Geotechnical Engineering Report

Maine Turnpike
Exit 103 ORT Conversion
West Gardiner, Maine

Prepared for:
Maine Turnpike Authority

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Sign-off Sheet

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1.0 Introduction

This report presents the results of our geotechnical exploration and analysis for the construction of the new Open Road Tolling (ORT) facility at Exit 103 on I-295 in West Gardiner, Maine. The new facility will replace an existing toll plaza and will be located approximately 700 feet to the north of the existing plaza. The existing toll plaza was constructed in 1972 and is incorporated into a highway ramp overpass. The ramp and overpass are no longer in use. The existing plaza consists of seven booths and a small administration building.

Our scope of work consisted of drilling 32 test borings, evaluating the subsurface conditions and providing preliminary geotechnical engineering recommendations for the design of the roadway embankment, toll booths, administration building, pedestrian tunnel, overhead tolling equipment gantry and overhead highway signs.

Elevations in this report are in feet and referenced to the vertical datum NAVD 88.

Recommendations in this report are made in accordance with the following codes:

- Administration Building – International Building Code 2009 (IBC 2009)
- Gantry, Pedestrian Tunnel, Toll Booths and Slopes – AASHTO LRFD Bridge Design Specifications, 7th Edition/2014 (AASHTO LRFD)
- Overhead Sign Structures – Maine DOT Standard Specifications 626 and 643; and Maine DOT Standard Detail 626.

2.0 Site and Project Information

The existing highway in the immediate area of the proposed ORT facility consists of two south bound lanes and two north bound lanes, separated by a grass median. Wooded areas are located along both sides of the highway. Along the east and west side of the project area the grade slopes downward from the edge of pavement at about a 2 Horizontal to 1 Vertical slope (2H:1V).

We understand the project will involve widening the highway by approximately 100 feet in the area of the new ORT facility; 50 feet on each side to accommodate the new toll plaza which includes ORT. The highway widening will require embankment fills up to 15 feet high. The new ORT facility will consist of the following:

- A small administration building;
- A small employee parking area;
- A 1900-foot long access roadway for the administration building;
- Three south bound cash lanes with toll booths;
- Three north bound cash lanes with toll booths;
- Two south bound and two north bound ORT lanes with an overhead toll equipment gantry and equipment slab; and
- A pedestrian tunnel.

3.0 Subsurface Information

3.1 LOCAL GEOLOGY

The Site is located in Kennebec County in Maine approximately five miles south of Augusta, Maine. The surficial soils in the project area are mapped on the "Surficial Geology, Gardiner Quadrangle, Maine" Maine Geological Survey Open File No. 09-8, 2009. Based on the map, the surficial soil in the immediate area of the Site is the Presumpscot Formation which consists of silt, clay and sand sized particles deposited in deep ocean water. The deposit typically has a stiff crust underlain by a very soft normally consolidated layer that is compressible. The map indicates that the surficial soil in the areas to the northeast, northwest and southwest of the site consist of glacial till. The till is general described as loose to very compact, poorly sorted, massive to weakly stratified mixture of sand, silt, and gravel-size rock debris deposited by glacial ice. The till locally includes lenses of water deposited sand and gravel. Boulders are commonly present on the ground surface.

Based on a map in the publication entitled "Bedrock Geology of Gardiner 15' Quadrangle, Maine" Maine Geological Survey Open File No. 84-8, 1984, the bedrock at the site consists of a pluton described as intrusive hornblende quartz diorite. A schist associated with the Waterville Formation is also mapped in the area.

3.2 EXISTING SUBSURFACE INFORMATION

Existing subsurface information was available on plans prepared by Howard, Needles, Tammen, and Bergendoff (HNTB) Consulting Engineers and titled "Ramp E Over Interstate 95 in the Town of West Gardiner". The plans were prepared for the design and construction of the bridge located above the existing toll plaza. Eleven test borings were drilled as part of the exploration program. The borings generally encountered approximately 8 feet of stiff to very stiff brown weathered silty clay, over 1 to 7 feet of medium stiff gray silty clay, over 2 to 9 feet of medium dense gray silty gravel and sand. The bedrock was described as biotite gneiss.

The HNTB plans indicate that the abutments and three of the four piers are founded on piles driven to bedrock. The fourth pier is founded on a spread footing bearing on bedrock. The toll booth and tunnel are shown on the plans and appear to be soil supported, but bearing capacities are not presented on the plans.

3.3 2018 SUBSURFACE EXPLORATION PROGRAMS

The subsurface exploration program was conducted in two phases, preliminary program in January 2018 and final program in June/July 2018. A total of 32 borings were drilled. A discussion of each program follows.

Soil samples were obtained by driving a 24-inch long, 2-inch outside diameter split spoon sampler with a 140-pound safety hammer falling 30 inches, in substantial accordance with ASTM D1586, the Standard Penetration Test (SPT). The blows for each 6-inches of penetration are recorded for a total of 24-inches. The sum of the blows required to drive the sampler from 6-

inches to 18-inches of penetration is referred to as the Standard Penetration Resistance, or N-value, which is an index of measure of in-situ soil density or consistency. N values for granular soils less than 5 are considered to be very loose, between 5 and 10 loose; between 11 and 24 medium dense; between 25 and 50 dense; and greater than 50 very dense. For cohesive soils N values less than 2 are considered to be very soft, between 2 and 4 soft; between 4 and 8 firm; between 8 and 15 stiff; between 15 and 30 very stiff and greater than 30 hard.

3.3.1 Preliminary Program

The preliminary exploration program consisted of the drilling of seven test borings between January 16 and 19, 2018. The purpose of the preliminary program was to investigate the subsurface soil, bedrock, and groundwater conditions in the area of the proposed administration building, toll plaza, and associated pedestrian tunnel. The location of the test borings is shown on the boring location plans. The test borings were drilled by New England Boring of Hermon, Maine. A track-mounted drill rig equipped with 4-inch solid stem auger or 3-inch diameter flush-joint steel casing was used to advance the borings.

The drill rig was equipped with an automatic hammer for the SPT test. Automatic hammers typically have a higher efficiency than safety hammers and therefore a hammer energy correction factor (CF) is needed to determine the SPT N60 value. Based on a report entitled "SPT Energy Testing" prepared by GZA dated March 31, 2017 and provided by New England Boring Contractors, the automatic hammer used for the test borings has an efficiency of 67.7 percent which results in a hammer energy correction factor of 1.13. The raw SPT values were multiplied by the appropriate correction factors to determine the SPT N_{60} values. Both the raw SPT values and SPT N_{60} values are recorded on the boring logs. The boring logs are provided in Appendix A.

Two-inch diameter PVC wells were installed in B-102(ow), B-104(ow) and B-107(ow). The wells were finished with flush mounted roadway boxes. Details of the well construction are presented on the well logs provided in Appendix B. Rock core samples were obtained from boring B-101, B-105 and B-106 using a NX double-walled core barrel. Photographs of the bedrock are provided in Appendix C.

3.3.2 Final Program

The final exploration program consisted of the drilling of 25 test borings designated B-108 through B-132. The borings were drilled between June 11 and June 22, 2018 and on July 9, 2018. The purpose of the final program was to investigate the subsurface soil, bedrock and groundwater conditions in the area of the proposed roadway widening, the access roadway to the administration building and the overhead sign locations. The locations of the test borings are shown on the boring location plans. The test borings were drilled by New England Boring of Hermon, Maine. The majority of the borings were drilled with a track-mounted drill rig equipped with 4.25-inch diameter hollow stem augers. Two borings were drilled with a truck-mounted drill rig equipped with 4.25-inch diameter hollow stem auger.

The ATV drill rig was equipped with a safety hammer for the SPT test which does not require correction for efficiency. However, the truck rig was equipped with an automatic hammer which

typically have a higher efficiency than safety hammers and therefore a hammer energy correction factor (CF) is needed to determine the SPT N_{60} value. Based on a report entitled "SPT Energy Testing, Truck Mounted Mobile B-53 Drill Rig, NH License Plate No. 4368" prepared by GZA dated July 19, 2018 and provided by New England Boring Contractors, the automatic hammer used for the test borings has an efficiency of 93.8 percent which results in a hammer energy correction factor of 1.56. The raw SPT values were multiplied by the appropriate correction factors to determine the SPT N60 values. Both the raw SPT values and SPT N60 values are recorded on the boring logs. The boring logs are provided in Appendix A.

Rock core samples were obtained from boring B-119 using a NX double-walled core barrel. The rock core samples were visually described by a Stantec geotechnical engineer. Photographs of the bedrock are provided in Appendix C.

In-situ field vane shear tests were attempted in the soft clay deposit at boring B-120. The intent was to evaluate the shear strength of the clay for use in the design of overhead sign structure foundations and slope stability evaluation. However, the vane was not able to be pushed into the clay due to sand seams within the clay.

4.0 Summarized Subsurface Conditions

The subsurface conditions encountered in the borings are based on widely spaced explorations and variations in conditions should be anticipated. In general, the test borings encountered a granular embankment fill overlying a relatively thin deposit of sand, marine clay, glacial till and bedrock. Bedrock was cored at borings B-101, B-105, B-106, and B-119. The soil samples were described in accordance with the modified Burmister system. A key for the Burmister system is provided in Appendix A prior to the boring logs. The subsurface conditions are typical of coastal Maine and are summarized in the following paragraphs.

4.1 ASPHALT

Asphalt pavement was encountered at the locations of borings B-118, B-119 and B-126 through B-129. The thickness of the asphalt ranged from 4 to 7 inches.

4.2 TOPSOIL

Topsoil was encountered at the locations of borings B-108, B-109, B-111, B-113, B-115, B-122, B-124 and B-125. The thickness generally ranged from 3 to 9 inches. At the location of boring B-115 the thickness was recorded as 24 inches.

4.3 EMBANKMENT FILL

Fill was encountered at the locations of borings B-104, B-105, B-114, B-116, B-117, B-118, B-119, B-121, B-123, B-124, B-126, B-127, B-128, B-129, and B-130. The embankment fill was encountered below the asphalt, topsoil, or at the surface and was approximately 4 to 18 feet thick. The fill generally consisted of brown to gray medium to fine sand with lesser amounts of silt and gravel. The recorded N-values ranged from 5 to 58 blows per foot (bpf), indicating a loose to very dense consistency.

4.4 SAND DEPOSIT

A natural sand deposit was encountered in all borings except for B-102, B-104, B-105, B-114, B-116, B-119, B-126, B-127, B-128, and B-131. The layer was generally encountered under a marine deposit and above probable bedrock. Where there was no marine clay, the sand layer was below the embankment fill or topsoil. The sand was approximately 2 to 20 feet thick. The deposit generally consisted of tan or brown, medium to fine sand, with some silt and little gravel. The recorded N-values ranged from 10 to 67 bpf, indicating a medium dense to very dense consistency.

4.5 MARINE CLAY DEPOSIT

A deposit of marine clay was encountered at the ground surface, under topsoil, or under embankment fill in all borings except for B-104, B-105, B-111, B-114. B-116, B-119, B-126, B-129, and B-130. The deposit ranged from 2 to 20 feet thick and described as a brown/gray clayey silt with traces of organics and gravel. The recorded N-values ranged from 2 to 22 bpf, indicating a soft to very stiff consistency.

4.6 GLACIAL TILL

An 8 inch to 3.5 feet thick layer of glacial till was encountered above the bedrock at borings B-102, B-106, and B-125. A layer of till was encountered at a depth of 15 feet at boring B-121 and was not fully penetrated at the terminal depth of 27 feet. The layer was described as a brown fine sand with lesser amounts of silt, and gravel or a gray silt with lesser amounts of clay and gravel. Blow counts of the till ranged from 27 to 58 bpf to refusal, which indicates a medium dense to very dense material.

4.7 BEDROCK

Based on drilling resistance, bedrock was encountered at all locations except boring B-121 with depths to top of bedrock ranging from 2.5 to 31.4 feet below the ground surface. Bedrock samples were obtained in 5-foot core runs using a NX type barrel at borings B-101, B-105, B-106, and B-119. Where bedrock was not cored, the bedrock surface was inferred by auger or split spoon refusal. Where shallow refusal occurred, a hole was offset approximately 5 feet from the original location and probed with an auger to confirm the refusal was on probable bedrock. Bedrock depths and how they were determined are found in Table 1 below. The bedrock was described as hard, slightly weathered, gray, fine grained Gneiss with low angle to moderately dipping, close to widely spaced, rough partly opened joints.

The cores were measured for percent recovery and rock quality designation (RQD). The recovery for the core runs was 87 and 92 percent. RQD is a rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core run. High-quality rock has an RQD of more than 75%; lower quality rock has an RQD of less than 50%. The RQD of the recovered bedrock cores was 33% to 77% percent, indicating fair-quality rock mass. Photographs of the rock cores are included in Appendix C.

Table 1 – Bedrock Depth and Elevation

Boring	Station (ft)	Offset (ft)	Location	Ground Elev. (ft)	Top of Bedrock		Cored or Refusal
					Depth (ft)	Elev. (ft)	
B-101	3500+00	97.0 LT	Administration Building	204.4	2.5	201.9	Cored
B-102	3500+00	50.0 LT	Southbound Toll Booths	208.5	6	202.5	Refusal
B-103	3500+84	52.6 LT	Southbound Toll Booths	208.5	7	201.5	Refusal
B-104	7499+39	22.0 LT	ORT Slabs and Gantries	214.8	8.8	206.0	Refusal
B-105	7500+59	22.0 LT	ORT Slabs and Gantries	214.8	9	205.8	Cored
B-106	8499+16	51.0 RT	Northbound Toll Booths	208.0	6.7	201.3	Cored
B-107	8499+95	60. RT	Northbound Toll Booths	208.0	4.8	203.2	Refusal
B-108	3491+04	45.6 LT	Southbound Overhead Sign/ Southbound Widening	203.0	16	187.0	Refusal
B-109	8491+13	33.3 RT	Northbound Widening	205.1	10.2	194.9	Refusal
B-110	113+85	19.7 RT	Admin Building Access Road	210.4	20.6	189.8	Refusal
B-111	118+32	64.4 LT	Admin Building Access Road	205.8	7.8	198.0	Refusal
B-112	3496+43	52.8 LT	Southbound Widening	206.0	6.1	199.9	Refusal
B-113	7496+38	64.0 RT	Northbound Widening	210.0	6.5	203.5	Refusal
B-114	3502+56	12.4 LT	Southbound Widening	218.2	13.4	204.8	Refusal
B-115	8503+79	58.8 RT	Northbound Widening	213.9	19.2	194.7	Refusal
B-116	7509+93	18.6 LT	Northbound Widening	215.9	15	200.9	Refusal
B-117	7427+29	22.3 LT	Northbound Overhead Sign	170.3	25.3	145.0	Refusal
B-118	7427+31	33.3 RT	Northbound Overhead Sign	172.1	31.4	140.7	Refusal
B-119	7449+92	38.0 LT	Northbound Overhead Sign	187.8	10.0	177.8	Cored
B-120	7449+88	45.7 RT	Northbound Overhead Sign	184.2	12.1	172.1	Refusal
B-121	7462+96	36.9 LT	Northbound Overhead Sign	195.4	NE	--	--
B-122	7462+89	41.4 RT	Northbound Overhead Sign	192.7	15.8	176.9	Refusal
B-123	7471+68	22.8 LT	Northbound Overhead Sign	198.9	19.3	179.6	Refusal
B-124	7477+26	30.0 LT	Northbound Overhead Sign	197.8	19.7	178.1	Refusal

Table 1 – Bedrock Depth and Elevation (continued)

Boring	Station (ft)	Offset (ft)	Location	Ground Elev. (ft)	Top of Bedrock		Cored or Refusal
					Depth (ft)	Elev. (ft)	
B-125	7477+26	42.0 RT	Northbound Overhead Sign	199.4	24.6	174.8	Refusal
B-126	4491+02	16.4 RT	Southbound Overhead Sign	211.9	6.0	205.9	Refusal
B-127	3508+74	20.1 LT	Southbound Overhead Sign	227.9	23.2	204.7	Refusal
B-128	4508+80	0.2 LT	Southbound Overhead Sign	228.1	19.8	208.3	Refusal
B-129	27+00	30.5 LT	Exit 103 Ramp Overhead Sign	226.2	36.2	190.0	Refusal
B-130	27+05	30.4 RT	Exit 103 Ramp Overhead Sign	221.5	28.6	192.9	Refusal
B-131	43+00	42.5 LT	Exit 103 Ramp Overhead Sign	215.7	24.8	190.9	Refusal
B-132	42+96	34.6 RT	Exit 103 Ramp Overhead Sign	216.9	22.3	194.6	Refusal

Note: NE = Not Encountered

4.8 GROUNDWATER

Groundwater levels were obtained from observation wells installed in borings B-102(ow), B-104(ow), and B-107(ow). The groundwater data in the f wells ranged from El 202.5 and El 206.5. Groundwater will vary over time due to seasonal changes in precipitation and temperature, snowmelt, and surrounding and on-site drainage characteristics.

Table 2 – Groundwater Depth and Elevation

Boring	Station (ft)	Offset (ft)	Location	Ground Elev. (ft)	Ground Water 1/19/2018		Ground Water 7/9/2018	
					Depth (ft)	Elev. (ft)	Depth (ft)	Elev. (ft)
B-102	3500+00 SB Cash	50 LT	North End of Pedestrian Tunnel	208.5	6	202.5	3.5	205.0
B-104	7499+39 NB ORT	22 LT	Midpoint of Pedestrian Tunnel	214.8	8.8	206.0	8.3	206.5
B-107	8499+95 NB Cash	60 RT	South End of Pedestrian Tunnel	208.0	4.8	203.2	2.4	205.6

4.9 HAND AUGER PROBES

Hand probes were made in the wetland and-low lying areas that will be filled as part of the highway widening. The purpose of the probes was to estimate the thickness of the organic soils in the wetlands and other low-lying areas where thick deposits of organic are typically located. The

locations of the hand probes are shown on the boring location plans. A summary of the results is provided in the table below:

Table 3 – Summary of Muck Thickness

Probe No.	Station (ft) (NB ORT Baseline)	Offset (ft)	Organic Thickness (inches)	Comments
HA-1	7477+32	130 LT	4	Organic soil
HA-2	7478+33	134 LT	4	Organic soil
HA-3	7478+24	89 RT	3	Organic soil
HA-4	7478+59	85 RT	0	Topsoil
HA-5	7479+45	87 RT	0	Topsoil
HA-6	7483+43	131 RT	0	Topsoil
HA-7	7484+33	89 RT	4	Topsoil
HA-8	7490+33	137 LT	8	Organic soil
HA-9	7494+26	136 LT	8	Organic soil
HA-10	7490+22	88 RT	3	Topsoil
HA-11	7490+93	72 RT	3	Topsoil
HA-12	7495+10	125 LT	6	Organic soil
HA-13	7495+58	123 LT	6	Organic soil
HA-14	7496+12	122 LT	6	Organic soil
HA-15	7512+38	154 LT	24	Highly organic soil
HA-16	7513+35	133 LT	30	Highly organic soil
HA-17	7514+35	120’ Left	24	Highly organic soil

5.0 Laboratory Testing

Laboratory tests were conducted on representative soil samples obtained from the test borings to assist in classification and to evaluate engineering properties. Laboratory soil testing consisted of grain size distribution, moisture content, and Atterberg Limits. Laboratory rock testing consisted of unconfined compression strength. Soil and rock testing were conducted by GeoTesting Express of Acton, MA. Results of the soil and rock tests are included in Appendix D and Appendix E, respectively. The results are summarized in the tables below.

Table 4 – Grain Size Distribution Summary

Boring No.	Sample No.	Depth (feet)	Stratum/Soil Description	Moisture Content	Percent Gravel	Percent Sand	Percent Fines
B-109	SS-4	6-8	Sand Deposit Medium to fine SAND, trace Silt	18.9	0	95.9	4.1
B-110	SS-2	2-4	Marine Clay SILT and medium to fine sand, trace fine gravel	12.7	3.8	40.2	56.0
B-114	SS-2	7-9	Embankment Fill Medium to fine SAND and silt, trace gravel	15.2	2.5	49.8	47.7
B-116	SS-4	6-8	Embankment Fill Medium to fine SAND and fine gravel, little silt	6.1	38.6	45.9	15.5
B-116	SS-6	10-12	Embankment Fill Medium to fine SAND, some silt, little fine gravel	10.0	11.4	63.3	25.3
B-118	SS-2	5-7	Embankment Fill SILT, some fine gravel, little fine sand	15.3	22.7	12.0	65.3
B-119	SS-3	6-8	Embankment Fill SILT and medium to fine sand, trace fine gravel	10.3	4.7	38.9	56.4
B-127	SS-5	14-16	Embankment Fill SILT and coarse to fine sand, little fine gravel	13.4	15.8	40.4	43.8
B-127	SS-7	18-20	Marine Clay SILT, some medium to fine sand, some fine gravel	17.3	22.6	31.8	45.6
B-128	SS-2	10-12	Embankment Fill Medium to fine SAND, some silt, some fine gravel	11.8	23.6	43.2	33.2
B-128	SS-3	12-14	Embankment Fill SILT, some medium to fine sand, trace fine gravel	18.3	5.5	26.8	67.7
B-129	SS-4	12-14	Embankment Fill SILT, trace fine gravel, trace fine sand,	25.3	0.3	7.0	92.7
B-129	SS-6	16-18	Sand Deposit Medium to fine SAND, some silt, little fine gravel	11.7	12.4	54.9	32.7
B-130	SS-4	6-8	Embankment Fill Fine SAND, little silt, trace fine gravel	15.9	0.5	65.7	33.8
B-130	SS-9	20-22	Sand Deposit Medium to fine SAND, some silt, trace fine gravel	18.4	3.9	68.0	28.1

Table 5 – Atterberg Limit Test Summary

Boring No.	Sample No.	Depth (feet)	Stratum	MC (%)	LL	PL	PI
B-108	SS-5	8–10	Marine Clay	30.6	39	18	21
B-109	SS-2	2-4	Marine Clay	26.8	38	18	20
B-110	SS-4	6-8	Marine Clay	25.6	41	20	21
B-115	SS-4	6-8	Marine Clay	22.4	21	14	7
B-115	SS-6	10-12	Marine Clay	23.8	31	18	13
B-118	SS-5	14-16	Marine Clay	22.6	37	18	19
B-120	SS-3	4-6	Marine Clay	32.3	38	18	20
B-122	SS-3	4-6	Marine Clay	22.2	27	17	10
B-123	SS-5	8-10	Marine Clay	26.3	46	20	26
B-124	SS-5	8-10	Marine Clay	27.6	41	18	23
B-130	SS-7	12-14	Marine Clay	21.4	34	17	17
B-131	SS-4	6-8	Marine Clay	29.8	41	20	21
B-132	SS-7	15-17	Marine Clay	28.0	34	15	19

Where: MC = Moisture Content
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index

Table 6 – Bedrock Result Test Summary

Boring No.	Core No.	Approximate Elevation (ft)	Bulk Density (lb/ft^3)	Compressive Strength (lb/in^2)	Failure Type
B-101	C-1	197.6	170	5,163	Discontinuity/Intact
B-106	C-2	194.8	174	1,985	Discontinuity
B-119	C-1	176.0	180	10,536	Intact

6.0 Discussions and Recommendations

Our recommendations provided below are based the subsurface information and our understanding of the proposed construction. Recommendations are provided for the proposed embankment slopes, ORT gantry, pedestrian tunnel, toll booth structures and administration building. The recommendation for the embankment slopes and ORT gantry are based on AASHTO LRFD 2014. The recommendations for the administration building are based on the IBC 2009. A generalized soil profile used in our analysis is provided in the Table 7. Soil strength parameters are provided in Table 8.

Table 7 – Generalized Soil Profile

Soil Stratum	Approximate Thickness (feet)
Existing Embankment Fill	4 to 18
Sand	2 to 20
Marine Clay	2 to 20
Glacial Till	1 to 4
Weathered/Fractured Bedrock	0 to 5
Bedrock	--

Table 8 – Summary of Soil Strength Parameters

Soil Stratum	Unit Weight, γ_m (pcf)	Drained Conditions		Undrained Conditions	
		Effective Friction Angle, φ' (Degrees)	Cohesion, c' (psf)	Friction Angle, φ (Degrees)	Cohesion, c (psf)
Existing Embankment Fill	125	32	0	32	0
Proposed Embankment Fill	125	34	0	34	0
Sand	120	31	0	31	0
Marine Clay	110	30	0	0	400 to 1,200
Glacial Till	135	38	0	38	0

6.1 ADMINISTRATION BUILDING

The proposed administration building will be located on the west side of the highway. The building will be one story with a basement level. The building footprint will be approximately 32 by 50 feet. The first floor is expected to be at El. 220.2 and the basement floor at El. 207.2. The pedestrian tunnel will connect the cash lane toll booths to the basement of the building.

The grade surrounding the proposed building is expected to be raised by approximately 15 feet. Given the relatively thin strata of naturally deposited soils overlying the bedrock, settlement due the grade raise is expected to be negligible and will occur as the fill is placed.

6.1.1 Building Footings

A spread footing foundation support system is considered to suitable for supporting the proposed building. The footings are expected to bear on compacted fill placed over the naturally deposited loose sand or stiff clay. The footings should be sized based using a net allowable bearing pressure of 2 kips per square foot (ksf). The minimum footing width is 18 inches for strip

footings and 3 feet for isolated footing. Total settlement is expected to be less than 1 inch and differential settlement is expected to be less than ½ inch over 50 feet.

6.1.2 Building Slabs

Slabs should be supported by a minimum of 12 inches of compacted fill meeting the requirements of MaineDOT Item No. 703.20, Gravel Borrow, or 12 inches of compacted 3/8-inch crushed stone. A modulus of subgrade reaction, k of no greater than 200 pounds per cubic inch (pci) should be used for the design of the slab. Slab settlements are anticipated be similar to that of the foundations. Please note that some cracking of slabs-on-grade is normal and should be expected. Cracking may occur not only as a result of heave or compression of underlying soil, but also as a result of concrete curing stresses. In order to reduce the potential for floor cracking, it is recommended that the measures listed below be followed during construction:

- The installation of floor slab construction joints as recommended by the American Concrete Institute (ACI) between the columns and walls and between columns to account for differential settlement.
- Backfill in areas supporting floor slabs should be moisture conditioned and compacted.
- Backfill below slabs in utility trenches should be carefully compacted.
- Exterior slabs should be structurally isolated from the building.

A vapor barrier is recommended for slabs on grade that are expected to receive moisture-sensitive floor adhesives or finishes. With the use of vapor barriers, the position of the barrier, materials used for the base course, curing methods for the concrete slab, and scheduling of the floor finishes should be carefully evaluated.

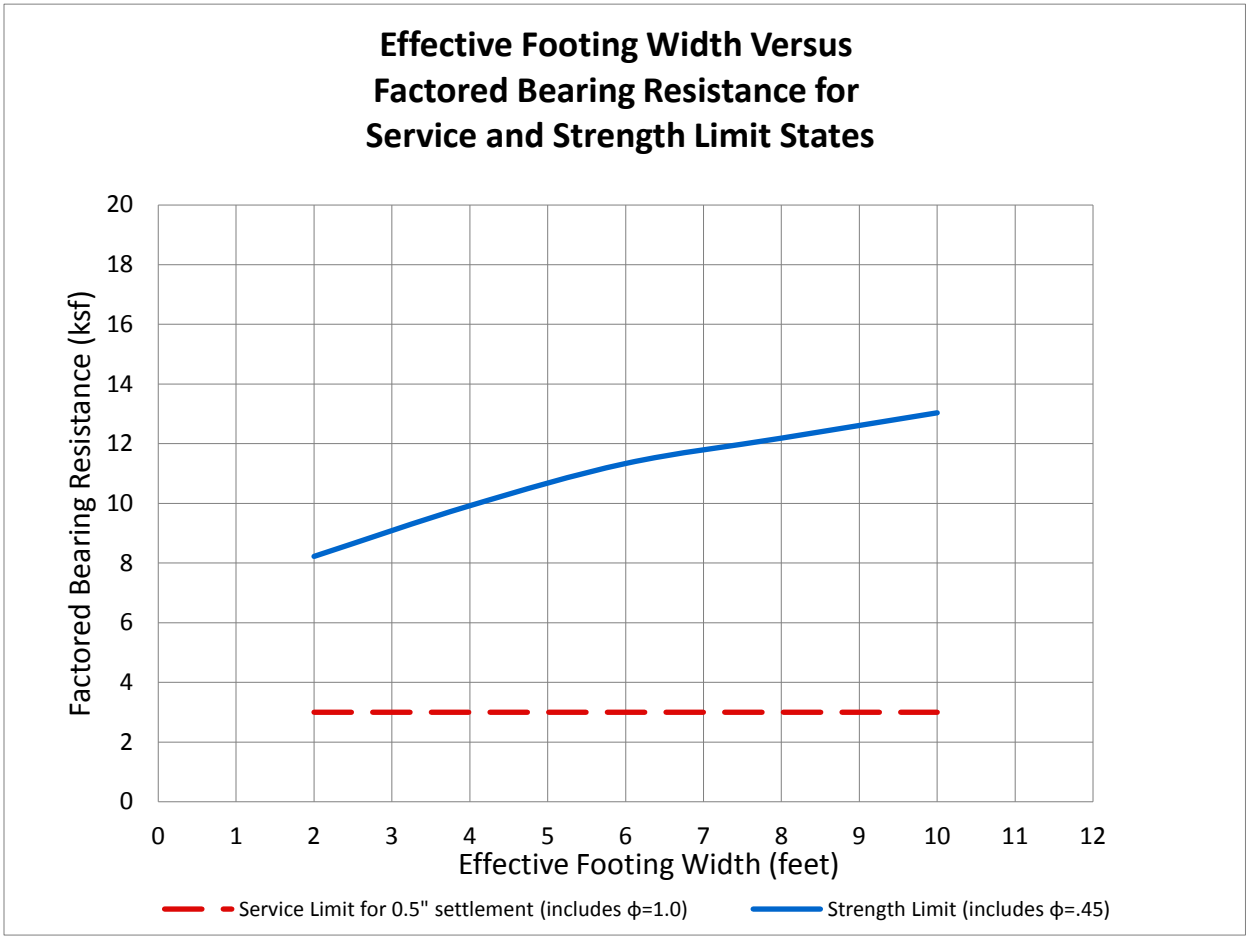
6.2 ORT GANTRY, ORT SLAB AND TOLL BOOTH FOUNDATIONS

The foundations for the proposed gantry and toll booth are expected to bear on the existing embankment fill or the proposed embankment fill. The existing and proposed embankment fill are suitable for supporting the existing structures on conventional spread footings.

The bearing resistance for the footings should be evaluated at the service and strength limit states using the figure below. As indicated in Section C10.6.2.1 of the AASHTO LRFD 2014 Code, the design of footings is frequently controlled by settlement at the service limit state. We recommend developing the dimensions of the spread footings at the service limit state and then checking that the strength and extreme limit states are satisfied. The factored bearing resistance at the service limit state (dashed red line), presented in the figure below, is 3.0 ksf. It includes a resistance factor (ϕb) equal to 1.0 and is based on a maximum settlement of 1/2 inch. The settlement will occur immediately after the gantry structure is constructed and prior to installation of the electronic tolling sensors.

Once the effective dimensions of the footings are determined, a factored bearing resistance at the strength limit state can be estimated from the solid blue line in the figure below. The factored bearing resistance must be greater than the applied factored vertical bearing pressure

determined by the structural engineer. The vertical bearing pressure should be calculated assuming a uniformly distributed pressure over an effective base area as shown in LRFD figure 11.6.3.2.-1. The strength limit state shown in the figure includes a resistance factor (φb) equal to 0.45. We recommend a minimum footing width of 4 feet.



The ORT lanes will have concrete slabs located below the overhead ORT gantry. These slabs will have electronic sensors embedded in the slabs. The sensors are sensitive to settlement. Based on the plans, the ORT slabs will be placed in the existing embankment and the grade will be increased approximately 2 feet at the slabs. The settlement beneath the proposed ORT slabs is expected to be negligible given the density, granular nature of the existing fill, and the relatively shallow bedrock.

Prior to placing fill in the area of the slabs, the existing subgrade should be proof rolled with a large vibratory roller. Any soil that exhibits pumping or weaving should be excavated and replaced with compacted granular borrow. The slabs can be designed using a subgrade modulus of 200 pounds per cubic inch (pci).

6.3 PEDESTRIAN TUNNEL

Based on the available plans, the bottom of the pedestrian tunnel will bear at a grade ranging from El. 206.2 at the west end to El. 206.8 at the east end. The tunnel should be founded on 2 feet of compacted fill meeting the requirements of MEDOT Item No. 703.22 (Underdrain Backfill Material - Type C) overlying the existing subgrade materials. The Underdrain Backfill Material should be completely wrapped in a non-woven filter fabric meeting the requirements of MEDOT Item No. 722.02, Drainage Geotextile. The boring logs indicate that the subgrade is expected to consist of sand, stiff to very stiff clay, or bedrock. Based on the required excavation depth for the 2 feet of compacted fill, it is likely that bedrock will need to be removed in the middle portion of the tunnel. Recommendations for permanent dewatering are provided later in this report.

6.4 EMBANKMENT DESIGN RECOMMENDATIONS

Based upon the available plans, fill embankments will be constructed along both sides of the highway, ramps and the access roadway. The side slopes along the east side of the highway will have a maximum fill height of approximately 10 feet with a maximum slope grade of 3H to 1V. The side slopes along the west side of the highway will have a maximum fill height of 21 feet with a maximum slope of 2H to 1V.

Proposed cut slopes are relatively minor along the project area. Cut slopes are proposed in the area of the State Route 126 over pass (Sta. 4481+00, SB ORT baseline and Sta. 7481+25, NB ORT baseline) and the area of the existing toll plaza (Sta. 4493+00, SB ORT baseline and Sta. 7493+00, NB ORT baseline). The proposed cut slopes are 2H to 1V along both sides of the roadway.

6.4.1 Settlement

The results of the test borings indicate bedrock to be relatively shallow in the area of the proposed toll plaza. Deposits of soft clay were not encountered in the test borings. Therefore, we expect settlement will occur as the embankment fill is placed. Long term consolidation settlement of the roadway embankments is not expected in the areas where grade raises are proposed.

6.4.2 Slope Stability

The stability of the proposed embankments was analyzed using the computer program Slope/W which is part of the GeoStudio suite of programs. Cross sections at NB ORT Station 7500+00 and SB ORT Station 4505+50 were determined to be the two most critical sections based on the height of the proposed fill and the proposed grade of the side slope. Between SB ORT Station 4502+50 and 4506+50 the side slopes will have a grade 1.5H to 1V in order to limit the impacts on the wetlands located at the toe of the slope. Typically, the side slopes are equal to or flatter than 2H to 1V.

Based on AASHTO criteria, slopes that do not support a structure require a factor of safety greater than 1.3 (resistance factor = 0.75). Slopes that support a structure require a factor of safety greater than 1.5 (resistance factor = 0.67). The proposed gantry and toll booth structures are far enough away from the top of the embankment slopes so that they are not considered to be supported

by the slope. Since the proposed administration building will have a basement level at approximately El. 207, the foundation subgrade will be near the toe of the slope. Therefore, the building is not considered to be supported by the slope and a factor of safety of 1.3 is considered acceptable. As indicated in Table 9, the proposed fill slopes meet the required factor safety. The slope stability calculations are presented in Appendix F.

Table 9 – Fill Slope Stability Summary

Embankment Location	Baseline for Stationing	Factor of Safety		Minimum Required Factor of Safety
		Undrained	Drained	
Sta. 7500+00	NB ORT Center Line	2.6	2.1	1.3
Sta. 4505+50	SB ORT Center Line	1.3	1.3	1.3

The proposed 2H to 1V cut slopes at the overpasses are expected to consist of compacted embankment fill and be stable at the proposed cut grades.

6.5 OVERHEAD SIGN STRUCTURES

The project involves the construction of one cantilevered sign structure and eight overhead sign bridges. The sign bridges will be single spans with lengths ranging from approximately 60 to 100 feet. The foundations for overhead structures should be designed using MaineDOT Standard Specifications 626 and 643 and the recommendations in the table below. Design charts based on soil properties are provided in the MaineDOT Standard Details 626. Depending on the structural loading and soil conditions, it may be necessary to support the overhead structures on single larger diameter drilled shafts or multiple drilled shafts. Table 10 summarizes the soil profiles at each foundation location.

At the sign post foundation to be located at Station 4491+00, offset 23 RT (SB ORT Baseline) bedrock was encountered at approximately 5.5 feet below the ground surface. As such a spread footing should be considered at this location. At several other locations bedrock may be encountered at depths above the depth of the drill shaft bottom as provided in the MaineDOT design charts.

Table 10 – Design Parameters for Overhead Sign Structures

Structure Type	Approximate Station/Offset (feet)	Boring No.	General Subsurface Profile[1]	Recommended Φ (degrees) or Su (psf)	Comments
Sign Bridge	7427+41 30 LT NB ORT Baseline	B-117	7 feet of Fill 13 feet of Stiff Clay 5 feet of Sand Probable Bedrock	Φ = 30°	
	7427+41 37 RT NB ORT Baseline	B-118	2 feet of Fill 18 feet of Stiff Clay Probable Bedrock	Φ = 30°	
Sign Bridge	7450+00 25 LT NB ORT Baseline	B-119	8 feet of Granular Fill 2 feet of Glacial Till Probable Bedrock	Φ = 32°	Shallow bedrock
	7450+00 37 RT NB ORT Baseline	B-120	10 feet Stiff Clay 2 feet Sand Probable Bedrock	Su = 400 psf	Shallow bedrock
Sign Bridge	7463+00 30 LT NB ORT Baseline	B-121	7 feet of granular fill 3.75 feet of Stiff Clay 4.25 feet of Sand 12 feet of glacial till	Φ = 30°	
	7463+00 46 RT NB ORT Baseline	B-122	0.75 feet of Organics 5.25 feet of Soft Clay 5.0 feet of Stiff Clay 4.8 feet of Sand Probable Bedrock	Su = 800 psf	Shallow bedrock
Cantilever Sign	7471+75 30 LT NB ORT Baseline	B-123	4 feet of granular fill 8 feet of Very stiff Clay 7 feet of sand Probable Bedrock	Su = 1200 psf	
Sign Bridge	7477+25 30 LT NB ORT Baseline	B-124	6 feet of Granular Fill 6 feet of Stiff Clay 8 feet of Sand	Φ = 30°	
	7477+25 44 RT NB ORT Baseline	B-125	15 feet of very Stiff Clay 6 feet of Sand 4 feet of Glacial Till Probable Bedrock	Su = 1200 psf	
Sign Bridge	4491+00 76 LT SB ORT Baseline	B-108	1 foot of Organics 9 feet of stiff Clay 6 feet of Sand Probable Bedrock	Su = 800 psf	
	4491+00 23 RT SB ORT Baseline	B-126	5.5 feet of Granular Fill Probable Bedrock	Φ = 32°	Shallow bedrock

Table 10 – Design Parameters for Overhead Sign Structures (continued)

Structure Type	Approximate Station/Offset (feet)	Boring No.	General Subsurface Profile [1]	Recommended Φ (degrees) or Su (psf)	Comments
Sign Bridge	4508+75 48 LT SB ORT Baseline	B-127	8 feet of Granular Fill 5 feet of Stiff Clay Probable Bedrock	Su = 1,200 psf	Shallow bedrock
	4508+75 33 RT SB ORT Baseline	B-128	10 feet of Granular Fill Probable Bedrock	Φ = 32°	Shallow bedrock
Sign Bridge	27+00 36 LT Exit 103 SB Ramp Baseline	B-129	5 feet Granular Fill > 21 feet Sand	Φ = 32°	
	27+00 30 RT Exit 103 SB Ramp Baseline	B-130	15 feet of Stiff Clay Fill 14 feet of Sand Probable Bedrock	Su = 1,200 psf	
Sign Bridge	43+00 34 LT Exit 103 SB Ramp Baseline	B-131	2 feet of Med Stiff Clay 2 feet of soft Organics 11 feet of Stiff Clay 1.5 foot of soft clay 7.5 Glacial Till	Su = 800 psf	
	43+00 30 RT Exit 103 SB Ramp Baseline	B-132	2 feet of sand 2 feet of soft Clay 1 feet of soft Organics 12.5 feet of Stiff Clay 5 feet of Sand Probable Bedrock	Su = 800 psf	

Notes:

(1) Borings B-118, B-127, B-128, B-129 and B-130 were drilled at the roadway elevation. The sign foundations will be located mid-slope at a lower elevation. The soil profile has been adjusted based on the elevation difference between the boring and foundation location.

6.6 FROST DEPTH

Foundations placed on soil should be founded below the frost depth at the site. The frost depth at the site was estimated using the method provided in Section 5.2.1 of the Maine DOT Bridge Design Guide (BDG). Based on Figure 5-1, the design freezing index is 1500 F-degrees days. The soil is considered to be coarse grained with a moist content ranging between 10 and 20 percent. Using Table 5-1, the frost penetration will range from 5.7 to 6.8 feet. A design frost depth of 6.0 feet is recommended for foundations bearing on soil.

6.7 LATERAL EARTH PRESSURES

Walls that are not allowed to rotate at the top, such as the sides of the pedestrian tunnel and the basement walls of administration building, should be designed based on at-rest pressure (K_o) and compacted granular backfill. These walls should be designed using K_o equal to 0.44 and a unit weight of 125 pounds per cubic foot (pcf) for the backfill. The resulting equivalent fluid pressure is 55 pcf. Because the walls will have a permanent drainage system, the equivalent fluid pressure does not include hydrostatic pressure.

We recommend the tunnel and basement walls that retain earth be backfilled with a compacted granular backfill with maximum fines content (percent passing 200 sieve) of 5 percent a minimum for a horizontal distance of 5 feet to provide a well-drained and less frost susceptible material in this zone. The backfill should be the requirements of MEDOT Item No. 304.09 (Aggregate Base Course – Crushed – Type A).

The pedestrian tunnel walls should be designed for a live load surcharge equivalent to the earth fill height summarized in LRFD Tables 3.11.6.4-1 and 3.11.6.4-2.

6.8 SEESMIC DESIGN PARAMETERS

The seismic design parameters were determined in accordance with the LRFD code and the IBC 2009 code. Our recommendations for each code are provided in the sections below.

6.8.1 IBC 2009 Code

The seismic site classification was evaluated in accordance with Section 1613.5.5 of the 2009 Edition of the International Building Code (IBC). Upon completion of construction, the soil profile is expected to generally consist of 10 to 15 feet of compacted fill overlying a thin layer of naturally deposited soil overlying bedrock. The bedrock will be approximately 20 feet below the ground surface. A value of 100 blows per foot was used for the bedrock. Therefore, in accordance with Table 1613.5.2 the seismic site classification for the site is Site Class C. Based on output from the United States Geologic Survey online seismic design software, the following acceleration parameters should be used:

Site Class C

S_S = 0.293 g
S_1 = 0.077 g

S_{DS} = 0.235 g
S_{D1} = 0.087 g

6.8.2 AASHTRO LRFD Code

The seismic site classification was evaluated in accordance with Section 3.10.3.1 of the LRFD Code. Upon completion of construction the soil profile is expected to generally consist of 10 to 15 feet of compacted fill overlying a thin layer of naturally deposited soil overlying bedrock. The bedrock will be approximately 20 feet below the ground surface. A value of 100 blows per foot

was used for the bedrock. Therefore, in accordance with Table 3.10.3.1-1 the seismic site classification for the site is Site Class C. Based on output from the United States Geologic Survey online seismic design software the following acceleration parameters should be used:

Site Class C

PGA = 0.078 g
F_{pga} = 1.2

S_S = 0.162 g
S_1 = 0.045 g

As = 0.094 g

S_{DS} = 0.194 g
S_{D1} = 0.077g

6.9 LIQUEFACTION ANALYSIS

Liquefaction is a condition when a soil undergoes continued deformation during the course of cyclic stress applications induced by an earthquake where pore water pressure becomes equal to the confining pressure (e.g. effective stress approaches zero) and large deformations occur. Significant factors influencing liquefaction include grain size distribution of sand, fines content, in-situ density, and vibration characteristics (e.g. design earthquake and acceleration coefficient). Liquefaction generally occurs in saturated, relatively loose (N values less than 15 bpf) sandy soils with low fines content (less than 15 percent). Based upon the density of the soil and elevated silt content, the soils at the site are not considered to be susceptible to liquefaction.

6.10 PERMANENT GROUNDWATER CONTROL

Permanent groundwater control will be required for the tunnel and basement portion of the administration building. The permanent groundwater control should consist of 12-inch diameter perforated pipes surrounded by at least 6 inches of MEDOT Item No. 703.22 (Underdrain Backfill Material – Type C). The pipes should be installed below the proposed tunnel and around the perimeter of the administration building basement level. Consideration should be given to installing waterproofing along the base slab and walls of the tunnel utilizing a pre-applied sheet membrane such as Preprufe 300R & 160R (as manufactured by WR Grace) or equivalent.

7.0 Construction Considerations

7.1 ADMINISTRATION BUILDING AND PARKING AREA

The following recommendations are specific to the administration building and associated parking area.

7.1.1 Subgrade Preparation

Once rough graded and immediately prior to placing fill, the building and pavement subgrade should be proof-rolled. In open areas, proof-rolling should be performed with a minimum of six passes using a steel drum roller with a minimum static weight of 10 tons. In areas of silty subgrade, the proof-rolling should be conducted without vibration to prevent disturbance to the subgrade. In confined areas, proof-compaction can be performed with six passes of a large reversible plate compactor. The proof-rolling is intended to detect evidence of pumping, rutting or weaving, which is indicative of unstable and unsuitable materials, and should be completed under the observation of the resident engineer.

Unsuitable soils or soils that become disturbed during construction should be completely excavated from the subgrade and replaced with compacted granular borrow. Granular borrow should conform to MaineDOT Standard Specification 703.19, Granular Borrow. The granular borrow should be compacted to 95 percent of the Modified Proctor maximum dry density (ASTM D1557).

If the unstable material is granular but too wet, then the material can be stockpiled and allow to dry. Any excavated soil that is unsuitable for reuse at the site should be transported from the site and disposed in accordance with all appropriate federal, state and local regulations.

7.1.2 Backfill Structural fill, Placement and compaction

The proposed administration building foundation will be supported on spread footings. The basement floor slab will be soil supported. New fill to raise grade within the area of the administration building should consist of granular borrow meeting the requirements of MaineDOT Item No. 703.19, Granular Borrow. Below the basement floor slab, 12 inches of soil meeting the requirements of MaineDOT Item No. 703.20, Gravel Borrow should be placed to provide a firm surface for the floor slabs.

One gradation test should be performed for each source of imported Granular Borrow and Gravel Borrow. The soil moisture content range should be ±3 percent of its optimum moisture content as determined by Modified Proctor and compacted fill should be placed in uniform lifts not exceeding 12 inches loose thickness when large vibratory rollers are used. When large reversible plate compactors are used the maximum loose lift shall be 6 inches. One Modified Proctor Test should be performed for each source of imported Structural Fill. Compaction should be at least 95% of the maximum dry density per ASTM D1557 (Modified Proctor). The percent compaction is determined in the field by ASTM D-6938 (nuclear density meter). A minimum of two in place density tests should be performed for each lift of fill placed.

7.2 TEMPORARY EXCAVATION BRACING

The installation of the pedestrian tunnel will require temporary earth support to retain soil during construction. Depending on the height of the excavation it is likely the earth support system will require internal bracing or tiebacks. Due to shallow bedrock cantilevered sheet piles are not expected to be feasible. The earth support system should be designed by a professional engineer licensed in the State of Maine.

Extraction of temporary sheets piles may cause settlement of the ground surface around the sheet piles. Areas of settlement should be backfilled with compacted granular borrow conforming to MaineDOT Standard Specification 703.19, Granular Borrow.

7.3 EMBANKMENT SLOPE CONSTRUCTION

Construction of embankment slopes shall be conducted in accordance with Section 203, Excavation and Embankment. Maximum lift thickness and minimum compaction requirements are provided in Section 203. The embankments should be constructed of soil meeting the requirements of MaineDOT Item No. 703.19, Granular Borrow.

Prior to placing fill for embankment construction, existing vegetation, unsuitable existing fill materials, asphalt, topsoil and other organic or deleterious material should be removed to expose suitable subgrade soils. Where proposed slopes are constructed against existing slopes, the existing slope should be continuously benched by excavating steps into the existing slope in accordance with Standard Specification Section 203.09 of the MaineDOT Standard Specifications. The entire area of the new embankment should be constructed in horizontal lifts and compacted. Unsuitable materials should not be wasted in the outer portion of fill slopes. Offsite waste disposal areas shall be established in accordance with Section 203.06 of the MaineDOT Standard Specifications.

We anticipate that slopes that are 2 H:1V or flatter will be treated with loam and seed to provide long term erosion control. Temporary erosion control can be provided by temporary erosion control matting, MEDOT Item No. 613.319. Slopes steeper than 2H:1V should be treated with a 4-inch cellular confinement system or a two-foot thick layer of stone fill.

Unsuitable soils or soils that become disturbed during construction should be completely excavated from the subgrade and replaced with compacted granular borrow. Granular borrow should conform to MaineDOT Standard Specification 703.19, Granular Borrow. The granular borrow should be compacted to 92 percent of the Modified Proctor maximum dry density (AASHTO T-180).

7.4 TRENCH EXCAVATIONS

The contractor should prevent surface water from entering trench excavation and install and a dewatering system to remove groundwater that enters the excavation to allow fill to be place in-the-dry. OSHA standards for trenches should be enforced by the contractor.

7.5 CONSTRUCTION DEWATERING

Dewatering is expected to be necessary for the installation of the pedestrian tunnel. It is anticipated that temporary dewatering can be accomplished by a system of shallow sumps and pumps. The dewatering system should be capable of lowering the groundwater to a depth of 2 feet below the bottom of the excavation. It should be noted that the marine clay soil present at the site are highly sensitive to moisture and will lose strength when saturated. Sumps should be

equipped with filter fabric to prevent the loss of fine-grained soils during pumping. Water pumped from the excavations should be discharged to settling ponds or frac tanks to allow fine particles to settle out prior to discharge. Water should be discharged in accordance with all applicable federal, state and local permits and regulations.

8.0 Limitations

8.1 USE OF REPORT

This report has been prepared for the exclusive use of the Maine Turnpike Authority and their respective assigns and designees. This report is not intended for the use or reliance of other (third) parties, without the express consent of Stantec and Maine Turnpike Authority. Any use, which a third party makes of this report, or any reliance on decisions made based on this report, is the responsibility of such third parties. Further, the findings of this study apply only to the specific Site and project described herein. The findings herein are inapplicable to other Sites, and to developments of different grading, layout, loading, and performance requirements. Stantec accepts no responsibility for damages, real or perceived, suffered by parties as a result of decisions made or actions based on the unintended and/or inappropriate use of this report.

This Geotechnical Report provides recommendations, and is intended for informational use, requiring interpretation by the owner, design team, and contractor for the design and construction of the project, and interpretation of final quantities and construction costs. The Geotechnical Report is not intended, or suitable, by itself, for use as a technical specification or to determine quantities. Anticipated quantities and/or costs may be provided in the Geotechnical Report; such information is an Engineer's interpretation, and may vary dramatically from contractor bids, which are based on potentially differing interpretations, and several other variables not available or considered by the Engineer.

8.2 SUBSEQUENT INVOLVEMENT

The geotechnical process incorporates initial exploration and recommendations as summarized herein and is followed by continuous involvement during key design and construction benchmarks. The recommendations provided herein are based on preliminary information and assumptions regarding proposed site grading, structural loading and performance requirements. It is recommended that Stantec review final foundation, grading, and other applicable plans to assess whether these recommendations require modification.

During construction, additional soil samples should be analyzed in the laboratory for moisture content, gradation, and moisture density relationship tests to evaluate the reuse of onsite soils (existing fill and natural sand strata) as backfill material.

Stantec should be retained to observe excavations and subgrade preparation to assess whether the intent of these recommendations is followed during construction, and whether other appropriate and/or cost-effective solutions may be warranted based on the actual conditions encountered. Further, a soil exploration is a random sampling of a Site. Should any conditions at the Site at any point during the project be encountered that differ from those summarized in the

report, Stantec should be notified immediately to permit reassessment of these conditions and the recommendations contained in the report.

8.3 REPRESENTATION AND INTERPRETATION OF DATA

Surficial and subsurface information presented herein is based on field measurements obtained during the exploration and site reconnaissance. The precision and accuracy of surficial data is a function of the references, benchmarks, methods and instruments employed, as summarized in the report. Subsurface data is based on measurements within the borehole or test pit using the sampling methods described on the exploration logs. The completeness, precision, and accuracy of such data is a function of the frequency and type of exploration and sampling employed, as well as the precision and accuracy of the surface location and elevation of the borehole and may vary from actual conditions encountered during excavations. Subsurface conditions between, beyond and below explorations, may vary dramatically from the nearest exploration, due to natural geologic action, deposition and weathering, or man-made activities.

Groundwater levels were recorded during the time periods and frequencies noted on the explorations. It is important to note that groundwater levels are disrupted by the exploration, and require equilibration periods to determine actual hydrostatic levels, which exceed the duration of the measurement period. Multiple hydrostatic groundwater levels may exist, including perched or trapped water, which may not necessarily be accurately represented by one water level reading. Groundwater levels fluctuate due to seasonal variations, adjacent surface water bodies, precipitation, and on-Site and nearby land use.

Figures

ORIGINAL SHEET - ANSI A

AUGUST, 2018
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Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, MAINE

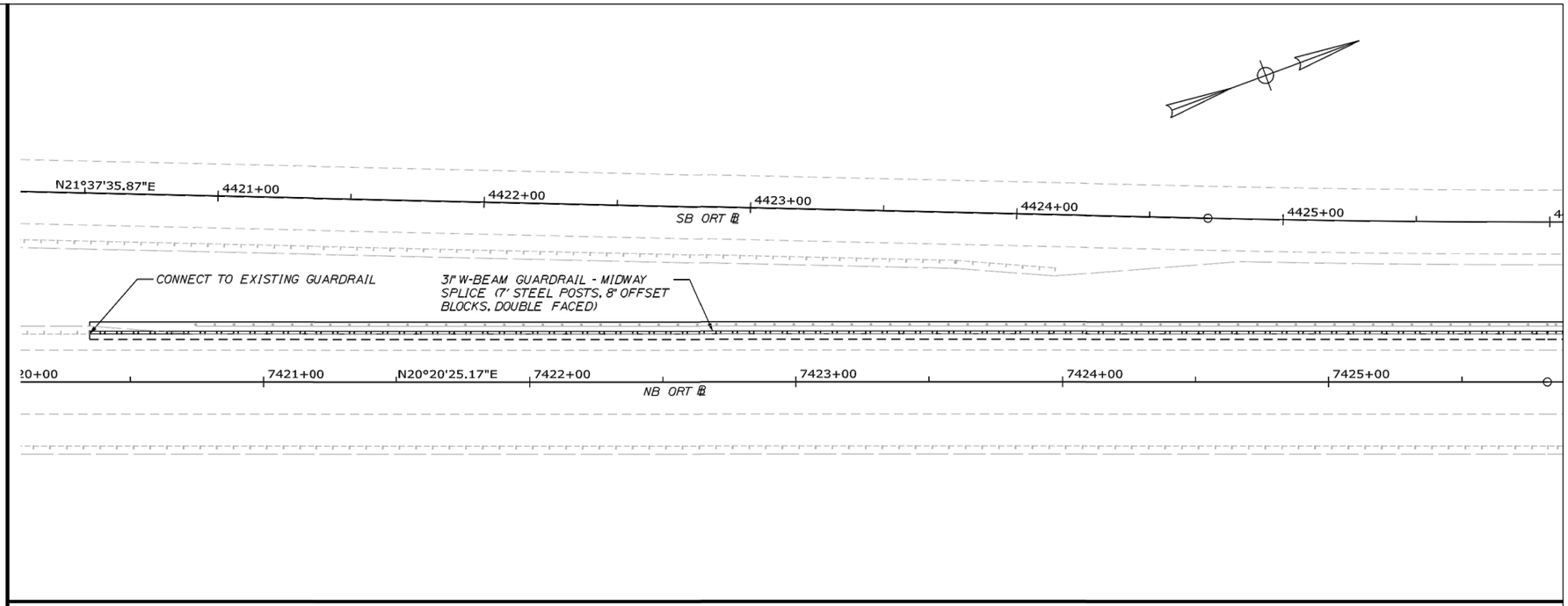
Figure No.
1

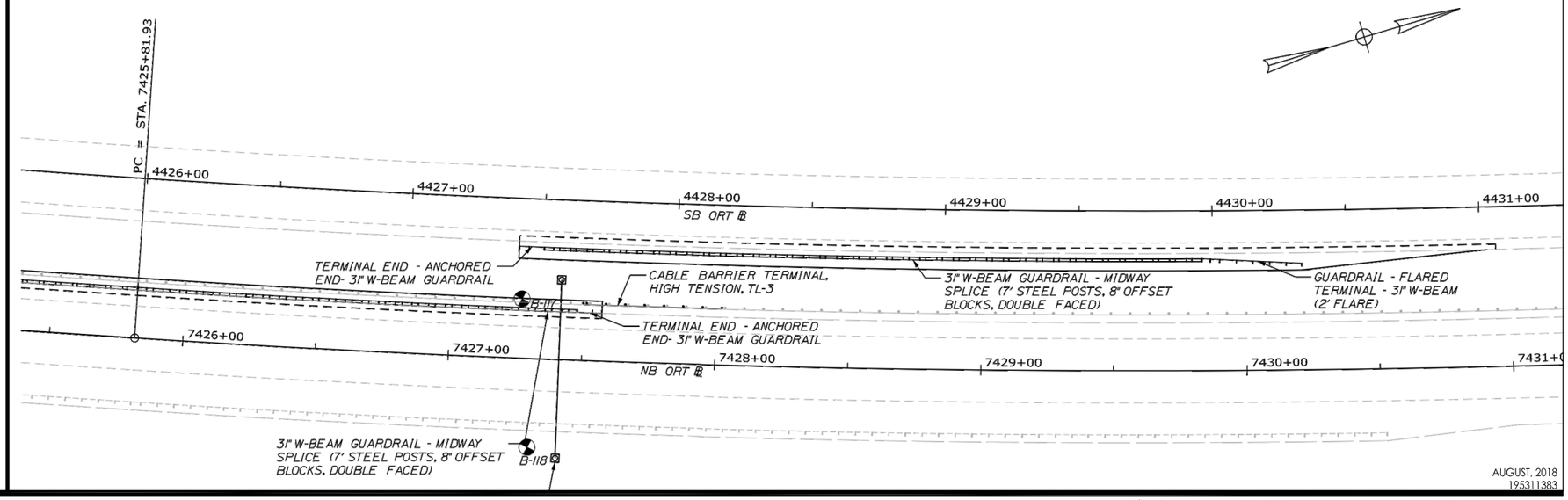
Title
SITE LOCUS MAP

PLAN LEGEND

	EXISTING	PROPOSED
R/W LINES		
EDGE OF GRAVEL		
EDGE OF PAVEMENT		
TRAVELWAY		
BORING	B-6	
SAWCUT		
CULVERT		
GUARDRAIL (BEAM)		
GUARDRAIL (CABLE)		
WATERWAY		
TREE LINE		
CATCH BASINS		
DITCH		
RIPRAP		
TEMPORARY STONE CHECK DAM		
SLOPE CUT LINE		C C C
SLOPE FILL LINE		F F F
CLEARING LIMIT LINE		CLL
SILT FENCE		S/F
SIGNS (SINGLE POST)		
SIGNS (DOUBLE POST)		
LIGHT POLES		
UTLITY POLES		
ELECTRICAL LINE	E	E
WATER LINE	W	W
COMMUNICATIONS LINE	T	T
QUAZITE JUNCTION BOX		

ORIGINAL SHEET - ANSI B





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Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

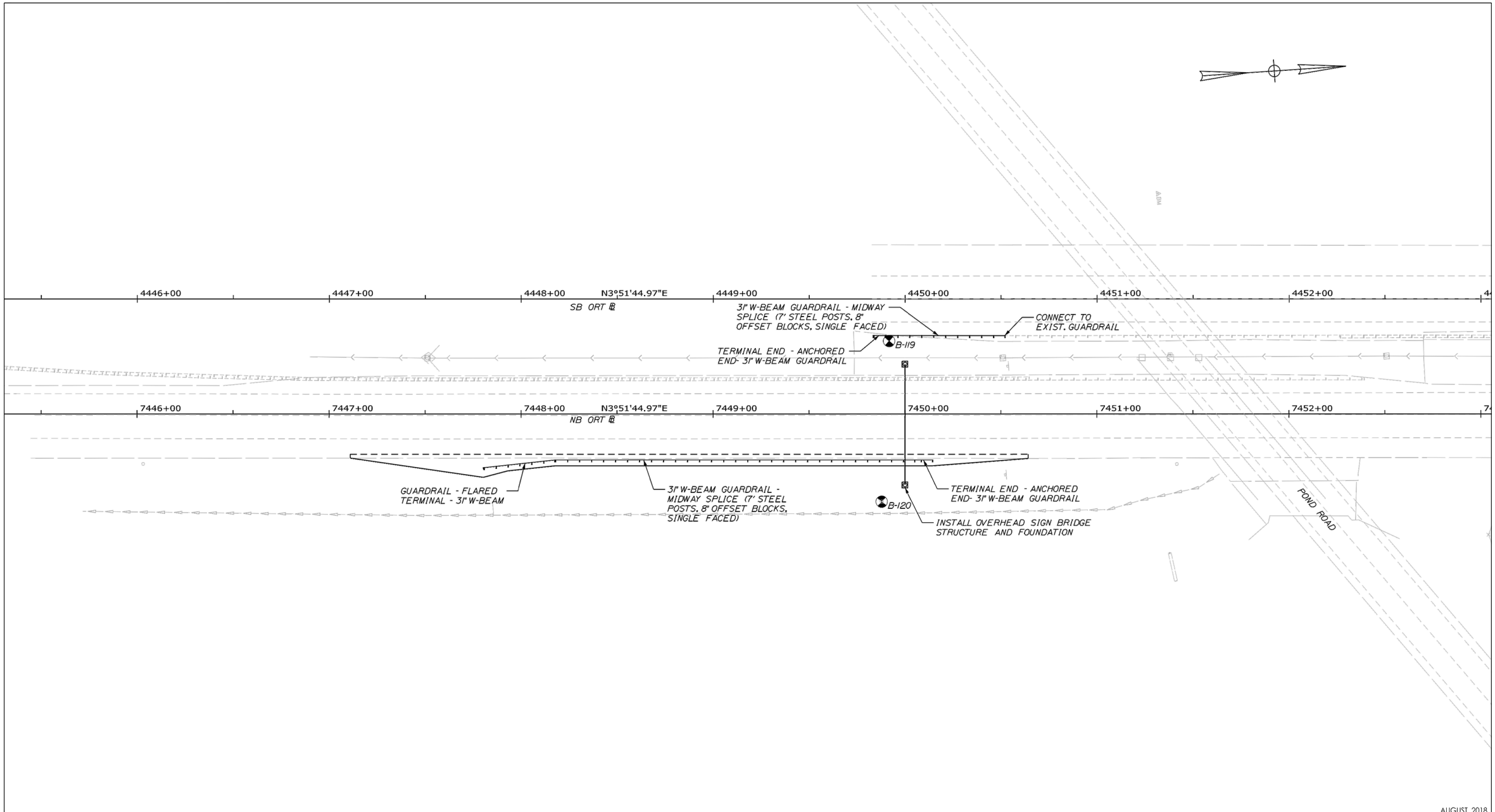
Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
2) Test borings B-107 through B-132 were drilled by New England Boring of Hermon, Maine during the period from June 11, 2018 through July 9, 2018 under supervision of Stantec personnel.

Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
2

Title
BORING LOCATION PLAN



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Legend

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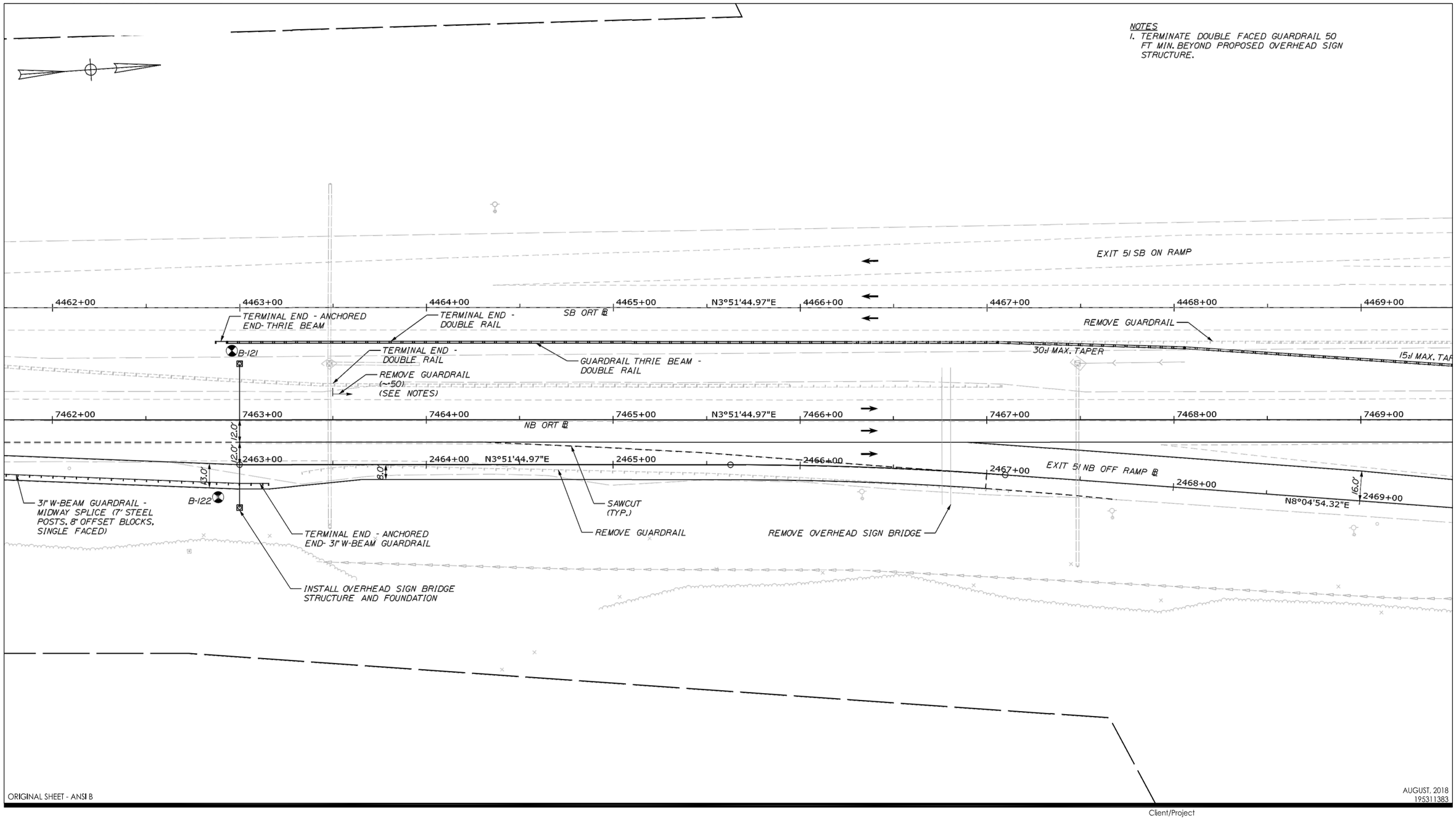
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
3

Title
BORING LOCATION PLAN

NOTES
1. TERMINATE DOUBLE FACED GUARDRAIL 50 FT MIN. BEYOND PROPOSED OVERHEAD SIGN STRUCTURE.



ORIGINAL SHEET - ANSI B

AUGUST, 2018
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Legend

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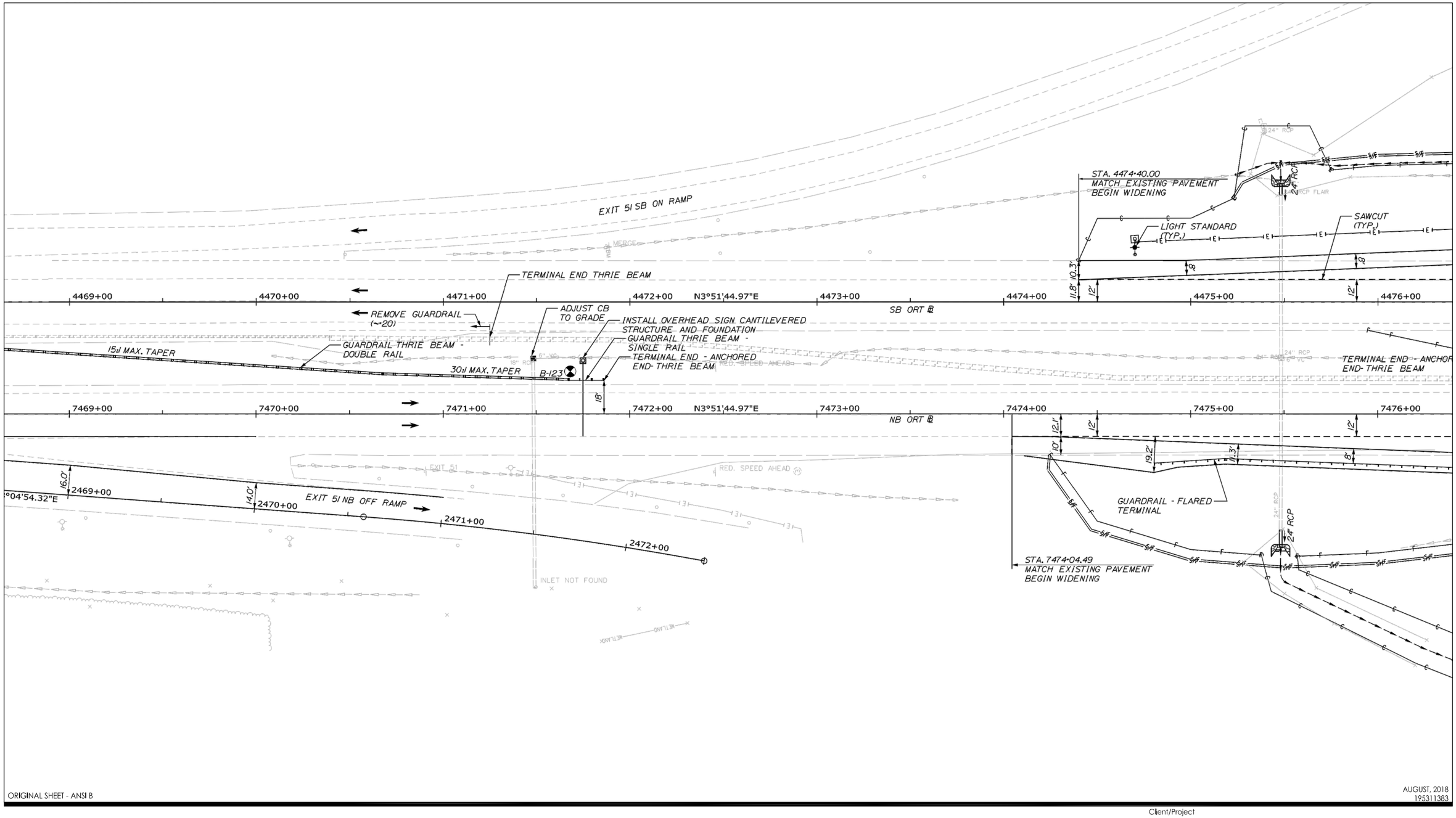
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
4

Title
BORING LOCATION PLAN



ORIGINAL SHEET - ANSI B

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Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

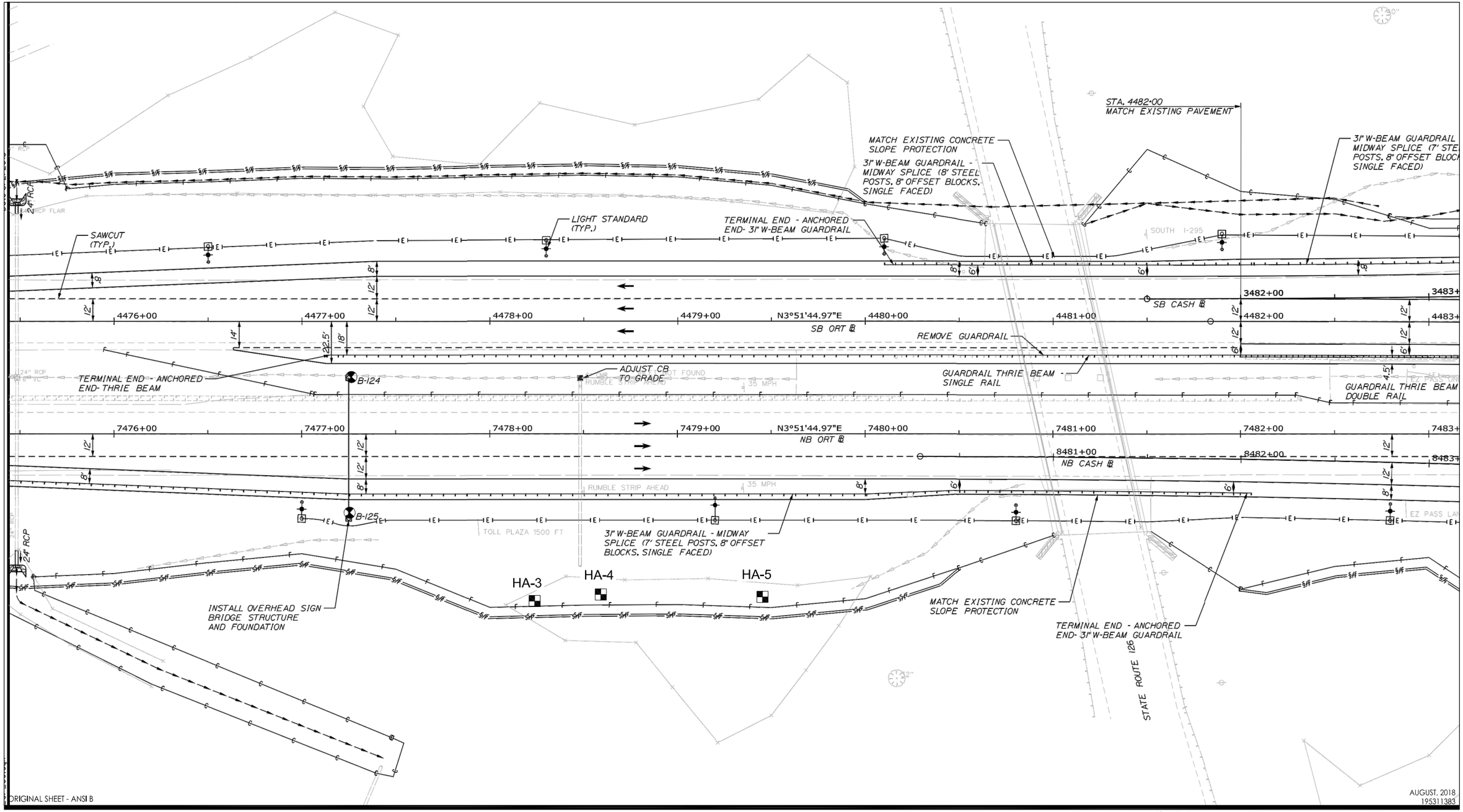
Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
2) Test borings B-107 through B-132 were drilled by New England Boring of Hermon, Maine during the period from June 11, 2018 through July 9, 2018 under supervision of Stantec personnel.

Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
5

Title
BORING LOCATION PLAN



ORIGINAL SHEET - ANSI B

AUGUST, 2018
195311383

Stantec
428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
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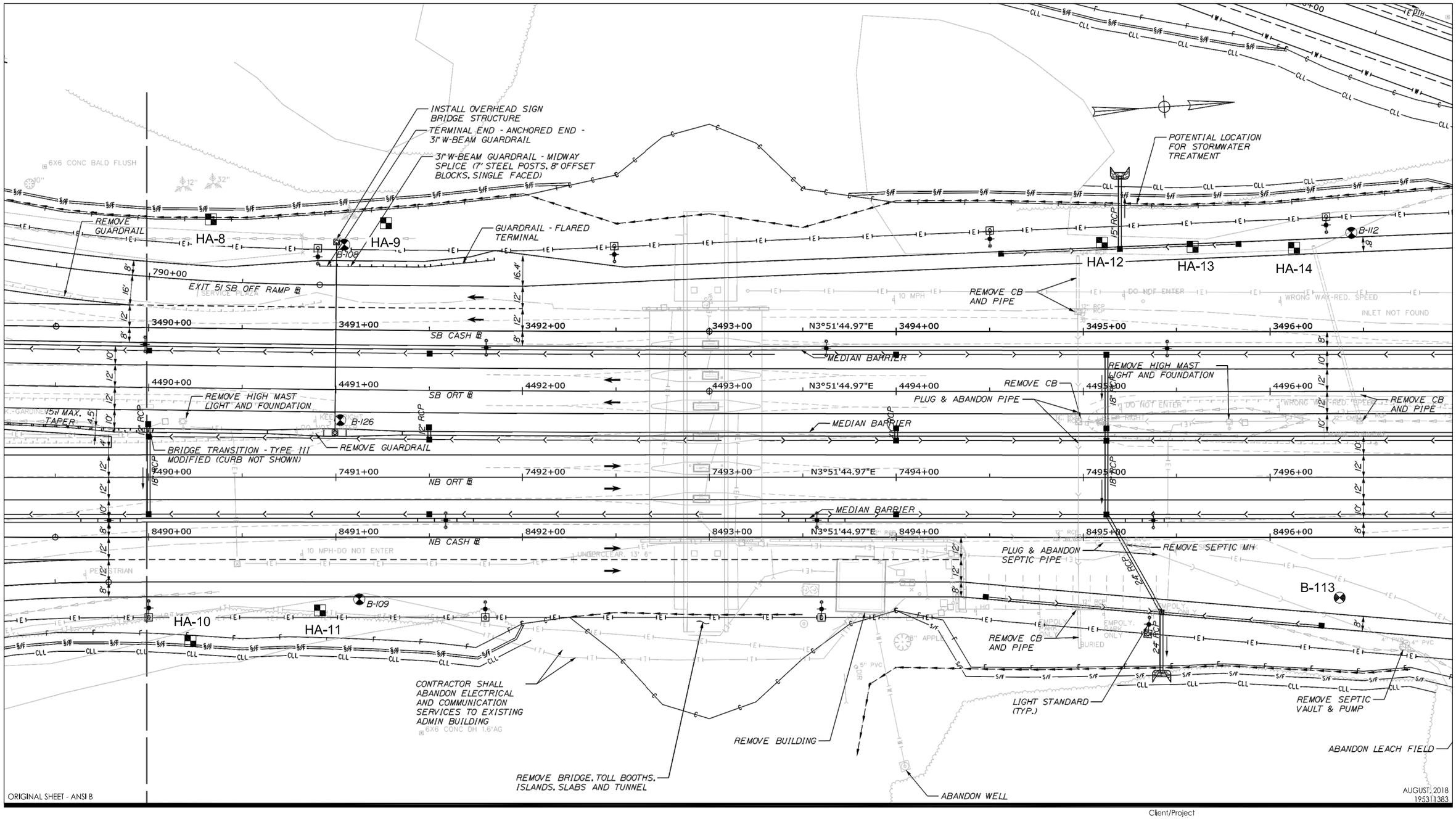
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
6

Title
BORING LOCATION PLAN



Stantec

428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
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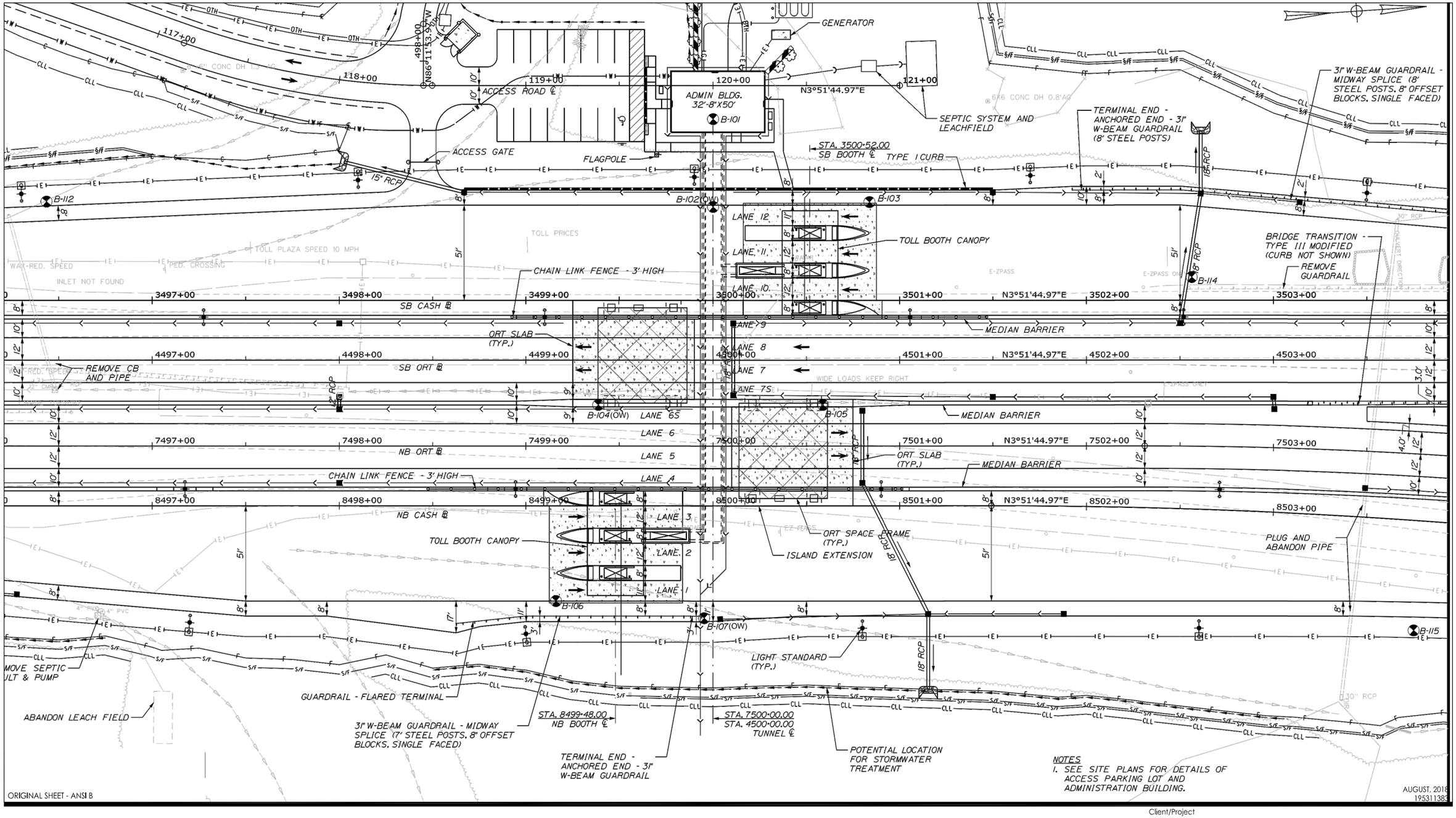
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
7

Title
BORING LOCATION PLAN



Stantec

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Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

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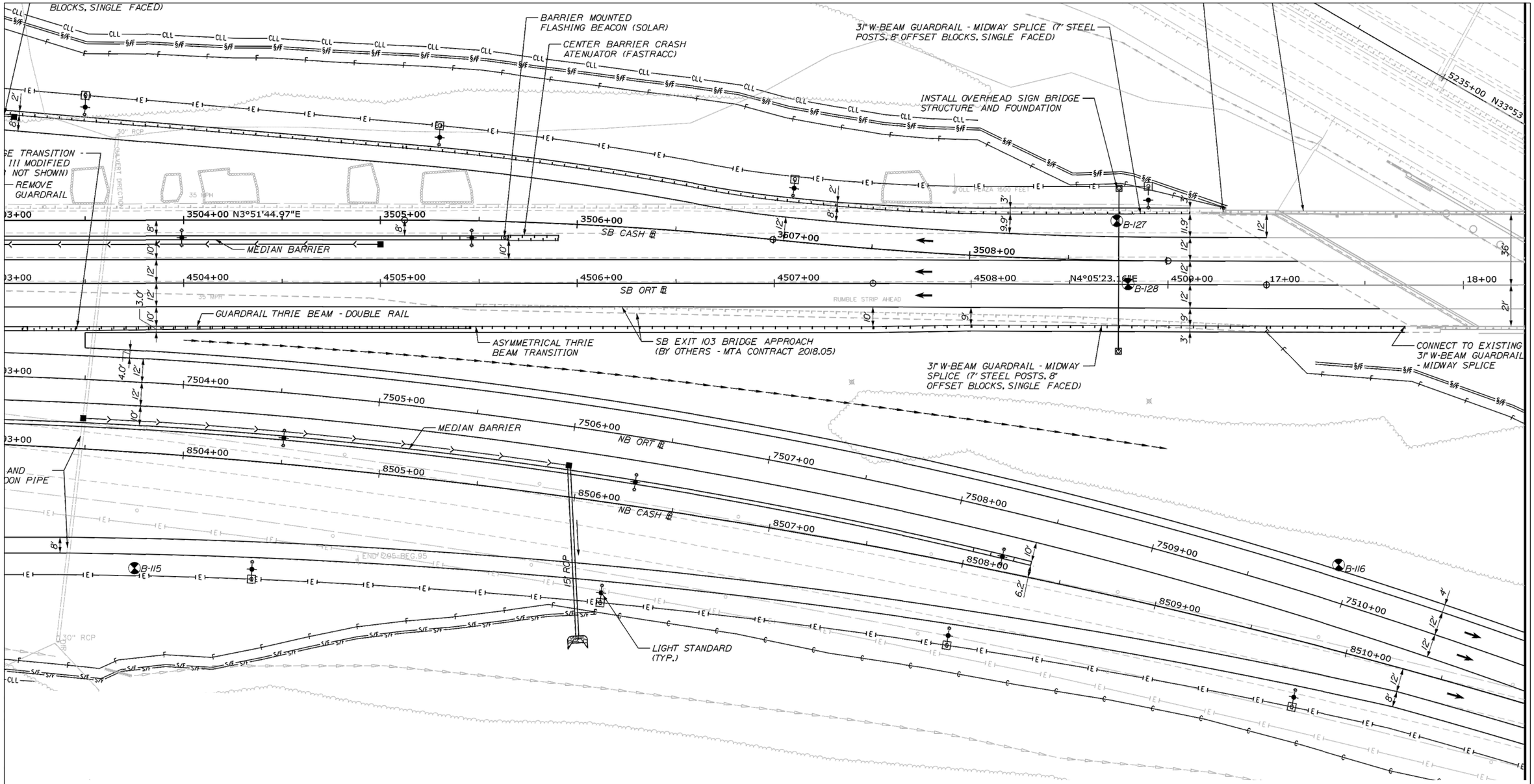
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
8

Title
BORING LOCATION PLAN



ORIGINAL SHEET - ANSI B

AUGUST, 2018
195311383

Stantec
428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
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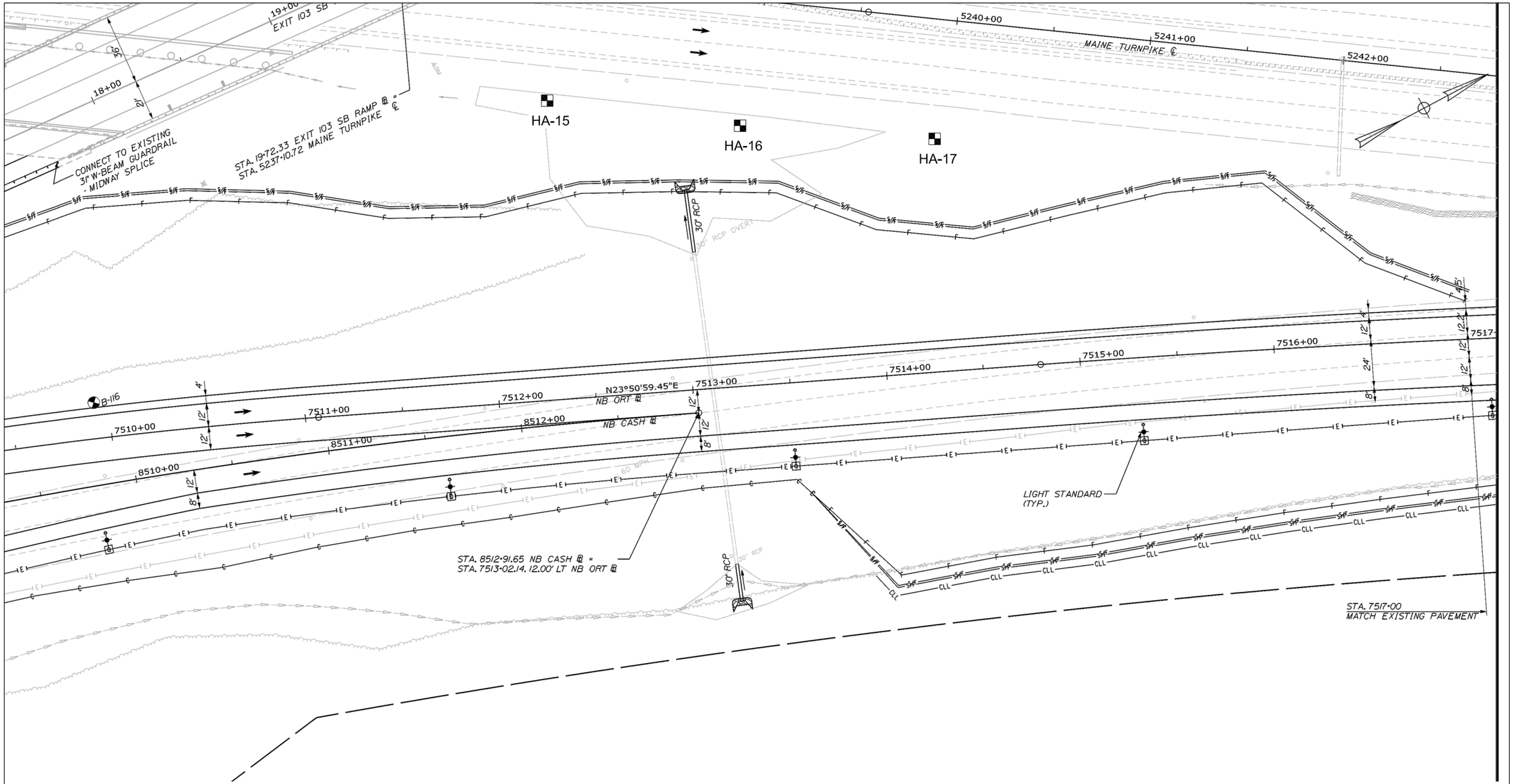
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
9

Title
BORING LOCATION PLAN



ORIGINAL SHEET - ANSI B

AUGUST, 2018
195311383

Stantec

428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

Notes

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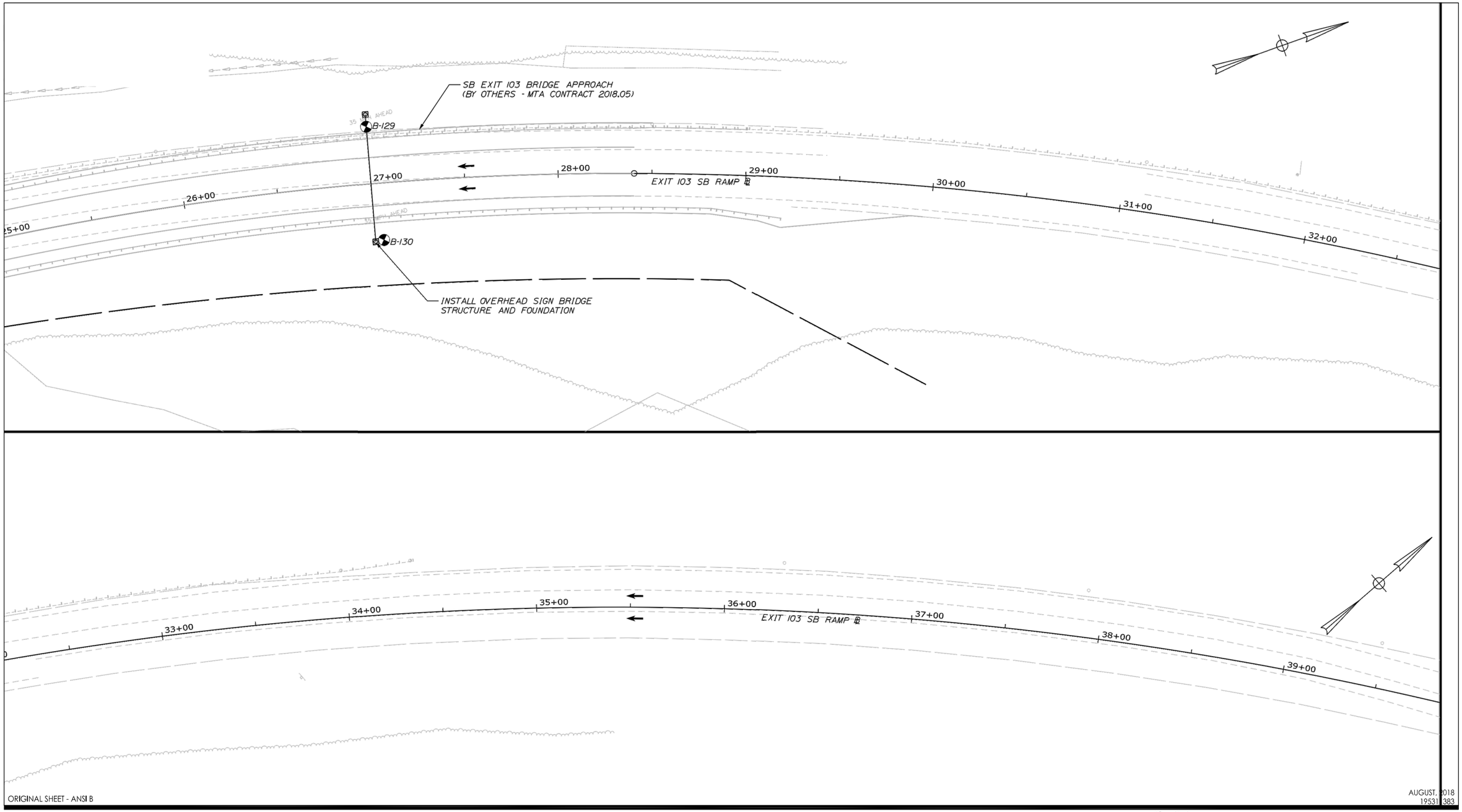
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
10

Title
BORING LOCATION PLAN



ORIGINAL SHEET - ANSI B

AUGUST, 2018
19531 383

Stantec

428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
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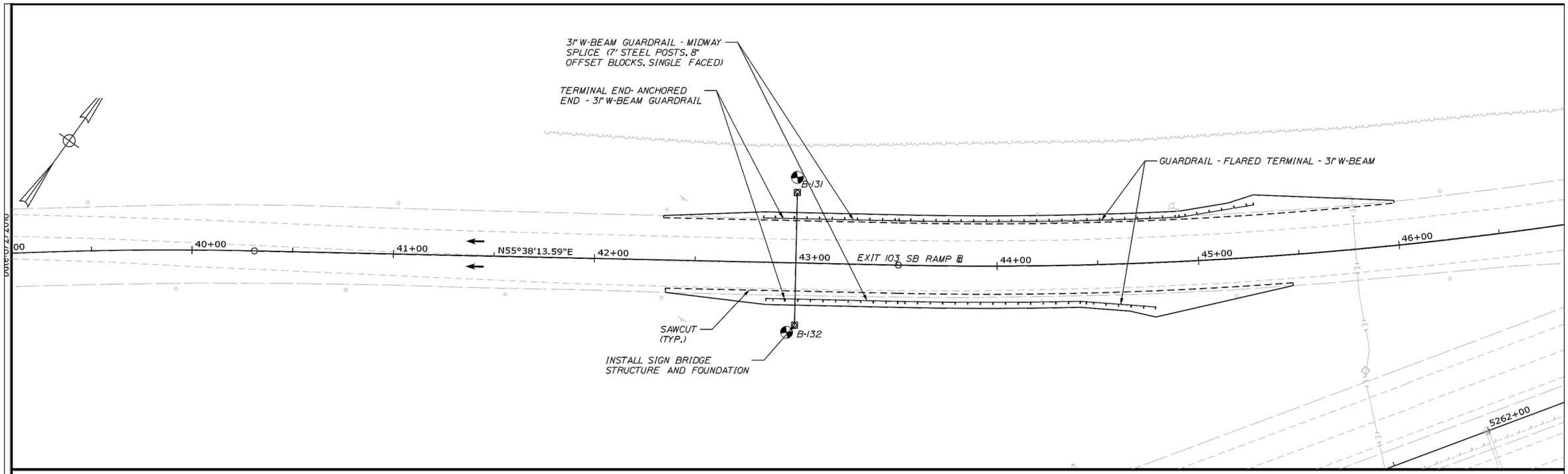
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
11

Title
BORING LOCATION PLAN



ORIGINAL SHEET - ANSI B

AUGUST, 2018
195311383

Stantec

428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

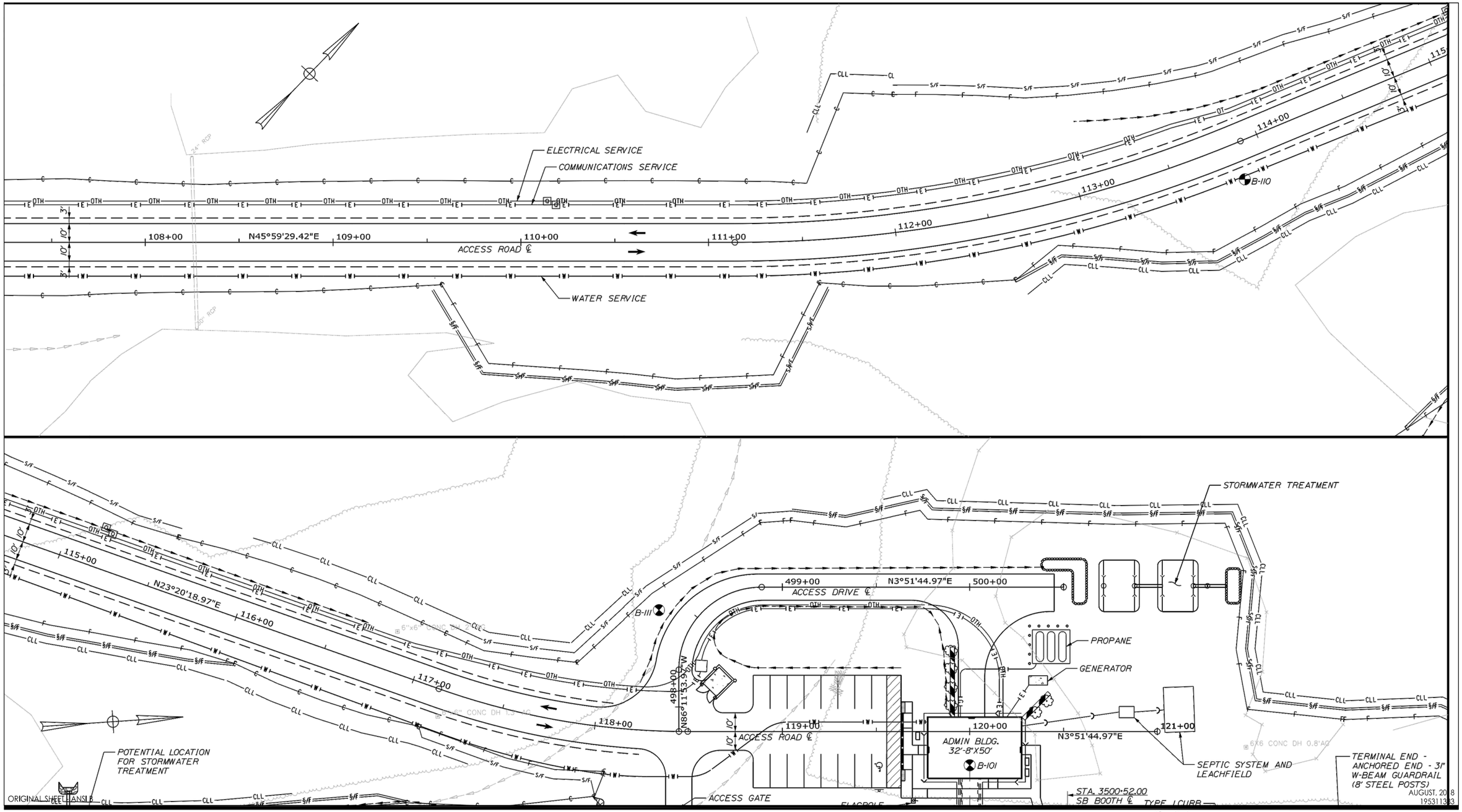
Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
2) Test borings B-107 through B-132 were drilled by New England Boring of Hermon, Maine during the period from June 11, 2018 through July 9, 2018 under supervision of Stantec personnel.

Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
12

Title
BORING LOCATION PLAN



Stantec

428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

Legend

B-1 Location and designation of test boring

HA-1 Location and designation of hand auger probe

Notes

1) Test borings B-101 through B-107 were drilled by New England Boring of Hermon, Maine during the period from January 16 to January 19, 2018 under the supervision of Stantec personnel.
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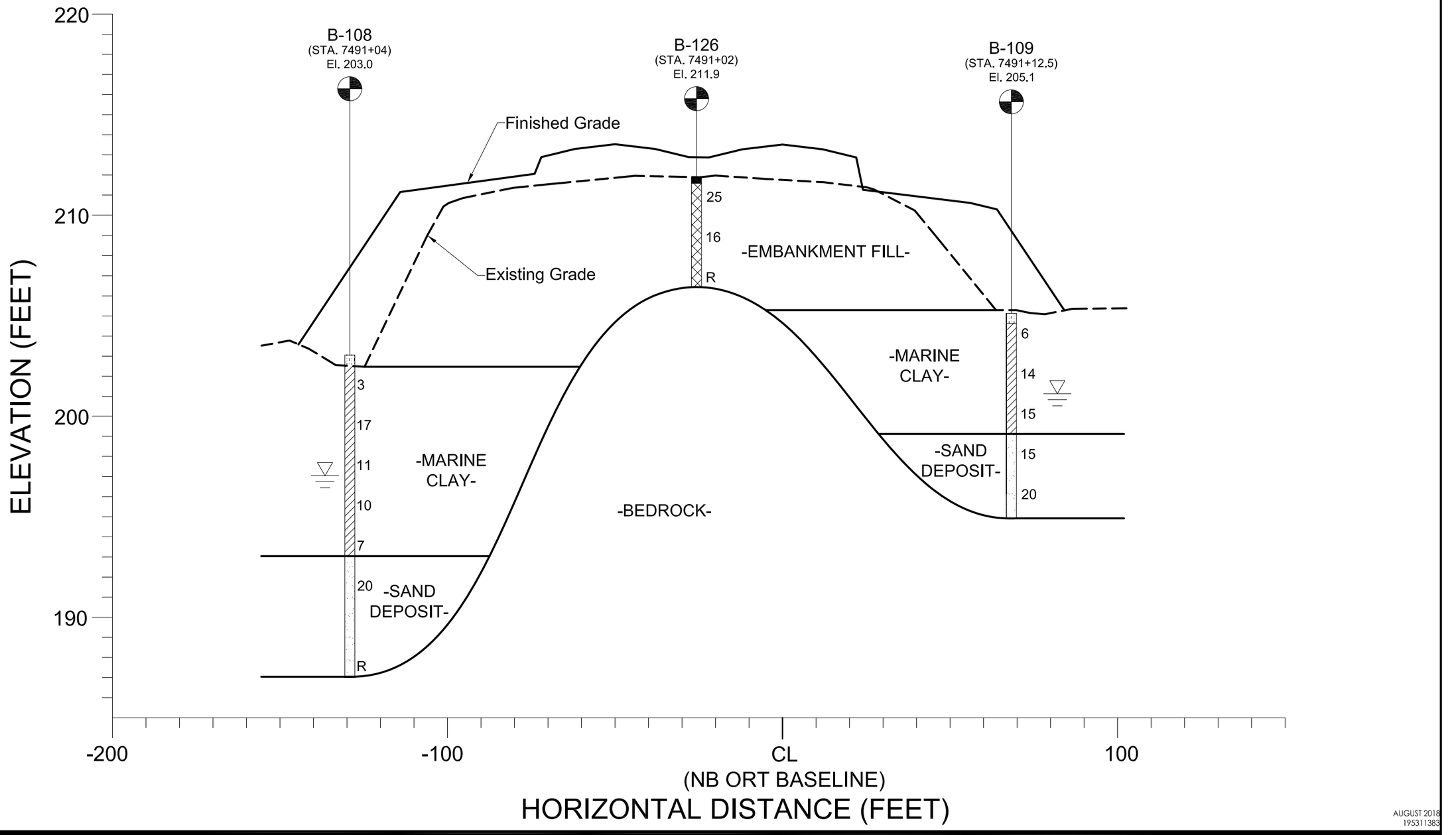
Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
13

Title
BORING LOCATION PLAN



ORIGINAL SHEET - ANSI B

AUGUST 2018
195311383

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SCARBOROUGH, ME
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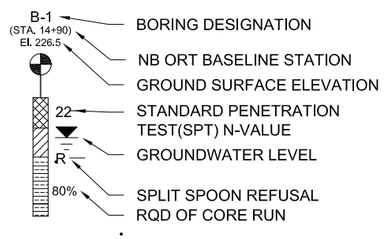


Legend

= SAND DESPOSIT
= EMBANKMENT FILL
= MARINE CLAY
= GLACIAL TILL
= BEDROCK

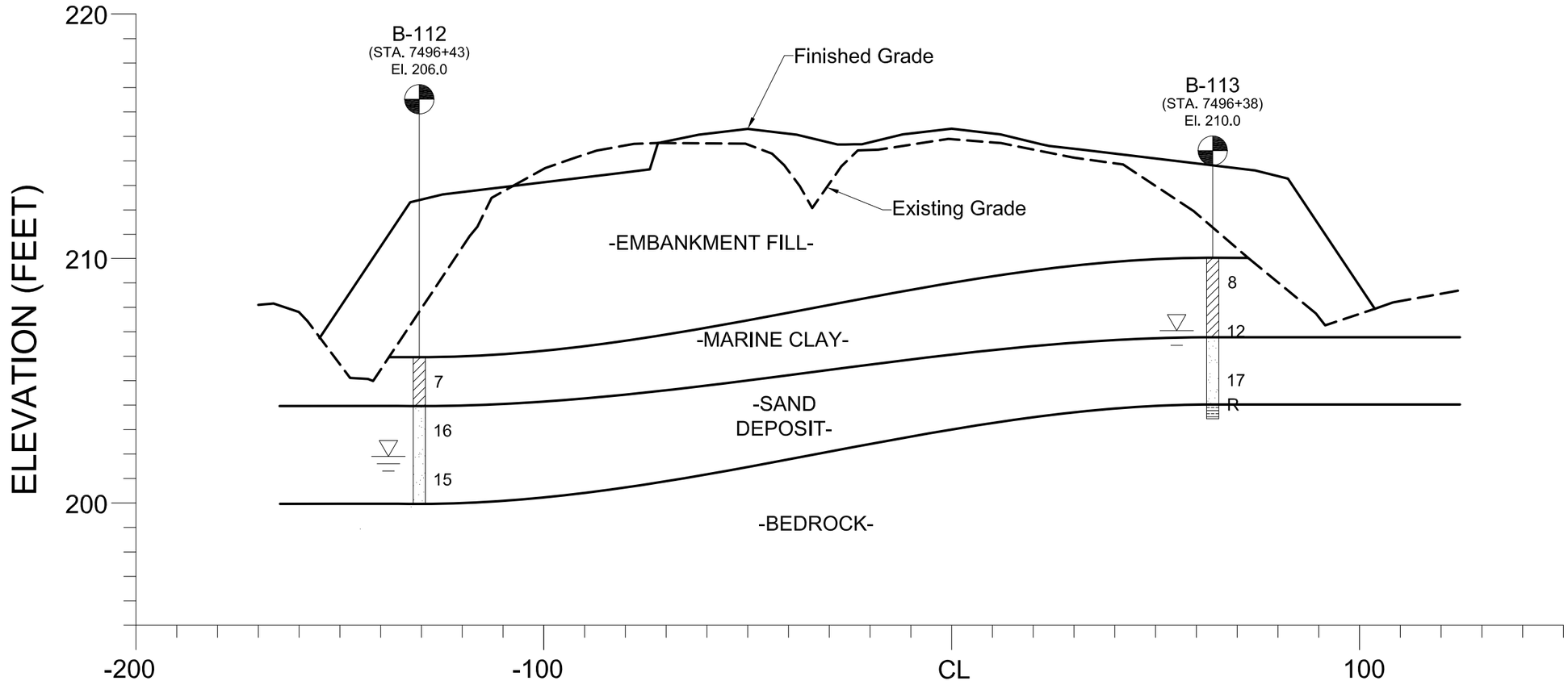
Notes

1) SUBSURFACE PROFILE WAS DEVELOPED FROM WIDELY SPACED BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME UNDER SUPERVISION OF STANTEC ON JUNE 15, 2018 THROUGH JULY 9, 2018.
2) BORING LOCATIONS ARE REFERENCED FROM THE NORTHBOUND ORT BASELINE.
3) ELEVATIONS SHOWN ARE IN FEET AND REFERENCED TO NAVD 1988.
4) TOP OF BEDROCK WAS DETERMINED BY AUGER REFUSAL OR BY ROCK CORE.
5) STRATA LINES ARE BASED ON LINEAR INTERPOLATION BETWEEN TEST BORINGS. ACTUAL CONDITIONS WILL VARY FROM THE CONDITIONS SHOWN.
6) GROUNDWATER ELEVATIONS WERE INTERPOLATED FROM SOIL SAMPLES AND DRILL CUTTINGS.
7) LOCATIONS OF TEST BORINGS WERE DETERMINED BY SURVEYING METHODS.

Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
14

Title
SUBSURFACE CROSS SECTION
STATION 7491+00

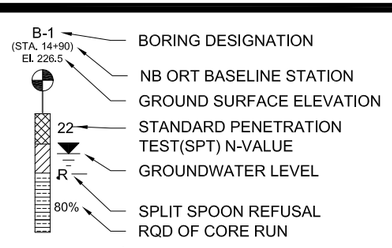


ORIGINAL SHEET - ANSI B

AUGUST 2018
195311388

Stantec

428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com



Legend

= SAND DEPOSIT
= EMBANKMENT FILL
= MARINE CLAY
= GLACIAL TILL
= BEDROCK

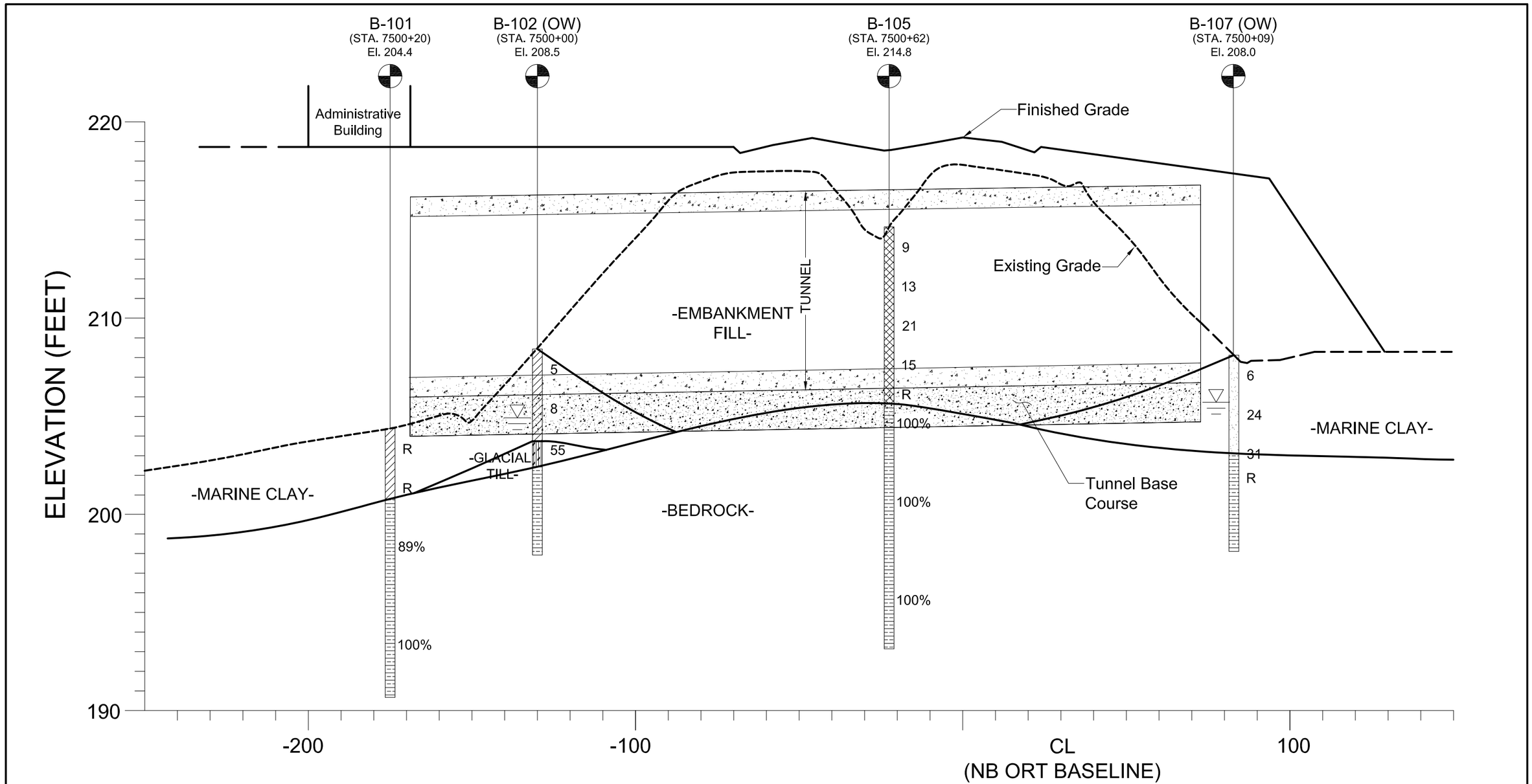
Notes

1) SUBSURFACE PROFILE WAS DEVELOPED FROM WIDELY SPACED BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME UNDER SUPERVISION OF STANTEC ON JUNE 15, 2018 THROUGH JULY 9, 2018.
2) BORING LOCATIONS ARE REFERENCED FROM THE NORTHBOUND ORT BASELINE.
3) ELEVATIONS SHOWN ARE IN FEET AND REFERENCED TO NAVD 1988.
4) TOP OF BEDROCK WAS DETERMINED BY AUGER REFUSAL OR BY ROCK CORE.
5) STRATA LINES ARE BASED ON LINEAR INTERPOLATION BETWEEN TEST BORINGS. ACTUAL CONDITIONS WILL VARY FROM THE CONDITIONS SHOWN.
6) GROUNDWATER ELEVATIONS WERE INTERPOLATED FROM SOIL SAMPLES AND DRILL CUTTINGS.
7) LOCATIONS OF TEST BORINGS WERE DETERMINED BY SURVEYING METHODS.

Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
15

Title
SUBSURFACE CROSS SECTION
STATION 7496+50



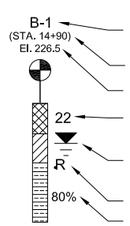
ORIGINAL SHEET - ANSI B

March 2018
195311383

Stantec

428 PAYNE ROAD
SCARBOROUGH, MAINE
www.stantec.com

Legend



BORING DESIGNATION
NB ORT BASELINE STATION
GROUND SURFACE ELEVATION
STANDARD PENETRATION TEST(SPT) N-VALUE
GROUNDWATER LEVEL IN OBSERVATION WELL
SPLIT SPOON REFUSAL
RQD OF CORE RUN

= SAND DEPOSIT
= EMBANKMENT FILL
= MARINE CLAY
= GLACIAL TILL
= BEDROCK

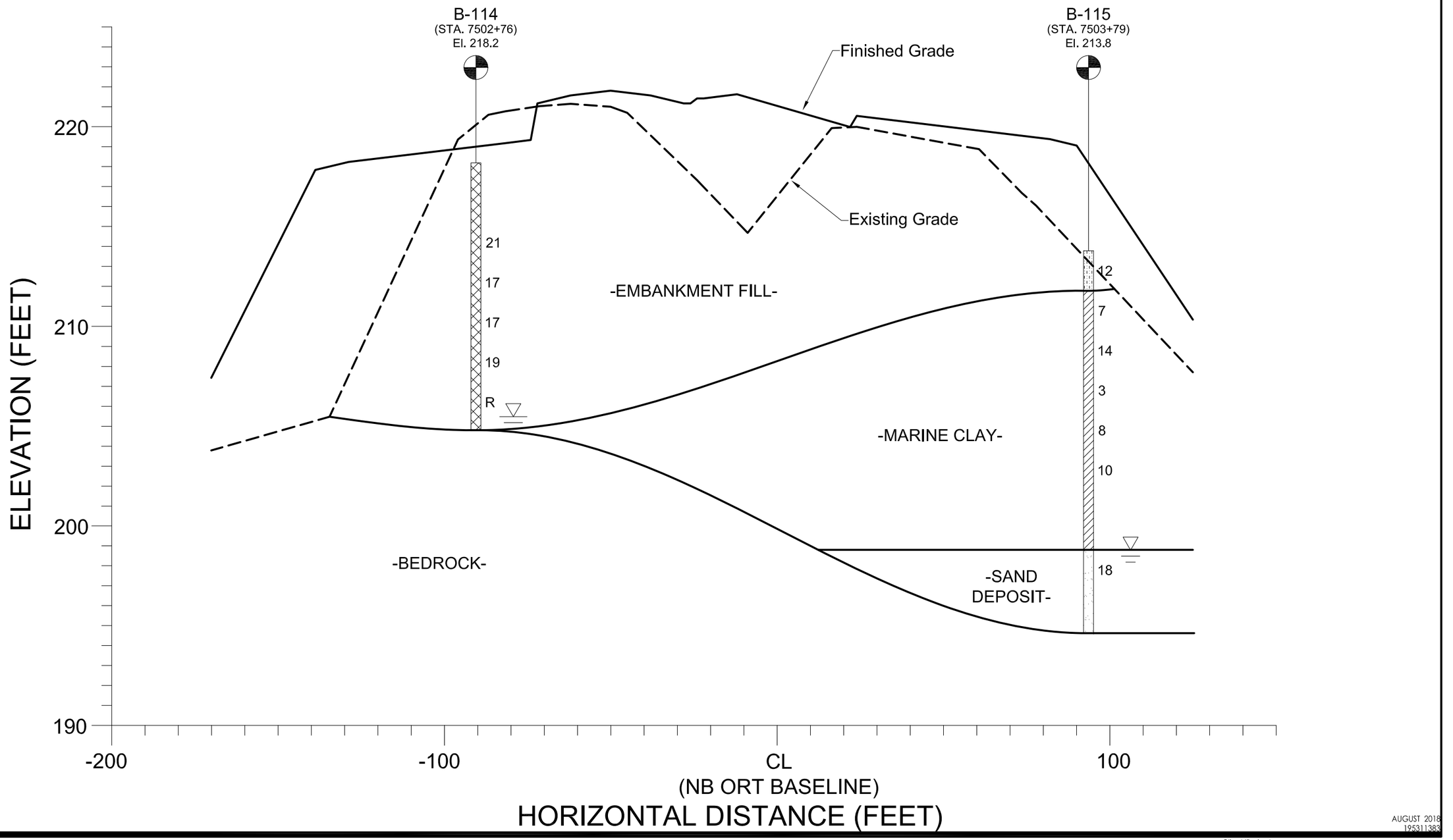
Notes

1) SUBSURFACE PROFILE WAS DEVELOPED FROM WIDELY SPACED BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME UNDER SUPERVISION OF STANTEC ON JANUARY 16, 2018 THOROUGH JANUARY 19, 2018.
2) BORING LOCATIONS ARE REFERENCED FROM THE EXIT 103 NORTHBOUND BASELINE.
3) ELEVATIONS SHOWN ARE IN FEET AND REFERENCED TO NAVD 1988.
4) TOP OF BEDROCK WAS DETERMINED BY ROLLER BIT RESISTANCE AND/OR BEDROCK CORING. ELEVATIONS SHOULD BE CONSIDERED APPROXIMATE.
5) STRATA LINES ARE BASED ON LINEAR INTERPOLATION BETWEEN TEST BORING LOCATION. ACTUAL CONDITIONS WILL VARY FROM THE CONDITIONS SHOWN.
6) GROUNDWATER ELEVATIONS WERE MEASURED IN MONITORING WELLS AND WILL VARY.
7) LOCATIONS OF TEST BORINGS WERE DETERMINED BY TAPING FROM EXISTING SITE FEATURES. GROUND SURFACE AT THE BORING LOCATIONS WAS DETERMINED BY INTERPOLATING FROM GROUND SURFACE CONTOURS.

Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
16

Title
SUBSURFACE CROSS SECTION
STATION 7500+00



ORIGINAL SHEET - ANSI B

AUGUST 2018
195311383

Stantec
428 PAYNE ROAD
SCARBOROUGH, ME
www.stantec.com

B-1 (STA. 14+90) El. 226.5 — BORING DESIGNATION; NB ORT BASELINE STATION; GROUND SURFACE ELEVATION
22 — STANDARD PENETRATION TEST(SPT) N-VALUE
R — GROUNDWATER LEVEL
80% — SPLIT SPOON REFUSAL RQD OF CORE RUN

Legend

= SAND DEPOSIT
= EMBANKMENT FILL
= MARINE CLAY
= GLACIAL TILL
= BEDROCK

Notes

1) SUBSURFACE PROFILE WAS DEVELOPED FROM WIDELY SPACED BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, ME UNDER SUPERVISION OF STANTEC ON JUNE 15, 2018 THROUGH JULY 9, 2018.
2) BORING LOCATIONS ARE REFERENCED FROM THE NORTHBOUND ORT BASELINE.
3) ELEVATIONS SHOWN ARE IN FEET AND REFERENCED TO NAVD 1988.
4) TOP OF BEDROCK WAS DETERMINED BY AUGER REFUSAL OR BY ROCK CORE.
5) STRATA LINES ARE BASED ON LINEAR INTERPOLATION BETWEEN TEST BORINGS. ACTUAL CONDITIONS WILL VARY FROM THE CONDITIONS SHOWN.
6) GROUNDWATER ELEVATIONS WERE INTERPOLATED FROM SOIL SAMPLES AND DRILL CUTTINGS.
7) LOCATIONS OF TEST BORINGS WERE DETERMINED BY SURVEYING METHODS.

Client/Project
MAINE TURNPIKE AUTHORITY
INTERCHANGE 103 ORT CONVERSION
WEST GARDINER, ME

Figure No.
17

Title
SUBSURFACE CROSS SECTION
STATION 7503+00

Appendix A

Test Boring Logs

TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION – Modified Burmister System

Component Definitions by Gradation

Material	Fraction	Sieve Limits	
		Upper	Lower
Boulders	--	--	12 inches
Cobbles	--	12 inches	3 inches
Gravel	Coarse	3 inches	¾ inches
	Fine	¾ inches	¼ inch
Sand	Coarse	No. 4 (1/4 in)	No. 10 (1/8 in)
	Medium	No. 10 (1/8 in)	No. 40 (1/32 in)
	Fine	No. 40 (1/32 in)	No. 200
Silt	--	No. 200	(non-plastic)
Clay	--	No. 200	(plastic)

Terminology describing component proportions:

Descriptive Term	Range of Proportion
Major Component	≥ 50%
And	35 – 50
Some	20 – 35
Little	10 – 20
Trace	0 – 10
With	Amount cannot be determined

Terminology describing compactness of cohesionless soils:

Density	**SPT N-Value**
Very Loose	<5
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

Terminology describing consistency of cohesive soils:

Consistency	**SPT N-Value**	**Undrained Shear Strength (ksf)**
Very Soft	< 2	<0.25
Soft	2 – 4	<0.25 – 0.5
Medium Stiff	4 – 8	0.5 – 1.0
Stiff	8 – 15	1.0 – 2.0
Very Stiff	15 – 30	2.0 – 4.0
Hard	> 30	>4.0

Plasticity	**General Soil Type**	**Thread Diameter (in.)**
Non-plastic	Silt	Cannot roll
Slightly	Clayey SILT	1/4
Low	SILT and Clay	1/8
Medium	CLAY and Silt	1/16
Highly	Silty CLAY	1/32
Very High	CLAY	1/64

Stantec

BOREHOLE LOG

B-101

CLIENT **Maine Turnpike Authority** STATION **3500+00 SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **97 Left** EXPLORATION No. **B-101**

EXPLORATION DATE **1/18/2018 to 1/18/2018** GROUND EL. **204.4** WATER LEVEL **Not Observed** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	204.4						in.			
0		Very loose, brown medium to fine SAND, some Clay, some Organics. Gray dry rock in tip. First refusal at 1'. Step over 1.5' South.			SS	1	5	WOH/12" 1/3" 50/1"	R	R
	203.1									
	201.9	-SAND DEPOSIT-								
		Auger through weathered rock to 3.5 feet			SS	2	5	50/5"	R	R
	200.9	-WEATHERED/FRACTURED BEDROCK-								
	200.4	Seat casing at 4 feet to core								
5		Core Run 1: 4' - 8.7' Recovery: 50in (89%) RQD: 15in (27%) Moderately hard, slightly weathered, dark gray to light gray fine grained GNEISS, with horizontal to moderately dipping, moderately close, rough, partly opened joints			RC	1	50			
	195.7									
10		Core Run 2: 8.7' - 13.7' Recovery: 60in (100%) RQD: 43in (72%) Moderately hard, slightly weathered, dark gray to light gray fine grained GNEISS, with horizontal to moderately dipping, moderately close, rough, partly opened joints - Barrel break at 3'			RC	2	60			
	190.7									
		End of boring at 13.7' Sampler refusal at 2.5'								
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Hermon, ME; Supervisor: NE Boring: Brad and Chris Stantec: Brian Foley
Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-102(OW)

CLIENT **Maine Turnpike Authority** STATION **3500+00 SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **50 Left** EXPLORATION No. **B-102(OW)**

EXPLORATION DATE **1/16/2018 to 1/18/2018** GROUND EL. **208.5** WATER LEVEL **2.4 feet** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	208.5						in.			
0		Medium stiff, brown CLAY, and Silt, trace Organics, trace fine Gravel			SS	1	20	2 2 3 3	5	6
	206.5	Stiff, brown CLAY, and Silt, trace black Organics. Iron stains -MARINE CLAY-			SS	2	20	3 3 5 8	8	9
	204.5	Hard, gray CLAY, some Silt. Iron stains								
	203.8	Hard, brown/gray medium to fine SAND, little Silt, trace fractured rock. Wet at tip.			SS	3	15	6 29 26 28	55	62
5	202.5	-GLACIAL TILL-			SS	4	0	50/2"	R	R
	202.3	Auger to 10.5' through bedrock No change in drilling resistance								
		-BEDROCK-								
10	198.0									
		End of boring at 10.5' Sampler refusal at 6' Well installed, see well log.								
		Offset 5' Northwest: Refusal at 5' with SSA -ground surface of offset is ~1' lower than original location								
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Hermon, ME; Supervisor: NE Boring: Brad and Chris Stantec: Brian Foley
Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-103

CLIENT **Maine Turnpike Authority** STATION **3500+84 SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **52.6 Left** EXPLORATION No. **B-103**

EXPLORATION DATE **1/18/2018 to 1/18/2018** GROUND EL. **208.5** WATER LEVEL **Not Observed** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	208.5						in.			
0		Stiff, brown CLAY, some fine Sand, trace organics			SS	1	12	3 3 5 8	8	9
	206.5	Loose, brown/gray medium to fine SAND, some Clay, little organics, little Silt -SAND DEPOSIT-			SS	2	14	4 3 3 2	6	7
5	204.5	Very loose, brownish gray fine SAND, and Clay, lttle Silt, trace fine Gravel. Very wet and loose in spoon			SS	3	14	1 1 2 20	3	3
	202.5				SS	4	14	41 22 50/2"	R	R
	201.5	Auger to 9' through bedrock -BEDROCK-								
	199.5	End of boring at 9' Sampler refusal at 7' Offset 6' Northwest: Refusal at 5.5' with SSA -ground surface of offset is ~1' lower than original location								
10										
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Hermon, ME; Supervisor: NE Boring: Brad and Chris Stantec: Brian Foley
Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-104(OW)

CLIENT **Maine Turnpike Authority** STATION **7499+39 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **22 Left** EXPLORATION No. **B-104(OW)**

EXPLORATION DATE **1/19/2018 to 1/19/2018** GROUND EL. **214.75** WATER LEVEL **5.7 feet** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	214.8						in.			
0		Loose, brown coarse to fine SAND, little Silt, trace fine Gravel, trace gravel. Trace organics in top 6"			SS	1	18	3 3 4 4	7	8
	212.8	Medium dense, brown coarse to fine SAND, little Silt, trace fine Gravel. Little clay in bottom 2"			SS	2	20	8 12 11 8	23	26
	210.8	Loose, gray/brown coarse to fine SAND, little Silt, little Clay, little fine Gravel			SS	3	17	2 5 3 4	8	9
5	208.8									
	208.2	-FILL-								
		Stiff, gray CLAY, and Silt, trace Sand. Irons stains			SS	4	24	4 5 9 18	14	16
	207.0									
	206.8	Medium dense, brown medium to fine SAND, little Silt			SS	5	4	11 30/2"	R	R
	206.0	Brown coarse to fine SAND, little Clay, little Silt. Iron stains								
10	204.3	Auger to 10.5' through bedrock -BEDROCK-								
		End of boring at 10.5' Sampler refusal at 8.8'								
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Hermon, ME; Supervisor: NE Boring: Brad and Chris Stantec: Brian Foley
Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-105

CLIENT **Maine Turnpike Authority** STATION **7500+59 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **22 Left** EXPLORATION No. **B-105**

EXPLORATION DATE **1/19/2018 to 1/19/2018** GROUND EL. **214.8** WATER LEVEL **Not Observed** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	214.8						in.			
0		Loose, brown medium to fine SAND, some Silt, trace Gravel, trace Organics			SS	1	18	12 4 5 6	9	10
	212.8	Stiff, gray CLAY, and Silt, some irons stains. Trace gravel at bottom			SS	2	15	4 6 7 8	13	15
	210.8	Medium dense, gray coarse to fine SAND, little Silt, little fine Gravel			SS	3	14	4 10 11 12	21	24
5	208.8	-FILL- No recovery			SS	4	0	1 8 7 8	15	17
	206.8	Very loose, gray medium to fine SAND, some Silt, trace black organics. Some clay at bottom 3"			SS	5	12	2 1 50/0"	R	R
	205.8	Core Run 1: 9' - 11.5' Recovery: 30in (100%) RQD: 9in (30%)			RC	1	30			
10	203.3	Moderately hard, slightly weathered, gray to light gray fine grained GNEISS, with horizontal to high angle, widely spaced, rough, partly opened joints -Barrel jam at 2.5'								
		Core Run 2: 11.5' - 16.5' Recovery: 60in (100%) RQD: 43in (72%)			RC	2	60			
15	198.3	Moderately hard, slightly weathered, gray to light gray fine grained GNEISS, with horizontal to high angle, widely spaced, rough, partly opened joints								
		Core Run 3: 16.5' - 21.5' Recovery: 60in (100%) RQD: 54in (90%)			RC	3	60			
20		Moderately hard, slightly weathered, gray to light gray fine grained GNEISS, with horizontal to high angle, widely spaced, rough, partly opened joints								
	193.3	End of boring at 21.5' Sampler refusal at 9'								

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Hermon, ME; Supervisor: NE Boring: Brad and Chris Stantec: Brian Foley
Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-106

CLIENT **Maine Turnpike Authority** STATION **8499+16 NB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **51 Right** EXPLORATION No. **B-106**

EXPLORATION DATE **1/16/2017 to 1/16/2017** GROUND EL. **208** WATER LEVEL **Not Observed** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	208.0						in.			
0		Loose, tan/brown coarse to fine SAND, little Silt, trace Gravel			SS	1	16	5 3 2 3	5	6
	206.0	Medium dense, tan/brown coarse to fine SAND, little Silt. Iron stains at top of sample.			SS	2	18	4 6 9 10	15	17
	204.0	-SAND DEPOSIT-								
5	202.8	Medium dense, tan fine SAND, some Silt			SS	3	18	5 7 7 11	14	16
	202.0	Tan fine SAND, and Silt, trace Clay, trace fine Gravel. Fractured gravel in tip.			SS	4	8	18 50/2"	R	R
	201.3	-GLACIAL TILL-								
	200.9	Seat casing on rock								
10		Core Run 1: 7.1' - 12.1' Recovery: 60in (100%) RQD: 12in (20%) Moderately hard, slightly weathered, gray to light gray fine grained GNEISS, with moderately dipping to high angle, close, rough, partly opened joints			RC	1	60			
	195.9	Core Run 2: 12.1' - 17.1' Recovery: 60in (100%) RQD: 24in (40%) Moderately hard, slightly weathered, gray to light gray fine grained GNEISS, with moderately dipping to high angle, close, rough, partly opened joints			RC	2	60			
15	190.9	End of boring at 17.1' Sampler refusal at 6.67'								
20										

Undrained Shear Strength - tsf

1 2 3 4

W_P W W_L

Water Content & Atterberg Limits

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Hermon, ME; Supervisor: NE Boring: Brad and Chris Stantec: Brian Foley
Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-107(OW)

CLIENT **Maine Turnpike Authority** STATION **8499+95 NB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **60.1 Right** EXPLORATION No. **B-107(OW)**

EXPLORATION DATE **1/16/2017 to 1/16/2017** GROUND EL. **208** WATER LEVEL **0 feet** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	208.0						in.			
0		Medium Stiff, brown/gray CLAY and Silt			SS	1	12	1 3 3 4	6	7
	206.0	-MARINE CLAY DEPOSIT-								
		Very stiff, brown/gray CLAY, little Silt, some coarse to fine Sand, little fine Gravel. Fractured gravel throughout sample.			SS	2	19	10 9 15 20	24	27
	204.0	Hard, brown CLAY, trace weathered rock, some Silt								
	203.2				SS	3	18	10 15 16 9	31	35
5		Gray weathered rock								
	202.0	-WEATHERED/FRACTURED ROCK-			SS	4	5	19 50/2"	R	R
	201.3	Auger to 10.1' through bedrock. No change in drilling resistance.								
		-BEDROCK-								
10	197.9									
		End of boring at 10.1' Sampler refusal at 6.67' Well installed, see well log								
		Offset 6' North: Refusal at 7.5' with SSA -ground surface of offset is ~1' lower than original location								
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Hermon, ME; Supervisor: NE Boring: Brad and Chris Stantec: Brian Foley
Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-108

CLIENT **Maine Turnpike Authority** STATION **3491+04 SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **45.5 Left** EXPLORATION No. **B-108**

EXPLORATION DATE **6/15/2018 to 6/15/2018** GROUND EL. **202.96** WATER LEVEL **6** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	203.0						in.			
0	202.1	Loose, brown medium to fine SAND, little Silt, trace organics. -TOPSOIL-			SS	1	16	2 2 1 2	3	3
	201.0	Loose, gray/brown SILT and CLAY, little fine Gravel. Very stiff, gray SILT and CLAY. Mottled. PP=3.0 tsf			SS	2	16	4 7 10 13	17	17
	199.0	Stiff, brown/gray SILT and CLAY. Mottled. PP=3.0 tsf -MARINE CLAY-			SS	3	24	4 5 6 7	11	11
5	197.0	Stiff, gray SILT and CLAY. Mottled. PP=3.0 tsf		▽	SS	4	24	3 5 5 6	10	10
	195.0	Medium stiff, gray SILT and CLAY. Mottled. 1-inch sandy silt seam in sample. PP=1.75 tsf			SS	5	24	3 3 4 4	7	7
10	193.0									
	192.5	Medium dense, gray coarse to fine SAND, some Silt, little Gravel.			SS	6	15	4 10 10 11	20	20
	192.0	Medium dense, gray/black fine SAND and GRAVEL								
	191.0	Medium dense, black GRAVEL -SAND DEPOSIT-								
15	188.0									
	187.5	Tan fine SAND, trace Silt.			SS	7	5	50/6"	R	R
	187.0									
		End of boring at 16 feet. Auger refusal.								
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-109

CLIENT **Maine Turnpike Authority** STATION **8491+12 NB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **33.3 Left** EXPLORATION No. **B-109**

EXPLORATION DATE **6/12/2018 to 6/13/2018** GROUND EL. **205.09** WATER LEVEL **4** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	205.1						in.			
0	204.8	Organics -TOPSOIL-			SS	1	18	1 2 4 5	6	6
	203.1	Loose, grayish brown SILT and CLAY. Slightly mottled. PP=1.25 tsf			SS	2	24	3 6 8 10	14	14
	201.1	Stiff, grayish brown SILT, and CLAY. Slightly mottled. PP=3.0 tsf -MARINE CLAY-		▽	SS	3	19	4 7 8 9	15	15
5	199.1	Very stiff, grayish brown SILT, and CLAY. Slightly mottled. 1-inch sand seam in sample PP=3.0 tsf			SS	4	24	1 5 10 16	15	15
	197.1	Medium dense, brown medium to fine SAND, little Silt, trace coarse Sand.			SS	5	15	12 10 10 50/2"	20	20
	195.1	Medium dense, brown coarse to fine SAND, some Silt, trace Gravel, trace black weathered rock. -SAND DEPOSIT-								
10	194.9	End of boring at 10.2 feet. Auger refusal. Offset 5 feet north and confirm auger refusal at 9.4 feet.								
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-110

CLIENT **Maine Turnpike Authority** STATION **113+85 Access Road** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **19.7 Left** EXPLORATION No. **B-110**

EXPLORATION DATE **6/21/2018 to 6/21/2018** GROUND EL. **210.37** WATER LEVEL **8** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	210.4						in.			
0		Medium dense, brown medium to fine SAND, trace Silt, little fine Gravel. -TOPSOIL-			SS	1	18	4 16 13 16	29	29
	208.4	Medium dense, brown fine SAND, and SILT, little coarse Sand.			SS	2	14	4 7 7 6	14	14
	206.4	-MARINE CLAY- Medium stiff, gray SILT and CLAY PP= 1.25-2 tsf			SS	3	14	2 2 3 6	5	5
5	204.4	Stiff, grayish brown SILT and CLAY. Mottled. PP=3.5 tsf			SS	4	18	3 6 8 12	14	14
	202.4	Medium dense, brown fine SAND and SILT, little coarse Sand, trace Gravel.		▽	SS	5	12	7 8 11 22	19	19
10	200.4	Medium dense, brown fine SAND, some Silt, little Gravel, little coarse Sand.			SS	6	17	18 11 13 14	24	24
	198.4	-SAND DEPOSIT-								
15	195.4	Medium dense, brown medium to fine SAND, some Silt, some Gravel, little coarse Sand. Dry gray rock in tip.			SS	7	18	11 14 14 27	28	28
	193.4									
20	190.4									
	189.8	Gray fine SAND, trace Silt, some angular Gravel. Possible decomposed weathered rock.			SS	8	7	23 50/1"	R	R
		End of boring at 20.6 feet. Sampler and auger refusal.								

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-111

CLIENT **Maine Turnpike Authority** STATION **118+31 Access Road** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **64.4 Right** EXPLORATION No. **B-111**

EXPLORATION DATE **6/15/2018 to 6/15/2018** GROUND EL. **205.819** WATER LEVEL **5** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	205.8						in.			
0	205.6	Orgaincs -TOPSOIL-			SS	1	18	1 2 8 11	10	10
	203.8	Medium dense, brown medium to fine SAND, some Silt.								
		Dense, brown fine SAND, little Silt, little Gravel. Iron stains. Gravel in tip.			SS	2	17	16 12 19 43	31	31
	201.8	-SAND DEPOSIT-								
5	200.8	Dense, brown fine SAND, little Silt, little Gravel. Iron stains. Black gravel/weathered rock in tip.		▽	SS	3	6	25 45 50/3"	R	R
	199.6	Auger grinding through weathered rock to 7.5 feet. -BEDROCK-								
	198.3	End of boring at 7.5 feet. Auger refusal. Offset 5 feet east and confirm grinding at 5.5 feet and auger refusal at 7.8 feet.								
10										
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-112

CLIENT **Maine Turnpike Authority** STATION **3496+43 SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **52.8 Left** EXPLORATION No. **B-112**

EXPLORATION DATE **6/15/2018 to 6/15/2018** GROUND EL. **206.036** WATER LEVEL **4** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	206.0						in.			
0		Medium stiff, gray SILT and CLAY. Orgaincs in top 6 inches. Sitly sand seam in bottom. PP=2 tsf			SS	1	21	1 3 4 9	7	7
	204.0	-MARINE CLAY-								
		Meidum dense, brown fine SAND and SILT, trace fine Gravel. Iron stains in tip.		▽	SS	2	16	7 8 8 12	16	16
	202.0									
5		Medium dense, brown fine SAND and SILT, trace fine Gravel. Weathered rock in tip. -SAND DEPOSIT-			SS	3	10	5 7 8 50/4"	15	15
	200.0									
	199.9	End of borings at 6.1 feet. Auger refusal. Offset 5 feet north and confirm auger reufsal at 5.9 feet.								
10										
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-113

CLIENT **Maine Turnpike Authority** STATION **8496+38 NB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **64 Right** EXPLORATION No. **B-113**

EXPLORATION DATE **6/13/2018 to 6/13/2018** GROUND EL. **210** WATER LEVEL **3** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	210.0				in.			
0	209.8	Dark brown fine SAND, some Silt, little Organics. -TOPSOIL-	SS	1	17	2 3 5 9	8	8
	208.0	Stiff, gray SILT and CLAY. Mottled. PP=2.25 tsf -MARINE CLAY-	SS	2	20	4 4 8 11	12	12
	206.8	Stiff, gray SILT and CLAY. Mottled. PP=3.5 tsf	SS	3	18	5 5 12 14	17	17
5	206.0	Medium dense, brown medium to fine SAND, little Silt.						
	204.9	Medium dense, brown medium to fine SAND, some Silt. -SAND DEPOSIT-	SS	4	0	50/4"	R	R
	204.0							
	203.7	Medium dense, brown/black SAND, and weathered ROCK.						
	203.4	Black/brown WEATHERED ROCK. Sample from tip. -BEDROCK-						
10		End of boring at 6.58 feet. Auger refusal. Offet 5 feet south and confirm auger refusal at 6.75 feet.						
15								
20								

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-114

CLIENT **Maine Turnpike Authority** STATION **3502+56 SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **12.4 Left** EXPLORATION No. **B-114**

EXPLORATION DATE **6/13/2018 to 6/13/2018** GROUND EL. **218.195** WATER LEVEL **13** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	218.2						in.			
0		Auger to 5 feet. Brown medium/fine SAND, little Silt, trace Gravel.								
5	213.2	Medium dense gray/brown coarse to fine SAND, some Silt, trace Gravel.			SS	1	20	8 10 11 11	21	21
	211.2	Medium dense, brown coarse to fine SAND, some Silt. -FILL-			SS	2	16	4 4 13 20	17	17
	209.2	Medium dense, brown medium to fine SAND and SILT.			SS	3	2	9 6 11 14	17	17
10	207.2	Medium dense, brown medium to fine SAND and SILT.			SS	4	2	13 10 9 9	19	19
	205.2			▽						
	204.9	Brown medium to fine SAND, some Silt, little coarse Sand.			SS	5	3	50/4"	R	R
	204.8	End of boring at 13.4 feet. Auger refusal. Offset 6 feet south and confirm auger refusal at 13.9 feet. Bedrock outcrop visable at toe of the slope.								
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-115

CLIENT **Maine Turnpike Authority** STATION **8503+79 NB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **58.8 Right** EXPLORATION No. **B-115**

EXPLORATION DATE **6/13/2018 to 6/13/2018** GROUND EL. **213.849** WATER LEVEL **15** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	213.8						in.			
0		Medium dense, brown medium to fine SAND, trace Silt, trace Gravel, trace Organics. -TOPSOIL-			SS	1	15	4 6 6 6	12	12
	211.8									
	211.0	Medium stiff, gray SILT and CLAY, trace Organics (wood).			SS	2	18	3 3 4 5	7	7
	209.8	Loose, borwn/gray coarse to fine SAND and SILT, little Clay.								
5		Medium stiff, gray SILT and CLAY, trace Organics. PP=0.25 tsf			SS	3	17	2 2 2 3	14	14
	207.8									
		Soft, gray SILT and CLAY, little Sand. -MARINE CLAY-			SS	4	16	2 2 1 1	3	3
	205.8									
		Stiff, gray SILT and CLAY.			SS	5	14	2 2 6 8	8	8
10	203.8									
		Very stiff, gray/brown SILT, some Clay, little coarse to fine SAND, trace organics.			SS	6	5	8 9 11 14	10	10
	201.8									
	198.8			▽						
15		Medium dense, brown medium to fine SAND, some Silt, little Gravel. Iron stains.			SS	7	16	7 8 10 20	18	18
	196.8	-SAND DEPOSIT-								
	194.7									
20		End of boring at 19.16 feet. Auger refusal.								

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-116

CLIENT **Maine Turnpike Authority** STATION **7509+93 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **18.6 Left** EXPLORATION No. **B-116**

EXPLORATION DATE **6/22/2018 to 6/22/2018** GROUND EL. **215.93** WATER LEVEL **12** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	215.9						in.			
0		Medium dense, brown medium to fine SAND, little Silt, trace Gravel, trace coarse Sand. Organics in top 6 inches.			SS	1	19	3 7 8 10	15	15
	213.9	Medium dense, brown medium to fine SAND, little Silt, trace fine Gravel.			SS	2	18	7 14 15 22	29	29
	211.9									
	211.7	Refusal on boulder. Offset 5 feet west.			SS	3	3	50/3"	R	R
5		Auger through 1.5 foot boulder at new hole location.								
	209.9	-FILL-								
		Dense, brown medium to fine SAND, little Silt, little Gravel, trace coarse Sand.			SS	4	20	16 19 19 23	38	38
	207.9									
		Dense, brown medium to fine SAND, little Silt, little Gravel, trace coarse Sand. Gravel in tip.			SS	5	16	20 32 50/5"	R	R
10	205.9									
		Dense, brown medium to fine SAND, little Silt, trace Gravel, trace coarse Sand. Black asphalt in sample.		▽	SS	6	12	18 20 25 36	45	45
	203.9									
	201.4									
	200.9	Auger griding at 14.5 feet.								
15		-BEDROCK-								
		End of boring at 15 feet. Auger refusal.								
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-117

CLIENT **Maine Turnpike Authority** STATION **7427+27 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **22.3 Left** EXPLORATION No. **B-117**

EXPLORATION DATE **6/20/2018 to 6/20/2018** GROUND EL. **170.285** WATER LEVEL **8** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	170.3						in.			
0		Loose, brown medium to fine SAND, trace Silt, little coarse to fine Gravel. Organics in top 4 inches.			SS	1	14	2 3 6 4	9	9
	168.3	Medium dense, medium to fine SAND, trace Silt, littel coarse to fine Gravel.			SS	2	5	5 6 6 6	12	12
	166.3	Meidum dense, brown fine SAND and SILT, trace Clay. Iron stains.			SS	3	16	4 8 9 8	17	17
5	164.3	-FILL-								
	163.3	Stiff, gray/brown SILT and CLAY. Slightly mottled.			SS	4	21	3 5 8 8	13	13
	162.3	Very stiff, gray SILT and CLAY. Mottled. PP=3.5 tsf		▽	SS	5	24	6 8 10 13	18	18
10	160.3	Very stiff, gray SILT and CLAY. Mottled. More plastic. PP=2.5 tsf			SS	6	24	5 6 7 7	13	13
	158.3	-MARINE CLAY-								
	155.3	Stiff, grayish brown SILT and CLAY. PP=1.5 tsf			SS	7	24	4 5 6 7	11	11
	153.3									
20	150.3	Very dense, brown/white/orange medium to fine SAND, some Silt, trace Gravel. -SAND DEPOSIT-			SS	8	18	18 27 40 36	67	67
	148.3									

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

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BOREHOLE LOG

B-117

CLIENT **Maine Turnpike Authority** STATION _____ PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET _____ EXPLORATION No. **B-117**

EXPLORATION DATE **6/20/2018 to 6/20/2018** GROUND EL. **170.285** WATER LEVEL **8** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY in.	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
		-SAND DEPOSIT-								
25	145.3									
	145.0	Brown/black medium to fine SAND, little Silt. Possible decomposed bedrock.			SS	9	2	50/3"	R	R
		End of boring at 25.25 feet. Sampler and Auger refusal.								
30										
35										
40										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec BOREHOLE LOG B-118

CLIENT Maine Turnpike Authority STATION 7427+31 NB ORT PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME OFFSET 33.3 Right EXPLORATION No. B-118

EXPLORATION DATE 6/11/2018 to 6/11/2018 GROUND EL. 172.14 WATER LEVEL 12 DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	172.1				in.			
0	171.7	5" Asphalt						
	171.1	Dense, gray/brown medium to fine SAND, trace coarse Sand, trace Silt, trace Gravel.	SS	1	7	9 19 14 15	33	33
	169.1	-FILL-						
5	167.1	Medium dense, grayish brown SILT, some Clay, trace fine Sand. Gravel in tip.	SS	2	8	5 7 10 50/5"	17	17
	165.1							
10	162.1	No recovery.	SS	3	0	10 7 4 6	11	11
	160.1							
	159.6	Brown/gray/black medium to fine SAND, some Silt, little coarse Sand.	SS	4	16	7 7 7 10	14	14
	158.1	Stiff, grayish brown SILT and CLAY. Mottled. PP=3.0 tsf						
15	156.1	Very stiff, grayish brown SILT and CLAY. Mottled. PP=3.0 tsf -MARINE CLAY-	SS	5	21	5 9 12 16	21	21
	154.1	Very stiff, grayish brown SILT and CLAY, trace black Mica. 3 inch silty sand seam in sample.	SS	6	21	10 12 10 11	22	22
	152.1	Stiff, gray SILT and CLAY, little Organics (wood). PP=1.25 tsf	SS	7	19	3 4 4 5	8	8
20	150.1	Stiff, gray SILT, some CLAY, trace Organics, trace fine Sand. PP=2.0 tsf	SS	8	19	1 3 7 9	10	10

Undrained Shear Strength - tsf: 1 2 3 4

Water Content & Atterberg Limits: W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

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STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-118

CLIENT Maine Turnpike Authority STATION PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME OFFSET EXPLORATION No. B-118

EXPLORATION DATE 6/11/2018 to 6/11/2018 GROUND EL. 172.14 WATER LEVEL 12 DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
25	147.1	Stiff, gray CLAY, little Silt. PP=2.0 tsf			SS	9	24	4 5 6 8	11	11
	145.1	-MARINE CLAY-								
30	142.1	Black/gray/brown meidum to fine SAND, some Silt.			SS	10	11	20 50/5"	R	R
	141.2	Gravel in tip.								
	140.7	-SAND DEPOSIT-								
		End of boring at 31.4 feet. Auger refusal.								
35										
40										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-119

CLIENT **Maine Turnpike Authority** STATION **7449+92 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **38.0 Left** EXPLORATION No. **B-119**

EXPLORATION DATE **6/20/2018 to 6/20/2018** GROUND EL. **187.754** WATER LEVEL _____ DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	187.8				in.			
0	187.2	7" Asphalt						
	186.8	Very dense, brown coarse to fine SAND, trace Silt, trace coarse to fine Gravel	SS	1	9	6 18 40 17	58	58
	184.8	Brown medium to fine SAND, some Silt, little Gravel. Mica at bottom 2 inches. -FILL-	SS	2	8	100 50/2"	R	R
5	184.0	Auger through boulder from 3.5-5.5 feet.						
	182.3	Dense, brown fine SAND, some Silt, little fine Gravel.	SS	3	15	19 16 18 24	44	44
	180.3							
	179.8	Light brown medium to fine SAND, some Silt, some coarse to fine Gravel, trace black weathered rock.	SS	4	16	29 33 31 30/2"	64	64
	178.0							
10	177.8	-TILL- Seat casing at 12.5 feet to core						
		Core Run 1: 10' - 12.5'	RC	1	26			
		Recovery: 26in (87%) RQD: 12in (33%)						
	175.3		SS	5	3	75/3"	R	R
	174.8	Hard, slightly weathered, gray, fine grained GNEISS, with low angle to moderately dipping close, rough partly open joints. Sand seam.						
15		Core run 2: 13'- 18'	RC	2	55			
		Recovery: 55in (92%) RQD: 46in (77%)						
	169.8	Hard, slightly weathered, gray, fine grained GNEISS, with low angle to moderately dipping close to wide, rough partly open joints.						
20		End of boring at 18 feet.						

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4" Drive and Wash, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-120

CLIENT **Maine Turnpike Authority** STATION **7449+88 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **45.7 Right** EXPLORATION No. **B-120**

EXPLORATION DATE **6/11/2018 to 6/12/2018** GROUND EL. **184.167** WATER LEVEL **4** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	184.2						in.			
0		Stiff, grayish brown CLAY, little Silt, trace Organics. PP=1.75 tsf			SS	1	13	4 4 4 5	8	8
	182.2	Medium stiff, grayish brown CLAY. PP=0.75 tsf			SS	2	24	2 2 2 3	4	4
	180.2	Soft, gray CLAY. Very plastic. PP=0 tsf -MARINE CLAY-		▽	SS	3	24	1 1 2 1	3	3
5	178.2	Vane shear unable to be pushed due to sand seam. Very soft, gray CLAY. Very plastic. PP=0 tsf			SS	4	24	1 1 1 1	2	2
	176.2	Vane shear unable to be pushed past 8.5 feet. Gray CLAY. Very plastic. Rock in tip. Offset 5 feet south east and resume hole at 10 feet.			SS	5	6	1 40 50/2"	R	R
10	174.2	Medium dense, brown coarse to fine SAND, some Silt, trace fine Gravel. -SAND DEPOSIT-			SS	6	6	4 7 9 50/3"	16	16
	172.2									
	172.1	End of boring at 12.1 feet. Auger refusal. First auger refusal at 9.25 feet.								
15										
20										

Undrained Shear Strength - tsf: 1 2 3 4

Water Content & Atterberg Limits: W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-121

CLIENT **Maine Turnpike Authority** STATION **7462+96 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **36.9 Left** EXPLORATION No. **B-121**

EXPLORATION DATE **6/19/2018 to 6/19/2018** GROUND EL. **195.38** WATER LEVEL **5** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	195.4						in.			
0		Medium dense, brown medium to fine SAND, little Silt, trace Gravel.			SS	1	13	1 7 6 9	13	13
	193.4	Medium dense, brown medium to fine SAND, little Silt, trace Gravel.			SS	2	16	7 11 17 18	28	28
	191.4	Medium dense, brown coarse to fine SAND, trace Silt, little Gravel. -FILL-		▽	SS	3	11	6 7 6 5	13	13
5	189.4									
	188.4	Medium stiff, grayish brown SILT, some Clay			SS	4	20	3 2 5 7	7	7
	187.4	Very stiff, grayish brown SILT and CLAY. Mottled. PP=3.0 tsf -MARINE CLAY-			SS	5	20	7 9 10 12	19	19
10	185.4									
	184.6	Medium dense, brown medium to fine SAND and SILT, trace Clay, trace fine Gravel. -SAND DEPOSIT-			SS	6	21	4 6 5 8	11	11
	183.4									
15	180.4	Brown fine SAND, some Silt, some coarse Sand, trace fine Gravel			SS	7	16	9 14 50/3"	R	R
	178.4	Auger refusal on boulder at 17 feet. Offset 5 feet north. -TILL-								
20	175.4	Brown fine SAND, some Silt, some coarse Sand, trace fine Gravel			SS	8	19	8 8 19 38	27	27
	173.4									

Undrained Shear Strength - tsf

1 2 3 4

W_P W W_L

Water Content & Atterberg Limits

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

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Stantec

BOREHOLE LOG

B-121

CLIENT Maine Turnpike Authority STATION PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME OFFSET EXPLORATION No. B-121

EXPLORATION DATE 6/19/2018 to 6/19/2018 GROUND EL. 195.38 WATER LEVEL 5 DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
		-TILL-								
25	170.4	Hard, gray SILT, some Clay, trace fine Gravel, trace weathered Rock.			SS	9	14	22 38 20 15	58	58
	168.4	End of boring at 28 feet. No refusal. Auger on harder material at 28 feet.								
30										
35										
40										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-122

CLIENT **Maine Turnpike Authority** STATION **7462+89 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **41.4 Right** EXPLORATION No. **B-122**

EXPLORATION DATE **6/12/2018 to 6/12/2018** GROUND EL. **192.727** WATER LEVEL **5** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	192.7						in.			
0	191.9	Medium dense, brown medium to fine SAND, trace Silt, trace Organics (roots). -TOPSOIL-			SS	1	15	3 5 5 5	10	10
	190.7	Stiff, brown SILT and CLAY, trace organics, trace fine Sand. Soft, grayish brown SILT, some Clay.			SS	2	14	2 2 2 3	4	4
	188.7	Soft, grayish brown SILT and CLAY, trace organics. PP=2.5 tsf -MARINE CLAY-		▽	SS	3	20	1 1 1 3	2	2
5	186.7	Stiff, grayish brown CLAY, some Silt. PP=3.0 tsf			SS	4	24	2 4 8 8	12	12
	184.7	Stiff, grayish brown CLAY, some Silt. PP=2.5 tsf			SS	5	18	4 6 5 6	11	11
10	182.7	Stiff, grayish brown CLAY, some Silt.			SS	6	15	1 4 6 9	10	10
	181.7	Medium dense, grayish brown medium fine SAND, some Clay, some Silt, little fine Gravel. -SAND DEPOSIT-								
15	177.7	Brown/black medium to fine SAND, some Silt, little gravel. Black weathered rock in tip.			SS	7	4	21 50/2"	R	R
	177.0									
	176.9	End of boring at 15.8 feet. Auger reufsal.								
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

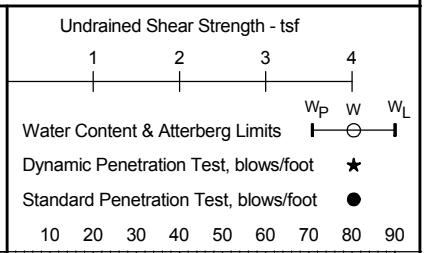
B-123

CLIENT **Maine Turnpike Authority** STATION **7471+68 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **22.8 Left** EXPLORATION No. **B-123**

EXPLORATION DATE **6/21/2018 to 6/21/2018** GROUND EL. **198.856** WATER LEVEL **11** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	198.9						in.			
0		Medium dense, brown fine SAND, trace Silt. Gravel in tip.			SS	1	1	3 7 6 8	13	13
	196.9	No recovery. Pushing cobble. -FILL-			SS	2	0	7 10 15 12	25	25
	194.9									
	194.5	Loose, brown medium to fine SAND, some Silt, trace Gravel.			SS	3	15	6 3 5 10	8	8
5	192.9	Stiff, brownish gray SILT, some Clay. PP=2.5 tsf								
		Very stiff, grayish brown SILT and CLAY. Mottled. 2 inch sand seam in sample. PP=3.5 tsf.			SS	4	24	5 7 12 16	19	19
	190.9	Very stiff, grayish brown SILT and CLAY. Mottled. PP=3.0 tsf -MARINE CLAY-			SS	5	24	6 7 10 15	17	17
10	188.9	Stiff, grayish brown SILT and CLAY. Mottled. PP=1.75 tsf		▽	SS	6	24	4 5 7 12	12	12
	187.0									
	186.9	Medium dense, brown medium to fine SAND, some Silt, little Gravel. -SAND DEPOSIT-								
15	183.9									
		Medium dense, grayish brown fine SAND and SILT, trace fine Gravel, trace Clay.			SS	7	22	6 5 7 11	12	12
	181.9									
	179.7									
20		End of boring at 19.3 feet. Auger refusal. Offset 5 feet south and confirm auger reufsal at 18.1 feet.								



Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

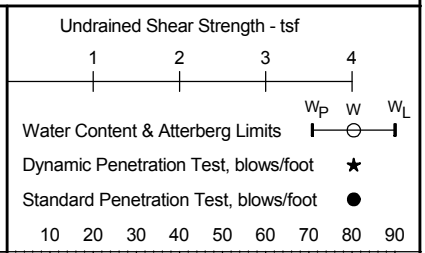
B-124

CLIENT **Maine Turnpike Authority** STATION **7477+26 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **30.3 Left** EXPLORATION No. **B-124**

EXPLORATION DATE **6/19/2018 to 6/19/2018** GROUND EL. **197.802** WATER LEVEL **5** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	197.8						in.			
0	197.6	Medium dense, dark brown medium to fine SAND, traceSilt, little Organics. -TOPSOIL-			SS	1	14	2 3 7 8	10	10
	195.8	Medium dense, brown coarse to fine SAND, little Silt, little Gravel.			SS	2	14	10 7 5 5	12	12
		Medium dense, brown coarse to fine SAND, little Silt, little Gravel. -FILL-								
	193.8	Loose, brown/gray coarse to fine SAND and SILT, trace Gravel, trace Clay.		▽	SS	3	15	2 2 4 5	6	6
5	191.8	Very stiff, grayish brown SILT, some Clay. -MARINE CLAY-			SS	4	16	3 8 18 12	18	18
	189.8	Stiff, grayish brown SILT and CLAY. Mottled. PP=3.0 tsf			SS	5	24	4 4 7 8	11	11
10	187.8	Stiff, grayish brown SILT and CLAY. Mottled. PP=2.75 tsf Reddish brown sand in tip.			SS	6	24	3 5 5 11	8	8
	185.8									
	182.8	Medium dense, tan/gray medium to fine SAND, some Silt, trace Gravel. -SAND DEPOSIT-			SS	7	18	7 14 9 9	23	23
15	180.8									
	178.2	End of boring at 19.6 feet. Auger refusal. Offset 5 feet north and confirm auger refusal at 19.7 feet.								
20										



Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-125

CLIENT **Maine Turnpike Authority** STATION **7477+25 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **42.0 Right** EXPLORATION No. **B-125**

EXPLORATION DATE **6/12/2018 to 6/12/2018** GROUND EL. **199.363** WATER LEVEL **10** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	199.4						in.			
0	199.0	Brown medium to fine SAND, trace Silt, trace coarse Sand. -TOPSOIL-			SS	1	12	4 6 10 10	16	16
	197.4	Very stiff, grayish brown SILT and CLAY. Mottled.								
		Very stiff, grayish brown SILT and CLAY. Mottled. -MARINE CLAY-			SS	2	24	4 8 11 12	17	17
	195.4									
5		Very stiff, grayish brown SILT and CLAY. Mottled. PP=2.5 tsf			SS	3	24	6 7 9 9	16	16
	193.4									
		Very stiff, grayish brown SILT and CLAY. Mottled. PP=2.25 tsf			SS	4	24	5 6 7 7	13	13
	191.4									
		Very stiff, gray SILT and CLAY. Less mottled. PP=2.25 tsf			SS	5	24	3 5 5 6	10	10
10	189.4			▽	SS	6	24	3 4 4 7	8	8
15	184.4	Medium dense, brown coarse to fine SAND, little Silt. Gravel in tip.			SS	7	24	16 16 11 30	17	17
	182.4	-SAND DEPOSIT-								
20	179.4									
		Medium dense, brown coarse to fine SAND, little Silt.								
	178.4	Hard, gray SILT and CLAY, trace fine Gravel.			SS	8	24	9 13 19 22	32	32
	177.4									

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

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STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-125

CLIENT Maine Turnpike Authority STATION PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME OFFSET EXPLORATION No. B-125

EXPLORATION DATE 6/12/2018 to 6/12/2018 GROUND EL. 199.363 WATER LEVEL 10 DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY in.	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	174.8	-TILL-								
25		End of boring at 24.58 feet. Auger refusal.								

Undrained Shear Strength - tsf
1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-126

CLIENT Maine Turnpike Authority | STATION 4491+02 SB ORT | PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME | OFFSET 16.4 Right | EXPLORATION No. B-126

EXPLORATION DATE 6/18/2018 to 6/18/2018 | GROUND EL. 211.88 | WATER LEVEL NE | DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	211.9						in.			
0	211.6	4" Asphalt								
	210.9	Medium dense, brown/black coarse to fine SAND, little Silt, little coarse to fine Gravel. -FILL-			SS	1	15	10 11 14 16	25	25
	208.9	Medium dense, brown medium to fine SAND, some Silt, trace Gravel.			SS	2	16	7 6 10 20	16	16
5	206.9				SS	3	2	50/2"	R	R
	206.7	Medium dense, brown medium to fine SAND, some Silt, trace Gravel.								
	206.4	End of boring at 5.5 feet. Auger refusal. Offset 5 feet north and confirm auger refusal at 6.0 feet.								
10										
15										
20										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-127

CLIENT **Maine Turnpike Authority** STATION **3508+74. SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **20.1 Left** EXPLORATION No. **B-127**

EXPLORATION DATE **7/9/2018 to 7/9/2018** GROUND EL. **227.89** WATER LEVEL **14** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	227.9						in.			
0	227.5	5" Asphalt								
	226.9	Medium dense, brown coarse to fine SAND, little Silt, trace Gravel.			SS	1	8	12 15 14 10	29	45
	224.9									
5	222.9	Medium dense, brown/black coarse to fine SAND, little Silt, trace Gravel.			SS	2	16	6 7 7 7	14	22
	220.9	-FILL-								
10	217.9	Medium dense, brown coarse to fine SAND, little Silt, trace fine Gravel.			SS	3	17	7 7 7 5	14	22
	215.9	Medium dense, brown medium to fine SAND, some Silt, trace Garvel, trace Clay.			SS	4	15	7 9 8 8	16	25
	213.9	Medium dense, brown/white/orange/black coarse to fine SAND, some Silt, trace Gravel.		▽	SS	5	19	3 7 7 7	14	22
15	211.9	Medium dense, brown/orange coarse to fine SAND, some Silt, trace Gravel.			SS	6	17	9 6 6 10	12	19
	209.9	Stiff, gray/brown SILT and CLAY. Organics in tip (roots).			SS	7	10	8 4 5 4	9	14
20	207.9	Stiff, grayish brown SILT, some Clay, trace Organics.			SS	8	14	4 4 4 8	8	12
	205.9	-MARINE CLAY-								

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Mike and Devin Stantec: Brian Foley

Rig Type: Mobile B-53 Truck Rig; Hammer: Auto Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

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BOREHOLE LOG

B-127

CLIENT **Maine Turnpike Authority** STATION _____ PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET _____ EXPLORATION No. **B-127**

EXPLORATION DATE **7/9/2018 to 7/9/2018** GROUND EL. **227.89** WATER LEVEL **14** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY in.	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	204.7	-MARINE CLAY-								
25		Boring terminated at 23.2 feet. Auger refusal. Offset boring 6 feet south and confirm auger refusal at 22.1 feet.								
30										
35										
40										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Mike and Devin Stantec: Brian Foley
Rig Type: Mobile B-53 Truck Rig; Hammer: Auto Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-128

CLIENT **Maine Turnpike Authority** STATION **4508+80 SB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **0.2 Left** EXPLORATION No. **B-128**

EXPLORATION DATE **6/18/2018 to 6/18/2018** GROUND EL. **228.13** WATER LEVEL **NE** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	228.1						in.			
0	227.6	6" Asphalt								
		Auger to 5 feet. Brown medium to fine sand trace silt in spoils.								
5	223.1	Medium dense, brown medium to fine SAND, little Silt, little coarse Sand, trace Gravel.			SS	1	20	6 8 9 10	17	17
	221.1	Gravel in spoils -FILL-								
10	218.1	Medium dense, brown/black coarse to fine SAND, little fSilt, trace fine Gravel.			SS	2	19	10 9 7 10	16	16
	217.1	Medium dense, brown fine SAND, some Silt, little fine Gravel.								
	216.1	Medium dense, brown fine SAND, some Silt, trace Clay.			SS	3	12	5 7 8 13	15	15
	214.1	Medium dense, brown SILT, some medium to fine Sand, trace Clay.			SS	4	0	8 9 8 7	17	17
15	212.1	Dense, brown medium to fine SAND, some Silt, trace coarse Sand. Gravel in tip.			SS	1.53	5	12 23 19 50/1"	42	42
	211.6	Auger refusal at 17.7 feet. Offset 5 feet north.								
	210.4									
	210.1	Gray SILT, some Clay, little medium to fine Sand. 1 inch layer of burried topsoil. -MARINE CLAY-			SS	6	0	3 6 50/6"	R	R
	208.6									
20	208.3	End of boring at 19.8 feet. Auger refusal. First auger refusal at 17.7 feet.								

Undrained Shear Strength - tsf: 1 2 3 4

Water Content & Atterberg Limits: W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-129

CLIENT **Maine Turnpike Authority** STATION **27+00 Exit 103 SB Ramp** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **30.5 Left** EXPLORATION No. **B-129**

EXPLORATION DATE **7/9/2018 to 7/9/2018** GROUND EL. **226.17** WATER LEVEL **14.5** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	226.2						in.			
0	225.8	5" Asphalt								
	225.2	Medium dense, brown medium to fine SAND, little Silt, little Gravel, white Gravel in bottom 2".			SS	1	8	4 9 18 14	27	42
	223.2									
	221.2									
5	220.3	Medium dense, brown medium to fine SAND, little Silt.			SS	2	17	7 9 4 5	13	20
	219.2	Medium dense, gray SILT, some Clay. -FILL-								
	216.2									
10	215.8	Medium dense, grayish brown medium to fine SAND, little Silt.			SS	3	12	3 2 12 13	14	22
	214.2	Stiff, grayish brown CLAYEY SILT, trace medium to fine Sand.			SS	4	14	38 6 3 5	9	14
	212.2	Stiff, grayish brown SILT, some Clay, trace coarse Sand, trace Gravel. Pushing cobble 12-12.5 feet.		▽						
	211.2				SS	5	24	7 11 14 15	25	39
15	210.2	Medium dense, gray/brown medium to fine SAND, some Silt, trace fine Gravel, trace Clay.								
	208.2	Medium dense, brown medium to fine SAND and SILT, little Gravel. -SAND DEPOSIT-			SS	6	20	5 12 13 33	25	39
	206.2	Very dense, brown/gray coarse to fine SAND, some Silt, some Gravel. Pushing cobbles.			SS	7	11	14 23 52 30	55	86
20	204.2	Dense, brown/gray coarse to fine SAND, some Silt, some Gravel.			SS	8	16	12 18 28 28	46	72

Undrained Shear Strength - tsf: 1 2 3 4

Water Content & Atterberg Limits: W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Mike and Devin Stantec: Brian Foley
Rig Type: Mobile B-53 Truck Rig; Hammer: Auto Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

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BOREHOLE LOG

B-129

CLIENT **Maine Turnpike Authority** STATION _____ PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET _____ EXPLORATION No. **B-129**

EXPLORATION DATE **7/9/2018 to 7/9/2018** GROUND EL. **226.17** WATER LEVEL **14.5** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY in.	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
25	201.2	Very dense, brown medium to fine SAND, some Silt, trace Gravel.			SS	9	12	12 25 28 50/1"	53	83
	199.6	-SAND DEPOSIT- Auger grinding at 26'-8"								
30	196.2	Very dense, brown medium to fine SAND, little Silt, little fine Gravel, trace black weathered rock.			SS	10	16	12 31 26 23	57	89
	194.2									
35	191.2	Brown SILT and FINE SAND, little coarse Sand.			SS	11	14	25 57 50/2"	R	R
	190.0	Boring terminated at 36.17 feet. Sampler refusal.								
40										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Mike and Devin Stantec: Brian Foley
Rig Type: Mobile B-53 Truck Rig; Hammer: Auto Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-130

CLIENT **Maine Turnpike Authority** STATION **27+05 Exit 103 SB Ramp** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **30.4 Right** EXPLORATION No. **B-130**

EXPLORATION DATE **6/14/2018 to 6/14/2018** GROUND EL. **221.53** WATER LEVEL **20** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	221.5						in.			
0		Loose, brown medium to fine SAND, trace Silt, trace Gravel			SS	1	14	1 1 2 4	3	3
	219.5	Loose, brown medium to fine SAND, trace Silt, trace Gravel			SS	2	17	2 6 7 5	13	13
	217.5	Stiff, gray/brown SILT and CLAY. PP=2.25 tsf			SS	3	22	3 3 7 7	10	10
5	216.5	Medium dense, gray SILT and medium to fine SAND.								
	215.5	-FILL- Loose, brown/gray medium to fine SAND, some Silt.			SS	4	7	3 2 3 4	5	5
	213.5	Medium stiff, brown/gray SILT, some Clay, trace medium Sand. PP=0 tsf			SS	5	12	2 2 3 3	5	5
10	211.5	Medium stiff, brown/gray SILT, some Clay, trace medium Sand. Pushed through cobble at 10.5 feet.			SS	6	12	7 24 6 5	30	30
	209.5	Stiff, gray SILT and CLAY, trace Organics. Iron stains. PP=3.25 tsf			SS	7	17	4 6 7 10	13	13
	207.5									
15	206.5	Medium dense, gray SILT and fine SAND, trace fine Gravel.			SS	8	17	6 11 13 20	24	24
	204.5	-SAND DEPOSIT-		▽						
20	201.5	Medium dense, brown medium to fine SAND, little Silt, trace Gravel.			SS	9	22	8 9 8 6	17	17
	199.5									

Undrained Shear Strength - tsf: 1 2 3 4

Water Content & Atterberg Limits: W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

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Stantec

BOREHOLE LOG

B-130

CLIENT Maine Turnpike Authority STATION PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME OFFSET EXPLORATION No. B-130

EXPLORATION DATE 6/14/2018 to 6/14/2018 GROUND EL. 221.53 WATER LEVEL 20 DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
25	196.5	Brown medium to fine SAND, some Silt, trace Gravel, some weathered Rock.			SS	10	17	9 16 50/5"	R	R
	195.1	-SAND DEPOSIT-								
	192.9	End of boring at 28.6 feet. Auger refusal.								
30										
35										
40										

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-131

CLIENT **Maine Turnpike Authority** STATION **43+00 Exit 103 SB Ramp** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **42.5 Left** EXPLORATION No. **B-131**

EXPLORATION DATE **6/13/2018 to 6/13/2018** GROUND EL. **215.71** WATER LEVEL **2** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	215.7						in.			
0		Medium stiff, grayish brown SILT and CLAY, trace coarse Sand, trace Organics.			SS	1	8	2 2 4 5	6	6
	213.7	-TOPSOIL-		▽						
	213.2	Loose, brown/tan medium to fine SAND, little Silt.								
		Soft, black organic SILT, trace wood. 1 inch layer of peat.			SS	2	11	1 1 1/12"	2	2
	211.7	-ORGANICS-								
	211.4	Soft black organic SILT, trace wood.								
5		Medium stiff, grayish brown SILT and CLAY, trace orgaincs.			SS	3	19	1 2 3 4	5	5
	209.7	PP=1.0 tsf								
		Stiff, grayish brown SILT and CLAY. Mottled. PP=2.75 tsf			SS	4	20	1 3 5 6	8	8
	207.7									
		Stiff, gray SILT and CLAY. Mottled. PP=2.5 tsf			SS	5	19	4 5 8 11	13	13
10	205.7									
		Stiff, gray SILT and CLAY. Less mottled. PP=2.5 tsf			SS	6	17	2 3 8 8	13	13
	203.7									
		-MARINE CLAY-								
15	200.7									
		Soft, gray CLAY, some Silt, trace fine Gravel. Very plastic. PP=0-0.25 tsf			SS	7	24	1 1 2 1	3	3
	198.7									
	198.2									
		Layer change at 17.5 feet.								
	195.7									
20		Medium dense, gray SILT and medium to fine Sand, trace Gravel. Black weathered rock in tip.			SS	8	8	5 8 17 50	25	25
	193.7									

Undrained Shear Strength - tsf

1 2 3 4

Water Content & Atterberg Limits W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

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Stantec

BOREHOLE LOG

B-131

CLIENT **Maine Turnpike Authority** STATION _____ PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET _____ EXPLORATION No. **B-131**

EXPLORATION DATE **6/13/2018 to 6/13/2018** GROUND EL. **215.71** WATER LEVEL **2** DATUM **NAVD 88**

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY in.	SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
		-MARINE CLAY-								
	191.0									
25		End of boring at 24.75 feet. Auger refusal.								
30										
35										
40										

Undrained Shear Strength - tsf
1 2 3 4
Water Content & Atterberg Limits W_P W W_L
Dynamic Penetration Test, blows/foot ★
Standard Penetration Test, blows/foot ●
10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Stantec

BOREHOLE LOG

B-132

CLIENT Maine Turnpike Authority STATION 42+96 Exit 103 SB Ramp PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME OFFSET 34.6 Right EXPLORATION No. B-132

EXPLORATION DATE 6/14/2018 to 6/14/2018 GROUND EL. 216.91 WATER LEVEL 8 DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES SPT blows / 6"	SPT N-Value	SPT N(60) VALUE
	216.9						in.			
0		Loose, brown medium to fine SAND, little Silt, trace organics.			SS	1	14	3 5 4 6	9	9
	214.9	-TOPSOIL-								
		Very soft. brown/gray SILT, some Clay, some black organics. Black organics in tip.			SS	2	15	1 1 1 6	2	2
	212.9									
		Soft, black organic SILT.			SS	3	20	1 1 2 6	3	3
5	211.9	-ORGANICS-								
		Soft, gray/brown SILT and CLAY. PP=2.5 tsf								
	210.9									
		Stiff, grayish brown SILT and CLAY. Mottled. PP=2.5 tsf 3" layer of black organic silt in sample.		▽	SS	4	16	2 6 8 10	14	14
	208.9									
		Very stiff, gray SILT and CLAY. Mottled. PP=3.0 tsf -MARINE CLAY-			SS	5	24	3 6 9 10	15	15
10	206.9									
		Very stiff, gray SILT and CLAY. PP=3.5 tsf			SS	6	24	6 7 10 10	17	17
	204.9									
15	201.9	Soft, gray SILT and CLAY. Varies in stiffness throughout spoon. PP=0.25 tsf			SS	7	24	1 1 3 3	4	4
	199.9									
	199.4	Layer change at 17.5 feet -SAND DEPOSIT-								
	196.9									
20		Medium dense, gray medium to fine SAND and SILT, trace Clay, trace Gravel.			SS	8	16	10 5 5 50/2"	10	10
	194.9									

Undrained Shear Strength - tsf: 1 2 3 4

Water Content & Atterberg Limits: W_P W W_L

Dynamic Penetration Test, blows/foot ★

Standard Penetration Test, blows/foot ●

10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley

Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test

□ Field Vane Test ■ Remolded

✖ Pocket Penetrometer / Torvane

Continued Next Page

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

BOREHOLE LOG

B-132

CLIENT Maine Turnpike Authority STATION PROJECT No. 195311383

LOCATION Exit 103 ORT, West Gardiner, ME OFFSET EXPLORATION No. B-132

EXPLORATION DATE 6/14/2018 to 6/14/2018 GROUND EL. 216.91 WATER LEVEL 8 DATUM NAVD 88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY in.	SAMPLES SPT blows / 6"	SAMPLES SPT N-Value	SPT N(60) VALUE
	194.6	End of boring at 22.3 feet. Auger refusal.								

Undrained Shear Strength - tsf
1 2 3 4
Water Content & Atterberg Limits W_P W W_L
Dynamic Penetration Test, blows/foot ★
Standard Penetration Test, blows/foot ●
10 20 30 40 50 60 70 80 90

Driller: New England Boring- Heron, ME; Supervisor: NE Boring: Tom and Mark Stantec: Brian Foley
Rig Type: Mobile B-53 ATV Rig; Hammer: Safety Hammer; 4.25" HSA, 2" Split Spoon Sampler

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

STN13-GEO-I-VOC EXIT103 ORT BORING 108 TO 132.GPJ JW NHP.GDT 8/13/18

Appendix B

Monitoring Well Logs

MONITORING WELL LOG

B-102(OW)

CLIENT **Maine Turnpike Authority** STATION **3500+00 SB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **50 Left** BOREHOLE No. **B-102(OW)**

DATES: BORING **1/16/2018 to 1/18/2018** WATER LEVEL **2.4 feet** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
	208.50							in.		
0		Medium stiff, brown CLAY, and Silt, trace Organics, trace fine Gravel			Flush-mounted Roadbox	SS	1	20	5	6
	206.5	Stiff, brown CLAY, and Silt, trace black Organics. Iron stains				SS	2	20	8	9
	204.5	-MARINE CLAY-								
	203.8	Hard, gray CLAY, some Silt. Iron stains								
5		Hard, brown/gray medium to fine SAND, little Silt, trace fractured rock. Wet at tip.			2-inch PVC screen packed in sand (0.5'-10.5')	SS	3	15	55	62
	202.5	-GLACIAL TILL-				SS	4	0	R	R
	202.3	Auger to 10.5' through bedrock No change in drilling resistance								
		-BEDROCK-								
10	198.0									
		End of boring at 10.5' Sampler refusal at 6' Well installed, see well log.			Bottom of well					
		Offset 5' Northwest: Refusal at 5' with SSA -ground surface of offset is ~1' lower than original location								
15										
20										

Driller: New England Boring- Hermon, ME; Stantec Field Representative: NE Boring: Brad and Chris Stantec: Brian Foley

Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

STN13-MON-I EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

MONITORING WELL LOG

B-104(OW)

CLIENT **Maine Turnpike Authority** STATION **7499+39 NB ORT** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **22 Left** BOREHOLE No. **B-104(OW)**

DATES: BORING **1/19/2018 to 1/19/2018** WATER LEVEL **5.7 feet** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
	214.75							in.		
0		Loose, brown coarse to fine SAND, little Silt, trace fine Gravel, trace gravel. Trace organics in top 6"			Flush-mounted Roadbox	SS	1	18	7	8
	212.8	Medium dense, brown coarse to fine SAND, little Silt, trace fine Gravel. Little clay in bottom 2"			2-inch PVC riser packed in sand (0.5'-4')	SS	2	20	23	26
	210.8	Loose, gray/brown coarse to fine SAND, little Silt, little Clay, little fine Gravel			2-inch PVC riser in bentonite (4'-5.5')	SS	3	17	8	9
5	208.8									
	208.2	-FILL-								
		Stiff, gray CLAY, and Silt, trace Sand. Irons stains				SS	4	24	14	16
	207.0									
	206.8	Medium dense, brown medium to fine SAND, little Silt			2-inch slotted PVC packed in sand (5.5'-10.5')					
	206.0	Brown coarse to fine SAND, little Clay, little Silt. Iron stains				SS	5	4	R	R
		Auger to 10.5' through bedrock								
10		-BEDROCK-								
	204.3									
		End of boring at 10.5'			Bottom of well					
		Sampler refusal at 8.8'								
15										
20										

Driller: New England Boring- Hermon, ME; Stantec Field Representative: NE Boring: Brad and Chris Stantec: Brian Foley

Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

STN13-MON-I EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

MONITORING WELL LOG

B-107(OW)

CLIENT **Maine Turnpike Authority** STATION **8499+95 NB Cash** PROJECT No. **195311383**

LOCATION **Exit 103 ORT, West Gardiner, ME** OFFSET **60.1 Right** BOREHOLE No. **B-107(OW)**

DATES: BORING **1/16/2017 to 1/16/2017** WATER LEVEL **0 feet** DATUM **NAVD88**

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
	208.00							in.		
0		Medium Stiff, brown/gray CLAY and Silt			Flush-mounted Roadbox	SS	1	12	6	7
		-MARINE CLAY DEPOSIT-								
	206.0	Very stiff, brown/gray CLAY, little Silt, some coarse to fine Sand, little fine Gravel. Fractured gravel throughout sample.				SS	2	19	24	27
	204.0	Hard, brown CLAY, trace weathered rock, some Silt								
	203.2									
5		Gray weathered rock			2-inch PVC screen packed in sand (0.5'-10.5')	SS	3	18	31	35
	202.0	-WEATHERED/FRACTURED ROCK-								
	201.3					SS	4	5	R	R
		Auger to 10.1' through bedrock. No change in drilling resistance.								
		-BEDROCK-								
10	197.9									
		End of boring at 10.1' Sampler refusal at 6.67' Well installed, see well log			Bottom of well					
		Offset 6' North: Refusal at 7.5' with SSA -ground surface of offset is ~1' lower than original location								
15										
20										

Driller: New England Boring- Hermon, ME; Stantec Field Representative: NE Boring: Brad and Chris Stantec: Brian Foley

Rig Type: Mobile B-53 Modified ATV Rig; Hammer: Auto Hammer; SSA and 3" diam. Drive and Wash, 2" Split Spoon Sampler

STN13-MON-I EXIT ORT BORING 101 TO 107.GPJ JW NHP.GDT 8/13/18

Appendix C

Rock Core Photos

APPENDIX C
Maine Turnpike Exit 103 ORT
West Gardiner, ME

B-106, C-1

B-106, C-2

B-101, C-1

B-101, C-2

APPENDIX C
Maine Turnpike Exit 103 ORT
West Gardiner, ME

Boring ID	~~Box~~ Core run	depth (ft)	Recovery		RQD		Drill time (min/ft)	Comments
			in	%	in	%		
B-105	1	9-11.5	30	100	9	30	2, 2, $\frac{1}{6}$	- barrel jam at 2.5' (start new run)
B-105	2	11.5-16.5	60	100	43	72	2, 2, 1.25, 1.25, 1.25	
B-105	3	16.5-21.5	60	100	54	90	1.25, 1.25, 1.25, 1.25, 1.25	

B-105, C-1

B-105, C-2

B-105, C-3

APPENDIX C
Maine Turnpike Exit 103 ORT
West Gardiner, ME

B-119, C-1

B-119, C-2

Appendix D

Laboratory Soil Test Results

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	07/23/18	Checked By:	emm
Depth :	---	Test Id:	462544		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
B-108	SS- 5	8-10	Moist, olive gray clay	30.6
B-109	SS- 2	2-4	Moist, olive gray clay	26.8
B-109	SS- 4	6-8	Moist, light grayish green sand	18.9
B-110	SS- 2	2-4	Moist, grayish green sandy clay	12.7
B-110	SS- 4	6-8	Moist, dark olive gray clay	25.6
B-114	SS- 2	7-9	Moist, olive brown silty sand	15.2
B-115	SS- 4	6-8	Wet, olive gray sandy silty clay	22.4
B-115	SS- 6	10-12	Moist, olive brown clay	23.8
B-116	SS- 4	6-8	Moist, light yellowish brown silty sand with gravel	6.1
B-116	SS- 6	10-12	Moist, light yellowish brown silty sand	10.0

Notes: Temperature of Drying : 110° Celsius

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	07/23/18	Checked By:	emm
Depth :	---	Test Id:	462536		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
B-118	SS- 2	5-7	Moist, grayish brown clay with gravel	15.3
B-118	SS- 5	14-16	Moist, dark olive gray clay	22.6
B-119	SS- 3	6-8	Moist, grayish green sandy clay	10.3
B-120	SS- 3	4-6	Moist, dark gray clay	32.3
B-122	SS- 3	4-6	Moist, olive gray clay	22.2
B-123	SS- 5	8-10	Moist, dark olive gray clay	26.3
B-124	SS- 5	8-10	Moist, olive gray clay	27.6
B-127	SS- 5	14-16	Moist, grayish brown silty sand with gravel	13.4
B-127	SS- 7	18-20	Moist, grayish green clayey sand with gravel	17.3
B-128	SS- 3	12-14	Moist, grayish green sandy clay	18.3

Notes: Temperature of Drying : 110° Celsius

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	07/24/18	Checked By:	emm
Depth :	---	Test Id:	462543		

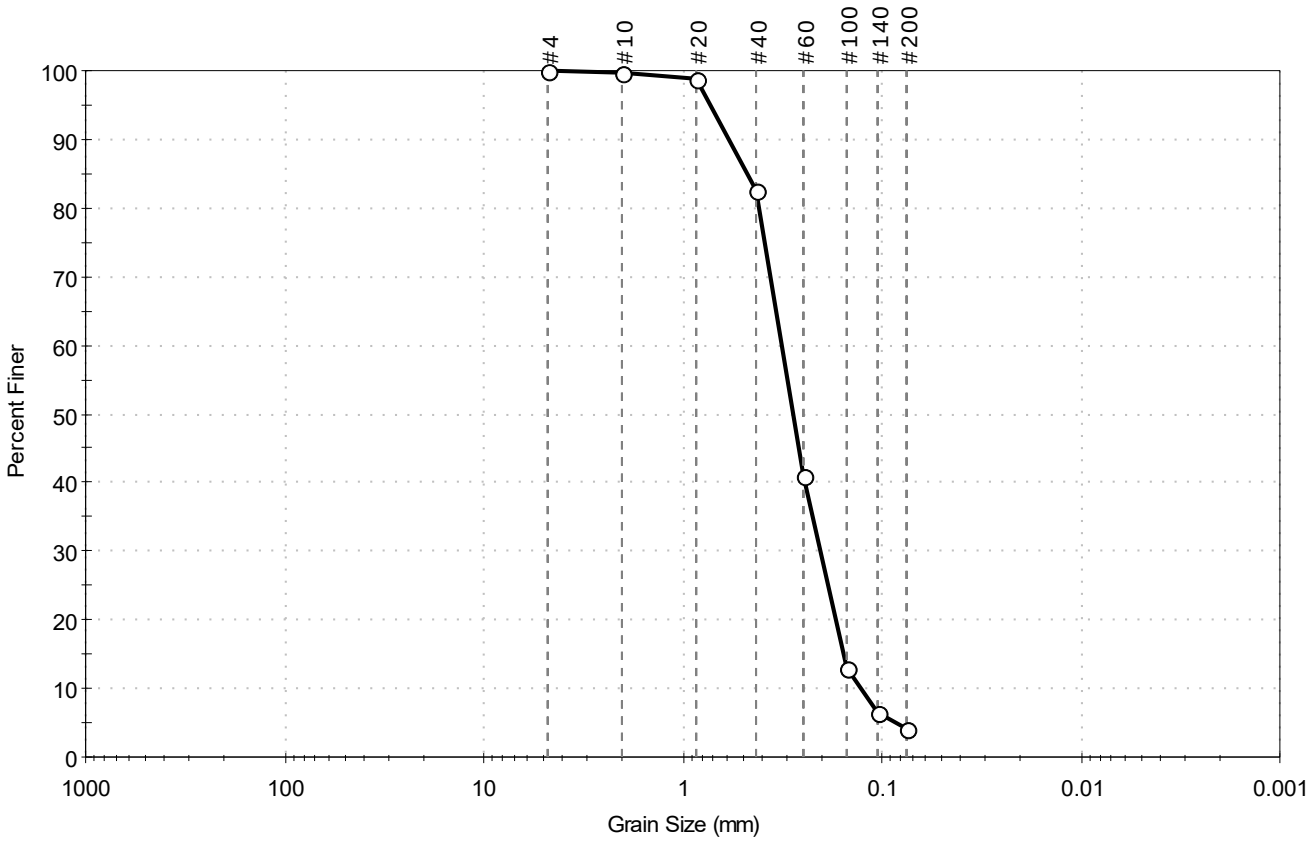
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
B-128	SS- 2	10-12	Moist, grayish green silty sand with gravel	11.8
B-129	SS- 4	12-14	Moist, grayish green clay	25.3
B-129	SS- 6	16-18	Moist, grayish green silty sand	11.7
B-130	SS- 4	6-8	Moist, grayish green clayey sand	15.9
B-130	SS- 7	12-14	Moist, olive gray clay	21.4
B-130	SS- 9	20-22	Moist, light yellowish brown silty sand	18.4
B-131	SS- 4	6-8	Moist, dark olive gray clay	29.8
B-132	SS- 7	15-17	Moist, dark gray clay	28.0

Notes: Temperature of Drying : 110° Celsius

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-109	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-4	Test Date:	07/24/18	Checked By:	emm
Depth :	6-8	Test Id:	462512		
Test Comment:	---				
Visual Description:	Moist, light grayish green sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	95.9	4.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	82		
#60	0.25	41		
#100	0.15	13		
#140	0.11	6		
#200	0.075	4.1		

Coefficients

D_{85} = 0.4724 mm	D_{30} = 0.2048 mm
D_{60} = 0.3189 mm	D_{15} = 0.1558 mm
D_{50} = 0.2806 mm	D_{10} = 0.1285 mm
C_u = 2.482	C_c = 1.024

Classification

ASTM Poorly graded SAND (SP)

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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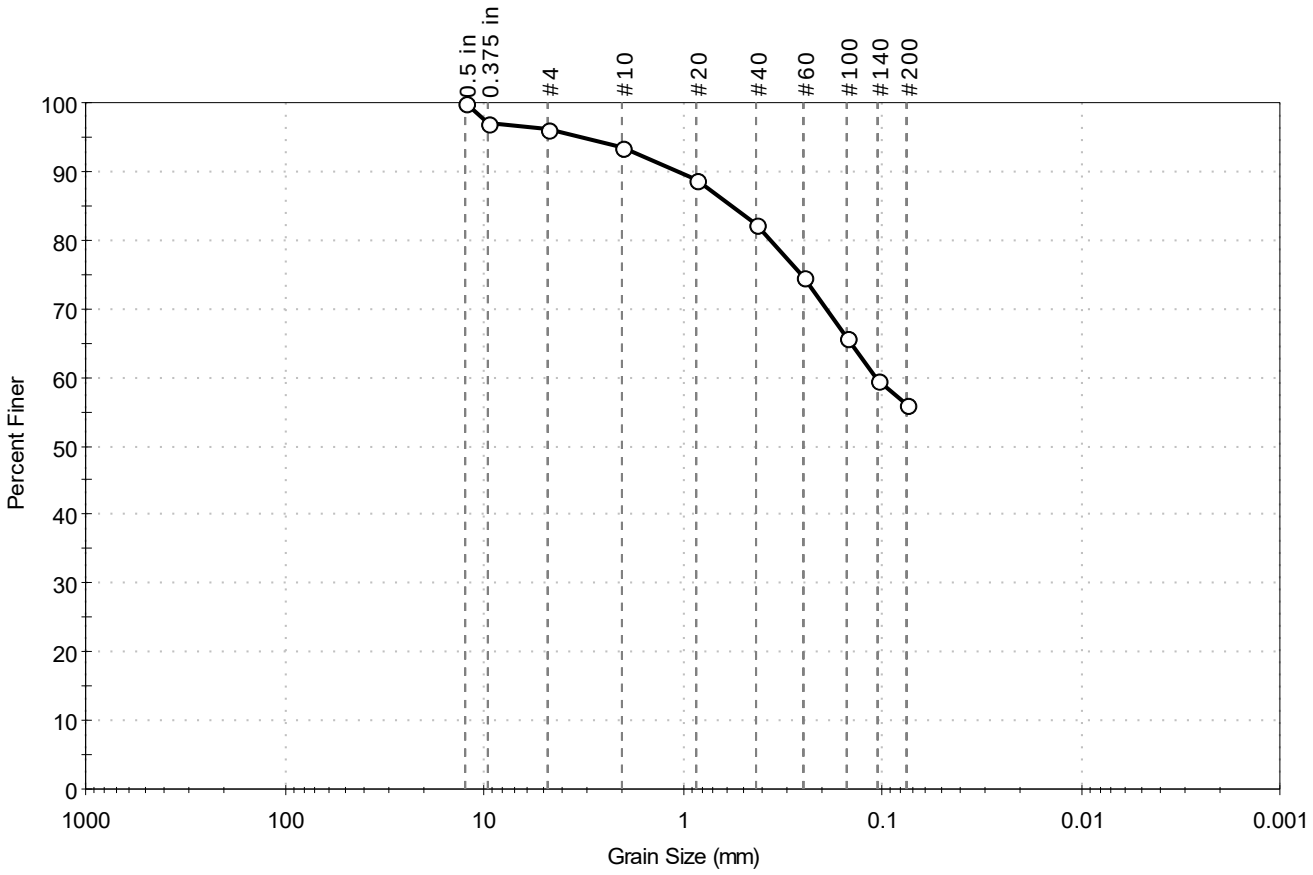
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-110	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-2	Test Date:	07/24/18	Checked By:	emm
Depth :	2-4	Test Id:	462513		
Test Comment:	---				
Visual Description:	Moist, grayish green sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.8	40.2	56.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	97		
#4	4.75	96		
#10	2.00	94		
#20	0.85	89		
#40	0.42	82		
#60	0.25	75		
#100	0.15	66		
#140	0.11	59		
#200	0.075	56		

Coefficients

D_{85} = 0.5608 mm D_{30} = N/A

D_{60} = 0.1091 mm D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

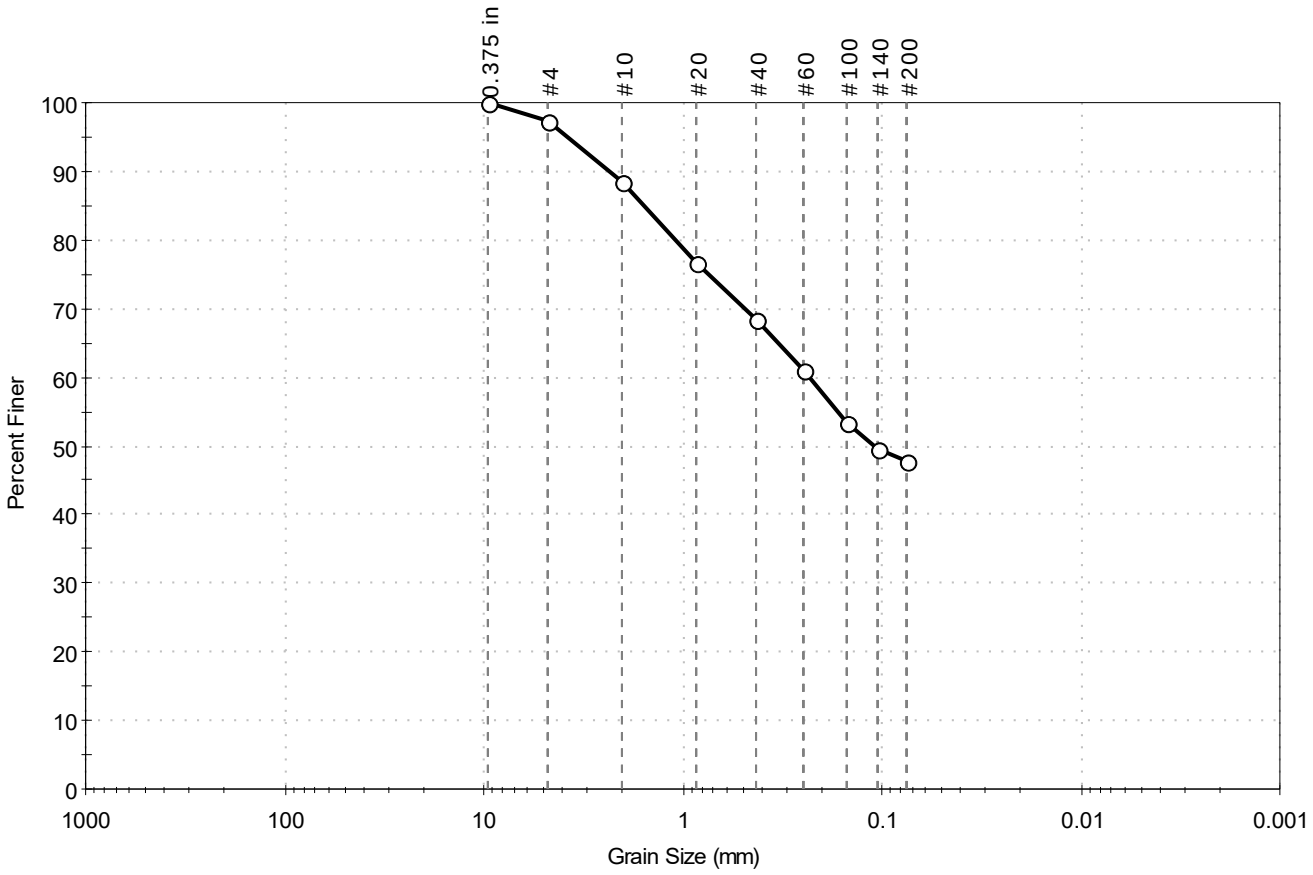
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-114	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-2	Test Date:	07/24/18	Checked By:	emm
Depth :	7-9	Test Id:	462514		
Test Comment:	---				
Visual Description:	Moist, olive brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	2.5	49.8	47.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	97		
#10	2.00	88		
#20	0.85	77		
#40	0.42	68		
#60	0.25	61		
#100	0.15	53		
#140	0.11	50		
#200	0.075	48		

Coefficients

D_{85} = 1.5617 mm D_{30} = N/A

D_{60} = 0.2343 mm D_{15} = N/A

D_{50} = 0.1095 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

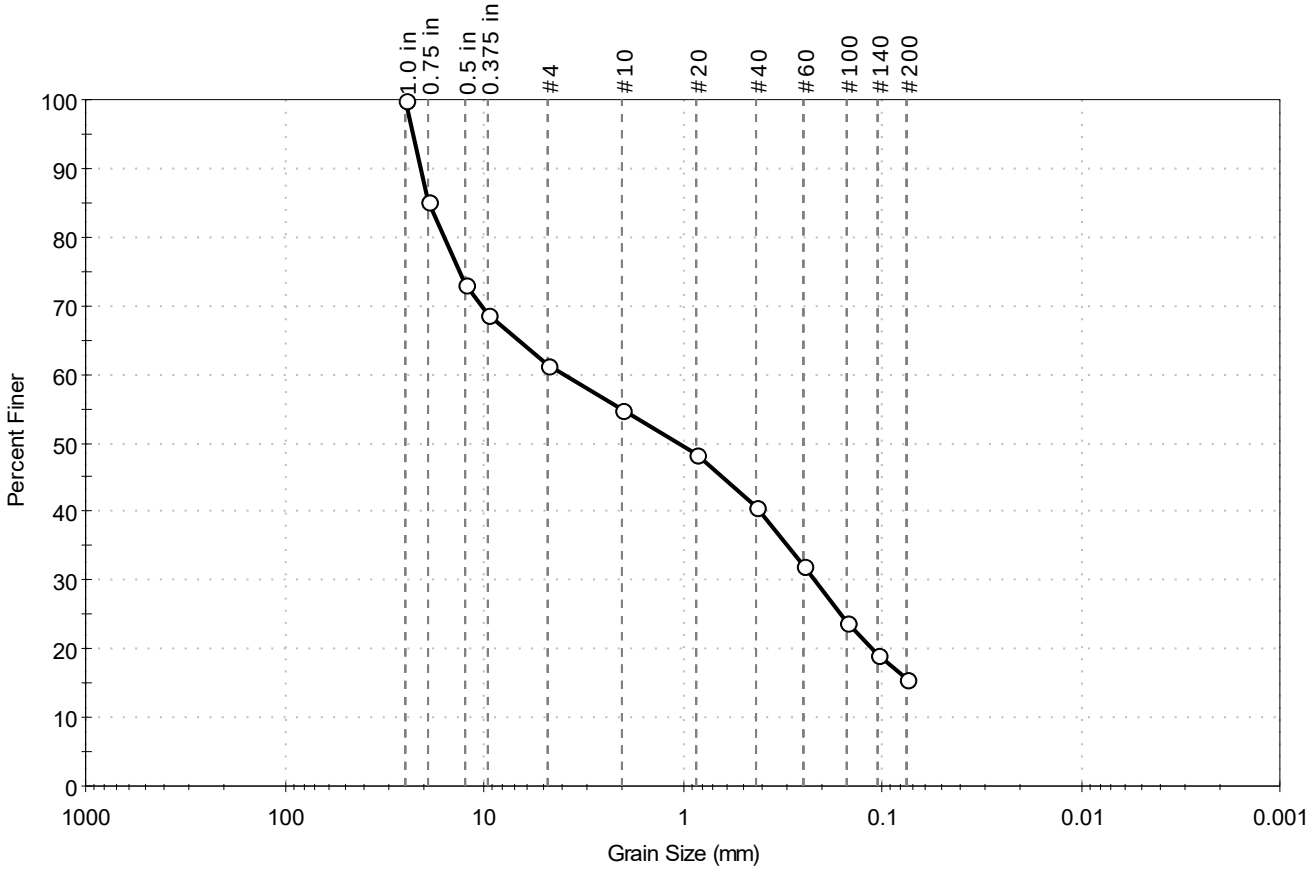
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-116	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-4	Test Date:	07/24/18	Checked By:	emm
Depth :	6-8	Test Id:	462515		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	38.6	45.9	15.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.0 in	25.00	100		
0.75 in	19.00	85		
0.5 in	12.50	73		
0.375 in	9.50	69		
#4	4.75	61		
#10	2.00	55		
#20	0.85	48		
#40	0.42	41		
#60	0.25	32		
#100	0.15	24		
#140	0.11	19		
#200	0.075	16		

Coefficients

D_{85} = 18.9000 mm	D_{30} = 0.2179 mm
D_{60} = 3.9585 mm	D_{15} = N/A
D_{50} = 1.0635 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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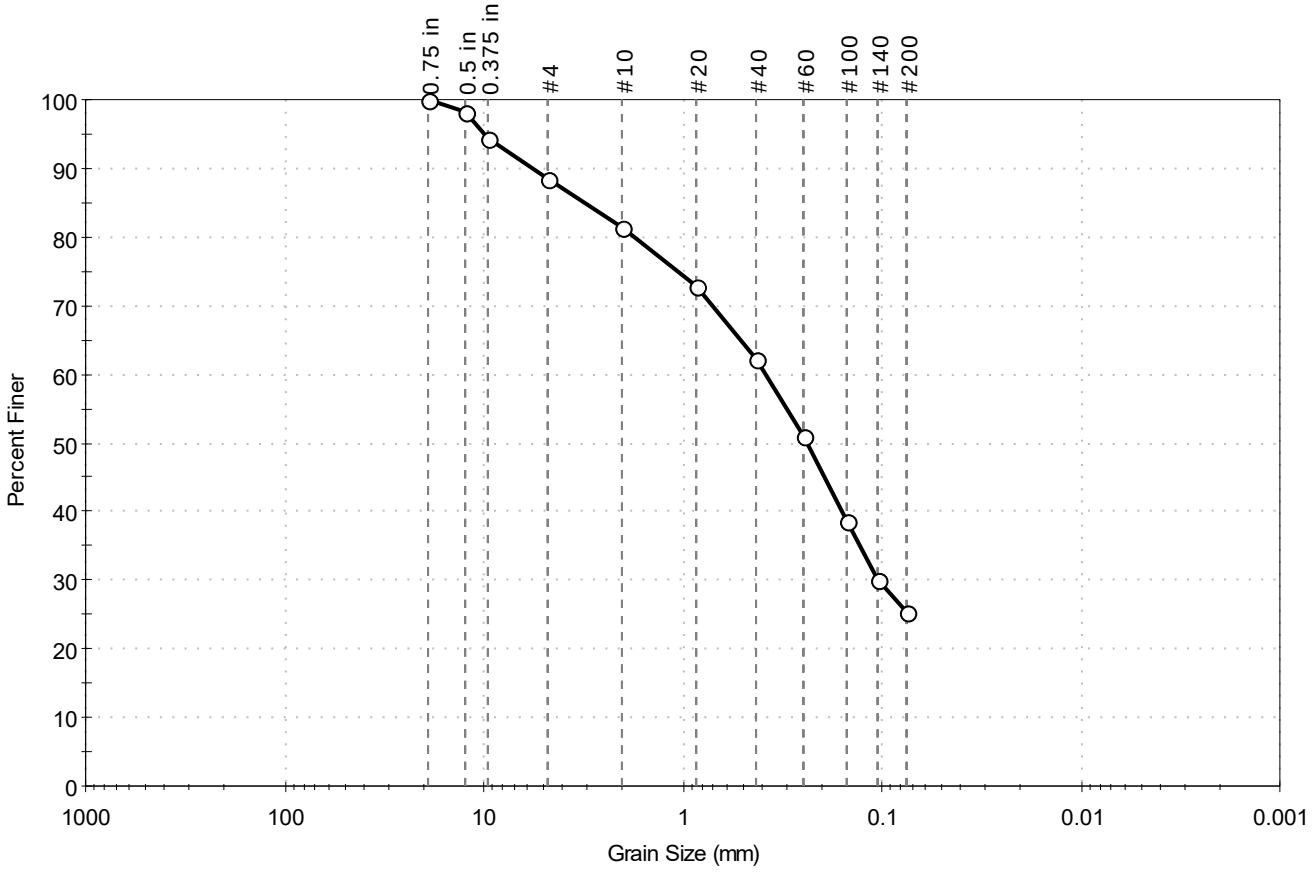
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-116	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-6	Test Date:	07/24/18	Checked By:	emm
Depth :	10-12	Test Id:	462521		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	11.4	63.3	25.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	98		
0.375 in	9.50	95		
#4	4.75	89		
#10	2.00	81		
#20	0.85	73		
#40	0.42	62		
#60	0.25	51		
#100	0.15	39		
#140	0.11	30		
#200	0.075	25		

Coefficients

D_{85} = 3.0820 mm D_{30} = 0.1055 mm

D_{60} = 0.3836 mm D_{15} = N/A

D_{50} = 0.2408 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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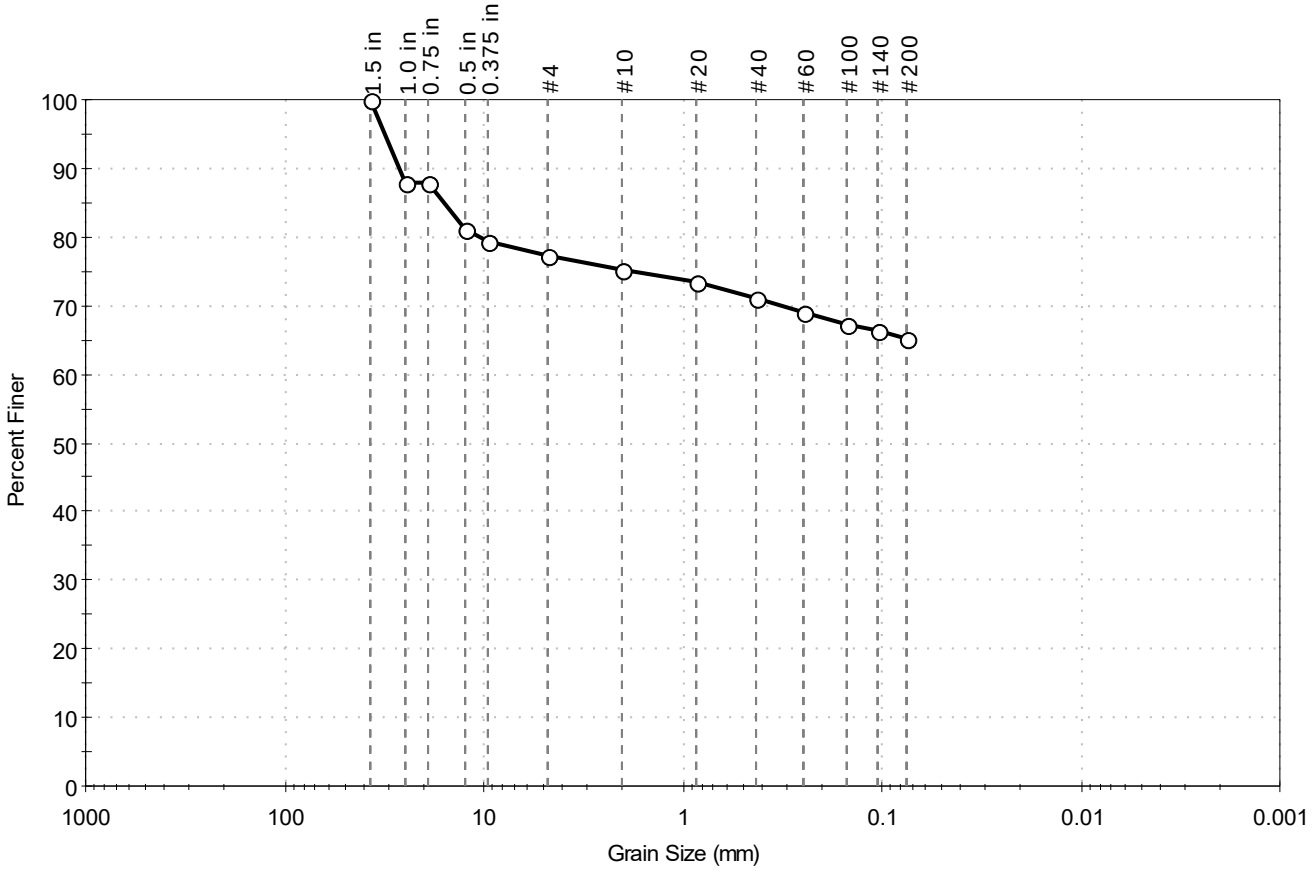
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-118	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-2	Test Date:	07/24/18	Checked By:	emm
Depth :	5-7	Test Id:	462522		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	22.7	12.0	65.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1.0 in	25.00	88		
0.75 in	19.00	88		
0.5 in	12.50	81		
0.375 in	9.50	79		
#4	4.75	77		
#10	2.00	75		
#20	0.85	73		
#40	0.42	71		
#60	0.25	69		
#100	0.15	67		
#140	0.11	66		
#200	0.075	65		

Coefficients

D_{85} = 15.8674 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

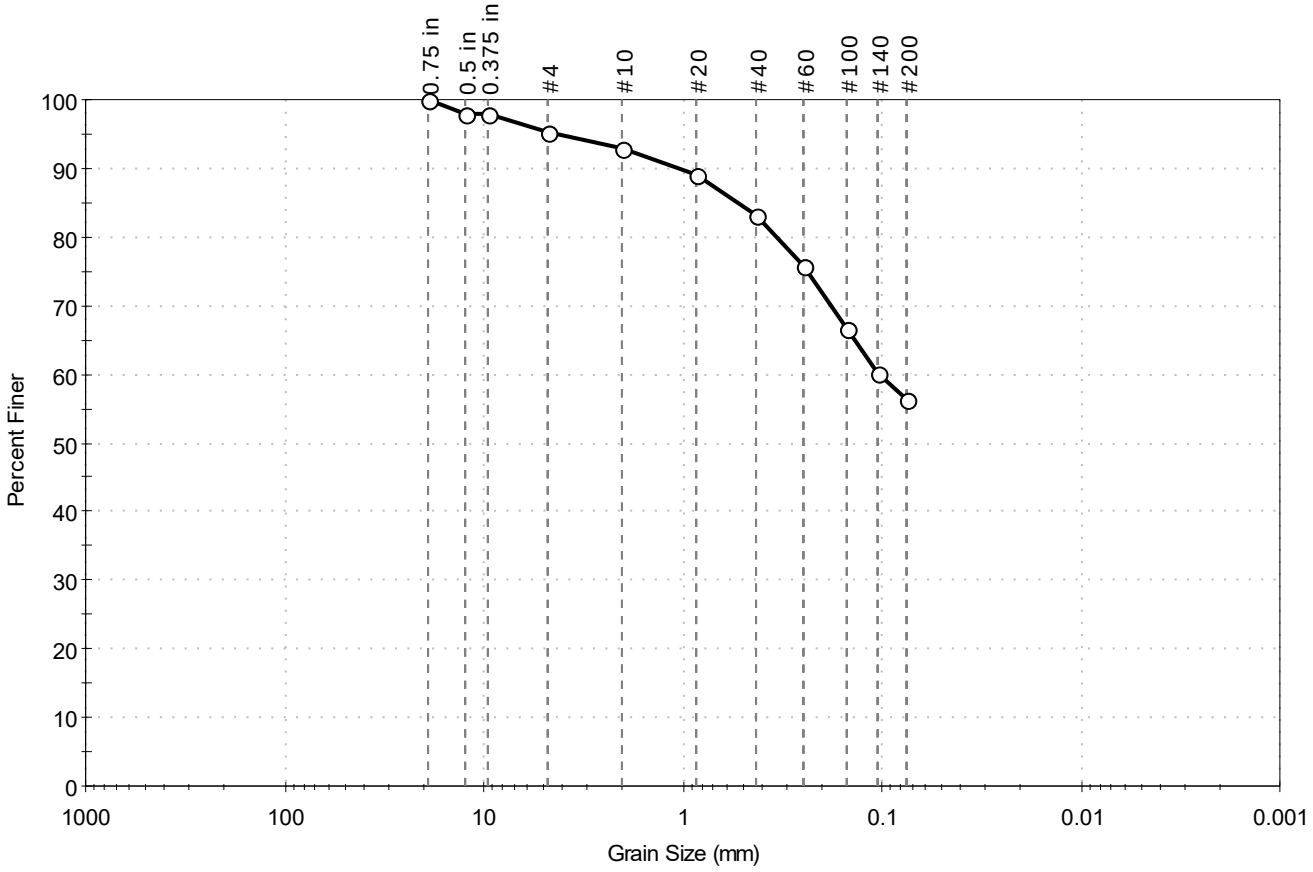
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-119	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-3	Test Date:	07/24/18	Checked By:	emm
Depth :	6-8	Test Id:	462523		
Test Comment:	---				
Visual Description:	Moist, grayish green sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	4.7	38.9	56.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	98		
0.375 in	9.50	98		
#4	4.75	95		
#10	2.00	93		
#20	0.85	89		
#40	0.42	83		
#60	0.25	76		
#100	0.15	67		
#140	0.11	60		
#200	0.075	56		

Coefficients

D_{85} = 0.5307 mm D_{30} = N/A

D_{60} = 0.1047 mm D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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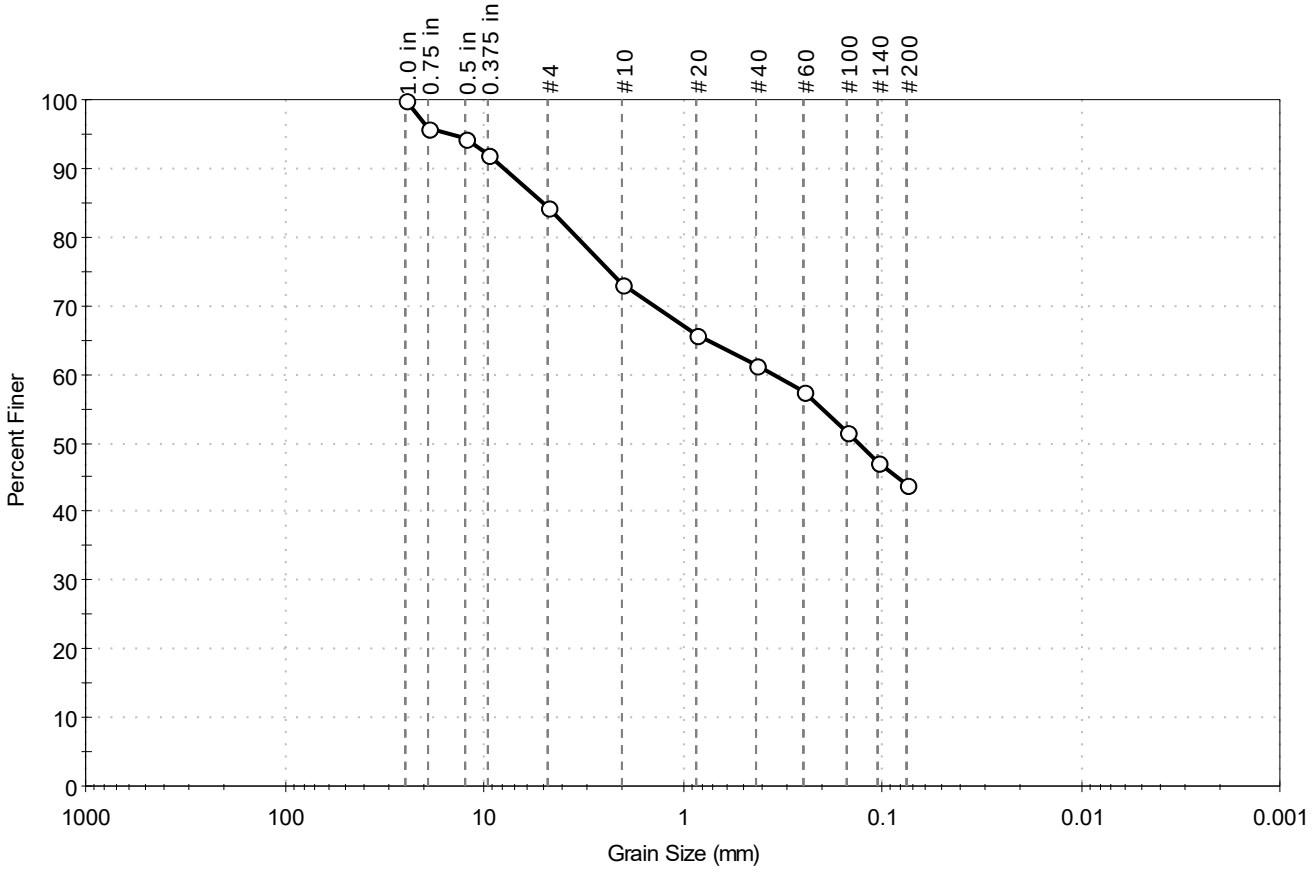
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-127	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-5	Test Date:	07/24/18	Checked By:	emm
Depth :	14-16	Test Id:	462524		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	15.8	40.4	43.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.0 in	25.00	100		
0.75 in	19.00	96		
0.5 in	12.50	94		
0.375 in	9.50	92		
#4	4.75	84		
#10	2.00	73		
#20	0.85	66		
#40	0.42	62		
#60	0.25	57		
#100	0.15	52		
#140	0.11	47		
#200	0.075	44		

Coefficients

D_{85} = 5.0757 mm	D_{30} = N/A
D_{60} = 0.3497 mm	D_{15} = N/A
D_{50} = 0.1311 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

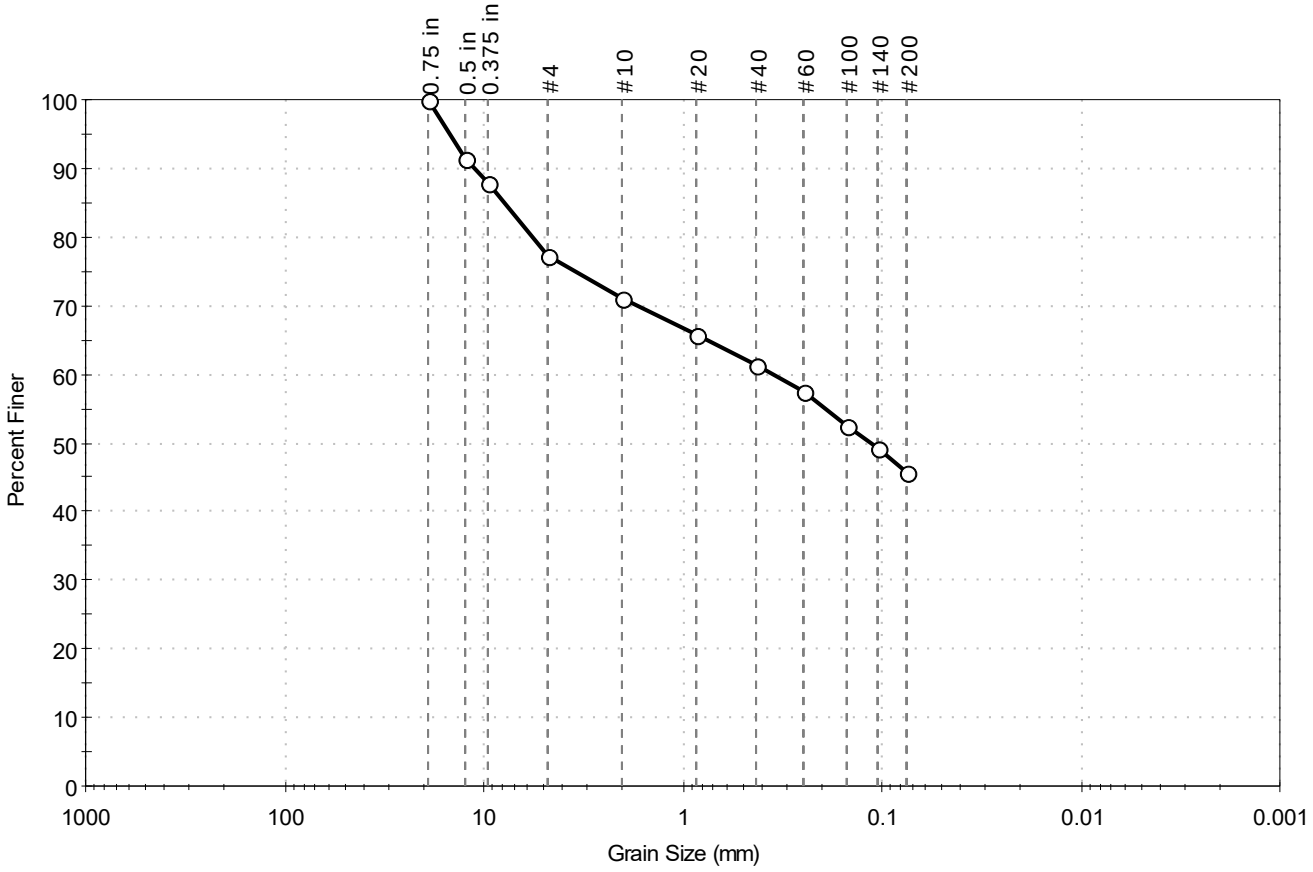
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

printed 7/25/2018 8:44:19 AM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-127	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-7	Test Date:	07/24/18	Checked By:	emm
Depth :	18-20	Test Id:	462525		
Test Comment:	---				
Visual Description:	Moist, grayish green clayey sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	22.6	31.8	45.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	91		
0.375 in	9.50	88		
#4	4.75	77		
#10	2.00	71		
#20	0.85	66		
#40	0.42	61		
#60	0.25	58		
#100	0.15	53		
#140	0.11	49		
#200	0.075	46		

Coefficients

D_{85} = 7.8790 mm D_{30} = N/A

D_{60} = 0.3505 mm D_{15} = N/A

D_{50} = 0.1142 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

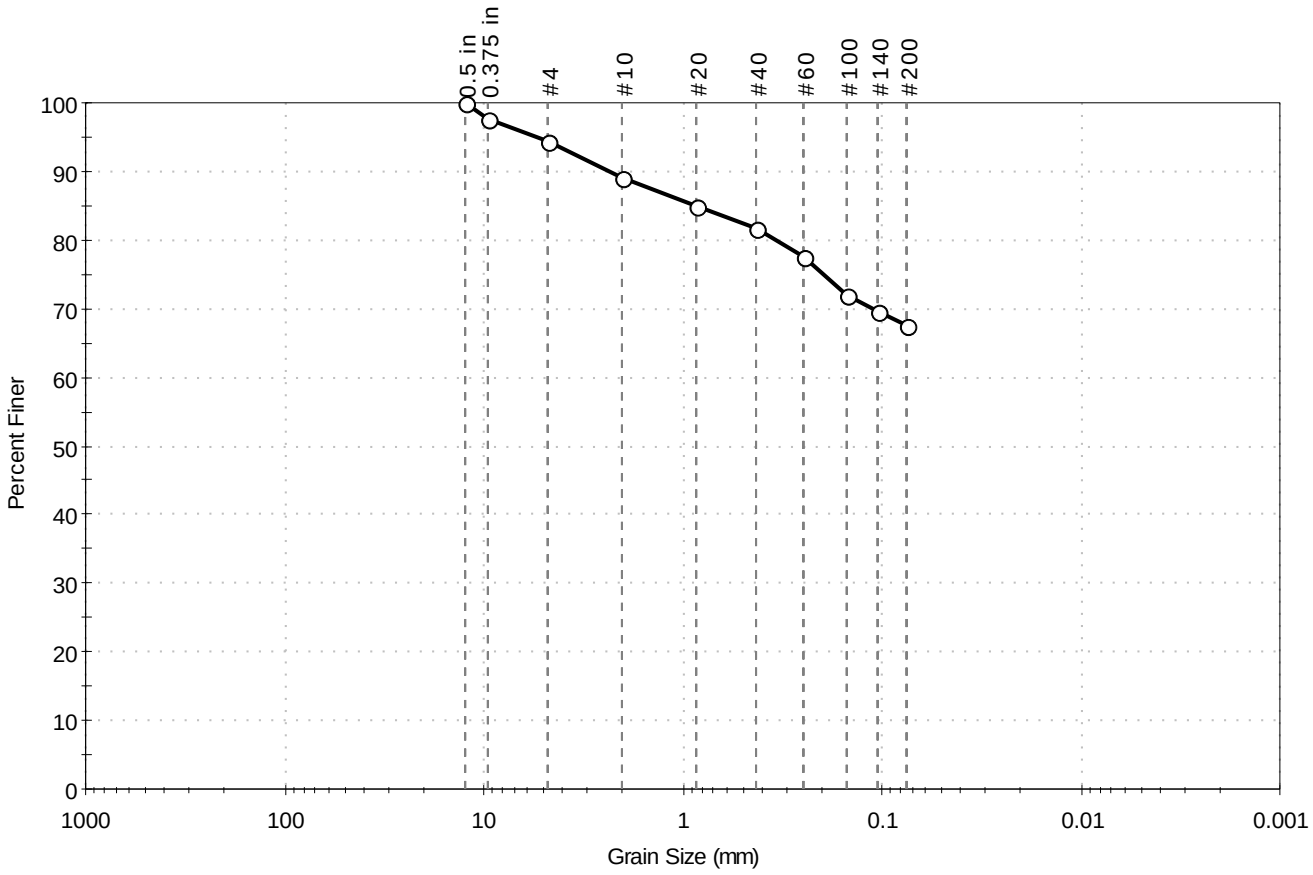
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-128	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-3	Test Date:	07/24/18	Checked By:	emm
Depth :	12-14	Test Id:	462516		
Test Comment:	---				
Visual Description:	Moist, grayish green sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	5.5	26.8	67.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	98		
#4	4.75	94		
#10	2.00	89		
#20	0.85	85		
#40	0.42	82		
#60	0.25	78		
#100	0.15	72		
#140	0.11	70		
#200	0.075	68		

Coefficients

D_{85} = 0.8564 mm D_{30} = N/A
D_{60} = N/A D_{15} = N/A
D_{50} = N/A D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

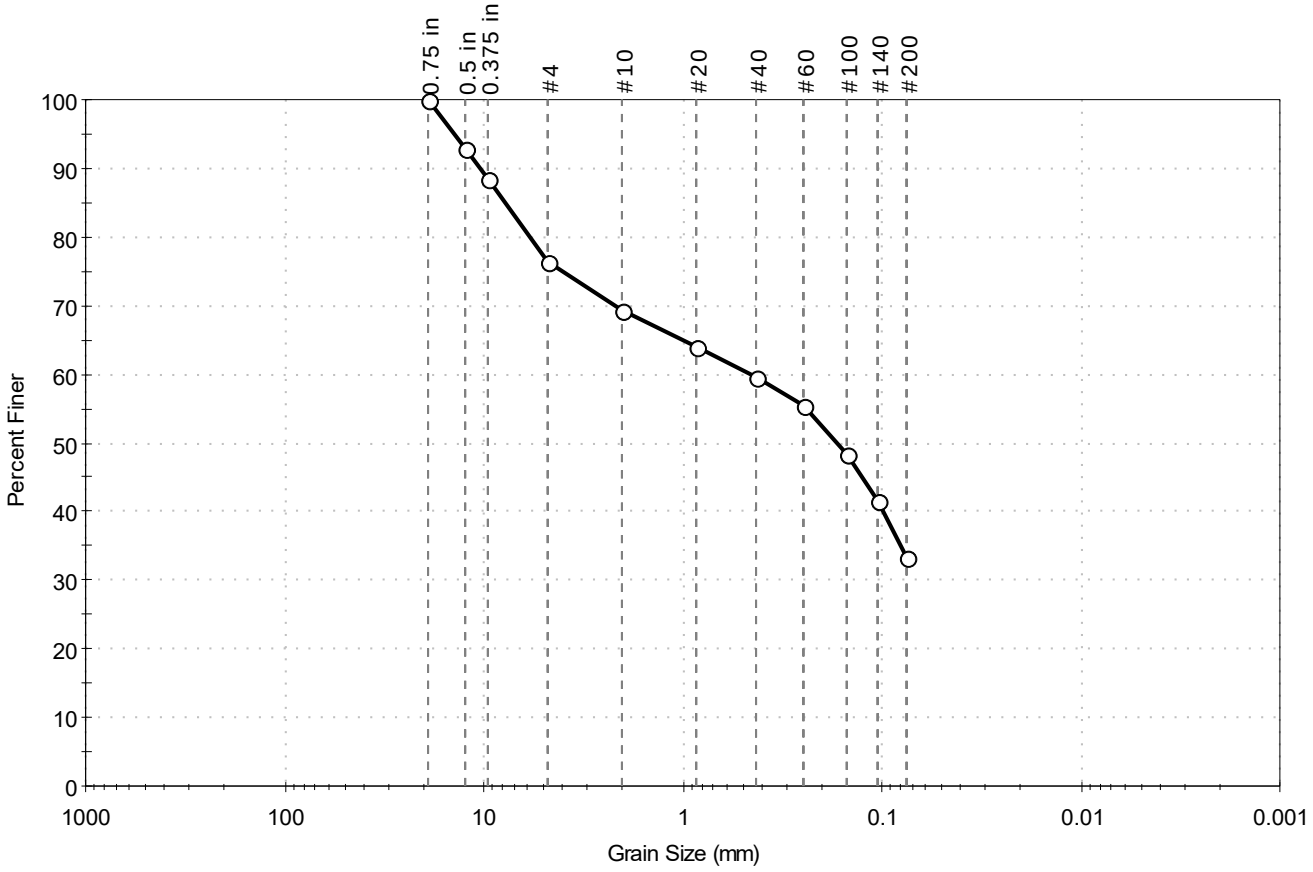
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-128	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-2	Test Date:	07/24/18	Checked By:	emm
Depth :	10-12	Test Id:	462526		
Test Comment:	---				
Visual Description:	Moist, grayish green silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	23.6	43.2	33.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	93		
0.375 in	9.50	88		
#4	4.75	76		
#10	2.00	69		
#20	0.85	64		
#40	0.42	60		
#60	0.25	55		
#100	0.15	48		
#140	0.11	42		
#200	0.075	33		

Coefficients

D_{85} = 7.7887 mm D_{30} = N/A

D_{60} = 0.4564 mm D_{15} = N/A

D_{50} = 0.1688 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

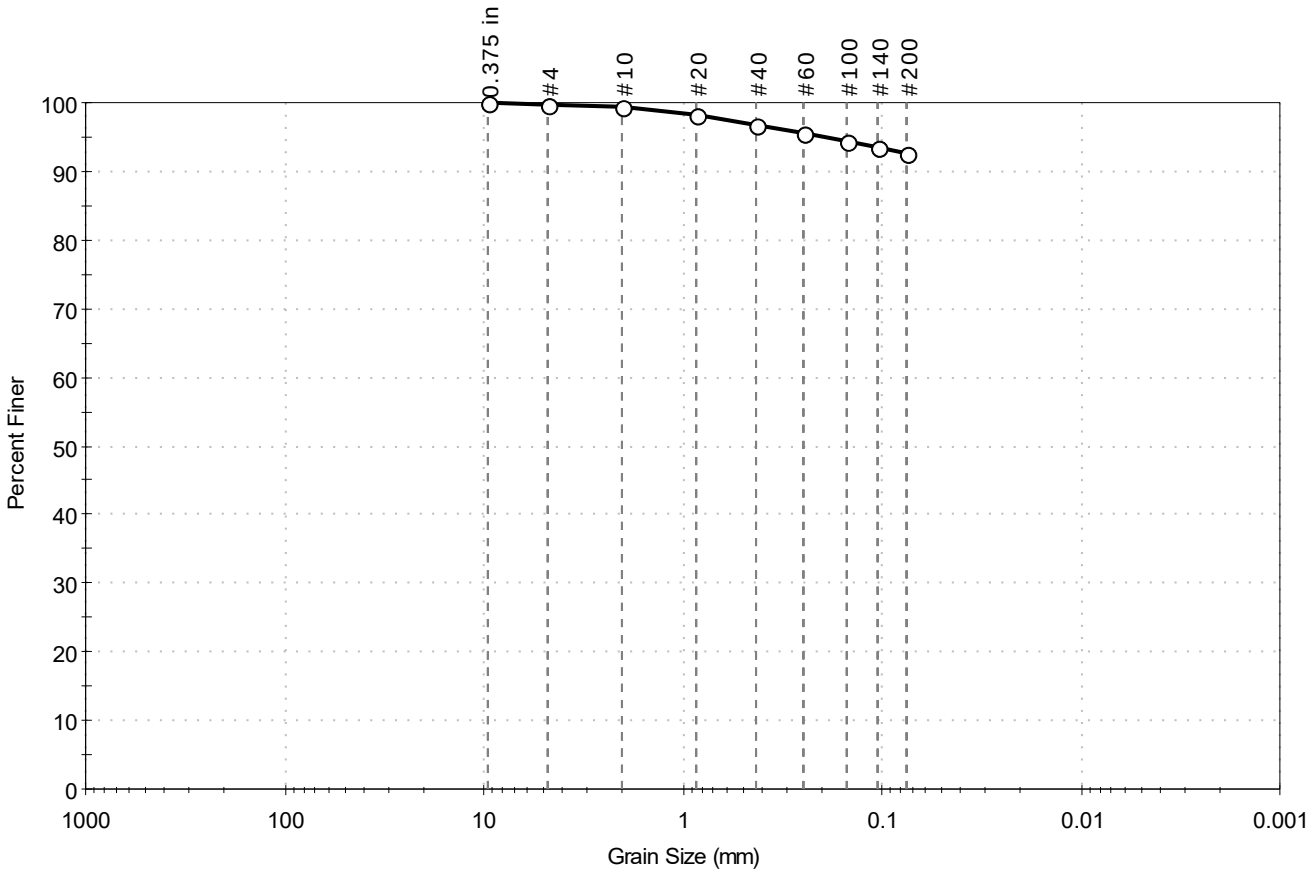
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-129	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-4	Test Date:	07/24/18	Checked By:	emm
Depth :	12-14	Test Id:	462517		
Test Comment:	---				
Visual Description:	Moist, grayish green clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.3	7.0	92.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	98		
#40	0.42	97		
#60	0.25	96		
#100	0.15	94		
#140	0.11	94		
#200	0.075	93		

Coefficients

D_{85} = N/A	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

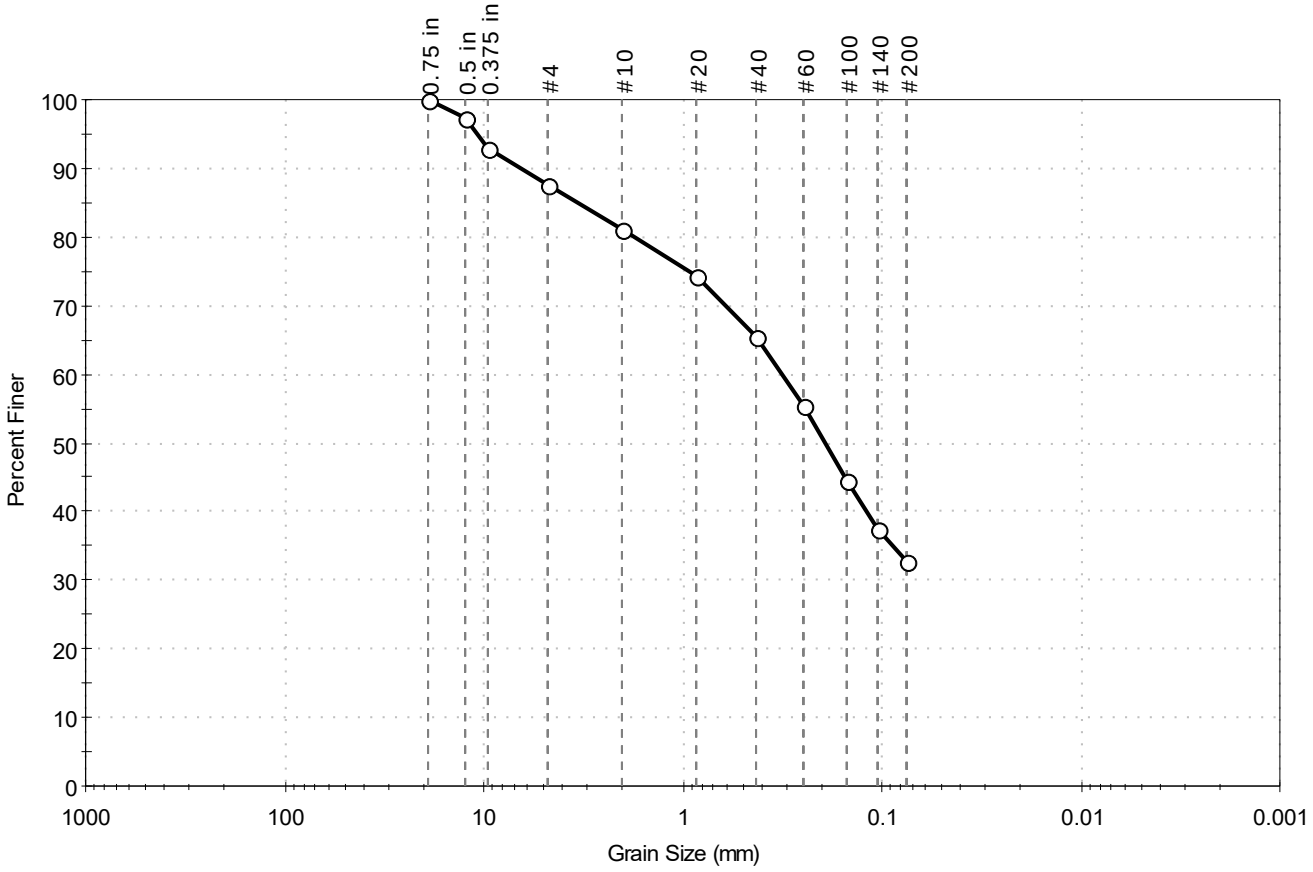
Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-129	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-6	Test Date:	07/24/18	Checked By:	emm
Depth :	16-18	Test Id:	462518		
Test Comment:	---				
Visual Description:	Moist, grayish green silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	12.4	54.9	32.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	97		
0.375 in	9.50	93		
#4	4.75	88		
#10	2.00	81		
#20	0.85	74		
#40	0.42	65		
#60	0.25	55		
#100	0.15	45		
#140	0.11	37		
#200	0.075	33		

Coefficients

D_{85} = 3.3425 mm D_{30} = N/A

D_{60} = 0.3183 mm D_{15} = N/A

D_{50} = 0.1938 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

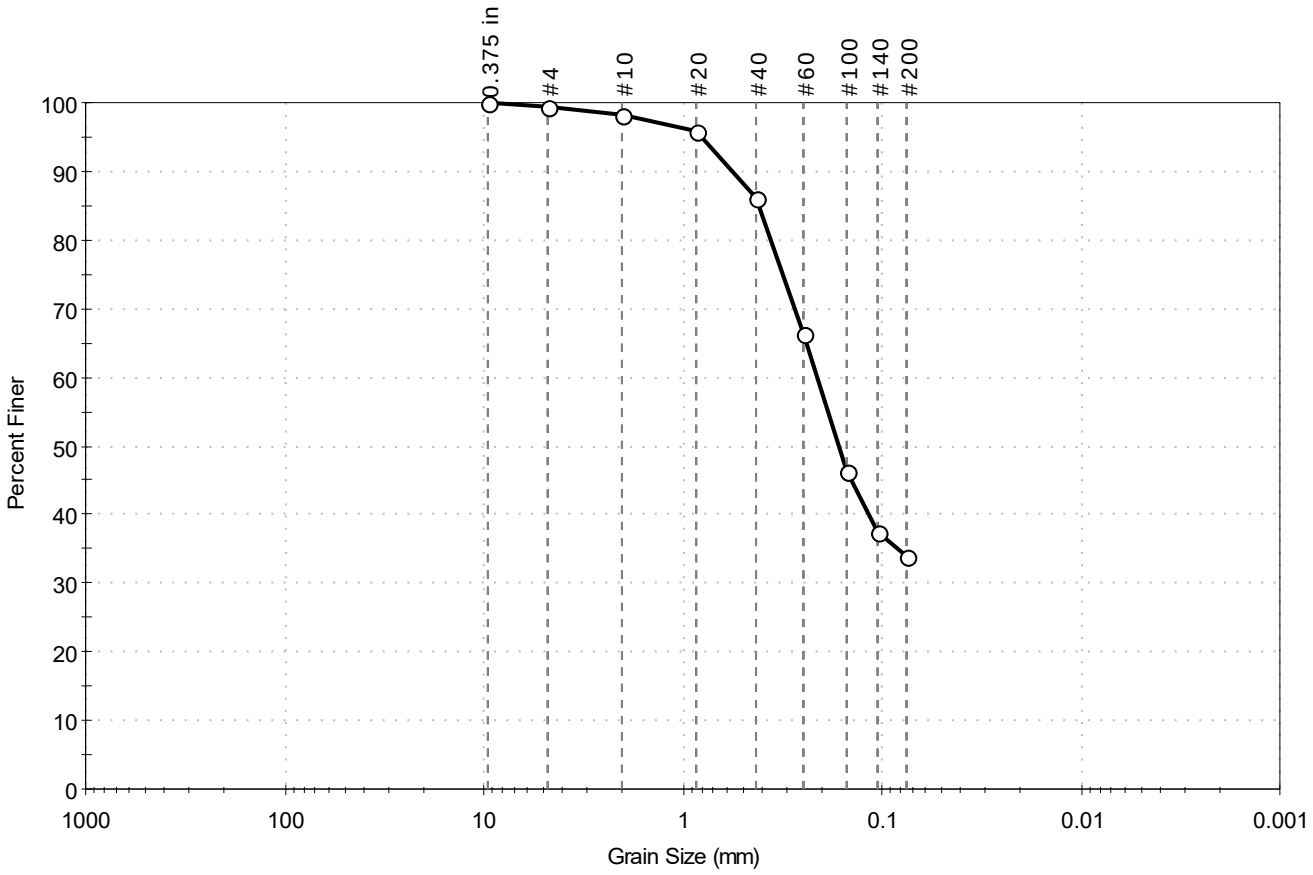
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-130	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-4	Test Date:	07/24/18	Checked By:	emm
Depth :	6-8	Test Id:	462519		
Test Comment:	---				
Visual Description:	Moist, grayish green clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.5	65.7	33.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	98		
#20	0.85	96		
#40	0.42	86		
#60	0.25	66		
#100	0.15	46		
#140	0.11	37		
#200	0.075	34		

Coefficients

D_{85} = 0.4115 mm D_{30} = N/A

D_{60} = 0.2125 mm D_{15} = N/A

D_{50} = 0.1652 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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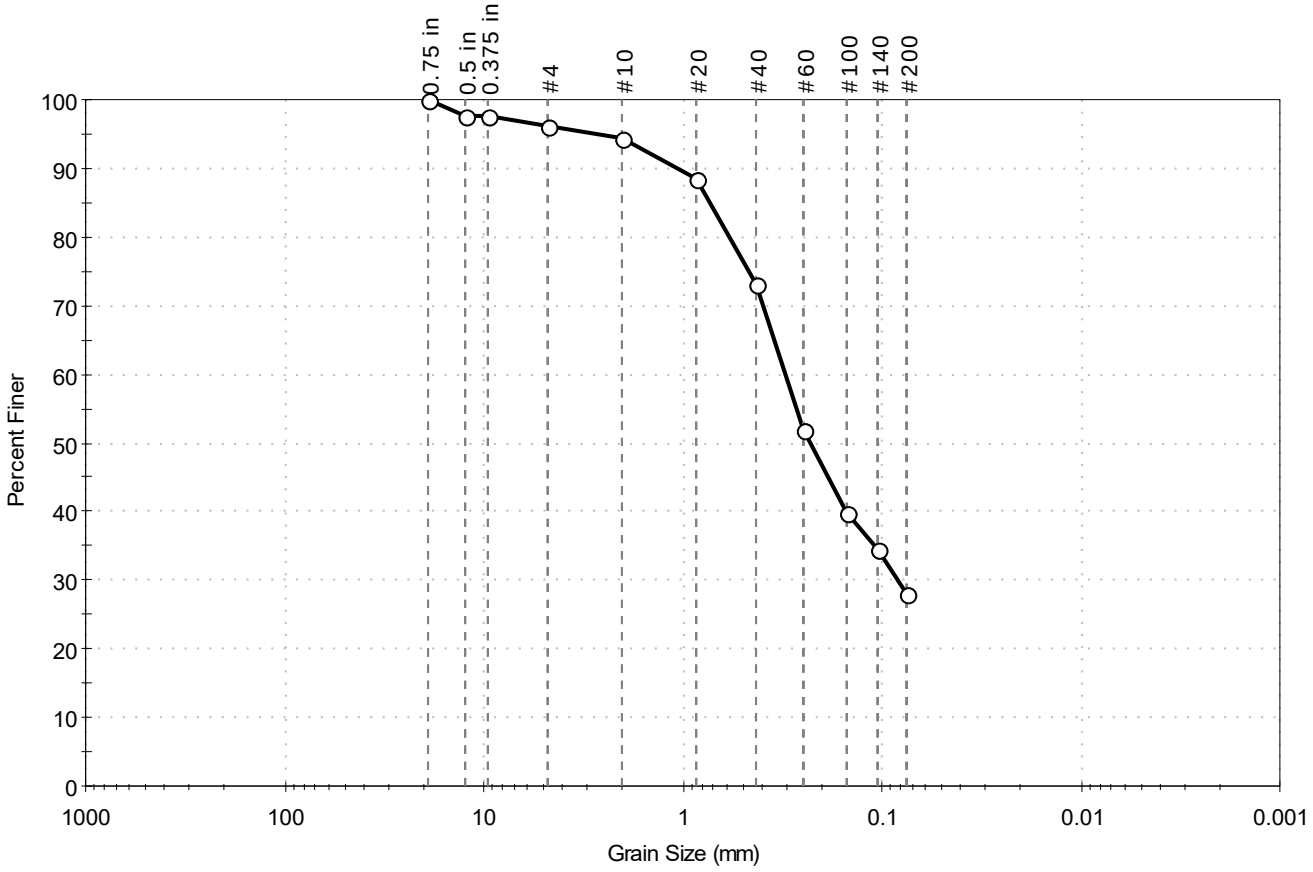
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-130	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-9	Test Date:	07/24/18	Checked By:	emm
Depth :	20-22	Test Id:	462520		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.9	68.0	28.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	98		
0.375 in	9.50	98		
#4	4.75	96		
#10	2.00	94		
#20	0.85	88		
#40	0.42	73		
#60	0.25	52		
#100	0.15	40		
#140	0.11	35		
#200	0.075	28		

Coefficients

D_{85} = 0.7291 mm D_{30} = 0.0830 mm

D_{60} = 0.3062 mm D_{15} = N/A

D_{50} = 0.2309 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

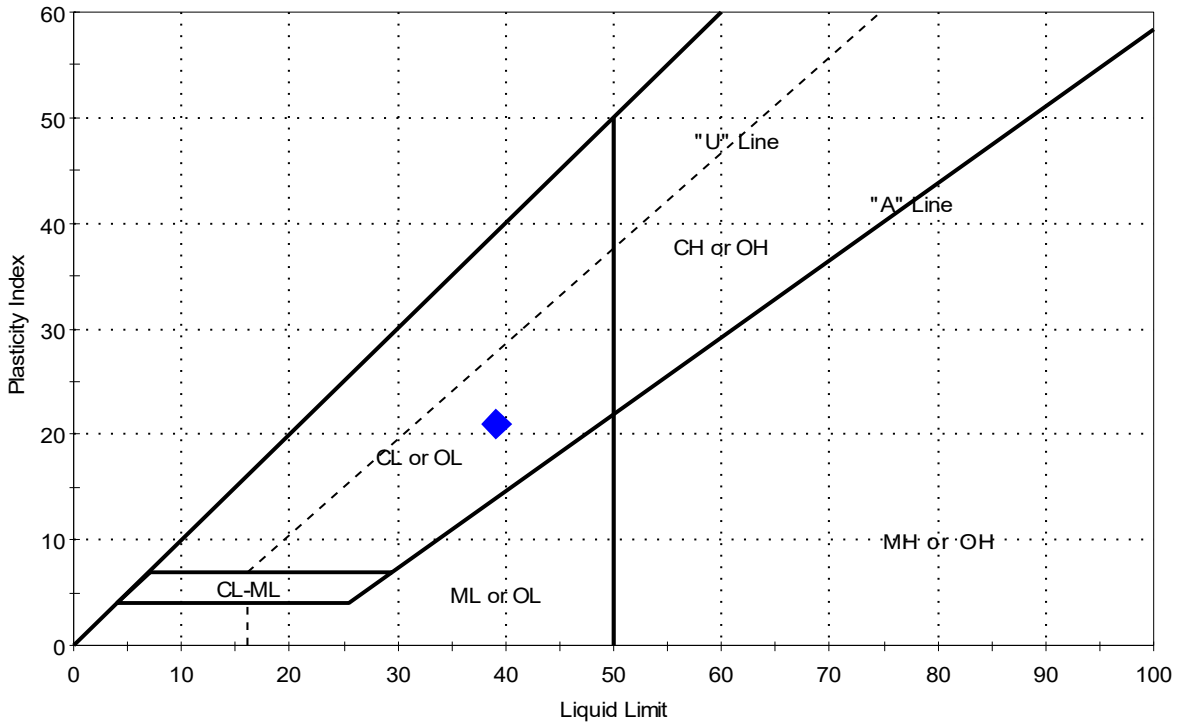
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-108	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-5	Test Date:	07/25/18	Checked By:	emm
Depth :	8-10	Test Id:	462499		
Test Comment:	---				
Visual Description:	Moist, olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-5	B-108	8-10	31	39	18	21	0.6	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: NONE

Toughness: MEDIUM

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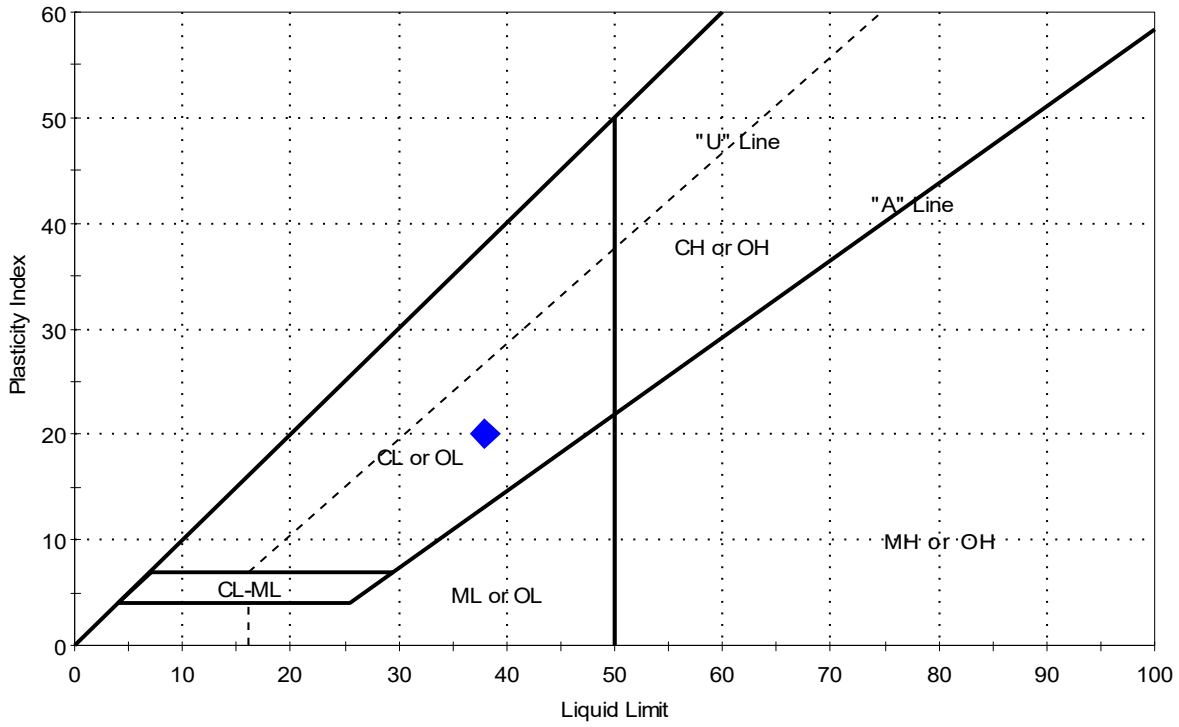
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-109	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-2	Test Date:	07/25/18	Checked By:	emm
Depth :	2-4	Test Id:	462500		
Test Comment:	---				
Visual Description:	Moist, olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-2	B-109	2-4	27	38	18	20	0.4	

Sample Prepared using the WET method

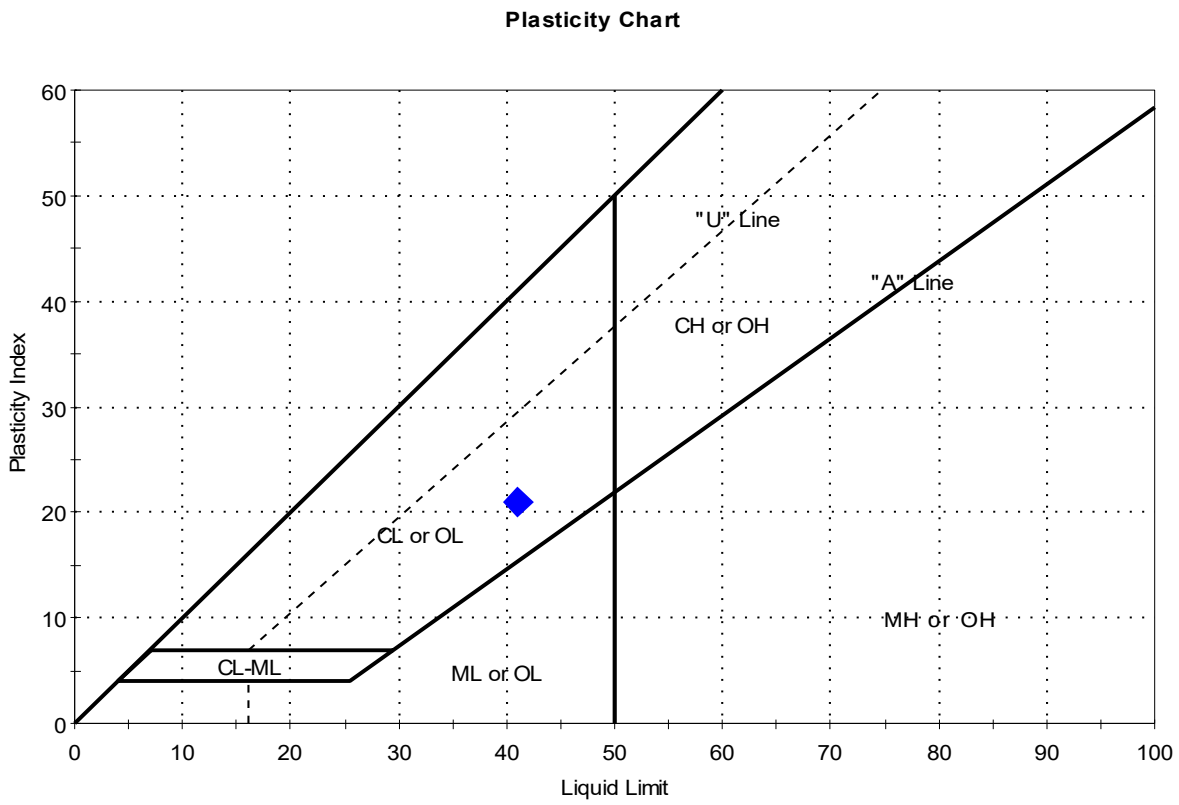
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-110	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-4	Test Date:	07/25/18	Checked By:	emm
Depth :	6-8	Test Id:	462501		
Test Comment:	---				
Visual Description:	Moist, dark olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-4	B-110	6-8	26	41	20	21	0.3	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

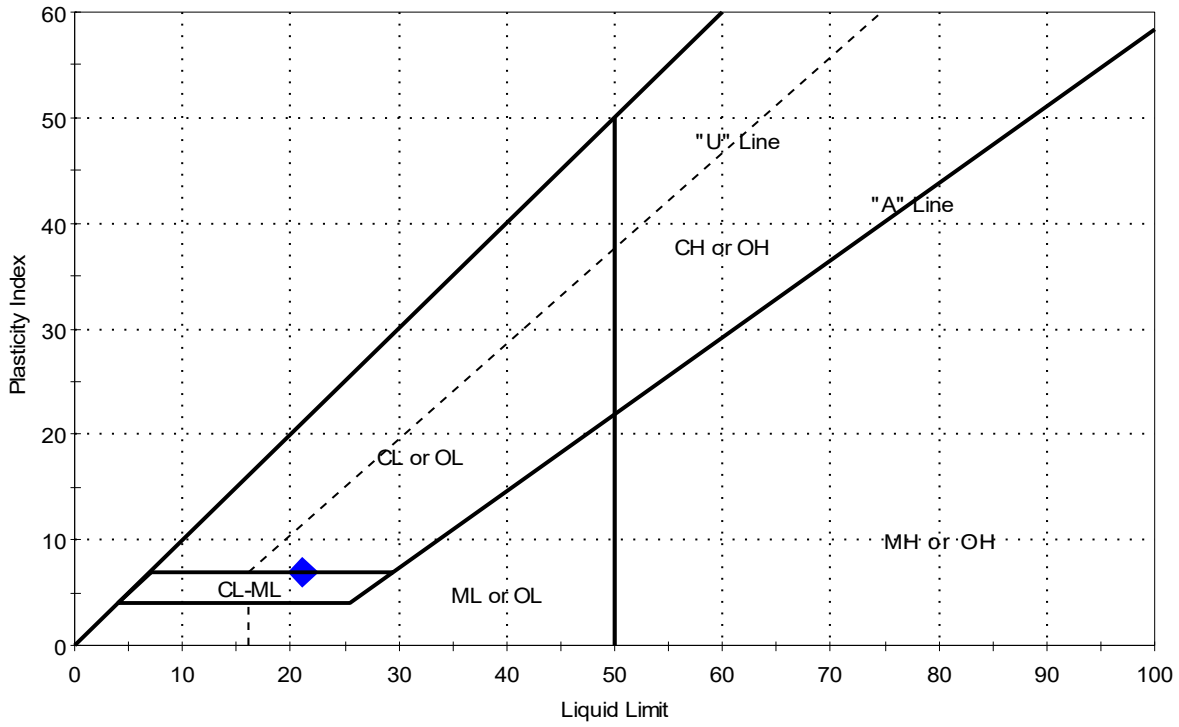
Dilatancy: NONE

Toughness: MEDIUM

printed 7/25/2018 8:50:32 AM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-115	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-4	Test Date:	07/24/18	Checked By:	emm
Depth :	6-8	Test Id:	462502		
Test Comment:	---				
Visual Description:	Moist, olive gray sandy silty clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-4	B-115	6-8	22	21	14	7	1.2	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

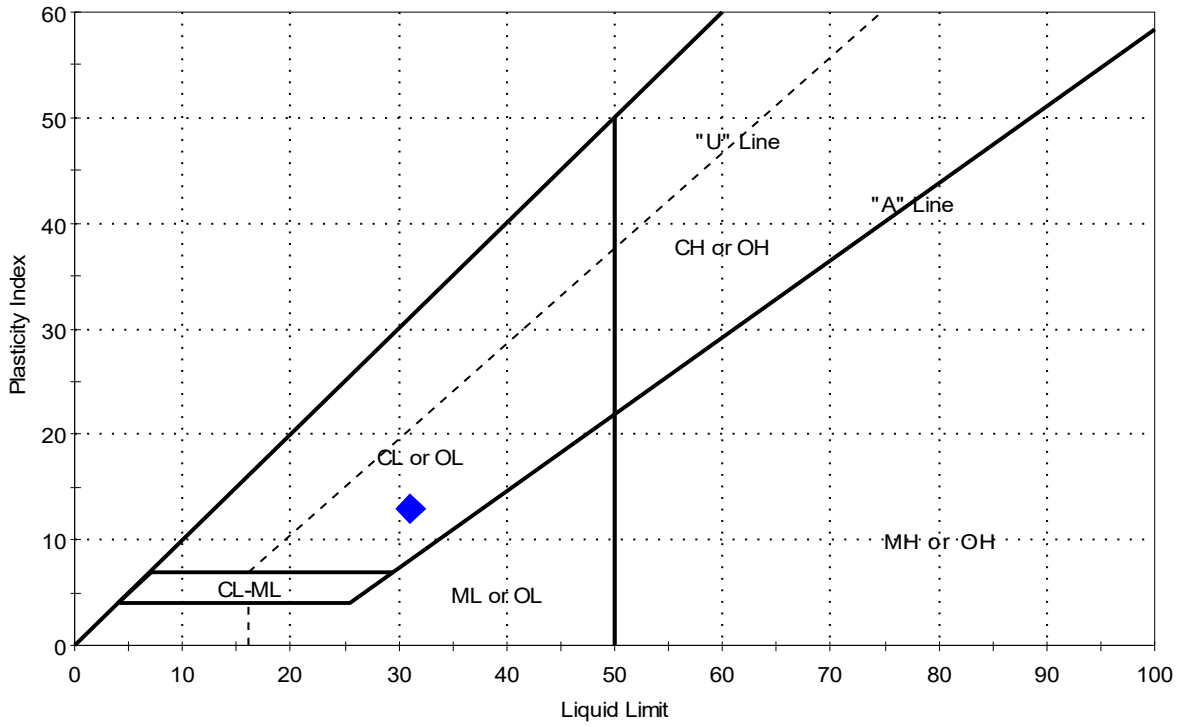
Dilatancy: SLOW

Toughness: MEDIUM

printed 7/25/2018 8:50:32 AM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-115	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-6	Test Date:	07/24/18	Checked By:	emm
Depth :	10-12	Test Id:	462503		
Test Comment:	---				
Visual Description:	Moist, olive brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-6	B-115	10-12	24	31	18	13	0.4	

Sample Prepared using the WET method

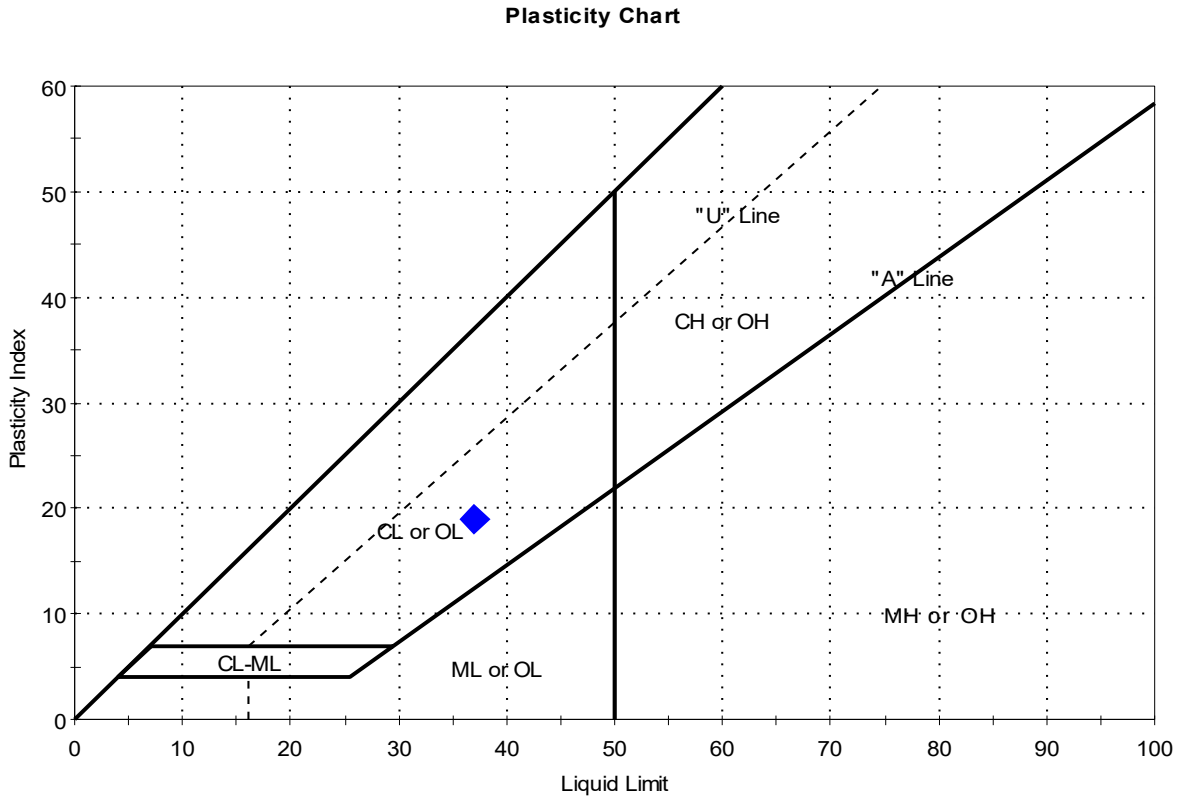
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-118	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-5	Test Date:	07/25/18	Checked By:	emm
Depth :	14-16	Test Id:	462507		
Test Comment:	---				
Visual Description:	Moist, dark olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-5	B-118	14-16	23	37	18	19	0.2	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: NONE

Toughness: MEDIUM

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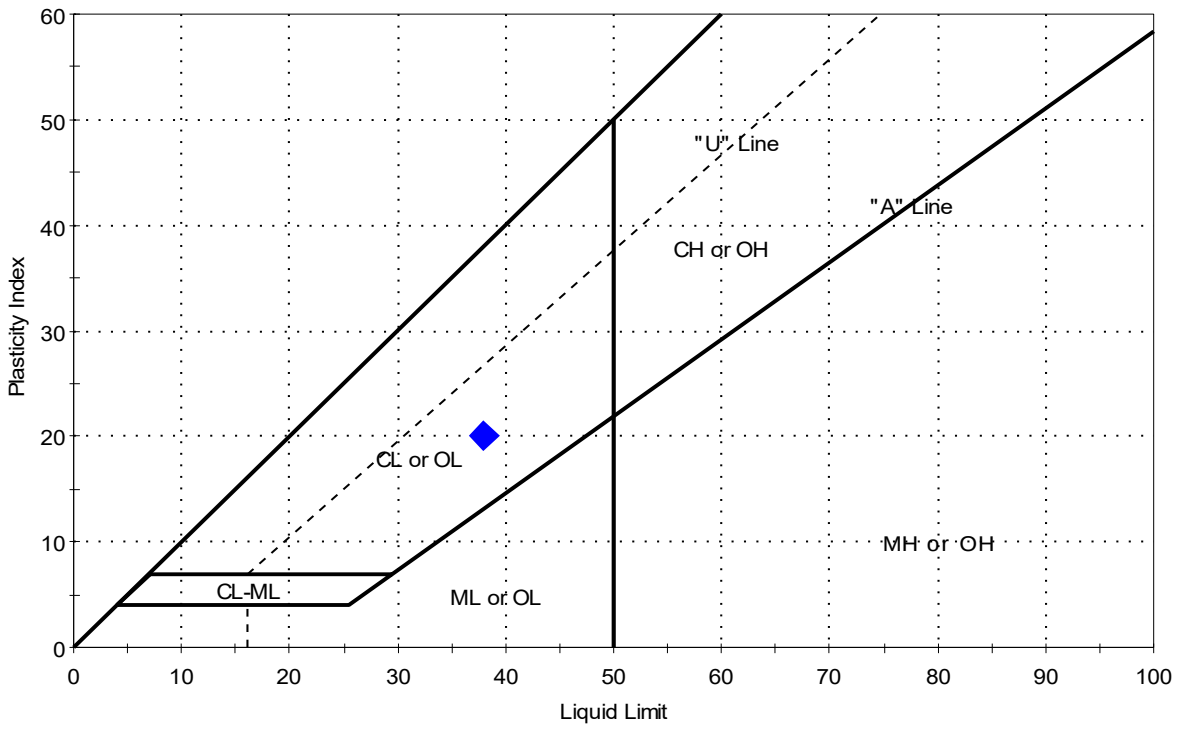
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-120	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-3	Test Date:	07/25/18	Checked By:	emm
Depth :	4-6	Test Id:	462508		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-3	B-120	4-6	32	38	18	20	0.7	

Sample Prepared using the WET method

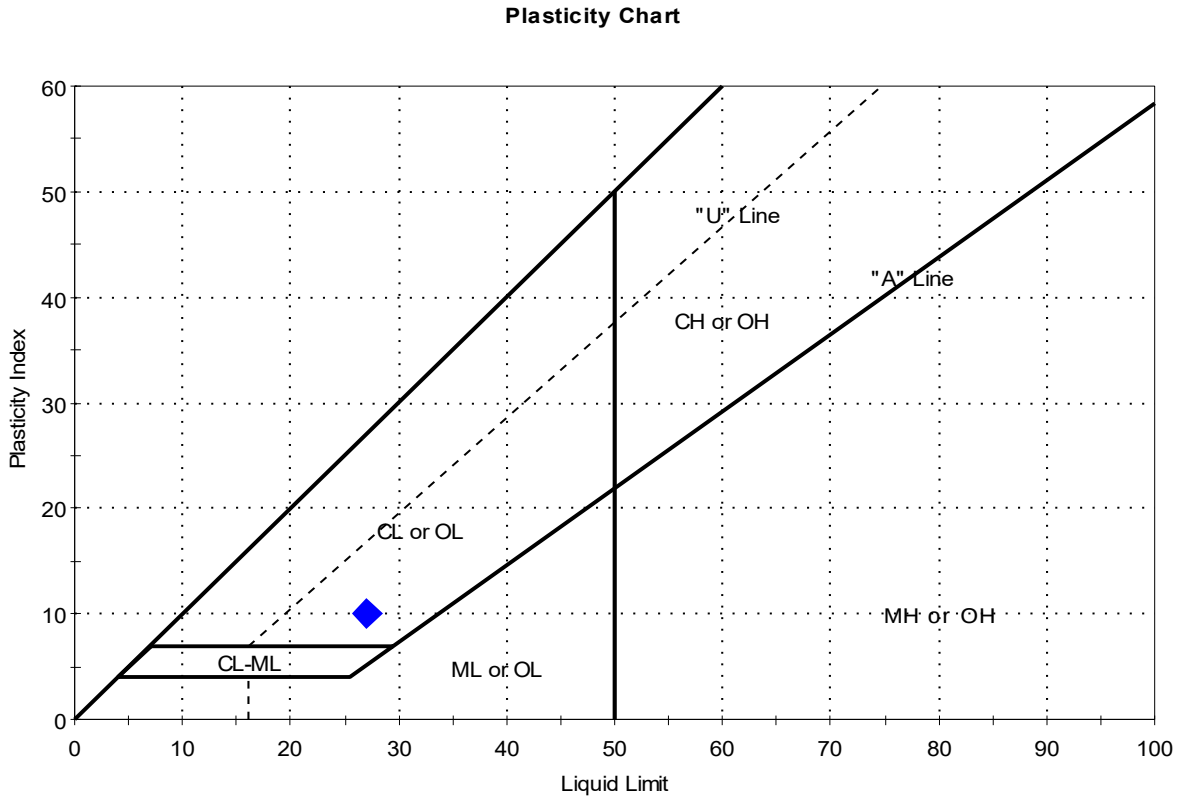
Dry Strength: VERY HIGH

Dilatancy: NONE

Toughness: MEDIUM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-122	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-3	Test Date:	07/24/18	Checked By:	emm
Depth :	4-6	Test Id:	462509		
Test Comment:	---				
Visual Description:	Moist, olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-3	B-122	4-6	22	27	17	10	0.5	

Sample Prepared using the WET method

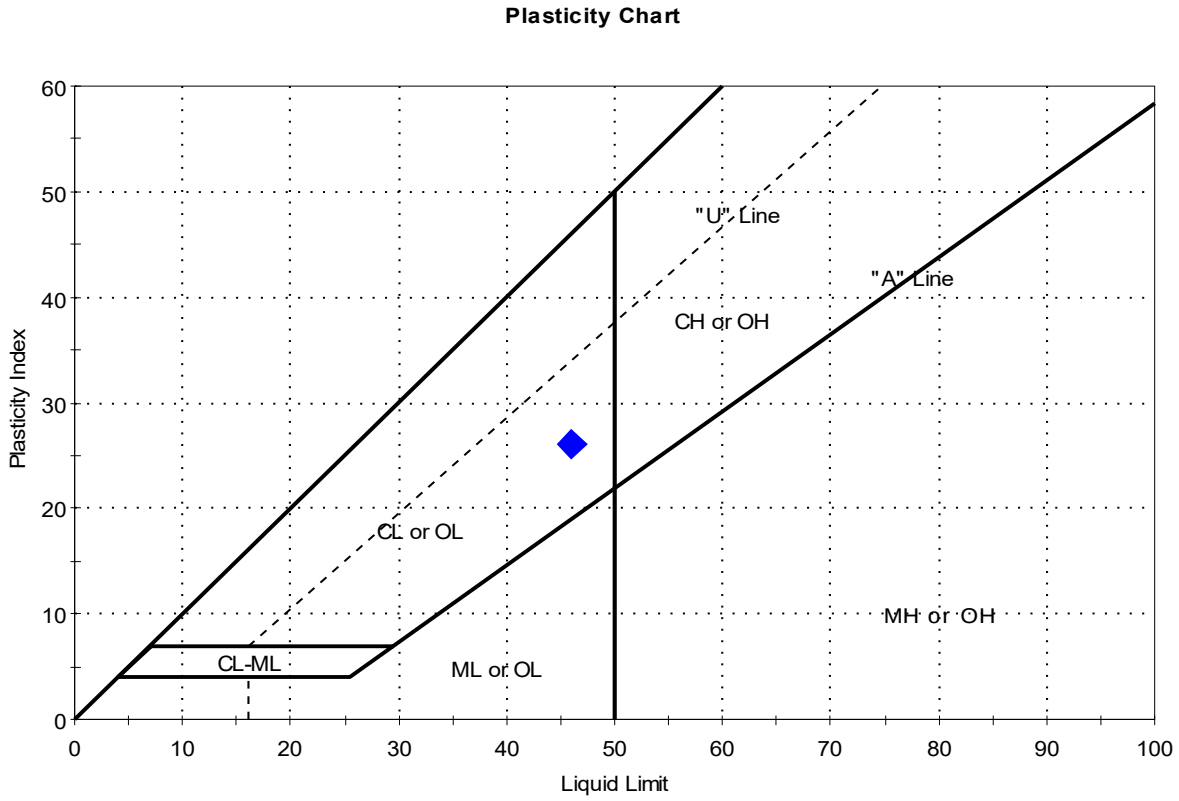
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-123	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-5	Test Date:	07/25/18	Checked By:	emm
Depth :	8-10	Test Id:	462510		
Test Comment:	---				
Visual Description:	Moist, dark olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-5	B-123	8-10	26	46	20	26	0.2	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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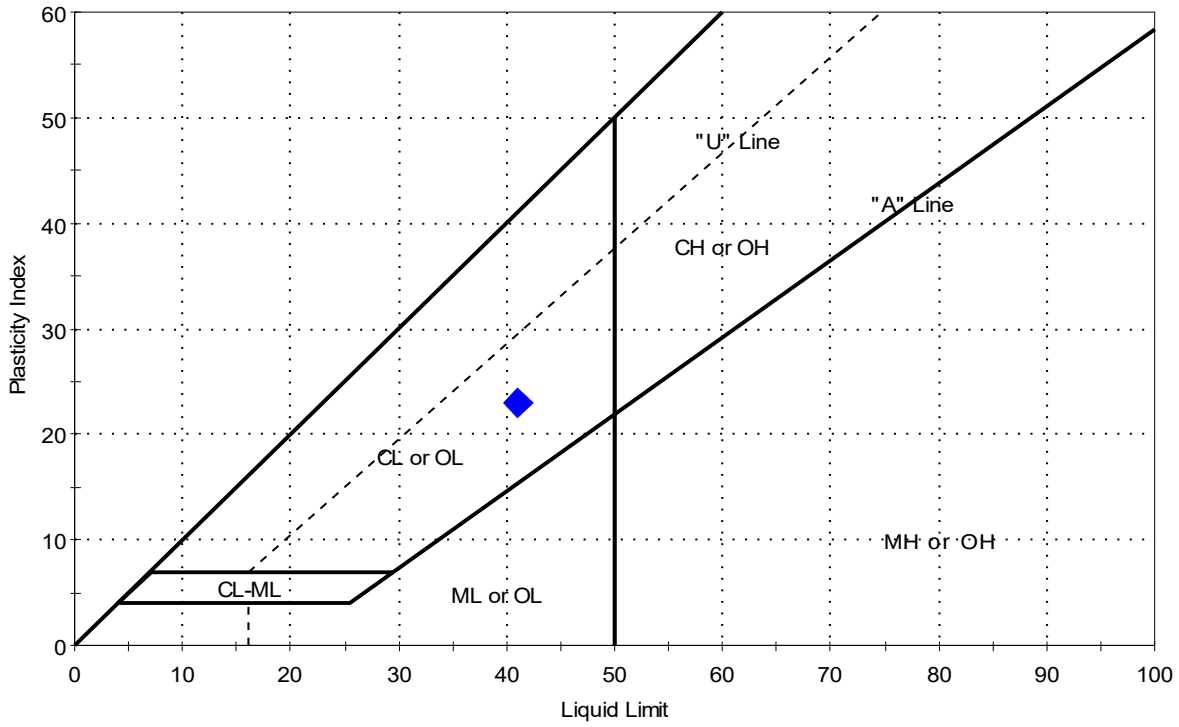
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-124	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-5	Test Date:	07/24/18	Checked By:	emm
Depth :	8-10	Test Id:	462511		
Test Comment:	---				
Visual Description:	Moist, olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-5	B-124	8-10	28	41	18	23	0.4	

Sample Prepared using the WET method

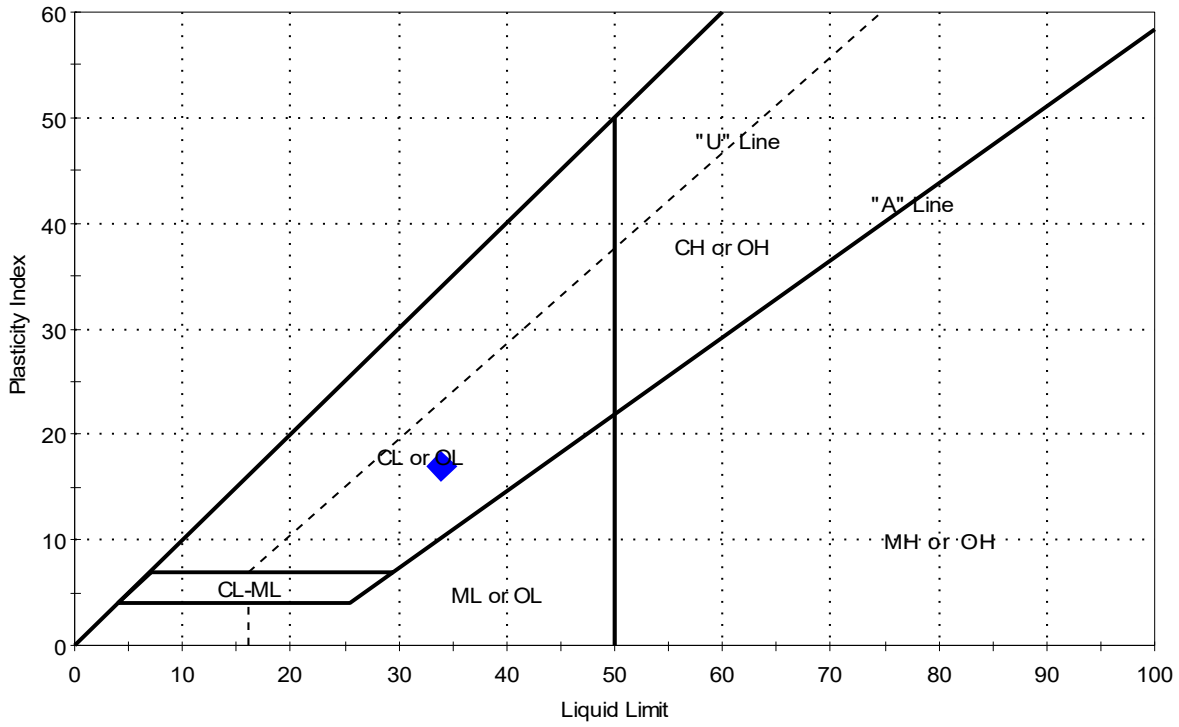
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-130	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-7	Test Date:	07/24/18	Checked By:	emm
Depth :	12-14	Test Id:	462504		
Test Comment:	---				
Visual Description:	Moist, olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-7	B-130	12-14	21	34	17	17	0.3	

Sample Prepared using the WET method

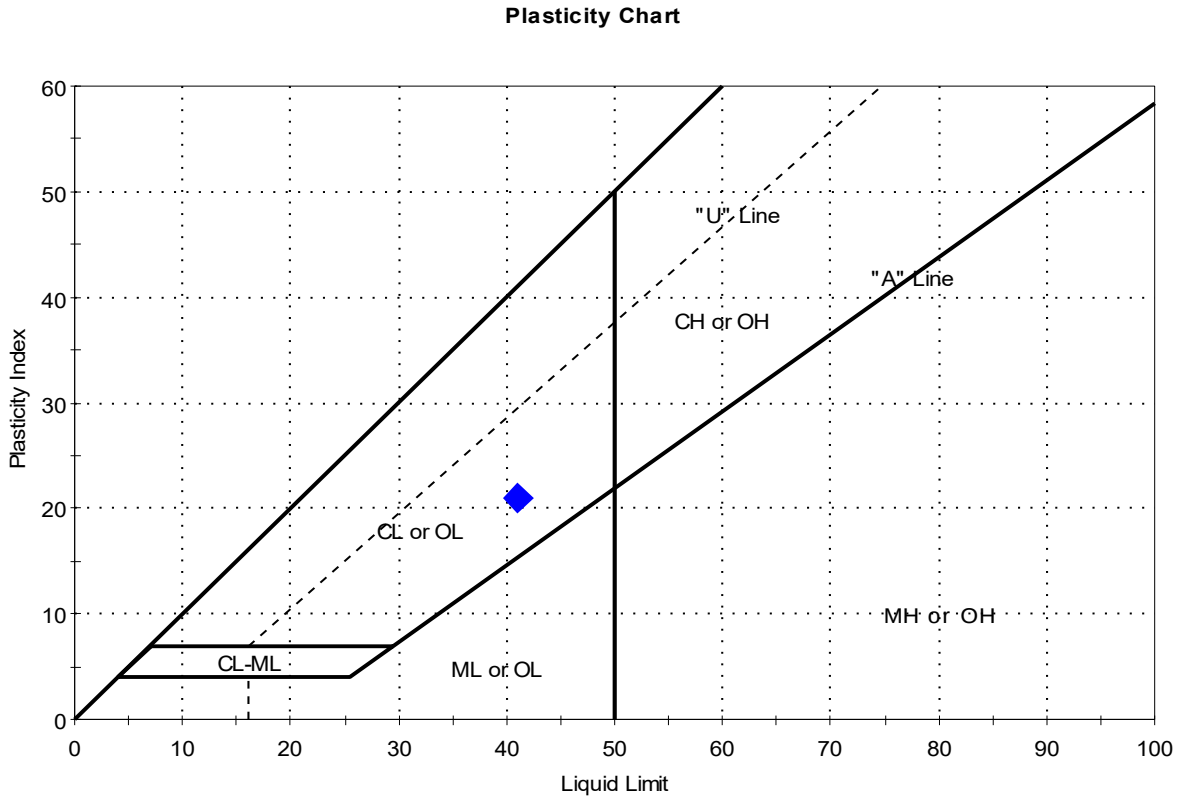
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-131	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-4	Test Date:	07/25/18	Checked By:	emm
Depth :	6-8	Test Id:	462505		
Test Comment:	---				
Visual Description:	Moist, dark olive gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-4	B-131	6-8	30	41	20	21	0.5	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: NONE

Toughness: MEDIUM

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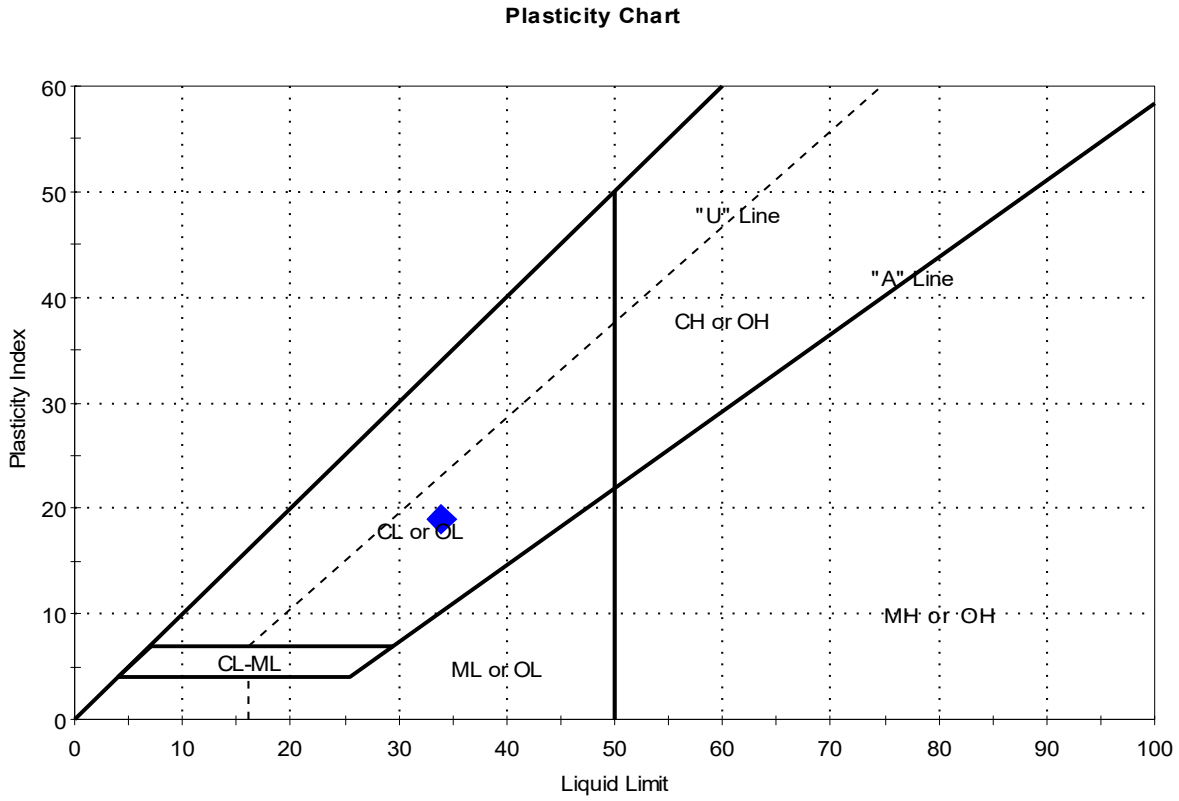
Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	B-132	Sample Type:	jar	Tested By:	GA
Sample ID:	SS-7	Test Date:	07/24/18	Checked By:	emm
Depth :	15-17	Test Id:	462506		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SS-7	B-132	15-17	28	34	15	19	0.7	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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Appendix E

Laboratory Rock Test Results

Client:	Stantec Inc.				
Project:	Exit 103 ORT				
Location:	West Gardiner, ME			Project No:	GTX-308455
Boring ID:	---	Sample Type:	---	Tested By:	trm
Sample ID:	---	Test Date:	07/31/18	Checked By:	jsc
Depth :	---	Test Id:	462558		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
B-101	C-1	6.5-7 ft	170	5163	3	Yes	---
B-106	C-2	13-14 ft	174	1985	2	Yes	---
B-119	C-1	11.25-12.25 ft	180	10536	1	Yes	---

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

Client:	Stantec Inc.	Test Date:	7/31/2018
Project Name:	Exit 103 ORT	Tested By:	trm
Project Location:	West Gardiner, ME	Checked By:	jsc
GTX #:	308455		
Boring ID:	B-101		
Sample ID:	C-1		
Depth:	6.5-7 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.37	4.37	4.37
Specimen Diameter, in:	1.98	1.98	1.98
Specimen Mass, g:	600.57		
Bulk Density, lb/ft^3	170	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

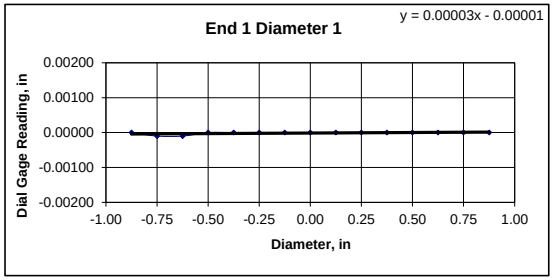
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

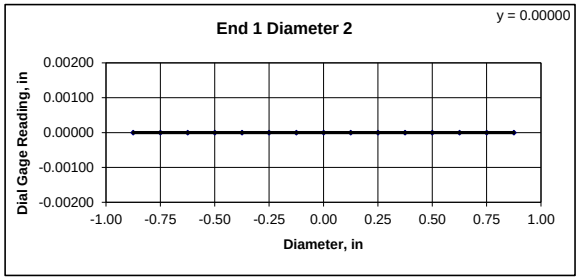
Difference between max and min readings, in:
0° = 0.00010 90° = 0.00000

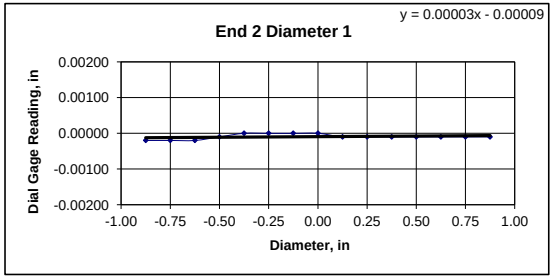
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00020	-0.00020	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020

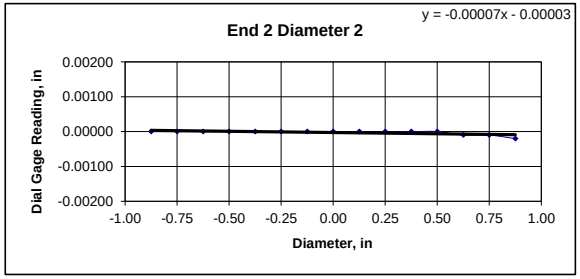
Difference between max and min readings, in:
0° = 0.0002 90° = 0.0002

Maximum difference must be < 0.0020 in. Difference = ± 0.00010
Flatness Tolerance Met? YES









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00003
Angle of Best Fit Line: 0.00180

End 2:
Slope of Best Fit Line 0.00003
Angle of Best Fit Line: 0.00196

Maximum Angular Difference: 0.00016

Parallelism Tolerance Met? YES
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00000
Angle of Best Fit Line: 0.00000

End 2:
Slope of Best Fit Line 0.00007
Angle of Best Fit Line: 0.00409

Maximum Angular Difference: 0.00409

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00010	1.980	0.00005	0.003	YES
Diameter 2, in (rotated 90°)	0.00000	1.980	0.00000	0.000	YES
END 2					
Diameter 1, in	0.00020	1.980	0.00010	0.006	YES
Diameter 2, in (rotated 90°)	0.00020	1.980	0.00010	0.006	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? YES

Client:	Stantec Inc.
Project Name:	Exit 103 ORT
Project Location:	West Gardiner, ME
GTX #:	308455
Test Date:	7/31/2018
Tested By:	trm
Checked By:	jsc
Boring ID:	B-101
Sample ID:	C-1
Depth, ft:	6.5-7 ft

After cutting and grinding

After break

Client:	Stantec Inc.	Test Date:	7/31/2018
Project Name:	Exit 103 ORT	Tested By:	trm
Project Location:	West Gardiner, ME	Checked By:	jsc
GTX #:	308455		
Boring ID:	B-106		
Sample ID:	C-2		
Depth:	13-14 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.09	4.09	4.09
Specimen Diameter, in:	2.00	2.00	2.00
Specimen Mass, g:	588.66		
Bulk Density, lb/ft^3	174	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.0	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

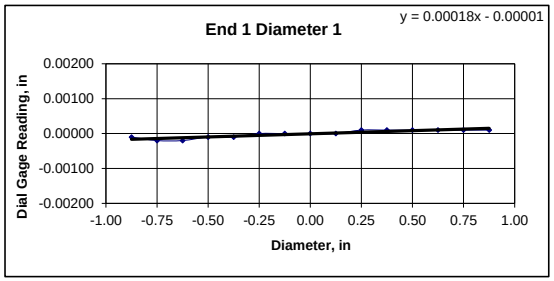
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00010	-0.00020	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

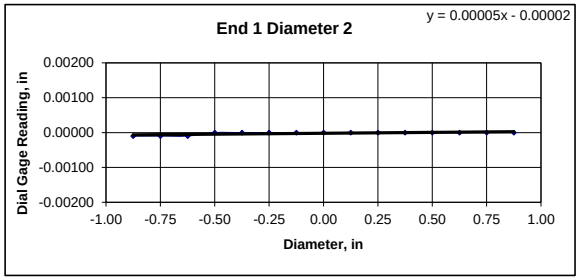
Difference between max and min readings, in:
0° = 0.00030 90° = 0.00010

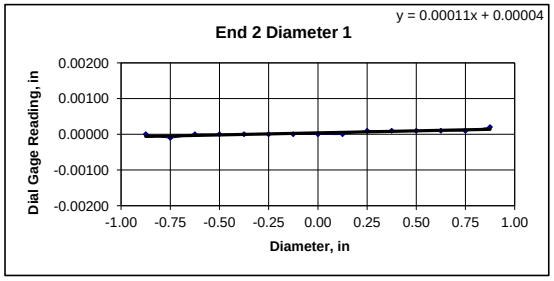
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010	0.00010	0.00020
Diameter 2, in (rotated 90°)	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020

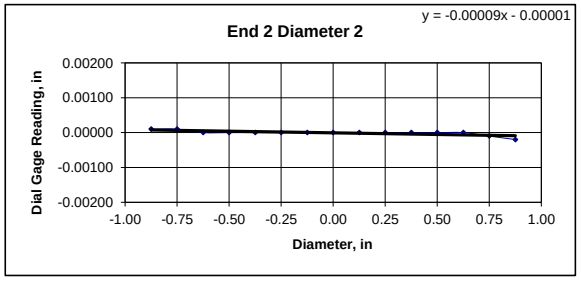
Difference between max and min readings, in:
0° = 0.0003 90° = 0.0003

Maximum difference must be < 0.0020 in. Difference = ± 0.00015
Flatness Tolerance Met? YES









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00018
Angle of Best Fit Line: 0.01031

End 2:
Slope of Best Fit Line 0.00011
Angle of Best Fit Line: 0.00655

Maximum Angular Difference: 0.00377

Parallelism Tolerance Met? YES
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00005
Angle of Best Fit Line: 0.00295

End 2:
Slope of Best Fit Line 0.00009
Angle of Best Fit Line: 0.00540

Maximum Angular Difference: 0.00246

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00030	2.000	0.00015	0.009	YES
Diameter 2, in (rotated 90°)	0.00010	2.000	0.00005	0.003	YES
END 2					
Diameter 1, in	0.00030	2.000	0.00015	0.009	YES
Diameter 2, in (rotated 90°)	0.00030	2.000	0.00015	0.009	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? YES

Client:	Stantec Inc.
Project Name:	Exit 103 ORT
Project Location:	West Gardiner, ME
GTX #:	308455
Test Date:	7/31/2018
Tested By:	trm
Checked By:	jsc
Boring ID:	B-106
Sample ID:	C-2
Depth, ft:	13-14 ft

After cutting and grinding

After break

Client:	Stantec Inc.	Test Date:	7/31/2018
Project Name:	Exit 103 ORT	Tested By:	trm
Project Location:	West Gardiner, ME	Checked By:	jsc
GTX #:	308455		
Boring ID:	B-119		
Sample ID:	C-1		
Depth:	11.25-12.25 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.17	4.17	4.17
Specimen Diameter, in:	1.98	1.98	1.98
Specimen Mass, g:	607.78		
Bulk Density, lb/ft^3	180	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.1	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

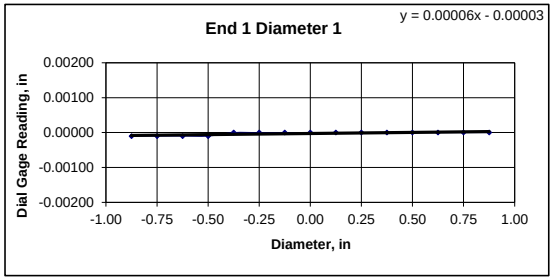
END FLATNESS AND PARALLELISM (Procedure FP1)

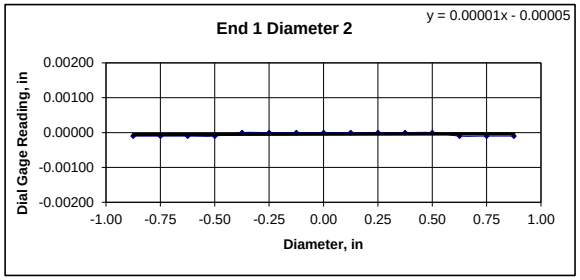
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010

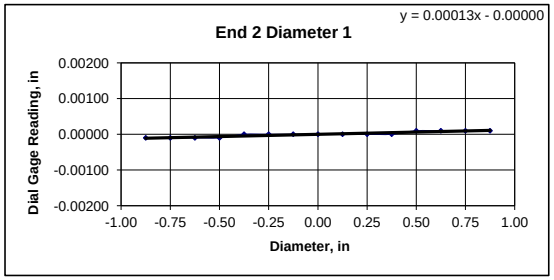
Difference between max and min readings, in:
0° = 0.00010 90° = 0.00010

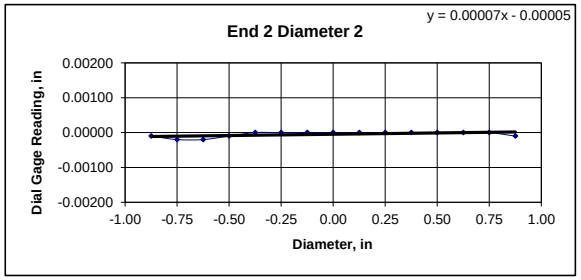
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010
Diameter 2, in (rotated 90°)	-0.00010	-0.00020	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010

Difference between max and min readings, in:
0° = 0.0002 90° = 0.0002
Maximum difference must be < 0.0020 in. Difference = ± 0.00010
Flatness Tolerance Met? YES









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00006
Angle of Best Fit Line: 0.00360

End 2:
Slope of Best Fit Line 0.00013
Angle of Best Fit Line: 0.00720

Maximum Angular Difference: 0.00360

Parallelism Tolerance Met? YES
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00001
Angle of Best Fit Line: 0.00065

End 2:
Slope of Best Fit Line 0.00007
Angle of Best Fit Line: 0.00426

Maximum Angular Difference: 0.00360

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00010	1.980	0.00005	0.003	YES
Diameter 2, in (rotated 90°)	0.00010	1.980	0.00005	0.003	YES
END 2					
Diameter 1, in	0.00020	1.980	0.00010	0.006	YES
Diameter 2, in (rotated 90°)	0.00020	1.980	0.00010	0.006	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? YES

Client:	Stantec Inc.
Project Name:	Exit 103 ORT
Project Location:	West Gardiner, ME
GTX #:	308455
Test Date:	7/31/2018
Tested By:	trm
Checked By:	jsc
Boring ID:	B-119
Sample ID:	C-1
Depth, ft:	11.25-12.25 ft

After cutting and grinding

After break

Appendix F

Calculations

SOIL STRENGTH PROPERTIES

Stantec

Purpose: Estimate soil properties for the various soils at the site.

Given: Test Boring Logs B-101 to B-107

Existing Embankment Fill

N_{field} = 7, 23, 8, 14, 9, 13, 21, 15 Average = 14

correct for auto-hammer × 1.13

N_{60} = 16 bpf

$\phi = 54 - 27\, e^{(-0.014 \times N_{60})} = 32°$ ✓ okay

The fill is generally cohesionless $c = 0$ psf

Typical unit weight $\gamma = 125$ pcf

Proposed Embankment Fill

Typical friction angle for compacted fill $\phi = 34°$

Embankment fill will be cohesionless $c = 0$ psf

Typical unit weight $\gamma = 125$ pcf

Designed by: Trey Dykstra Checked by:

Stantec

Sand Deposit

B-103 $N = 9, 7, 3$
B-106 $N = 5, 15, 14$

$N_{ave} = 9$

correct for auto-hammer (CF = 1.13)

$N_{60\ ave} = 9 \times 1.13 = 10$

$\phi = 54 - 27.6\, e^{(-0.014 N)} = 30°$

B-112 $N = 16, 15$
B-113 $N = 17$
B-114 N/A
B-115 $N = 18$

$N_{ave} = 16.5$ use 16 no correction

$\phi = 54 - 27.6\, e^{(-0.014 N)}$

$\phi = 32°$

Use $\phi = 31°$

Designed by: Trey Dykstra

Checked by:

Stantec

Marine Clay

B-102 $N = 5, 8$ auto hammer $CF = 1.13$
B-107 $N = 6$

$N_{ave} = 6$ $N_{60\ ave} = 6 \times 1.13 = 7$

B-108 $N = 17, 11, 10, 7$
B-109 $N = 6, 14, 15$
B-110 $N = 14, 5, 14$
B-112 $N = 7$
B-113 $N = 8$
B-115 $N = 7, 14, 3, 8, 10$

$N_{ave} = 10$ $N_{60\ ave} = 10$ No correction

$S_u = 1,300$ psf

Some N value are 6 to 8 range

$S_u = 800$ psf to be conservative.

For undrained $\phi = 0°$

For drained $\phi = 30°$
$c = 0$ psf

Base on previous projects $\gamma_m = 110$ pcf

Designed by: Trey Dykstra Checked by:

Stantec

Glacial Till

Typical values

$\phi = 38^{\circ}$
$c = 0$ psf
$\gamma = 135$ pcf

Designed by: Trey Dykstra

Checked by:

Correlation between N60 Values and Undrained Shear Strength

Consistency	Field Identification	Undrained Shear Strength, S_u (psf)	Standard Penetration Test Blowcount* (blows/ft)
Very soft	Easily penetrated several inches by fist	< 250	< 2
Soft	Easily penetrated several inches by thumb	250 - 500	2 - 4
Medium	Can be penetrated several inches by thumb with moderate effort	500 - 1000	4 - 8
Stiff	Readily indented by thumb but penetrated only with great effort	1000 - 2000	8 - 15
Very stiff	Readily indented by thumbnail	2000 - 4000	15 - 30
Hard	Indented with difficulty by thumbnail	> 4000	> 30

**The correlation between undrained strength and SPT blowcount is rather unreliable*

Reference: From Peck et al. 1974

Use Su = 800 psf
for slope stability analysis

Typical Values of Peak Friction Angle (ø) for Normally Consolidated Clays

Plasticity index	ϕ' (deg)
10	33 ± 5
20	31 ± 5
30	29 ± 5
40	27 ± 5
60	24 ± 5
80	22 ± 5

Source: Data from Bjerrum and Simons (1960).
"c' = 0 for these materials.

Reference: From Duncan and Wright (2005)

Table 3.11.5.3-1—Friction Angle for Dissimilar Materials (U.S. Department of the Navy, 1982a)

Interface Materials	Friction Angle, δ (degrees)	Coefficient of Friction, tan δ (dim.)
Mass concrete on the following foundation materials:		
• Clean sound rock	35	0.70
• Clean gravel, gravel-sand mixtures, coarse sand	29 to 31	0.55 to 0.60
• Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	24 to 29	0.45 to 0.55
• Clean fine sand, silty or clayey fine to medium sand	19 to 24	0.34 to 0.45
• Fine sandy silt, nonplastic silt	17 to 19	0.31 to 0.34
• Very stiff and hard residual or preconsolidated clay	22 to 26	0.40 to 0.49
• Medium stiff and stiff clay and silty clay	17 to 19	0.31 to 0.34
Masonry on foundation materials has same friction factors.		
Steel sheet piles against the following soils:		
• Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	22	0.40
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17	0.31
• Silty sand, gravel or sand mixed with silt or clay	14	0.25
• Fine sandy silt, nonplastic silt	11	0.19
Formed or precast concrete or concrete sheet piling against the following soils:		
• Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	22 to 26	0.40 to 0.49
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17 to 22	0.31 to 0.40
• Silty sand, gravel or sand mixed with silt or clay	17	0.31
• Fine sandy silt, nonplastic silt	14	0.25
Various structural materials:		
• Masonry on masonry, igneous and metamorphic rocks:		
○ dressed soft rock on dressed soft rock	35	0.70
○ dressed hard rock on dressed soft rock	33	0.65
○ dressed hard rock on dressed hard rock	29	0.55
• Masonry on wood in direction of cross grain	26	0.49
• Steel on steel at sheet pile interlocks	17	0.31

Use = 0.50

3.11.5.4—Passive Lateral Earth Pressure Coefficient, k_p

For noncohesive soils, values of the coefficient of passive lateral earth pressure may be taken from Figure 3.11.5.4-1 for the case of a sloping or vertical wall with a horizontal backfill or from Figure 3.11.5.4-2 for the case of a vertical wall and sloping backfill. For conditions that deviate from those described in Figures 3.11.5.4-1 and 3.11.5.4-2, the passive pressure may be calculated by using a trial procedure based on wedge theory, e.g., see Terzaghi et al. (1996). When wedge theory is used, the limiting value of the wall friction angle should not be taken larger than one-half the angle of internal friction, ϕ_f.

For cohesive soils, passive pressures may be estimated by:

C3.11.5.4

The movement required to mobilize passive pressure is approximately 10.0 times as large as the movement needed to induce earth pressure to the active values. The movement required to mobilize full passive pressure in loose sand is approximately five percent of the height of the face on which the passive pressure acts. For dense sand, the movement required to mobilize full passive pressure is smaller than five percent of the height of the face on which the passive pressure acts, and five percent represents a conservative estimate of the movement required to mobilize the full passive pressure. For poorly compacted cohesive soils, the movement required to mobilize full passive pressure is larger than five percent of the height of the face on which the pressure acts.

3.4 Construction Loads

The construction live load to be used for constructibility checks is 50 psf applied over the entire deck area. Consideration should be given to slab placement sequence for calculation of maximum force effects.

3.5 Railroad Loads

Railroad bridges should be designed according to the latest American Railroad Engineering and Maintenance-of-Way Association specifications (AREMA, 2002), with the Cooper live loading as determined by the railroad company.

3.6 Earth Loads

3.6.1 General

Earth pressures considered for wall and substructure design must use the appropriate soil weight shown in Table 3-3.

Table 3-3 Material Classification

Soil Type	Soil Description	Internal Angle of Friction of Soil, ϕ	Soil Total Unit Weight (pcf)	Coeff. of Friction, tan δ, Concrete to Soil	Interface Friction, Angle, Concrete to Soil δ
1	Very loose to loose silty sand and gravel Very loose to loose sand Very loose to medium density sandy silt Stiff to very stiff clay or clayey silt	29^o *	100	0.35	19^o
2	Medium density silty sand and gravel Medium density to dense sand Dense to very dense sandy silt	33^o	120	0.40	22^o
3	Dense to very dense silty sand and gravel Very dense sand	36^o	130	0.45	24^o
4	Granular underwater backfill Granular borrow	32^o	125	0.45	24^o
5	Gravel Borrow	36^o	135	0.50	27^o

* The value given for the internal angle of friction (ϕ) for stiff to very stiff silty clay or clayey silt should be used with caution due to the large possible variation with different moisture contents.

For Borings B-101 to B-107

Table 1 - Summary of Energy Measurements - 992 Bangor Road - Prospect, ME

Test Boring ID	Drill Rig	Type of Test Hammer Type	Hammer ID	Sample No.	Sample Depth top bottom	SPT Blows per 6"				Distance to bottom of sampler from center of instrumented rod (feet)	Rated Energy (ft.-lbs.)	Average Transferred Energy (ft.-lbs.)	Average Transfer Efficiency (%)	Average Hammer Blow Rate (blows/min.)	No. of Hammer Blows Recorded
Test Boring 3-27-2017	Mobil B53 Tracked Rig	SPT 140 lb. Automatic	Automatic Hammer #NEBC1	S1	10' 12'	6	8	11	12	14.3	350	253	72.2%	50.2	39
		SPT 140 lb. Automatic	Automatic Hammer #NEBC1	S2	12' 14'	18	17	23	23	16.3	350	274	78.3%	57.2	87
		SPT 140 lb. Automatic	Automatic Hammer #NEBC1	S3	15' 17'	6	12	14	13	19.3	350	249	71.2%	49.1	44
		SPT 140 lb. Automatic	Automatic Hammer #NEBC1	S4	17' 19'	11	14	23	23	21.3	350	264	75.5%	52.2	78
Test Boring 3-27-2017	Mobil B53 Rubber Tracked Rig	SPT 140 lb. Automatic	Automatic Hammer #NEBC2	S1	9' 11'	6	13	17	20	14.3	350	233	66.5%	59.1	56
		SPT 140 lb. Automatic	Automatic Hammer #NEBC2	S2	11' 13'	19	15	11	11	16.3	350	240	68.6%	59.6	66
		SPT 140 lb. Automatic	Automatic Hammer #NEBC2	S3	14' 16'	6	7	9	10	19.3	350	235	67.2%	60.0	32
		SPT 140 lb. Automatic	Automatic Hammer #NEBC2	S4	16' 18'	12	12	11	12	21.3	350	240	68.5%	60.4	49
Test Boring 3-27-2017	CME Trailer Rig	SPT 140 lb. Automatic	Automatic Hammer #MTB AH3	S1	10' 12'	6	8	12	15	14.3	350	238	68.0%	53.9	43
		SPT 140 lb. Automatic	Automatic Hammer #MTB AH3	S2	12' 14'	18	15	16	17	16.3	350	245	70.0%	54.7	68
		SPT 140 lb. Automatic	Automatic Hammer #MTB AH3	S3	14' 16'	10	11	10	12	16.3	350	247	70.5%	54.4	46
		SPT 140 lb. Automatic	Automatic Hammer #MTB AH3	S4	16' 18'	13	12	13	17	19.3	350	233	66.5%	54.4	58

Average efficency = 67.7%
correction = 67.7/60 = 1.13

For Borings B-127 and B-129

Table 1 - Summary of Energy Measurements - Newburgh, ME

Drill Rig	Test Date	Type of Test Hammer Type	Sample No.	Sample Depth (feet) top bottom	SPT Blows per 6"				N-Value (middle ft.)	Distance to bottom of sampler from center of instrumented rod (feet)	Rated Energy (ft.-kips)	Average Transferred Energy (ft.-kips.)	Average Transfer Efficiency (%)	Average Hammer Blow Rate (blows/min.)
Truck Mounted Mobile B-53 Rig No. B-24	7/3/2018	Mobile 140 lb. Automatic	S2	12 14	11	9	10	8	19	16.0	0.350	0.329	94.0	53.7
		Mobile 140 lb. Automatic	S3	14 16	8	7	7	11	14	19.0	0.350	0.331	94.6	51.9
		Mobile 140 lb. Automatic	S4	16 18	8	8	8	8	16	21.0	0.350	0.334	95.3	51.8
		Mobile 140 lb. Automatic	S5	18 20	13	12	12	8	24	23.0	0.350	0.323	92.3	51.7
		Mobile 140 lb. Automatic	S6	20 22	6	6	7	Ref.	13	25.0	0.350	0.325	92.9	51.7

Notes: (1) Driller Name: Brad Enos - New England Boring Contractors
(2) Averaged only for impacts during the middle one ft. of the test which relates to the observed N-Value.
(3) Ref. = Refusal

Average efficency = 93.8%
correction = 93.8/60 = 1.56

BEARING RESISTANCE

PROJECT NAME: **EXIT 103 ORT Conversion** **LRFD BEARING RESISTANCE**

Location: **ORT Gantry** **PLOTS**

Engineering Inputs:

Unit weight of soil, ϒ:					
Above footing (pcf)	125.0 pcf	125.0 pcf	125.0 pcf	125.0 pcf	125.0 pcf
Below footing (pcf)	125.0 pcf	125.0 pcf	125.0 pcf	125.0 pcf	125.0 pcf
Friction angle, ϕ	32	32	32	32	32
Groundwater depth, D_w	13.0 ft	13.0 ft	13.0 ft	13.0 ft	13.0 ft
Undrained shear strength	0.0 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf

Effective Footing Width	2.0 ft	4.0 ft	6.0 ft	8.0 ft	10.0 ft
Footing Depth	5 ft	5 ft	5 ft	5 ft	5 ft
Footing Length	10.0 ft	10.0 ft	10.0 ft	10.0 ft	10.0 ft
Bearing Strata	Dense sand	Dense sand	Dense sand	Dense sand	Dense sand
Strength Limit State Resistance Factor	0.45	0.45	0.45	0.45	0.45
Nominal Bearing Capacity, q_u	18.3 ksf	22.1 ksf	25.2 ksf	27.1 ksf	29.0 ksf
Strength Limit (includes ϕ=.45)	8.2 ksf	9.9 ksf	11.3 ksf	12.2 ksf	13.0 ksf
Service Limit for 0.5" settlement (includes ϕ=1.0)	7.3 ksf	4.7 ksf	3.7 ksf	3.2 ksf	2.8 ksf

Bearing Restance Based on Settlement, $q_o=(144*E_s*B_z*S_e)/[(1-v^2)*sqrt(A')]$

Ultimate bearing capacity, $q_u= c*N_{cm}+ϒ*D_f*N_{qm}*C_{wq}+.5*ϒ*B*N_{ϒm}*C_{wϒ}$

BEARING AND SETTLEMENT CALCULATION FACTORS					
Poisson's Ratio, v	0.3	0.3	0.3	0.3	0.3
Youngs Nodulus, E_s	4	4	4	4	4
Shape factor, B_z	1.24	1.13	1.09	1.09	1.08
N_{cm}	35.5	35.5	35.5	35.5	35.5
N_{qm}	23.2	23.2	23.2	23.2	23.2
C_{wq}	1.00	1.00	1.00	1.00	1.00
$N_{\gamma m}$	30.2	30.2	30.2	30.2	30.2
$C_{w\gamma}$	1	1	0.9	0.8	0.8

*Shape rigidity factor interpolated from Table 10.6.2.4.2-1 based on Length/Base ratio.

*Applied vertical stress, q_o, is the ultimate pressure transered from the footing in which all load factors equal 1 and includes the footing weight itself.

*Shape rigidity factor interpolated from Table 10.6.2.4.2-1 based on Length/Base ratio.

Table C10.4.6.3-1 Elastic Constants of Various Soils (Modified after U.S. Departement of the Navy, 1982; Bowles, 1988)

Soil Type	Typical Range of Youngs Modulus Values, Es (ksi)		Poisson's Ratio, v	
Clay:	**Lower**	**Upper**	**Lower**	**Upper**
Soft clay	-	-	0.40	0.50
Medium stiff	0.347	2.08	0.40	0.50
Stiff clay	2.08	6.94	0.40	0.50
Very stiff clay	6.94	13.89	0.40	0.50
Silt:	0.278	2.78	0.30	0.35
Fine Sand:				
Loose fine sand	1.11	1.67	0.25	0.25
Medium dense fine sand	1.67	2.78	0.25	0.25
Dense fine sand	2.78	4.17	0.25	0.25
Sand:				
Loose sand	1.39	4.17	0.20	0.36
Medium dense sand	4.17	6.94	0.20	0.36
Dense sand	6.94	11.11	0.30	0.40
Gravel:				
Loose gravel	4.17	11.11	0.20	0.35
Medium dense gravel	11.11	13.89	0.20	0.35
Dense gravel	13.89	27.78	0.30	0.40

Table 10.6.2.4.2-1 Elastic Shape and Rigidity Factors, EPRI (1983)

L/B	Flexable, B_z (avg.)	Rigid, B_z
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

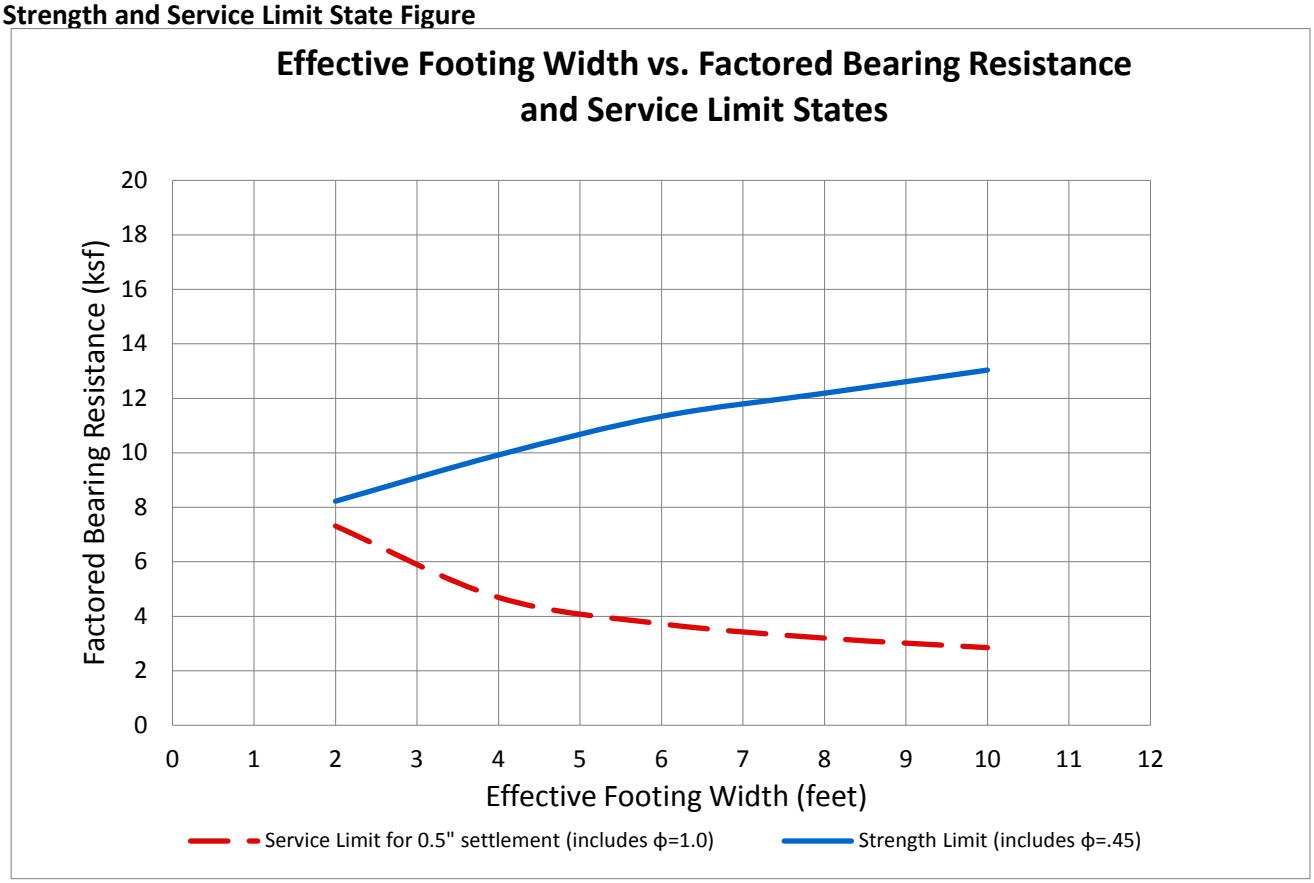
Table 10.6.3.1.2a-1 Bearing Capacity Factors N_c (Prandri, 1921), N_q (Reissner, 1924), and N_γ (Vesic,1975)

ϕ_f	N_c	N_q	N_γ
25	20.7	10.7	10.9
26	22.3	11.9	12.5
27	23.9	13.2	14.5
28	25.8	14.7	16.7
29	27.9	16.4	19.3
30	30.1	18.4	22.4
31	32.7	20.6	26.0
32	35.5	23.2	30.2
33	38.6	26.1	35.2
34	42.2	29.4	41.1
35	46.1	33.3	48.0
36	50.6	37.8	56.3
37	55.6	42.9	66.2
38	61.4	48.9	78.0
39	67.9	56.0	92.3
40	75.3	64.2	109.4

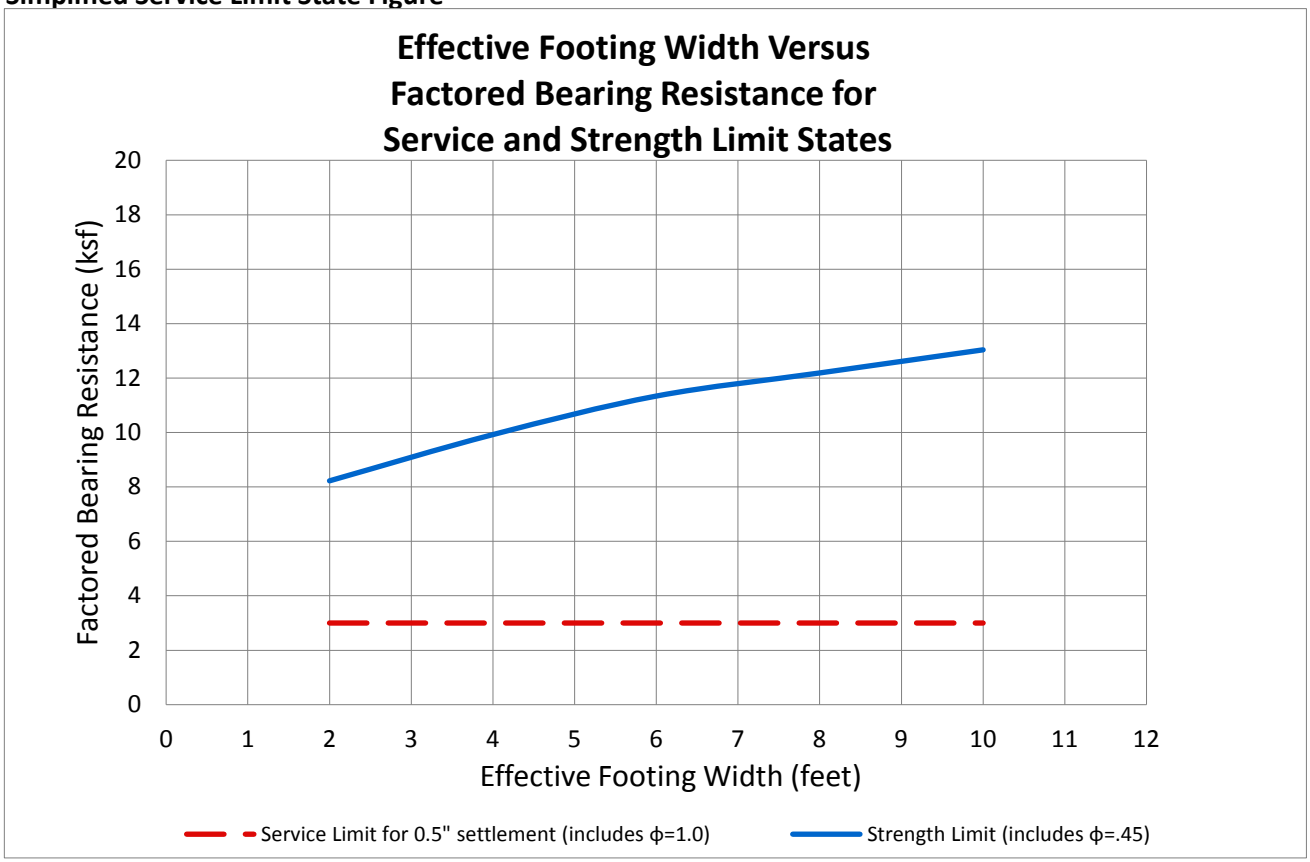
Table 10.6.3.1.2a-2 Coefficients C_{wq} and $D_{w\gamma}$ for Various Groundwater Depths

D_w	C_{wq}	$C_{w\gamma}$
0	0.5	0.5
D_f	1.0	0.5
$>1.5B+D_f$	1.0	1.0

Strength and Service Limit State Figure

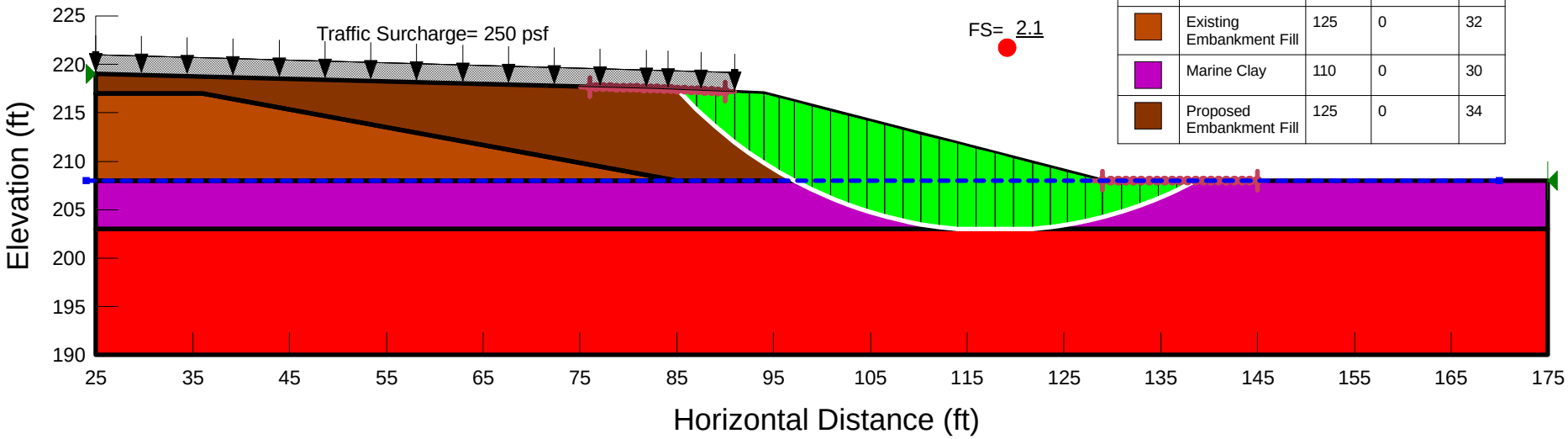


Simplified Service Limit State Figure



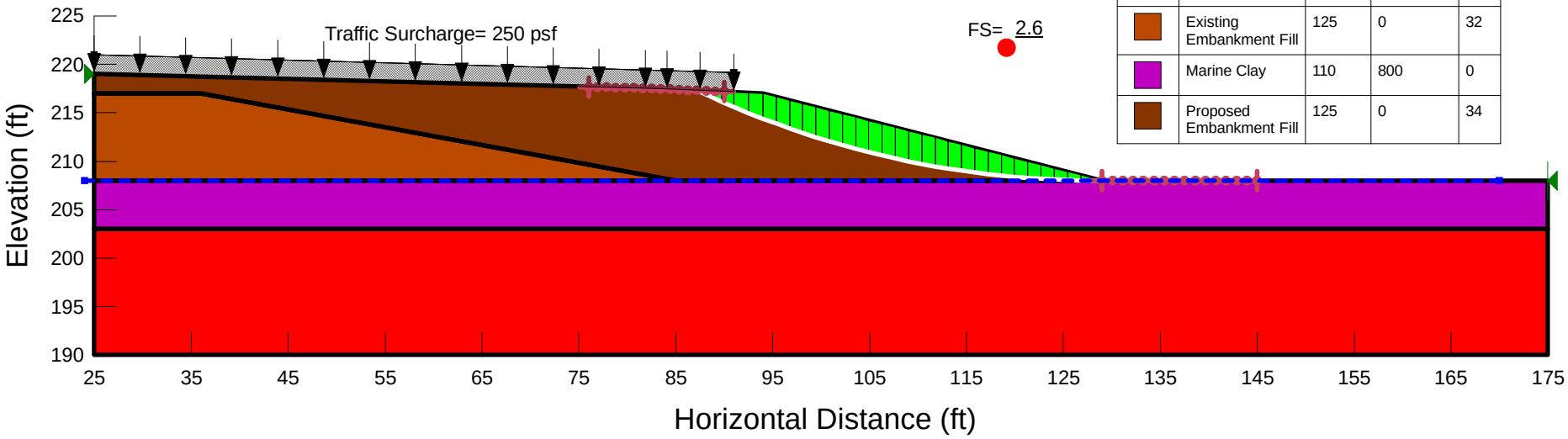
STABILITY ANALYSIS

MTA Gardiner, ME
I-295 NB
Station 7500+00
Slope Stability
Drained Condition



Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Bedrock			
	Existing Embankment Fill	125	0	32
	Marine Clay	110	0	30
	Proposed Embankment Fill	125	0	34

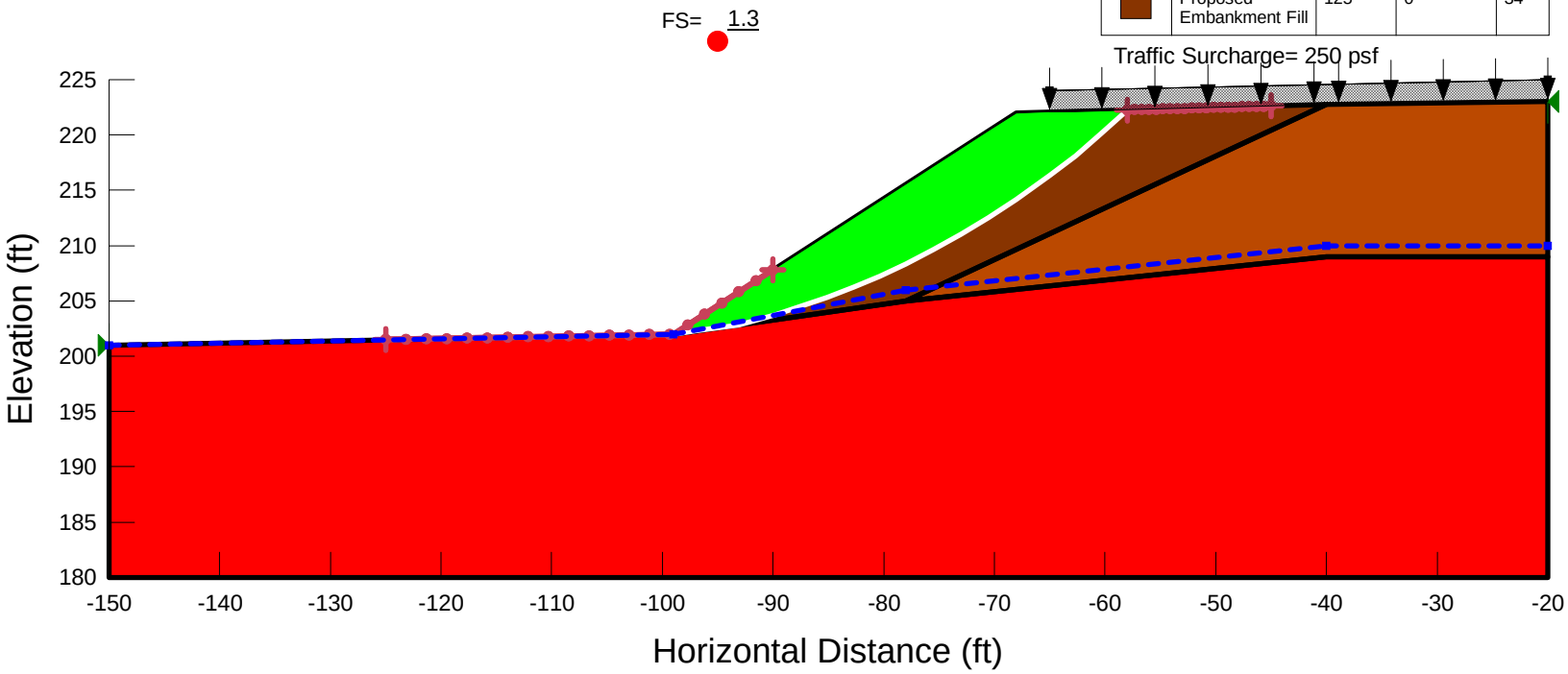
MTA Gardiner, ME
I-295 NB
Station 7500+00
Slope Stability
Undrained Condition



Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Bedrock			
	Existing Embankment Fill	125	0	32
	Marine Clay	110	800	0
	Proposed Embankment Fill	125	0	34

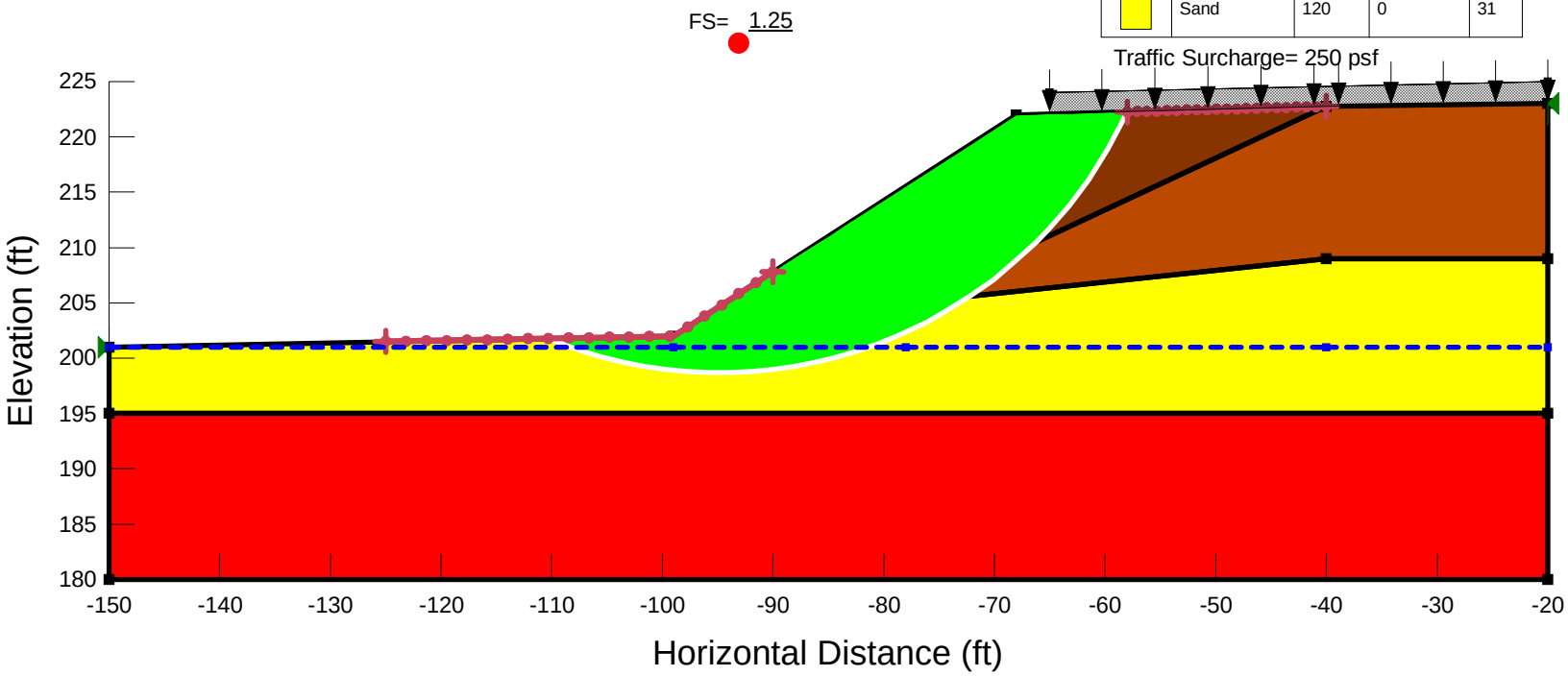
MTA Gardiner, ME
I-295 SB
Station 4505+50
Slope Stability

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Bedrock			
	Existing Embankment Fill	125	0	32
	Proposed Embankment Fill	125	0	34



MTA Gardiner, ME
I-295 SB
Station 4505+50
Slope Stability
Sand above bedrock is assumed to exist, and is conservative

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Bedrock			
	Existing Embankment Fill	125	0	32
	Proposed Embankment Fill	125	0	34
	Sand	120	0	31



SEISMIC DESIGN

PROJECT NAME: Exit 103 ORT Conversion
LOCATION: West Gardiner, Maine
TEST BORINGS USED FOR ANALYSIS:
B-101, B-102, B-103, B-104, B-105, B-107
Ground Elevation = 220

SEISMIC SITE CLASSIFICATION

Site Class = C

> 50 = C
15 to 50 = D
<15 = E

BORING NO: B-101

N-Value	Thickness (d) [feet]	d/N	
25	16	0.64	Proposed Fill
100	84	0.84	
Sum	100	1.48	
N' =	**67.6**		

BORING NO: B-102

N-Value	Thickness (d) [feet]	d/N	
25	12	0.48	Proposed Fill
6	2	0.33	
9	2	0.22	
62	2	0.03	
100	82	0.82	
Sum	100	1.89	
N' =	**53.0**		

BORING NO: B-103

N-Value	Thickness (d) [feet]	d/N	
25	12	0.48	Proposed Fill
9	2	0.22	
7	2	0.29	
3	2	0.67	
100	82	0.82	
Sum	100	2.47	
N' =	**40.4**		

BORING NO: B-104

N-Value	Thickness (d) [feet]	d/N	
25	5	0.20	Proposed Fill
8	2	0.25	
26	2	0.08	
9	2	0.22	
16	2	0.13	
100	87	0.87	
Sum	100	1.74	
N' =	**57.3**		

BORING NO: B-105

N-Value	Thickness (d) [feet]	d/N	
25	5	0.20	Proposed Fill
10	2	0.20	
15	2	0.13	
24	2	0.08	
17	2	0.12	
100	87	0.87	
Sum	100	1.60	
N' =	**62.3**		

BORING NO: B-106

N-Value	Thickness (d) [feet]	d/N	
25	12	0.48	Proposed Fill
6	2	0.33	
17	2	0.12	
16	2	0.13	
100	82	0.82	
Sum	100	1.88	
N' =	**53.3**		

BORING NO: B-107

N-Value	Thickness (d) [feet]	d/N	
25	12	0.48	Proposed Fill
7	2	0.29	
27	2	0.07	
35	2	0.06	
100	82	0.82	
Sum	100	1.72	
N' =	**58.2**		

USGS Design Maps Detailed Report

2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design (44.214°N, 69.824°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Article 3.4.1 — Design Spectra Based on General Procedure

Note: Maps in the 2009 AASHTO Specifications are provided by AASHTO for Site Class B. Adjustments for other Site Classes are made, as needed, in Article 3.4.2.3.

From Figure 3.4.1-2 [1]	PGA = 0.078 g
From Figure 3.4.1-3 [2]	S_S = 0.162 g
From Figure 3.4.1-4 [3]	S_1 = 0.045 g

Article 3.4.2.1 — Site Class Definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Article 3.4.2.

Table 3.4.2.1–1 Site Class Definitions

SITE CLASS	SOIL PROFILE NAME	Soil shear wave velocity, $\overline{v}_s$, (ft/s)	Standard penetration resistance, $\overline{N}$	Soil undrained shear strength, $\overline{s}_u$, (psf)
A	Hard rock	$\overline{v}_s > 5{,}000$	N/A	N/A
B	Rock	$2{,}500 < \overline{v}_s \leq 5{,}000$	N/A	N/A
C	Very dense soil and soft rock	$1{,}200 < \overline{v}_s \leq 2{,}500$	$\overline{N} > 50$	>2,000 psf
D	Stiff soil profile	$600 \leq \overline{v}_s < 1{,}200$	$15 \leq \overline{N} \leq 50$	1,000 to 2,000 psf
E	Stiff soil profile	$\overline{v}_s < 600$	$\overline{N} < 15$	<1,000 psf
E	—	Any profile with more than 10 ft of soil having the characteristics: 1. Plasticity index $PI > 20$, 2. Moisture content $w \geq 40\%$, and 3. Undrained shear strength $\overline{s}_u < 500$ psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays ($H > 10$ feet of peat and/or highly organic clay where H = thickness of soil) 3. Very high plasticity clays ($H > 25$ feet with plasticity index $PI > 75$) 4. Very thick soft/medium stiff clays ($H > 120$ feet)		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Article 3.4.2.3 — Site Coefficients

Table 3.4.2.3-1 (for F_{pga})—Values of F_{pga} as a Function of Site Class and Mapped Peak Ground Acceleration Coefficient

Site Class	Mapped Peak Ground Acceleration				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = C and PGA = 0.078 g, F_{PGA} = 1.200

Table 3.4.2.3-1 (for F_a)—Values of F_a as a Function of Site Class and Mapped Short-Period Spectral Acceleration Coefficient

Site Class	Spectral Response Acceleration Parameter at Short Periods				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 0.162 g, F_a = 1.200

Table 3.4.2.3-2—Values of F_v as a Function of Site Class and Mapped 1-sec Period Spectral Acceleration Coefficient

Site Class	Mapped Spectral Response Acceleration Coefficient at 1-sec Periods				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_1

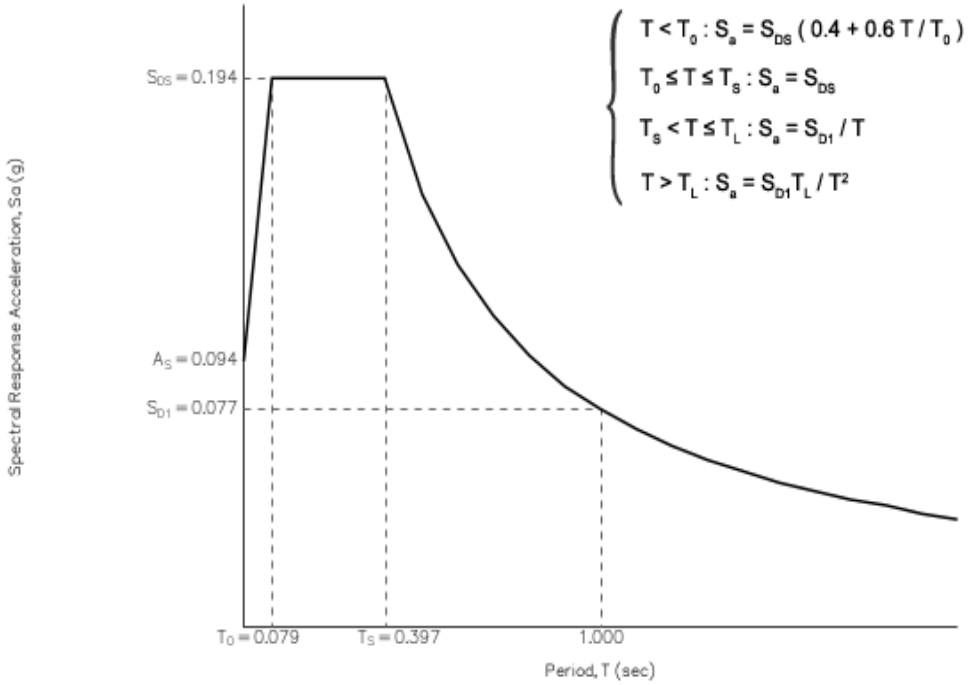
For Site Class = C and S_1 = 0.045 g, F_v = 1.700

Equation (3.4.1-1): $A_S = F_{PGA}\ PGA = 1.200 \times 0.078 = 0.094$ g

Equation (3.4.1-2): $S_{DS} = F_a\ S_S = 1.200 \times 0.162 = 0.194$ g

Equation (3.4.1-3): $S_{D1} = F_v\ S_1 = 1.700 \times 0.045 = 0.077$ g

Figure 3.4.1-1: Design Response Spectrum



Article 3.5 - Selection of Seismic Design Category (SDC)

Table 3.5-1—Partitions for Seismic Design Categories A, B, C, and D

VALUE OF S_{D1}	SDC
$S_{D1} < 0.15g$	A
$0.15g \le S_{D1} < 0.30g$	B
$0.30g \le S_{D1} < 0.50g$	C
$0.50g \le S_{D1}$	D

For Risk Category = I and S_{D1} = 0.077 g, Seismic Design Category = A

Seismic Design Category ≡ "the design category in accordance with Table 3.5-1" = A

References

1. *Figure 3.4.1-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-2.pdf
2. *Figure 3.4.1-3*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-3.pdf
3. *Figure 3.4.1-4*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-4.pdf

USGS Design Maps Detailed Report

2006/2009 International Building Code (44.214°N, 69.824°W)

Site Class C – "Very Dense Soil and Soft Rock", Occupancy Category I/II/III

Section 1613.5.1 — Mapped acceleration parameters

Note: Maps in the 2006 and 2009 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.5.3.

From Figure 1613.5(1) [1]	S_S = 0.293 g
From Figure 1613.5(2) [2]	S_1 = 0.077 g

Section 1613.5.2 — Site class definitions

SITE CLASS	SOIL PROFILE NAME	Soil shear wave velocity, $\overline{v}_s$, (ft/s)	Standard penetration resistance, $\overline{N}$	Soil undrained shear strength, $\overline{s}_u$, (psf)
A	Hard rock	$\overline{v}_S$ > 5,000	N/A	N/A
B	Rock	2,500 < $\overline{v}_S$ ≤ 5,000	N/A	N/A
C	Very dense soil and soft rock	1,200 < $\overline{v}_S$ ≤ 2,500	$\overline{N}$ > 50	>2,000 psf
D	Stiff soil profile	600 ≤ $\overline{v}_S$ < 1,200	15 ≤ $\overline{N}$ ≤ 50	1,000 to 2,000 psf
E	Stiff soil profile	$\overline{v}_S$ < 600	$\overline{N}$ < 15	<1,000 psf
E	—	Any profile with more than 10 ft of soil having the characteristics: 1. Plasticity index *PI* > 20, 2. Moisture content *w* ≥ 40%, and 3. Undrained shear strength $\overline{s}_u$ < 500 psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays (*H* > 10 feet of peat and/or highly organic clay where *H* = thickness of soil) 3. Very high plasticity clays (*H* > 25 feet with plasticity index *PI* > 75) 4. Very thick soft/medium stiff clays (*H* > 120 feet)		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 1613.5.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.5.3(1)
VALUES OF SITE COEFFICIENT F_a

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 0.293 g, F_a = 1.200

TABLE 1613.5.3(2)
VALUES OF SITE COEFFICIENT F_v

Site Class	Mapped Spectral Response Acceleration at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.077 g, F_v = 1.700

In the equations below, the equation number corresponding to the 2006 edition is listed first, and that corresponding to the 2009 edition is listed second.

Equation (16-37; 16-36): $S_{MS} = F_a S_S = 1.200 \times 0.293 = 0.352$ g

Equation (16-38; 16-37): $S_{M1} = F_v S_1 = 1.700 \times 0.077 = 0.130$ g

Section 1613.5.4 — Design spectral response acceleration parameters

Equation (16-39; 16-38): $S_{DS} = ⅔ S_{MS} = ⅔ \times 0.352 = 0.235$ g

Equation (16-40; 16-39): $S_{D1} = ⅔ S_{M1} = ⅔ \times 0.130 = 0.087$ g

Section 1613.5.6 — Determination of seismic design category

TABLE 1613.5.6(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD RESPONSE ACCELERATION

VALUE OF S_{DS}	OCCUPANCY CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Occupancy Category = I and S_{DS} = 0.235 g, Seismic Design Category = B

TABLE 1613.5.6(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	OCCUPANCY CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Occupancy Category = I and S_{D1} = 0.087 g, Seismic Design Category = B

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Occupancy Categories I, II, and III, and **F** for those in Occupancy Category IV, irrespective of the above.

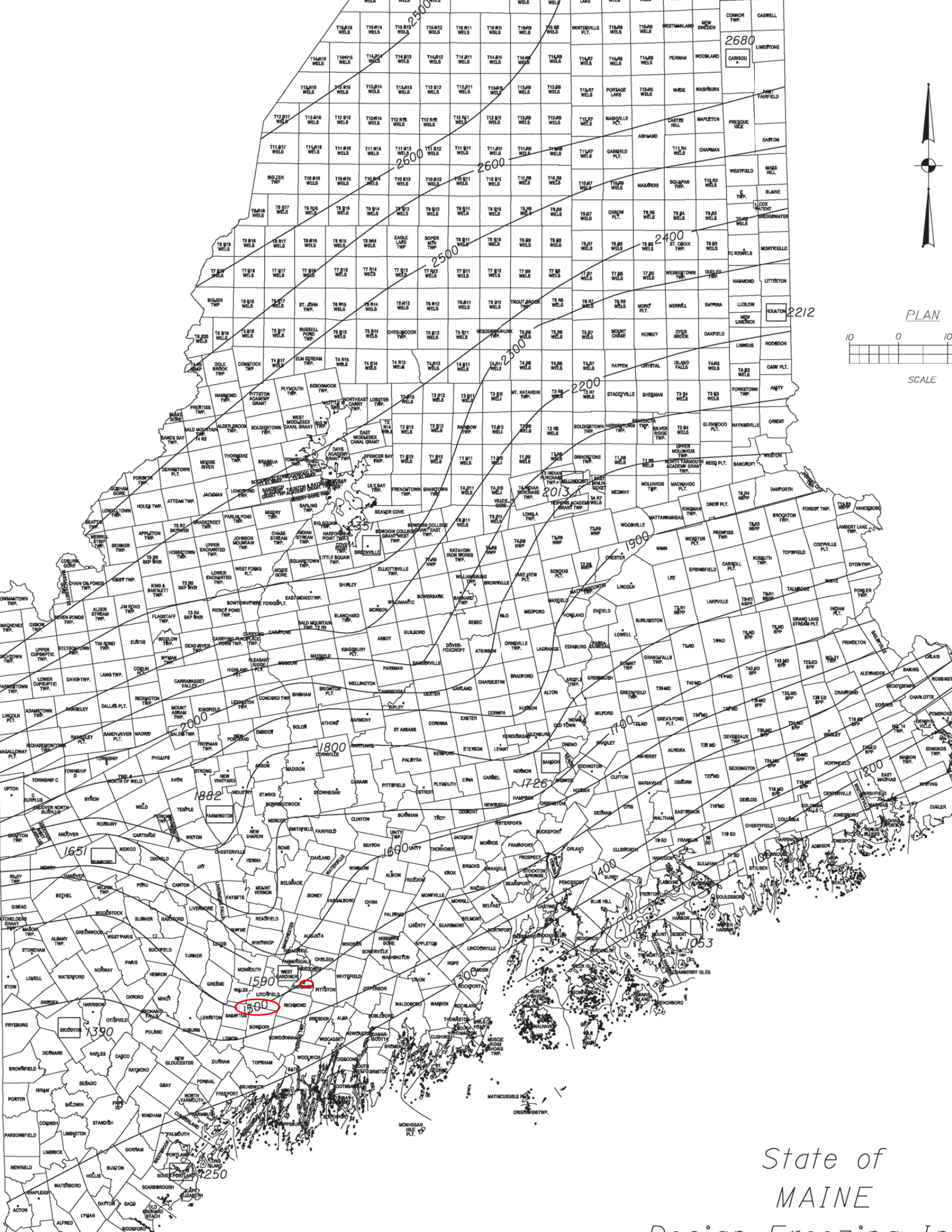
Seismic Design Category ≡ "the more severe design category in accordance with Table 1613.5.6(1) or 1613.5.6(2)" = B

Note: See Section 1613.5.6.1 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 1613.5(1)*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2006-Figure1613_5(01).pdf
2. *Figure 1613.5(2)*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2006-Figure1613_5(02).pdf

FROST PENETRATION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SCALE
State of
MAINE
Design Freezing In

5.2 General

5.2.1 Frost

Any foundation placed on seasonally frozen soils must be embedded below the depth of frost penetration to provide adequate frost protection and to minimize the potential for freeze/thaw movements. Fine-grained soils with low cohesion tend to be most frost susceptible. Soils containing a high percentage of particles smaller than the No. 200 sieve also tend to promote frost penetration.

In order to estimate the depth of frost penetration at a site, Table 5-1 has been developed using the Modified Berggren equation and Figure 5-1 Maine Design Freezing Index Map. The use of Table 5-1 assumes site specific, uniform soil conditions where the Geotechnical Designer has evaluated subsurface conditions. Coarse-grained soils are defined as soils with sand as the major constituent. Fine-grained soils are those having silt and/or clay as the major constituent. If the make-up of the soil is not easily discerned, consult the Geotechnical Designer for assistance. In the event that specific site soil conditions vary, the depth of frost penetration should be calculated by the Geotechnical Designer.

Table 5-1 Depth of Frost Penetration

Design Freezing Index	Frost Penetration (in)					
	Coarse Grained			Fine Grained		
	w=10%	w=20%	w=30%	w=10%	w=20%	w=30%
1000	66.3	55.0	47.5	47.1	40.7	36.9
1100	69.8	57.8	49.8	49.6	42.7	38.7
1200	73.1	60.4	52.0	51.9	44.7	40.5
1300	76.3	63.0	54.3	54.2	46.6	42.2
1400	79.2	65.5	56.4	56.3	48.5	43.9
1500	82.1	67.9	58.4	58.3	50.2	45.4
1600	84.8	70.2	60.3	60.2	51.9	46.9
1700	87.5	72.4	62.2	62.2	53.5	48.4
1800	90.1	74.5	64.0	64.0	55.1	49.8
1900	92.6	76.6	65.7	65.8	56.7	51.1
2000	95.1	78.7	67.5	67.6	58.2	52.5
2100	97.6	80.7	69.2	69.3	59.7	53.8
2200	100.0	82.6	70.8	71.0	61.1	55.1
2300	102.3	84.5	72.4	72.7	62.5	56.4
						57.6
						58.8
						60.0

Frost Penetration = 6.8 to 5.7 ft
Use 6 feet for design

OVERHEAD SIGN POST CALCULATIONS

Stantec

Purpose: Estimate soil engineering properties at the overhead sign structures

Correlation between N60 Values and Undrained Shear Strength

Consistency	Field Identification	Undrained Shear Strength, S_u (psf)	Standard Penetration Test Blowcount* (blows/ft)
Very soft	Easily penetrated several inches by fist	< 250	< 2
Soft	Easily penetrated several inches by thumb	250 - 500	2 - 4
Medium	Can be penetrated several inches by thumb with moderate effort	500 - 1000	4 - 8
Stiff	Readily indented by thumb but penetrated only with great effort	1000 - 2000	8 - 15
Very stiff	Readily indented by thumbnail	2000 - 4000	15 - 30
Hard	Indented with difficulty by thumbnail	> 4000	> 30

**The correlation between undrained strength and SPT blowcount is rather unreliable*

Reference: From Peck, et al. 1974

Designed by: T. Dykstra 7/27/18 Checked by:

Stantec

B-108

0-10' Stiff/v stiff clay

$N_{60} = 17, 11, 10, 7$
$N_{60ave} = 11$

from figure $S_u = 1150$ psf use $S_u = 800$ psf

10'-16' Sand

$N_{60} = 20$
$N_{60ave} = 20$

$\phi = 54 - 27e^{(-0.014 N_{60})} = 33^\circ$ use $\phi = 32^\circ$

Use design chart for Su = 800 psf

Designed by: B Foley 7/27/18 Checked by: Ty Dykstra

Stantec

B-117

0'-7' Existing granular fill

$N_{60} = 9, 12, 17$

$N_{60\,ave} = 13$

$\phi = 54 - 27.6\, e^{(-0.014\, N_{60})} = 31°$ use $\phi = 30°$

7'-20' Stiff / V. Stiff Clay

$N_{60} = 18, 13, 11$

$N_{60\,ave} = 14$

from figure $S_u = 1,400$ psf use 1,200 psf (highest MnDOT chart)

20'-25 Sand

$N_{60} = 67$ $N_{60\,ave} = 67$

$\phi = 54 - 27.6\, e^{(-0.014\, N)} = 43°$ use $\phi = 34°$

25' Bedrock

Use design chart for phi = 30 degrees

Designed by: T. Dykstra 7/27/18 Checked by: 7/27/2018

Stantec

B-118

0'-12' Existing granular fill

N_{60} = ~~33~~, 17, 11

$N_{60\ ave}$ = ~~20~~ 14

$\phi = 54 - 27.6\, e^{(-0.014\, N_{60})}$ = 31°

use ϕ = 30°

12'-30' Stiff/V. Stiff Clay

N_{60} = 14, 21, 22, 8, 10, 11

$N_{60\ ave}$ = 14

from figure S_u = 1,900 psf

use 1,200 psf (highest value in MEDOT charts)

30' Bedrock

Use design chart for phi = 30 degrees

Designed by: T. Dykstra 7/27/18

Checked by: 7/27/2018

Stantec

B-119

0'-8' Existing granular fill

$N_{60} = 58, 44$

$N_{60\,ave} = 51$

$\phi = 54 - 27.6\, e^{(-0.014\, N_{60})} = 40°$ use $\phi = 34°$

8'-10' Glacial Till

$\phi = 34°$ (conservative)

10' Bedrock

Use design chart for phi = 32 degrees

B-120

0'-10' Soft to Stiff clay

$N_{60} = 8, 4, 3, 2$

$N_{60\,ave} = 4$

From figure $S_u = 500$ psf use $S_u = 400$ psf

10'-12' Sand Deposit

Mostly in clay
Use design chart for Su = 400 psf

$N_{60\,ave} = N_{60} = 16$

$\phi = 54 - 27.6\, e^{(-0.014\, N)} = 32°$

12' Bedrock

Designed by: T. Dykstra 7/27/18 Checked by: 7/27/2018

Stantec

B-121

0'–7' Existing granular fill

N_{60} = 13, 28, 13 $N_{60\,ave}$ = 18

$\phi = 54 - 27.6\,e^{(-0.014\,N_{60})} = 32°$

7'–11' V. Stiff Clay

$N_{60} = N_{60\,ave} = 19$

From figure S_u = 2,500 psf Use S_u = 1,200 psf

11'–15' Sand Deposit

$N_{60} = N_{60\,ave} = 11$

$\phi = 54 - 27.6\,e^{(-0.014\,N_{60})} = 30°$ $\phi = 30°$

15'–27' Glacial Till

N_{60} = 27, 58

$N_{60\,ave}$ = 43

$\phi = 54 - 27.6\,e^{(-0.014\,N_{60})} = 39°$ Use $\phi = 34°$

Use design chart for phi = 30 degrees

Designed by: T. Rivera 7/27/18 Checked by: 7/27/2018

Stantec

B-122

0'-11' Stiff Clay

N_{60} = 10, 4, 2, 12, 11 $N_{60\ ave}$ = 8

From figure S_u = 1,000 psf use S_u = 800 psf

11'-16' Sand deposit

$N_{60} = N_{60\ ave}$ = 10

$\phi = 54 - 27.6\,e^{(-0.014\,N_{60})} = 30°$

16' Bedrock

Use design chart for Su = 800 psf

B-123

0'-4' Existing granular fill

N_{60} = 13, 25 $N_{60\ ave}$ = 19

$\phi = 54 - 27.6\,e^{(-0.014\,N_{60})} = 33°$ use $\phi = 32°$

4'-12' Stiff/V. Stiff Clay

N_{60} = 8, 19, 17, 12 $N_{60\ ave}$ = 14

from figure S_u = 1,400 psf use S_u = 1,200 psf

12'-19' Sand

$N_{60\ ave} = N_{60} = 12$ $\phi = 54 - 27.6^{(-0.014\,N_{60})} = 30°$ use $\phi = 36°$

19' Bedrock

Use design chart for Su = 1200 psf

Designed by: T. Dykstra 7/27/18 Checked by: 7/27/2018

Stantec

B-124

0'-6' Existing granular fill

$N_{60} = 10, 12, 6$

$N_{60\,ave} = 9$

$\phi = 54 - 27.6\, e^{(-0.014\, N_{60})} = 30^\circ$ use $\phi = 30^\circ$

6'-12' St.ff / V. stiff clay

$N_{60} = 18, 11, 8$

$N_{60\,ave} = 12$

from figure, $S_u = 1570$ psf use $S_u = 1200$ psf (highest MnDOT chart)

12'-20' Sand

$N_{60} = 23$

$N_{60\,avg} = 23$

$\phi = 54 - 27.6\, e^{(-0.014\, N_{60})} = 34^\circ$ use $\phi = 34^\circ$

20' Bedrock

Use design charts for phi = 30 degrees

Designed by: B. Foley 7/27/18 Checked by: Ty Dykstra

Stantec

B-125

0'-15' Stiff / v. stiff clay

$N_{60} = 16, 17, 16, 13, 10$

$N_{60\,avg} = 14$

from figure, $S_u = 1850$ psf use $S_u = 1200$ psf (highest MnDOT chart)

15'-21' Sand

$N_{60} = 8, 17$

$N_{60\,ave} = 12$

$\phi = 54 - 27e^{(-0.014 N_{60})} = 31°$ use $\phi = 30°$

21'-25' Till (cohesive)

$N_{60} = 32$

$N_{60\,ave} = 32$

from figure, $S_u = 4000$ psf use $S_u = 1200$ psf (highest MnDOT chart)

25' Bedrock

Use design charts for Su = 1,200 psf

Designed by: B. Foley 7/27/18 Checked by: Ty Dykstra

Stantec

B-126

0'-5.5' Existing granular fill

$N_{60} = 25, 16$

$N_{60\,ave} = 20$

$\phi = 54 - 27e^{(-0.014 N_{60})} = 33°$ use $\phi = 32°$

5.5' Bedrock

Use design charts for phi = 32 degrees
Very shallow bedrock, recommend footing

Designed by: B Foley 7/27/18 Checked by: Ty Dykstra

Stantec

B-127

0-8 Existing granular fill

N_{60} = ~~29, 11~~, 14, 16, 14, 12

$N_{60\,ave}$ = ~~16~~ 14

correcting for hammer type: $N_{60\,ave\,corrected}$ = 14 (1.3) = ~~21~~ 18 (for autohammer)

$\phi = 54 - 27e^{(-0.014 N_{60})} = 33°$ use $\phi = 32°$

18' - 23' Stiff clay

$N_{60} = 9, 8$

$N_{60\,ave} = 8.5$

correcting for hammer type: $N_{60\,ave\,corrected} = 8.5 (1.3) = 11$ (for autohammer)

from figure, $S_u = 1430$ psf use $S_u = 1200$ psf (highest MnDOT chart)

23' Bedrock

Use design charts for Su = 1,200 psf

Designed by: B Foley 7/27/18 Checked by: Ty Dykstra

Stantec

B-128

0'- 10 Existing granular fill

N_{60} = ~~17~~, 16, 15, 17, 42

$N_{60\,ave}$ = ~~21~~ 22

$\phi = 54 - 27e^{(-0.014 N_{60})} = 33°$ use $\phi = 32°$

20' Bedrock

Use design charts for phi = 32 degrees

Designed by: BBley 7/27/18 Checked by: Ty Dykstra

Stantec

B-129

0'-~~15~~ 5' Existing granular fill

N_{60} = ~~27~~, ~~13~~, 14, 9

N_{ave} = ~~15~~ 11

correcting for hammer type: $N_{60ave\ corrected}$ = ~~15~~ 11 (1.3) = ~~19~~ 14 (for autohammer)

$\phi = 54 - 27e^{(-0.014 N_{60})}$ = 32 use $\phi = 32°$

15'-36' Sand

N_{60} = 25, 55, 46, 53, 57

N_{60ave} = 47

correcting for hammer type: $N_{60ave\ corrected}$ = 47 (1.3) = 61 (for autohammer)

$\phi = 54 - 27e^{(-0.014 N_{60})}$ = 42° use $\phi = 34°$

Use design charts for phi = 32 degrees

Designed by: BFoley 7/27/18 Checked by: Ty Dykstra

Stantec

B-130

0' - 5' Existing cohesive fill

N_{60} = ~~3, 13, 10, 5, 5,~~ 13

$N_{60\,ave}$ = ~~8~~ 13

from figure, S_u = ~~1000~~ psf 1,700 use S_u = ~~800~~ psf 1,200

15' - 29' Sand

N_{60} = 24, 17

$N_{60\,ave}$ = 20

$\phi = 54 - 27e^{(-0.014 N_{60})} = 33°$ use $\phi = 32°$

Use design charts for Su = 1,200 psf

Designed by: B Foley 7/27/18 Checked by: Ty Dykstra

Stantec

B-131

0 - 17' medium stiff / stiff clay

N_{60} = 6, 2, 5, 8, 13, 13, 3
N_{60ave} = 7

from figure, S_u = ~~750~~ psf use S_u = ~~600~~ psf
875 800

17' - 25' very stiff clay

N_{60} = 25
N_{60ave} = 25

from figure, S_u = 3300 psf use S_u = 1200 psf
(highest MEDOT chart)

25' Bedrock

Use design charts for Su = 800 psf

Designed by: B. Foley 7/27/2018 Checked by: Ty Dykstra

Stantec

B-132

0'-17' Medium Stiff clay

N_{60} = 2, 3, 14, 15, 17, 4

$N_{60\,ave}$ = 9

from figure, S_u = 1140 psf, use S_u = 1000 psf

17'-22' Sand

N_{60} = 10

$N_{60\,ave}$ = 10

$\phi = 54 - 27e^{(-0.014 N_{60})} = 30°$ use $\phi = 30°$

22' Bedrock

Use design charts for Su = 800 psf

Designed by: B Foley 7/27/18 Checked by: Ty Dykstra