottom of the subbase layer of the proposed pavement sections. Where possible, the prepared clay subgrade should be graded to drain toward the perimeter ditches.

PAVEMENT DESIGN

The following table summarizes the proposed pavement section, as presented in the VHB 60% plan submission set dated November 12, 2014. The proposed section, as tabulated below, will provide a Structural Number (SN) equal to 3.23.

Layer	Struct. Coeff	Drain Coeff	Thickness (inches)	SN	Estimated Design Life
HMA Grading 12.5mm (Surface)	0.44	1	2	0.88	20 years
HMA Grading 19.0mm	0.44	1	2	0.88	
Base Course Type A	0.12	1	4	0.48	
Subbase Type D	0.09	1	11	0.99	
			Sum	3.23	

GZA performed pavement design analysis in accordance with the MaineDOT HDG to confirm if the proposed pavement section was acceptable for encountered subgrade conditions. Traffic data, provided by VHB via email on January 21, 2015, indicated an AADT for the park and ride lot of 675. Based on this, GZA estimated a 20-year 18-kip ESAL equivalent of 38,550. The following assumptions were also made in accordance with the HDG.

Pavement Design Input	Value
Serviceability Loss (Δ PSI)	2.5
Reliability Factor	85%
Overall Standard Deviation	0.45

GZA calculated the minimum required SN values for the park and ride, based on an AADT of 675, provided by VHB, and the anticipated subgrade materials. It is anticipated that subgrade materials for the park and ride lot will consist of either Silty Clay or imported granular fill. The recommended soil support S-value and recommended subgrade resilient modulus values used in section analysis is presented below:

Material	Maine Frost Classification	Recommended Soil Support S-Value	Recommended Subgrade Resilient Modulus, Mr (psi)
Silty Clay	IV	3	2,800
Clean Granular Fill (new)	0	5	6,100

Based on these assumptions, the minimum required SN for pavement sections placed over in-situ Silty Clay or imported granular fill is 3.0 and 2.4, respectively, Therefore, the proposed pavement section (SN=3.23) is acceptable for either subgrade condition.

FILL MATERIAL AND PLACEMENT RECOMMENDATIONS



Fill materials beneath the pavement section should consist of MaineDOT 703.19 Granular Borrow for Underwater Backfill.

Fill materials should be placed systematically in horizontal layers not more than 12-inches in thickness prior to compaction. Compaction equipment should preferably consist of heavy, self-propelled vibratory rollers. Fill materials must be compacted to a dry density of at least 95% of the maximum dry density determined in accordance with the American Society for Testing and Materials (ASTM) D 1557. In the event that weaving or rutting begins to occur, compaction should proceed without vibration, until enough fill is in place to provide a stable base.

SETTLEMENT

New fill on the order of 5 feet or less is anticipated within the limits of the new park and ride lot. Settlement of the parking lot will vary based on the amount of fill placement and the clay stratum thickness. Generally, the site is underlain by 5 to 10 feet of stiff silty clay over approximately 75 feet of soft, compressible, silty clay. Total estimated settlements, assuming a 3- to 5-foot grade raise and a total clay thickness of 75 feet, are anticipated to be on the order of 4 to 5 inches.

Initial settlements of approximately 1 inch or less are anticipated. In addition, most of the settlement will be a result of secondary compression, and is anticipated to occur in the time period approximately 5 to 50 years after the fill is placed.

REUSE OF ON-SITE MATERIALS

It is anticipated that soils encountered on site are **not** suitable for re-use as base course materials for the proposed pavement section. Refer to **Appendix C** for laboratory results. Excavated silty clay soil may be re-used as common borrow in landscaped areas. Due to the variability of the soils across the Site, GZA recommends that the excavated soils be assessed by a qualified geotechnical engineer to assure conformance with the gradation specifications prior to reuse of on-site materials.

CLOSURE

We trust this information meets current project needs. Please feel free to call Jennifer Baron at (207) 358-5119 if additional information is needed.

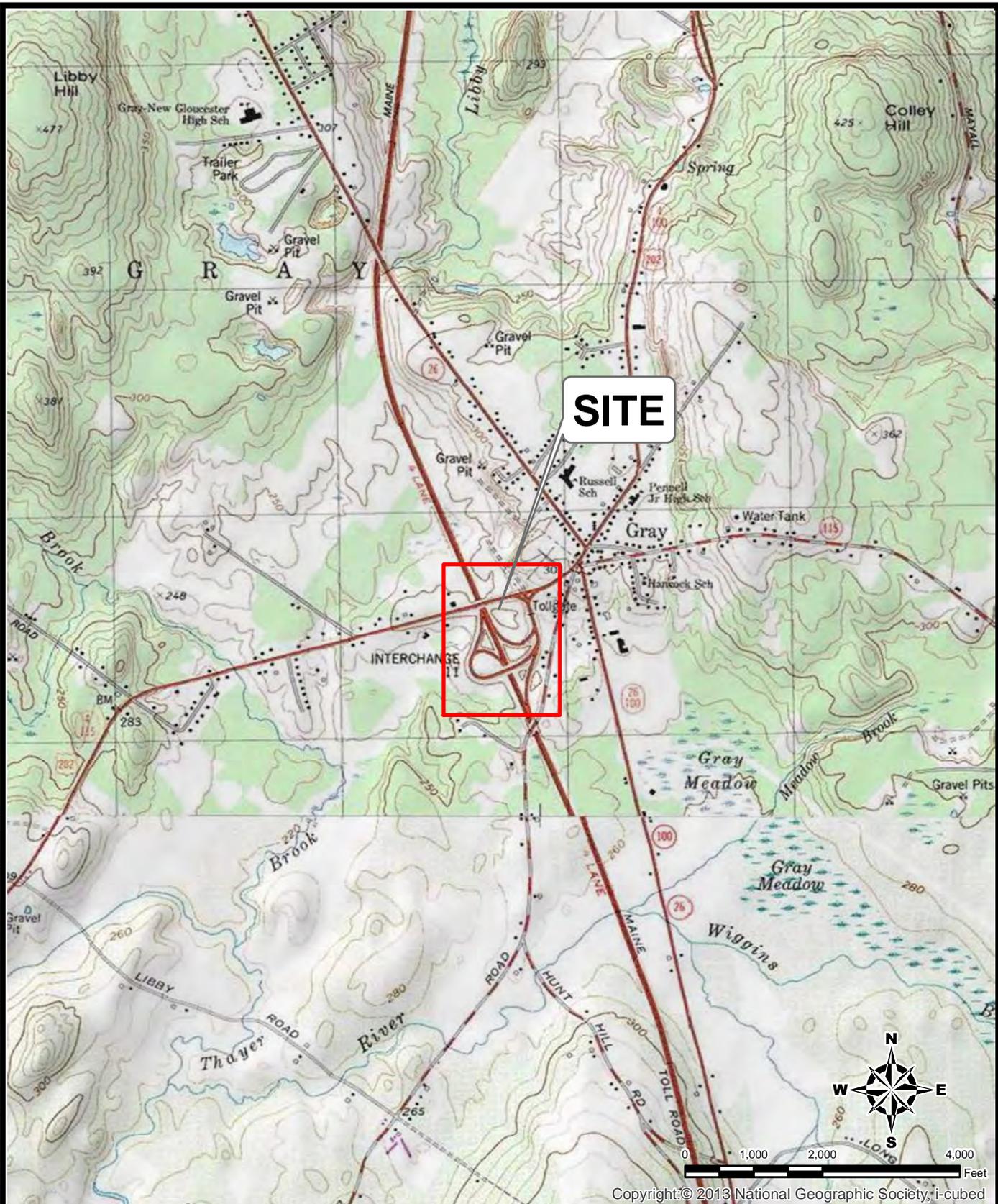
JRB/CLS/RJM:dim

C:\Users\jennifer.baron\Desktop\DRAFT 25829 Pavement Design Memo 01-21-15.docx

Attachments: Figure 1 – Locus Plan
Figures 2 – Boring Location Plan
Appendix A – Limitations
Appendix B – Park and Ride Lot Boring Logs (Preliminary)
Appendix C – Preliminary Park and Ride Lot Laboratory Testing Results

FIGURES

© 2014 - GZA GeoEnvironmental, Inc. C:\GIS\MTA\Exit 63\Figure 1 - Locus Plan.mxd, 12/31/2014, 2:24:05 PM, aimee.mountain



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SOURCE: THIS MAP CONTAINS THE ESRI ARCSIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCSIS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS

MAINE TURNPIKE EXIT 63 INTERCHANGE IMPROVEMENTS GRAY, MAINE	
LOCUS PLAN	

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: VHB	
PROJ MGR: JRB DESIGNED BY: JRB DATE: 12/31/2014	REVIEWED BY: CLS DRAWN BY: ADM PROJECT NO. 09.0025829.00	CHECKED BY: RJM SCALE: 1 in = 2,000 ft REVISION NO.	FIGURE 1

© 2013 - GZA GeoEnvironmental, Inc. GZA-P:\09 Jobs\0025829\09_0025829.00 - Gray Interchange\Figures-CAD\25829 Gray BLP.dwg [ANSI D - 34x22] January 22, 2015 - 10:20am evan.lonsdale



NOTES:

- 1) BASE MAP DEVELOPED FROM PLANS PROVIDED BY VHB, ENTITLED "Alignments.dgn", "Borings.dgn", "Contours.dgn", "Highway.dgn", "Text.dgn", "Topo.dgn", AND "VHB_WetlandEdges.dgn", DATED JANUARY 16, 2014.
- 2) THE LOCATION OF THE TEST BORINGS WERE DETERMINED BY SURVEY. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
- 3) TEST BORING GZ-103 WAS NOT DRILLED.

LEGEND:

 TEST BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF BROCKTON, MA ON NOVEMBER 6, 2014 AND OBSERVED BY GZA PERSONNEL.
 GZ-103



NO.	ISSUE/DESCRIPTION	BY	DATE
<small>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.</small>			
GRAY INTERCHANGE EXIT 63 GRAY, MAINE			
BORING LOCATION PLAN			
<small>PREPARED BY:</small>  GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		<small>PREPARED FOR:</small> VHB	
<small>PROJ MGR:</small> JB <small>DESIGNED BY:</small> ETL <small>DATE:</small> JANUARY 2015	<small>REVIEWED BY:</small> JB <small>DRAWN BY:</small> ETL <small>PROJECT NO.:</small> 09.0025829.00	<small>CHECKED BY:</small> JB <small>SCALE:</small> 1" = 30' <small>REVISION NO.:</small> --	<small>FIG OR DWG</small> 2 <small>SHEET NO. 1 OF XX</small>

APPENDICES

APPENDIX A

LIMITATIONS



GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions .
3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.
4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.
6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.
7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however

occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.
9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Cost Estimates

11. Unless otherwise stated, our cost estimates are only for comparative and general planning purposes. These estimates may involve approximate quantity evaluations. Note that these quantity estimates are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no control over either when the work will take place or the labor and material costs required to plan and execute the anticipated work, our cost estimates were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

Additional Services

12. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B

PARK AND RIDE LOT BORING LOGS (PRELIMINARY)

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-101
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 244
Final Boring Depth (ft.): 21
Date Start - Finish: 11/6/2014 - 11/6/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/6/14	1410	8.5'	20 min

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	14	1 1 7 10	8	S-1: Top 6": Topsoil. Bottom 8": Medium stiff, gray-brown, Clayey SILT, some fine to medium Sand. (ML)			0.5	TOPSOIL	243.5
		S-2	2.0-4.0	24	16	8 10 11 13	21	S-2: Very stiff, brown-gray, CLAY & SILT, trace Sand. (CL)				SILTY CLAY	
		S-3	4.0-6.0	24	20	2 3 6 6	9	S-3: Stiff, gray and brown, Silty CLAY, little fine Sand.			6		238.0
		S-4	9.0-11.0	24	20	1 1 2 2	3	S-4: Soft to medium stiff, gray, Silty CLAY, trace fine Sand. (CL)				SILTY CLAY	
		S-5	14.0-16.0	24	24	WOR		S-5: Soft to medium stiff, gray, Silty CLAY. (CL) Note: Approximately 1/8" seam of coarse to medium Sand at 15.0'.	1				
		S-6	19.0-21.0	24	3	WOR		S-6: Soft to medium stiff, gray, Silty CLAY, wet. (CL)			21		223.0
							End of exploration at 21 feet.						

REMARKS
 1 - Soil appeared very wet at top of 14.0' sample.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-101

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-102
SHEET: 1 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
HSA & Rod Probe

Boring Location: See Plan
Ground Surface Elev. (ft.): 242.5
Final Boring Depth (ft.): 82
Date Start - Finish: 11/6/2014 - 11/6/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/6/14	1230	11.5'	20 min

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5 10 15 20 25 30		S-1	0.0-2.0	24	14	1 1 1 5	2	S-1: Top 6": Very loose, dark brown, fine to medium SAND and Clayey Silt, with organic material (roots). (SM) Bottom 8": Gray, Silty CLAY, trace fine Sand. (CL)			0.5	TOPSOIL	242.0
		S-2	4.0-6.0	24	18	7 7 9 11	16	S-2: Very stiff, gray, Silty CLAY, trace fine Sand. (CL)			6	SILTY CLAY	236.5
		S-3	9.0-11.0	24	20	1 1 2 1	3	S-3: Soft to medium stiff, gray, Silty CLAY, wet. (CL)					
		S-4	14.0-16.0	24	24	1 1 WOH	1	S-4: Soft to medium stiff, gray, Silty CLAY, wet. (CL)					
		S-5	19.0-21.0	24	20	WOR		S-5: Soft to medium stiff, gray, Silty CLAY, wet. (CL)					
		S-6	24.0-26.0	24	6	WOR		S-6: Soft to medium stiff, gray, Silty CLAY, wet. (CL)					
		S-7	29.0-	24	10	WOR		S-7: Soft to medium stiff, gray, Silty CLAY, wet. (CL)					

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-102

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-102
SHEET: 3 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
HSA & Rod Probe

Boring Location: See Plan
Ground Surface Elev. (ft.): 242.5
Final Boring Depth (ft.): 82
Date Start - Finish: 11/6/2014 - 11/6/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/6/14	1230	11.5'	20 min

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
28												
11												
8												
9												
13												
65												
12												
11												
15												
18												
70												
15												
13												
13												
16												
75										75		167.5
20												
19												
21												
24												
80												
24												
20												
37												
							End of exploration at 82 feet.					
85												
90												

DRAFT

REMARKS
2 - No refusal.

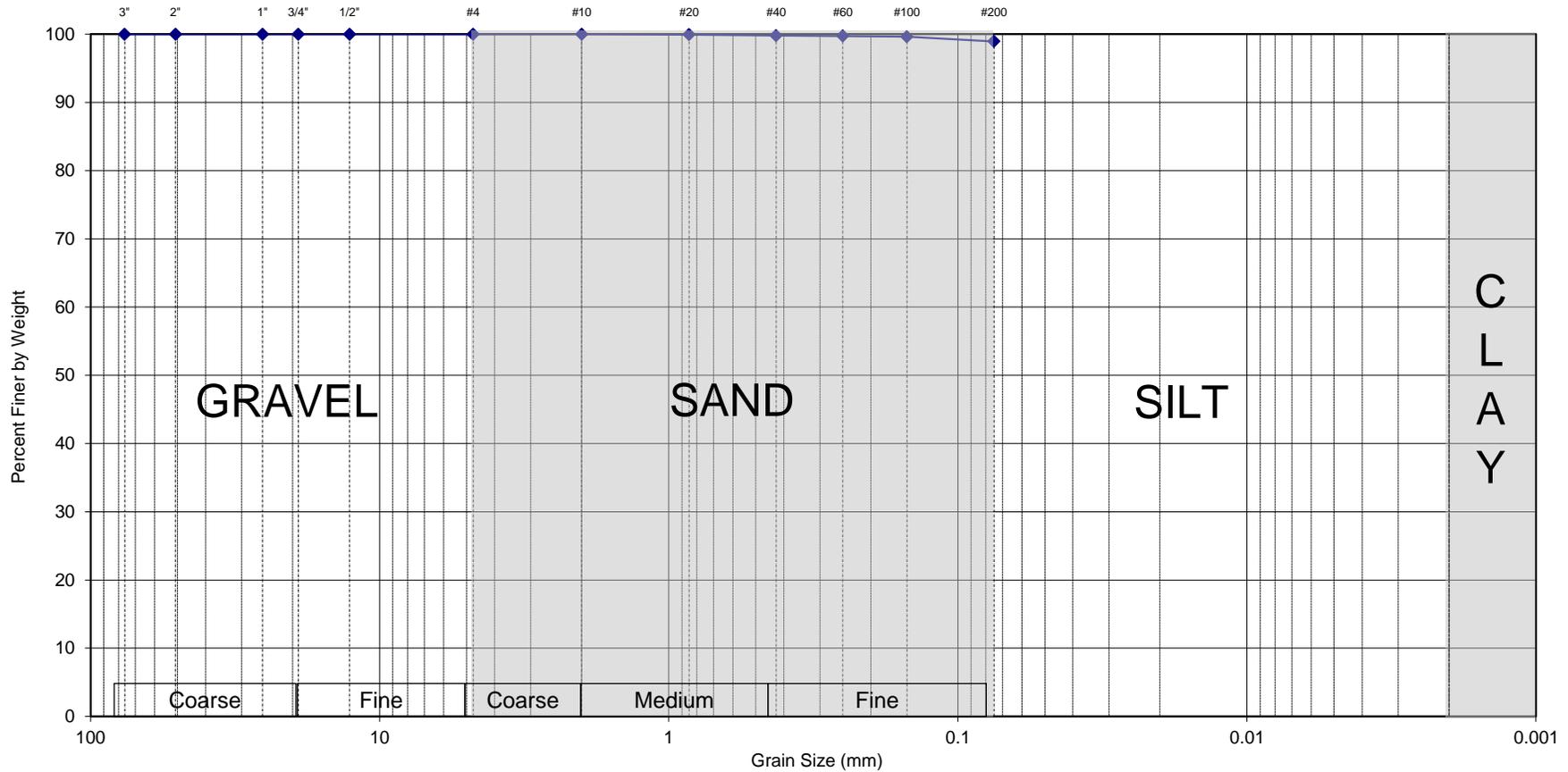
See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-102

APPENDIX C

PARK AND RIDE LOT PRELIMINARY LABORATORY TESTING RESULTS

U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
1.1%

Fines
98.9%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
32	GZ-101	S-2	2-4'	Gray-brown CLAY & SILT, trace Sand (CL)	27.6			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	100.0
#20	99.9
#40	99.8
#60	99.7
#100	99.6
#200	98.9

74-14-0003
Exit 63 Interchange
Gray, ME
GZA Project # 09.0025829.00
Tested by: LM Date: 12/17/14
Reviewed by: MBP Date: 12/24/14

THIELSCH
ENGINEERING
195 Frances Ave., Cranston, RI 02910
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APPENDIX C
TEST BORING LOGS

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-101
SHEET: 1 of 1
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 244
Final Boring Depth (ft.): 21
Date Start - Finish: 11/6/2014 - 11/6/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/6/14	1410	8.5'	20 min

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	14	1 1 7 10	8	S-1: Top 6": Topsoil. Bottom 8": Medium stiff, gray-brown, Clayey SILT, some fine to medium Sand. (ML)			0.5	TOPSOIL	243.5
		S-2	2.0-4.0	24	16	8 10 11 13	21	S-2: Very stiff, brown-gray, CLAY & SILT, trace Sand. (CL)				SILTY CLAY	
		S-3	4.0-6.0	24	20	2 3 6 6	9	S-3: Stiff, gray and brown, Silty CLAY, little fine Sand. (CL)			6		238.0
		S-4	9.0-11.0	24	20	1 1 2 2	3	S-4: Soft to medium stiff, gray, Silty CLAY, trace fine Sand. (CL)				SILTY CLAY	
		S-5	14.0-16.0	24	24	WOR		S-5: Soft to medium stiff, gray, Silty CLAY. (CL) Note: Approximately 1/8" seam of coarse to medium Sand at 15.0'.	1				
		S-6	19.0-21.0	24	3	WOR		S-6: Soft to medium stiff, gray, Silty CLAY, wet. (CL)			21		223.0
							End of exploration at 21 feet.	2					

REMARKS
1 - Soil appeared very wet at top of 14.0' sample.
2 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-101

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-102
SHEET: 3 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 HSA & Rod Probe

Boring Location: See Plan
Ground Surface Elev. (ft.): 242.5
Final Boring Depth (ft.): 82
Date Start - Finish: 11/6/2014 - 11/6/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/6/14	1230	11.5'	20 min

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
28												
11												
8												
9												
13												
65												
12												
11												
15												
18												
70												
15												
13												
13												
16												
75										75	POSSIBLE SAND OR SILTY CLAY	167.5
20												
19												
21												
24												
80												
24												
20												
37								2		82	POSSIBLE GLACIAL TILL	160.5
							End of exploration at 82 feet.					
85												
90												

REMARKS
 2 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-102

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-105
SHEET: 2 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 HSA & Rod Probe

Boring Location: See Plan
Ground Surface Elev. (ft.): 244.5
Final Boring Depth (ft.): 70
Date Start - Finish: 11/6/2014 - 11/6/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
	WOR											
	WOR											
	WOR											
	WOR											
	WOR											
35	WOR											
	WOR											
	WOR											
	WOR											
	WOR											
40	WOR											
	WOR											
	WOR											
	WOR											
	WOR											
45	WOR											
	WOR											
	WOR											
	WOR											
	WOR											
50	WOR											
	WOR											
	WOR											
	WOR											
	WOR											
55	WOR											
	WOR											
	WOR											
	WOR											
	WOR											
60	WOR											

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-105

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-105
SHEET: 3 of 3
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 HSA & Rod Probe

Boring Location: See Plan
Ground Surface Elev. (ft.): 244.5
Final Boring Depth (ft.): 70
Date Start - Finish: 11/6/2014 - 11/6/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
	WOR											
12								2		61		183.5
12										PROBABLE GLACIAL TILL		
15												
23												
27												
31												
28												
31												
50								3		70		174.5
70							End of exploration at 70 feet.					
75												
80												
85												
90												

REMARKS	2 - Transition to probable glacial till inferred based on rod probe resistance. 3 - No refusal.
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See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-105

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-106
SHEET: 1 of 4
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 246
Final Boring Depth (ft.): 109
Date Start - Finish: 11/20/2014 - 11/20/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
		S-1	1.0-3.0	24	18	14 21 19 18	40	S-1: Dense, brown, fine to coarse SAND and Gravel, trace Silt. (Road base) (SP)			0.3	ASPHALT	245.7
		S-2	3.0-5.0	24	15	9 7 9 10	16	S-2: Medium dense, brown, fine to medium SAND, little Silt. (SM)			3	FILL	243.0
5		S-3	5.0-7.0	24	20	10 8 5 6	13	S-3: Medium dense, brown/gray, fine to medium SAND and Silt. (SM)				SAND	
10		S-4	10.0-12.0	24	20	2 3 2 3	5	S-4: Medium stiff, gray, Silty CLAY, little fine Sand lenses. (CL)			9		237.0
15		S-5	13.5-15.5	24	24	WOR		S-5: Soft to medium stiff, gray, Silty CLAY. (CL)					
20		V-1	17.0-	7	0			V-1: Field Vane, $T_{raw} = 115$ in.-lbs ($S_u = 295$ psf)	1				
		V-2	17.6-18.0-18.6	7	0			V-2: Field Vane, $T_{raw} = 110/50$ in.-lbs ($S_u = 285/130$ psf)	2			SILTY CLAY	
		S-6	20.0-22.0	24	24	WOR		S-6: Soft to medium stiff, gray, Silty CLAY. (CL)					
25		S-7	25.0-27.0	24	24	WOR		S-7: Soft to medium stiff, gray, Silty CLAY. (CL)					
30		WOR							3		27	PROBABLE SILTY CLAY	219.0

REMARKS

1 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field vane tests. T_{raw} = measured torque, S_u = calculated undrained shear strength.
 2 - Vanes conducted with AW rods, no stabilizer to maintain elevation, rods dropped 4"-6" during tests, test interval likely disturbed.
 3 - Began rod probe at 27.0' bgs. Blows per foot to drive AW rod are recorded on log under casing blows.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-106

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-106
SHEET: 4 of 4
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 246
Final Boring Depth (ft.): 109
Date Start - Finish: 11/20/2014 - 11/20/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
28												
18												
21												
17												
16												
95												
16												
16												
19												
23												
100											PROBABLE SAND OR GLACIAL TILL	
18												
17												
15												
105												
18												
22												
15												
105												
19												
18												
19												
18								4		109		137.0
110							End of exploration at 109 feet.					
115												
120												

REMARKS
 4 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-106

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-108
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 246
Final Boring Depth (ft.): 12
Date Start - Finish: 11/7/2014 - 11/7/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	10	1 4 6 4	10	S-1: Medium dense, gray and brown, SILT & CLAY, some fine Sand, trace roots and grass. (ML)			2	TOPSOIL	244.0
		S-2	4.0-6.0	24	22	5 8 10 12	18	S-2: Very stiff, gray, CLAY & SILT, trace fine Sand. (CL)				CLAY & SILT	
		S-3	10.0-12.0	24	6	2 3 3 4	6	S-3: Medium stiff, gray, CLAY & SILT, trace fine Sand. (CL)	1		12		234.0
								End of exploration at 12 feet.	2				
10													
15													
20													
25													
30													

REMARKS
 1 - Appears wet at 9.0'.
 2 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-108

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-109
SHEET: 1 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 242
Final Boring Depth (ft.): 33
Date Start - Finish: 12/2/2014 - 12/2/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Groundwater Depth (ft.)		
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)					Depth (ft.)	Stratum Description Elev. (ft.)	
5		S-1	0.0-2.0	24	15	2 15 25 15	40	S-1: Top 6": Topsoil. Bottom 9": Dense, medium to coarse SAND and Gravel. (SP)			0.5	TOPSOIL 241.5	
		S-2	2.0-4.0	24	17	11 14 13 11	27	S-2: Medium dense, gray, fine to medium SAND, trace Silt. (SP)				SAND	
		S-3	4.0-6.0	24	24	5 7 8 10	15	S-3: Top 12": Medium dense, gray, fine to medium SAND, trace Silt. Bottom 12": Stiff, gray, Silty CLAY. (CL)			5	237.0	
		S-4	10.0-12.0	24	24	4 4 5 4	9	S-4: Stiff, gray, Silty CLAY. (CL)					
		S-5	15.0-17.0	24	18	4 2 1 WOR	3	S-5: Soft to medium stiff, gray, Silty CLAY, some fine to medium Sand. (CL)				SILTY CLAY	
		S-6	20.0-22.0	24	24	WOR/24"			S-6: Soft to medium stiff, gray, Silty CLAY. (CL)				
		S-7	25.0-	24	24				S-7: Gray, Silty CLAY. (CL)				
	V-1	27.0	7					V-1: Field Vane, $T_{raw} = 70/30$ in.-lbs ($S_u = 180/75$ psf)			27	215.0	
	V-2	25.4-26.0-26.4-27.0	7					V-2: Field Vane, $T_{raw} = 290/55$ in.-lbs ($S_u = 750/140$ psf)	1 2			POSSIBLE GLACIAL TILL	
											29.5	212.5	
												WEATHERED ROCK	

REMARKS
1 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field vane tests. T_{raw} = measured torque, S_u = calculated undrained shear strength.
2 - Medium to coarse Sand with Gravel in tip of spoon.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-109

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-109
SHEET: 2 of 2
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 242
Final Boring Depth (ft.): 33
Date Start - Finish: 12/2/2014 - 12/2/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)	
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
									3			WEATHERED ROCK		
									4		33		209.0	
35								End of exploration at 33 feet.						
40												POSSIBLE BEDROCK		
45														
50														
55														
60														

REMARKS

3 - Possible weathered rock based on increased drilling resistance and observations of wash return.
 4 - Roller bit refusal, possible top of bedrock.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-109

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-111
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 245
Final Boring Depth (ft.): 12
Date Start - Finish: 11/7/2014 - 11/7/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/7/14	1145	7.4'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	24	2 4 2 6	6	S-1: Top 12": Medium stiff, gray and black, SILT & CLAY, some fine Sand, trace roots and organics. (ML) Bottom 12": Medium stiff, gray and brown, CLAY & SILT, some fine Sand. (CL)			1	TOPSOIL	244.0
		S-2	5.0-7.0	24	15	4 4 6 6	10	S-2: Stiff, gray, CLAY & SILT, trace fine Sand. (CL)				CLAY & SILT	
		S-3	10.0-12.0	24	20	2 2 3 3	5	S-3: Medium stiff, gray, CLAY & SILT, little fine Sand. (CL)			12		233.0
								End of exploration at 12 feet.	1				

REMARKS
 1 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-111

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-112
SHEET: 2 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 247.5
Final Boring Depth (ft.): 38.6
Date Start - Finish: 11/14/2014 - 11/14/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/14/14	0730	6.2'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
10												
7												
21												
26												
35												
40												
54												
37												
18												
20								4		38.6		208.9
40	30/0"						End of exploration at 38.6 feet.					
45												
50												
55												
60												

REMARKS
 4 - Rod probe refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-112

TEST BORING LOG



Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-114
SHEET: 1 of 3
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 250
Final Boring Depth (ft.): 76.5
Date Start - Finish: 11/26/2014 - 12/1/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/25/14	1040	4.5	0
12/5/14	1230	4.0	10 days

Depth (ft)	Casing Blows/ Core Rate	Sample				SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description	Elev. (ft.)	Equipment Installed
		No.	Depth (ft.)	Pen. (in)	Rec. (in)							
0-3.0	VAC						: Brown, medium to coarse SAND and Gravel. (Topsoil) (SP)	1		247.0	Road Box Filter Sand 2" ID Solid Sch 40 PVC Well Riser 2' 4' 5' 2" ID Slotted Sch 40 PVC Well Screen (0.01" Slot)	
3.0-10.0	VAC						: Brown, medium to coarse SAND, some Gravel. (SP)				FILL	
10.0-12.0	S-1		24	23	1 3 9 2	12	S-1 : Stiff, gray, Silty CLAY. (CL)			240.0		
15.0-17.0	S-2		24	24	WOR/24"		S-2 : Soft, gray, Silty CLAY. (CL)				Filter Sand	
20.0-22.0	S-3		24	24			S-3 : Soft, gray, Silty CLAY. (CL)	2			20'	
22.0-21.0	V-1		7				V-1 : Field Vane, $T_{raw} = 125/55$ in.-lbs (Su = 320/140 psf)					
21.0-22.0	V-2		7				V-2 : Field Vane, $T_{raw} = 120/40$ in.-lbs (Su = 310/100 psf)					

REMARKS
1 - Vacuum excavation 0'-10.0' bgs. Descriptions from cutting and sidewall observations.
2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field vane tests. T_{raw} = measured torque, Su = calculated undrained shear strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-114

GZA TEMPLATE TEST BORING W/ EQUIP.; 2/18/2015; 4:07:17 PM

TEST BORING LOG



Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-114
SHEET: 2 of 3
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 250
Final Boring Depth (ft.): 76.5
Date Start - Finish: 11/26/2014 - 12/1/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/25/14	1040	4.5	0
12/5/14	1230	4.0	10 days

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description Modified Burmister	Remark	Field Test Data	Stratum		Equipment Installed
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)				SPT Value	Depth (ft.)	
35		U-1	30.0-32.0	24	24							
		S-4	32.0	24	24		S-4 : Soft, gray, CLAY. (CL)					
		V-3	34.0	7			V-3 : Field Vane, T _{raw} = 70/20					
		V-4	32.4-33.0 33.4-34.0	7			V-4 : Field Vane, T _{raw} = 115/55 in.-lbs (Su = 295/140 psf)					
40		S-5	40.0	24	24		S-5 : Soft to medium stiff, gray, CLAY & SILT. (CL)			CLAY & SILT		
		V-5	42.0	7			V-5 : Field Vane, T _{raw} = 180/25					
		V-6	40.4-41.0 41.4-42.0	7			V-6 : Field Vane, T _{raw} = 265/60 in.-lbs (Su = 685/155 psf)					
50		S-6	50.0-52.0	24	19	7 14 15 14	S-6 : Medium dense, brown, fine to medium SAND, some Silt, wet. (SM)			50.5 199.5		
		S-7	55.0-57.0	24	18	10 13 19 18	S-7 : Dense, brown, fine to medium SAND, trace Silt, wet. (SM)			SAND		
60												

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-114

TEST BORING LOG



Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-114
SHEET: 3 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 250
Final Boring Depth (ft.): 76.5
Date Start - Finish: 11/26/2014 - 12/1/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/25/14	1040	4.5	0
12/5/14	1230	4.0	10 days

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum		Equipment Installed
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)					Depth (ft.)	Elev. (ft.)	
65		S-8	60.0-62.0	24	16	11 16 20 16	36	S-8 : Dense, brown, fine to medium SAND, trace Silt, wet. (SM)			SAND		
		S-9	65.0-67.0	24	24	9 4 7 8	11	S-9 : Stiff, gray, Silty CLAY, little fine to medium, Silty Sand. (CL)			SILTY CLAY	65 ----- 185.0	
		S-10	70.0-72.0	24	24	19 20 18 13	38	S-10 : Dense, brown, fine to medium SAND, trace Silt, wet. (SM)			SAND	70 ----- 180.0	
		S-11	75.0-76.5	18	14	49 63 108	R	S-11 : Very dense, gray-brown, fine to coarse SAND, some Gravel, little Silt, wet. (SM)			GLACIAL TILL	75 ----- 175.0 76.5 ----- 173.5	
80								Split spoon refusal. End of exploration at 76.5 feet.					

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-114

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-115
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
 SSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 271.5
Final Boring Depth (ft.): 12
Date Start - Finish: 11/19/2014 - 11/19/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	5	1 4 3 2	7	S-1: Loose, dark brown, fine to medium SAND, some Silt, roots and grass. (SM)			2	TOPSOIL	269.5
		S-2	2.0-4.0	24	9	2 4 7 8	11	S-2: Medium dense, light brown, medium to coarse SAND, some Gravel, trace Silt. (SP)				FILL	
		S-3	4.0-6.0	24	10	6 4 3 5	7	S-3: Loose, light brown, medium to coarse SAND, some Gravel, trace Silt. (SP)			6	FILL	265.5
		S-4	10.0-12.0	24	10	4 6 8 6	14	S-4: Top 12": Medium dense, brown, fine to medium SAND, some Clayey Silt. (SM) Bottom 12": Stiff, gray, CLAY & SILT, trace fine Sand. (CL)	1		11	SAND	260.5
								End of exploration at 12 feet.			12	CLAY & SILT	259.5

REMARKS
 1 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-115

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-116
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
SSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 272
Final Boring Depth (ft.): 12
Date Start - Finish: 11/20/2014 - 11/20/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	10	5 9 13 18	22	S-1: Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt. (SW-SM)			0.3	TOPSOIL	271.7
		S-2	2.0-4.0	24	6	11 17 18 6	35	S-2: Dense, brown, fine to coarse SAND, some Gravel, trace Silt. (SW-SM)					
		S-3	4.0-6.0	24	0	5 4 5 5	9	S-3: No recovery.					
		S-4	10.0-12.0	24	8	5 4 3 9	7	S-4: Loose, brown, fine to coarse SAND, some Gravel, trace Silt. (SW-SM)	1		12		260.0
								End of exploration at 12 feet.					

REMARKS
1 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-116

TEST BORING LOG



GZA
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Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-117
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
 SSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 273
Final Boring Depth (ft.): 12
Date Start - Finish: 11/21/2014 - 11/21/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/21/14	0935	NE	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	14	20 16 12 10	28	S-1: Medium dense, brown, medium to coarse SAND and Gravel, trace Silt. (SP)			0.2	TOPSOIL	272.8
		S-2	2.0-4.0	24	10	7 11 9 7	20	S-2: Medium dense, brown, medium to coarse SAND and Gravel, trace Silt. (SP)				FILL	
		S-3	4.0-6.0	24	8	8 5 4 3	9	S-3: Loose, brown, medium to coarse SAND and Gravel, trace Silt. (SP)			6		267.0
		S-4	10.0-12.0	24	16	2 4 8 9	12	S-4: Stiff, gray, Silty CLAY, trace fine Sand lenses. (CL)	1		12		261.0
								End of exploration at 12 feet.					

REMARKS
 1 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-117

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-118
SHEET: 1 of 1
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
 SSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 273
Final Boring Depth (ft.): 12
Date Start - Finish: 11/21/2014 - 11/21/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	11	2 4 7 8	11	S-1: Medium dense, brown, fine to coarse SAND, some Gravel, little Silt, trace leaves, roots. (SW-SM)					
		S-2	2.0-4.0	24	9	8 5 3 3	8	S-2: Loose, brown, fine to coarse SAND, some Gravel, trace Silt, trace roots. (SW-SM)			4	FILL	269.0
		S-3	4.0-6.0	24	8	3 4 4 3	8	S-3: Loose, brown/gray, fine to medium SAND, some Clayey Silt. (SM)			6	SAND	267.0
		S-4	10.0-12.0	24	24	5 5 7 9	12	S-4: Stiff, gray, CLAY & SILT, trace fine Sand. (CL)	1		12	CLAY & SILT	261.0
								End of exploration at 12 feet.					

REMARKS
 1 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-118

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-119
SHEET: 1 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 263
Final Boring Depth (ft.): 57.5
Date Start - Finish: 12/5/2014 - 12/5/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/8/14	1545	11.0'	0
3/17/15		8.9	3 months

Depth (ft)	Casing Blows/ Core Rate	Sample						Sample Description Modified Burmister	Remark	Field Test Data	Stratum		Equipment Installed
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value				Depth (ft.)	Elev. (ft.)	
5		S-1	0.0-2.0	24	2	4 5 7 14	12	S-1 : Medium dense, brown, fine to coarse SAND, little Gravel. (SW)	1		FILL	Stand Pipe Bentonite 2" ID Solid Sch 40 PVC Well Riser 4' 5' 2" ID Slotted SLD 40 PVC Well Screen (0.01" Slot) Filter Sand 20'	
		S-2	2.0-4.0	24	10	19 26 36 35	62						S-2 : Very dense, brown, fine to coarse SAND, little Gravel, trace Silt. (SW-SM)
		S-3	4.0-6.0	24	15	31 40 36 26	76	S-3 : Very dense, brown, fine to coarse SAND, little Gravel, trace Silt. (SW-SM)					
		S-4	10.0-12.0	24	13	19 20 25 11	45	S-4 : Dense, brown, fine to coarse SAND, little Gravel, trace Silt. (SW-SM)					
		S-5	15.0-17.0	24	20	4 3 2 2	5	S-5 : Top 15": Loose, brown, fine to coarse SAND. (SW) Bottom 5": Gray, Silty CLAY. (CL)					
		S-6	20.0-22.0	24	13	1 2 2 2	4	S-6 : Soft to medium stiff, gray, Silty CLAY, seams of fine to medium Sand. (CL)					
		S-7	25.0-27.0	24	11	7 3 5 3	8	S-7 : Loose, brown, fine to medium SAND, wet. (SP)					
16.3										246.7			
25											SILTY CLAY		
27											SAND		
											SILTY CLAY		

REMARKS
1 - Top of Well Standpipe is 3' above ground surface. Top of PVC well riser is 2.5' above ground surface.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-119

GZA TEMPLATE TEST BORING W/ EQUIP.; 12/7/2015; 1:32:46 PM

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-119
SHEET: 2 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 263
Final Boring Depth (ft.): 57.5
Date Start - Finish: 12/5/2014 - 12/5/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/8/14	1545	11.0'	0
3/17/15		8.9	3 months

Depth (ft)	Casing Blows/ Core Rate	Sample						Sample Description Modified Burmister	Remark	Field Test Data	Stratum		Equipment Installed
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value				Depth (ft.)	Description Elev. (ft.)	
35		S-8	30.0-32.0	24	20	3 3 1 6	4	S-8 : Soft to medium stiff, gray, Silty CLAY, seams of fine to medium Sand. (CL)			SILTY CLAY		
40		S-9	35.0-37.0	24	24	1 1 1 2	2	S-9 : Loose, brown, fine to medium SAND, trace Silt, wet. (SP-SM)			SAND		
45		S-10	40.0-42.0	24	14	5 5 4 4	9	S-10 : Loose, brown, fine to medium SAND, trace Clay, wet. 1" clay seam. (SP-SC)	2		GLACIAL TILL		
50		S-11	47.0-48.3	15	12	14 16 100/3"	R	S-11 : Very dense, brown, fine to coarse SAND and Gravel, trace Silt. (SW-SM)	3		POSSIBLE BEDROCK		
55								End of exploration at 57.5 feet.	4				
60													

REMARKS
2 - Drilling effort increased at 43.0' bgs. Possible top of glacial till.
3 - Casing refusal at 48.5' bgs.
4 - Advanced roller bit with consistent resistance from 50.0' - 57.5' bgs when truck ran out of water. Possible bedrock at 50.0' bgs.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-119

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-120
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 252
Final Boring Depth (ft.): 28.3
Date Start - Finish: 11/13/2014 - 11/13/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample						Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value						
5		S-1	0.0-2.0	24	14	1 3 5 5	8	S-1: Top 3": Topsoil. Middle 9": Stiff, gray, SILT & CLAY, little fine to coarse Sand, trace roots. (ML)			0.3	TOPSOIL	251.7
		S-2	2.0-4.0	24	17	5 5 6 7	11	Bottom 2": Loose, brown, fine to coarse SAND, little Silt, trace Gravel. (SM)			2	FILL	250.0
		S-3	4.0-6.0	24	12	7 8 8 8	16	S-2: Stiff, gray, CLAY & SILT, little fine to coarse Sand. (CL) S-3: Very stiff, gray, Silty CLAY, trace fine to coarse Sand, trace Gravel. (CL)					
10	6	S-4	10.0-12.0	24	20	2 3 3 7	6	S-4: Medium stiff, gray to dark brown, CLAY & SILT, trace fine Sand, trace root fibers. (CL)			12		240.0
15		S-5	15.0-17.0	24	16	5 18 18 27	36	S-5: Dense, brown, fine to coarse SAND, some Gravel, little Silt. (SM)					
20		S-6	20.0-22.0	24	10	13 12 11 9	23	S-6: Medium dense, gray, fine to coarse SAND, some Gravel, trace Silt. (SM)					
25		S-7	25.0-27.0	24	8	17 14 8 6	22	S-7: Medium dense, gray to brown, fine to coarse SAND and Gravel, trace Silt. (SM)					
30								End of exploration at 28.3 feet.	1		27.7 28.3		224.3 223.7
												POSSIBLE BOULDER OR BEDROCK	

REMARKS
1 - Roller bit refusal at 28.3' bgs, probably boulder or bedrock.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-120

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-120A
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 257.5
Final Boring Depth (ft.): 30
Date Start - Finish: 11/13/2014 - 11/13/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/13/14	1030	10.9'	20 min

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
		S-1	0.0-2.0	24	18	1 1 7 7	8	S-1: Loose, gray-brown, fine to coarse SAND, some Silt, little Gravel. (SM)			0.3	TOPSOIL	257.2
		S-2	2.0-4.0	24	17	7 7 6 4	13	S-2: Top 12": Medium dense, fine to coarse SAND, little Silt. (SM) Bottom 5": Stiff, gray, CLAY & SILT, some fine to medium Sand. (Possible Reworked Material) (CL)			3	FILL	254.5
5		S-3	4.0-6.0	24	10	3 3 4 6	7	S-3: Medium stiff, gray, CLAY & SILT, trace Sand. (Possible Reworked Material) (CL)				POSSIBLE FILL	
10	20	S-4	10.0-12.0	24	10	1 6 7 7	13	S-4: Top 8": Stiff, gray, CLAY & SILT, little fine Sand. (Possible Reworked Material) (CL) Bottom 2": Medium dense, brown, fine SAND, little Silt. (SM)			10.7	SAND	246.8
15	25	S-5	15.0-17.0	24	17	5 4 3 10	7	S-5: Medium stiff, gray, SILT & CLAY, trace fine Sand. (CL)	1		15	SILT & CLAY	242.5
20	36	S-6	20.0-22.0	24	9	15 24 17 16	41	S-6: Dense, brown, fine to coarse SAND, some Gravel, little Silt. (SM)			20	GLACIAL TILL	237.5
25	63	S-7	25.0-26.9	22	8	11 15 38 26/4"	53	S-7: Very dense, brown, fine to coarse SAND, some Gravel, little Silt. (SM)					
30								End of exploration at 30 feet.	3		30		227.5

REMARKS

1 - Drilling resistance change at 15.0' bgs indicated possible top of Silt & Clay.
2 - Rod was bouncing, split spoon refusal at 26.9' bgs.
3 - Roller bit refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-120A

TEST BORING LOG



Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-121
SHEET: 1 of 1
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 251
Final Boring Depth (ft.): 12
Date Start - Finish: 12/2/2014 - 12/2/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/5/14	1240	Dry	3 days

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description	Elev. (ft.)	Equipment Installed	
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
5		S-1	0.0-2.0	24	12	2 2 3 6	5	S-1 : Topsoil.	1		TOPSOIL	248.5	← Stand Pipe	
		S-2	2.0-4.0	24	18	6 8 8 8	16	S-2 : Very stiff, gray, Silty CLAY, some fine to medium Sand. (CL)			2.5		248.5	
		S-3	4.0-6.0	24	24	10 13 16 16	29	S-3 : Very stiff, gray, Silty CLAY, trace fine to medium Sand. (CL)						← Filter Sand
		S-4	10.0-12.0	24	20	6 23 44 42	67	S-4 : Top 14": Dense, brown, fine to medium SAND and Gravel, trace Silt. (SM) Bottom 6": Rock fragments.			10		241.0	← 10'
10								End of exploration at 12 feet.			GLACIAL TILL	239.5		
											POSSIBLE BOULDER OR WEATHERED ROCK	239.0		
15														
20														
25														
30														

REMARKS
1 - Top of Well Standpipe is 2.6' above ground surface. Top of PVC well riser is 2.1' above ground surface.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

**Exploration No.:
GZ-121**

GZA TEMPLATE TEST BORING W/ EQUIP.; 2/18/2015; 4:07:19 PM

TEST BORING LOG



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Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-122
SHEET: 1 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
SSA/Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 241.5
Final Boring Depth (ft.): 39.5
Date Start - Finish: 11/11/2014 - 11/11/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/11/14		4.5'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	12	1 1 2 6	3	S-1: Very loose, brown, fine SAND, little Silt, trace roots. (SM)			0.2	TOPSOIL	241.3
		S-2	2.0-4.0	24	17	6 9 9 7	18	S-2: Medium dense, brown and gray, fine SAND, little Silt. (SM)			4	SAND	237.5
		S-3	4.0-6.0	24	15	6 6 7 4	13	S-3: Stiff, brown, SILT, some fine Sand. (ML)			8	SILT	233.5
		S-4	10.0-12.0	24	10	7 5 8 11	13	S-4: Medium dense, gray, fine to coarse SAND, some Gravel, little Silt. (SM)				GLACIAL TILL	
		S-5	15.0-17.0	24	8	30 13 9 10	22	S-5: Medium dense, gray, fine to coarse SAND, some Gravel, little Silt. (SM)					
		S-6	20.0-22.0	24	3	22 21 17 16	38	S-6: Dense, black and gray, GRAVEL, some coarse Sand, little Silt. (GM)			20	POSSIBLE WEATHERED ROCK	221.5
		S-7	25.0-26.3	15	10	34 91 100/3"	R	S-7: Very dense, gray-brown, GRAVEL and fine to coarse Sand, little Silt. (Weathered Rock) (GP-GM)			26.3		215.2
	55	C-1	26.5-31.5	60	50	RQD = 58%		C-1: Gray, medium to hard, slightly weathered, fine grained, GRANITE. Joints are very close to moderately close, moderately dipping, undulating, rough, discolored, moderately open.	1			BEDROCK	

REMARKS
1 - Advanced casing to 26.5' bgs and began coring.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-122

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-122
SHEET: 2 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 SSA/Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 241.5
Final Boring Depth (ft.): 39.5
Date Start - Finish: 11/11/2014 - 11/11/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/11/14		4.5'	0

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample				SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Groundwater Depth (ft.)	
			Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)					Depth (ft.)	Stratum Description
49		C-2	31.5-	36	30.5	RQD = 17%	C-2: Gray, medium to hard, slightly weathered, fine grained, GRANITE. Joints are very close to close, moderately dipping, undulating, rough, discolored, partially open to open. C-3: Gray, hard, slightly weathered, fine grained, GRANITE. Joints are close to wide, moderately dipping, undulating, rough, discolored, partially open.					
10			34.5									
62												
35		C-3	34.5-	60	60	RQD = 85%						
50			39.5									
42												
47												
46												
47												
40								End of exploration at 39.5 feet.				39.5
45												
50												
55												
60												

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-122

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-123
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 245
Final Boring Depth (ft.): 10
Date Start - Finish: 11/11/2014 - 11/11/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/11/14	0700	6.7'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)	
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							SPT Value
5		S-1	0.0-2.0	24	10	1 1 3 8	4	S-1: Loose, brown and gray, fine to medium SAND, little Silt, trace Gravel, with roots in top 4". (SM)			0.3	TOPSOIL	244.7
		S-2	2.0-3.3	15	12	11 44 50/3"	R	S-2: Very dense, gray, fine to medium SAND, some Gravel, little Silt. (SM)				GLACIAL TILL	
		S-3	4.0-6.0	24	15	28 22 22 35	44	S-3: Dense, brown and gray, fine to coarse SAND and Gravel, trace Silt. (SM)					
10									1 2	8 10	----- -----	237.0 235.0	POSSIBLE BOULDER OR BEDROCK
								End of exploration at 10 feet.					

REMARKS

1 - Advanced roller bit through increased resistance from 8.0'-10.0' bgs (possible boulder or bedrock).
 2 - Auger refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-123

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-124
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 246.5
Final Boring Depth (ft.): 26.7
Date Start - Finish: 11/11/2014 - 11/11/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/11/14	0640	8.3'	12 hrs

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	6	1 1 1 1	2	S-1: Very loose, dark brown, fine to medium SAND, little Silt, trace roots. (SM)			0.3	TOPSOIL	246.2
		S-2	2.0-4.0	24	19	1 2 3 7	5	S-2: Loose, brown, fine SAND and Silty Clay. (SM)			4	SAND	242.5
		S-3	4.0-6.0	24	18	5 5 8 10	13	S-3: Stiff, gray/brown, CLAY & SILT, trace fine Sand. (CL)				SILTY CLAY	
10	17	S-4	10.0-12.0	24	10	15 20	49	S-4: Top 12": Very stiff, gray, Silty CLAY and fine to coarse SAND, little Gravel. (CL) Bottom 12": Very dense, gray to black, fine to coarse SAND and Gravel, little Silt. (SM)			11	GLACIAL TILL	235.5
	27					29 24							
15	83	S-5	15.0-17.0	24	12	16 25	62	S-5: Very dense, gray-brown, GRAVEL and fine to coarse Sand, some Silt. (Weathered Rock) (GM)			15	WEATHERED ROCK	231.5
	65					37 33							
20	84	S-6	20.0-21.2	14	8	49 62	R	S-6: Very dense, gray, fine to coarse SAND, some Gravel, little Silt. (Weathered Rock) Split spoon refusal. (SM)			21.2	BEDROCK	225.3
						53/2"							
25		C-1	21.7-26.7	60	56	RQD = 68%		C-1: Gray, moderately hard to hard, fresh, medium grained GRANITE. Joints are fresh, high angle.			26.7		219.8
30								End of exploration at 26.7 feet.					

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-124

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
 Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-126
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 246.5
Final Boring Depth (ft.): 19.5
Date Start - Finish: 11/10/2014 - 11/10/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/10/14		8.2'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	10	1 1 1 5	2	S-1: Top 6": Topsoil. Bottom 4": Loose, brown, fine SAND, some Silt, trace roots, leaves. (SM)			0.5	TOPSOIL	246.0
		S-2	2.0-4.0	24	14	4 10 12 12	22	S-2: Dense, brown, fine SAND, little Silt (seams, lenses). (SM)			4	SAND	242.5
		S-3	4.0-6.0	24	18	7 6 8 8	14	S-3: Stiff, gray-brown, CLAY & SILT, trace fine Sand. (CL)				CLAY & SILT	
10	10	S-4	10.0-12.0	24	12	WOH 1 1 8	2	S-4: Soft to medium stiff, gray-brown, CLAY & SILT, little fine Sand. (CL)	1		11.5		235.0
15	59/6"	S-5	15.0-17.0	24	10	11 9 9 17	18	S-5: Medium dense, gray, fine to medium SAND, some Gravel, little Silt. (SM)	2 3		19.5	GLACIAL TILL	227.0
20	30/1"							End of exploration at 19.5 feet.					
25													
30													

REMARKS

- 1 - Top of Glacial Till strata inferred from drilling behavior and observations of washwater. Coarse Sand to fine Gravel encountered at 11.5', mixed with Clay & Silt.
- 2 - Advanced roller bit from 18.2'-19.5' bgs with significant resistance (possible weathered rock).
- 3 - Roller bit refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-126

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-127
SHEET: 1 of 1
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 259
Final Boring Depth (ft.): 15
Date Start - Finish: 11/13/2014 - 11/13/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/13/14	0657	3.5'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	12	1 3 7 8	10	S-1: Loose, brown, fine SAND, trace Silt, trace roots.			0.3	TOPSOIL	258.7
		S-2	2.0-4.0	24	17	10 6 8 9	14	S-2: Medium dense, brown, fine SAND, little Silt. (SM)				SAND	
		S-3	4.0-6.0	24	22	10 10 7 7	17	S-3: Medium dense, brown, fine SAND, some Silt. (SM)					
		S-4	10.0-12.0	24	16	11 7 8 15	15	S-4: Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt. (SM)			6.5		252.5
15	60/6"							End of exploration at 15 feet.	2		15		244.0
20													
25													
30													

REMARKS

1 - Based on drilling behavior, gravel was encountered at approximately 6.5' bgs.
 2 - Casing refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-127

GZA TEMPLATE TEST BORING, 2/18/2015, 4:08:07 PM

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-127A
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 257
Final Boring Depth (ft.): 11.9
Date Start - Finish: 11/18/2014 - 11/18/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)	
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
5		S-1	0.6-2.6	24	10	10 15 17 21	32	S-1: Dense, brown, medium to coarse SAND, some Gravel, trace Silt. (Road base) (SP-SM)	1		0.6	ASPHALT	256.4	
		S-2	2.6-4.6	24	12	21 32 70 80	>100	S-2: Very dense, brown, medium to coarse SAND, some Gravel, trace Silt. (Road base) (SP-SM)						
		S-3	4.6-5.2	7	7	60 50/1"	R	S-3: Very dense, brown, fine to coarse SAND, little Gravel, trace Silt, wet. (SP-SM)				4.6		252.4
		S-4	10.0-11.9	21	13	23 17 25 50/3"	42	S-4: Dense, brown, fine to coarse SAND, some Silt, little Gravel. (SM) Split spoon refusal.				7	COBBLE / BOULDER	250.0
								End of exploration at 11.9 feet.			11.9	GLACIAL TILL	245.1	
												POSSIBLE BEDROCK OR BOULDER		

REMARKS
 1 - Roller bit to 6.3' bgs, could not seat casing, switched back to augers. Ground through boulder to approximately 7.0' bgs and continued advancing borehole with casing.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-127A

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-128
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
SSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 259
Final Boring Depth (ft.): 13.3
Date Start - Finish: 11/19/2014 - 11/19/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/19/14	1100	7.0'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.5-2.5	24	14	12 13 11 12	24	S-1: Medium dense, brown, medium to coarse SAND, little Gravel, trace Silt. (Road base) (SP-SM)			0.5	ASPHALT	258.5
		S-2	2.5-4.5	24	17	14 18 21 22	39	S-2: Dense, brown, fine to coarse SAND, little Gravel, trace Silt. (SM)				FILL	
		S-3	4.5-6.5	24	18	32 22 15 13	37	S-3: Top 12": Dense, brown, medium to coarse SAND and Gravel, trace Silt. (SP-SM) Bottom 6": Very stiff, Silty CLAY, trace fine Sand, trace root fibers. (CL)			5.5		253.5
		S-4	10.0-12.0	24	15	23 20 43 30	63	S-4: Top 9": Dense, gray, fine to coarse SAND and Gravel, little Silt. (SM) Bottom 6": Very dense, brown and black, GRAVEL, some medium to coarse Sand, trace Silt. (GM)	1 2		10		249.0
										11.5	GLACIAL TILL	247.5	
										12.3	WEATHERED BEDROCK	246.7	
										13.3	POSSIBLE BEDROCK	245.7	
15								End of exploration at 13.3 feet.					
20													
25													
30													

REMARKS
1 - Auger advancing slowly with significant resistance from 12.3'-13.3' bgs, auger refusal at 13.3' bgs.
2 - Auger refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-128

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-129
SHEET: 1 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 245.5
Final Boring Depth (ft.): 42
Date Start - Finish: 12/3/2014 - 12/3/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	16	2 5 4 5	9	S-1: Loose, brown, medium to coarse SAND. (SP)					
		S-2	2.0-4.0	24	18	7 9 9 17	18	S-2: Very stiff, gray, Silty CLAY, little fine to medium Sand. (CL)			2	SAND	243.5
		S-3	4.0-6.0	24	20	23 23 23 21	46	S-3: Top 10": Dense, brown, medium to coarse SAND and Gravel. (SP) Bottom 10": Very stiff, gray-brown, Silty CLAY. (CL)			4	SILTY CLAY	241.5
											4.8	SAND	240.7
		S-4	10.0-12.0	24	24	4 4 4 5	8	S-4: Medium stiff, gray, Silty CLAY. (CL)					
		S-5	15.0-17.0	24	16	WOR/24"		S-5: Soft to medium stiff, gray, Silty CLAY. (CL)					
		S-6	20.0-22.0	24	11	WOR/24"		S-6: Soft to medium stiff, gray, Silty CLAY. (CL)					
25		S-7	25.0-27.0	24	24	3 1 1 1	2	S-7: Top 9": Loose, brown, fine to medium SAND. (SP) Bottom 15": Soft to medium stiff, gray, Silty CLAY. (CL)			25		220.5
										25.8	SAND	219.7	
												SILTY CLAY	

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-129

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-129
 SHEET: 2 of 2
 PROJECT NO: 09.0025829.00
 REVIEWED BY: J. Baron

Logged By: B. Cardali
 Drilling Co.: New England Boring Contractors
 Foreman: Rich Leonard

Type of Rig: ATV
 Rig Model:
 Drilling Method:
 Drive & Wash

Boring Location: See Plan
 Ground Surface Elev. (ft.): 245.5
 Final Boring Depth (ft.): 42
 Date Start - Finish: 12/3/2014 - 12/3/2014

H. Datum:
 V. Datum:

Hammer Type: Donut
 Hammer Weight (lb.): 140
 Hammer Fall (in.): 30
 Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
 Sampler O.D. (in.): 2.0
 Sampler Length (in.): 24
 Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
35		S-8	35.0-37.0	24	14	15 14 14 17	28	S-8: Medium dense, gray, fine to medium SAND, little Gravel, little Silt, wet. (SM)			35	SILTY CLAY	210.5
40									1		42	GLACIAL TILL	203.5
45								End of exploration at 42 feet.					
50													
55													
60													

REMARKS	1 - No refusal.
----------------	-----------------

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-129

TEST BORING LOG



GZA
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Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-130
SHEET: 1 of 1
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 239
Final Boring Depth (ft.): 27.5
Date Start - Finish: 12/4/2014 - 12/4/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/4/14	0830	5.0'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	15	1 6 6 10	12	S-1: Medium dense, brown, fine to coarse SAND, trace Silt. (SM)			2	SAND	237.0
		S-2	2.0-4.0	24	4	9 12 10 11	22	S-2: Very stiff, gray, Silty CLAY, little fine to medium Sand. (CL)				SILTY CLAY	
		S-3	4.0-6.0	24	11	10 8 7 9	15	S-3: Stiff, gray, Silty CLAY. (CL)					
10		S-4	10.0-12.0	24	24	2 2 3 2	5	S-4: Medium stiff, gray, Silty CLAY. (CL)					
15		S-5	15.0-17.0	24	13	19 26 20 32	46	S-5: Dense, brown, medium to coarse SAND, little Silt, trace Gravel, wet. (SM)			15		224.0
20	61	S-6	20.0-22.0	24	3	22 15 13 11	28	S-6: Medium dense, brown, fine to coarse SAND and Gravel, trace Silt, wet. (SM)				GLACIAL TILL	
	36												
	34												
	28												
25	30	S-7	25.0-27.0	24	1	9 4 7 20	11	S-7: Medium dense, brown, fine to coarse SAND and Gravel, trace Silt, wet. (SM)					
27.5								End of exploration at 27.5 feet.	1 2		27.5	POSSIBLE BOULDER OR BEDROCK	211.5

REMARKS

1 - Advanced roller bit from 27.0'-27.5' bgs with significant resistance, possible boulder or bedrock.
2 - Roller bit refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-130

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-131
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 245
Final Boring Depth (ft.): 26.6
Date Start - Finish: 11/12/2014 - 11/12/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
		S-1	0.0-2.0	24	12	1 1 3 5	4	S-1: Medium stiff, gray, Silty CLAY, little fine to medium Sand, trace roots. (CL)			0.3	TOPSOIL	244.7
		S-2	2.0-4.0	24	12	3 6 6 4	12	S-2: Stiff, gray to brown, CLAY & SILT, trace fine to medium Sand. (CL)					
5		S-3	4.0-6.0	24	14	2 4 6 10	10	S-3: Stiff, gray, Silty CLAY, trace fine Sand. (CL)					
10		S-4	10.0-12.0	24	24	1 1 1 2	2	S-4: Soft to medium stiff, gray, Silty CLAY, trace fine Sand. (CL)			12		233.0
15		S-5	15.0-17.0	24	19	WOH 14 13 14	27	S-5: Dense, gray to brown, fine to coarse SAND, some Gravel, trace Silt. (SM)					
20		S-6	20.0-22.0	14	5	11 14 14 17	28	S-6: Dense, brown, fine to coarse SAND and Gravel, trace Silt. (SM)					
25		S-7	25.0-26.6	19	8	5 7 5 50/1"	12	S-7: Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt. (SM) Split spoon refusal.			26.6		218.4
								End of exploration at 26.6 feet.					
30													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-131

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-135
SHEET: 1 of 3
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 247.5
Final Boring Depth (ft.): 71.9
Date Start - Finish: 11/10/2014 - 11/10/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5	WOH	S-1	0.0-2.0	24	12	1 1 1 3	2	S-1: Loose, brown, fine to medium SAND, some Silt. Roots and organics, leaves. (SM)			2	TOPSOIL	245.5
		S-2	5.0-7.0	24	18	3 5 6 4	11	S-2: Stiff, gray to brown, CLAY & SILT, little fine Sand. (CL)					
10	WOH	S-3	10.0-12.0	24	20	WOH/24"		S-3: Soft to medium stiff, gray, Silty CLAY. (CL)					
		S-4	15.0-17.0	24	10	WOH/24"		S-4: Soft to medium stiff, gray, Silty CLAY. (CL)					
15	WOH	S-5	20.0-22.0	24	17	WOH/24"		S-5: Soft to medium stiff, gray, Silty CLAY. (CL)					
		S-6	25.0-27.0	24	20	WOH/24"		S-6: Soft to medium stiff, gray, Silty CLAY. (CL)					
30	PUSH PUSH PUSH								1	27	PROBABLE SILTY CLAY	220.5	

REMARKS
 1 - Begin probe at 27.0' bgs. Blows per foot to advance AW rod are recorded on log in Casing Blows column.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-135

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-135
SHEET: 3 of 3
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 247.5
Final Boring Depth (ft.): 71.9
Date Start - Finish: 11/10/2014 - 11/10/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
3												
3												
30										62	PROBABLE SILTY CLAY	185.5
19												
20												
65												
19												
17												
18											PROBABLE SAND OR GLACIAL TILL	
23												
70												
29												
45												
33								2		71.9		175.6
							End of exploration at 71.9 feet.					
75												
80												
85												
90												

REMARKS
 2 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-135

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-136
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 247
Final Boring Depth (ft.): 22
Date Start - Finish: 11/20/2014 - 11/20/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/20/14	0845	4.7'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)	
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
5		S-1	0.0-2.0	24	12	1 3 2 3	5	S-1: Loose, brown, fine to medium SAND, little Clayey Silt, trace roots. (SM)	1		0.3	TOPSOIL	246.7	
		S-2	2.0-4.0	24	10	1 2 2 2	4	S-2: Loose, brown, fine to medium SAND, some Silt, trace Gravel. (SM)			4		FILL	243.0
		S-3	4.0-6.0	24	16	1 1 1 2	2	S-3: Very loose, brown/gray, fine to medium SAND, some Clayey Silt, wet. (Organic odor) (SM)			6		SAND	241.0
		S-4	10.0-12.0	24	24	1 2 2 1	4	S-4: Soft to medium stiff, gray, Silty CLAY, trace fine Sand. (CL)						
		S-5	15.0-17.0	24	24	WOR		S-5: Soft to medium stiff, gray, Silty CLAY. (CL)						
		S-6	20.0-22.0	24	24	WOR		S-6: Soft to medium stiff, gray, Silty CLAY. (CL)			2	22		
							End of exploration at 22 feet.							

REMARKS

1 - Transition from Sand to Silty CLAY inferred based on observed drilling behavior and change in color/consistency of return water.
2 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-136

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-137
SHEET: 1 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 252
Final Boring Depth (ft.): 44
Date Start - Finish: 11/14/2014 - 11/14/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/14/14	0930	1.3'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
		S-1	0.0-	24	8	2 6	15	S-1: Medium dense, brown, medium to coarse SAND and Gravel, trace Silt, trace roots. (SM)			0.3	TOPSOIL	251.7
			2.0			9 7					2	FILL	250.0
5		S-2	5.0- 7.0	24	5	7 8 8 10	16	S-2: Very stiff, gray, Silty CLAY, some fine to coarse Sand. (CL)					
10		S-3	8.0- 10.0	24	22	3 5 5 7	10	S-3: Stiff, gray, Silty CLAY. (CL)					
		S-4	10.0- 12.0	24	20	4 6 4 6	10	S-4: Stiff, gray, Silty CLAY, trace fine Sand (lenses). (CL)					
		S-5	12.0- 14.0	24	24	2 2 2 3	4	S-5: Soft to medium stiff, gray, Silty CLAY. (CL)					SILTY CLAY
15		S-6	14.0- 16.0	24	24	WOH WOH 1 2	1	S-6: Soft to medium stiff, gray, Silty CLAY. (CL)					
		S-7	16.0-	24	24			S-7: Medium stiff, gray, Silty CLAY. (CL)					
		V-1	18.0	7				V-1: Field Vane, T _{raw} = 240/60 in.-lbs (Su = 620/155 psf)	1				
		V-2	16.4-	7				V-2: Field Vane, T _{raw} = 260/75 in.-lbs (Su = 670/190 psf)					
20			17.0										
		S-8	18.0-	24				S-8: Medium stiff, gray, Silty CLAY. (CL)					
		V-3	20.0-	7				V-3: Field Vane, T _{raw} = 175/30 in.-lbs (Su = 450/75 psf)					
		V-4	22.0-	7				V-4: Field Vane, T _{raw} = 200/40 in.-lbs (Su = 520/100 psf)	2		22		230.0
		WOH	20.4-										
		WOH	21.0-										
25		WOH	21.4-										
		WOH	22.0-										
		WOH											
		WOH											
		WOH											
30		WOH											

REMARKS
 1 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field vane tests. T_{raw} = measured torque, Su = calculated undrained shear strength.
 2 - Began rod probe at 22.0' bgs. Blows per foot to drive AW rod are recorded on log under casing blows.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-137

GZA TEMPLATE TEST BORING, 2/18/2015, 4:08:14 PM

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-137
 SHEET: 2 of 2
 PROJECT NO: 09.0025829.00
 REVIEWED BY: J. Baron

Logged By: N. Williams
 Drilling Co.: New England Boring Contractors
 Foreman: Brad Enos

Type of Rig: ATV
 Rig Model:
 Drilling Method:
 Drive & Wash

Boring Location: See Plan
 Ground Surface Elev. (ft.): 252
 Final Boring Depth (ft.): 44
 Date Start - Finish: 11/14/2014 - 11/14/2014

H. Datum:
 V. Datum:

Hammer Type: Donut
 Hammer Weight (lb.): 140
 Hammer Fall (in.): 30
 Auger or Casing O.D./I.D Dia (in.): 3

Sampler Type: SS
 Sampler O.D. (in.): 2.0
 Sampler Length (in.): 24
 Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/14/14	0930	1.3'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)						
6												
15												
11												
10												
7												
35											PROBABLE SILTY CLAY	
6												
5												
6												
7												
40										39		213.0
17												
27												
22											POSSIBLE SILTY CLAY OR SAND OR GLACIAL TILL	
26												
26												
50/0"								3		44		208.0
45							End of exploration at 44 feet.					
50												
55												
60												

REMARKS
 3 - Probe refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-137

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-138
SHEET: 1 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 250
Final Boring Depth (ft.): 62
Date Start - Finish: 11/25/2014 - 11/26/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5	VAC		0.0-2.0					Brown, medium to coarse SAND, trace Gravel. (SP)	1				
	VAC		2.0-10.0					Brown, medium to coarse SAND, little Gravel. (SP)					
	VAC												
	VAC												
	VAC												
	VAC												
	VAC												
	VAC												
	VAC												
10		S-1	10.0-12.0	24	14	4 3 4 3	7	S-1: Medium stiff, gray-brown, Silty CLAY. (CL)	2		10	----- 240.0	
15		U-1	15.0-17.0	24	24			U-1: Gray, Silty CLAY. (CL)					
20		S-2	17.0-19.0	24	24			S-2: Soft to medium stiff, gray, Silty CLAY. (CL)					
		V-1	19.0	7				V-1: Field Vane, $T_{raw} = 200/70$ in.-lbs (Su = 515/180 psf)					
		V-2	17.4-18.0	7				V-2: Field Vane, $T_{raw} = 180/40$ in.-lbs (Su = 465/100 psf)					
			18.4-19.0										
25		U-2	25.0-27.0	24	24			U-2: Gray, SILT & CLAY. (CL)					
30		S-3	27.0-29.0	24	0			S-3: No recovery.					
		V-3	29.0	7				V-3: Field Vane, $T_{raw} = 170/40$ in.-lbs (Su = 440/100 psf)					
		V-4	27.4-28.0	7				V-4: Field Vane, $T_{raw} = 150/30$ in.-lbs (Su = 390/80 psf)					

REMARKS

1 - Vacuum excavation to 10.0' bgs. Descriptions from cuttings and sidewall observations.
 2 - Tapered vane with 2.5" diameter, 4.5" height and 45 degree taper was used for field vane tests. T_{raw} = measured torque, Su = calculated undrained shear strength.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-138

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-138
SHEET: 2 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 250
Final Boring Depth (ft.): 62
Date Start - Finish: 11/25/2014 - 11/26/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
			28.4-29.0										
35		U-3	35.0-37.0	24	0			U-3: No recovery.					
		S-4	37.0-39.0	24	24			S-4: Soft to medium stiff, gray, Silty CLAY. (CL)					
		V-5	39.0-37.4	7				V-5: Field Vane, T _{raw} = 90/25 in.-lbs (Su = 230/65 psf)					
		V-6	37.4-38.0	7				V-6: Field Vane, T _{raw} = 200/40 in.-lbs (Su = 515/100 psf)					
40		U-4	38.4-39.0	24	0			U-4: No recovery.					
			40.0-42.0										
		V-7	43.4-44.0	7				V-7: Field Vane, T _{raw} = 140/60 in.-lbs (Su = 360/155 psf)					
45		V-8	44.0-44.4	7				V-8: Field Vane, T _{raw} = 255/10 in.-lbs (Su = 660/25 psf)					
		S-5	44.4-45.0	24	20	4 6 9 10	15	S-5: Stiff, brown, Silty CLAY and fine to medium Sand. (CL)					
			45.0-47.0										
50		S-6	50.0-52.0	24	24	WOR WOR WOR WOH	0	S-6: Soft to medium stiff, gray, Silty CLAY, trace fine to medium Sand. (CL)					
55		S-7	55.0-55.3	4	4	100/3"	R	S-7: Gray, Silty CLAY, trace fine to medium Sand, fractured rock in tip of spoon. (CL)			55.3		194.7
60												GLACIAL TILL	

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-138

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-138
SHEET: 3 of 3
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 250
Final Boring Depth (ft.): 62
Date Start - Finish: 11/25/2014 - 11/26/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

NOT MEASURED

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
		S-8	60.0-62.0	24	4	32 41 32 31	73	S-8: Dense, brown, GRAVEL and fine to medium Sand, trace Silt, wet. (GM)	3		62	GLACIAL TILL	188.0
65								End of exploration at 62 feet.					
70													
75													
80													
85													
90													

REMARKS
3 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-138

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-139
SHEET: 1 of 1
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: Truck
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 278
Final Boring Depth (ft.): 22
Date Start - Finish: 11/21/2014 - 11/21/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/21/14	1115	10.0'	0

Depth (ft)	Casing Blows/ Core Rate	Sample						Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value						
5		S-1	0.0-2.0	24	12	1 2 3 5	5	S-1: Loose, brown/black, fine to coarse SAND, little Gravel, little Silt, trace organics. (SM)			0.4	TOPSOIL	277.6
		S-2	2.0-4.0	24	11	7 8 10 12	18	S-2: Medium dense, gray/tan, fine to medium SAND, little Silt. (SM)			4	FILL	274.0
		S-3	4.0-6.0	24	18	8 11 9 10	20	S-3: Very stiff, gray, CLAY & SILT, little fine to medium Sand (lenses). (CL)				CLAY & SILT	
		S-4	10.0-12.0	24	19	4 8 7 12	15	S-4: Top 12": Stiff, gray, CLAY & SILT, little fine Sand (lenses). (CL) Bottom 12": Medium dense, brown, fine to medium SAND, trace Silt. (SM)			11		267.0
		S-5	15.0-17.0	24	12	6 8 11 10	19	S-5: Medium dense, brown, fine to coarse SAND, trace Silt. (SM)				GLACIAL TILL	
		S-6	20.0-22.0	24	12	10 15 20 19	35	S-6: Dense, brown, medium to coarse SAND, trace Silt. (SM)	1		22		256.0
								End of exploration at 22 feet.					

REMARKS
 1 - No refusal.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-139

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-140
SHEET: 1 of 2
PROJECT NO.: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 261
Final Boring Depth (ft.): 31.5
Date Start - Finish: 12/4/2014 - 12/5/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)	
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
5	PUSH	S-1	0.0-2.0	24	15	3 6 8 4	14	S-1: Medium dense, fine to medium SAND, trace Silt. (SM)						
	PUSH	S-2	2.0-4.0	24	16	3 3 11 10	14	S-2: Medium dense, fine to medium SAND, trace Silt. (SM)				FILL		
	PUSH		4.0-6.0						24	24	11 14 17 23	31	S-3: Top 10": Medium dense, fine to medium SAND, trace Silt. (SM) Bottom 14": Stiff, gray, Silty CLAY. (CL)	
	PUSH	S-4	10.0-12.0	24	24	3 4 4 4	8	S-4: Medium stiff, gray, Silty CLAY. (CL)					SILTY CLAY	
	PUSH		15.0-17.0						24	24	WOR 1 2 1	3	S-5: Soft to medium stiff, gray, Silty CLAY. (CH)	
	20	PUSH	S-6	20.0-22.0	24	16	4 6 7 9	13	S-6: Medium dense, fine to medium SAND, trace Silt, wet. (SM)			20		241.0
		PUSH		25.0-27.0						24	2	26 84 60 33	>100	S-7: Very dense, fine to medium SAND, trace Silt, wet. (SM)

REMARKS
1 - Advanced roller bit through increased resistance from 27.0'-31.5' bgs.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-140

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-140
SHEET: 2 of 2
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
 Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 261
Final Boring Depth (ft.): 31.5
Date Start - Finish: 12/4/2014 - 12/5/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
									1 2		31.5	GLACIAL TILL POSSIBLE BEDROCK	229.5
35								End of exploration at 31.5 feet.					
40													
45													
50													
55													
60													

REMARKS
 2 - Roller bit refusal, possible boulder or bedrock at 31.5' bgs.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-140

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-142
SHEET: 1 of 1
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: N. Williams
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 235
Final Boring Depth (ft.): 24.5
Date Start - Finish: 11/13/2014 - 11/13/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
11/13/14	1500	7.2'	0

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
		S-1	0.0-2.0	24	5	1 1 1 2	2	S-1: Soft, gray, SILT & CLAY, some fine Sand, trace roots. (CL)			0.3	TOPSOIL	234.7
		S-2	2.0-4.0	24	19	2 4 8 8	12	S-2: Stiff, gray/brown, SILT & CLAY, little fine Sand. (CL)					
5		S-3	4.0-6.0	24	15	3 5 6 6	11	S-3: Stiff, gray/brown, Silty CLAY, trace fine Sand, trace root fibers. (CL)					
10		S-4	10.0-12.0	24	24	WOR/24"		S-4: Soft to medium stiff, gray, Silty CLAY, trace fine Sand. (CL)					
15		S-5	15.0-17.0	24	10	3 WOH WOH WOH	0	S-5: Very loose, gray, fine to medium SAND, trace Silt. (SM)			15		220.0
20		S-6	20.0-22.0	24	5	10 12 25 16	37	S-6: Dense, black to gray, fine to coarse SAND and Gravel, little Silt. (Weathered Rock) (SM)			20		215.0
25	20/6"								1		23.5	POSSIBLE BEDROCK	211.5
								End of exploration at 24.5 feet.			24.5		210.5

REMARKS
1 - Casing and roller bit refusal at 24.5' bgs.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-142

GZA TEMPLATE TEST BORING: 2/18/2015, 4:08:17 PM

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-143
SHEET: 1 of 1
PROJECT NO: 09.0025829.00
REVIEWED BY: J. Baron

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Rich Leonard

Type of Rig: ATV
Rig Model:
Drilling Method:
Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 236
Final Boring Depth (ft.): 27
Date Start - Finish: 12/3/2014 - 12/3/2014

H. Datum:
V. Datum:

Hammer Type: Donut
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
NOT MEASURED			

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0.0-2.0	24	4	3 9 11 4	20	S-1: Medium dense, brown, fine to medium SAND, trace Gravel, trace Silt. (SM)					
		S-2	2.0-4.0	24	6	3 3 3 2	6	S-2: Loose, brown, fine to medium SAND, trace Gravel. (SP)				FILL	
		S-3	4.0-6.0	24	4	2 2 1 2	3	S-3: Loose, brown, fine to medium SAND, trace Gravel, trace Silt. (SM)			6		230.0
10		S-4	10.0-12.0	24	18	1 2 2 2	4	S-4: Soft to medium stiff, gray, Silty CLAY, trace fine to medium Sand. (CL)				SILTY CLAY	
		S-5	15.0-17.0	24	24	2 2 2 2	4	S-5: Soft to medium stiff, gray, Silty CLAY. (CL)					
20		S-6	20.0-22.0	24	7	16 13 19 25	32	S-6: Dense, gray, medium to coarse SAND and Gravel, trace Silt. (SM)			20		216.0
										22.5		213.5	
25												POSSIBLE WEATHERED ROCK	
										27		209.0	
30								End of exploration at 27 feet.	1			POSSIBLE BEDROCK	

REMARKS
1 - Advanced roller bit through increased resistance from 22.5'-27.0' bgs, possible weathered rock.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-143

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-201
SHEET: 1 of 2
PROJECT NO: 09.0025829.01
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: Truck
Rig Model:
Drilling Method:
 HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 282
Final Boring Depth (ft.): 37
Date Start - Finish: 9/21/2015 - 9/21/2015

H. Datum:
V. Datum:

Hammer Type: Safety
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
9/21/15	1015	35.0	--

Depth (ft)	Casing Blows/ Core Rate	Sample						SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
5		S-1	0-2	24	10	1 1 6 8	7	S-1: Top 4": Loose, dark brown, mulch. Bottom 6": Loose, tan, fine to medium SAND, little Gravel, trace Silt. (SW)	1	0.3 ppm	0.4	MULCH	281.6	
		S-2	2-4	24	10	11 15 11 12	26	S-2: Medium dense, tan, fine to coarse SAND, little Gravel, trace Silt. (SW)		0.3 ppm				
		S-3	4-6	24	13	8 20 18 15	38	S-3: Dense, tan, fine to medium SAND, trace Silt. (SP)		0.0 ppm				
		S-4	6-8	24	18	12 8 10 11	18	S-4: Medium dense, tan, fine to medium SAND, trace Silt. (SP)		0.0 ppm				
		S-5	10-12	24	19	4 4 4 4	8	S-5: Loose, tan, fine to medium SAND, trace Silt. (SP)		0.0 ppm				
		S-6	15-17	24	15	4 3 5 6	8	S-6: Loose, tan, fine to medium SAND, trace Silt. (SP)		0.0 ppm			SAND	
		S-7	20-22	24	14	5 8 9 11	17	S-7: Medium dense, tan, fine to medium SAND, trace Silt. (SP)		0.0 ppm				
		S-8	25-27	24	16	7 10 9 11	19	S-8: Medium dense, tan, fine to medium SAND, trace Silt. (SP)		0.0 ppm				

REMARKS
 1 - Field test data indicates field screening of headspace samples for volatile organic vapors with a Thermo 580B OVM portable Photolonization Detector (PID) equipped with an 11.8 eV lamp. The instrument was calibrated using the Maine DEP set points for gasoline.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-201

GZA TEMPLATE TEST BORING; 10/23/2015; 9:28:40 AM

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-201
SHEET: 2 of 2
PROJECT NO: 09.0025829.01
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: Truck
Rig Model:
Drilling Method:
HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 282
Final Boring Depth (ft.): 37
Date Start - Finish: 9/21/2015 - 9/21/2015

H. Datum:
V. Datum:

Hammer Type: Safety
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
9/21/15	1015	35.0	--

Depth (ft)	Casing Blows/ Core Rate	Sample						SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
35		S-9	30-32	24	19	8 9 9 7	18	S-9: Medium dense, tan, fine to medium SAND, trace Silt. (SP)	2	0.0 ppm		SAND		
		S-10	35-37	24	12	20 32 53 26	85	S-10: Very dense, gray/tan, fine to coarse SAND and GRAVEL, trace Silt. (SW)		0.0 ppm	35	GLACIAL TILL	247.0	
								End of exploration at 37 feet.			37		245.0	

REMARKS 2 - Drilling effort increased at 33.5' bgs.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-201

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
Exit 63
Gray, Maine

EXPLORATION NO.: GZ-202
SHEET: 1 of 2
PROJECT NO: 09.0025829.01
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: Truck
Rig Model:
Drilling Method:
HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 280
Final Boring Depth (ft.): 31.1
Date Start - Finish: 9/21/2015 - 9/21/2015

H. Datum:
V. Datum:

Hammer Type: Safety
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
9/21/15	1300	27.5	--

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0-2	24	11	1 1 6 21	7	S-1: Loose, brown, fine to coarse SAND, trace Silt, trace Gravel, trace organics. (SP-SW)	1	0.5 ppm	FILL		
		S-2	3-5	24	8	11 9 14 7	23	S-2: Medium dense, brown/black, GRAVEL, some fine to coarse Sand, trace Silt, pieces of asphalt. (GP)	2	1.2 ppm			
		S-3	5-7	24	4	5 3 12 14	15	S-3: Medium dense, brown, GRAVEL, some fine to coarse Sand, trace Silt, pieces of asphalt. (GP)		1.9 ppm			
	10		S-4	10-12	24	15	3 8 6 6	14	S-4: Medium dense, tan, fine to medium SAND, trace Silt. (SP)		0.0 ppm	10	270.0
	15		S-5	15-17	24	16	4 8 8 11	16	S-5: Medium dense, tan, fine to medium SAND, trace Silt. (SP)		0.1 ppm	SAND	
	20		S-6	20-22	24	15	5 10 12 14	22	S-6: Medium dense, tan, fine to medium SAND, little Silt. Clay and silt seam from 20.2'-20.4' bgs. (SP)		0.1 ppm	20.2 20.4	259.8 259.6
	25		S-7	25-27	24	16	7 9 11 14	20	S-7: Medium dense, tan, fine to medium SAND, trace Silt. (SP)	3	0.0 ppm	SAND	
30													

REMARKS

1 - Boulder at 2.1' bgs; augered to 3.0' bgs to sample (S-2).
 2 - Field test data indicates field screening of headspace samples for volatile organic vapors with a Thermo 580B OVM portable Photolozation Detector (PID) equipped with an 11.8 eV lamp. The instrument was calibrated using the Maine DEP set points for gasoline.
 3 - Increased auger resistance and drilling effort from 27.5-30.0' bgs.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-202

GZA TEMPLATE TEST BORING; 10/23/2015; 9:28:41 AM

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

Maine Turnpike Authority
 Exit 63
 Gray, Maine

EXPLORATION NO.: GZ-202
SHEET: 2 of 2
PROJECT NO: 09.0025829.01
REVIEWED BY:

Logged By: B. Cardali
Drilling Co.: New England Boring Contractors
Foreman: Brad Enos

Type of Rig: Truck
Rig Model:
Drilling Method:
 HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 280
Final Boring Depth (ft.): 31.1
Date Start - Finish: 9/21/2015 - 9/21/2015

H. Datum:
V. Datum:

Hammer Type: Safety
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 2 1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
9/21/15	1300	27.5	--

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
		S-8	30-31.1	13	13	53 69 50/1"	R	S-8: Top 2": Very dense, tan, fine to medium SAND, trace Silt. (SP) Middle 8": Hard, gray, CLAY and SILT, trace fine Sand. (CL) Bottom 3": Very dense, gray/brown, GRAVEL, little fine to coarse Sand, trace Silt. (GP) End of exploration at 31.1 feet.		0.0 ppm	30.2 30.9 31.1	CLAY & SILT GLACIAL TILL	249.8 249.1 248.9
35													
40													
45													
50													
55													
60													

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:
GZ-202

GZA TEMPLATE TEST BORING; 10/23/2015; 9:28:42 AM



APPENDIX D

LABORATORY TESTING RESULTS

LABORATORY TESTING DATA SHEET

Matthew P. Kelly

Project Name Exit 63 Interchange
 Project No. 09.0025829.00
 Project Manager J. Baron

Project Location Gray, Maine
 Assigned By J. Baron
 Date 12/23/2014

Reviewed By _____
 Date Reviewed 12/23/2014

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests								Strength Tests				Consol.	Laboratory Log and Soil Description
				Water Content %	LL %	PL %	Sieve -200 %	Hyd -2 μ %	ORG %	G _s	Dry unit wt. pcf	Torvane	Remolded Torvane	Failure Criteria	Strain %	$\frac{C_c}{1 + e_0}$	
GZ-114	U-1	30- 32	1	Average Total Unit Weight (30.0-32.0') = 111.5 pcf													Gray CLAY & SILT (CL) Very Soft Consistency ("Sensitive Clay") Maine Frost Classification = IV AASHTO = A6
		30.2		48.4								Tv= 0.10 tsf	RTv= 0 tsf				
		30.2- 30.7		(Sample Saved)													
		30.8		48.4								Tv= 0.15 tsf	RTv= 0 tsf				
		31.0- 31.1		42.6							79.3				0.15		
		31.1- 31.2		53.9	40	21											
		31.4		52.1								Tv= 0.08 tsf	RTv= 0 tsf				



195 Frances Avenue
 Cranston, RI 02910
 401-467-6454

Soil Consolidation Test ASTM D2435



195 Frances Ave., Cranston, RI 02910

Project Exit 63 Interchange

Project Location Gray, ME

File # 09.0025829.00

Boring GZ-114 Sample U-1

Depth 31.0-31.1'

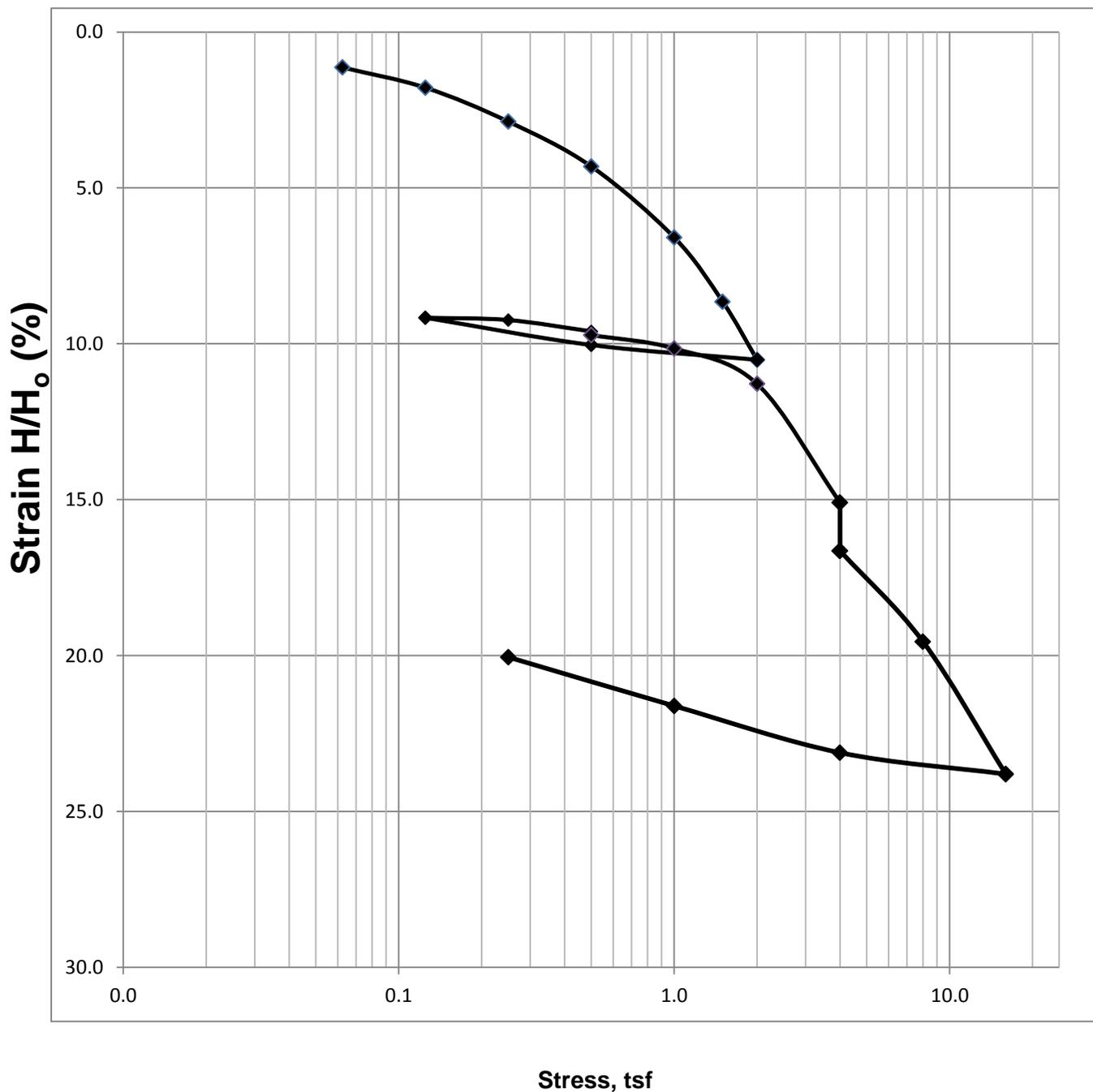
Set Up By AS

Description See Summary Sheet

Water Content % 42.6%

γ_d (pcf) 79.3

Test # C 1



One-Dimensional Consolidation Testing Of Soil (ASTM D2435-04)
Method B (End of Primary Increments)

Project Name <u>Exit 63 Interchange</u>	Technician <u>AS</u>
Location <u>Gray, ME</u>	Reviewer <u>MBP</u>
Project Number <u>09.0025829.00</u>	
Boring Number <u>GZ-114</u>	Sample Number <u>U-1</u>
Depth <u>31.0-31.1'</u>	Test Number <u>C 1</u>
Specific Gravity <u>2.65</u> (estimated)	
Initial Water Content <u>42.6%</u>	Initial Dry Unit Weight (pcf) <u>79.3</u>
Final Water Content <u>28.0%</u>	Final Dry Unit Weight (pcf) <u>103.1</u>
Initial Sample Height (in.) <u>0.800</u>	Initial Void Ratio <u>1.086</u>
Final Sample Height (in.) <u>0.615</u>	Final Void Ratio <u>0.603</u>

Notes: _____

Increment Number	Stress (tsf)	Cummulative Deflection (in)	Strain (%)	T ₉₀ (min)	Cv ₉₀ (cm ² /sec)	C _α
1	0	0	0			
2	0.0625	0.0091	1.138			
3	0.125	0.0143	1.788	1.7	8.15E-03	
4	0.25	0.0230	2.875	10.2	1.31E-03	
5	0.5	0.0345	4.313	11.6	1.10E-03	
6	1	0.0527	6.588	13.0	9.40E-04	
7	1.5	0.0692	8.650	11.6	1.01E-03	
8	2	0.0841	10.513	13.0	9.11E-04	
9	0.5	0.0803	10.038			
10	0.125	0.0733	9.163			
11	0.25	0.0739	9.238	4.0	2.98E-03	
12	0.5	0.0768	9.600	4.0	2.97E-03	
13	0.5	0.0778	9.719			0.00031
14	1	0.0812	10.150	4.0	2.87E-03	
15	2	0.0903	11.288	4.0	2.63E-03	
16	4	0.1207	15.088	4.0	2.54E-03	
17	4	0.1331	16.638			0.00350
18	8	0.1564	19.550	6.0	1.41E-03	
19	16	0.1904	23.800	4.8	1.78E-03	
20	4	0.1849	23.113			
21	1	0.1729	21.613			
22	0.25	0.1604	20.050			

LABORATORY TESTING DATA SHEET

Matthew P. Kelly

Project Name Exit 63 Interchange
 Project No. 09.0025829.00
 Project Manager J. Baron

Project Location Gray, Maine
 Assigned By J. Baron
 Date 12/23/2014

Reviewed By _____
 Date Reviewed 12/23/2014

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests								Strength Tests				Consol.	Laboratory Log and Soil Description
				Water Content %	LL %	PL %	Sieve -200 %	Hyd -2 μ %	ORG %	G _s	Dry unit wt. pcf	Torvane	Remolded Torvane	Failure Criteria	Strain %	$\frac{C_c}{1 + e_0}$	
GZ-138	U-1	15- 17	2	Average Total Unit Weight (15.0-17.0') = 112.0 pcf													Gray Silty CLAY (CL) Very Soft to Soft Consistency ("Sensitive Clay") Maine Frost Classification = IV AASHTO = A7
		15.2		38.4								Tv= 0.28 tsf	RTv= .10 tsf				
		15.2- 15.7		(Sample Saved)													
		15.8		42.1								Tv= 0.19 tsf	RTv= .05 tsf				
		15.9- 16.0		38.7							84.1				0.18		
		16.0- 16.1		40.7	43	22											
		16.4		37.2								Tv= 0.25 tsf	RTv= .05 tsf				
		16.4- 16.9		(Sample Saved)													



195 Frances Avenue
 Cranston, RI 02910 401-467-6454

Soil Consolidation Test ASTM D2435



195 Frances Ave., Cranston, RI 02910

Project Exit 63 Interchange

Project Location Gray, ME

File # 09.0025829.00

Boring GZ-138

Sample U-1

Depth 15.9-16.0'

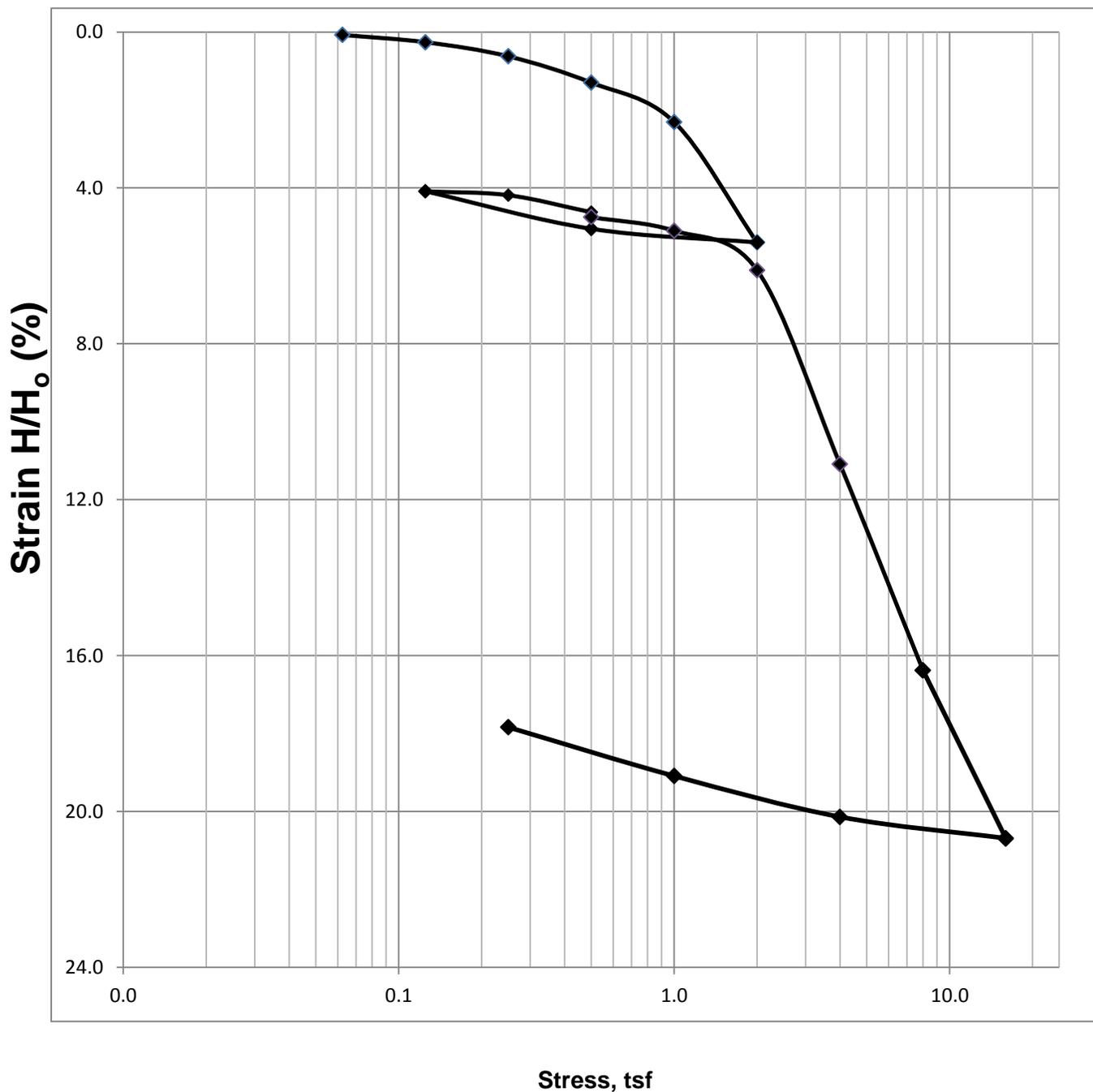
Set Up By AS

Description See Summary Sheet

Water Content % 38.7%

γ_d (pcf) 84.1

Test # C 2



One-Dimensional Consolidation Testing Of Soil (ASTM D2435-04)
Method B (End of Primary Increments)

Project Name <u>Exit 63 Interchange</u>	Technician <u>AS</u>
Location <u>Gray, ME</u>	Reviewer <u>MBP</u>
Project Number <u>09.0025829.00</u>	
Boring Number <u>GZ-138</u>	Sample Number <u>U-1</u>
Depth <u>15.9-16.0'</u>	Test Number <u>C 2</u>
Specific Gravity <u>2.67</u> (estimated)	
Initial Water Content <u>38.7%</u>	Initial Dry Unit Weight (pcf) <u>84.1</u>
Final Water Content <u>26.7%</u>	Final Dry Unit Weight (pcf) <u>102.4</u>
Initial Sample Height (in.) <u>0.800</u>	Initial Void Ratio <u>0.981</u>
Final Sample Height (in.) <u>0.657</u>	Final Void Ratio <u>0.627</u>

Notes: _____

Increment Number	Stress (tsf)	Cummulative Deflection (in)	Strain (%)	T ₉₀ (min)	Cv ₉₀ (cm ² /sec)	C _α
1	0	0	0			
2	0.0625	0.0006	0.075			
3	0.125	0.0021	0.263	6.0	2.40E-03	
4	0.25	0.0050	0.625	3.0	4.74E-03	
5	0.5	0.0104	1.300	3.0	4.64E-03	
6	1	0.0185	2.313	2.3	5.81E-03	
7	2	0.0432	5.400	7.3	1.80E-03	
8	0.5	0.0404	5.050			
9	0.125	0.0327	4.088			
10	0.25	0.0335	4.188	2.0	6.64E-03	
11	0.5	0.0370	4.625	3.0	4.41E-03	
12	0.5	0.0380	4.750			0.000313
13	1	0.0408	5.100	2.0	6.43E-03	
14	2	0.0489	6.113	3.0	3.85E-03	
15	4	0.0887	11.088	6.0	1.70E-03	
16	8	0.1310	16.375	5.8	1.59E-03	
17	16	0.1655	20.688	3.0	3.10E-03	
18	4	0.1611	20.138			
19	1	0.1527	19.088			
20	0.25	0.1427	17.838			

LABORATORY TESTING DATA SHEET

Matthew P. Kelly

Project Name Exit 63 Interchange
 Project No. 09.0025829.00
 Project Manager J. Baron

Project Location Gray, Maine
 Assigned By J. Baron
 Date 12/23/2014

Reviewed By _____
 Date Reviewed 12/23/2014

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests								Strength Tests				Consol.	Laboratory Log and Soil Description
				Water Content %	LL %	PL %	Sieve -200 %	Hyd -2 μ %	ORG %	G _s	Dry unit wt. pcf	Torvane	Remolded Torvane	Failure Criteria	Strain %	$\frac{C_c}{1 + e_0}$	
GZ-138	U-2	25- 27	3	Average Total Unit Weight (25.0-27.0') = 111.8 pcf													Gray SILT & CLAY (CL) Very Soft Consistency ("Sensitive Clay") Maine Frost Classification = IV AASHTO = A-4
		25.4		50.5								Tv= 0.10 tsf	RTv= 0 tsf				
		25.4- 25.9		(Sample Saved)													
		25.9		31.8								Tv= 0.09 tsf	RTv= 0 tsf				
		26.0- 26.1		27.5							99.3				0.08		
		26.2- 26.3		29.7	24	17											
		26.5		41.8								Tv= 0.10 tsf	RTv= 0 tsf				
		26.5- 27.0		(Sample Saved)													



195 Frances Avenue
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 401-467-6454

Soil Consolidation Test ASTM D2435



195 Frances Ave., Cranston, RI 02910

Project Exit 63 Interchange

Project Location Gray, ME

File # 09.0025829.00

Boring GZ-138

Sample U-2

Depth 26.0-26.1'

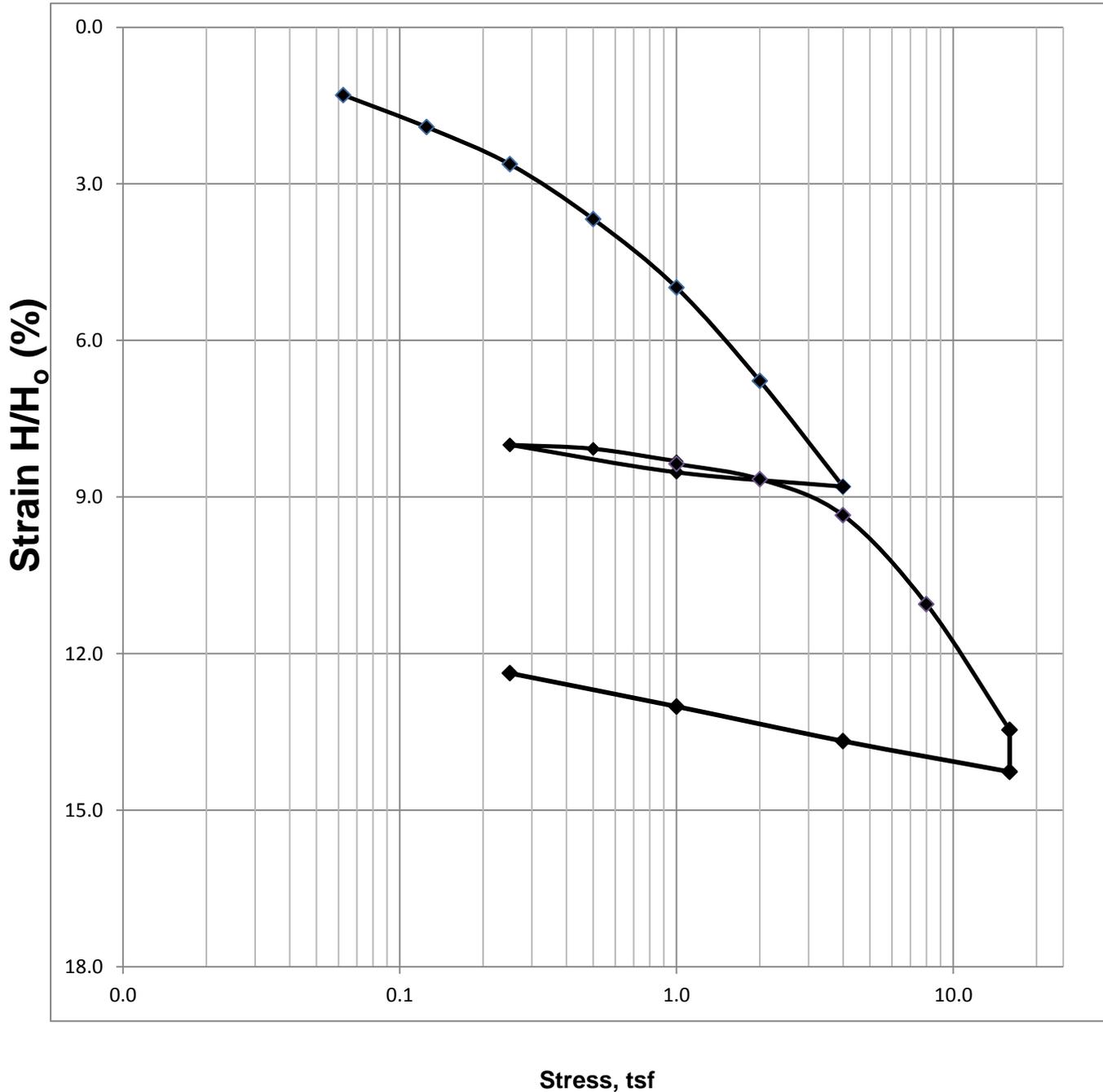
Set Up By AS

Description See Summary Sheet

Water Content % 27.5%

γ_d (pcf) 99.3

Test # C 3



One-Dimensional Consolidation Testing Of Soil (ASTM D2435-04)
Method B (End of Primary Increments)

Project Name <u>Exit 63 Interchange</u>	Technician <u>AS</u>
Location <u>Gray, ME</u>	Reviewer <u>MBP</u>
Project Number <u>09.0025829.00</u>	
Boring Number <u>GZ-138</u>	Sample Number <u>U-2</u>
Depth <u>26.0-26.1'</u>	Test Number <u>C 3</u>
Specific Gravity <u>2.65</u> (estimated)	
Initial Water Content <u>27.5%</u>	Initial Dry Unit Weight (pcf) <u>99.3</u>
Final Water Content <u>19.7%</u>	Final Dry Unit Weight (pcf) <u>113.4</u>
Initial Sample Height (in.) <u>0.800</u>	Initial Void Ratio <u>0.665</u>
Final Sample Height (in.) <u>0.701</u>	Final Void Ratio <u>0.459</u>

Notes: _____

Increment Number	Stress (tsf)	Cummulative Deflection (in)	Strain (%)	T ₉₀ (min)	Cv ₉₀ (cm ² /sec)	C _α
1	0	0	0			
2	0.0625	0.0104	1.300			
3	0.125	0.0153	1.913	14.0	9.88E-04	
4	0.25	0.0210	2.625	9.0	1.50E-03	
5	0.5	0.0294	3.675	7.3	1.81E-03	
6	1	0.0399	4.988	4.8	2.62E-03	
7	2	0.0542	6.775	4.4	2.75E-03	
8	4	0.0704	8.800	2.6	4.77E-03	
9	1	0.0682	8.525			
10	0.25	0.0640	8.000			
11	0.5	0.0646	8.075	1.0	1.23E-02	
12	1	0.0665	8.313	1.0	1.23E-02	
13	1	0.0669	8.363			0.00009
14	2	0.0693	8.656	1.2	9.91E-03	
15	4	0.0748	9.350	1.5	7.70E-03	
16	8	0.0884	11.050	1.5	7.29E-03	
17	16	0.1077	13.463	1.5	7.15E-03	
18	16	0.1141	14.263			0.00237
19	4	0.1094	13.675			
20	0.25	0.0990	12.375			



State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

Exit 63 Interchange

MDOT Project Number:

GZA Project Number: 09.0025829.00

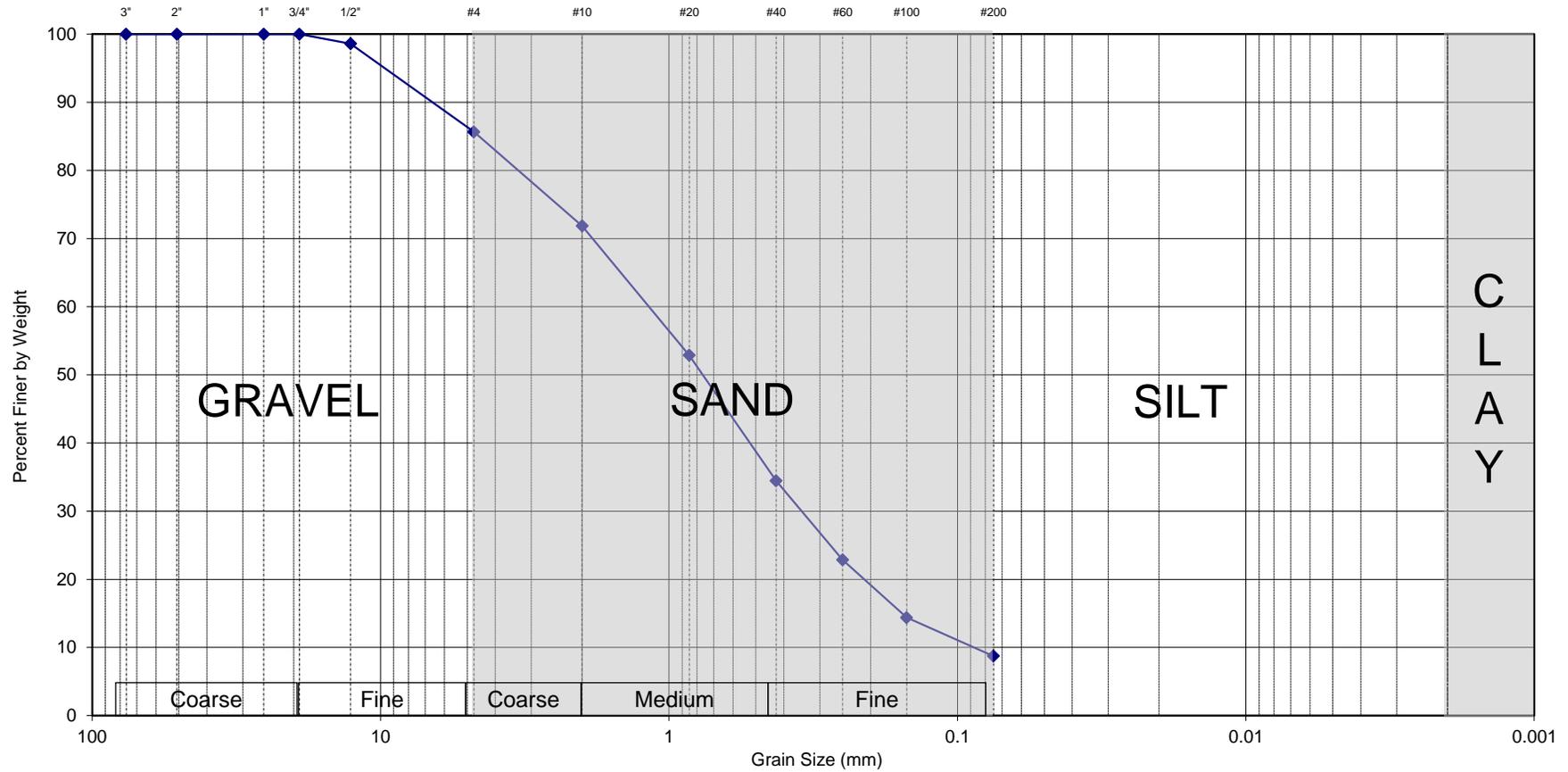
Town(s): Gray, ME

Boring & Sample Identification Number	Station (Feet)	Sample No.	Depth (Feet)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
GZ-119		S-3	4-6	4		4.8			SW-SM	A-1-b	0
GZ-139		S-2	2-4	5		8.7			SM	A-1-b	II
GZ-116		S-2	2-4	6		6.5			SW-SM	A-1-b	0
GZ-127		S-2	2-4	7		23.2			SM	A-2-4	II
GZ-122		S-3	4-6	8		24.9			ML	A-4	IV
GZ-133		S-2	2-4	9		19.2			SP-SM	A-3	0
GZ-136		S-2	2-4	10		18.4			SM	A-2-4	II
GZ-114		S-11	75-77	11		10.6			SM	A-1-b	II
GZ-106		S-3	5-7	12		21.7			SM	A-4	II
GZ-122		S-5	15-17	13		8.8			SM	A-1-b	II
GZ-122		S-7	25-26.3	14		7.9			GP-GM	A-1-a	0
GZ-124		S-5	15-17	15		8.1			GM	A-1-b	I
GZ-127A		S-4	10-11.9	16		11.9			SM	A-2-4	II

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)
 WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98
 LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98
 PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

U.S. STANDARD SIEVE AND HYDROMETER



Gravel
14.4%

Sand
76.9%

Fines
8.7%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
4	GZ-119	S-3	4-6'	Brown f-c SAND, little fine Gravel, trace Silt (SW-SM)	4.8			

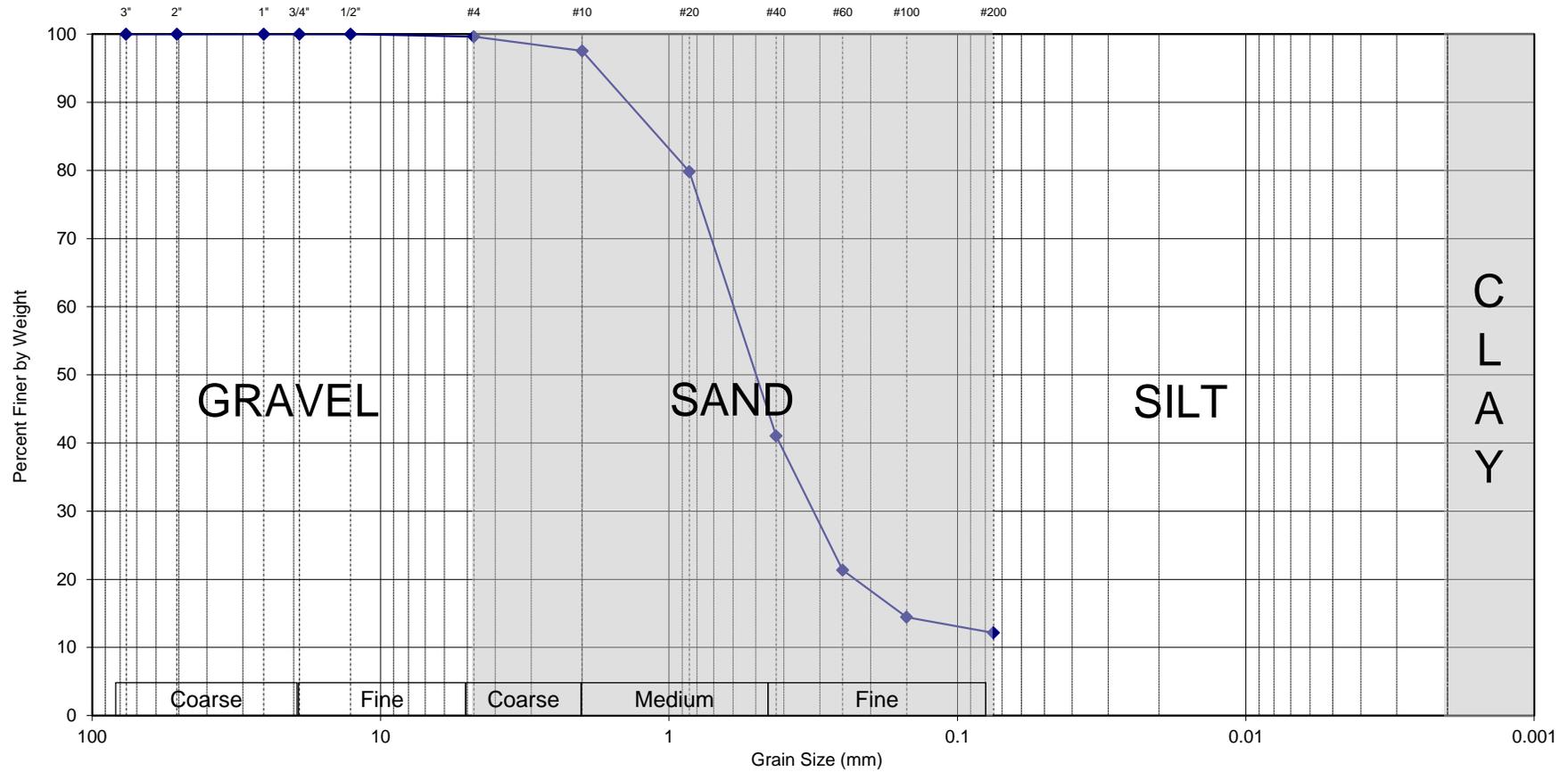
Sieve Size	% Passing
3/4"	100.0
1/2"	98.6
#4	85.6
#10	71.9
#20	52.9
#40	34.5
#60	22.8
#100	14.4
#200	8.7

74-14-0003
Exit 63 Interchange
Gray, ME
GZA Project # 09.0025829.00
Tested by: LM Date: 12/17/14
Reviewed by: MBP Date: 12/24/14



195 Frances Ave., Cranston, RI 02910
401-467-6454

U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.4%

Sand
87.5%

Fines
12.1%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
5	GZ-139	S-2	2-4'	Brown f-m SAND, little Silt (SM)	8.7			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	99.6
#10	97.5
#20	79.8
#40	41.0
#60	21.3
#100	14.4
#200	12.1

74-14-0003
Exit 63 Interchange
Gray, ME
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195 Frances Ave., Cranston, RI 02910
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
23.5%

Sand
67.1%

Fines
9.4%

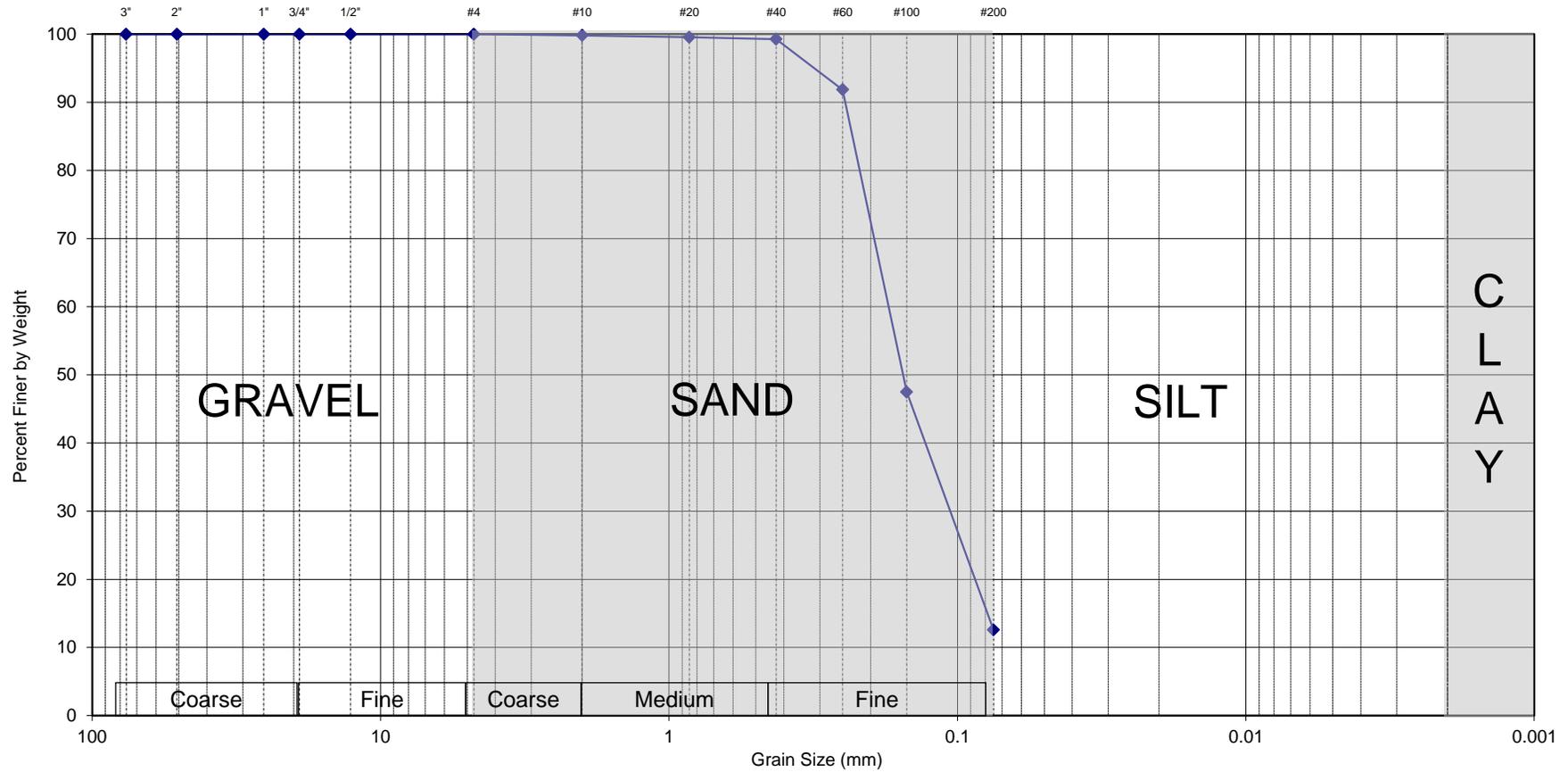
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
6	GZ-116	S-2	2-4'	Brown f-c SAND, some fine Gravel, trace Silt (SW-SM)	6.5			

Sieve Size	% Passing
3/4"	100.0
1/2"	92.1
#4	76.5
#10	65.8
#20	49.6
#40	31.7
#60	20.3
#100	13.5
#200	9.4

74-14-0003
Exit 63 Interchange
Gray, ME
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
87.4%

Fines
12.6%

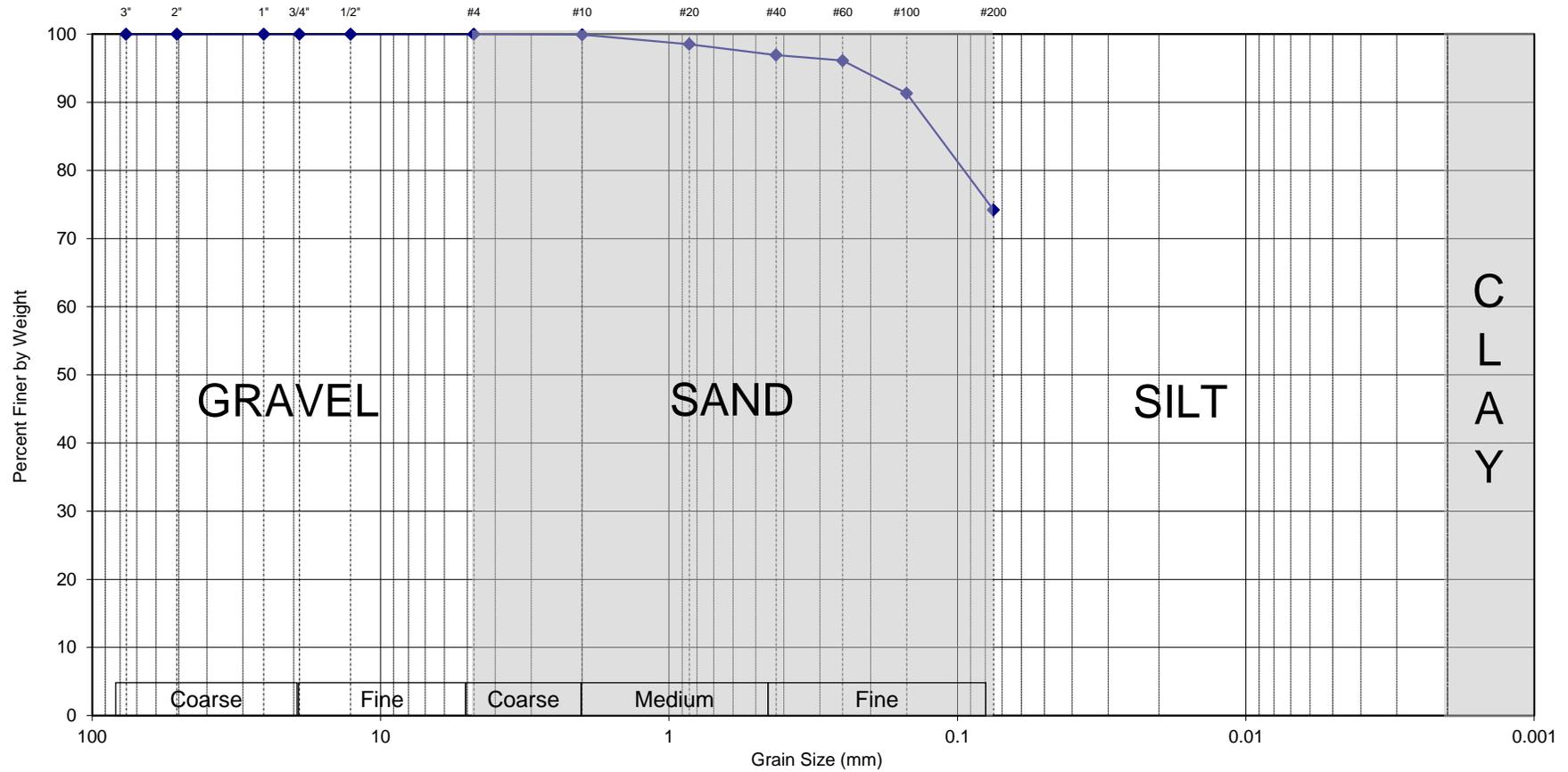
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
7	GZ-127	S-2	2-4'	Brown fine SAND, little Silt (SM)	23.2			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	99.8
#20	99.5
#40	99.3
#60	91.8
#100	47.5
#200	12.6

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Exit 63 Interchange
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
25.8%

Fines
74.2%

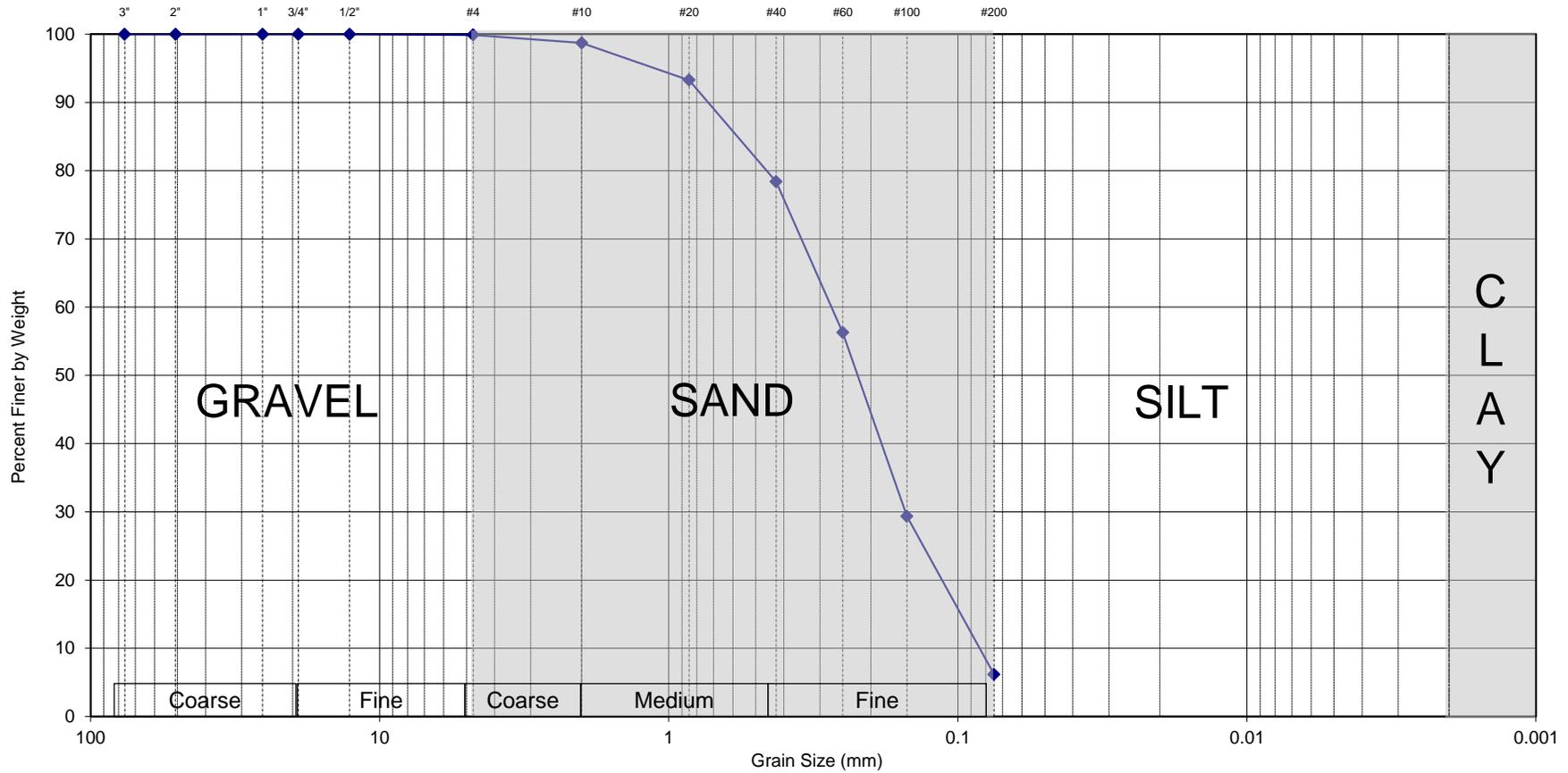
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
8	GZ-122	S-3	4-6'	Brown SILT, some fine Sand (ML)	24.9			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	99.9
#20	98.5
#40	96.9
#60	96.1
#100	91.3
#200	74.2

74-14-0003
Exit 63 Interchange
Gray, ME
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.1%

Sand
93.7%

Fines
6.2%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
9	GZ-133	S-2	2-4'	Brown f-m SAND, trace Silt (SP-SM)	19.2			

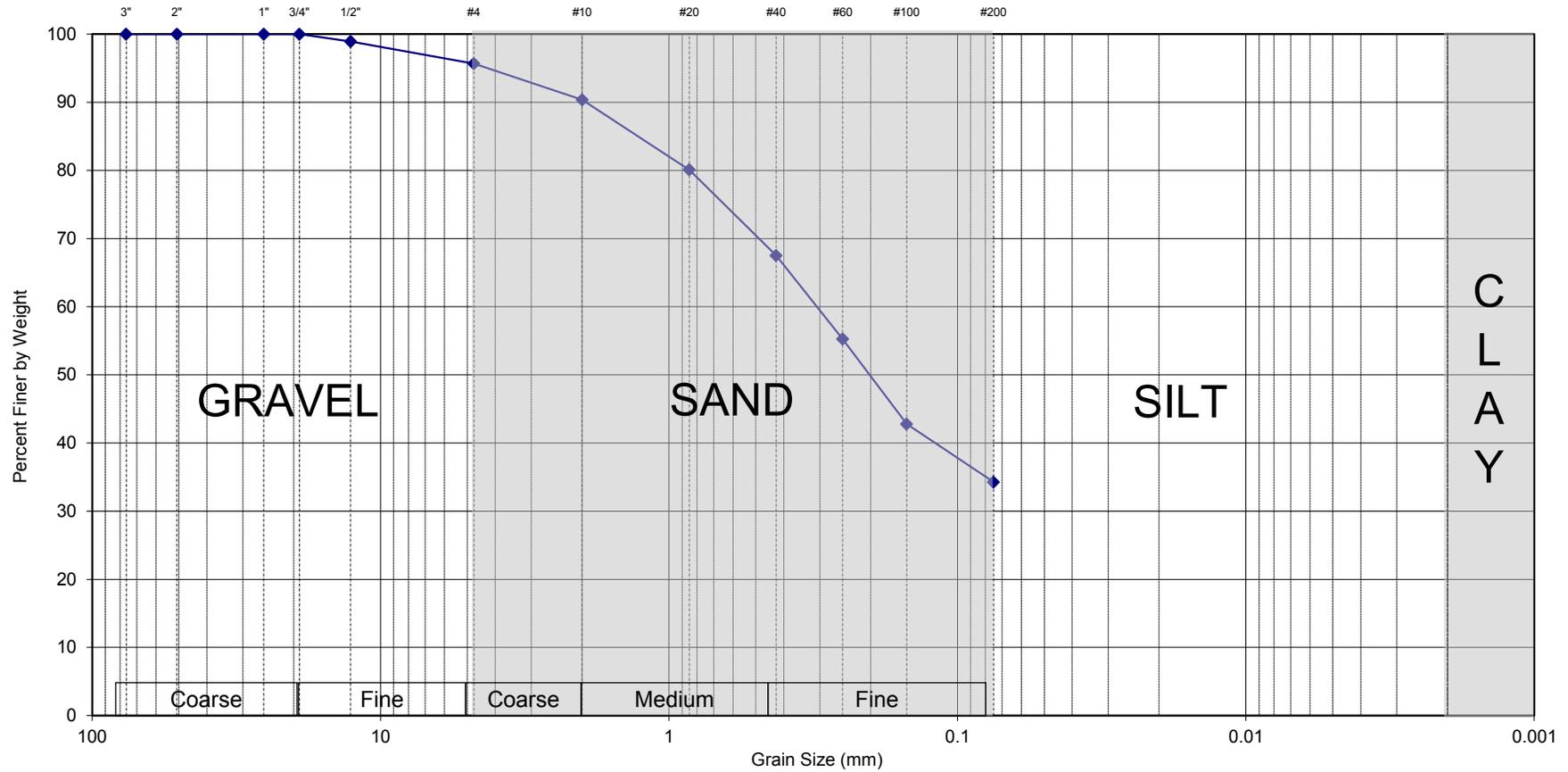
Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	99.9
#10	98.7
#20	93.3
#40	78.4
#60	56.3
#100	29.3
#200	6.2



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Exit 63 Interchange
Gray, ME
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
4.3%

Sand
61.4%

Fines
34.3%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
10	GZ-136	S-2	2-4'	Brown f-m SAND, some Silt, trace Gravel (SM)	18.4			

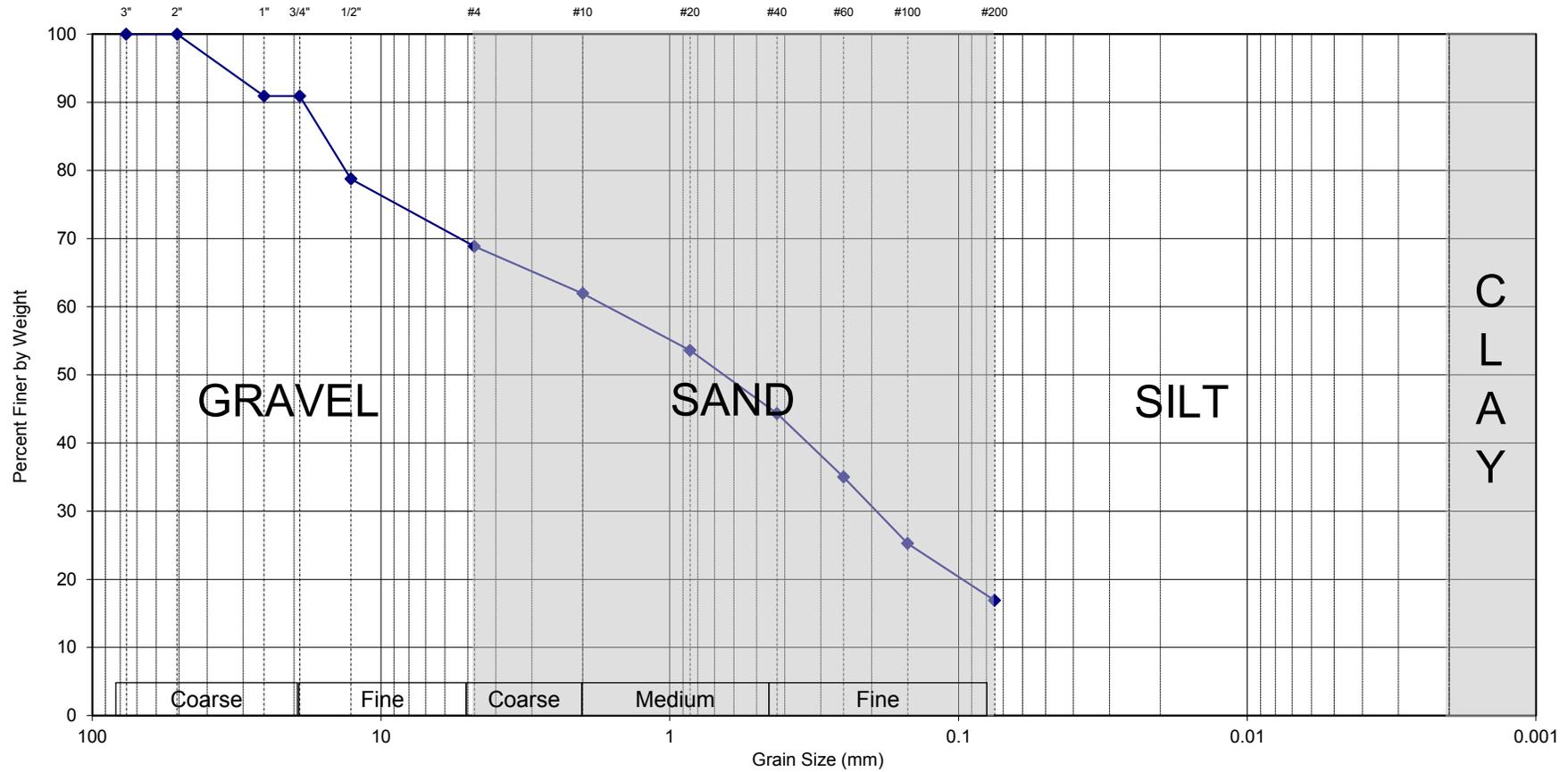
Sieve Size	% Passing
3/4"	100.0
1/2"	98.9
#4	95.7
#10	90.4
#20	80.1
#40	67.5
#60	55.3
#100	42.8
#200	34.3

74-14-0003
Exit 63 Interchange
Gray, ME
GZA Project # 09.0025829.00
Tested by: LM Date: 12/17/14
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195 Frances Ave., Cranston, RI 02910
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
31.1%

Sand
52.0%

Fines
16.9%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
11	GZ-114	S-11	75-77'	Gray-brown f-c SAND, some f-c Gravel, little Silt (SM)	10.6			

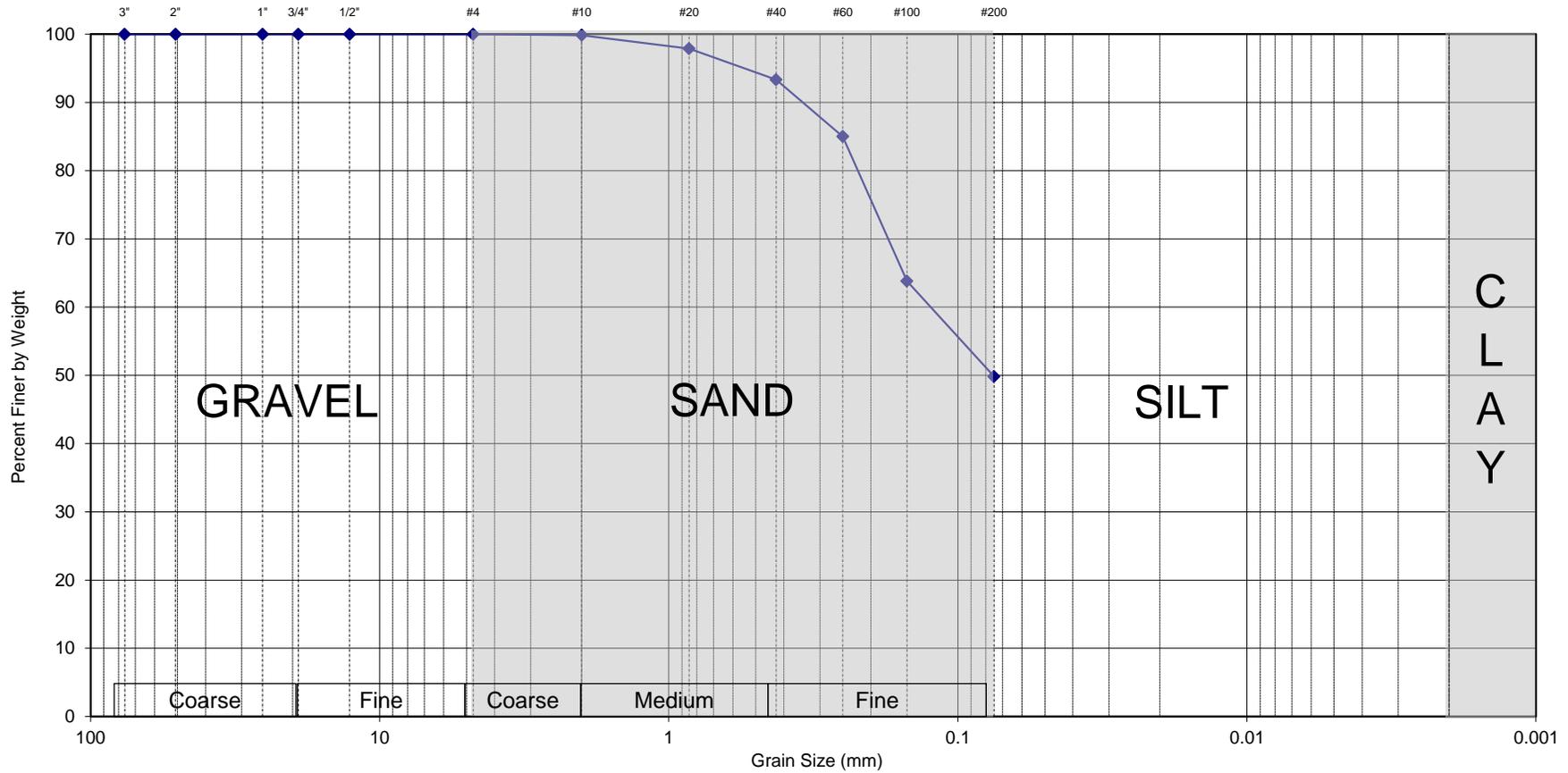
Sieve Size	% Passing
3/4"	90.9
1/2"	78.8
#4	68.9
#10	61.9
#20	53.6
#40	44.3
#60	35.0
#100	25.2
#200	16.9



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Exit 63 Interchange
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
50.2%

Fines
49.8%

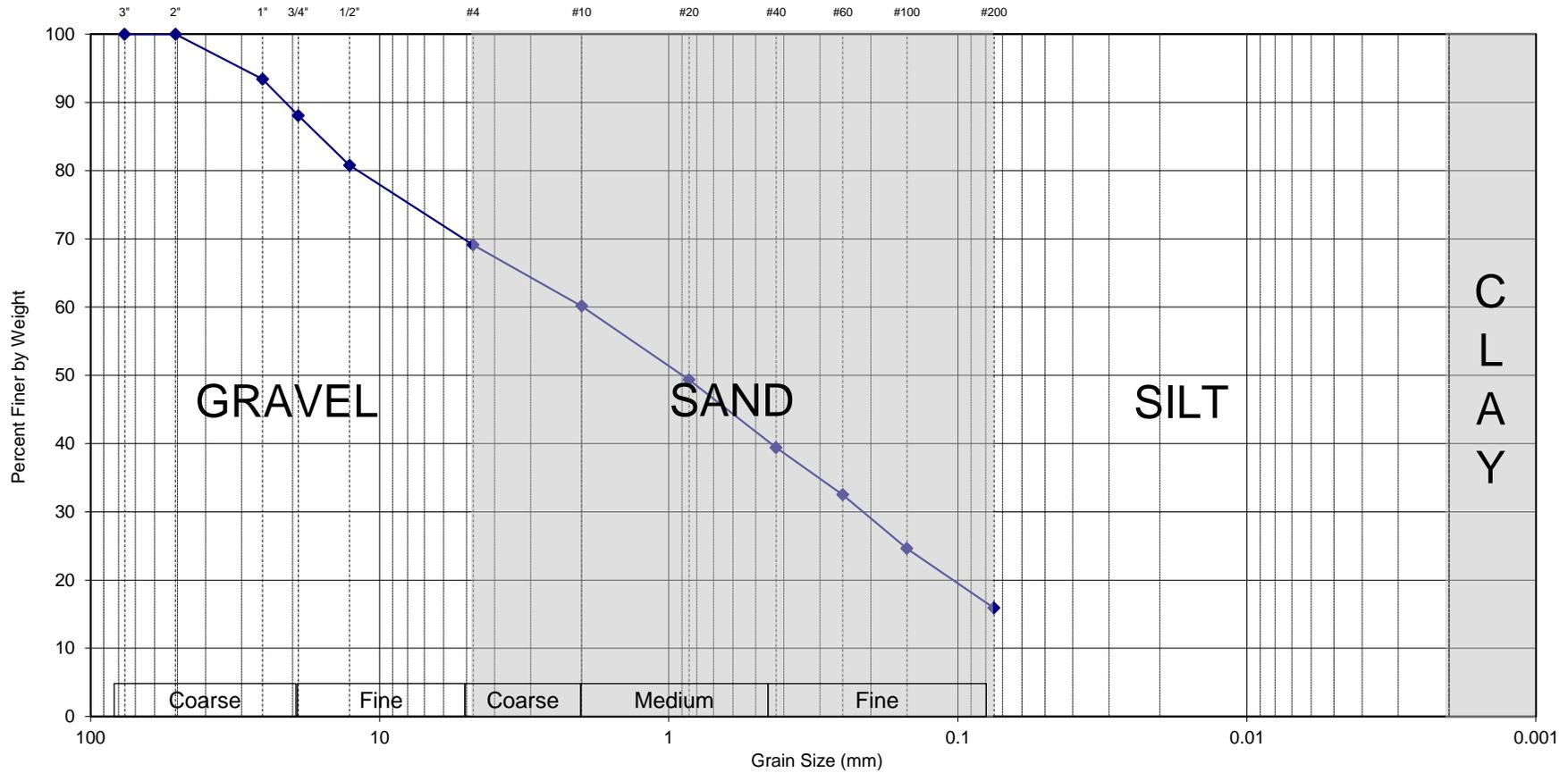
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
12	GZ-106	S-3	5-7'	Brown f-m SAND and SILT (SM)	21.7			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	99.9
#20	97.9
#40	93.3
#60	85.0
#100	63.8
#200	49.8

74-14-0003
Exit 63 Interchange
Gray, ME
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
30.9%

Sand
53.2%

Fines
15.9%

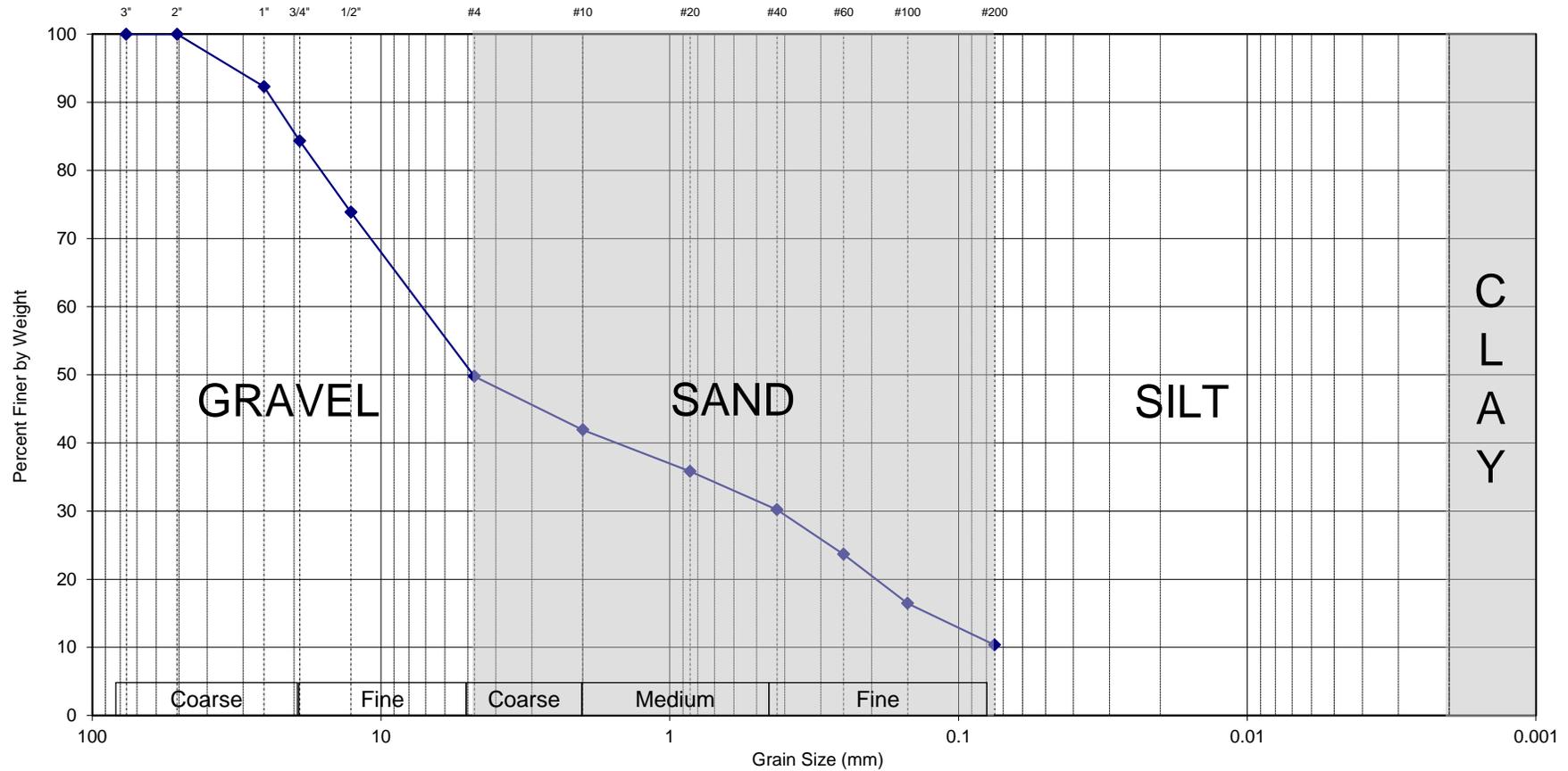
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
13	GZ-122	S-5	15-17'	Gray f-c SAND, some f-c Gravel, little Silt (SM)	8.8			

Sieve Size	% Passing
3/4"	88.1
1/2"	80.8
#4	69.1
#10	60.2
#20	49.4
#40	39.4
#60	32.5
#100	24.6
#200	15.9

74-14-0003
Exit 63 Interchange
Gray, ME
GZA Project # 09.0025829.00
Tested by: LM Date: 12/17/14
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
50.2%

Sand
39.4%

Fines
10.4%

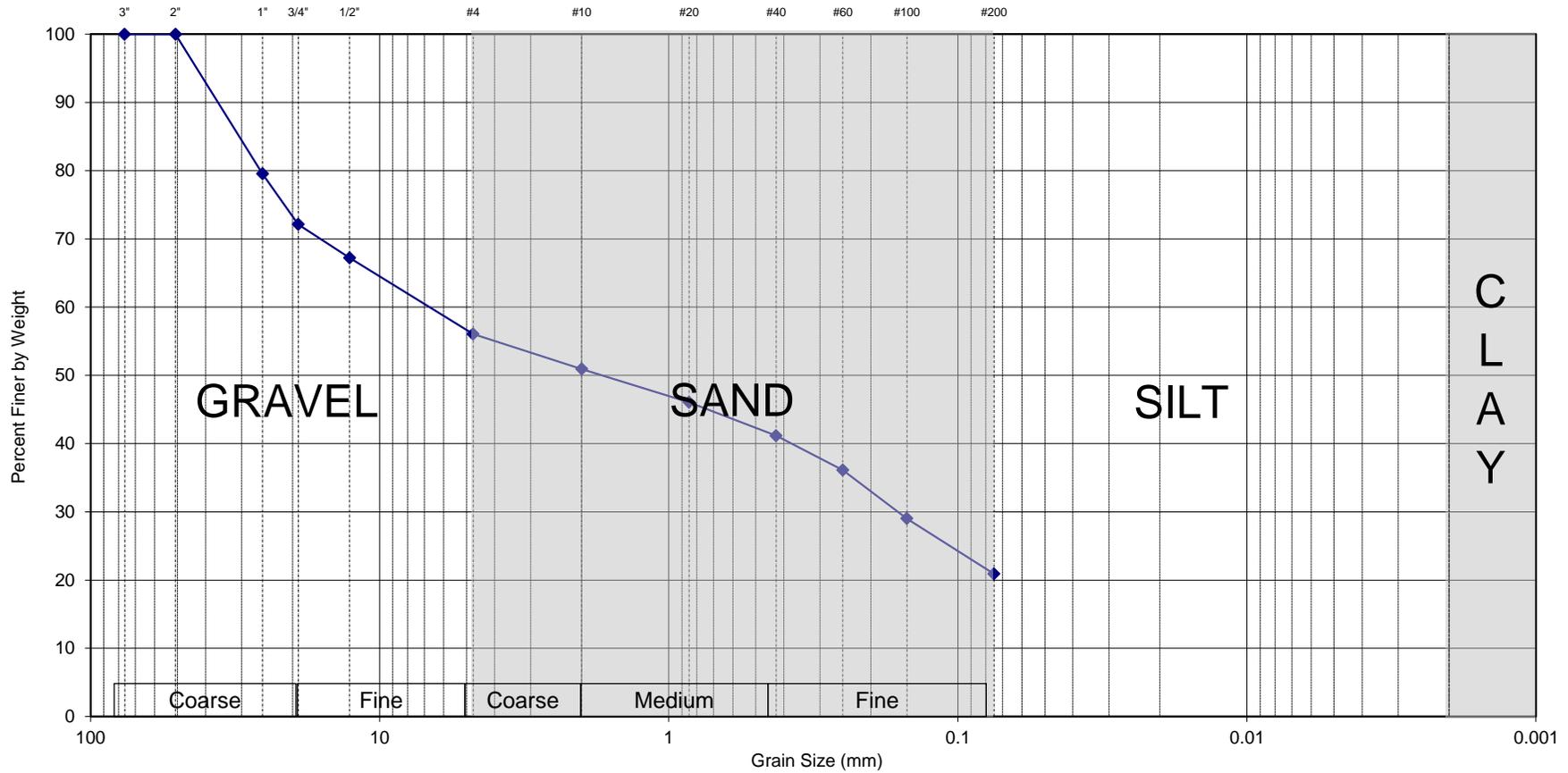
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
14	GZ-122	S-7	25-26.3'	Gray-brown f-c GRAVEL and f-c SAND, little Silt (GP-GM)	7.9			

Sieve Size	% Passing
3/4"	84.3
1/2"	73.9
#4	49.8
#10	41.9
#20	35.8
#40	30.2
#60	23.7
#100	16.5
#200	10.4

74-14-0003
Exit 63 Interchange
Gray, ME
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
43.9%

Sand
35.2%

Fines
20.9%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
15	GZ-124	S-5	15-17'	Gray-brown f-c GRAVEL and f-c SAND, some Silt (GM)	8.1			

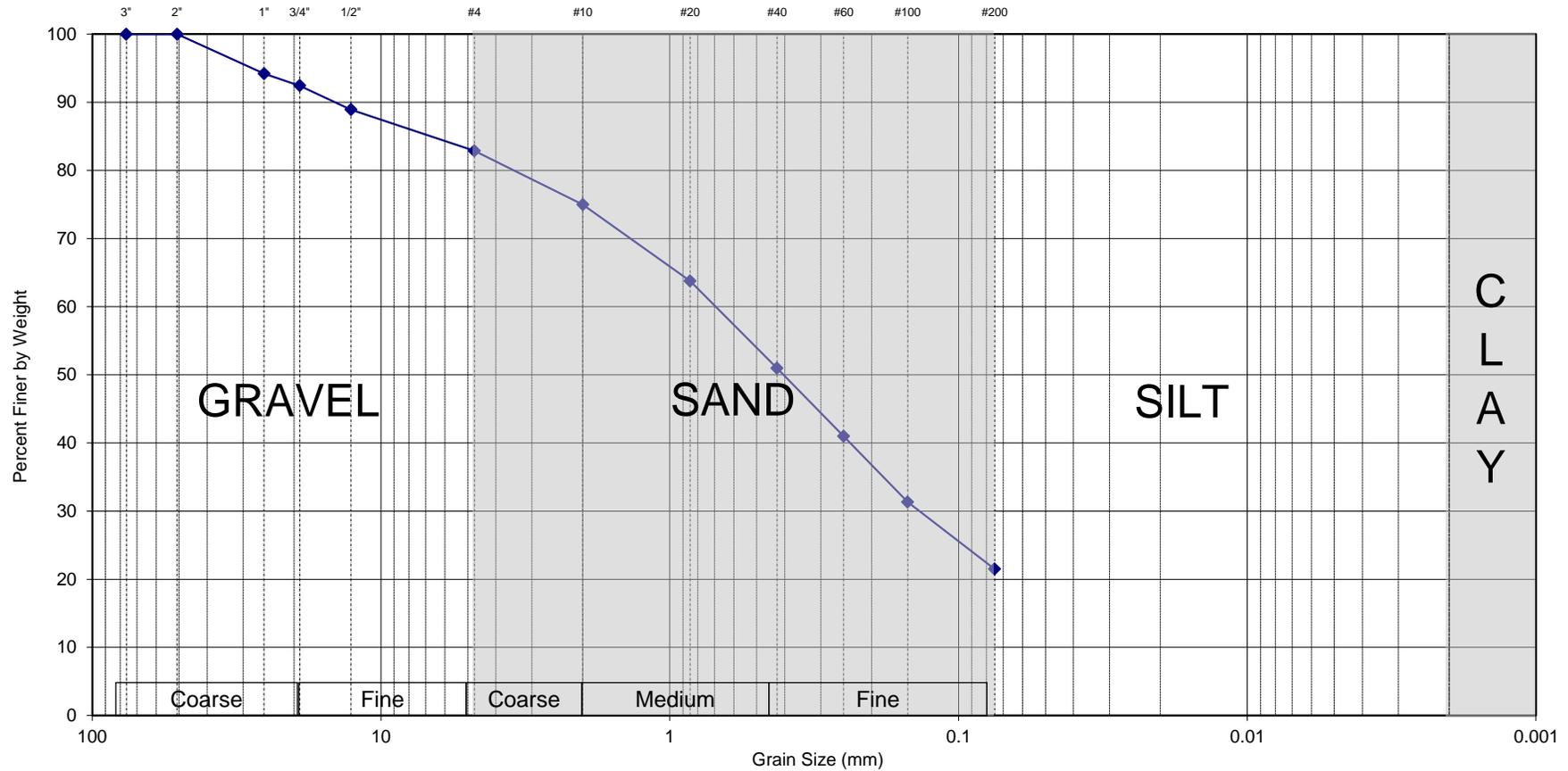
Sieve Size	% Passing
3/4"	72.1
1/2"	67.2
#4	56.1
#10	50.9
#20	46.1
#40	41.2
#60	36.1
#100	29.0
#200	20.9



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Gray, ME
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
17.1%

Sand
61.4%

Fines
21.5%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
16	GZ-127A	S-4	10-11.9'	Brown f-c SAND, some Silt, little f-c Gravel (SM)	11.9			

Sieve Size	% Passing
3/4"	92.4
1/2"	88.9
#4	82.9
#10	75.0
#20	63.8
#40	51.0
#60	41.0
#100	31.3
#200	21.5

74-14-0003
Exit 63 Interchange
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State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

Exit 63 Interchange

MDOT Project Number:

GZA Project Number: 09.0025829.00

Town(s): Gray, ME

Boring & Sample Identification Number	Station (Feet)	Sample No.	Depth (Feet)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
GZ-129		S-4	10-12	28		34.2	47	23	CL	A-7	IV
GZ-129		S-6	20-22	29		43.1	39	18	CL	A-6	IV
GZ-140		S-4	10-12	30		43.5	49	25	CL	A-7	IV
GZ-140		S-5	15-17	31		53.1	52	30	CH	A-7	IV
GZ-101		S-2	2-4	32		27.6			CL	A-6	IV
GZ-102		S-3	9-11	33		38.8	39	18	CL	A-6	IV
GZ-102		S-8	34-36	34		43.5	32	13	CL	A-6	IV
GZ-114		S-1	10-12	35		41.2	43	22	CL	A-6	IV
GZ-105		S-2	2-4	36		21.9			SM	A-4	II
GZ-105		S-6	19-21	37		44.4	39	17	CL	A-6	IV
GZ-108		S-2	4-6	38		28.5			CL	A-6	IV
GZ-133		S-5	14-16	39		50.5	43	21	CL	A-7	IV
GZ-106		S-4	10-12	40		38.1	39	14	CL	A-6	IV
GZ-106		S-6	20-22	41		45.5	39	17	CL	A-6	IV
GZ-142		S-3	4-6	42		30.7	40	15	CL	A-6	IV
GZ-126		S-3	4-6	43		34.0	47	24	CL	A-7	IV
GZ-109		S-7	25-27	44		35.2	30	10	CL	A-4	IV

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible).

The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

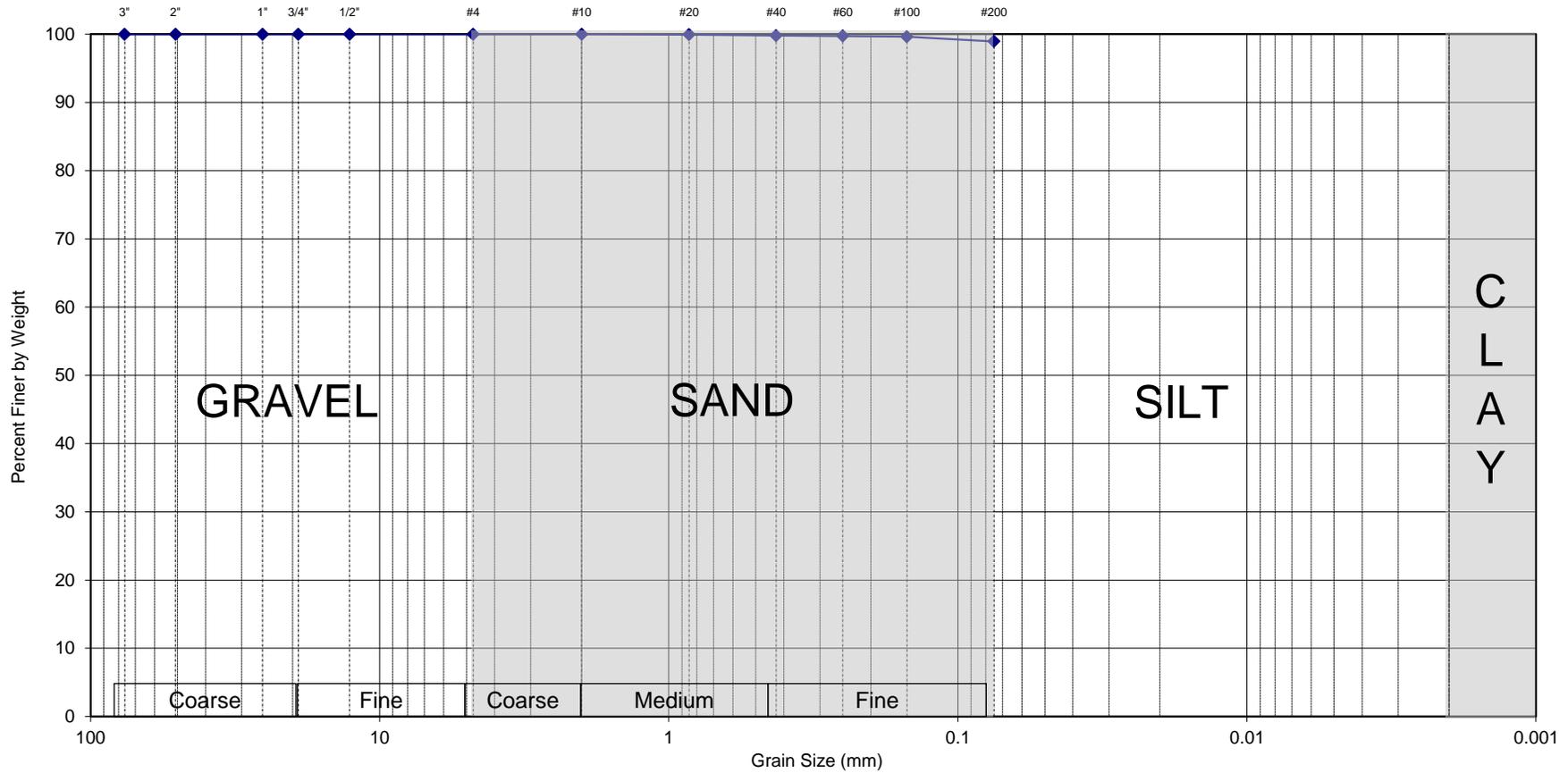
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
1.1%

Fines
98.9%

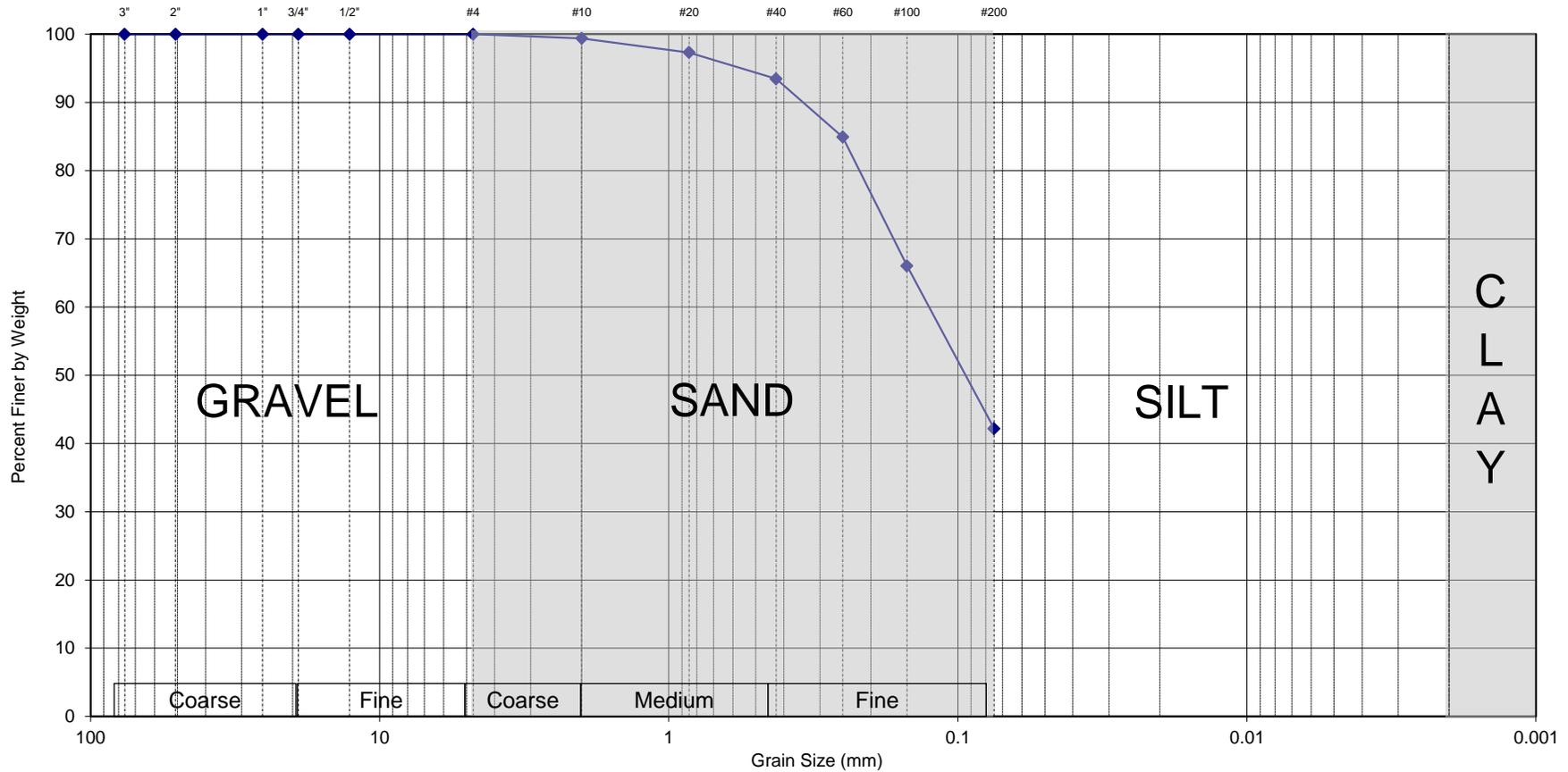
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
32	GZ-101	S-2	2-4'	Gray-brown CLAY & SILT, trace Sand (CL)	27.6			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	100.0
#20	99.9
#40	99.8
#60	99.7
#100	99.6
#200	98.9

74-14-0003
Exit 63 Interchange
Gray, ME
GZA Project # 09.0025829.00
Tested by: LM Date: 12/17/14
Reviewed by: MBP Date: 12/24/14

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401-467-6454

U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
57.8%

Fines
42.2%

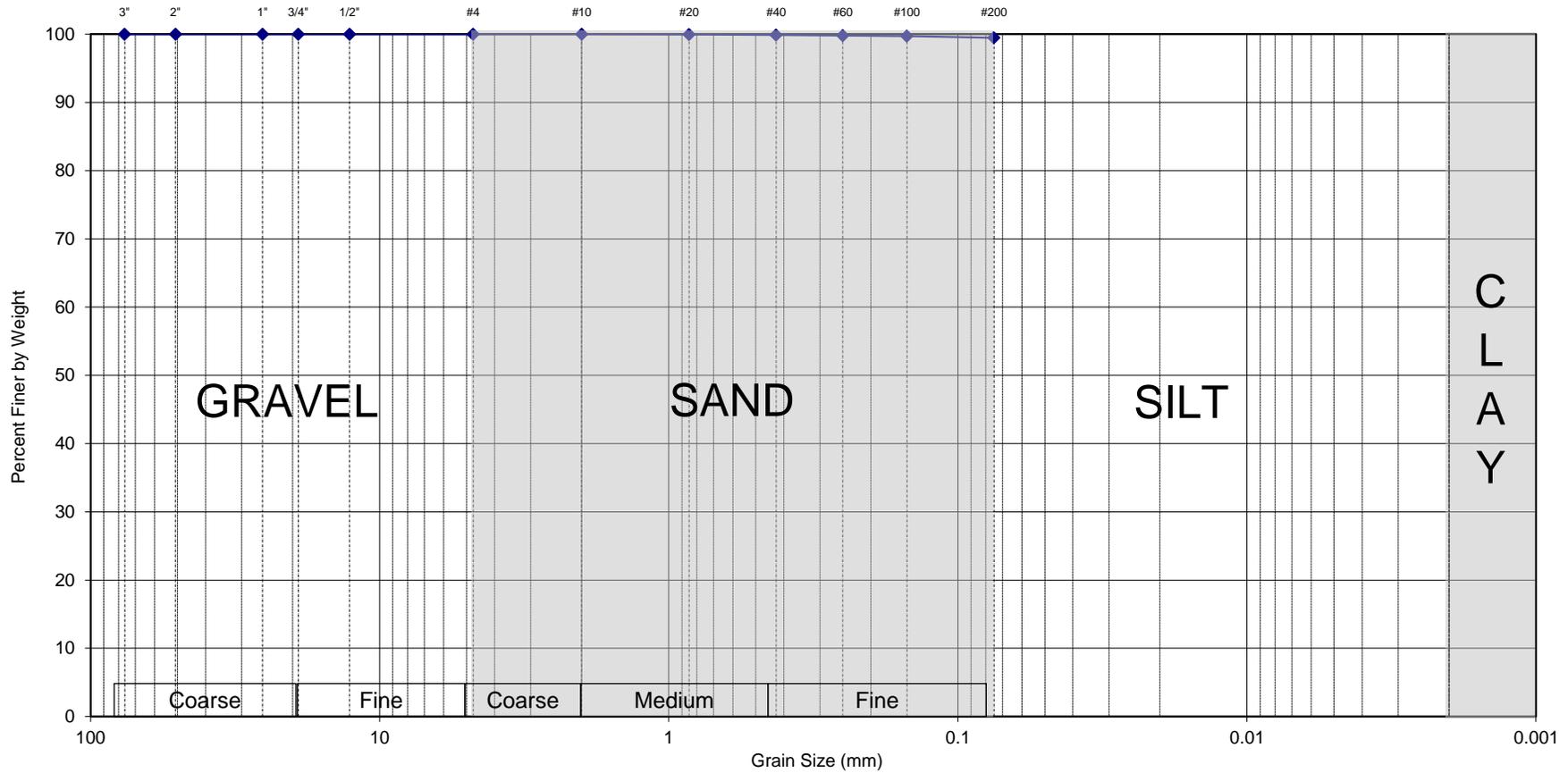
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
36	GZ-105	S-2	2-4'	Brown f-m SAND and SILT (SM)	21.9			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	99.4
#20	97.3
#40	93.4
#60	84.9
#100	66.0
#200	42.2

74-14-0003
Exit 63 Interchange
Gray, ME
GZA Project # 09.0025829.00
Tested by: LM Date: 12/17/14
Reviewed by: MBP Date: 12/24/14

THIELSCH
ENGINEERING
195 Frances Ave., Cranston, RI 02910
401-467-6454

U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
0.6%

Fines
99.4%

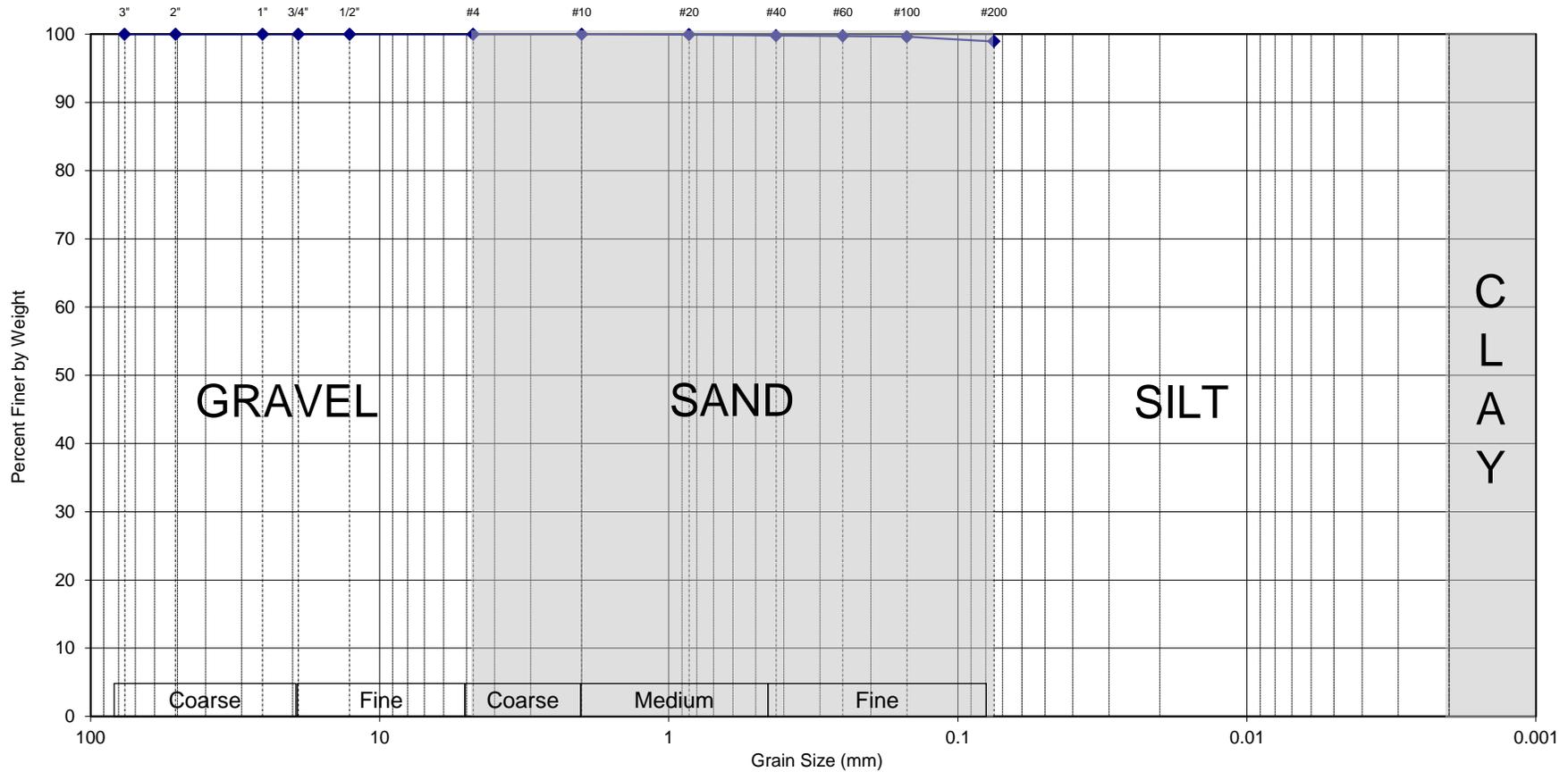
Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
38	GZ-108	S-2	4-6'	Gray CLAY & SILT, trace Sand (CL)	28.5			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	100.0
#20	100.0
#40	99.9
#60	99.8
#100	99.7
#200	99.4

74-14-0003
Exit 63 Interchange
Gray, ME
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U.S. STANDARD SIEVE AND HYDROMETER



Gravel
0.0%

Sand
1.1%

Fines
98.9%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
32	GZ-101	S-2	2-4'	Gray-brown CLAY & SILT, trace Sand (CL)	27.6			

Sieve Size	% Passing
3/4"	100.0
1/2"	100.0
#4	100.0
#10	100.0
#20	99.9
#40	99.8
#60	99.7
#100	99.6
#200	98.9

74-14-0003
Exit 63 Interchange
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