PORTLAND AREA WIDENING & SAFETY IMPROVEMENTS

Portland, Maine

Geotechnical Design Report

FEBRUARY 7, 2020

PREPARED FOR

The Maine Turnpike
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GEOTECHNICAL DESIGN REPORT
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PORTLAND, MAINE

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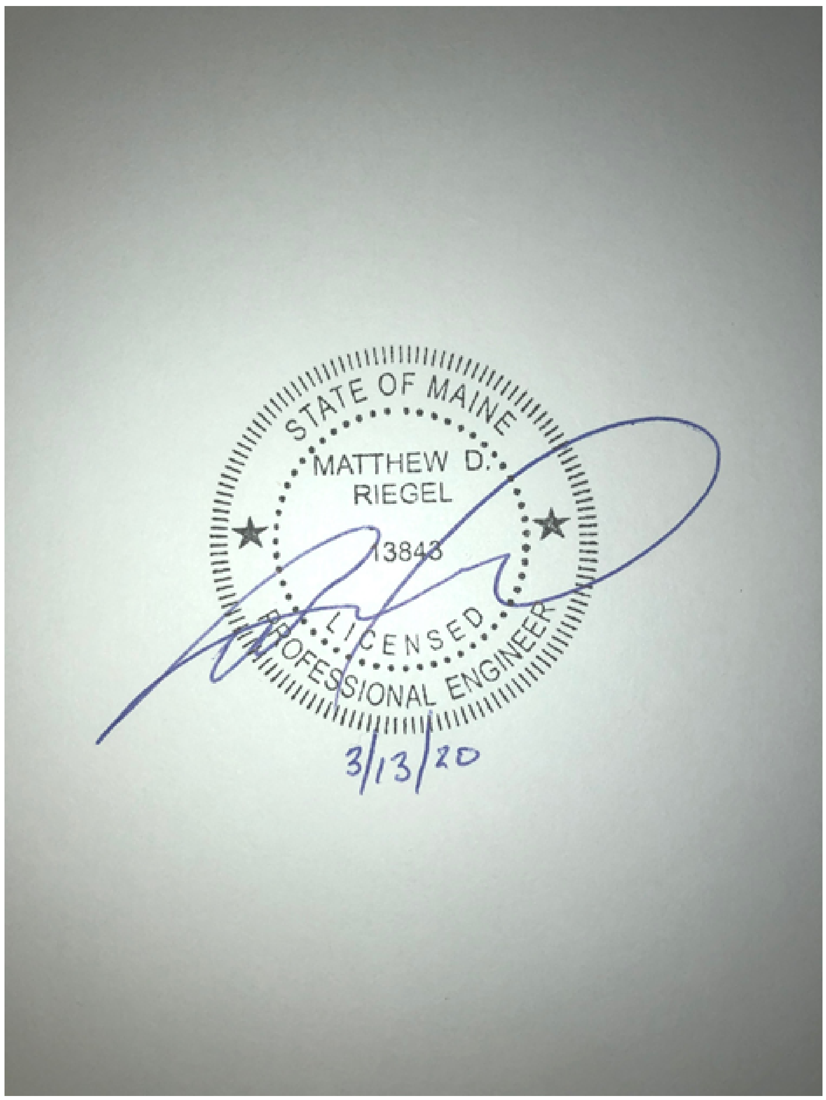
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1.0 PROJECT DESCRIPTION AND SCOPE

1.1 Introduction

HNTB Corporation has been retained by the Maine Turnpike Authority (MTA) to design and provide recommendations associated with the Portland Area Widening and Safety Improvements project in Portland, Maine (see **Figure 1** – Project Site Location Map). The following represents the results of the final geotechnical assessment prepared by HNTB for this project. The general limits for the project begin at Holmes Road approximately 0.5 miles south of Exit 44 and extends 5.6 miles north to the southern terminus of the Warren Avenue Bridge Replacement Project. The improvements consist of the addition of a third lane along the Northbound and Southbound barrels of the existing mainline, shoulder widening, median improvements, drainage improvements and stormwater best management practices. The project will be divided into two Contracts; Portland Area Widening and Safety Improvements 2020.03 (PAW1) and Portland Area Widening and Safety Improvements 2020.04 (PAW2). A single geotechnical report will be prepared for roadways, embankments and structures included in both Contracts.

The project scope requires extension of existing culverts, assessment of existing utilities and pavement performance, and subsequently design of each of the above-mentioned elements. The following components have been assessed through geotechnical analysis with results and recommendations included in this report:

- Embankment global stability
- Embankment settlement
- Settlement of existing utilities
- Utility vault foundations
- Structure foundation for the retaining walls at Red Brook and Long Creek culvert extension
- Sign structure foundations
- Conditions of existing pavement
- New pavement
- Rock excavation

1.2 Scope of Services

In completing this report, HNTB has performed the following scope of services:

- Reviewed available geotechnical data for the project site.
- Developed and implemented a subsurface investigation including a geotechnical boring, geophysical survey, and laboratory testing program.
- Analyzed the resulting data collected to identify subsurface conditions that impact the design and construction of the project.

- Prepared a geologic subsurface profile at locations where fill will be placed and analysis required.
- Established geotechnical engineering design parameters based on the available subsurface information.
- Conducted geotechnical analyses and provided recommendations and for the support of the proposed embankment and structures.
- Conducted assessment of existing pavement conditions and performed pavement analyses based on available traffic data.
- Provided pavement recommendations for the extent of the project.
- Assessed rock slope conditions and provided recommendations on the proposed rock slopes along the widening.

1.3 Proposed Improvements and Project Construction Contracts

The project begins approximately at Station 2121+50 with median reconstruction with barrier; the embankment widening starts approximately the Exit 44 NB off-ramp to I-295 at about Station 2190+50 and ends at the southern terminus of the Warren Avenue Bridge Replacement Project at Station 2427+50. The existing mainline runs N-S and consist of two 12-foot-wide lanes and a shoulder in each direction with a 26-foot-wide median between the two barrels. The proposed improvements consist of adding a new 12-foot-wide travel lane to the east and west of the mainline. In addition, multiple existing culverts will need to be extended and new wingwalls installed to accommodate the widening at some locations. Two sign structures will be constructed; one overhead and one post/frame. In addition, there are two existing utility vaults which will be extended as part of this contract. Single slope concrete pier protection barriers will be installed around all piers that are located inside the required roadway clear zone.

All the overpass and underpass bridges within the project limits were designed to accommodate the future widening and have been modified in support of the widening as standalone contracts.

At this time (2/7/20) this geotechnical report presents final conclusions for the widening and structures located within PAW1 limits and interim recommendations for widening and structures within PAW2 limits. This report will be amended to include the final recommendations for the widening within PAW2 limits as part of a future submission. Information pertaining to the proposed structures is provided in Table 1-1.

Table 1-1: Summary of Proposed Embankment Widening and Structures

Contract	Proposed Feature	Designation	Station Limits/Station
PAW1	Embankment/ Pavement	NB Mainline	2190+50 to 2294+00
		SB Mainline	2169+00 to 2292+00
	Culverts	Red Brook	2197+50+/-
		Long Creek	2272+69+/-
	Utilities	Portland Water District (PWD) - Water Line	2176+40
		PWD - Water Line	2210+00
		Ocean Properties – Sewer Line	2251+70
		Unitil Corporation (UC) - Gas Line	2274+75
		Dead River Properties (DRP) - Sewer Line	2237+50
	Sign Structures	Holmes Rd	2133+14
		Crosby Area	2266+50
	Earth Retaining Structures	SB Mainline and Gorham Road (Gorham Road)	2176+75 to 2177+85
		SB Mainline and I-295 (I-295)	2190+50 to 2192+92
		NB Mainline and I-295 (I-295)	2193+25 to 2196+00
		NB Mainline and Running Hill Road (Running Hill Road)	2250+04 to 2251+50
PAW2	Embankment/ Pavement	NB Mainline	2294+00 to 2425+50
		SB Mainline	2292+00 to 2427+50
	Utility Vaults	TBD	2340+02.81
		TBD	2360+00
	Culverts	TBD	TBD
	Utilities	TBD	TBD
	Sign Structures	Brighton Rd	TBD
	Earth Retaining Structures	TBD	TBD

* - Further information is provided in Section 6.5.5.
TBD – To Be Determined

1.4 Project Controls and Design Criteria

This Geotechnical Report has been prepared to accompany the 100% Design Submittal. The design and recommendations included herein are based upon and consistent with the drawings prepared for this submittal dated February 7, 2020.

All design for the Portland Area Widening and Safety Improvements project is in accordance with the AASHTO LRFD Bridge Design Specifications, 8th Edition (AASHTO). Additional design references are indicated within the report where applicable.

All elevations presented in this report are provided in feet and refer to the North American Vertical Datum of 1988 (NAVD 88). Horizontal coordinates are provided in feet and refer to the North American Datum of 1983 (NAD 83). Boring locations were field located with elevations estimated based on topographic survey data.

2.0 Geology And Site Conditions

2.1 Site Geology

The project is located within the Portland West 7.5-minute quadrangle in the coastal lowland of southwestern Maine. The region has been subjected to recent glaciation within the last 25,000 years (late Wisconsin glaciation) resulting in a physiographic surficial geology primarily composed of unconsolidated sediments such as sand and gravel of glacial origin. The bedrock geology of the southwestern part of the physiographic region is underlain by metamorphic rock formations of the Casco Bay Group which are characteristically composed of fine grained, thinly laminated gneiss, schist, marble and quartzite with north-northeast trending upright folds.

Existing geologic mapping utilized for this assessment includes bedrock and surficial geology mapping prepared by the Maine Geological Survey (MGS) for the Portland West quadrangle. Excerpts from the surficial and bedrock geology mapping are included in **Figure 2** and **Figure 3**, respectively.

According to the "Surficial Geology, Portland West Quadrangle, Maine, published by the Maine Geological Survey most of the alignment is underlain by the Presumpscot Formation which is comprised of silt, clay and minor sand deposited on the sea floor during the late-glacial marine submergence.

The surficial geology map indicates that the Southbound lane, from Station 2254+10 to 2260+00 and Northbound lane from station 2305+50 to 2314+00, is underlain by till. This material is composed of dense sand, silt and gravel size rock debris deposited directly from glacial ice.

Areas along the mainline from south end of the project to about station 2175+00, from Station 2317+50 to 2322+00, and from Station 2363+00 to 2380+50 are underlain by urban fill associated with the roadway construction.

3.0 Subsurface Explorations

3.1 General

A multiphase subsurface investigation was developed by HNTB and executed by

Schonewald Engineering Associates, Inc (SEA) of Cumberland Maine, under the direction of HNTB, which included 37 borings, and 11 pavement cores. The borings are identified as HB-PAMI-101 through HB-PAMI-127, HB-PAMI-201 through HB-PAMI-205, HB-PAMI-301, HB-PAMI-401, HB-VMS-101 to HB-VMS-103 and HB-VMS-201 to HB-VMS-202. The pavement cores are identified as HB-PCORE-101 to HB-PCORE-105, HB-CORE-201, HB-CORE-202 and, HB-PAVE-101 to HB-PAVE-105. The HB-PAVE series were performed in 2017 and the remainder of the borings were performed throughout 2019.The HB-PAVE borings were advanced using hollow stem augers from a Mobile drill rig. The remainder of the borings were advanced using cased wash boring methods from a Mobile drill rig using 4.0 inch (HW-size) and 3.0 inch (NW-size) inside diameter steel casing. Standard Penetration Testing (SPT) was performed in general accordance with ASTM D1586 by driving a 1-3/8-inch ID split spoon sampler with a 140-lb hammer dropped 30 inches to obtain samples continuously or at approximately 5-foot intervals.

Each sample was removed from the sampler in the field, examined, and classified. The number of hammer blows required to advance the sampler through each six-inch interval was recorded and is provided on each boring log. The SPT N-value is defined as the total number of blows required to advance the sampler through the second and third six-inch interval of any given 24-inch sampling interval. All SPT N-values discussed in this report have been corrected to account for hammer efficiency and overburden stress ($N1_{60}$). The subsurface investigation plan depicting the location of the borings and the pavement cores is included in **Appendix A**.

In-situ vane shear testing was completed in accordance with the requirements detailed in ASTM D 2573 and are outlined below. In situ vane shear testing involves using a four-bladed vane of specified dimensions in undisturbed soil to determine the torque required to shear a cylindrical surface to evaluate undrained shear strengths (Su) and remolded shear strengths (Sr) in soft to stiff clays (FHWA-NHI-16-072 G.E.C. No. 5). The vane is advanced into the test soil and the blade is rotated at a maximum rate of six degrees per minute until failure of the soil occurs while the resulting torque measurement is recorded. This first test is used to approximate the undrained shear strength of the soil. Following the initial test, the remolded strength of the soil is measured after 10 rapid turns of the vane (FHWA-INHI-16-072 G.E.C. No. 5).

3.2 Geotechnical Subsurface Exploration

A summary of the borings indicating associated design feature, boring locations and depths of exploration are included in **Table 3-1**. All the pavement cores were sampled for several feet below the pavement box and as such they were also utilized for the interpretation of the subsurface conditions. HB-PAMI-200 series borings were performed to assess the depth of bedrock within the Crosby area where pavement distress has been observed over time. In order to assess the pavement conditions within this area, the HBPAVE and PCORE series pavement cores/borings were performed. Section 7 of this report provides the limits and a detailed description of the Crosby Area conditions and recommendations. In-situ vane shear testing results are reported in **Table 3-2**.

Table 3-1: Summary of Subsurface Exploration

Design Feature	Boring No.	Approximate Station	Offset (feet)	Ground Elevation (feet)	Depth of Boring (feet)	Bottom of Exploration Elevation (feet)
Embankment	HB-PAMI-101	2172+50	65L	50	21.0	29.0
Red Brook Culvert	HB-PAMI-102	2196+75	60L	65	50.5	14.5
	HB-PAMI-103	2198+50	75R	62	49.7	12.3
Embankment	HB-PAMI-104	2216+10	65R	63	21.0	42.0
	HB-PAMI-105	2236+45	95R	58	21.0	37.0
	HB-PAMI-106	2243+05	65R	61	24.2	36.8
	HB-PAMI-107	2256+35	90R	63	25.7	37.3
	HB-PAMI-108	2266+25	65R	58	21.0	37.0
Long Creek Culvert	HB-PAMI-109	2270+90	95L	54	18.5	35.5
	HB-PAMI-109B	2272+90	55L	54	25.5	28.5
	HB-PAMI-110	2272+95	75R	45	19.0	26.0
Embankment	HB-PAMI-111	2278+15	120R	64	16.0	48.0
	HB-PAMI-112	2288+65	105R	72	12.1	59.9
	HB-PAMI-113	2307+70	70R	82	4.5	77.5
	HB-PAMI-114	2323+00	90R	36	61.0	-25.0
	HB-PAMI-115	2327+20	90R	50	26.0	24.0
Utility Vault	HB-PAMI-116	2340+80	80R	59	70.6	-11.6
	HB-PAMI-117	2340+00	95L	67	90.0	-23.0
Utility Vault	HB-PAMI-118	2359+20	70L	61	47.3	13.7
	HB-PAMI-119	2360+50	100R	60	43.1	16.9
Embankment	HB-PAMI-120	2369+05	95L	59	36.0	23.0
	HB-PAMI-121	2371+70	100R	60	56.0	4.0
	HB-PAMI-122	2371+80	100L	62	51.0	11.0
	HB-PAMI-123	2375+05	110L	71	63.0	8.0
	HB-PAMI-124	2283+00	95R	107	14.5	92.5
	HB-PAMI-125	2402+05	75R	74	21.0	53.0
	HB-PAMI-126	2408+30	95R	72	26.0	46.0
	HB-PAMI-127	2420+80	100R	54	104	50.0
Pavement	HB-PAMI-201	2258+57	1.3R	69.5	10.0	59.5
	HB-PAMI-202	2259+57	0.9R	68.5	7.7	60.8
	HB-PAMI-203	2260+56	1.1R	67.5	7.4	60.1
	HB-PAMI-204	2261+58	0.8R	66.5	9.0	57.5
	HB-PAMI-205	2262+57	1.4R	65.0	10	55.0
DRP Sewer Line	HB-PAMI-301	2238+30	69L	60.5	32	28.5
UC Gas Line	HB-PAMI-401	2275+44	93L	50	15.8	34.2

Design Feature	Boring No.	Approximate Station	Offset (feet)	Ground Elevation (feet)	Depth of Boring (feet)	Bottom of Exploration Elevation (feet)
Sign Structures	HB-VMS-101	2123+03	78.8R	52.8	111.2	-59.2
	HB-VMS-102	2121+11	9.4L	56	113.6	-57.6
	HB-VMS-103	2125+10	0	52.5	125.4	-72.9
	HB-VMS-201	2133+14	112.9L	44.5	93.0	-48.5
	HB-VMS-202	2392+00	97L	86.5	20.2	66.3
Pavement	HB-PCORE-101	2253+25	2.4R	69.5	5.2	64.3
	HB-PCORE-102	2255+30	2.4R	70.0	5.2	64.8
	HB-PCORE-103	2261+65	2.2R	66.5	5.2	61.3
	HB-PCORE-104	2263+05	2.7R	64.5	5.2	59.3
	HB-PCORE-105	2265+80	2.8R	60.5	5.1	55.4
	HB-PCORE-201	2250+22	2.1R	68	5.0	63.0
	HB-PCORE-202	2250+90	1.8R	68	4.9	63.1
	HB-PAVE-101	2266+50	9.8L	59.5	13.4	46.1
	HB-PAVE-102	2264+50	9.1L	62	12	50
	HB-PAVE-103	2260+00	7.4L	68	5.2	62.8
	HB-PAVE-103A	2260+00	3.0R	68.5	4.8	63.7
	HB-PAVE-104	2252+85	9.0L	68	14.0	54.0
	HB-PAVE-105	2248+75	9.6L	67	16.0	51.0

Note: All borings are used for embankment design in addition to the structures noted.
Subsurface condition as shown in Figure 4 is used for the earth retaining structures and PWD water line.

Table 3-2: Summary of In-Situ Vane Shear Tests

Boring No.	Test No.	Test Depth (feet)	Test Elevation (feet)	Undrained Shear Strength (psf)	Remolded Shear Strength (psf)
HB-PAMI-102	V1	19.8	45.2	426	55
HB-PAMI-102	V2	20.8	44.2	371	55
HB-PAMI-102	V3	24.8	40.2	508	55
HB-PAMI-102	V4	25.8	39.2	385	27
HB-PAMI-102	V5	29.8	35.2	398	14
HB-PAMI-102	V6	30.8	34.2	330	0
HB-PAMI-102	V7	34.8	30.2	398	14
HB-PAMI-102	V8	35.8	29.2	357	0
HB-PAMI-102	V9	39.8	25.2	536	27
HB-PAMI-102	V10	40.8	24.2	398	0

Boring No.	Test No.	Test Depth (feet)	Test Elevation (feet)	Undrained Shear Strength (psf)	Remolded Shear Strength (psf)
HB-PAMI-103	V1	19.8	42.2	316	27
HB-PAMI-103	V2	20.8	41.2	302	27
HB-PAMI-103	V3	29.3	32.7	343	14
HB-PAMI-103	V4	30.3	31.7	385	27
HB-PAMI-106	V1	19.8	41.2	1016	137
HB-PAMI-106	V2	20.8	40.2	920	137
HB-PAMI-107	V1	19.8	43.2	549	69
HB-PAMI-107	V2	20.8	42.2	467	27
HB-PAMI-108	V1	14.8	43.2	659	110
HB-PAMI-108	V2	15.8	42.2	591	82
HB-PAMI-108	V3	19.8	38.2	412	41
HB-PAMI-108	V4	20.8	37.2	577	55
HB-PAMI-114	V1	19.8	16.2	618	82
HB-PAMI-114	V2	20.8	15.2	494	55
HB-PAMI-114	V3	26.8	9.2	398	27
HB-PAMI-114	V4	27.8	8.2	453	0
HB-PAMI-114	V5	29.8	6.2	494	0
HB-PAMI-114	V6	30.8	5.2	440	0
HB-PAMI-114	V7	34.8	1.2	481	14
HB-PAMI-114	V8	35.8	0.2	536	14
HB-PAMI-114	V9	44.8	-8.8	673	0
HB-PAMI-114	V10	45.8	-9.8	522	0
HB-PAMI-114	V11	49.8	-13.8	591	0
HB-PAMI-114	V12	50.8	-14.8	742	0
HB-PAMI-114	V13	54.8	-18.8	838	0
HB-PAMI-117	V1	19.8	47.2	385	27
HB-PAMI-117	V2	20.8	46.2	302	14
HB-PAMI-117	V3	24.8	42.2	357	0
HB-PAMI-117	V4	25.8	41.2	275	0
HB-PAMI-117	V5	34.8	32.2	357	0
HB-PAMI-117	V6	35.8	31.2	343	0
HB-PAMI-118	V1	16.8	44.2	467	55
HB-PAMI-118	V2	17.8	43.2	412	27
HB-PAMI-118	V3	24.8	36.2	316	14
HB-PAMI-118	V4	25.8	35.2	302	0
HB-PAMI-118	V5	29.8	31.2	302	14

Boring No.	Test No.	Test Depth (feet)	Test Elevation (feet)	Undrained Shear Strength (psf)	Remolded Shear Strength (psf)
HB-PAMI-118	V6	30.8	30.2	275	0
HB-PAMI-119	V1	14.8	45.2	563	55
HB-PAMI-119	V2	15.8	44.2	522	27
HB-PAMI-119	V3	19.8	40.2	426	14
HB-PAMI-119	V4	20.8	39.2	371	14
HB-PAMI-120	V1	14.8	44.2	742	124
HB-PAMI-120	V2	15.8	43.2	632	96
HB-PAMI-120	V3	19.8	39.2	467	41
HB-PAMI-120	V4	20.8	38.2	385	14
HB-PAMI-121	V1	21.8	38.2	659	69
HB-PAMI-121	V2	22.8	37.2	563	55
HB-PAMI-121	V3	24.8	35.2	426	41
HB-PAMI-121	V4	25.8	34.2	440	27
HB-PAMI-121	V5	29.8	30.2	522	27
HB-PAMI-121	V6	30.8	29.2	591	55
HB-PAMI-121	V7	36.8	23.2	467	55
HB-PAMI-121	V8	37.8	22.2	467	55
HB-PAMI-121	V9	39.8	20.2	508	69
HB-PAMI-121	V10	40.8	19.2	467	69
HB-PAMI-121	V11	44.8	15.2	989	-
HB-PAMI-122	V1	24.8	37.2	563	55
HB-PAMI-122	V2	25.8	36.2	494	41
HB-PAMI-122	V3	29.8	32.2	494	27
HB-PAMI-122	V4	30.8	31.2	536	27
HB-PAMI-122	V5	37.8	24.2	440	55
HB-PAMI-122	V6	38.8	23.2	494	55
HB-PAMI-122	V7	44.8	17.2	659	137
HB-PAMI-123	V1	24.8	46.2	426	41
HB-PAMI-123	V2	25.8	45.2	371	41
HB-PAMI-123	V3	31.8	39.2	357	14
HB-PAMI-123	V4	32.8	38.2	385	14
HB-PAMI-123	V5	34.8	36.2	536	14
HB-PAMI-123	V6	35.8	35.2	440	14
HB-PAMI-123	V7	41.8	29.2	412	41
HB-PAMI-123	V8	42.8	28.2	343	41

Boring No.	Test No.	Test Depth (feet)	Test Elevation (feet)	Undrained Shear Strength (psf)	Remolded Shear Strength (psf)
HB-PAMI-123	V9	46.8	24.2	494	55
HB-PAMI-123	V10	47.8	23.2	440	69
HB-PAMI-123	V11	51.8	19.2	494	82
HB-PAMI-126	V1	14.8	57.2	343	27
HB-PAMI-126	V2	15.8	56.2	357	14
HB-PAMI-126	V3	19.8	52.2	302	27
HB-PAMI-126	V4	20.8	51.2	302	27
HB-PAMI-126	V5	24.8	47.2	275	14
HB-PAMI-126	V6	25.8	46.2	275	14
HB-PAMI-127	V1	9.8	44.2	302	14
HB-PAMI-127	V2	10.8	43.2	233	0
HB-PAMI-127	V3	19.8	34.2	206	0
HB-PAMI-127	V4	20.8	33.2	233	0
HB-PAMI-127	V5	24.8	29.2	206	14
HB-PAMI-127	V6	25.8	28.2	233	0
HB-PAMI-127	V7	34.8	19.2	343	0
HB-PAMI-127	V8	35.8	18.2	343	0
HB-VMS-101	V1	35.8	21.2	522	14
HB-VMS-101	V2	36.8	20.2	508	0
HB-VMS-101	V3	40.8	16.2	508	14
HB-VMS-101	V4	41.8	15.2	398	0
HB-VMS-101	V5	45.8	11.2	494	14
HB-VMS-101	V6	46.8	10.2	440	0
HB-VMS-101	V7	50.8	6.2	494	27
HB-VMS-101	V8	51.8	5.2	481	27
HB-VMS-101	V9	55.8	1.2	536	0
HB-VMS-101	V10	56.8	0.2	549	0
HB-VMS-101	V11	60.8	-3.8	604	14
HB-VMS-101	V12	70.8	-13.8	865	0
HB-VMS-101	V13	71.8	-14.8	742	0
HB-VMS-102	V1	30.8	25.2	742	27
HB-VMS-102	V2	31.8	24.2	563	27
HB-VMS-102	V3	35.8	20.2	494	14
HB-VMS-102	V4	36.8	19.2	481	0
HB-VMS-102	V5	40.8	15.2	398	0
HB-VMS-102	V6	41.8	14.2	426	14

Boring No.	Test No.	Test Depth (feet)	Test Elevation (feet)	Undrained Shear Strength (psf)	Remolded Shear Strength (psf)
HB-VMS-102	V7	45.8	10.2	444	14
HB-VMS-102	V8	46.8	9.2	426	14
HB-VMS-102	V9	50.8	5.2	536	14
HB-VMS-102	V10	51.8	4.2	536	14
HB-VMS-102	V11	60.8	-4.8	604	27
HB-VMS-102	V12	61.8	-5.8	549	0
HB-VMS-103	V1	20.8	31.7	357	27
HB-VMS-103	V2	21.8	30.7	453	14
HB-VMS-103	V3	25.8	26.7	536	41
HB-VMS-103	V4	30.8	21.7	481	14
HB-VMS-103	V5	31.8	20.7	481	14
HB-VMS-103	V6	35.8	16.7	412	27
HB-VMS-103	V7	40.8	11.7	426	14
HB-VMS-103	V8	41.8	10.7	426	14
HB-VMS-103	V9	45.8	6.7	440	27
HB-VMS-103	V10	46.8	5.7	398	14
HB-VMS-103	V11	65.8	-13.3	549	27
HB-VMS-103	V12	66.8	-14.3	591	0
HB-VMS-103	V13	70.8	-18.3	604	14
HB-VMS-103	V14	71.8	-19.3	618	14
HB-VMS-103	V15	75.8	-23.3	659	0
HB-VMS-103	V16	76.8	-24.3	646	0
HB-VMS-103	V17	80.8	-28.3	879	27
HB-VMS-103	V18	81.8	-29.3	646	0
HB-VMS-201	V1	15.8	28.7	522	14
HB-VMS-201	V2	16.8	27.7	536	27
HB-VMS-201	V3	20.8	23.7	426	14
HB-VMS-201	V4	21.8	22.7	508	14
HB-VMS-201	V5	25.8	18.7	618	27
HB-VMS-201	V6	30.8	13.7	522	0
HB-VMS-201	V7	31.8	12.7	618	0
HB-VMS-201	V8	35.8	8.7	385	0
HB-VMS-201	V9	36.8	7.7	467	0
HB-VMS-201	V10	40.8	3.7	398	14
HB-VMS-201	V11	41.8	2.7	522	0
HB-VMS-201	V12	45.8	-1.3	453	0

Boring No.	Test No.	Test Depth (feet)	Test Elevation (feet)	Undrained Shear Strength (psf)	Remolded Shear Strength (psf)
HB-VMS-201	V13	46.8	-2.3	481	0
HB-VMS-201	V14	50.8	-6.3	522	14
HB-VMS-201	V15	51.8	-7.3	536	0

Boring HB-PAMI-301 and laboratory test results associated with this boring are not included in this report. See section 6.5.4 for further information.

3.3 Geophysical Investigation

To delineate the anticipated bedrock surface in areas where rock excavation is anticipated and where shallow rock is expected to impact pavement performance HNTB developed a geophysical survey program using Ground Penetrating Radar (GPR) methods to delineate rock surface in critical areas of the site. GPR uses a high frequency electromagnetic pulse, transmitted from a radar antenna to probe the near surface ground conditions. The transmitted radar signals are reflected from subsurface interfaces of materials with contrasting electrical properties. Travel times of the radar signal can be converted to approximate depth below the surface by correlation with targets of known depths and by a curve matching routine.

Hager-Richter Geoscience, Inc of Salem, New Hampshire, under the direction of HNTB, performed the geophysical survey along three areas within the extent of PAW1 and PAW2. GPR data were acquired along traverses oriented parallel to the travel lanes. GPR traverses located in the highway shoulder were spaced a few feet apart and the GPR traverses located in the outer portions of the right of way were spaced 10-20 feet apart.

Due to the limited accessibility, the GPR survey was performed along the shoulder and outside of the current roadway within the proposed widening footprint. A copy of the report prepared by Hager-Richter is included in **Appendix B**. The surveyed areas encompassed are presented in **Table 3-3**.

Table 3-3: Geophysical Investigation Survey Areas

Limits of Survey	Bound
2406+50 to 2381+00	South
2378+50 to 2402+50	North
2301+00 to 2313+00	South
2301+00 to 2316+00	North

Limits of Survey	Bound
2245+00 to 2270+50	South
2252+00 to 2268+50	North

4.0 LABORATORY TEST RESULTS

Upon completion of the subsurface investigation program, a laboratory testing program was performed to verify the visual-manual field classifications and to aid in determination of the engineering soil and rock properties. Laboratory soil testing was performed by R.W. Gillespie & Associates, Inc. of Saco, Maine.

Laboratory soil testing consisted of grain size analyses, percent passing #200, Atterberg limit tests with natural moisture content and consolidation testing.

A summary of the laboratory tests to determine index properties are presented in the following sections. The complete laboratory results are presented in **Appendix A**. The soil testing was performed in general accordance with the following ASTM Standards:

Natural Moisture Content	ASTM D2216
Atterberg Limits	ASTM D4318
Grain Size Analysis	ASTM D422
Percent Passing No. 200 Sieve	ASTM D1140
Consolidation	ASTM D2435

Laboratory soil testing results are summarized below in **Table 4-1**. Additionally, laboratory test results have been summarized and presented on the boring logs also provided in **Appendix A**.

Table 4-1: Summary of Identification Tests Results

Boring No.	Sample No.	Depth (feet)	Water Content (%)	Atterberg Limits			Particle Distribution (%)		
				LL	PL	PI	Gravel	Sand	Fines
HB-PAMI-101	3D	9-11	31.0	22.8	15.1	7.7	-	22.3	77.7
HB-PAMI-101	4D	14-16	32.3	24.4	16.4	8.0	-	-	-
HB-PAMI-102	5D	19-20	39.3	35.5	19.0	16.5	-	-	98.6

Boring No.	Sample No.	Depth (feet)	Water Content (%)	Atterberg Limits			Particle Distribution (%)		
				LL	PL	PI	Gravel	Sand	Fines
HB-PAMI-103	6D	28.5-30.5	35.0	42.6	20.8	21.8	-	-	99.1
HB-PAMI-103	U2	35-37	44.7	39.9	19.7	20.2	-	-	-
HB-PAMI-106	3D	9-11	31.3	47.9	21.1	26.8	-	-	99.2
HB-PAMI-106	5D	19-21	36.1	39.7	19.1	20.6	0.2	3.1	96.7
HB-PAMI-107	5D	19-21	38.5	36.8	18.1	18.7	-	-	96.9
HB-PAMI-109	2D	9-11	31.4	39.4	18.6	20.8	-	2.2	97.8
HB-PAMI-109B	3D	9-11	24.0	25.9	15.9	10.0		12.2	87.8
HB-PAMI-110	3D	9-11	30.4	27.6	18.7	8.9	-	22.6	77.4
HB-PAMI-114	4D	14-16	37.0	45.0	22.7	22.3	-	-	94.6
HB-PAMI-114	U1	24-26	46.3	50.0	22.9	27.1	-	-	-
HB-PAMI-114	7D	34-36	36.0	40.4	20.3	20.1	-	-	94.2
HB-PAMI-115	3D	9-11	34.2	48.8	22.3	26.5	-	-	98.8
HB-PAMI-117	8D	29-31	38.0	41.2	22.2	19.0	-	-	-
HB-PAMI-118	3D	9-11	29.1	46.2	22.1	24.1	-	-	-
HB-PAMI-119	5D	19-21	38.4	38.9	19.9	19.0	-	-	94.7
HB-PAMI-120	4D	14-16	29.1	40.8	23.0	17.8	-	-	99.1
HB-PAMI-121	4D	14-16	28.9	47.1	25.9	21.2	-	-	99.1
HB-PAMI-121	7D	29-31	36.9	44.1	21.9	22.2	-	-	94.8
HB-PAMI-121	U2	34-36	45.3	44.5	23.5	21.0	-	-	-
HB-PAMI-122	6D	24-26	30.8	42.4	22.6	19.8	-	-	94.3
HB-PAMI-122	U1	34-36	43.9	44.1	22.1	22.0	-	-	-
HB-PAMI-123	U1	29-31	-	41.0	20.9	20.1	-	-	-
HB-PAMI-123	7D	31-33	49.2	61.8	24.4	37.4	-	-	98.1
HB-PAMI-126	4D	14-16	45.9	46.3	20.9	25.4	-	-	97.1
HB-PAMI-127	1D	2-4	26.8	24.0	20.1	3.9	-	-	-
HB-PAMI-127	3D	9-11	31.9	26.7	17.7	9.0	-	-	98.2
HB-PAMI-127	U1	14-16	-	39.7	22.0	17.7	-	-	-
HB-PAMI-127	6D	34-36	49.1	37.1	21.7	15.4	-	-	-

Boring No.	Sample No.	Depth (feet)	Water Content (%)	Atterberg Limits			Particle Distribution (%)		
				LL	PL	PI	Gravel	Sand	Fines
HB-PAMI-201	2D	2-3.7	13.4				2.6	85.2	12.2
HB-PAMI-201	2D-A	3.7-4	7.6				21.6	60.4	18.0
HB-PAMI-201	3D	5.1-6	28.6				-	4.4	95.6
HB-PAMI-202	1D	1.3-2	14.4				7.1	77.2	15.7
HB-PAMI-202	2D	2-4	11.5				10.2	77.9	11.9
HB-PAMI-202	3D	4-4.4	12.2				10.3	68.8	20.9
HB-PAMI-202	4D	6-7.7	14.7	NP	NP	NP			26.4
HB-PAMI-203	1D	1.4-2	12.4				4.1	77.1	18.8
HB-PAMI-203	2D	2-3.2	12.4				2.4	83.6	14.0
HB-PAMI-203	3D	4-5.3	11.3				38.4	38.3	23.3
HB-PAMI-204	2D	2-4	11.3				3.9	85.8	10.3
HB-PAMI-204	3D	4-6	12.8				6.8	64.8	28.4
HB-PAMI-204	4D	6-8	11.9				8.5	52.6	38.9
HB-PAMI-205	2D	2-3.3	8.9				1.1	90	8.9
HB-PAMI-205	2D-A	3.3-4	23.1	42.6	23.1	19.5	-	13.4	86.6
HB-PAMI-205	4D	6-8	28.2	46	24.2	21.8	-	0.6	99.4
HB-VMS-101	1D	5-7	25.5				1.3	74.3	24.4
HB-VMS-101	3D	15-17	29.0				-	65.3	34.7
HB-VMS-101	4D	20-22	38.6	34.2	18.4	15.8	-	8.7	91.3
HB-VMS-101	7D	35-37	34.9	31.3	18.9	12.4			97.5
HB-VMS-101	8D	40-42	31.8	29.8	19.4	10.4			98.1
HB-VMS-102	1D	5-7	19.9				8.0	82.3	9.7
HB-VMS-102	3D	15-17	23.4				-	96.8	3.2
HB-VMS-102	5D	25-27	32.4	29.6	19.1	10.5			98.0
HB-VMS-102	6D	30-32	31.9	27.5	18.2	9.3			96.0
HB-VMS-102	7D	35-37	32.9	30.4	20.4	10.0			97.4
HB-VMS-103	2D	10-12	18.1				0.9	95	4.1
HB-VMS-103	3D	15-17	36.2	31.5	19.5	12		1.8	98.2
HB-VMS-103	4D	20-22	37.4	31.5	19.8	11.7			97.9

Boring No.	Sample No.	Depth (feet)	Water Content (%)	Atterberg Limits			Particle Distribution (%)		
				LL	PL	PI	Gravel	Sand	Fines
HB-VMS-103	5D	25-27	34.0	32.7	20.1	12.6			97.7
HB-VMS-103	6D	30-32	27.3	25	18.4	6.6			97.5
HB-PCORE-101	2D	3.2-5.2	15.8				1.5	89.4	9.1
HB-PCORE-102	1D	1.2-3.2	13.8				0.8	85.4	13.8
HB-PCORE-102	2D	3.5-5.2	12.8				1.8	79.2	19.0
HB-PCORE-103	1D	1.2-3.2	10.8				7.2	70.8	22.0
HB-PCORE-103	2D	3.2-5.2	25.5	37.8	22.8	15.0	-	16.9	83.1
HB-PCORE-104	1D	1.2-3.2	12.6				3.5	81.5	15.0
HB-PCORE-104	2D	3.2-5.2	26.5	38	20.8	17.2	-	11.7	88.3
HB-PCORE-105	1D	1.2-3.2	11.5				24.9	57.9	17.2
HB-PCORE-105	1D-A	3.1-5.1	17.6				1.1	87.8	11.1
HB-PAVE-103	1D	1-3	6.1	-	-	-	4.0	80.1	15.9

5.0 SUBSURFACE CONDITIONS

5.1 Generalized Subsurface Stratification

The interpretation of soil and groundwater conditions within the project are based on information obtained at the boring locations only. This information has been used as the basis for the conclusions and recommendations contained in this report. Significant variations at areas not explored by the project borings may require reevaluation of the findings and conclusions contained herein if found during construction.

A generalized interpretive subsurface profile is included as **Figure 4** and is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed through interpretations of widely spaced borings and samples. Actual soil transitions included in the subsurface profile may vary and may be more erratic than indicated. Borings performed by others are used for the development of the subsurface profile and to aid in the interpretation between the HB series subsurface information.

Subsurface conditions encountered in the test borings generally consist of medium dense to dense granular fill overlying a stiff marine silt-clay crust layer. Beneath the stiff marine silt-clay crust, the borings encountered either soft marine silt-clay or loose marine sand and silt, both of which are underlain by dense glacial till. The glacial till overlies bedrock. In some areas along the corridor the bedrock is encountered at the ground surface.

Stratum 1: Fill

The test borings HB-PAMI-100, 200, 300 and 400 series performed along the Maine Turnpike encountered medium dense granular fill from existing grade to elevations ranging between 102 feet and 23 feet. The medium dense granular fill generally consists of fine to medium sand with trace to some gravel, trace to some silt, and trace coarse sand. The SPT $N1_{60}$ average value for the fill is 19 blows per foot (bpf).

Stratum 2: Marine Silt-Clay Crust

A marine silt-clay crust stratum was encountered immediately below the fill in most test borings. This material was encountered to elevations ranging between 62 feet and 18 feet, and consists primarily of silt, organic silt, clayey silt, silt and clay, and clay and silt, with trace amounts gravel and fine sand. The SPT $N1_{60}$ average value for this stratum is 17 bpf.

Thirteen (13) Atterberg limit tests were performed yielding an average liquid limit of 42, average plastic limit of 22, and average natural moisture content of 31 percent. The Atterberg limits were accompanied with percent passing #200 tests. Results of the analyses show that the amount of sample finer than the #200 sieve ranges between approximately 83 to 99 percent.

Stratum 3a: Soft Marine Silt-Clay

Soft marine silt-clay was generally encountered immediately below the marine silt-clay crust. This material was encountered directly below the fill at boring HB-PAMI-111, HB-PAMI-115 and HB-PAMI-127. The stratum is encountered at elevations ranging between 18 feet and 50 feet. The soft marine silt-clay consists primarily of clay and silt, silty clay, and silty sand.

One hundred fifty-six (156) field vane shear tests were performed with an average undrained shear strength (Su) value of 480 psf. Twenty-seven (27) Atterberg limit tests were performed yielding an average liquid limit of 38, average plastic limit of 21, and average natural moisture content of 38 percent. Eighteen (18) standard grain size and percent passing #200 analyses were performed. Results of the sieve analysis indicate that the amount of sample finer than the #200 sieve ranges between approximately 94 and 99 percent.

Stratum 3b: Marine Interbedded Sand & Silt

In the southern portion of the project, dense marine interbedded sand and silt was encountered immediately below the fill with elevations ranging between 59 feet and 35.7 feet. Beneath the dense marine interbedded sand and silt, loose marine interbedded sand and silt was encountered.

Stratum 3c: Loose Marine Sand & Silt

In the northern portion of the project, at Station 2273+00, loose marine sand was encountered immediately below the fill with elevations ranging between 60 and 32 feet. The loose marine sand and silt consists primarily of silty sand and silt.

Results of the sieve analyses for marine interbedded sand and silt and loose marine sand and silt show that the amount of sample finer than the #200 sieve ranges between approximately 34.7 and 78 percent.

Stratum 4: Till

The till stratum was encountered throughout the site at elevations ranging between -25 feet and 77.5 feet. The till consisted of fine to coarse sand and gravel with trace to some silt. The SPT $N1_{60}$ average value for this stratum is 38 bpf. The till overlies the granofels and metasandstone bedrock.

Stratum 5: Bedrock

Bedrock was sampled at five borings and the top of bedrock elevation encountered at each location is provided in **Table 5.1**.

Table 5-1: Approximate Top of Bedrock Elevation

Boring	Elevation of Top of Rock
HB-PAMI-109	40.8
HB-PAMI-109B	33.5
HB-PAMI-110	32.5
HB-PAMI-112	59.9
HB-PAMI-113	78.8
HB-PAMI-124	97.9

Bedrock encountered at the site generally consists of hard, typically fresh to slightly weathered, aphanitic to fine grained, grey and brown grey Granofels and Metasandstone bedrock with calcsilicate veins.

Rock quality designation (RQD) is a common parameter that is used to help assess the competency of the sampled bedrock. RQD is defined as the sum of the pieces of recovered bedrock greater than 4 inches in length divided by the total length of cored bedrock. RQD values of the bedrock that were encountered on site range from 50 to 82 percent, with an average of approximately 72 percent.

Based on the geophysical and geotechnical investigation the bedrock generally dips from the West to the East. The bedrock is encountered at shallow depths along the Southbound barrel between approximately the following Stations: 2243+50 to 2249+00, 2254+50 and 2309+00 to 2315+00, 2383+50 to 2404+50. The bedrock is encountered at shallow depths along the Northbound barrel between Station 2304+00 to 2315+00 and 2383+50 to 2396+00.

5.2 Groundwater

Groundwater was encountered and recorded during the geotechnical investigation and the elevations are reported in **Table 5-2**.

Table 5-2: Groundwater Elevation

Boring No.	Elevation of Groundwater
HB-PAMI-101	49.1
HB-PAMI-102	54.6
HB-PAMI-104	60.3
HB-PAMI-105	49.0
HB-PAMI-109B	42.5
HB-PAMI-112	61.9
HB-PAMI-113	81.5
HB-PAMI-115	50.0
HB-PAMI-116	55.8
HB-PAMI-117	59.4
HB-PAMI-118	56.6
HB-PAMI-119	49.1
HB-PAMI-121	57.4
HB-PAMI-122	55.8
HB-PAMI-123	66.1
HB-PAMI-124	103.0
HB-PAMI-125	60.2
HB-PAMI-127	50.0
HB-PAMI-202	65.3
HB-PAMI-203	64.1
HB-PAMI-204	60.8

Boring No.	Elevation of Groundwater
HB-PAMI-401	48.7
HB-VMS-101	50.8
HB-VMS-102	49.6
HB-VMS-103	46.9
HB-VMS-201	42.3
HB-VMS-202	77.5

The groundwater used for design was based on the level encountered at the nearby boring where analysis was performed. Groundwater reported is the elevation as encountered during the drilling process and elevations will fluctuate seasonally following events of precipitation.

6.0 Roadway and Structure Geotechnical Analysis

6.1 Proposed Improvements and Design

As indicated in Section 1.3, the improvements include embankment widening, culvert extensions, utility vault construction, sign structures and concrete barrier walls. The methodology of design for each of the improvements is described in the below sections.

6.2 Resistance Factors

All foundations were designed and assessed under service, strength and extreme limit state load combinations in accordance with AASHTO LRFD Sections 3, 6, 10 and 11. The resistance factors used for the design are provided in **Table 6-1**.

Table 6-1: Resistance Factors

	Resistance Factor		
	Service Limit State	Strength Limit State	Extreme Limit State
Shallow Foundation			
Bearing Resistance		0.45	1
Settlement	1		
Pile Foundation			
Axial Compression Resistance	-	0.6	1.0
Uplift Resistance	-	0.5	0.8
Lateral Resistance	1.0	-	-
Drivability	-	0.65	-
Global Stability			
Foundation/Structures	0.65	-	-
Slope/Embankments	0.75	-	-

6.3 Preliminary Subsurface Material Properties

Geotechnical design parameters for soil and rock were developed for each stratum based on material descriptions, standard published correlations, results from laboratory testing, and engineering judgment. A summary of soil design properties is provided below in Table 6-2.

Table 6-2: Engineering Parameters of Subsurface Materials

Soil Properties	Strata				
	Embankment Fill	Marine Silt-Clay Crust	Soft Marine Silt-Clay	Marine Interbedded Sand & Silt	Till
γ (pcf)	117	112	112	100	117
φ' (deg)	34	26	23-28	23	34
c' (psf)	-	220*-500	1500	350	-
E_s (ksi)	6.9	-	-	2.1	4.2
C_{ce}	-	0.12	0.25-0.3	-	-
C_{re}	-	0.02	0.03-0.05	-	-
OCR	-	-	1**	-	-
Pc (ksf)	-	6.0	-	-	-
C_v (ft^2/day)	-	0.3	0.3	-	-
$C_{\alpha\varepsilon}$	-	0.007	0.005-0.007	-	-

Note: The consolidation properties are derived from consolidation lab test results.

- \- This value is used for global stability at Station 2225+50 and the layer is modeled with an increasing rate of undrained shear strength with depth from 220 psf to 824 psf.
- ** Based on consolidation test data of the borings performed for Cumming Road project, OCM = 600 psf (OCM = Pc-σ') is used for calculation of the settlement at Red Brook Culvert

Note: The consolidation properties are derived from consolidation lab test results.
Where: γ = Total unit weight of soil - correlated.
φ' = Internal friction angle of drained soil, per multiple SPT-N value correlations.
k= Subgrade modulus – correlated (above WT / below WT).
c'= Undrained shear strength for undrained soil based on in-situ vain shear testing.
Es= Modulus of elasticity – correlated.
Cce= Compression Index, strain based
Cre= Recompression Index, strain based
OCR= Overconsolidation ratio
C_v= Coefficient of consolidation
C_{ae}= Secondary compression index, strain based

6.4 Embankment Geotechnical Design and Recommendations

6.4.1 Global Stability Analysis

The project scope includes widening the existing embankment from Station 2169+00 to 2427+50. The height of the proposed fill at the toe of the existing embankment varies from 3 feet to 9 feet. The width of the widening is up to 12 to 17 feet from the crest of the existing embankment. The slope of the proposed embankment varies from 6H:1V to 2H:1V. The highway cross sections along with the subsurface conditions at each location were reviewed. Given the presence of the soft sensitive material, critical sections were selected to perform global stability calculations using limit equilibrium analysis and settlement analysis.

Global stability limit equilibrium analysis was performed of the embankment sections at Station 2225+50, 2273+00, 2421+50 as controlling sections. Given the conditions along the mainline it is anticipated that the factors of safety at other areas along the alignment will be higher or equal to the analyzed sections.

Spencer's Method of analysis was used to perform all global stability analyses and satisfies both force and moment equilibrium and meets the requirements prescribed by AASHTO LRFD Article C11.6.2.2.

Global stability analyses were performed for long term loading conditions using drained soil strength design parameters and short-term loading conditions using undrained soil strength design parameters specified in **Table 6-3.** Subsurface conditions for global stability analyses at each approach were selected based on the review and interpretation of the available borings. Additionally, a surcharge load of 250 psf was applied to the approach embankment to simulate the vehicular live load, as per Section 3.11.6.4 of AASHTO.

A global stability resistance factor of 0.75 is required when embankments are not supporting or contain structural elements (such as an abutment). This resistance factor translates to a minimum required factor of safety of approximately 1.33. **Table 6-3** presents the results of the global stability analysis.

Table 6-3: Results of Global Stability Analysis

Station	Factor of Safety	
	Drained	Undrained
2225+50	2.1	1.9
2273+00	1.5	1.3
2421+50	1.4	1.8

The results indicate that the factor of safety for the global stability in the short-term undrained conditions and in the long-term conditions satisfy the AASHTO requirement.

6.4.2 Settlement Analysis

Settlement induced by the proposed embankment fills was analyzed utilizing Settle3D v4.0 by Rocscience. A settlement analysis was performed at Stations, 2169+50 SB, 2227+00 SB, 2284+00 NB, 2410+00 NB, 2421+50 SB. The analysis is performed to assess the magnitude of settlement using regular weight fill. The critical stations were chosen given the shallow depth from bottom of the embankment to the top of the soft compressible materials encountered, thickness of the soft compressible material and amount of fill placed.

The deformation values reported herein consist of consolidation settlement after the widened embankment is placed. The immediate settlement occurs in the upper cohesionless materials overlying the soft clay and is negligible (less than 5% of total settlement) when compared to the settlement from the underlying sensitive clay, and therefore has not been reported.

The results of the settlement analysis are included in **Table 6-4**. These values are taken at the proposed guardrail location and represent the maximum total settlement in the transverse and longitudinal direction given the subsurface condition information to date. Settlements are reported at the 15-year mark after the construction that corresponds with the approximate 12-year resurfacing cycle frequency carried out by the Maine Turnpike Authority.

The results indicate that areas around Station 2169+50 SB will need a more frequent repaving cycle than the typical 12 years typically set by the Maine Turnpike Authority. Results at Station 2421+50 SB indicate that the settlements are in excess of what can be addressed with an increase in paving frequency. To mitigate the settlement around this area, that extends from Station 2421+50 SB to 2423+50 SB, the use of lightweight fill is recommended. Due to the generally small volume of the required fill, the use of geofoam is not practical at this location. Lightweight fill aggregates such expanded shale aggregate is best suited and can be placed with the same equipment as standard fill, other lightweight materials may be substituted such as foamed glass. The analysis at this section using the lightweight fill aggregate will be finalized as the design is moved forward for PAW2 submission.

Table 6-4: Results of Settlement Analysis Along Pavement

Station	6 months (inches)	15 years (inches)	100 years (inches)
2169+50 SB	1.3	5.1	7.1
2227+00 SB	0.8	4.2	6.3
2284+00 NB	<0.5	1.2	5.5
2410+00 NB	1.3	3.7	5.3
2421+50 SB	2.9	9.9	15.7

6.5 Structure Geotechnical Foundation Assessment

6.5.1 Utility Vault

Two utility vaults cross the mainline at Stations 2340+02.81 and 2360+00. The subsurface conditions at the structure located at 2340+02.81 consist of fill up to about elevation 62, underlain by loose to medium dense marine sands to about elevation 52. The soft marine silt-clay extends from about elevation 52 to about elevation -7. Glacial till underlies the marine silt clay that consist of very dense cohesionless material. Based on the as-built drawings the existing structure that underlies the embankment is supported on 2 rows of HP12x53 driven steel piles. The width of the vault is 11.1 feet and the height is 9.6 feet. The elevation of the bottom of the pile cap is about elevation 52.1. The structure will need to be extended by approximately 11 feet to the west of the mainline and approximately 23 feet to the east of the mainline. Given the existing structure is supported on piles, it is recommended that the proposed extensions also be supported on piles. It is anticipated that the same pile size and spacing as the existing footprint will be used for the support of the widened vaults. The bottom of the pile caps for the extensions will match the existing bottom of cap elevation. The piles would need to be driven into the very dense glacial till material in order to resist the required loads. The analysis of the pile layout will be performed as the design is finalized for PAW2 submission.

The subsurface conditions at the utility vault located at Station 2360+00 consist of fill to about elevation 52, underlain by stiff marine silt clay crust to elevation 48. The soft marine silt clay extends from elevation 48 to about elevation 12. Glacial till underlies the marine clay. Based on the as-built drawings the existing utility is supported on shallow foundation at about elevation 48.4. The width of the vault is approximately 11 feet and the height is 10.5 feet. The structure will need to be extended to the east by 12.5 feet to the east of the existing vault.

The loads were determined by the structural group and a pressure demand is provided. The resistance of the bearing materials is calculated based on Equation 10.6.3.1.2a of AASHTO LRFD. The results of the analysis are provided below:

Table 6-5: Results of Bearing Resistance at Utility Vault at Station 2360+00

Factored Pressure Demand (ksf)	Nominal Bearing Resistance (ksf)	Factored Bearing Resistance (ksf)
1.3	3.3	1.5

A settlement analysis was also performed at this location in accordance to Equation 10.6.2.4.3-5 and 10.6.2.4.3-9 of AASHTO LRFD. The results indicate that the primary settlement will be about 1 inch and the secondary settlement will be about 3 inches. The primary settlement will occur over a period of approximately 11 years and the secondary settlement is calculated for a period of 50 years. This information is currently under review and the potential for a deep foundation will be determined upon establishing settlement criteria for the facility.

6.5.2 Culvert Extensions Wingwalls

The Red Brook Culvert and the Long Creek Culvert will need to be extended to accommodate the widening. An assessment for the type of wall at each location has been performed based on the height of the wall and bearing materials.

6.5.2.1.1. Red Brook Culvert

The existing Red Brook Culvert is an approximate 10'-11" by 12'-0" corrugated elliptical pipe with an existing inlet at about elevation 50. This culvert will be extended approximately 9 feet to the east of the Northbound mainline. The plans indicate that the west end of the culvert will require a headwall and two wingwalls. At the east extension the soil will the slopped on a 2:1 above and around the culvert and no walls are needed. The subsurface conditions at this location consist of medium dense fill extending to elevation 50, underlaying by marine silty clay to elevation 25. The borings at this location are terminated about 10 feet into the glacial till that is encountered below the marine silty clay. The 100-year flood elevation at the culvert is 55.4.

The plans call for the bottom of the footing for the headwall at elevation 45.6 and the height of the wall from 16.5 feet at the culvert location flaring down to 9 feet at the end of the wingwall. The wingwalls are approximately 25 and 45 feet long. A prefabricated modular concrete gravity type wall has been assessed at this location. The wall was designed for the active pressure of the backfill behind it and the lateral pressure of the live load surcharge. Due to the bottom of the wall bearing on the soft clay material, the high groundwater table and the relatively high pressure imparted by the regular fill behind the wall, a gravity wall with the typical B/H ratio, is not feasible. at this location. To alleviate the loads exerted onto the wall, AASHTO A57 will be placed within the wall and within the active wedge behind the wall, from the bottom to 5 feet below the top of wall. Lightweight fill will be placed within the top 5 feet behind and within the wall.. To satisfy sliding, eccentricity and bearing resistance the width of the wall will need to be minimum 10 feet. Foamed glass aggregate is considered as a feasible lightweight fill option for use at this location. The material is produced from 100% post-consumer recycled glass and is characterized by highly frictional surface and a low unit weight. A separation geotextile will be placed at the face of the excavation of the active wedge, between the natural materials and the new backfill materials. A settlement of less than 1 inch is anticipated for the above-mentioned layout. **Table 6-6** presents a summary of the results of the analysis.

Table 6-6: Results of Bearing Resistance at Red Brook Culvert

Limit State	Factored Pressure Demand (ksf)	Nominal Bearing Resistance (ksf)	Factored Bearing Resistance (ksf)
Strength	2.0	5.1	2.8
Extreme	2.4	2.8	2.5

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6.5.2.1.2. Long Creek Culvert

The existing Long Creek Culvert is a 78-inch diameter reinforced concrete pipe with an existing inlet elevation at about 34.25. The culvert will be extended by about 8 feet to the west with a headwall. To the east of the Northbound mainline a headwall and wingwalls will be placed above the culvert to hold the widened embankment back. The subsurface conditions at this location consist of medium dense fill extending to elevation 46, underlain by marine sands to elevation 37. The borings at this location were drilled through the till underlaying the marine sands are terminated into the bedrock that is encountered below the marine sands at elevation 33.5. The 100 year flood elevation at the culvert is 43.07.

The plans call for the bottom of the footing for the headwall at elevation 38.06 and the height of the wingwall from 11.5 feet at the highest point adjacent to the culvert and diminishing toward the end of the wall. The wingwalls are 25 feet long each. Given the presence of the shallow bedrock a prefabricated modular concrete gravity type wall is feasible at this location. The wall would be supported at the top of bedrock providing sufficient bearing resistance to handle the required loads. Similar to Red Brook, the wall is designed to withstand the active earth pressure from the embankment fill behind it and the lateral pressure from the live load surcharge. Sliding, eccentricity and bearing resistance are satisfied for a minimum width of 7.5 feet. **Table 6-7** presents the results of the analysis.

Table 6-7: Results of Bearing Resistance at Loong Creek Culvert

Limit State	Factored Pressure Demand (ksf)	Nominal Bearing Resistance (ksf)	Factored Bearing Resistance (ksf)
Strength	4.7	11.0	6.1
Extreme	3.3	7.2	6.5

6.5.3 Earth Retaining Structures

Earth retaining structures are proposed at Gorham Road, I-295 and Running Hill Road Intersections with the mainline. The purpose of the structures is to provide the necessary space to accommodate the widening underneath the above-mentioned structures. The earth retaining structures are typically 7.8 feet high and have a moment slab where the foundation is embedded underneath the roadway. The structures are designed for the active earth pressure that is exerted from the slopped fill behind it for strength limit state; and for service limit state consisted of assessing settlement. Primary settlement is anticipated to be less than 1 inch that will occur over the period of 3.5 years and secondary settlement is estimated to be 2.5 inches to occur for the remainder of 100 years. Designed for strength limit state that consisted of sliding, eccentricity and bearing resistance. No seismic design was performed as per section 11.5.4.2 of AASHTO.

6.5.4 Utilities

Existing utilities along the PAW1 project limits have been assessed for settlement. The assessment took into consideration the location of the utility, amount of fill to be placed and subsurface conditions. Two locations have been considered suspectable to settlement; water line at station 2210+00 and 8-inch diameter gas line at station 2274+75. In addition, two locations have been requested to be assessed; the sewer line at Station 2251+70 and the water line at 2176+40.

6.5.4.1.1. Sewer Line at Station 2176+40

Existing borings which were performed for the Gorham Road intersection with the Turnpike were used for the assessment of the settlement at this location. The subsurface conditions consist of fill to about elevation 49 underlain by soft marine silty clay to about elevation 3. The marine silty clay is underlain by till. Based on the highway sections, about 20 feet wide and 3 feet of fill will be placed to the east of the mainline and about 10 feet wide and 3 feet height of fill will be placed to the west of the mainline. The bottom of the new fill will be at about elevation 57. Due to the minimal amount of fill and the relatively deep top elevation of the marine silty clay layer, the settlement at this location is estimated 2 inch in 50 years.

6.5.4.1.2. Water Line at Station 2210+00

The settlement analyses at the water line has been performed based on the borings performed for the Cummings Road project. The subsurface conditions consist of fill extending to about elevation 55, underlain by interbedded sand and silt extending to about elevation 36, underlain by marine silt and clay to about elevation 21. Glacial till is encountered below the marine silt and clay. The amount of fill to be placed to the east of Northbound mainline along the Exit 45 NB off ramp is minimal and settlement is not considered to be a concern. The amount of fill to be placed to the west of the mainline along Exit 45 SB on ramp is about 17 feet wide and 2.5 feet high with the bottom elevation of about 62.5. The settlement of the sewer is estimated along the west of the Southbound mainline and the results are reported in Table 6-8.

6.5.4.1.3. Sewer Line at Station 2251+70

Several borings were performed in the vicinity of the utility. Due to potential variation of the subsurface conditions between the North Bound and the South Bound the conditions at the sewer line are based on interpretation and may vary slightly. The subsurface conditions consist of fill extending to about elevation 63 and overlying marine silt clay crust to elevation 52. The crust is underlain by a stratum of soft marine clay that extends to about elevation 50. Glacial till underlies below the soft marine clay. The impacts to the sewer will arise from the placement of two new wedges of embankment fill on either side of the mainline. The top of the existing embankment is at about elevation +68 and the toe is at about elevation +65. There is about 3 feet of fill being placed along the edges of the existing embankment in order to accommodate the widening.

Due to the low height of the new embankment fill and the relative minimal thickness of the Marine Clay, it is anticipated that the settlements of the sewer will be 1.5 inches over the course of 50 years.

6.5.4.1.4. Gas Line at Station 2274+50

The settlement analyses at the gas line was performed based on the subsurface conditions encountered at boring HB-PAMI-401. Very dense fill was encountered to about elevation 46, underlain by loose to medium dense marine sediment, underlain by marine silt clay crust to about elevation 35.7. Glacial till was encountered below elevation 35.7. The amount of fill to the east to be placed of the Northbound mainline is considered minimal and settlement is not a concern. The amount of fill to be placed to the west is about 25 feet wide, 3.5 feet high with the bottom at about elevation 45. The settlement of the gas line is estimated along the west of the mainline and it is reported in **Table 6-8**.

Table 6-8: Results of Settlement Analysis at Utilities

Time	Utility at station 2210+00	Utility at station 2274+75
1 Year	<1	<1
10 Years	0.9-1.1	1.1-1.4
30 Years	1.1-1.6	1.3-1.6
50 Years	1.1-1.6	1.4-1.7

The sewer line crossing the mainline at station 2237+50 was also considered for settlement analysis. The assessment related to this utility has been performed as part of the MTA Exit 45 project and included in a memorandum prepared by the geotechnical group and forwarded to the Exit 45 HNTB project management in Portland, Maine.

6.5.5 Sign Structures

Three sign structures are proposed as part of the project, north of Holmes Road, over the Southbound barrel, in close proximity of the entrance to the Crosby Maintenance Yard and one in the vicinity of Brighton Road. The design of the foundation for the support of the sign structures is performed based on LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2015 with 2018 Interim revisions.

6.5.5.1.1. *Overhead Sign Structure at Station 2133+14*

Boring HB-VMS-201 is performed in the vicinity of the sign structure near Holmes Road, at station 2133+14.22. This boring encountered fill to elevation 42.5, underlain by loose interbedded marine silt and sands to elevation 36, underlain by soft marine silt clay to the bottom of the boring, elevation –48.5. The proposed sign structure will be overhead. The right side will the supported on 34 feet long, 10 feet wide, and 3 feet thick concrete cap that will connect a 2x5 array of HP12x74 piles. The left side will be supported on 13 feet long, 10 feet wide and 3 feet thick concrete cap that will connect a 2x3 array of HP12x74. Design loading information was provided by the structural engineer. The group pile behavior of the foundation was modeled using FB Multipier, version 5.5. The piles were analyzed using a pinned head connection. The piles have been modeled with yield strength of 50ksi. The factored and nominal structural resistance of the HP12x74 is 654 kips and 1090 kips, respectively. The design is performed using HP12x63, however to account for the wetting and drying effects, the next pile size is recommended for construction. Table 6-9 provides the design loads and table 6-10 presents the summary of the pile group design.

Table 6-9: Design Loads for the Overhead Sign Structure Foundation – Station 2133+14

Side	Limit State	X (kip)	Y (kip)	Z (kip)	Mx (kip.ft)	My (kip.ft)	Mz (kip.ft)
Right	Service	13	47	171	1,479	503	
	Strength	0	0.0	214	0	223	
	Extreme 1	13	47	188	1,479	521	
	Extreme 2	13	47	154	1,479	485	
	Extreme 3	124	41	221	287	953	
Left	Service	13	47	48	1,479	503	
	Strength	0	0	60	0	222	
	Extreme 1	13	47	53	1,479	521	
	Extreme 2	13	47	43	1,479	485	

Table 6-10: Summary of Pile Group Design for the Support of Overhead Sign Structure – Station 2133+14

Side	Limit State	Axial Demand (kip)		Maximum Moment (kip.ft)	Depth to Maximum Moment (ft)	Maximum Lateral Deflection (in)	D/C
		Compression	Uplift				
Right	Service	50	22	17	3	0.2	0.1
	Strength	44	<1	0	0	-	0.1
	Extreme	61	13	52	8	0.6	0.3
Left	Service	133	58	32	8	0.3	0.2
	Strength	29	0	0	0	-	<0.1
	Extreme	118	52	32	8	0.3	0.2

Depth to maximum moment from bottom of pile cap.

A static axial analysis is performed using DrivenPiles, version 1.3.7. Based on the analysis required, axial resistances can be achieved within the soft marine clay material. However due to the cyclic nature of loading and the sensitivity nature of the clays in the area, a loss of undrained shear strength starting at the top of the layer could occur. As such it is recommended that the piles be driven to minimum the top of the glacial till. One pile dynamic analyzer (PDA) test is recommended to be performed for both foundations. Based on borings performed nearby the sign structure the top of the glacial till is anticipated to be at elevation -53. The length of the test pile should be 10 feet longer than the estimated length provided herein and the order length of the production piles will be determined once the test pile is driven to glacial till and required capacities are achieved.

Table 6-11: Foundation Recommendation for the Support of Overhead Sign Structure – Station 2133+14

Factored Geotechnical Resistance (kips)		Nominal Geotechnical Resistance (kips)		Minimum Pile Tip Elevation	Estimated Pile Tip Elevation
Compression	Uplift	Compression	Uplift		
135	52	135	65	-53.0	-58.0

Design governed by the extreme limit state of the left side foundation and axial analysis.

6.5.5.1.2. Sign Structure at Station 2266+50

Boring HB-PAMI-108 is performed in the vicinity of this sign structure at Station 2266+25. The subsurface conditions at this location consist of marine silty clay crust to elevation 45.5 underlain by soft marine silty clay to the bottom of the boring at elevation 37. The sign structure will be supported through posts in two 30-inch diameter drilled shafts. The top of the drilled shaft will be at about the ground surface, elevation 58.5. Design loads are provided by the structural engineer per shaft and applied at the top of the shaft. The design of the shaft is controlled by the short column behavior of the foundation. The embedment depth of the shaft will be 12 feet setting the drilled shaft tip elevation to 46.5.

Boring HB-VMS-202 is performed in the vicinity of the sign structure near Brighton Road. This boring encountered fill to elevation 80.9, underlain by glacial till terminating in this layer at elevation 66.3. The proposed sign structure will be supported on a single post supported on a drilled shaft. Further details on the sign structure support will be finalized for the submission of PAW2 Contract.

7.0 Pavement Design

The existing mainline runs N-S and consist of two 12 feet wide lanes and a 8-10 feet wide shoulder in each direction with a 26-foot-wide median between the two travel ways. The proposed improvements consist of adding a new 12 feet wide travel lane and 12-14 feet wide shoulder to the east and west of the Turnpike mainline. The existing 8-foot wide shoulder will be widened for a new travel lane and a new shoulder will be constructed.

The purpose of this report is to analyze and develop pavement rehabilitation options for:

1. reuse design for a 6 feet wide existing shoulder for a future travel lane, with the remaining 2-4 feet removed,
2. a pavement design of the Crosby area travel lane, and
3. a pavement design of the Crosby area shoulder

Pavement rehabilitation options such as overlay or mill and overlay were considered as the preferred option over a full depth replacement wherever possible to achieve a typical 12-year pavement life. The project is grouped into several sections based on the pavement sections, conditions, drainage, and past performance. The structural strength of the existing shoulder pavement sections was evaluated to perform as a travel lane and necessary pavement rehabilitation techniques were proposed to extend the pavement life in areas of poor pavement performance.

High severity distresses including surface raveling, transverse, longitudinal and alligator cracking and water bleeding and pumping has been observed along the southbound roadway in the proximity of Running Hill Road between Sta. 2255+00 to Sta. 2266+00 denoted herein as “Crosby Pavements”. Poor pavement performance within this section has resulted in a history of more frequent rehabilitations. These pavements sections were analyzed separately.

7.1 Typical Pavement Sections

Typical Turnpike flexible pavement section consists of 10-inch thick bituminous pavement, 4-inch thick aggregate base course, 8-inch thick aggregate subbase course, and 19-inch thick granular borrow.

7.2 Pavement Assessment

During subsurface explorations, several borings were performed on the roadway. Details of the explorations are provided in Section 3. Pavement coring was performed on these borings and followed by the soil sampling in the granular base, subbase, and subgrade materials. Based on the pavement thickness and quality of the granular materials, the borings were grouped into three categories as follows:

- Borings performed on Pavement Shoulders outside of the Crosby Pavements.
- Borings performed on Southbound Pavement Shoulders within the Crosby Pavements.
- Borings performed on Southbound Mainline Pavement within the Crosby Pavements.

Table 7-1: Summary of Borings Performed on Pavement Shoulders outside of the Crosby Pavements

Southbound Shoulder				Northbound Shoulder			
Pavement Core	Station	Offset	Pavement Depth (in)	Pavement Core	Station	Offset	Pavement Depth (in)
MTA-1S1	2171+00	9' Lt.	10	MTA-1N1	2171+00	9' Rt.	9
MTA-2S1	2192+12	9' Lt.	13	MTA-2N1	2192+12	9' Rt.	13
MTA-3S1	2234+36	9' Lt.	9	MTA-3N1	2229+08	9' Rt.	11
MTA-4S1	2249+00	9' Lt.	8	MTA-4N1	2249+00	9' Rt.	14
MTA-5S1	2287+00	9' Lt.	8	MTA-6N1	2312+00	9' Rt.	8
MTA-6S1	2308+28	9' Lt.	7	MTA-7N1	2329+40	9' Rt.	10
MTA-7S1	2329+40	9' Lt.	11	MTA-8N1	2349+00	9' Rt.	8
MTA-8S1	2355+80	9' Lt.	9	MTA-9N1	2382+20	9' Rt.	11
MTA-9S1	2382+20	9' Lt.	10	MTA-10N1	2408+60	9' Rt.	10
MTA-10S1	2408+60	9' Lt.	11	MTA-11N1	2435+00	9' Rt.	10
MTA-11S1	2435+00	9' Lt.	10	MTA-1N2	2171+00	43' Rt.	11
MTA-1S2	2171+00	43' Lt.	7	MTA-2N2	2192+12	43' Rt.	13
MTA-2S2	2192+12	43' Lt.	9	MTA-3N2	2229+08	43' Rt.	7.5
MTA-3S2	2234+36	43' Lt.	8	MTA-4N2	2249+00	43' Rt.	14.5
MTA-4S2	2249+00	43' Lt.	6	MTA-6N2	2312+00	43' Rt.	10
MTA-5S2	2287+00	43' Lt.	7	MTA-7N2	2329+40	43' Rt.	10
MTA-6S2	2308+28	43' Lt.	9	MTA-8N2	2349+00	43' Rt.	8
MTA-7S2	2329+40	43' Lt.	8	MTA-9N2	2382+20	43' Rt.	9.5
MTA-8S2	2355+80	43' Lt.	10	MTA-10N2	2408+60	43' Rt.	7
MTA-9S2	2382+20	43' Lt.	9	MTA-11N2	2435+00	43' Rt.	7
MTA-10S2	2408+60	43' Lt.	11	NB-1	2198+00	NA	13
MTA-11S2	2435+00	43' Lt.	5	NB-3	2308+75	NA	8.4
SB-1	2198+00	NA	12	NB-4	2321+40	NA	7.2
SB-3	2308+75	NA	9.6	NB-5	2430+20	NA	9.6
SB-4	2321+40	NA	6	NB-2	2254+00	-	9.6
SB-5	2430+20	NA	14.4	MTA-5N1	2271+32	9' Rt.	8.0
				MTA-5N2	2271+32	43' Rt.	11.0
Minimum Thickness (in)			5.0	Minimum Thickness (in)			7.0
Maximum Thickness (in)			14.4	Maximum Thickness (in)			14.5
Average Thickness (in)			9.1	Average Thickness (in)			10.0

Table 7-2: Summary of Borings Performed on Southbound Pavement Shoulders within the Crosby Pavements

Pavement Core	Station	Offset	Pavement Depth (in)
HB-PAVE-101	2266+50	9.8' Lt. *	5.0
HB-PAVE-103	2260+00	7.4' Lt. *	6.0
HB-PAMI-109B	2272+90	50' Lt	8.0
SB-2	2254+00	-	9.6
Minimum Thickness (in)			**5.0**
Maximum Thickness (in)			**9.6**
Average Thickness (in)			**7.2**

Note: * - Offset was measured from the right edge of right travel lane.

Table 7-3: Summary of Borings Performed on Southbound Mainline Pavement within Crosby

Pavement Core	Station	Offset	Pavement Depth (in)
HB-PCORE-101	2253+25	2.4ft Rt of SB White Line (right wheel rut)	12.5
HB-PCORE-102	2255+30	2.4 Rt of SB white line (right wheel rut)	7.2
HB-PCORE-103	2261+65	2.2 ft Rt of SB white line (right wheel rut)	13.5
HB-PCORE-104	2263+05	2.7 ft Rt of SB white line (right wheel rut)	9.0
HB-PCORE-105	2265+80	2.8 ft Rt of SB white line	9.5
HB-PAVE-103A	2260+00	3.0' Rt of White Line (travel lane outside wheel rut)	13.0
Minimum Thickness (in)			**7.2**
Maximum Thickness (in)			**13.5**
Average Thickness (in)			**10.8**

In addition to the pavement cores a number of soil borings were advanced and utilized for this assessment. A laboratory testing program was performed to verify the visual-manual field classifications and to aid in determination of the engineering soil properties. The soil samples tested from the top two samples were utilized to evaluate the granular base courses and subgrade materials. **Tables 7-4 and 7-5** detail the results of these tests.

Table 7-4: Summary of Lab Results for Granular Base Courses and Subgrade outside of the Crosby Pavements

Location		Boring No.	Sample Depth below Asphalt (ft)	Fines Content (%)	Classification
Outside of Crosby	SB Shoulder	SB-1	2-4	5.2	SP
		SB-3	2-4	6.9	SP-SM
		SB-4	0-2	7.0	SP-SM
		SB-5	2-4	6.2	SW-SM
	NB Shoulder	NB-1	0-2	3.5	SP-SM
		NB-3	0-2	4.5	SP
		NB-5	2-4	5.0	SW-SM
		NB-2	0-2	8.9	SP-SM

Table 7-5: Summary of Lab Results for Granular Base Courses and Subgrade within Crosby Pavements

Location		Boring No.	Sample Depth below Asphalt (ft)	Fines Content (%)	Classification
Within Crosby	SB Shoulder	HB-PAVE-103	0-2	15.9	SM
		SB-2	0-2	9.8	SW-SM
	SB Lane	HB-PCORE-101	0-2	15.6	SM
			2-4	9.1	SP-SM
		HB-PCORE-102	0-2	13.8	SM
			2-4	19.0	SM
		HB-PCORE-103	0-2	22.0	SM
			2-4	83.1	CL
		HB-PCORE-104	0-2	15.0	SM
			2-4	88.3	CL

The soil samples tested within the first 2 feet below the asphalt pavement represent the aggregate base course, subbase course, and granular borrow of the existing pavement box. The materials tested form 2 feet to 4 feet below the asphalt represents the subgrade materials. The materials tested outside of the Crosby satisfy the requirement for the maximum fines content. The materials tested within the Crosby do not satisfy the gradation requirements for granular aggregates and the subgrade materials were silty sand to clays as summarized in **Table 7-5**. These subgrades are in poor condition and not suitable for drainage.

In addition, shallow bedrock was encountered in Borings HB-PAVE-103 and 103A. The other borings, outside of shallow rock area, indicate an impervious layer of clay exists approximately 3 to 4 feet below the roadway surface. At the locations where the top of rock is shallow, the rock is behaving as the impervious layer and restricting infiltration and where rock is at depth there is also a clay layer adversely impacting drainage. These conditions likely resulted in water ponding below the pavement box leading to pumping and bottom up cracking.

The gradation for the aggregate base course, aggregate subbase course, and the granular borrow materials are specified in the Standard Specifications. These materials are specified as the Coarse Aggregates Type A, B, C, or D consist of significant amount of gravels (classified as GW or GP in accordance with USCS Classification system) with limiting the fines to 8 percent. The aggregates encountered below the asphalt pavements (classified as SP, SW, SP-SM, SW-SM, or SM in accordance with USCS Classification system) do not conform to the Maine DOT Standard Specifications. These substandard aggregates are not suitable for providing adequate drainage and structural strength.

7.3 Design Traffic Information

7.3.1 Traffic Data

Annual average daily traffic (AADT) data for each Turnpike (I-95) segment from Exit 44 through Exit 48 were collected by the Turnpike Authority automated system and are provided in **Tables 7-6** and **7-7** for Northbound and Southbound directions, respectively. The volumes are broken out by Turnpike vehicle classes.

Table 7-6: Annual Average Daily Traffic-Northbound

Limits	2018 AADTs -- *Northbound*							
	2-axle car	*2 axles, 6 tires*	*3 axles*	*4 axles*	*5 axles*	*6 axles*	*2-axle car w/ trailer*	*All Classes*
	Cl1	**Cl2**	**Cl3**	**Cl4**	**Cl5**	**Cl6**	**Cl7&8**	**Total**
Ex44-45	24,517	503	171	209	1,508	237	313	27,459
Ex45-46	22,689	546	186	237	1,342	280	315	25,595
Ex46-47	24,444	562	185	226	1,297	282	324	27,320
Ex47-48	22,774	519	177	223	1,250	275	320	25,538

Table 7-7: Annual Average Daily Traffic- Southbound

Limits	2018 AADTs -- *Southbound*							
	2-axle car	*2 axles, 6 tires*	*3 axles*	*4 axles*	*5 axles*	*6 axles*	*2-axle car w/ trailer*	*All Classes*

	Cl1	Cl2	Cl3	Cl4	Cl5	Cl6	Cl7&8	Total
Ex44-45	22,157	526	209	215	1,514	213	302	25,135
Ex45-46	23,750	580	226	261	1,425	253	332	26,827
Ex46-47	26,760	615	212	245	1,400	274	351	29,856
Ex47-48	24,613	546	198	231	1,350	266	342	27,547

7.3.2 18-kip Equivalency Factors

The 18-kip Equivalency Factors obtained from the AASHTO Guide for "Design of Pavement Structures", 1993 for interstate highways are as follows:

Table 7-8: 18-kip Equivalency Factors

Vehicle Class	FHWA Class	Vehicle Description	18-kip Equivalency Factor
C11	2	2-axle car	0.002
C12	5	2-axle, 6 tire	0.25
C13	6	3-axle	0.80
C14	8	4-axle	4.50
C15	10	5-axle	2.30
C16	11	6-axle	1.30
C17&8	12	2-axle car with trailer	1.00

7.4 Design Data for Empirical Design

7.4.1 Subgrade Material

The soils considered in design are silty sand to silts and clays, which are predominate in the area. Therefore, the drainage in the existing subgrade is considered to be poor. The pavement sections were designed using roadbed soil resilient moduli (MR = 1500 CBR) of 6,000 psi based on a CBR value of 4 for the Crosby Area and 12,000 psi based on CBR of 8 for Outside of Crosby.

7.4.2 Seasonal Adjustments for Subgrade

The M_R values were seasonally adjusted. The seasonal adjustment values were estimated (AASHTO, 1993) as follows (**Table 7-9**):

Table 7-9: Seasonal Adjustments for Subgrade

Season	Climate Condition	Adjusted M_R (M_{RM})
Fall	Wet	1.0 M_R
Winter	Frozen	2.0 M_R limited to 30,000 psi
Spring	Wet	0.8 M_R
Summer	Dry	1.0 M_R

As described in Page II-12 of AASHTO (1993), relative damage (u_f) calculated for each climate condition and the average of the relative damage (u_{fa}) is used to calculate the seasonally adjusted roadbed soil resilient modulus (M_{RA}) using the following expressions:

$$u_f = 1.18x10^8 \, M_{RM}^{-2.32}$$

$$M_{RA} = \left[\frac{u_{fa}}{1.18x10^8}\right]^{-0.431}$$

7.4.3 Serviceability Index

The following initial and terminal serviceability indices are recommended for the Interstate Highways:

Initial Serviceability Level = 4.2
Terminal Serviceability Level = 3.0

7.4.4 Seasonal Adjustments for Serviceability

The freezing index values were used in estimating the maximum serviceability loss due to frost heave. The maximum serviceability loss due to frost heave is estimated as 2.0 from Figure G.7 of AASHTO Guide for "Design of Pavement Structures", 1993 (AASHTO 1993). The serviceability loss due to frost heave is estimated to be 0.45 from Figure G.8 of AASHTO (1993). A frost penetration depth of 5.5 feet was used for the design. A frost rate of 10 mm/day was used in the design.

7.4.5 Overall Standard Deviation

Overall Standard Deviation (S_0) of 0.45 is recommended for the flexible pavements.

7.4.6 Reliability

The reliability percentage accounts for the variability and degree of uncertainty associated with pavement design to ensure that the design will last through the design period. According to AASHTO (1993), 90 percent reliability is used for the Interstate Highways.

7.4.7 Lane Distribution Factor

The Lane Distribution Factor is defined as the percent of all trucks in the design lane. According to AASHTO (1993), the percent of all trucks in the design lane is:

- 100 percent for highways with two-lane (one-lane each direction)
- 90 percent for highways with four-lane (two-lane each direction)
- 80 percent for highways with six-lane or more (three-lane each direction).

A Lane Distribution Factor of 80 percent is used for Turnpike, which will consist of three lanes in each direction after the proposed improvement.

7.4.8 Structural Layer Coefficients

In accordance with AASHTO (1993) the following structural coefficients are used for flexible pavements:

$a_1 = 0.44$	New Asphalt Pavements
$a_2 = 0.30$	Existing Asphalt Pavements
$a_3 = 0.11\text{-}0.14$	Aggregate Base Course and Aggregate Subbase Course
$a_4 = 0.06\text{-}0.09$	Granular Borrow

The layer coefficients for Aggregate Base Course, Aggregate Subbase Course, and Granular Borrow depend on the resilient modulus of the layer. Typical range for aggregates varies from 0.11 to 0.20 for the resilient modulus range of 25,000 to 50,000 psi. The samples collected and tested during the subsurface exploration indicate that the aggregate courses are finer than the gradation specified in the standard specifications. Based on the lab test results, layer coefficient of 0.11 is recommended for the aggregate courses. The layer coefficient for granular borrow material varies from 0.06 to 0.11 for a resilient modulus range of 9,000 to 15,000 psi. The layer coefficient of 0.08 and 0.09 is recommended for the granular borrows encountered with in the Crosby Area and Outside of Crosby, respectively.

7.4.9 Drainage Coefficients

The subgrade soils encountered during subsurface exploration, consist of low to very low permeability silts and clays, are considered as not adequate to provide drainage. In addition, existing drainage ditch running parallel to the roadway is filled with fine grained soils and obstructing the drainage of water collected underneath the pavement box. The ditch will be widened and deepened during construction to improve the drainage. However, the permeability is expected to be low for the subgrades. Therefore, the drainage in the existing subgrade is considered to be poor with the drainage coefficient of 1.0.

7.5 Design of Structural Section of the Pavement

The proposed roadway improvements will increase the roadway profile by 1.5 inches, after 1.5 inch overlay contract (2021.##) is complete. Several pavement section combinations were considered to adequately satisfy the minimum Structure Number (SN) requirement. As mentioned in the beginning of this section, pavement rehabilitation options such as overlay or mill and overlay were considered as the preferred option than full depth replacement. The roadway was split into three zones for the pavement design based on the existing pavement sections, quality of the subgrade, drainage conditions, and past performance of existing pavements as described below:

7.5.1 Shoulders Outside the Crosby Area

The majority of the pavement cores indicate that the asphalt pavement thickness for the shoulder pavement vary from 7 inches to 14.5 inches except isolated locations spotted with thicknesses as low as 5 inches. The aggregate courses and subgrade materials are relatively good. No major issues regarding the performance of the pavement sections or distresses were reported in this area.

The remaining design life of existing shoulder pavements including the additional 1.5 inches of overlay was estimated as follows:

Table 7-10: Remaining Pavement Life for Outside of Crosby Southbound Area Shoulders

Existing Pavement Thickness (inches)	Overlay Thickness (inches)	Remaining Pavement Life (years)
>10	1.5	20
>8.5	1.5	12
8.0	1.5	11
7.5	1.5	10
7.0	1.5	8
6.5	1.5	7
6.0	1.5	6
5.0	1.5	4

The pavement sections with remaining life less than 12 years were analyzed for mill and overlay options to maintain a design life of 12 years and the results are shown below. The net change in roadway profile is maintained at 1.5 inches in the results shown below. The results shown in **Table 7-11** are only based on the structural strength required for a design life of 12 years and a cost analysis or a life cycle cost analysis was not performed. Due to the variation of the milling thickness and the unknown amount of macadam within the pavement box, full depth replacement is recommended.

Table 7-11: Mill and Overlay Options for Outside of Crosby Southbound Area Shoulders

Asphalt Thickness (inch)		
Existing Pavement	Mill	Overlay
>8.5	0.0	1.5
8.0	1.0	2.5
7.5	2.0	3.5
7.0	3.0	4.5
<7.0	Full Depth Pavement Replacement Recommended; Mill & Overlay Not Recommended	

7.5.2 Southbound Shoulders Within the Crosby Area

Based on the four pavement cores obtained in this zone, the asphalt pavement thickness for the shoulder pavement varies from 5 inches to 9.5 inches with an average of 7 inches. The granular base, subbase, and granular borrow materials are not in conformance with the standards and the subgrade is not adequate to satisfy the drainage requirements. Severe pavement distresses as indicated in Section 7.0 were observed in this area and have resulted in more frequent repairs and repaving.

The remaining design life of existing shoulder pavement including the additional 1.5 inches of overlay was estimated as 4 years for the highest asphalt thickness pavement. Therefore, full depth pavement replacement is recommended. The station limits are provided in Section 7.0.

7.5.3 Southbound Mainline Lanes Within the Crosby Area

Based on the six pavement cores obtained in this zone, the asphalt pavement thickness for the mainline pavement vary from 7 inches to 13.5 inches with an average of 11 inches. The granular base, subbase, and granular borrow materials are not in conformance with the standards and the subgrade is not adequate to satisfy the drainage requirements. Severe pavement distresses as indicated in Section 7.0 were observed in this area and resulted with more frequent repairs and repaving.

The remaining design life of existing mainline pavement including the additional 1.5 inches of overlay was estimated as 7 years for the average asphalt thickness and 11 years for the highest asphalt thickness. Based on the analysis, the thickest pavement section with additional 1.5 inches of overlay is inadequate to provide structural strength. Therefore, full depth pavement replacement is recommended for this entire area.

In order to further study the failure mechanisms and validate the results obtained from the empirical flexible pavement design based on AASHTO (1993), Mechanistic-Empirical Pavement Design was performed using AASHTOWare Pavement ME Design Software (Version 2.5.5). The analysis was performed using the average existing asphalt thickness of 11 inches and additional overlay thickness of 1.5 inches. The underlying soil models for granular base and subgrade materials were selected based on the available gradation data from the lab testing. The hourly climate data for the past 10 years for obtained from nearby station located in Naples, Maine. The results indicate that high severity distresses such as fatigue cracking, bottom-up cracking, and permanent deformations are expected within the service life of less than 5 years. The summary of the results is provided below:

Table 7-12: Mechanistic Design Summary for **Crosby Southbound Area Travel Lanes**

Distress Type	Distress at Specified Reliability		Reliability (%)		Expected Pavement Life (Years)	Criterion Satisfied?
	Target	Predicted	Target	Achieved		
Terminal IRI (in/mile)	172	212.74	90.00	61.51	5	Fail
Permanent deformation - total pavement (in)	0.75	1.02	90.00	23.00	4	Fail
AC total fatigue cracking: bottom up + reflective (% lane area)	25.00	100.00	90.00	0.00	2	Fail
AC total transverse cracking: thermal + reflective (ft/mile)	2500	333.20	90.00	100.00	12	Pass
Permanent deformation - AC only (in)	0.25	0.49	90.00	15.42	-	Fail
AC bottom-up fatigue cracking (% lane area)	25.00	25.40	50.00	34.46	-	Fail
AC thermal cracking (ft/mile)	1000	15.00	50.00	100.00	12	Pass
AC top-down fatigue cracking (ft/mile)	2000	13800	90.00	0.03	1	Fail

Full depth pavement option was reanalyzed using Tensar SPECTRAPAVE software (Version 4.7) to optimize the thickness of the granular borrow. Based on the analysis, the 19-inch thick granular borrow can be eliminated by adding a layer of geogrid and a layer of geotextile without affecting the performance and design life. However, this option is not the preferred alternative due to a high freezing index in the area.

7.6 Construction Considerations

7.6.1 Pavement Overlay

1. Wherever only the pavement overlay is constructed, a layer of tack coat shall be applied prior to the overlay.
2. At the locations where mill and overlay is recommended, tack coat shall be applied before paving each lift.

7.6.2 Full Depth Replacement

1. Where unsuitable subgrade consisting of soft cohesive layers are encountered below the bottom of the Granular Borrow, one of the alternatives specified below shall be considered:
   a. Over excavate to a minimum of 2 feet below the bottom of the proposed Granular Borrow and replace with an additional 2 feet Granular Borrow with separation geotextile placed between the additional granular borrow and 19 inches of Granular Borrow below the pavement box.
   b. Place two layers of geogrid. One layer of geogrid shall be placed at the bottom of the Granular Borrow and another layer of geogrid shall be placed 6 inches above the first geogrid..
2. If bedrock is encountered at the bottom of the Granular Borrow, over excavate the rock up to 1 foot below the bottom of the Granular Borrow and backfill with Granular Borrow.
3. The subgrade will serve as both a foundation for the pavement structure and a working platform to support construction equipment, and it should be compacted and graded properly and uniformly.
4. In order to facilitate drainage, the subgrade shall be prepared with 2 percent slope towards the drainage ditch and daylighted at least 1-foot above the bottom of the ditch. The subgrade shall be continuous across the roadway.
5. All pavement layers should be constructed with an adequate cross slope so as to promote drainage of the pavement.
6. Materials, Equipment, and Paving techniques shall confirm to Maine DOT Standard Specifications.
7. Tack coat shall be applied in between each asphalt lifts.

7.7 Recommendations

7.7.1 Shoulders Outside the Crosby Area

Due to the potential variation of thickness of pavement and unknown thickness of macadam, as indicated in Table 7-11, it is recommended to remove the existing shoulder pavement along the limits of the project and replace with full depth pavement. The shoulder pavement should be saw cut at the existing edge of travel way; approximately 37 feet Lt. and Rt.

The full depth asphalt section should include the following:

1.5 inch thick Bituminous Overlay (Contract 2021.##)
8.5-inch thick Bituminous Pavement
4-inch thick Aggregate Base Course

7.7.2 Southbound Mainline Lanes and Shoulders Within the Crosby Area

Full depth pavement replacement is recommended for the Crosby Area Southbound, Sta. 2255+00 to Sta. 2266+00, mainline travel lanes and shoulders. It is recommended that the full depth Maine Turnpike Standard Pavement Section be utilized.

Standard Pavement Section

1.5 inch thick Bituminous Overlay (Contract 2021.##)
8.5-inch thick Bituminous Pavement
4-inch thick Aggregate Base Course
8-inch thick Aggregate Subbase Course
19-inch thick Granular Borrow
Separation Geotextile

During the construction of the drainage ditch, if rock is observed within 1 foot below the bottom of the proposed pavement box, then over excavate 1 foot below the pavement box and backfill with granular borrow.

7.7.3 Pavement Widening Areas

New full depth pavement is recommended for the widened portion of the roadways. The standard full depth pavement section specified is Section 7.7.2 can be utilized.

8.0 ROCK SLOPE EXCAVATION

8.1 Proposed Excavation

The proposed excavation required for the widening of the Main Turnpike is anticipated to encounter rock at the following locations:

Table 8-1: Rock Slope Limits

Location No.	Start Station	End Station	Roadway	Description of Location	Maximum Proposed Cut Slope Height (ft)	Approx. Length (ft)
1	2257+50	2260+50	SB	North of Running Hill Road Underpass MM 45.4	18	300
2	2289+50	2290+00	NB	South of Exit 46 NB On Ramp	7	50
3	2304+50	2307+00	SB	North of Congress Street Underpass MM 46.4	16	250
4	2392+00	2394+50	NB	South of Brighton Avenue Underpass MM 48.3	13	250

The following describes general site geology, existing site conditions, design selection of the proposed rock cut slope inclination and rockfall catchment width, and construction recommendations for the proposed rock cuts.

8.2 Site Geology for Rock Excavation

The site is located in the Appalachian Region, New England Physiographic Province, Seaboard Lowland Section. Bedrock at the proposed rock cut is Silurian-Ordovician age stratified rocks of the Merrimack Group including the Berwick Formation (SOb) and Eliot Formation (SOe). The Berwick Formation is described as fine-grained medium gray migmatized and non-migmatized quartz-plagioclase biotite gneiss and granofels with minor light medium gray calc-silicate gneiss or granofels. The Berwick Formation outcrops along the Maine Turnpike at Location 4 and is also exposed in the adjacent Blue Rock Quarry located to the West of the Maine Turnpike. The Eliot Formation is described as fine-grained buff-weathering, medium-gray quartz-plagioclase-biotite phyllite with interlayered dark gray phyllite and is reported to be strongly sheared throughout the formation. The Elliot Formation is present at Locations 1, 2, and 3. The geologic origin of both formations is deep ocean sediments, which formed sandstone and shale, and were later metamorphosed during the Acadian Orogeny during the early to middle Devonian time, which caused complex folding. Igneous intrusive sills are also present in the surrounding region.

8.3 Existing Site Conditions Within Rock Excavation Limits

8.3.1 Location 1

Rock cut slope Location 1 is bound between Running Hill Road to the South and an existing Maine Turnpike Authority Maintenance Building to the North and is proposed to extend approximately 300 feet in length, to the west of the Southbound Maine Turnpike. The existing Running Hill Road bridge structures, Maintenance Buildings, and commercial building east of the Maine Turnpike are located within a 500-foot radius of the proposed rock cut. The maximum proposed cut slope height at Location 1 is 18 feet. The Ground Penetrating Radar (GPR) data indicates the existing rock surface slope varies from roughly 19 to 24 degrees above horizontal as shown on the attached cross sections.

8.3.2 Location 2

Rock cut slope Location 2 is bound between Skyway Drive to the South and Congress Street to the North and proposed to extend approximately 50 feet in length, to the east of the Northbound Maine Turnpike. A sign structure to the Southwest and toll plaza to the Northeast are the closest structures. The maximum proposed cut slope height at Location 2 is 7 feet. The GPR data indicates the existing rock surface slope varies from roughly 14 to 22 degrees above horizontal as shown on the attached cross sections.

8.3.3 Location 3

Rock cut slope Location 3 is bound between Congress Street to the South and the Stroudwater Trail to the North and is proposed to extend approximately 250 feet in length, to the West of the Southbound Maine Turnpike. Roughly 4 commercial buildings and gas and electrical utilities are located within a 500-foot radius of the proposed rock cut. The maximum proposed cut slope height at Location 3 is 16 feet. The GPR data indicates the existing rock surface slope varies from roughly 16 to 39 degrees above horizontal.

8.3.4 Location 4

Rock cut slope Location 4 is bound between the Main Central Railroad to the South and Brighton Avenue to the North and is proposed to extend approximately 250 feet in length, to the West of the Southbound Maine Turnpike. Several commercial buildings, the Main Central Railroad, Brighton Avenue Bridge Structure, and the Blue Rock Quarry are located within a 500-foot radius of the proposed rock cut. The maximum proposed cut slope height at Location 4 is 13 feet. The GPR data indicates the existing rock surface slope varies from roughly 12 to 29 degrees above horizontal.

8.4 Rock Quality

The following borings were taken in the vicinity of the proposed rock cut slope locations:

Table 8-2: Borings Taken in the Vicinity of the Proposed Rock Cut

Location No.	Nearest Boring	Rock Core Taken	Subsurface Profile Sheet*
1	HB-PAVE-103	No	8 – Sta. 2247+00 to 2260+00
2	HB-PAMI-112	No	11 – Sta. 2288+00 to 3202+00
3	HB-PAMI-113	No	12 – Sta. 2302+00 to 2316+00
4	HB-PAMI-124	Yes 5'	17 – Sta. 2370+00 to 2383+00

*The subsurface profile is included as Figure 4 in the Geotechnical Design Report.

Rock was encountered at Elevation 97.9 in Boring HB-PAMI-124, and five feet of rock core was taken. The rock core run returned 100% recovery with a Rock Quality Designation (RQD) of 50%. The rock was classified as Phyllite, rather than Granofels or Gneiss, which are reported on the geologic map.

The geophysical survey conducted by HGR is provided in Section 3.3.

8.5 Laboratory Test Results of Rock

Typical values for uniaxial compressive strength from AASHTO, Table 4.4.8.1.2B vary from 3,500 to 35,000 psi for Phyllite and 3,500 to 45,000 psi for Gneiss were utilized for this exercise.

Uniaxial compressive strength tests results on five (5) rock core samples taken from the nearby Stroudwater Bridge Project ranged from 2,511 to 6,954, with an average of 4,720 psi. The rock for Stroudwater Bridge Project was classified as metapelite, with calcsilicate veins.

Uniaxial compressive strength tests results on six (6) rock core samples taken from the MCRR Bridge Project ranged from 4,564 to 12,682, with an average of 6,813 psi. The rock for MCRR Bridge Project was classified as granofels and metasandstone with calcsilicate veins.

8.6 Rock Slope Engineering

HNTB performed a desk study review of available geologic maps, soil boring logs, laboratory testing results, geophysical survey results, and site photos from Google Street view. The only visible exposed rock from Google Street view was observed at Location 3, where the rock appears to be lite gray in color and blocky, with three sets of roughly orthogonal discontinuities (one nearly horizontal, one nearly vertical striking roughly perpendicular to the roadway, and one nearly vertical striking roughly parallel to the roadway). Much of the rock cut slope is obscured by vegetation. Existing available geologic structure data was obtained from the bedrock geology map as described above.

Rock mass strength could behave in three distinct ways:

- Massive rock is controlled by the rock's intact strength obtained from uniaxial compressive strength tests on rock core specimen or from typical values in the absence of site-specific data.
- Jointed rock, with one or more sets of discontinuities, is generally controlled by the shear strength of the discontinuity, which is ideally derived from a basic friction angle obtained from direct shear testing on saw cut rock core samples and adjusted for joint roughness and infill conditions. The shear strength of a discontinuity is generally lower strength than the rock's intact strength. In the absence of lab data, typical values of basic friction angle can be obtained based on rock type / grain size.
- Highly fractured or very weak or weathered rock behaves as a rock mass, which are estimate using the Hoek and Brown failure criterion.

Considering the uniaxial compressive strength values reported above, the intact strength is not assumed to control the overall strength of the rock mass. Since direct shear testing was not performed for this project, a basic friction angle for rock discontinuities was assumed to be 27 degrees based on AASHTO,

Table 10.4.6.4-1 and joint roughness was assumed to be 0 degrees. Therefore, the total friction angle of discontinuities used in the analysis was 27 degrees.

Stereographic analysis was performed using RocSciences's DIPS version 7, to evaluate the kinematic viability of the planar sliding, wedge sliding and toppling. The stereographic analysis was performed using the geologic mapping data obtained for the bedrock geology map, assuming the proposed rock cut slope would be parallel to the roadway alignment and using the discontinuity shear strength (friction angle only) described above.

Table 8-3: Summary of Stereographic Analysis

Location No.	Trend of Rock Cut	Proposed Rock Cut Slope Inclination from Horizontal (Degrees)	Poles Resulting in Planar Sliding (%)	Intersections Resulting in Wedge Sliding (%)	Intersections Resulting in Direct Toppling (%)	Intersections Resulting in Oblique Direct Toppling (%)	Poles Resulting in Flexural Toppling (%)
1	N35°E	53	0	0	0	0	0
2	S05°W	53	0	0	0	30	0
3	N00°E	53	0	0	0	33	0
4	S18°W	53	0	0	0	40	60

Notes:

1. Given the small number of data points, one point could result in a significant percent.
2. Geologic mapping not performed. Results are based solely on data points obtained from bedrock geologic map,
3. Oblique toppling is not anticipated to occur due to lateral restraint.
4. Alternatively, given the large catchment available and low consequence of a rockfall event, dowels may be omitted from the contract.

Given the character of the rock as understood from the information available, the stability was also assessed assuming the rock is weathered or highly fractured, which may be an underprediction of the actual rock strength conditions. The analysis indicated that the factors of safety are satisfactory for a proposed cut angle of 53 degrees (0.75H:1V). Therefore, A 0.75H:1V slope is proposed. A constructability level blast design was not performed for this project.

8.7 Rock Fall Mitigation

The drainage ditch width proposed is generally 30 feet or wider, which is considerably wider than required to retain rockfall. Based on the FHWA Rockfall Catchment Ditch Design Guide, a 40 tall 0.75H:1V slope with a 6H:1V ditch slope can retain 95% of rockfall within 15 feet. Considering the maximum slope height is only 18 feet, the catchment width is considerably more than adequate to retain rockfall. Therefore, no site specific rockfall simulation modeling was performed.

8.8 Rock Slope Conclusions and Construction Recommendations

A 0.75H:1V slope is proposed for the four rock cut slopes, with the cut made parallel to the existing roadway. More than 30 feet of catchment width is shown on the cross sections to accommodate drainage ditches and is much greater than the width required for rockfall catchment.

The following provisions should be added to the Contract Documents for improved safety, reduced risk of longer roadway closures, and a better-quality cut slope:

- Limit pre-split drill holes to 3-inch diameter (Blast hole diameter is limited to 3-inches in the specifications already, but no requirement is provided for pre-split holes).
- Set maximum presplit spacing to 24 inches or less for a more uniform face (No pre-split maximum spacing requirement was provided in the specifications).
- Require a minimum 25 millisecond delay between presplit holes and production hole.
- Require the blast design keep the direction of the shot parallel to the roadway to minimize flyrock.
- Elaborate on well water quality tests in Specification Section 105.2.6.
- Special notification or monitoring requirements for Maine Central Railroad.

The following pay items will need to be quantified and accounted for in the Contract Documents:

- 203.21 – Rock Excavation per Cubic Yard
    - Measured and paid as the plan quantity
    - Calculate using average end area method
- 203.211 – Presplitting Rock per Linear Foot
    - Presplit is measured from top or rock elevation to toe of slope elevation
    - Assume pre-split holes are spaced every 24 inches to calculate number of holes

9.0 LIMITATIONS OF REPORT

The conclusions and recommendations contained in this report are based upon the subsurface data obtained during this investigation and on details stated in this report. The validity of the conclusions and recommendations contained in this report are necessarily limited by, among other things, the scope of field investigation and by the number of borings. Therefore, given the nature of this subsurface study, there is a possibility that actual conditions encountered will differ from those discussed in this report. Should conditions arise which differ from those described in this report, HNTB should be notified immediately and provided with all information when available regarding subsurface conditions.

As part of the geotechnical recommendations presented in this report, HNTB makes no warranty as to the absence or presence of any environmental hazard or waste present on any property evaluated hereunder and all reports generated here to are qualified as being based upon existing data reasonably available to HNTB and not subject to independent verification. HNTB is not responsible for any latent defects that could not be reasonably discovered during the performance of its services and makes no legal representations whatsoever concerning any matter, including but not limited to, the ownership of any property or the interpretation of any law. These limitations form a material part of this report and are considered incorporated by reference therein. No warranty for the contents of this report, neither expressed nor implied, is made except that professional services were performed in accordance with generally accepted principles and practices.

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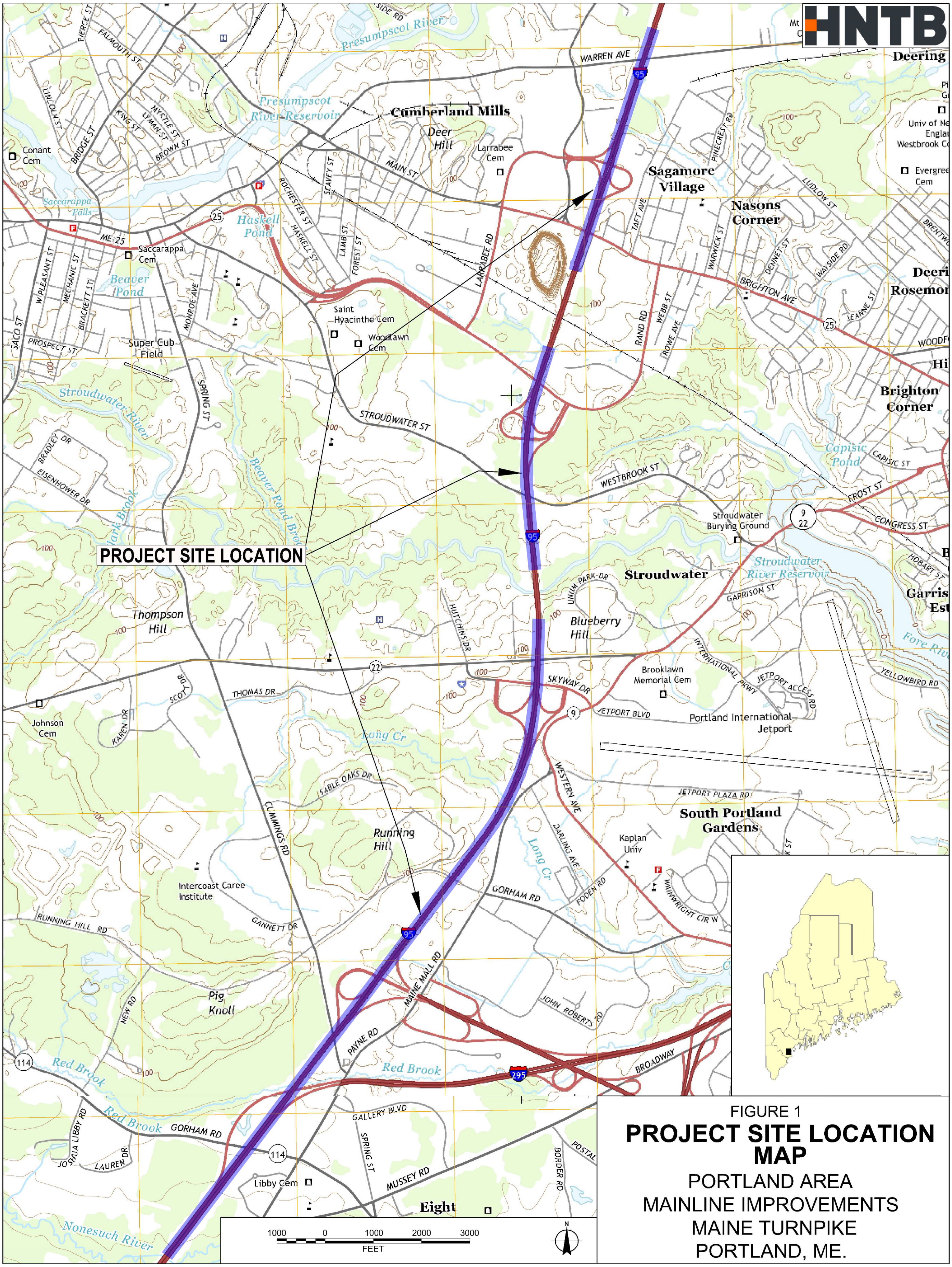
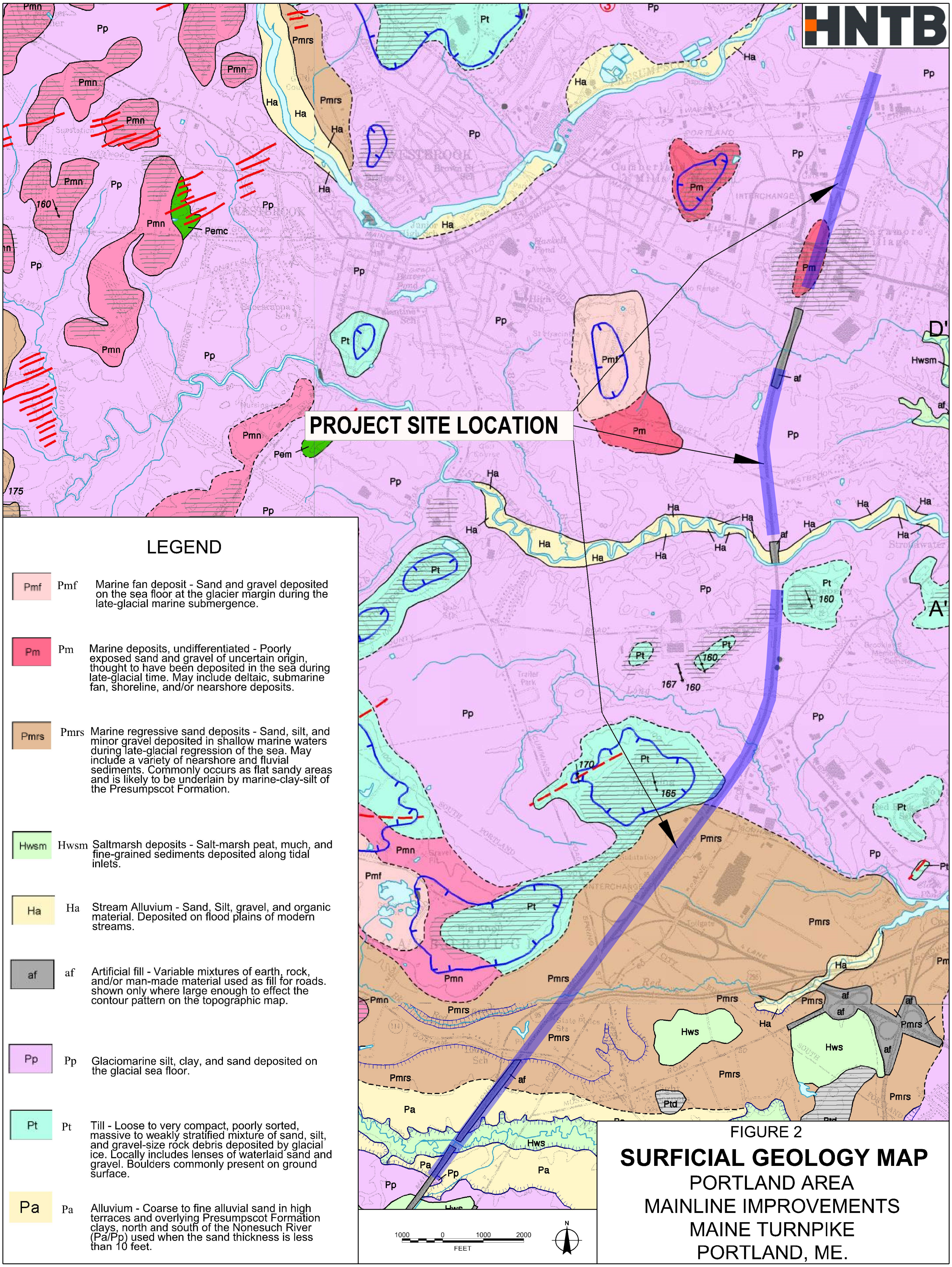


FIGURE 1

PROJECT SITE LOCATION MAP

PORTLAND AREA
MAINLINE IMPROVEMENTS
MAINE TURNPIKE
PORTLAND, ME.

Basemap: U.S.G.S. Portland West Quadrangle, US Topo, 2014



LEGEND

Pmf	Pmf	Marine fan deposit - Sand and gravel deposited on the sea floor at the glacier margin during the late-glacial marine submergence.
Pm	Pm	Marine deposits, undifferentiated - Poorly exposed sand and gravel of uncertain origin, thought to have been deposited in the sea during late-glacial time. May include deltaic, submarine fan, shoreline, and/or nearshore deposits.
Pmrs	Pmrs	Marine regressive sand deposits - Sand, silt, and minor gravel deposited in shallow marine waters during late-glacial regression of the sea. May include a variety of nearshore and fluvial sediments. Commonly occurs as flat sandy areas and is likely to be underlain by marine-clay-silt of the Presumpscot Formation.
Hwsm	Hwsm	Saltmarsh deposits - Salt-marsh peat, much, and fine-grained sediments deposited along tidal inlets.
Ha	Ha	Stream Alluvium - Sand, Silt, gravel, and organic material. Deposited on flood plains of modern streams.
af	af	Artificial fill - Variable mixtures of earth, rock, and/or man-made material used as fill for roads. shown only where large enough to effect the contour pattern on the topographic map.
Pp	Pp	Glaciomarine silt, clay, and sand deposited on the glacial sea floor.
Pt	Pt	Till - Loose to very compact, poorly sorted, massive to weakly stratified mixture of sand, silt, and gravel-size rock debris deposited by glacial ice. Locally includes lenses of waterlaid sand and gravel. Boulders commonly present on ground surface.
Pa	Pa	Alluvium - Coarse to fine alluvial sand in high terraces and overlying Presumpscot Formation clays, north and south of the Nonesuch River (Pa/Pp) used when the sand thickness is less than 10 feet.

FIGURE 2

SURFICIAL GEOLOGY MAP

PORTLAND AREA
MAINLINE IMPROVEMENTS
MAINE TURNPIKE
PORTLAND, ME.

Basemap: MEGS Surficial Geologic Map, Gardiner Quadrangle, 2009

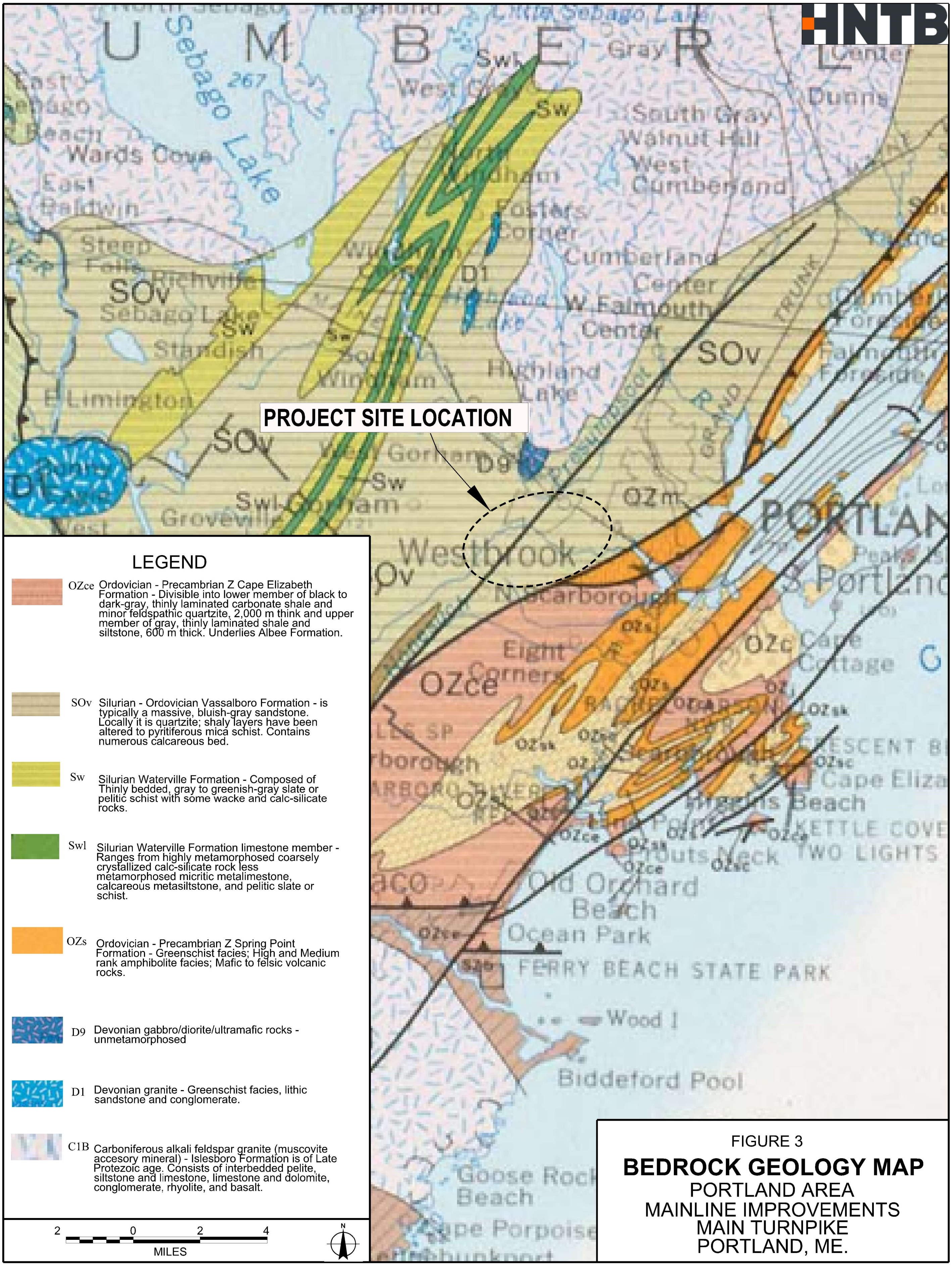


FIGURE 3
BEDROCK GEOLOGY MAP
PORTLAND AREA
MAINLINE IMPROVEMENTS
MAIN TURNPIKE
PORTLAND, ME.

Basemap: MEGS Bedrock Geologic Map of Maine, 1985

Date:$date$

NOTES:

1. THIS SUBSURFACE PROFILE REPRESENTS THE INTERPRETATION OF THE CONDITIONS ALONG THE CENTERLINE OF THE MAINLINE. THE PROFILE CONTAINS INTERPRETATIONS OF WIDELY SPACED TEST BORINGS DATA AND SHOULD NOT BE USED AS PART OF THE CONTRACT DOCUMENT.

2. THE DEPTH AND THICKNESS OF SUBSURFACE STRATA INDICATED ON THE PROFILE WERE GENERALIZED FROM AND INTERPOLATED BETWEEN BORING LOCATIONS. THE TRANSITION BETWEEN MATERIALS MAY BE MORE OR LESS GRADUAL THAN INDICATED.

3. THE HB-PAMI BORING ELEVATIONS ARE APPROXIMATE AND ESTIMATED BASED ON THE AVAILABLE TOPOGRAPHY MAPS. THE ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.

4. THE ELEVATIONS OF BORINGS PERFORMED BY OTHERS ARE TAKEN FROM THE LOGS PUBLISHED IN THE CONTRACT DOCUMENTS OF THE RESPECTIVE PROJECT.

5. AT LOCATIONS WHERE THE SUBSURFACE CONDITIONS VARY WIDELY BETWEEN THE NORTHBOUND AND SOUTHBOUND. THE BORING INFORMATION IS SCREENED.

6. N* INDICATES THAT SPT N VALUES ARE REPORTED DUE TO MISSING INFORMATION OF HAMMER EFFICIENCY. N INDICATED THAT THE SPT N VALUES ARE CORRECTED FOR HAMMER EFFICIENCY.

7. GROUNDWATER REPORTED REPRESENTS WATER LEVEL ENCOUNTERED DURING DRILLING. THE GROUNDWATER IS ANTICIPATED TO FLUCTUATE SEASONALLY AND FOLLOWING EVENTS OF PRECIPITATION.

8. AT BRIDGE LOCATIONS, ONE BORING IS USED AND SHOWN AS A REPRESENTATION OF THE SUBSURFACE CONDITIONS.

LEGEND:

- ALLUVIUM
- FILL
- MARINE SILT-CLAY CRUST
- MARINE INTERBEDDED SAND AND SILT UPPER
- MARINE INTERBEDDED SAND AND SILT LOWER
- MARINE SAND
- MARINE SILT-CLAY
- GLACIAL TILL
- ROCK
- WATER

APPROXIMATE AS DRILLED LOCATION OF BORINGS PERFORMED BY SCHONEWALD ENGINEERING ASSOCIATES INC IN 2019

APPROXIMATE AS-DRILLED LOCATION OF BORINGS PERFORMED BY OTHERS

APPROXIMATE AS-DRILLED LOCATION OF PAVEMENT CORES PERFORMED BY THE MAINE TURNPIKE AUTHORITY

APPROXIMATE AS-DRILLED LOCATION OF PAVEMENT CORE BORINGS PERFORMED BY SHONEWALD ENGINEERING ASSOCIATES INC IN 2019

APPROXIMATE AS-DRILLED LOCATION OF PAVEMENT CORE BORINGS PERFORMED BY S.W. COLE ENGINEERING INC IN 2018

APPROXIMATE AS-DRILLED LOCATION OF PAVEMENT CORE BORINGS PERFORMED BY SCHONEWALD ENGINEERING INC IN 2017

GROUNDWATER OBSERVED DURING DRILLING

= SPT-N VALUE (SEE NOTE 6)

Su=(#)psf = UNDRAINED STRENGTH IN SITU VANE SHEAR/UNDRAINED STRENGTH

REC:XX% = ROCK CORE RECOVERY

REQ:XX% = ROCK QUALITY DESIGNATION

FIGURE 4-1

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
Drawn	TAH	4/14	In Charge of	MDR	4/14

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340 County Road, Suite 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 228-0909

MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE NOTES

CONTRACT:

SHEET NUMBER: $PSETNO$ OF $PSETT

Filename: $file$

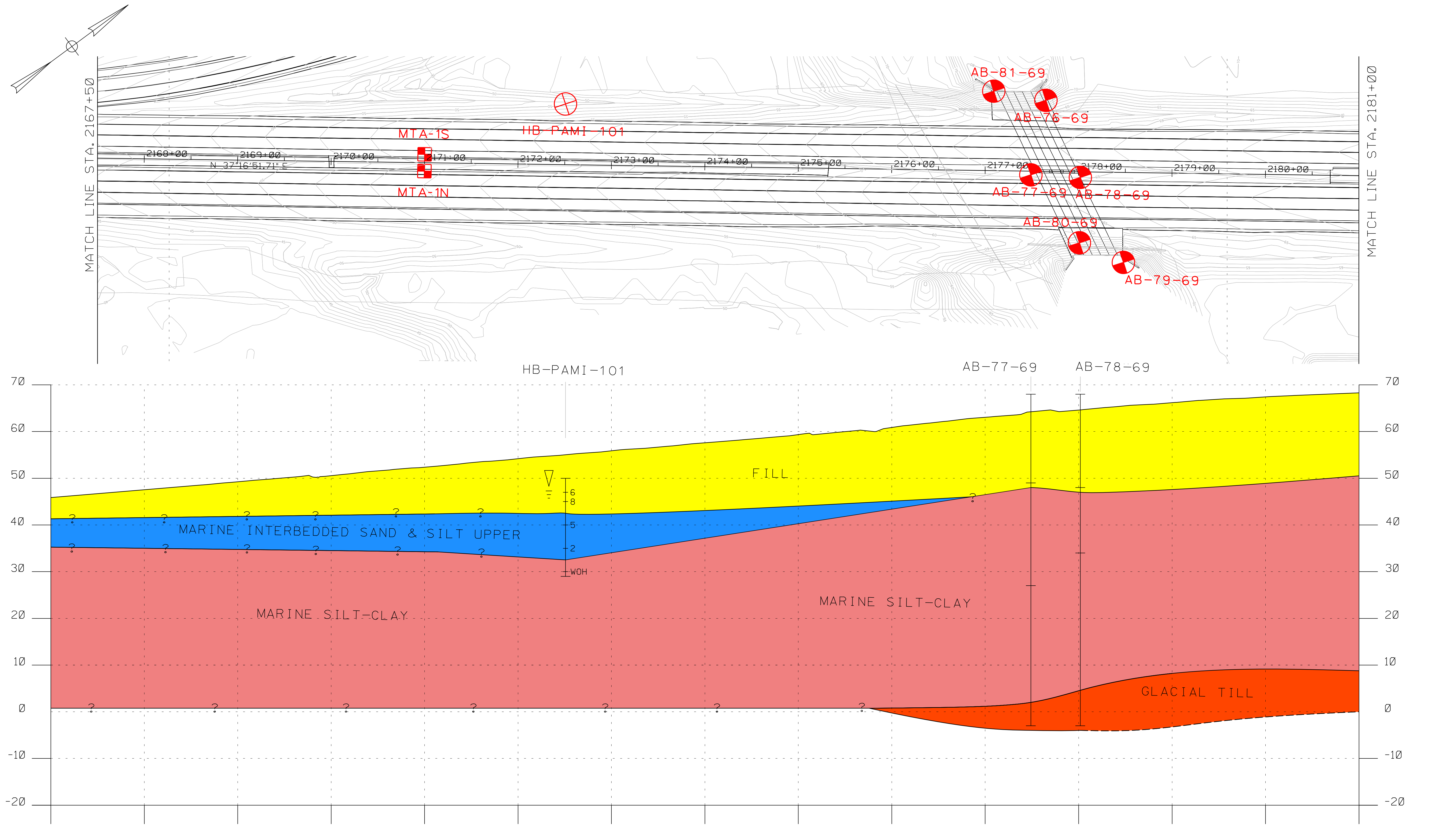

FIGURE 4-2

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 1

CONTRACT:

SHEET NUMBER:
$PSETNO$ OF $PSETT

Date:$date$

Filename: $file$

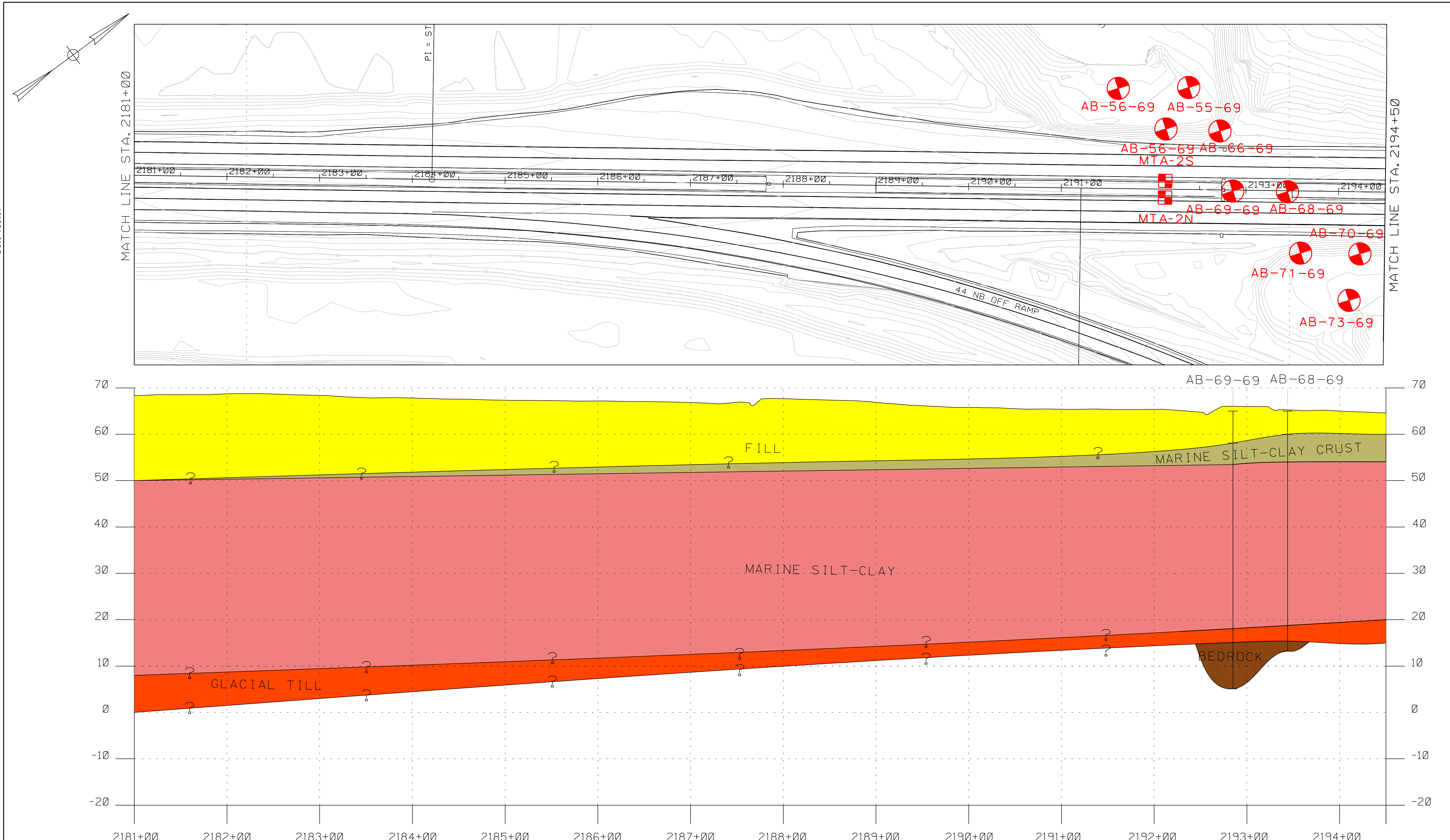

FIGURE 4-3

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 2

CONTRACT:

SHEET NUMBER:
$PSETNO$ OF $PSETT

Date:$date$
Filename: $file$

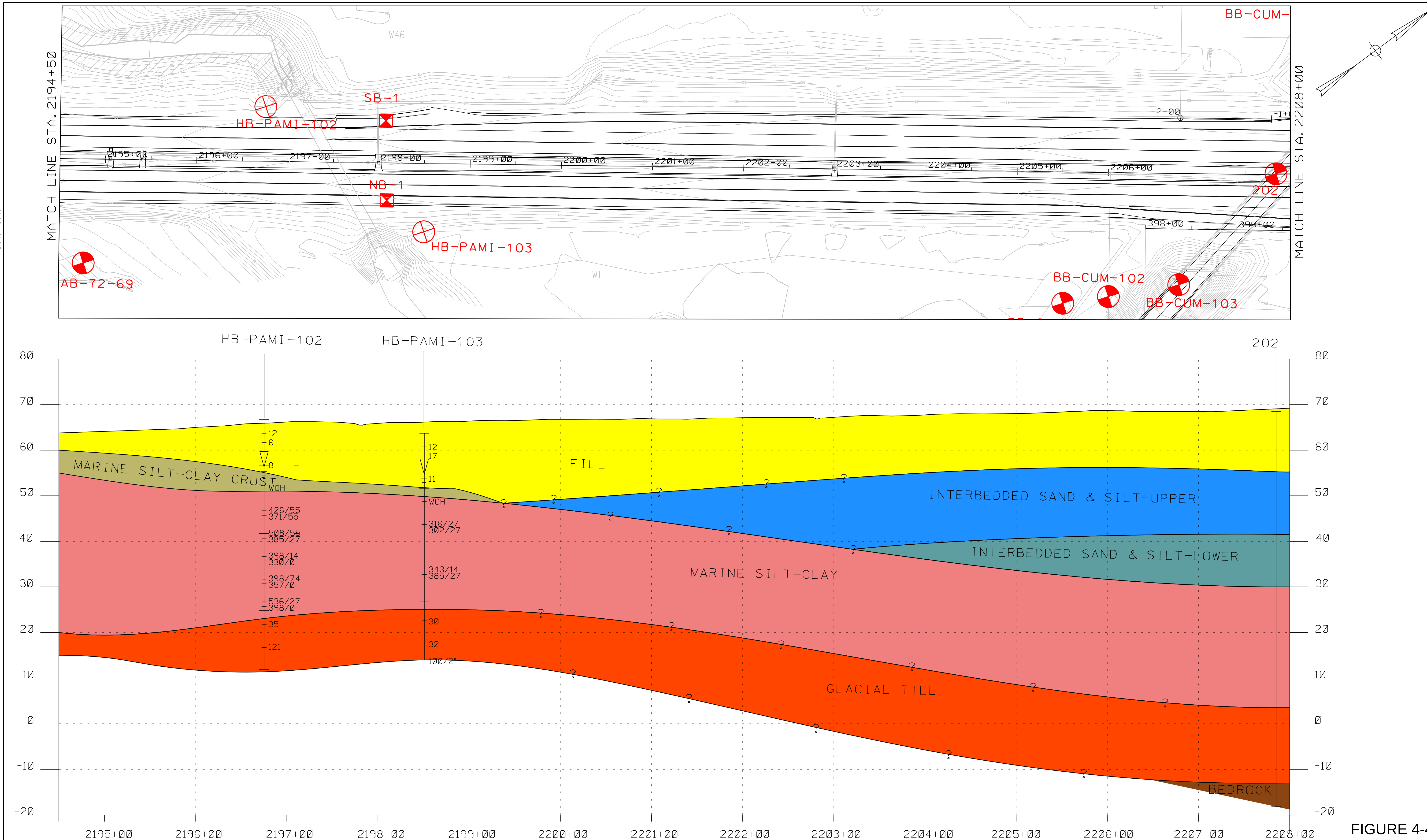

FIGURE 4-4

Scale: 50 0 50 100 Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 3

CONTRACT:

SHEET NUMBER:
$PSETNO$ OF $PSETT

Date:$date$

Filename: $file$

Date:$date$

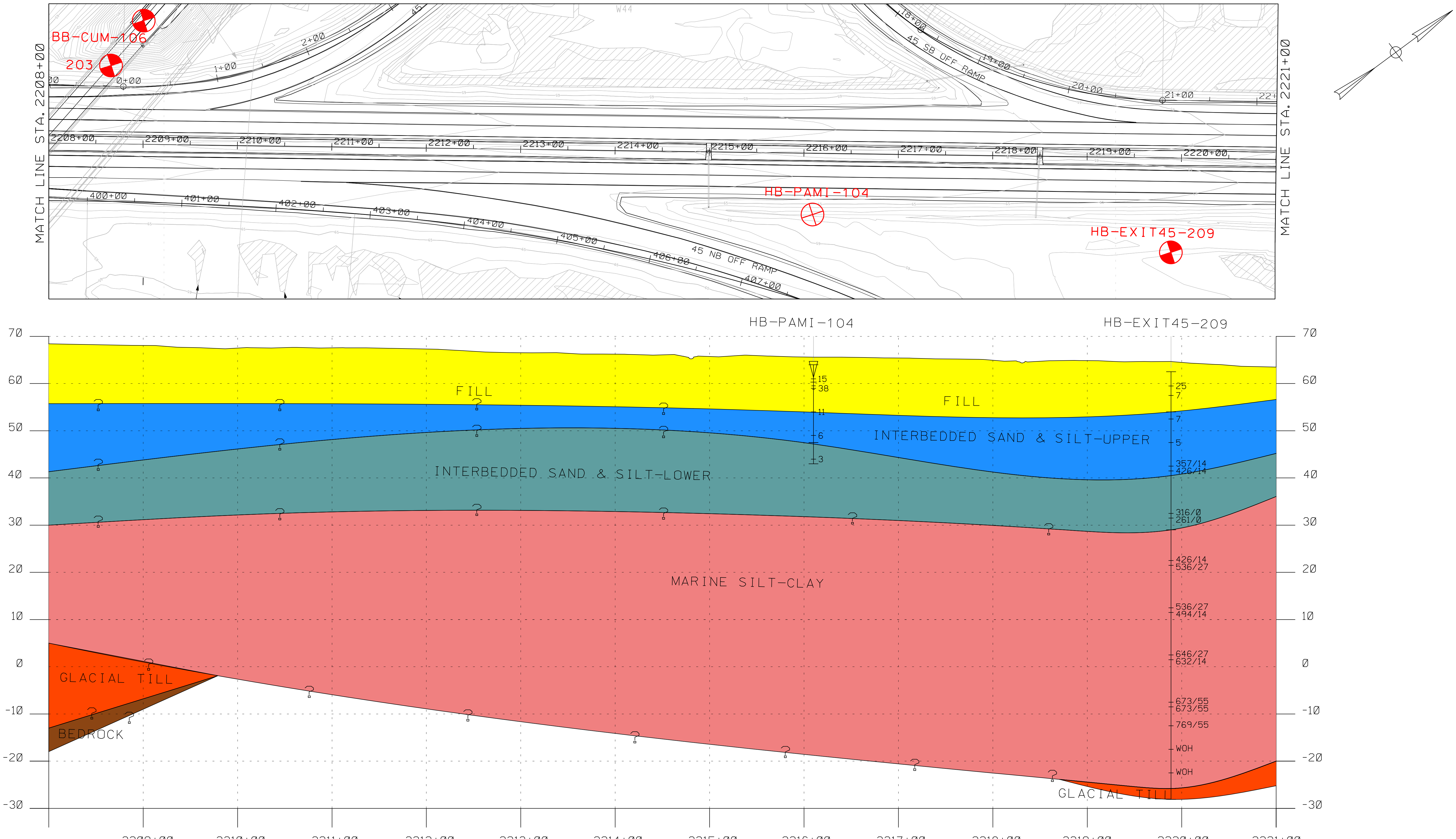

FIGURE 4-5

Scale:

50 0 50 100

Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
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SUBSURFACE PROFILE 4

SHEET NUMBER:

CONTRACT:

$PSETNO$ OF $PSETT

Filename: $file$

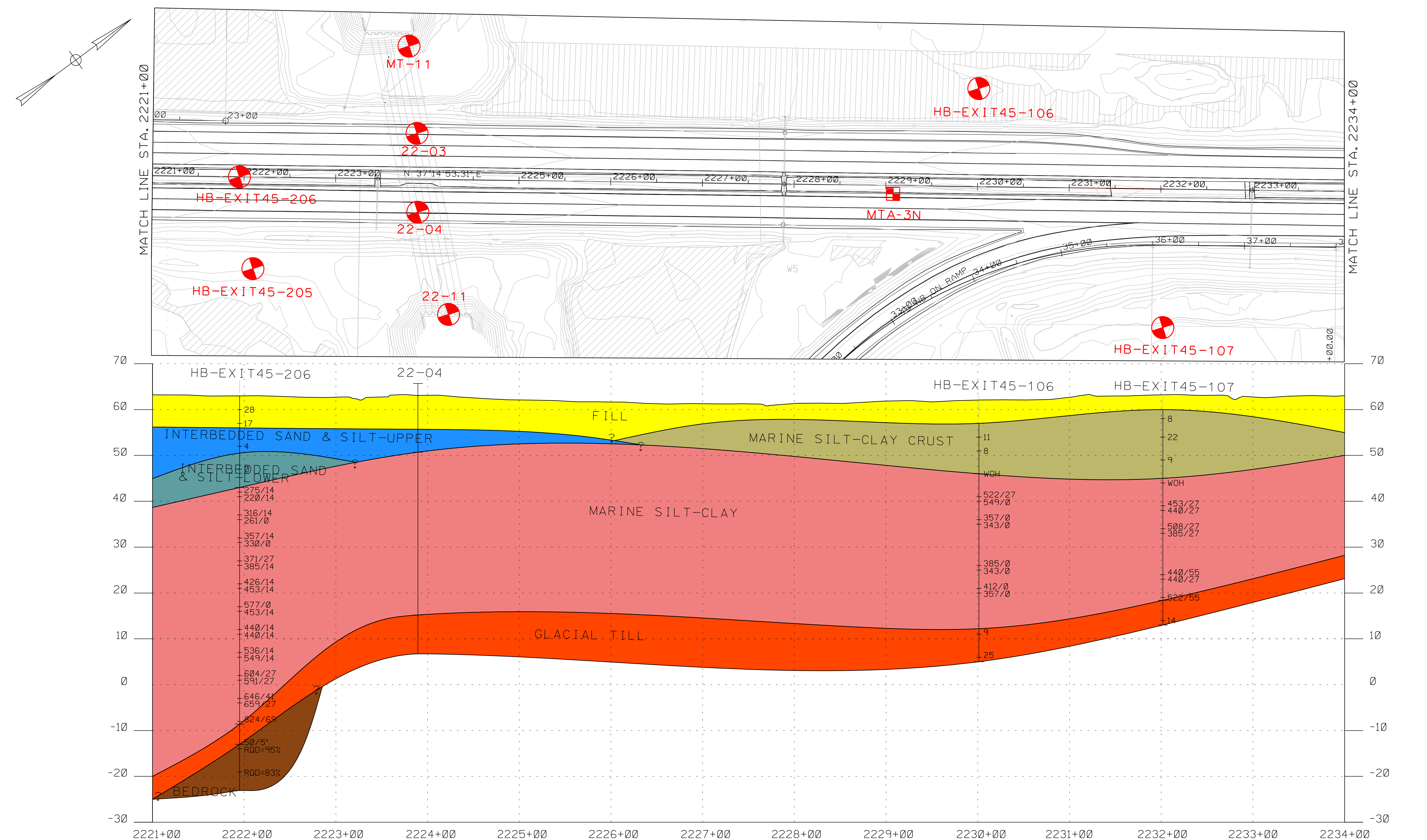

FIGURE 4-6

Scale: 50 0 50 100 Scale of Feet	Designed by: HNTB

No.	Revision	By	Date

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 5

CONTRACT:

SHEET NUMBER:
$PSETNO$ OF $PSETT(

Date:$date$

Filename: $file$

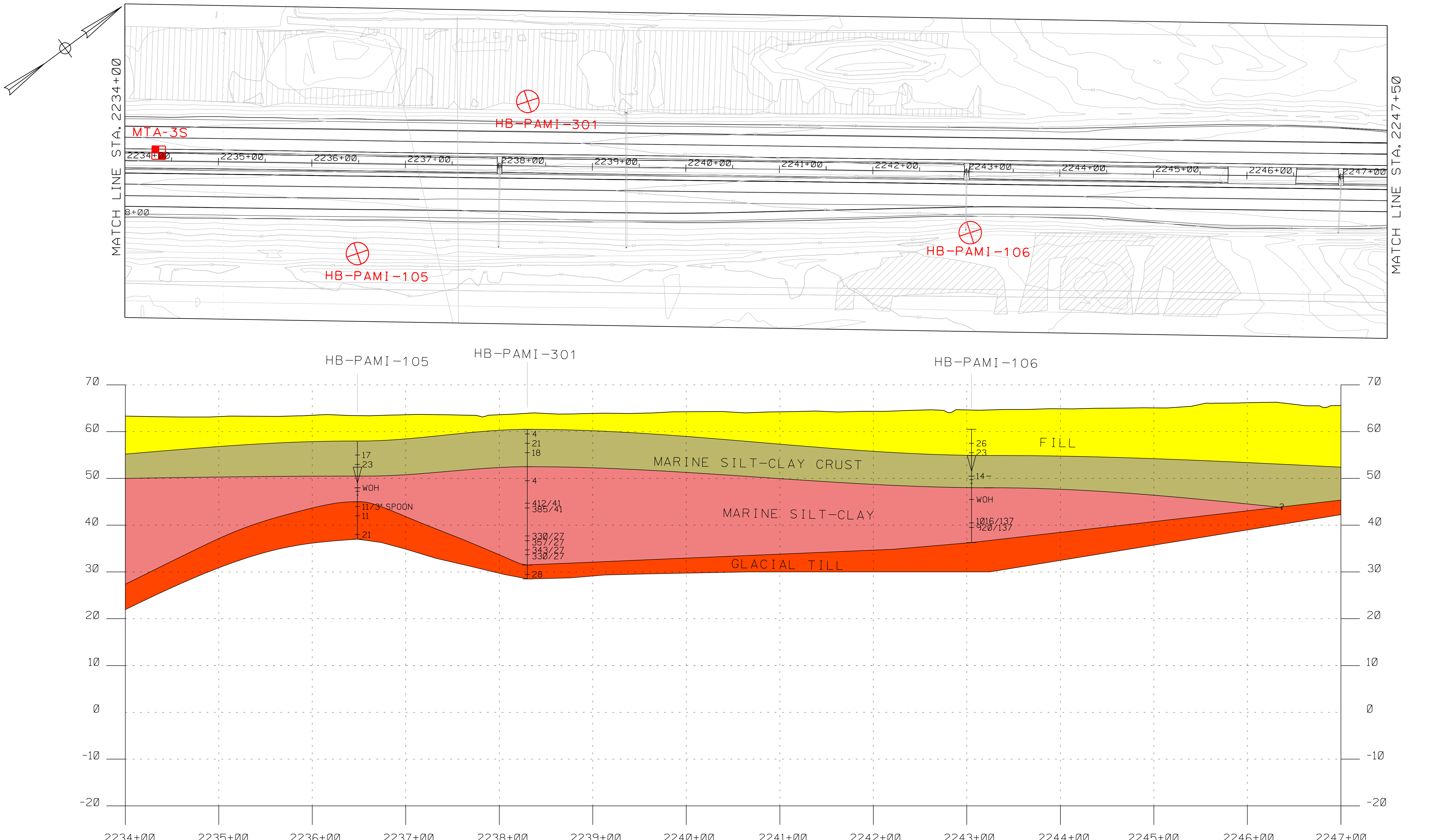

FIGURE 4-7

Scale: 50 0 50 100 Scale of Feet

No.	Revision	By	Date

Designed by: HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
Drawn	TAH	4/14	In Charge of	MDR	4/14

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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 6

SHEET NUMBER:

CONTRACT: $PSETNO$ OF $PSETT

Date:$date$

Filename: $file$

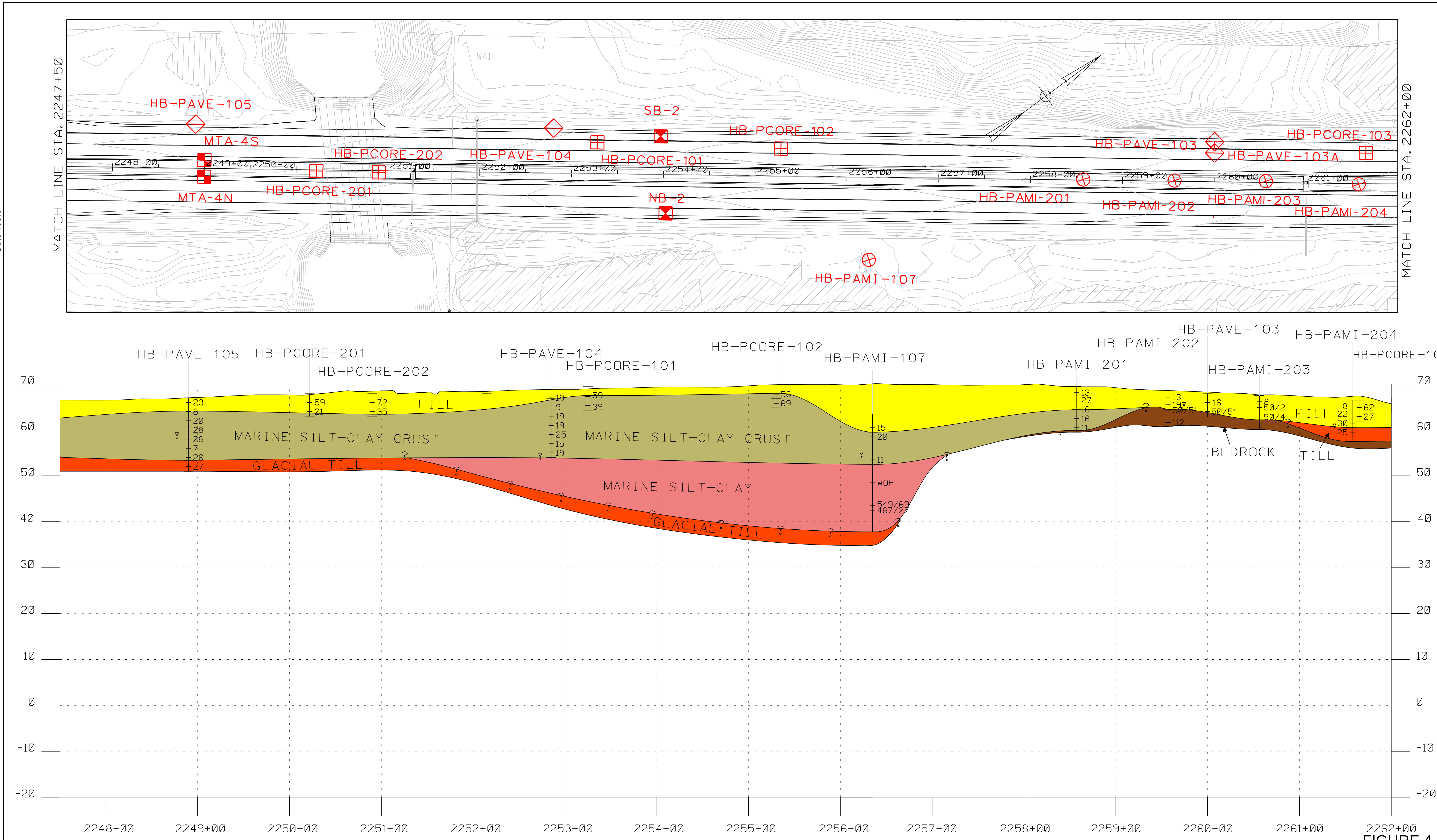

FIGURE 4-8

Scale:

50 0 50 100

Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	PEM	$checkdate1$	Checked	RWH	$checkdate1$
Drawn	SLS	$checkdate1$	In Charge of	RAL	$checkdate1$

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MTA PROJECT MANAGER: $MTAPM$

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 7

SHEET NUMBER: HP-08

CONTRACT:$MTACONTRACT$

$PSETNO$ OF $PSETT

Date:$date$

Filename: $file$

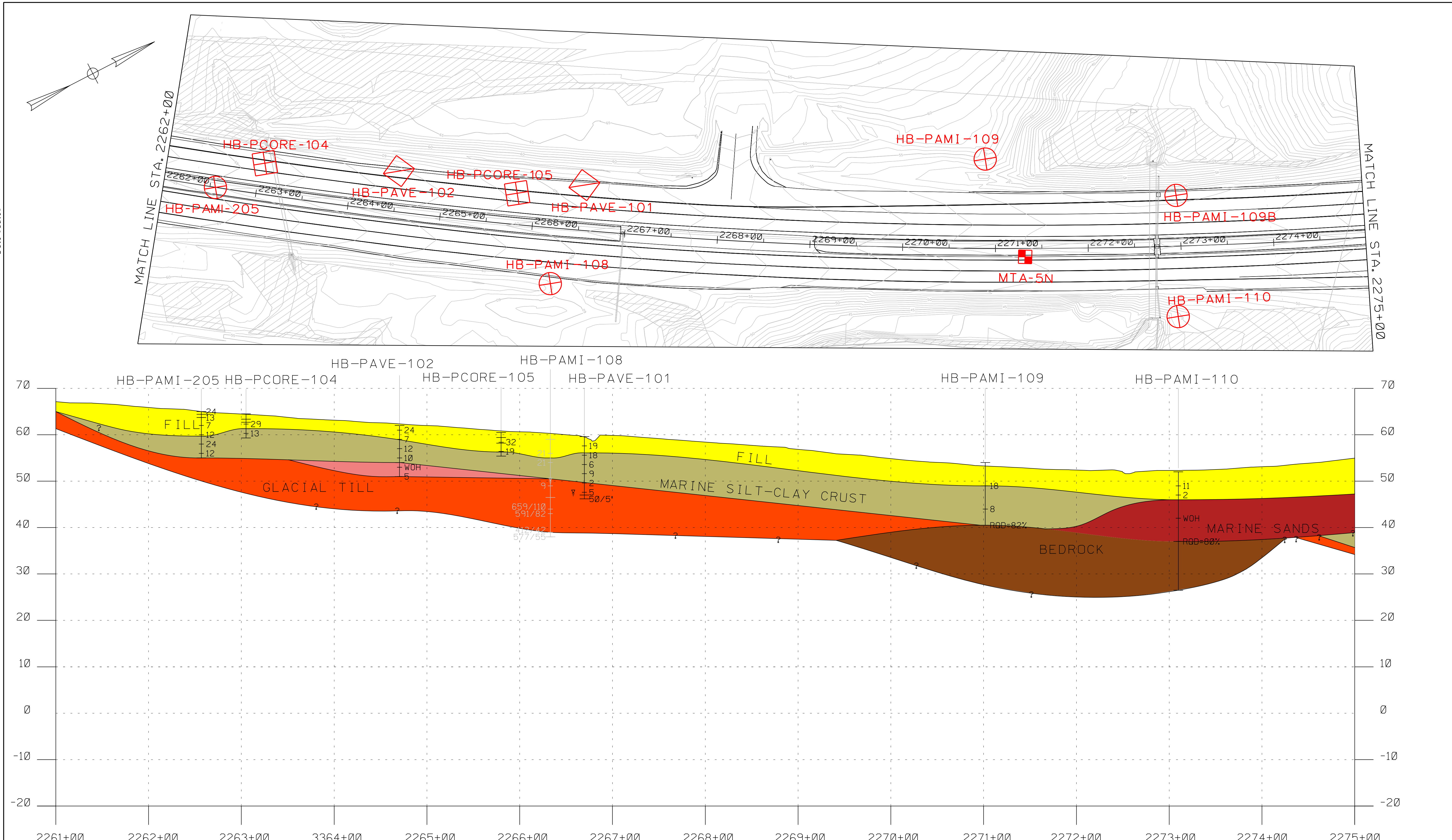

FIGURE 4-9

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 8

SHEET NUMBER:
CONTRACT:
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Date:$date$
Filename: $file$

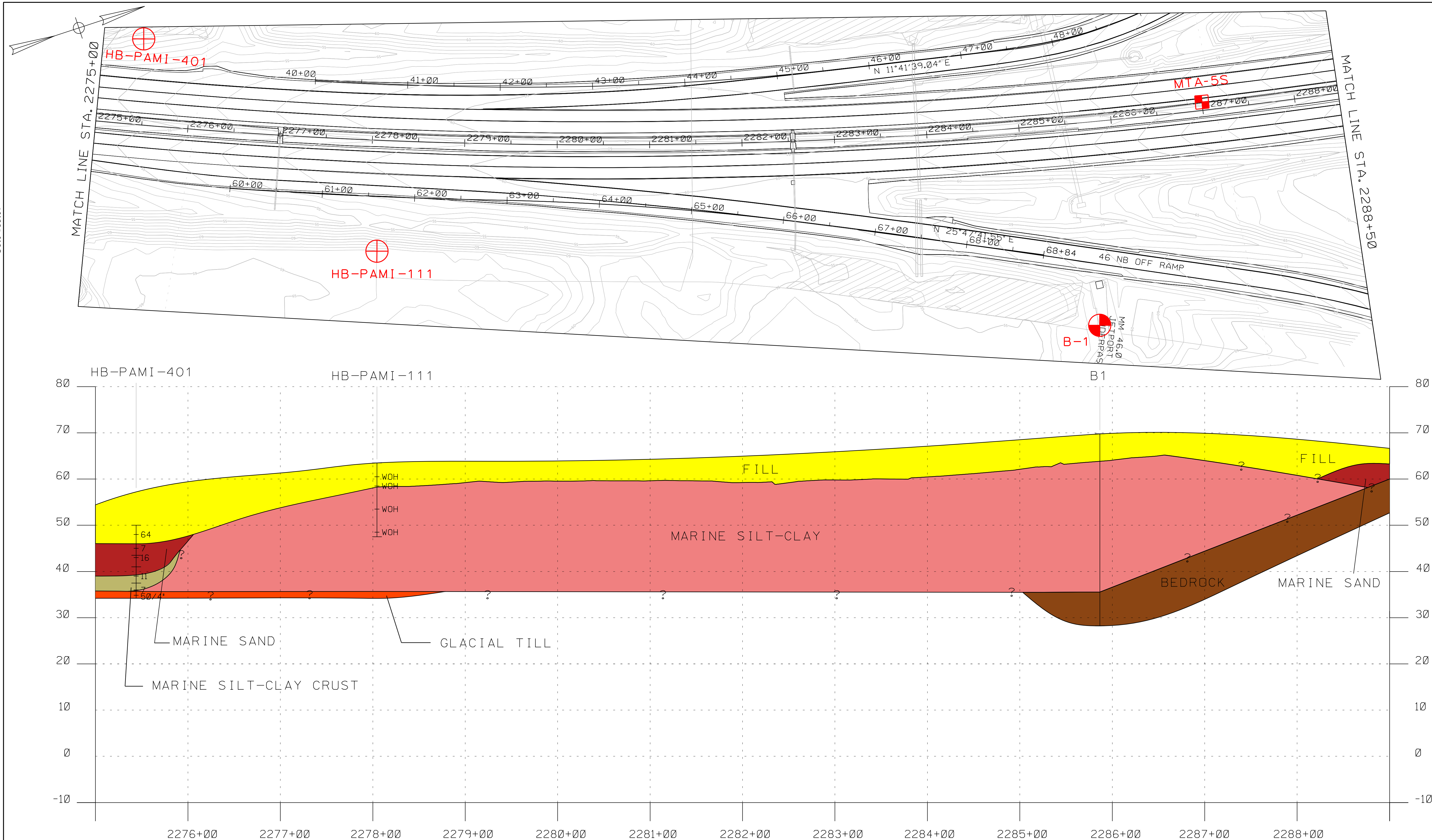

FIGURE 4-10

Scale:
50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
Drawn	TAH	4/14	In Charge of	MDR	4/14

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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 9

CONTRACT:

SHEET NUMBER:
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Date:$date$
Filename: $file$

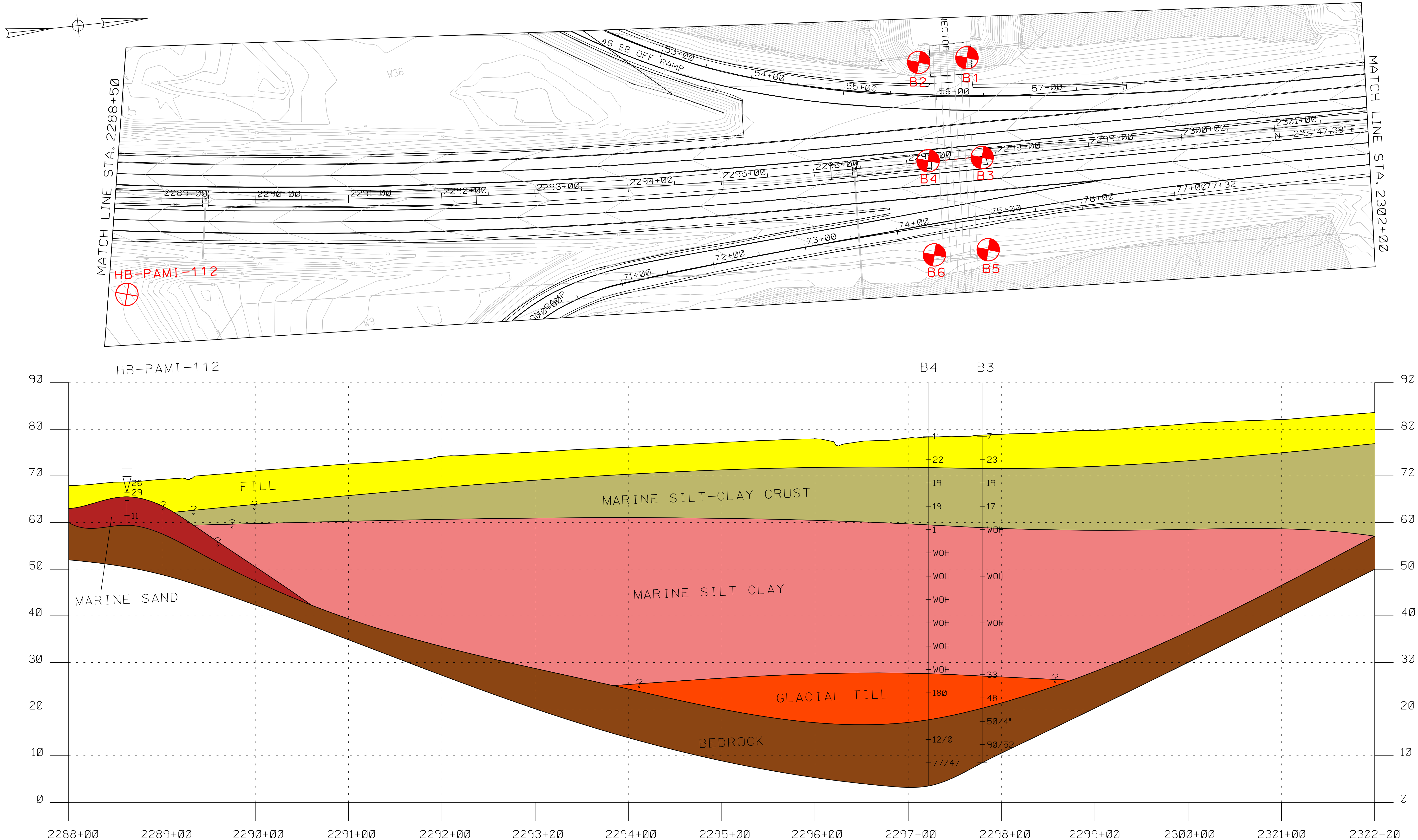

FIGURE 4-11

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 10

SHEET NUMBER:

CONTRACT:

$PSETNO$ OF $PSETTC

Date:$date$

Filename: $file$

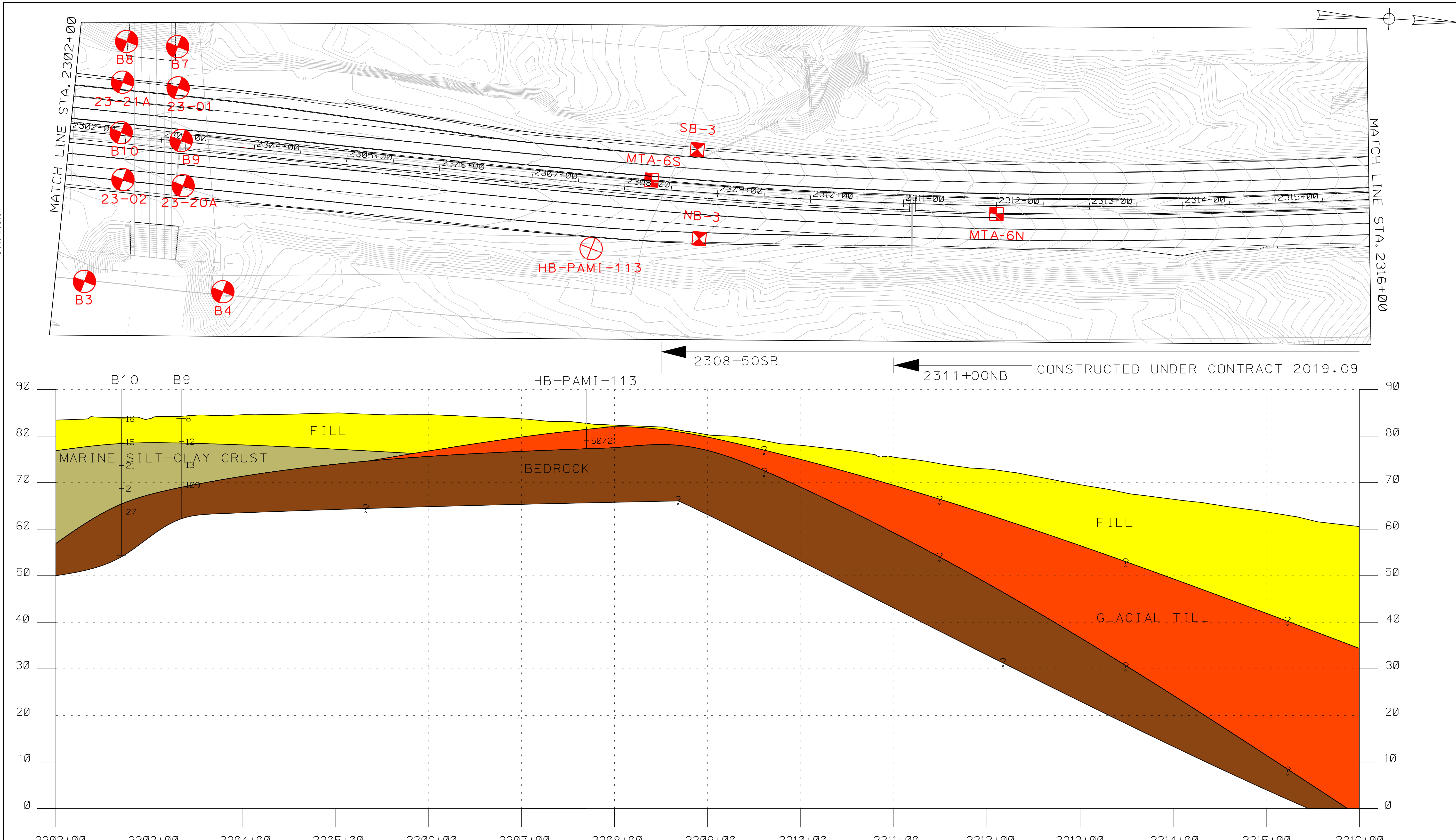

FIGURE 4-12

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
Drawn	TAH	4/14	In Charge of	MDR	4/14

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 11

SHEET NUMBER:
CONTRACT:
$PSETNO$ OF $PSETTOT

Date:$date$
Filename: $file$

Date:$date$

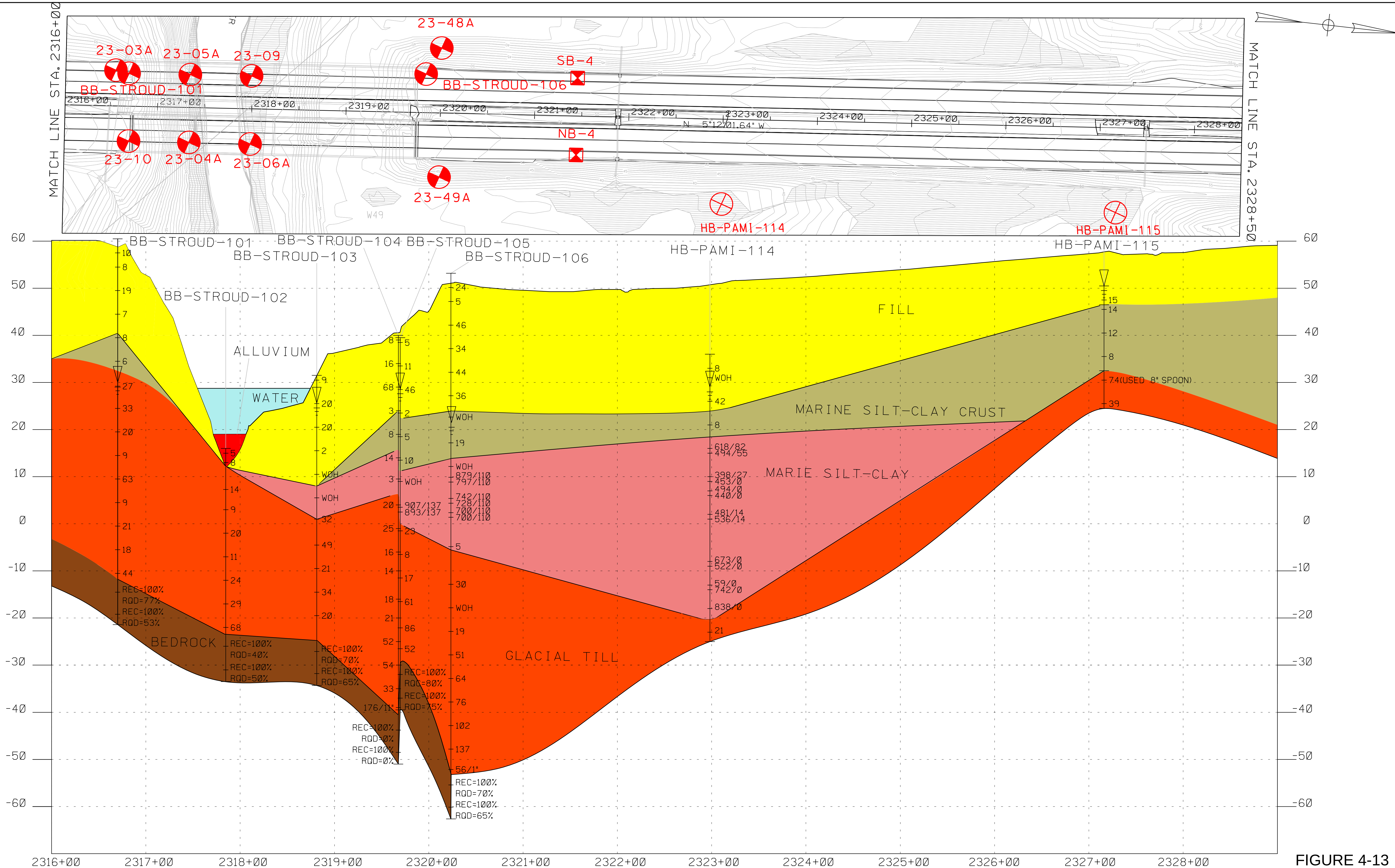

FIGURE 4-13

Scale: 50 0 50 100

Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
Drawn	TAH	4/14	In Charge of	MDR	4/14

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

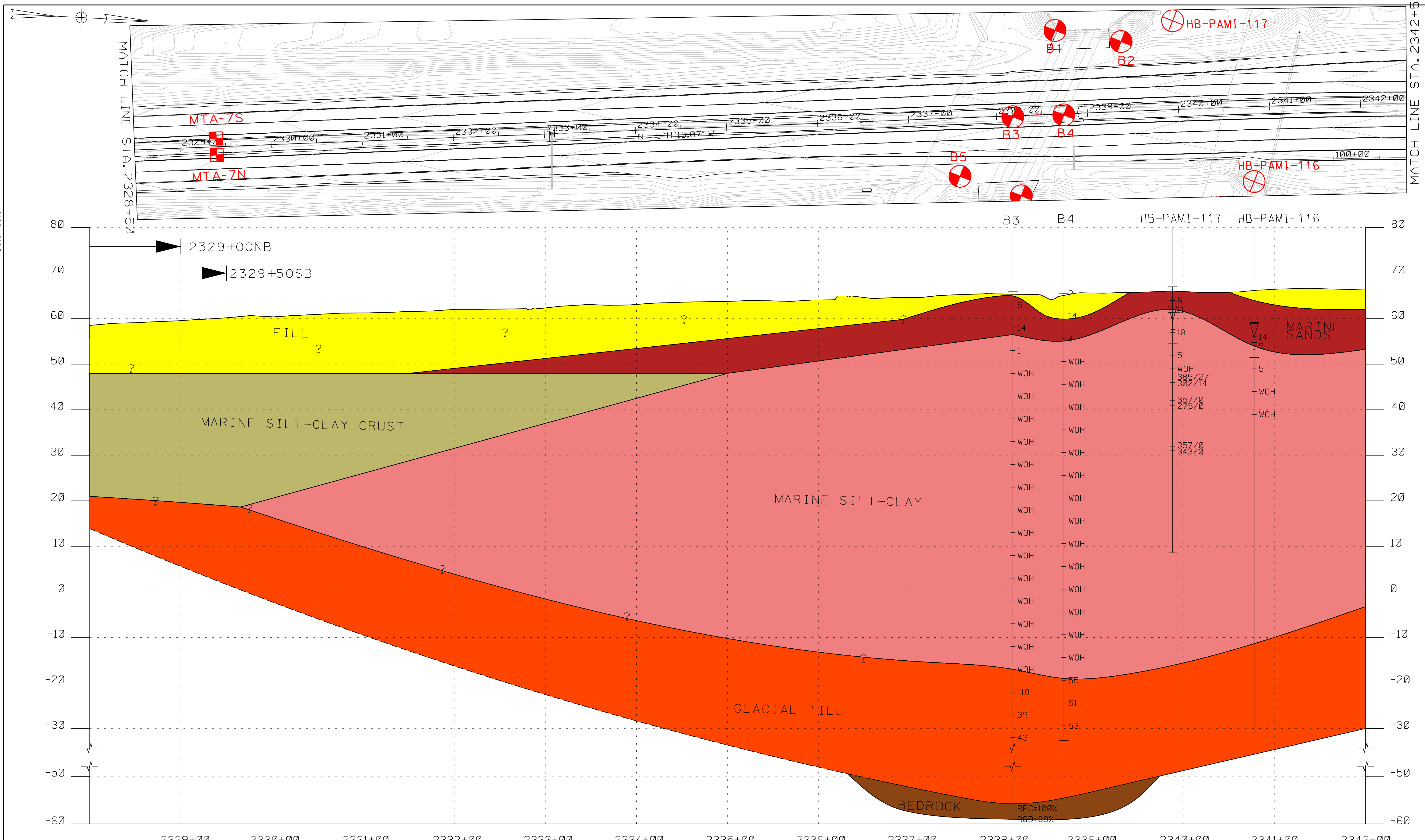
SUBSURFACE PROFILE 12

CONTRACT:

SHEET NUMBER:

$PSETNO$ OF $PSETT

Filename: $file$



Date:$date$

Scale:
50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
Drawn	TAH	4/14	In Charge of	MDR	4/14

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER:

FIGURE 4-14

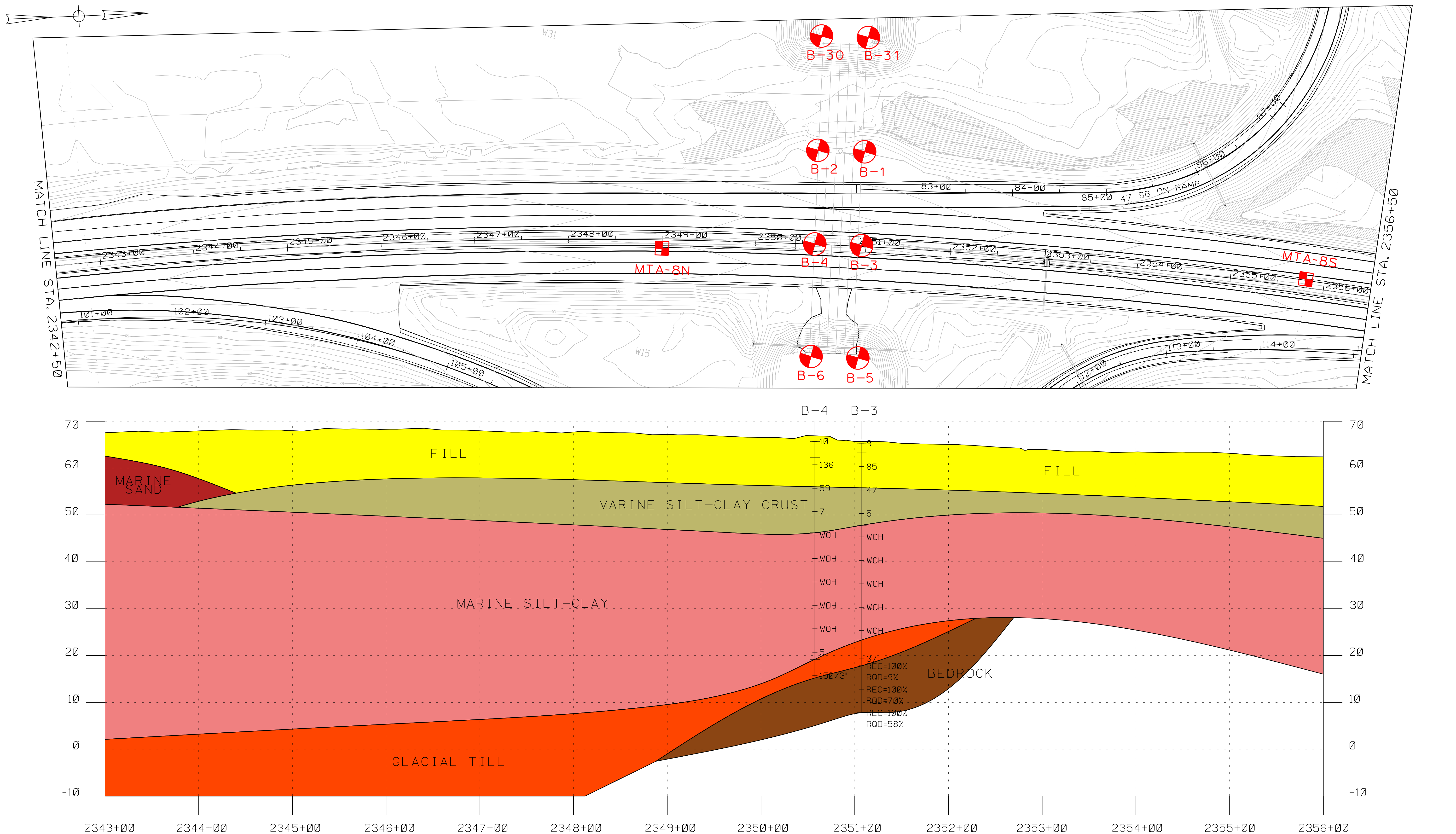
PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 13

CONTRACT:

SHEET NUMBER:
$PSETNO$ OF $PSETT

Filename: $file$



Scale: 50 0 50 100

Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 14

CONTRACT:

SHEET NUMBER:

$PSETNO$ OF $PSET

Date:$date$

Filename: $file$

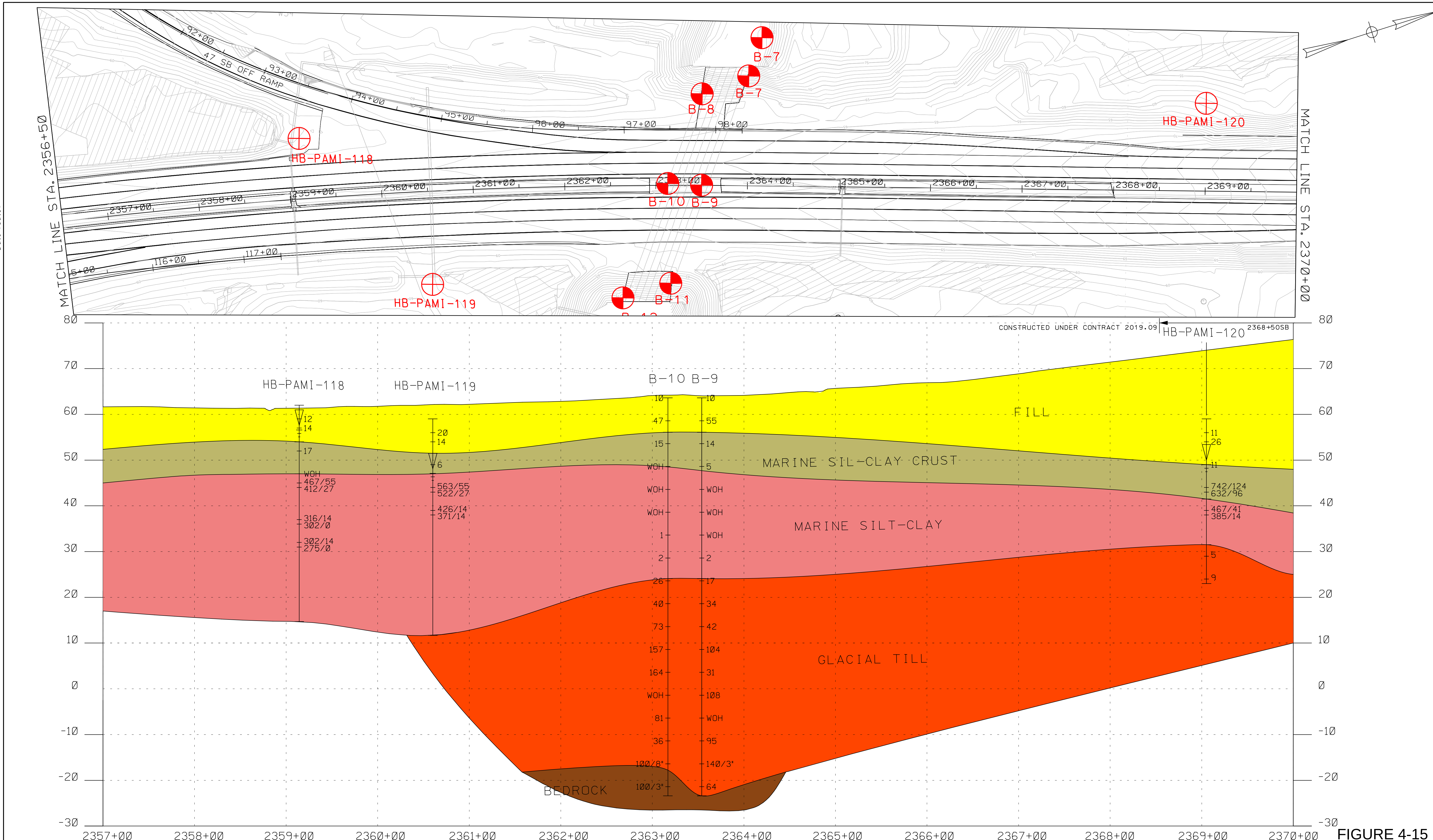

FIGURE 4-15

Scale: 50 0 50 100 Scale of Feet	Designed by: HNTB	HNTB CORPORATION 340 County Road, Suite 6-C Westbrook, ME 04092 TEL (207) 774-5155 FAX (207) 228-0909	MAINE TURNPIKE THE GOLD STAR MEMORIAL HIGHWAY

No.	Revision	By	Date

CONSULTANT PROJECT MANAGER: $CONSULTANTPM$

	By	Date		By	Date
Designed	HJ	4/14	Checked		4/14
Drawn	TAH	4/14	In Charge of	MDR	4/14

MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 15

SHEET NUMBER:

CONTRACT:

$PSETNO$ OF $PSETTO

Date:$date$

Filename: $file$

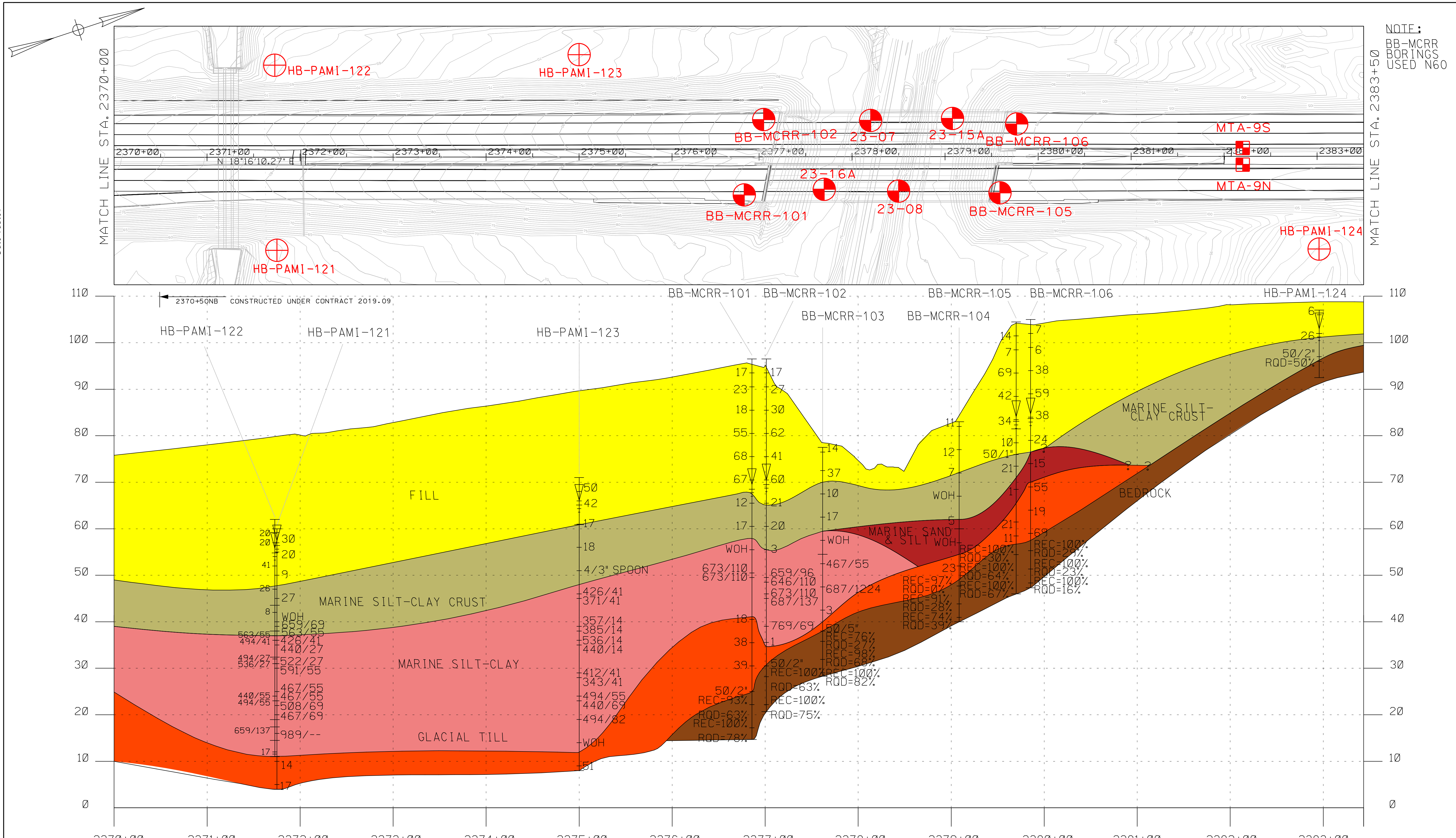

FIGURE 4-16

Scale:	Designed by:			
No. / Revision / By / Date	HNTB	HNTB CORPORATION 340 County Road, Suite 6-C Westbrook, ME 04092 TEL (207) 774-5155 FAX (207) 228-0909	MAINE TURNPIKE THE GOLD STAR MEMORIAL HIGHWAY	PORTLAND AREA WIDENING MM 43.7 TO MM 49.3 SUBSURFACE PROFILE 16
	CONSULTANT PROJECT MANAGER: $CONSULTANTPM$		MTA PROJECT MANAGER:	SHEET NUMBER:
	Designed HJ 4/14 · Checked 4/14 Drawn TAH 4/14 · In Charge of MDR 4/14			CONTRACT: $PSETNO$ OF $PSETT

Date:$date$
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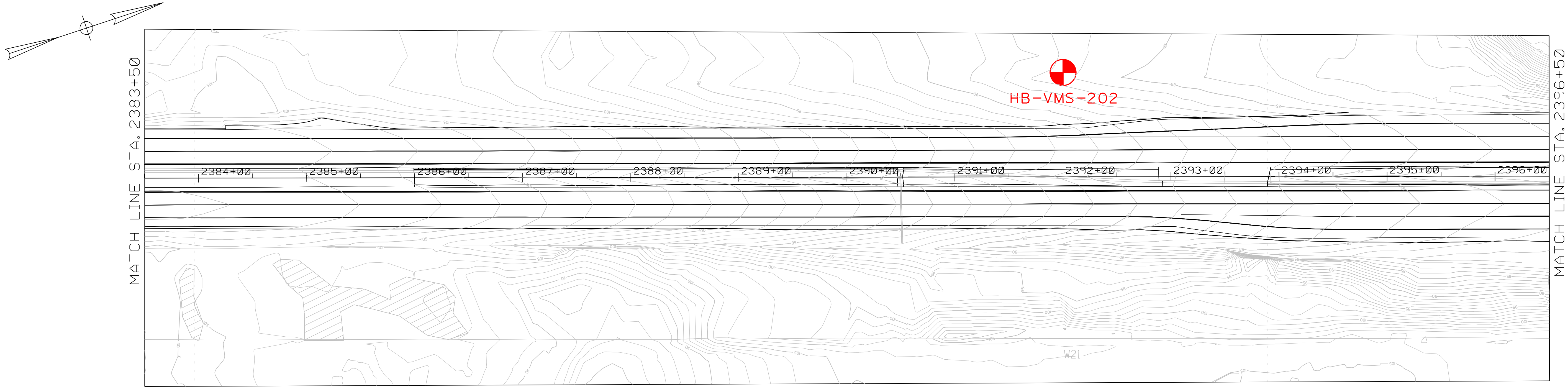

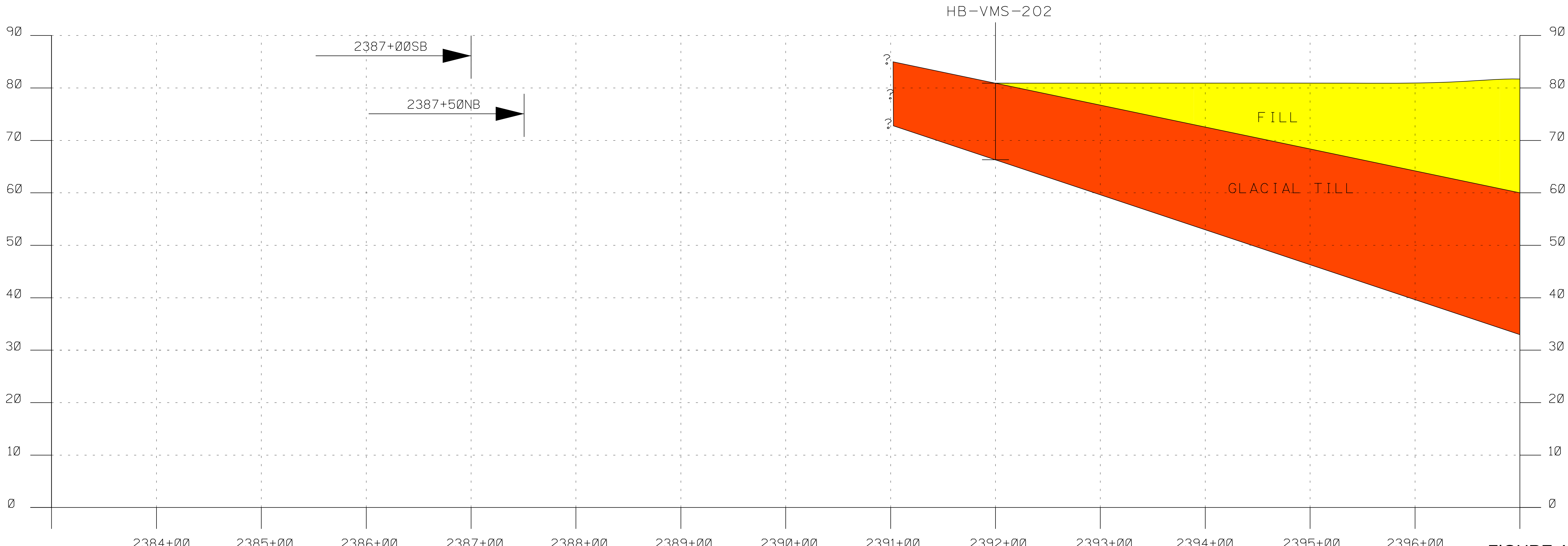

FIGURE 4-17

Scale: 50 0 50 100 Scale of Feet

No.	Revision	By	Date

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 17

SHEET NUMBER:

CONTRACT:

$PSETNO$ OF $PSET

Date:$date$

Filename: $file$

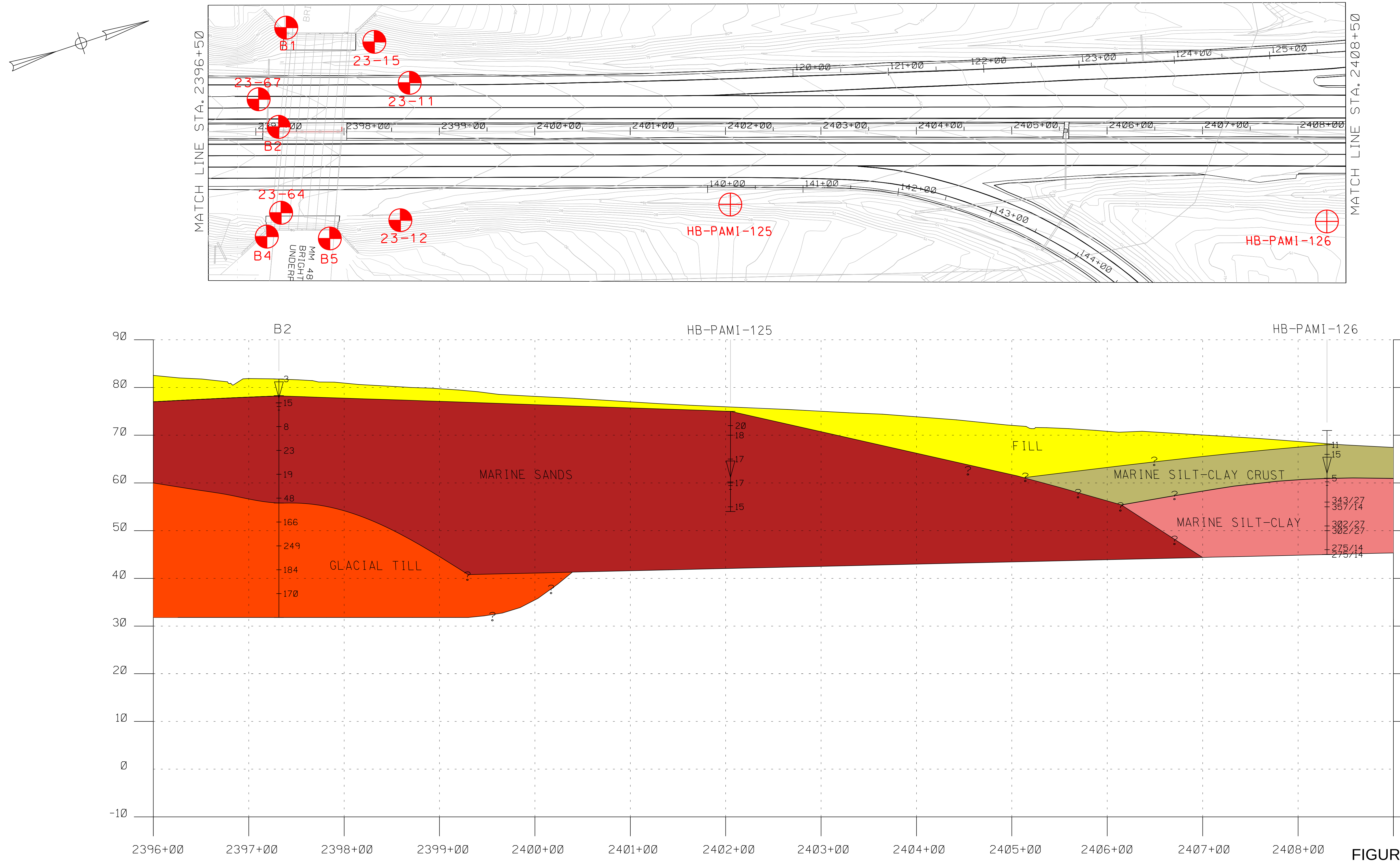

FIGURE 4-18

Date:$date$

Scale:

50 0 50 100

Scale of Feet

No.	Revision	By	Date

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MTA PROJECT MANAGER:

PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 18

SHEET NUMBER:

CONTRACT:

$PSETNO$ OF $PSETT

Filename: $file$

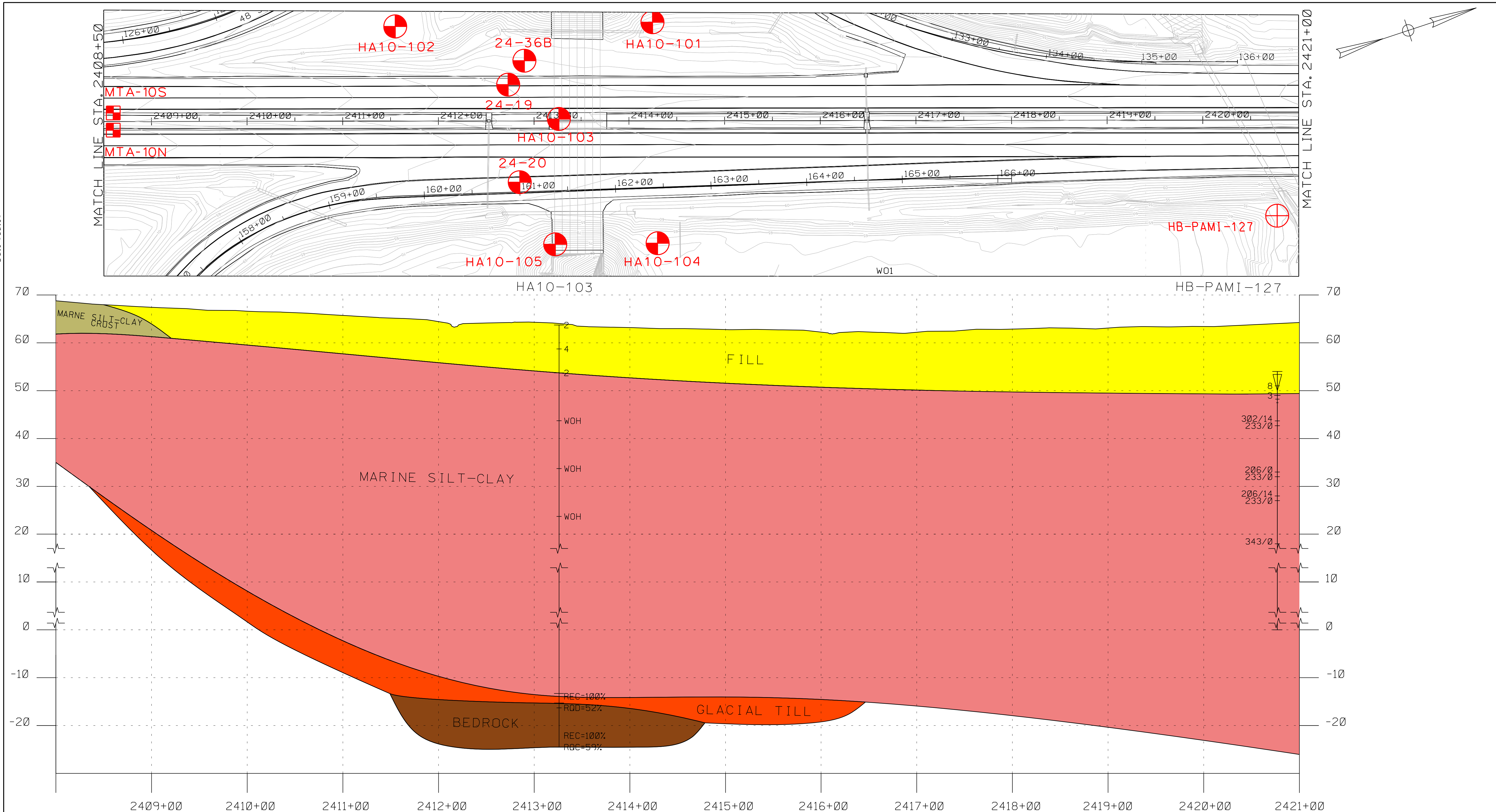

FIGURE 4-19

Scale:	50 0 50 100 Scale of Feet

No.	Revision	By	Date

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PORTLAND AREA WIDENING
MM 43.7 TO MM 49.3

SUBSURFACE PROFILE 19

SHEET NUMBER:

CONTRACT:

$PSETNO$ OF $PSETT

Date:$date$

Filename: $file$

APPENDIX A

Geotechnical Data Reports

APPENDIX A

Data Reports

Borings HB-PAMI-101 through HB-PAMI-127

SCHONEWALD ENGINEERING ASSOCIATES, INC.
■ www.SchonewaldEngineering.com ■

FIELD AND LABORATORY DATA REPORT
PRELIMINARY GEOTECHNICAL PROGRAM
PORTLAND AREA MAINLINE IMPROVEMENTS
MAINE TURNPIKE MM 43.7 TO 49.3
SCARBOROUGH TO PORTLAND, MAINE

PREPARED FOR:

HNTB Corporation
Westbrook, Maine

PREPARED BY:

Isabel V. (Be) Schonewald, P.E.
Schonewald Engineering Associates, Inc. (SchonewaldEA)
129 Middle Road
Cumberland, Maine 04021
Be@SchonewaldEngineering.com

March 28, 2019

SchonewaldEA Project No. 18-017

SCHONEWALD ENGINEERING ASSOCIATES, INC.
■ www.SchonewaldEngineering.com ■

FIELD AND LABORATORY DATA REPORT
PRELIMINARY GEOTECHNICAL PROGRAM
PORTLAND AREA MAINLINE IMPROVEMENTS
MAINE TURNPIKE MM 43.7 TO 49.3
SCARBOROUGH TO PORTLAND, MAINE

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SUBSURFACE EXPLORATION LOCATION PLANS

DRAFT PDR
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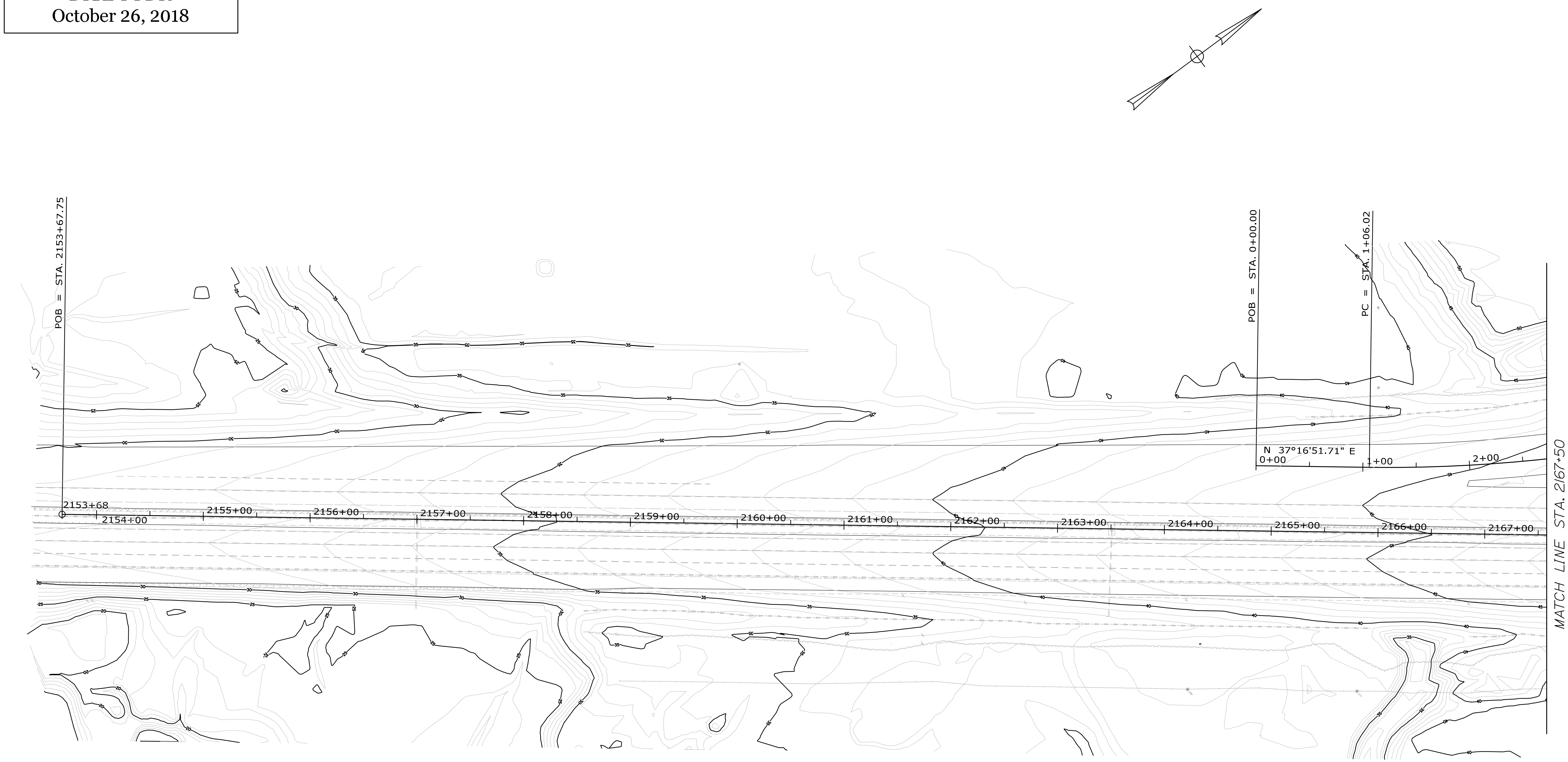
Date:10/22/2018



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Scale of Feet

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MAINE TURNPIKE

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MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

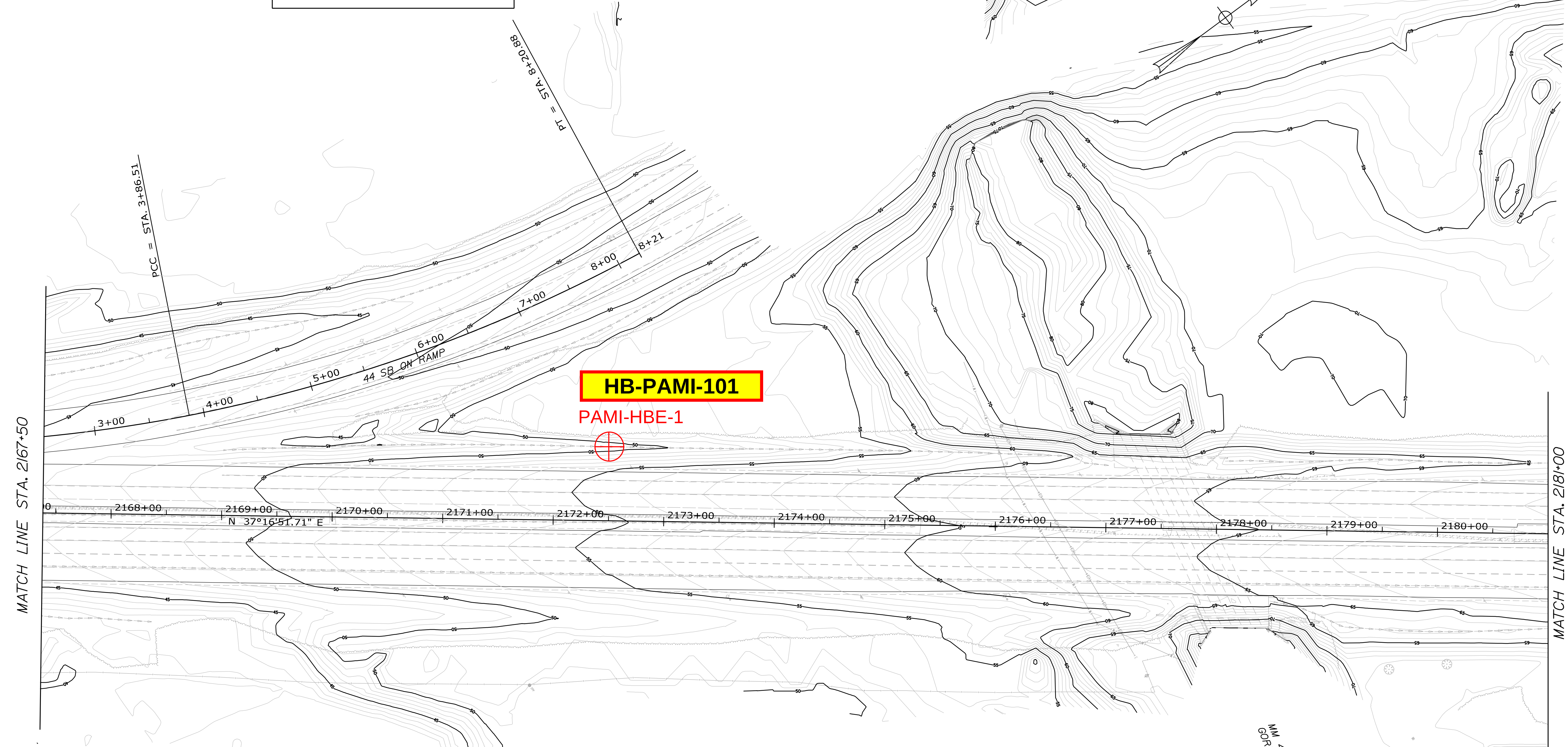
HIGHWAY PLAN 01

SHEET NUMBER: HP-01

CONTRACT:2020.XX

Date:10/22/2018

DRAFT PDR
October 26, 2018



LEGEND

PROPOSED EMBANKMENT WIDENNING BORING LOCATION

Scale: 50 0 50 100 Scale of Feet No. / Revision / By / Date	Designed by: HNTB CONSULTANT PROJECT MANAGER: Dale A. Mitchell, P.E. Designed PEM 10\18 Checked RWH 10\18 Drawn SLS 10\18 In Charge of RAL 10\18	HNTB CORPORATION 340 County Road, Suite 6-C Westbrook, ME 04092 TEL (207) 774-5155 FAX (207) 228-0909	MAINE TURNPIKE THE GOLD STAR MEMORIAL HIGHWAY MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3
HIGHWAY PLAN 02

SHEET NUMBER: HP-02
CONTRACT:2020.XX

Filename: 005_BorLoc_Plan_02.dgn

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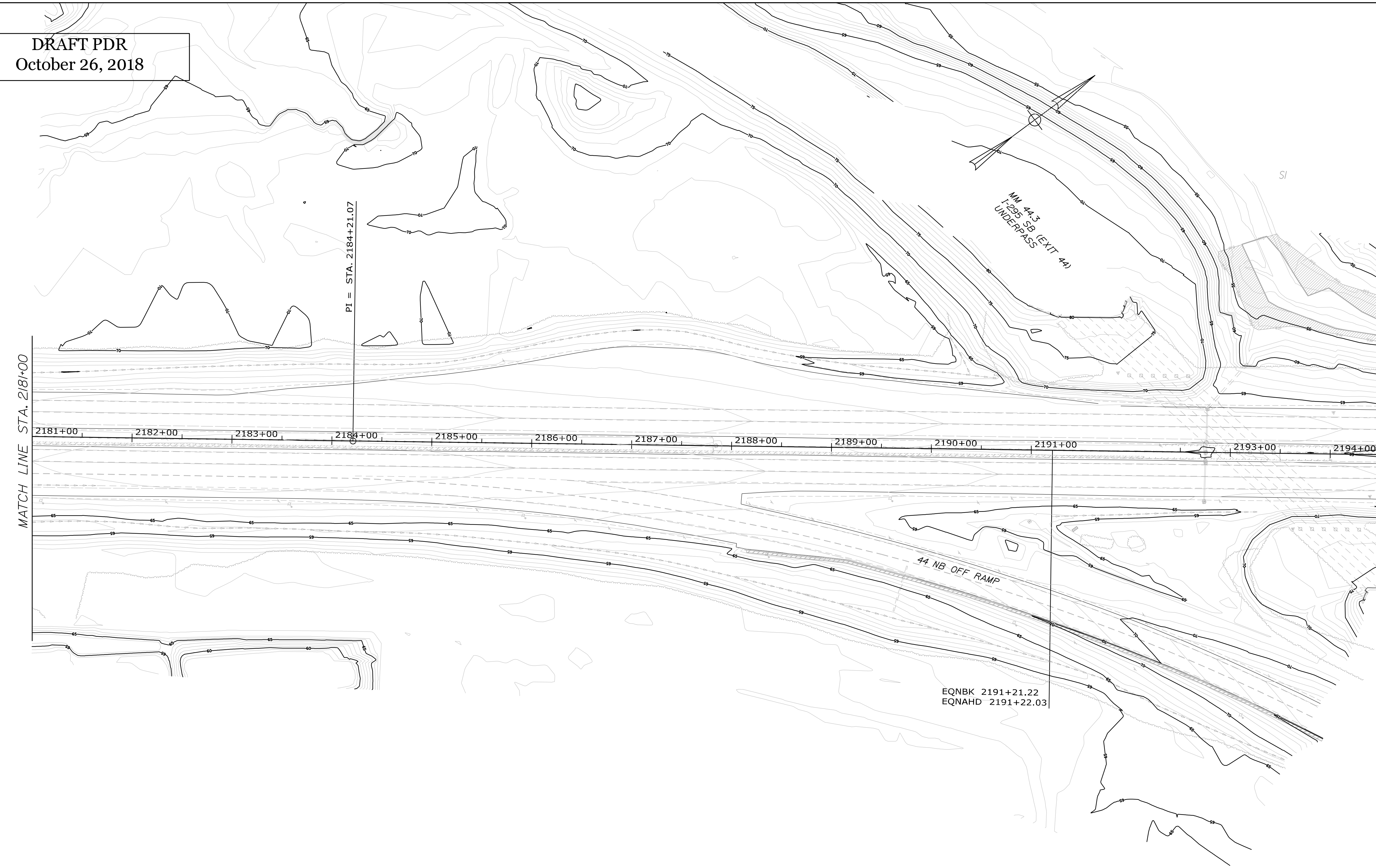
October 26, 2018



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Scale of Feet

No.	Revision	By	Date

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MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 03

SHEET NUMBER: HP-03

CONTRACT:2020.XX

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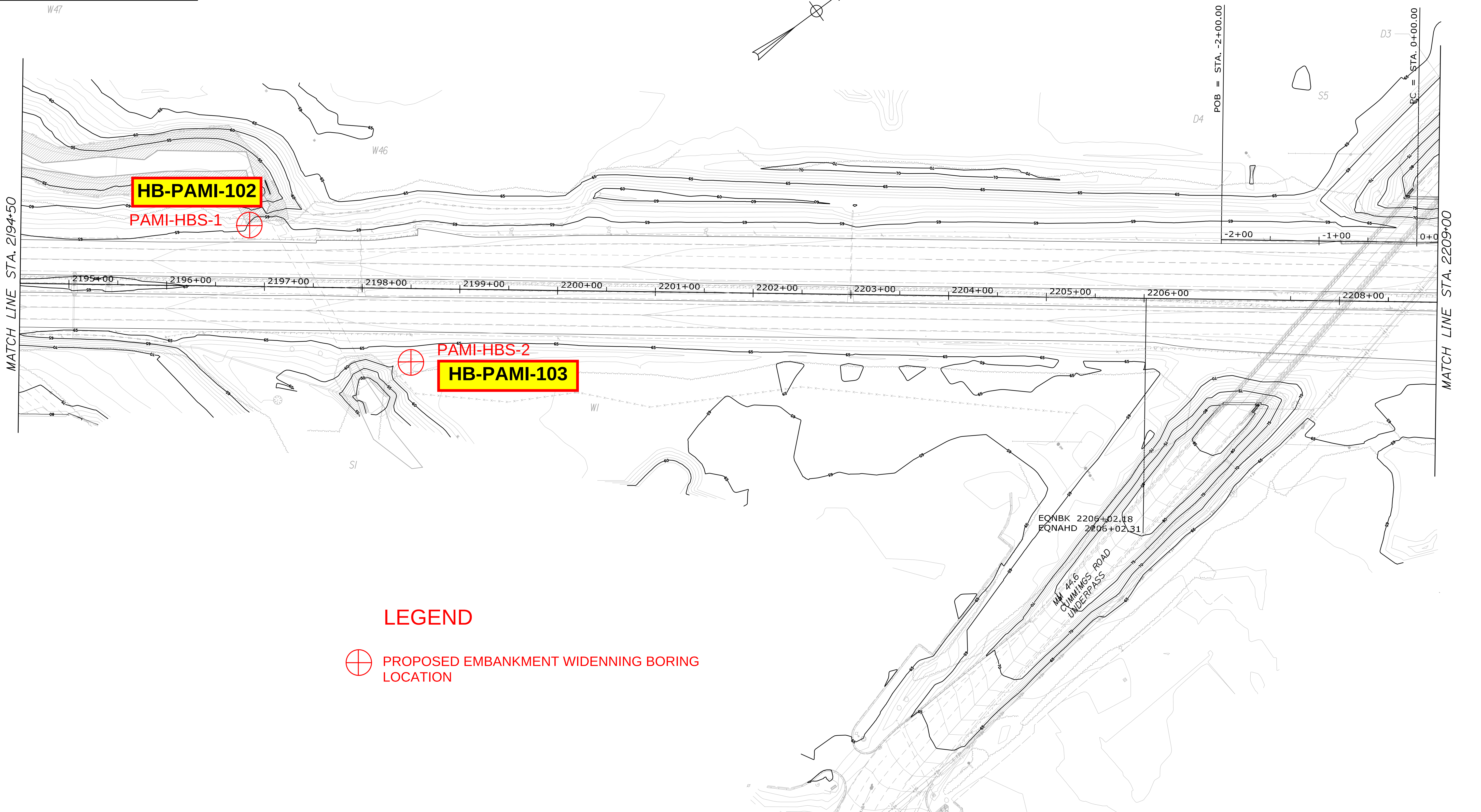

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MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 04

SHEET NUMBER: HP-04

CONTRACT:2020.XX

Date:10/22/2018

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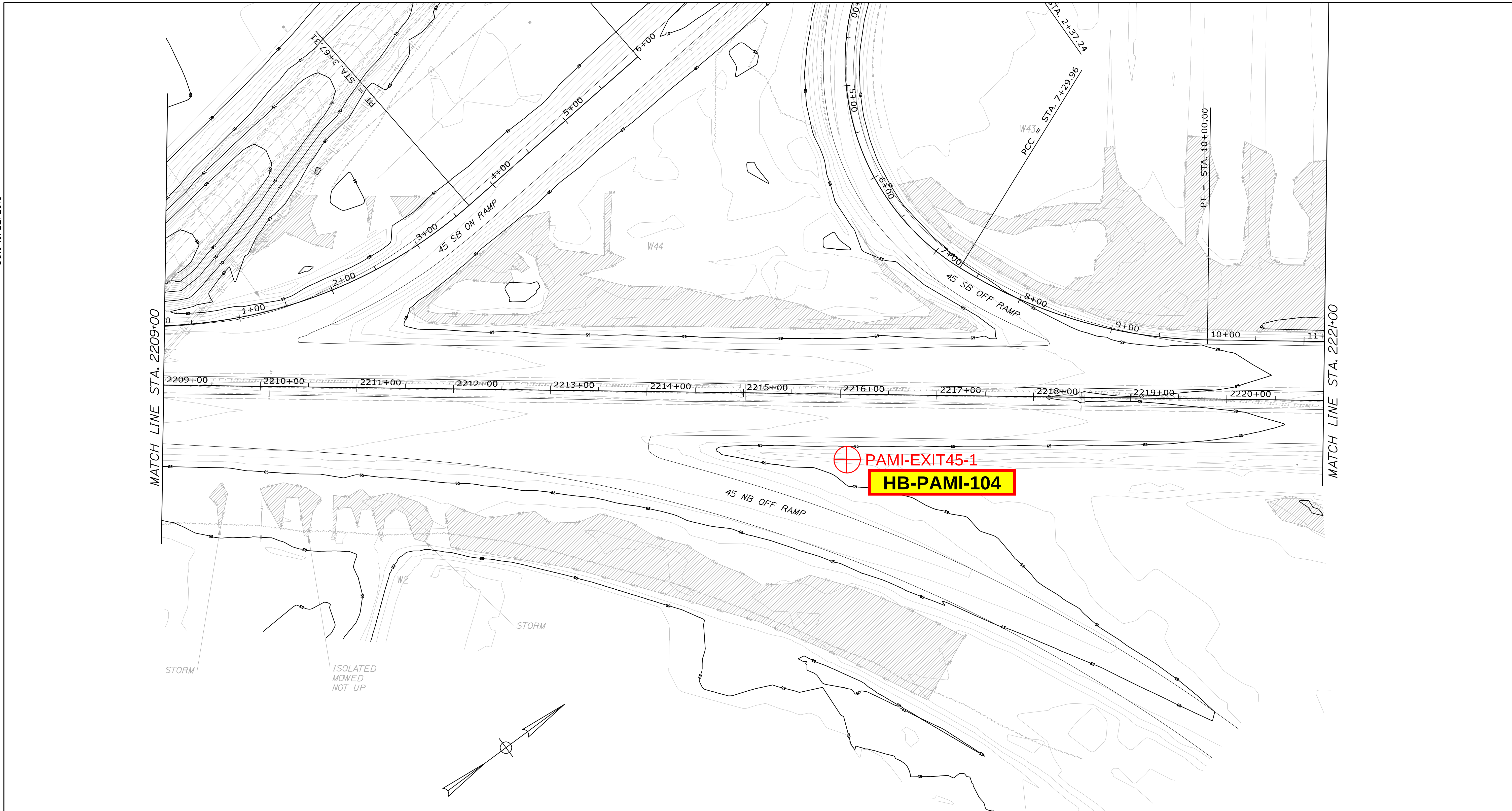

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Scale of Feet

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MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 05

SHEET NUMBER: HP-05

CONTRACT:2020.XX

Filename: 008_BorLoc_Plan_05.dgn

Date:10/22/2018

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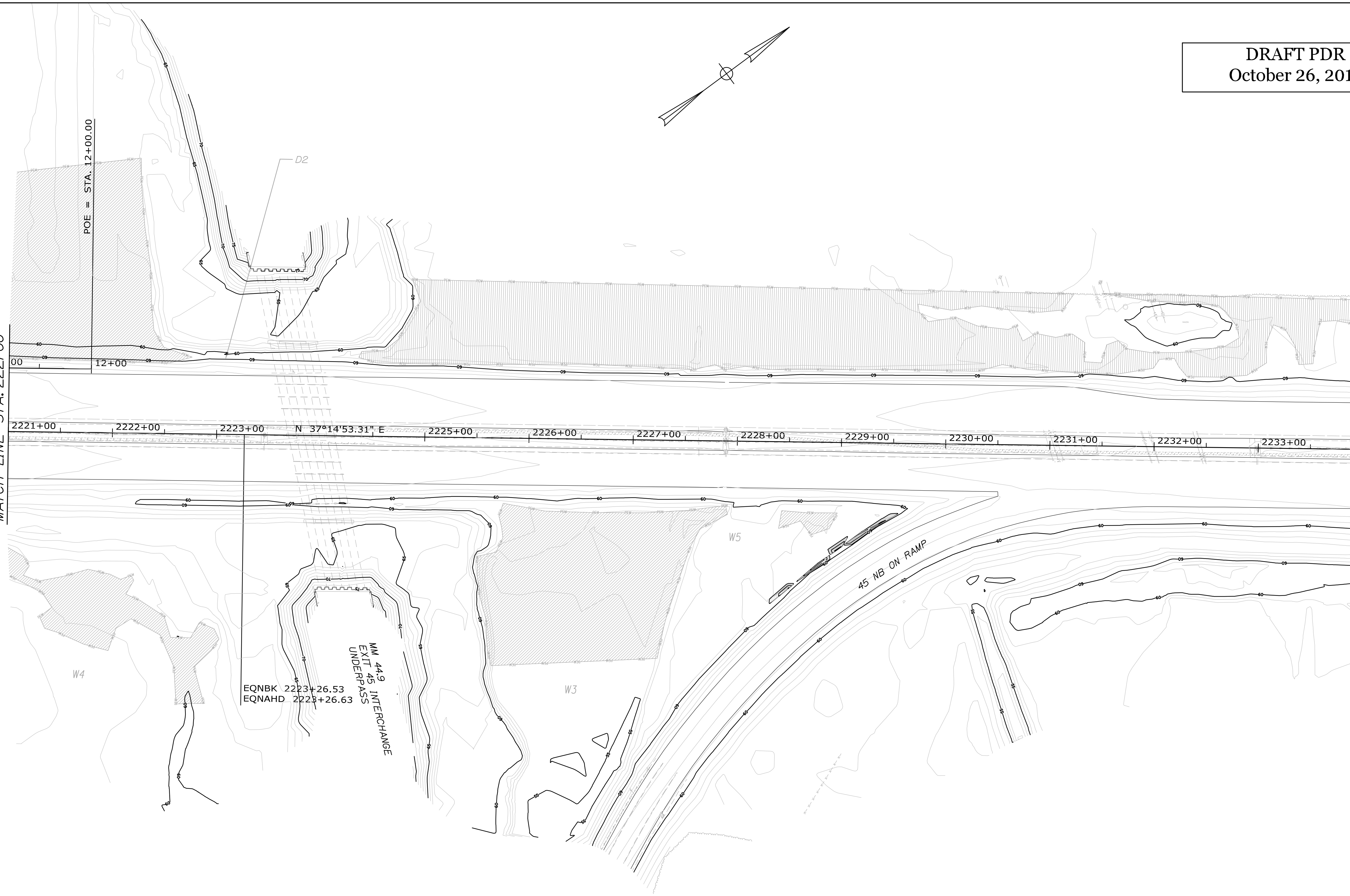

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MEMORIAL HIGHWAY

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PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 06

SHEET NUMBER: HP-06

CONTRACT:2020.XX

Filename: 009_BorLoc_Plan_06.dgn

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October 26, 2018

Date:10/22/2018

Filename: 010_BorLoc_Plan_07.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

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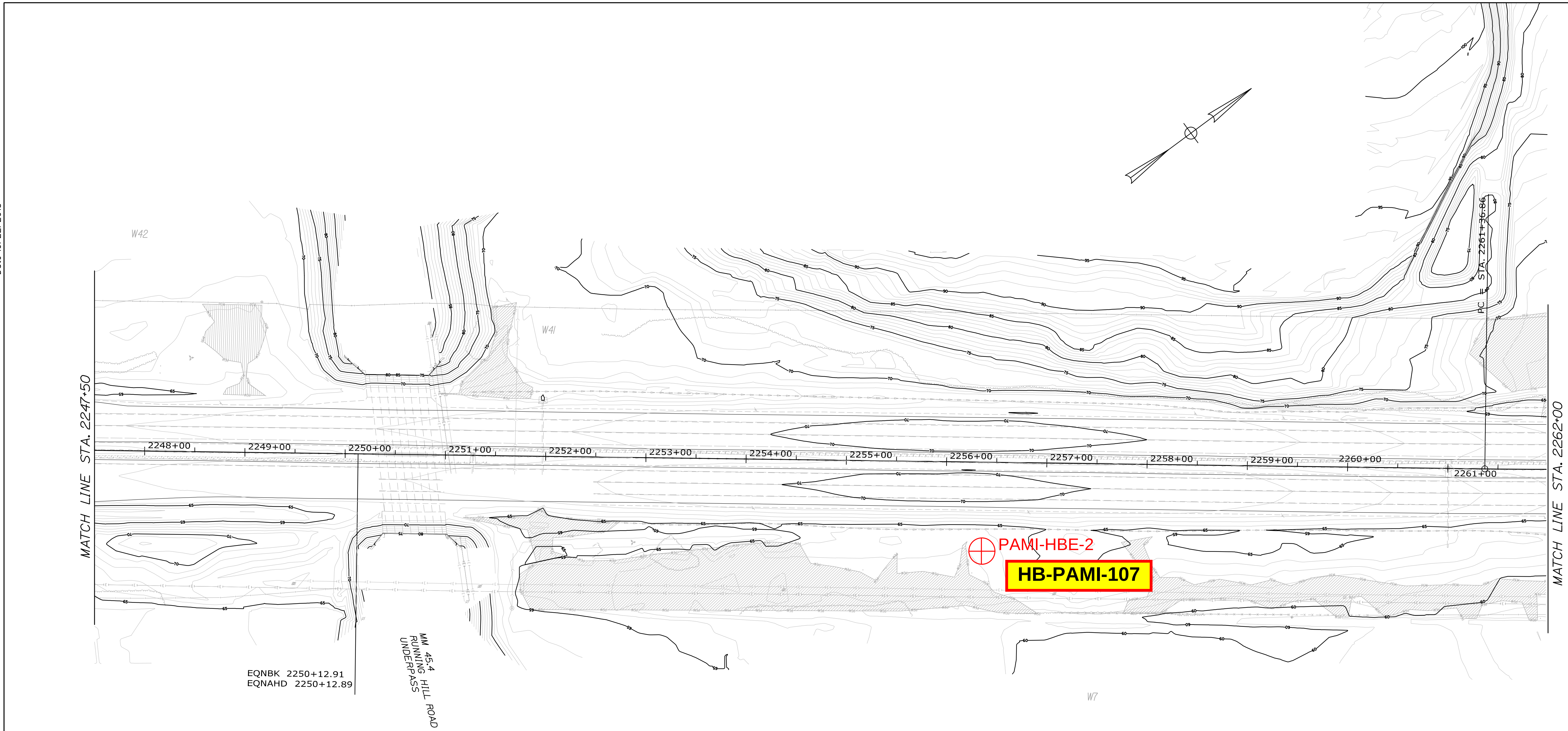
PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 07

SHEET NUMBER: HP-07

CONTRACT:2020.XX

Date:10/22/2018



LEGEND

PROPOSED EMBANKMENT WIDENNING BORING LOCATION

Filename: 011_BorLoc_Plan_08.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

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PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 08

SHEET NUMBER: HP-08

CONTRACT:2020.XX

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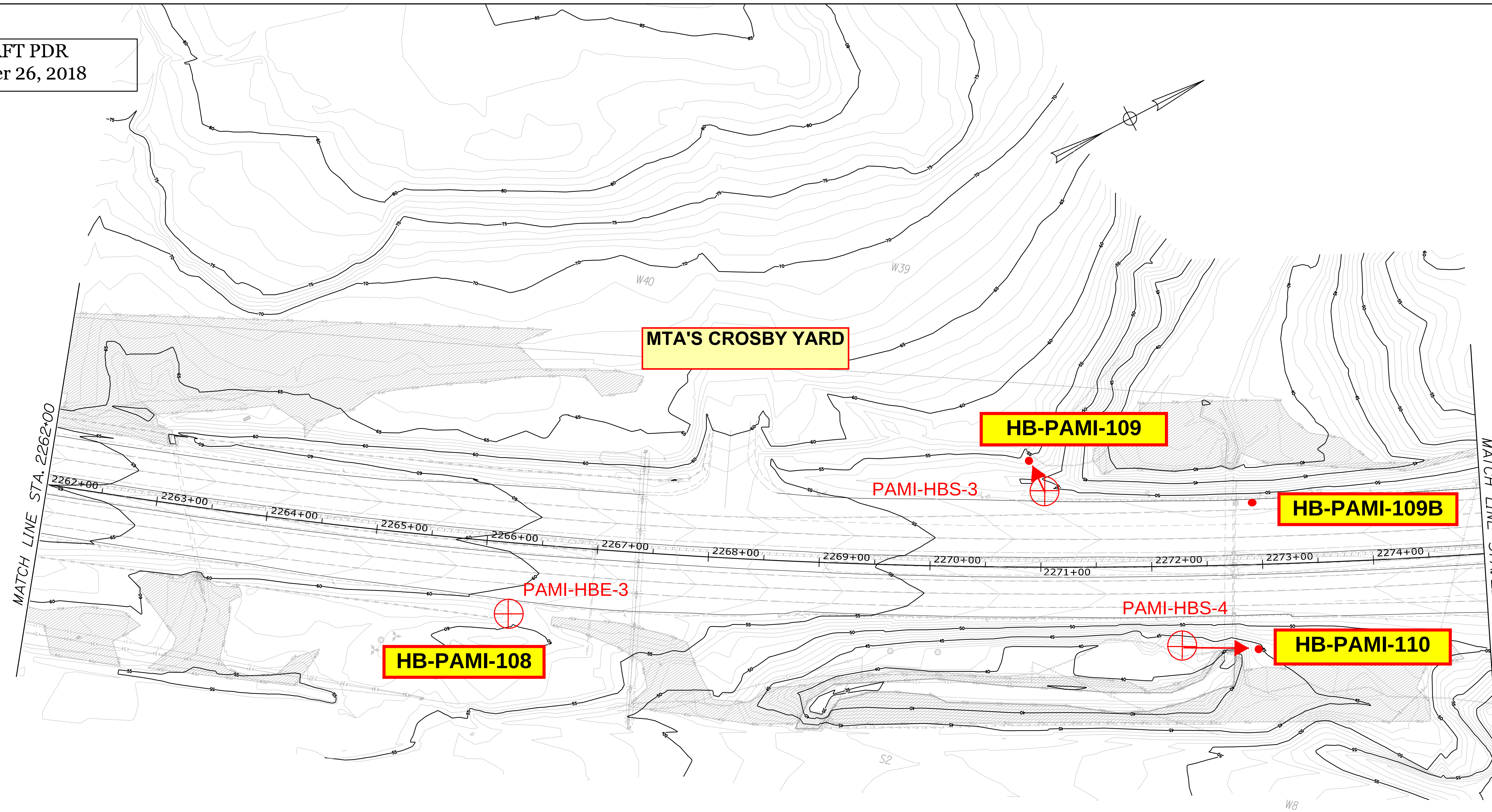
October 26, 2018

Date:10/22/2018



LEGEND

PROPOSED EMBANKMENT WIDENNING BORING LOCATION

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

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PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 09

SHEET NUMBER: HP-09

CONTRACT:2020.XX

Filename: 012_BorLoc_Plan_09.dgn

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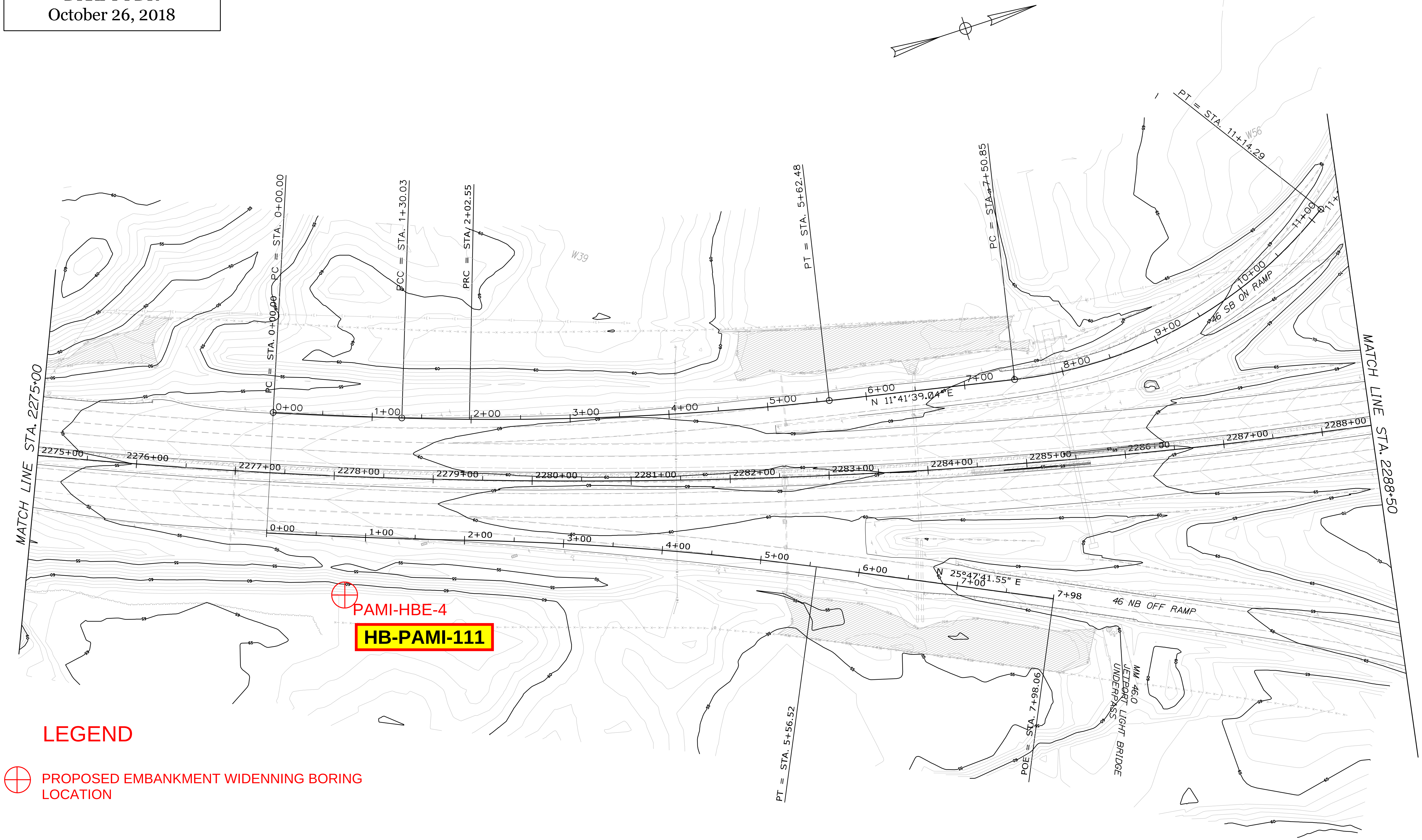

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PROPOSED EMBANKMENT WIDENNING BORING LOCATION

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Scale of Feet

No.	Revision	By	Date

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CONSULTANT PROJECT MANAGER: Dale A. Mitchell, P.E.

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PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 10

SHEET NUMBER: HP-10

CONTRACT:2020.XX

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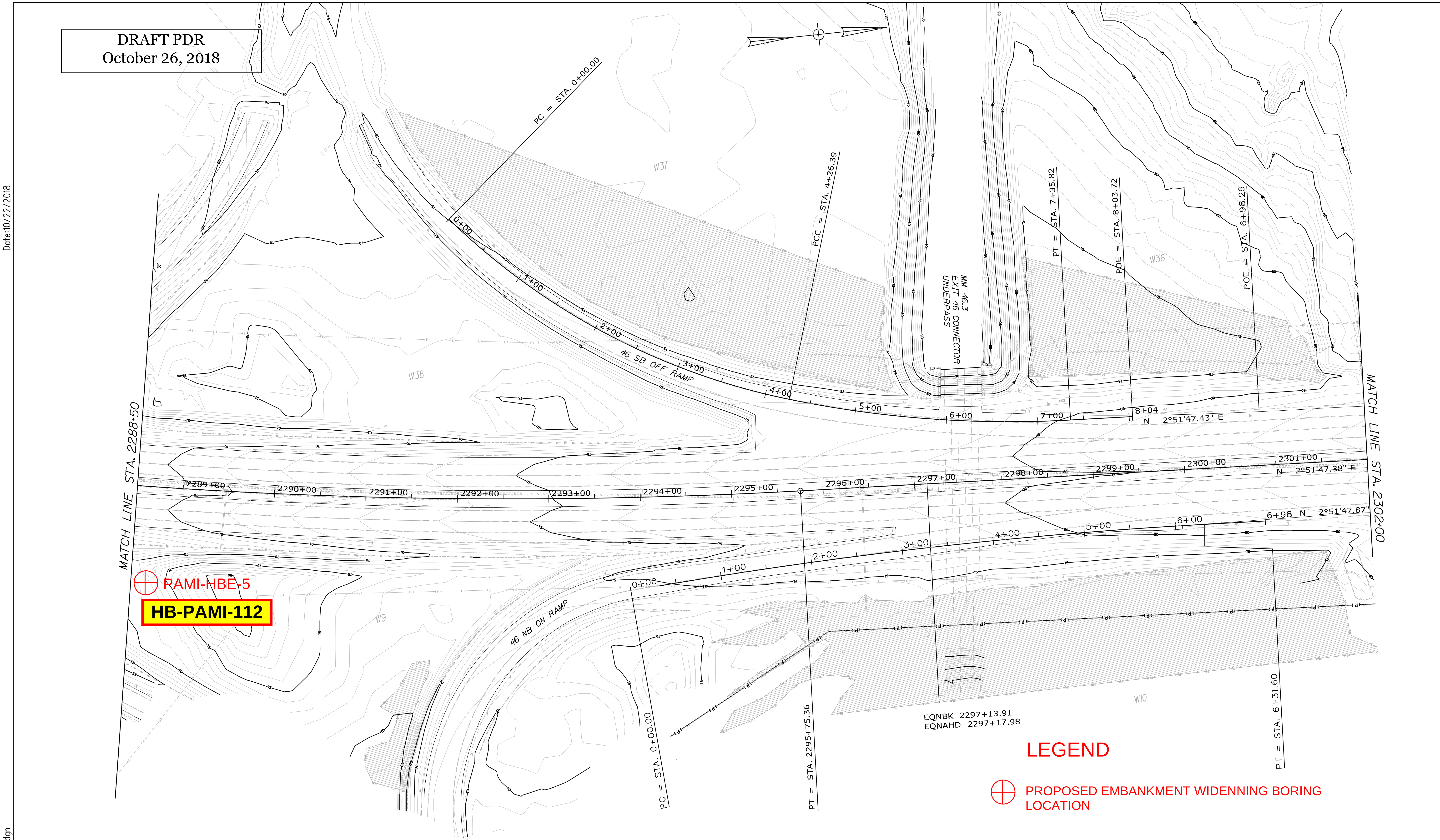

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No.	Revision	By	Date

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THE GOLD STAR MEMORIAL HIGHWAY

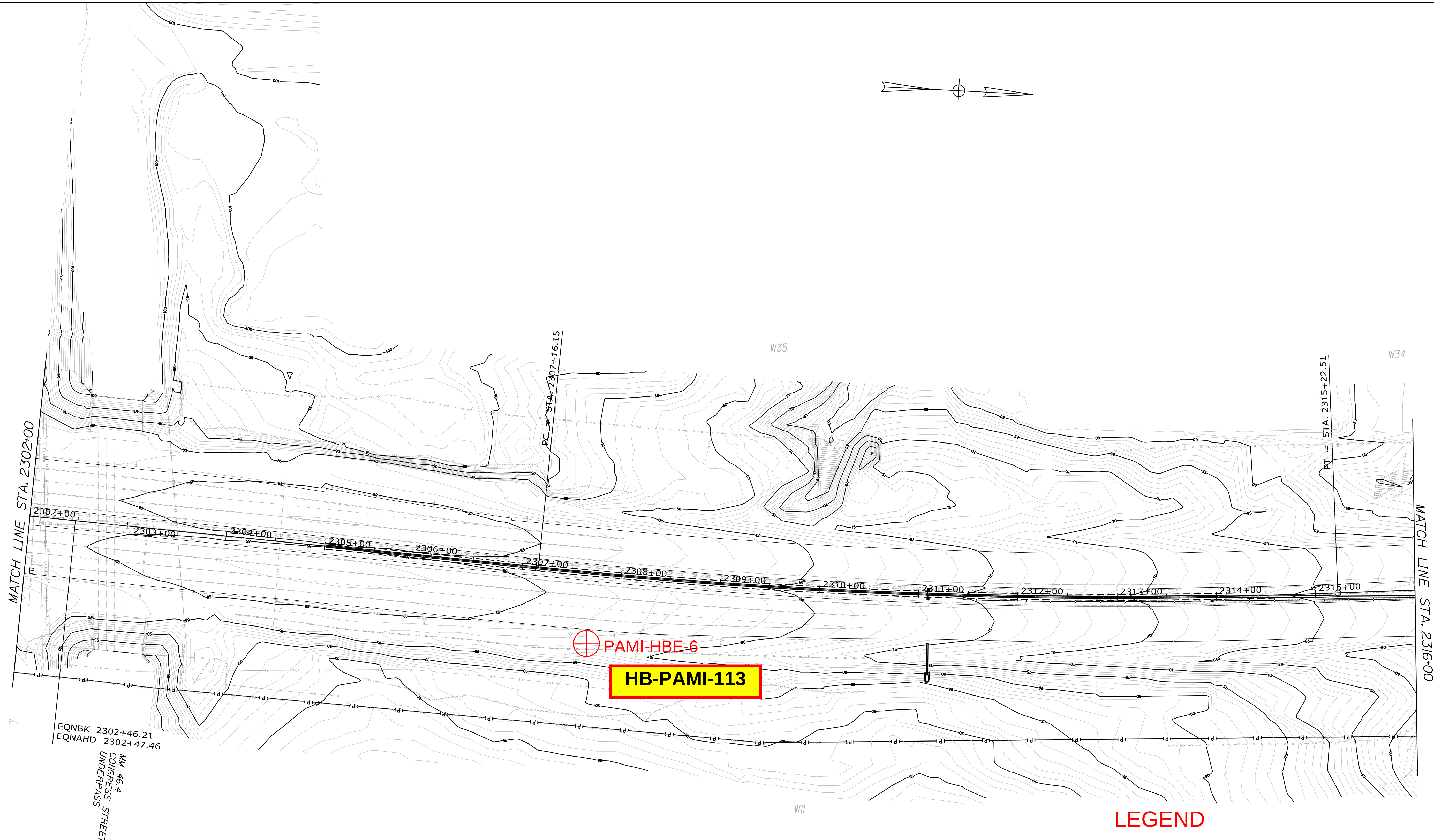
MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

STROUDWATER OVERPASS REHABILITATION

SURVEY PLAN 1

SHEET NUMBER: HP-11

CONTRACT:2020.XX



LEGEND

PROPOSED EMBANKMENT WIDENNING BORING LOCATION

Date:10/22/2018

Filename: 015_BorLoc_Plan_12.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

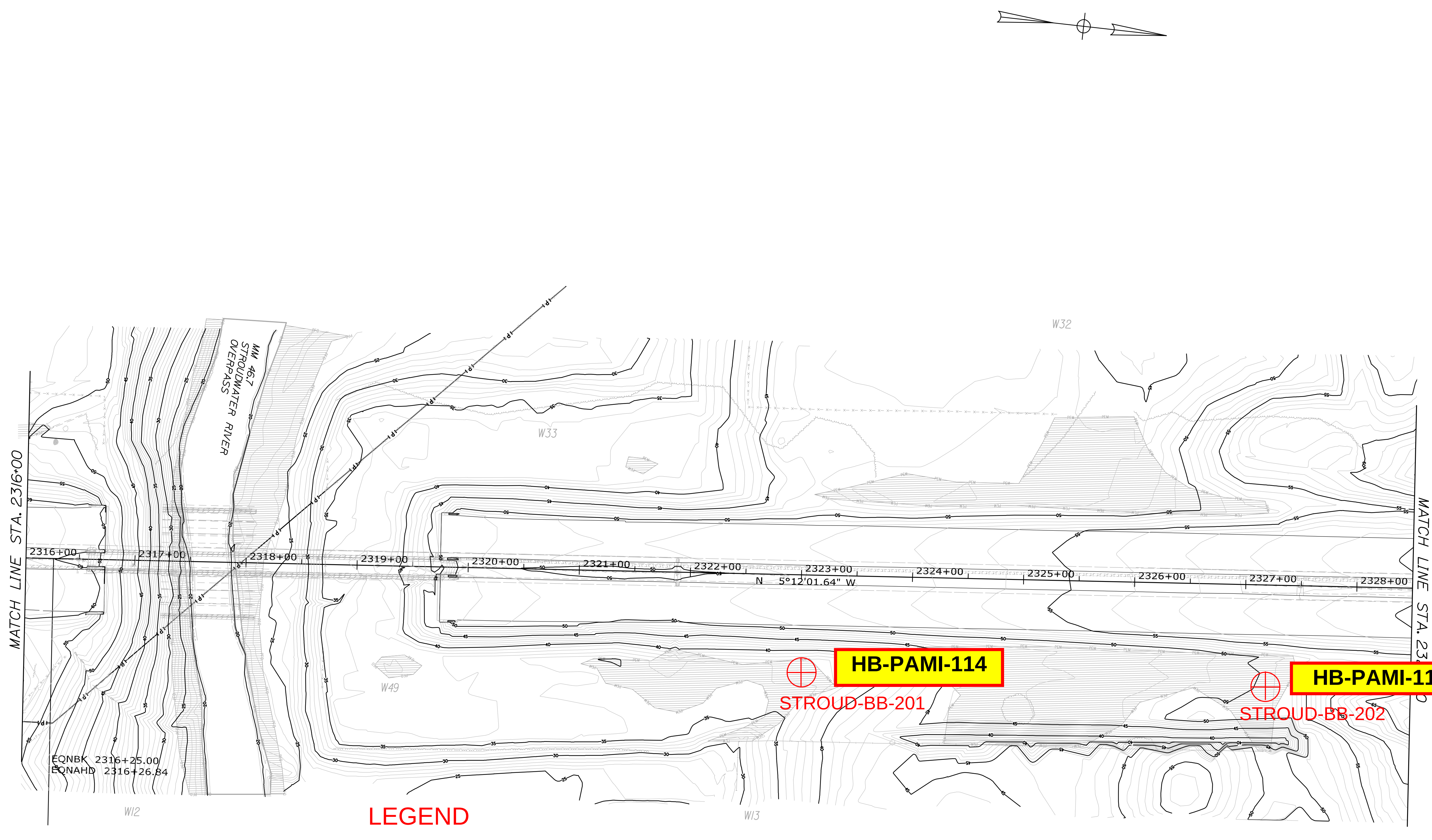
MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

STROUDWATER OVERPASS
REHABILITATION

SURVEY PLAN 2

SHEET NUMBER: HP-12

CONTRACT:2020.XX



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PROPOSED EMBANKMENT WIDENNING BORING LOCATION

Date:10/22/2018

Filename: 016_BorLoc_Plan_13.dgn

Scale: 50 0 50 100 Scale of Feet

No.	Revision	By	Date

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

STROUDWATER OVERPASS REHABILITATION

SURVEY PLAN 3

CONTRACT:2020.XX

SHEET NUMBER: HP-13

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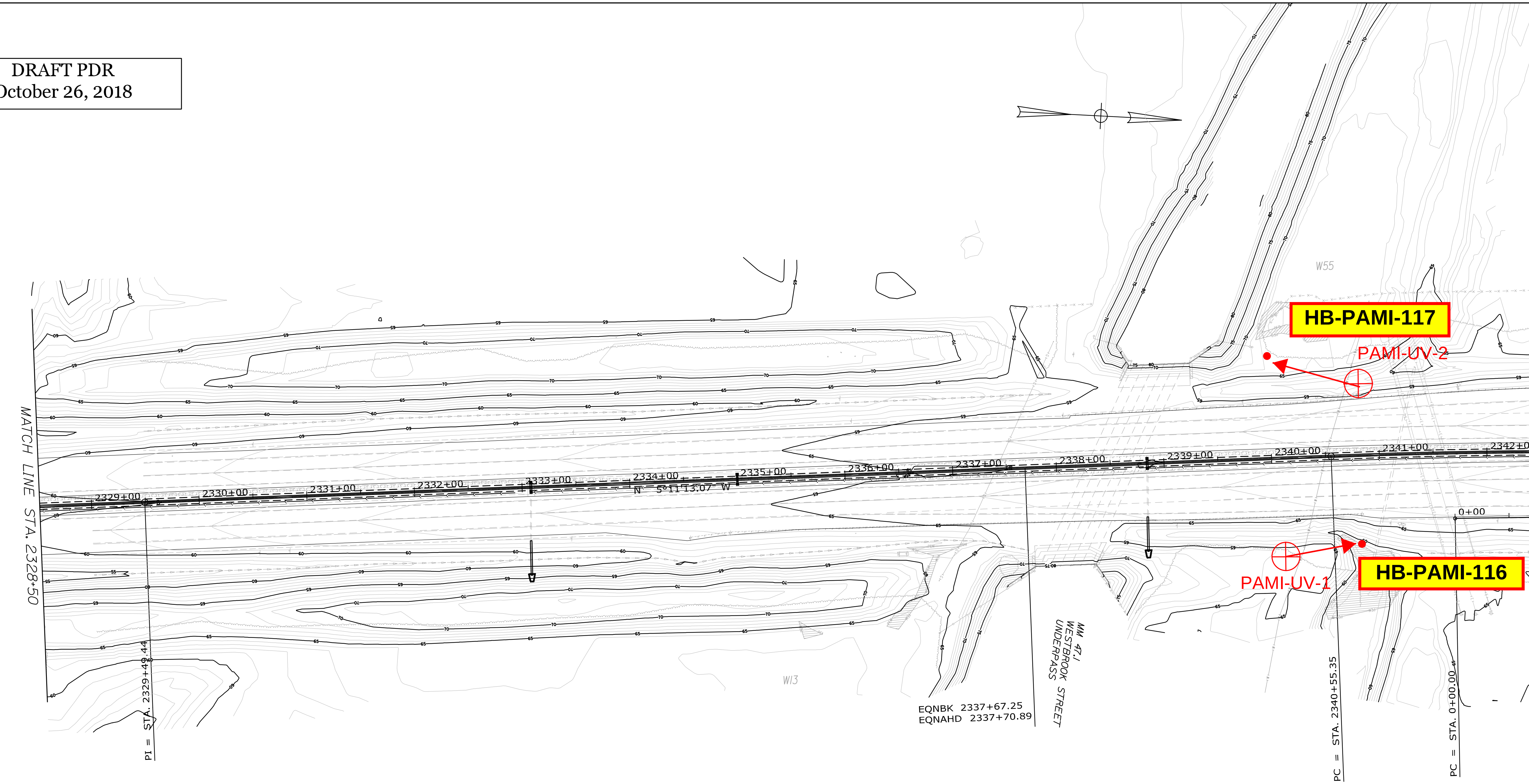
October 26, 2018



Date:10/22/2018

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 14

SHEET NUMBER: HP-14

CONTRACT:2020.XX

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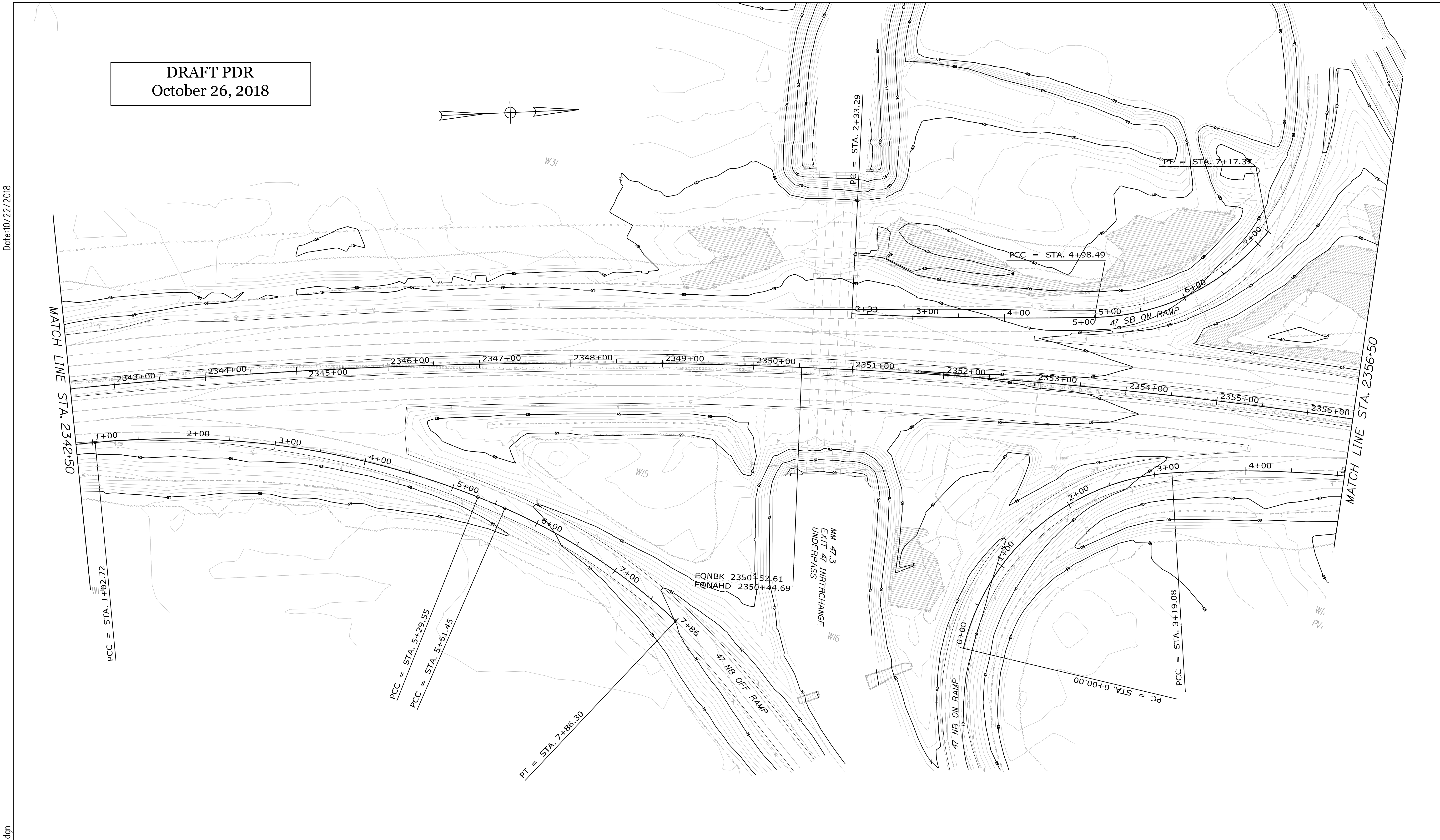

Date:10/22/2018

Filename: 018_BorLoc_Plan_15.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

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MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 15

SHEET NUMBER: HP-15

CONTRACT:2020.XX

15 OF 21

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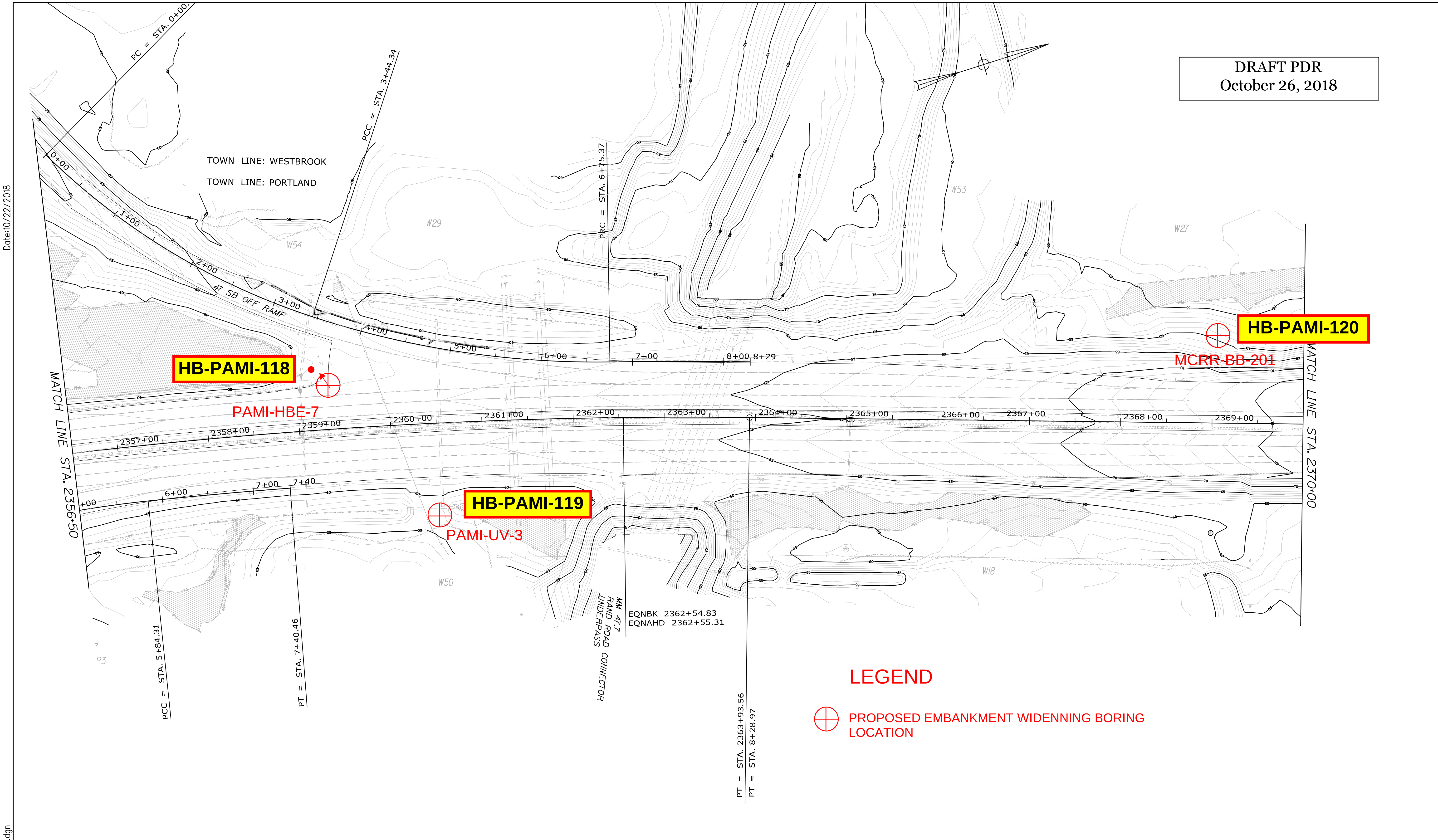

Scale: 50 0 50 100
Scale of Feet

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PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 16

SHEET NUMBER: HP-16

CONTRACT:2020.XX

Date:10/22/2018

Filename: 019_BorLoc_Plan_16.dgn

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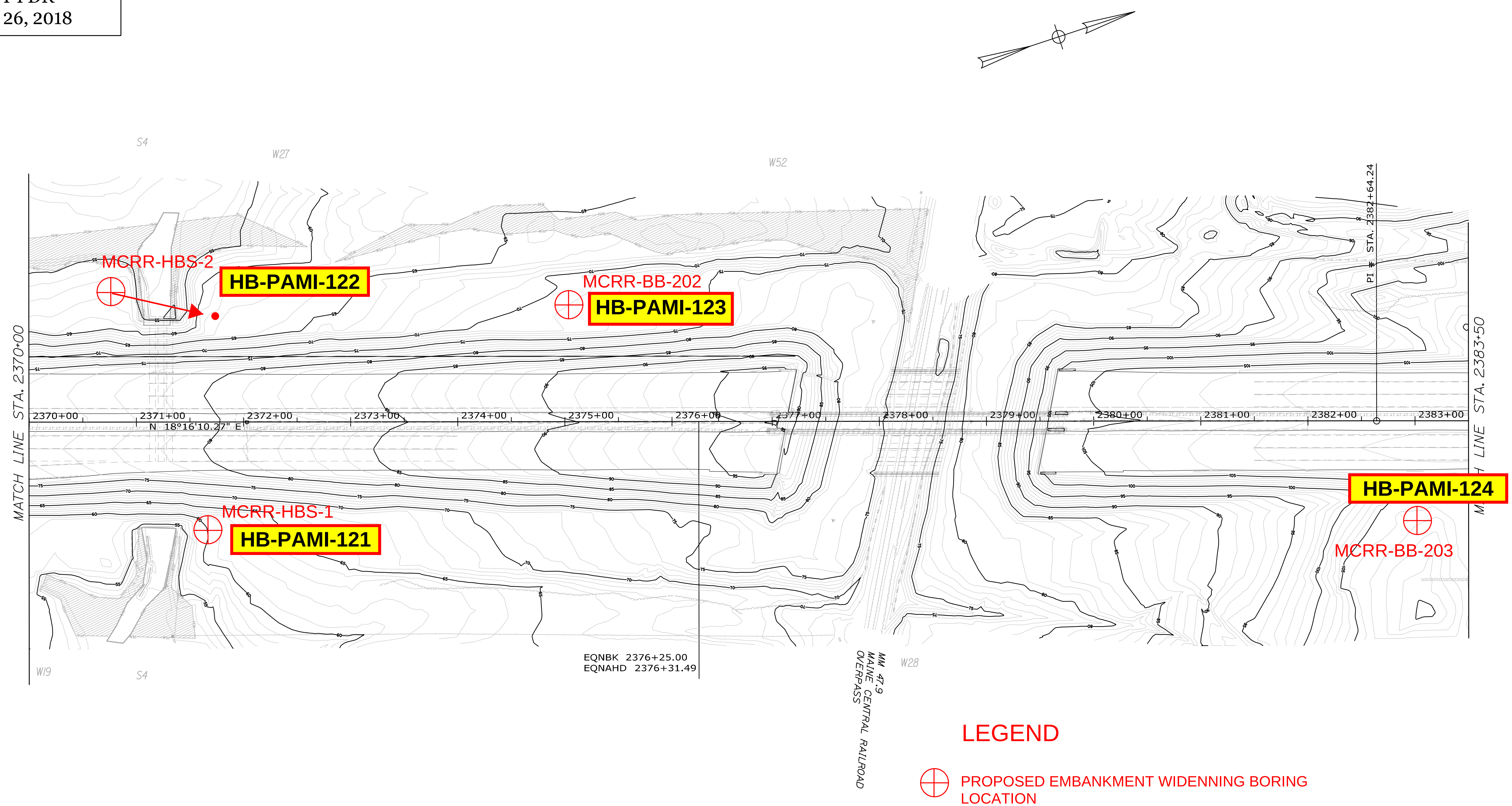

Date:10/22/2018

Filename: 020_BorLoc_Plan_17.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

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HNTB

CONSULTANT PROJECT MANAGER: Dale A. Mitchell, P.E.

	By	Date		By	Date
Designed	PEM	10\18	Checked	RWH	10\18
Drawn	SLS	10\18	In Charge of	RAL	10\18

HNTB CORPORATION
340 County Road, Suite 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 228-0909

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

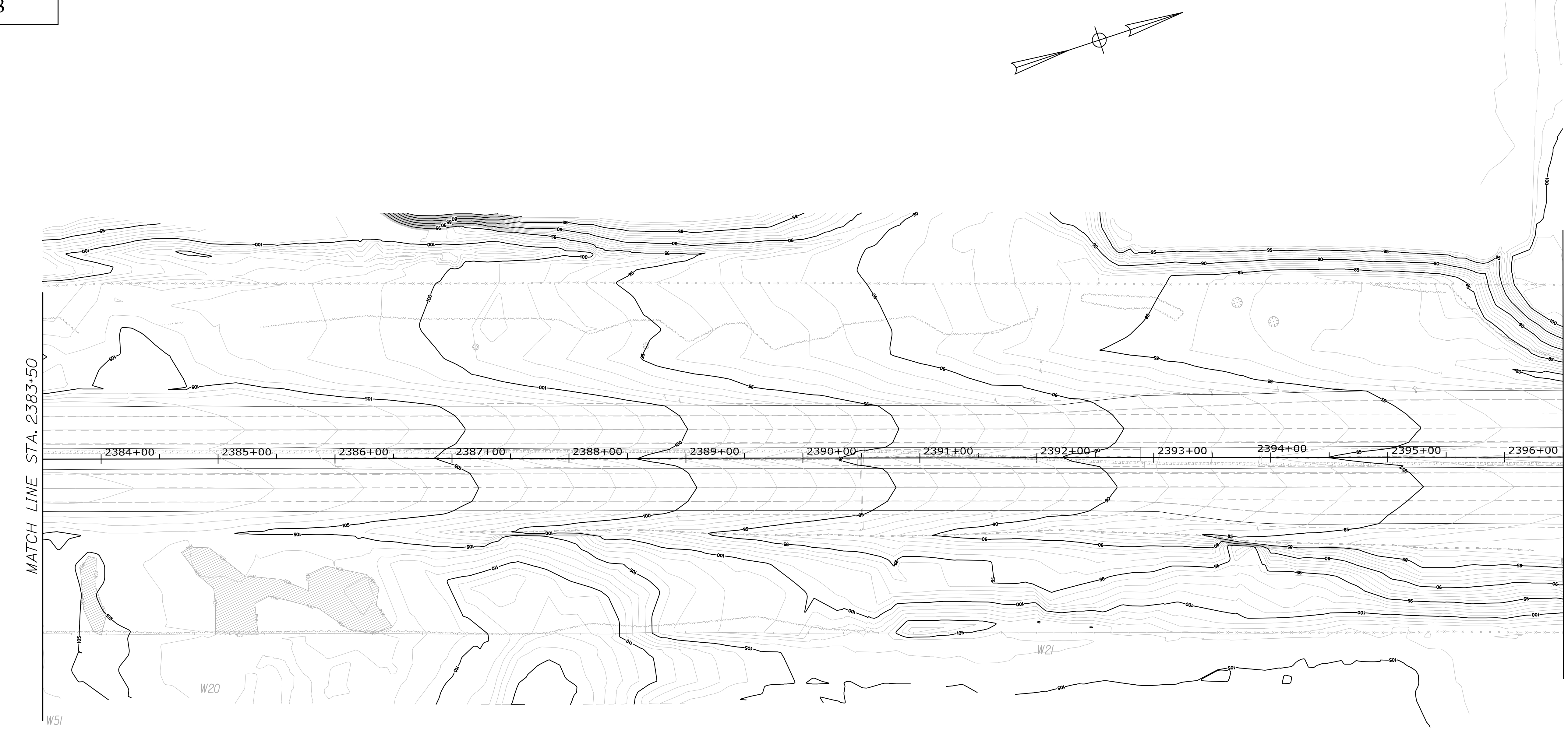
PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 17

SHEET NUMBER: HP-17

CONTRACT:2020.XX

DRAFT PDR
October 26, 2018



Date:10/22/2018

Filename: 021_BorLoc_Plan_18.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: Dale A. Mitchell, P.E.

	By	Date		By	Date
Designed	PEM	10\18	Checked	RWH	10\18
Drawn	SLS	10\18	In Charge of	RAL	10\18

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FAX (207) 228-0909

MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

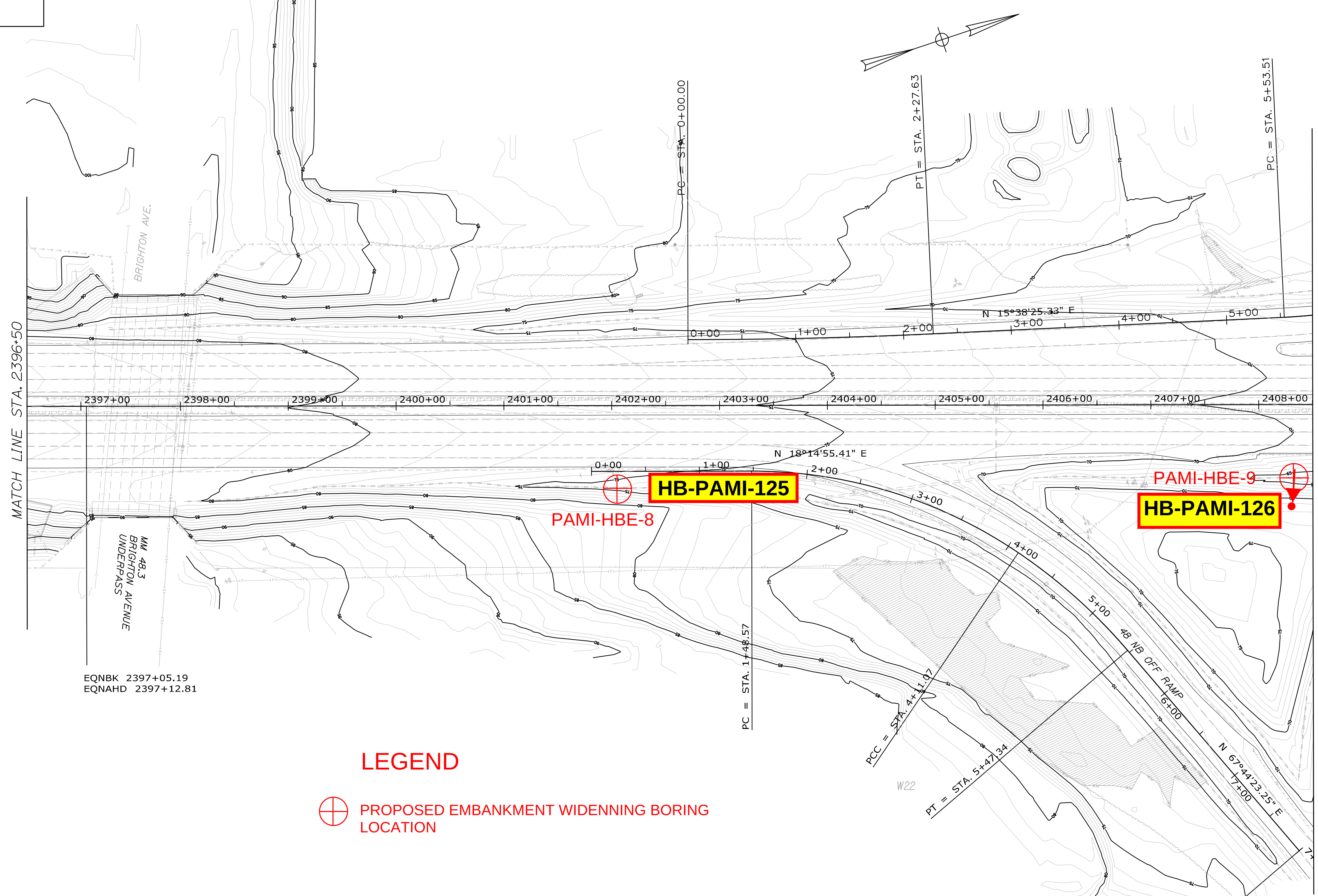
PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 18

SHEET NUMBER: HP-18

CONTRACT:2020.XX

DRAFT PDR
October 26, 2018



Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: Dale A. Mitchell, P.E.

	By	Date		By	Date
Designed	PEM	10\18	Checked	RWH	10\18
Drawn	SLS	10\18	In Charge of	RAL	10\18

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 19

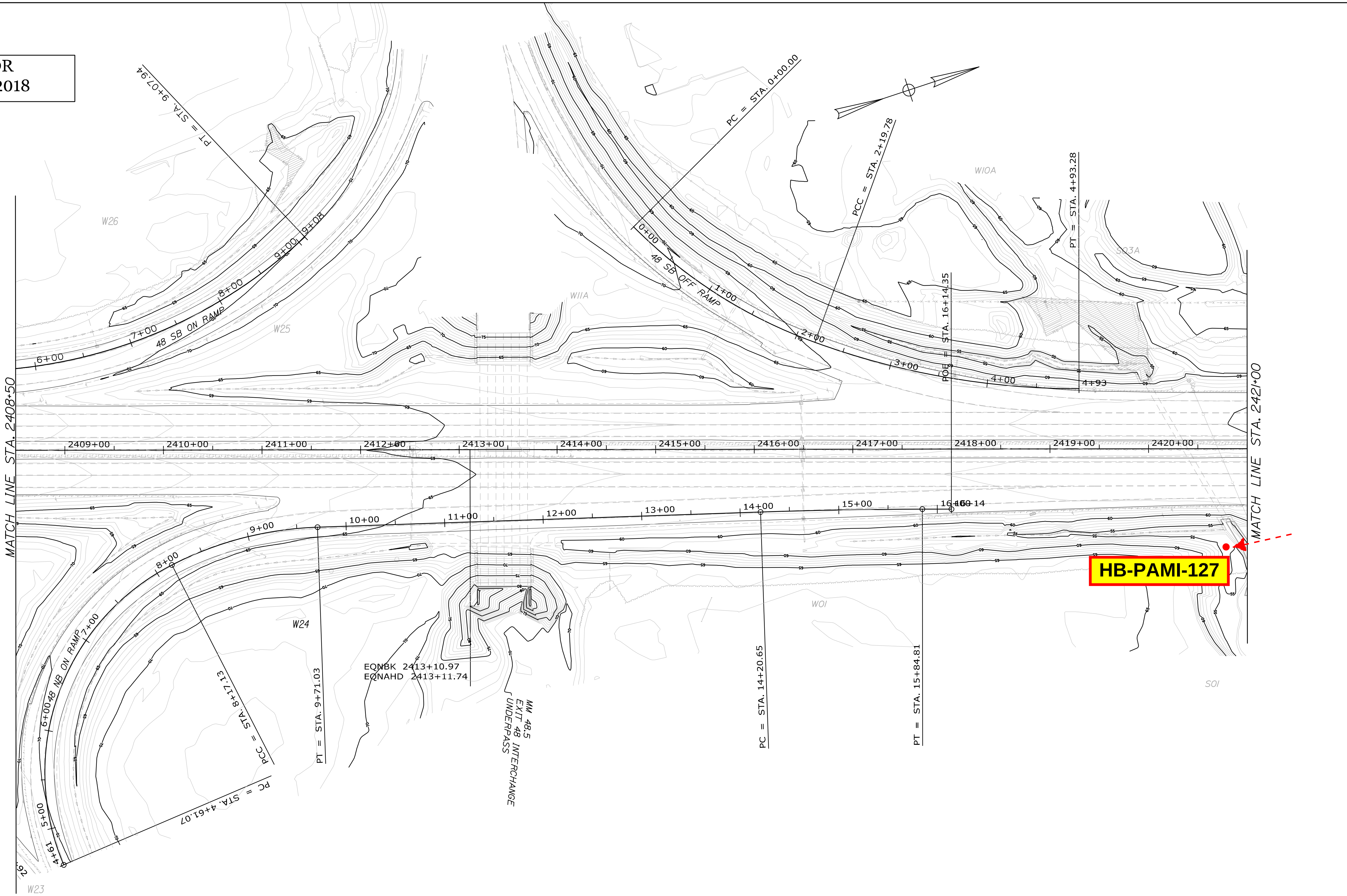
SHEET NUMBER: HP-19

CONTRACT:2020.XX

Date:10/22/2018

Filename: 022_BorLoc_Plan_19.dgn

DRAFT PDR
October 26, 2018



Date:10/22/2018

Filename: 023_BorLoc_Plan_20.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: Dale A. Mitchell, P.E.

	By	Date		By	Date
Designed	PEM	10\18	Checked	RWH	10\18
Drawn	SLS	10\18	In Charge of	RAL	10\18

HNTB CORPORATION
340 County Road, Suite 6-C
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TEL (207) 774-5155
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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

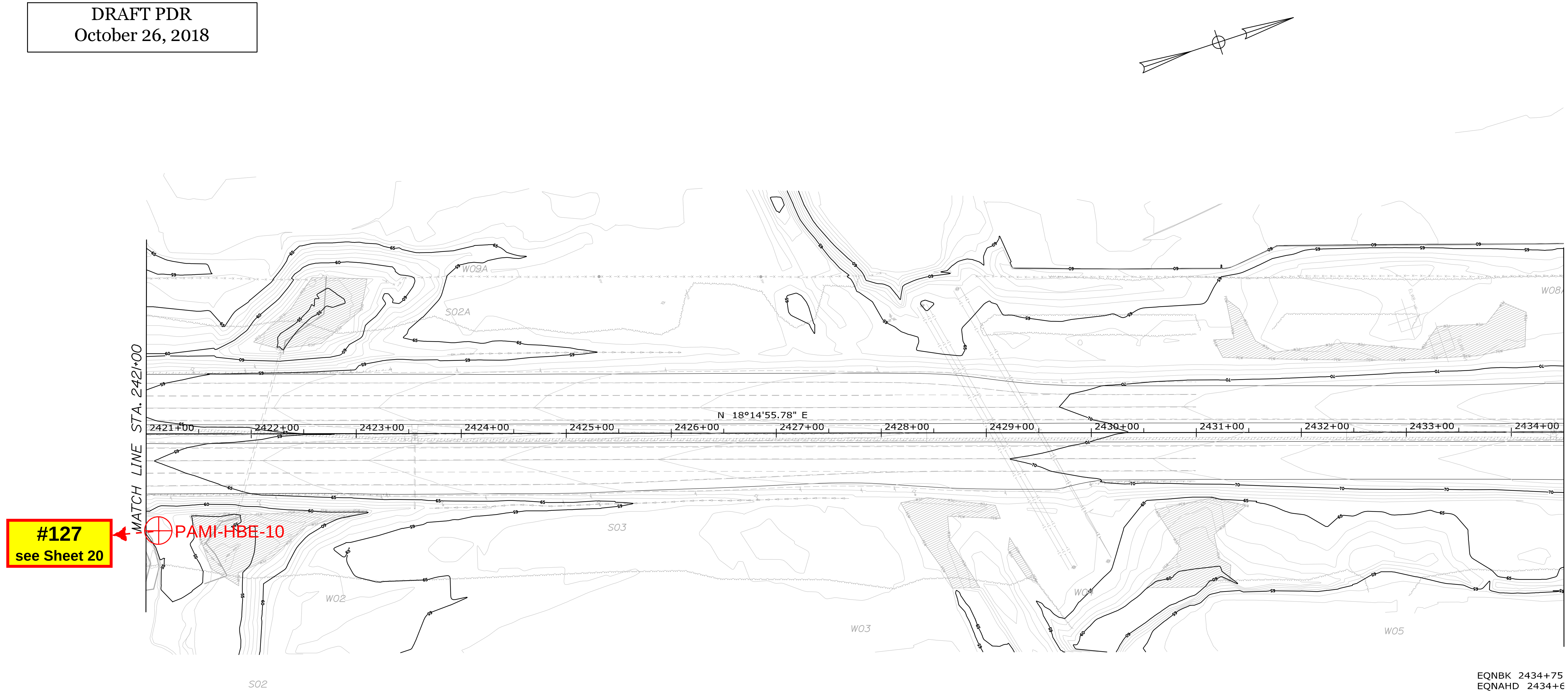
HIGHWAY PLAN 20

SHEET NUMBER: HP-20

CONTRACT:2020.XX

20 OF 21

DRAFT PDR
October 26, 2018



Date:10/22/2018

Filename: 024_BorLoc_Plan_21.dgn

Scale: 50 0 50 100
Scale of Feet

No.	Revision	By	Date

Designed by:

HNTB

CONSULTANT PROJECT MANAGER: Dale A. Mitchell, P.E.

	By	Date		By	Date
Designed	PEM	10\18	Checked	RWH	10\18
Drawn	SLS	10\18	In Charge of	RAL	10\18

HNTB CORPORATION
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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: Ralph C. Norwood, IV, P.E., P.T.O.E.

PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3

HIGHWAY PLAN 21

SHEET NUMBER: HP-21

CONTRACT:2020.XX

LOGS OF 100-SERIES SUBSURFACE EXPLORATIONS

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-101 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	50 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/7/18: 1105-1235	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2172+50, 65 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 2 ft	**Water Level*:**	0.9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0							SSA			
	1D	24/12	2.0 - 4.0	2-2-2-2	4	6	PUSH		1D: Brown, wet, v. loose, fine to coarse SAND, little fine Gravel, trace Silt. GRANULAR FILL	
	2D	24/9	4.0 - 6.0	1-2-3-5	5	8	5		2D: Red brown, loose, fine to coarse SAND, trace Silt; with fine to medium Sand, some Silt in tip of spoon.	
5							27			
							34			
							67	42.5	7.5	
							54			
	3D	24/14	9.0 - 11.0	4-2-1/12"	3	5	36		3D: Grey, interbedded, v. loose, fine SAND, trace Silt; Silty CLAY, trace very fine Sand; and fine SAND, some Silt. INTERBEDDED MARINE FINE SANDS AND SILT	CL A-4(4) -#200=78% WC=31% LL=23 PL=15 PI=8
10							26			
							29			
							33			
							31			
	4D	24/20	14.0 - 16.0	1-1/18"	1	2	OPEN		4D: Grey, interbedded, v. soft, Silty CLAY, trace very fine Sand; and fine SAND, some Silt.	CL WC=32% LL=24 PL=16 PI=8
15										
	5D	24/24	19.0 - 21.0	WOR/18"-3	--				5D: Grey, interbedded, v. soft, Silty CLAY, trace very fine Sand; and fine Sandy SILT.	
20										
								29.0	21.0 **Bottom of Exploration at 21.0 feet below ground surface.** No refusal.	
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PAMI-101

SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-102 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	65 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/5/18; 1155-12/7/18; 1025	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2196+75, 60 LT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	10.4 ft (open, end)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/13	2.0 - 4.0	4-4-4-3	8	12				1D: Brown, damp, loose, fine to medium SAND, trace to little Silt, trace coarse Sand. GRANULAR FILL	
	2D	24/8	4.0 - 6.0	2-2-2-2	4	6	19			2D: Brown, damp, v. loose, fine to medium SAND, trace to little Silt, trace coarse Sand.	
5							11				
							12				
							12				
							14				
	3D	24/7	9.0 - 11.0	1-3-2-2	5	8	8			3D: Brown, loose, fine to coarse SAND, trace Silt. Olive grey, Silt-Clay in tip of spoon.	
10							6				
							8	54.0		11.0 MARINE SILT-CLAY CRUST	
							10				
							10				
	4D	24/14	14.0 - 16.0	WOH/24"	--		WOH	51.0		14.0 4D: Grey, v. soft, Silty CLAY. MARINE SILT-CLAY	
15							WOH				
							7				
							13				
							22				
	5D V1	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 426/ 55 psf			OPEN			5D: Dark grey with occasional black, Silty CLAY, trace very fine Sand. V1: Tu=15.5 / Tr=2 ft-lbs (65 mm x 130 mm vane)	CL -#200=99% WC=39% LL=36 PL=19 PI=17
20	V2		20.6 - 21.0	Su= 371/ 55 psf						V2: Tu=13.5 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
25	6D V3	24/10	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su= 508/ 55 psf						6D: Dark grey with occasional black, Silty CLAY, trace very fine Sand.	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-102 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	65 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/5/18; 1155-12/7/18; 1025	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2196+75, 60 LT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	10.4 ft (open, end)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V4		25.6 - 26.0	Su= 385/ 27 psf						V3: Tu=18.5 / Tr=2 ft-lbs (65 mm x 130 mm vane) V4: Tu=14 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
	7D V5	24/24	29.0 - 31.0 29.6 - 30.0	VANE INTERVAL Su= 398/ 14 psf						7D: Dark grey, Silty CLAY. V5: Tu=14.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
30	V6		30.6 - 31.0	Su= 330/ 0 psf						V6: Tu=12 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	8D V7	24/24	34.0 - 36.0 34.6 - 35.0	VANE INTERVAL Su= 398/ 14 psf						8D: Dark grey black, Silty CLAY with nodules throughout. V7: Tu=14.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
35	V8		35.6 - 36.0	Su= 357/ 0 psf						V8: Tu=13 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	9D V9	24/3	39.0 - 41.0 39.6 - 40.0	VANE INTERVAL Su= 536/ 27 psf						9D: Dark grey, Silty CLAY with nodules throughout. V9: Tu=19.5 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
40	V10		40.6 - 41.0	Su= 398/ 0 psf						V10: Tu=14.5 / Tr=0 ft-lbs (65 mm x 130 mm vane) 41.7 ft: Gravelly material noted; possible concretion.	
								21.5		43.5	
	10D	24/8	44.0 - 46.0	6-8-15-16	23	35				10D: Grey, m. dense, Silty fine to coarse SAND, some Gravel. TILL	
45										48 to 49 ft: Roller cone through boulder.	
50	11D	18/10	49.0 - 50.5	22-37-43	80	121				11D: Grey, v. dense, Silty GRAVEL, some fine to coarse Sand.	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-102 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	65 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/5/18; 1155-12/7/18; 1025	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2196+75, 60 LT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	10.4 ft (open, end)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50								14.5		50.5 **Bottom of Exploration at 50.5 feet below ground surface.** No refusal.	
55											
60											
65											
70											
75											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 3 of 3

Boring No.: HB-PAMI-102

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-103 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	62 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/10/18; 0955-12/11/18; 1125	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2198+50, 75 RT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/13	2.0 - 4.0	4-4-4-5	8	12				1D: Brown, damp, loose, fine to coarse SAND, trace fine Gravel, trace Silt. GRANULAR FILL	
	2D	24/13	4.0 - 6.0	4-5-6-5	11	17				2D: Brown, damp, m. dense, fine to coarse SAND, trace fine Gravel, trace Silt.	
5											
10	3D	24/13	9.0 - 11.0	4-4-3-2	7	11	28			3D: Brown, damp to moist, loose, fine to coarse SAND, trace fine Gravel, trace Silt, with rust staining at bottom of sample. Grey Silt-Clay in tip of spoon.	
							26				
							21	50.0		12.0	
							19				
							21				
15	4D	24/24	14.5 - 16.5	WOR/18"-2	--		PUSH			4D: Grey, v. soft, Silty CLAY, trace very fine Sand. MARINE SILT-CLAY	
										17 to 19 ft: Possible sand seams.	
20	5D V1	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 316/ 27 psf			OPEN			5D: Dark grey, Silty CLAY. V1: Tu=11.5 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
	V2		20.6 - 21.0	Su= 302/ 27 psf						V2: Tu=11 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
25	MU	24/0	24.0 - 26.0	HYD PUSH						MU: No recovery; sample slid out of tube when brought to surface.	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-103 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	62 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/10/18; 0955-12/11/18; 1125	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2198+50, 75 RT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
25										
	U1	24/24	26.5 - 28.5	HYD PUSH					U1: Dark grey, Silty CLAY.	
	6D	24/24	28.5 - 30.5	VANE INTERVAL					6D: Dark grey, Silty CLAY.	CL -#200=99% WC=35% LL=43 PL=21 PI=22
	V3		29.1 - 29.5	Su= 343/ 14 psf					V3: Tu=12.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
30	V4		30.1 - 30.5	Su= 385/ 27 psf					V4: Tu=14 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
35	U2	24/21	35.0 - 37.0	HYD PUSH					U2: Dark grey, Silty CLAY, with fine Sand on bottom of sample.	CONSOL (Cv, Cα) WC=42% LL=40 PL=20 PI=20
								25.0	37.0 37.0 ft: Gravelly material noted.	
	7D	24/8	39.0 - 41.0	11-9-11-8	20	30	80		7D: Dark grey, m. dense, Silty GRAVEL, some fine to coarse Sand. TILL	
40							66			
							44			
							41			
							54			
	8D	24/12	44.0 - 46.0	5-6-15-17	21	32	OPEN		8D: Dark grey, m. dense, Gravelly SILT, some fine to coarse Sand.	
45										
	9D	8/5	49.0 - 49.7	56-100/2"	--			12.3	9D: Dark grey, Gravelly SILT, some fine to coarse Sand. 49.7	
50										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-103 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	62 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/10/18; 0955-12/11/18; 1125	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2198+50, 75 RT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50										**Bottom of Exploration at 49.7 feet below ground surface.** No refusal.	
55											
60											
65											
70											
75											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-PAMI-103

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-104	**Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	63 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/11/18; 1155-1325	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2216+10, 65 RT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	2.7 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/3	2.0 - 4.0	4-4-6-18	10	15				1D: Brown, moist, loose, fine to coarse SAND, some Silt, little Gravel; appears reworked. FILL	
	2D	24/16	4.0 - 6.0	10-13-12-12	25	38	28	59.0		4.0 2D: Dark red brown, wet, m. dense, fine to coarse SAND, trace fine Gravel, trace Silt; appears undisturbed. CLEAN SANDS	
5							46				
							53				
							50				
							57				
	3D	24/6	9.0 - 11.0	3-4-3-4	7	11	18			3D: Tan brown, loose, find to coarse SAND, little fine Gravel, trace Silt.	
10							25				
							44				
							81				
							101	50.0		13.0	
	4D	24/9	14.0 - 16.0	2-1-3-5	4	6	35			4D: Grey, v. loose, fine to medium SAND, little to some Silt, trace fine Gravel. MARINE SILTY FINE SANDS	
15							36				
							83				
							65	45.5		17.5	
							82				
	5D	24/24	19.0 - 21.0	1-1-1/12"	2	3				5D: Grey, v. soft, interbedded, Silty CLAY, trace very fine Sand; and Silty fine SAND. INTERBEDDED MARINE FINE SANDS AND SILT	
20								42.0		21.0 **Bottom of Exploration at 21.0 feet below ground surface.** No refusal.	
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-PAMI-104

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-105
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	58 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/12/18; 0950-1155	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2236+45, 95 RT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	9 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0							SSA			
	1D	24/24	2.0 - 4.0	2-4-7-8	11	17			1D: Olive brown, mottled, slightly desiccated, stiff, Clayey SILT, trace very fine Sand; appears disturbed. SILT-CLAY FILL	
								54.0	4.0	
	2D	24/24	4.0 - 6.0	4-7-8-9	15	23			2D: Olive brown, slightly mottled, stiff, SILT & CLAY, trace very fine Sand. MARINE SILT-CLAY CRUST	
5										
								50.0	8.0	
	3D	24/24	9.0 - 11.0	WOH/24"	--		PUSH		3D: Dark grey, CLAY & SILT grading to Silty CLAY, trace very fine Sand. MARINE SILT-CLAY	
10							38			
							30			
	MU						29	45.0	MU: Attempt tube sample at 13.0 ft; piston sampler not extend; no penetration.	
									13.0	
	4D	24/11	13.0 - 15.0	4-4-7-3	3"dia		26		4D: Grey, Silty GRAVEL, some fine to coarse Sand. TILL	
							31		Grey, Silty fine to coarse SAND, little to some Gravel. Changing at 16.4 ft to:	
15	5D	24/16	15.0 - 17.0	WOH-4-3-3	7	11	24		5D: Brown, fine to medium SAND, trace to little Silt, trace coarse Sand.	
							33			
							41			
							55			
	6D	24/16	19.0 - 21.0	8-7-7-11	14	21			6D: Grey, m. dense, Silty fine to medium SAND, some Gravel, trace coarse Sand.	
20										
								37.0	21.0	
									Bottom of Exploration at 21.0 feet below ground surface. No refusal.	
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-PAMI-105

Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-106 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	61 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/12/18; 1210-1335	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2243+05, 65 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	2.0 - 4.0	4-6-11-13	17	26				1D: Olive brown, mottled, desiccated, v. stiff, Clayey SILT, trace fine Sand; appears reworked.	
	2D	24/24	4.0 - 6.0	5-6-9-10	15	23				2D: Olive brown, slightly mottled, stiff, Clayey SILT, trace fine Sand; appears possibly reworked.	
5								55.0		6.0	
10	3D	24/24	9.0 - 11.0	3-4-5-6	9	14	PUSH			3D: Olive grey, stiff, CLAY & SILT. MARINE SILT-CLAY CRUST	CL -#200=99% WC=31% LL=48 PL=21 PI=27
								48.5		12.5	
	MV									14.8 ft: Unable to push vane below 14.8 feet.	
15	4D	24/24	14.0 - 16.0	(--/12")-WOH/12"	--		OPEN			4D: Dark grey with occasional black, v. soft, Silty CLAY, with one Silty fine to medium Sand seam. MARINE SILT-CLAY	
20	5D V1	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su=1016/137 psf						5D: Dark grey, Silty CLAY, trace very fine Sand with two fine Sandy SILT seams. V1: Tu=37 / Tr=5 ft-lbs (65 mm x 130 mm vane)	CL A-6(21) -#200=97% WC=36% LL=40 PL=19 PI=21
	V2		20.6 - 21.0	Su=920/137 psf						V2: Tu=33.5 / Tr=5 ft-lbs (65 mm x 130 mm vane) 21.0 ft: Hydraulically push rod probe.	
										23.3 ft: Sand seams noted.	
25								36.8		24.2 **Bottom of Exploration at 24.2 feet below ground surface.**	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-106 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	61 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/12/18; 1210-1335	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2243+05, 65 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25										24.2 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
30											
35											
40											
45											
50											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-PAMI-106

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-107
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	63 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/13/18; 0930-1055	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2256+35, 90 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0							SSA			
	1D	24/24	2.0 - 4.0	2-4-6-6	10	15			1D: Olive brown, mottled, desiccated, stiff, Clayey SILT, trace fine Sand; appears reworked. SILT-CLAY FILL	
								59.0	4.0	
	2D	24/24	4.0 - 6.0	4-5-8-9	13	20			2D: Olive brown, slightly mottled, stiff, Clayey SILT grading to SILT & CLAY; appears undisturbed. MARINE SILT-CLAY CRUST	
5										
	3D	24/24	9.0 - 11.0	2-4-3-5	7	11	OPEN		3D: Olive brown, m. stiff, SILT & CLAY with occasional seams fine Sand, grading to CLAY & SILT.	
10										
								52.0	11.0	
	4D	24/24	14.0 - 16.0	WOH/24"	--				4D: Dark grey, v. soft, Silty CLAY. MARINE SILT-CLAY	
15										
	5D V1	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 549/ 69 psf					5D: Dark grey with occasional black, Silty CLAY, trace very fine Sand. V1: Tu=20 / Tr=2.5 ft-lbs (65 mm x 130 mm vane)	CL -#200=97% WC=39% LL=37 PL=18 PI=19
20	V2		20.6 - 21.0	Su= 467/ 27 psf					V2: Tu=17 / Tr=1 ft-lbs (65 mm x 130 mm vane) 21.0 ft: Hydraulically push rod probe.	
									24.2 ft: Sand seams noted.	
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-107
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	63 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/13/18; 0930-1055	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2256+35, 90 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25								37.3		25.7 **Bottom of Exploration at 25.7 feet below ground surface.** 25.7 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
30											
35											
40											
45											
50											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-108
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	58 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/13/18; 1135-1310	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2266+25, 65 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	2.0 - 4.0	5-6-8-9	14	21				1D: Olive brown grey, mottled, desiccated, stiff, SILT-CLAY FILL with rust fine Sand at bottom of sample.	
								54.0		4.0	
5	2D	24/24	4.0 - 6.0	4-6-8-8	14	21				2D: Olive brown, slightly mottled, stiff, Clayey SILT grading to SILT & CLAY; appears undisturbed. MARINE SILT CLAY CRUST	
10	3D	24/24	9.0 - 11.0	2-3-3-5	6	9	OPEN			3D: Olive grey, slightly mottled, m. stiff, CLAY & SILT with one 1/4-inch seam grey Silty fine SAND.	
								45.5		12.5	
15	4D V1	24/24	14.0 - 16.0 14.6 - 15.0	VANE INTERVAL Su= 659/ 110 psf						4D: Dark grey, Silty CLAY, trace very fine Sand. V1: Tu=24 / Tr=4 ft-lbs (65 mm x 130 mm vane)	
	V2		15.6 - 16.0	Su= 591/ 82 psf						V2: Tu=21.5 / Tr=3 ft-lbs (65 mm x 130 mm vane)	
20	5D V3	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 412/ 41 psf						5D: Dark grey, Silty CLAY with nodules throughout. V3: Tu=15 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	
	V4		20.6 - 21.0	Su= 577/ 55 psf						V4: Tu=21 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
								37.0		21.0 **Bottom of Exploration at 21.0 feet below ground surface.** No refusal.	
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-PAMI-108

Schonewald Engineering Associates, Inc.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-109
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	NQ2
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/9/19; 0930-1125	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2270+90, 95 LT (approx)	**Casing ID/OD:**	HW (4") to 9 ft; NW (3") to 13.5 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	4.0 - 6.0	3-5-7-8	12	18				1D: Olive brown, mottled, desiccated, Clayey SILT, trace to little fine Sand; appears reworked. FILL Changing at 5.0 ft to:	
5								49.0		5.0 — 1D (cont'd): Olive brown, slightly mottled, Clayey SILT, trace fine Sand; possibly undisturbed. MARINE SILT-CLAY CRUST	
	2D	24/24	9.0 - 11.0	WOH-2-3-2	5	8	OPEN			2D: Olive grey, m. stiff, CLAY & SILT, trace fine Sand with four seams of fine Sandy SILT.	CL A-6(21) -#200=98% WC=31% LL=39 PL=19 PI=21
10											
								40.8		13.2	
	R1	60/60	13.5 - 18.5	RQD: 49" = 82%						13.2 ft: Roller cone grinding; able to penetrate to 13.5 ft. R1: Hard, fresh, aphanitic to fine grained, grey PHYLLITE with highly undulating remnant bedding and occasional calcsilicate veins. Moderately spaced, low angle and moderately dipping breaks; undulating, rough, typically fresh, and open; shiny. Core times: 2:40/ 3:00/ 3:35/ 4:05/ 3:40 min:sec/ft. GOOD ROCK QUALITY	
15											
								35.5		18.5 **Bottom of Exploration at 18.5 feet below ground surface.**	
20											
25											

Remarks:

Located approximately 180 ft SB of inlet end of Long Creek culvert; invert in elevation approximately 38 to 40 ft.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-PAMI-109

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-109B
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	NQ2
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/15/19; 1020-1310	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2272+90, 55 LT (approx)	**Casing ID/OD:**	HW(4") to 14 ft; NW(3") to 20.5 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	11.5 (end, open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA	53.3		8 inches HMA ——— 0.7	
	1D	24/14	2.0 - 4.0	17-17-15-14	32	48				1D: Grey brown, dry, dense, fine to coarse SAND, some fine Gravel, little to some Silt. GRANULAR FILL	
	2D	24/11	4.0 - 6.0	19-43-41-40	84	127				2D: Grey brown, dry, v. dense, fine to coarse SAND, some Silt, some fine Gravel. 5 ft: Boney based on drilling behavior.	
5											
								46.0		— — — 8.0 8 ft: SILT-CLAY on augers.	
	3D	24/18	9.0 - 11.0	2-3-2-3	5	8	47			3D: Olive brown, damp to moist, loose, mix of Silty fine to medium SAND; Clayey SILT, little to some fine Sand; and fine Sandy SILT; appears reworked. MISC FILL	CL A-4(7) -#200=88% WC=24% LL=26 PL=16 PI=10
10							43				
							47				
							45				
							58				
	4D	24/11	14.0 - 16.0	1-2-1-3	3	5	OPEN			4D: Olive brown grey, soft, SILT & CLAY, little to some fine to coarse Sand, little fine Gravel. FILL	
15											
								37.0		— — — 17.0 17 ft: Possible transition to native material (Till)	
	5D	8/5	19.0 - 19.7	36-60/2"	--					5D: Grey with rust staining, Silty GRAVEL, some fine to coarse Sand; TILL with weathered rock.	
20	R1	60/57	20.5 - 25.5	RQD: 45" = 75%				33.5		——— 20.5 R1: Hard, typically fresh, aphanitic to fine grained, grey PHYLLITE with highly undulating remnant bedding and occasional calcsilicate veins. Close to moderately spaced, low angle and moderately dipping breaks; undulating, rough, typically fresh, and open; shiny. Open fracture zone from 23.6 to 23.9 ft. Core times: 2:30/ 2:30/ 3:00/ 3:05/ 2:45 min:sec/ft. FAIR TO GOOD ROCK QUALITY	
25											

Remarks:

Located in SB shoulder, approximately 20 ft NB of Long Creek culvert; invert in elevation approximately 38 to 40 ft.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-109B
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	NQ2
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/15/19; 1020-1310	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2272+90, 55 LT (approx)	**Casing ID/OD:**	HW(4") to 14 ft; NW(3") to 20.5 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	11.5 (end, open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25								28.5		25.5 **Bottom of Exploration at 25.5 feet below ground surface.**	
30											
35											
40											
45											
50											

Remarks:

Located in SB shoulder, approximately 20 ft NB of Long Creek culvert; invert in elevation approximately 38 to 40 ft.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-110
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	45 ft (est'd)	**Core Barrel:**	NQ2
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/13/18; 1340- 12/14/18; 1035	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2272+95, 75 RT (approx)	**Casing ID/OD:**	HW(4") to 14 ft; NW(3") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/7	2.0 - 4.0	5-4-3-3	7	11				1D: Brown, loose MISC FILL, including rounded gravel, topsoil and root mat, and silty granular material.	
								41.0		4.0	
5	2D	24/18	4.0 - 6.0	WOH/12"-1-1	1	2				2D: Brown, v. loose, fine Sandy SILT, grading to grey at bottom of sample. MARINE SILTY FINE SANDS	
10	3D	24/21	9.0 - 11.0	WOR-WOH/18"	--		14			3D: Grey, v. loose, SILT, some fine Sand.	CL A-4(5) -#200=77% WC=30% LL=28 PL=19 PI=9
							20				
							21				
							50/6" RC	32.5		12.5 12.5 ft: Casing refusal; able to roller cone to 14.0 ft with effort.	
15	R1	60/60	14.0 - 19.0	RQD: 48" = 80%						R1: Hard, fresh, aphanitic to fine grained, light grey, PHYLLITE with highly undulating remnant bedding and occasional typically high angle, thin calcsilicate veins. Moderately spaced, low angle to moderately dipping breaks; undulating, rough, typically fresh, and open with occasional mud infilling; shiny. Core times: 3:05/ 2:35/ 2:40/ 2:45/ 2:55 min:sec/ft GOOD ROCK QUALITY	
								26.0		19.0 **Bottom of Exploration at 19.0 feet below ground surface.**	
20											
25											

Remarks:

Located approximately 25 ft NB of outlet end of Long Creek culvert; invert out elevation approximately 38 to 40 ft.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PAMI-110

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-111
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	64 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/14/18; 1045-1140	**Drilling Method:**	auger boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2278+15, 120 RT (approx)	**Casing ID/OD:**		**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 14 ft	**Water Level*:**	none observed

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
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S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	2.0 - 4.0	WOH/24"	--					1D: Olive grey, slightly mottled, v. soft, CLAY & SILT, trace very fine Sand with few organics. MARINE SILT-CLAY	
	2D	24/21	4.0 - 6.0	WOH/24"	--					2D: Olive grey, v. soft, Silty CLAY, trace very fine Sand.	
5											
	3D	24/24	9.0 - 11.0	WOH/24"	--					3D: Olive grey with occasional black, v. soft, Silty CLAY, trace very fine Sand.	
10											
	4D	24/24	14.0 - 16.0	WOH/24"	--					4D: Dark grey black, v. soft, Silty CLAY with one 1/8-inch seam of broken shells.	
15											
								48.0		16.0 **Bottom of Exploration at 16.0 feet below ground surface.** No refusal.	
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PAMI-111

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-112 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	72 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/14/18; 1220-1300	**Drilling Method:**	auger boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2288+65, 105 RT (approx)	**Casing ID/OD:**		**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 12.1 ft	**Water Level*:**	10.1 ft (end, open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	2.0 - 4.0	3-5-12-15	17	26				1D: Red brown grey rust, damp, m. dense, Silty fine to coarse SAND, little Gravel. MISC FILL	
	2D	24/24	4.0 - 6.0	7-8-11-12	19	29				2D: Red brown, damp, m. dense, Silty fine to coarse SAND, trace to little Gravel; appears reworked. MISC FILL	
5											
								66.0		6.0	
	3D	24/21	9.0 - 11.0	2-3-4-4	7	11				3D: Brown, moist to wet, loose, fine to medium Sandy SILT, trace to little fine Gravel, trace coarse Sand. MARINE SILTY FINE SANDS	
10											
								60.9		11.1	
										11.1 ft: Grinding on hard surface.	
								59.9		12.1	
										Bottom of Exploration at 12.1 feet below ground surface. Auger refusal.	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Page 1 of 1

Boring No.: HB-PAMI-112

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-113
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	82 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/18/18; 0950-1030	**Drilling Method:**	auger boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2307+70, 70 RT (approx)	**Casing ID/OD:**		**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4.5 ft	**Water Level*:**	0.5 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	14/10	2.0 - 3.2	3-6-50/2"	--					1D: Brown, wet, fine Sandy SILT, trace fine Gravel, trace coarse Sand; decomposed rock in tip of spoon.	
								78.8		3.2	
										3.2 ft: Auger grinding on solid surface.	
								77.5		4.5	
5										**Bottom of Exploration at 4.5 feet below ground surface.** Auger refusal.	
10											
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-114 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	36 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/18/18; 1145-12/19/18; 1115	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2323+00, 90 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0							SSA			
	1D	24/22	2.0 - 4.0	2-2-3-3	5	8			1D: Grey brown, damp, m. stiff, SILT-CLAY FILL with occasional seams and pockets of sand and gravel.	
	2D	24/17	4.0 - 6.0	WOH/18"-2	--				2D: Brown grey, moist, v. soft, SILT-CLAY FILL with sand.	
5										
10	3D	24/24	9.0 - 11.0	7-12-16-33	28	42	OPEN		3D: Brown grey, moist, v. stiff, SILT-CLAY FILL; appears reworked.	
								23.5	12.5	
15	4D	24/24	14.0 - 16.0	2-3-2-2	5	8			4D: Olive brown, m. stiff, CLAY & SILT with two fine Sandy SILT seams; appears undisturbed. MARINE SILT-CLAY CRUST	CL -#200=95% WC=37% LL=45 PL=23 PI=22
								18.5	17.5	
20	5D V1	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 618/ 82 psf					5D: Dark grey with occasional black, Silty CLAY, trace very fine Sand. MARINE SILT-CLAY V1: Tu=22.5 / Tr=3 ft-lbs (65 mm x 130 mm vane)	
	V2		20.6 - 21.0	Su= 494/ 55 psf					V2: Tu=18 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
25	U1	24/24	24.0 - 26.0	HYD PUSH					U1: Dark grey black, Silty CLAY.	CONSOL (Cv, Cα)

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-114 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	36 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/18/18; 1145-12/19/18; 1115	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2323+00, 90 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

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MV = Unsuccessful Insitu Vane Shear Test attempt

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hammer efficiency = calculated hammer efficiency
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R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25											WC=53% LL=50 PL=23 PI=27
	V3		26.6 - 27.0	Su= 398/ 27 psf						V3: Tu=14.5 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
	V4		27.6 - 28.0	Su= 453/ 0 psf						V4: Tu=16.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	6D V5	24/24	29.0 - 31.0 29.6 - 30.0	VANE INTERVAL Su= 494/ 0 psf						6D: Dark grey black, Silty CLAY. V5: Tu=18 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
30	V6		30.6 - 31.0	Su= 440/ 0 psf						V6: Tu=16 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	7D V7	24/18	34.0 - 36.0 34.6 - 35.0	VANE INTERVAL Su= 481/ 14 psf						7D: Dark grey black, Silty CLAY. V7: Tu=17.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	CL -#200=94% WC=36% LL=40 PL=20 PI=20
35	V8		35.6 - 36.0	Su= 536/ 14 psf						V8: Tu=19.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
	U2	24/24	39.0 - 41.0	HYD PUSH						U2: Dark grey black, Silty CLAY.	
40											
	8D V9	24/17	44.0 - 46.0 44.6 - 45.0	VANE INTERVAL Su= 673/ 0 psf						8D: Dark grey black, Silty CLAY, with nodules throughout. V9: Tu=24.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
45	V10		45.6 - 46.0	Su= 522/ 0 psf						V10: Tu=19 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
50	9D V11	24/15	49.0 - 51.0 49.6 - 50.0	VANE INTERVAL Su= 591/ 0 psf						9D: Dark grey black, Silty CLAY, with nodules throughout. V11: Tu=21.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	

Remarks:

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Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-114 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	36 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/18/18; 1145-12/19/18; 1115	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2323+00, 90 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
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R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
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WOR = weight of rods
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LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
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UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50	V12		50.6 - 51.0	Su= 742/ 0 psf						V12: Tu=27 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
55	10D V13	24/12	54.0 - 56.0 54.6 - 55.0	VANE INTERVAL Su= 838/ 0 psf						10D: Dark grey black, Silty CLAY, with nodules throughout and multiple concretions. V13: Tu=30.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	MV									MV: Unable to push vane below 55.7 ft.	
56.7								-20.7		56.7 ft: Stratum change based on drilling behavior.	
60	11D	24/4	59.0 - 61.0	8-5-9-10	14	21				11D: Dark grey, m. dense, fine to coarse Sandy GRAVEL, trace to little Silt. TILL	
61.0								-25.0		**Bottom of Exploration at 61.0 feet below ground surface.** No refusal.	
65											
70											
75											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-115 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	50 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/19/18; 1140-1330	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2327+20, 90 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	ground surface

IN-SITU SAMPLING AND TESTING:
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V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
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hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	2.0 - 4.0	1-4-6-8	10	15				1D: Brown, wet, stiff, SILT-CLAY FILL with occasional seams and pockets of sand and gravel; appears reworked.	
								46.0		4.0	
	2D	24/24	4.0 - 6.0	4-4-5-7	9	14				2D: Olive brown, slightly mottled, moist (tight), stiff, Clayey SILT, trace fine Sand; appears undisturbed. MARINE SILT-CLAY CRUST	
5											
	3D	24/24	9.0 - 11.0	2-4-4-5	8	12	OPEN			3D: Olive brown, moist (tight), m. stiff, SILT & CLAY, trace fine Sand.	CL -#200=99% WC=34% LL=49 PL=22 PI=27
10											
	4D	24/24	14.0 - 16.0	WOH-2-3-2	5	8				4D: Olive grey brown, m. stiff, CLAY & SILT with four seams fine Sandy SILT.	
15											
								32.0		18.0 ft: Stratum change based on drilling behavior. 18.0	
	5D	12/6	19.0 - 20.0	26-74	3"dia					5D: Brown, GRAVEL, some Silt, some fine to coarse Sand. TILL	
20											
	6D	24/6	24.0 - 26.0	19-15-11-14	26	39				6D: Grey brown, m. dense, fine to coarse Sandy GRAVEL, some Silt.	
25											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-115
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	50 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/19/18; 1140-1330	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2327+20, 90 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	ground surface

IN-SITU SAMPLING AND TESTING:
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LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
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LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25								24.0		26.0 **Bottom of Exploration at 26.0 feet below ground surface.** No refusal.	
30											
35											
40											
45											
50											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements, Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-116
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	59 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/20/18; 0945-1135	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2340+80, 80 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	3.2 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0							SSA			
	1D	24/10	2.0 - 4.0	4-5-4-3	9	14			1D: Brown, wet, loose, fine to coarse SAND, little Gravel, trace to little Silt. GRANULAR FILL	
	2D	24/10	4.0 - 6.0	2-2-1-4	3	5	--		Brown grey, wet, v. loose, fine to medium SAND, little to some Silt, trace fine Gravel, trace coarse Sand. GRANULAR FILL Changing at 5.6 ft to:	
5							19	53.4	5.6	
							29	53.0	2D: Grey brown, fine to medium Sandy ORGANIC SILT with brown fibrous PEAT; appears to be original ground. 6.0	
							21			
							26			
	3D	24/1	9.0 - 11.0	1-2-1-1	3	5	23		3D: (limited recovery) Grey, v. loose, fine SAND, some Silt. MARINE SILTY FINE SANDS	
10							20			
							18			
							19	46.5	12.5	
							20			
	4D	24/24	14.0 - 16.0	WOR/12"-WOH/12"	--		OPEN		4D: Olive grey, v. soft, Silty CLAY with four seams fine Sandy SILT. MARINE SILT-CLAY	
15										
	5D	24/24	19.0 - 21.0	WOR/18"-WOH	--				5D: Olive grey, v. soft, Silty CLAY with three seams fine Sandy SILT.	
20									21.0 ft: Hydraulically push rod probe.	
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-116 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	59 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/20/18; 0945-1135	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2340+80, 80 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	3.2 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25											
30											
35											
40											
45											
50											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-116 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	59 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/20/18; 0945-1135	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2340+80, 80 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	3.2 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines   WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50											
55											
60											
65										65 ft: Sand seams noted.	
70								-11.6		70.6 **Bottom of Exploration at 70.6 feet below ground surface.** 70.6 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
75											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-117
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	67 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/4/18; 1345 - 12/5/18; 1110	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2340+00, 95 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	7.6 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/17	2.0 - 4.0	2-2-2-2	4	6				1D: Brown grey, damp to moist, v. loose, layered SILTY GRANULAR and SILT-CLAY FILL	
	2D	24/16	4.0 - 6.0	2-3-4-2	7	11				2D: Grey brown, moist, loose, layered SILTY GRANULAR and SILT-CLAY FILL	
5											
								59.5		7.5	
	3D	24/16	9.0 - 11.0	3-5-7-6	12	18	15			3D: Olive grey grading to dark grey, wet, m. dense, Silty fine to medium SAND, trace coarse Sand. MARINE SILTY FINE SANDS	
10							24				
							45				
							26				
							29			14.0 ft: Unable to push vane.	
	4D	24/3	14.0 - 16.0	2-2-1-1	3	5	OPEN			4D: Dark grey, v. loose, Silty fine to medium SAND.	
15											
								50.0		17.0	
	5D	24/24	17.0 - 19.0	WOR/18"-WOH	--					5D: Olive grey, v. soft, Silty CLAY with three 1-inch layers Silty fine SAND in upper 9 inches of sample. MARINE SILT-CLAY	
	6D V1	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 385/ 27 psf						6D: Dark grey, Silty CLAY. V1: Tu=14 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
20	V2		20.6 - 21.0	Su= 302/ 14 psf						V2: Tu=11 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
25	7D V3	24/24	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su= 357/ 0 psf						7D: Dark grey, Silty CLAY with occasional small nodules. V3: Tu=13 / Tr=0 ft-lbs (65 mm x 130 mm vane)	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-117
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	67 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/4/18; 1345 - 12/5/18; 1110	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2340+00, 95 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	7.6 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V4		25.6 - 26.0	Su= 275/ 0 psf						V4: Tu=10 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	8D	24/24	29.0 - 31.0	VANE ERROR						8D: Dark grey, Silty CLAY with occasional nodules.	CL WC=38% LL=41 PL=22 PI=19
30											
	9D V5	24/24	34.0 - 36.0 34.6 - 35.0	VANE INTERVAL Su= 357/ 0 psf						9D: Dark grey, Silty CLAY with nodules throughout. V5: Tu=13 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
35	V6		35.6 - 36.0	Su= 343/ 0 psf						V6: Tu=12.5 / Tr=0 ft-lbs (65 mm x 130 mm vane) 36.0 ft: Hydraulically push rod probe.	
40											
45											
50											

Remarks:

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Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-117 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	67 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/4/18; 1345 - 12/5/18; 1110	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2340+00, 95 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	7.6 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50											
55											
60											
65											
70											
75											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-117
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	67 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/4/18; 1345 - 12/5/18; 1110	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2340+00, 95 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	7.6 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
75											
80											
										83.3 ft: Sand seams noted.	
85											
90								-23.0		90.0 **Bottom of Exploration at 90.0 feet below ground surface.** 90.0 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
95											
100											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-118 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	61 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/4/18; 0835-1145	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2359+20, 70 LT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	4.4 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0							SSA			
	1D	24/18	2.0 - 4.0	6-5-3-4	8	12			1D: Grey brown, loose, damp to moist, layered GRANULAR and SILT-CLAY FILL.	
	2D	24/15	4.0 - 6.0	2-3-6-7	9	14	28		2D: Grey brown, loose, moist to wet, layered GRANULAR and SILT-CLAY FILL.	
5							45			
							32			
							64	53.0	8.0	
							96			
	3D	24/24	9.0 - 11.0	4-5-6-8	11	17	OPEN		3D: Olive brown, slightly mottled, stiff, Clayey SILT. MARINE SILT-CLAY CRUST	CL WC=29% LL=46 PL=22 PI=24
10										
	4D	24/24	14.0 - 16.0	WOH/24"	--				4D: Olive brown grey grading to dark grey black, v. soft, SILT & CLAY grading to Silty CLAY.	
15								46.0	15.0	
	5D V1	24/24	16.0 - 18.0 16.6 - 17.0	VANE INTERVAL Su= 467/ 55 psf					5D: Dark grey, Silty CLAY. MARINE SILT CLAY V1: Tu=17 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
	V2		17.6 - 18.0	Su= 412/ 27 psf					V2: Tu=15 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
	U1	24/24	19.0 - 21.0	HYD PUSH					U1: Dark grey, Silty CLAY.	
20										
25	6D V3	24/1	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su= 316/ 14 psf					6D: Dark grey, Silty CLAY. V3: Tu=11.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-118
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	61 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/4/18; 0835-1145	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2359+20, 70 LT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	4.4 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V4		25.6 - 26.0	Su= 302/ 0 psf						V4: Tu=11 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	7D V5	24/24	29.0 - 31.0 29.6 - 30.0	VANE INTERVAL Su= 302/ 14 psf						7D: Dark grey black, Silty CLAY. V5: Tu=11 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
30	V6		30.6 - 31.0	Su= 275/ 0 psf						V6: Tu=10 / Tr=0 ft-lbs (65 mm x 130 mm vane) 31.0 ft: Hydraulically push rod probe.	
35											
40										41 ft: Sand seams noted.	
45											
								13.7		47.3 **Bottom of Exploration at 47.3 feet below ground surface.** 47.3 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
50											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-119
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	60 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/20/18; 1205-1345	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2360+50, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	10.9 ft (open, end)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	2.0 - 4.0	3-4-9-10	13	20				1D: Olive brown, mottled, slightly desiccated, damp, stiff SILT-CLAY FILL with little fine Sand; appears reworked.	
	2D	24/24	4.0 - 6.0	2-3-6-7	9	14				2D: Olive brown, mottled, damp, stiff, SILT-CLAY FILL with trace to little fine Sand; appears reworked.	
5											
								52.5		7.5	
	3D	24/24	9.0 - 11.0	2-2-2-2	4	6	OPEN			3D: Olive brown, slightly mottled, SILT & CLAY, trace fine Sand as pockets, grading to olive grey, CLAY & SILT; appears undisturbed. MARINE SILT-CLAY CRUST	
10											
								47.0		13.0	
	4D V1	24/24	14.0 - 16.0 14.6 - 15.0	VANE INTERVAL Su= 563/ 55 psf						4D: Dark grey black, Silty CLAY with occasional nodules. MARINE SILT-CLAY V1: Tu=20.5 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
15	V2		15.6 - 16.0	Su= 522/ 27 psf						V2: Tu=19 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
	5D V3		19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 426/ 14 psf						5D: Dark grey black, Silty CLAY with occasional nodules. V3: Tu=15.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	CL -#200=95% WC=38% LL=39 PL=20 PI=19
20	V4		20.6 - 21.0	Su= 371/ 14 psf						V4: Tu=13.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane) 21.0 ft: Hydraulically push rod probe.	
25											

Remarks:

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Page 1 of 2

Boring No.: HB-PAMI-119

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-119 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	60 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/20/18; 1205-1345	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2360+50, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	10.9 ft (open, end)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25											
30											
35											
40											
										41.5 ft: Sand seams noted.	
								16.9		43.1 **Bottom of Exploration at 43.1 feet below ground surface.** 43.1 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
45											
50											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-PAMI-119

Schonewald Engineering Associates, Inc.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-120 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	59 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/3/18; 1000 - 12/4/18; 1255	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2369+05, 95 LT (approx)	**Casing ID/OD:**	HW (4") to 34 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/24	2.0 - 4.0	3-3-4-7	7	11				1D: Olive brown grey, mottled, desiccated, damp, m. stiff, Clayey SILT, little fine Sand; appears reworked. SILT-CLAY FILL	
	2D	24/24	4.0 - 6.0	4-8-9-11	17	26				2D: Olive grey brown, mottled, moist, v. stiff, Clayey SILT, trace fine Sand; appears reworked. SILT-CLAY FILL	
5											
	3D	24/24	9.0 - 11.0	2-3-4-5	7	11	OPEN			3D: Olive brown grey, slightly mottled, moist, m. stiff, Clayey SILT grading to SILT & CLAY; upper portion of sample possibly reworked.	
10								49.0		10.0	
	4D V1	24/24	14.0 - 16.0 14.6 - 15.0	VANE INTERVAL Su= 742/ 124 psf						4D: Olive grey, CLAY & SILT, trace very fine Sand. MARINE SILT-CLAY CRUST V1: Tu=27 / Tr=4.5 ft-lbs (65 mm x 130 mm vane)	CL -#200=99% WC=29% LL=41 PL=23 PI=18
15	V2		15.6 - 16.0	Su= 632/ 96 psf						V2: Tu=23 / Tr=3.5 ft-lbs (65 mm x 130 mm vane)	
								41.5		17.5	
	5D V3	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su= 467/ 41 psf						5D: Dark grey black, Silty CLAY. MARINE SILT-CLAY V3: Tu=17 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	
20	V4		20.6 - 21.0	Su= 385/ 14 psf						V4: Tu=14 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
	U1	24/24	24.0 - 26.0	HYD PUSH						U1: Dark grey, Silty CLAY.	
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

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Boring No.: HB-PAMI-120

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-120 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	59 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	12/3/18; 1000 - 12/4/18; 1255	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2369+05, 95 LT (approx)	**Casing ID/OD:**	HW (4") to 34 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25											
								30.3		28.7 29.0 ft: Unable to push vane. 6D: Grey, v. loose, fine to coarse SAND, little to some Silt, trace to little Gravel. TILL	
	6D	24/6	29.0 - 31.0	1-2-2-2	4	6	26				
30							25				
							31				
							33				
							36			7D: Grey, loose, fine to coarse SAND, some Gravel, some Silt. TILL	
	7D	24/7	34.0 - 36.0	2-3-3-3	6	9					
35											
								23.0		36.0 **Bottom of Exploration at 36.0 feet below ground surface.** No refusal.	
40											
45											
50											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 2 of 2

Boring No.: HB-PAMI-120

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-121 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	60 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/28/18; 1020 - 11/29/18; 0955	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2371+70, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	2.6 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/15	2.0 - 4.0	5-10-10-14	20	30				1D: Brown, wet, m. dense, fine to medium SAND, some Silt, trace coarse Sand; silt content varies. FILL	
	2D	24/7	4.0 - 6.0	3-6-7-7	13	20	--			2D: Brown, wet, m. dense, fine to medium SAND, little to some Silt, trace coarse Sand with one piece of gravel in bottom of sample. FILL	
5							23				
							34				
							38				
							50				
	3D	24/9	9.0 - 11.0	5-3-3-3	6	9	15			3D: Brown, loose, fine to medium SAND, trace to little Silt, trace coarse Sand, trace fine Gravel; organic odor. FILL	
10							14				
							26				
							46	47.0		13.0	
							108				
	4D	24/24	14.0 - 16.0	6-7-11-11	18	27	OPEN			4D: Olive brown, slightly mottled, Clayey SILT with occasional pockets and partings grey Silt. MARINE SILT-CLAY CRUST	CL -#200=99% WC=29% LL=47 PL=26 PI=21
15											
	5D	24/24	19.0 - 21.0	WOH/18"-3	--					5D: Olive grey brown, mottled, CLAY & SILT, trace fine Sand.	
20											
	V1		21.6 - 22.0	Su= 659/ 69 psf						V1: Tu=24 / Tr=2.5 ft-lbs (65 mm x 130 mm vane)	
	V2		22.6 - 23.0	Su= 563/ 55 psf						V2: Tu=20.5 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
								36.5		23.5	
25	6D V3	24/24	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su= 426/ 41 psf						6D: Dark grey black, Silty CLAY. MARINE SILT-CLAY V3: Tu=15.5 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	

Remarks:

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Boring No.: HB-PAMI-121

Schonewald Engineering Associates, Inc.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-121 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	60 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/28/18; 1020 - 11/29/18; 0955	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2371+70, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	2.6 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
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MU = Unsuccessful Thin Wall Tube Sample attempt
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MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
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N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V4		25.6 - 26.0	Su= 440/ 27 psf						V4: Tu=16 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
	U1	24/24	27.0 - 29.0	HYD PUSH						U1: Dark grey, Silty CLAY.	
	7D V5	24/24	29.0 - 31.0 29.6 - 30.0	VANE INTERVAL Su= 522/ 27 psf						7D: Dark grey black, Silty CLAY. V5: Tu=19 / Tr=1 ft-lbs (65 mm x 130 mm vane)	CL -#200=95% WC=37% LL=44 PL=22 PI=22
30	V6		30.6 - 31.0	Su= 591/ 55 psf						V6: Tu=21.5 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
	U2	24/24	34.0 - 36.0	HYD PUSH						U2: Dark grey, Silty CLAY.	CONSOL (Cv, Cα) WC=45% LL=45 PL=24 PI=21
35											
	V7		36.6 - 37.0	Su= 467/ 55 psf						V7: Tu=17 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
	V8		37.6 - 38.0	Su= 467/ 55 psf						V8: Tu=17 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
	8D V9	24/24	39.0 - 41.0 39.6 - 40.0	VANE INTERVAL Su= 508/ 69 psf						8D: Dark grey black, Silty CLAY. V9: Tu=18.5 / Tr=2.5 ft-lbs (65 mm x 130 mm vane)	
40	V10		40.6 - 41.0	Su= 467/ 69 psf						V107: Tu=17 / Tr=2.5 ft-lbs (65 mm x 130 mm vane)	
								17.5		42.5	
	9D V11	24/24	44.0 - 46.0 44.6 - 45.0	(VANE/12")-2-2 Su= 989/ -- psf	--					9D: Dark grey, Silty CLAY with two 4-inch layers fine Sandy SILT. V11: Tu=36 / Tr=-- ft-lbs (65 mm x 130 mm vane) 45.0 ft: Unable to push vane; possible sand layer.	
45											
								11.4		48.6	
50	10D	24/5	49.0 - 51.0	5-5-4-4	9	14				48.6 ft: Driller notes gravelly material. 10D: Grey, loose, fine to medium SAND, some Gravel, trace Silt,	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-121
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	60 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/28/18; 1020 - 11/29/18; 0955	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2371+70, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	2.6 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50										trace coarse Sand. TILL	
	11D	24/7	54.0 - 56.0	4-4-7-8	11	17				11D: Grey, m. dense, Gravelly fine to coarse SAND, trace Silt. TILL	
55											
								4.0		56.0 **Bottom of Exploration at 56.0 feet below ground surface.** No refusal.	
60											
65											
70											
75											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-122
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	62 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/30/18; 1000 - 1445	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2371+80, 100 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	6.2 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/13	2.0 - 4.0	3-6-7-5	13	20				1D: Brown, damp to moist, m. dense, fine to coarse SAND, some Gravel, some Silt. GRANULAR FILL	
	2D	24/12	4.0 - 6.0	2-9-4-3	13	20				2D: Brown, moist to wet, m. dense, fine to coarse SAND, some Gravel, some Silt. GRANULAR FILL	
5											
	3D	24/14	9.0 - 11.0	7-15-12-18	27	41	--			3D: Grey brown, m. dense, Silty fine to medium SAND, little Gravel, trace coarse Sand. TILL FILL	
10							62				
							47				
							26	50.0		12.0	
							89	49.0		13.0	
	4D	24/24	14.0 - 16.0	7-8-9-12	17	26	OPEN			4D: Olive brown, mottled, v. stiff, Clayey SILT. MARINE SILT-CLAY CRUST	
15											
	5D	24/24	19.0 - 21.0	1-2-3-3	5	8				5D: Olive grey brown, m. stiff, CLAY & SILT with few partings and seams fine Sandy SILT.	
20											
								38.0		24.0	
25	6D V1	24/--	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su= 563/ 55 psf						6D: Olive grey grading to dark grey, Silty CLAY. MARINE SILT-	CL -#200=94%

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-122 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	62 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/30/18; 1000 - 1445	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2371+80, 100 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	6.2 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
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MD = Unsuccessful Split Spoon Sample attempt
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MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V2		25.6 - 26.0	Su= 494/ 41 psf						CLAY V1: Tu=20.5 / Tr=2 ft-lbs (65 mm x 130 mm vane) V2: Tu=18 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	WC=31% LL=42 PL=23 PI=20
	7D V3	24/18	29.0 - 31.0 29.6 - 30.0	VANE INTERVAL Su= 494/ 27 psf						7D: Dark grey black, Silty CLAY, trace very fine Sand. V3: Tu=18 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
30	V4		30.6 - 31.0	Su= 536/ 27 psf						V4: Tu=19.5 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
	U1	24/24	34.0 - 36.0	HYD PUSH						U1: Dark grey, Silty CLAY.	CONSOL (Cv, Cα) WC=43% LL=44 PL=22 PI=22
35											
	8D V5	24/24	37.0 - 39.0 37.6 - 38.0	VANE INTERVAL Su= 440/ 55 psf						8D: Dark grey black, Silty CLAY, trace very fine Sand. V5: Tu=16 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
	V6		38.6 - 39.0	Su= 494/ 55 psf						V6: Tu=18 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
40											
	U2	24/24	41.0 - 43.0	HYD PUSH						U2: Dark grey, Silty CLAY.	
	9D V7	24/24	44.0 - 46.0 44.6 - 45.0	VANE INTERVAL Su= 659/ 137 psf						9D: Dark grey, Silty CLAY, trace very fine Sand. V7: Tu=24 / Tr=5 ft-lbs (65 mm x 130 mm vane)	
45										45.7 ft: Unable to push vane below 45.7 ft.	
								14.5		47.5 47.5 ft: Driller notes gravelly material; apparent stratum change.	
50	10D	24/12	49.0 - 51.0	5-6-5-7	11	17				10D: Grey, m. dense, fine to medium SAND, little to some Silt, little fine Gravel, trace coarse Sand. TILL	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-122
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	62 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/30/18; 1000 - 1445	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2371+80, 100 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	6.2 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50								11.0		51.0 **Bottom of Exploration at 51.0 feet below ground surface.** No refusal.	
55											
60											
65											
70											
75											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-123 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	71 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/29/18; 1015 - 11/30/18; 0945	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2375+05, 110 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	4.9 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
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hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/19	2.0 - 4.0	9-17-16-17	33	50				1D: Brown, damp, dense, fine to medium SAND, trace Silt. GRANULAR FILL	
	2D	24/21	4.0 - 6.0	9-13-15-20	28	42				2D: Brown, moist, m. dense, fine to medium SAND, trace Silt.	
5											
	3D	24/15	9.0 - 11.0	2-4-7-8	11	17	--			Red brown, wet, fine to medium SAND, trace to little Silt. Changing at 10.1 ft to:	
10							88	60.9 60.6		10.1 Dark brown grading to grey, ORGANIC SILT, some fine to medium Sand. ORIGINAL GROUND Changing at 10.4 ft to:	
							110			10.4 3D: Olive brown, mottled, Clayey SILT with pockets grey, fine Sandy SILT. MARINE SILT-CLAY CRUST	
							159				
							193			14.0 ft: Unable to push vane.	
	4D	24/24	14.0 - 16.0	4-5-7-9	12	18	OPEN			4D: Olive brown grey, mottled, stiff, SILT & CLAY.	
15											
	5D	24/24	19.0 - 21.0	2-2-2-3	3"dia					19.0 ft: Unable to push vane. 5D: Olive grey, CLAY & SILT.	
20											
								48.5		22.5	
25	6D V1	24/24	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su = 426/ 41 psf						6D: Dark grey, Silty CLAY. MARINE SILT- CLAY V1: Tu=15.5 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	

Remarks:

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Boring No.: HB-PAMI-123

Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-123 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	71 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/29/18; 1015 - 11/30/18; 0945	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2375+05, 110 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	4.9 ft (likely perched)

IN-SITU SAMPLING AND TESTING:
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MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
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RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
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BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
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LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V2		25.6 - 26.0	Su = 371/ 41 psf						V2: Tu=13.5 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	
	U1	24/24	29.0 - 31.0	HYD PUSH						U1: Dark grey, Silty CLAY.	CONSOL (Cv, Cα) WC=41% LL=41 PL=21 PI=20 CH -#200=98% WC=49% LL=62 PL=24 PI=37
30											
	7D V3	24/24	31.0 - 33.0 31.6 - 32.0	VANE INTERVAL Su = 357/ 14 psf						7D: Dark grey with occasional black, Silty CLAY. V3: Tu=13 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
	V4		32.6 - 33.0	Su = 385/ 14 psf						V4: Tu=14 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
	8D V5	24/24	34.0 - 36.0 34.6 - 35.0	VANE INTERVAL Su = 536/ 14 psf						8D: Dark grey with occasional black, Silty CLAY. V5: Tu=19.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
35	V6		35.6 - 36.0	Su = 440/ 14 psf						V6: Tu=16 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
	U2	24/24	37.0 - 39.0	HYD PUSH						U2: Dark grey, Silty CLAY.	
40											
	9D V7	24/24	41.0 - 43.0 41.6 - 42.0	VANE INTERVAL Su = 412/ 41 psf						9D: Dark grey, Silty CLAY. V7: Tu=15 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	
	V8		42.6 - 43.0	Su = 343/ 41 psf						V8: Tu=12.5 / Tr=1.5 ft-lbs (65 mm x 130 mm vane)	
45											
	10D V9	24/24	46.0 - 48.0 46.6 - 47.0	VANE INTERVAL Su = 494/ 55 psf						10D: Dark grey, Silty CLAY. V9: Tu=18 / Tr=2 ft-lbs (65 mm x 130 mm vane)	
	V10		47.6 - 48.0	Su = 440/ 69 psf						V10: Tu=16 / Tr=2.5 ft-lbs (65 mm x 130 mm vane)	
50											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-123 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	71 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	11/29/18; 1015 - 11/30/18; 0945	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2375+05, 110 LT (approx)	**Casing ID/OD:**	HW (4") to 14 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	4.9 ft (likely perched)

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ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50											
	11D V11	24/24	51.0 - 53.0 51.6 - 52.0	VANE INTERVAL Su = 494/ 82 psf						11D: Dark grey, Silty CLAY. V11: Tu=18 / Tr=3 ft-lbs (65 mm x 130 mm vane)	
								18.8		52.2 MV: Unable to push vane below 52.2 ft.	
55											
	12D	24/24	56.0 - 58.0	WOR/24"	--					12D: Dark grey, Silty CLAY with numerous seams and layers fine Sandy SILT. MARINE SILT AND SANDS	
								11.5		59.5 59.5 ft: Driller notes gravelly material; probable stratum change	
60											
	13D	24/8	61.0 - 63.0	6-14-20-17	34	51				13D: Dark grey, dense, Gravelly fine to medium SAND, little to some Silt, trace coarse Sand. TILL	
								8.0		63.0 **Bottom of Exploration at 63.0 feet below ground surface.** No refusal.	
65											
70											
75											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-124
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	107 ft (est'd)	**Core Barrel:**	NQ2
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/11/19; 0845-1015	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2383+00, 95 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft; NW (3") to 9.5 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	4.0 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0	1D	24/12	0.0 - 2.0	2-2-2-3	4	6	SSA	106.2	Dark brown, damp, Silty TOPSOIL. Changing at 0.8 ft to: 0.8 1D: Red brown, damp, fine to coarse SAND, trace Gravel, trace Silt. FILL	
	2D	24/20	4.0 - 6.0	3-8-9-11	17	26			2D: Brown, damp to moist, m. dense, interbedded, fine Sandy SILT, and fine SAND, little Silt; upper 10 inches appear reworked.	
5								102.1	4.9	
	2D-A			AUGER CUTTINGS					2D-A (auger cuttings 6 to 9 ft): Brown, wet, Silty fine SAND, trace fine Gravel. MARINE SILTY FINE SANDS	
	3D R1	2/1 60/60	9.0 - 9.2 9.5 - 14.5	50/2" RQD: 30"=50%	--		RC	97.9	3D: Brown, wet, fine to coarse SAND, little to some Silt, trace fine Gravel; appears to contain weathered rock fragments. 9.1	
10									R1: Hard, fresh to slightly weathered, aphanitic to fine grained, grey PHYLLITE with high angle remnant bedding and occasional calcsilicate veins. Close to moderately spaced, low angle and near vertical breaks; undulating, rough, typically discolored (rust), and open with occasional infilling; shiny. Core times: 2:30/ 1:40/ 1:45/ 1:40/ 1:40 min:sec/ft. POOR ROCK QUALITY	
								92.5	14.5	
15									**Bottom of Exploration at 14.5 feet below ground surface.**	
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Boring No.: HB-PAMI-124

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-125
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	74 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/11/19; 1050-1215	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2402+05, 75 RT (approx)	**Casing ID/OD:**	HW (4") to 19 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	13.8 ft (open, end)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/13	2.0 - 4.0	4-7-6-6	13	20				1D: Tan brown, damp, m. dense, fine to coarse SAND, trace to little Silt, trace fine Gravel; appears undisturbed. MARINE SANDS	
	2D	24/14	4.0 - 6.0	6-6-6-7	12	18	--			2D: Tan brown, damp, m. dense, fine to coarse SAND, trace Silt.	
5							68				
							73				
							74				
							78				
	3D	24/8	9.0 - 11.0	5-5-6-7	11	17	20			3D: Tan brown, m. dense, fine to coarse SAND, trace Silt.	
10							34				
							62				
							87				
							99				
	4D	24/8	14.0 - 16.0	5-5-6-7	11	17	38			4D: Tan brown, m. dense, fine to coarse SAND, trace Silt.	
15							54				
							61				
							68				
							66				
	5D	24/6	19.0 - 21.0	3-4-6-5	10	15				5D: Tan brown, loose, fine to medium SAND, trace Silt.	
20											
								53.0		21.0 **Bottom of Exploration at 21.0 feet below ground surface.** No refusal.	
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Boring No.: HB-PAMI-125

SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-126 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	72 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/11/19; 1305-1445	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2408+30, 95 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/21	2.0 - 4.0	2-3-4-4	7	11				1D: Olive brown, mottled, desiccated, damp, m. stiff, Clayey SILT, little fine Sand; appears reworked. SILT-CLAY FILL	
								68.0		4.0	
	2D	24/24	4.0 - 6.0	3-4-6-6	10	15				2D: Olive brown, mottled, slightly desiccated, damp, stiff, Clayey SILT, trace fine Sand; appears undisturbed. MARINE SILT-CLAY CRUST	
5											
	3D	24/24	9.0 - 11.0	WOH-1-2-2	3	5	OPEN			3D: Olive brown grey, slightly mottled, moist, SILT & CLAY grading to olive grey, moist to wet, CLAY & SILT.	
10								62.0		10.0	
	4D V1	24/24	14.0 - 16.0 14.6 - 15.0	VANE INTERVAL Su = 343/ 27 psf						4D: Dark grey black, Silty CLAY with occasional nodules. MARINE SILT-CLAY. V1: Tu=12.5 / Tr=1 ft-lbs (65 mm x 130 mm vane)	CL -#200=97% WC=46% LL=46 PL=21 PI=25
15	V2		15.6 - 16.0	Su = 357/ 14 psf						V2: Tu=13 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	
	5D V3	24/22	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su = 302/ 27 psf						5D: Dark grey, Silty CLAY. V3: Tu=11 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
20	V4		20.6 - 21.0	Su = 302/ 27 psf						V4: Tu=11 / Tr=1 ft-lbs (65 mm x 130 mm vane)	
25	6D V5	24/24	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su = 275/ 14 psf						6D: Dark grey black, Silty CLAY with nodules throughout. V5: Tu=10 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-126 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	72 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/11/19; 1305-1445	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2408+30, 95 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 9 ft	**Water Level*:**	none observed above 9 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V6		25.6 - 26.0	Su = 275/ 14 psf				46.0		V6: Tu=10 / Tr=0.5 ft-lbs (65 mm x 130 mm vane) 26.0 **Bottom of Exploration at 26.0 feet below ground surface.** No refusal.	
30											
35											
40											
45											
50											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-127 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/10/19; 0915-1225	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2420+80, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	4.0 ft

IN-SITU SAMPLING AND TESTING:
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V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
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LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
	1D	24/17	2.0 - 4.0	2-2-3-2	5	8				1D: Red brown grading to grey, fine Sandy SILT with occasional seams Silty CLAY, little fine Sand. FILL	ML to CL WC=27% LL=24 PL=20 PI=4
	2D	24/24	4.0 - 6.0	2-1-1/12"	2	3	PUSH	49.4		Grey, fine Sandy SILT. FILL Changing at 4.6 ft to: 4.6 2D: Grey, Silty CLAY. MARINE SILT-CLAY	
5											
	3D V1	24/24	9.0 - 11.0 9.6 - 10.0	VANE INTERVAL Su = 302/ 14 psf			OPEN			3D: Dark grey, Silty CLAY, trace fine Sand. V1: Tu=11 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	CL -#200=98% WC=32% LL=27 PL=18 PI=9
10	V2		10.6 - 11.0	Su = 233/ 0 psf						V2: Tu=8.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	U1	24/24	14.0 - 16.0	HYD PUSH						U1: Dark grey, Silty CLAY.	CONSOL (Cv, Cα) WC=44% LL=40 PL=22 PI=18
15											
	4D V3	24/24	19.0 - 21.0 19.6 - 20.0	VANE INTERVAL Su = 206/ 0 psf						4D: Dark grey, Silty CLAY with nodules throughout. V3: Tu=7.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
20	V4		20.6 - 21.0	Su = 233/ 0 psf						V4: Tu=8.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
25	5D V5	24/24	24.0 - 26.0 24.6 - 25.0	VANE INTERVAL Su = 206/ 14 psf						5D: Grey, Silty CLAY. V5: Tu=7.5 / Tr=0.5 ft-lbs (65 mm x 130 mm vane)	

Remarks:

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Schonewald Engineering Associates, Inc.	PROJECT: Portland Area Mainline Improvements, Maine Turnpike MM 43.7 to 49.3 LOCATION: Scarborough to Portland, ME	Boring No.: HB-PAMI-127 Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/10/19; 0915-1225	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2420+80, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	4.0 ft

IN-SITU SAMPLING AND TESTING:
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MD = Unsuccessful Split Spoon Sample attempt
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MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
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LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	V6		25.6 - 26.0	Su = 233/ 0 psf						V6: Tu=8.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	U2	24/24	29.0 - 31.0	HYD PUSH						U2: Grey, Silty CLAY.	
30											
	6D	24/7	34.0 - 36.0	VANE INTERVAL						6D: Grey, SIlty CLAY with nodules throughout.	CL WC=49% LL=37 PL=22 PI=15
35	V7		34.6 - 35.0	Su = 343/ 0 psf						V7: Tu=12.5 / Tr=0 ft-lbs (65 mm x 130 mm vane)	
	V8		35.6 - 36.0	Su = 343/ 0 psf						V8: Tu=12.5 / Tr=0 ft-lbs (65 mm x 130 mm vane) 36.0 ft: Hydraulically push rod probe.	
40											
45											
50											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3	**Boring No.:** HB-PAMI-127	
LOCATION: Scarborough to Portland, ME	**Proj. No.:** 18-017	

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/10/19; 0915-1225	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2420+80, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	4.0 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50											
55											
60											
65											
70											
75											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Schonewald Engineering Associates, Inc.	**PROJECT:** Portland Area Mainline Improvements Maine Turnpike MM 43.7 to 49.3 **LOCATION:** Scarborough to Portland, ME	**Boring No.:** HB-PAMI-127 **Proj. No.:** 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/10/19; 0915-1225	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2420+80, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 4 ft	**Water Level*:**	4.0 ft

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
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ADDITIONAL DEFINITIONS:
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BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
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LABORATORY TEST RESULTS:
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UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
75											
80											
85											
90											
95											
100											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Portland Area Mainline Improvements
Maine Turnpike MM 43.7 to 49.3
LOCATION: Scarborough to Portland, ME

Boring No.: HB-PAMI-127
Proj. No.: 18-017

Driller:	New England Boring Contractors	**Elevation (ft.)**	54 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	1/10/19; 0915-1225	**Drilling Method:**	cased wash boring	**Hammer Type:**	calibrated auto-hammer
Boring Location:	Sta 2420+80, 100 RT (approx)	**Casing ID/OD:**	HW (4") to 9 ft	**Hammer Efficiency:**	0.906
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IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
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ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
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R = Rock Core Sample
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LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
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LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
100											
								-50.0		104.0 **Bottom of Exploration at 104.0 feet below ground surface.** No rod probe refusal (out of rods).	
105											
110											
115											
120											
125											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

PHOTOGRAPHS OF ROCK CORE OBTAINED IN 100-SERIES SUBSURFACE EXPLORATIONS

Photo 1: Core box containing dried rock core from PAMI preliminary test borings; left side of core box (top portion of cores). Slots from top to bottom:

1) HB-PAMI-109, R1
2) HB-PAMI-109B, R1
3) HB-PAMI-110, R1
4) HB-PAMI-124, R1.

Photo 2: Core box containing dried rock core from PAMI preliminary test borings; right side of core box (bottom portion of cores). Slots from top to bottom:

1) HB-PAMI-109, R1
2) HB-PAMI-109B, R1
3) HB-PAMI-110, R1
4) HB-PAMI-124, R1.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

ROCK CORE PHOTOGRAPHS
PORTLAND AREA MAINLINE IMPROVEMENTS
MAINE TURNPIKE MM 43.7 TO 49.3
SCARBOROUGH TO PORTLAND, MAINE

Sheet No.:

1 of 1

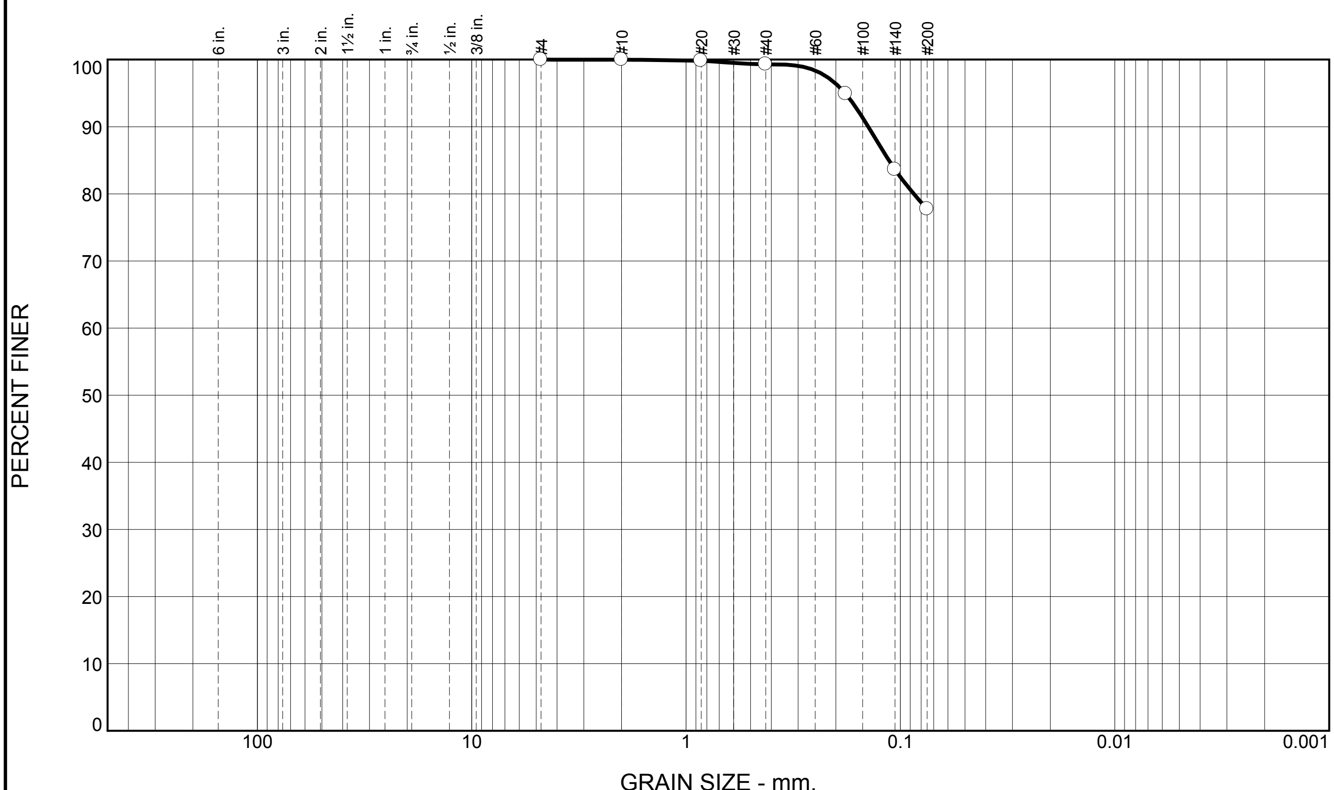
RESULTS OF LABORATORY TESTS COMPLETED BY RWG&A ON SPLIT-SPOON AND UNDISTURBED TUBE SOIL SAMPLES

SCHONEWALD ENGINEERING ASSOCIATES, INC.
■ www.SchonewaldEngineering.com ■

LABORATORY TEST RESULTS CONTENTS

Boring No.	Sample No.	Sample Depth (ft., BGS)	Material	Tests
HB-PAMI-101	3D	9-11	interbedded sands and silt	Atterberg Limits, grain size w/o hydrometer
HB-PAMI-101	4D	14-16	interbedded sands and silt	Atterberg Limits
HB-PAMI-102	5D	19-21	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-103	6D	28.5-30.5	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-103	U2	35-37	marine silt-clay	1D consolidation, Atterberg Limits
HB-PAMI-106	3D	9-11	marine silt-clay crust	Atterberg Limits, % passing #200 sieve
HB-PAMI-106	5D	19-21	marine silt-clay	Atterberg Limits, grain size w/o hydrometer
HB-PAMI-107	5D	19-21	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-109	2D	9-11	marine silt-clay crust	Atterberg Limits, grain size w/o hydrometer
HB-PAMI-109B	3D	9-11	misc fill	Atterberg Limits, grain size w/o hydrometer
HB-PAMI-110	3D	9-11	f sandy silt	Atterberg Limits, grain size w/o hydrometer
HB-PAMI-114	4D	14-16	marine silt-clay crust	Atterberg Limits, % passing #200 sieve
HB-PAMI-114	U1	24-26	marine silt-clay	1D consolidation, Atterberg Limits
HB-PAMI-114	7D	34-36	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-115	3D	9-11	marine silt-clay crust	Atterberg Limits, % passing #200 sieve
HB-PAMI-117	8D	29-31	marine silt-clay	Atterberg Limits
HB-PAMI-118	3D	9-11	marine silt-clay crust	Atterberg Limits
HB-PAMI-119	5D	19-21	marine silt-clay	Atterberg Limits % passing #200 sieve
HB-PAMI-120	4D	14-16	marine silt-clay crust	Atterberg Limits % passing #200 sieve
HB-PAMI-121	4D	14-16	marine silt-clay crust	Atterberg Limits, % passing #200 sieve
HB-PAMI-121	7D	29-31	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-121	U2	34-36	marine silt-clay	1D consolidation, Atterberg Limits
HB-PAMI-122	6D	24-26	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-122	U1	34-36	marine silt-clay	1D consolidation, Atterberg Limits
HB-PAMI-123	U1	29-31	marine silt-clay	1D consolidation, Atterberg Limits
HB-PAMI-123	7D	31-33	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-126	4D	14-16	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-127	1D	2-4	fill	Atterberg Limits
HB-PAMI-127	3D	9-11	marine silt-clay	Atterberg Limits, % passing #200 sieve
HB-PAMI-127	U1	14-16	marine silt-clay	1D consolidation, Atterberg Limits
HB-PAMI-127	6D	34-36	marine silt-clay	Atterberg Limits
HB-PAVE-103	1D	1-3	road gravels	grain size with hydrometer

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	21.6	77.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.8		
#40	99.3		
#80	94.9		
#140	83.6		
#200	77.7		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 15.1 LL= 22.8 PI= 7.7

Coefficients

D_{90}= 0.1412 D_{85}= 0.1133 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(4)

Remarks

Moisture Content: 31.0%

Location: HB-PAMI-101
Sample Number: 3D **Depth:** 9'-11' **Date:** 2/21/2019

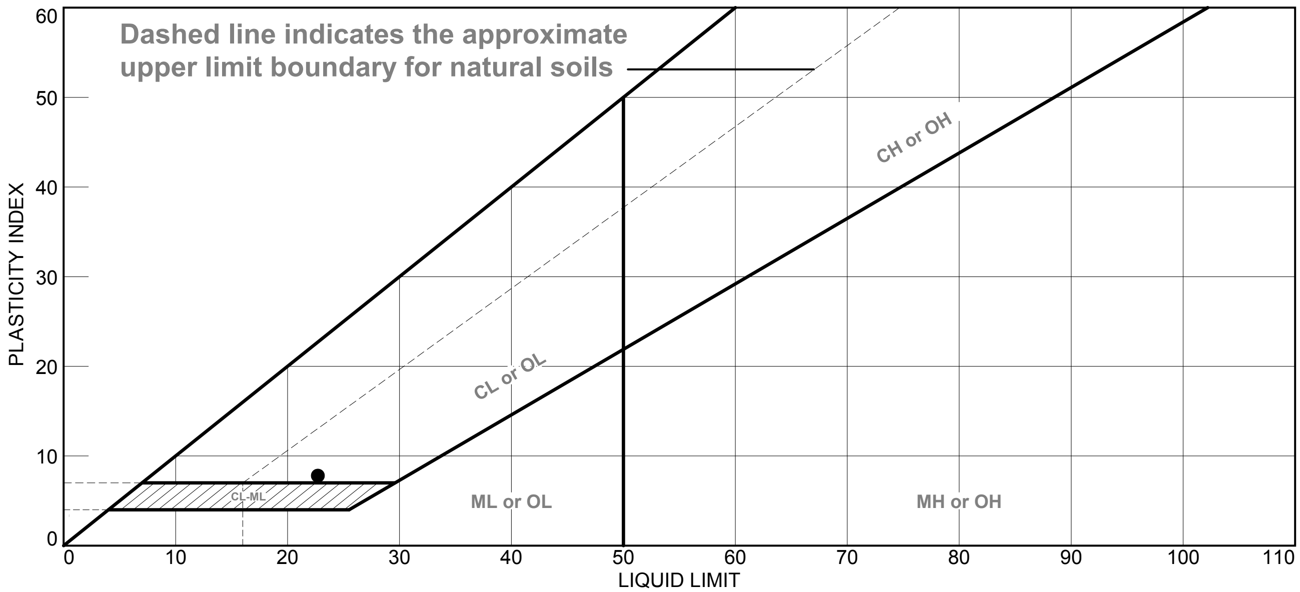
R.W. Gillespie & Associates, Inc. Biddeford, Maine

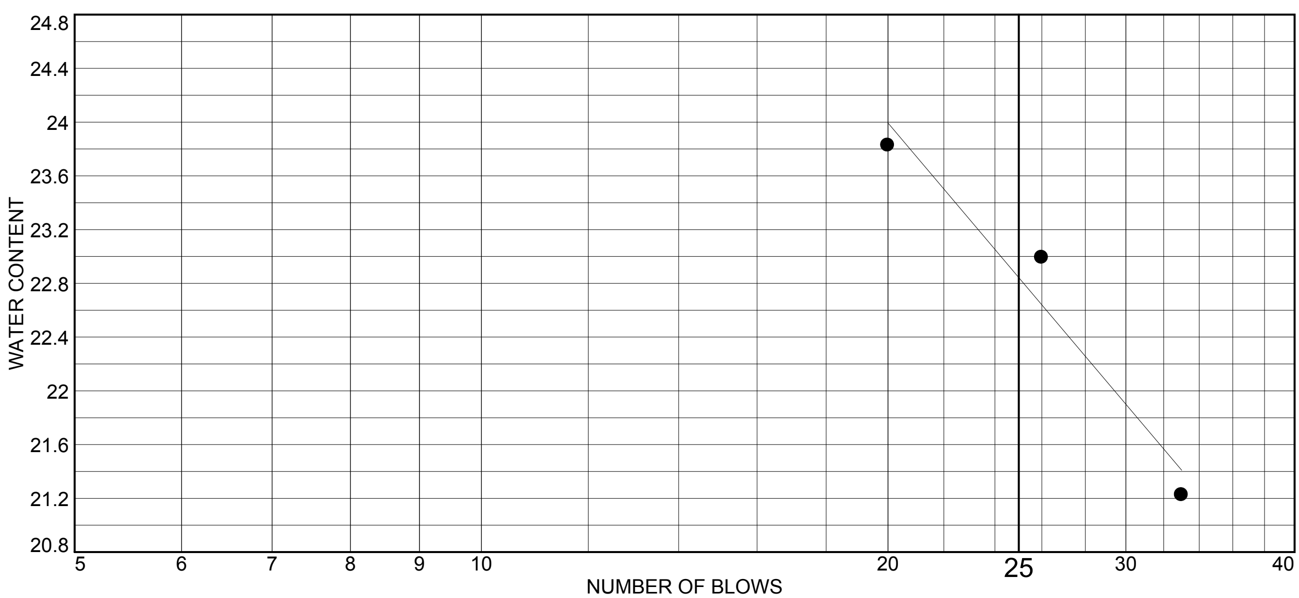
Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17 Portland, ME
Project No: 1368-015 **Lab No.** 15395-01

Tested By: AGS/JMT/JJB **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay with sand	22.8	15.1	7.7	99.3	77.7	CL

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-101

Sample Number: 3D **Depth:** 9'-11'

Remarks:

R.W. Gillespie & Associates, Inc.

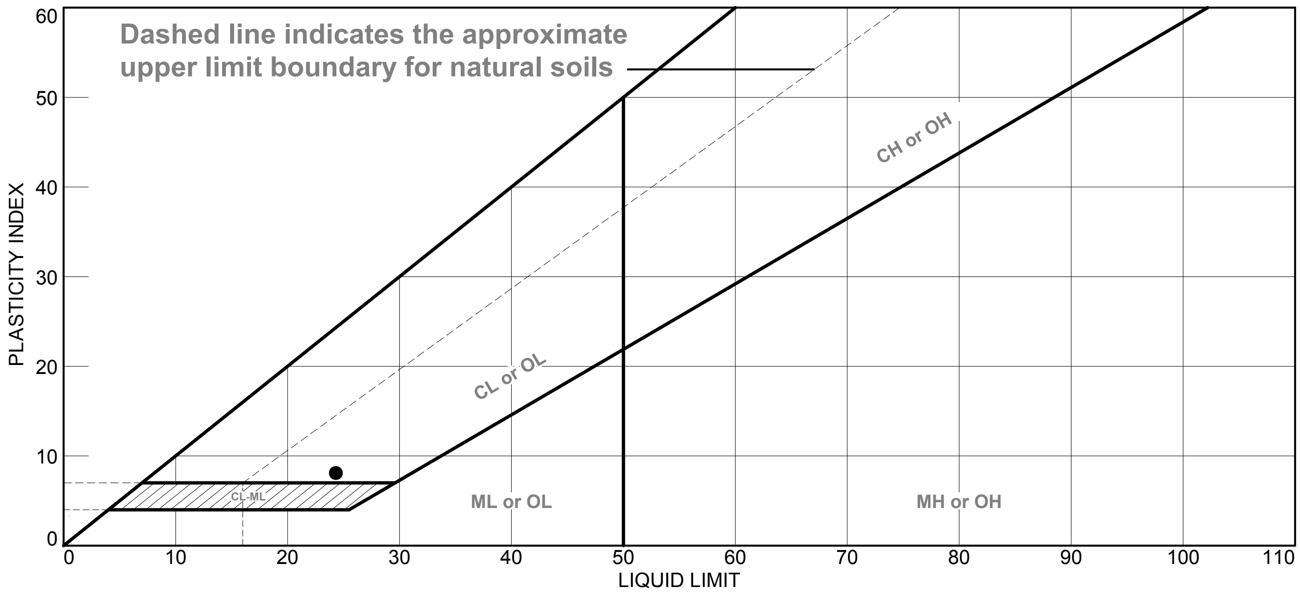
Biddeford, Maine

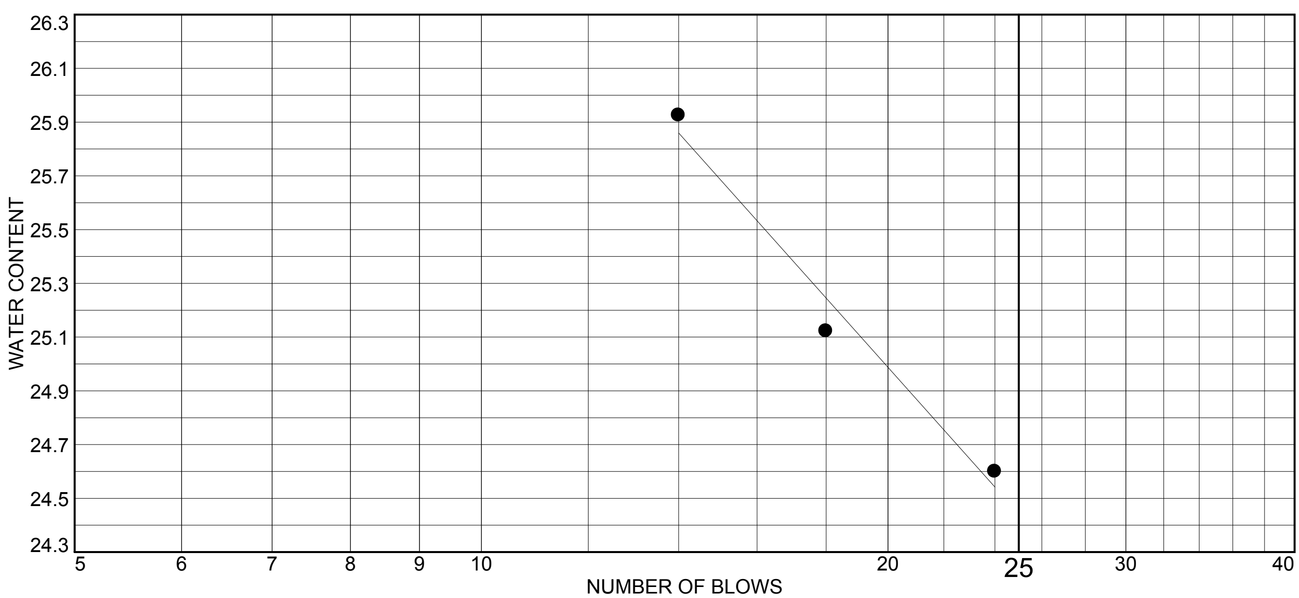
Lab No. 15395-01

Tested By: JMT/JJB **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	24.4	16.4	8.0			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-101

Sample Number: 4D **Depth:** 14'-16'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

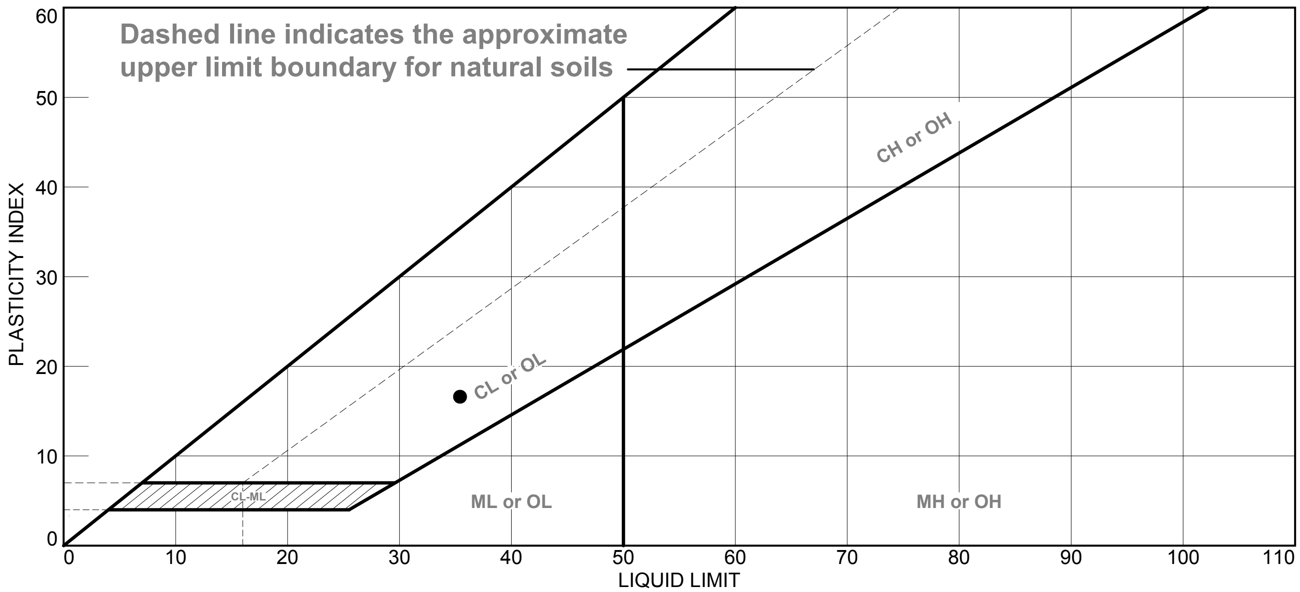
●Moisture Content: 32.3%

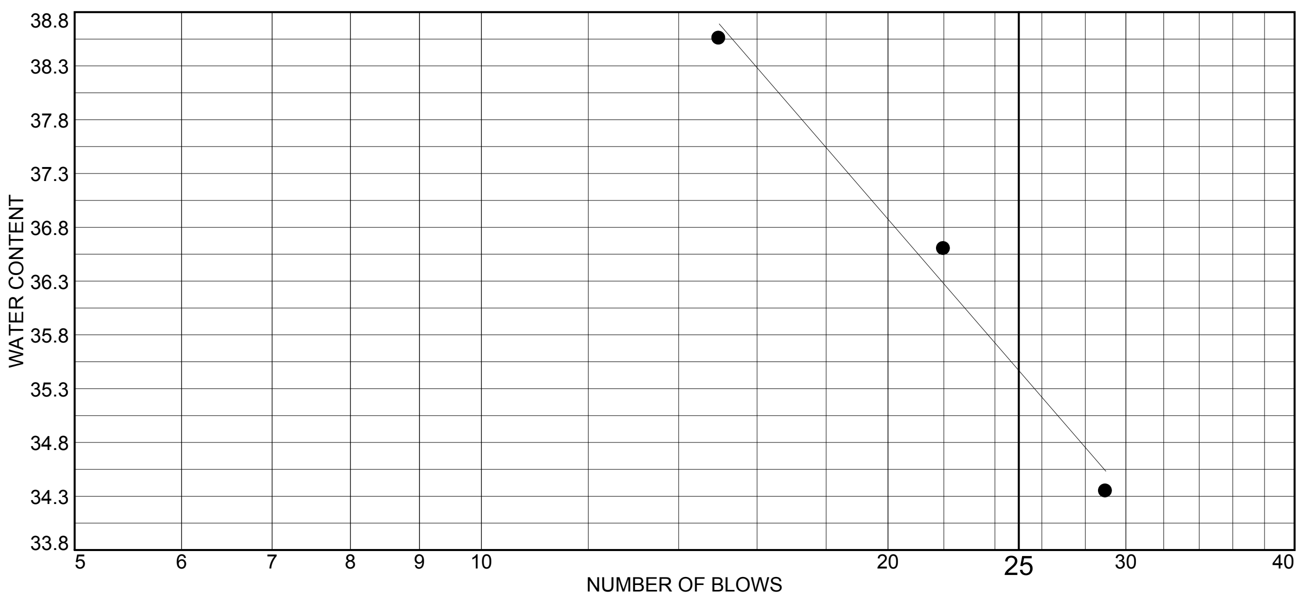
Lab No. 15395-02

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	35.5	19.0	16.5		98.6	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-102

Sample Number: 5D **Depth:** 19'-20'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

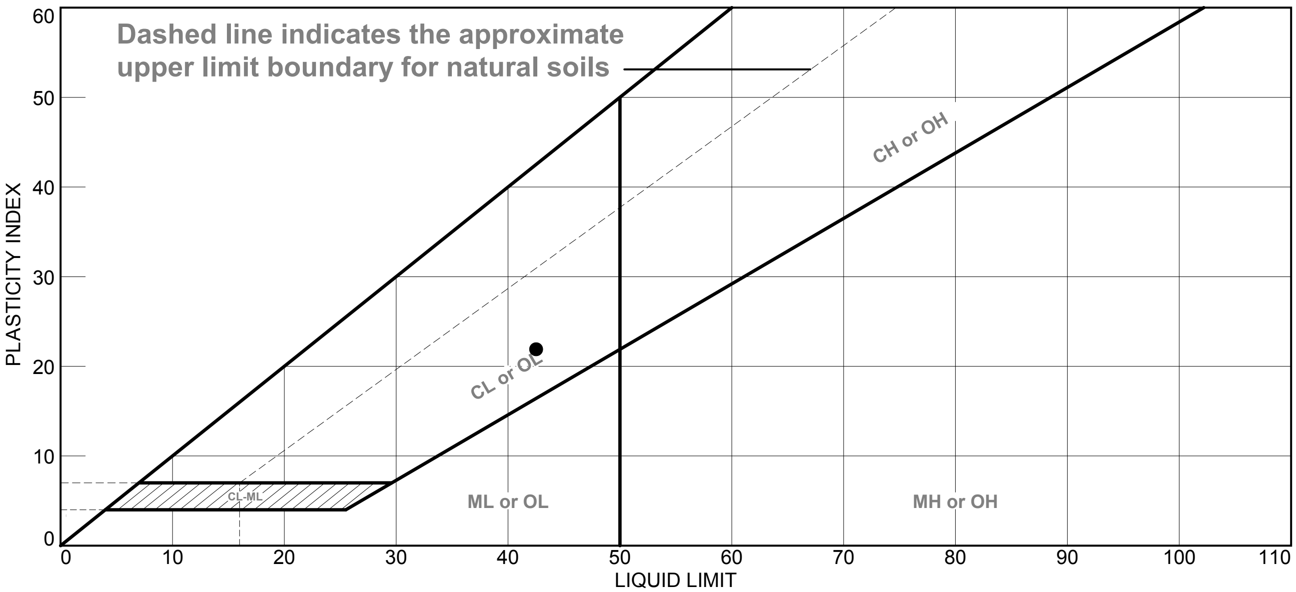
●Moisture Content: 39.3%

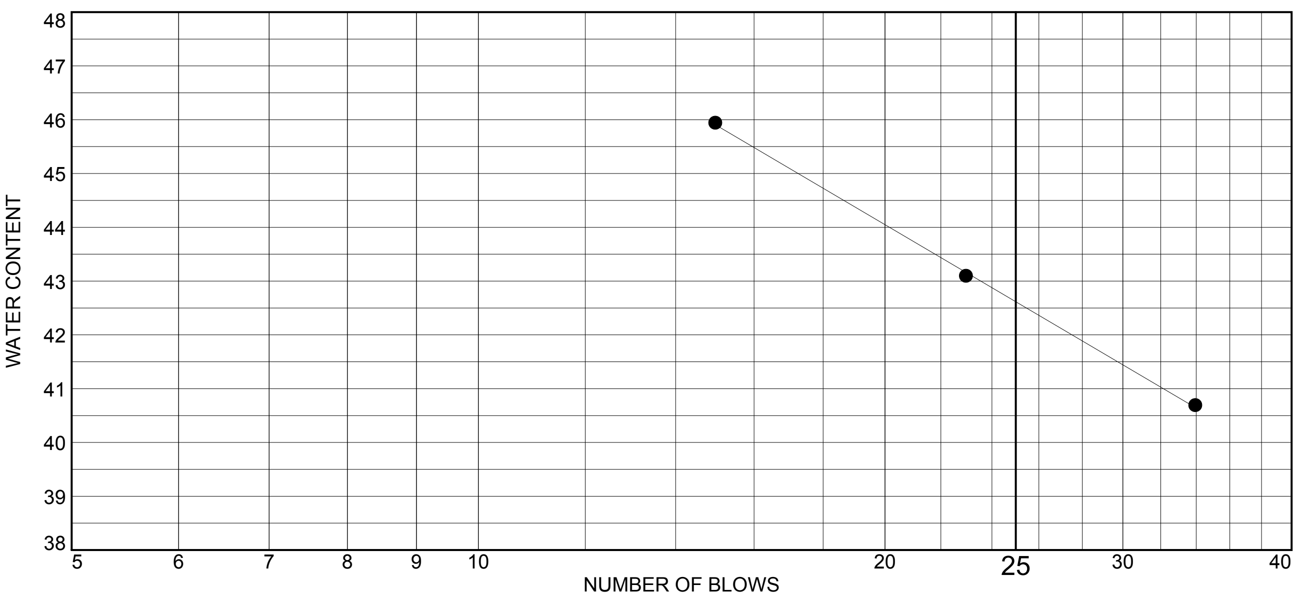
Lab No. 15395-03

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	42.6	20.8	21.8		99.1	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-103

Sample Number: 6D **Depth:** 28.5'-30.5'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

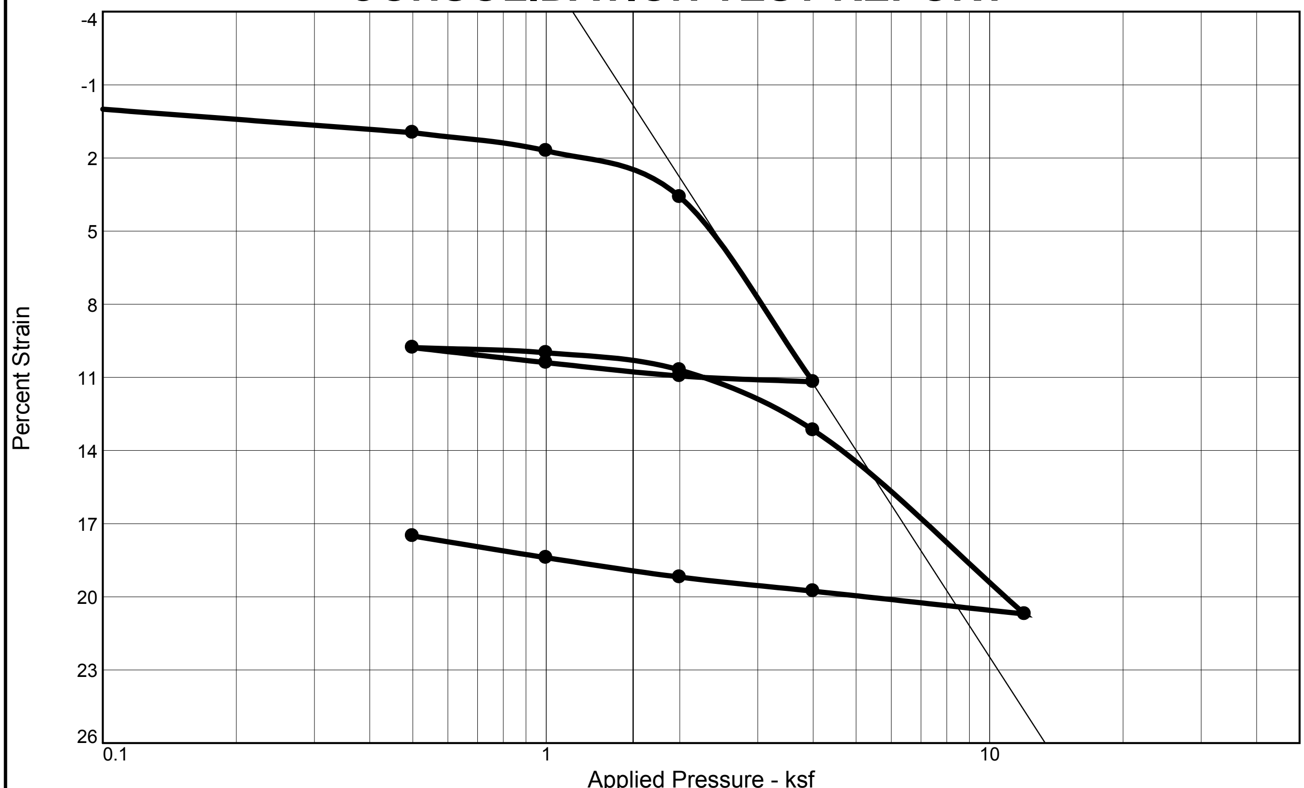
●Moisture Content: 35.0%

Lab No. 15395-04

Tested By: JMT **Checked By:** MTG

MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	2.159		8	1.00	2.387		15	0.50	0.190	
2	1.00	2.406		9	2.00	1.709	0.001				
3	2.00	1.223		10	4.00	0.087	0.007				
4	4.00	0.164		11	12.00	0.486					
5	2.00	4.027		12	4.00	2.826					
6	1.00	1.548		13	2.00	1.235					
7	0.50	0.698		14	1.00	0.477					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
100.7 %	42.0 %	79.7	39.9	20.2	2.70		2.0	0.60	0.14	1.127

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME

Location: HB-PAMI-103 **Depth:** 35'-37' **Sample Number:** U-2

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:
Square Time Cv Values
2KSF 0.627 ft^2/day
4KSF 1.232 ft^2/day

Lab No. 15394-01

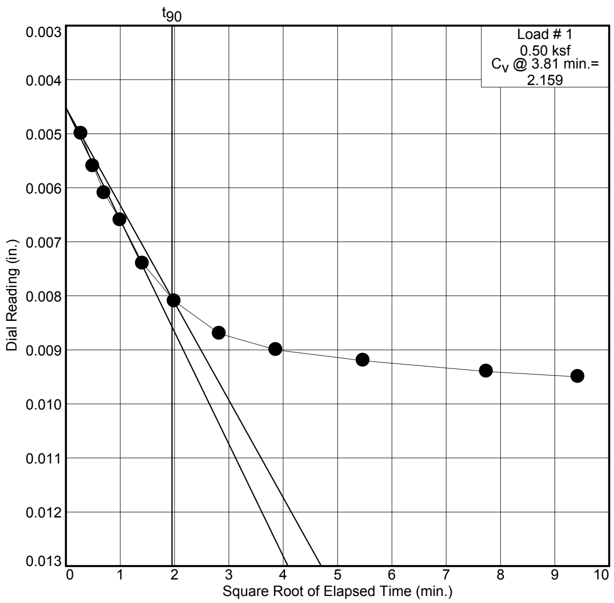
Tested By: JRF **Checked By:** MTG

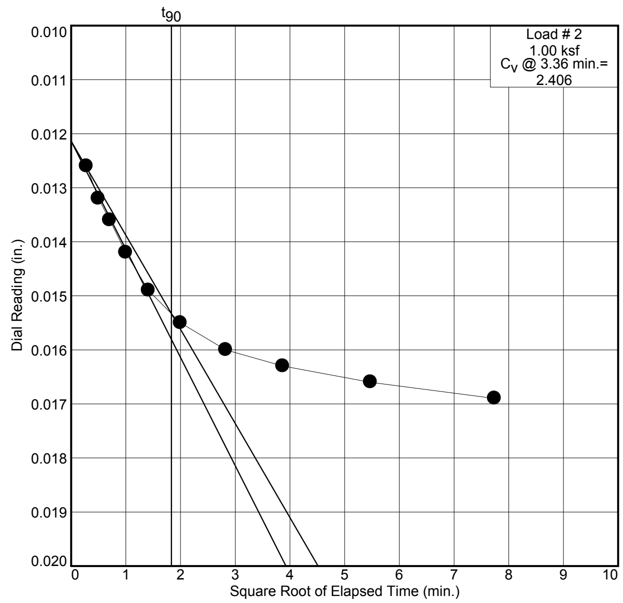
MTG

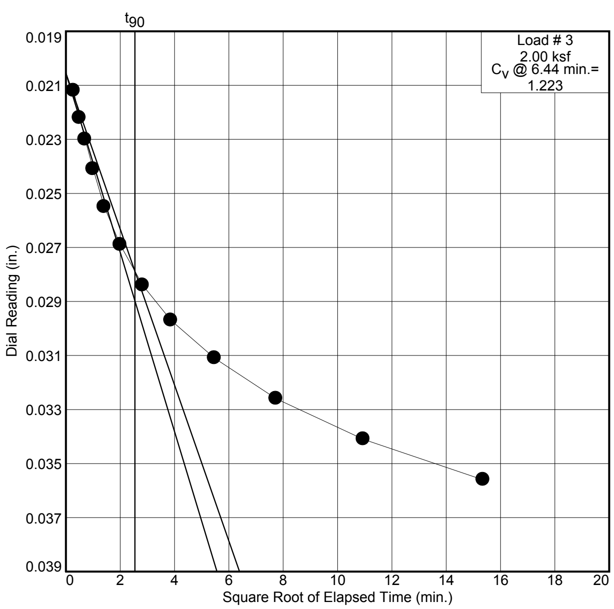
Dial Reading vs. Time

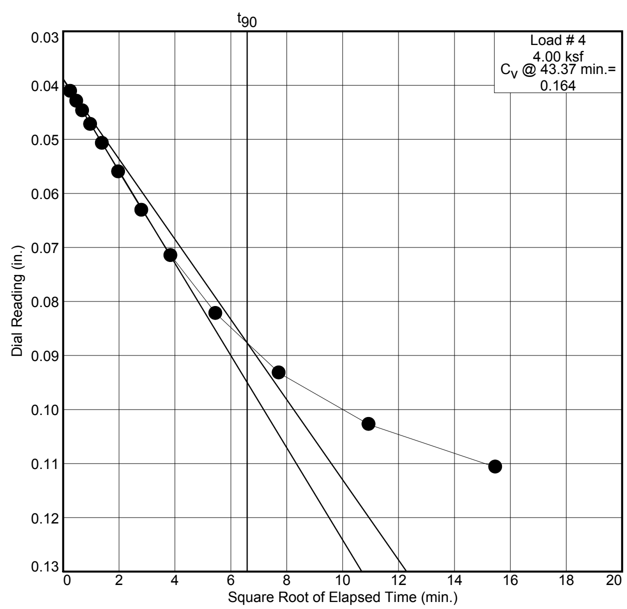
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-103   Depth: 35'-37'   Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

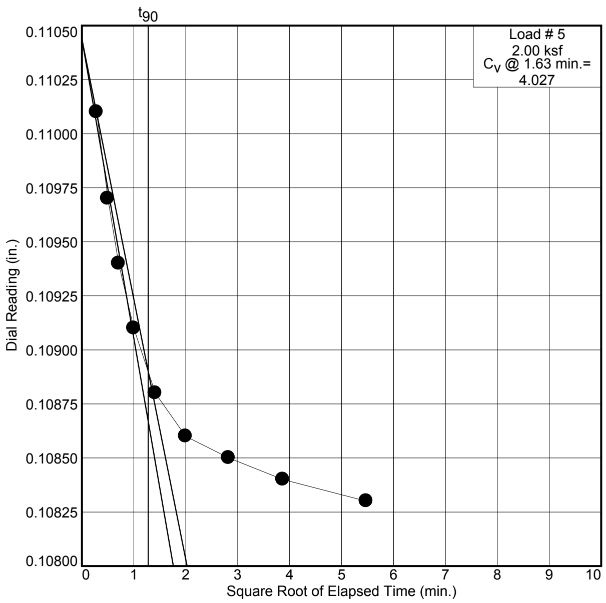
Lab No. 15394-

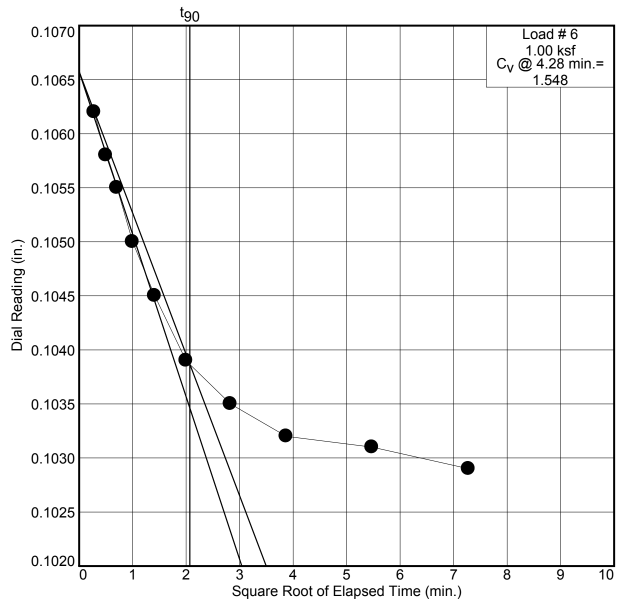
MTG

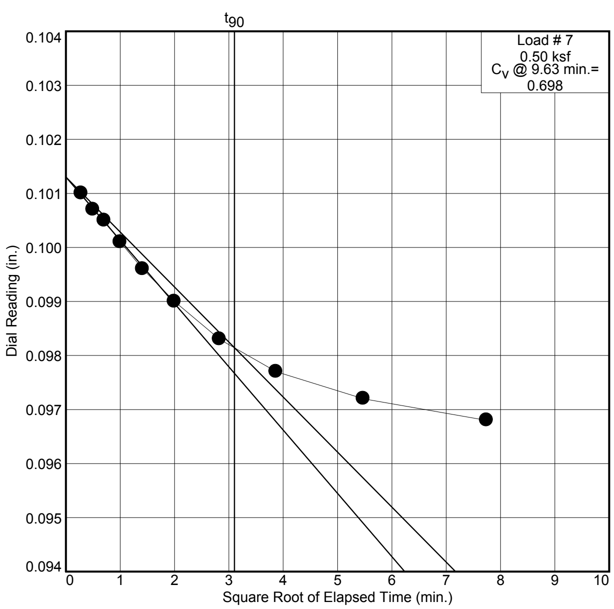
Dial Reading vs. Time

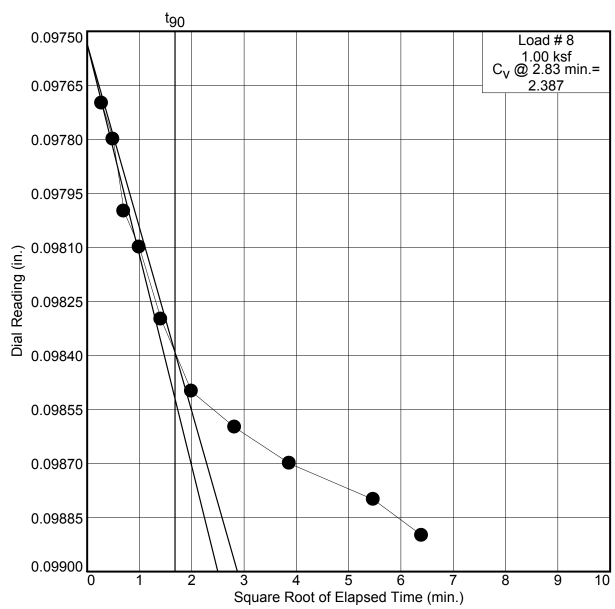
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-103 Depth: 35'-37' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

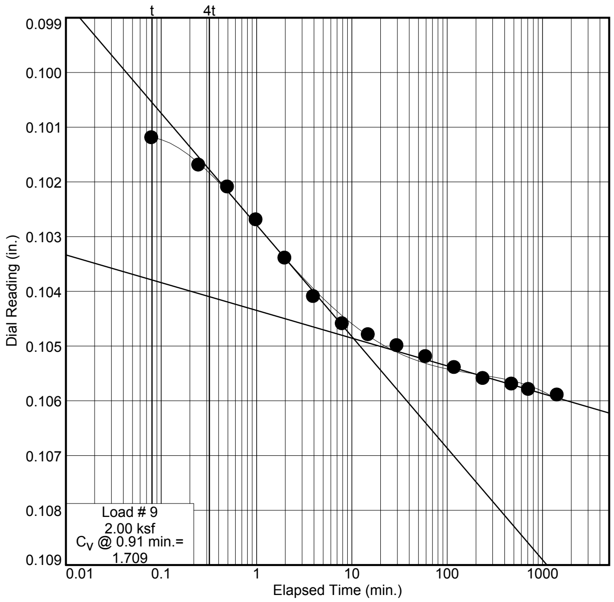
Lab No. 15394-

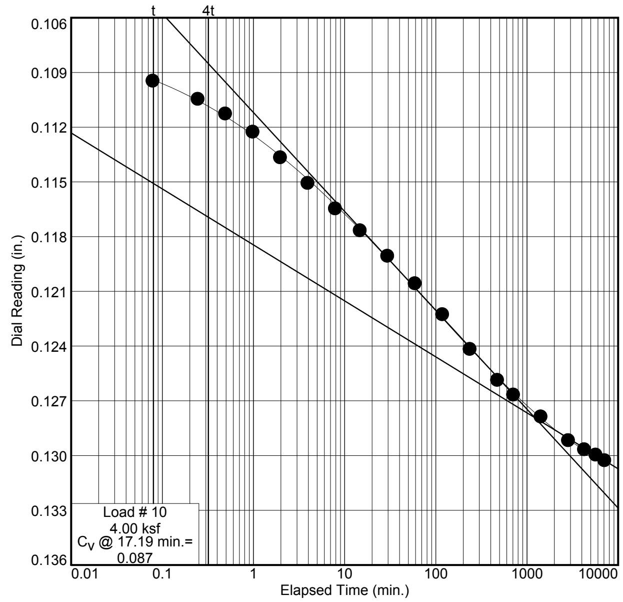
MTG

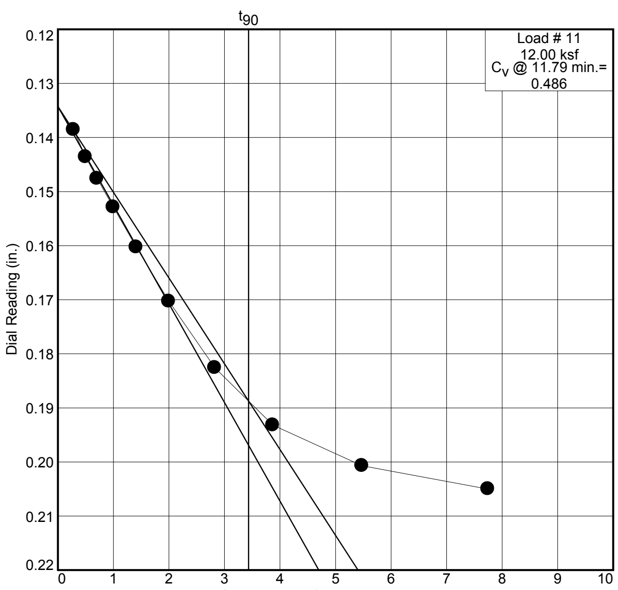
Dial Reading vs. Time

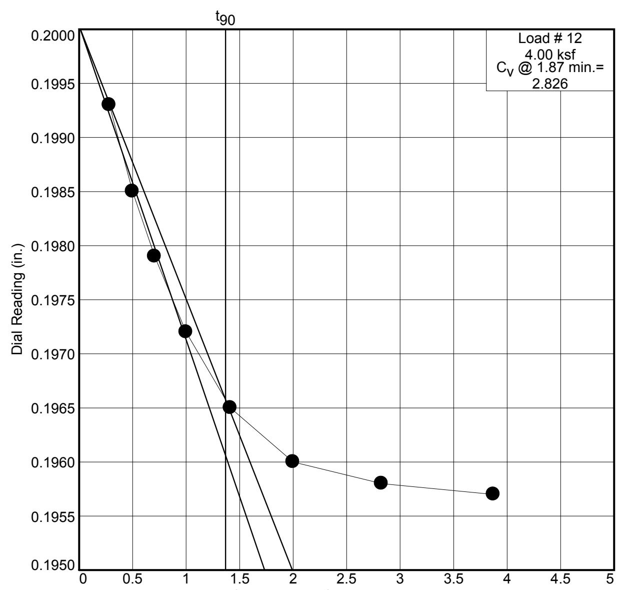
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-103   Depth: 35'-37'   Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

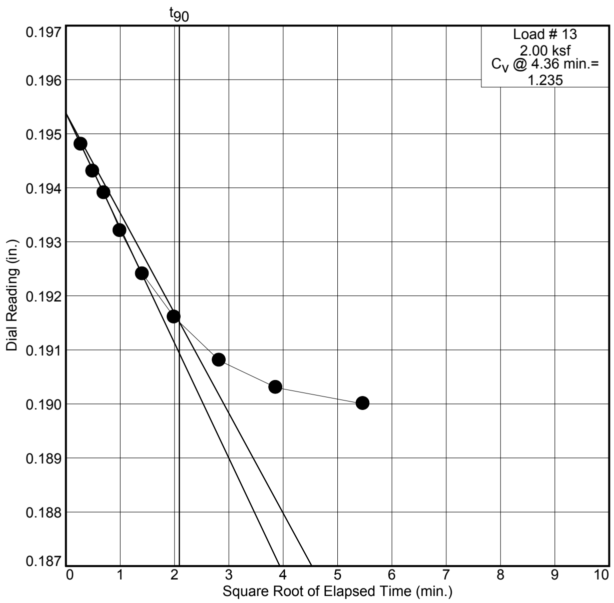
Lab No. 15394-

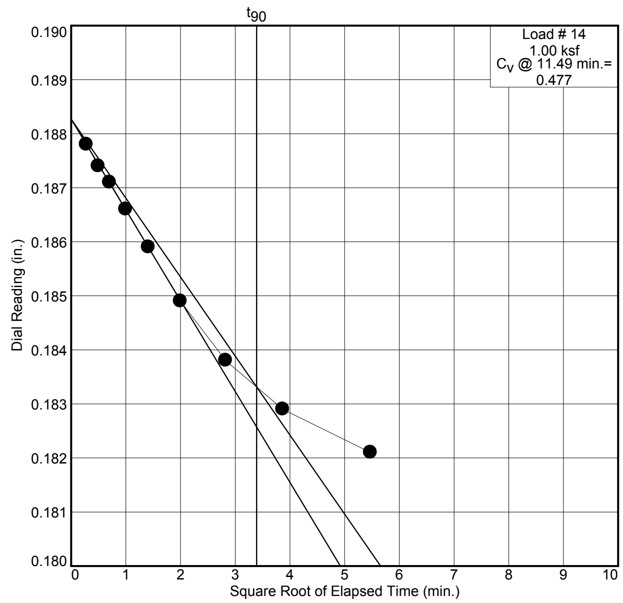
MTG

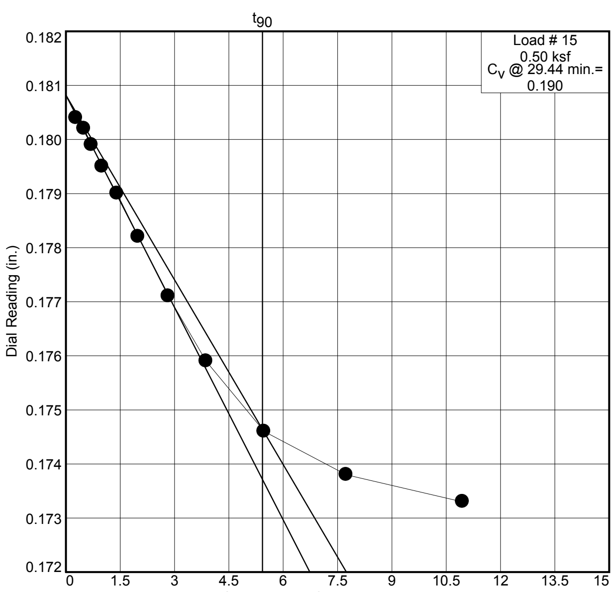
Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-103 Depth: 35'-37' Sample Number: U-2







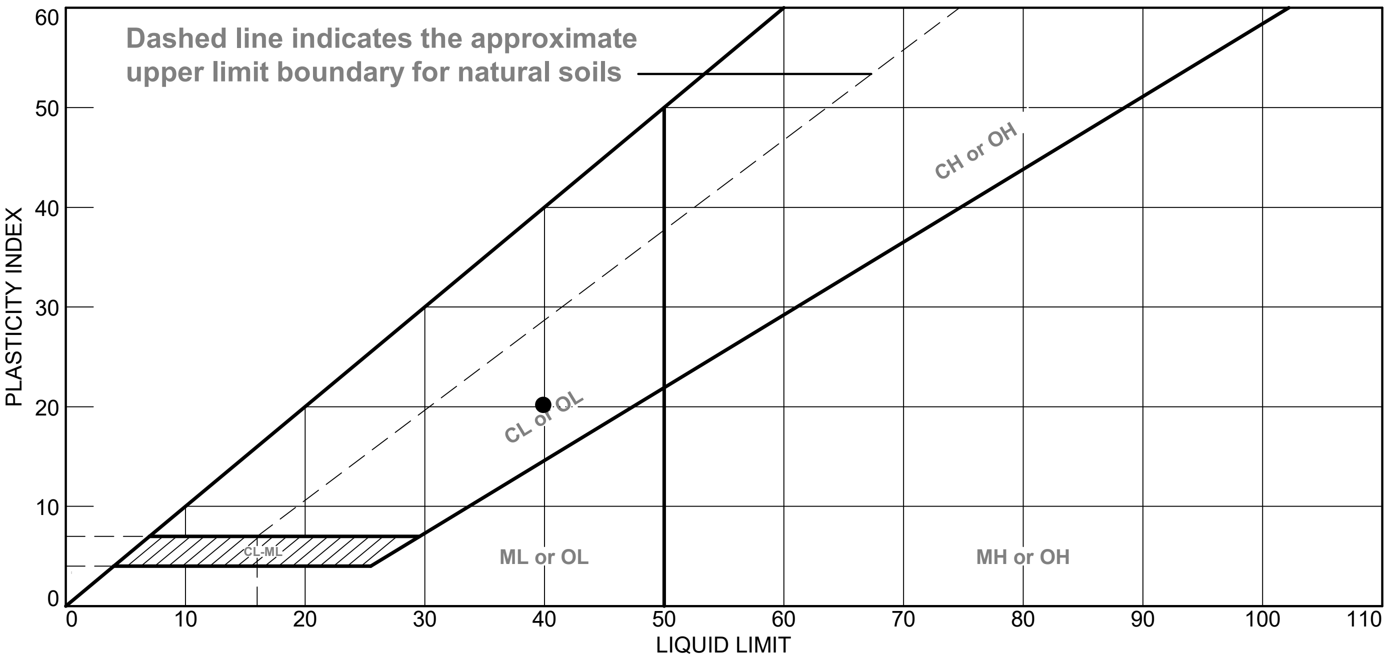
R.W. Gillespie & Associates, Inc.

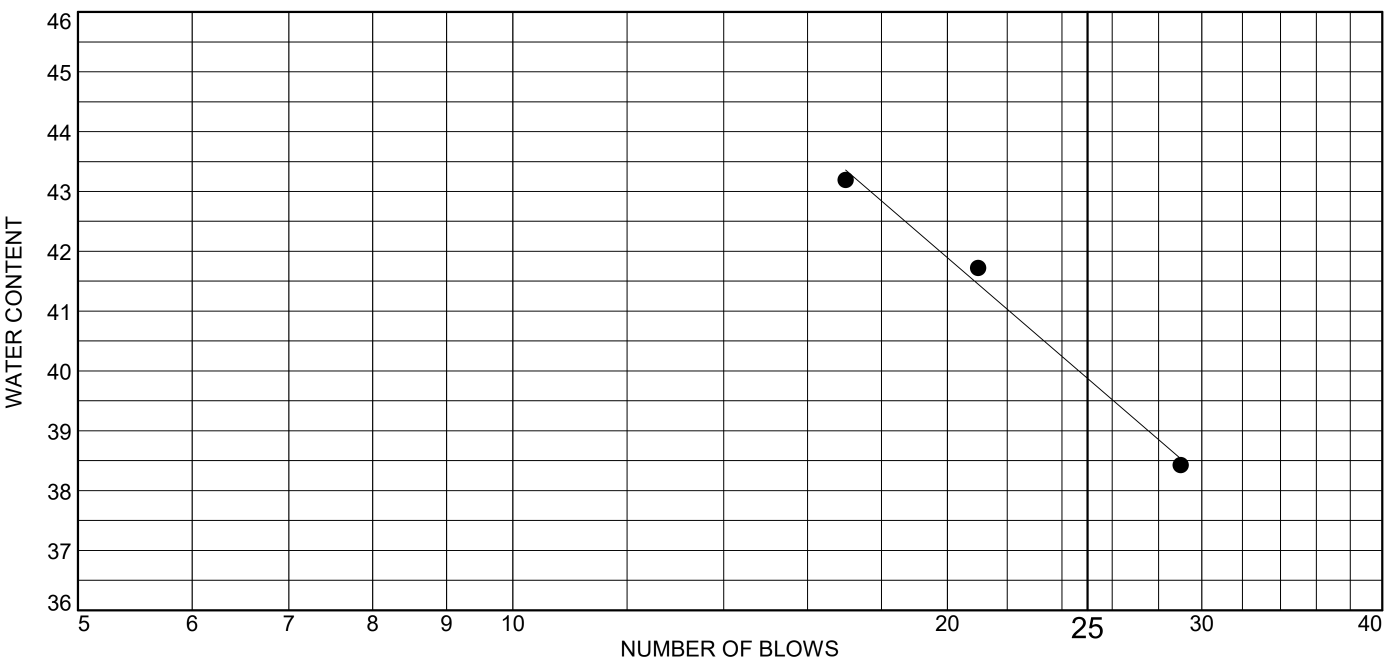
Biddeford, Maine

Lab No. 15394-

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	39.9	19.7	20.2			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-103

Sample Number: U-2 **Depth:** 35'-37'

Remarks:

● Moisture Content: 44.7%

R.W. Gillespie & Associates, Inc.

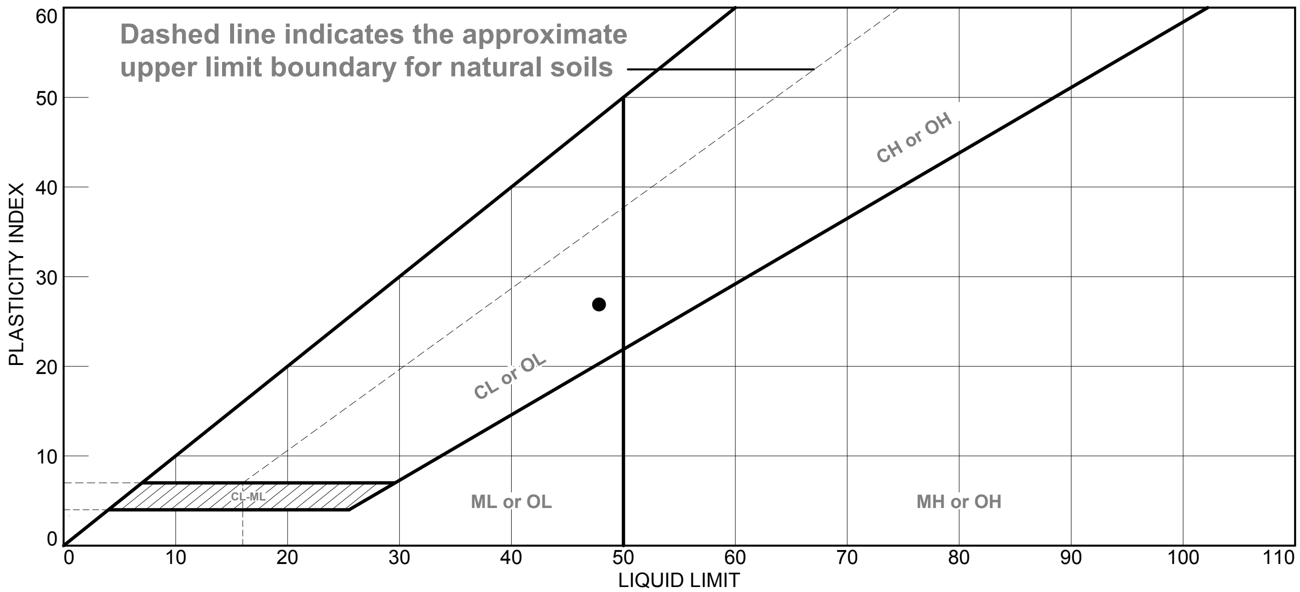
Biddeford, Maine

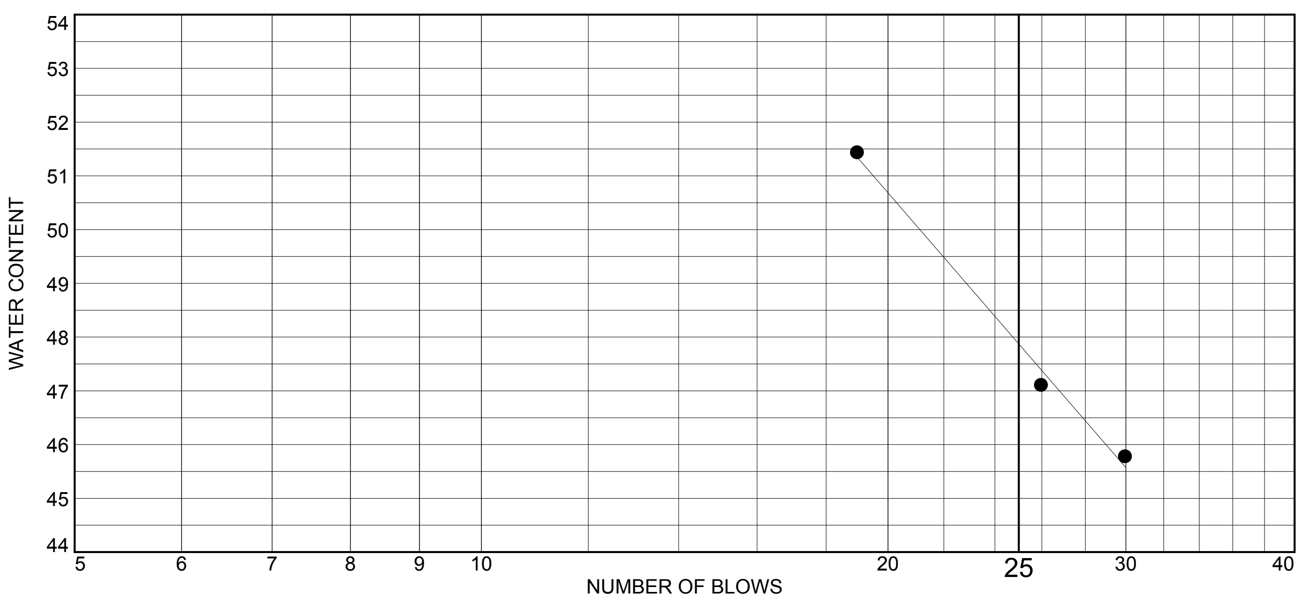
Lab No. 15394-01

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	47.9	21.1	26.8		99.2	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-106

Sample Number: 3D **Depth:** 9'-11'

Remarks:

●Moisture Content: 31.3%

R.W. Gillespie & Associates, Inc.

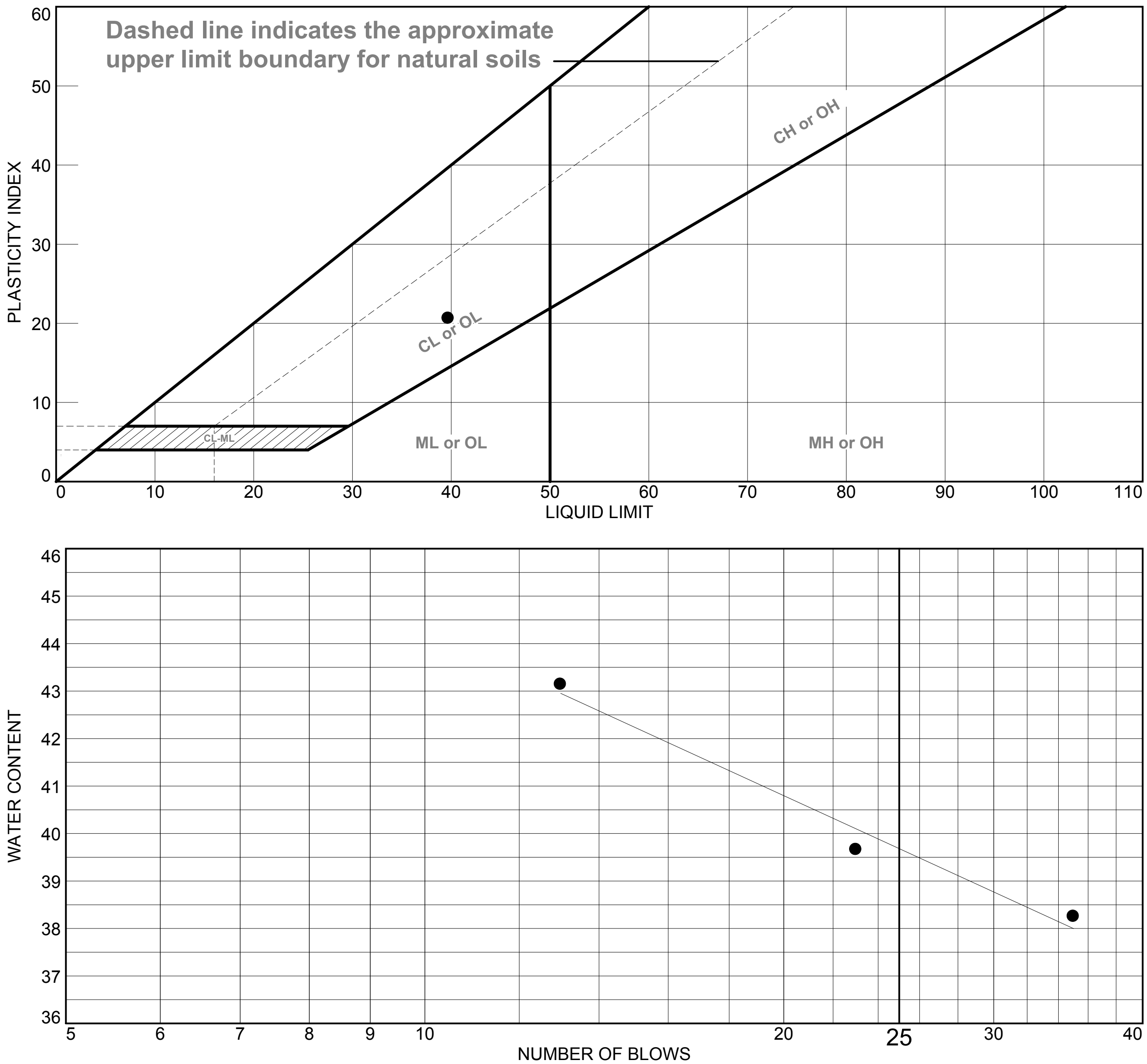
Biddeford, Maine

Lab No. 15395-05

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	39.7	19.1	20.6	99.3	96.7	CL

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-106

Sample Number: 5D **Depth:** 19'-21'

Remarks:

●Moisture Content: 36.1%

R.W. Gillespie & Associates, Inc.

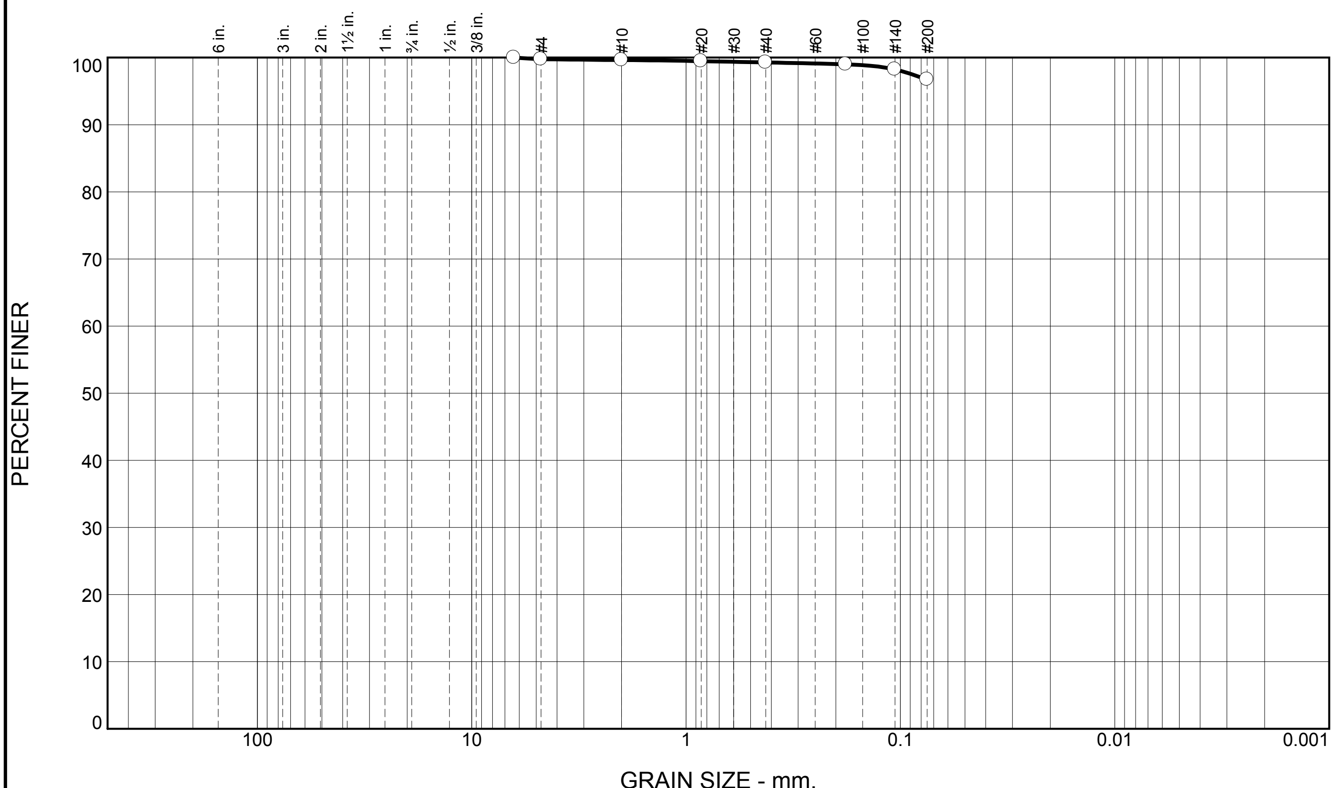
Biddeford, Maine

Lab No. 15395-06

Tested By: JMT **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.2	0.3	2.6	96.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	99.8		
#10	99.6		
#20	99.5		
#40	99.3		
#80	99.0		
#140	98.2		
#200	96.7		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19.1 LL= 39.7 PI= 20.6

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(21)

Remarks

Moisture Content: 36.1%

Location: HB-PAMI-106
Sample Number: 5D **Depth:** 19'-21' **Date:** 2/21/2019

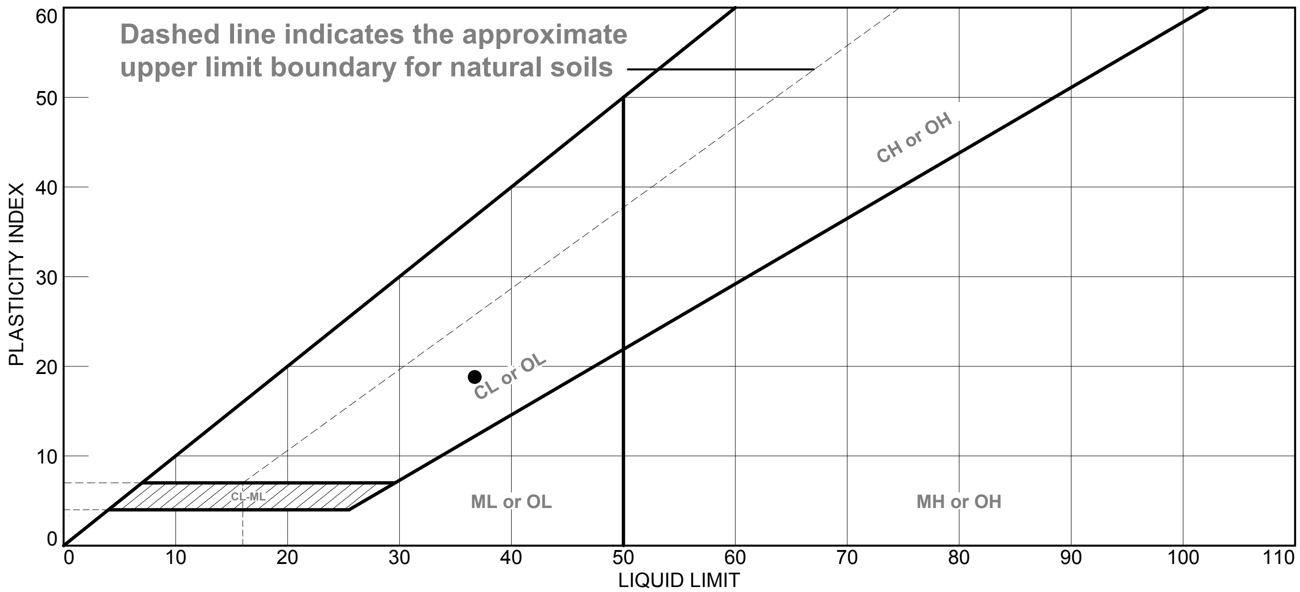
R.W. Gillespie & Associates, Inc. Biddeford, Maine

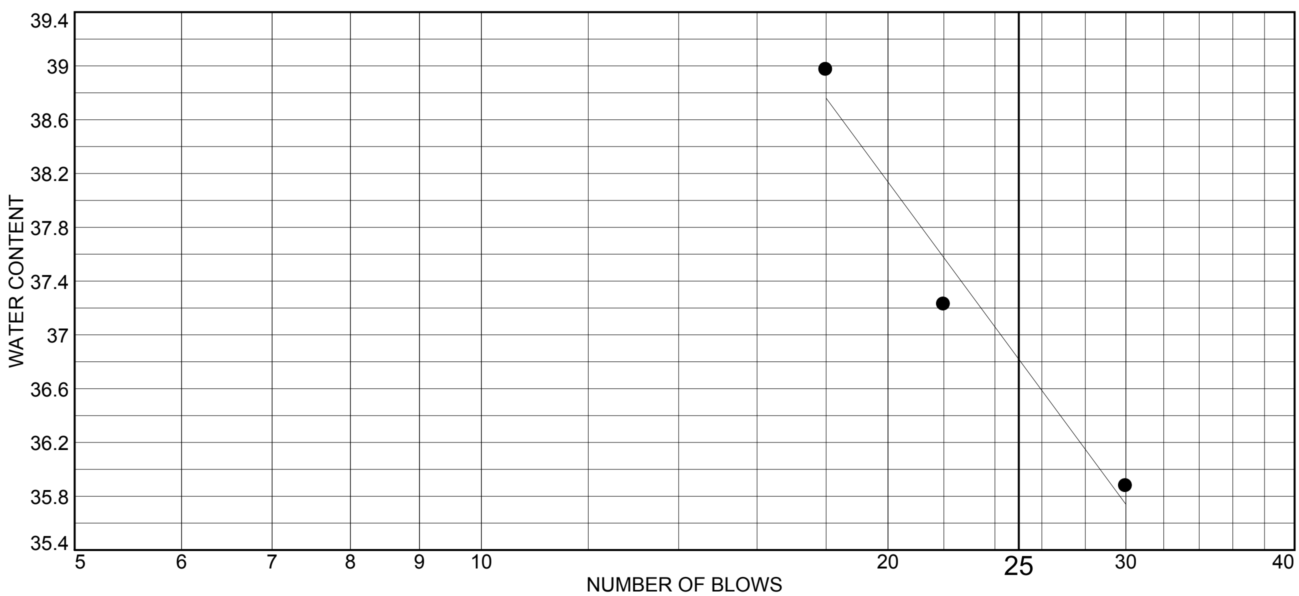
Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME
Project No: 1368-015 **Lab No.** 15395-06

Tested By: JMT/AGS/JJB **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	36.8	18.1	18.7		96.9	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-107

Sample Number: 5D **Depth:** 19'-21'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

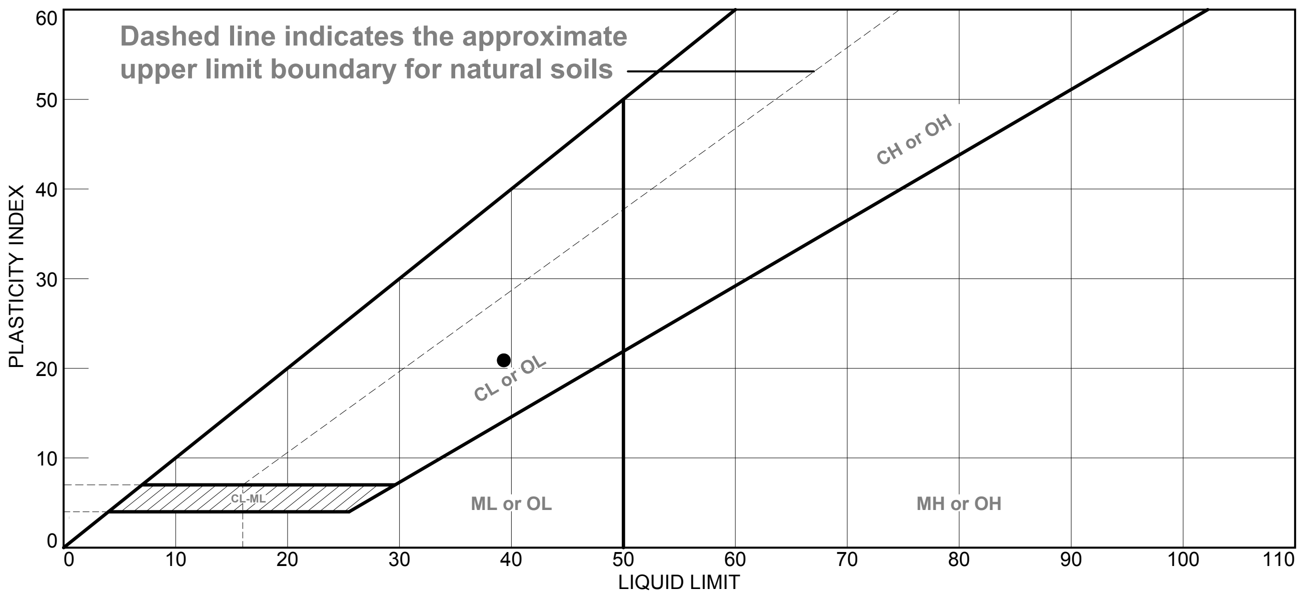
●Moisture Content: 38.5%

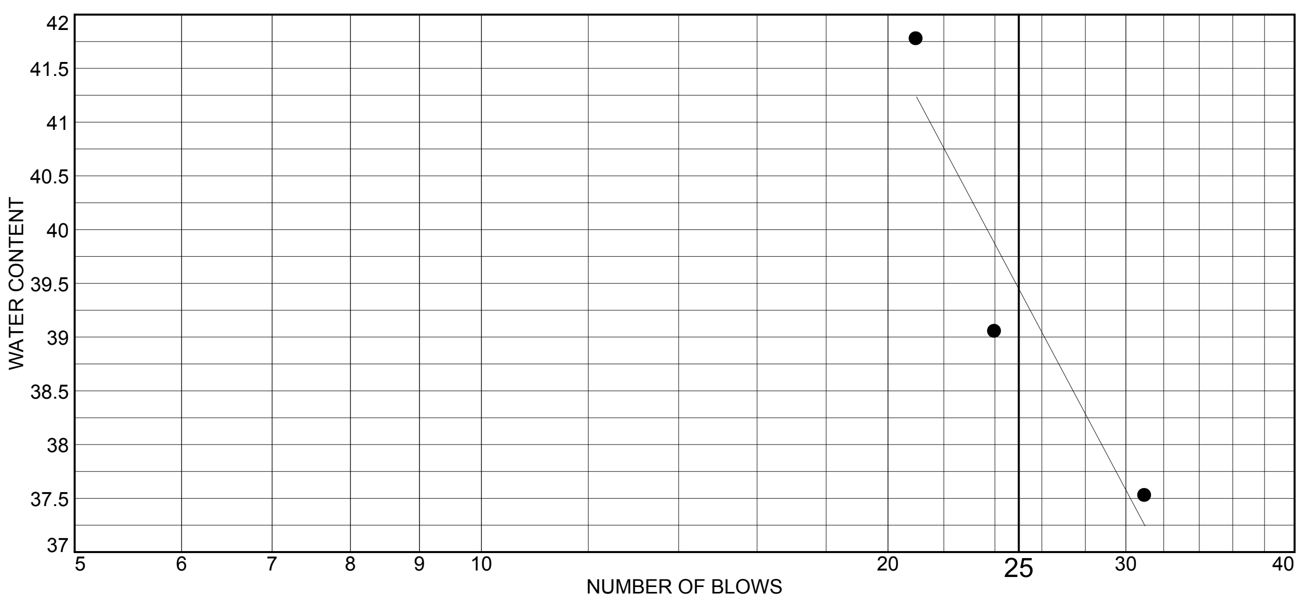
Lab No. 15395-07

Tested By: AGS **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	39.4	18.6	20.8	99.8	97.8	CL

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-109

Sample Number: 2D **Depth:** 9'-11'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

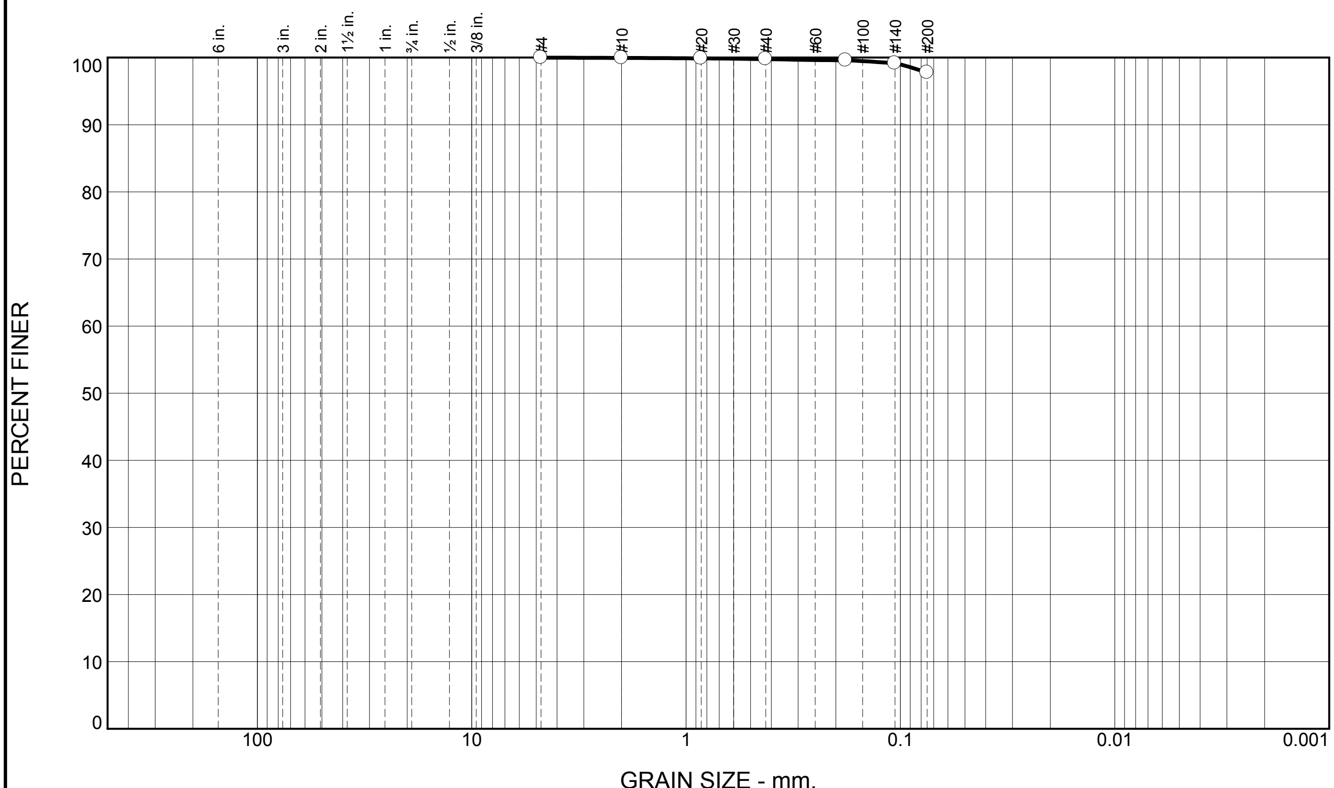
Remarks:

Lab No. 15395-08

Tested By: AGS **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	2.0	97.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.8		
#80	99.6		
#140	99.2		
#200	97.8		

* (no specification provided)

Soil Description

Lean Clay

Atterberg Limits

PL= 18.6 LL= 39.4 PI= 20.8

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(21)

Remarks

Moisture Content: 31.4%

Location: HB-PAMI-109
Sample Number: 2D **Depth:** 9'-11' **Date:** 3/19/19

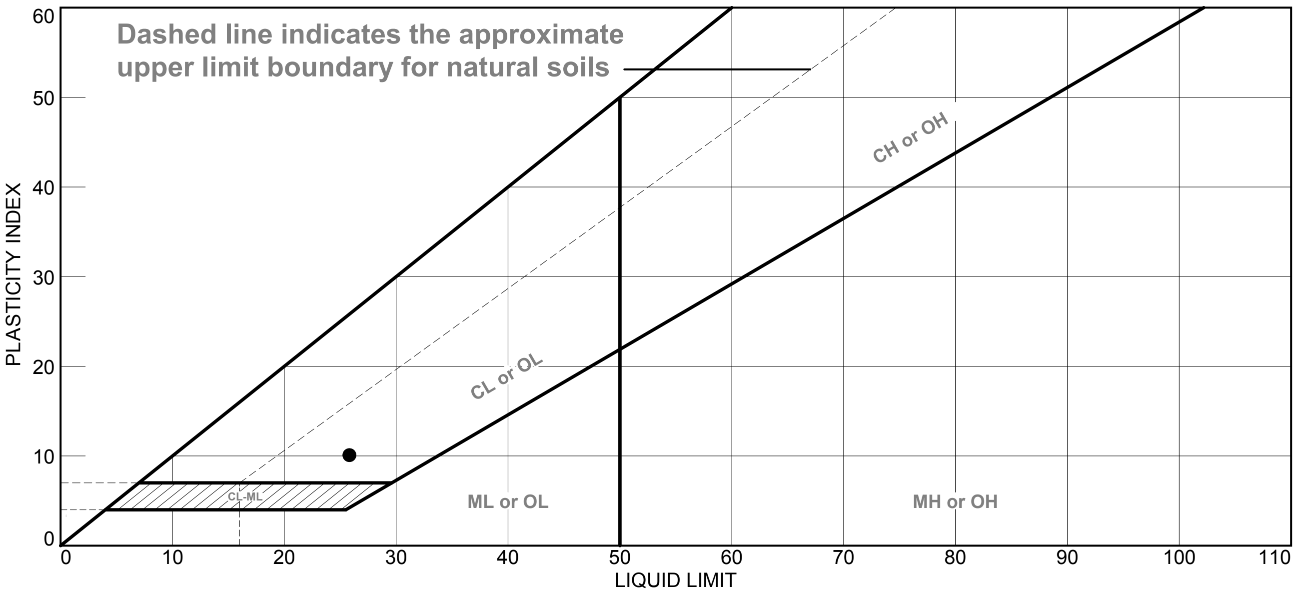
R.W. Gillespie & Associates, Inc. Biddeford, Maine

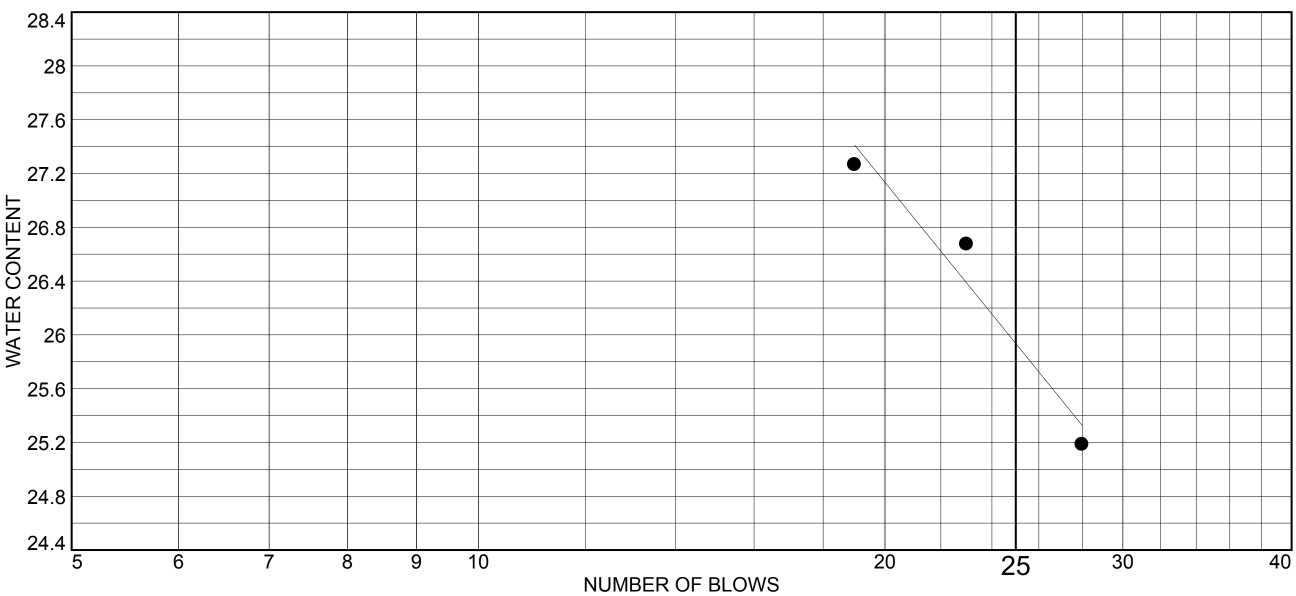
Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME
Project No: 1368-015 **Lab No.** 15395-08

Tested By: AGS **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	lean clay	25.9	15.9	10.0	99.5	87.8	CL

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-109B

Sample Number: 3D **Depth:** 9'-11'

Remarks:

R.W. Gillespie & Associates, Inc.

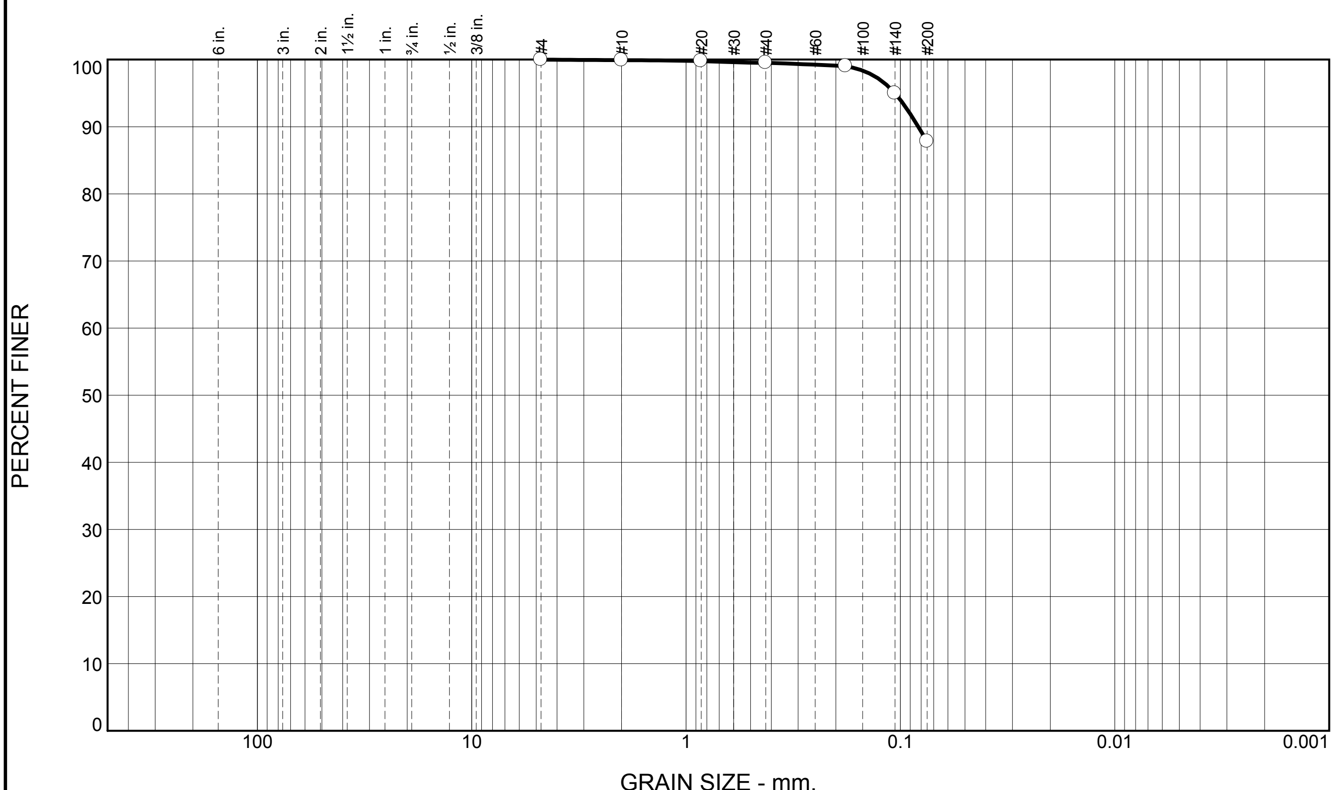
Biddeford, Maine

Lab No. 15395-09

Tested By: AGS **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.4	11.7	87.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.8		
#40	99.5		
#80	99.0		
#140	95.0		
#200	87.8		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 15.9 LL= 25.9 PI= 10.0

Coefficients

D_{90}= 0.0825 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

Moisture Content: 24.0%

Location: HB-PAMI-109B
Sample Number: 3D **Depth:** 9'-11' **Date:** 3/19/19

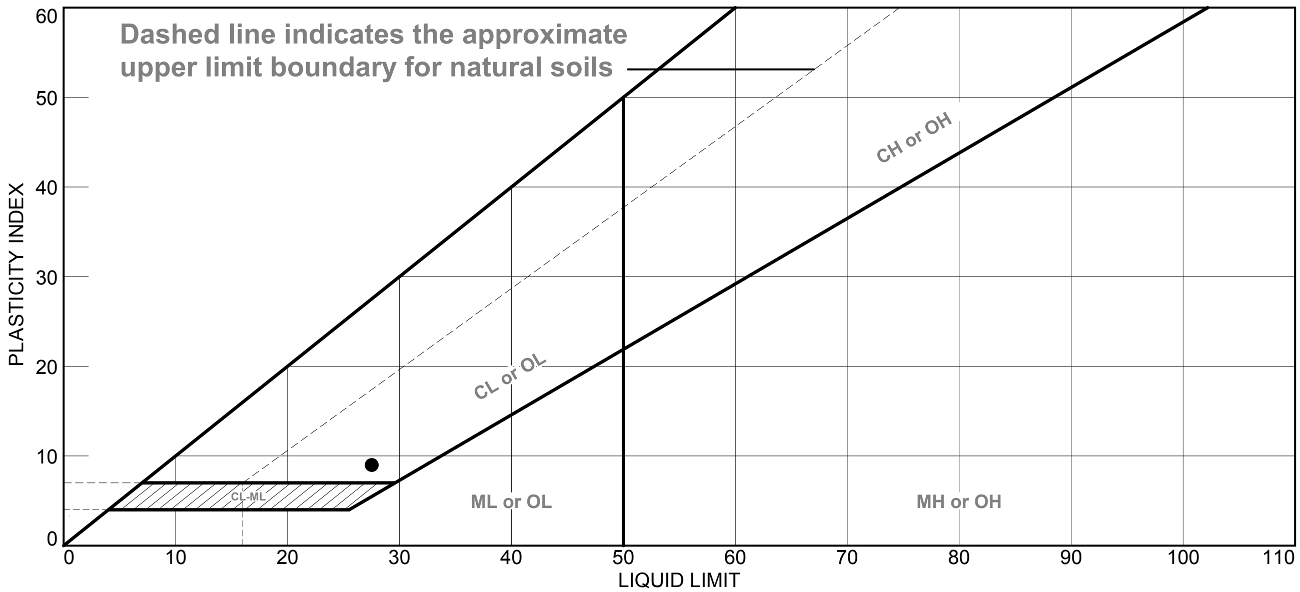
R.W. Gillespie & Associates, Inc.
Biddeford, Maine

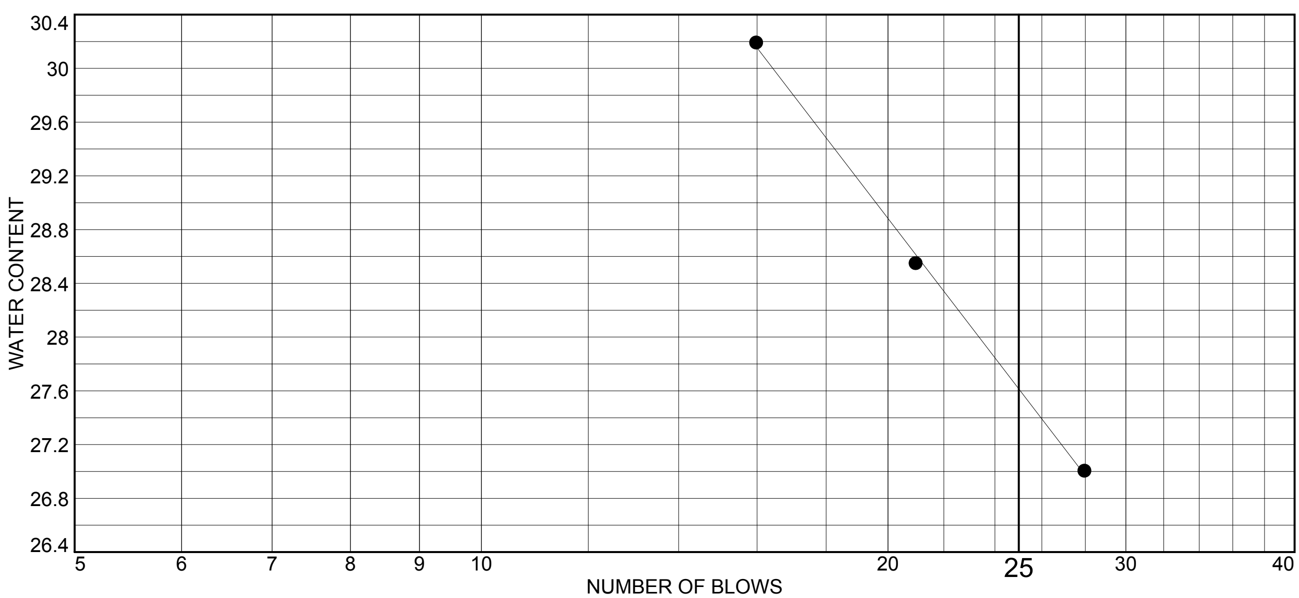
Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME
Project No: 1368-015 **Lab No.** 15395-09

Tested By: AGS **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	lean clay with sand	27.6	18.7	8.9	98.7	77.4	CL

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-110

Sample Number: 3D **Depth:** 9'-11'

Remarks:

R.W. Gillespie & Associates, Inc.

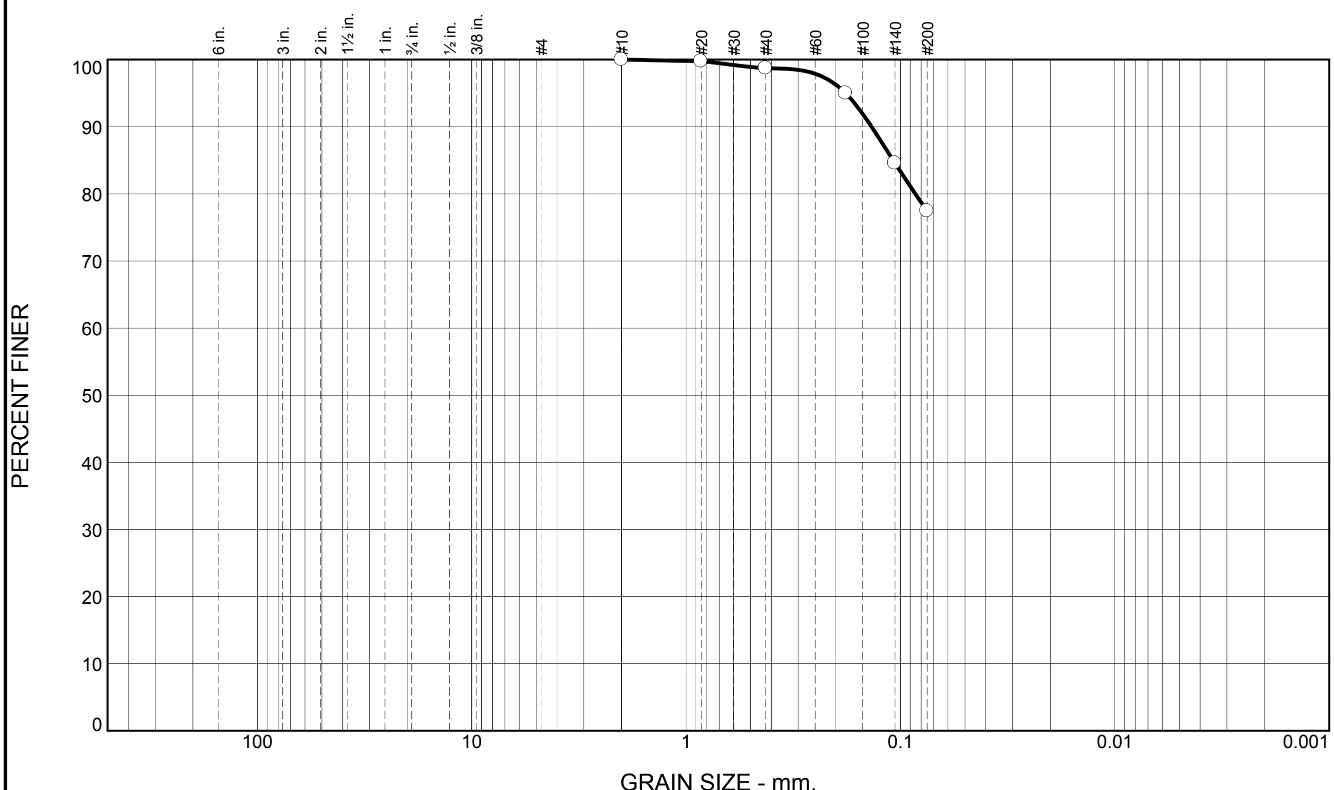
Biddeford, Maine

Lab No. 15395-10

Tested By: AGS **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.3	21.3	77.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#40	98.7		
#80	95.0		
#140	84.6		
#200	77.4		

* (no specification provided)

Soil Description

lean clay with sand

Atterberg Limits

PL= 18.7 LL= 27.6 PI= 8.9

Coefficients

D_{90}= 0.1363 D_{85}= 0.1082 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(5)

Remarks

Moisture Content: 30.4%

Location: HB-PAMI-110
Sample Number: 3D **Depth:** 9'-11' **Date:** 3/19/19

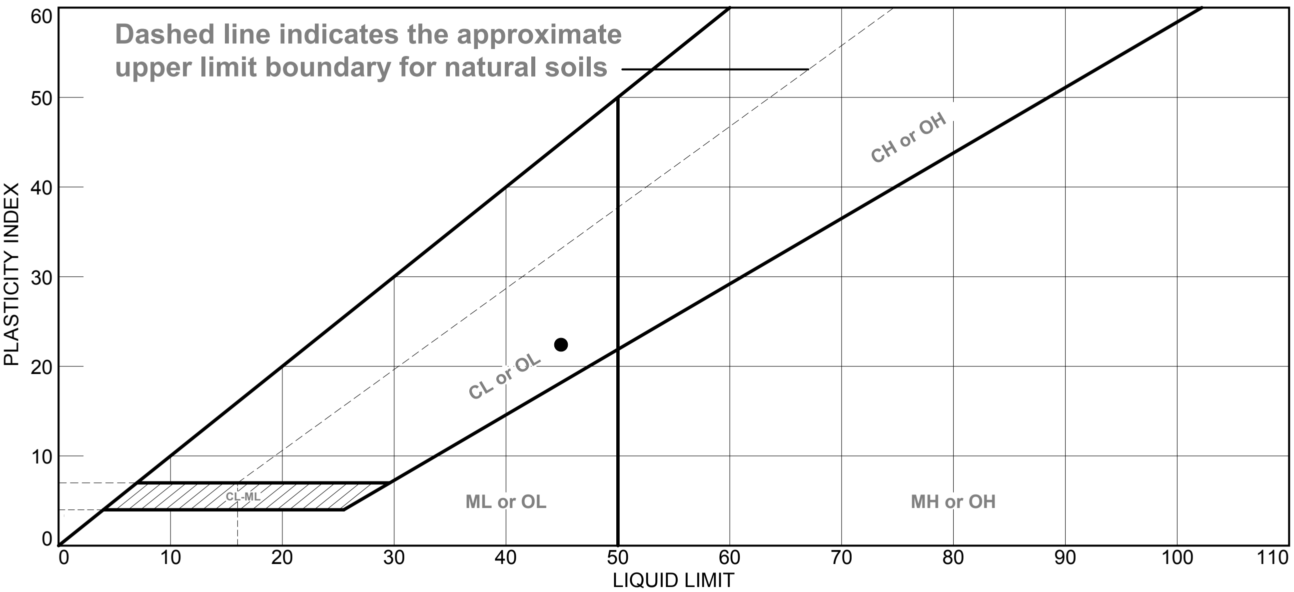
R.W. Gillespie & Associates, Inc. Biddeford, Maine

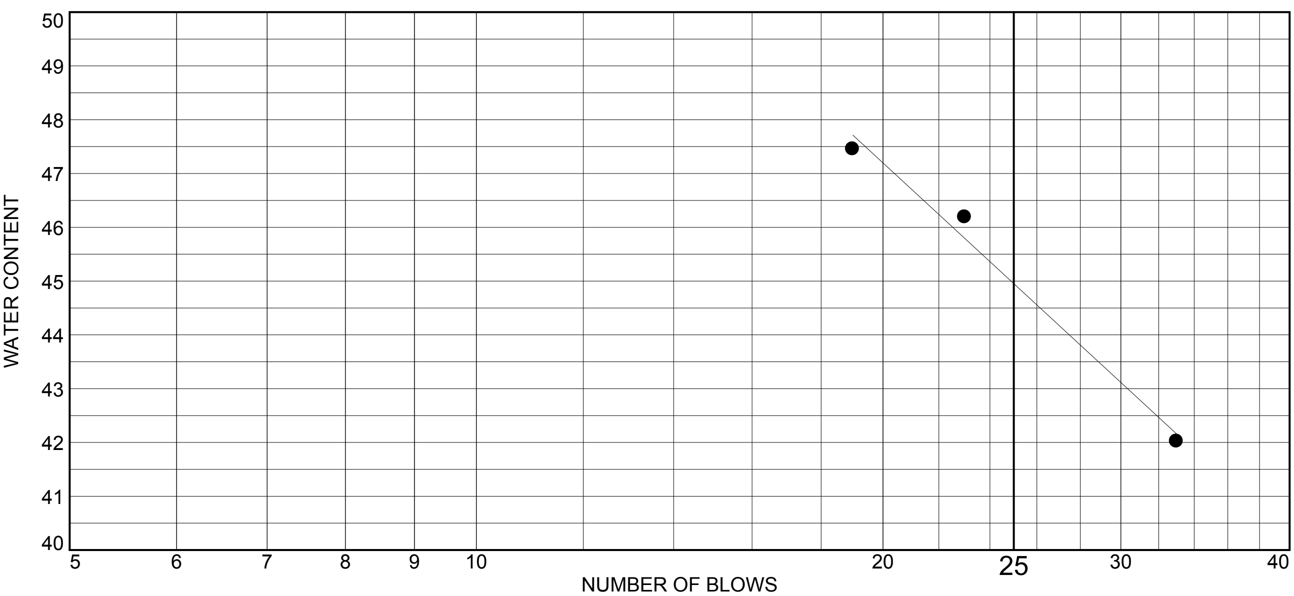
Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME
Project No: 1368-015 **Lab No.** 15395-10

Tested By: AGS **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	45.0	22.7	22.3		94.6	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-114

Sample Number: 4D **Depth:** 14'-16'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

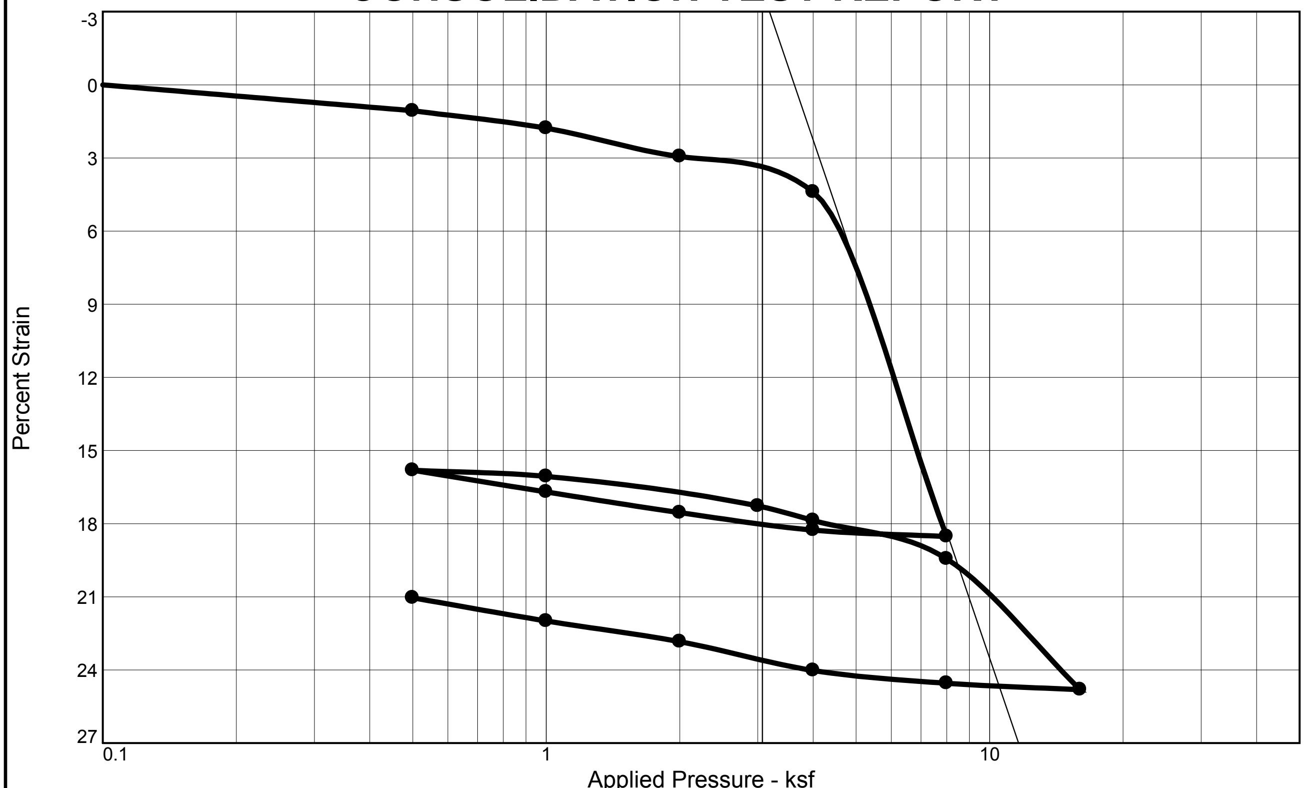
●Moisture Content: 37.0%

Lab No. 15395-11

Tested By: JMT **Checked By:** MTG

MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	5.474		8	1.00	0.333		15	8.00	7.086	
2	1.00	5.380		9	0.50	0.161		16	4.00	1.111	
3	2.00	3.126		10	1.00	0.968		17	2.00	0.324	
4	4.00	2.885		11	3.00	1.283	0.001	18	1.00	0.148	
5	8.00	0.083		12	4.00	0.477	0.002	19	0.50	0.069	
6	4.00	4.220		13	8.00	0.901					
7	2.00	70.020		14	16.00	0.290					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
95.8 %	53.3 %	69.2	50.0	27.1	2.70		4.1	1.34	0.16	1.502

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME

Location: HB-PAMI-114 **Depth:** 24'-26' **Sample Number:** U-1

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:
Square Time Cv Values
3KSF - 0.698 ft^2/day
4KSF - 0.573 ft^2/day

Lab No. 15394-02

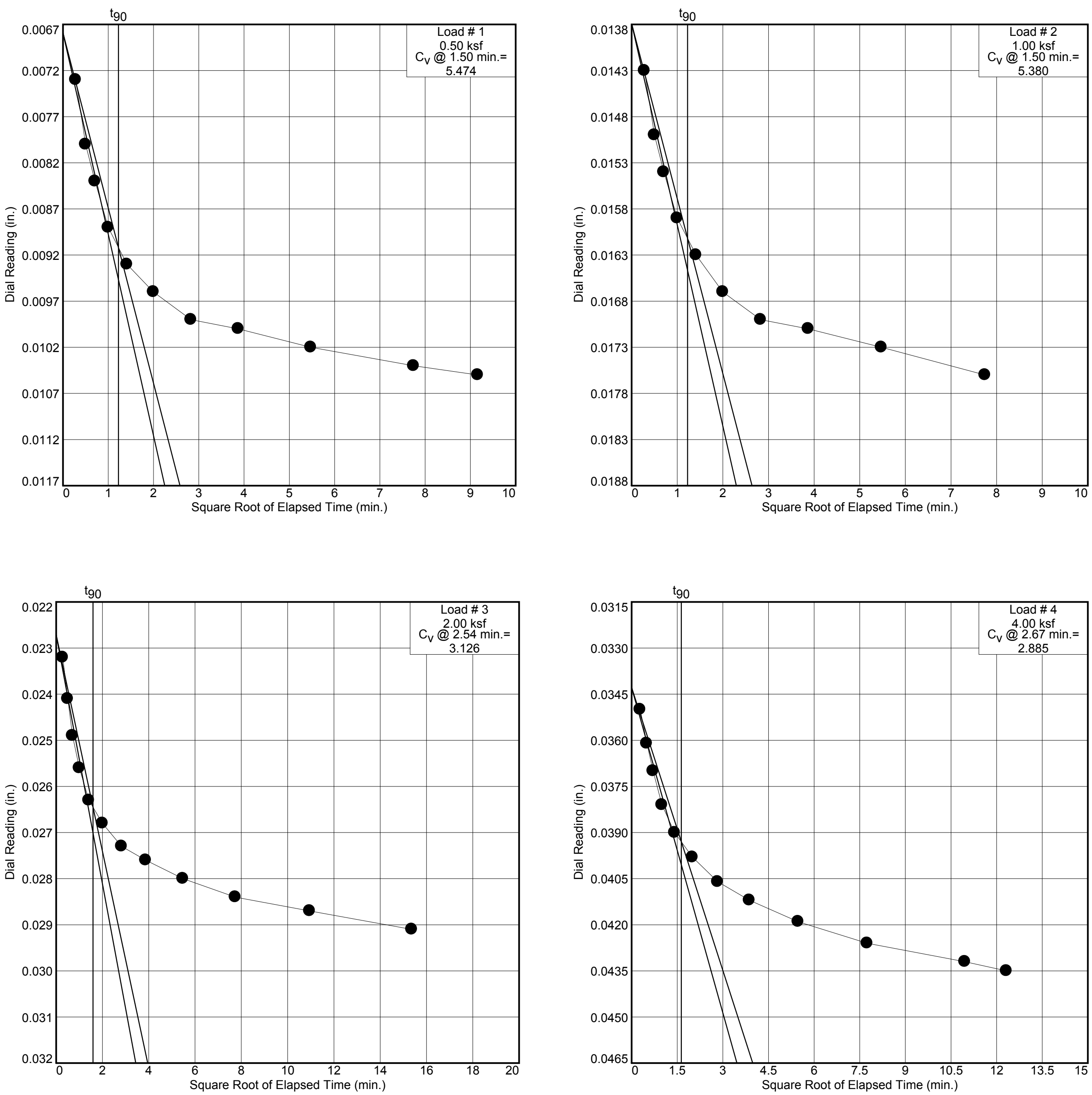
Tested By: JRF **Checked By:** MTG

MTG

Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-114 Depth: 24'-26' Sample Number: U-1



R.W. Gillespie & Associates, Inc.

Biddeford, Maine

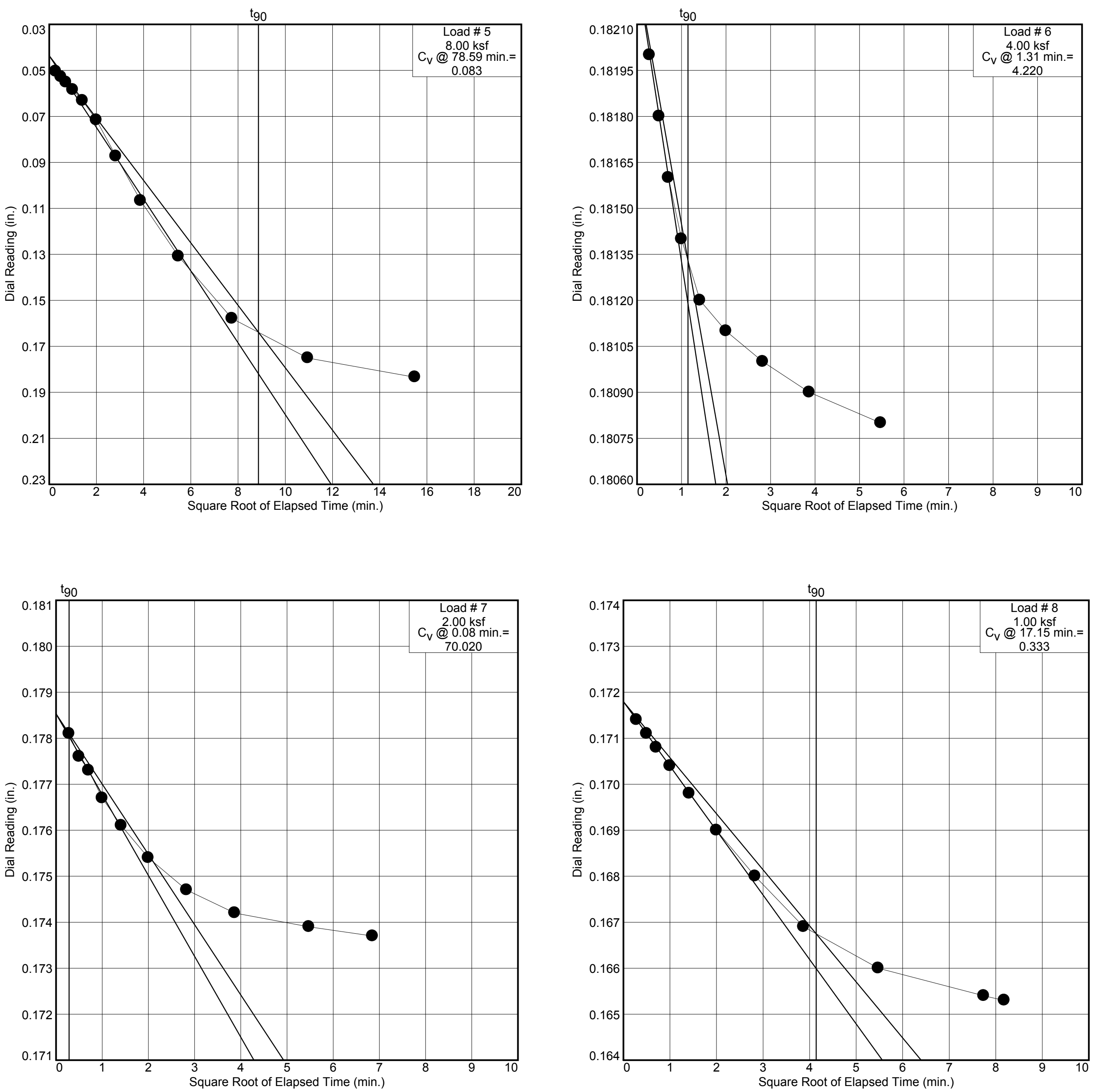
Lab No. 15394-

MTG

Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-114 Depth: 24'-26' Sample Number: U-1



R.W. Gillespie & Associates, Inc.

Biddeford, Maine

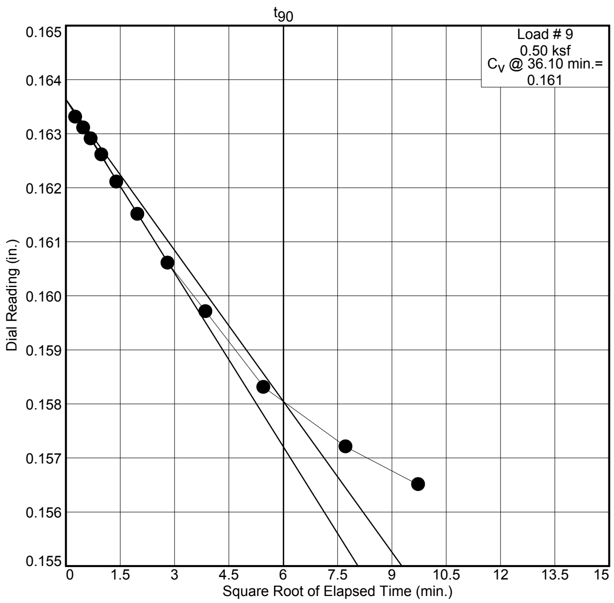
Lab No. 15394-

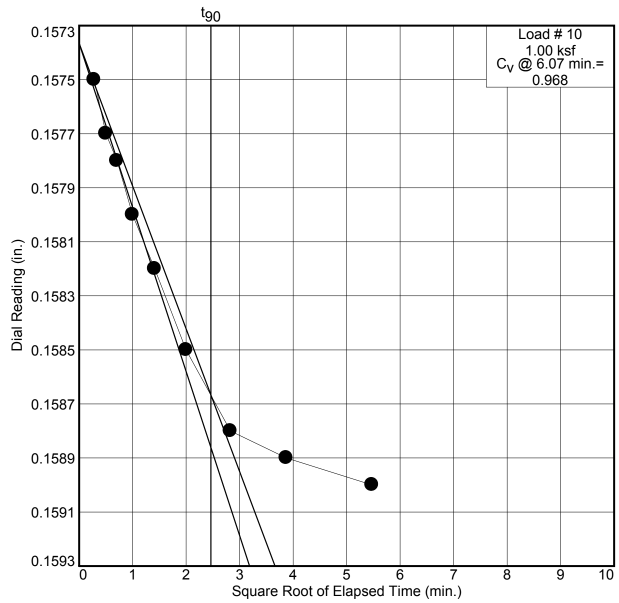
MTG

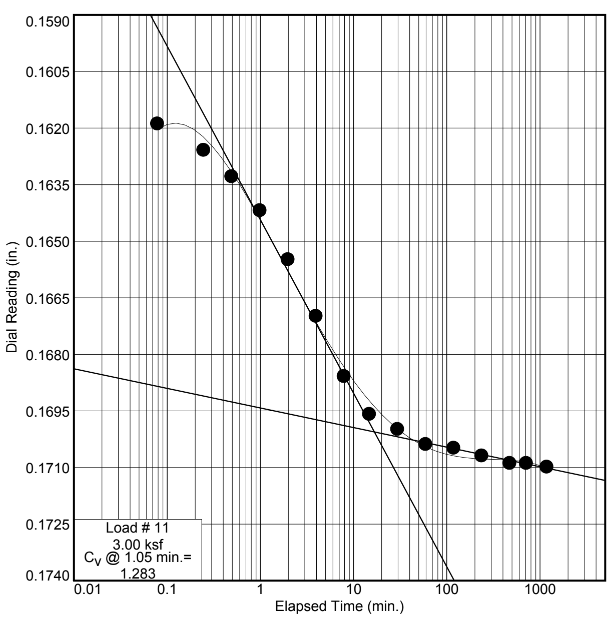
Dial Reading vs. Time

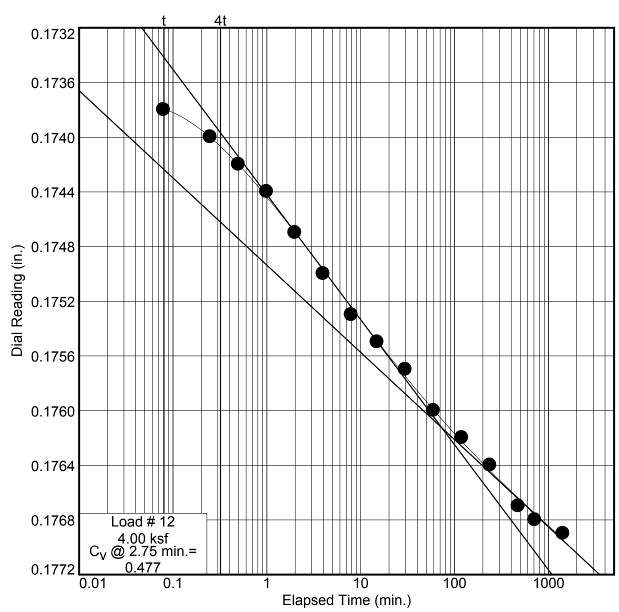
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-114 Depth: 24'-26' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

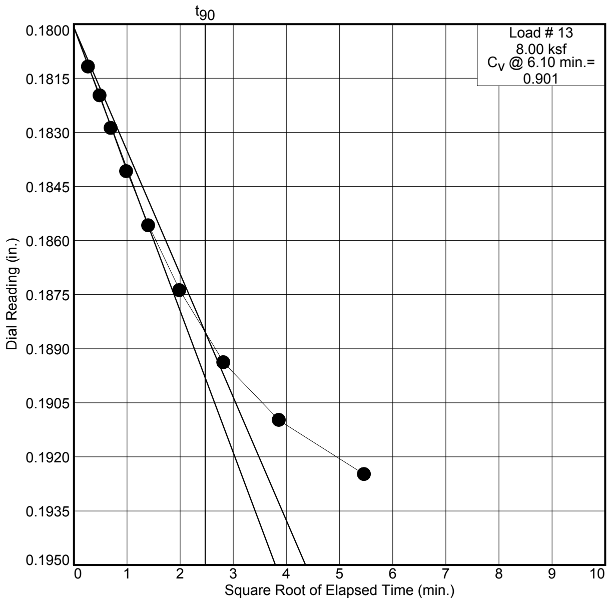
Lab No. 15394-

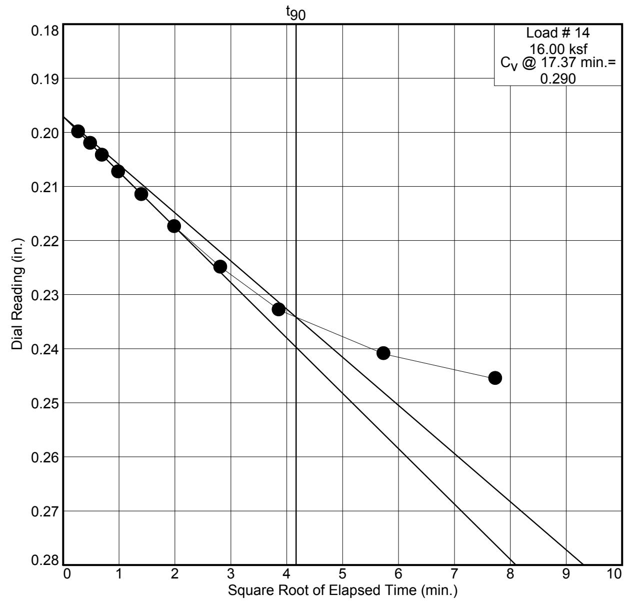
MTG

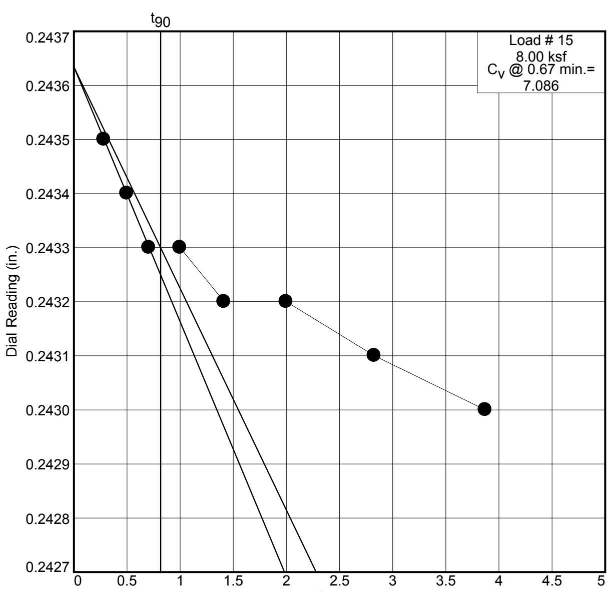
Dial Reading vs. Time

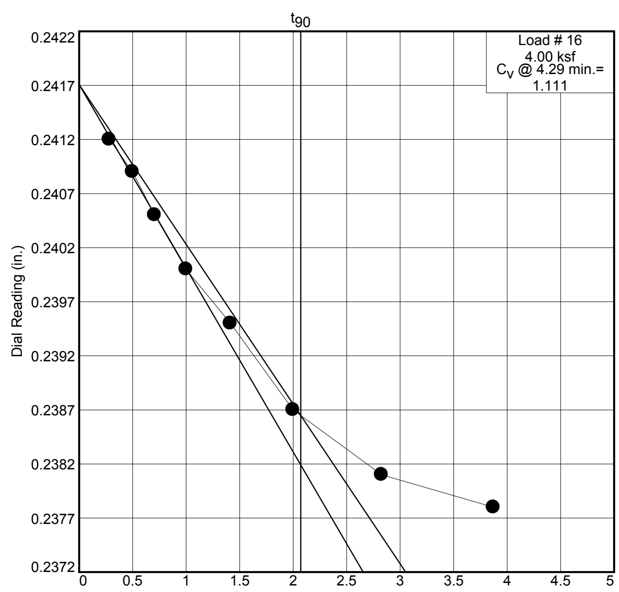
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-114 Depth: 24'-26' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

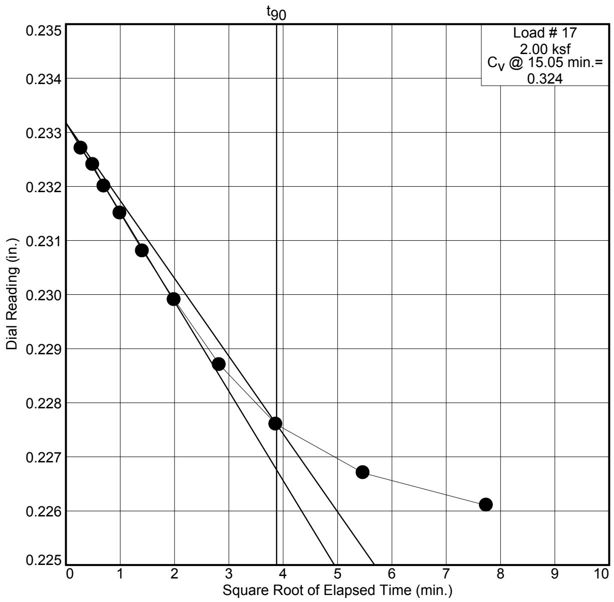
Lab No. 15394-

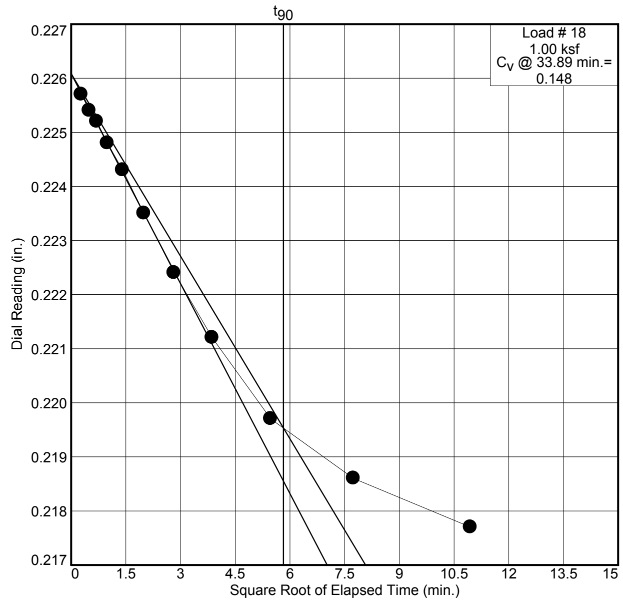
MTG

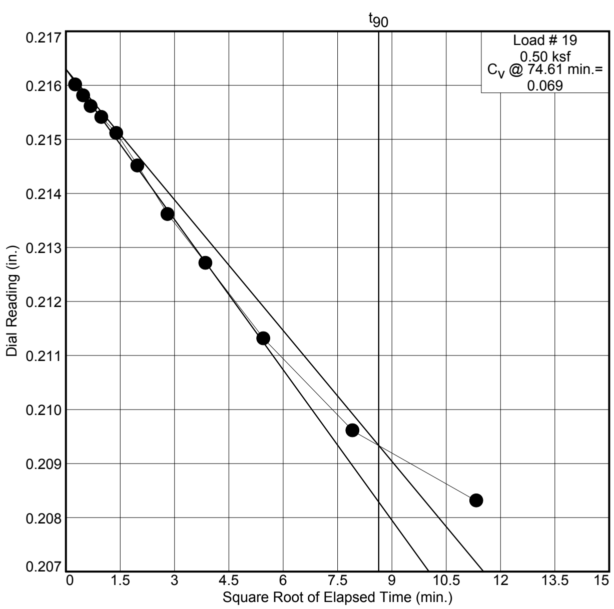
Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-114 Depth: 24'-26' Sample Number: U-1







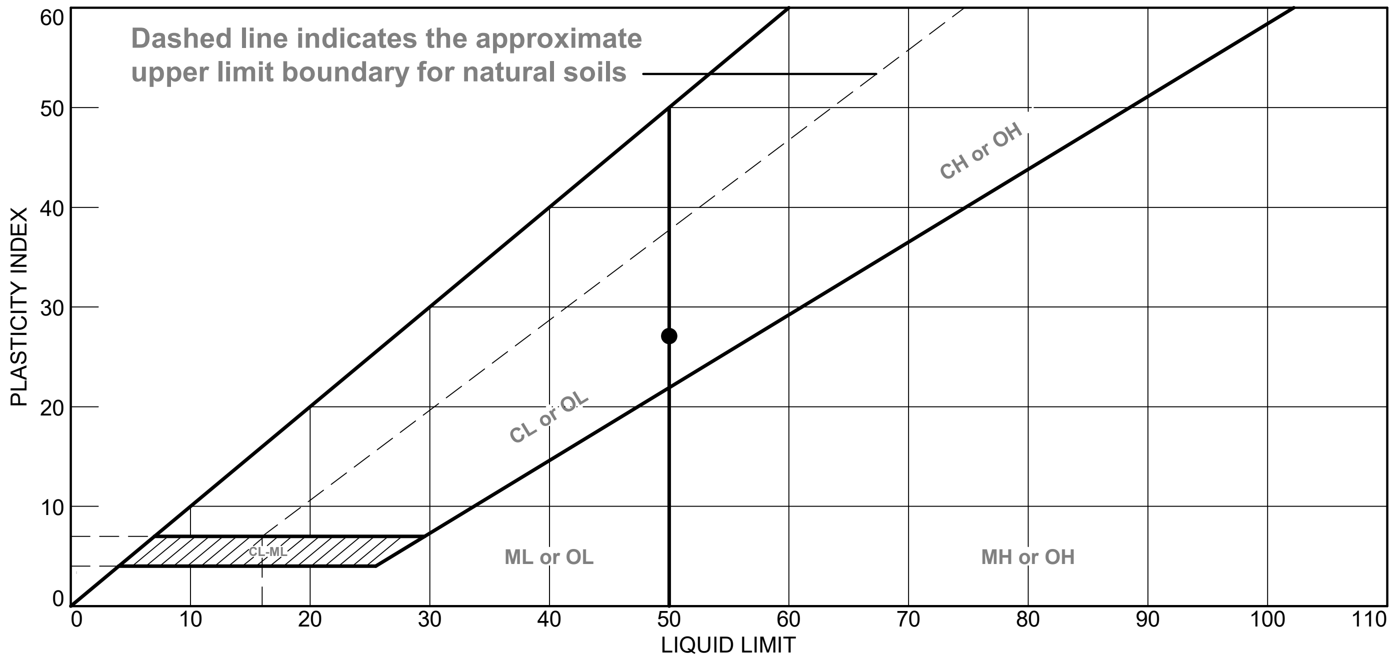
R.W. Gillespie & Associates, Inc.

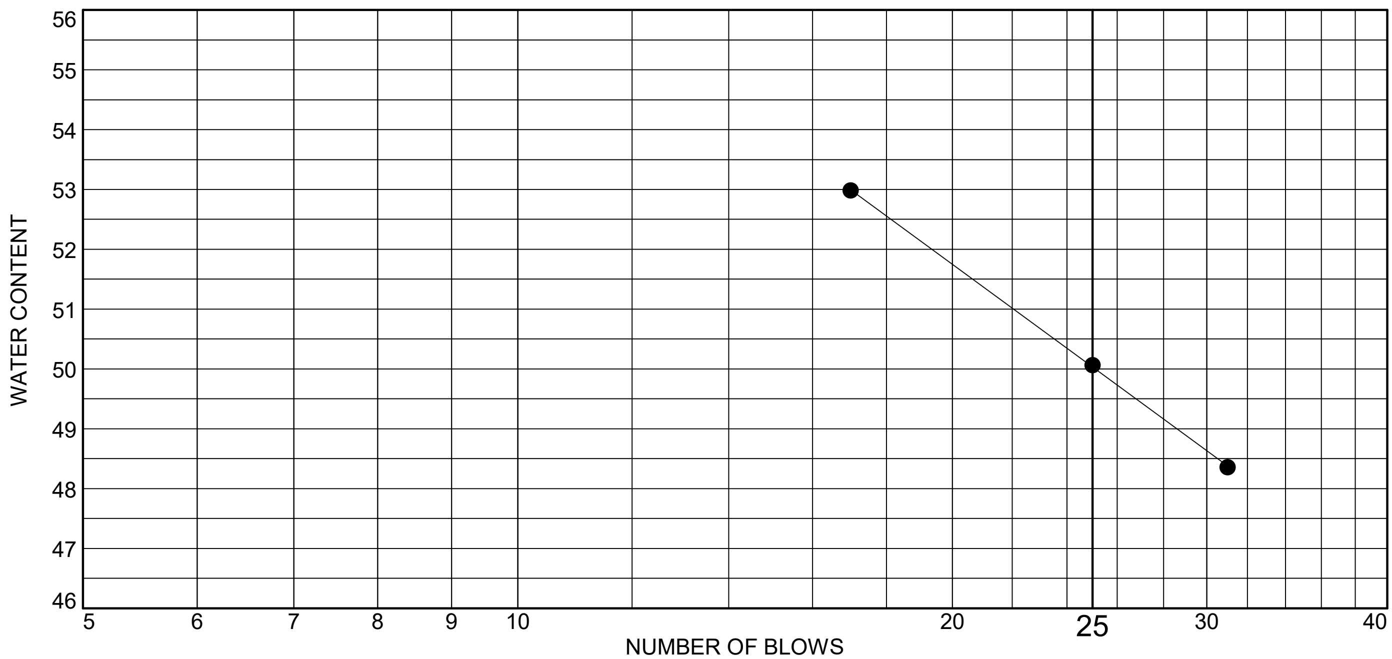
Biddeford, Maine

Lab No. 15394-

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	50.0	22.9	27.1			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-114

Sample Number: U-1 **Depth:** 24'-26'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

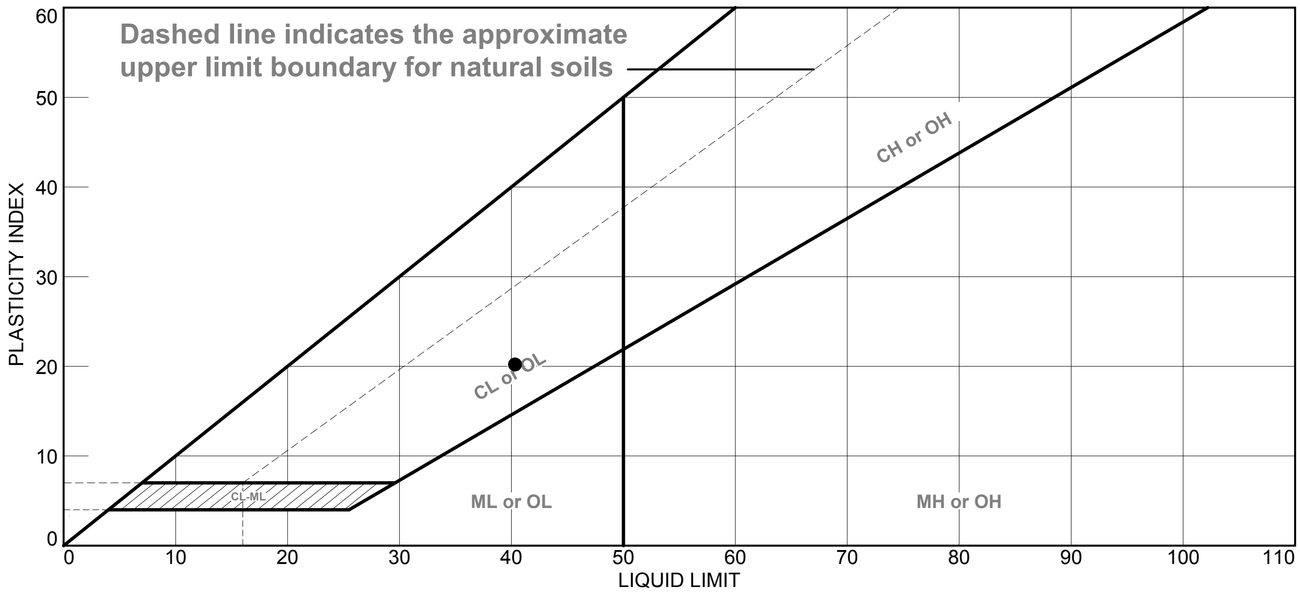
● Moisture Content: 46.3%

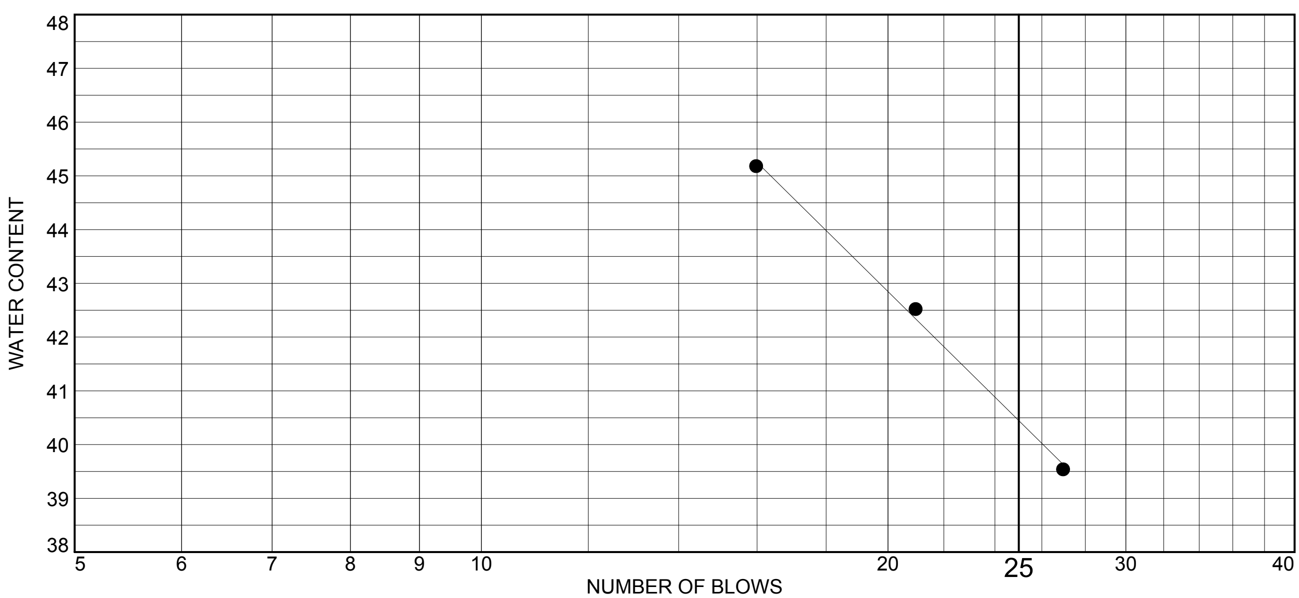
Lab No. 15394-02

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	40.4	20.3	20.1		94.2	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-114

Sample Number: 7D **Depth:** 34'-36'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

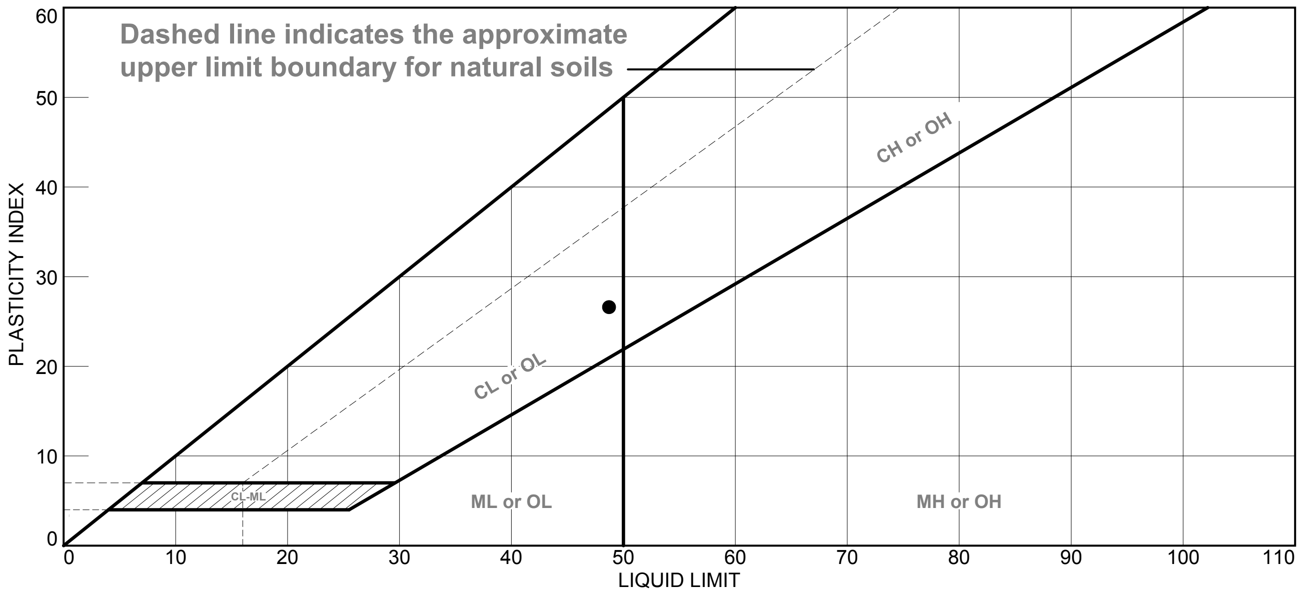
●Moisture Content: 36.0%

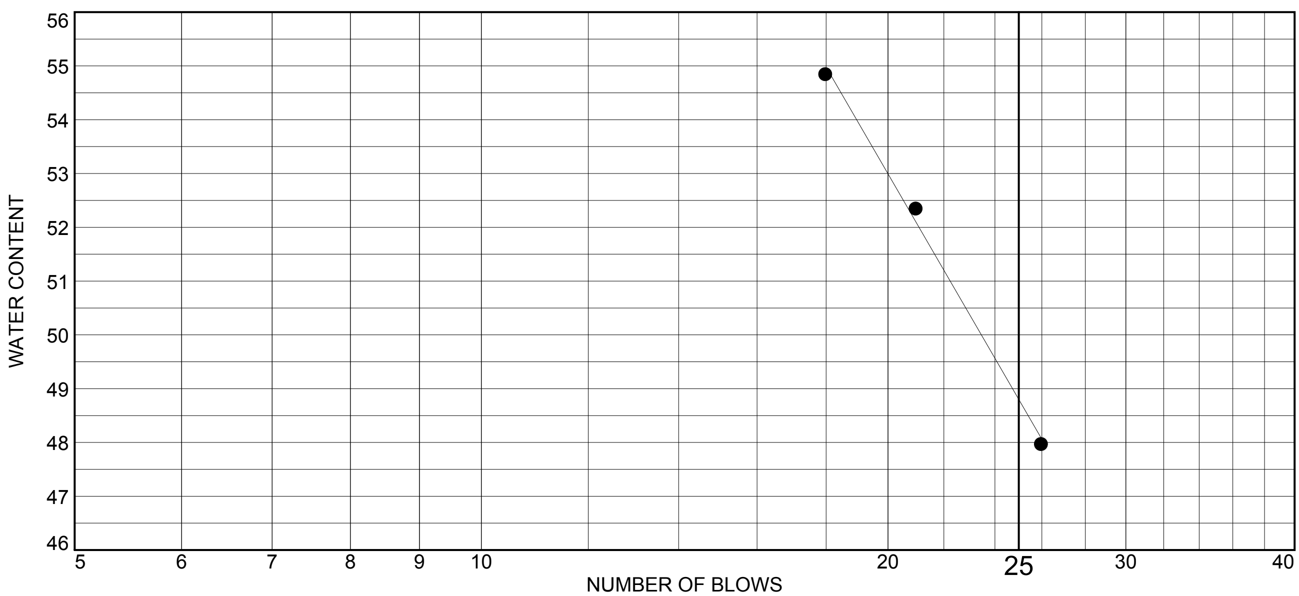
Lab No. 15395-12

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	48.8	22.3	26.5		98.8	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-115

Sample Number: 3D **Depth:** 9'-11'

Remarks:

●Moisture Content: 34.2%

R.W. Gillespie & Associates, Inc.

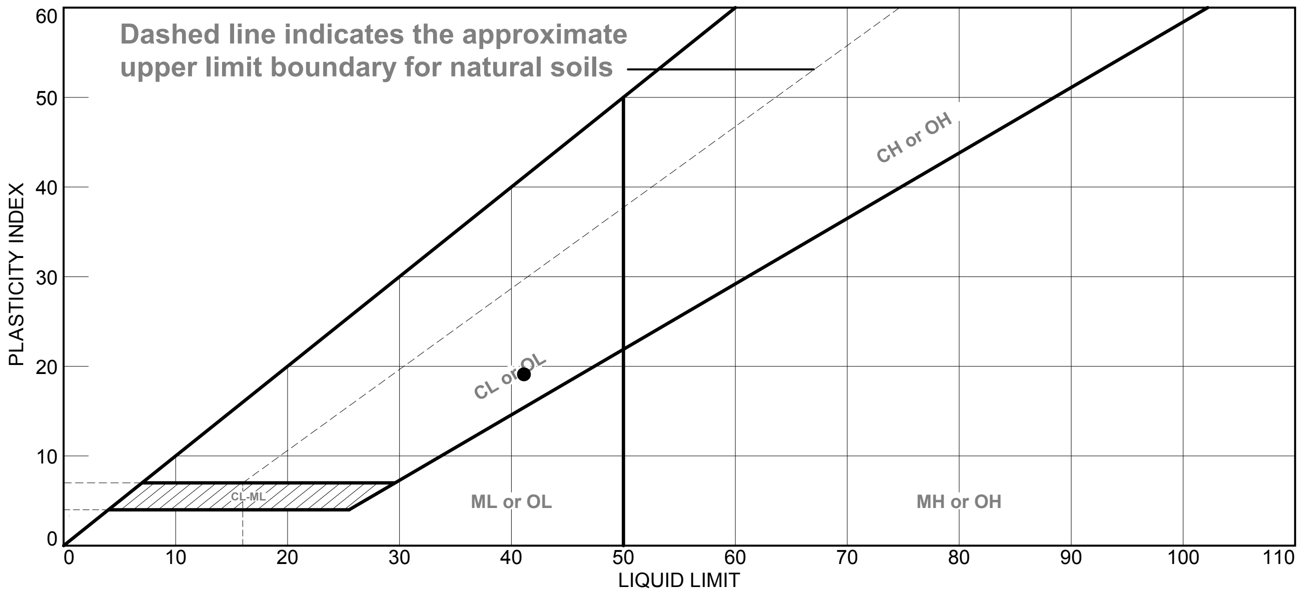
Biddeford, Maine

Lab No. 15395-13

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	41.2	22.2	19.0			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-117

Sample Number: 8D **Depth:** 29'-31'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

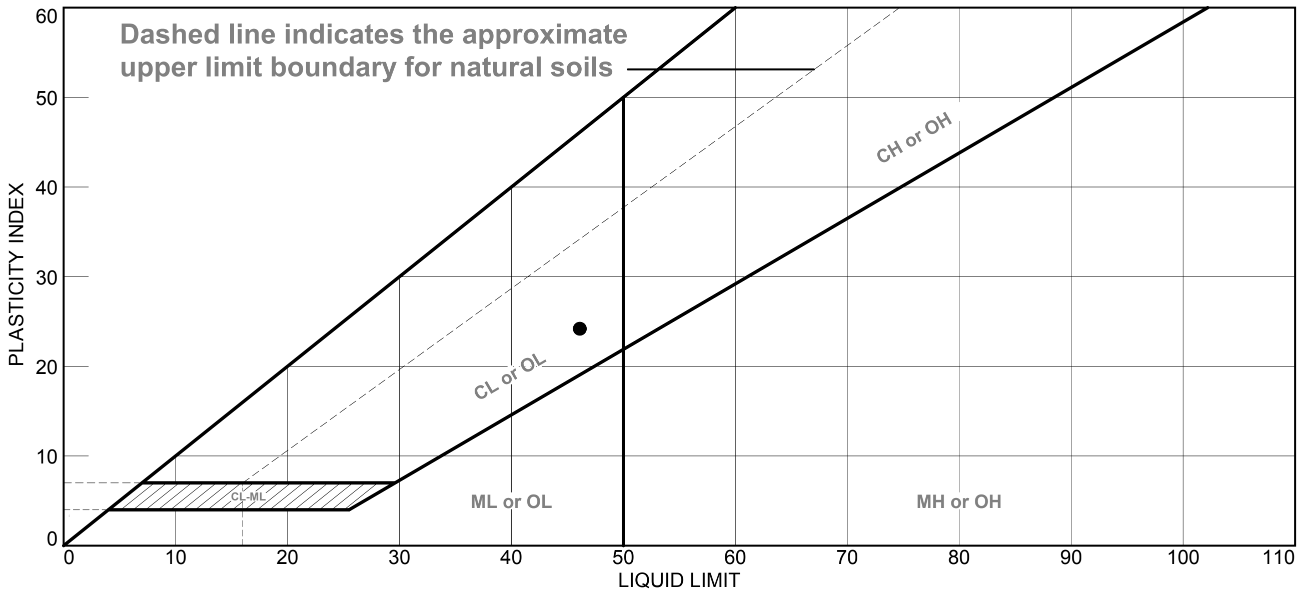
●Moisture Content: 38.0%

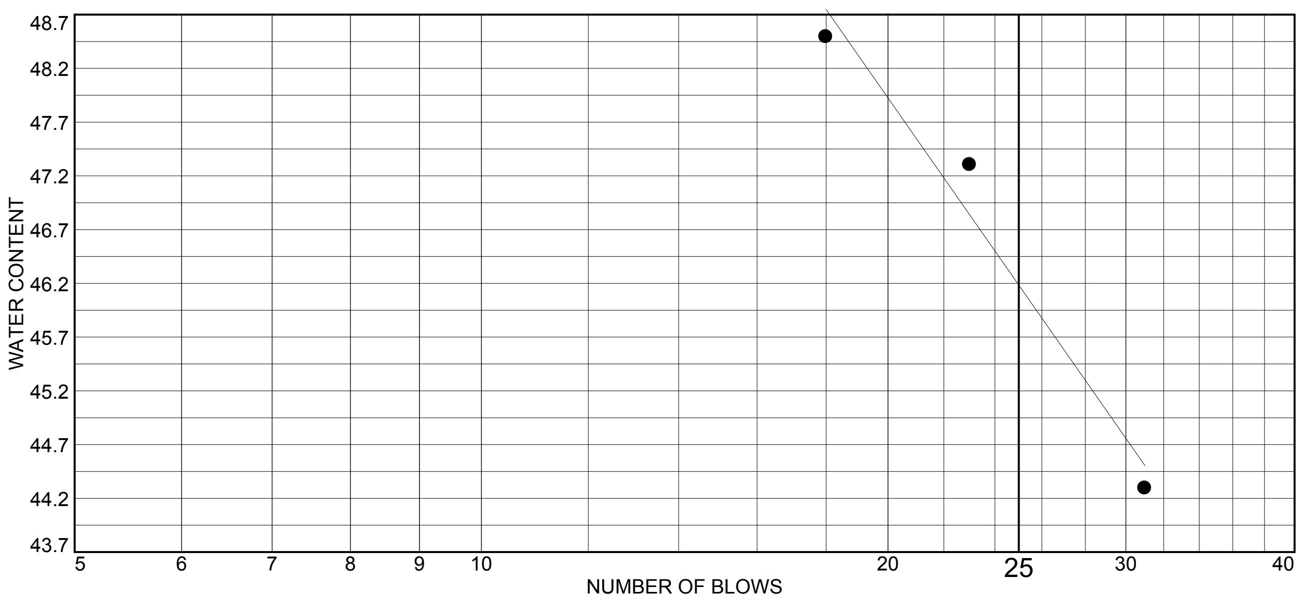
Lab No. 15395-14

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	46.2	22.1	24.1			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-118

Sample Number: 3D **Depth:** 9'-11'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

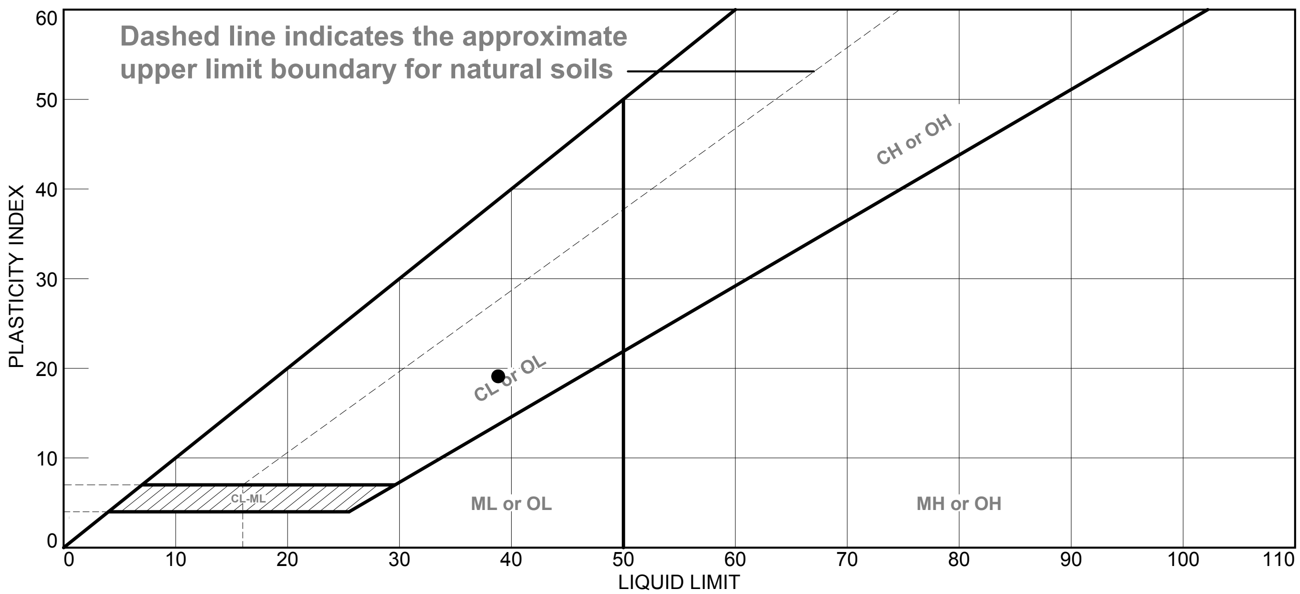
●Moisture Content: 29.1%

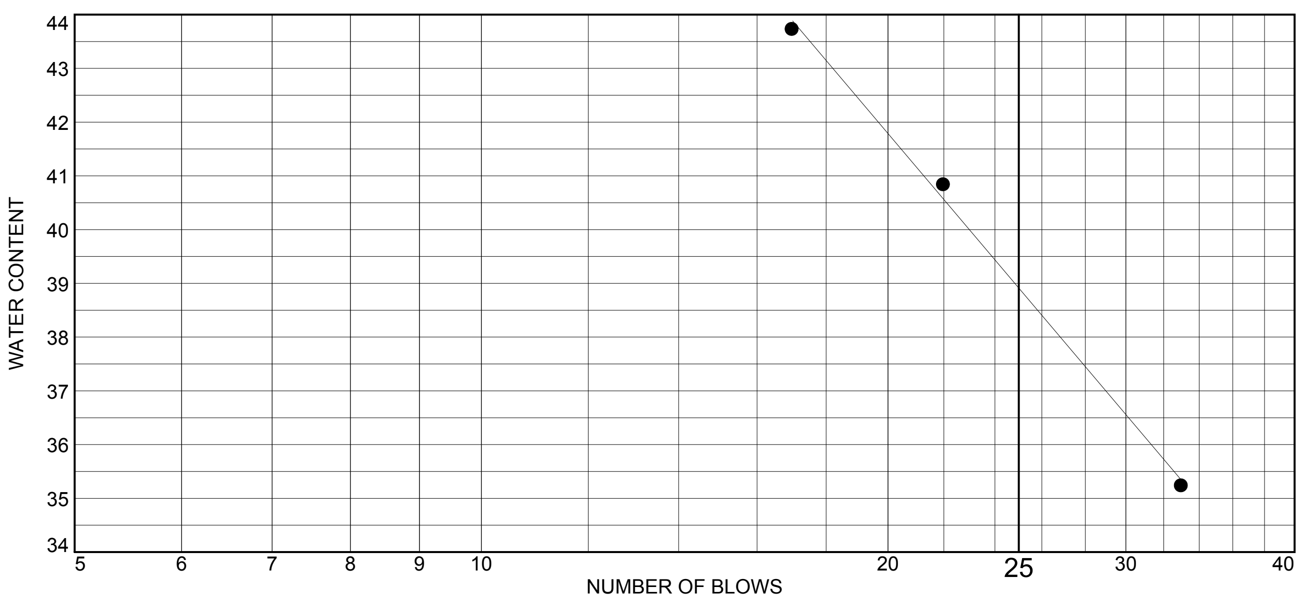
Lab No. 15395-15

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	38.9	19.9	19.0		94.7	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-119

Sample Number: 5D **Depth:** 19'-21'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

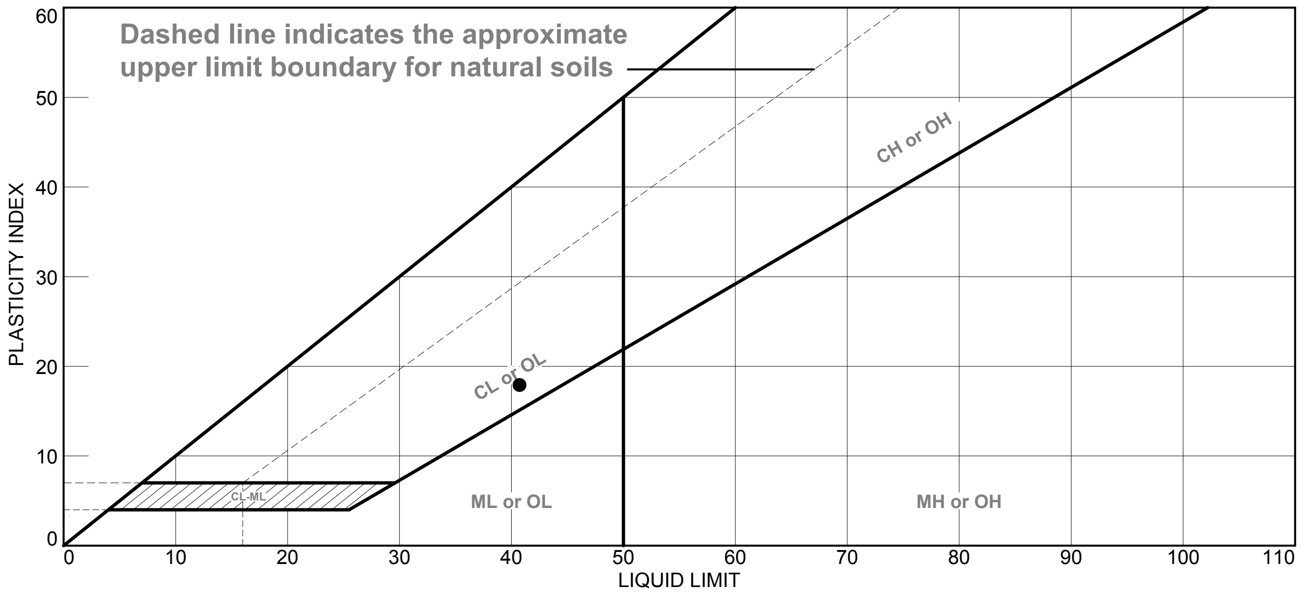
●Moisture Content: 38.4%

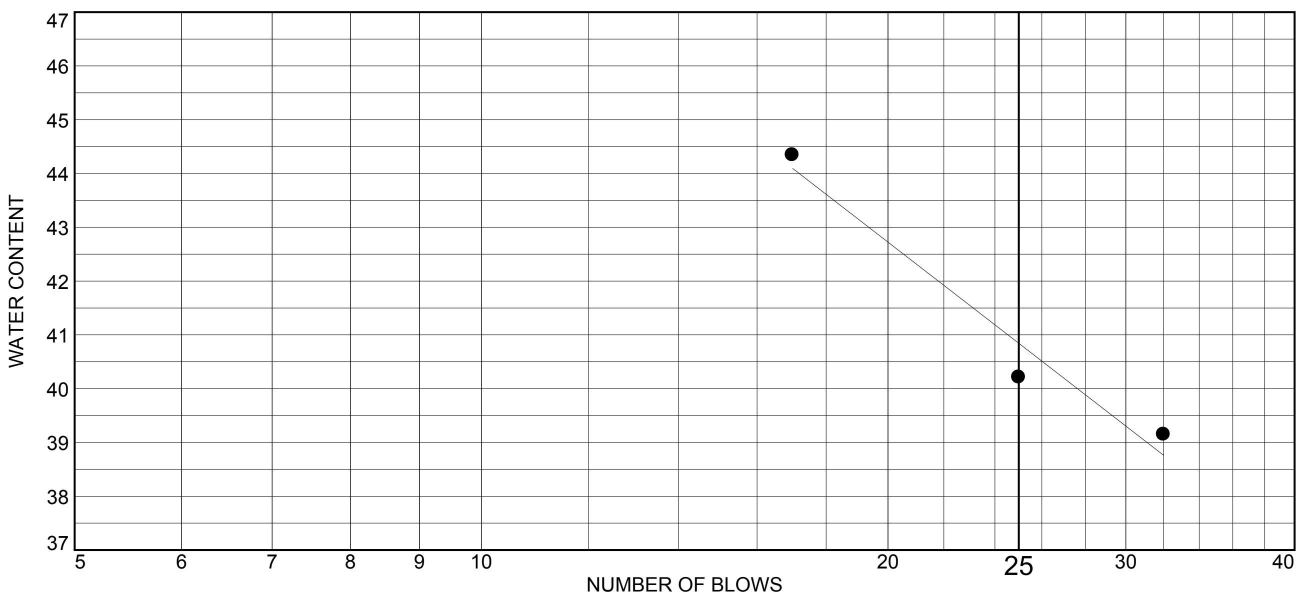
Lab No. 15395-16

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	40.8	23.0	17.8		99.1	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-120

Sample Number: 4D **Depth:** 14'-16'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

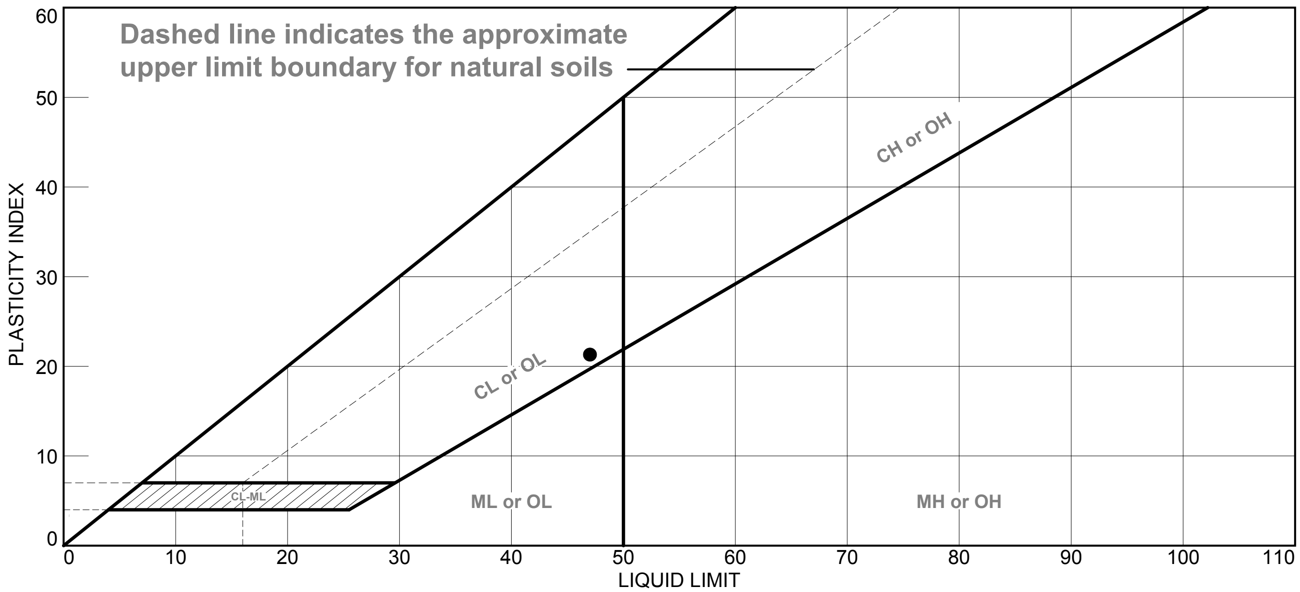
●Moisture Content: 29.1%

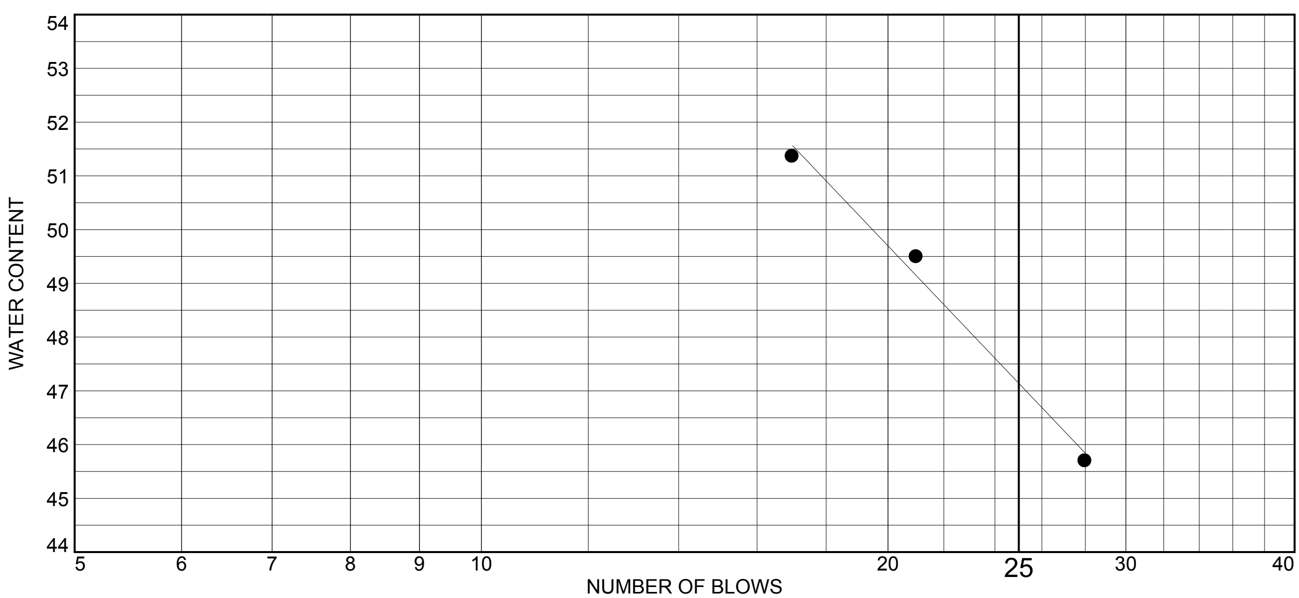
Lab No. 15395-17

Tested By: JJB **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	47.1	25.9	21.2		99.1	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-121

Sample Number: 4D **Depth:** 14'-16'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

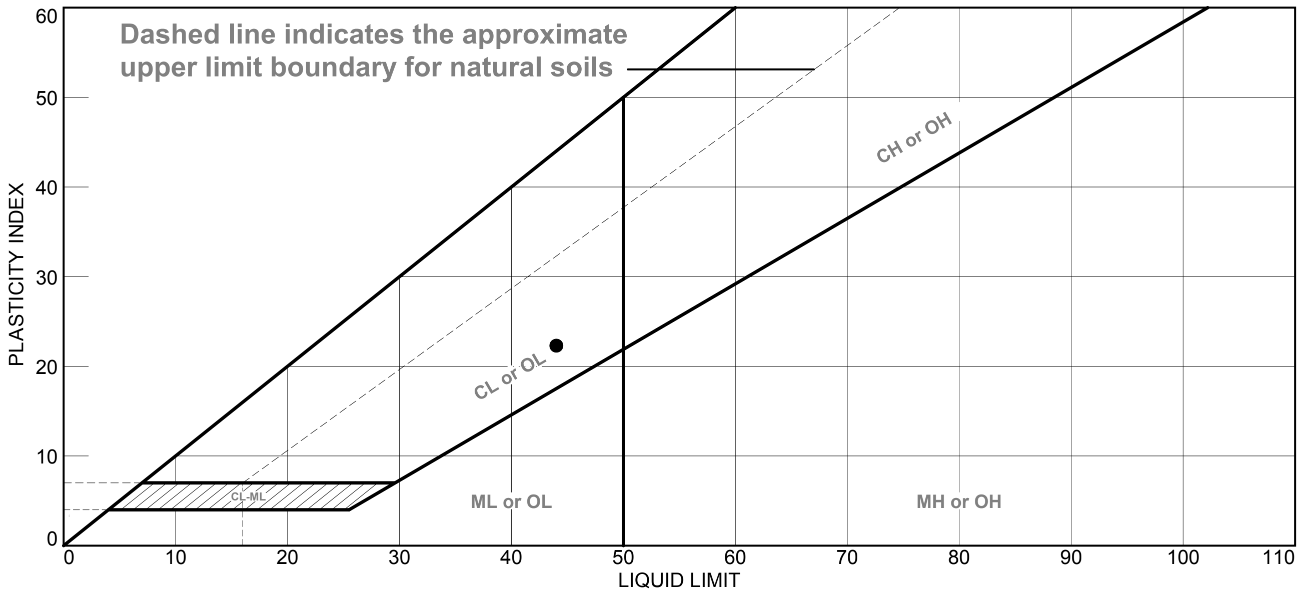
●Moisture Content: 28.9%

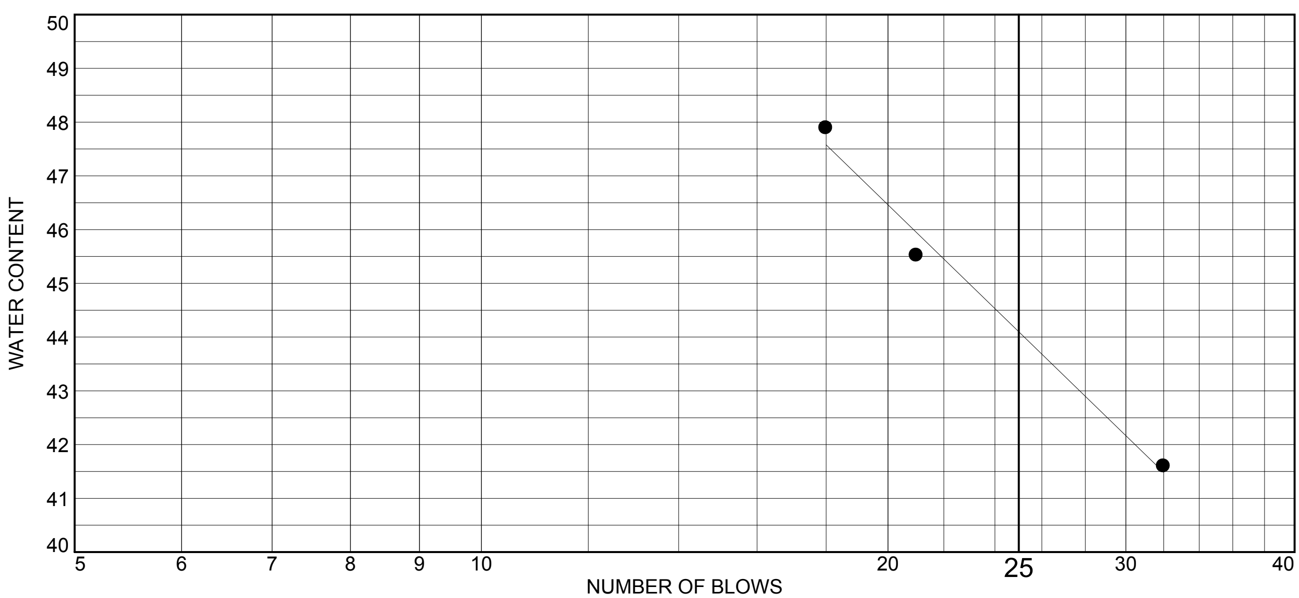
Lab No. 15395-18

Tested By: JJB **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	44.1	21.9	22.2		94.8	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-121

Sample Number: 7D **Depth:** 29'-31'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

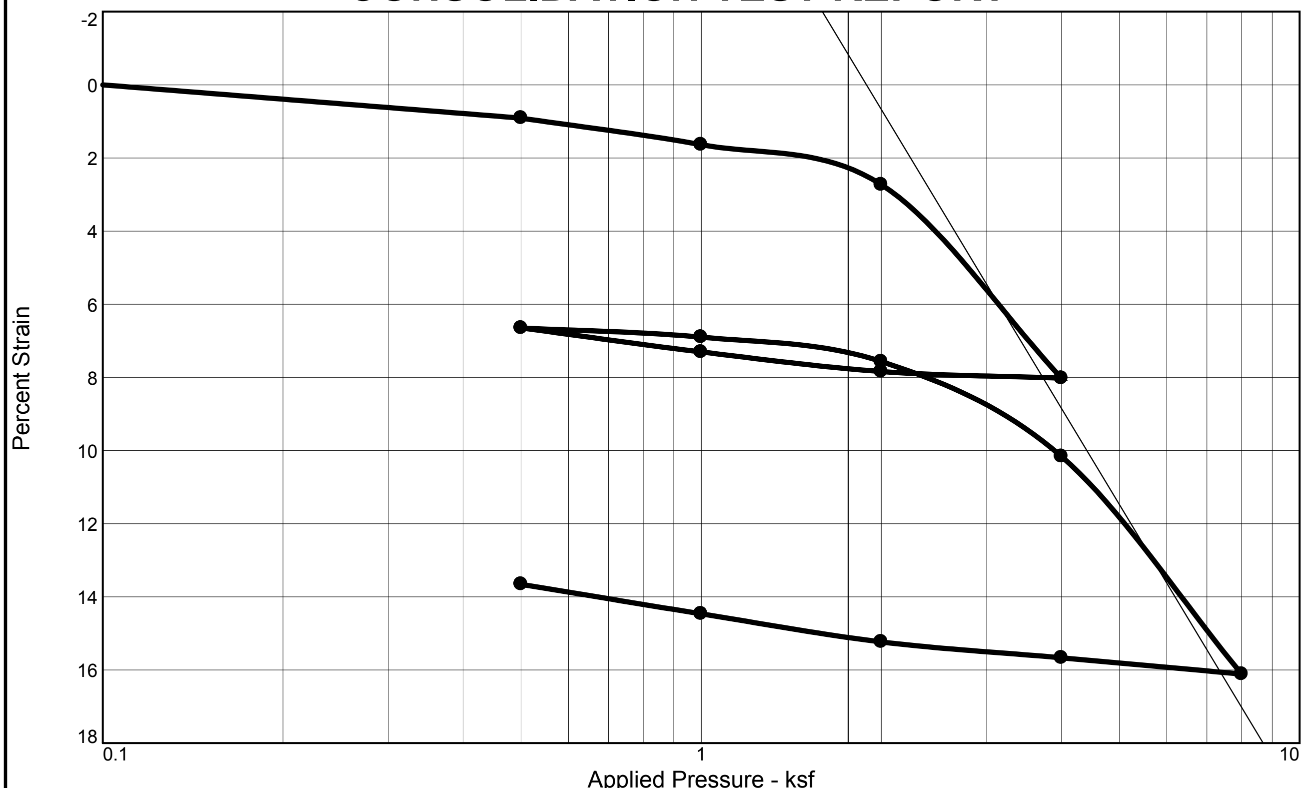
●Moisture Content: 36.9%

Lab No. 15395-19

Tested By: JJB **Checked By:** MTG

MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	1.839		8	1.00	4.409		15	0.50	0.274	
2	1.00	3.480		9	2.00	1.893	0.001				
3	2.00	3.702		10	4.00	0.102	0.008				
4	4.00	0.321		11	8.00	0.237					
5	2.00	7.978		12	4.00	4.033					
6	1.00	2.401		13	2.00	1.707					
7	0.50	0.822		14	1.00	0.676					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
101.2 %	45.3 %	76.9	44.5	21.0	2.70		2.4	0.60	0.17	1.208

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME

Location: HB-PAMI-121 **Depth:** 34'-36' **Sample Number:** U-2

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:
Square Time Cv Values
2KSF-2.082 ft^2/day
4KSF-0.672 ft^2/day

Lab No. 15394-03

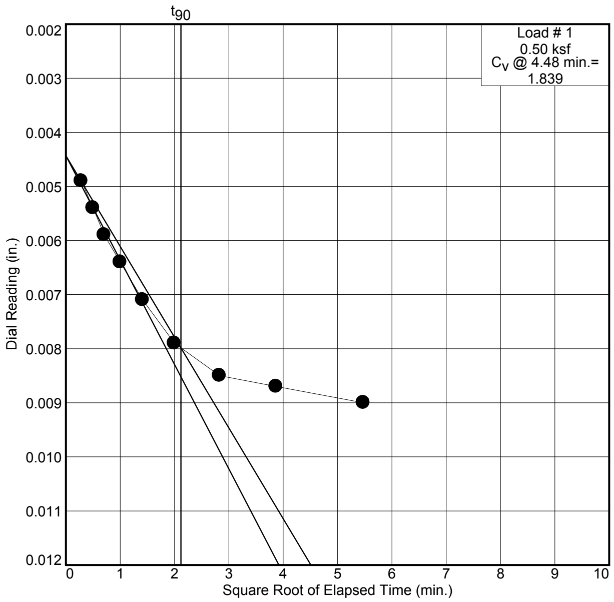
Tested By: JRF **Checked By:** MTG

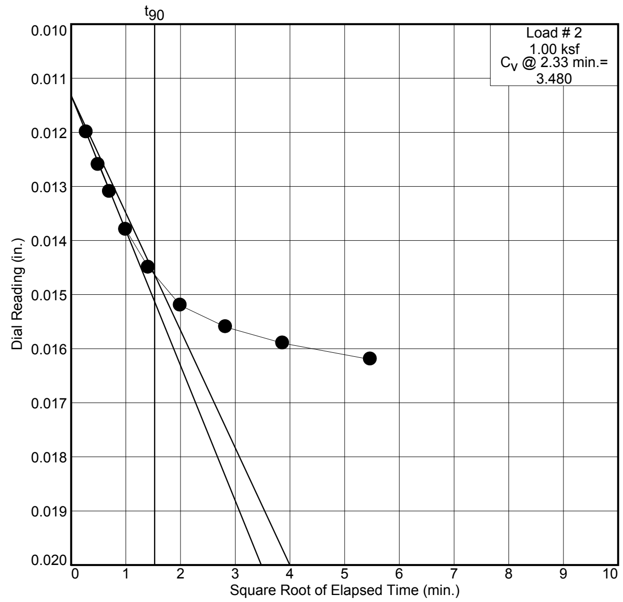
MTG

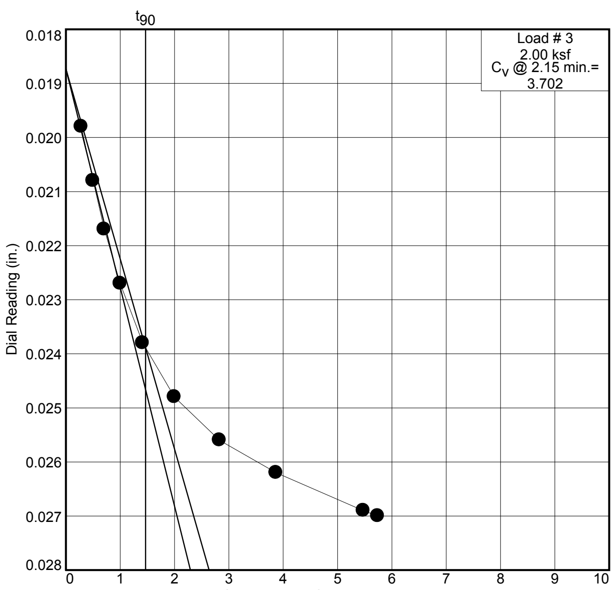
Dial Reading vs. Time

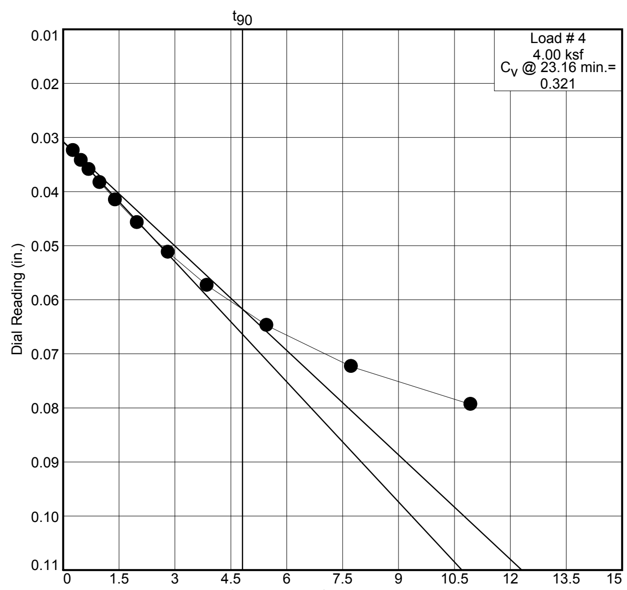
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-121 Depth: 34'-36' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

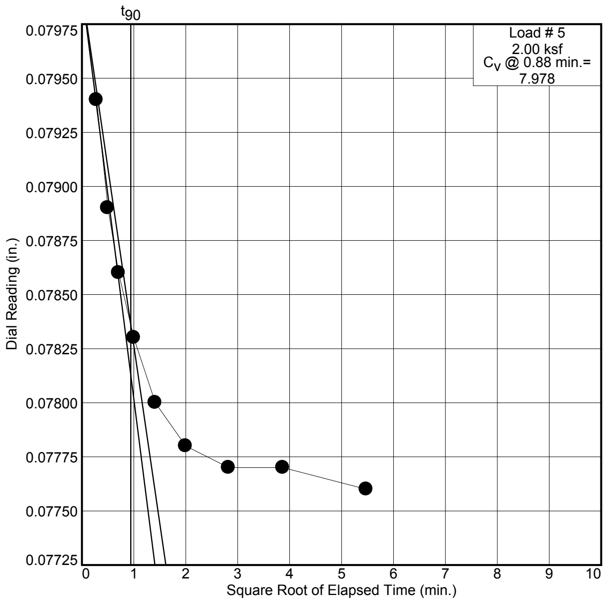
Lab No. 15394-

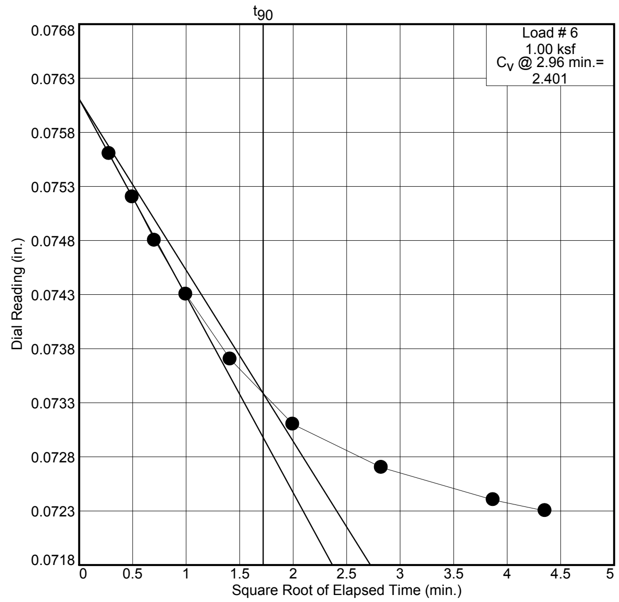
MTG

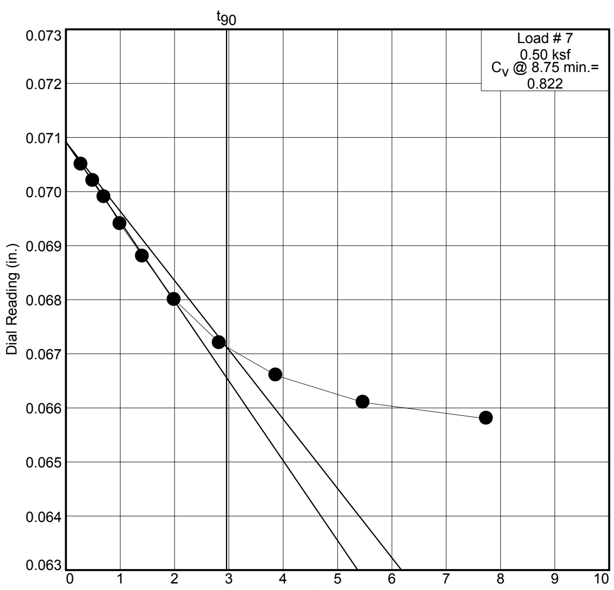
Dial Reading vs. Time

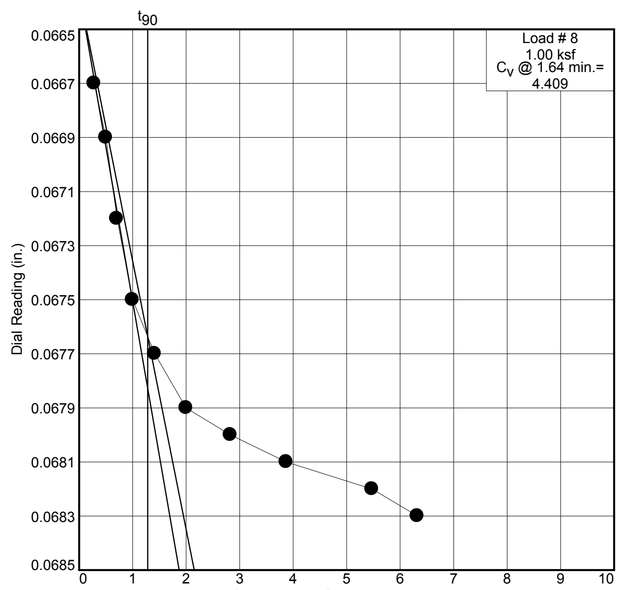
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-121 Depth: 34'-36' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

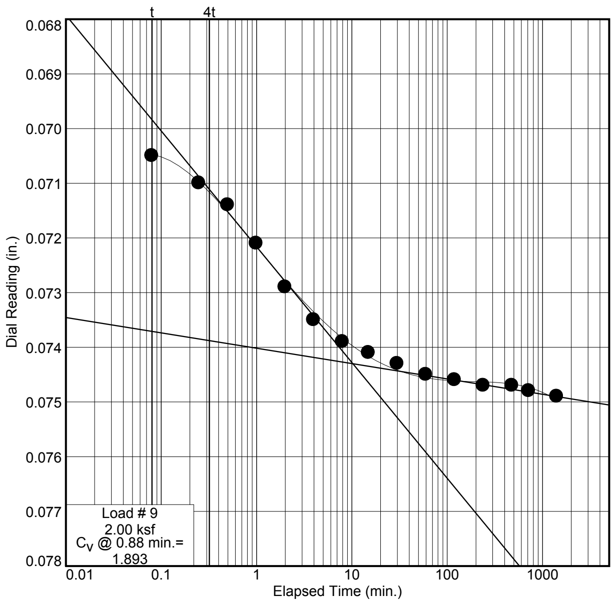
Lab No. 15394-

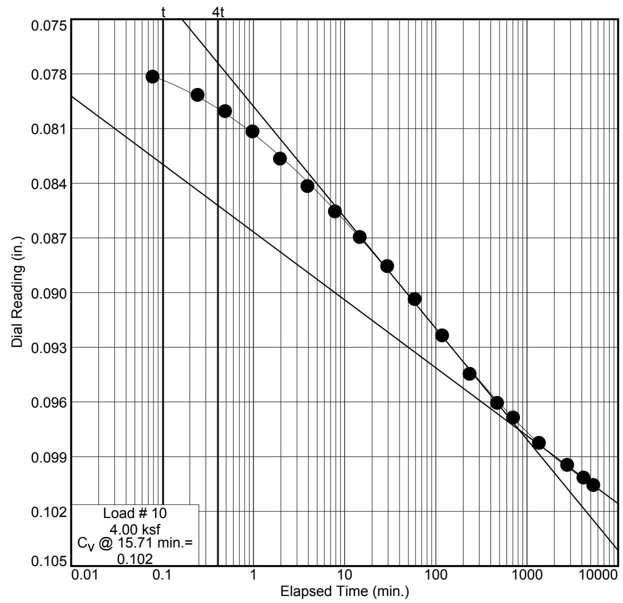
MTG

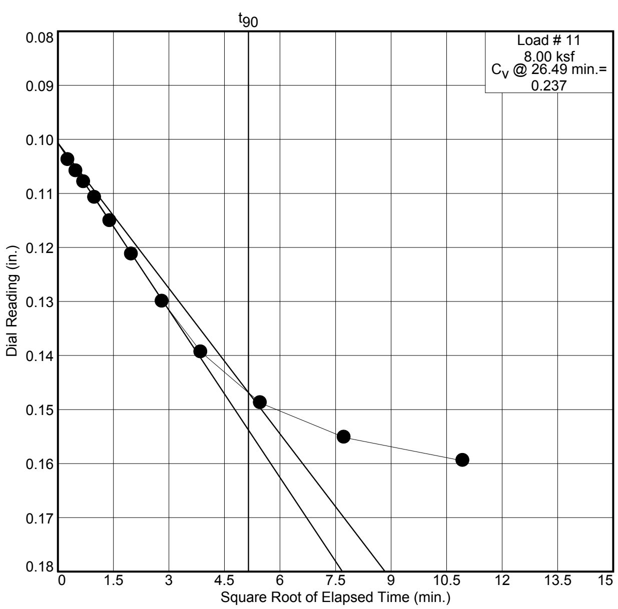
Dial Reading vs. Time

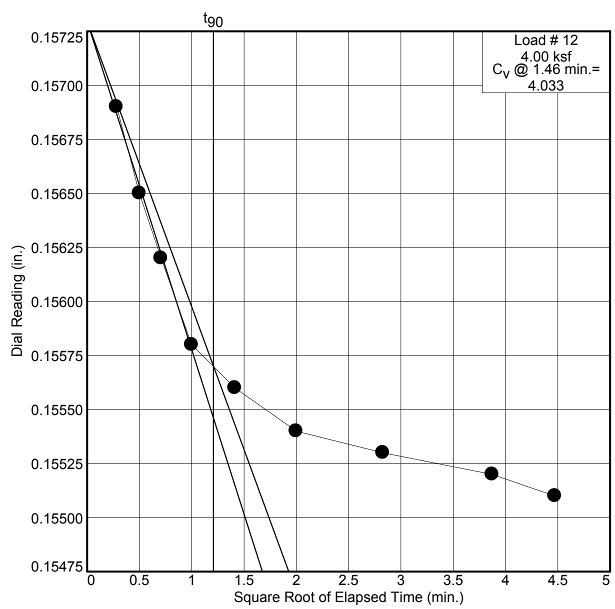
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-121 Depth: 34'-36' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

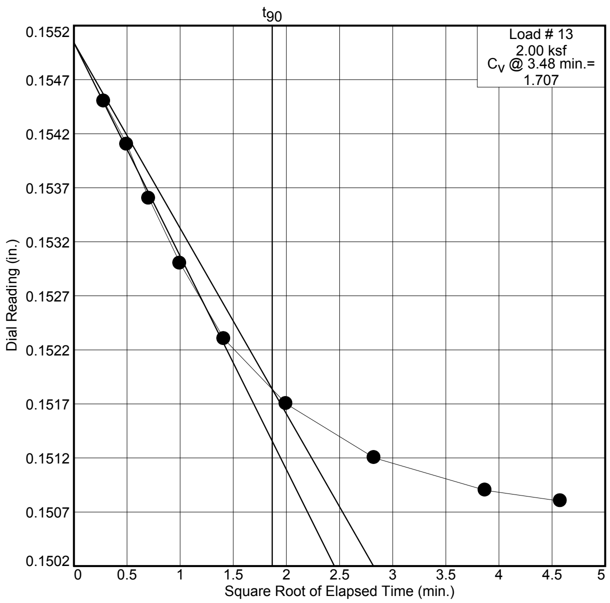
Lab No. 15394-

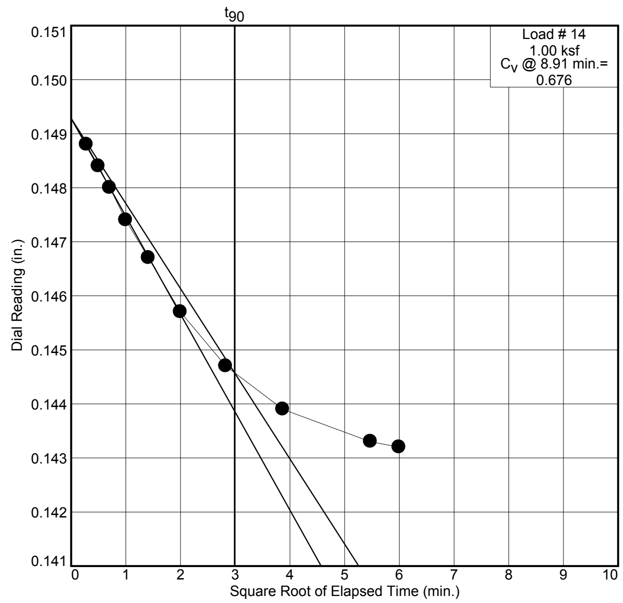
MTG

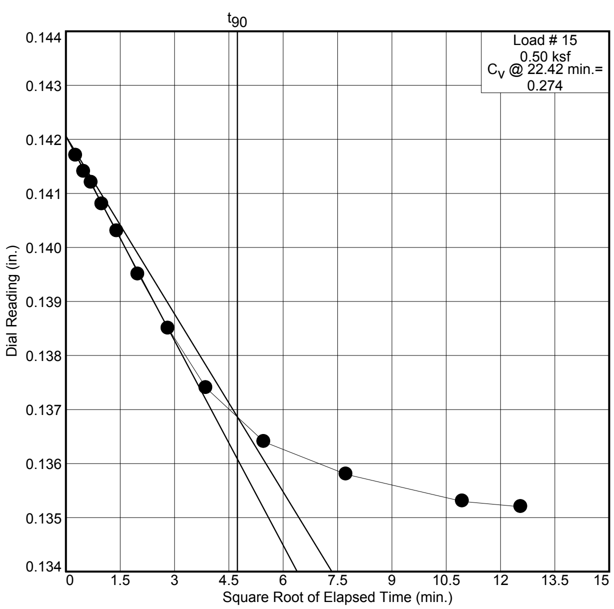
Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-121 Depth: 34'-36' Sample Number: U-2







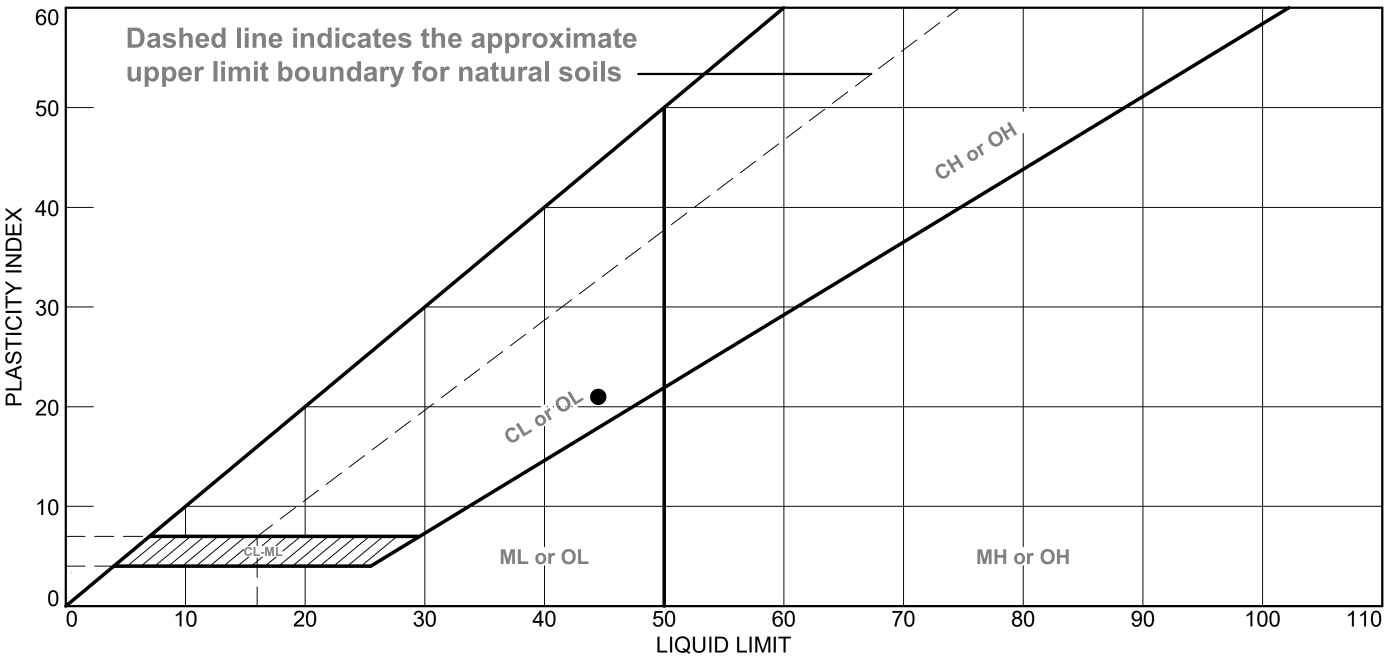
R.W. Gillespie & Associates, Inc.

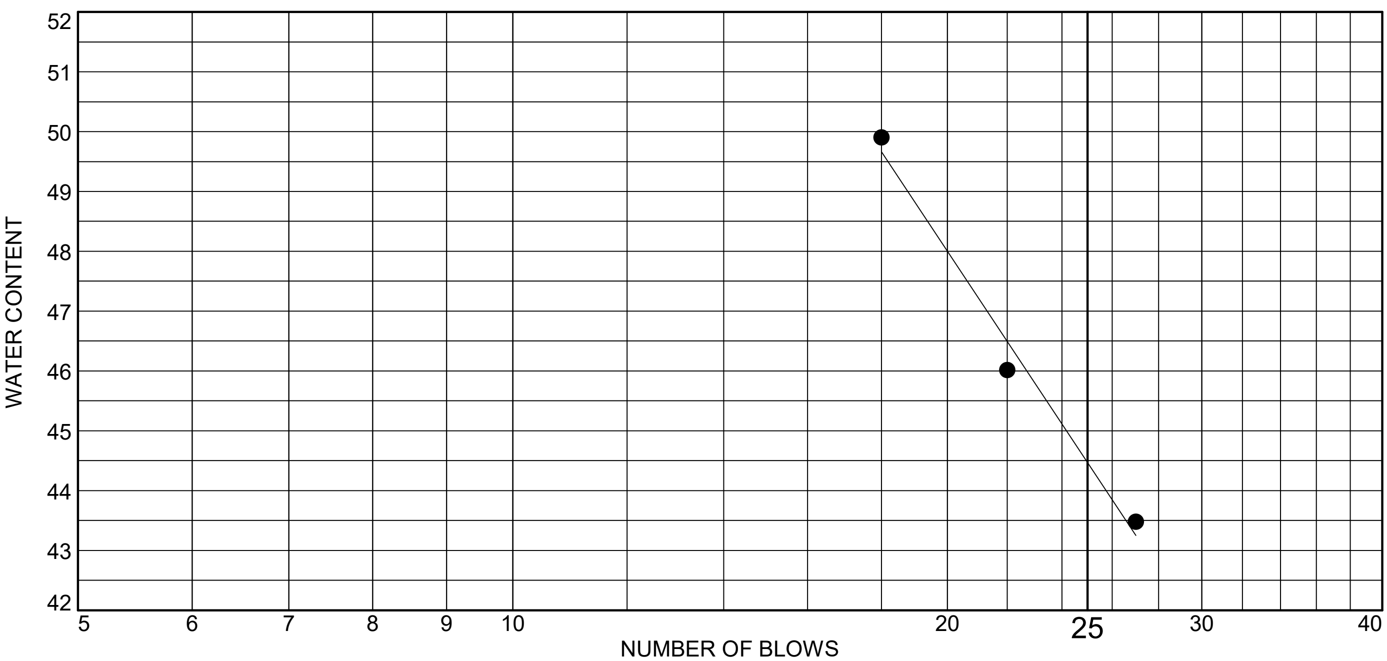
Biddeford, Maine

Lab No. 15394-

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	44.5	23.5	21.0			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-121

Sample Number: U-2 **Depth:** 34'-36'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

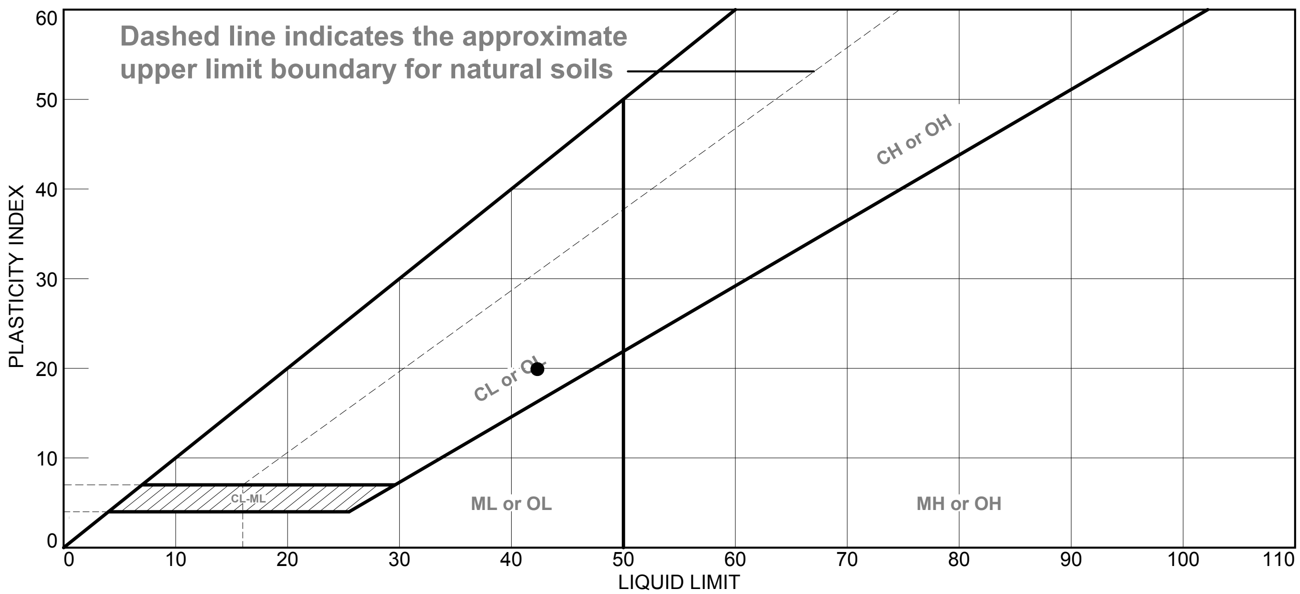
● Moisture Content: 45.3%

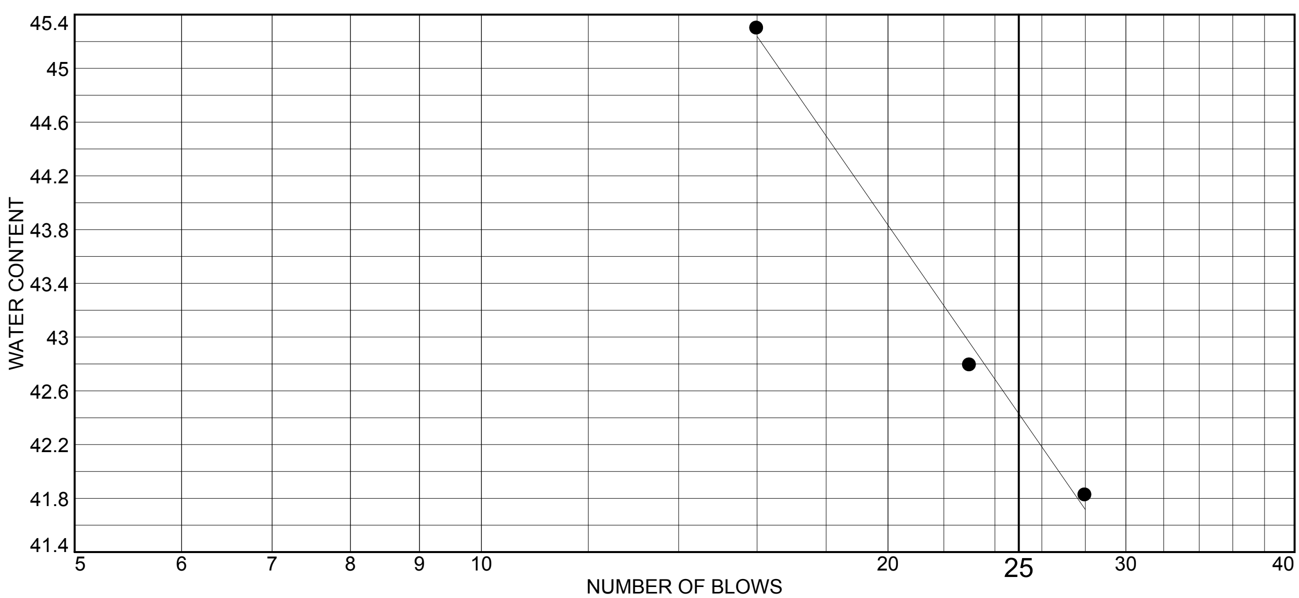
Lab No. 15394-03

MTG

Tested By: AGS **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	42.4	22.6	19.8		94.3	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-122

Sample Number: 6D **Depth:** 24'-26'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

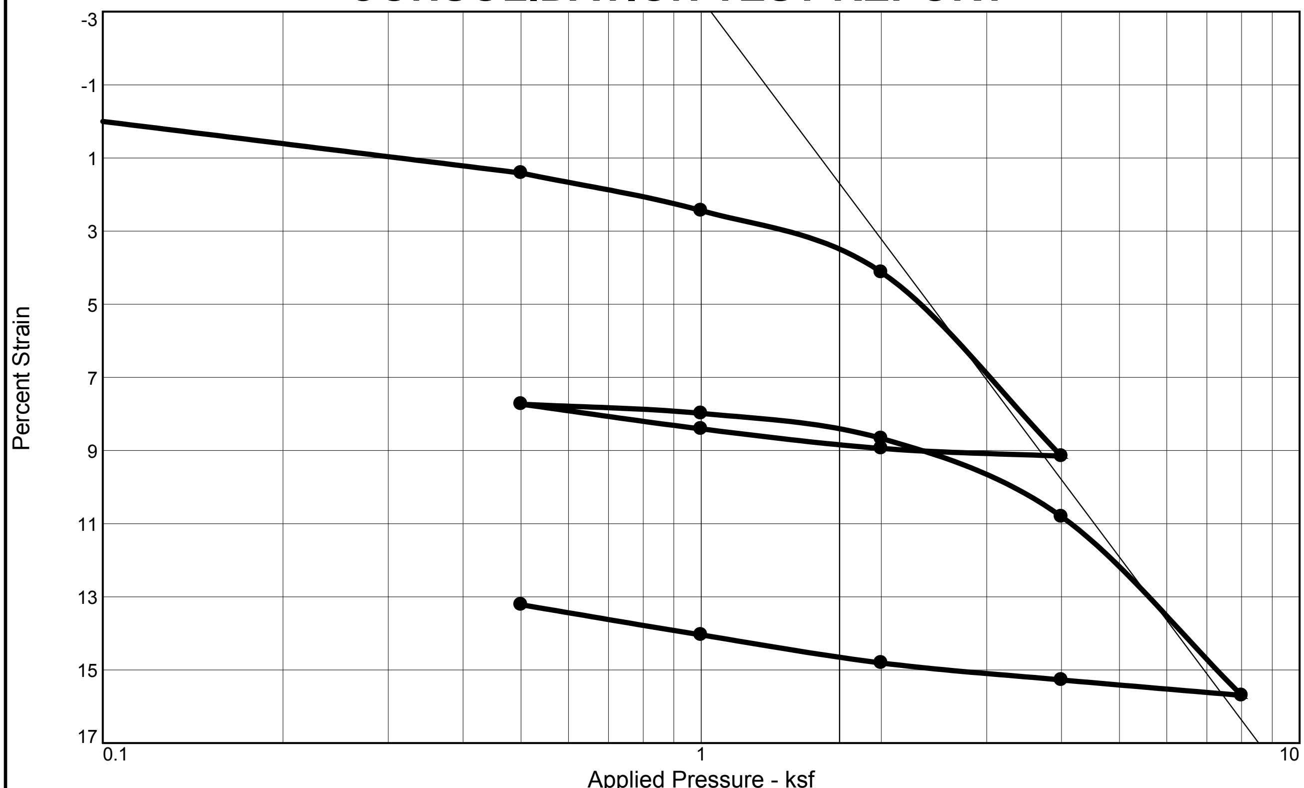
●Moisture Content: 30.8%

Lab No. 15395-20

Tested By: JJB **Checked By:** MTG

MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	1.571		8	1.00	3.783		15	0.50	0.278	
2	1.00	1.705		9	2.00	2.263	0.001				
3	2.00	1.532		10	4.00	0.368	0.006				
4	4.00	0.362		11	8.00	0.254					
5	2.00	4.038		12	4.00	8.143					
6	1.00	1.778		13	2.00	1.812					
7	0.50	0.758		14	1.00	0.651					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
99.1 %	42.5 %	79.3	44.1	22.0	2.7		2.1	0.47	0.14	1.157

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME

Location: B-PAMI-122 **Depth:** 34'-36' **Sample Number:** U-1

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:
Square Time Cv Values
2KSF 1.362 ft^2/day
4KSF 0.674 ft^2/day

Lab No. 15394-04

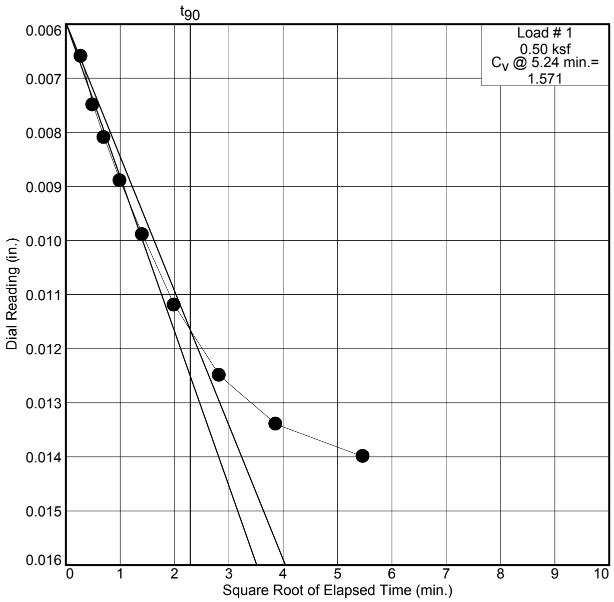
Tested By: JRF **Checked By:** MTG

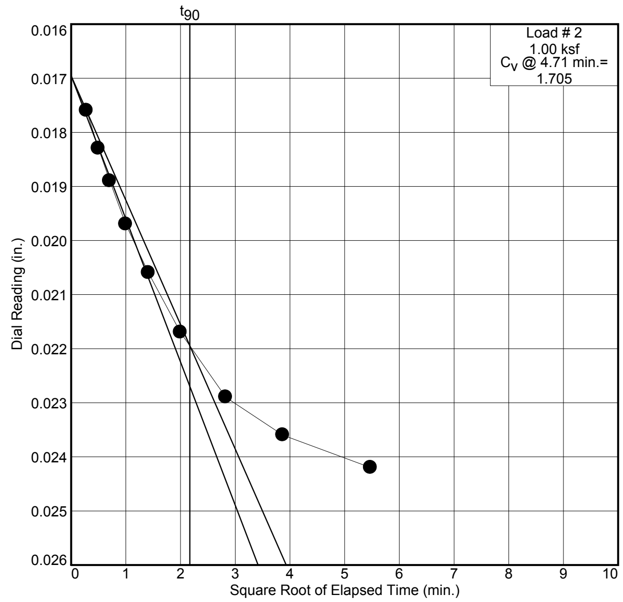
MTG

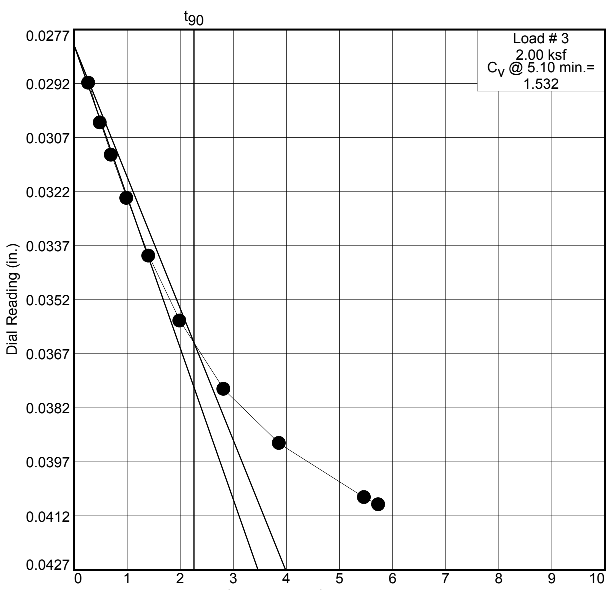
Dial Reading vs. Time

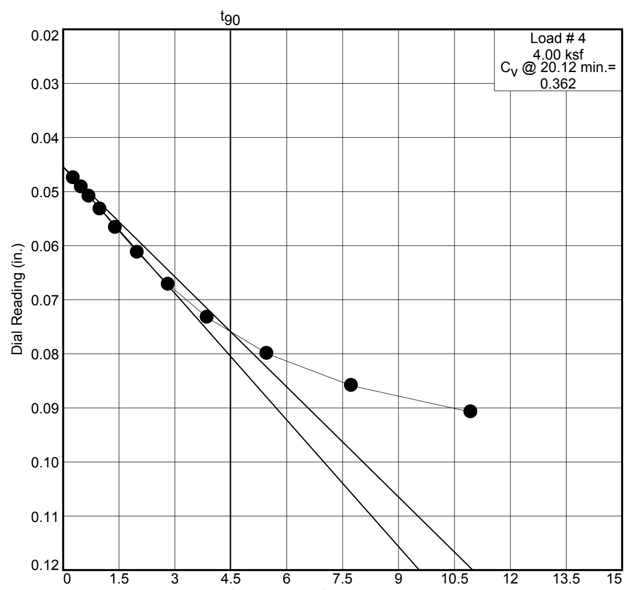
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: B-PAMI-122 Depth: 34'-36' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

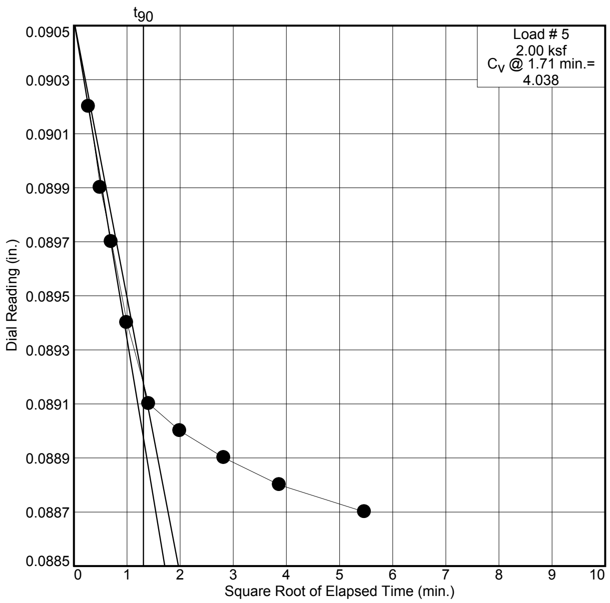
Lab No. 15394-

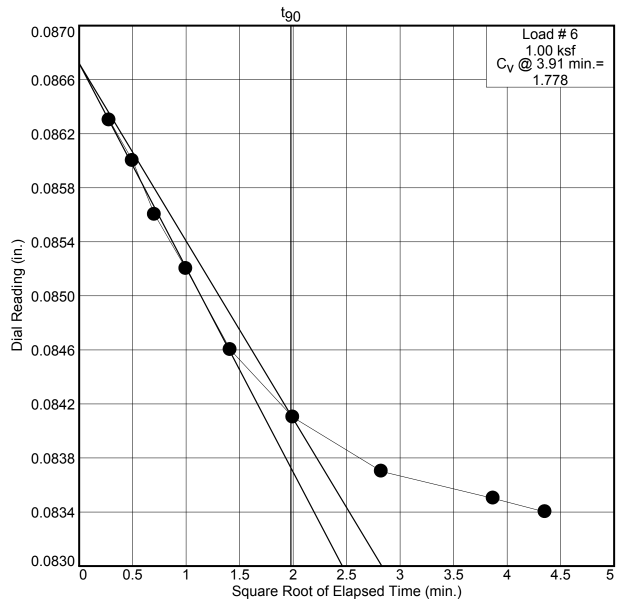
MTG

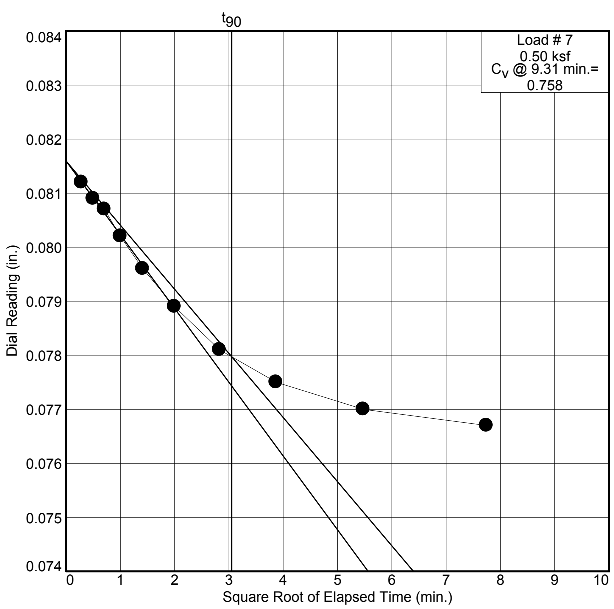
Dial Reading vs. Time

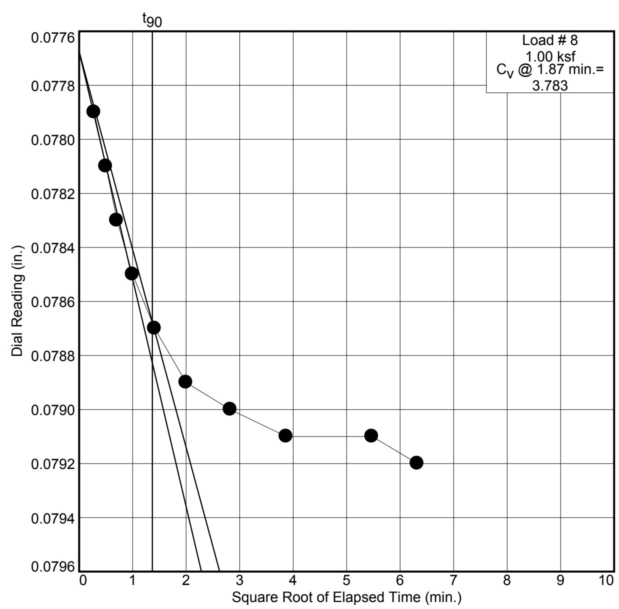
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: B-PAMI-122 Depth: 34'-36' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

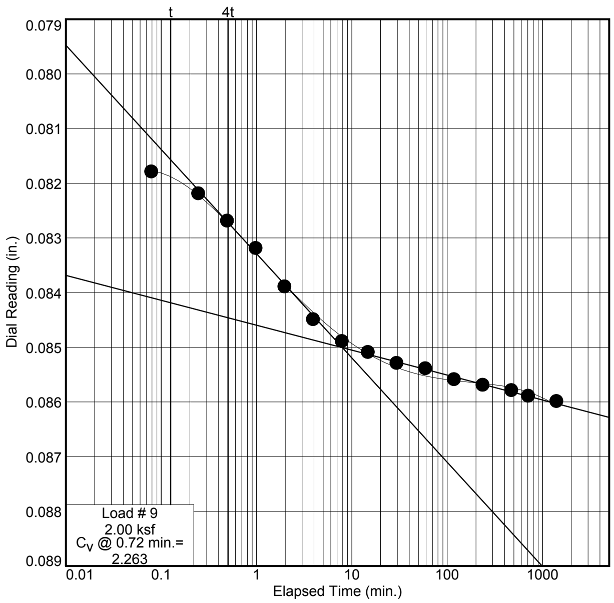
Lab No. 15394-

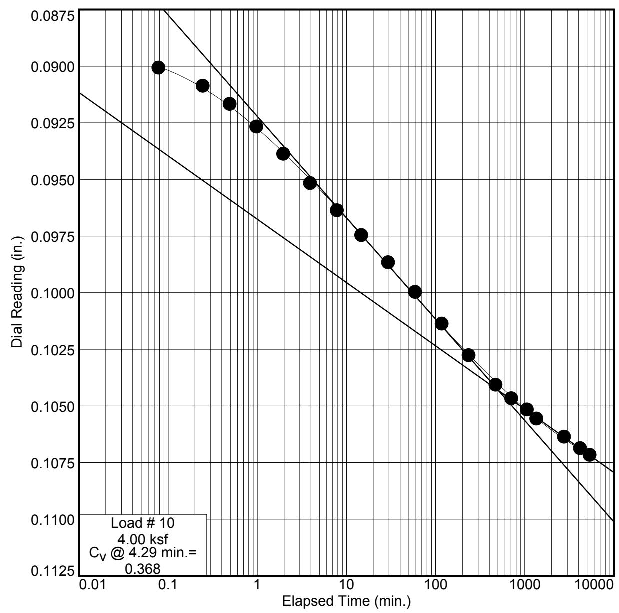
MTG

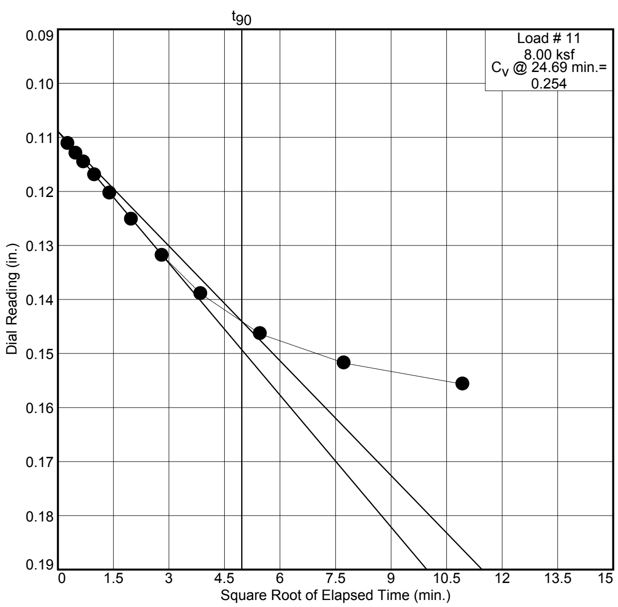
Dial Reading vs. Time

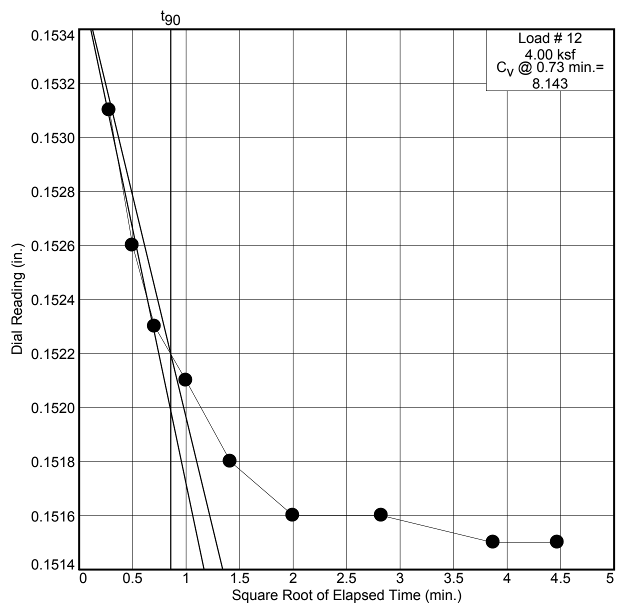
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: B-PAMI-122 Depth: 34'-36' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

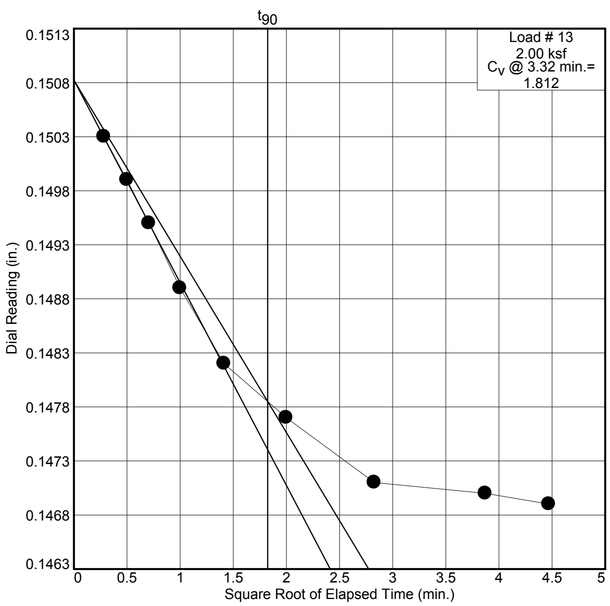
Lab No. 15394-

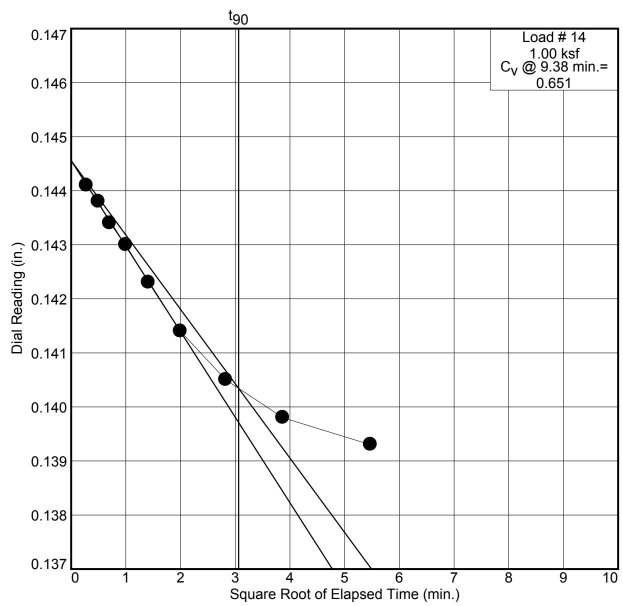
MTG

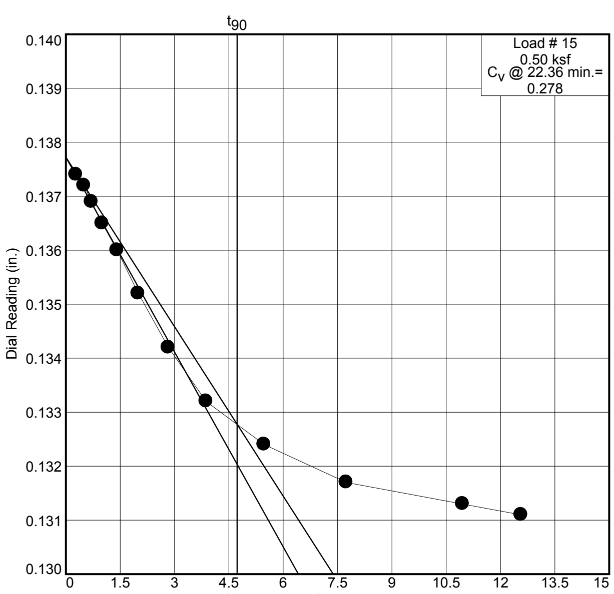
Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: B-PAMI-122 Depth: 34'-36' Sample Number: U-1







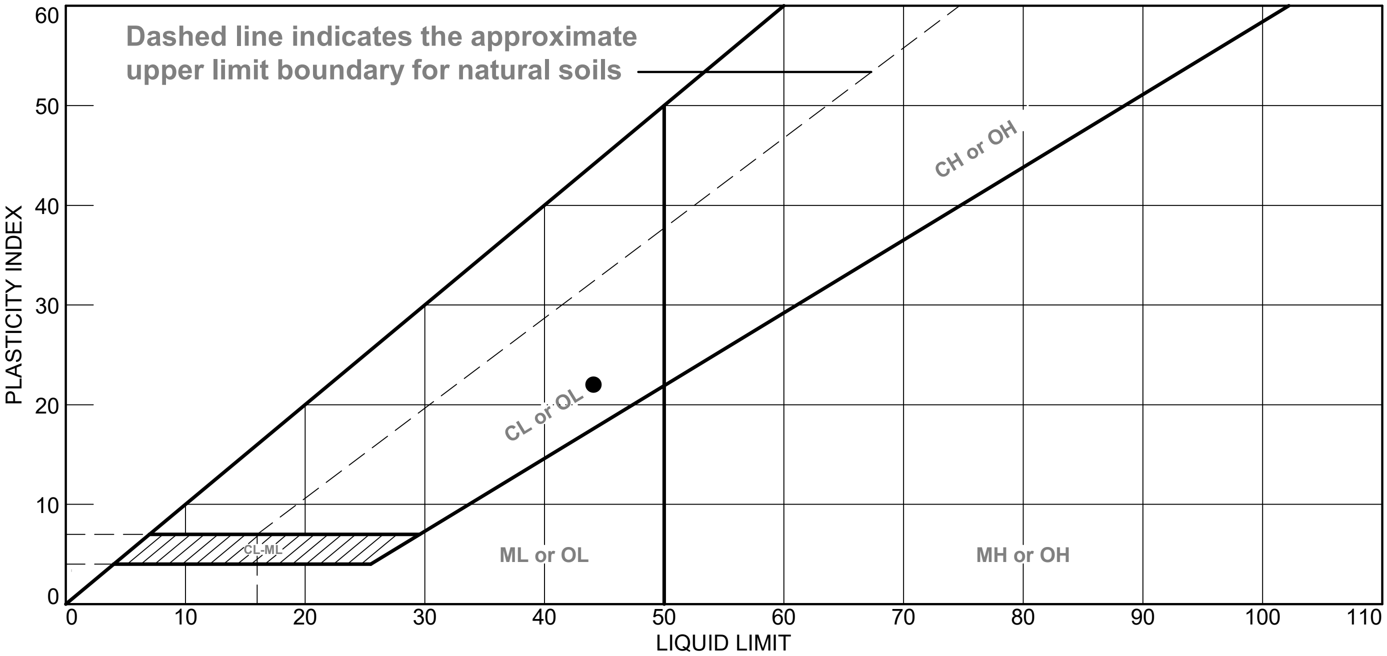
R.W. Gillespie & Associates, Inc.

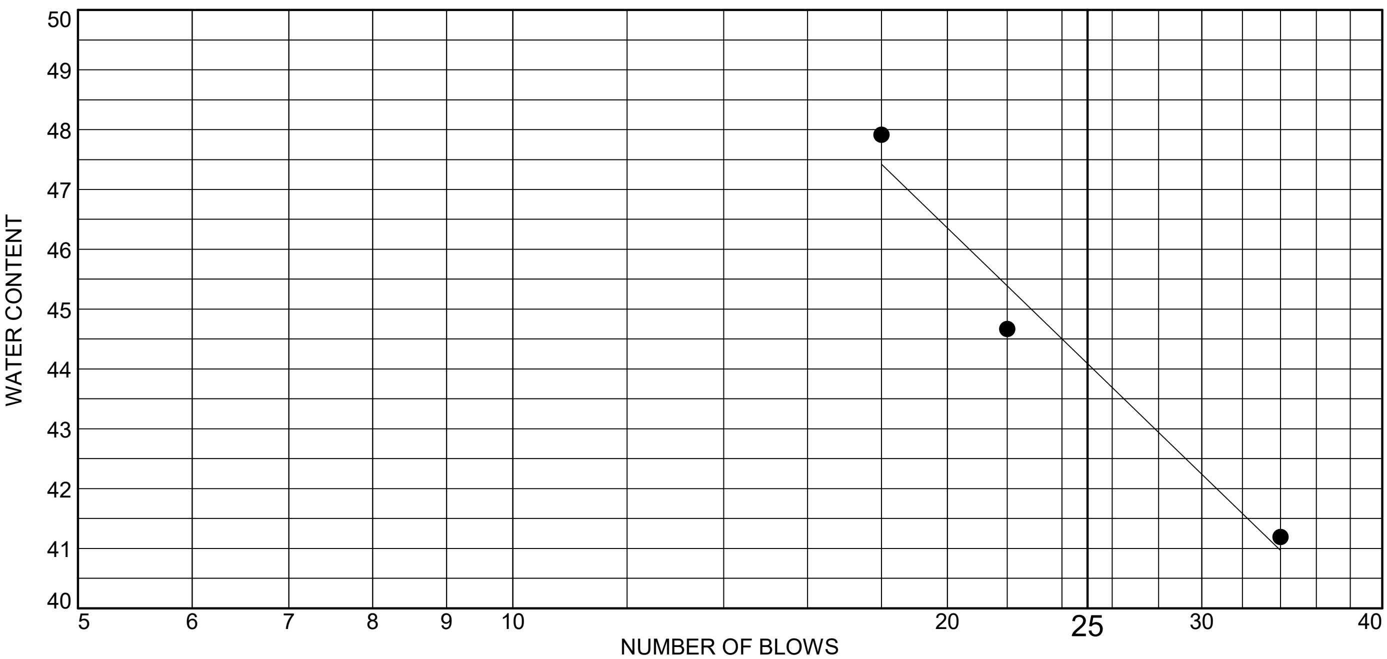
Biddeford, Maine

Lab No. 15394-

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	44.1	22.1	22.0			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: B-PAMI-122

Sample Number: U-1 **Depth:** 34'-36'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

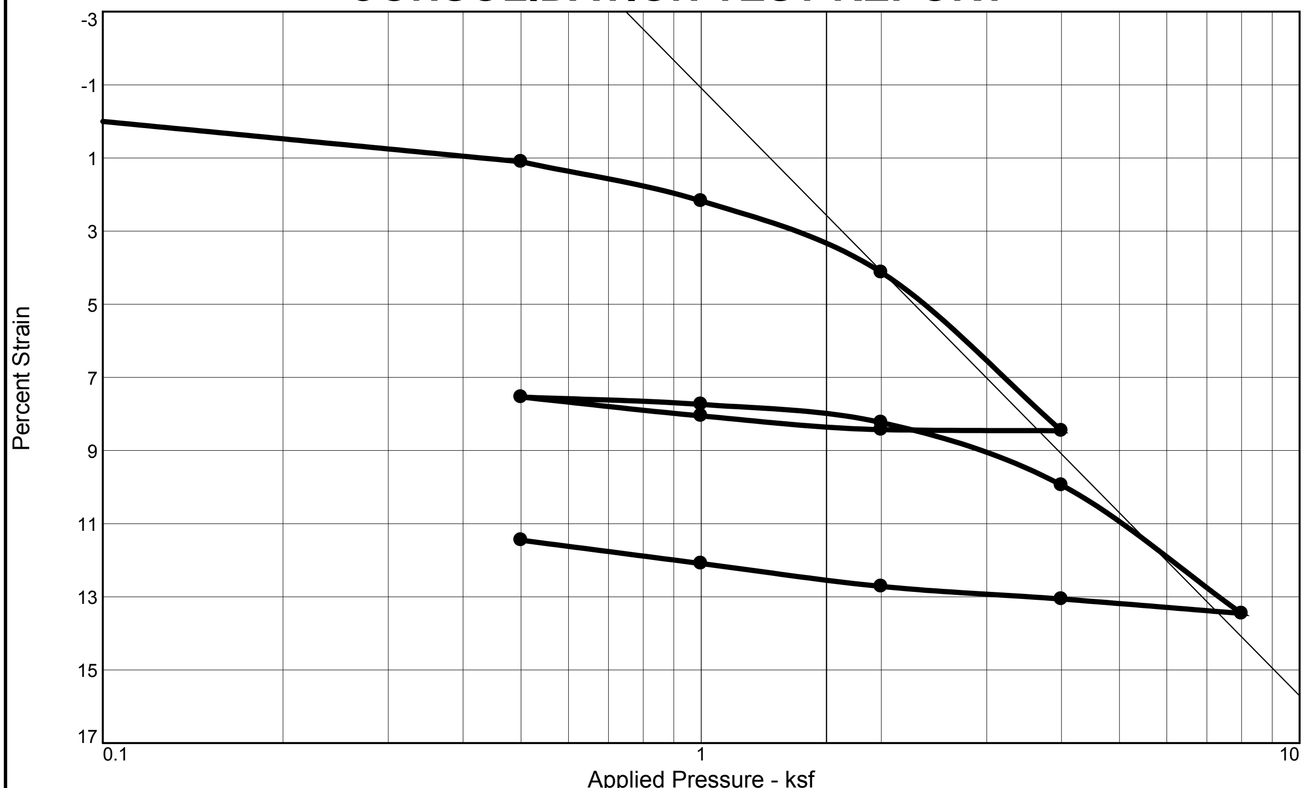
● Moisture Content: 43.9%

Lab No. 15394-04

Tested By: JJB **Checked By:** MTG

MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	0.861		8	1.00	1.754		15	0.50	0.356	
2	1.00	0.919		9	2.00	2.714	0.001				
3	2.00	0.748		10	4.00	0.108	0.005				
4	4.00	0.343		11	8.00	0.370					
5	2.00	2.901		12	4.00	6.003					
6	1.00	3.719		13	2.00	2.119					
7	0.50	0.910		14	1.00	0.940					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
103.0 %	41.2 %	80.7	41.0	20.1	2.7		1.8	0.35	0.10	1.081

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME

Location: HB-PAMI-123 **Depth:** 29'-31' **Sample Number:** U-1

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:
Square Time Cv Values
2KSF- 2.128 ft^2/day
4KSF- 1.320 ft^2/day

Lab No. 15394-05

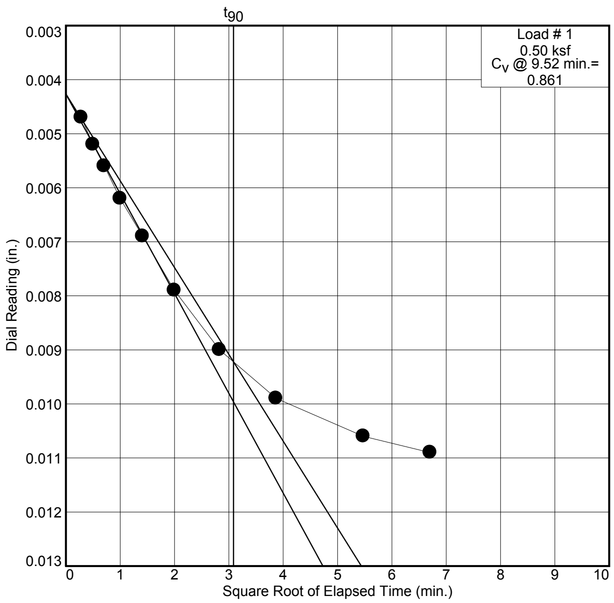
Tested By: JRF **Checked By:** MTG

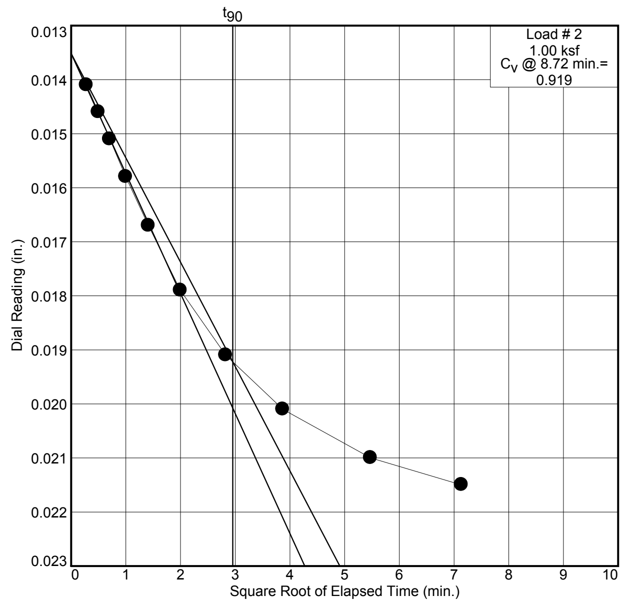
MTG

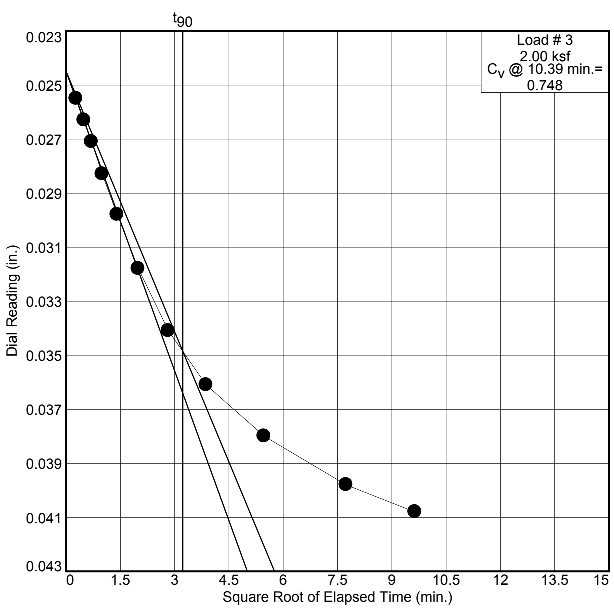
Dial Reading vs. Time

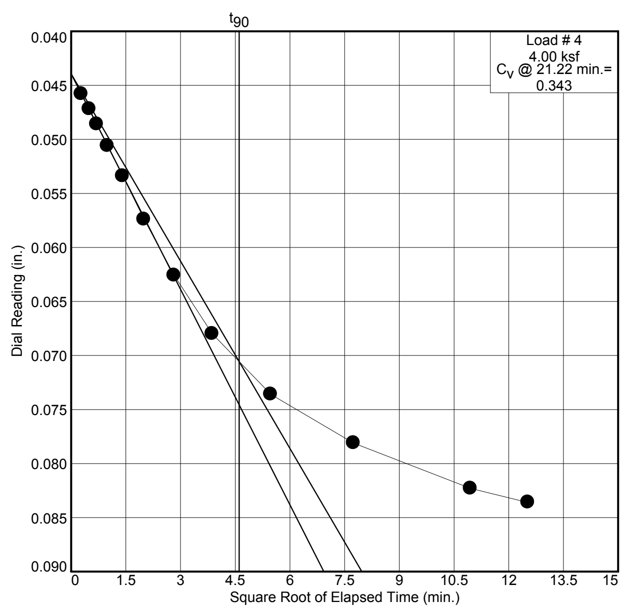
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-123 Depth: 29'-31' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

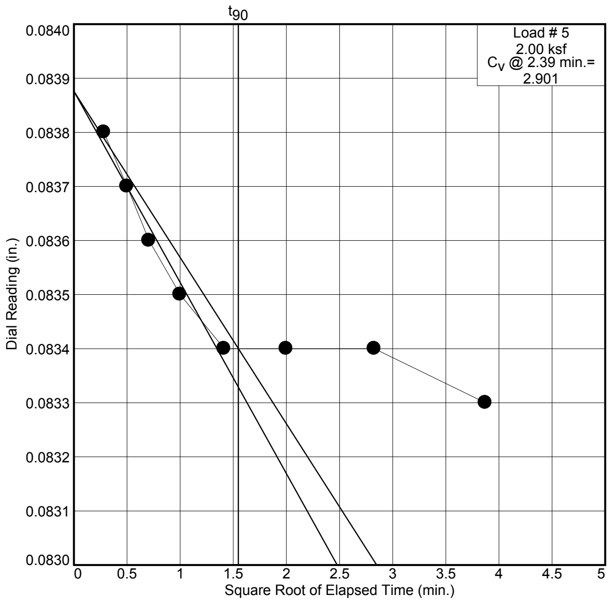
Lab No. 15394-

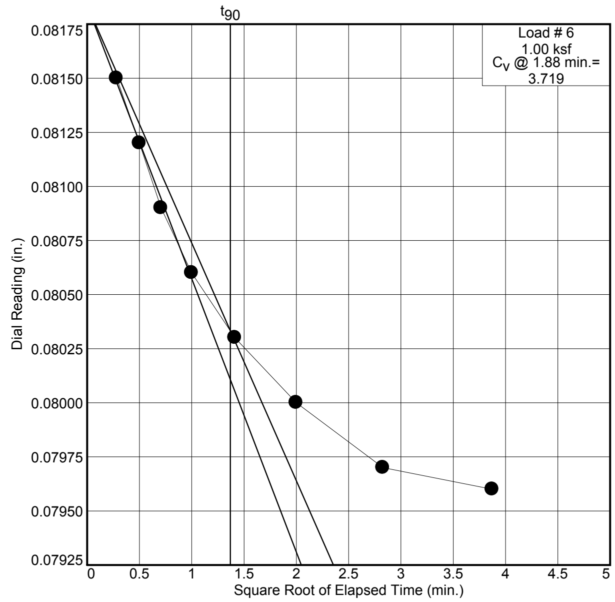
MTG

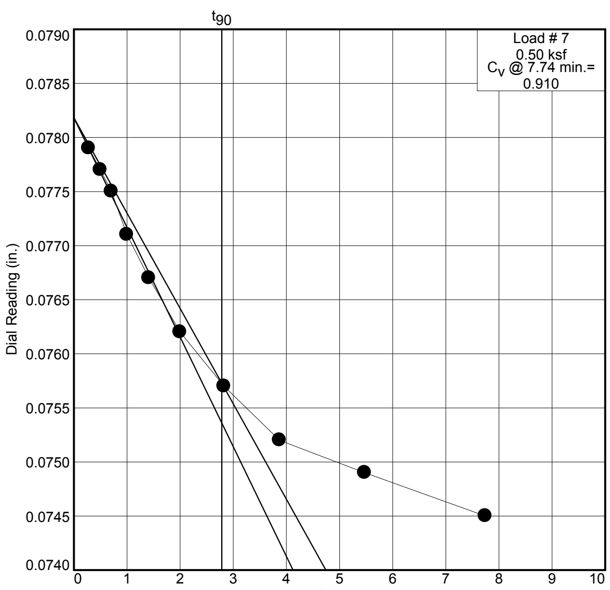
Dial Reading vs. Time

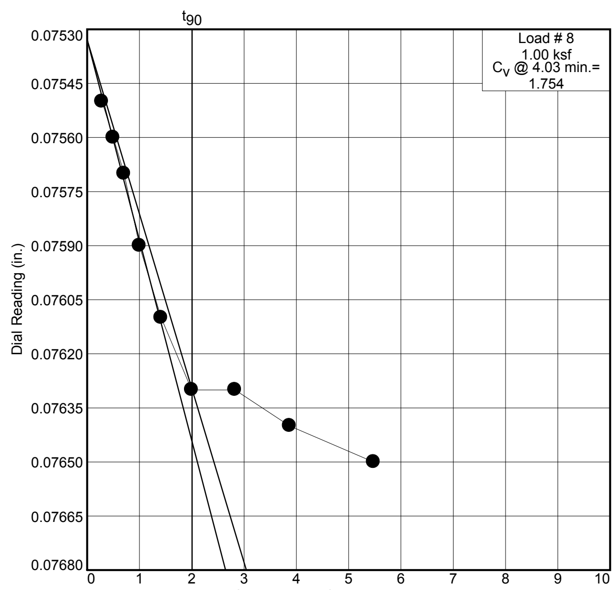
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-123 Depth: 29'-31' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

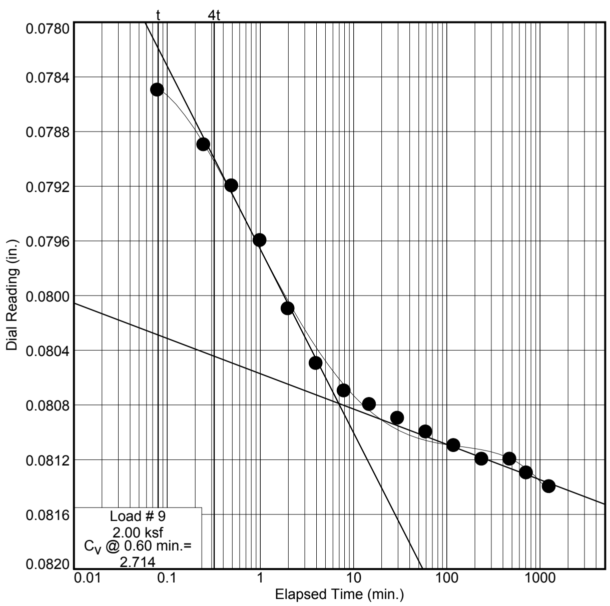
Lab No. 15394-

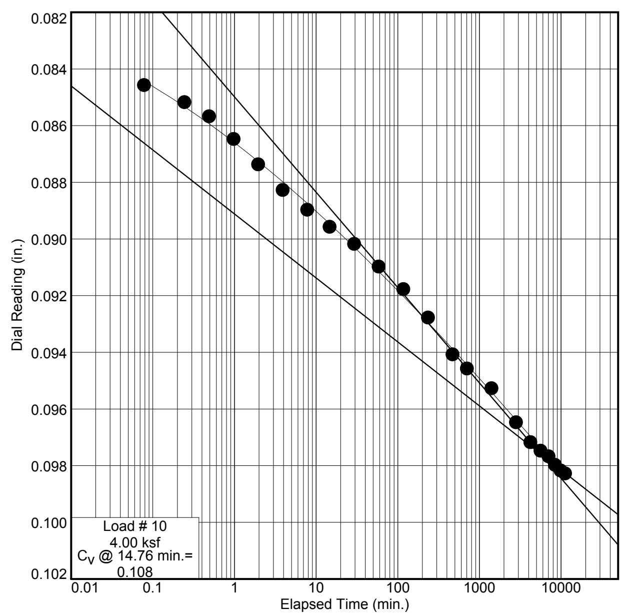
MTG

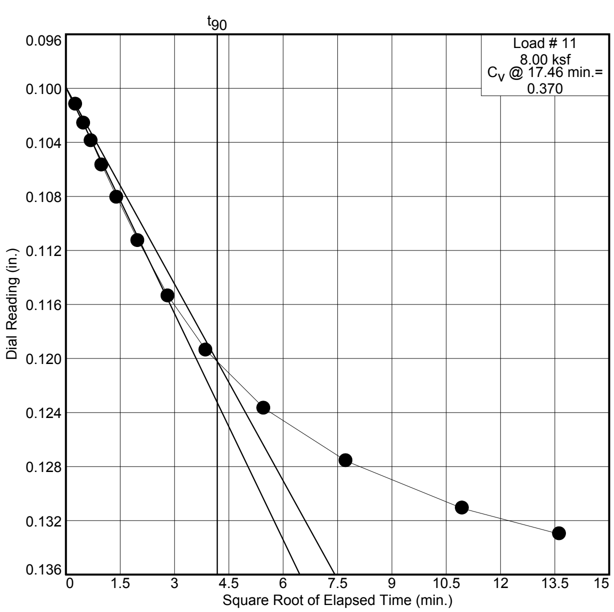
Dial Reading vs. Time

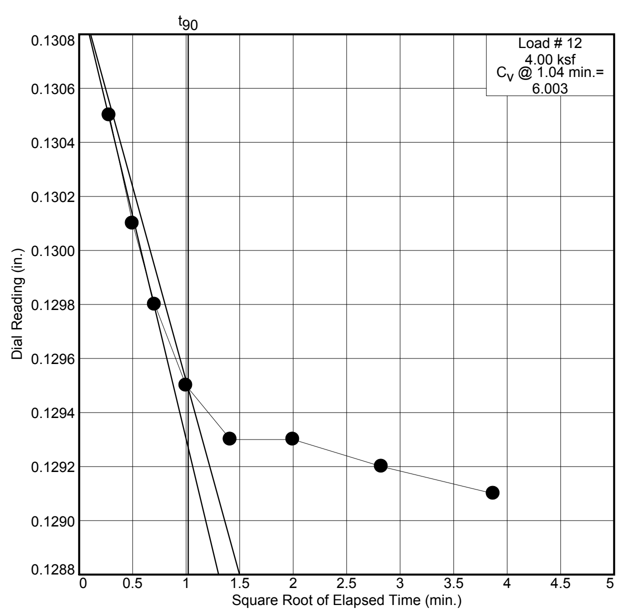
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-123 Depth: 29'-31' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

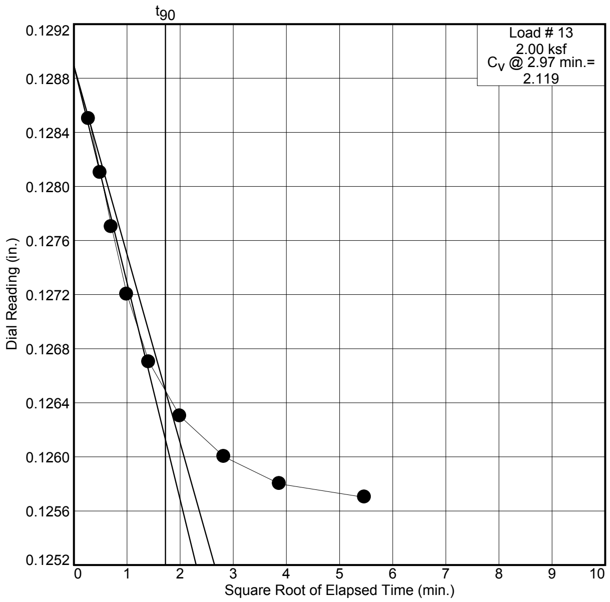
Lab No. 15394-

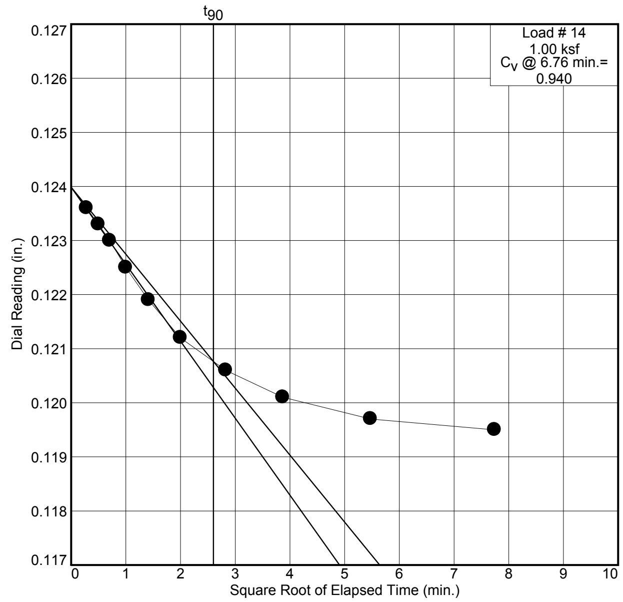
MTG

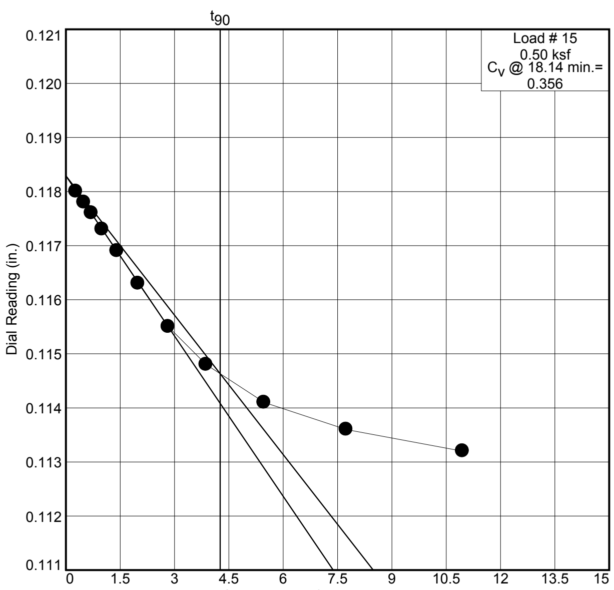
Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-123 Depth: 29'-31' Sample Number: U-1







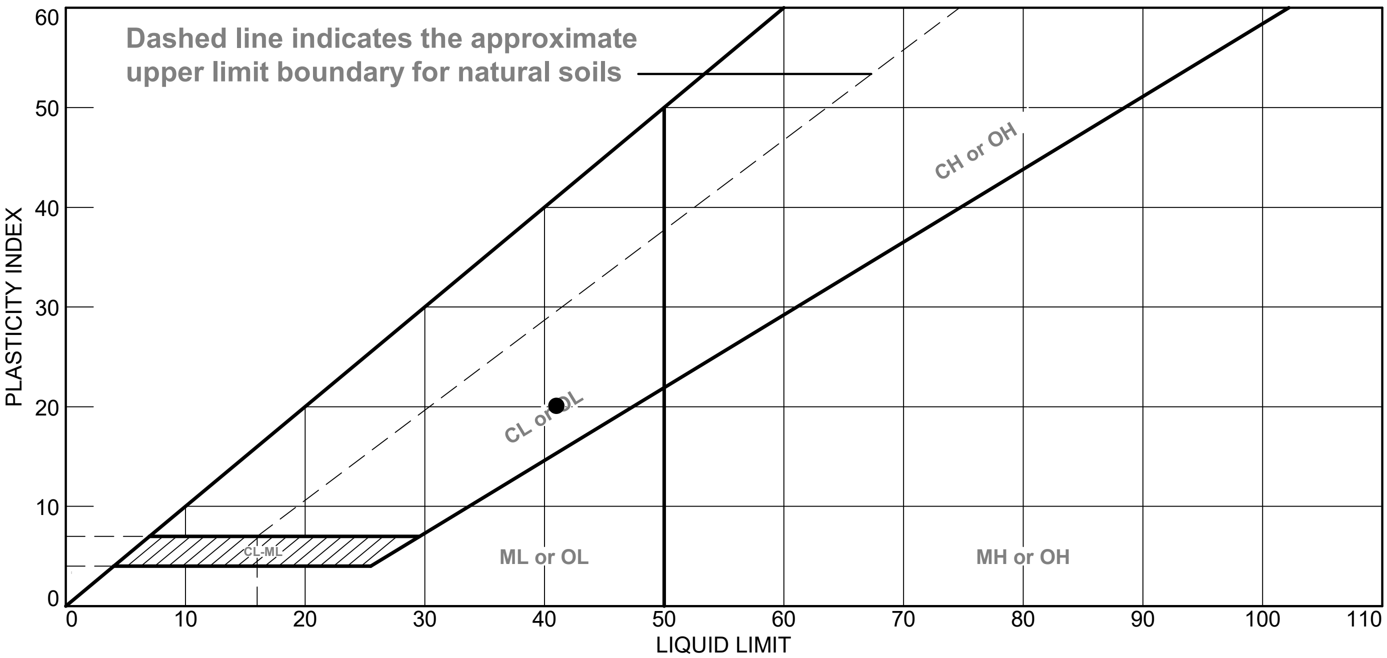
R.W. Gillespie & Associates, Inc.

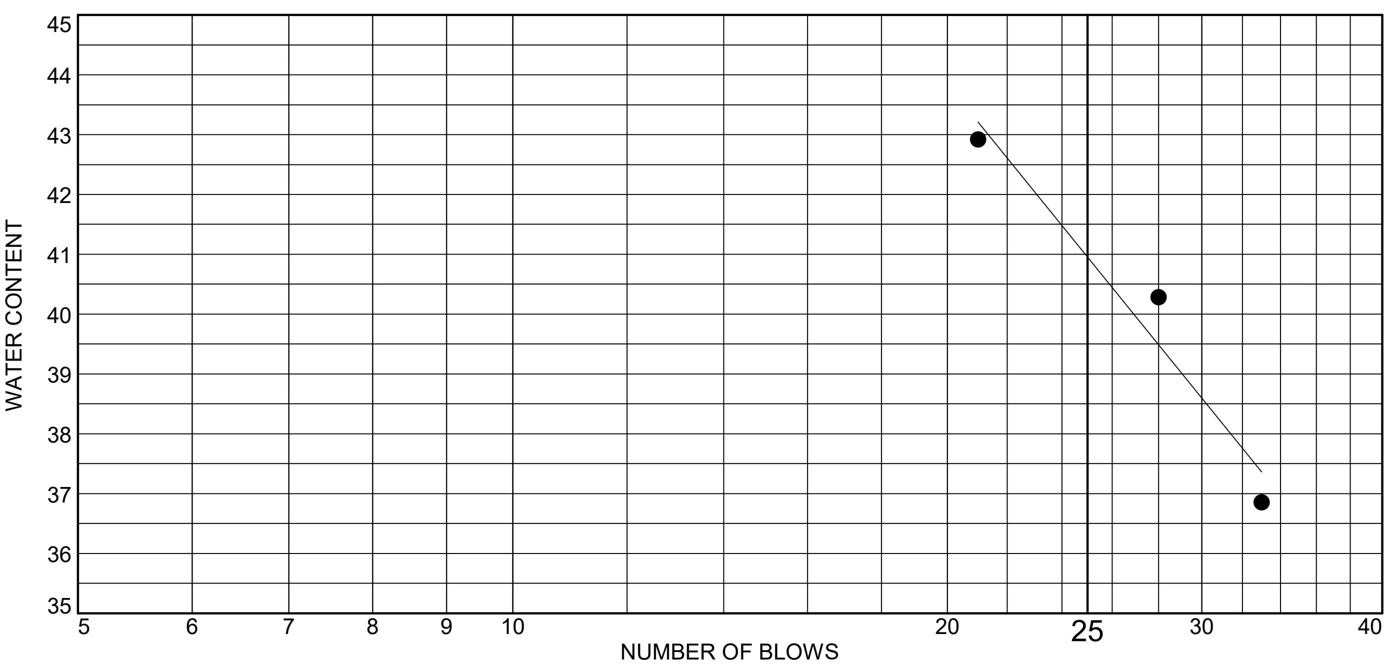
Biddeford, Maine

Lab No. 15394-

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	41.0	20.9	20.1			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-123

Sample Number: U-1 **Depth:** 29'-31'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

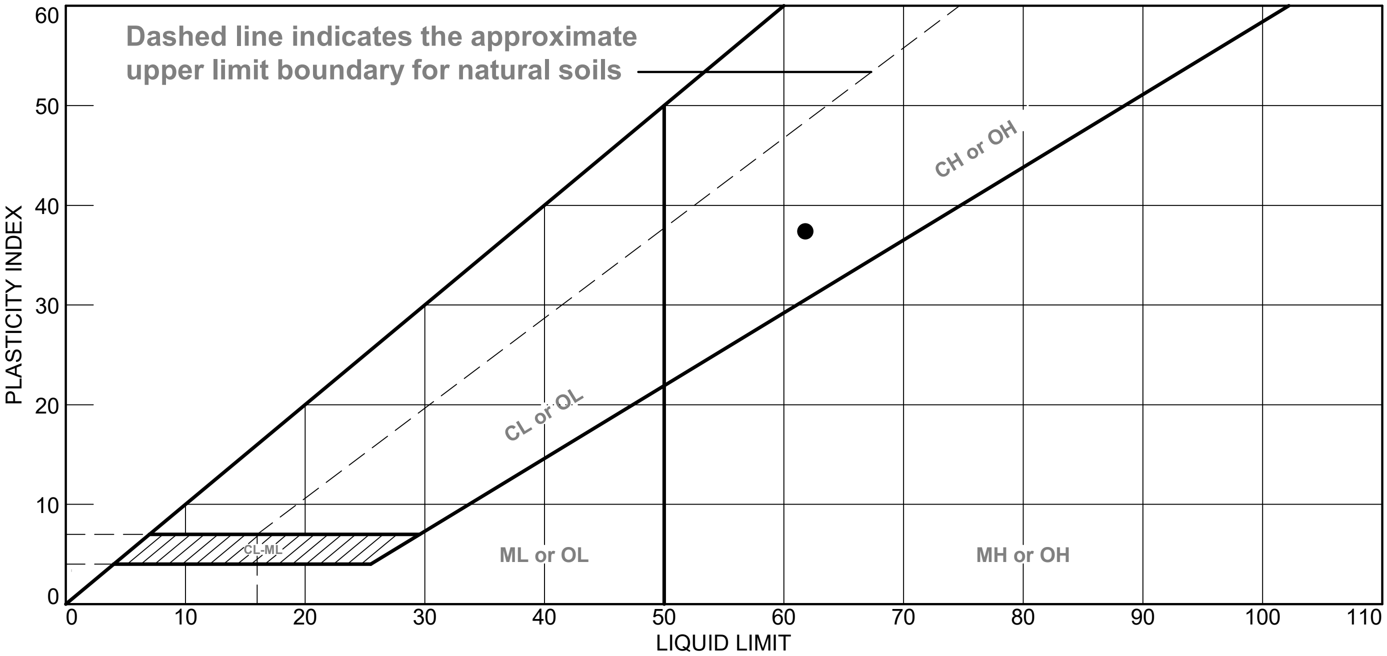
Remarks:

Lab No. 15394-05

Tested By: JJB **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fat Clay	61.8	24.4	37.4		98.1	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-123

Sample Number: 7D **Depth:** 31'-33'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

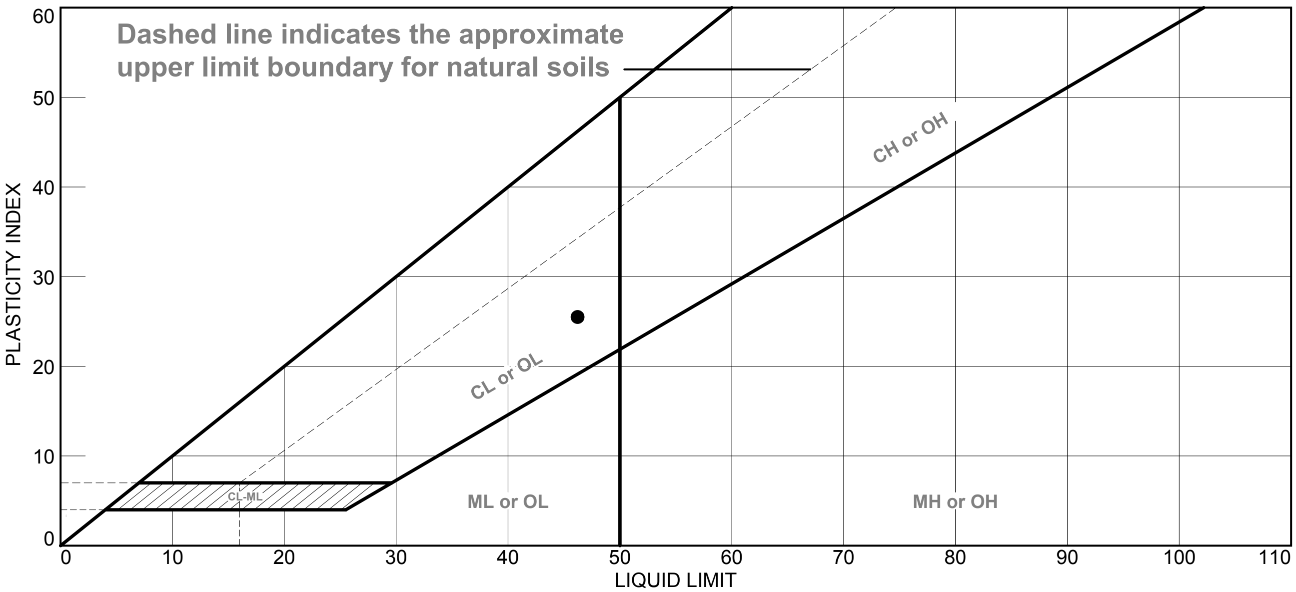
Remarks:

● Moisture Content: 49.2%

Lab No. 15395-21

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	46.3	20.9	25.4		97.1	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-126

Sample Number: 4D **Depth:** 14'-16'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

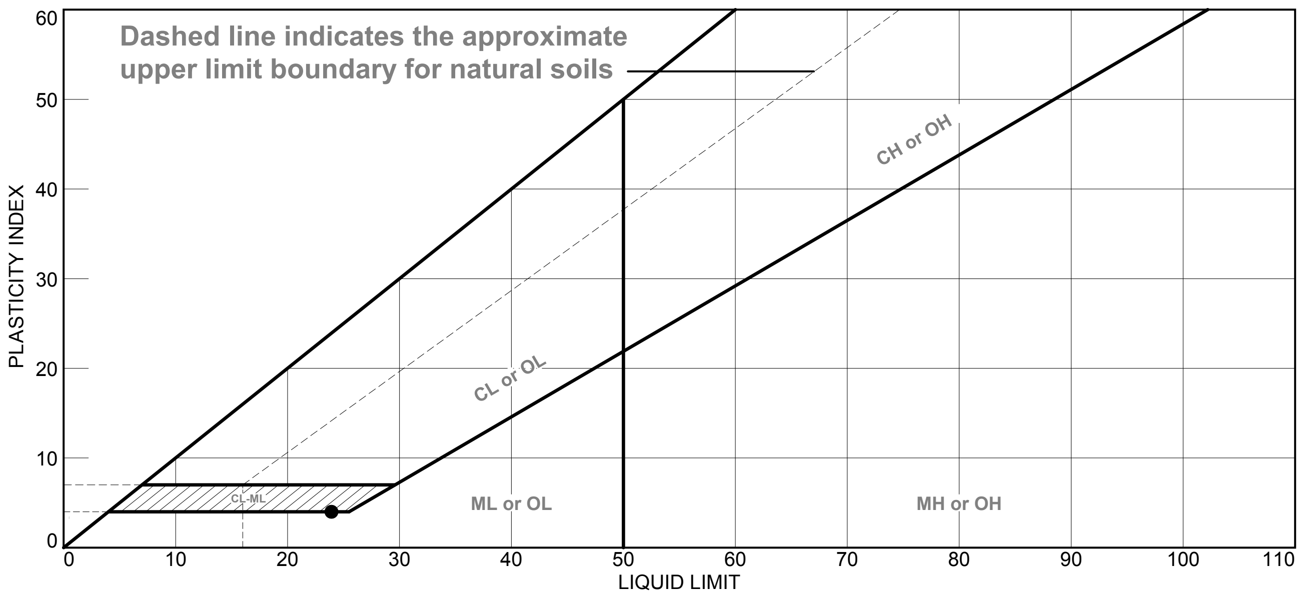
●Moisture Content: 45.9%

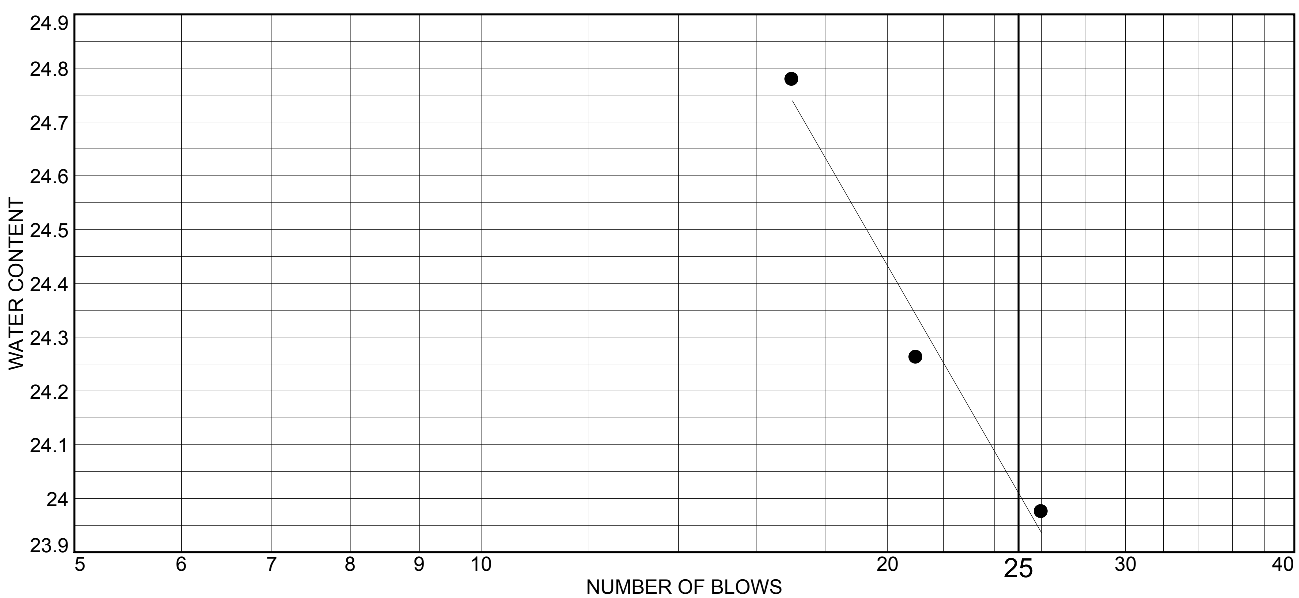
Lab No. 15395-22

Tested By: JJB **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Low Plasticity Silt to Lean Clay	24.0	20.1	3.9			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-127

Sample Number: 1D **Depth:** 2'-4'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

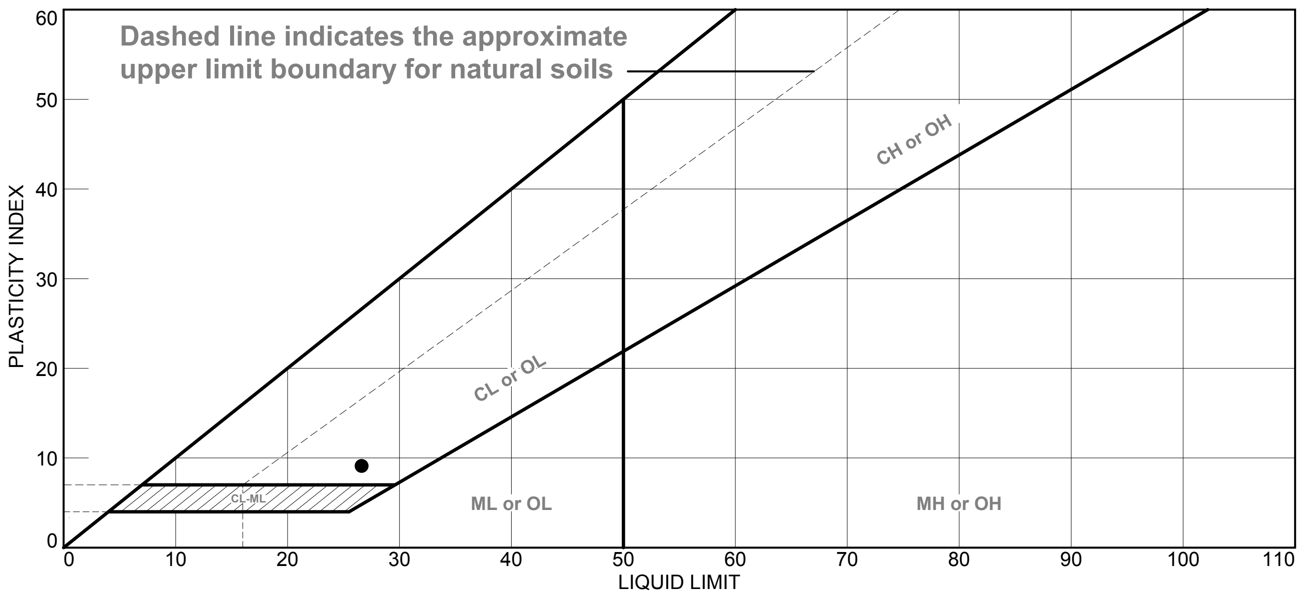
●Moisture Content: 26.8%

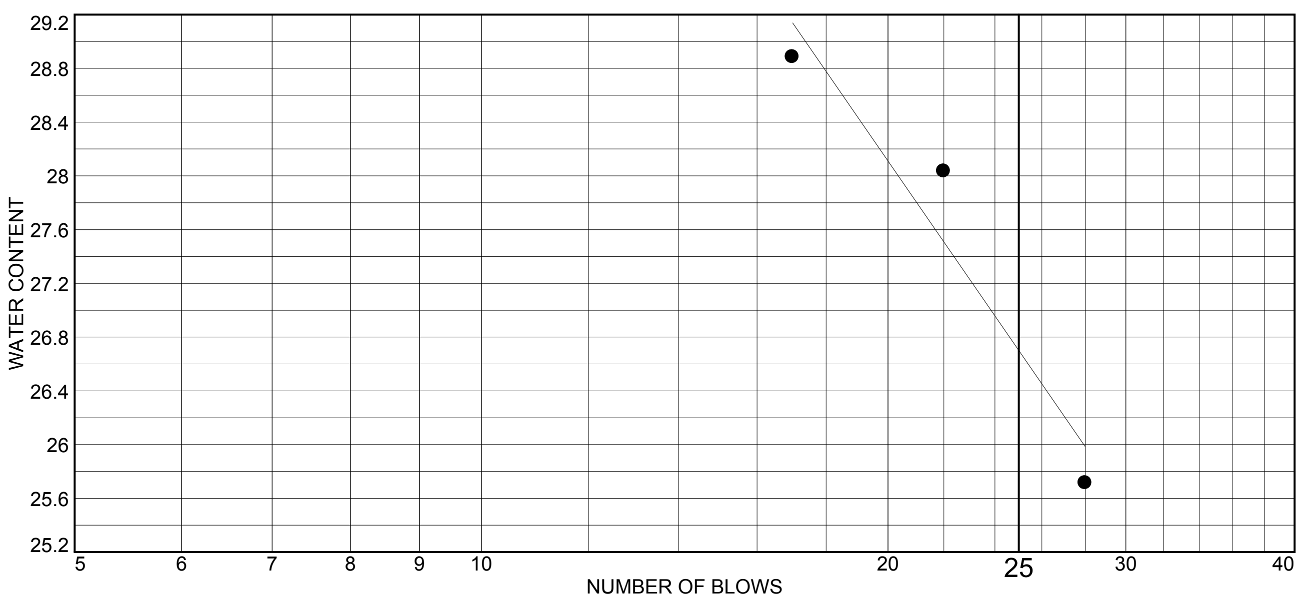
Lab No. 15395-23

Tested By: AGS **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	26.7	17.7	9.0		98.2	

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-127

Sample Number: 3D **Depth:** 9'-11'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

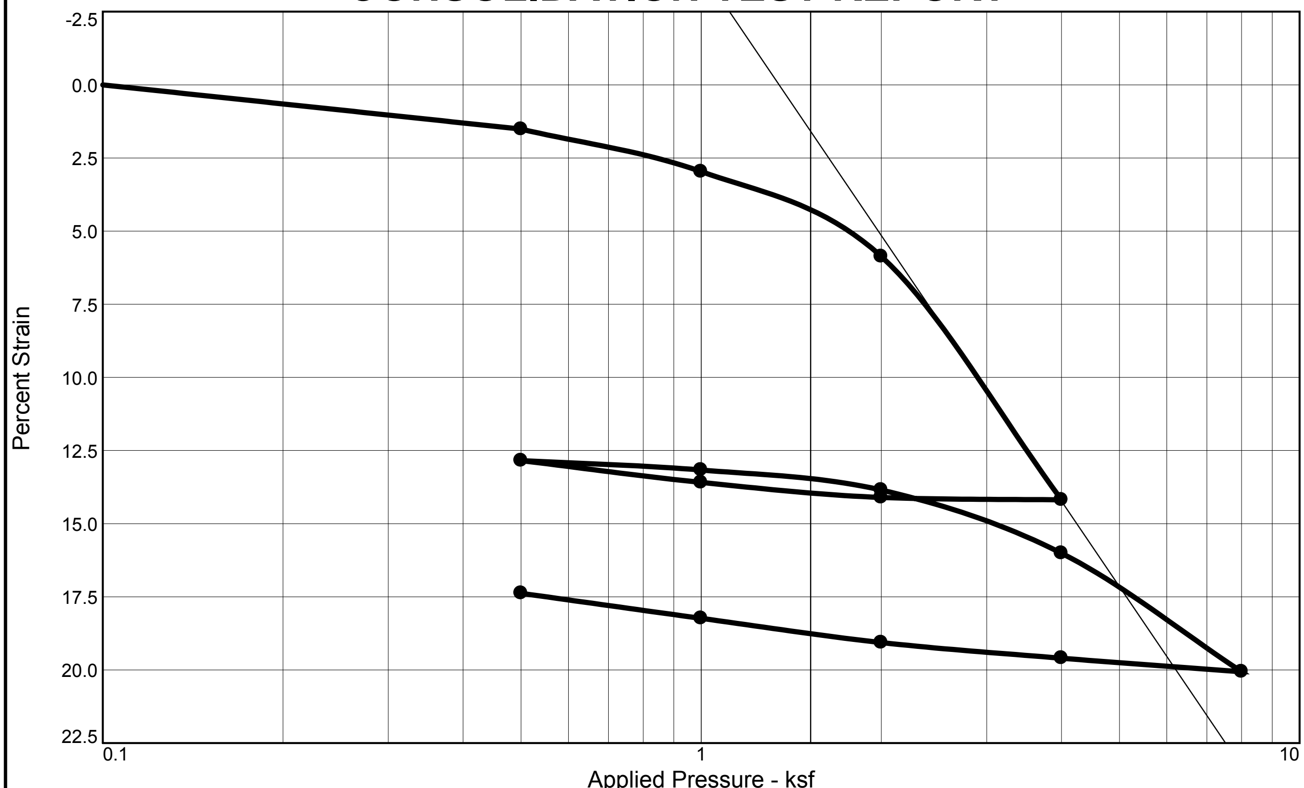
●Moisture Content: 31.9%

Lab No. 15395-24

Tested By: AGS **Checked By:** MTG

MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	1.676		8	1.00	1.667		15	0.50	0.267	
2	1.00	1.070		9	2.00	1.773	0.001				
3	2.00	0.899		10	4.00	0.217	0.004				
4	4.00	0.182		11	8.00	0.312					
5	2.00	4.549		12	4.00	3.210					
6	1.00	2.181		13	2.00	2.200					
7	0.50	0.636		14	1.00	0.617					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
91.8 %	44.4 %	75.8	39.7	17.7	2.7		1.9	0.70	0.14	1.307

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME

Location: HB-PAMI-127 **Depth:** 14'-16' **Sample Number:** U-1

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:
Square Time Cv Values
2KSF- 1.131 ft^2/day
4KSF- 0.615 ft^2/day

Lab No. 15394-06

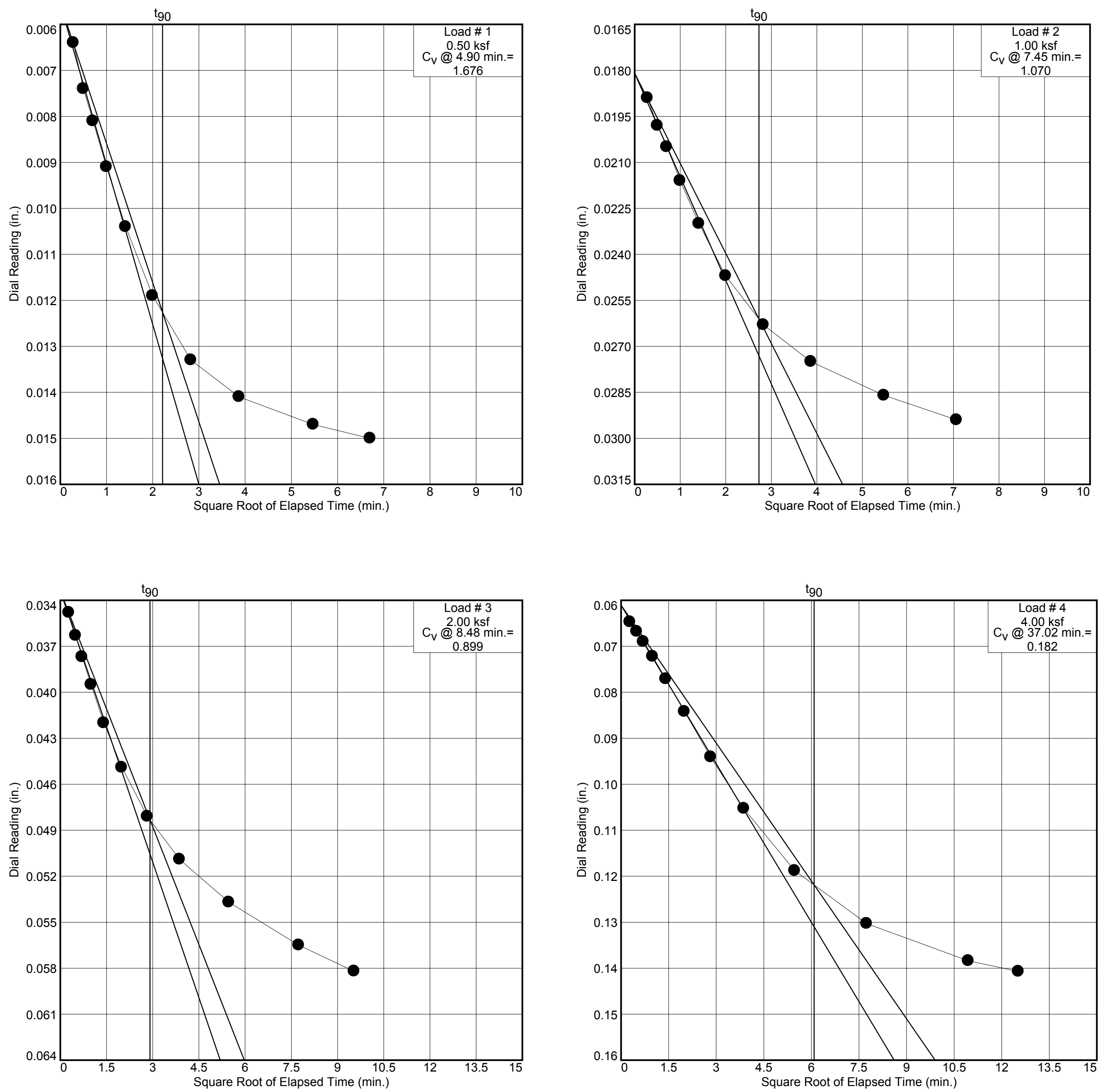
Tested By: JRF **Checked By:** MTG

MTG

Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-127 Depth: 14'-16' Sample Number: U-1



R.W. Gillespie & Associates, Inc.

Biddeford, Maine

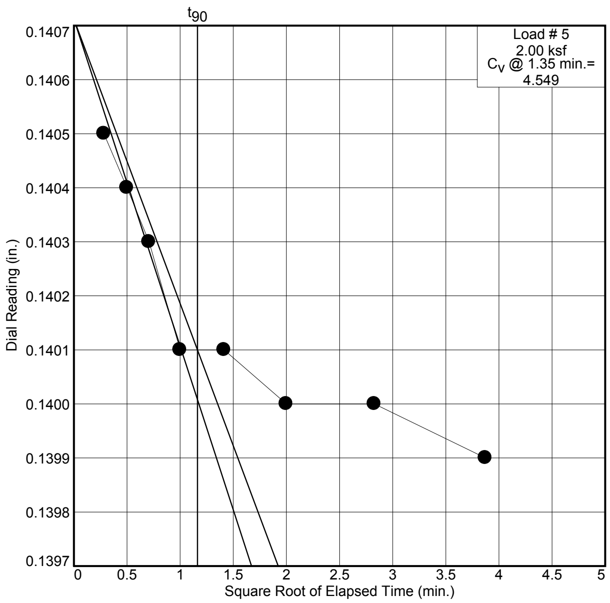
Lab No. 15394-

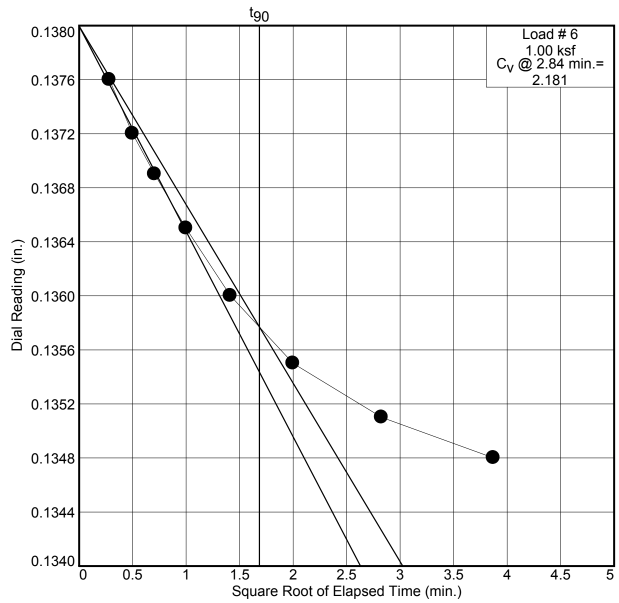
MTG

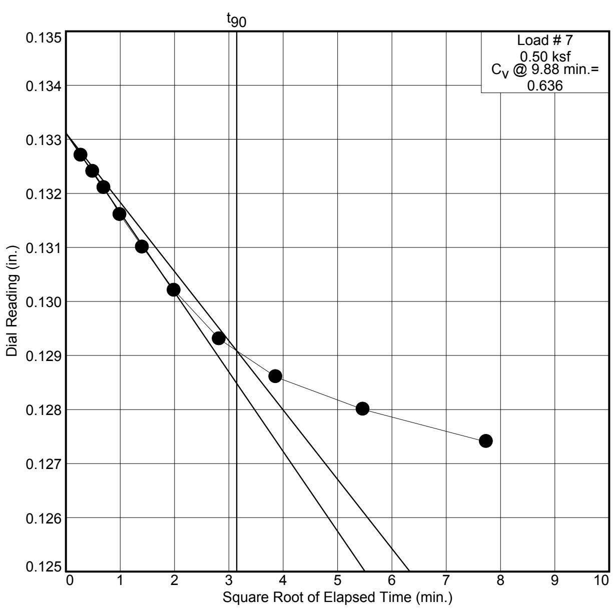
Dial Reading vs. Time

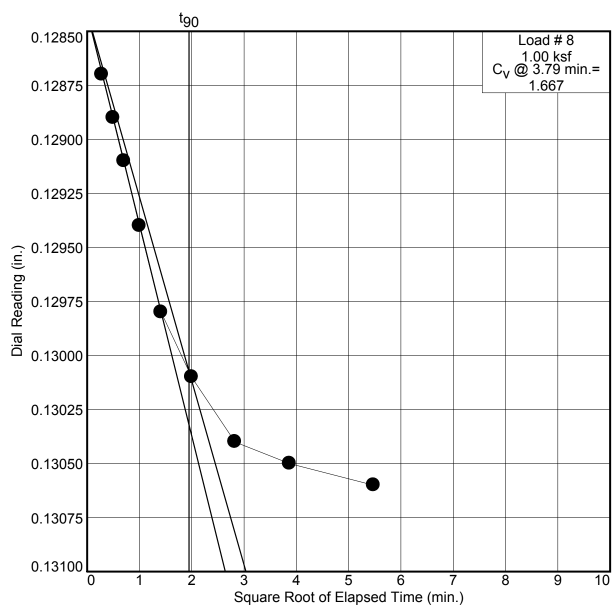
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-127 Depth: 14'-16' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

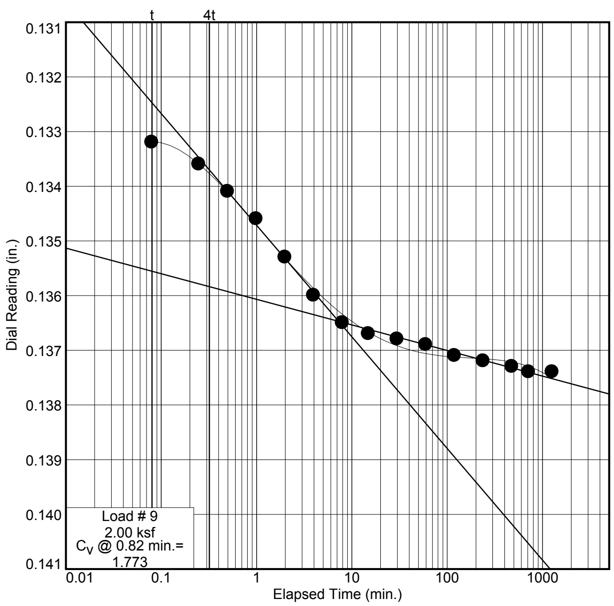
Lab No. 15394-

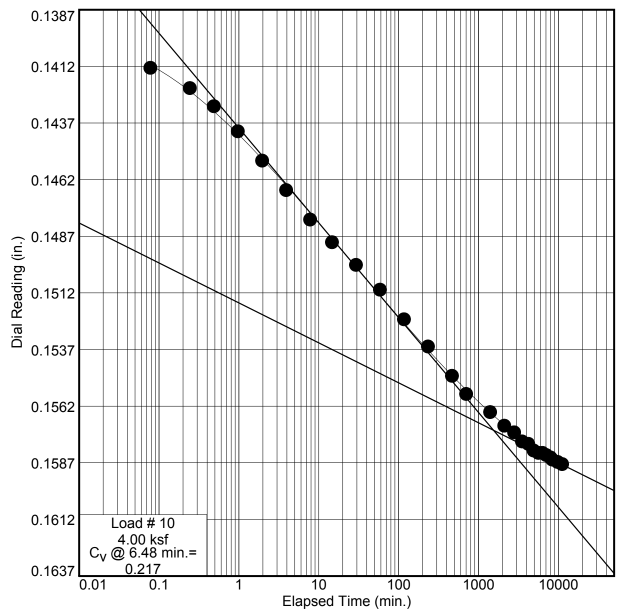
MTG

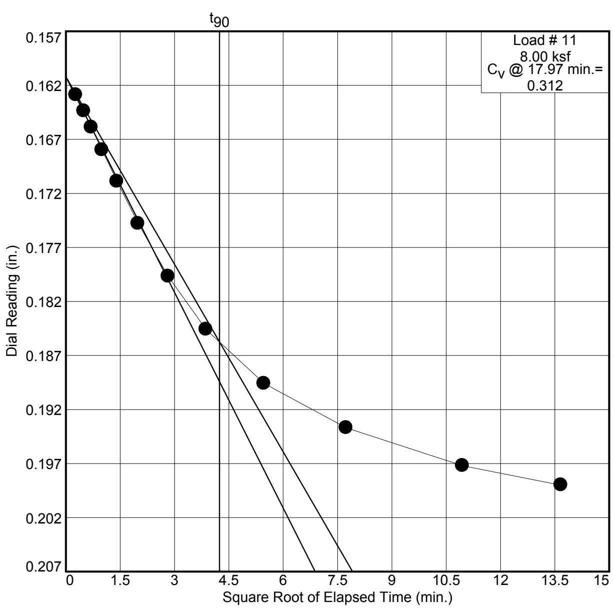
Dial Reading vs. Time

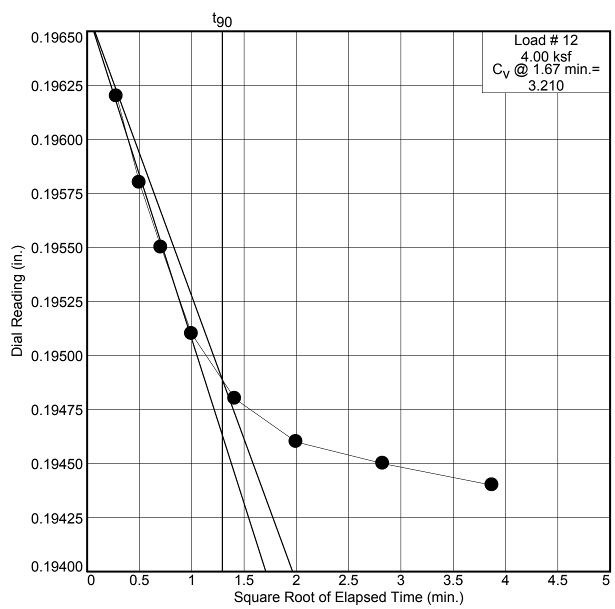
Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-127 Depth: 14'-16' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

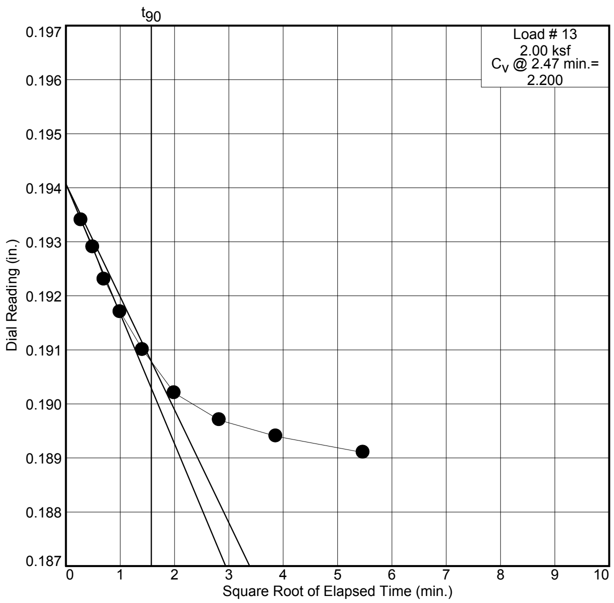
Biddeford, Maine

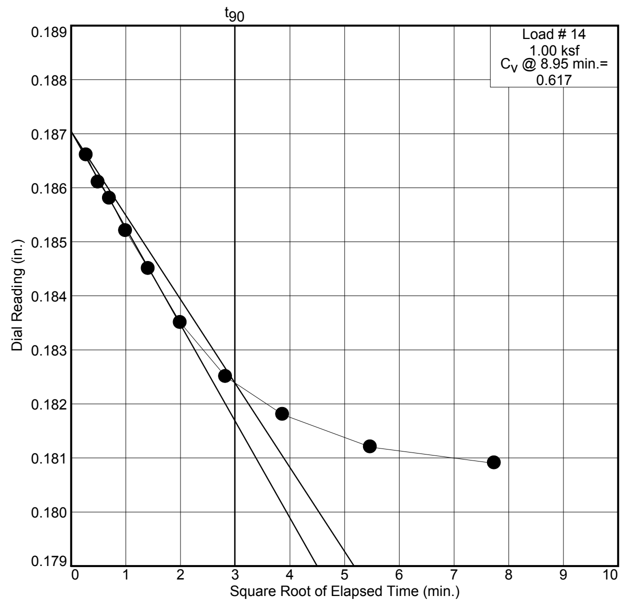
Lab No. 15394-

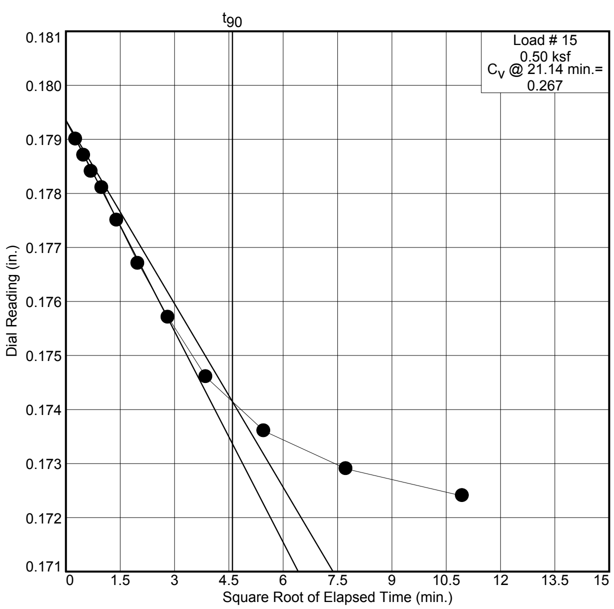
Dial Reading vs. Time

Project No.: 1368-015
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Location: HB-PAMI-127 Depth: 14'-16' Sample Number: U-1





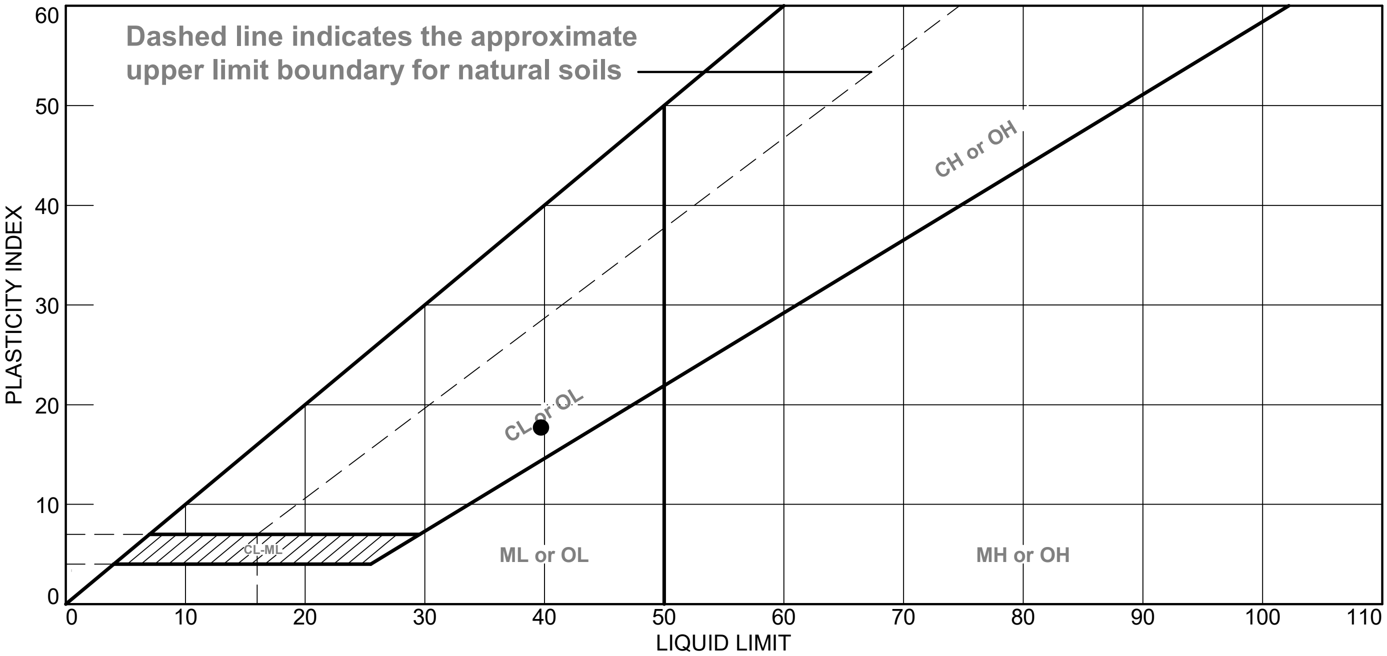


R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15394-

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	39.7	22.0	17.7			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-127

Sample Number: U-1 **Depth:** 14'-16'

Remarks:

R.W. Gillespie & Associates, Inc.

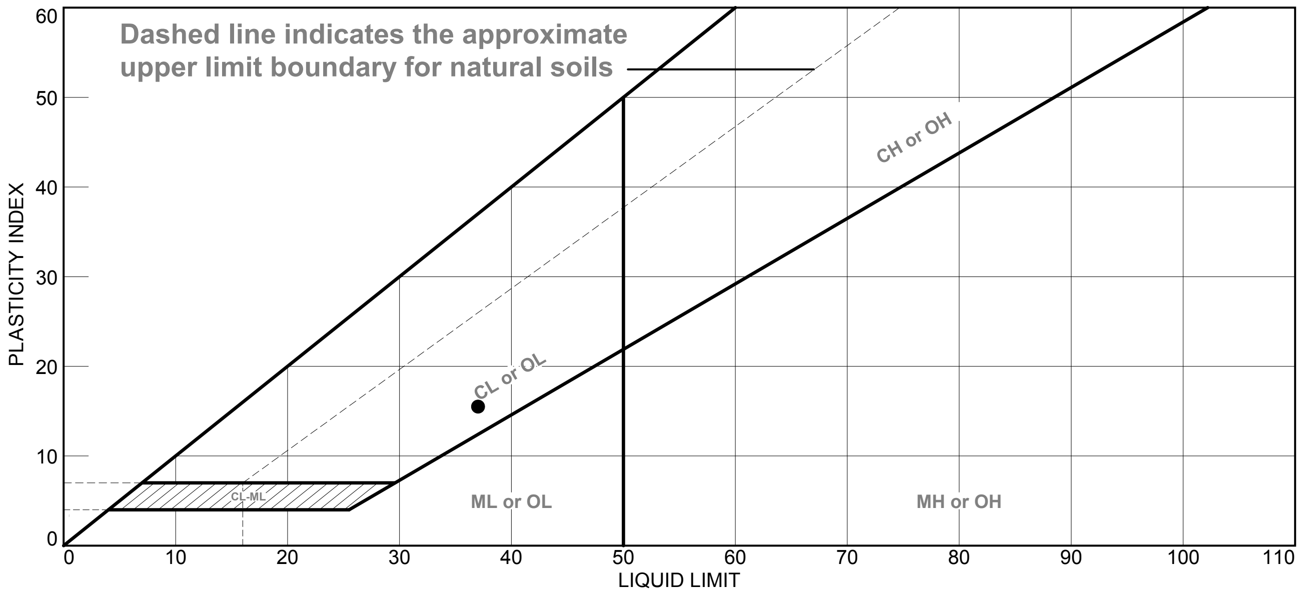
Biddeford, Maine

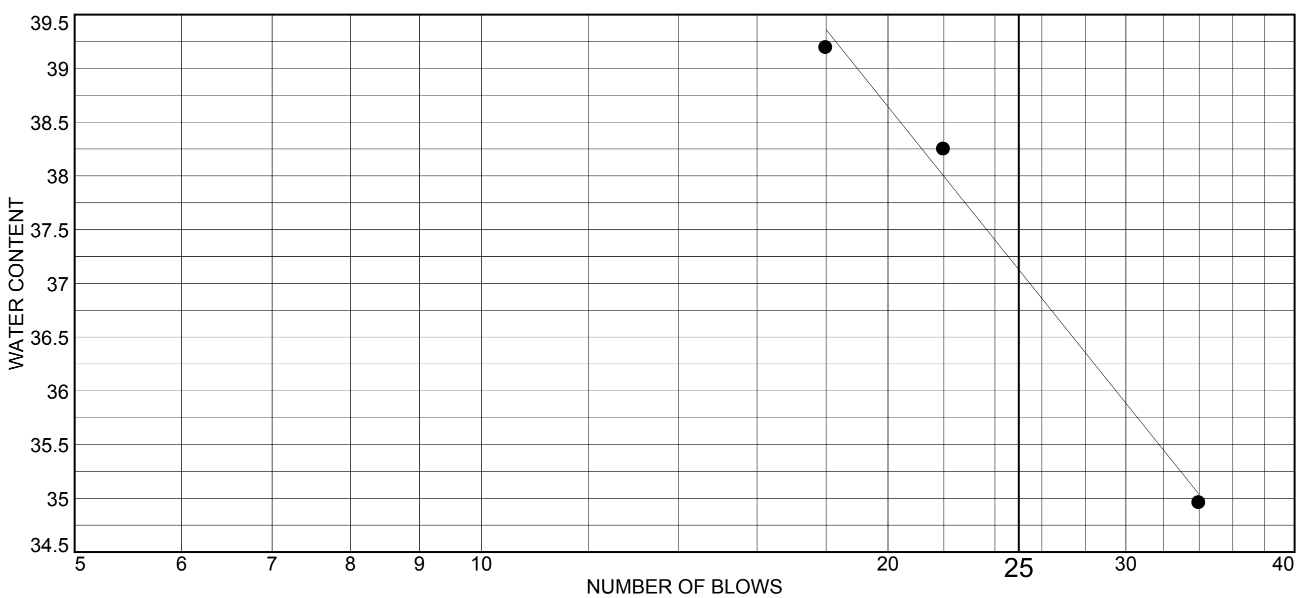
Lab No. 15394-06

MTG

Tested By: AGS **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean	37.1	21.7	15.4			

Project No. 1368-015 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17

Portland, ME

Location: HB-PAMI-127

Sample Number: 6D **Depth:** 34'-36'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

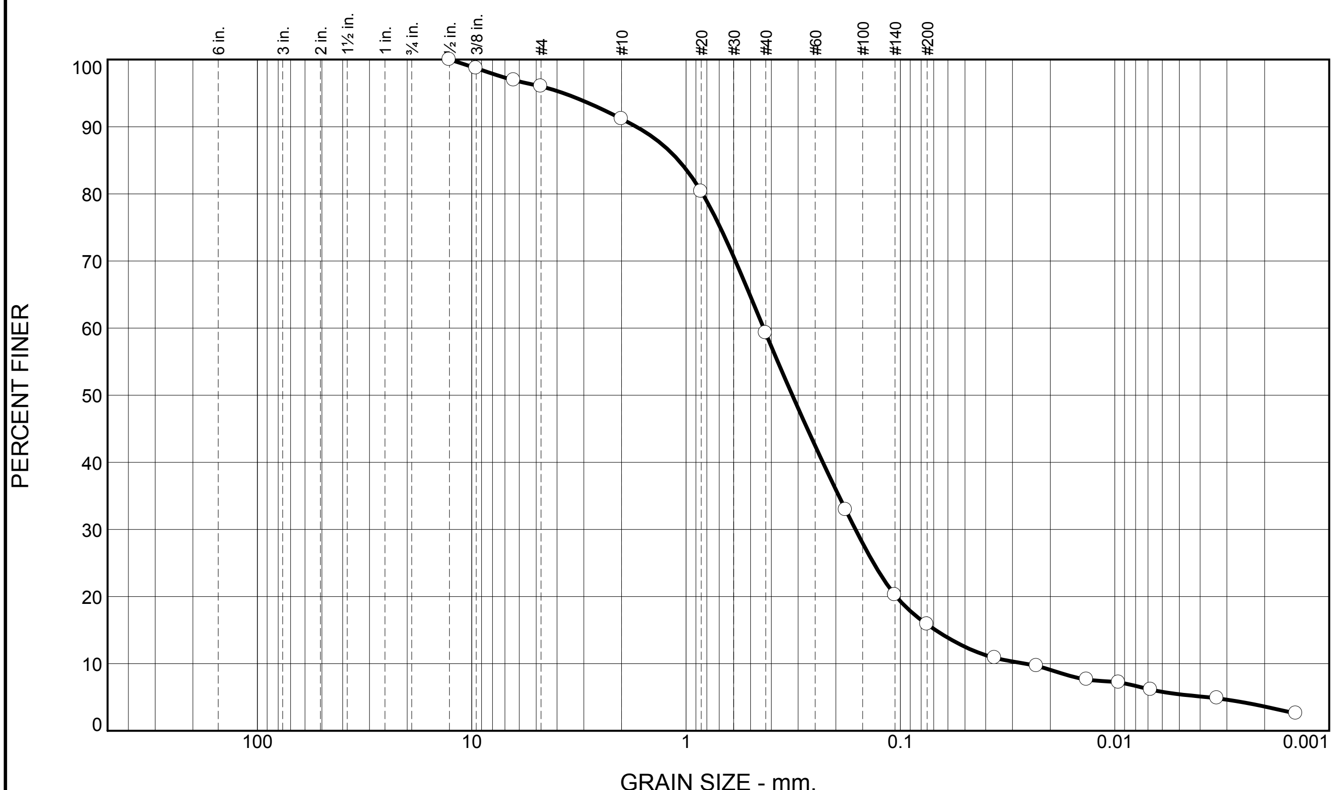
●Moisture Content: 49.1%

Lab No. 15395-25

Tested By: JJB **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.0	4.8	31.9	43.4	10.5	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.7		
1/4"	96.9		
#4	96.0		
#10	91.2		
#20	80.4		
#40	59.3		
#80	32.9		
#140	20.2		
#200	15.9		
0.0363 mm.	10.9		
0.0231 mm.	9.6		
0.0135 mm.	7.6		
0.0096 mm.	7.2		
0.0068 mm.	6.1		
0.0033 mm.	4.8		
0.0014 mm.	2.6		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.7056 D_{85}= 1.0842 D_{60}= 0.4345
D_{50}= 0.3191 D_{30}= 0.1620 D_{15}= 0.0685
D_{10}= 0.0262 C_u= 16.60 C_c= 2.31

Classification

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

Remarks

Moisture Content: 6.1%

Location: HB-PAVE-103
Sample Number: 1D **Depth:** 1'-3' **Date:** 3/12/2019

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

Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAMI (Portland Area Mainline Improvements) #18-17
Portland, ME
Project No: 1368-015 **Lab No.** 15413

Tested By: JJB **Checked By:** MTG

MTG

APPENDIX A

Data Reports

Pavement Cores/Borings HB-PCORE-101 through HB-PCORE-105
Borings HB-PAMI-201 through HB-PAMI-205
Borings HB-VMS-101 through HB-VMS-103

SCHONEWALD ENGINEERING ASSOCIATES, INC.
■ www.SchonewaldEngineering.com ■

FIELD AND LABORATORY DATA REPORT
FINAL DESIGN GEOTECHNICAL PROGRAM
PORTLAND AREA WIDENING
MAINE TURNPIKE MM 43.7 TO 49.3
SCARBOROUGH TO PORTLAND, MAINE

PREPARED FOR:

HNTB Corporation
Westbrook, Maine

PREPARED BY:

Isabel V. (Be) Schonewald, P.E.
Schonewald Engineering Associates, Inc. (SchonewaldEA)
129 Middle Road
Cumberland, Maine 04021
Be@SchonewaldEngineering.com

August 2019

SchonewaldEA Project No. 19-117

SCHONEWALD ENGINEERING ASSOCIATES, INC.
www.SchonewaldEngineering.com

FIELD AND LABORATORY DATA REPORT
FINAL DESIGN GEOTECHNICAL PROGRAM
PORTLAND AREA WIDENING
MAINE TURNPIKE MM 43.7 TO 49.3
SCARBOROUGH TO PORTLAND, MAINE

TABLE OF CONTENTS

SCHONEWALD ENGINEERING ASSOCIATES, INC.
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CROSBY YARD AREA PAVEMENT CORES (HB-PCORE-100s)

TEST BORING LOGS

TABULATION OF BORING LOCATIONS				
Boring No.	**Station (approx)**	**Offset (relative to SB white line)**	**Elevation (est'd)**	**Comments**
HB-PCORE-101	2253+25	2.4 ft RT	69.5 ft	SB right wheel rut
HB-PCORE-102	2255+30	2.4 ft RT	70 ft	SB right wheel rut
HB-PCORE-103	2261+65	2.2 ft RT	66.5 ft	SB right wheel rut
HB-PCORE-104	2263+05	2.7 ft RT	64.5 ft	SB right wheel rut
HB-PCORE-105	2265+80	2.8 ft RT	60.5 ft	SB right wheel rut

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Pavement Cores
LOCATION: South Portland, ME

Boring No.: HB-PCORE-101
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	69.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/29/19; 2315-2355	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2253+25 (approx.); offset 2.4 ft RT of SB white line (right wheel rut)	**Casing ID/OD:**	6" dia pavement core	**Hammer Efficiency:**	0.906
		Auger ID/OD:	n/a	**Water Level*:**	

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	PC	14/14	0.0 - 1.2	6" dia. core			CORE			Pavement Core: 14 inches total thickness; core: 3 layers (7", 2.5", and 3.5" thick) of bound material with loose (unbound) aggregate between.	
								68.3		1.2	
	1D	24/13	1.2 - 3.2	17-19-20-25	39	59	OPEN			SILTY AGGREGATE Changing at approximately 2.0 ft to:	
								67.5		2.0	
										1D: Grey brown grading to tan, fine to medium SAND, little silt, trace gravel, trace coarse sand. SAND FILL	#15619-01 WASH SIEVE A-2-4(0) SM -#200=15.6% WC=10.7%
3	2D	24/15	3.2 - 5.2	20-16-10-12	26	39				2D: Tan, medium dense, fine to medium SAND, trace to little silt, trace gravel, trace coarse sand. SAND FILL Changing at approximately 4.9 ft to:	#15619-02 WASH SIEVE A-3 SP-SM -#200=9.1% WC=15.8%
								64.6		4.9	
								64.3		2D-A: Grey, Clayey SILT, little fine sand. MARINE SILT-CLAY CRUST	
										5.2	
6										**Bottom of Exploration at 5.2 feet below ground surface.** No refusal.	
9											
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PCORE-101

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Pavement Cores
LOCATION: South Portland, ME

Boring No.: HB-PCORE-102
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	70 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/29/19; 2235-2310	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2255+30 (approx.); offset 2.4 ft RT of SB white line (right wheel rut)	**Casing ID/OD:**	6" dia pavement core	**Hammer Efficiency:**	0.906
		Auger ID/OD:	n/a	**Water Level*:**	

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	PC	14/14	0.0 - 1.2	6" dia. core			CORE			Pavement Core: 14 inches total thickness; core: upper 6 inches in 3 pieces with weathered fractures; bottom 8 inches unbound aggregate.	
	1D	24/12	1.2 - 3.2	16-16-21-21	37	56	OPEN	68.8		1.2 Grey brown, fine to coarse SAND, some gravel, some silt. SILTY AGGREGATE	
								68.0		Grading at approximately 2.0 ft to: 2.0 1D: Tan, fine to medium SAND, little silt, trace coarse sand, trace gravel. SAND FILL	#15619-03 WASH SIEVE A-2-4(0) SM -#200=13.8% WC=13.8%
3	2D	24/14	3.2 - 5.2	20-25-21-18	46	69		66.8		3.2 2D: Tan grading at approximately 4.5 ft to grey, dense, fine to medium SAND, little to some silt, trace coarse sand, trace gravel. TILL	#15619-04 WASH SIEVE A-2-4(0) SM -#200=19.0% WC=12.8%
								64.8		5.2 **Bottom of Exploration at 5.2 feet below ground surface.** No refusal.	
6											
9											
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PCORE-102

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Pavement Cores
LOCATION: South Portland, ME

Boring No.: HB-PCORE-103
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	66.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/29/19; 2150-2220	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2261+65 (approx.); offset 2.2 ft RT of SB white line (right wheel rut)	**Casing ID/OD:**	6" dia pavement core	**Hammer Efficiency:**	0.906
		Auger ID/OD:	n/a	**Water Level*:**	

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	PC	14/14	0.0 - 1.2	6" dia. core			CORE			Pavement Core: 14 inches total thickness; core: 3 layers (5.5", 5.5", and 2.5" thick) of bound material with weathered (unbound) aggregate between.	
								65.3		1.2	
	1D	24/11	1.2 - 3.2	10-26-15-17	41	62	OPEN			1D: Brown grey, dense, fine to coarse SAND, some silt, little gravel. SILTY AGGREGATE Grading at approximately 2.8 ft to:	
								63.7		2.8	
3								63.4		Tan brown, fine to medium SAND, little silt, trace to little gravel, trace coarse sand. SAND FILL	#15619-05 WASH SIEVE A-2-4(0) SM -#200=22.0% WC=10.8%
										3.1	
	2D	24/16	3.2 - 5.2	10-8-10-11	18	27				Olive grey, silt-clay in tip of spoon. MARINE SILT-CLAY CRUST 2D: Olive brown, mottled, very stiff, Clayey SILT, trace to little fine sand; appears undisturbed. MARINE SILT-CLAY CRUST	#15619-06 WASH SIEVE ATTERBERGS A-6(13) CL -#200=83.1% WC=25.5% LL=37.8 PL=22.8 PI=15.0
								61.3		5.2	
										Bottom of Exploration at 5.2 feet below ground surface. No refusal.	
6											
9											
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PCORE-103

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Pavement Cores
LOCATION: South Portland, ME

Boring No.: HB-PCORE-104
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	64.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/29/19; 2115-2145	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2263+05 (approx.); offset 2.7 ft RT of SB white line (right wheel rut)	**Casing ID/OD:**	6" dia pavement core	**Hammer Efficiency:**	0.906
		Auger ID/OD:	n/a	**Water Level*:**	

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	PC	14/14	0.0 - 1.2	6" dia. core			CORE			Pavement Core: 14 inches total thickness; core: upper 9 inches sound, bonded; bottom 5 inches bonded, but weathered.	
	1D	24/13	1.2 - 3.2	15-17-12-9	29	44	OPEN	63.3		1.2 SILTY AGGREGATE Changing at approximately 1.8 ft to:	
								62.7		1.8 1D: Brown tan, medium dense, fine to medium SAND, little silt, trace coarse sand, trace gravel. SAND FILL Silt-clay material in tip of spoon.	#15619-07 WASH SIEVE A-2-4(0) SM -#200=15.0% WC=12.6%
3	2D	24/14	3.2 - 5.2	5-6-7-10	13	20		61.3		3.2 2D: Olive grey grading to olive brown, Clayey SILT, little fine sand grading to Clayey SILT, trace to little fine sand. MARINE SILT-CLAY CRUST	#15619-08 WASH SIEVE ATTERBERGS A-6(15) CL -#200=88.3% WC=26.5% LL=38.0 PL=20.8 PI=17.2
								59.3		5.2 **Bottom of Exploration at 5.2 feet below ground surface.** No refusal.	
6											
9											
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PCORE-104

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Pavement Cores
LOCATION: South Portland, ME

Boring No.: HB-PCORE-105
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	60.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/29/19; 2025-2110	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2265+80 (approx.); offset 2.8 ft RT of SB white line (right wheel rut)	**Casing ID/OD:**	6" dia pavement core	**Hammer Efficiency:**	0.906
		Auger ID/OD:	n/a	**Water Level*:**	

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	PC	14/14	0.0 - 1.2	6" dia. core			CORE			Pavement Core: 13 inches total thickness; core: upper 9.5 inches sound, bonded; bottom 3.5 inches partially bonded, primarily large aggregate.	
								59.4		1.1	
	1D	24/15	1.1 - 3.1	13-18-14-13	32	48	OPEN			1D: Brown, fine to coarse SAND, some gravel, little to some silt. SILTY AGGREGATE Changing at approximately 2.3 ft to:	#15619-09 WASH SIEVE A-1-b SM -#200=17.2% WC=11.5%
								58.2		2.3	
3										1D-A: Tan, fine to medium SAND, trace to little silt, trace gravel, trace coarse sand. SAND FILL Tan, fine to medium SAND, trace to little silt, trace coarse sand. SAND FILL	#15619-10 WASH SIEVE A-2-4(0) SM -#200=11.1% WC=17.6%
	2D	24/16	3.1 - 5.1	9-10-9-9	19	29				Changing at approximately 4.2 ft to:	
								56.3		4.2	
										2D: Olive brown, slightly mottled, Clayey SILT, trace fine sand with occasional partings of fine sandy silt. MARINE SILT-CLAY CRUST	
								55.4		5.1	
										Bottom of Exploration at 5.1 feet below ground surface. No refusal.	
6											
9											
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1

Boring No.: HB-PCORE-105

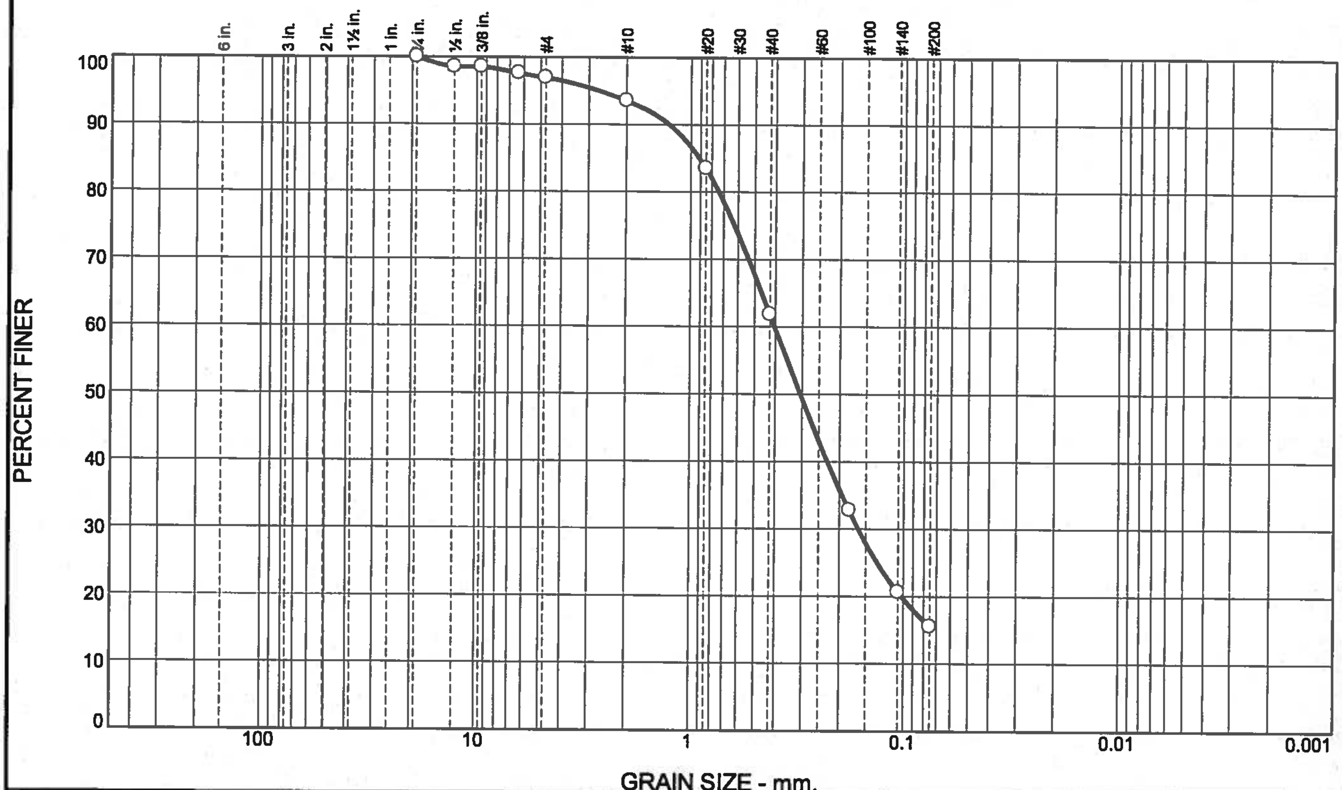
SCHONEWALD ENGINEERING ASSOCIATES, INC.
■ www.SchonewaldEngineering.com ■

CROSBY YARD AREA PAVEMENT CORES (HB-PCORE-100s)

LABORATORY TEST REPORTS

TABULATION OF SOIL TESTING (RWG&A PROJECT NO. 1368-016) (listed in order of test report presentation)				
Boring No.	**Sample No.**	**Sample Depth (ft., BGS)**	**RWG&A LAB NO.**	**Tests Completed**
HB-PCORE-101	1D	1.2-3.2	#15619-1	wash sieve gradation
HB-PCORE-101	2D	3.2-5.2	#15619-2	wash sieve gradation
HB-PCORE-102	1D	1.2-3.2	#15619-3	wash sieve gradation
HB-PCORE-102	2D	3.2-5.2	#15619-4	wash sieve gradation
HB-PCORE-103	1D	1.2-3.2	#15619-5	wash sieve gradation
HB-PCORE-103	2D	3.2-5.2	#15619-6	wash sieve gradation; Atterberg Limits
HB-PCORE-104	1D	1.2-3.2	#15619-7	wash sieve gradation
HB-PCORE-104	2D	3.2-5.2	#15619-8	wash sieve gradation; Atterberg Limits
HB-PCORE-105	1D	1.1-3.1	#15619-9	wash sieve gradation
HB-PCORE-105	1D-A	3.1-5.1	#15619-10	wash sieve gradation

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	3.3	31.7	46.3	15.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.5		
3/8"	98.5		
1/4"	97.6		
#4	96.9		
#10	93.6		
#20	83.5		
#40	61.9		
#80	32.8		
#140	20.7		
#200	15.6		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.2593 D_{85}= 0.9100 D_{60}= 0.4036
D_{50}= 0.3056 D_{30}= 0.1626 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 10.7%

Location: HB-PCORE-101 Portland, ME
Sample Number: 1D **Depth:** 1.2'-3.2'

Date: 7-11-2019

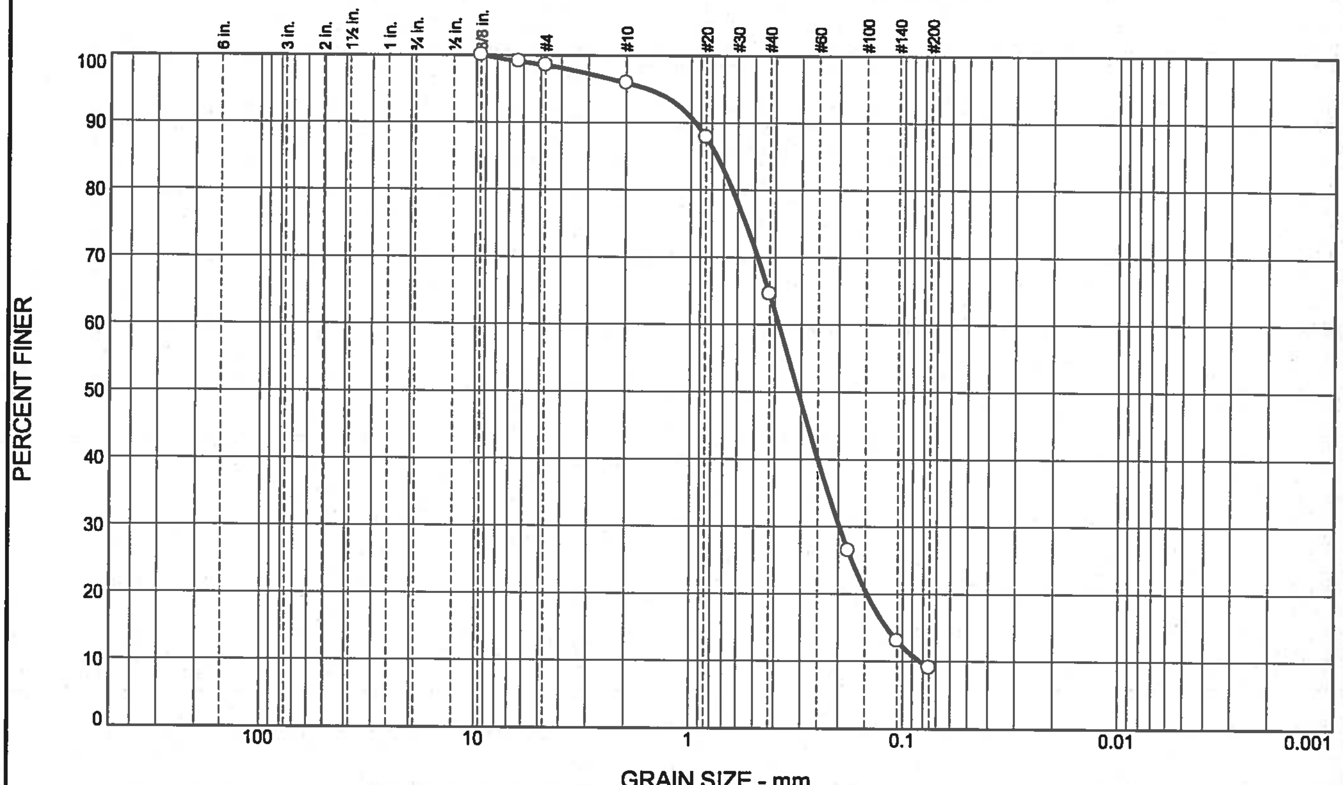
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-01

Tested By: MSM/MCM **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.5	2.6	31.3	55.5	9.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	99.1		
#4	98.5		
#10	95.9		
#20	87.9		
#40	64.6		
#80	26.5		
#140	13.0		
#200	9.1		

* (no specification provided)

Soil Description

poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9508 D_{85}= 0.7535 D_{60}= 0.3838
D_{50}= 0.3099 D_{30}= 0.1978 D_{15}= 0.1186
D_{10}= 0.0826 C_u= 4.65 C_c= 1.23

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 15.8%

Location: HB-PCORE-101 Portland, ME
Sample Number: 2D **Depth:** 3.2'-5.2'

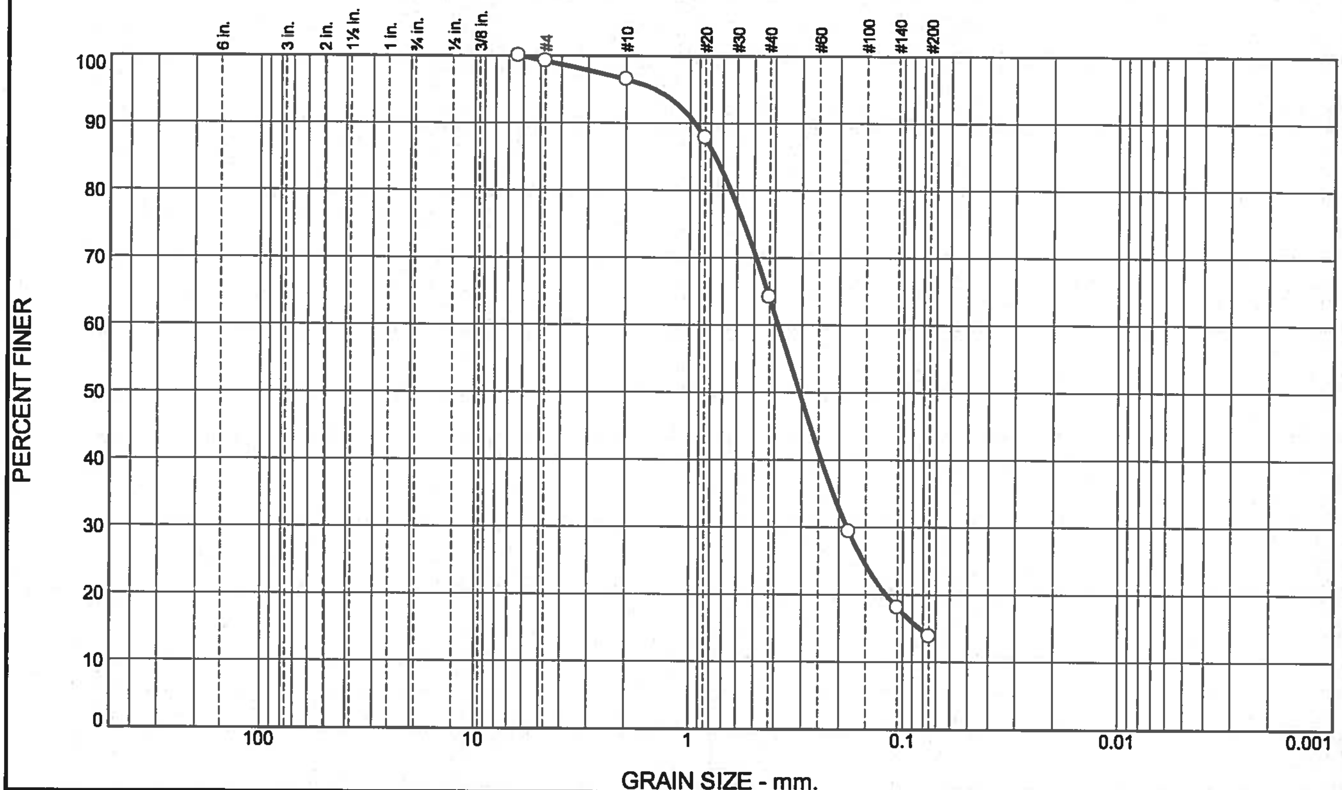
Date: 7-11-2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-02

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	2.7	32.3	50.4	13.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	99.2		
#10	96.5		
#20	87.8		
#40	64.2		
#80	29.4		
#140	18.1		
#200	13.8		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9470 D_{85}= 0.7592 D_{60}= 0.3857
D_{50}= 0.3072 D_{30}= 0.1838 D_{15}= 0.0831
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 13.8%

Location: HB-PCORE-102 Portland, ME
Sample Number: 1D **Depth:** 1.2'-3.2' **Date:** 7-11-2019

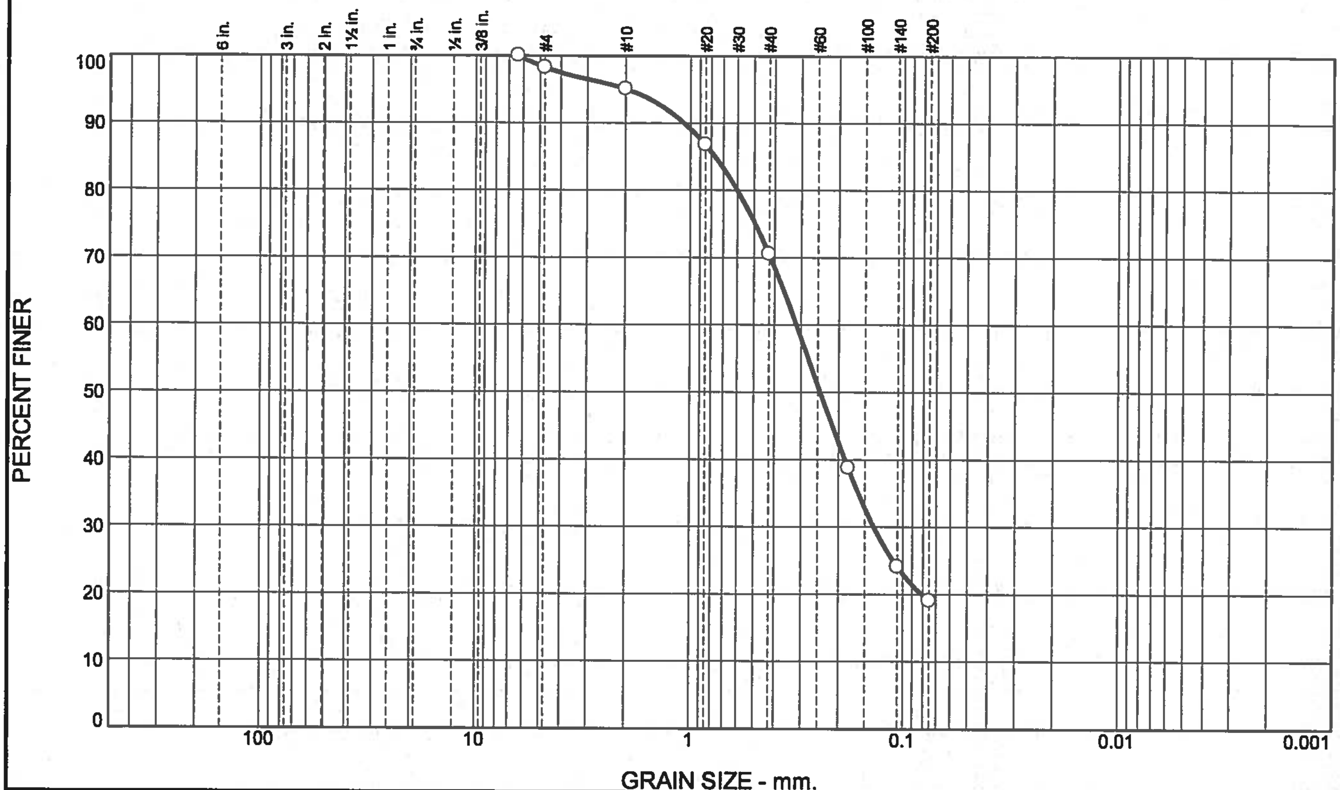
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-03

Tested By: MSM/MCM **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	3.1	24.6	51.5	19.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	98.2		
#10	95.1		
#20	86.8		
#40	70.5		
#80	38.8		
#140	24.1		
#200	19.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0693 D_{85}= 0.7658 D_{60}= 0.3155
D_{50}= 0.2435 D_{30}= 0.1362 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 12.8%

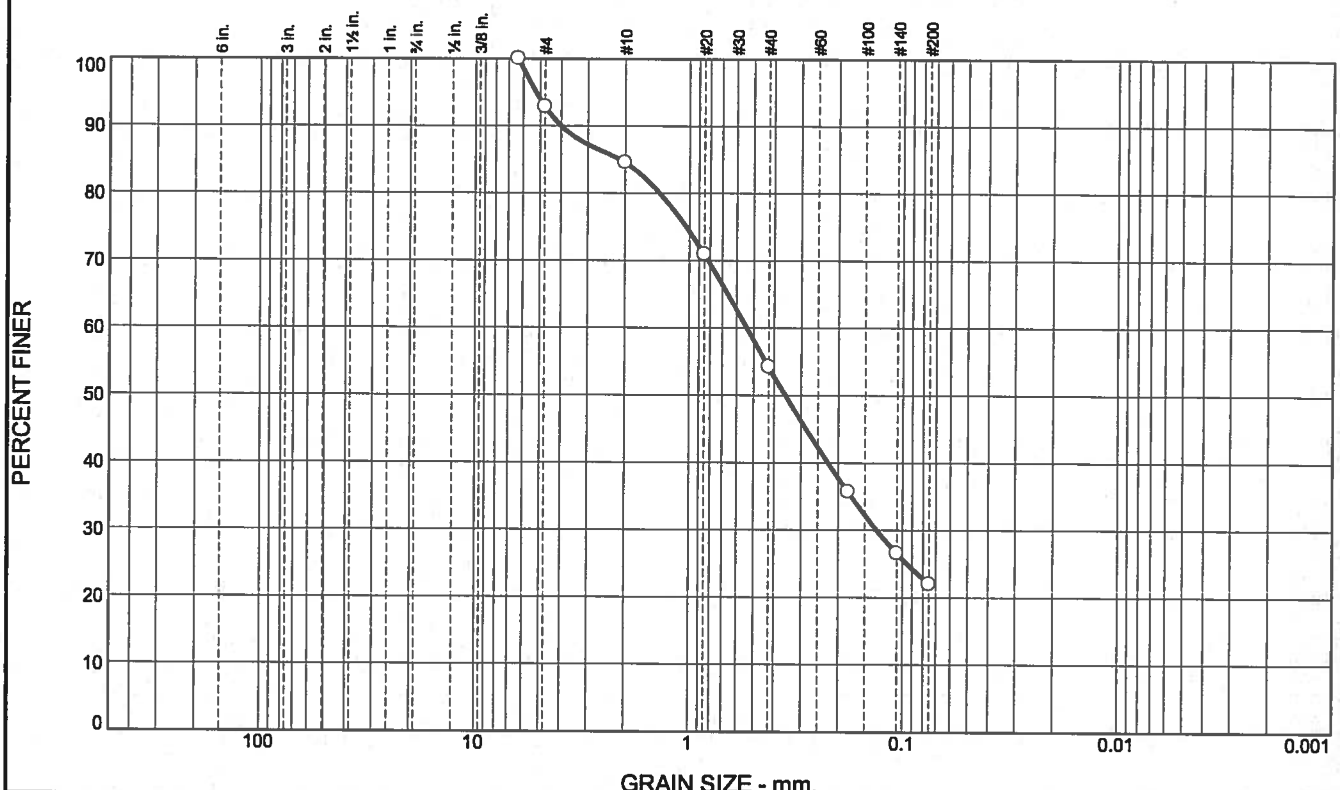
Location: HB-PCORE-102 Portland, ME
Sample Number: 2D **Depth:** 3.2'-5.2' **Date:** 7-11-2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-04

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.2	8.2	30.4	32.2	22.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	92.8		
#10	84.6		
#20	70.9		
#40	54.2		
#80	35.7		
#140	26.5		
#200	22.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.0032 D_{85}= 2.1104 D_{60}= 0.5378
D_{50}= 0.3549 D_{30}= 0.1317 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 10.8%

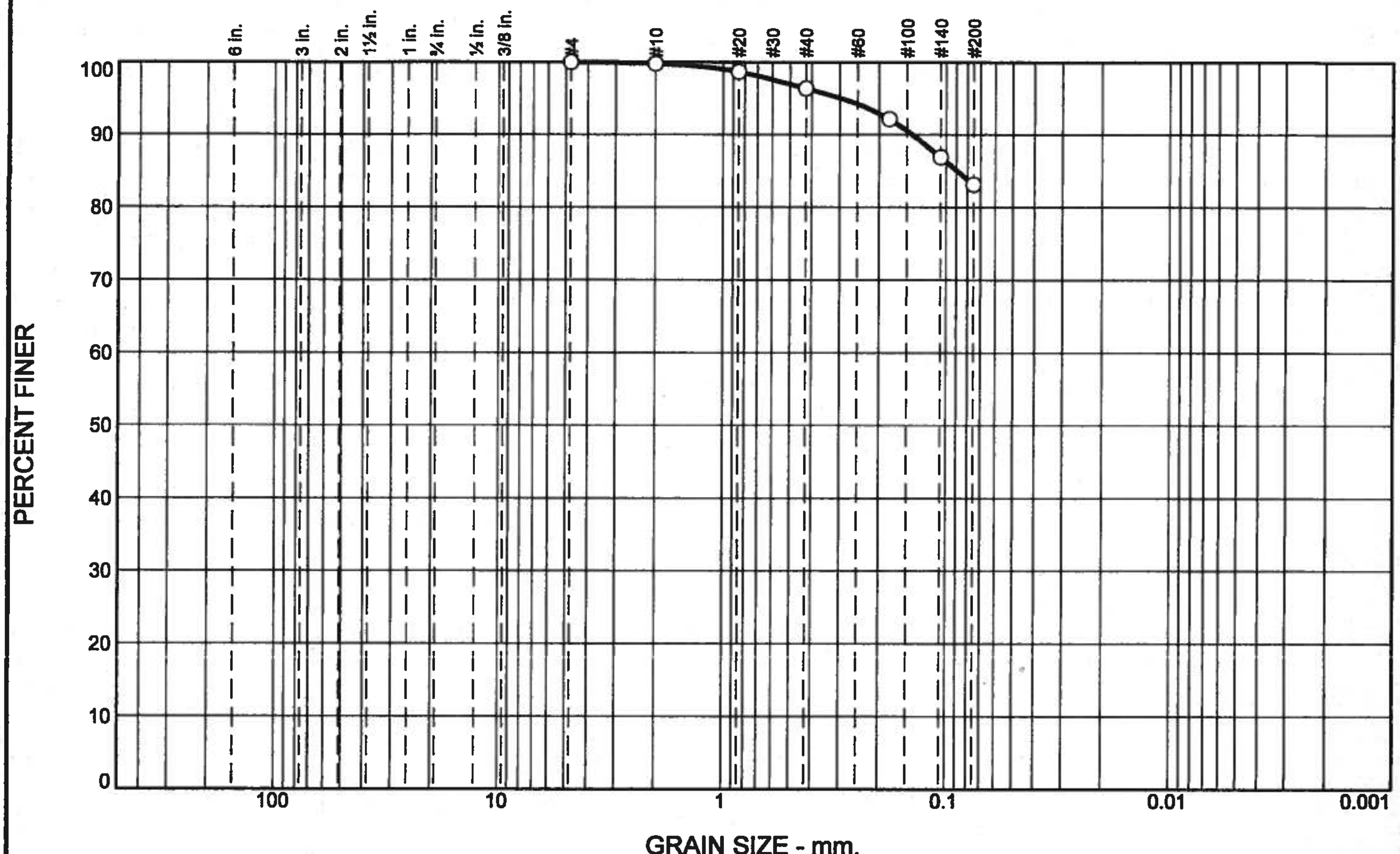
Location: HB-PCORE-103 Portland, ME
Sample Number: 1D **Depth:** 1.2'-3.2' **Date:** 7-11-2019

R.W. Gillespie & Associates, Inc. Biddeford, Maine	**Client:** Schonewal Engineering Associates, Inc. **Project:** Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME **Project No:** 1368-016 **Lab No.** 15619-05

Tested By: MSM/MCM **Checked By:** MTG

McDl

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	3.4	13.3	83.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.6		
#40	96.4		
#80	92.2		
#140	86.9		
#200	83.1		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 22.8 LL= 37.8 PI= 15.0

Coefficients

D_{90}= 0.1417 D_{85}= 0.0888 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Natural Moisture: 25.5%

Location: HB-PCORE-103
Sample Number: 2D **Depth:** 3.2'-5.2' **Date:** 7/18/2019

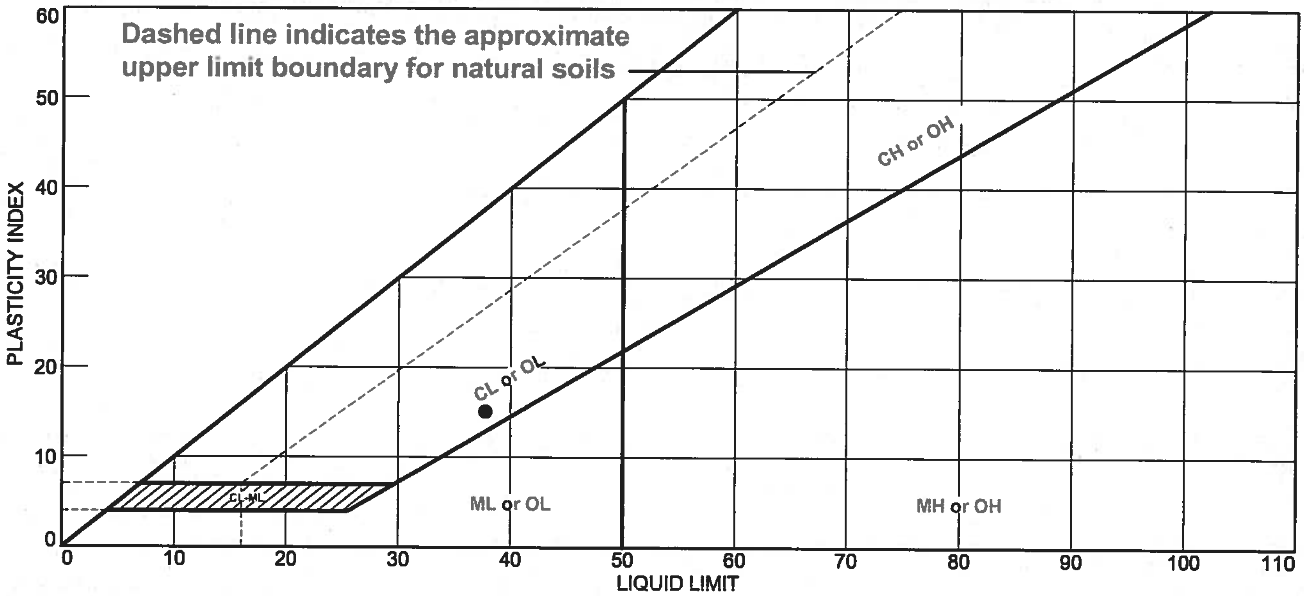
R.W. Gillespie & Associates, Inc. Biddeford, Maine

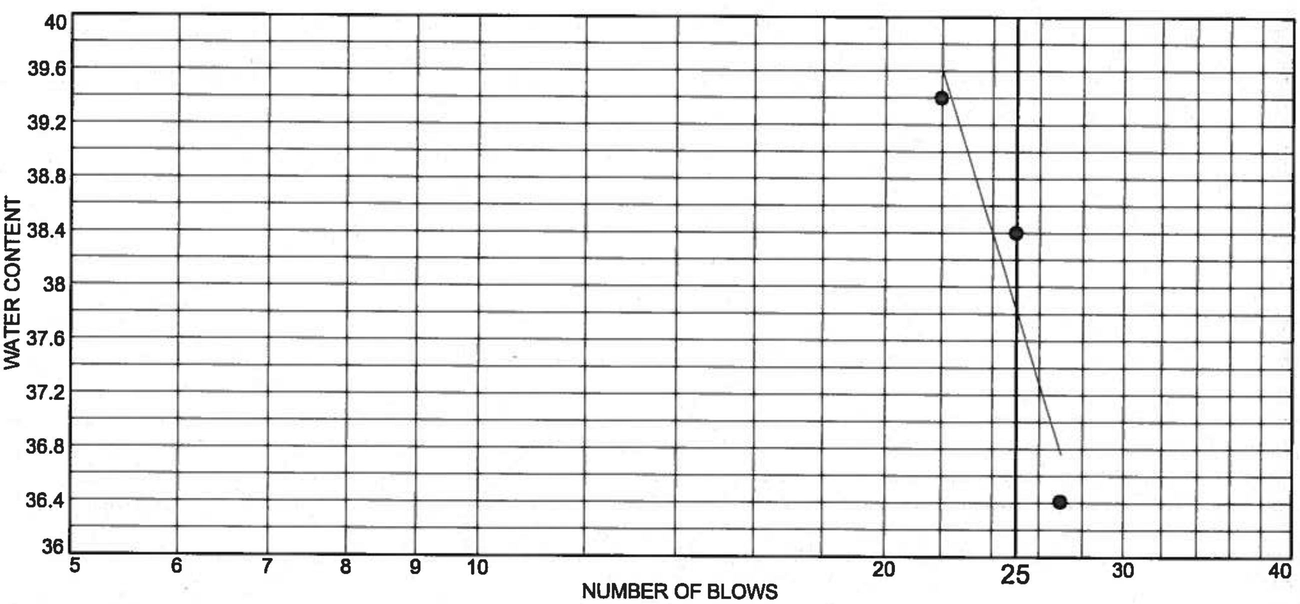
Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-06

Tested By: JJB **Checked By:** MTG

McBh

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	37.8	22.8	15.0	97.0	86.1	CL

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-PCORE-103
Sample Number: 2D **Depth:** 3.2'-5.2'

R.W. Gillespie & Associates, Inc.

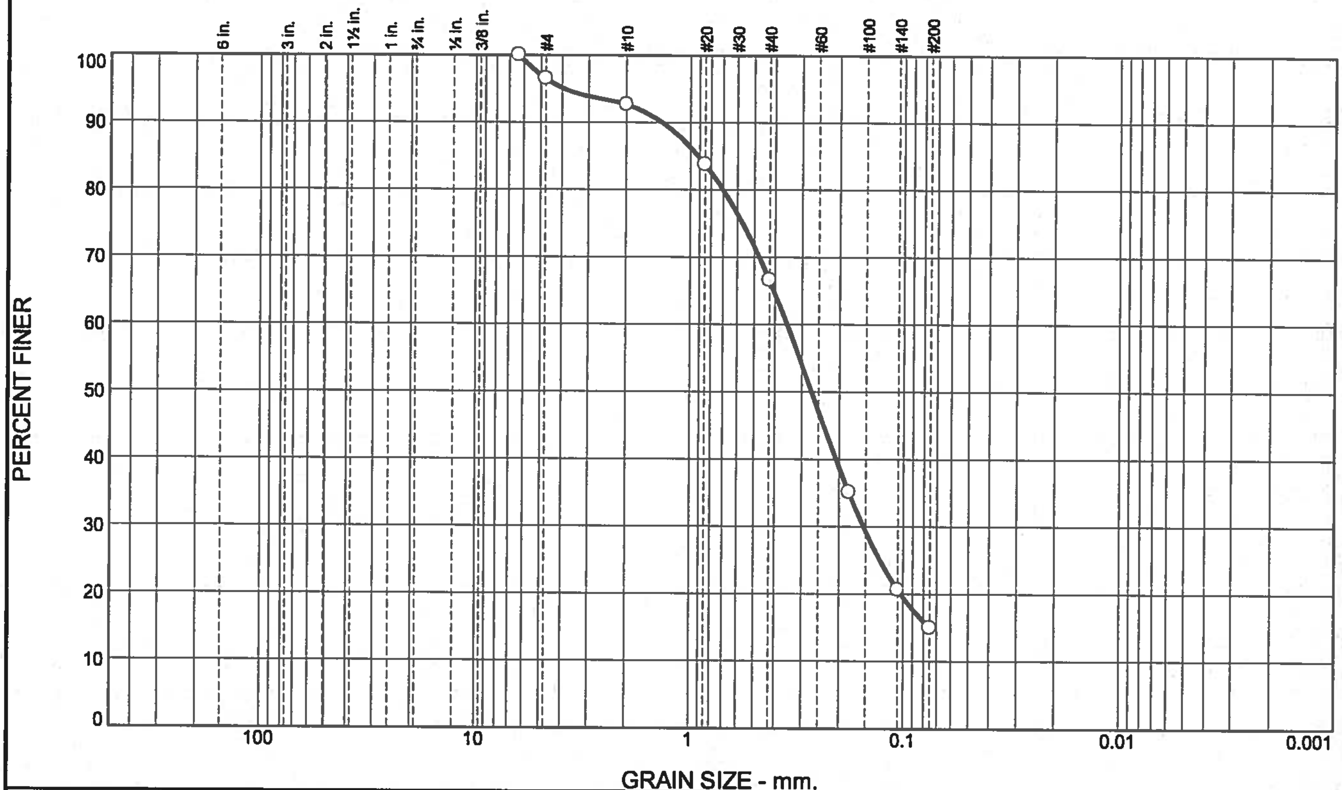
Biddeford, Maine

Remarks:
●Natural Moisture Content: 25.5%

Lab No. 15619-06

Tested By: JMT **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.5	3.8	26.1	51.6	15.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	96.5		
#10	92.7		
#20	83.8		
#40	66.6		
#80	35.1		
#140	20.6		
#200	15.0		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.3554 D_{85}= 0.9153 D_{60}= 0.3516
D_{50}= 0.2696 D_{30}= 0.1535 D_{15}= 0.0750
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 12.6%

Location: HB-PCORE-104 Portland, ME
Sample Number: 1D **Depth:** 1.2'-3.2'

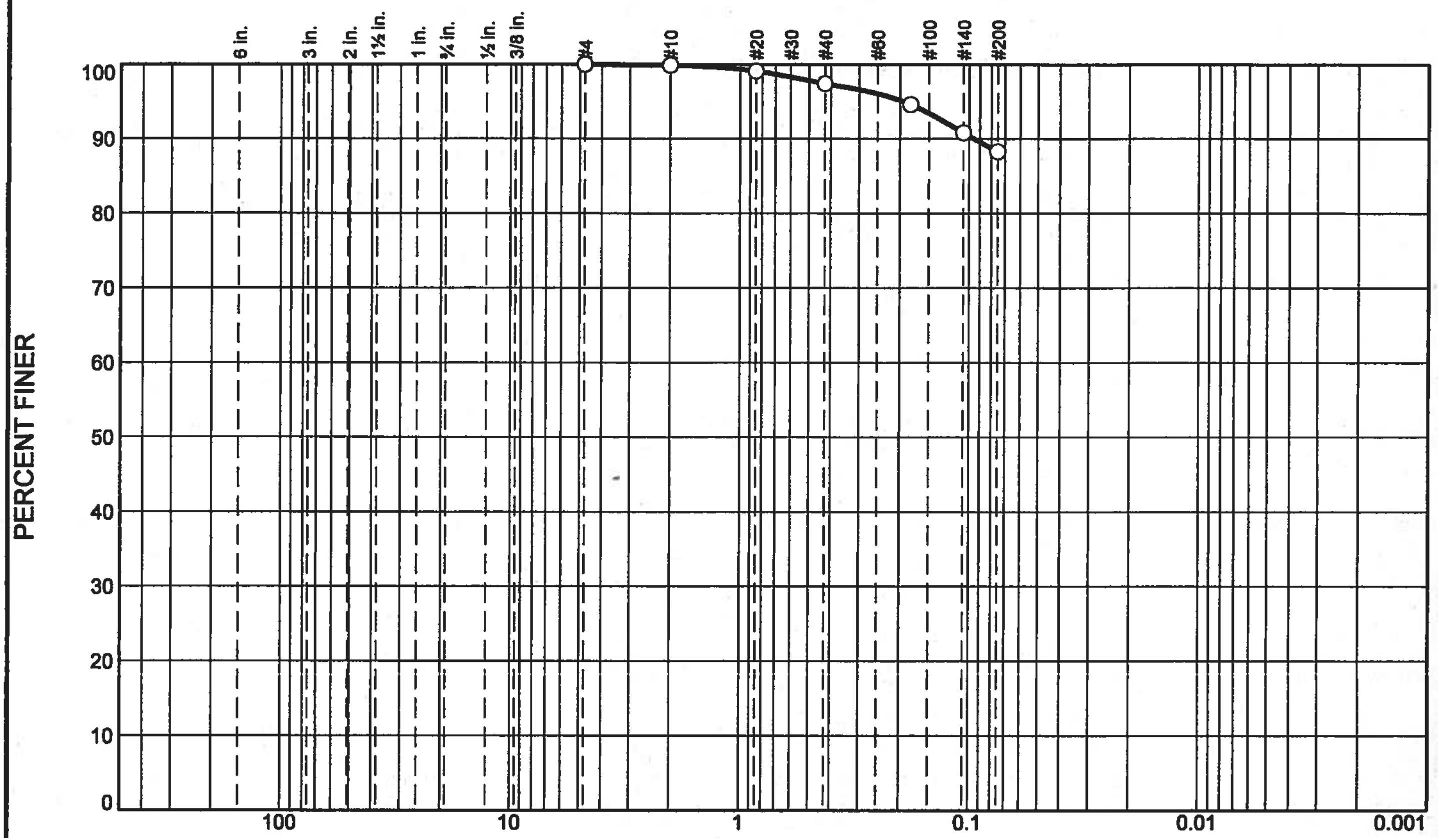
Date: 7-11-2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-07

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.5	9.1	88.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.1		
#40	97.4		
#80	94.6		
#140	90.8		
#200	88.3		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20.8 LL= 38.0 PI= 17.2

Coefficients

D_{90}= 0.0949 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Natural Moisture: 26.5%

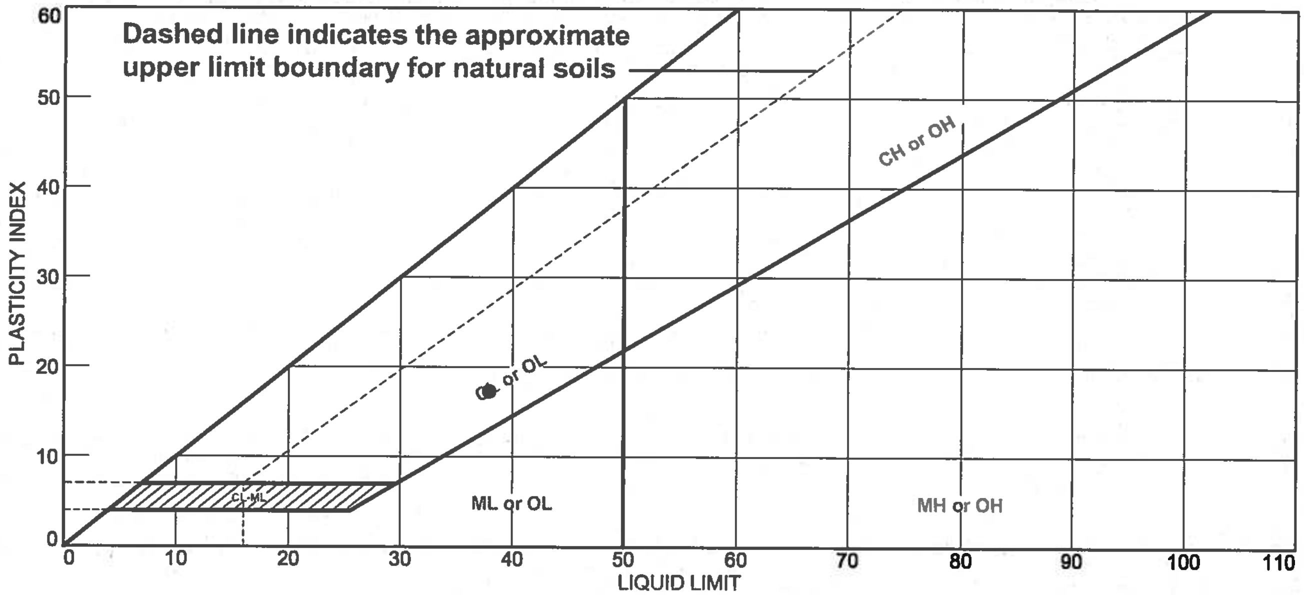
Location: HB-PCORE-104
Sample Number: 2D **Depth:** 3.2'-5.2' **Date:** 7/18/2019

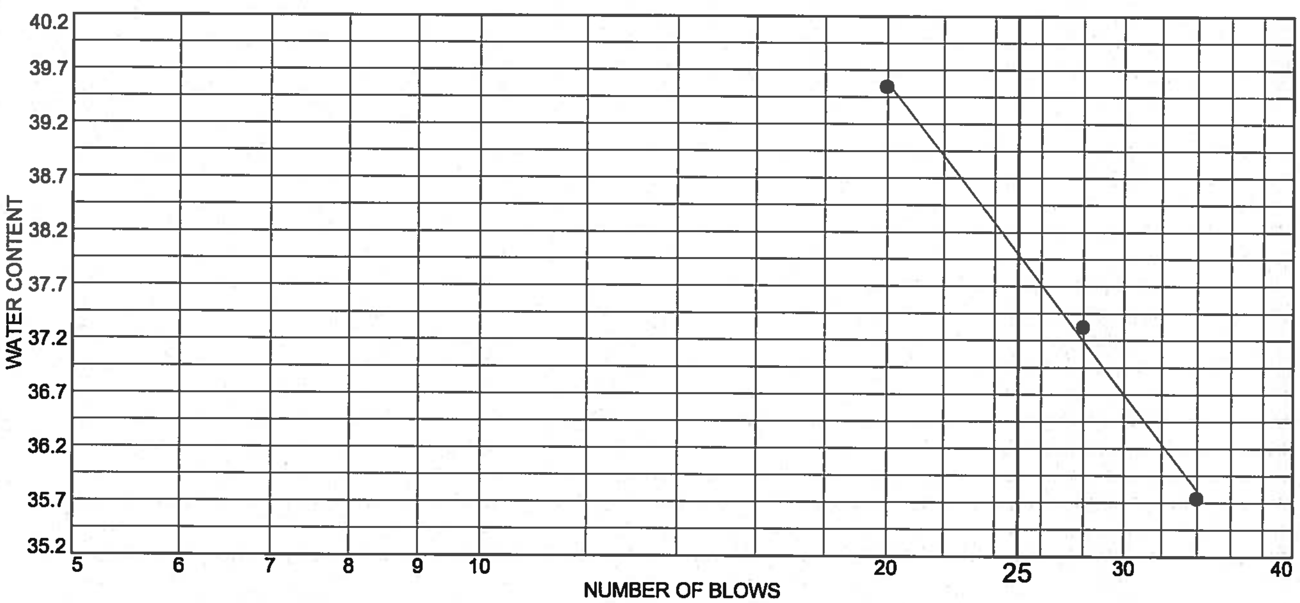
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-08

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	38.0	20.8	17.2	97.9	90.7	CL

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-PCORE-104
Sample Number: 2D **Depth:** 3.2'-5.2'

Remarks:

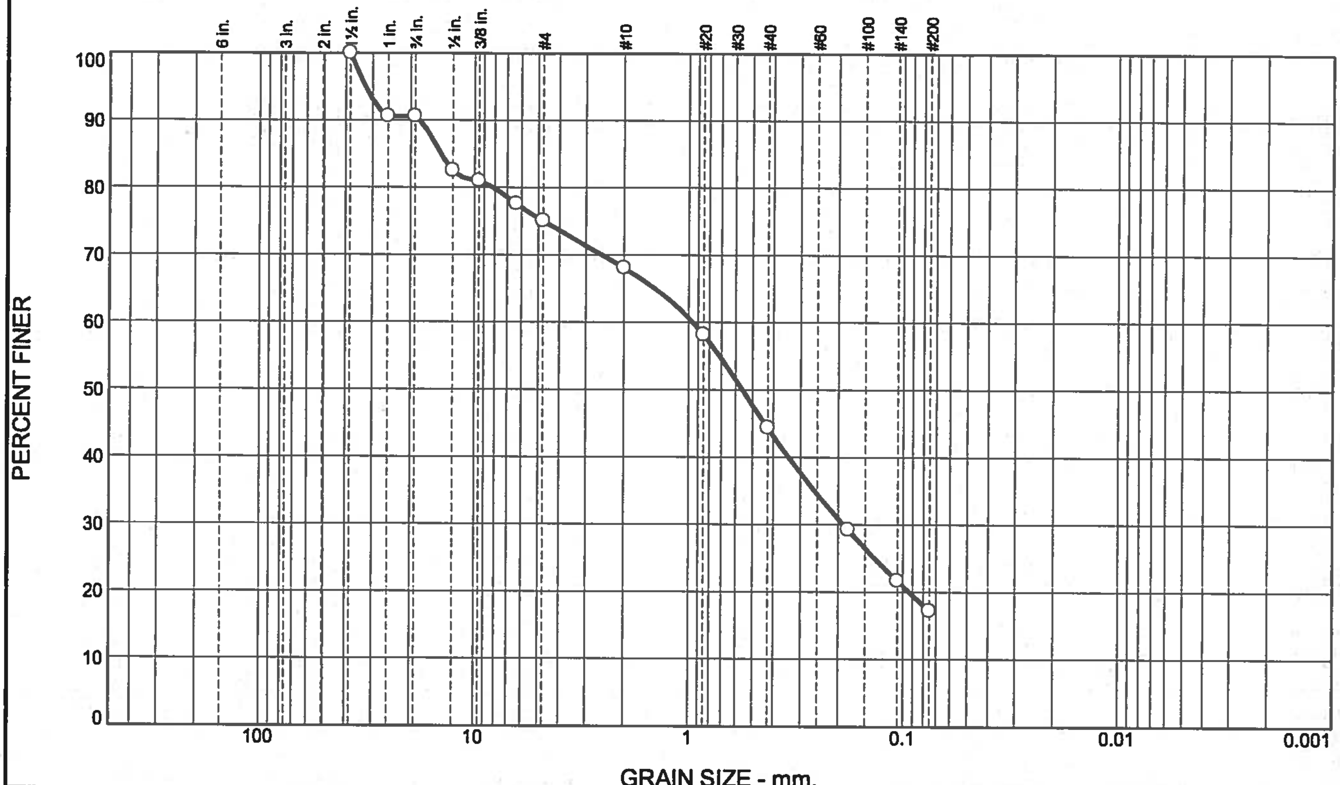
R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15619-08

Tested By: JMT **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.4	15.5	7.0	23.7	27.2	17.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	90.6		
3/4"	90.6		
1/2"	82.5		
3/8"	81.0		
1/4"	77.6		
#4	75.1		
#10	68.1		
#20	58.2		
#40	44.4		
#80	29.3		
#140	21.7		
#200	17.2		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 18.0927 D_{85}= 14.4024 D_{60}= 0.9546
D_{50}= 0.5576 D_{30}= 0.1889 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content: 11.5%

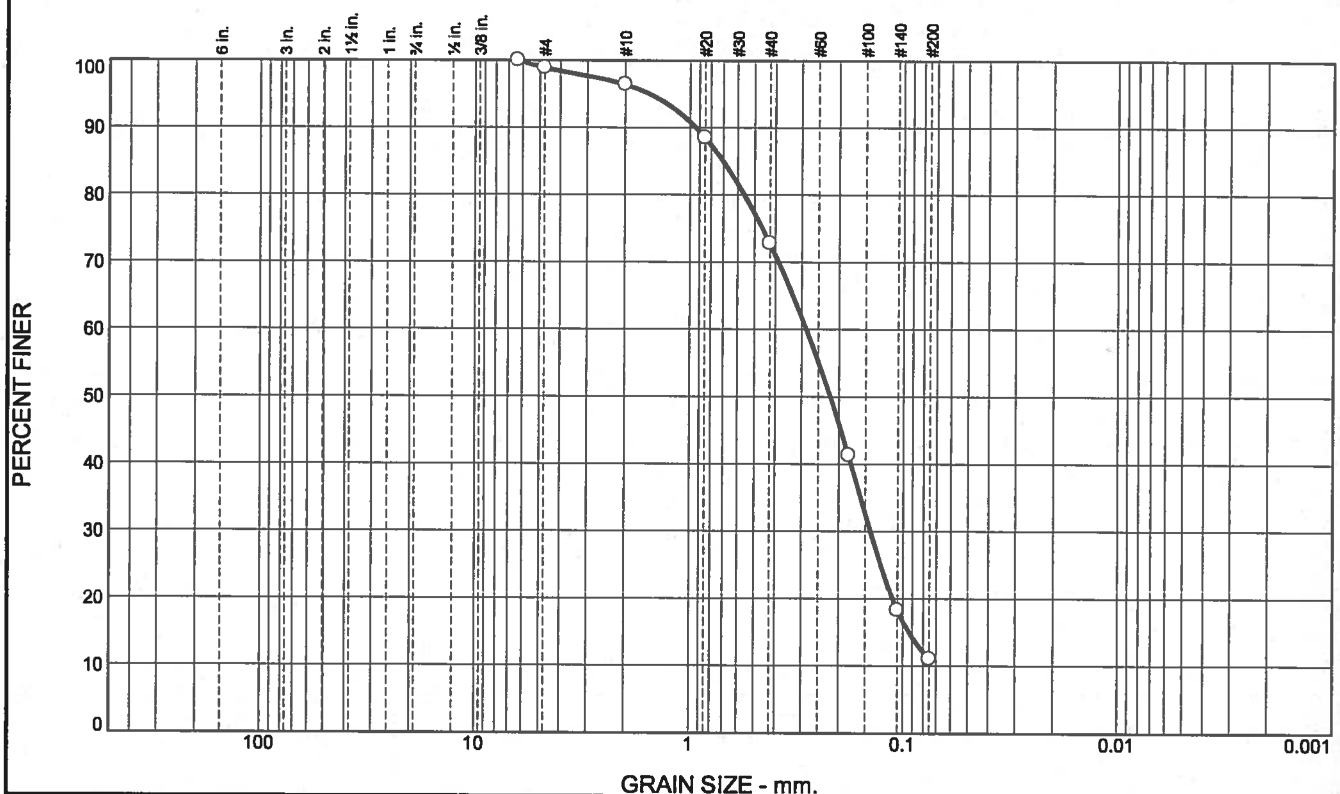
Location: HB-PCORE-105
Sample Number: 1D **Depth:** 1.2'-3.2' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-09

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	2.5	23.6	61.7	11.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	98.9		
#10	96.4		
#20	88.5		
#40	72.8		
#80	41.3		
#140	18.3		
#200	11.1		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9389 D_{85}= 0.7005 D_{60}= 0.2847
D_{50}= 0.2195 D_{30}= 0.1419 D_{15}= 0.0934
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 17.6%

Location: HB-PCORE-105
Sample Number: 1D-A **Depth:** 3.1'-5.1' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-10

Tested By: MSM/MCM **Checked By:** MTG

Schonewald Engineering Associates, Inc.
www.SchonewaldEngineering.com

CROSBY YARD AREA MEDIAN BORINGS (HB-PAMI-200s)

TEST BORING LOGS

TABULATION OF BORING LOCATIONS				
Boring No.	**Station**	**Offset (relative to SB yellow line)**	**Elevation (est'd)**	**Comments**
HB-PAMI-201	2258+57.4	1.3 ft RT	69.5 ft	SB median
HB-PAMI-202	2259+56.8	0.9 ft RT	68.5 ft	SB median
HB-PAMI-203	2260+56.3	1.1 ft RT	67.5 ft	SB median
HB-PAMI-204	2261+57.5	0.8 ft RT	66.5 ft	SB median
HB-PAMI-205	2262+56.9	1.4 ft RT	65 ft	SB median

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-PAMI-201
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	69.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/31/19; 0020-0120	**Drilling Method:**	auger boring	**Hammer Type:**	Automatic
Boring Location:	Station 2258+57.4; offset 1.3 ft RT of SB yellow line (median)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.906
		Auger ID/OD:	HSA to 8 ft	**Water Level*:**	none observed

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	1D	16/2	0.7 - 2.0	(5)-6-7	13	20	HSA			8 inches HMA	
								68.8		0.7 — Grey brown, SILTY AGGREGATE Changing at approximately 1.1 ft to:	
								68.4		1.1 — 1D: Tan, moist, fine to medium SAND, little silt, trace coarse sand. SAND FILL	
	2D	24/17	2.0 - 4.0	6-10-17-22	27	41				2D: Tan, moist, medium dense, fine to medium SAND, little silt, trace coarse sand, trace gravel. SAND FILL Changing at approximately 3.7 ft to:	#15619-11 WASH SIEVE A-2-4(0) SM -#200=12.2% WC=13.4%
3											
								65.8		3.7 — 2D-A: Grey tan, fine to medium SAND, some gravel, some silt, trace coarse sand. FILL	#15619-12 WASH SIEVE A-1-b SM -#200=18.0% WC=7.6%
	3D	24/18	4.0 - 6.0	16-8-8-13	16	24				Grey tan, moist, fine to coarse SAND, some gravel, some silt. FILL Changing at 5.1 ft to:	
								64.4		5.1 — 3D: Olive brown, damp (tight), Clayey SILT, trace very fine sand. MARINE SILT-CLAY CRUST	#15619-13 WASH SIEVE ATTERBERGS A-6(19) CL -#200=95.6% WC=28.6% LL=39.9 PL=21.3 PI=18.6
6	4D	24/24	6.0 - 8.0	8-8-8-7	16	24				4D: Olive brown, slightly mottled, damp (tight), very stiff, SILT & CLAY with two partings fine sandy silt. MARINE SILT-CLAY CRUST	
	5D	24/22	8.0 - 10.0	5-3-8-49	11	17				Olive brown, mottled, moist, stiff, CLAY & SILT, trace very fine sand as partings. MARINE SILT-CLAY CRUST Changing at 9.6 ft to:	
9											
								59.9		9.6 — 5D: Grey tan, moist, Silty GRAVEL, little fine to coarse sand; appears to be broken and weathered rock.	
								59.5		10.0 — **Bottom of Exploration at 10.0 feet below ground surface.** No refusal.	
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-PAMI-201

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-PAMI-202
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	68.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/30/19; 2325 - 5/31/19; 0015	**Drilling Method:**	auger boring	**Hammer Type:**	Automatic
Boring Location:	Station 2259+56.8; offset 0.9 ft RT of SB yellow line (median)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 6 ft	**Water Level*:**	3.2 ft (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	1D	16/8	0.7 - 2.0	(4)-7-6	13	20	SSA			8 inches HMA	
								67.8		0.7 — Grey brown SILTY AGGREGATE Changing at 1.3 ft to:	
								67.2		1.3 — 1D: Tan brown, damp, fine to medium SAND, little silt, trace to little fine gravel, trace coarse sand. SAND FILL	#15619-14 WASH SIEVE A-2-4(0) SM -#200=15.7% WC=14.4%
	2D	24/18	2.0 - 4.0	5-7-12-17	19	29				2D: Tan brown, moist, medium dense, fine to medium SAND, little silt, little gravel, trace coarse sand; more gravel in bottom of sample; silt content varies in layers. SAND FILL	#15619-15 WASH SIEVE A-2-4(0) SP-SM -#200=11.9% WC=11.5%
3											
	3D	5/5	4.0 - 4.4	50/5"	--			64.5		4.0 — 3D: Olive grey, wet, fine to coarse SAND, some silt, little to some gravel; gravel appears to be broken rock. FILL / REWORKED 4.4 ft: Able to push cobble to side.	#15619-16 WASH SIEVE A-1-b SM -#200=20.9% WC=12.2%
6	4D	20/15	6.0 - 7.7	20-34-78-50/3"	112	169				4D: Olive brown and grey, very dense, GRAVEL, some silt, little to some fine to coarse sand; appears to be reworked; much of gravel appears to be broken rock. FILL / REWORKED	#15619-17 -#200 SIEVE ATTERBERGS -#200=26.4% WC=14.7% LL=NV PL=NP PI=NP
								60.8		7.7 — **Bottom of Exploration at 7.7 feet below ground surface.** Split-spoon refusal.	
9											
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-PAMI-203
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	67.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/30/19; 2235-2320	**Drilling Method:**	auger boring	**Hammer Type:**	Automatic
Boring Location:	Station 2260+56.3; offset 1.1 ft RT of SB yellow line (median)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 7.4 ft	**Water Level*:**	3.4 ft (open, end)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	1D	16/7	0.7 - 2.0	(4)-5-3	8	12	SSA	66.8		8-1/2 inches HMA — 0.7	
								66.1		Grey brown SILTY AGGREGATE Changing at 1.4 ft to: — 1.4	#15619-18 WASH SIEVE A-2-4(0) SM -#200=18.8% WC=12.4%
	2D	14/9	2.0 - 3.2	5-7-50/2"	--					1D: Olive tan, moist, fine to medium SAND, little to some silt, trace gravel, trace coarse sand. SAND FILL 2D: Olive tan, moist, fine to medium SAND, little silt, trace coarse sand, trace gravel. SAND FILL	
3								64.3		— 3.2 3.2 to 4.0 ft: Cobble	#15619-19 WASH SIEVE A-2-4(0) SM -#200=14.0% WC=12.4%
	3D	16/13	4.0 - 5.3	5-34-50/4"	--					3D: Olive grey, wet, fine to coarse Sandy GRAVEL, some silt with pockets / chunks silt-clay. FILL / REWORKED	#15619-20 WASH SIEVE A-1-b GM -#200=23.3% WC=11.3%
								62.2		— 5.3 5.3 to 7.4 ft: Auger cuttings appear to be broken rock.	
6											
								60.1		— 7.4 **Bottom of Exploration at 7.4 feet below ground surface.** Auger refusal.	
9											
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-PAMI-204
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	66.5 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/30/19; 2130-2230	**Drilling Method:**	auger boring	**Hammer Type:**	Automatic
Boring Location:	Station 2261+57.5; offset 0.8 ft RT of SB yellow line (median)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.906
		Auger ID/OD:	HSA to 8 ft	**Water Level*:**	5.7 ft (inside augers)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	1D	17/9	0.6 - 2.0	(7)-4-4	8	12	HSA	65.9		7-1/2 inches HMA (0.6) Grey brown SILTY AGGREGATE Changing at 1.5 ft to:	
								65.0		(1.5) 1D: Tan, moist, fine to medium SAND, little to some silt, trace coarse sand. SAND FILL	
3	2D	24/19	2.0 - 4.0	4-8-14-13	22	33				2D: Tan, damp, medium dense, fine to medium SAND, trace to little silt, trace coarse sand, trace gravel. SAND FILL	#15619-21 WASH SIEVE A-3 SP-SM -#200=10.3% WC=11.3%
	3D	24/16	4.0 - 6.0	9-12-18-15	30	45		62.5		(4.0) 3D: Somewhat layered: Grey, brown, and tan, wet and moist, medium dense, fine to medium SAND, some silt, trace gravel, trace coarse sand; appears to be reworked. FILL / REWORKED	#15619-22 WASH SIEVE A-2-4(0) SM -#200=28.4% WC=12.8%
6	4D	24/16	6.0 - 8.0	9-9-16-14	25	38		60.5		(6.0) 4D: Olive tan brown, wet, medium dense, Silty fine to coarse SAND, trace to little gravel. TILL	#15619-23 WASH SIEVE A-4(0) SM -#200=38.9% WC=11.9%
	5D	10/10	8.0 - 8.8	7-50/4"	--			57.7		5D: Olive tan brown, wet, fine to coarse SAND, some silt, little gravel. TILL Broken rock in tip of spoon. (8.8)	
9								57.5		(9.0) **Bottom of Exploration at 9.0 feet below ground surface.** Auger refusal; auger walking right.	
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Improvements-Crosby Area SB Median **LOCATION:** South Portland, ME	**Boring No.:** HB-PAMI-205 **Proj. No.:** 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	65 ft (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/30/19; 2030-2125	**Drilling Method:**	auger boring	**Hammer Type:**	Automatic
Boring Location:	Station 2262+56.9; offset 1.4 ft RT of SB yellow line (median)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.906
		Auger ID/OD:	HSA to 8 ft	**Water Level*:**	none observed

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	1D	17/9	0.6 - 2.0	(5)-6-7	13	20	HSA	64.4		7 inches HMA; 0.6	
								63.7		Grey brown SILTY AGGREGATE Grading at 1.3 ft to: 1.3	
	2D	24/23	2.0 - 4.0	7-4-3-3	7	11				1D: Tan, moist, fine to medium SAND, little silt, trace coarse sand. SAND FILL 2D: Tan, moist, loose, fine to medium SAND, trace to little silt, trace coarse sand. SAND FILL Changing at 3.3 ft to:	#15619-24 WASH SIEVE A-3 SP-SM -#200=8.9% WC=8.9%
3								61.7		3.3 2D-A: Olive brown, mottled, desiccated, moist, Clayey SILT, little fine sand; appears reworked. FILL / REWORKED	#15619-25 WASH SIEVE ATTERBERGS A-7-6(18) CL -#200=86.6% WC=23.1% LL=42.6 PL=23.1 PI=19.5
	3D	24/24	4.0 - 6.0	4-5-7-9	12	18				3D: Olive brown, mottled, moist, stiff, Clayey SILT, trace to little fine sand; appears to be reworked to 5.3 ft. FILL / REWORKED	
								59.7		5.3	
6	4D	24/21	6.0 - 8.0	9-12-12-12	24	36				4D: Olive brown, slightly mottled, moist, very stiff, SILT & CLAY. MARINE SILT-CLAY CRUST	#15619-26 WASH SIEVE ATTERBERGS A-7-6(25) CL -#200=99.4% WC=28.2% LL=46.0 PL=24.2 PI=21.8
	5D	24/24	8.0 - 10.0	3-5-7-7	12	18				5D: Olive brown, moist, stiff, CLAY & SILT. MARINE SILT-CLAY CRUST	
9								55.0		10.0 **Bottom of Exploration at 10.0 feet below ground surface.** No refusal.	
12											
15											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-PAMI-205

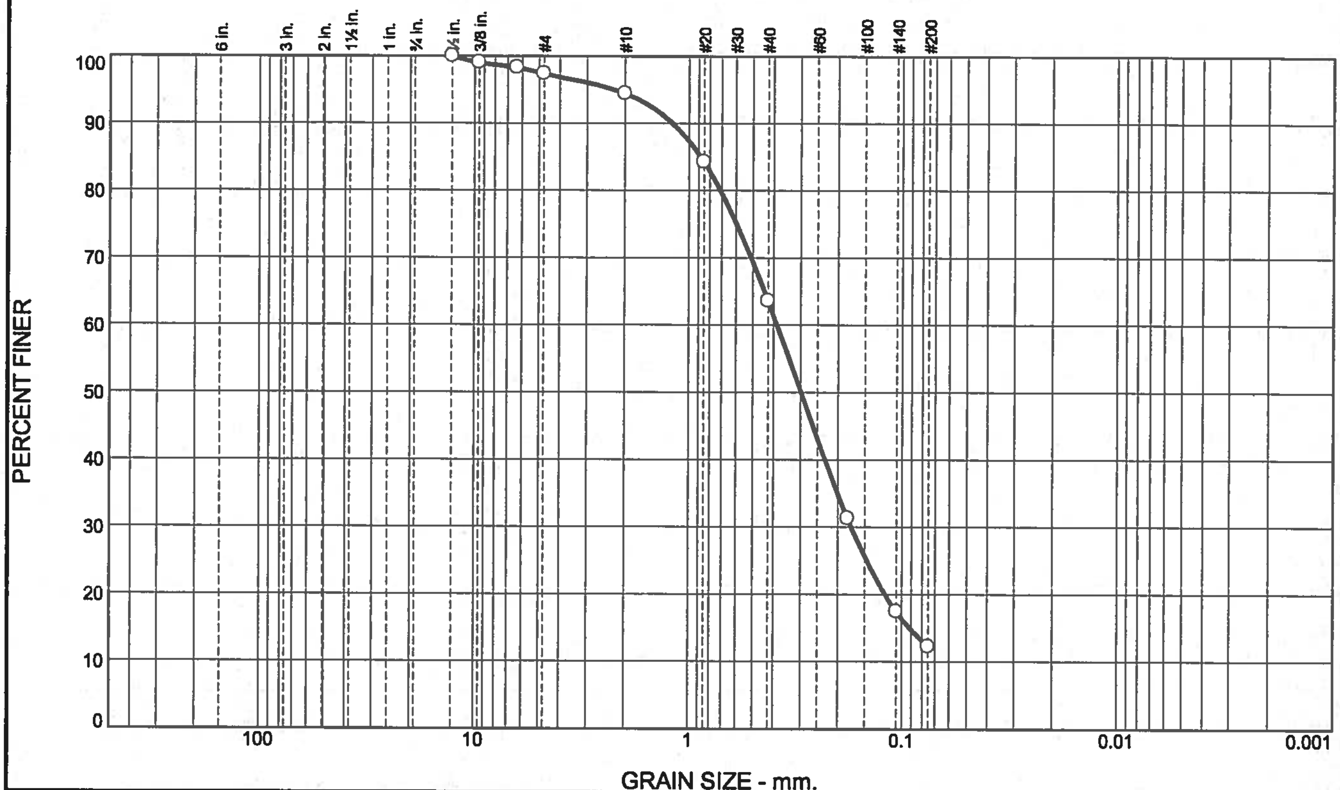
SCHONEWALD ENGINEERING ASSOCIATES, INC.
www.SchonewaldEngineering.com

CROSBY YARD AREA MEDIAN BORINGS (HB-PAMI-200s)

LABORATORY TEST REPORTS

TABULATION OF SOIL TESTING (RWG&A PROJECT NO. 1368-016) (listed in order of test report presentation)				
Boring No.	**Sample No.**	**Sample Depth (ft., BGS)**	**RWG&A LAB NO.**	**Tests Completed**
HB-PAMI-201	2D	2-3.7	#15619-11	wash sieve gradation
HB-PAMI-201	2D-A	3.7-4	#15619-12	wash sieve gradation
HB-PAMI-201	3D	5.1-6	#15619-13	wash sieve gradation; Atterberg Limits
HB-PAMI-202	1D	1.3-2	#15619-14	wash sieve gradation
HB-PAMI-202	2D	2-4	#15619-15	wash sieve gradation
HB-PAMI-202	3D	4-4.4	#15619-16	wash sieve gradation
HB-PAMI-202	4D	6-7.7	#15619-17	percent passing #200; Atterberg Limits
HB-PAMI-203	1D	1.4-2	#15619-18	wash sieve gradation
HB-PAMI-203	2D	2-3.2	#15619-19	wash sieve gradation
HB-PAMI-203	3D	4-5.3	#15619-20	wash sieve gradation
HB-PAMI-204	2D	2-4	#15619-21	wash sieve gradation
HB-PAMI-204	3D	4-6	#15619-22	wash sieve gradation
HB-PAMI-204	4D	6-8	#15619-23	wash sieve gradation
HB-PAMI-205	2D	2-3.3	#15619-24	wash sieve gradation
HB-PAMI-205	2D-A	3.3-4	#15619-25	wash sieve gradation; Atterberg Limits
HB-PAMI-205	4D	6-8	#15619-26	wash sieve gradation; Atterberg Limits

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.6	3.0	30.8	51.4	12.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.0		
1/4"	98.3		
#4	97.4		
#10	94.4		
#20	84.3		
#40	63.6		
#80	31.3		
#140	17.4		
#200	12.2		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1928 D_{85}= 0.8804 D_{60}= 0.3859
D_{50}= 0.2982 D_{30}= 0.1730 D_{15}= 0.0916
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 13.4%

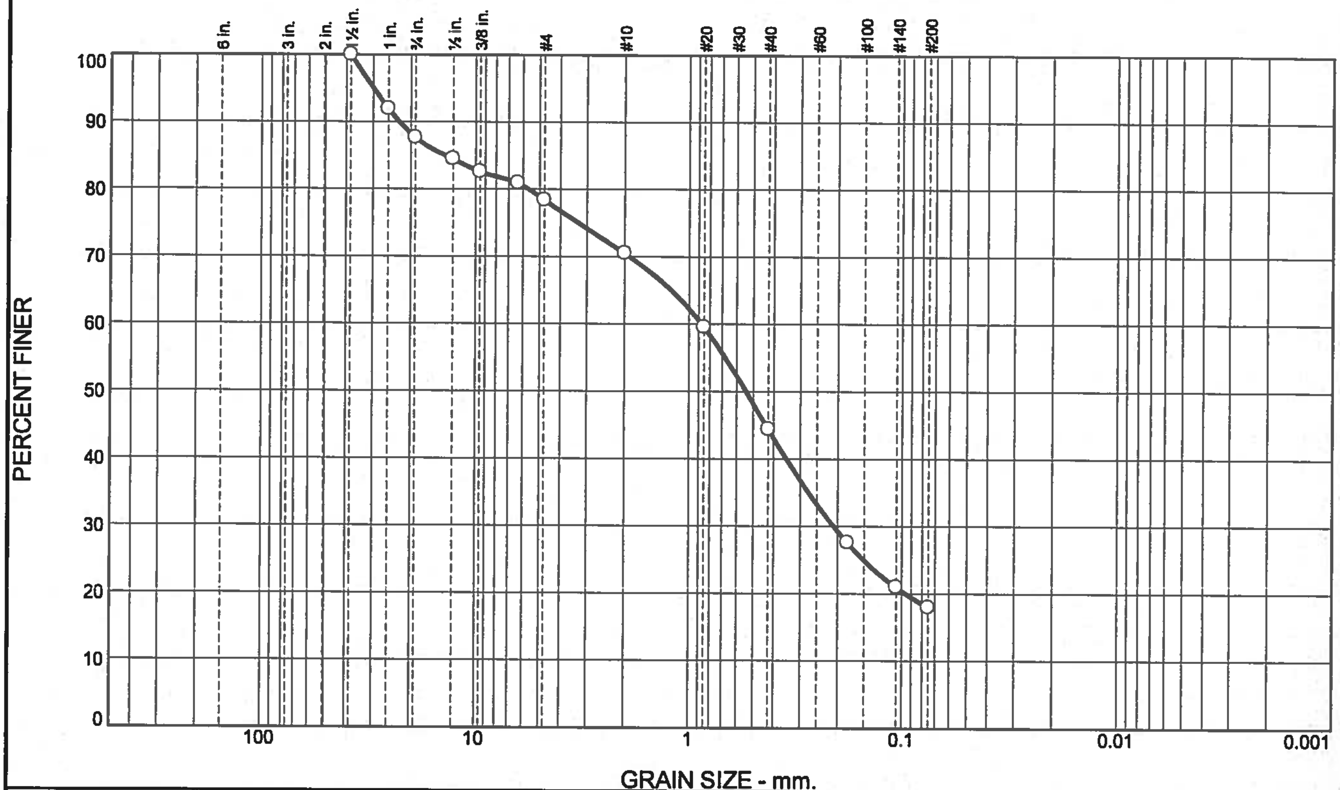
Location: HB-PAMI-201
Sample Number: 2D **Depth:** 2'-3.7' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-11

Tested By: MCM/MSM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.3	9.3	7.9	26.1	26.4	18.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	91.9		
3/4"	87.7		
1/2"	84.5		
3/8"	82.6		
1/4"	80.9		
#4	78.4		
#10	70.5		
#20	59.6		
#40	44.4		
#80	27.6		
#140	21.0		
#200	18.0		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 22.6233 D_{85}= 13.6873 D_{60}= 0.8704
D_{50}= 0.5417 D_{30}= 0.2086 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content: 7.6%

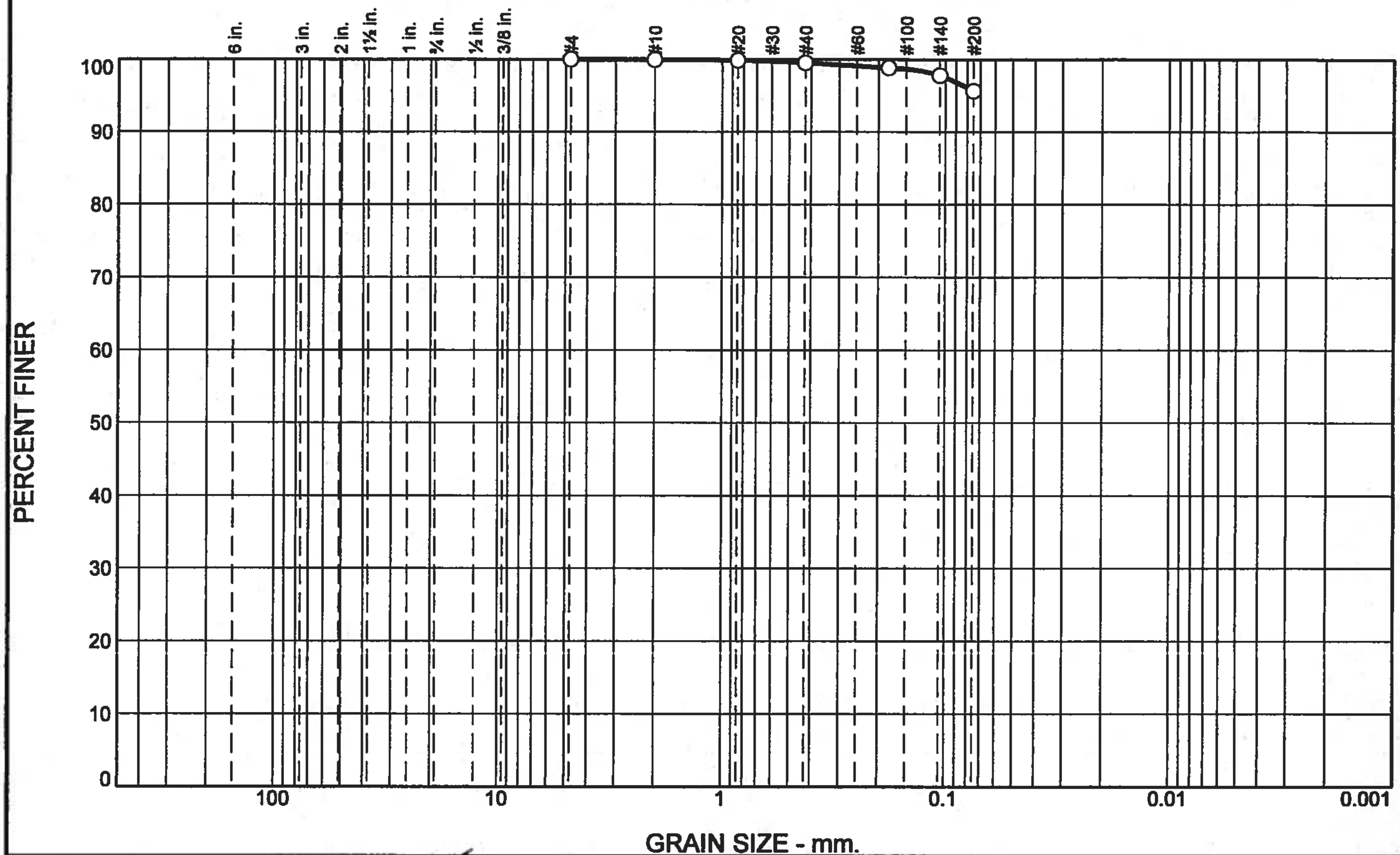
Location: HB-PAMI-201
Sample Number: 2D-A **Depth:** 3.7'-4' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-12

Tested By: MCM/MSM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	3.9	95.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.5		
#80	98.8		
#140	97.8		
#200	95.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 21.3 LL= 39.9 PI= 18.6

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

Natural Moisture 28.6%

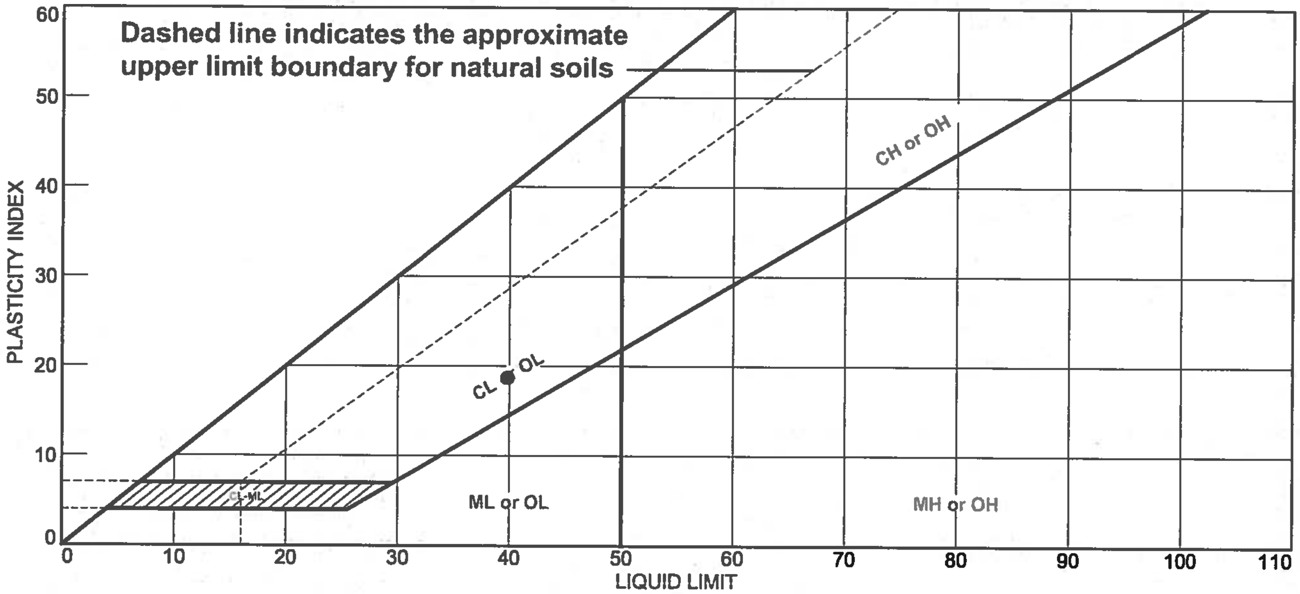
Location: HB-PAMI-201
Sample Number: 3D **Depth:** 5.1'-6' **Date:** 7/18/2019

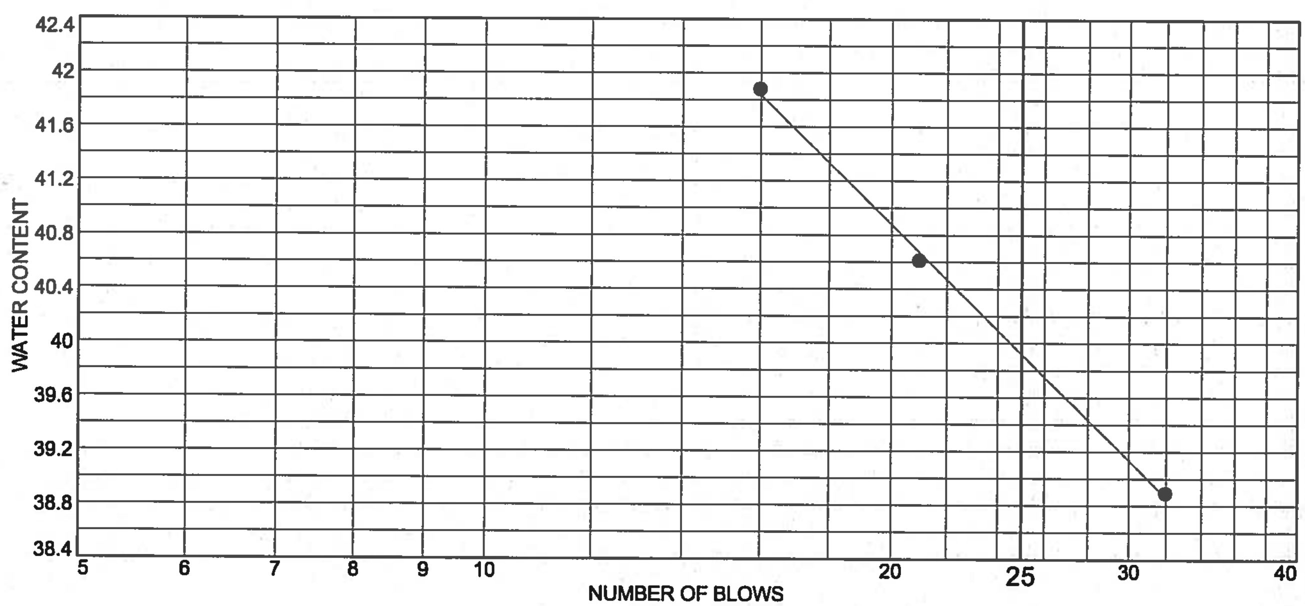
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-13

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	39.9	21.3	18.6	99.6	96.5	CL

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.

Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)

Portland, ME

Location: HB-PAMI-201

Sample Number: 3D **Depth:** 5.1'-6'

R.W. Gillespie & Associates, Inc.

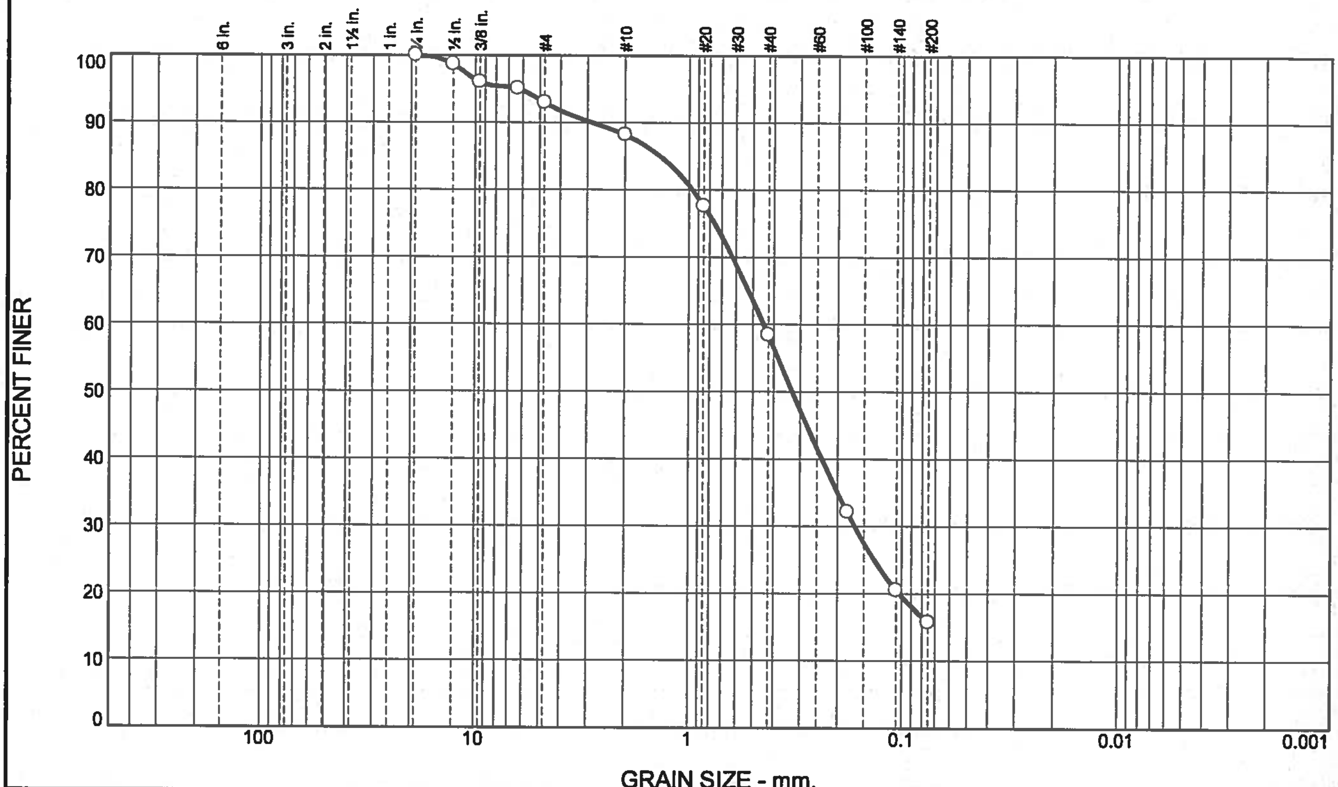
Biddeford, Maine

Remarks:

Lab No. 15619-13

Tested By: JMT **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.1	4.7	29.8	42.7	15.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.7		
3/8"	96.0		
1/4"	95.1		
#4	92.9		
#10	88.2		
#20	77.6		
#40	58.4		
#80	32.1		
#140	20.5		
#200	15.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 2.8469 D_{85}= 1.3623 D_{60}= 0.4465
D_{50}= 0.3264 D_{30}= 0.1659 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 14.4%

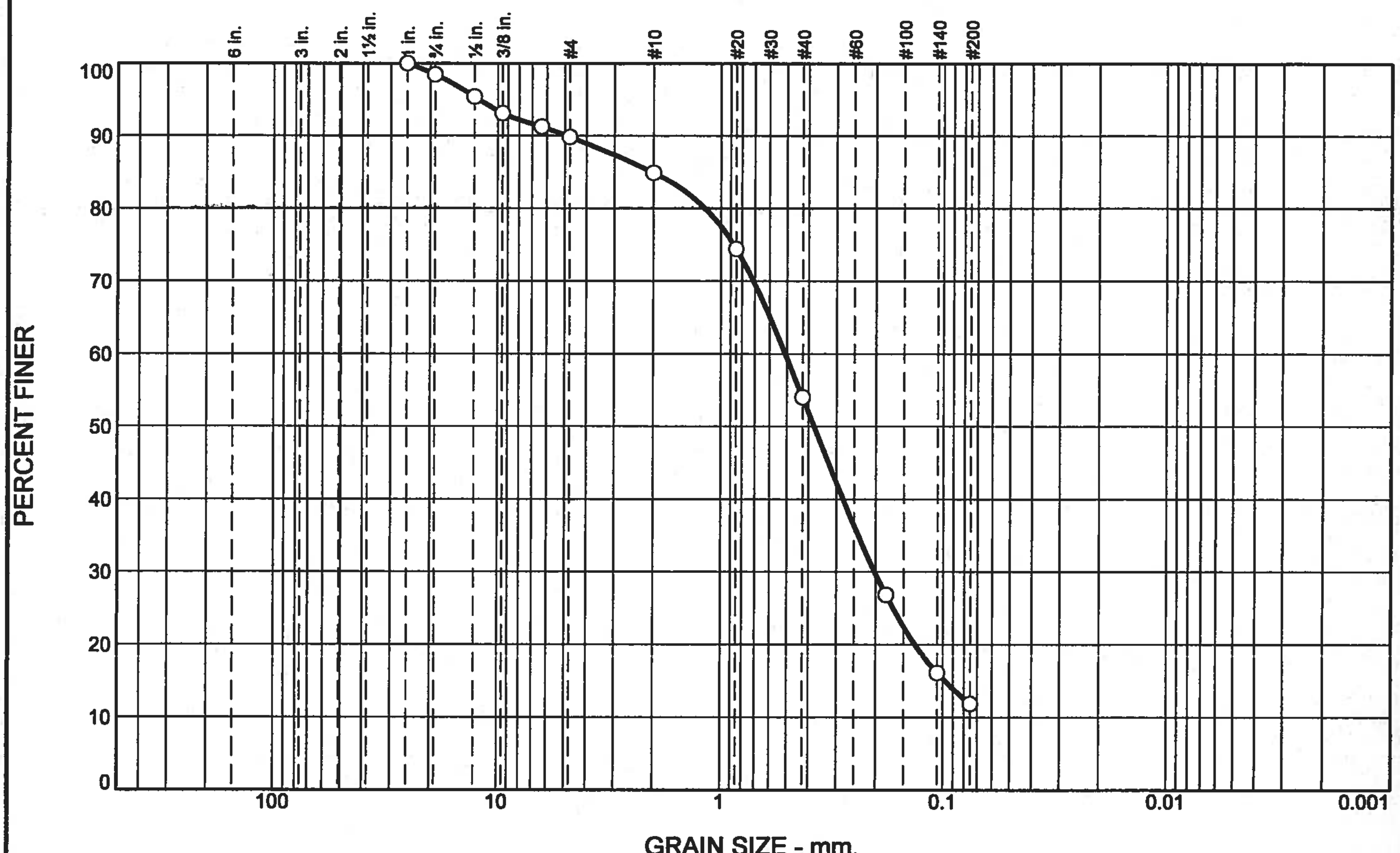
Location: HB-PAMI-202
Sample Number: 1D **Depth:** 1.3'-2' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-14

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.6	8.6	4.9	30.9	42.1	11.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	98.4		
1/2"	95.4		
3/8"	93.1		
1/4"	91.2		
#4	89.8		
#10	84.9		
#20	74.4		
#40	54.0		
#80	26.9		
#140	16.1		
#200	11.9		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.9070 D_{85}= 2.0293 D_{60}= 0.5086
D_{50}= 0.3776 D_{30}= 0.2022 D_{15}= 0.0980
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 11.5%

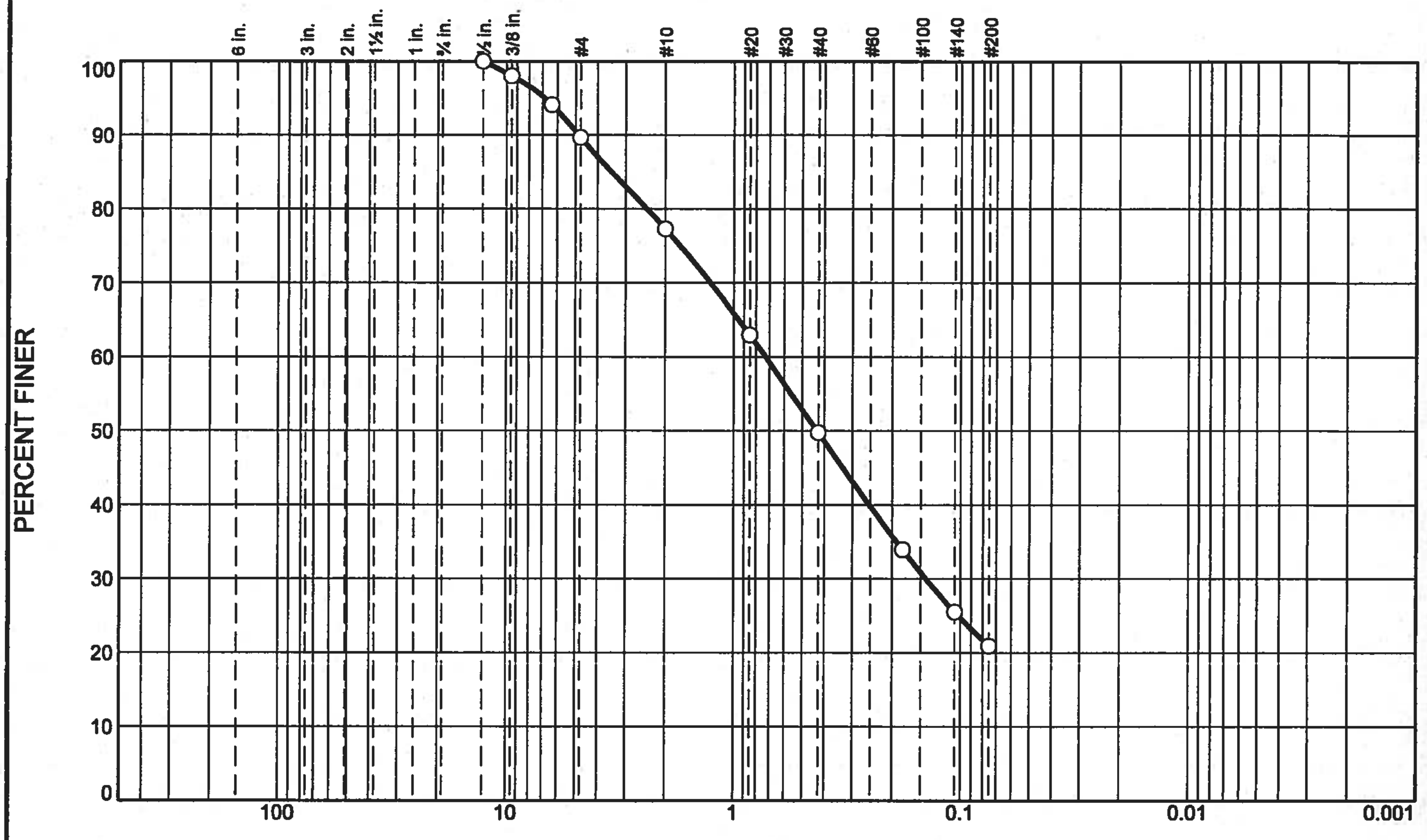
Location: HB-PAMI-202
Sample Number: 2D **Depth:** 2'-4' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-15

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.3	12.4	27.6	28.8	20.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.0		
1/4"	94.1		
#4	89.7		
#10	77.3		
#20	63.0		
#40	49.7		
#80	33.9		
#140	25.5		
#200	20.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.8455 D_{85}= 3.4559 D_{60}= 0.7255
D_{50}= 0.4307 D_{30}= 0.1423 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content: 12.2%

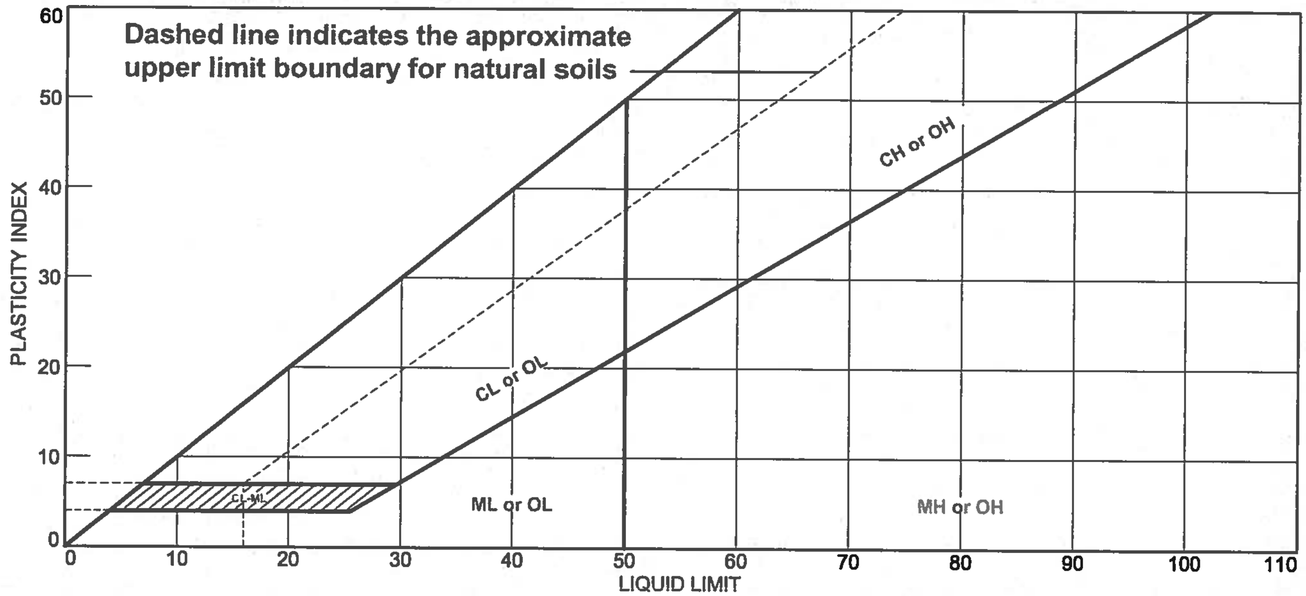
Location: HB-PAMI-202
Sample Number: 3D **Depth:** 4'-4.4' **Date:** 7/11/2019

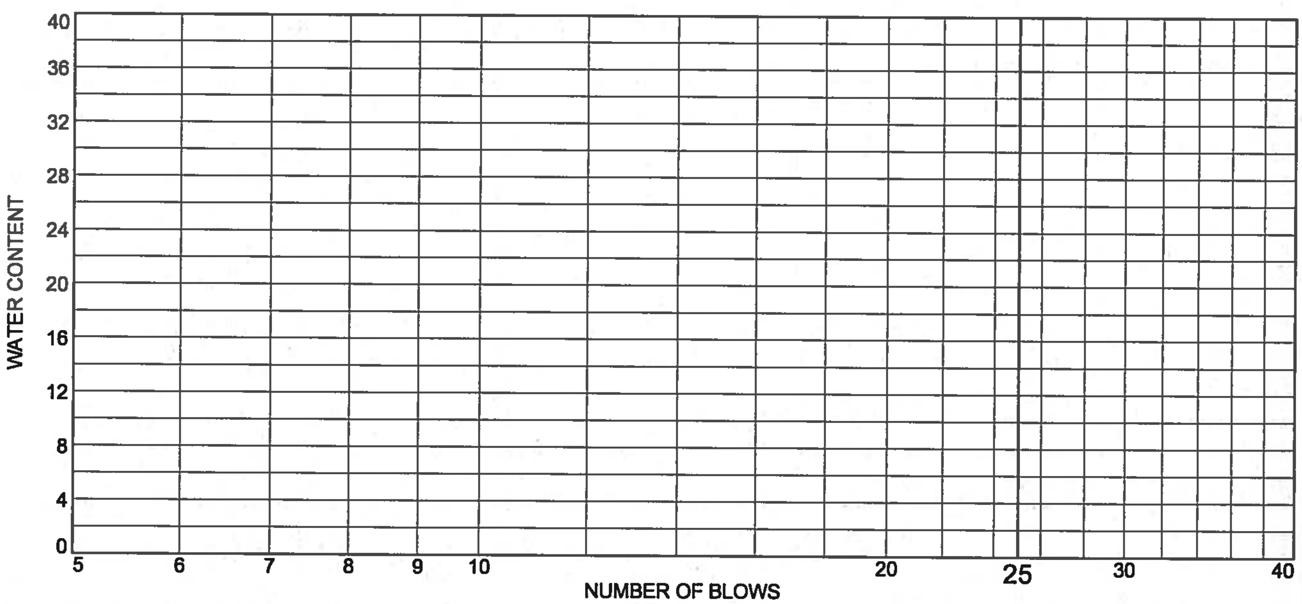
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-16

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		NV	NP	NP		26.4	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.

Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)

Portland, ME

Location: HB-PAMI-202

Sample Number: 4D **Depth:** 6'-7.7'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

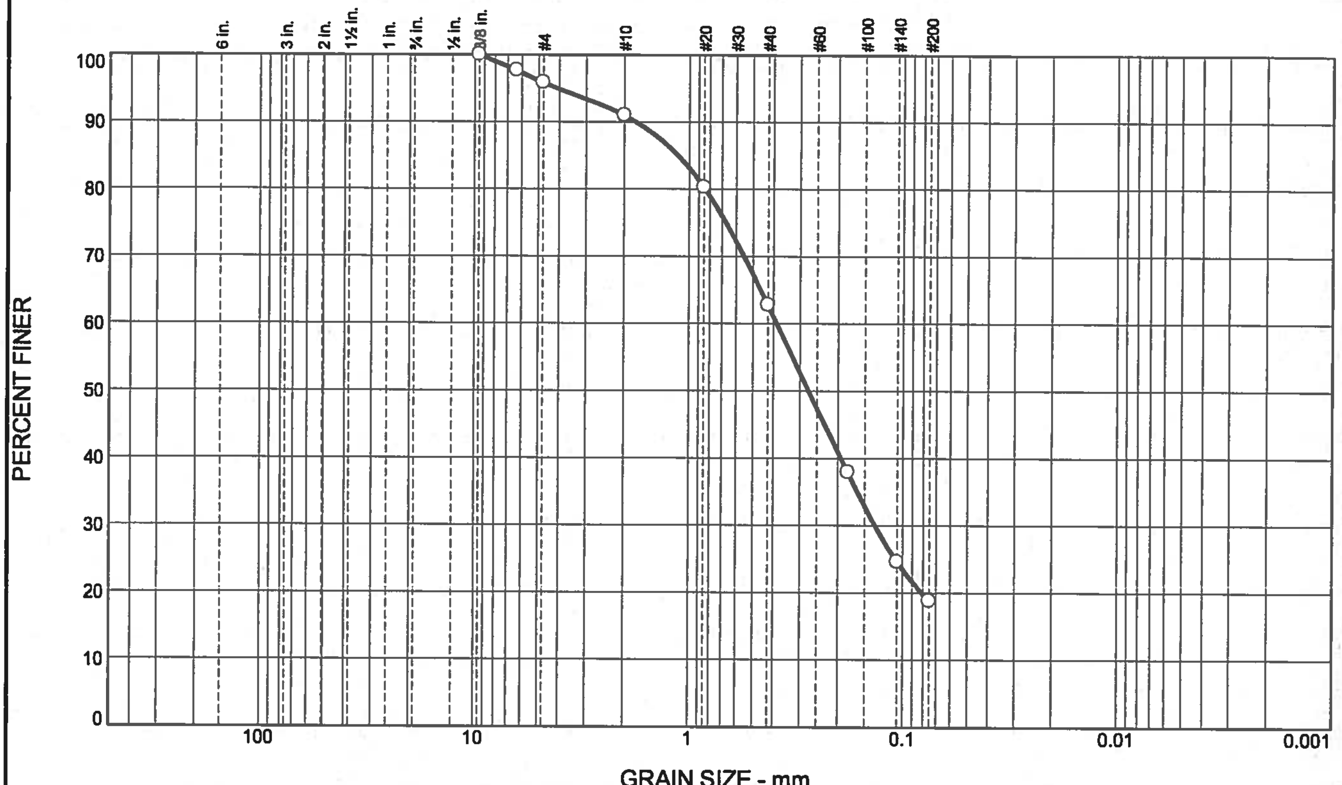
●Natural Moisture: 14.7%

Lab No. 15619-17

Tested By: JMT **Checked By:** MTG

MatM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.1	4.9	28.2	44.0	18.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	97.7		
#4	95.9		
#10	91.0		
#20	80.3		
#40	62.8		
#80	37.9		
#140	24.6		
#200	18.8		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.7638 D_{85}= 1.1235 D_{60}= 0.3858
D_{50}= 0.2734 D_{30}= 0.1343 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 12.4%

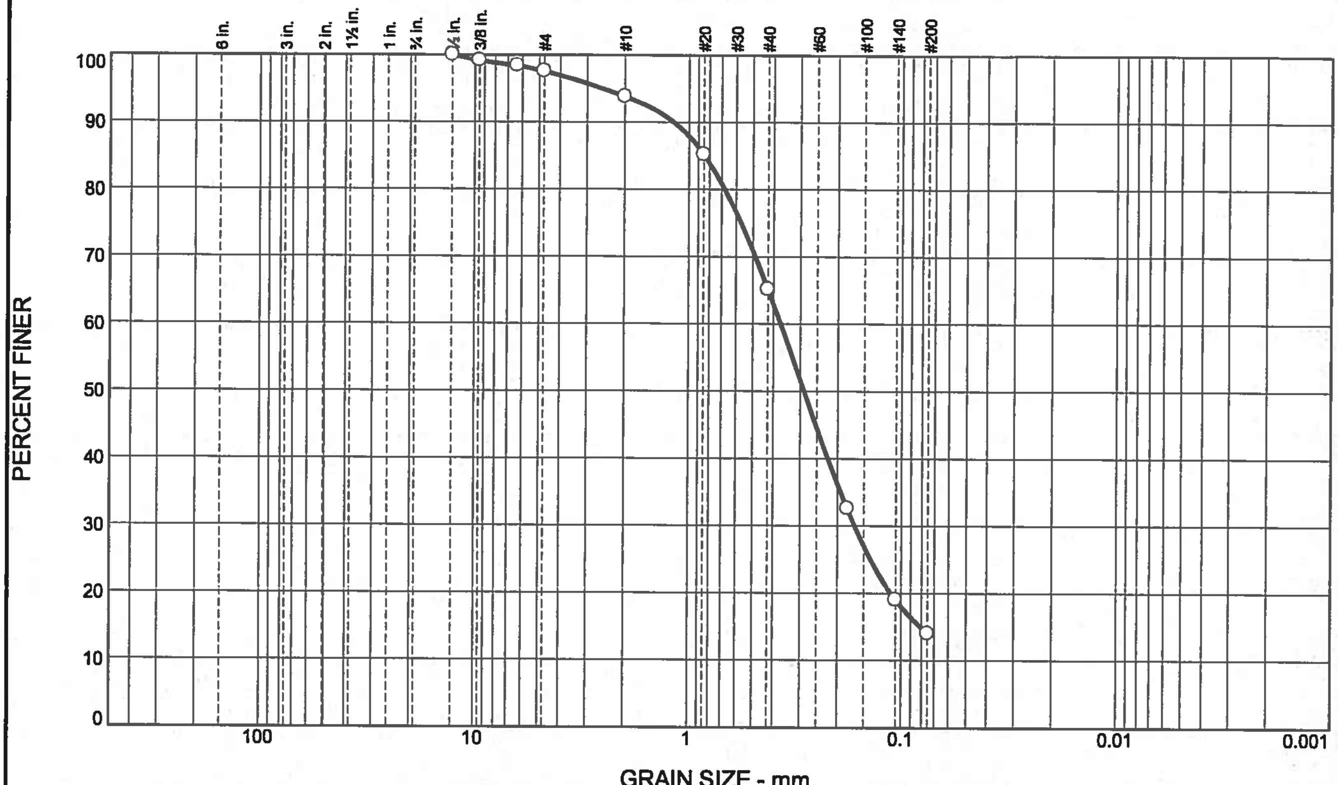
Location: HB-PAMI-203
Sample Number: 1D **Depth:** 1.4'-2' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-18

Tested By: JJB **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	3.8	28.6	51.2	14.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.2		
1/4"	98.4		
#4	97.6		
#10	93.8		
#20	85.2		
#40	65.2		
#80	32.6		
#140	19.0		
#200	14.0		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1731 D_{85}= 0.8409 D_{60}= 0.3706
D_{50}= 0.2874 D_{30}= 0.1659 D_{15}= 0.0809
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 12.4%

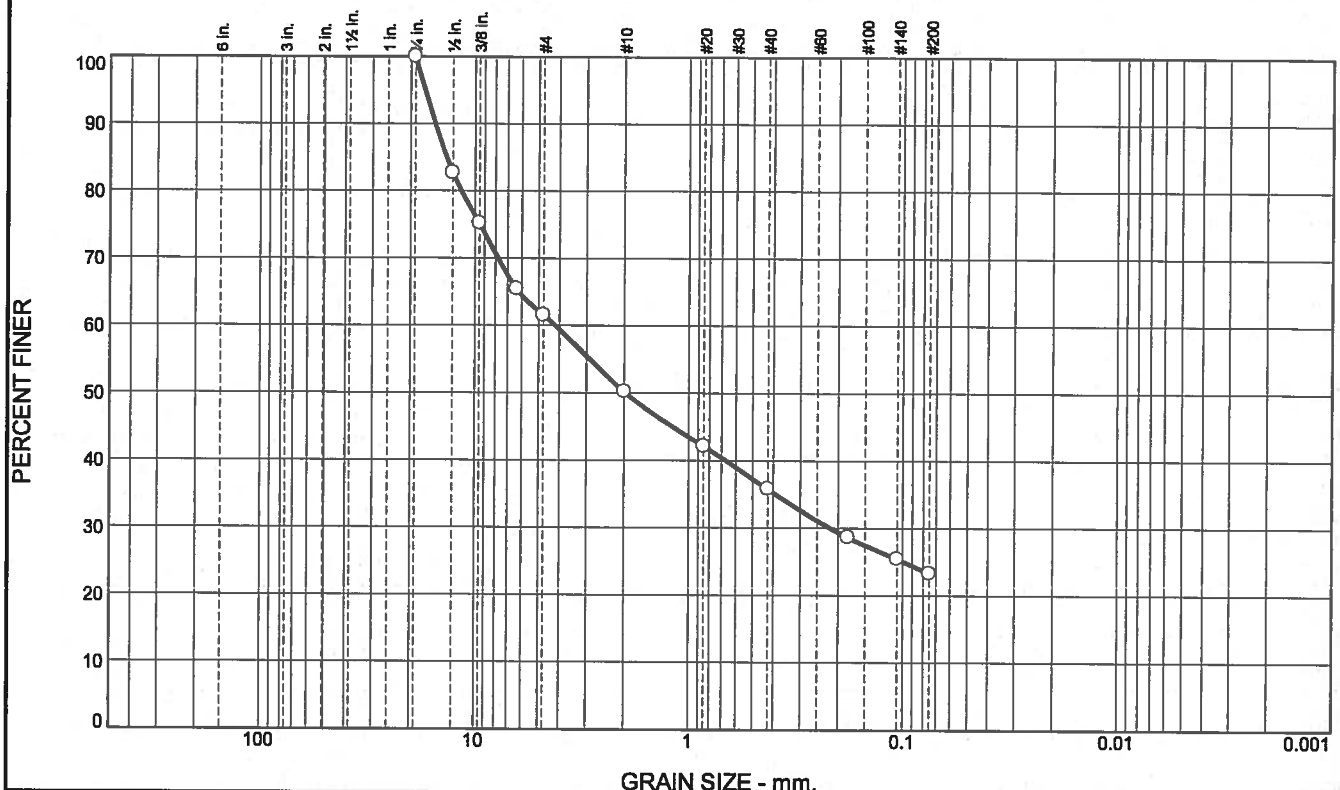
Location: HB-PAMI-203
Sample Number: 2D **Depth:** 2'-3.2' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-19

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	38.4	11.4	14.4	12.5	23.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	82.7		
3/8"	75.2		
1/4"	65.4		
#4	61.6		
#10	50.2		
#20	42.2		
#40	35.8		
#80	28.7		
#140	25.4		
#200	23.3		

* (no specification provided)

Soil Description

Silty gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 15.3623 D_{85}= 13.5779 D_{60}= 4.1810
D_{50}= 1.9645 D_{30}= 0.2166 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

Moisture Content: 11.3%

Location: HB-PAMI-203
Sample Number: 3D **Depth:** 4'-5.3' **Date:** 7/11/2019

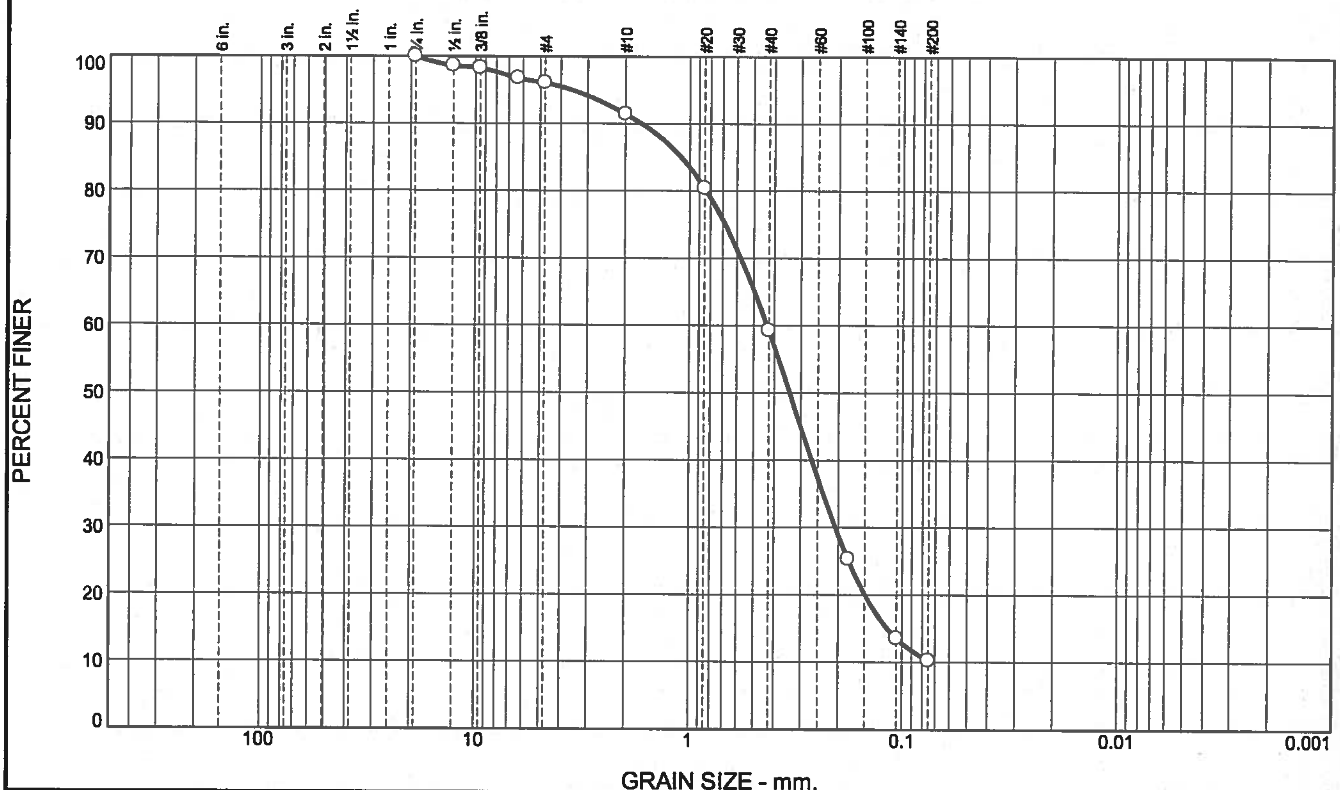
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-20

Tested By: MSM/MCM **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.9	4.6	32.2	49.0	10.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.6		
3/8"	98.3		
1/4"	96.8		
#4	96.1		
#10	91.5		
#20	80.4		
#40	59.3		
#80	25.3		
#140	13.5		
#200	10.3		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.6747 D_{85}= 1.0915 D_{60}= 0.4330
D_{50}= 0.3382 D_{30}= 0.2065 D_{15}= 0.1170
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 11.3%

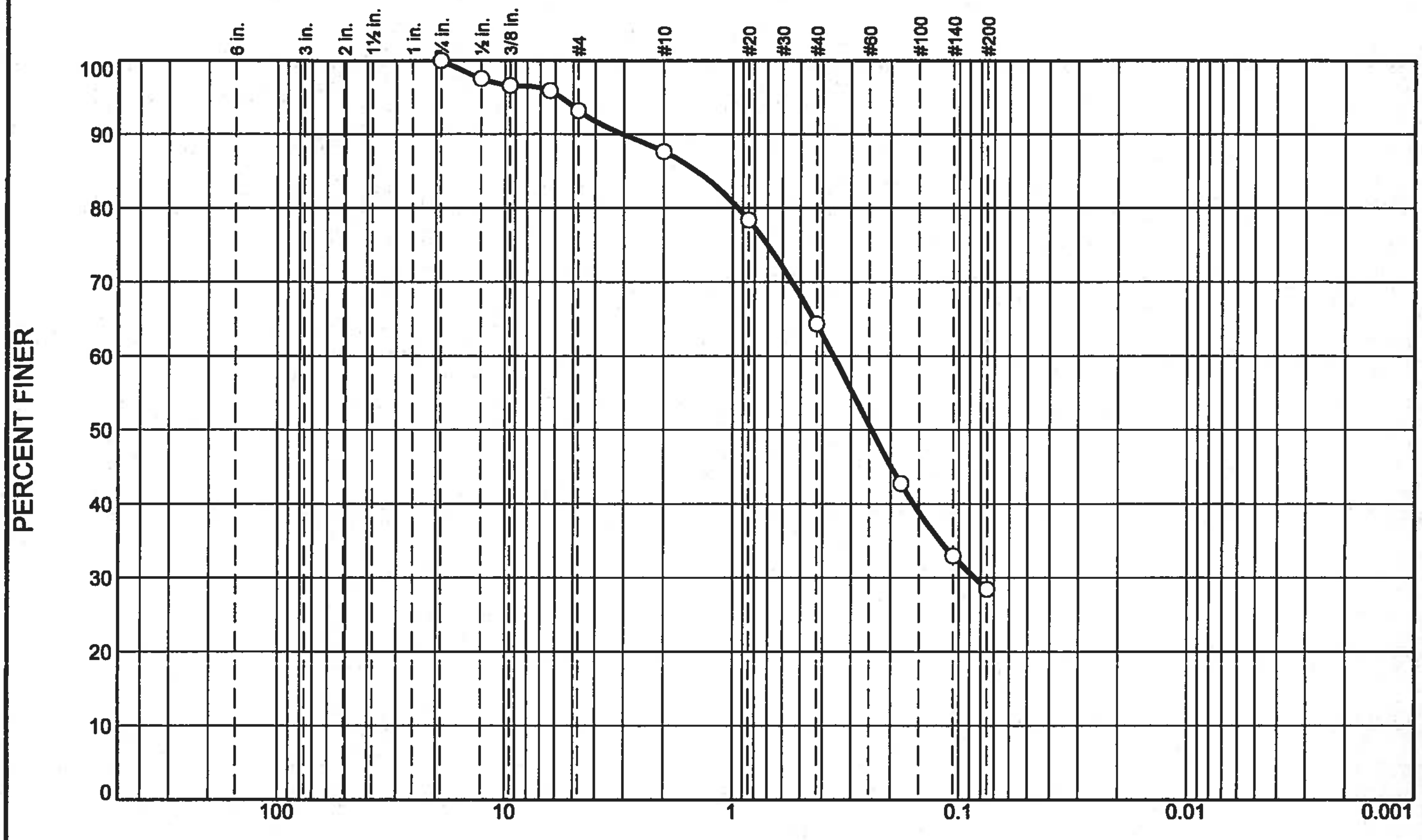
Location: HB-PAMI-204
Sample Number: 2D **Depth:** 2'-4' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-21

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.8	5.6	23.3	35.9	28.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	97.5		
3/8"	96.6		
1/4"	95.9		
#4	93.2		
#10	87.6		
#20	78.4		
#40	64.3		
#80	42.7		
#140	32.9		
#200	28.4		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.0341 D_{85}= 1.4372 D_{60}= 0.3577
D_{50}= 0.2433 D_{30}= 0.0853 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 12.8%

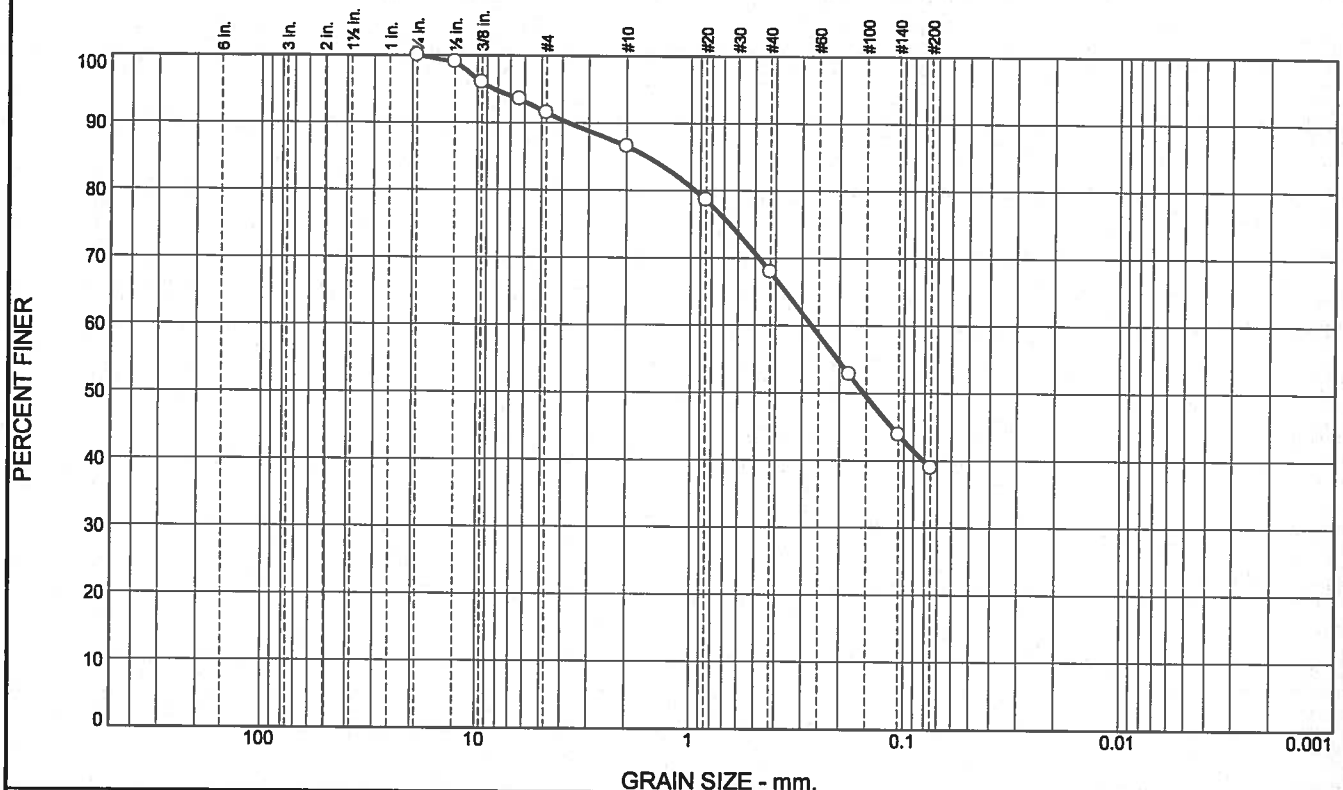
Location: HB-PAMI-204
Sample Number: 3D **Depth:** 4'-6' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-22

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.5	5.0	18.5	29.1	38.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	99.0		
3/8"	96.0		
1/4"	93.5		
#4	91.5		
#10	86.5		
#20	78.6		
#40	68.0		
#80	52.8		
#140	43.8		
#200	38.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.7404 D_{85}= 1.6010 D_{60}= 0.2696
D_{50}= 0.1538 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Moisture Content: 11.9%

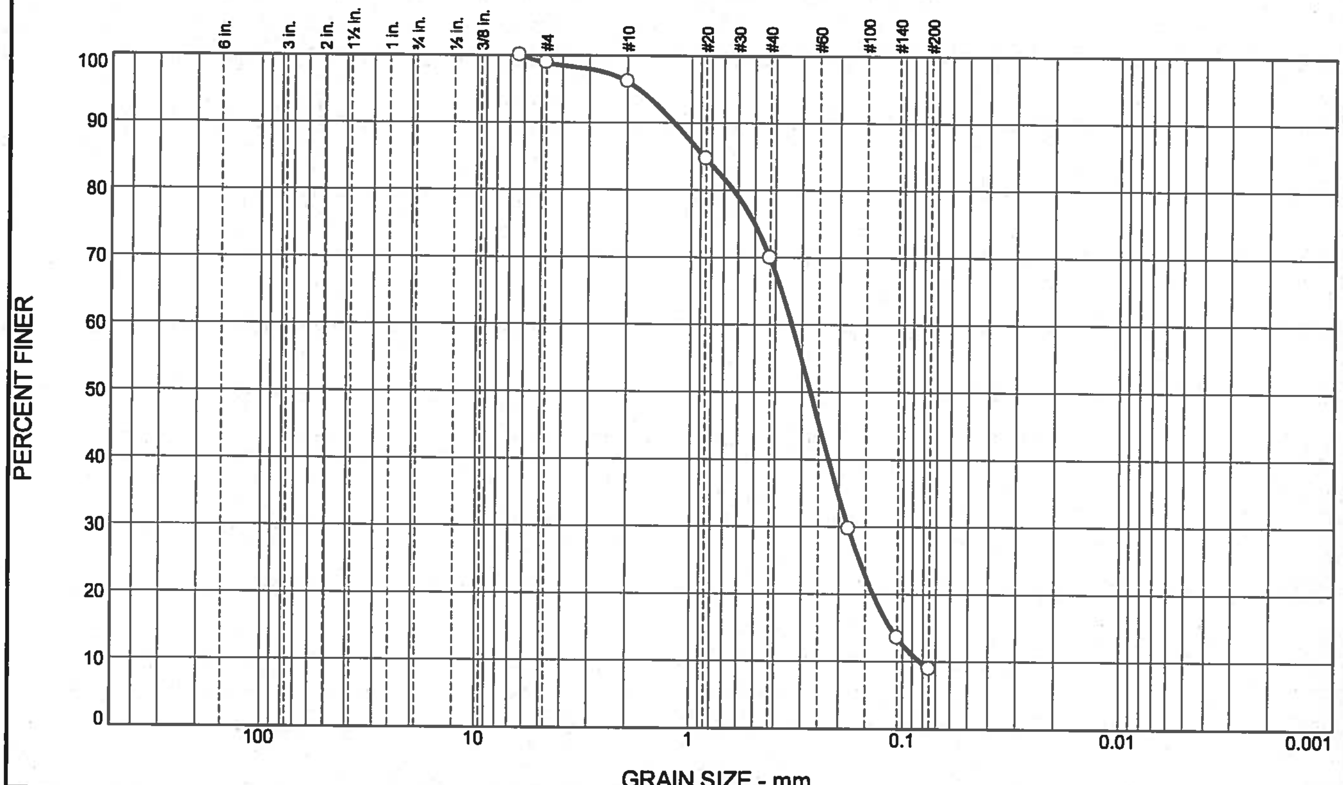
Location: HB-PAMI-204
Sample Number: 4D **Depth:** 6'-8' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-23

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	2.8	26.2	61.0	8.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	98.9		
#10	96.1		
#20	84.7		
#40	69.9		
#80	29.7		
#140	13.5		
#200	8.9		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.2044 D_{85}= 0.8681 D_{60}= 0.3348
D_{50}= 0.2733 D_{30}= 0.1812 D_{15}= 0.1140
D_{10}= 0.0828 C_u= 4.05 C_c= 1.19

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 8.9%

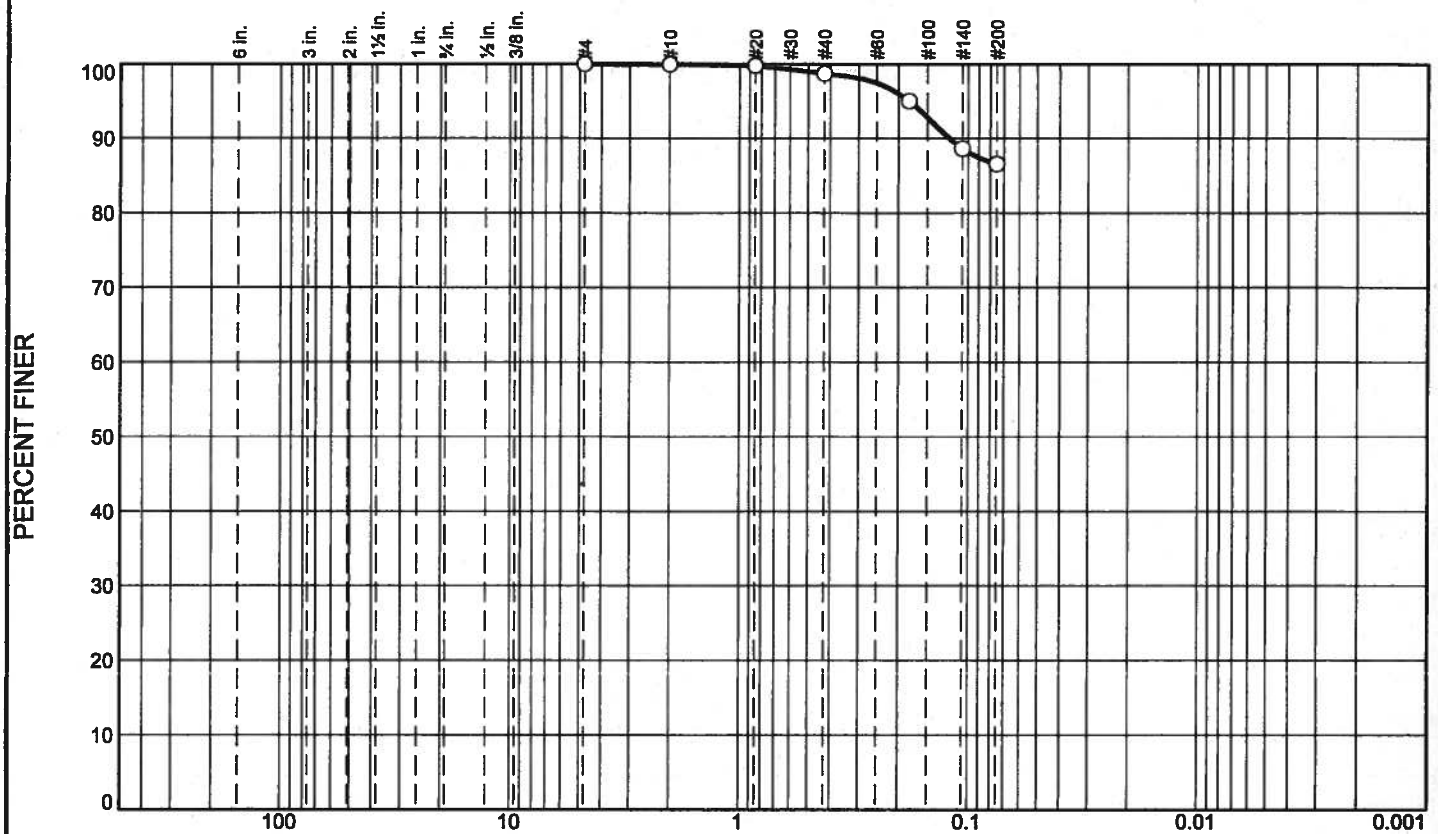
Location: HB-PAMI-205
Sample Number: 2D **Depth:** 2'-3.3' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-24

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.3	12.1	86.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.7		
#40	98.7		
#80	95.0		
#140	88.6		
#200	86.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 23.1 LL= 42.6 PI= 19.5

Coefficients

D_{90}= 0.1203 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(18)

Remarks

Natural Moisture: 23.1%

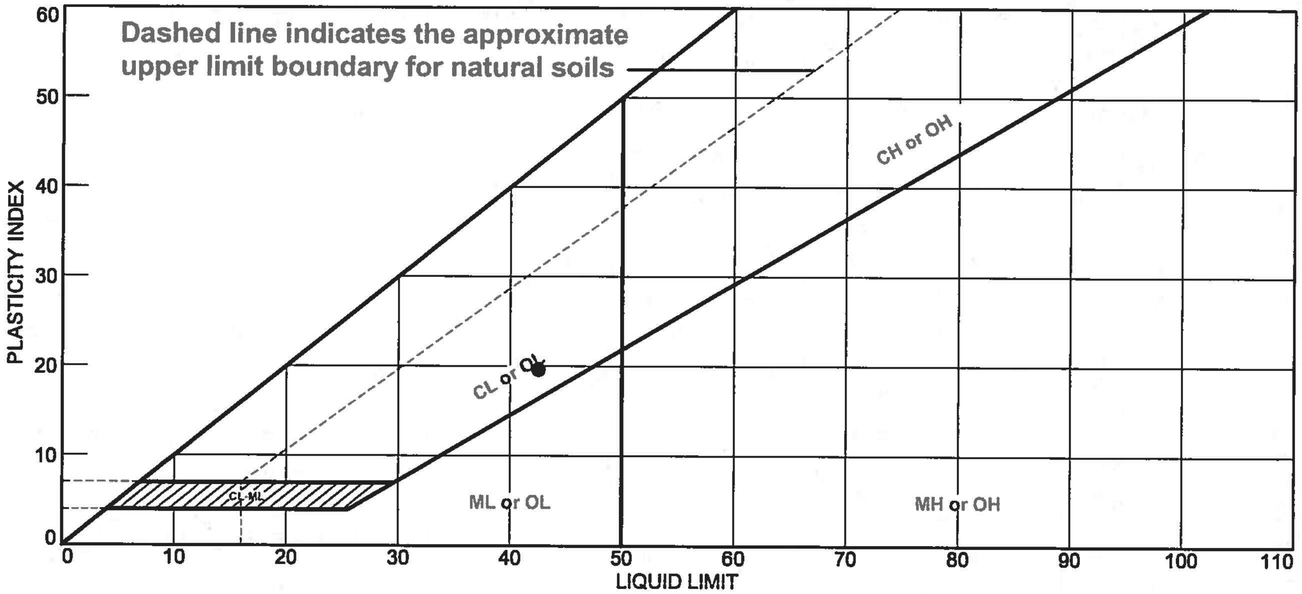
Location: HB-PAMI-205
Sample Number: 2D-A **Depth:** 3.3'-4' **Date:** 7/18/2019

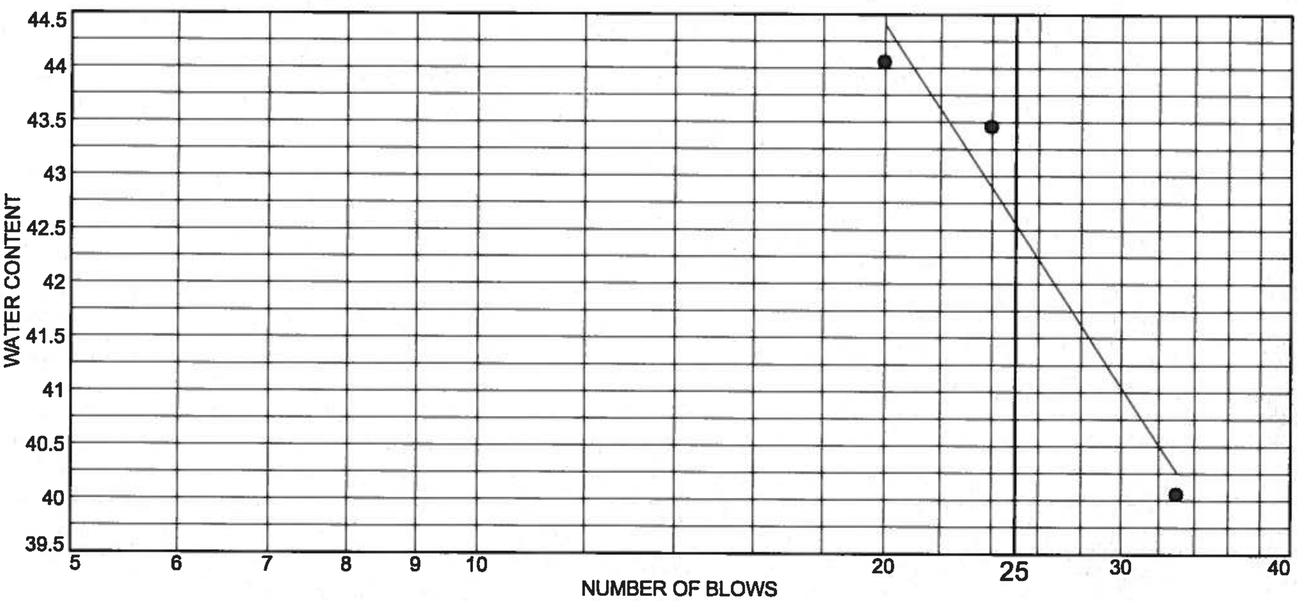
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-25

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	42.6	23.1	19.5	99.1	90.1	CL

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.

Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)

Portland, ME

Location: HB-PAMI-205

Sample Number: 2D-A **Depth:** 3.3'-4'

Remarks:

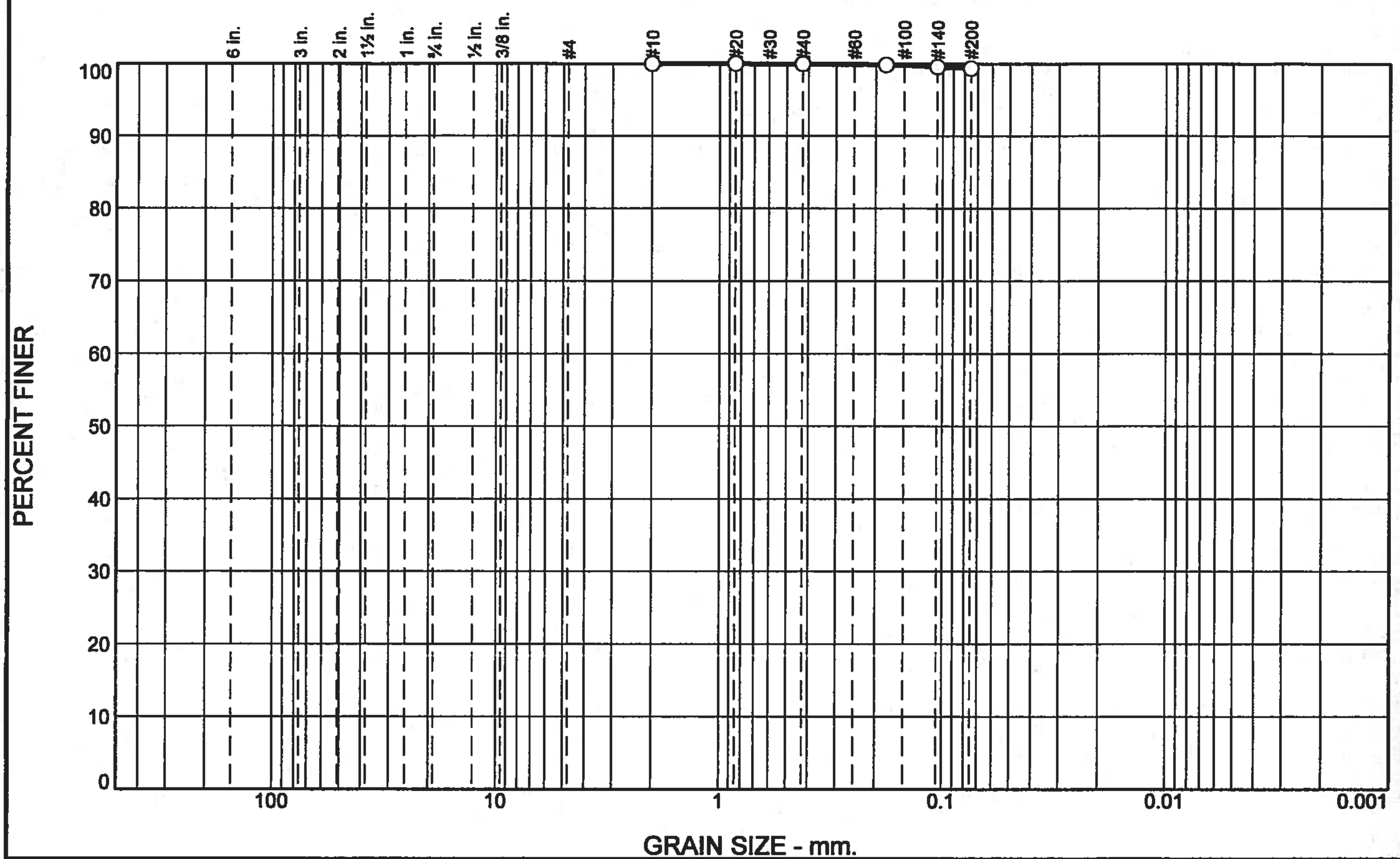
R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15619-25

Tested By: JMT **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	0.5	99.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#80	99.8		
#140	99.6		
#200	99.4		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 24.2 LL= 46.0 PI= 21.8

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(25)

Remarks

Natural Moisture: 28.2%

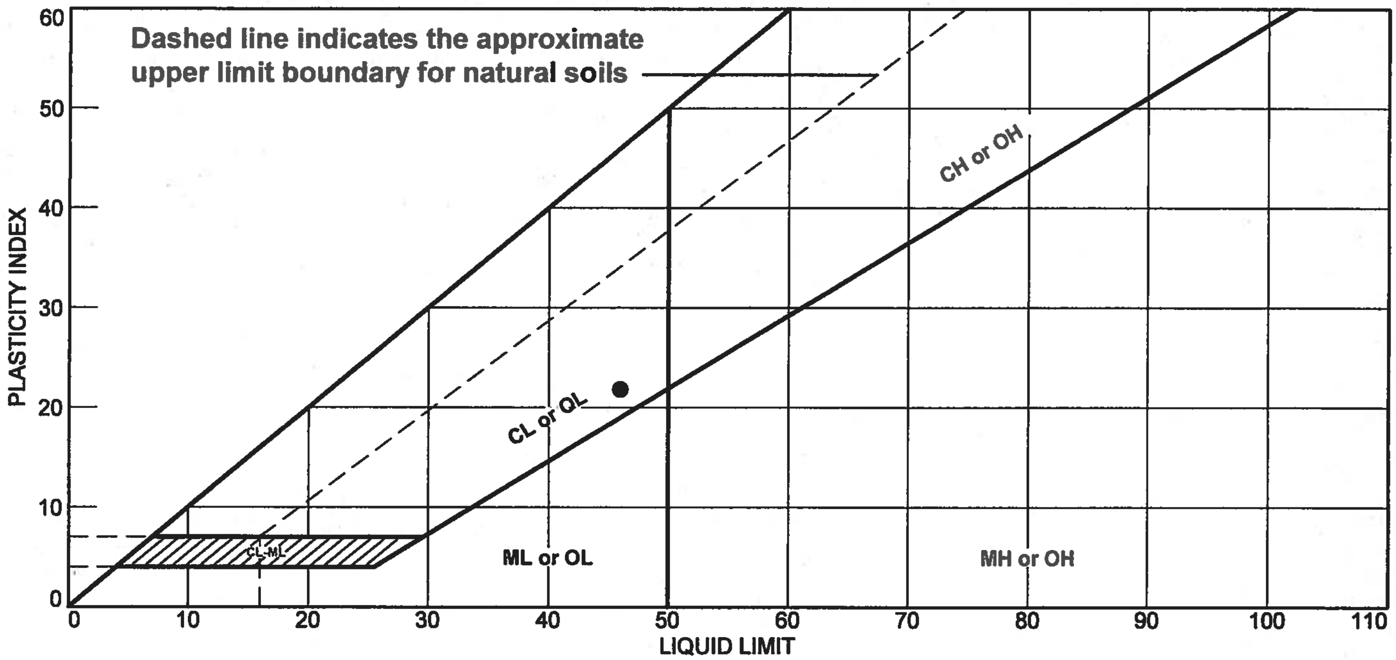
Location: HB-PAMI-205
Sample Number: 4D **Depth:** 6'-8' **Date:** 7/18/2019

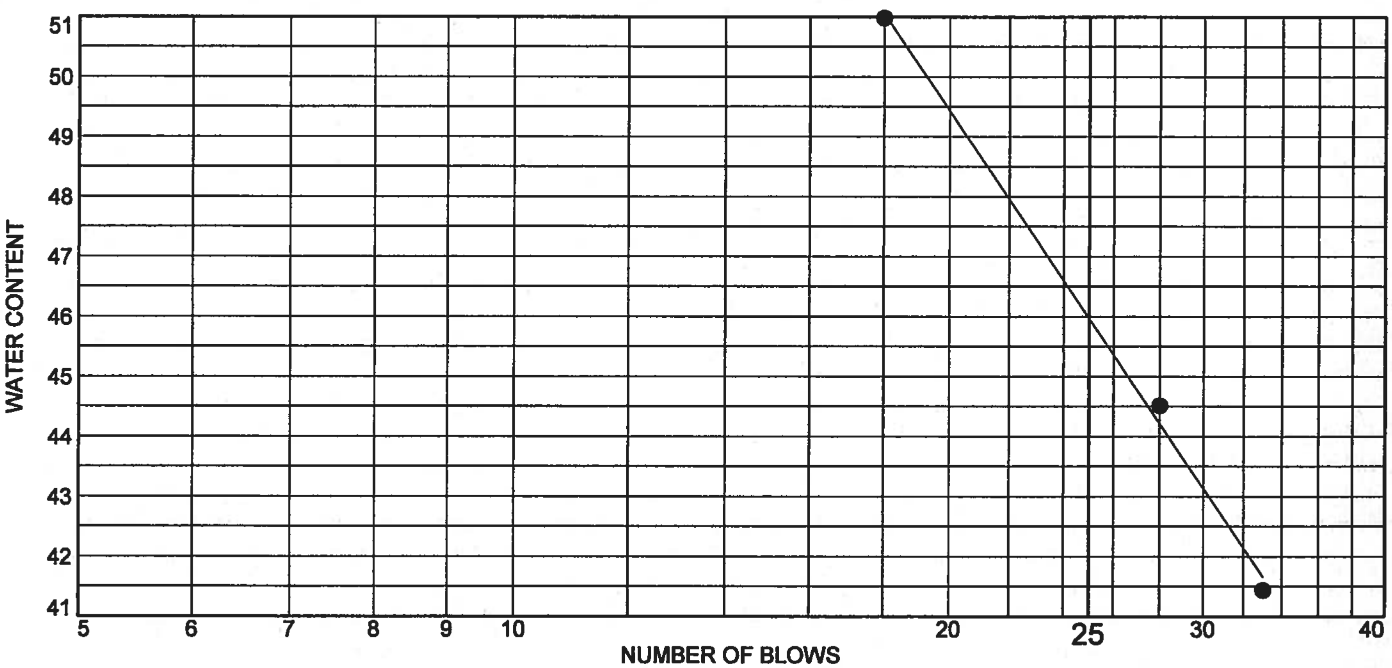
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-26

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	46.0	24.2	21.8	99.9	99.4	CL

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.

Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)

Portland, ME

Location: HB-PAMI-205

Sample Number: 4D **Depth:** 6'-8'

Remarks:

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15619-26

Tested By: JJB **Checked By:** MTG

Schonewald Engineering Associates, Inc.
www.SchonewaldEngineering.com

HOLMES ROAD VMS BORINGS (HB-VMS-100s)

TEST BORING LOGS

TABULATION OF BORING LOCATIONS				
Boring No.	**Station**	**Offset**	**Elevation (est'd)**	**Comments**
HB-VMS-101	tbd	tbd	57 ft	NB sign, outboard upright
HB-VMS-102	2121+11.1	7 ft LT	56 ft	NB sign, median upright
HB-VMS-103	2125+10.4	CL	52.5 ft	SB sign, median upright

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-VMS-101
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	57 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/22/19; 1445 - 5/23/19; 1030	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:		**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.2 ft BGS (open, perched?)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
5	1D	24/15	5.0 - 7.0	6-7-6-6	13	20	46			1D (composite sample): Grey tan, moist, medium dense, Silty fine SAND, trace medium to coarse sand. Grading to red tan, wet, fine to coarse SAND, trace to little silt, trace gravel. SAND	#15619-27 WASH SIEVE A-2-4(0) SM -#200=24.4% WC=25.5%
							42				
							32				
							29	48.5		8.5	
							34				
10	2D	24/11	10.0 - 12.0	2-2-1-2	3	5	7			2D (composite sample: Grey, very loose, fine SAND, little silt, trace medium to coarse sand. Grading to fine Sandy SILT. INTERBEDDED MARINE SILT AND SANDS	
							8				
							6				
							17				
							14				
15	3D	24/12	15.0 - 17.0	2-3-1-2	4	6	18			3D (composite sample): Very loose, interbedded, orange tan, fine SAND, trace to little silt; grey tan, fine to medium SAND, some silt; and grey, fine Sandy SILT. INTERBEDDED MARINE SILT AND SANDS	#15619-28 WASH SIEVE A-2-4(0) SM -#200=34.7% WC=29.0%
							19				
							20				
							25				
							34				
20	4D	24/14	20.0 - 22.0	2-2-2/12"	4	6	13			Olive tan, very loose, fine to medium SAND, little to some silt. INTERBEDDED MARINE SILT AND SANDS	
							23	35.7		21.3 Changing at 21.3 ft to 4D: Olive brown, mottled, Clayey SILT, trace to little fine sand. MARINE SILT-CLAY CRUST	#15619-29 WASH SIEVE ATTERBERGS A-6(14) CL -#200=91.3% WC=38.6% LL=34.2 PL=18.4
							29				
							49				
							46				
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Improvements-Crosby Area SB Median **LOCATION:** South Portland, ME	**Boring No.:** HB-VMS-101 **Proj. No.:** 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	57 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/22/19; 1445 - 5/23/19; 1030	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:		**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.2 ft BGS (open, perched?)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	5D	24/19	25.0 - 27.0	3-1/12"-4	1	2	HW OPEN			5D: Olive brown, very soft, Clayey SILT, little very fine sand with one 3-inch layer and one 4-inch layer olive brown, Silty fine SAND at top and bottom of sample. MARINE SILT-CLAY CRUST	PI=15.8
	MV									MV: Unable to push vane deeper than 30.8 ft.	
30	6D	24/23	30.0 - 32.0	WOR-WOH/18"	-					6D: Olive grey, very soft, CLAY & SILT, trace very fine sand with multiple seams fine sandy silt partings. MARINE SILT-CLAY CRUST	
								25.0		32.0	
35	7D	24/24	35.0 - 37.0	push thru vane						7D: Olive grey with dark grey streaks, medium stiff, Silty CLAY, trace very fine sand with occasional nodules and fine sandy silt partings. MARINE SILT-CLAY	#15619-30 -#200 SIEVE ATTERBERGS -#200=97.5% WC=34.9% LL=31.3 PL=18.9 PI=12.4
	V1		35.6 - 36.0	Su = 522/ 14 psf						V1: 19 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V2		36.6 - 37.0	Su = 508/ 0 psf						V2: 18.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
40	8D	24/24	40.0 - 42.0	push thru vane						8D: Olive grey grading to dark grey, soft to medium stiff, Silty CLAY, trace very fine sand with occasional nodules and fine sandy silt partings. MARINE SILT-CLAY	#15619-31 -#200 SIEVE ATTERBERGS -#200=98.1% WC=31.8% LL=29.8 PL=19.4 PI=10.4
	V3		40.6 - 41.0	Su = 508/ 14 psf						V3: 18.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V4		41.6 - 42.0	Su = 398/ 0 psf						V4: 14.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
45	9D	24/24	45.0 - 47.0	push thru vane						9D: Dark grey, soft, Silty CLAY, trace to little very fine sand with occasional nodules and fine sandy silt pockets. MARINE SILT-CLAY	
	V5		45.6 - 46.0	Su = 494/ 14 psf						V5: 18 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V6		46.6 - 47.0	Su = 440/ 0 psf						V6: 16 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
50											

Remarks:

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Boring No.: HB-VMS-101

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-VMS-101
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	57 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/22/19; 1445 - 5/23/19; 1030	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:		**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.2 ft BGS (open, perched?)

IN-SITU SAMPLING AND TESTING:
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MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50	10D	24/24	50.0 - 52.0	push thru vane						10D: Dark grey, soft, Silty CLAY, little very fine sand with occasional nodules and fine sandy silt partings. MARINE SILT-CLAY V7: 18 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings) V8: 17.5 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V7		50.6 - 51.0	Su = 494/ 27 psf							
	V8		51.6 - 52.0	Su = 481/ 27 psf							
55	11D	24/24	55.0 - 57.0	push thru vane						11D: Dark grey with occasional black, medium stiff, Silty CLAY, trace to little very fine sand with occasional nodules and fine sandy silt partings. MARINE SILT-CLAY V9: 19.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) V10: 20 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V9		55.6 - 56.0	Su = 536/ 0 psf							
	V10		56.6 - 57.0	Su = 549/ 0 psf							
60	12D	24/24	60.0 - 62.0	push thru vane						12D: Dark grey with occasional black, medium stiff, Silty CLAY, trace very fine sand with nodules throughout and occasional fine sandy silt partings. MARINE SILT-CLAY V11: 22 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings) MV: Unable to push vane deeper than 61.3 ft.	
	V11		60.6 - 61.0	Su = 604/ 14 psf							
	MV										
65											
70	13D	24/24	70.0 - 72.0	push thru vane						13D: Dark grey black, medium stiff, Silty CLAY, trace very fine sand with nodules throughout. MARINE SILT-CLAY V12: 31.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) V13: 27 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) 72.0 ft: Hydraulically push rod probe.	
	V12		70.6 - 71.0	Su = 865/ 0 psf							
	V13		71.6 - 72.0	Su = 742/ 0 psf							
							N-ROD PROBE				
75											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-VMS-101
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	57 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/22/19; 1445 - 5/23/19; 1030	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:		**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.2 ft BGS (open, perched?)

IN-SITU SAMPLING AND TESTING:
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MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
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RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
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BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
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LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
75											
80											
85											
90											
95											
100											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median LOCATION: South Portland, ME	Boring No.: HB-VMS-101 Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	57 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/22/19; 1445 - 5/23/19; 1030	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:		**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.2 ft BGS (open, perched?)

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S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
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BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
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LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines   WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
100											
105											
										108.3 ft: Resistance noted.	
110											
								-54.2		111.2 **Bottom of Exploration at 111.2 feet below ground surface.** 111.2 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
115											
120											
125											

Remarks:

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* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Improvements-Crosby Area SB Median **LOCATION:** South Portland, ME	**Boring No.:** HB-VMS-102 **Proj. No.:** 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	56 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/21/19; 1255 - 5/22/19; 1350	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2121+11.1; 7 ft LT (o/s 6.4 ft RT of SB yellow line)	**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.4 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
5	1D	24/12	5.0 - 7.0	2-6-10-8	16	24	26			1D: Dark red brown, moist to wet, medium dense, fine to medium SAND, little silt, trace coarse sand, trace gravel. FILL	#15619-32 WASH SIEVE A-3 SW-SM -#200=9.7% WC=19.9%
							55				
							41				
							49				
							48				
10	2D	24/5	10.0 - 12.0	3-3-3-4	6	9	21			2D: Brown, loose, fine to coarse SAND, trace gravel, trace silt. FILL	
							24	44.0		12.0	
							42				
							54				
							67				
15	3D	24/14	15.0 - 17.0	3-4-4-5	8	12	32			3D: Red tan grading to grey tan, loose, fine SAND, trace silt, trace medium to coarse sand. SAND	#15619-33 WASH SIEVE A-3 SP -#200=3.2% WC=23.4%
							33				
							50				
							69				
							78				
20	4D	24/15	20.0 - 22.0	3-3-3-4	6	9	51			4D: Tan, loose, fine to medium SAND, some silt with one 1/2-inch seam rust, fine to medium sand, trace to little silt. SAND	
							34				
							64				
							83				
25							66	31.5		24.5	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Improvements-Crosby Area SB Median **LOCATION:** South Portland, ME	**Boring No.:** HB-VMS-102 **Proj. No.:** 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	56 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/21/19; 1255 - 5/22/19; 1350	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2121+11.1; 7 ft LT (o/s 6.4 ft RT of SB yellow line)	**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.4 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	5D	24/24	25.0 - 27.0	1/12"-1/12"	-		HW OPEN			5D: Grey, very soft, Silty CLAY, trace very fine sand with one 1-inch layer and multiple seams grey, fine sandy silt. MARINE SILT-CLAY	#15619-34 -#200 SIEVE ATTERBERGS -#200=98.0% WC=32.4% LL=29.6 PL=19.1 PI=10.5
30	6D V1 V2	24/24	30.0 - 32.0 30.6 - 31.0 31.6 - 32.0	push thru vane Su = 742/ 27 psf Su = 563/ 27 psf						6D: Olive grey grading to dark grey with black streaks, medium stiff, Silty CLAY, trace very fine sand with one seam fine sandy silt at top of sample. MARINE SILT-CLAY V1: 27 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings) V2: 20.5 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	#15619-35 -#200 SIEVE ATTERBERGS -#200=96.0% WC=31.9% LL=27.5 PL=18.2 PI=9.3
35	7D V3 V4	24/24	35.0 - 37.0 35.6 - 36.0 36.6 - 37.0	push thru vane Su = 494/ 14 psf Su = 481/ 0 psf						7D: Grey with occasional black streaks, soft, Silty CLAY, trace very fine sand with nodules throughout and multiple seams fine sandy silt. MARINE SILT-CLAY V3: 18 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings) V4: 17.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	#15619-36 -#200 SIEVE ATTERBERGS -#200=97.4% WC=32.9% LL=30.4 PL=20.4 PI=10.0
40	8D V5 V6	24/24	40.0 - 42.0 40.6 - 41.0 41.6 - 42.0	push thru vane Su = 398/ 0 psf Su = 426/ 14 psf						8D: Dark grey with occasional black streaks, soft, Silty CLAY, trace very fine sand with occasional nodules. MARINE SILT-CLAY V5: 14.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) V6: 15.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
45	9D V7 V8	24/21	45.0 - 47.0 45.6 - 46.0 46.6 - 47.0	push thru vane Su = 444/ 14 psf Su = 426/ 14 psf						9D: Dark grey black, soft, Silty CLAY, trace very fine sand with occasional nodules. MARINE SILT-CLAY V7: 16 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings) V8: 15.5/ 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
50											

Remarks:

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PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-VMS-102
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	56 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/21/19; 1255 - 5/22/19; 1350	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2121+11.1; 7 ft LT (o/s 6.4 ft RT of SB yellow line)	**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.4 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50	10D	24/22	50.0 - 52.0	push thru vane						10D: Dark grey black, medium stiff, Silty CLAY, trace very fine sand with occasional nodules. MARINE SILT-CLAY V9: 19.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings) V10: 19.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V9		50.6 - 51.0	Su = 536/ 14 psf							
	V10		51.6 - 52.0	Su = 536/ 14 psf							
55											
60	11D	24/24	60.0 - 62.0	push thru vane						11D: Dark grey, medium stiff, Silty CLAY, trace very fine sand with nodules throughout and one seam silty fine sand. MARINE SILT-CLAY V11: 22 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings) V12: 20 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) 62.0 ft: Hydraulically push rod probe.	
	V11		60.6 - 61.0	Su = 604/ 27 psf							
	V12		61.6 - 62.0	Su = 549/ 0 psf							
							N-ROD PROBE				
65											
70											
75											

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Improvements-Crosby Area SB Median **LOCATION:** South Portland, ME	**Boring No.:** HB-VMS-102 **Proj. No.:** 19-117	

Driller:	New England Boring Contractors	**Elevation (ft.)**	56 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/21/19; 1255 - 5/22/19; 1350	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2121+11.1; 7 ft LT (o/s 6.4 ft RT of SB yellow line)	**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.4 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
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MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
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SSA/HSA=solid/hollow stem auger
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AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
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LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
75											
80											
85											
90											
95											
100											

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median LOCATION: South Portland, ME	Boring No.: HB-VMS-102 Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	56 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/21/19; 1255 - 5/22/19; 1350	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2121+11.1; 7 ft LT (o/s 6.4 ft RT of SB yellow line)	**Casing ID/OD:**	HW (4") to 25 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 5 ft	**Water Level*:**	6.4 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
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MV = Unsuccessful Insitu Vane Shear Test attempt

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hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

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AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
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Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
100											
105											
110										110.7 ft: Resistance noted.	
								-57.6		113.6 **Bottom of Exploration at 113.6 feet below ground surface.** 113.6 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
115											
120											
125											

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SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-VMS-103
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	52.5 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/20/19; 1040 - 5/21/19; 1215	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2125+10.4; CL (o/s 2.5 ft LT of median guardrail face)	**Casing ID/OD:**	HW (4") to 20 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 10 ft	**Water Level*:**	5.6 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
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ADDITIONAL DEFINITIONS:
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hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

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WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
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Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0							SSA				
5	1D	24/19	5.0 - 7.0	8-19-33-38	52	79				1D: Brown, wet, very dense, fine to coarse SAND, little to some silt. FILL	
10	2D	24/11	10.0 - 12.0	4-11-11-11	22	33	--			2D: Grey, wet, medium dense, fine to coarse SAND, trace silt. FILL	#15619-37 WASH SIEVE A-1-b SP -#200=4.1% WC=18.1%
							30				
							68				
							100	39.0		13.5	
							86				
15	3D	24/20	15.0 - 17.0	WOR-WOH-1-2	1	2	33			3D: Grey, very soft, CLAY & SILT, trace very fine sand with multiple seams of fine sandy silt. MARINE SILT-CLAY CRUST	#15619-38 WASH SIEVE ATTERBERGS A-6(12) CL -#200=98.2% WC=36.2% LL=31.5 PL=19.5 PI=12.0
							35				
							36				
							29	34.0		18.5	
							25				
20	4D V1	24/24	20.0 - 22.0 20.6 - 21.0	push thru vane Su = 357/ 27 psf			HW OPEN			4D: Grey, Silty CLAY, trace very fine sand. MARINE SILT-CLAY V1: 13 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	#15619-39 -#200 SIEVE ATTERBERGS -#200=97.9% WC=37.4% LL=31.5 PL=19.8 PI=11.7
	V2		21.6 - 22.0	Su = 453/ 14 psf						V2: 16.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings); partings noted during push.	
25											

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median LOCATION: South Portland, ME	Boring No.: HB-VMS-103 Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	52.5 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/20/19; 1040 - 5/21/19; 1215	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2125+10.4; CL (o/s 2.5 ft LT of median guardrail face)	**Casing ID/OD:**	HW (4") to 20 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 10 ft	**Water Level*:**	5.6 ft BGS (open)

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MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
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RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
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Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25	5D	24/24	25.0 - 27.0	(vane/12")-1/12"	-					5D: Olive grey grading to grey with occasional black streaks, medium stiff, Silty CLAY, trace very fine sand with multiple seams of fine sandy silt. MARINE SILT-CLAY V3: 19.5 / 1.5 ft-lbs (65 mm x 130 mm vane raw torque readings) MV: Unable to push vane deeper than 26.0 ft.	#15619-40 -#200 SIEVE ATTERBERGS -#200=97.7% WC=34.0% LL=32.7 PL=20.1 PI=12.6
	V3		25.6 - 26.0	Su = 536/ 41 psf							
	MV										
30	6D	24/24	30.0 - 32.0	push thru vane						6D: Grey with black streaks, soft, Silty CLAY, trace very fine sand with multiple partings and seams of fine sandy silt. MARINE SILT-CLAY V4: 17.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings) V5: 17.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	#15619-41 -#200 SIEVE ATTERBERGS -#200=97.5% WC=27.3% LL=25.0 PL=18.4 PI=6.6
	V4		30.6 - 31.0	Su = 481/ 14 psf							
	V5		31.6 - 32.0	Su = 481/ 14 psf							
35	7D	24/24	35.0 - 37.0	(vane/18")-WOR	-					7D: Grey, soft, Silty CLAY, trace very fine sand with multiple partings fine sandy silt and occasional shells. MARINE SILT-CLAY V6: 15 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings) MV: Unable to push vane deeper than 36.7 ft.	
	V6		35.6 - 36.0	Su = 412/ 27 psf							
	MV										
40	8D	24/24	40.0 - 42.0	push thru vane						8D: Grey, soft, Silty CLAY, trace very fine sand with occasional nodules and partings of fine sandy silt. MARINE SILT-CLAY V7: 15.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings) V8: 15.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V7		40.6 - 41.0	Su = 426/ 14 psf							
	V8		41.6 - 42.0	Su = 426/ 14 psf							
45	9D	24/24	45.0 - 47.0	push thru vane						9D: Grey with occasional black streaks, soft, Silty CLAY, trace very fine sand; coarse sand on bottom of sample. MARINE SILT-CLAY V9: 16 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings) V10: 14.5/ 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V9		45.6 - 46.0	Su = 440/ 27 psf							
	V10		46.6 - 47.0	Su = 398/ 14 psf							
50											

Remarks:

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Improvements-Crosby Area SB Median **LOCATION:** South Portland, ME	**Boring No.:** HB-VMS-103 **Proj. No.:** 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	52.5 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/20/19; 1040 - 5/21/19; 1215	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2125+10.4; CL (o/s 2.5 ft LT of median guardrail face)	**Casing ID/OD:**	HW (4") to 20 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 10 ft	**Water Level*:**	5.6 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
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MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50	10D	24/24	50.0 - 52.0	WOR/24"	-					10D: Dark grey with occasional black streaks, Silty CLAY, trace very fine sand with occasional nodules. MARINE SILT-CLAY	
55	11D	24/24	55.0 - 57.0	WOR/12"-1/12"	-					11D: Dark grey with occasional black streaks, Silty CLAY, trace very fine sand with nodules and multiple seams silty fine sand. MARINE SILT-CLAY	
60	12D	24/24	60.0 - 62.0	WOR/24"	-					12D: Dark grey black, Silty CLAY, trace very fine sand with nodules throughout and occasional pockets and one seam silty fine sand. MARINE SILT-CLAY	
65	13D	24/24	65.0 - 67.0	push thru vane						13D: Dark grey black, medium stiff, Silty CLAY, trace very fine sand with nodules throughout. MARINE SILT-CLAY	
	V11		65.6 - 66.0	Su = 549/ 27 psf						V11: 20 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V12		66.6 - 67.0	Su = 591/ 0 psf						V12: 21.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
70	14D	24/24	70.0 - 72.0	push thru vane						14D: Dark grey black, medium stiff, Silty CLAY, trace very fine sand with nodules throughout. MARINE SILT-CLAY	
	V13		70.6 - 71.0	Su = 604/ 14 psf						V13: 22 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V14		71.6 - 72.0	Su = 618/ 14 psf						V14: 22.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
75											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median
LOCATION: South Portland, ME

Boring No.: HB-VMS-103
Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	52.5 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/20/19; 1040 - 5/21/19; 1215	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2125+10.4; CL (o/s 2.5 ft LT of median guardrail face)	**Casing ID/OD:**	HW (4") to 20 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 10 ft	**Water Level*:**	5.6 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded
BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
75	15D	24/24	75.0 - 77.0	push thru vane						15D: Dark grey black, medium stiff, Silty CLAY with nodules throughout. MARINE SILT-CLAY	
	V15		75.6 - 76.0	Su = 659/ 0 psf						V15: 24 / 10 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V16		76.6 - 77.0	Su = 646/ 0 psf						V16: 23.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
80	V17		80.6 - 81.0	Su = 879/ 27 psf						V17: 32 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V18		81.6 - 82.0	Su = 646/ 0 psf						V18: 23.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
							N-ROD PROBE			82.0 ft: Hydraulically push rod probe.	
85											
90											
95											
100											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	PROJECT: MeTPK Portland Area Mainline Improvements-Crosby Area SB Median LOCATION: South Portland, ME	Boring No.: HB-VMS-103 Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	52.5 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/20/19; 1040 - 5/21/19; 1215	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2125+10.4; CL (o/s 2.5 ft LT of median guardrail face)	**Casing ID/OD:**	HW (4") to 20 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 10 ft	**Water Level*:**	5.6 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
100											
105											
110											
115											
120											
										121.7 ft: Resistance noted.	
125											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT:	MeTPK Portland Area Mainline Improvements-Crosby Area SB Median	**Boring No.:**	HB-VMS-103
LOCATION:	South Portland, ME	**Proj. No.:**	19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	52.5 ft (est'd)	**Core Barrel:**	N/A
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	5/20/19; 1040 - 5/21/19; 1215	**Drilling Method:**	cased wash boring	**Hammer Type:**	Automatic
Boring Location:	Station 2125+10.4; CL (o/s 2.5 ft LT of median guardrail face)	**Casing ID/OD:**	HW (4") to 20 ft	**Hammer Efficiency:**	0.906
		Auger ID/OD:	SSA to 10 ft	**Water Level*:**	5.6 ft BGS (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
125								-72.9		125.4 **Bottom of Exploration at 125.4 feet below ground surface.** 125.4 ft: Rod probe fetches up; stands rig; inferred bottom of Marine Silt-Clay; bottom of boring; no refusal.	
130											
135											
140											
145											
150											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

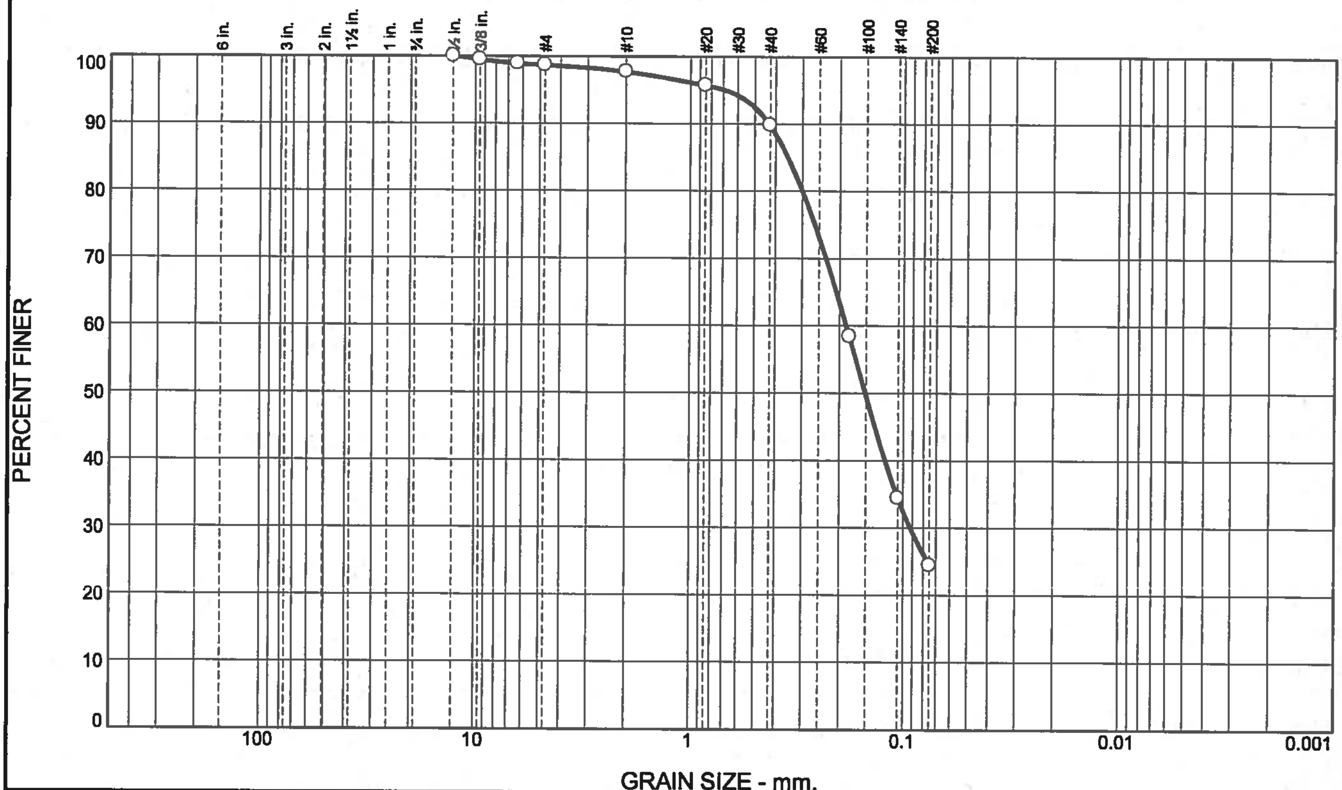
SCHONEWALD ENGINEERING ASSOCIATES, INC.
www.SchonewaldEngineering.com

HOLMES ROAD VMS BORINGS (HB-VMS-100s)

LABORATORY TEST REPORTS

TABULATION OF SOIL TESTING (RWG&A PROJECT NO. 1368-016) (listed in order of test report presentation)				
Boring No.	**Sample No.**	**Sample Depth (ft., BGS)**	**RWG&A LAB NO.**	**Tests Completed**
HB-VMS-101	1D	5-7	#15619-27	wash sieve gradation
HB-VMS-101	3D	15-17	#15619-28	wash sieve gradation
HB-VMS-101	4D	20-22	#15619-29	wash sieve gradation; Atterberg Limits
HB-VMS-101	7D	35-37	#15619-30	percent passing #200; Atterberg Limits
HB-VMS-101	8D	40-42	#15619-31	percent passing #200; Atterberg Limits
HB-VMS-102	1D	5-7	#15619-32	wash sieve gradation
HB-VMS-102	3D	15-17	#15619-33	wash sieve gradation
HB-VMS-102	5D	25-27	#15619-34	percent passing #200; Atterberg Limits
HB-VMS-102	6D	30-32	#15619-35	percent passing #200; Atterberg Limits
HB-VMS-102	7D	35-37	#15619-36	percent passing #200; Atterberg Limits
HB-VMS-103	2D	10-12	#15619-37	wash sieve gradation
HB-VMS-103	3D	15-17	#15619-38	wash sieve gradation; Atterberg Limits
HB-VMS-103	4D	20-22	#15619-39	percent passing #200; Atterberg Limits
HB-VMS-103	5D	25-27	#15619-40	percent passing #200; Atterberg Limits
HB-VMS-103	6D	30-32	#15619-41	percent passing #200; Atterberg Limits

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.3	1.0	7.9	65.4	24.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.5		
1/4"	98.9		
#4	98.7		
#10	97.7		
#20	95.7		
#40	89.8		
#80	58.4		
#140	34.4		
#200	24.4		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4292 D_{85}= 0.3497 D_{60}= 0.1860
D_{50}= 0.1513 D_{30}= 0.0924 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 25.5%

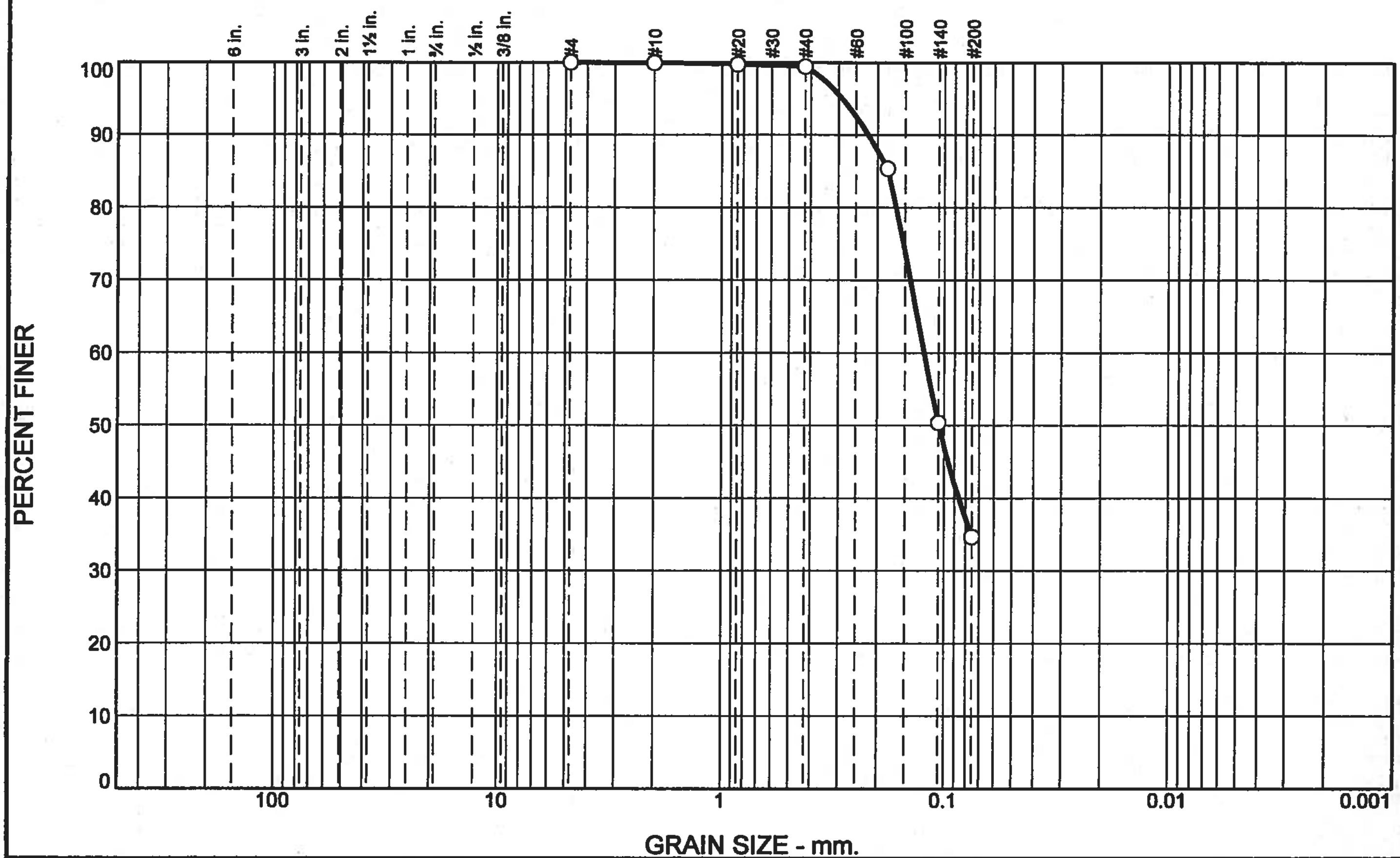
Location: HB-VMS-101
Sample Number: 1D **Depth:** 5'-7' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-27

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.5	64.7	34.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	99.4		
#80	85.4		
#140	50.4		
#200	34.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2199 D_{85}= 0.1788 D_{60}= 0.1231
D_{50}= 0.1054 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 29.0%

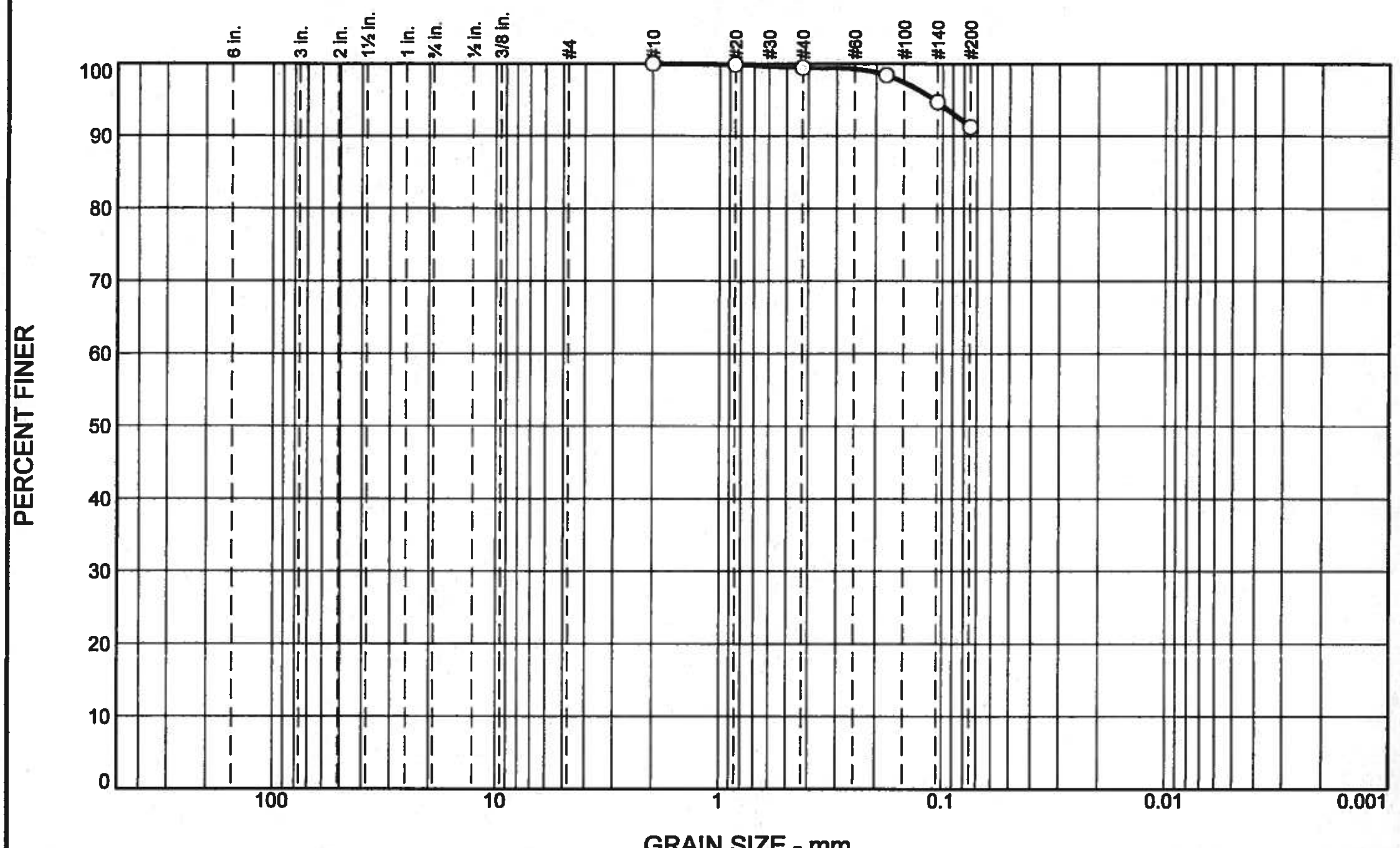
Location: HB-VMS-101
Sample Number: 3D **Depth:** 15'-17' **Date:** 7/11/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-28

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	8.2	91.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.5		
#80	98.4		
#140	94.7		
#200	91.3		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18.4 LL= 34.2 PI= 15.8

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Natural Moisture 38.6%

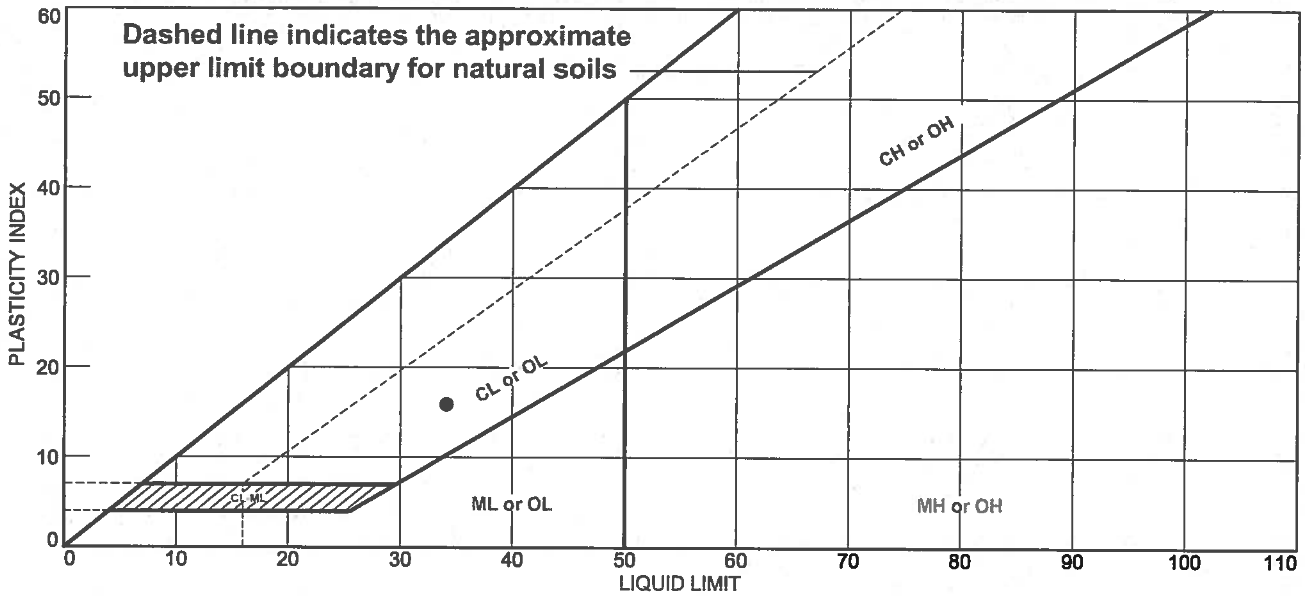
Location: HB-VMS-101
Sample Number: 4D **Depth:** 20'-22' **Date:** 7/18/2019

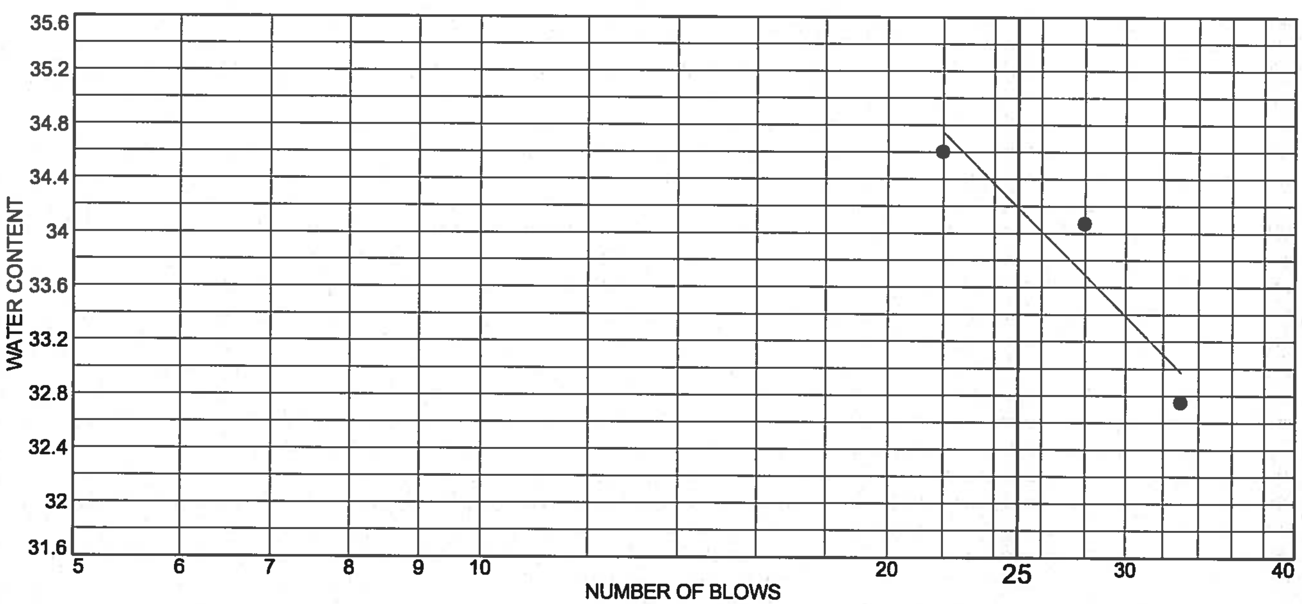
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-29

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	34.2	18.4	15.8	99.6	93.4	CL

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-VMS-101
Sample Number: 4D **Depth:** 20'-22'

Remarks:

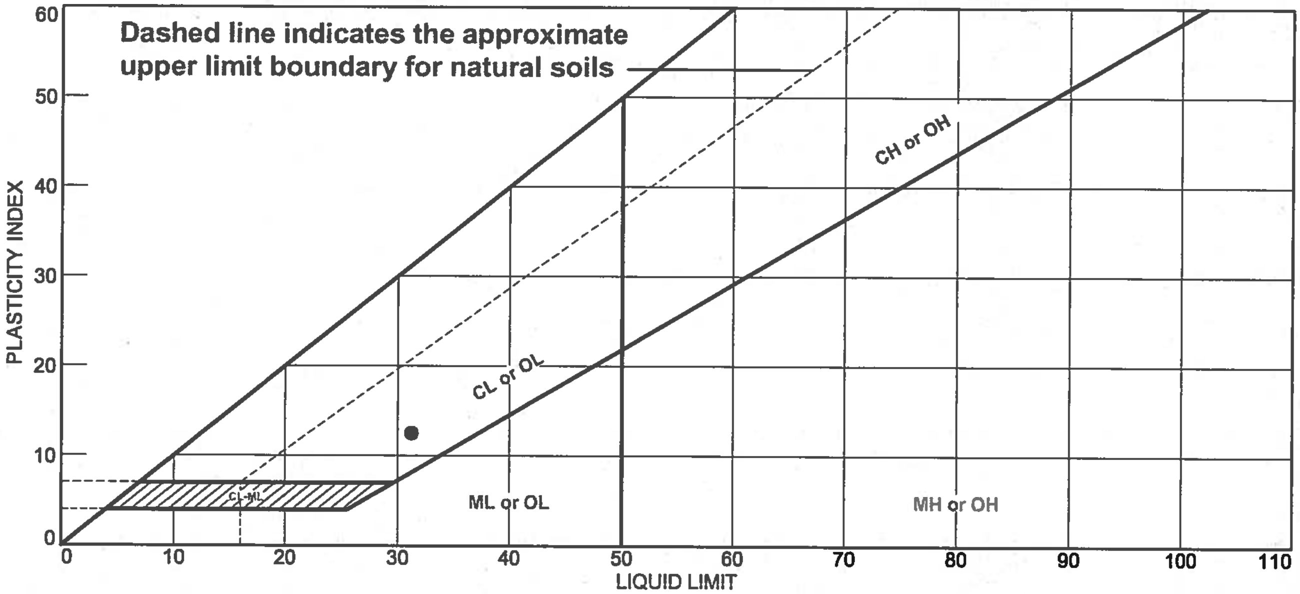
R.W. Gillespie & Associates, Inc.

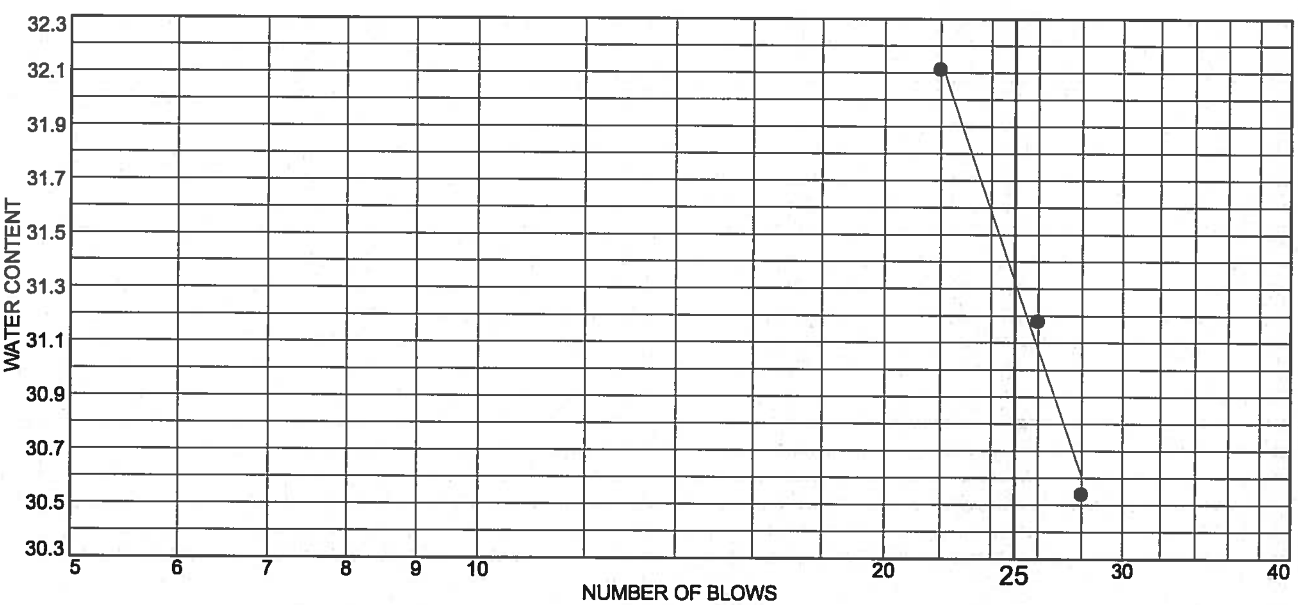
Biddeford, Maine

Lab No. 15619-29

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	31.3	18.9	12.4		97.5	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-VMS-101
Sample Number: 7D **Depth:** 35'-37'

R.W. Gillespie & Associates, Inc.

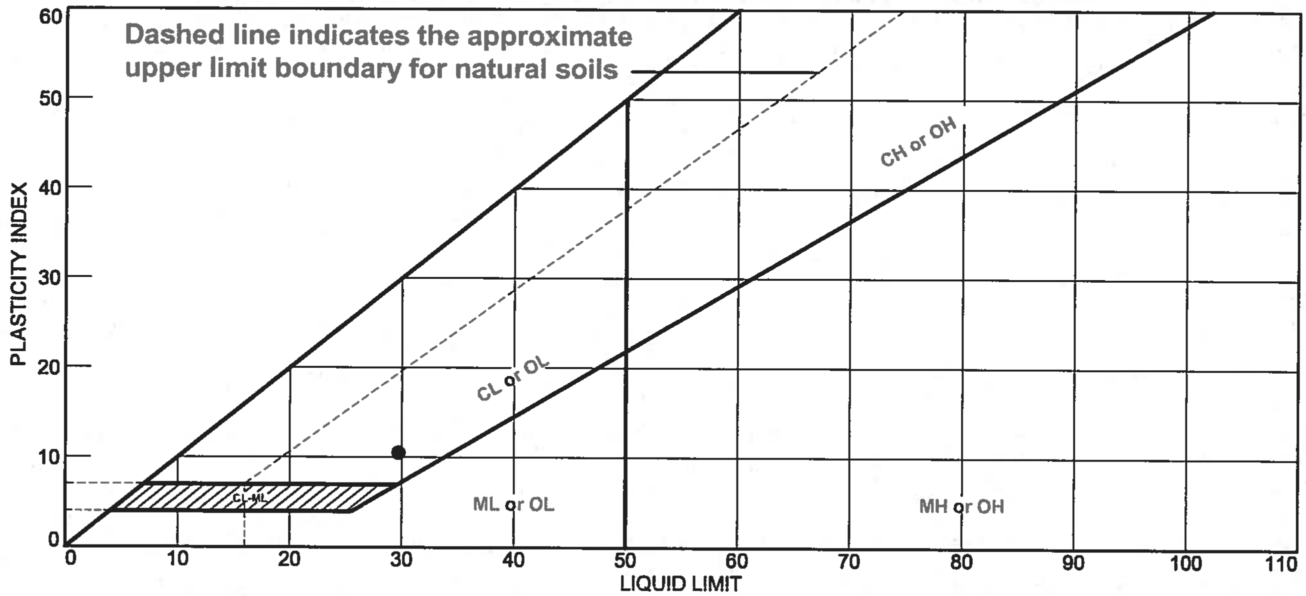
Biddeford, Maine

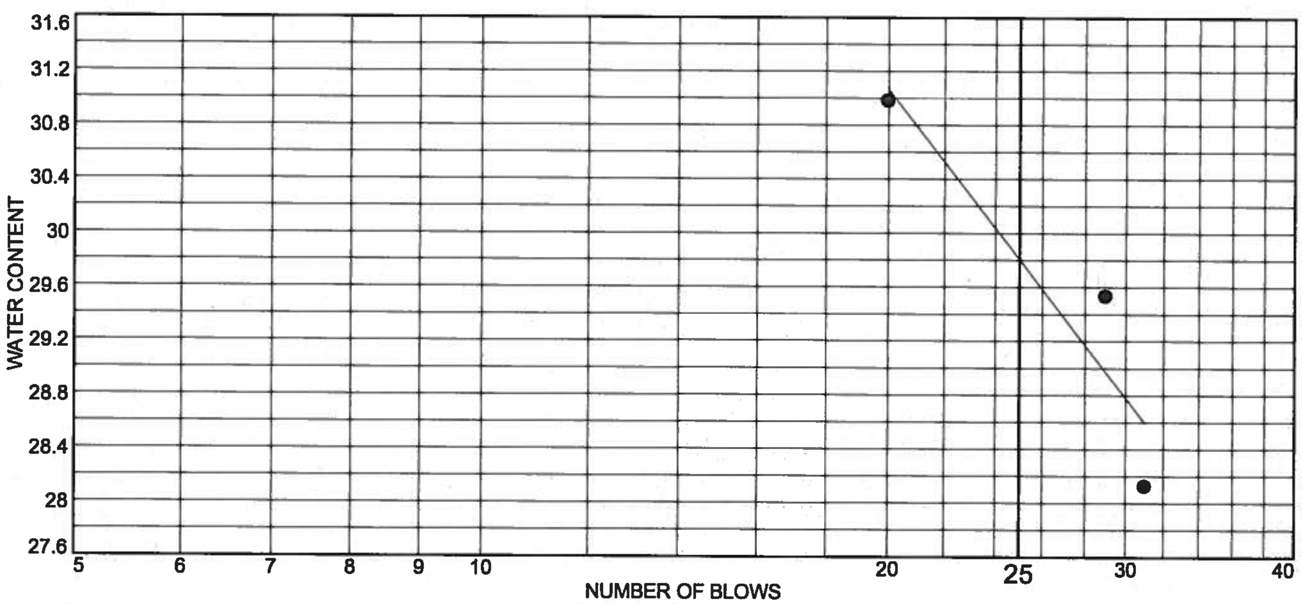
Remarks:
●Natural Moisture Content: 34.9%

Lab No. 15619-30

Tested By: JMT **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	29.8	19.4	10.4		98.1%	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-VMS-101
Sample Number: 8D **Depth:** 40'-42'

R.W. Gillespie & Associates, Inc.

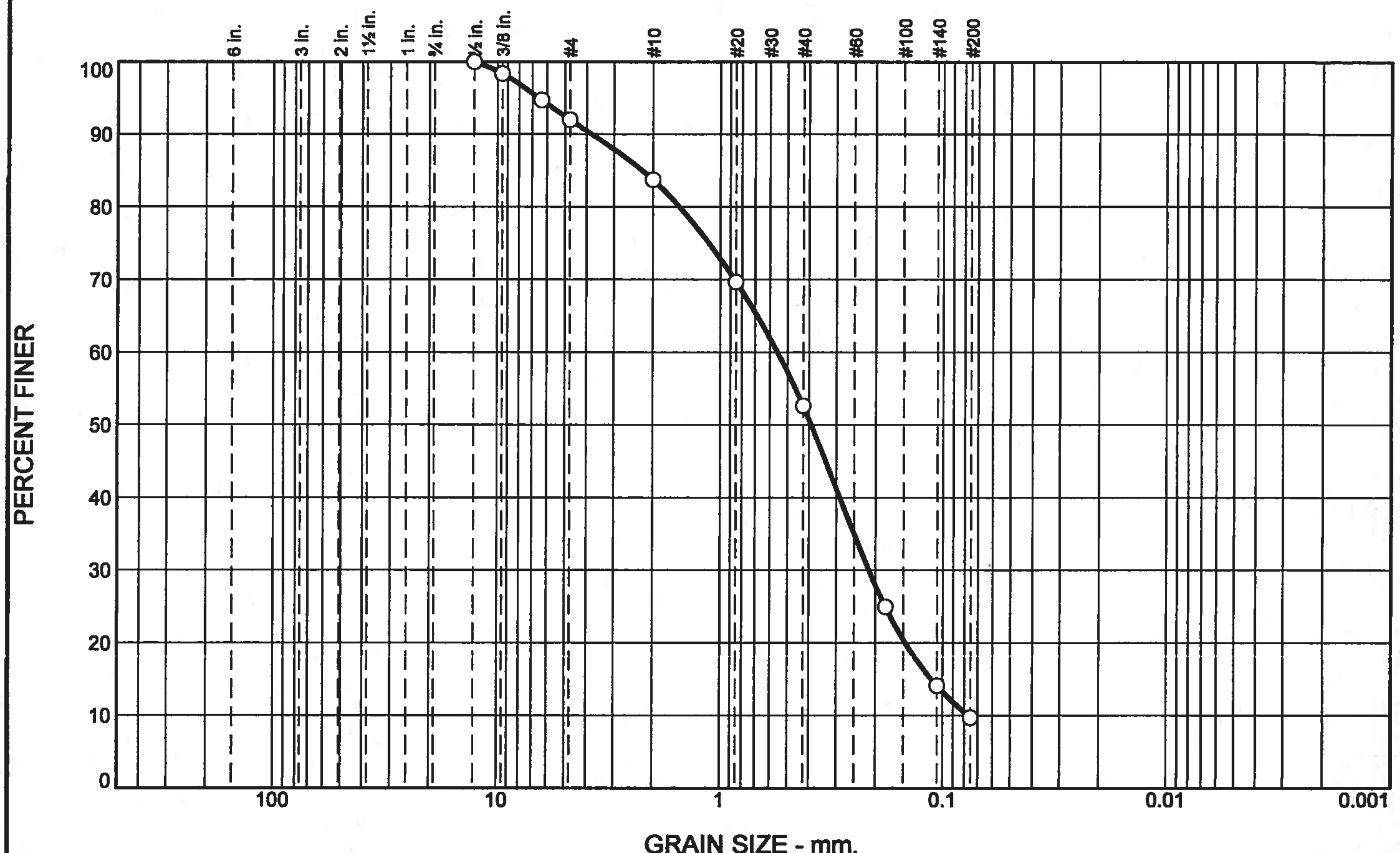
Biddeford, Maine

Remarks:
●Natural Moisture: 31.8%

Lab No. 15619-31

Tested By: JMT **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.0	8.3	31.1	42.9	9.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.4		
1/4"	94.7		
#4	92.0		
#10	83.7		
#20	69.7		
#40	52.6		
#80	24.9		
#140	14.1		
#200	9.7		

* (no specification provided)

Soil Description

well-graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.7819 D_{85}= 2.2316 D_{60}= 0.5543
D_{50}= 0.3908 D_{30}= 0.2141 D_{15}= 0.1125
D_{10}= 0.0769 C_u= 7.21 C_c= 1.08

Classification

USCS= SW-SM AASHTO= A-3

Remarks

Moisture Content: 19.9

Source of Sample: HB-VMS-102 **Depth:** 5'-7'
Sample Number: 1D

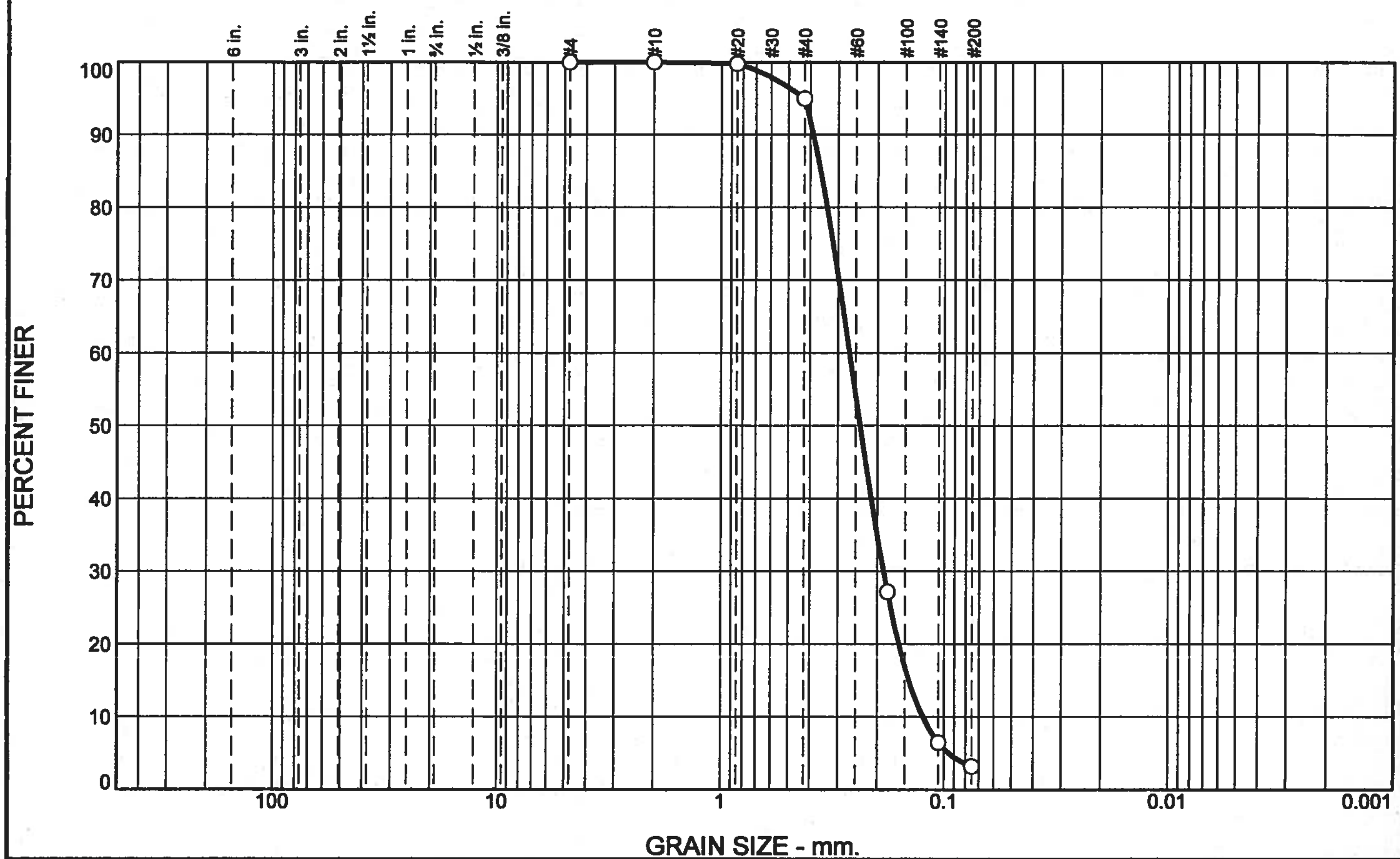
Date: 7/24/2019

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

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Project No: 1368-016 **Lab No.** 15619-32

Tested By: MSM/MCM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	5.0	91.8	3.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.8		
#40	95.0		
#80	27.1		
#140	6.4		
#200	3.2		

* (no specification provided)

Soil Description

Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3873 D_{85}= 0.3591 D_{60}= 0.2663
D_{50}= 0.2385 D_{30}= 0.1875 D_{15}= 0.1438
D_{10}= 0.1245 C_u= 2.14 C_c= 1.06

Classification

USCS= SP AASHTO= A-3

Remarks

Moisture Content: 23.4%

Location: HB-VMS-102
Sample Number: 3D **Depth:** 15'-17' **Date:** 7/11/2019

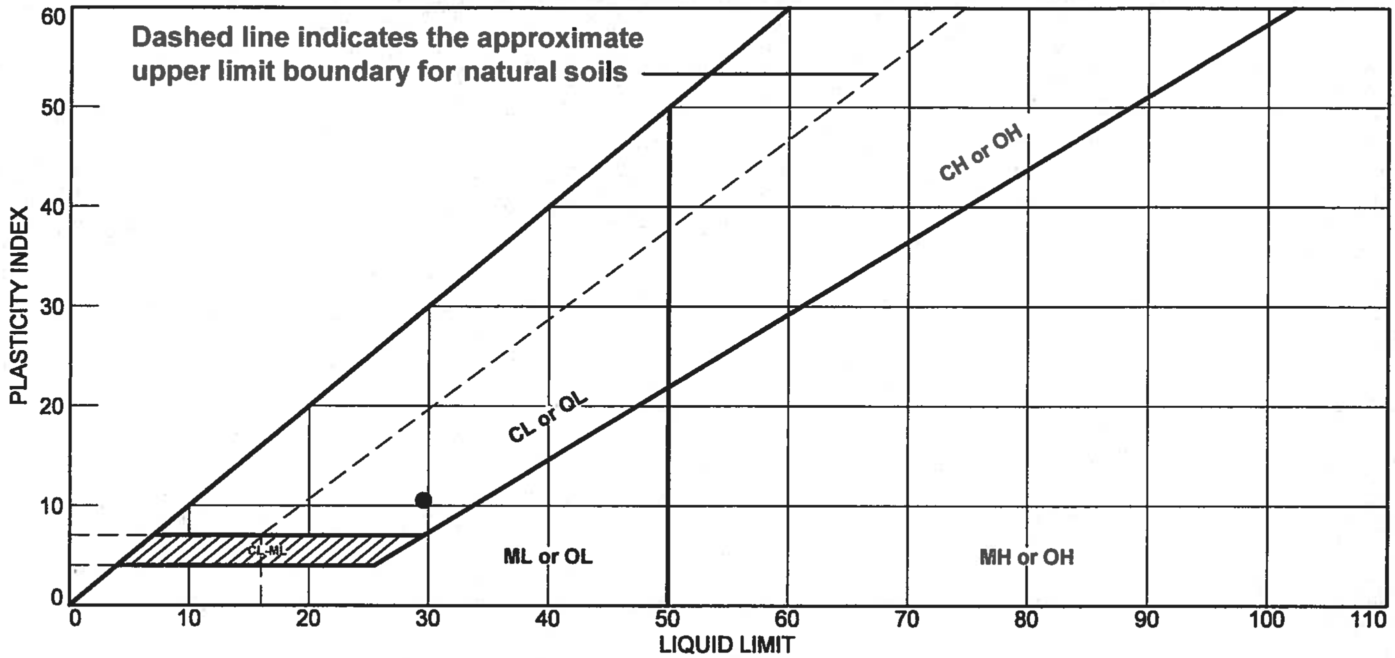
R.W. Gillespie & Associates, Inc. Biddeford, Maine

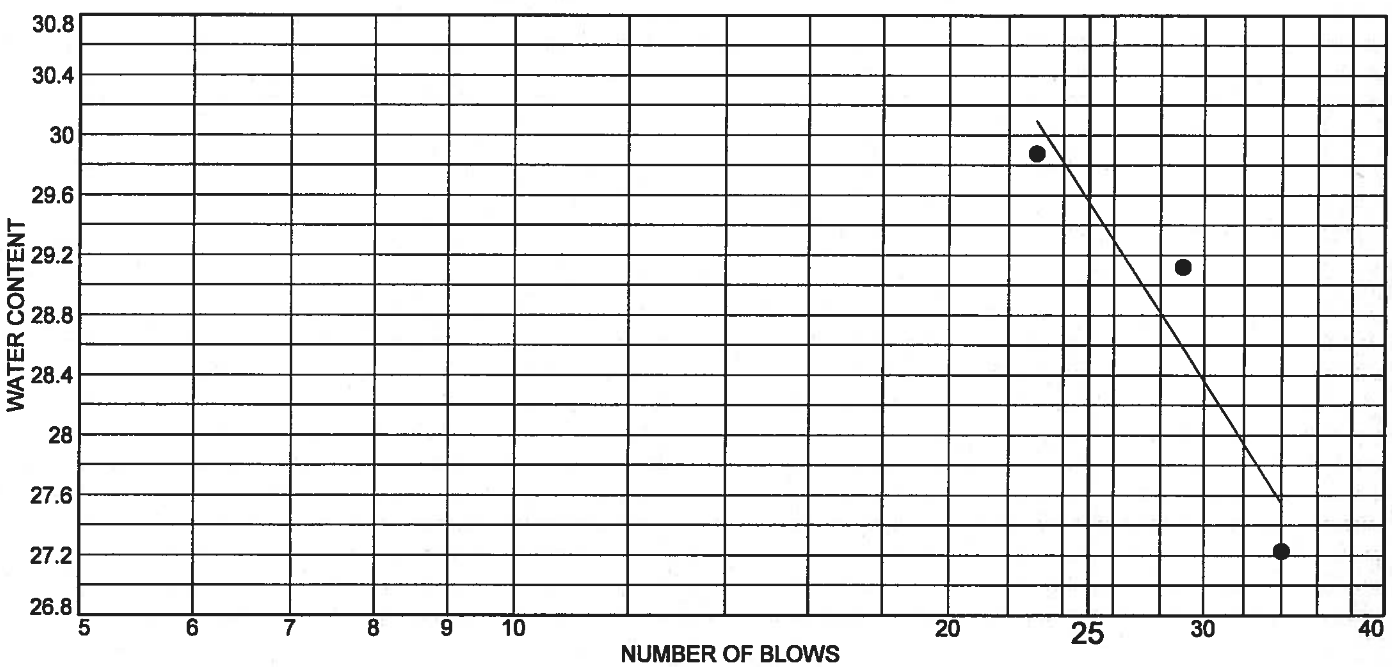
Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-33

Tested By: MSM/MCM **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	29.6	19.1	10.5		98.0	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.

Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)

Portland, ME

Location: HB-VMS-102

Sample Number: 5D **Depth:** 25'-27'

Remarks:

●Natural Moisture 32.4%

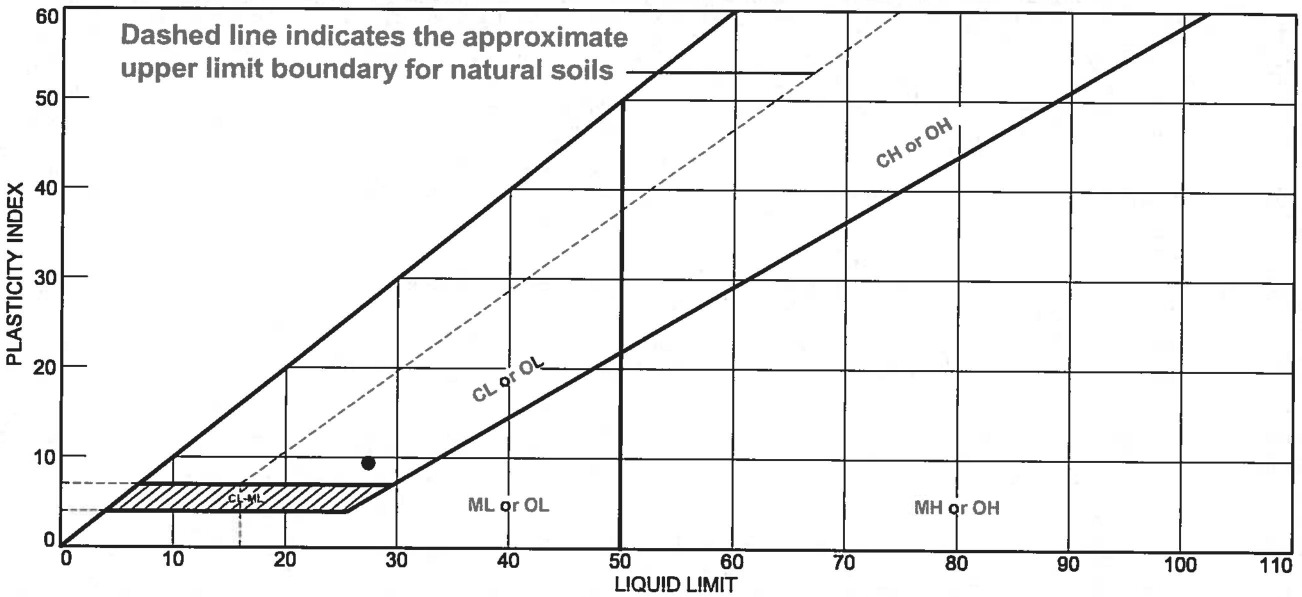
R.W. Gillespie & Associates, Inc.

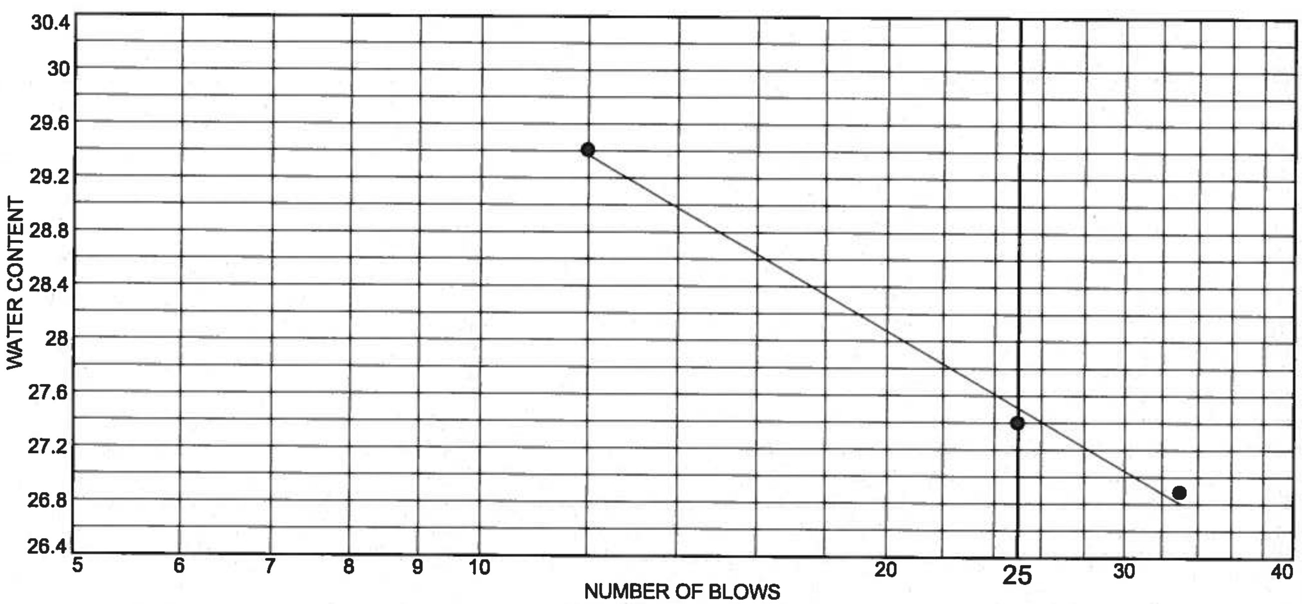
Biddeford, Maine

Lab No. 15619-34

Tested By: JMT **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	27.5	18.2	9.3		96.0	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-VMS-102
Sample Number: 6D **Depth:** 30'-32'

R.W. Gillespie & Associates, Inc.

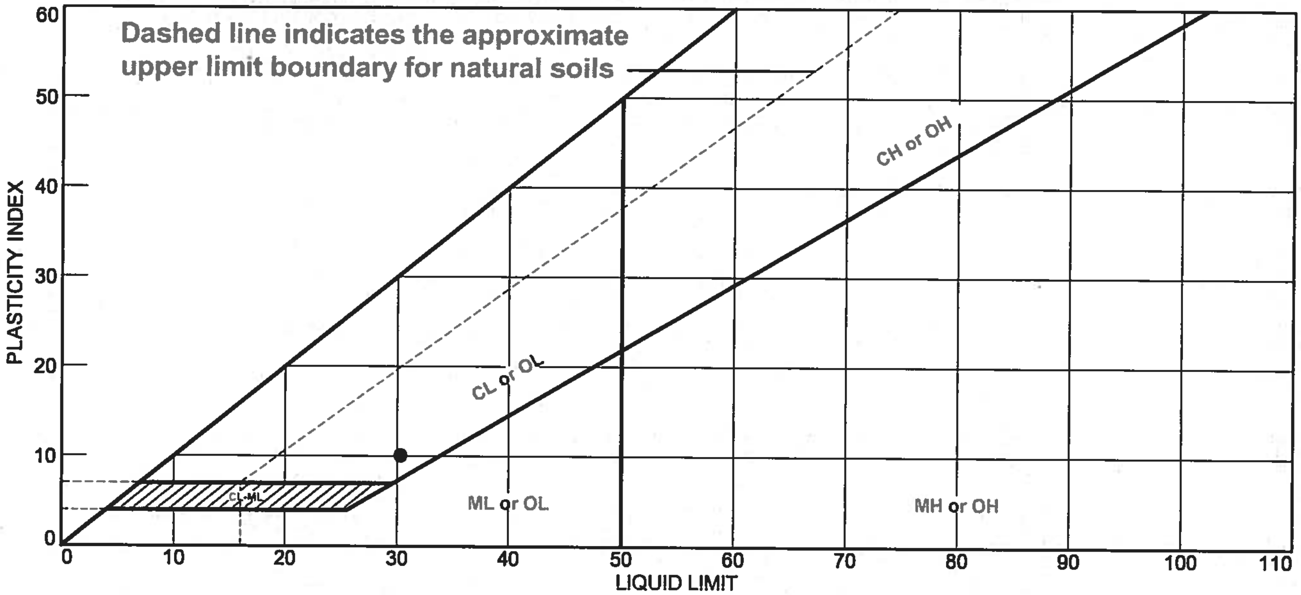
Biddeford, Maine

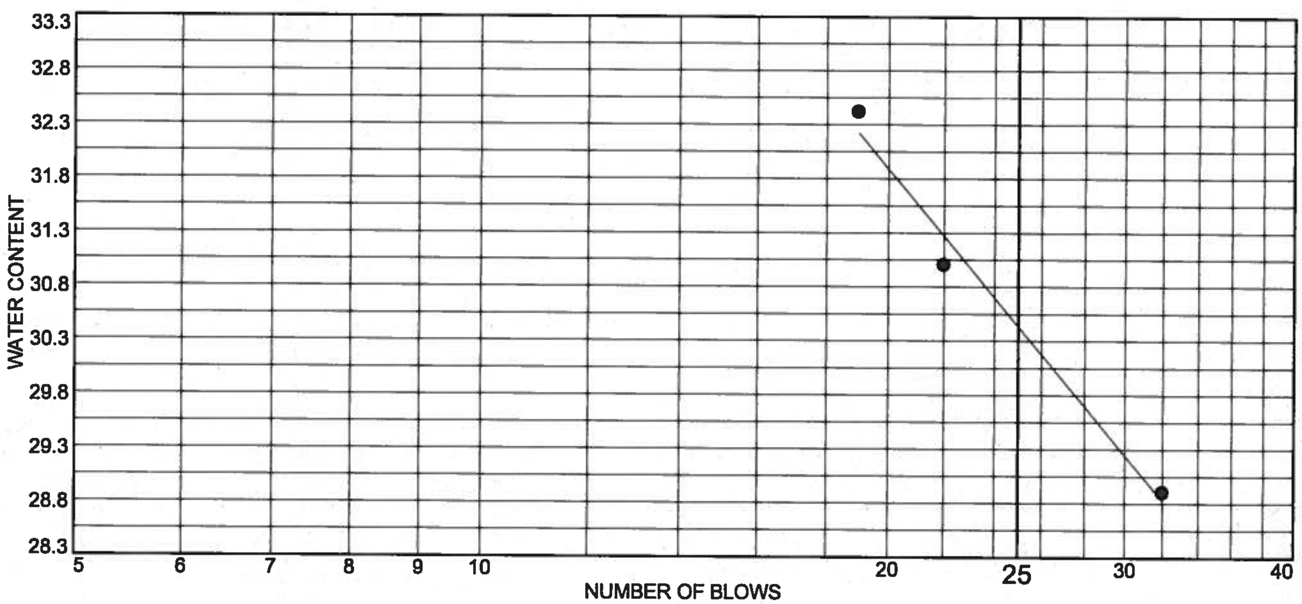
Remarks:
●Natural Moisture 31.9%

Lab No. 15619-35

Tested By: JMT **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	30.4	20.4	10.0		97.4	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.

Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)

Portland, ME

Location: HB-VMS-102

Sample Number: 7D **Depth:** 35'-37'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

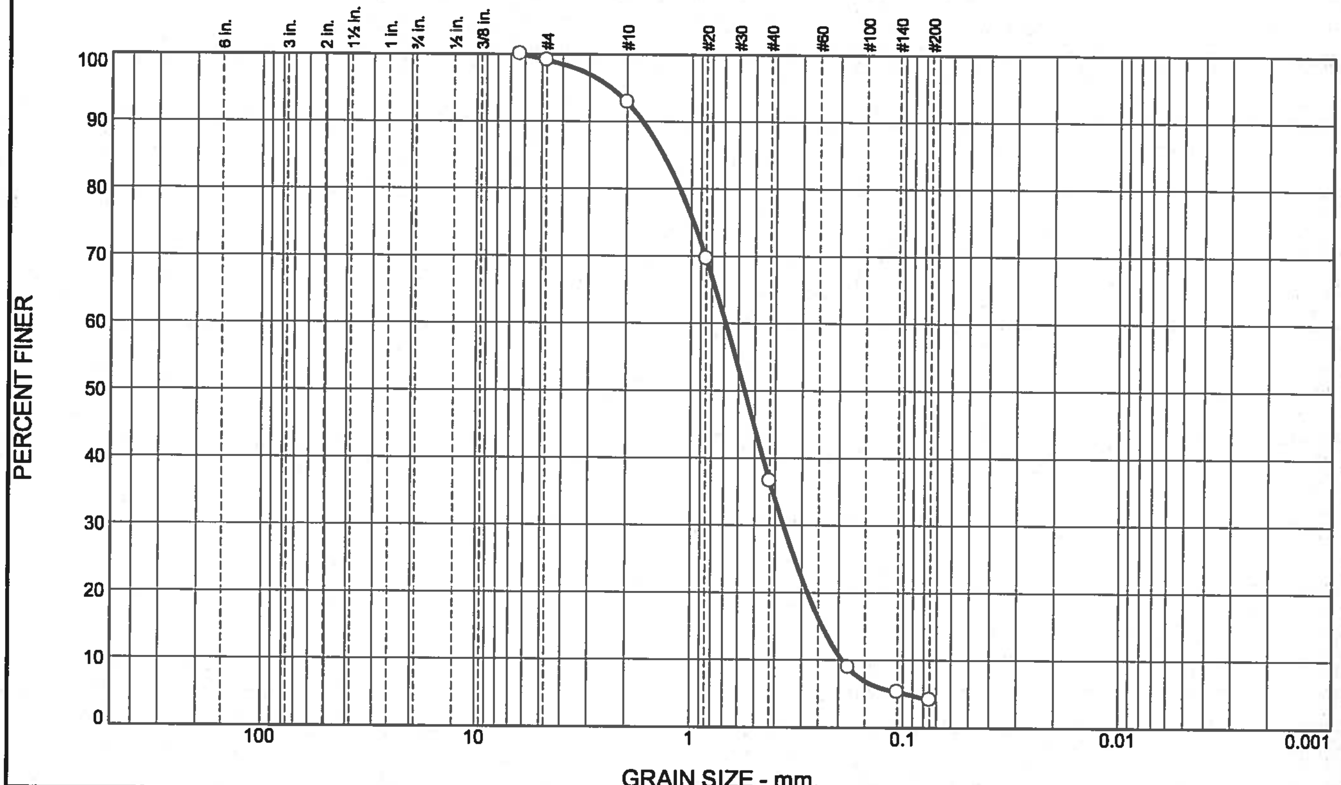
Remarks:

●Natural Moisture 32.9%

Lab No. 15619-36

Tested By: JMT **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	6.2	56.3	32.5	4.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	99.1		
#10	92.9		
#20	69.7		
#40	36.6		
#80	8.9		
#140	5.3		
#200	4.1		

* (no specification provided)

Soil Description

Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.6856 D_{85}= 1.3464 D_{60}= 0.6863
D_{50}= 0.5599 D_{30}= 0.3661 D_{15}= 0.2390
D_{10}= 0.1919 C_u= 3.58 C_c= 1.02

Classification

USCS= SP AASHTO= A-1-b

Remarks

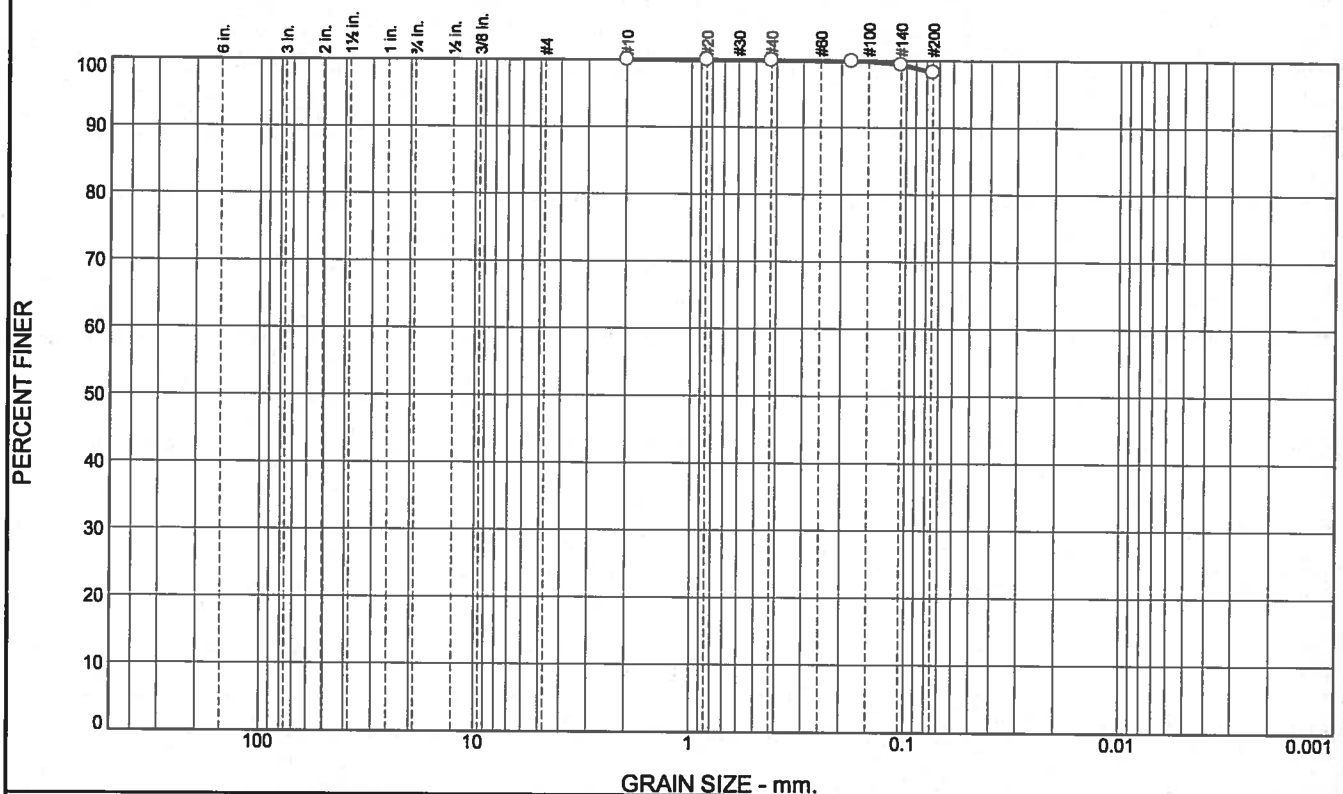
Moisture Content: 18.1%

Location: HB-VMS-103
Sample Number: 2D **Depth:** 10'-12' **Date:** 7/11/2019

R.W. Gillespie & Associates, Inc. Biddeford, Maine	**Client:** Schonewal Engineering Associates, Inc. **Project:** Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME **Project No:** 1368-016 **Lab No.** 15619-37

Tested By: MCM/MSM **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	1.7	98.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#80	99.9		
#140	99.4		
#200	98.2		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19.5 LL= 31.5 PI= 12.0

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

Moisture Content: 36.2%

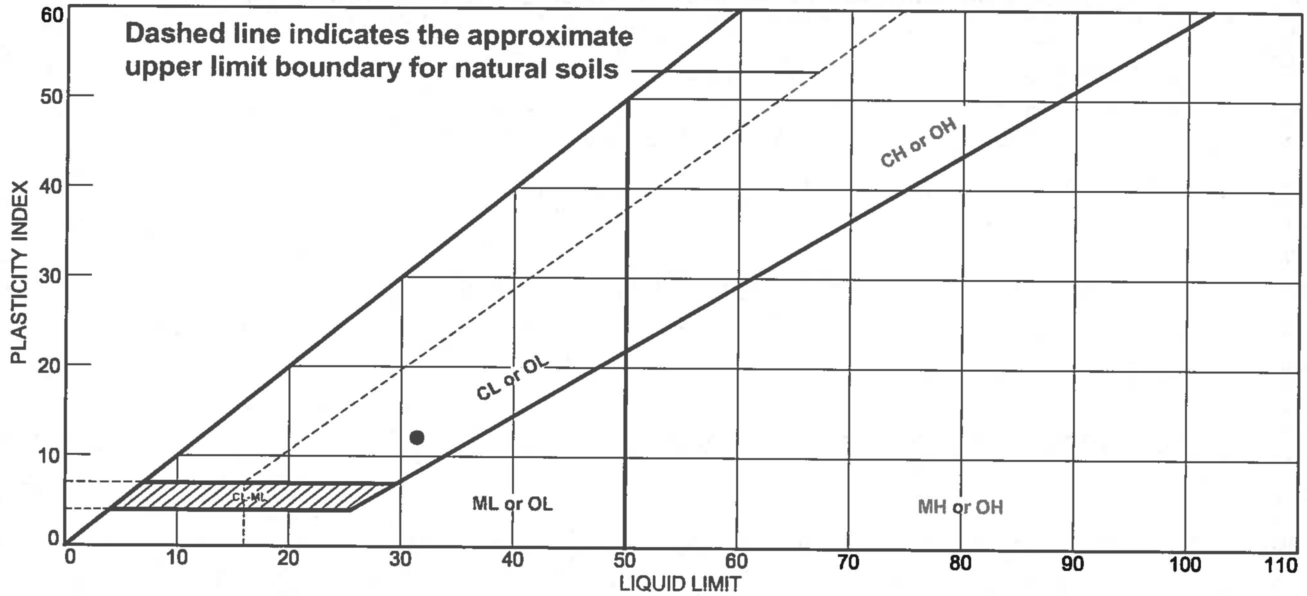
Location: HB-VMS-103
Sample Number: 3D **Depth:** 15'-17' **Date:** 7/18/2019

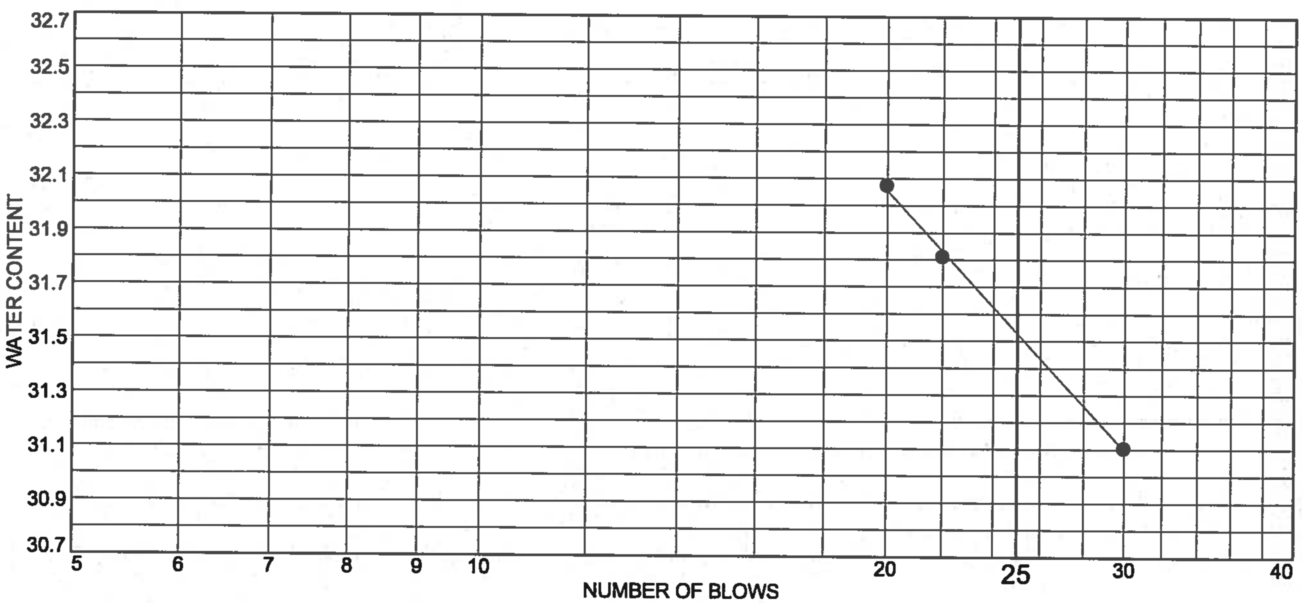
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117) Portland, ME
Project No: 1368-016 **Lab No.** 15619-38

Tested By: JJB **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	31.5	19.5	12.0		98.1	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.

Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)

Portland, ME

Location: HB-VMS-103

Sample Number: 3D **Depth:** 15'-17'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

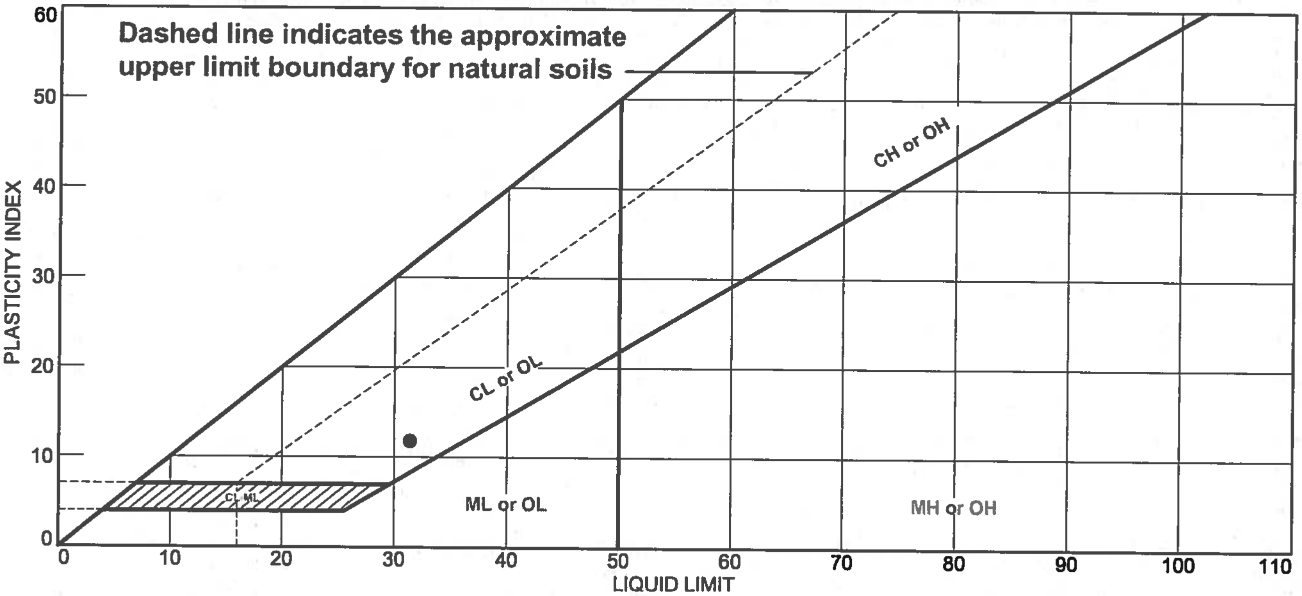
●Natural Moisture: 36.2%

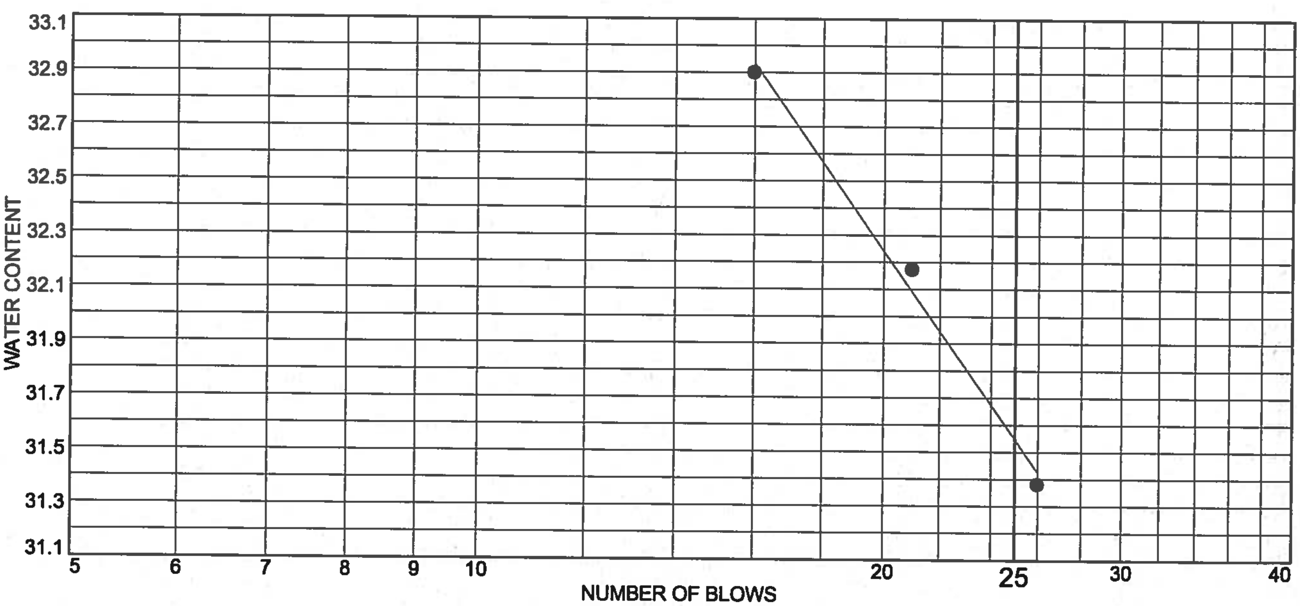
Lab No. 15619-38

Tested By: JMT **Checked By:** MTG

MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	31.5	19.8	11.7		97.9	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-VMS-103
Sample Number: 4D **Depth:** 20'-22'

R.W. Gillespie & Associates, Inc.

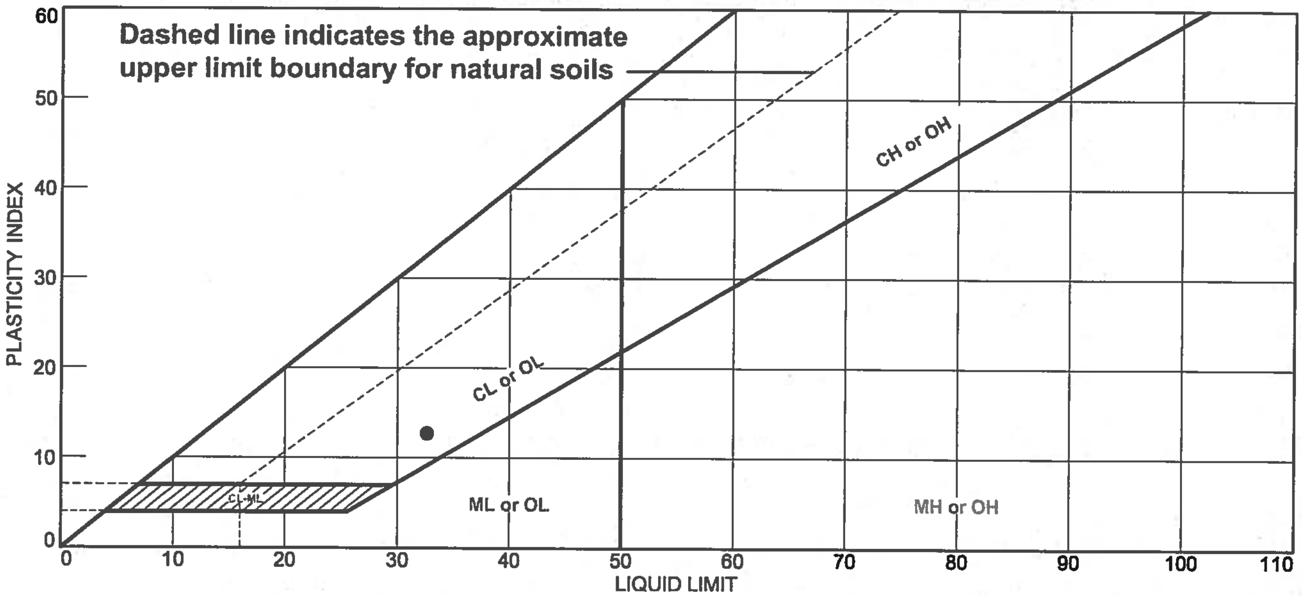
Biddeford, Maine

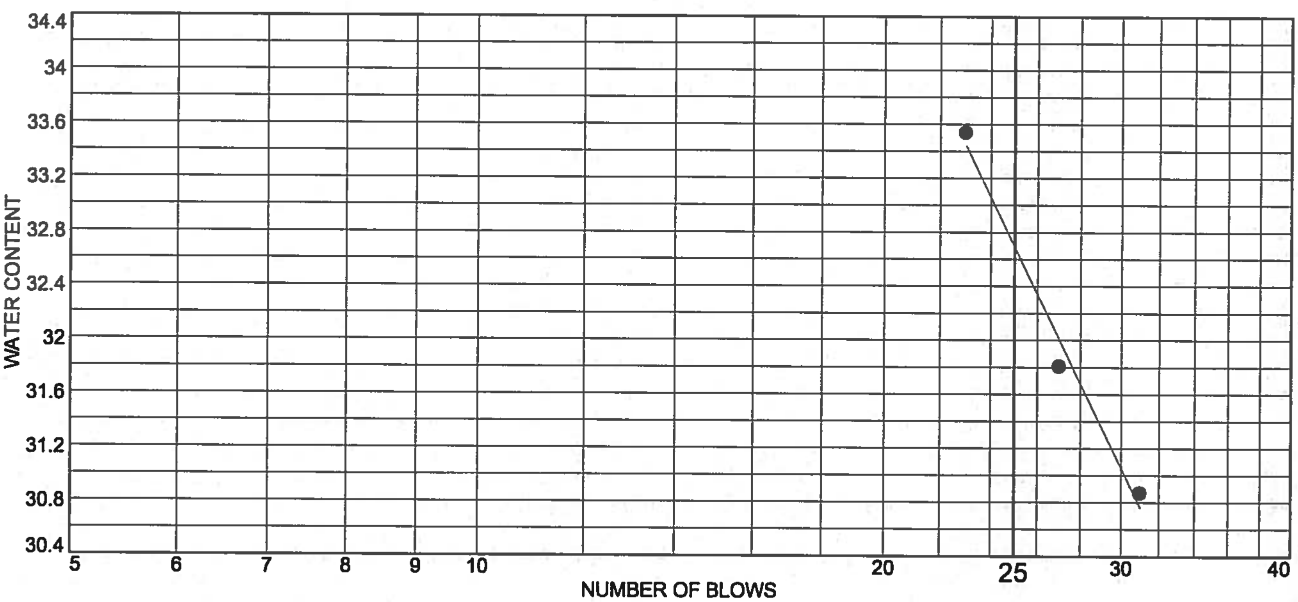
Remarks:
●Natural Moisture: 37.4%

Lab No. 15619-39

Tested By: JMT **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	32.7	20.1	12.6		97.7	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-VMS-103
Sample Number: 5D **Depth:** 25'-27'

Remarks:
●Natural Moisture 34.0%

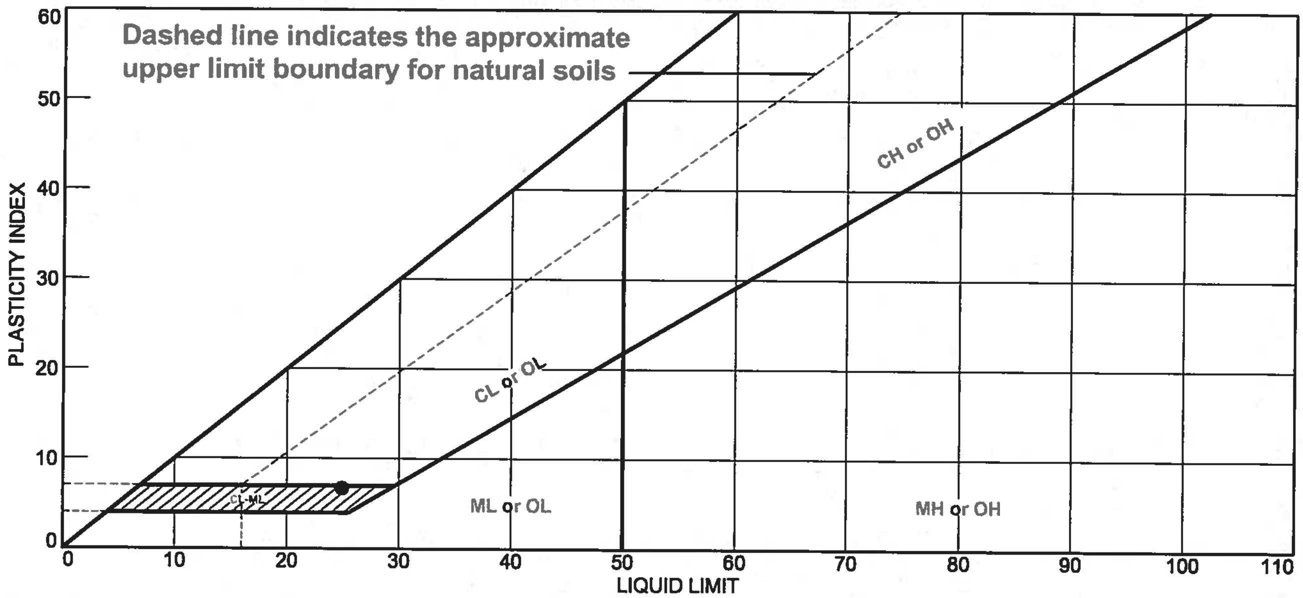
R.W. Gillespie & Associates, Inc.

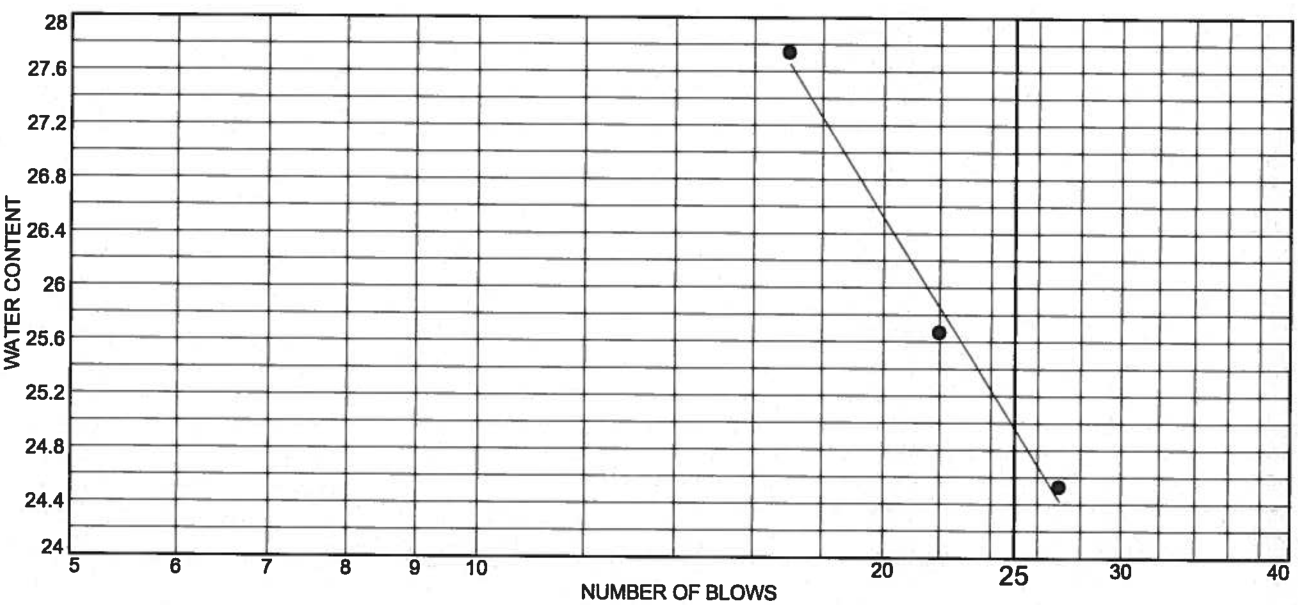
Biddeford, Maine

Lab No. 15619-40

Tested By: JMT **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	25.0	18.4	6.6		97.5	

Project No. 1368-016 **Client:** Schonewal Engineering Associates, Inc.
Project: Me TPK Ptld Area Widening- Phase 2 (#19-117)
Portland, ME
Location: HB-VMS-103
Sample Number: 6D **Depth:** 30'-32'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:
●Natural Moisture 27.3%

Lab No. 15619-41

Tested By: JMT **Checked By:** MTG

APPENDIX A

Data Reports

Boring HB-PAMI-301
Pavement Cores/Borings HB-PCORE-201 and HB-PCORE-202

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Widening / Exit 45 - Utility Crossings **LOCATION:** South Portland, ME	**Boring No.:** HB-PAMI-301 **Proj. No.:** 19-117

Driller:	New England Boring Contractors	**Elevation (ft.):**	60.5 ft (est'd)	**Auger ID/OD:**	--/4.5 inches (SSA)
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	9/26/19; 2240 - 9/27/19; 0115	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	approx. Sta. 2238+30, 69 ft LT	**Casing ID/OD:**	4.0/4.5 inches	**Water Level*:**	none observed before water introduced
Hammer Efficiency Factor:	0.842	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt

R = Rock Core Sample
Hammer Efficiency Factor=Rig-Specific Annual Calibration Value
N-uncorrected = Raw Field SPT N-value
N_{60} = Raw SPT N Value Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOR/C = Weight of Rods/ Casing
WOH = Weight of Hammer
-- = Not Recorded/Applicable
BOREHOLE ADVANCEMENT METHOD:
SSA/HSA = Solid/ Hollow Stem Auger
RC = Roller Cone/PUSH = Hydraulic Push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL = 1-D consolidation test
UU/CIU/etc = laboratory (shear) strength test
LL=Liquid Limit/PL=Plastic Limit/PI=Plasticity Index
q_p = unconfined compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
0	1D	24/18	0.0 - 2.0	WOH-1-2-3	3	4	SSA			Olive grey tan, mottled, damp to moist, very loose, SILT, little fine sand with minor roots; grading to SILT, some clay, trace fine sand. MARINE SILT-CLAY CRUST	
	2D	24/24	2.0 - 4.0	4-6-9-10	15	21				Olive tan, slightly mottled, damp (tight), stiff, SILT, some clay to Clayey SILT, trace to little fine sand. MARINE SILT-CLAY CRUST	
	3D	24/23	4.0 - 6.0	3-5-8-9	13	18	PUSH			Olive brown, slightly mottled, damp (tight), stiff, Clayey SILT. MARINE SILT-CLAY CRUST	
5											
								52.5		8.0	
10	4D	24/24	10.0 - 12.0	1-2-1-2	3	4				Olive grey grading to dark grey, soft, Silty CLAY. MARINE SILT-CLAY	
15	5D	24/24	15.0 - 17.0	push thru vane	--					Dark grey, soft, Silty CLAY. MARINE SILT-CLAY	
	V1		15.6 - 16.0	Su= 412/ 41 psf						V1: 15 / 1.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V2		16.6 - 17.0	Su= 385/ 41 psf						V2: 14 / 1.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
20	1U	24/24	20.0 - 22.0	hydraulic push	--					Dark grey, soft, Silty CLAY. MARINE SILT-CLAY	LAB TESTS: Su-lab consol, WCn, Atts Su-lab consol, WCn Su-lab
	V3		22.6 - 23.0	Su= 330/ 27 psf						V3: 12 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V4		23.6 - 24.0	Su= 357/ 27 psf						V4: 13 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
25											

Remarks:

Sample 1U lab tests:
20.6' Su-lab=470 psf; 20.9' Su-lab=491 psf; 21.3' Su-lab=480 psf
20.7' 1-D consol; WCn=41.5%, LL=45.7, PL=23.2, PI=22.5
21.1' 1-D consol; WCn=44.7%

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

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: MeTPK Portland Area Mainline Widening / Exit 45 - Utility Crossings Location: South Portland, ME	Boring No.: HB-PAMI-301 WIN: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	60.5 ft (est'd)	**Auger ID/OD:**	--/4.5 inches (SSA)
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	9/26/19; 2240 - 9/27/19; 0115	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	approx. Sta. 2238+30, 69 ft LT	**Casing ID/OD:**	4.0/4.5 inches	**Water Level*:**	none observed before
Hammer Efficiency Factor: 0.842		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140 lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
25	6D	24/24	25.0 - 27.0	push thru vane	--					Dark grey with occasional black streaks, soft, Silty CLAY. MARINE SILT-CLAY	
	V5		25.6 - 26.0	Su= 343/ 27 psf						V5: 12.5 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V6		26.6 - 27.0	Su= 330/ 27 psf						V6: 12 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
								31.5		29.0	
30	7D	24/15	30.0 - 32.0	7-9-11-12	20	28				Grey, medium dense, Silty fine to medium SAND, some gravel. TILL	
								28.5		32.0	
										Bottom of Exploration at 32.0 feet below ground surface. No refusal.	
35											
40											
45											
50											

Remarks:

Sample 1U lab tests:
20.6' Su-lab=470 psf; 20.9' Su-lab=491 psf; 21.3' Su-lab=480 psf
20.7' 1-D consol; WCn=41.5%, LL=45.7, PL=23.2, PI=22.5
21.1' 1-D consol; WCn=44.7%

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

R. W. Gillespie & Associates, Inc.
20 Pomerleau St., Suite 100, Biddeford, ME 04005 207-286-8008
177 Shattuck Way, Suite 1 West, Newington NH 03801 603-427-0244
44 Wood Avenue, Suite I, Mansfield, MA 508-623-0101

LETTER OF TRANSMITTAL

Date:	Project No.:
October 9, 2019	1368-017

Attention:
Isabel V. (Be) Schonewald, P.E. (Be@schonewaldengineering.com)

Re:
Laboratory Testing
MeTPK PAW (3) Utility Crossing
Portland, Maine

Schonewald Engineering Associates, Inc.

129 Middle Road

Cumberland, ME 04021

We are sending you attached Laboratory Test Results.

Laboratory No. (s)	Test (s) Performed
15745: HB-PAMI-301, 1U 20'-22', Portland, ME	Vane Shears, Moisture Contents, Atterburg Limits, Consol at 20.7', Consol at 21.1'

Remarks:

Copy to:

If enclosures are not noted, kindly notify us at once.

Laboratory Vane Shear Test Results

ASTM D4648 Standard Test Method for Laboratory Miniature Vane Shear Test for Saturated Fine-Grained Clayey Soil

Project: MeTPK PAW (3) Utility Crossing (#19-117)
Location: South Portland, ME
Client: Schonewald Engineering Associates, Inc.
Date: 10/2/2019
Project No.: 1368-017
Test Depth: 20.60 to 21.30

Boring/Sample No.		HB-PAMI-301, 1U			Lab No.	15745	
Test No.	Test Depth (ft)	Vane Size	Max. Torque (Undisturbed) (kg-cm)	Max. Torque (Remolded) (kg-cm)	Undrained Shear Strength (psf)	Undrained Shear Strength (psf)	Moisture Content
1	20.6	L	45	3	470	31	47%
2	20.9	L	47	4	491	42	47%
3	21.3	L	46	6	480	63	45%

Vane Size	
	(mm)
S	16 x 32
M	20 x 40
L	24.5 x 50.8

Tested By: AGS

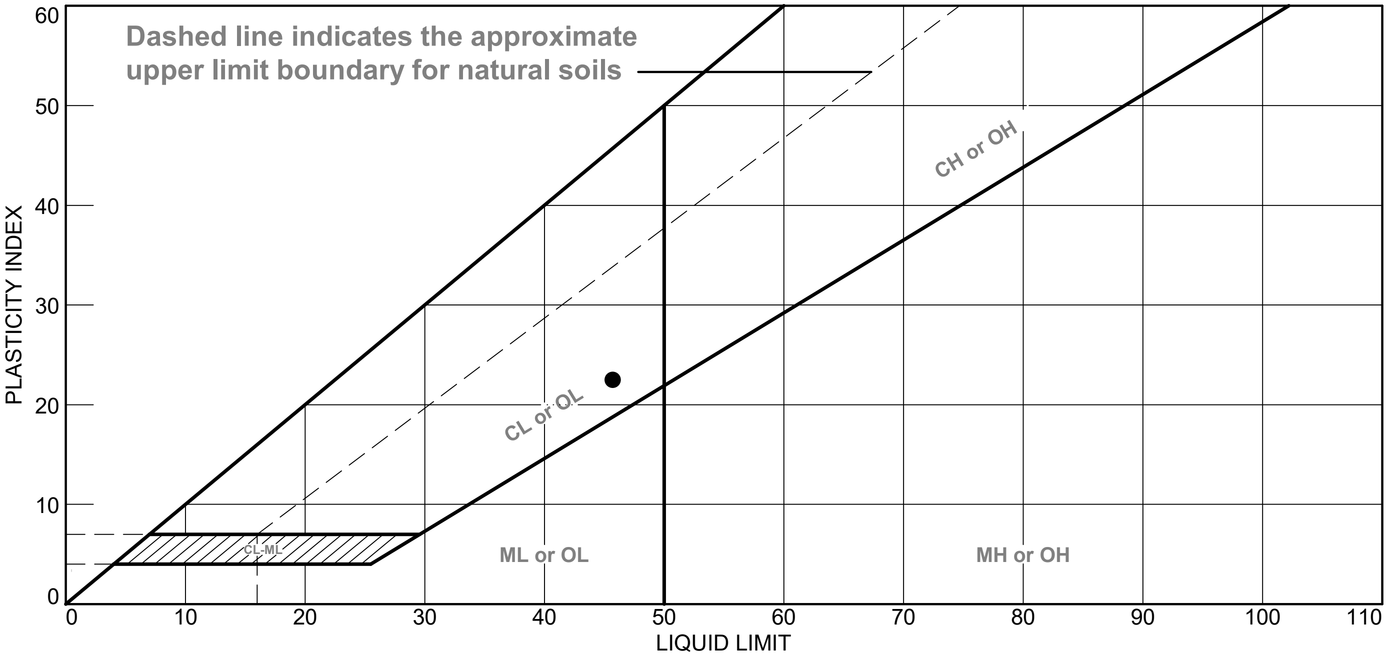
Checked By: MTG/EJW

MTG

R.W. Gillespie & Associates

86 Industrial Park Rd., Suite 4, Saco ME 04072, 207-286-8008 / 200 International Dr., Suite 170, Portsmouth NH 03801, 603-427-0244

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	45.7	23.2	22.5			

Project No. 1368-017 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301
Sample Number: 1U **Depth:** 20.7

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

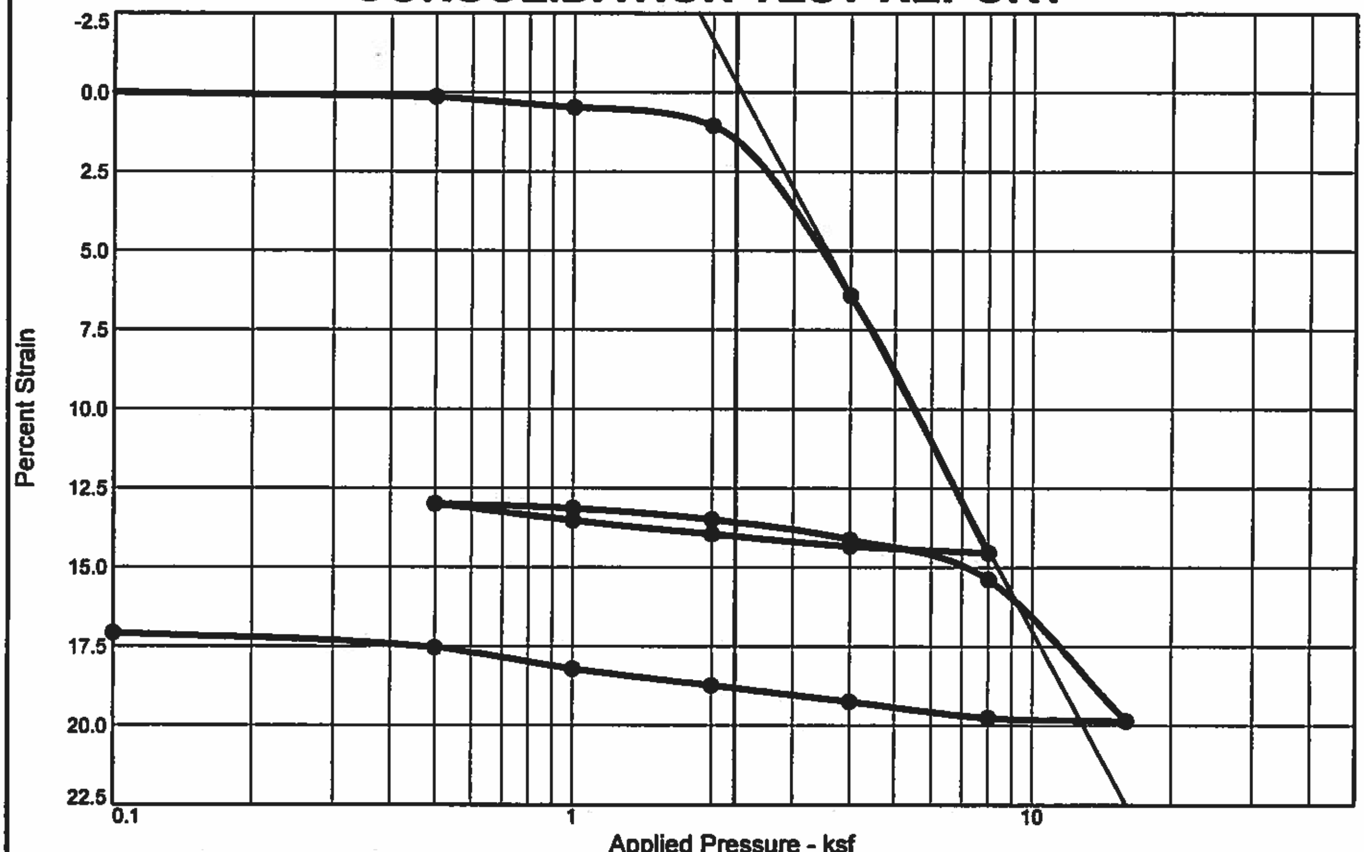
Remarks:

Lab No. 15745

Tested By: AGS **Checked By:** MTG/EJW

MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	4.538		8	1.00	0.711		15	8.00	4.155	
2	1.00	9.989		9	0.50	0.354		16	4.00	1.581	
3	2.00	3.507		10	1.00	1.289		17	2.00	0.810	
4	4.00	0.233		11	2.00	1.301		18	1.00	0.345	
5	8.00	0.222		12	4.00	1.435		19	0.50	0.147	
6	4.00	3.448		13	8.00	1.187		20	0.10	0.084	
7	2.00	1.550		14	16.00	0.442					

Natural Saturation	Natural Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
94.4 %	41.5 %	78.7	45.7	22.5	2.7		2.8	0.59	0.10	1.187

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-017 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 **Depth:** 20.7 **Sample Number:** 1U

Remarks:

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15745-01

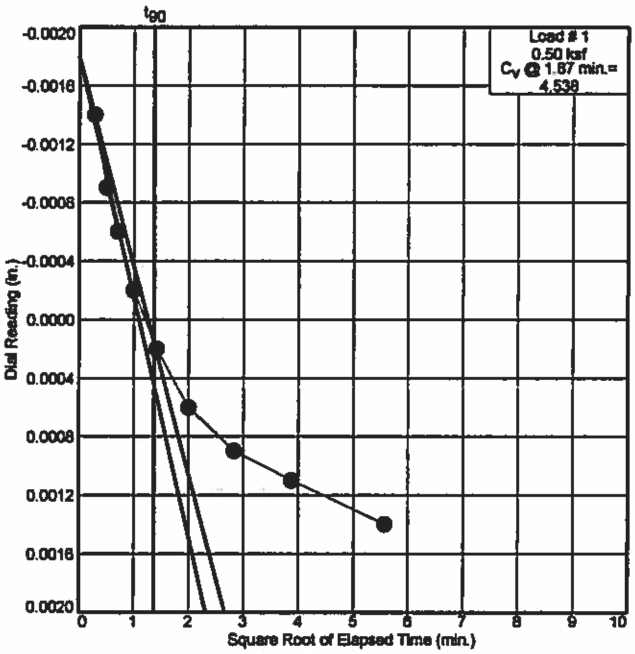
Tested By: AGS **Checked By:** MTG/EJW

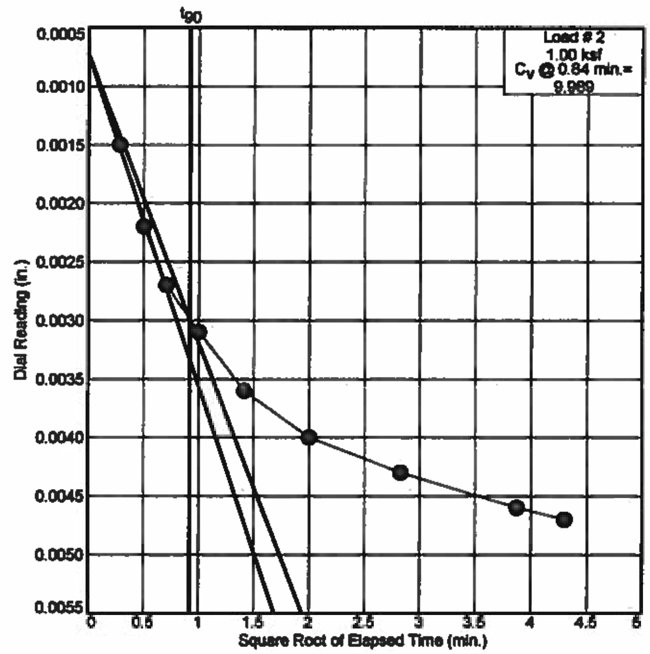
MR

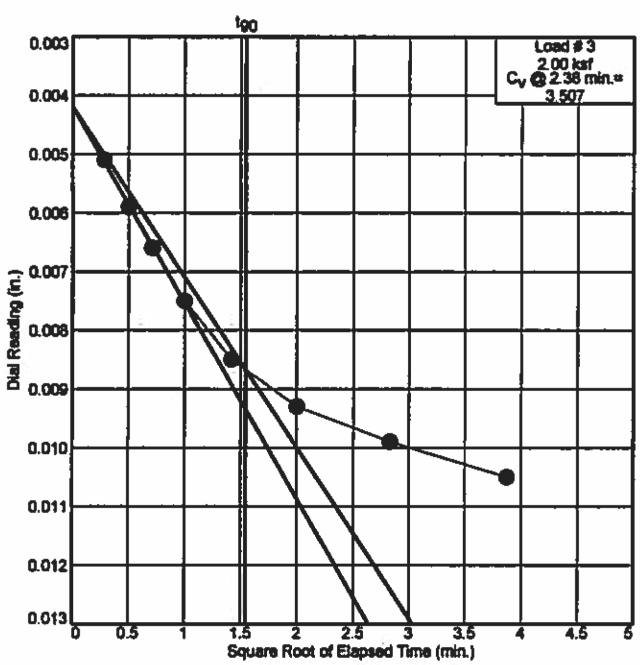
Dial Reading vs. Time

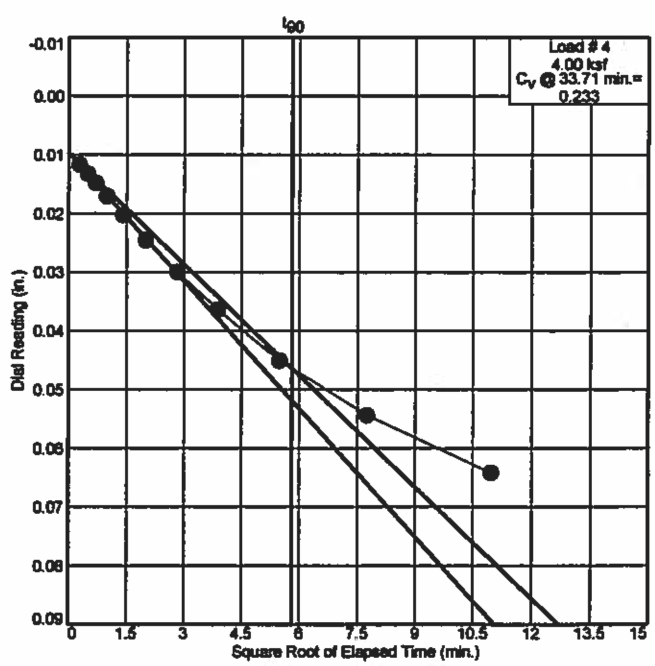
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301　　Depth: 20.7　　Sample Number: 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

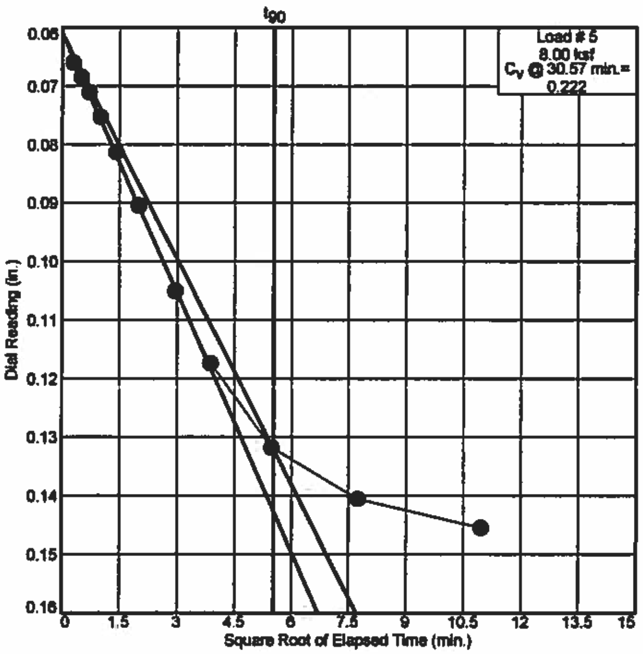
Lab No. 15745-01

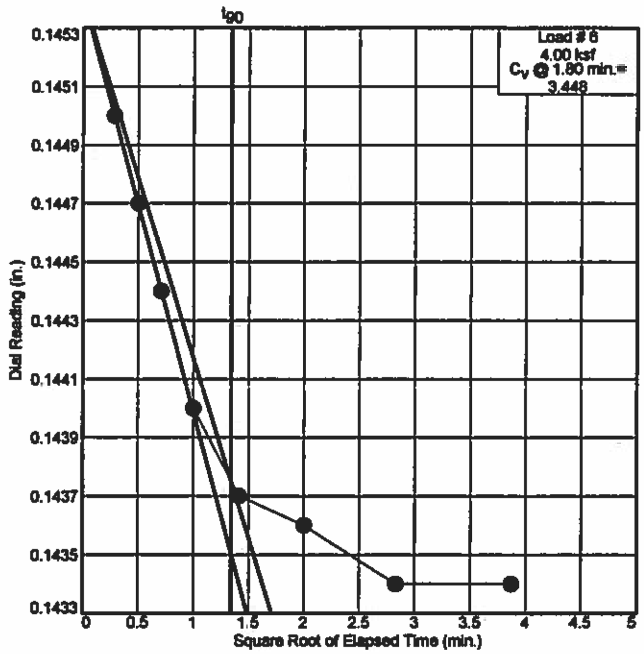
MTB

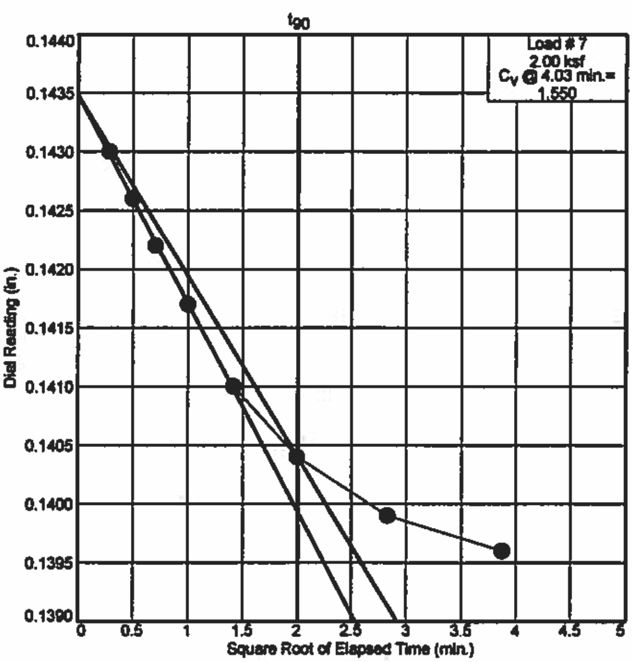
Dial Reading vs. Time

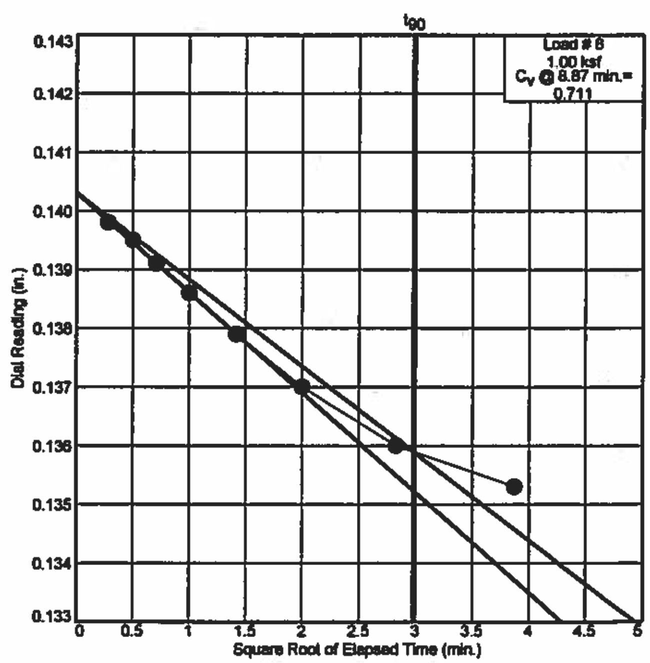
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 **Depth:** 20.7 **Sample Number:** 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

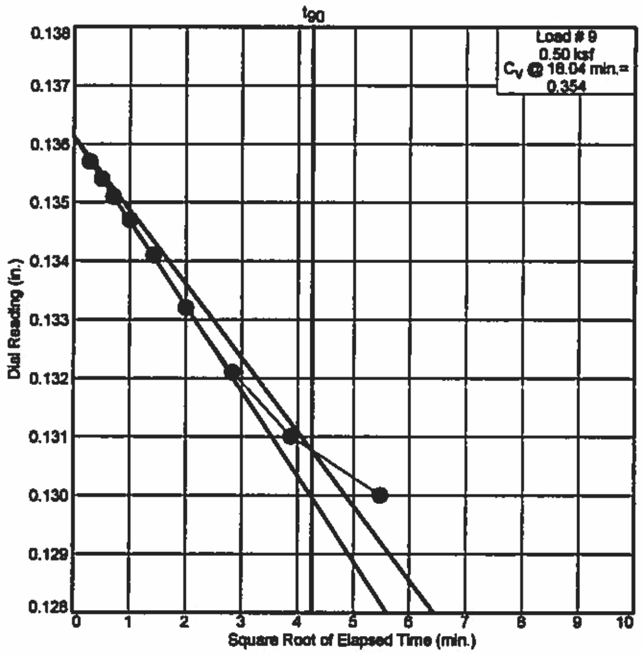
Lab No. 15745-01

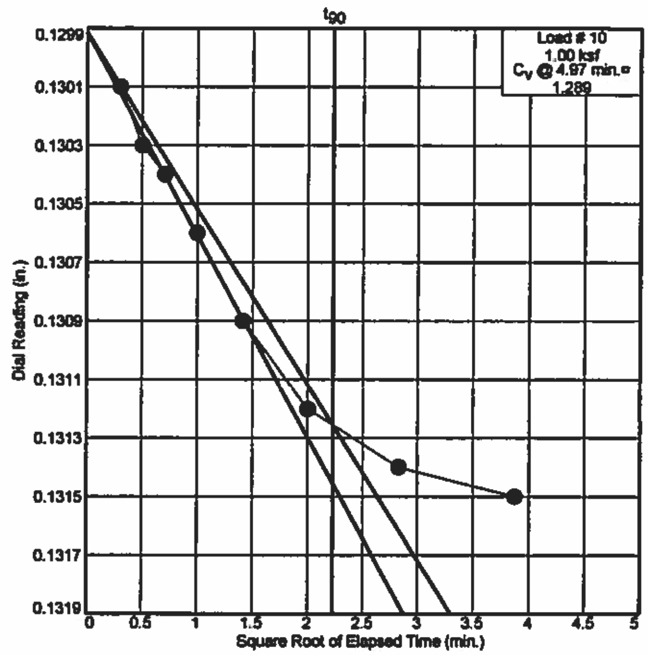
mTa

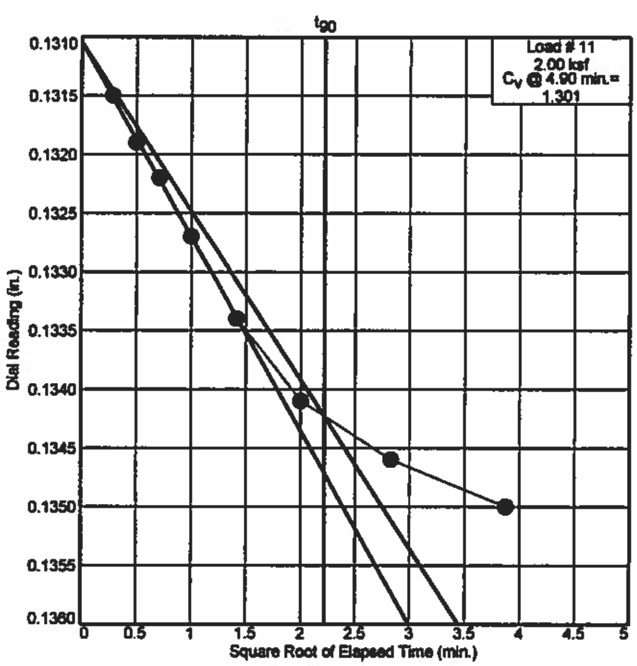
Dial Reading vs. Time

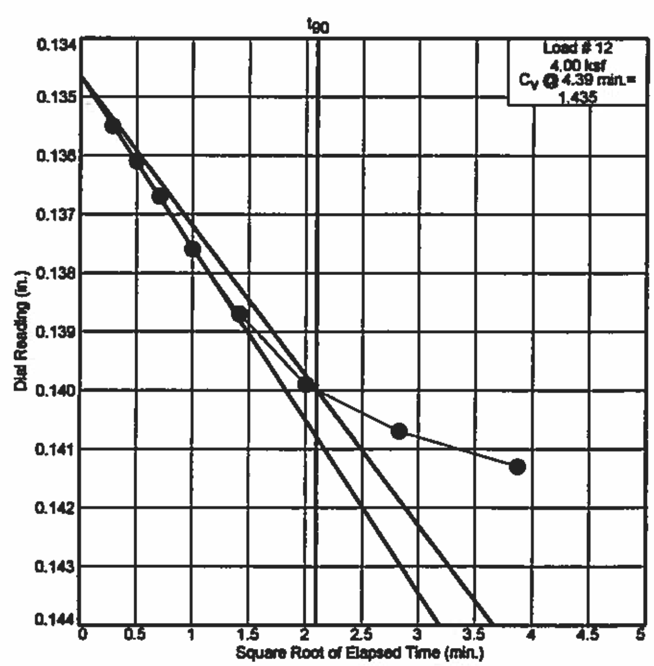
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 **Depth:** 20.7 **Sample Number:** 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

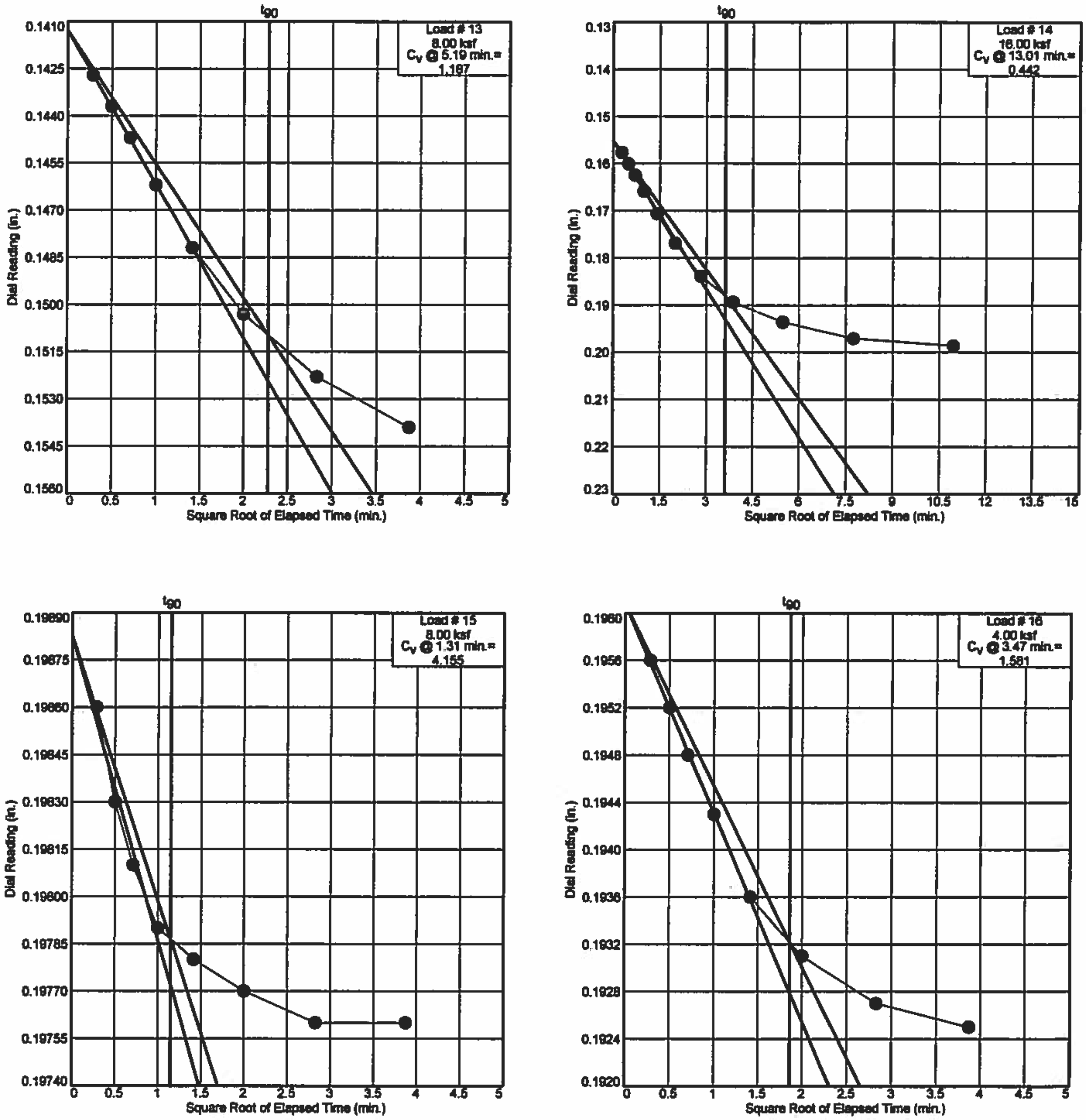
Lab No. 15745-01

MR

Dial Reading vs. Time

Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 Depth: 20.7 Sample Number: 1U



R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15745-01

MR

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Project No.: 1368-017
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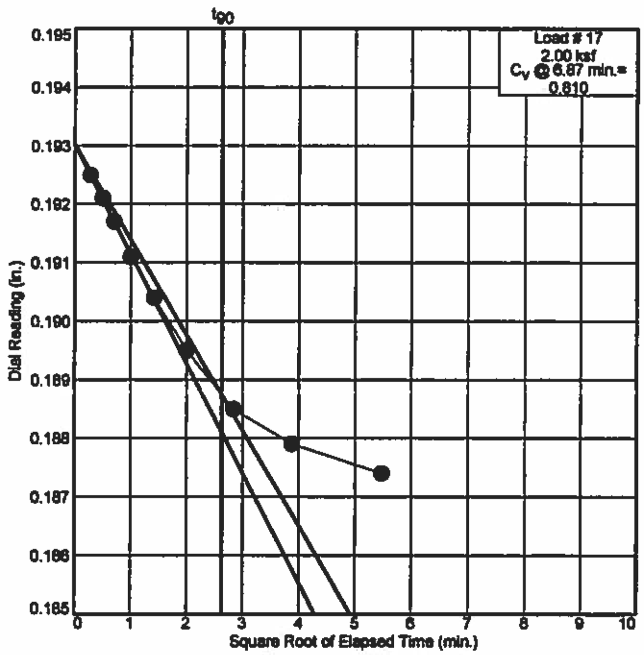
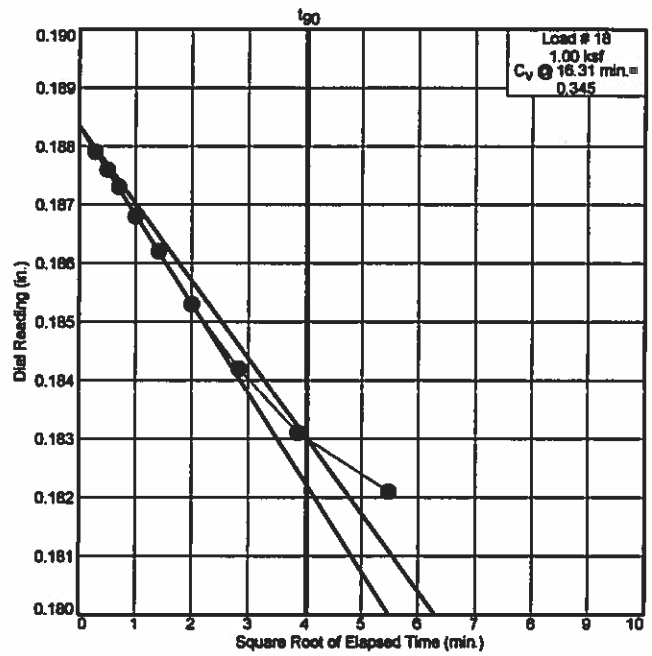
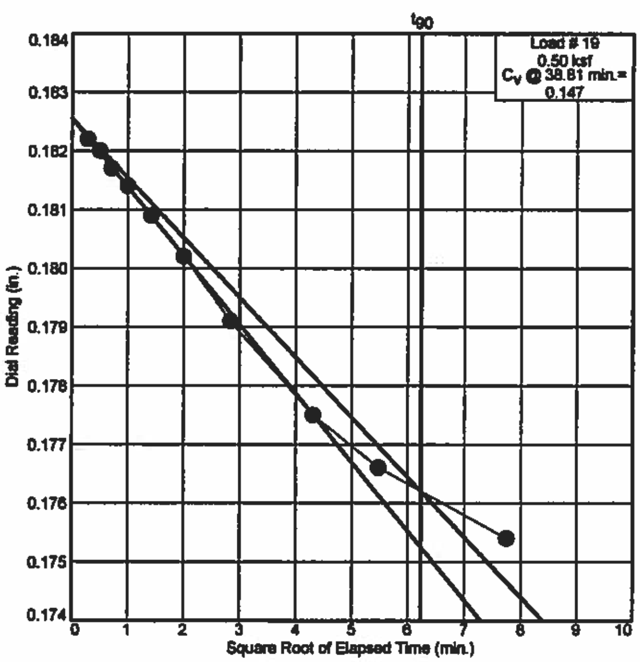
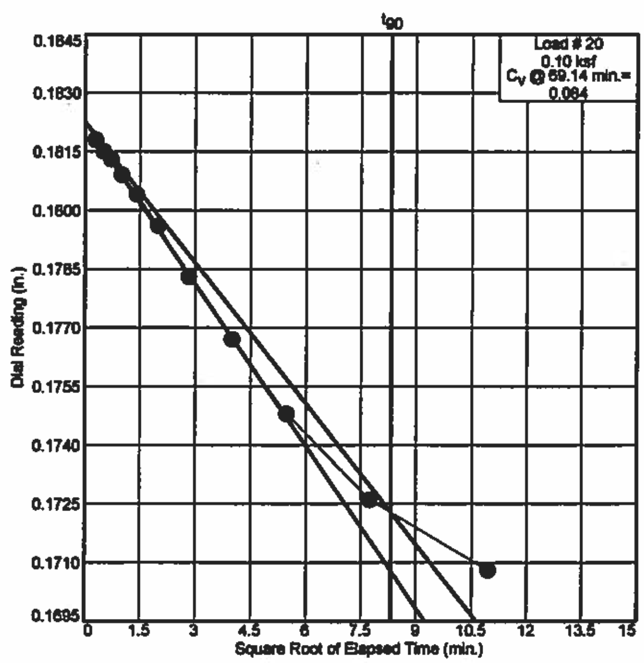
Location: HB-PAMI-301 **Depth:** 20.7 **Sample Number:** 1U









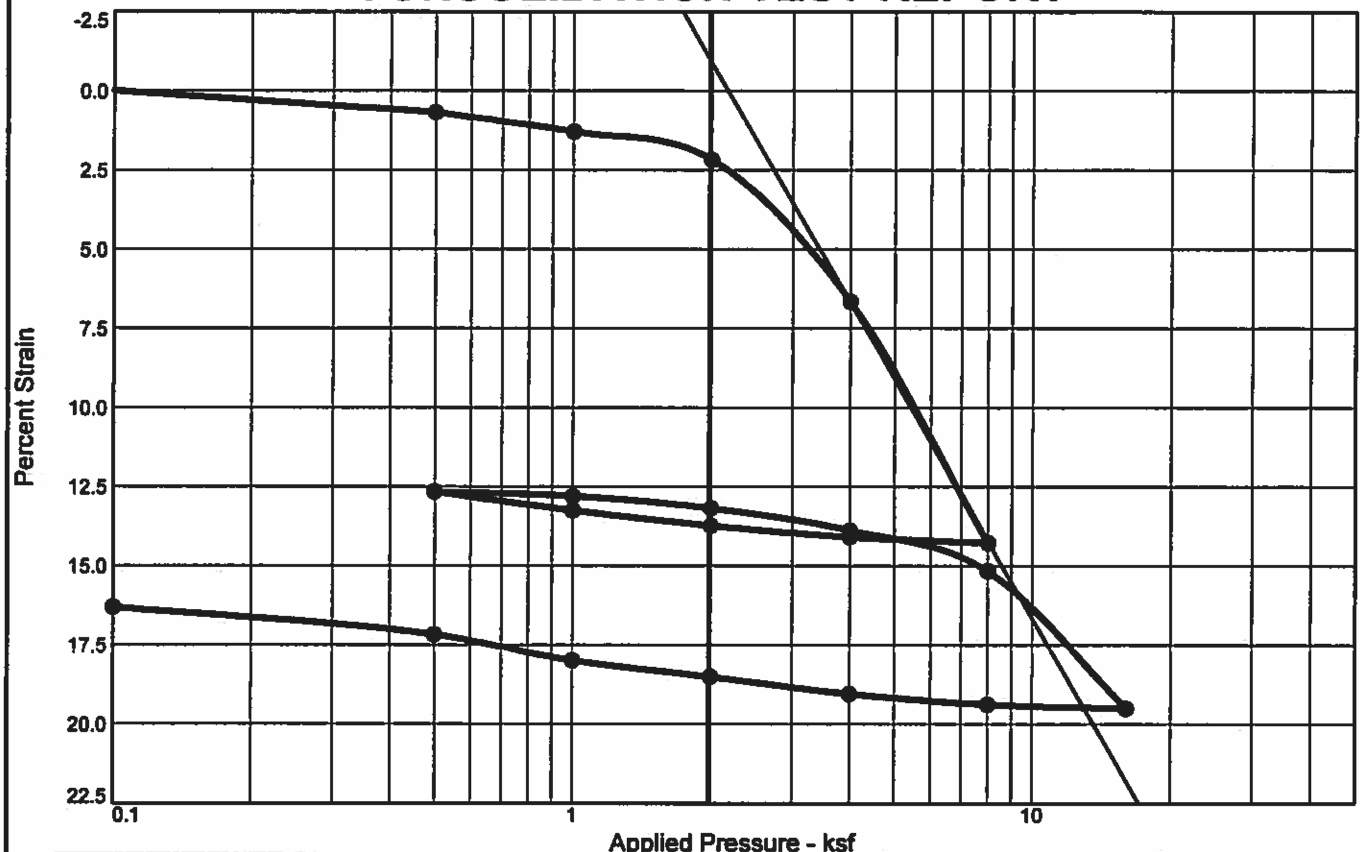
R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15745-01

MDG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α	No.	Load (ksf)	C_v (ft.^{2}/day)	C_α
1	0.50	2.144		8	1.00	0.943		15	8.00	11.573	
2	1.00	3.684		9	0.50	0.414		16	4.00	2.502	
3	2.00	2.652		10	1.00	6.217		17	2.00	1.164	
4	4.00	0.444		11	2.00	1.474		18	1.00	0.382	
5	8.00	0.379		12	4.00	2.683		19	0.50	0.178	
6	4.00	4.813		13	8.00	1.714		20	0.10	0.088	
7	2.00	1.968		14	16.00	0.699					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
101.8 %	44.7 %	77.0	45.7	22.5	2.7		2.8	0.55	0.10	1.185

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 1368-017 **Client:** Schonewald Engineering Associates, Inc.

Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 **Depth:** 21.1 **Sample Number:** 1U

Remarks:

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15745-02

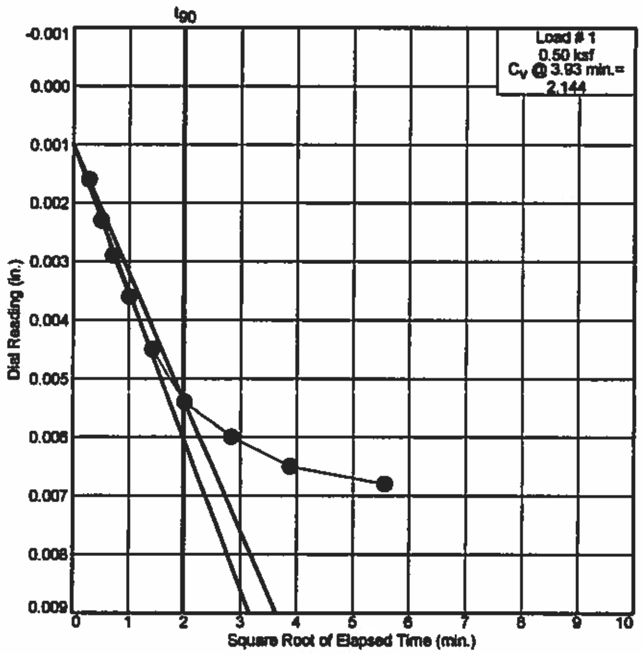
Tested By: AGS **Checked By:** MTG/EJW

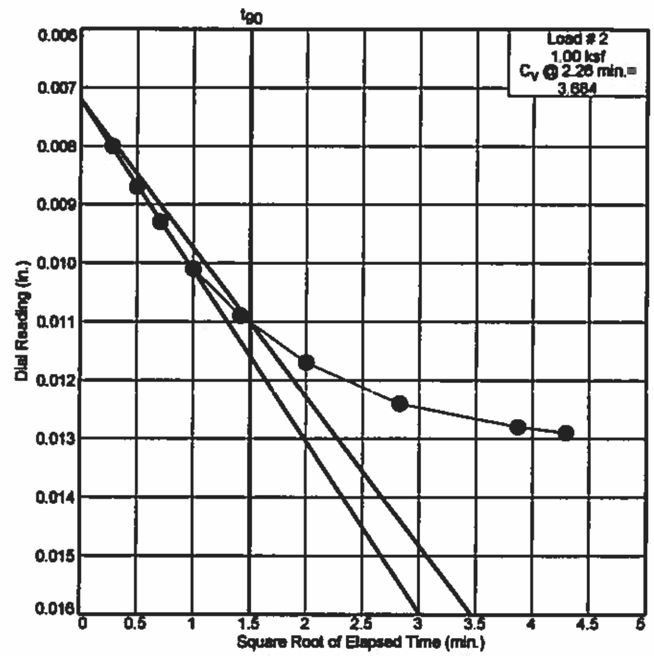
MTG

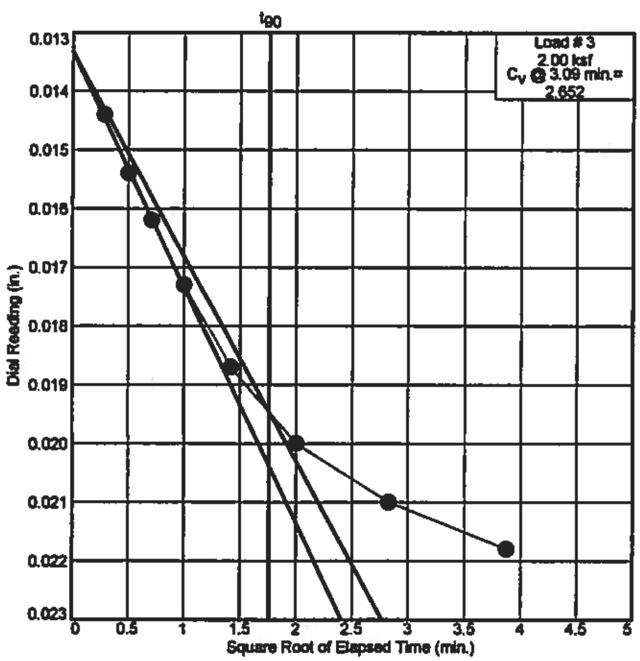
Dial Reading vs. Time

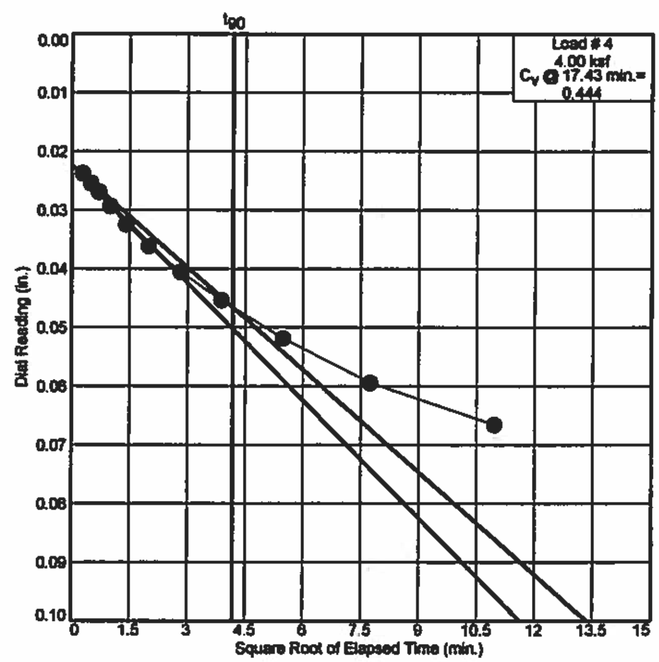
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 Depth: 21.1 Sample Number: 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

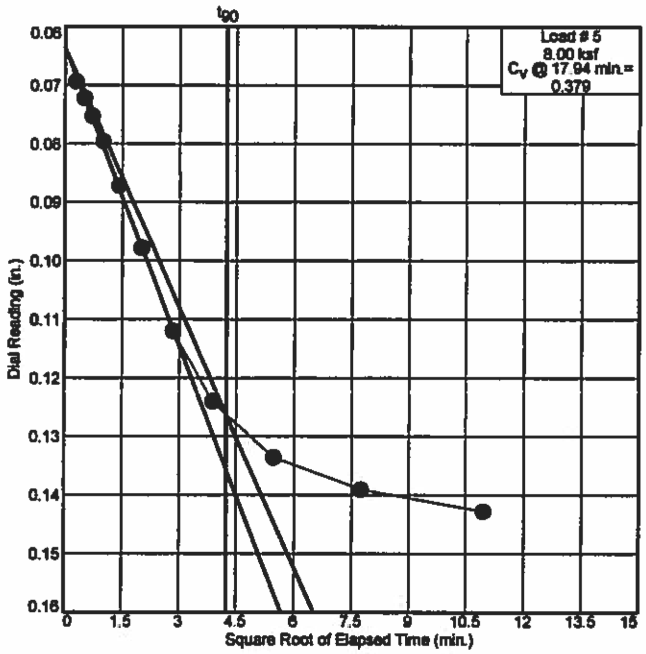
Lab No. 15745-02

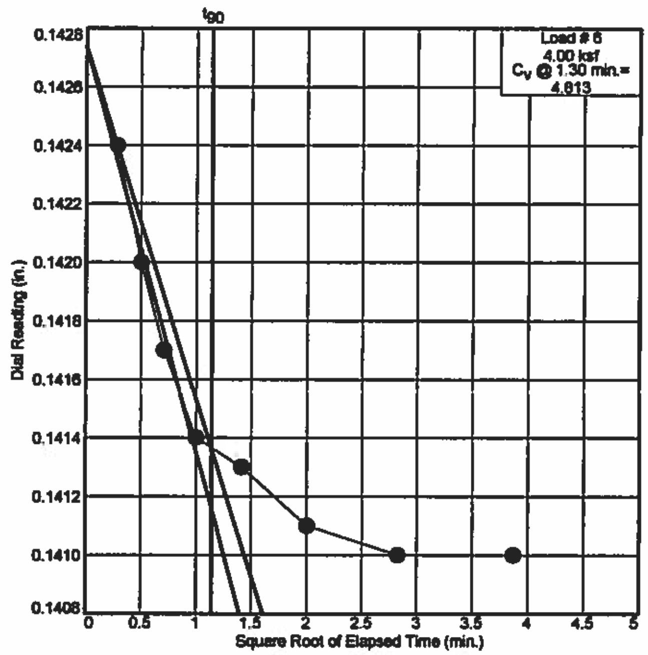
MTG

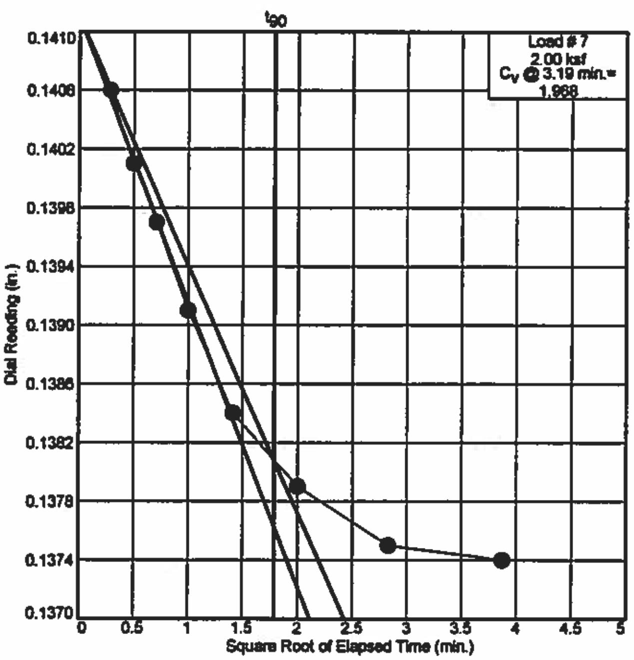
Dial Reading vs. Time

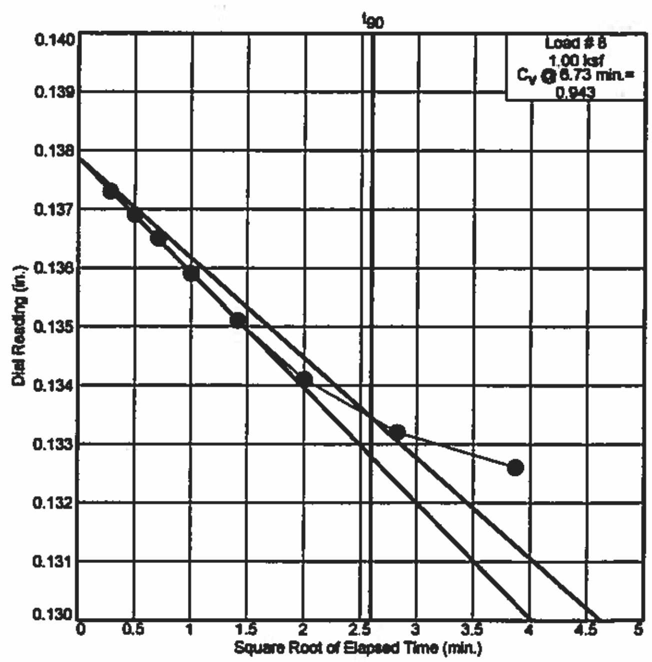
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 Depth: 21.1 Sample Number: 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

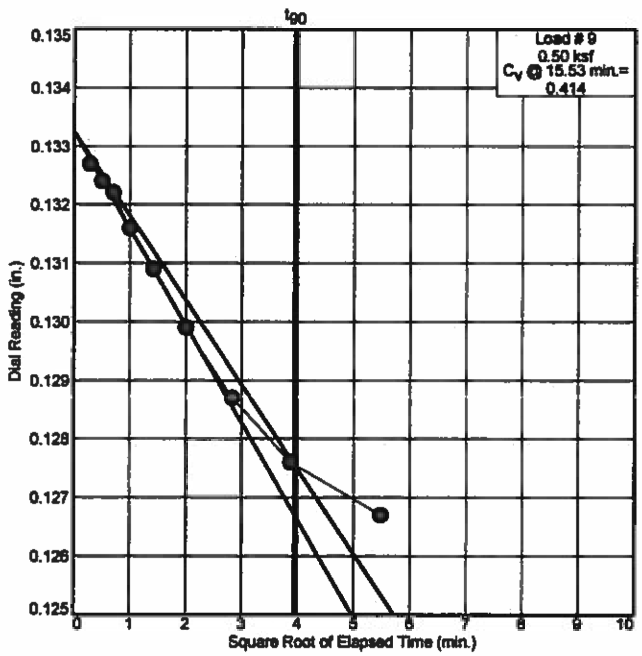
Lab No. 15745-02

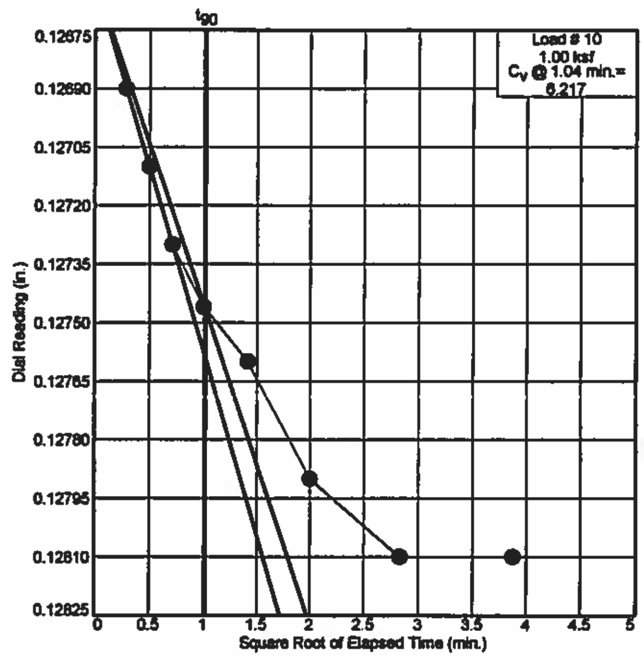
MTG

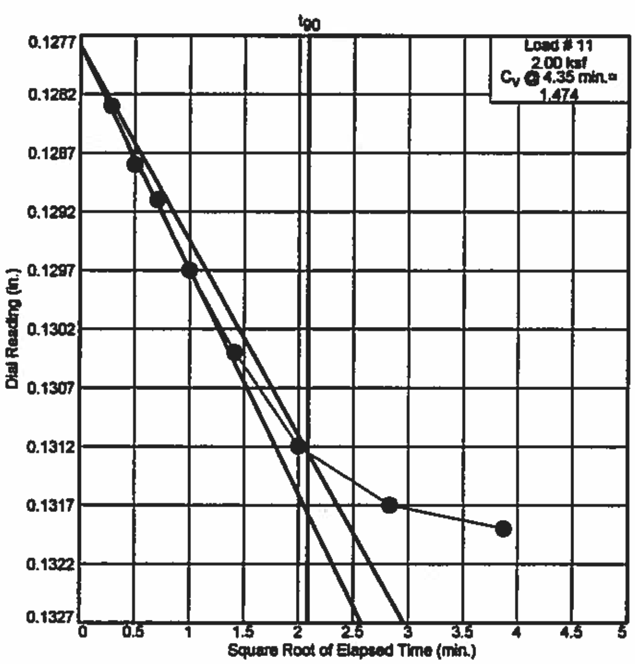
Dial Reading vs. Time

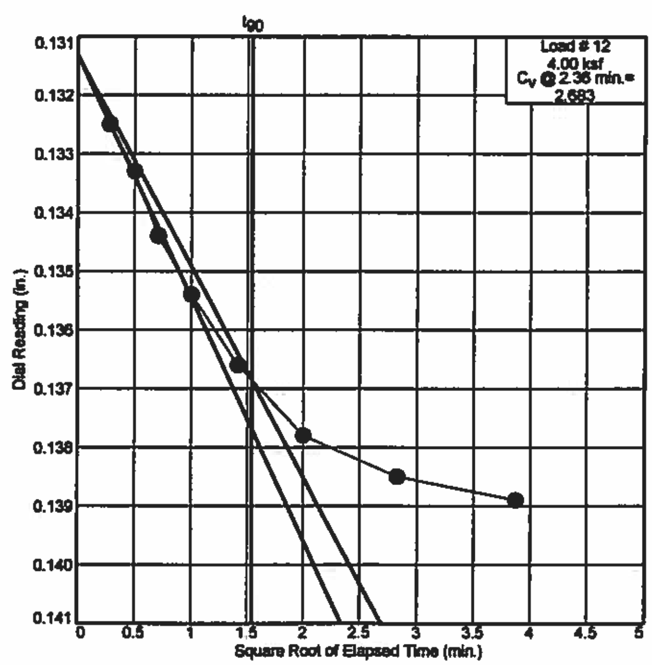
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 Depth: 21.1 Sample Number: 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

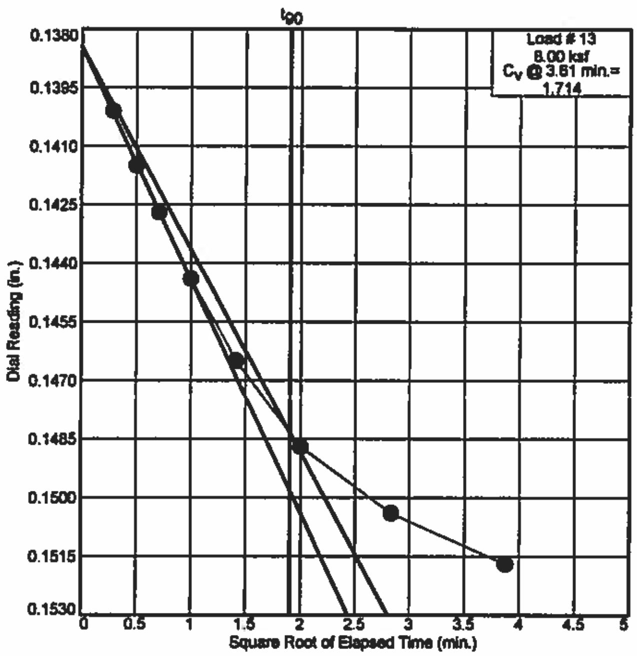
Lab No. 15745-02

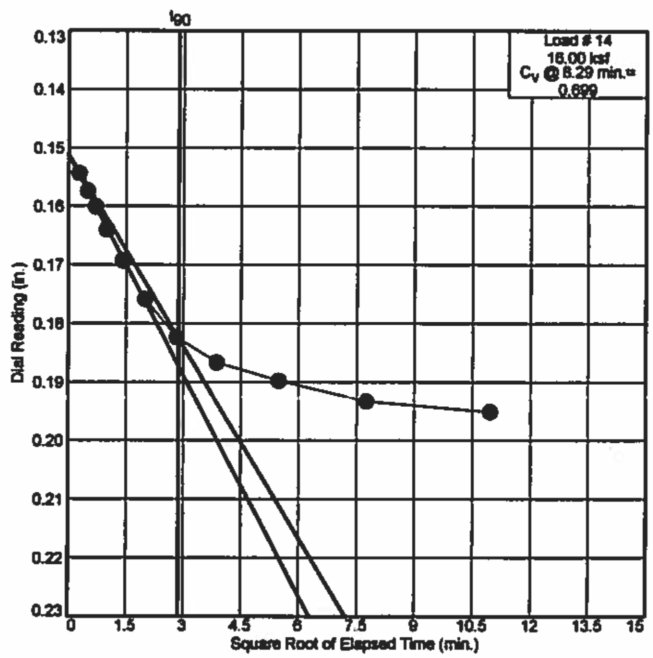
MTB

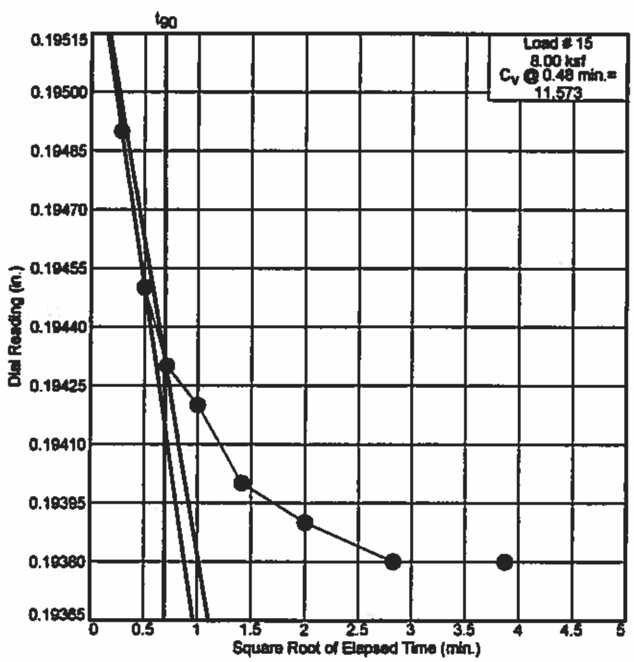
Dial Reading vs. Time

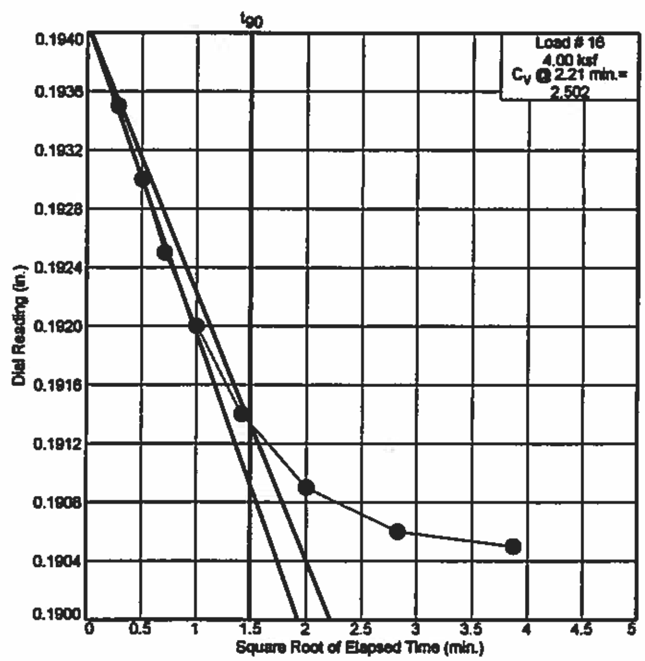
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 **Depth:** 21.1 **Sample Number:** 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

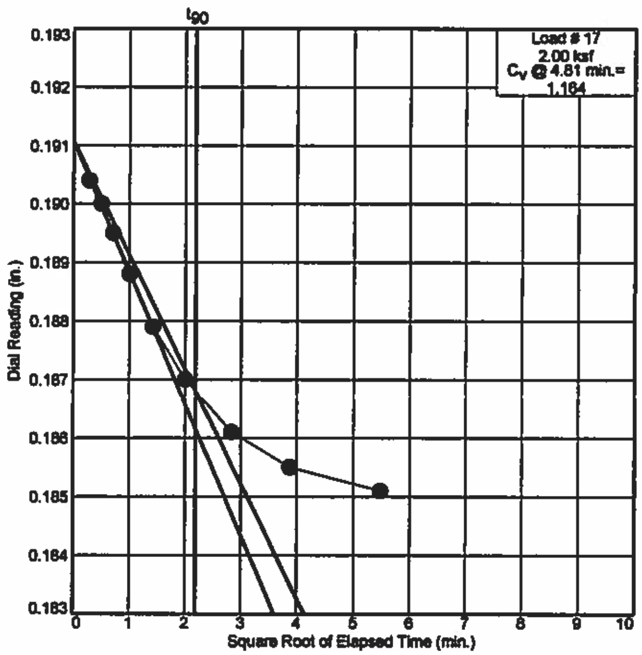
Lab No. 15745-02

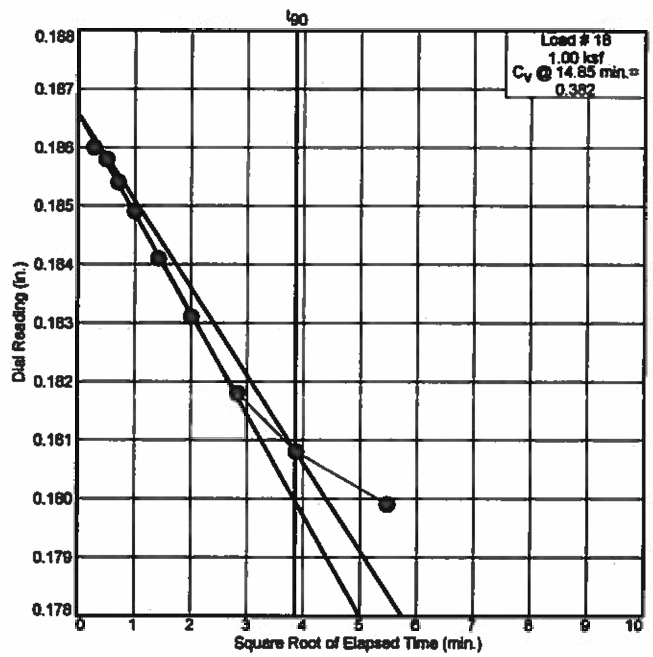
MTB

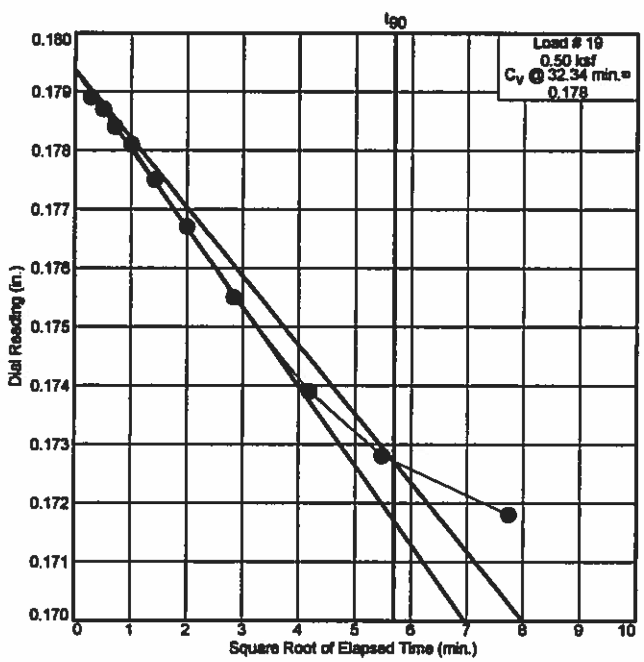
Dial Reading vs. Time

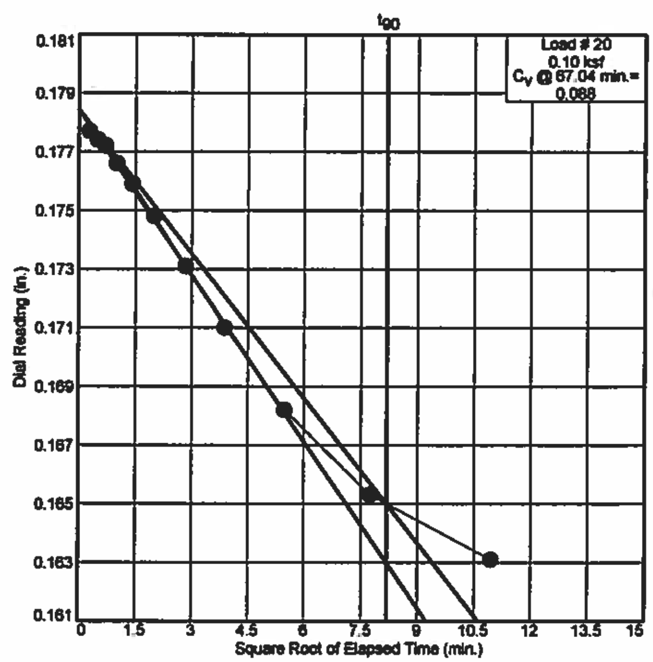
Project No.: 1368-017
Project: MeTPK PAW (3) Utility Crossing

Location: HB-PAMI-301 **Depth:** 21.1 **Sample Number:** 1U









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15745-02

MTB

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Widening-Running Hill Road Pavement Cores

LOCATION: South Portland, ME

Boring No.: HB-PCORE-201

Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	68 ft.	**Auger ID/OD:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	9/26/19; 2140-2205	**Drilling Method:**	cased wash boring	**Core Barrel:**	n/a
Boring Location:	Station 2250+22; see remarks	**Casing ID/OD:**	5" dia pavement core	**Water Level*:**	none observed
Hammer Efficiency Factor: 0.842		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt

R = Rock Core Sample
Hammer Efficiency Factor=Rig-Specific Annual Calibration Value
N-uncorrected = Raw Field SPT N-value
N_{60} = Raw SPT N Value Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOR/C = Weight of Rods/ Casing
WOH = Weight of Hammer
-- = Not Recorded/Applicable
BOREHOLE ADVANCEMENT METHOD:
SSA/HSA = Solid/ Hollow Stem Auger
RC = Roller Cone/PUSH = Hydraulic Push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL = 1-D consolidation test
UU/CIU/etc = laboratory (shear) strength test
LL=Liquid Limit/PL=Plastic Limit/PI=Plasticity Index
q_p = unconfined compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
0	PC	11/11	0.0 - 0.9	5" dia. core	--		CORE			Pavement Core: 11 inches total thickness; one piece with no distinct weathered zones (layers), over approx. 1 inch unbound material.	
								67.0		1.0	
	1D	24/18	1.0 - 3.0	27-23-19-15	42	59	OPEN	66.7		Dark brown black, SILTY AGGREGATE 1.3	
								66.3		Changing at 1.3 ft to: Brown, fine to coarse SAND, some gravel, little silt. GRANULAR FILL 1.7	#15806-01 WASH SIEVE A-2-4(0)/ SM -#200=14.5% WC=13.1%
										Changing at 1.7 ft to 1D: Brown, moist (tight), fine to medium SAND, little silt, trace gravel, trace coarse sand. SAND FILL	
3	2D	24/15	3.0 - 5.0	7-6-9-12	15	21				Brown grey, wet, fine to medium SAND, little to some silt, trace gravel, trace coarse sand. SAND FILL	
								63.9		4.1	
										Changing at 4.1 ft to 2D: Olive brown grey, moist (tight), slightly mottled, Clayey SILT, trace fine sand; appears reworked. SILT-CLAY BORROW	
								63.0		5.0	
										Bottom of Exploration at 5.0 feet below ground surface. No refusal.	
6											
9											
12											
15											

Remarks:

SB side of bridge in SB Lane 2 (right / travel lane)
offset 1.3 ft RT of SB white line;
approx. 2 ft off of SB bridge fascia

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

Boring No.: HB-PCORE-201

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Widening-Running Hill Road Pavement Cores

LOCATION: South Portland, ME

Boring No.: HB-PCORE-202

Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	68 ft.	**Auger ID/OD:**	n/a
Operator:	Enos/ Share	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (rubber track ATV)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	9/26/19; 2100-2130	**Drilling Method:**	cased wash boring	**Core Barrel:**	n/a
Boring Location:	Station 2250+90; see remarks	**Casing ID/OD:**	5" dia pavement core	**Water Level*:**	2.7 ft (open)
Hammer Efficiency Factor: 0.842		**Hammer Type:**	Automatic ☒ Hydraulic ☐	Rope & Cathead ☐	

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt

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Hammer Efficiency Factor=Rig-Specific Annual Calibration Value
N-uncorrected = Raw Field SPT N-value
N_{60} = Raw SPT N Value Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
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SSA/HSA = Solid/ Hollow Stem Auger
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q_p = unconfined compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
0	PC 1D	11/11 24/16	0.0 - 0.9 0.9 - 2.9	5" dia. core 22-25-26-24	0 51	0 72	CORE OPEN			Pavement Core: 11 inches total thickness; four approx. 3-inch thick pieces (layers); somewhat weathered.	
								67.1		0.9 1D: Dark brown, SILTY AGGREGATE	
								66.1		1.9 Changing at 1.9 ft to 1D-A: Brown, moist (tight), fine to coarse SAND, little silt, trace to little gravel. GRANULAR FILL	#15806-02 WASH SIEVE A-2-4(0)/ SM -#200=13.2% WC=9.8%
	2D	24/12	2.9 - 4.9	18-15-10-11	25	35					
3								65.1		2.9 2D: Brown, wet, fine to medium SAND, little silt, trace gravel, trace coarse sand. SAND FILL	#15806-03 #200 SIEVE -#200=12.7% WC=16.0%
								63.4 63.1		4.6 Changing at 4.6 ft: Olive brown grey, moist (tight), slightly mottled, Clayey SILT, trace fine sand; appears reworked. SILT-CLAY BORROW 4.9	
										Bottom of Exploration at 4.9 feet below ground surface. No refusal.	
6											
9											
12											
15											

Remarks:

NB side of bridge in SB Lane 2 (right / travel lane)
offset 1.8 ft RT of SB white line;
approx. 2 ft off of NB bridge fascia

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

R. W. Gillespie & Associates, Inc.
20 Pomerleau St., Suite 100, Biddeford, ME 04005 207-286-8008
177 Shattuck Way, Suite 1 West, Newington NH 03801 603-427-0244
44 Wood Avenue, Suite I, Mansfield, MA 508-623-0101

LETTER OF TRANSMITTAL

Date:	Project No.:
November 15, 2019	1368-018
Attention: Isabel V. (Be) Schonewald, P.E. (Be@schonewaldengineering.com)	
Re: Laboratory Testing MeTPK PAW Running Hill Rd PCORE (#19-117) South Portland, Maine	

Schonewald Engineering Associates, Inc.

129 Middle Road

Cumberland, ME 04021

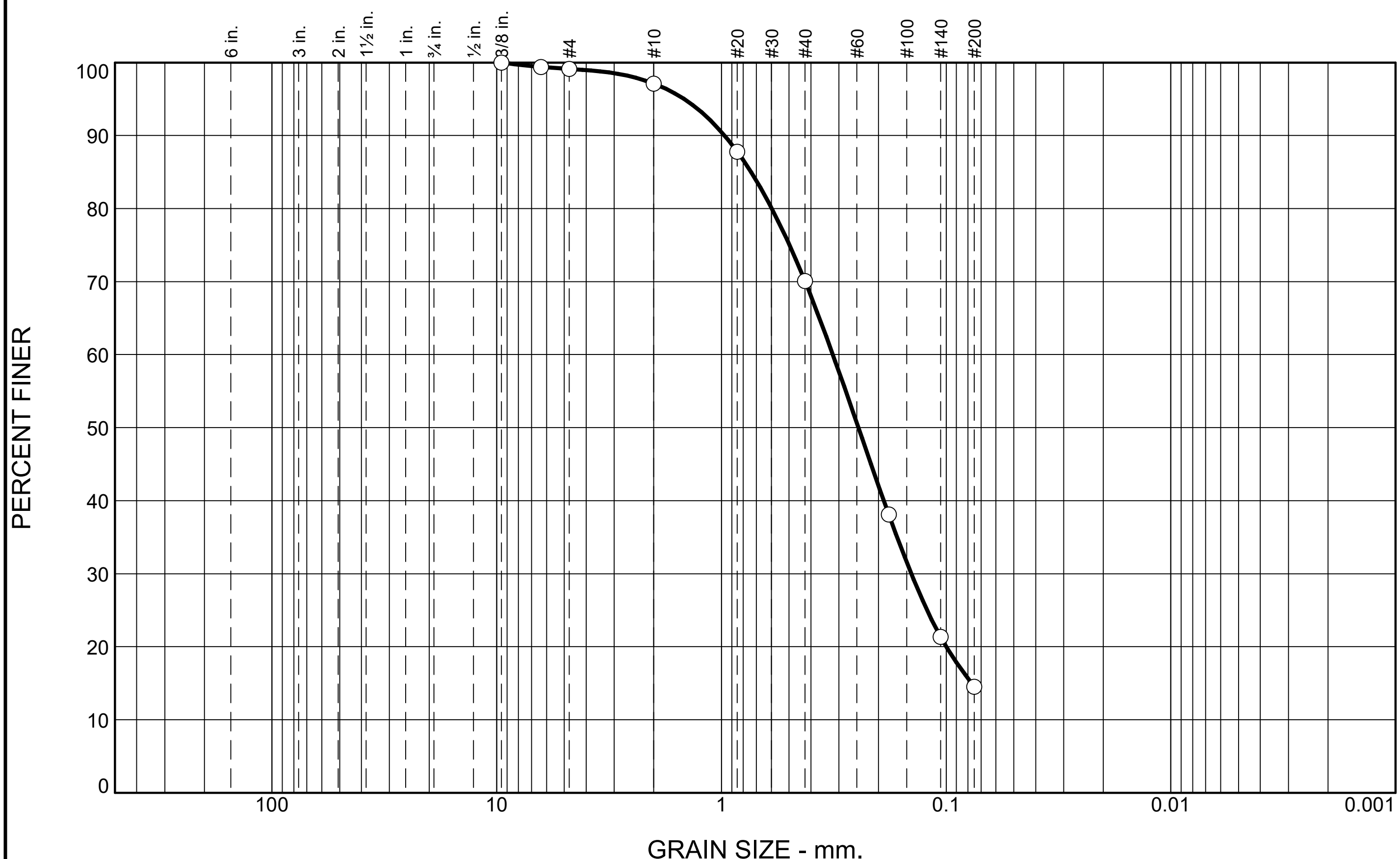
We are sending you attached Laboratory Test Results.

Laboratory No. (s)	Test (s) Performed
15806-01: HB-PCORE-201, 1D, 1.7'-3', S.Portland, ME	Washed Gradation
15806-02: HB-PCORE-202, 1D-A, 1.9'-2.9', S.Portland, ME	Washed Gradation
15806-03: HB-PCORE-202, 2D, 2.9'-4.6', S.Portland, ME	Washed Over #200 Sieve

Remarks:

Copy to:

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	2.0	27.0	55.6	14.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	99.4		
#4	99.1		
#10	97.1		
#20	87.8		
#40	70.1		
#80	38.1		
#140	21.3		
#200	14.5		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9686 D_{85}= 0.7383 D_{60}= 0.3195
D_{50}= 0.2459 D_{30}= 0.1430 D_{15}= 0.0771
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 13.1%

Location: HB-PCORE-201
Sample Number: 1D **Depth:** 1.7'-3' **Date:** 11/14/2019

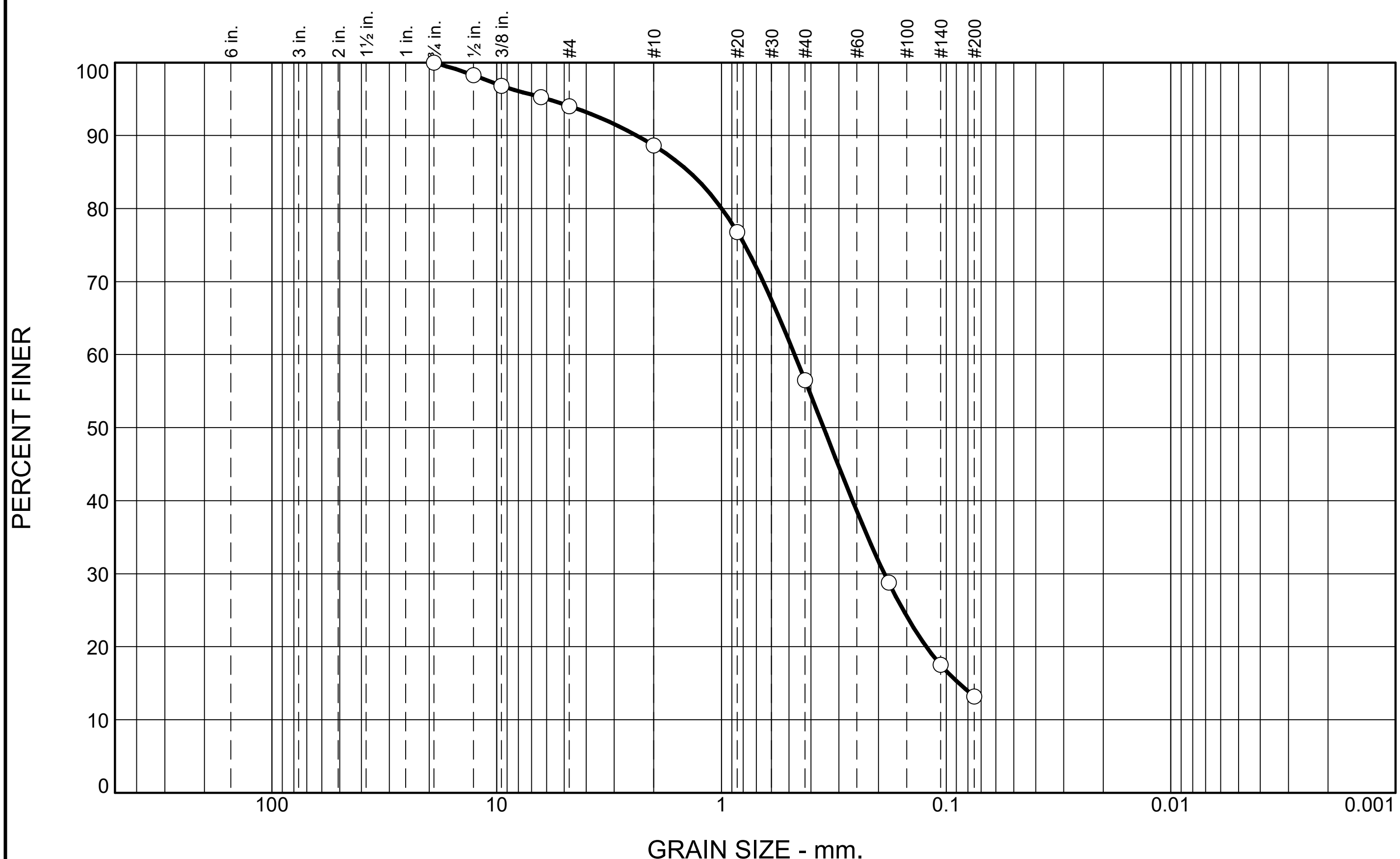
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAW Running Hill Rd PCORE (#19-117)
South Portland, ME
Project No: 1368-018 **Lab No.** 15806-01

Tested By: AGS **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.0	5.4	32.1	43.3	13.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.3		
3/8"	96.8		
1/4"	95.2		
#4	94.0		
#10	88.6		
#20	76.8		
#40	56.5		
#80	28.8		
#140	17.5		
#200	13.2		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 2.3803 D_{85}= 1.3882 D_{60}= 0.4723
D_{50}= 0.3513 D_{30}= 0.1882 D_{15}= 0.0878
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 9.8%

Location: HB-PCORE-202
Sample Number: 1D-A/1.9'-2.9'
Date: 11/14/2019

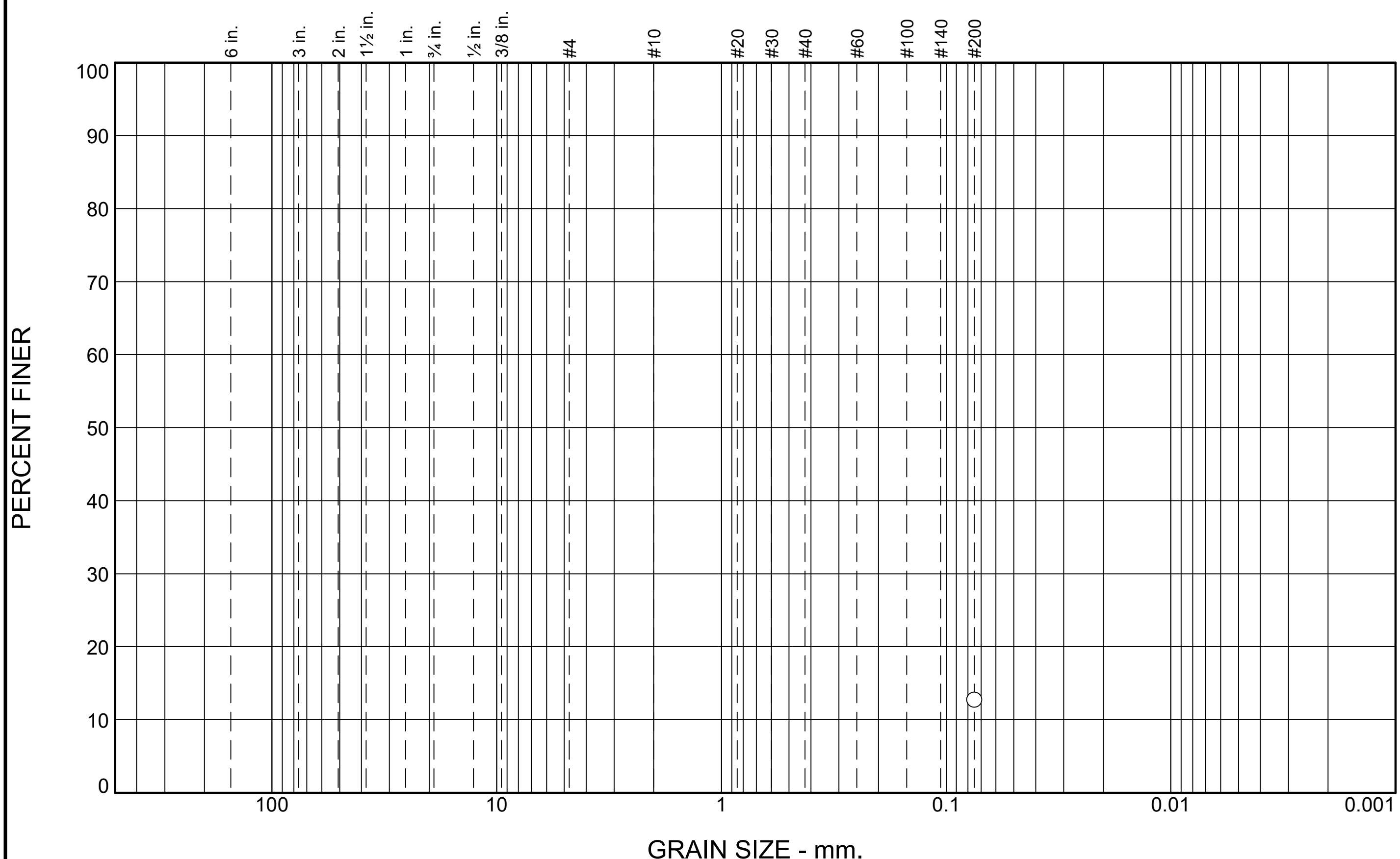
R.W. Gillespie & Associates, Inc. Biddeford, Maine

Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAW Running Hill Rd PCORE (#19-117)
South Portland, ME
Project No: 1368-018 **Lab No.** 15806-02

Tested By: AGS **Checked By:** MTG

MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						12.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	12.7		

* (no specification provided)

Soil Description

Sand Fill - washed over #200 sieve only

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content: 16.0%

Location: HB-PCORE-202
Sample Number: 2D **Depth:** 2.9'-4.6' **Date:** 11/14/2019

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

Client: Schonewald Engineering Associates, Inc.
Project: MeTPK PAW Running Hill Rd PCORE (#19-117)
South Portland, ME
Project No: 1368-018 **Lab No.** 15806-03

Tested By: AGS **Checked By:** MTG

MTG

APPENDIX A

Data Reports

Boring HB-PAMI-401
Borings HB-VMS-201 and HB-VMS-202

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Widening - Utility Crossing

LOCATION: South Portland, ME

Boring No.: HB-PAMI-401

Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	50 (est'd)	**Auger ID/OD:**	--/4.5 inches (SSA)
Operator:	Schaefer/ Titus	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 ATV (NEBC #D-19)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	10/30/19; 1035-1310	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	2275+44, 93 ft LT (est'd)	**Casing ID/OD:**	4.0/4.5 inches	**Water Level*:**	1.3 ft (open, 30 min stab)
Hammer Efficiency Factor: 0.707		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
Hammer Efficiency Factor=Rig-Specific Annual Calibration Value
N-uncorrected = Raw Field SPT N-value
N_{60} = Raw SPT N Value Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOR/C = Weight of Rods/ Casing
WOH = Weight of Hammer
-- = Not Recorded/Applicable

BOREHOLE ADVANCEMENT METHOD:
SSA/HSA = Solid/ Hollow Stem Auger
RC = Roller Cone/PUSH = Hydraulic Push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL = 1-D consolidation test
UU/CIU/etc = laboratory (shear) strength test
LL=Liquid Limit/PL=Plastic Limit/PI=Plasticity Index
q_p = unconfined compressive strength of rock

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
0							SSA				
	1D	24/16	1.0 - 3.0	22-30-24-25	54	64				Dark olive grey brown, wet, Silty GRAVEL, some fine to coarse sand; appears reworked. FILL 3 to 4 ft: Very boney; difficult to advance boring; break through at 4 ft.	
								46.0		4.0	
5	2D	24/18	4.0 - 6.0	2-2-4-5	6	7				Dark olive grey, wet, ORGANIC SILT, some clay, some fine to medium sand, with three 1/2-inch layers wood and organic matter. ORIGINAL GROUND SURFACE	
								43.5		6.5	
	3D	24/17	6.0 - 8.0	1-6-8-10	14	16	--			Dark grey brown with rust mottling (fine sand lenses), moist (tight), Organic Silty fine SAND, little to some clay, trace medium to coarse sand. MARINE SEDIMENT	
							--				
							62				
								41.0		9.0	
10							--				
	4D	24/12	10.0 - 12.0	15-5-4-6	9	11	OPEN			Olive grey, slightly mottled, moist (tight), Clayey SILT, trace fine sand. MARINE SILT-CLAY CRUST	
								37.5		12.5	
	5D	24/21	13.0 - 15.0	1-1-5-15	6	7				5D: Grey, Silty CLAY. Changing at 14.3 ft to:	
								35.7		14.3	
15										5D-A: Grey, fine to medium Sandy SILT, little clay, trace gravel, trace coarse sand; appears to be transition to TILL	
	6D	4/3	15.0 - 15.3	50/4"	--		RC	34.2		Grey, GRAVEL, some silt, trace to little fine to coarse sand. TILL 15.8	
										Bottom of Exploration at 15.8 feet below ground surface. Roller cone refusal.	
20											
25											

Remarks:

NEBC Rig #D-19 automatic hammer calibrated on 7/8/19.

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

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: MeTPK Portland Area Mainline Improvements-Variable Message Signs

LOCATION: Scarborough to Portland, ME

Boring No.: HB-VMS-201

Proj. No.: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	TBD	**Auger ID/OD:**	SSA to 5'
Operator:	Schaefer/Titus	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (track mounted)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	10/15/19; 1410-10/16/19; 1210	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	see remarks	**Casing ID/OD:**	HW (4") to 30'	**Water Level*:**	2.2 ft (open, no stabilization)
Hammer Efficiency Factor: 0.707		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
Hammer Efficiency Factor=Rig-Specific Annual Calibration Value
N-uncorrected = Raw Field SPT N-value
N_{60} = Raw SPT N Value Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOR/C = Weight of Rods/ Casing
WOH = Weight of Hammer
-- = Not Recorded/Applicable

BOREHOLE ADVANCEMENT METHOD:
SSA/HSA = Solid/ Hollow Stem Auger
RC = Roller Cone/PUSH = Hydraulic Push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL = 1-D consolidation test
UU/CIU/etc = laboratory (shear) strength test
LL=Liquid Limit/PL=Plastic Limit/PI=Plasticity Index
q_p = unconfined compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
0							SSA				
										2.0	
	1D	24/16	3.0 - 5.0	WOH-1-3-2	4	5				Dark grey, moist (tight), soft, interbedded, Clayey SILT, trace fine sand and Silty fine SAND. INTERBEDDED MARINE SILT AND SANDS	
5	2D	24/13	5.0 - 7.0	WOH/12"-1-2	1	1	PUSH			Dark grey, moist (tight), very loose, interbedded Silty fine SAND; fine SAND, little silt; and Clayey SILT, trace fine sand. INTERBEDDED MARINE SILT AND SANDS	
										8.5	
10	3D	24/24	10.0 - 12.0	WOH/24"	--					Olive grey, Silty CLAY with numerous seams fine Sandy SILT. MARINE SILT-CLAY	
15	4D	24/24	15.0 - 17.0	push thru vane						Olive grey, medium stiff, Silty CLAY with three seams fine Sandy SILT. MARINE SILT-CLAY	
	V1		15.6 - 16.0	Su= 522/ 14 psf						V1: 19 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V2		16.6 - 17.0	Su= 536/ 27 psf						V2: 19.5 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings)	
20	5D	24/17	20.0 - 22.0	push thru vane						Olive grey, soft to medium stiff, Silty CLAY, trace very fine sand with numerous partings and seams fine Sandy SILT. MARINE SILT-CLAY	
	V3		20.6 - 21.0	Su= 426/ 14 psf						V3: 15.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings); seams and partings noted during push.	
	V4		21.6 - 22.0	Su= 508/ 14 psf						V4: 18.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings); seams and partings noted during push.	
25											

Remarks:

NEBC Rig No. D-19 auto hammer calibration on 7/8/2019
Location: SB side I-95; approx. 1,000 ft N'ly of Holmes Rd and 50 ft offset project left from guardrail face

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

Boring No.: HB-VMS-201

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MeTPK Portland Area Mainline Improvements-Variable Message Signs
Location: Scarborough to Portland, ME

Boring No.: HB-VMS-201
WIN: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	TBD	**Auger ID/OD:**	SSA to 5'
Operator:	Schaefer/Titus	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (track mounted)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	10/15/19; 1410-10/16/19; 1210	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	see remarks	**Casing ID/OD:**	HW (4") to 30'	**Water Level*:**	2.2 ft (open, no
Hammer Efficiency Factor: 0.707		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140 lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
25	6D	24/24	25.0 - 27.0	push thru vane						Olive grey, medium stiff, Silty CLAY, trace very fine sand with one 4-inch seam fine Sandy SILT at 26 ft. MARINE SILT-CLAY V5: 22.5 / 1 ft-lbs (65 mm x 130 mm vane raw torque readings); seams and partings noted during push. MV: Unable to push vane deeper than 26.0 ft; possible sand seam.	
	V5		25.6 - 26.0	Su= 618/ 27 psf							
	MV										
30	7D	24/24	30.0 - 32.0	push thru vane			OPEN			Dark olive grey black, medium stiff, Silty CLAY, trace very fine sand with numerous partings and seams fine Sandy SILT. MARINE SILT-CLAY V6: 19 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings); seams and partings noted during push. V7: 22.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings); seams and partings noted during push.	
	V6		30.6 - 31.0	Su= 522/ 0 psf							
	V7		31.6 - 32.0	Su= 618/ 0 psf							
35	8D	24/24	35.0 - 37.0	push thru vane						Dark olive grey black, soft, Silty CLAY, trace very fine sand with few partings fine Sandy SILT and occasional nodules. MARINE SILT-CLAY V8: 14 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) V9: 17 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V8		35.6 - 36.0	Su= 385/ 0 psf							
	V9		36.6 - 37.0	Su= 467/ 0 psf							
40	9D	24/24	40.0 - 42.0	push thru vane						Dark olive grey black, soft to medium stiff, Silty CLAY, trace very fine sand with few partings fine Sandy SILT and occasional nodules. MARINE SILT-CLAY V10: 14.5 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings) V11: 19 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V10		40.6 - 41.0	Su= 398/ 14 psf							
	V11		41.6 - 42.0	Su= 522/ 0 psf							
45	10D	24/24	45.0 - 47.0	push thru vane						Dark olive grey black, soft, Silty CLAY, trace very fine sand with nodules throughout. MARINE SILT-CLAY V12: 16.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) V13: 17.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V12		45.6 - 46.0	Su= 453/ 0 psf							
	V13		46.6 - 47.0	Su= 481/ 0 psf							
50											

Remarks:

NEBC Rig No. D-19 auto hammer calibration on 7/8/2019
Location: SB side I-95; approx. 1,000 ft N'ly of Holmes Rd and 50 ft offset project left from guardrail face

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MeTPK Portland Area Mainline Improvements-Variable Message Signs
Location: Scarborough to Portland, ME

Boring No.: HB-VMS-201
WIN: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	TBD	**Auger ID/OD:**	SSA to 5'
Operator:	Schaefer/Titus	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (track mounted)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	10/15/19; 1410-10/16/19; 1210	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	see remarks	**Casing ID/OD:**	HW (4") to 30'	**Water Level*:**	2.2 ft (open, no
Hammer Efficiency Factor: 0.707		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
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SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140 lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
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N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
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G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
50	11D	24/12	50.0 - 52.0	push thru vane						Dark olive grey black, medium stiff, Silty CLAY, trace very fine sand with nodules throughout. MARINE SILT-CLAY	
	V14		50.6 - 51.0	Su= 522/ 14 psf						V14: 19 / 0.5 ft-lbs (65 mm x 130 mm vane raw torque readings)	
	V15		51.6 - 52.0	Su= 536/ 0 psf						V15: 19.5 / 0 ft-lbs (65 mm x 130 mm vane raw torque readings) 52 ft: Hydraulically push rod probe.	
55											
60											
65											
70											
75											

Remarks:

NEBC Rig No. D-19 auto hammer calibration on 7/8/2019
Location: SB side I-95; approx. 1,000 ft N'ly of Holmes Rd and 50 ft offset project left from guardrail face

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: MeTPK Portland Area Mainline Improvements-Variable Message Signs
Location: Scarborough to Portland, ME

Boring No.: HB-VMS-201
WIN: 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	TBD	**Auger ID/OD:**	SSA to 5'
Operator:	Schaefer/Titus	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (track mounted)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	10/15/19; 1410-10/16/19; 1210	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	see remarks	**Casing ID/OD:**	HW (4") to 30'	**Water Level*:**	2.2 ft (open, no
Hammer Efficiency Factor:	0.707	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
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T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
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PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
75											
80											
85											
90										93.0	
										Bottom of Exploration at 93.0 feet below ground surface. Rod probe not fetch up; out of rods; bottom of boring, no refusal.	
95											
100											

Remarks:

NEBC Rig No. D-19 auto hammer calibration on 7/8/2019
Location: SB side I-95; approx. 1,000 ft N'ly of Holmes Rd and 50 ft offset project left from guardrail face

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** MeTPK Portland Area Mainline Improvements-Variable Message Signs	**Boring No.:** HB-VMS-202
	LOCATION: Scarborough to Portland, ME	**Proj. No.:** 19-117

Driller:	New England Boring Contractors	**Elevation (ft.)**	86.5 (approx.)	**Auger ID/OD:**	SSA to 10'
Operator:	Schaefer/Titus	**Datum:**	NAVD88	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53 (track mounted)	**Hammer Wt./Fall:**	140 lbs/30 inches
Date Start/Finish:	10/15/19; 0940-1305	**Drilling Method:**	cased wash boring	**Core Barrel:**	N/A
Boring Location:	Station 2392+00, 97 ft left (approx.)	**Casing ID/OD:**	HW (4") to 20'	**Water Level*:**	9.0 ft (open, no stabilization)
Hammer Efficiency Factor: 0.707		**Hammer Type:**	Automatic ☒	Hydraulic ☐	Rope & Cathead ☐

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt

R = Rock Core Sample
Hammer Efficiency Factor=Rig-Specific Annual Calibration Value
N-uncorrected = Raw Field SPT N-value
N_{60} = Raw SPT N Value Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOR/C = Weight of Rods/ Casing
WOH = Weight of Hammer
-- = Not Recorded/Applicable

BOREHOLE ADVANCEMENT METHOD:
SSA/HSA = Solid/ Hollow Stem Auger
RC = Roller Cone/PUSH = Hydraulic Push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL = 1-D consolidation test
UU/CIU/etc = laboratory (shear) strength test
LL=Liquid Limit/PL=Plastic Limit/PI=Plasticity Index
q_p = unconfined compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results
0							SSA				
	1D	24/16	3.0 - 5.0	9-11-13-9	24	28				Grey tan, damp to moist, medium dense, Gravelly fine to coarse SAND, little to some silt; possibly reworked. FILL	
5	2D	24/18	5.0 - 7.0	7-9-10-13	19	22		80.9		FILL changing at 5.6 ft to: 5.6	
										2D: Grey tan, moist, medium dense, fine to medium SAND, some gravel, trace to little silt, trace coarse sand. TILL	
	3D	24/18	8.0 - 10.0	12-12-16-17	28	33				Grey tan, moist (tight), medium dense, Gravelly fine to medium SAND, trace to little silt, trace coarse sand. TILL	
10	4D	24/14	10.0 - 12.0	17-24-23-23	47	55	29			Grey tan with rust layers, moist (tight), dense, Gravelly fine to medium SAND, trace to little silt, trace coarse sand; with dark grey brown pockets that appear to be decomposed pieces of gravel. TILL	
							38				
							72				
							83				
							94				
15	5D	24/17	15.0 - 17.0	26-42-53-63	95	112	RC			Grey tan, moist (tight), very dense, fine to medium SAND, some gravel, little silt, trace coarse sand. TILL	
20	6D	2/2	20.0 - 20.2	50/2"	--			66.3		no recovery (wash) 20.2	
										Bottom of Exploration at 20.2 feet below ground surface. Split-spoon refusal.	
25											

Remarks:

NEBC Rig No. D-19 auto hammer calibration on 7/8/2019

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

Boring No.: HB-VMS-202

APPENDIX B

Hager-Richter Geoscience Geophysical Report

HAGER-RICHTER
GEOSCIENCE, INC.

GEOPHYSICAL SURVEY
PORTLAND AREA MAINLINE IMPROVEMENTS
MAINE TURNPIKE
PORTLAND, MAINE

Prepared for:

HNTB Corporation
9 Entin Road - Suite 202
Parsippany, New Jersey 07054

Prepared by:

Hager-Richter Geoscience, Inc.
8 Industrial Way - D10
Salem, New Hampshire 03079

File 18J95
December, 2018

HAGER-RICHTER
GEOSCIENCE,INC.

GEOPHYSICISTS FOR THE ENGINEERING COMMUNITY
8 INDUSTRIAL WAY - D10
SALEM, NEW HAMPSHIRE 03079-5820
TELEPHONE (603) 893-9944
FAX (603) 893-8313

December 11, 2018
File 18J95

Matthew Riegel, P.E., D.GE
Associate Vice President
HNTB Corporation
9 Entin Road - Suite 202
Parsippany, New Jersey 07054

Tel (973) 434-3109
Cell (973) 632-7541
Fax (973) 434-3101

RE: Geophysical Survey
Portland Area Mainline Improvements
Maine Turnpike
Portland, Maine

Dear Mr. Riegel:

In this report we summarize the results of a geophysical survey conducted by Hager-Richter Geoscience, Inc. (Hager-Richter) along a portion of the Maine Turnpike (Interstate 95) in Portland, Maine for HNTB Corporation (HNTB) in October, 2018. The geophysical survey was performed in support of a geotechnical investigation for planned improvements to the Maine Turnpike.

INTRODUCTION

As part of the Portland Area Mainline Improvements (PAMI) Project for the Maine Turnpike in Portland, Maine, HNTB required information regarding the depth and configuration of the bedrock surface in three areas of the northbound and southbound sides of the proposed widening. The general locations of the project areas are shown in Figure 1. According to information provided by HNTB, the length of northbound and southbound roadway alignment requiring the geophysical survey totals approximately 7,050 feet. HNTB was interested in determining the depth and configuration of the bedrock surface where bedrock is less than about ten feet deep.

The three areas of interest for the survey are identified as the Northern Area, Central Area, and the Southern Area, and their locations are shown on Figure 1. The areas of interest extended from the breakdown lane to the limits of the right-of way. The areas included paved and gravel shoulders, ditches, and grassy and wooded areas.

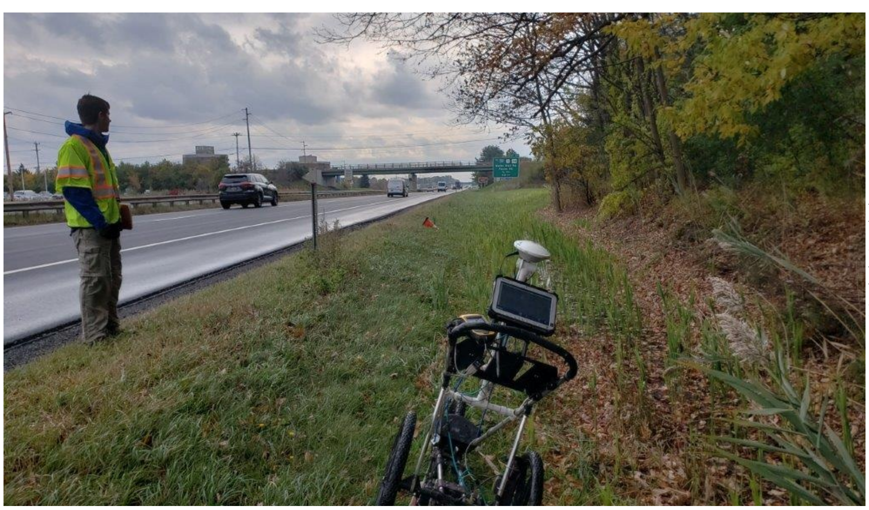
OBJECTIVES

The objective of the geophysical survey was to provide information, where possible, on the depth of bedrock, where the depth of bedrock is less than about ten feet, along the accessible portions of approximately 7,050 feet of proposed lane widening.

THE SURVEY

The geophysical survey was conducted using the ground penetrating radar (GPR) method. Steven Grant, P.G., and Will Orfei of Hager-Richter conducted the geophysical survey on October 23 - 26, 2018. The fieldwork was coordinated with Matthew Riegel, P.E., D.GE, of HNTB. Mr. Dale Mitchell, also of HNTB, was onsite at the beginning of the survey and walked the areas of interest with Hager-Richter personnel. Data analysis and interpretation were completed at the Hager-Richter offices. Original data and field notes will be retained in the Hager-Richter files for a minimum of three years.

GPR data were acquired along traverses oriented parallel to the travel lanes with a variable spacing. GPR traverses located in the highway shoulder areas were spaced a few feet apart and GPR traverses located in the outer portions of the right-of-way were spaced 10 to 20 feet apart, where access allowed. GPR traverses oriented perpendicular to the travel lanes and spaced 20 to 100 feet were also acquired. GPR data acquired in wooded or brushy areas were acquired along lines with multiple bend points due to access. Steep slopes and bedrock outcrops, water-filled ditches, bridge embankments, and wooded areas limited access to the areas of interest. Photograph 1 shows typical site conditions.



Photograph 1. View to the south along the Maine Turnpike, north of Running Hill Road. The GPR unit is shown in the foreground.

The locations of the GPR traverses were recorded with a Trimble DGPS system as the data were acquired. Use of the DGPS system allowed the GPR survey to be conducted in "walking mode" where access was available and provided horizontal control without the need for the time and expense of establishing a staked survey grid.

EQUIPMENT

The GPR survey was conducted using a Geophysical Survey Systems, Inc. SIR 4000 digital radar system using a 350 MHz hyper-stacking antenna with 180 ns[1] time window. The system includes a survey wheel that triggers the recording of data at fixed intervals, thereby increasing the accuracy of the locations of features detected along the survey lines.

GPR uses a high-frequency electromagnetic pulse (referred to herein as "radar signal") transmitted from a radar antenna to probe the subsurface. The transmitted radar signals are reflected from subsurface interfaces of materials with contrasting electrical properties. Travel times of the radar signal can be converted to approximate depth below the surface by correlation with targets of known depths and by a curve matching routine. We monitor the acquisition of GPR data in the field and record the GPR data digitally for subsequent processing. Interpretation of the records is based on the nature and intensity of the reflected signals and on the resulting patterns.

Data from the GPR survey were processed using RADAN 7.4 GPR processing software from Geophysical Survey Systems, Inc. We reviewed profile images and created plan view time slice maps of the GPR data.

LIMITATIONS OF THE METHOD

HAGER-RICHTER GEOSCIENCE, INC. MAKES NO GUARANTEE THAT THE DEPTH OF BEDROCK WAS ACCURATELY DETERMINED IN THIS SURVEY. HAGER-RICHTER GEOSCIENCE, INC. IS NOT RESPONSIBLE FOR DETERMINING THE DEPTH OF BEDROCK WHERE THE INTERFACE CANNOT BE DETECTED BECAUSE OF SITE CONDITIONS. THE BEDROCK DEPTHS DETERMINED SHOULD NOT BE USED FOR CONTRACT BEDROCK REMOVAL QUANTITIES.

[1] ns, abbreviation for nanosecond, 1/1,000,000,000 second. Light and the GPR signal require about 1 ns to travel 1 ft in air. The GPR signal requires about 3.5 ns to travel 1 ft in unsaturated sandy soil.

There are limitations of the GPR technique: (1) surface conditions, (2) electrical conductivity and thickness of the subsurface layers, (3) electrical properties of the target(s), and (4) spacing of the traverses. Of these restrictions, only the last is controllable by us in most cases.

The condition of the survey surface can affect the quality of the GPR data and the depth of penetration of the GPR signal. For exterior sites, a surface covered with obstacles such as automobiles, dumpsters, thick leaf debris, materials piles, etc. limit the survey access. Similarly, for interior sites, a surface covered with obstacles such as desks, benches, laboratory equipment, etc. also limit access. Some floor coverings may limit the coupling of the GPR antenna with the subsurface.

The electrical conductivity of the subsurface determines the attenuation of the GPR signals, and thereby limits the maximum depth of exploration. The GPR signal does not penetrate clay-rich soils or soils contaminated with road salt. In some cases, the GPR signal may not penetrate below concrete pavement, and some asphalts are electrically conducting.

A strong contrast in the electrical conductivities of the ground and the target (for examples, UST, pipe, void, dry well, drum, contaminant plume) is required to obtain a reflection of the GPR signal. If the contrast is too small, then the reflection may be too weak to recognize, and the target can be missed.

Spacing of the traverses is limited by access at many sites, but where flexibility of traverse spacing is possible, the spacing is adjusted on the basis of the size of the target.

RESULTS

The geophysical survey to detect bedrock as part of the Portland Area Mainline Improvements Project along portions of the Maine Turnpike consisted of a ground penetrating radar (GPR) survey across three specified areas of interest, identified as the Northern, Central, and Southern Areas. The interpretation of the GPR data are shown in Figures 2 through 4.

Apparent GPR signal penetration was generally fair to good across much of the area of interest, with two-way traveltime reflections received for 50 to 70 ns of the 180 ns records recorded. Based on site-specific time-to-depth conversions for the GPR signal in most areas, the GPR signal penetration is estimated to have been approximately 7 to 10 feet. GPR signal penetration was limited in breakdown lanes and some shoulder areas to about 40 to 60 ns, or about 5 to 8 feet.

GPR reflections consistent with those expected for the bedrock surface are evident in the records for some areas. Bedrock was detected at depths ranging from 0 feet (i.e outcrop at surface) to as deep as 10 feet (i.e. the limit of GPR penetration). In areas where GPR reflections could be reliably picked as the top of bedrock, color contour plots of bedrock depth have been generated.

In other surveyed areas, reflections consistent with the top of bedrock were not received within the zone of GPR signal penetration, and we infer that bedrock is likely deeper than about 7 to 8 feet, a conservative estimate of the depth of GPR penetration. Areas where bedrock is likely deeper than about 7 to 8 feet are shown as blue stippled areas in Figures 2 through 4.

In some surveyed areas, it was not possible to determine whether GPR reflections from bedrock were received within the zone of GPR signal penetration. Such areas are shown as red stippled areas on Figures 2 through 4. In such areas, GPR reflections were present but could be caused by features other than bedrock. Many of the areas along breakdown lanes, shoulders, and ditches fall into this category, in part due to reduced depth of GPR signal penetration and possible interference from roadbed materials.

HNTB indicated that the geophysical data contained within this report might guide future boring and test pit programs (i.e. ground truth). It would be beneficial to confirm bedrock depths in areas where bedrock depth was interpreted using the GPR, and to confirm findings where bedrock was interpreted to be deeper than the depth of bedrock penetration. The most useful areas to obtain ground truth, however, might be in locations where bedrock depths could not be determined based on the GPR data. Good examples of such locations include areas along road shoulders or in a broad area located north of Running Hill Road and west of the southbound Maine Turnpike.

The GPR method works best where the method is used to provide continuity of depths between borings. Ground truth is necessary to increase the accuracy of the estimates of depth from GPR data due to variation in the velocity of the radar wave in soils caused by changes in water content or composition. For projects such as the subject project, where data are acquired over large distances, the GPR signal propagation velocities are likely to change along the length of the alignment.

The bedrock models shown as contour plots should not be used for contract bedrock removal quantities.

CONCLUSIONS

Based on the results of the geophysical survey conducted by Hager-Richter Geoscience, Inc. along specified portions of the Maine Turnpike in the vicinity of Portland, Maine in October, 2018, we conclude that:

- Results from the GPR survey can be grouped into three categories; areas where bedrock depths could be determined, areas where bedrock was likely to be deeper than about 7-8 feet, and areas where bedrock depth could not be determined.

- Where bedrock depths could be determined, the data is presented as contour plots of bedrock depth, ranging from 0 to 10 feet depth.

- Borings and test pits could help confirm findings, in particular in areas where bedrock depths could not be determined on the basis of the GPR data.

LIMITATIONS

This letter report was prepared for the exclusive use of HNTB and the Maine Turnpike Authority (Collectively, Client). No other party shall be entitled to rely on this Report or any information, documents, records, data, interpretations, advice or opinions given to Client by Hager-Richter Geoscience, Inc. (H-R) in the performance of its work. The Report relates solely to the specific project for which H-R has been retained and shall not be used or relied upon by Client or any third party for any variation or extension of this project, any other project or any other purpose without the express written permission of H-R. Any unpermitted use by Client or any third party shall be at Client's or such third party's own risk and without any liability to H-R.

H-R has used reasonable care, skill, competence and judgment in the performance of' its services for this project consistent with professional standards for those providing similar services at the same time, in the same locale, and under like circumstances. Unless otherwise stated, the work performed by H-R should be understood to be exploratory and interpretational in character and any results, findings or recommendations contained in this Report or resulting from the work proposed may include decisions which are judgmental in nature and not necessarily based solely on pure science or engineering. It should be noted that our conclusions might be modified if subsurface conditions were better delineated with additional subsurface exploration including, but not limited to, test pits, soil borings with collection of soil and water samples, and laboratory testing.

Except as expressly provided in this limitations section, H-R makes no other representation or warranty of any kind whatsoever, oral or written, expressed or implied; and all implied warranties of merchantability and fitness for a particular purpose, are hereby disclaimed.

If you have any questions or comments on this letter report, please contact us at your convenience. It has been a pleasure to work with you on this project. We look forward to working with you again in the future.

Sincerely yours,

HAGER-RICHTER GEOSCIENCE, INC.

Steven Grant, P.G.
Senior Geophysicist

Jeffrey Reid, P.G.
Owner and Principal Geophysicist

Attachments: Figure 1 - General Site Location
Figure 2 - Northern Area
Figure 3 - Central Area
Figure 4 - Southern Area

APPROXIMATE SCALE (mile)
0 1 2

NOTE:

Modified from Google Earth Pro aerial photograph.

Figure 1 General Site Location Portland Area Mainline Improvements Maine Turnpike Portland, Maine
File 18J95 / December, 2019
HAGER—RICHTER Salem, NH | Fords, NJ

LEGEND

DEPTH OF BEDROCK COULD NOT BE DETERMINED ON THE BASIS OF GPR DATA

SCALE (feet)
0 150 300

N

H-R

NOTE:
Modified from Google Earth Pro aerial photograph.

Figure 2
Geophysical Survey – Northern Area
Portland Area Mainline Improvements
Maine Turnpike
Portland Maine

File 18J95	December, 2019

HAGER–RICHTER
SALEM, NH | FORDS, NJ

N
H-R

LEGEND

DEPTH OF BEDROCK COULD NOT BE DETERMINED ON THE BASIS OF GPR DATA

BEDROCK DEPTH LIKELY DEEPER THAN ~ 7'–8'

SCALE (feet)
0 150 300

NOTE:
Modified from Google Earth Pro aerial photograph.

Figure 3
Geophysical Survey – Central Area
Portland Area Mainline Improvements
Maine Turnpike
Portland, Maine

File 18J95	December, 2019

HAGER–RICHTER
Salem, NH | Fords, NJ

10
9
8
7
6
5
4
3
2
1
0
Bedrock Depth (feet)

LEGEND

DEPTH OF BEDROCK COULD NOT BE DETERMINED ON THE BASIS OF GPR DATA

BEDROCK DEPTH LIKELY DEEPER THAN ~ 7'-8'

SCALE (feet)
0 150 300

N

H-R

NOTE:

Modified from Google Earth Pro aerial photograph.

Figure 4
Geophysical Survey – Southern Area
Portland Area Mainline Improvements
Maine Turnpike
Portland Maine

File 18J95	December, 2019

HAGER–RICHTER
SALEM, NH | FORDS, NJ

APPENDIX C

Pavement Distress Preliminary Investigation Report by Schonewald Associates Inc

SCHONEWALD ENGINEERING ASSOCIATES, INC.
■ www.SchonewaldEngineering.com ■

129 MIDDLE ROAD, CUMBERLAND, MAINE 04021
phone 207/829-5226
cell 207/272-9879

VIA EMAIL

*****DRAFT*****

TO: Dale Mitchell, P.E., HNTB Corporation (HNTB)
Ray Hanf, P.E., HNTB

FROM: Be Schonewald, P.E., Schonewald Engineering Associates, Inc. (SchonewaldEA)

DATE: November 21, 2017

PROJ. NO.: 17-034

RE: Summary of Geotechnical Findings and Recommendations
Pavement Distress Evaluation
Maine Turnpike, Southbound, Crosby Maintenance Yard to Running Hill Road
South Portland, Maine

The purpose of this memorandum is to present the findings of the limited geotechnical program completed to evaluate the possible cause of and provide recommendations for mitigating the observed pavement distress in the SB barrel of the Maine Turnpike mainline between approximately MTA's Crosby Maintenance Yard and Running Hill Road in South Portland, Maine.

SchonewaldEA's work was completed in accordance with Task Order Number 908.01 dated September 13, 2017 to our Master / Task Order Agreement (HNTB Project Number 63272) that is dated February 23, 2016. This memorandum is subject to the limitations contained in the Closure section of the memorandum. A quality assurance review of the technical aspects of SchonewaldEA's work is being completed by Stephen J. Rabasca, P.E. of SoilMetrics, LLC located in Cape Elizabeth, Maine.

PROJECT UNDERSTANDING

SchonewaldEA has observed that the southbound barrel of the Maine Turnpike has experienced excessive distress along a rather isolated section from just northbound of the entrance road to the MTA's Crosby Maintenance Yard to a few hundred feet south of the Running Hill Road underpass (study area). The distress is manifested by severe cracking, as well as rutting. The distress is most pronounced in the SB travel lane and is somewhat less severe in the SB passing lane. The NB pavement in this area does not appear to be any more broken down than is typical.

GEOLOGICAL SETTING

A broad area of land adjacent to the SB barrel in this section of the Turnpike slopes towards the Turnpike, while the surrounding land slopes away from the NB barrel of the Turnpike. The westerly and uphill side of the Turnpike in the "study area" is dominated by the Running Hill glacial till and rock knob. Long Creek, a significant perennial stream, crosses under the Turnpike mainline approximately 450 feet northbound of the entrance road to Crosby Yard. The Turnpike mainline tends to act as a barrier to overland flow of surface water in the study area.

According to the geological map entitled "Surficial Geology, Portland West Quadrangle, Maine," published by the Maine Geological Survey, Open File No. 08-16, scale 1:24,000, the surficial soils are mapped as marine silt-clay (Presumpscot Formation) over much of the upgradient watershed, except for the Running Hill glacial till / rock knob. Surficial soils southbound of Running Hill Road are mapped as sands and silts that were deposited in shallow marine waters and that typical overlie marine silt-clays. Attached Figure 1 was taken from the above-referenced surficial geology map and identifies the study area.

TEST BORING PROGRAM

SchonewaldEA retained New England Boring Contractors (NEBC) of Hermon, Maine to drill five test borings (HB-PAVE-101 through -105) and one test probe (HB-PAVE-103A) along the westerly side of the SB barrel of the Turnpike mainline in the study area. The borings were drilled using auger boring techniques to avoid the use of drilling water. The approximate locations of the explorations are shown on attached Figures 2 through 4. Details and sampling methods used, field data obtained, and soil and groundwater conditions encountered are provided on the boring logs attached as Appendix A. The drilling work was completed overnight on October 2nd - 3rd, 2017 and was observed and logged by SchonewaldEA.

Standard Penetration Tests (SPTs) were completed and split-spoon soil samples obtained continuously from near the ground surface to the bottom of each test boring, which was typically taken to encountering glacial till or refusal. The depth of the bottom of the borings ranged from 4.8 to 16.0 feet Below the Ground Surface (BGS). No sampling or testing was completed in the test probe; subsurface conditions were logged based on drilling behavior and observation of the auger cuttings. A shallow one-inch diameter PVC groundwater level observation well was installed in the HB-PAVE-102 borehole upon completion of the test boring. Observation well details are summarized on the HB-PAVE-102 boring log; a flush-mounted curb box was installed to complete the well installation. The boreholes were backfilled with drill cuttings supplemented by manufactured sand and gravel upon completion of the test boring; and pavement patched where applicable.

LABORATORY TESTING PROGRAM

A limited geotechnical laboratory testing program was completed. Select samples of the sand subbase and silt-clay subgrade materials that were encountered in the test borings were submitted to the R. W. Gillespie & Associates, Inc. geotechnical laboratory in Saco, Maine for gradation analyses, with and without hydrometer. The purpose of the laboratory program was to confirm the field classifications and relative fines contents of the sand subbase material and silt-clay subgrade material. The laboratory testing program is summarized in the following table.

Boring No.	Sample No.	Sample Depth	Sample Representative of: Test Performed:
HB-PAVE-102	2D	2 to 3.1 ft. BGS	sand subbase; sieve gradation test
HB-PAVE-102	2D-A	3.1 to 4 ft. BGS	silt-clay subgrade; sieve with hydrometer gradation test
HB-PAVE-104	2D	2 to 4 ft. BGS	sand subbase; sieve gradation test
HB-PAVE-104	3D	4 to 6 ft. BGS	silt-clay subgrade; sieve with hydrometer gradation test

Laboratory test results are attached as Appendix B and the results are summarized on the boring logs that are attached as Appendix A.

SUBSURFACE CONDITIONS

The generalized stratigraphy encountered in test borings HB-PAVE-101, -102, -104, and -105 consisted of a thin layer of gravelly granular fill (granular base material), underlain by clean sand with limited amounts of gravel (sand subbase), underlain by stiff grading to soft marine silt-clay (silt-clay subgrade), underlain by glacial till. Glacial till was encountered in all but HB-PAVE-104 at or above 13.6 feet BGS; HB-PAVE-104 was terminated without refusal to 14.0 feet BGS in very stiff silt-clay containing numerous sand seams. The bottom of the clean sand subbase material was observed to be saturated in most of the test borings.

Test boring and probe HB-PAVE-103(A) were advanced in an area where outcrop, presumably part of the Running Hill glacial till and rock knob, was observed in the westerly backslope. Granular fill and glacial till was encountered overlying weathered or broken rock in these explorations; shallow refusal (between 4.8 and 5.2 feet BGS) was believed to be on bedrock based on drilling behavior and geological setting; rock core was not obtained to confirm the nature of the refusal surface.

Descriptions of the soil samples obtained in the test borings are provided on the boring logs attached as Appendix A.

KEY FINDINGS AND CONCLUSIONS

The following summarizes the key findings from the test boring and laboratory testing programs:

- Relatively high-permeability clean subbase sand was encountered overlying relatively low-permeability silt-clay or bedrock subgrade;
- The bottom of the clean sand subbase material was observed to be saturated (wet) in many of the test borings despite a prolonged drought at the time the test borings were completed;
- A general lack of maintenance of the ditch and the strip between the edge of pavement and the ditch was noted, as evidenced by a windrow of winter sand along the edge of pavement that appeared to impede surface water runoff and saturated conditions (muck) and vegetation at the inlet to a significant cross-culvert located at approximately Station 2263+00; and
- The top of the low-permeability subgrade appears to be above the existing bottom of ditch at many of the test boring locations.

Based on these findings, SchonewaldEA concludes that the likely underlying cause for the pavement distress is related to the inability of water (infiltration water and, to a lesser extent, groundwater) that has collected in the clean sand subbase material to drain away from under the pavement. Attached Figure 5 illustrates this issue. The following section provides thoughts on actions that should be considered to mitigate the pavement distress issue.

GEOTECHNICAL-RELATED RECOMMENDATIONS

SchonewaldEA provides the following geotechnical recommendations for addressing the pavement distress observed in the study area.

RECOMMENDATIONS FOR SHORT TERM AND ON-GOING MAINTENANCE ACTIVITIES:

- Clean out and reshape ditch such that the ditch invert is below the observed top of silt-clay subgrade, estimated to range from 3 to 4 feet below shoulder grade;
- Check grades and regrade the ditch invert to promote flow to existing cross-culverts;
- Clean and rehabilitate as needed the inlets and outlets of cross-culverts to eliminate ponding to the extent practicable;
- To the extent practicable, clean out winter sand accumulation and other debris in the median to promote drainage to existing catchbasins;
- Complete thorough spring clean-up that includes removal of winter sand and sediment that has accumulated between the edge of pavement and outside edge of the ditch.

RECOMMENDATIONS FOR LONG-TERM (RECOGNIZING PROPOSED MAINLINE WIDENING)

- Redesign (size) ditch system to "modern" standards to accommodate storm flows from the substantially more developed upgradient area;
- Incorporate a robust underdrain system into the ditch system design to address (depress) seasonal rise in groundwater levels and to remove storm water runoff more efficiently;
- Evaluate the benefit of incorporating a sheet or edge drain into the design for the proposed widening. This may involve a step down at the subgrade level and addition of a sheet drain header and lateral system beneath the new lane and/or shoulder; and
- Reevaluate and upgrade surface water drainage system in the median to more efficiently remove surface water runoff from the mainline pavement (e.g., permeable pavement in median overlying permeable soil that extends to below the adjacent subgrade level with the incorporation of an underdrain and more closely spaced catchbasins).

An outstanding question is whether the existing silt-clay subgrade has been disturbed and "weakened" by traffic travelling over the saturated sand subbase. If the silt-clay subgrade has been disturbed, it is likely that the existing cracks will "migrate" up through new pavement despite enhancing the drainage system as described above. Full-depth reconstruction would probably be needed to mitigate this issue. Disturbance of the subgrade surface cannot be readily assessed by completing test borings. Recognizing the maintenance of traffic challenges, one way to assess the integrity of the subgrade surface in order to evaluate the need for full-depth reconstruction would be to excavate the road section to expose subgrade in relatively large test areas (two) located in the travel lane. Since most damage to the subgrade surface would be expected to occur during spring thaw, this should be the target timeframe to complete the assessment.

CLOSURE

This memorandum has been prepared for the use of the Maine Turnpike Authority and their design consultant HNTB Corporation for specific application to mitigating the distressed pavement observed in the southbound barrel of the Maine Turnpike between approximately the Crosby Maintenance Yard and a few hundred feet southbound of Running Hill Road in South Portland, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

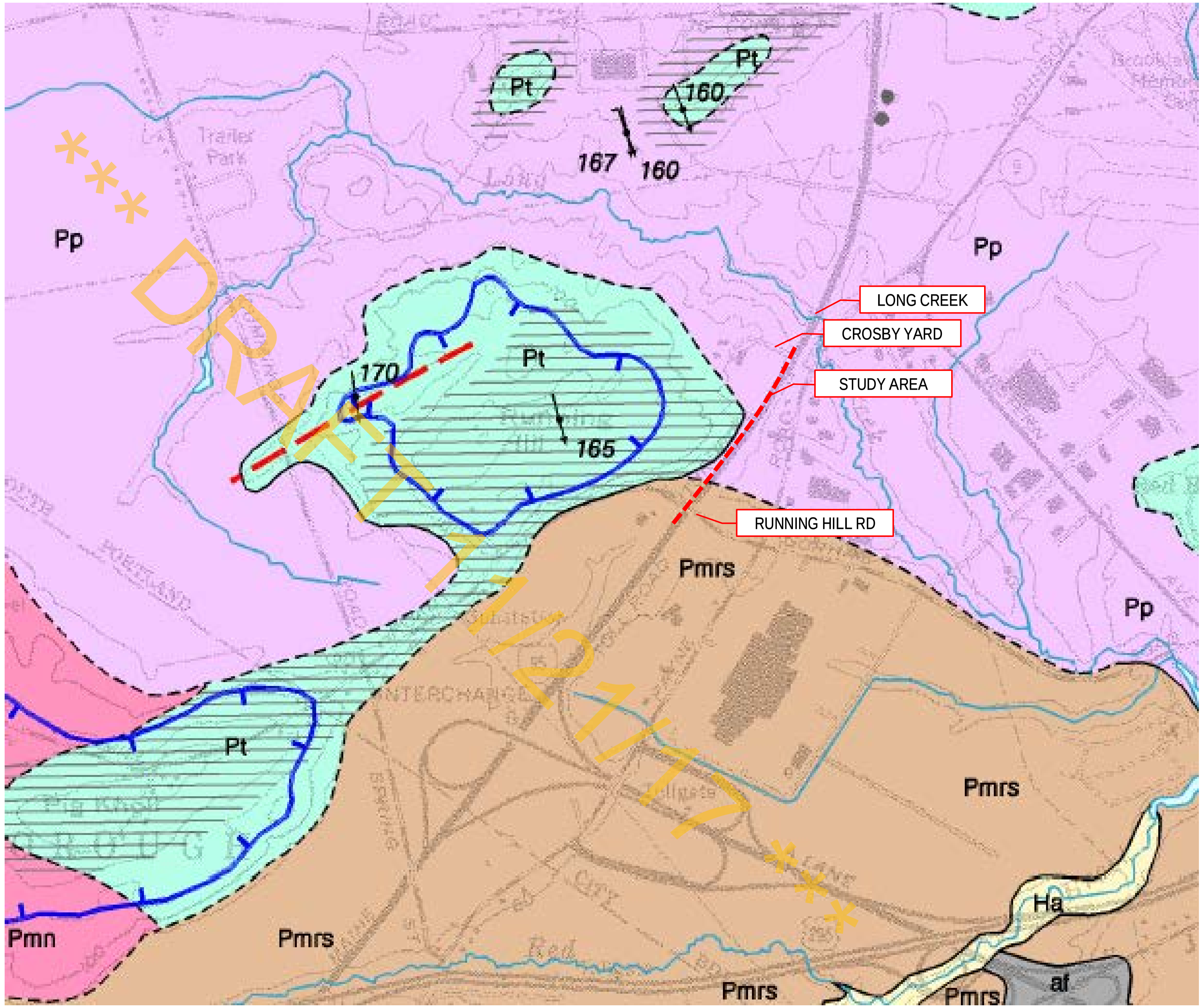
As HNTB Corporation's plan(s) for the mitigation of the pavement distress are developed, this report should be reviewed by a geotechnical engineer to assess the appropriateness of the conclusions and recommendations and to modify the recommendations as appropriate to address the design details. The analyses and recommendations presented in this memorandum are based in part upon a limited subsurface investigation consisting of widely-spaced and discrete explorations completed in the study area. If variations from the conditions encountered during the investigation appear evident during design and construction activities, it may also become necessary to re-evaluate the recommendations made in this memorandum.

It is recommended that a geotechnical engineer be provided the opportunity to review the design drawings and specifications to confirm that earthwork and other geotechnical recommendations and construction considerations presented in this memorandum are properly interpreted and implemented.

Attachments: Figures 1 through 5
Appendix A: Boring Logs
Appendix B: Laboratory Test Results

SCHONEWALD ENGINEERING ASSOCIATES, INC.
■ www.SchonewaldEngineering.com ■

FIGURES



SOURCE: GEOLOGICAL MAP ENTITLED "SURFICIAL GEOLOGY, PORTLAND WEST QUADRANGLE, MAINE," PUBLISHED BY THE MAINE GEOLOGICAL SURVEY, OPEN FILE NO. 08-16, SCALE 1:24,000

Pp	MARINE SILT-CLAY (PRESUMPSCOT FM)
Pmrs	NEAR SHORE MARINE SANDS AND SILTS
Pt	GLACIAL TILL (THIN VENEER WHERE HATCHED)
	BEDROCK

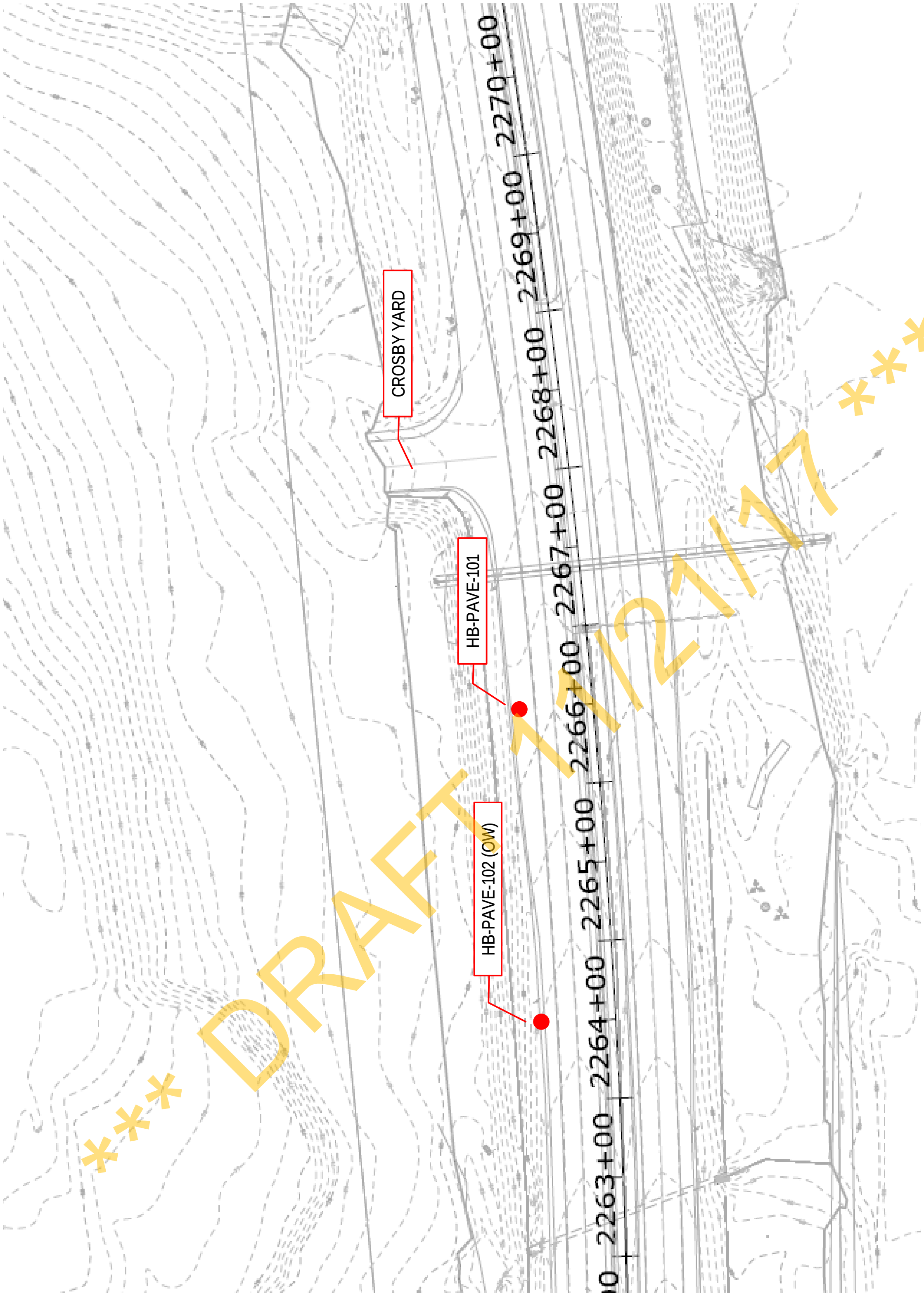
FIGURE DEPICTING SURFICIAL GEOLOGY
MAINE TURNPIKE PAVEMENT EVALUATION
MeTPK SB CROSBY YARD TO RUNNING HILL RD
SOUTH PORTLAND, MAINE

PROJECT NO.:	17-034
DATE:	NOV. 2017
DRAWN BY:	IVS
SCALE:	NTS

SCHONEWALD ENGINEERING ASSOCIATES, INC.

Figure No.:

1



PLAN NOTES

1. PLAN WAS DEVELOPED FROM AN UNTITLED PDF PLAN PROVIDED BY HNTB CORPORATION. ORIGINAL SCALE 1"=100'.

2. THE AS-DRILLED LOCATIONS OF THE TEST BORINGS WERE DETERMINED IN THE FIELD BY SCHONEWALDEA BY MEASURING FROM PROMINENT SITE FEATURES DEPICTED ON THE PLAN. THE LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

3. TEST BORINGS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, MAINE ON OCT. 2-3, 2017 AND WERE OBSERVED AND LOGGED BY SCHONEWALDEA. DETAILED DESCRIPTIONS OF THE MATERIALS ENCOUNTERED ARE PROVIDED ON THE BORING LOGS.

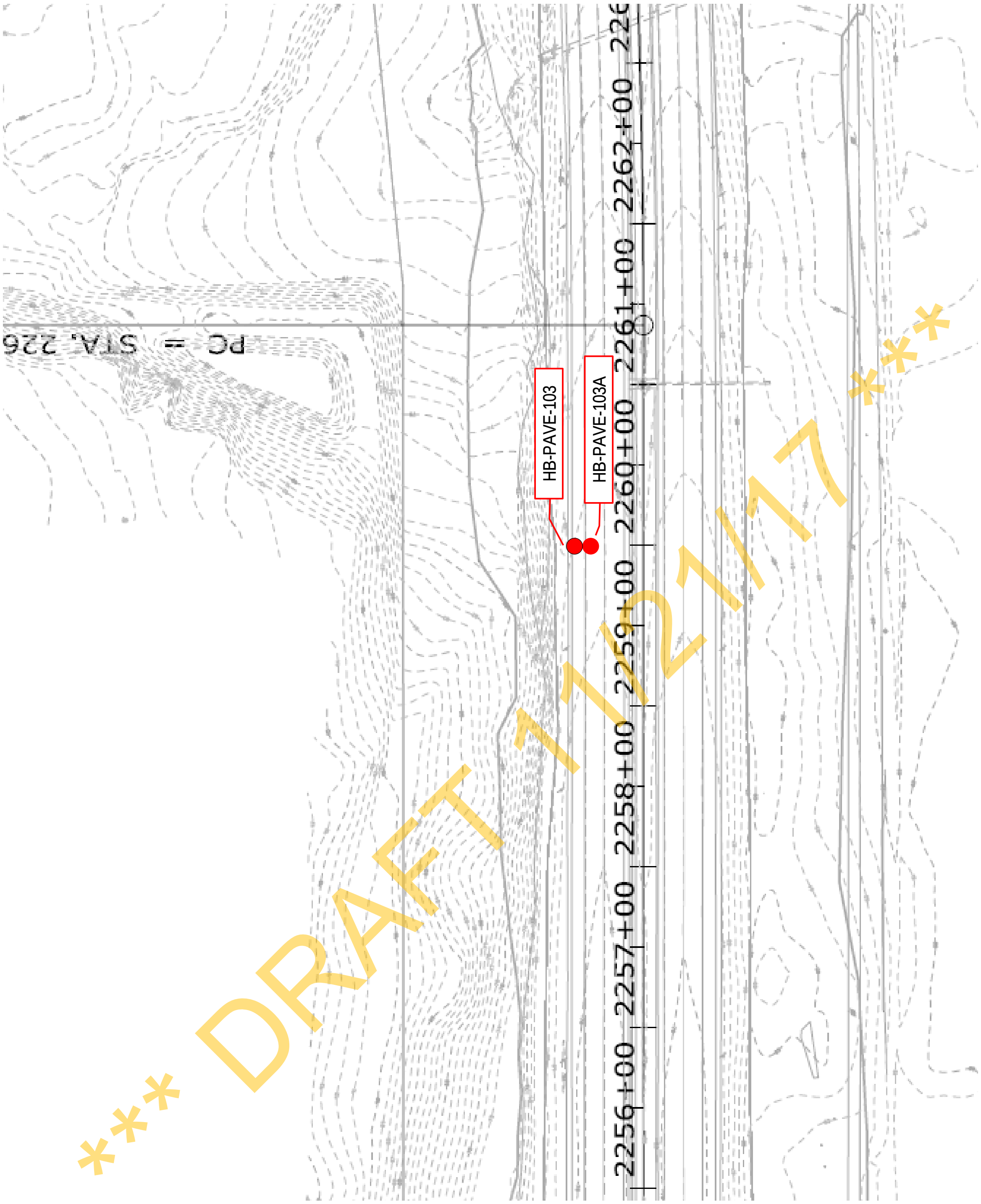
SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT NO.:	**17-034**
DATE:	**NOV. 2017**
DRAWN BY:	**IVS**
SCALE (APPROX):	**1" = 100'**

BORING LOCATION PLAN
MAINE TURNPIKE PAVEMENT EVALUATION
MeTPK SB CROSBY YARD TO RUNNING HILL RD
SOUTH PORTLAND, MAINE

Figure No.:

2



PLAN NOTES

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2. THE AS-DRILLED LOCATIONS OF THE TEST BORINGS WERE DETERMINED IN THE FIELD BY SCHONEWALDEA BY MEASURING FROM PROMINENT SITE FEATURES DEPICTED ON THE PLAN. THE LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

3. TEST BORINGS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, MAINE ON OCT. 2-3, 2017 AND WERE OBSERVED AND LOGGED BY SCHONEWALDEA. DETAILED DESCRIPTIONS OF THE MATERIALS ENCOUNTERED ARE PROVIDED ON THE BORING LOGS.

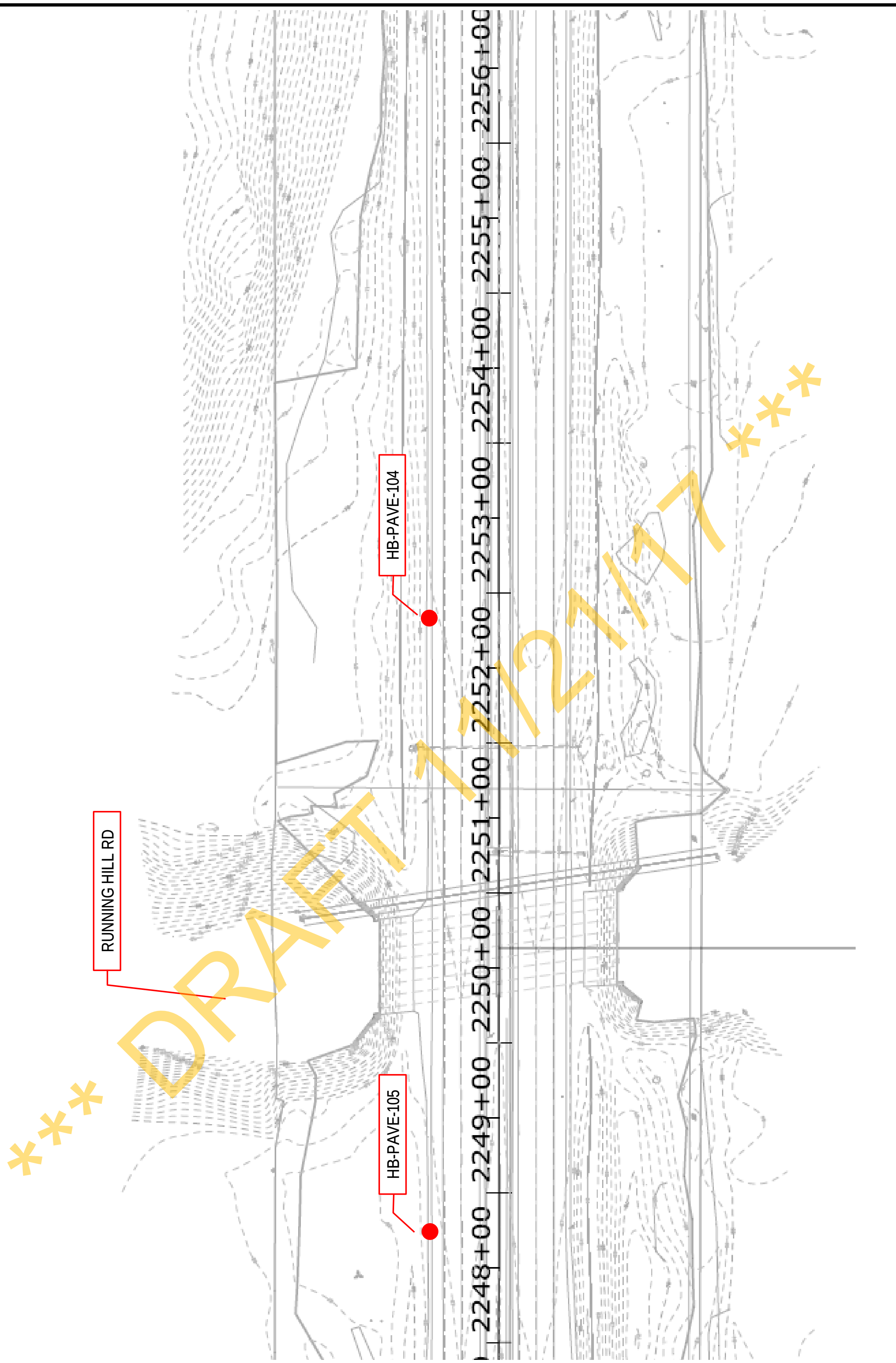
SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT NO.: 17-034
DATE: NOV. 2017
DRAWN BY: IVS
SCALE (APPROX): 1" = 100'

BORING LOCATION PLAN
MAINE TURNPIKE PAVEMENT EVALUATION
MeTPK SB CROSBY YARD TO RUNNING HILL RD
SOUTH PORTLAND, MAINE

Figure No.:

3



PLAN NOTES

1. PLAN WAS DEVELOPED FROM AN UNTITLED PDF PLAN PROVIDED BY HNTB CORPORATION. ORIGINAL SCALE 1"=100'.

2. THE AS-DRILLED LOCATIONS OF THE TEST BORINGS WERE DETERMINED IN THE FIELD BY SCHONEWALDEA BY MEASURING FROM PROMINENT SITE FEATURES DEPICTED ON THE PLAN. THE LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

3. TEST BORINGS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, MAINE ON OCT. 2-3, 2017 AND WERE OBSERVED AND LOGGED BY SCHONEWALDEA. DETAILED DESCRIPTIONS OF THE MATERIALS ENCOUNTERED ARE PROVIDED ON THE BORING LOGS.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT NO.:	17-034
DATE:	NOV. 2017
DRAWN BY:	IVS
SCALE (APPROX):	1" = 100'

BORING LOCATION PLAN
MAINE TURNPIKE PAVEMENT EVALUATION
MeTPK SB CROSBY YARD TO RUNNING HILL RD
SOUTH PORTLAND, MAINE

Figure No.: 4

TEST BORING	STATION (APPROX.)	OFFSET (FROM SB WHT LINE)	GROUND SURFACE ELEV (APPROX.) (ft)	ADJACENT DITCH INV. ELEV (APPROX.) (ft)	TOP OF SILT-CLAY / ROCK SUBGRADE DEPTH (ft, BGS)	TOP OF SILT-CLAY / ROCK SUBGRADE ELEV (ft)	? SUBGRADE ABOVE DITCH INVERT ?	CONCLUSION
HB-PAVE-101	2266+50	9.8 ft LT	59.5	56.5	3.5	56.0	NO	sand subbase unable to drain
HB-PAVE-102	2264+50	9.1 ft LT	62.0	58.0	3.1	58.9	YES	sand subbase able to drain
HB-PAVE-103	2260+00	7.4 ft LT	68.0	66.5	4.3	63.7	NO	sand subbase unable to drain
HB-PAVE-103A	2260+00	3.0 ft RT	68.5	66.5	3.4	65.1	NO	sand subbase unable to drain
HB-PAVE-104	2252+85	9.0 ft LT	68.0	66.5	4.2	63.8	NO	sand subbase unable to drain
HB-PAVE-105	2248+75	9.6 ft LT	67.0	66.0	2.9	64.1	NO	sand subbase unable to drain

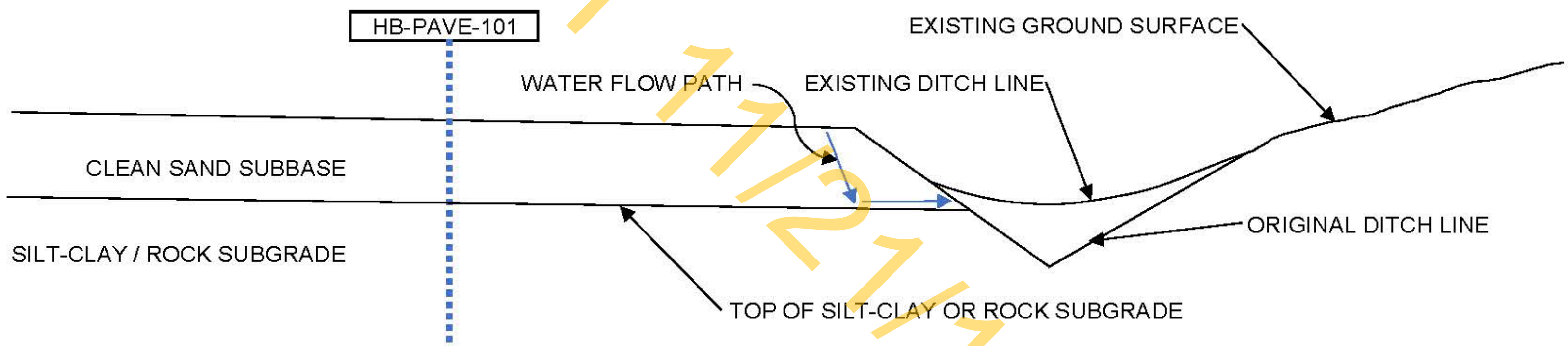


ILLUSTRATION OF PROBABLE ISSUE

Figure No.: 5

ILLUSTRATION OF KEY FINDINGS
MAINE TURNPIKE PAVEMENT EVALUATION
MeTPK SB CROSBY YARD TO RUNNING HILL RD
SOUTH PORTLAND, MAINE

PROJECT NO.:	17-034
DATE:	NOV. 2017
DRAWN BY:	IVS
SCALE:	NTS

SCHONEWALD ENGINEERING ASSOCIATES, INC.

SCHONEWALD ENGINEERING ASSOCIATES, INC.
www.SchonewaldEngineering.com

APPENDIX A

SUBSURFACE EXPLORATION LOGS

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Pavement Distress MeTPK Exit 45 to Exit 46 **LOCATION:** South Portland, ME	**Boring No.:** HB-PAVE-101 **Proj. No.:** 17-034

Driller:	New England Boring Contractors	**Elevation (ft.)**	59.5 (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Royal	**Datum:**		**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	10/2/17; 1935-2055	**Drilling Method:**	Hollow Stem Auger	**Hammer Type:**	auto
Boring Location:	2266+50, 9.8 ft LT of wht line (shoulder extension - Crosby acceleration lane)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.677
		Auger ID/OD:	2.25" ID/ 5.88" OD	**Water Level*:**	12.2' (in augers)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Sample Information

Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows
1D	24/12	1.0 - 3.0	9-9-8-7	17	19	
2D	24/22	3.0 - 5.0	6-8-8-9	16	18	
3D	24/24	5.0 - 7.0	2-2-3-5	5	6	
4D	24/24	7.0 - 9.0	4-4-4-5	8	9	
5D	24/24	9.0 - 11.0	1-1-1-1	2	2	
6D	24/18	11.0 - 13.0	2-2-2-2	4	5	
6D-A						
7D	5/0	13.0 - 13.4	50/5"	-		

Depth (ft.)	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0	59.1	5 in HMA	
0.4		1D: Brown, damp to moist, m. dense, fine to medium SAND, trace to little Silt, trace fine Gravel, trace coarse Sand. FILL Brown, moist, fine to coarse SAND, little Silt, trace to little fine Gravel; btm of sand wet; changing at 3.5 ft to:	
3.5	56.0	2D: Olive grey, slightly mottled, v. stiff, Clayey SILT, trace fine Sand; appears undisturbed. MARINE SILT-CLAY 3D: Olive brown, m. stiff, SILT & CLAY, trace fine Sand. 4D: Olive brown grey, m. stiff, CLAY & SILT, with one 1/16-in seam grey fine Sand. 5D: Grey, soft, CLAY & SILT, with few partings fine Sandy SILT. 6D: Grey with black streaks, m. stiff, Silty CLAY, with several partings and seams of fine Sandy SILT at 12.2 ft; changing at 12.6 ft to:	
12.6	46.9	6D-A: Grey, wet, fine to coarse Sandy SILT, little fine Gravel. TILL	
	46.1	7D: No recovery. (Sandy SILT, some Gravel with weathered PHYLLITE in tip of spoon.)	
13.4		**Bottom of Exploration at 13.4 feet below ground surface.** Split-spoon refusal.	

Remarks:

Adjacent ditch invert elev. 56.5 (est'd).

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Pavement Distress MeTPK Exit 45 to Exit 46 **LOCATION:** South Portland, ME	**Boring No.:** HB-PAVE-102 (OW)	**Proj. No.:** 17-034

Driller:	New England Boring Contractors	**Elevation (ft.)**	62 (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Royal	**Datum:**		**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	10/2/17; 2105-2240	**Drilling Method:**	Hollow Stem Auger	**Hammer Type:**	auto
Boring Location:	2264+50, 9.1 ft LT of wht line (off EP)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.677
		Auger ID/OD:	2.25" ID/ 5.88" OD	**Water Level*:**	9.5' (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0	1D	24/13	0.0 - 2.0	8-12-9-7	21	24			1D: Dark brown, damp, fine to coarse Sandy GRAVEL, trace to little Silt; grading at 1.0 ft to:	
								61.0	—1.0— Brown tan, moist, fine to medium SAND, little Gravel, trace to little Silt, trace coarse Sand. FILL	
	2D	24/19	2.0 - 4.0	4-3-3-6	6	7			2D: Brown tan, moist, fine to medium SAND, trace fine Gravel, trace Silt, trace coarse Sand; btm of sand wet; changing at 3.1 ft to:	A-3 SP-SM WC=13.9% -#200=9.0%
	2D-A							58.9	—3.1— 2D-A: Olive grey, mottled and desiccated, Clayey SILT, trace fine Sand; appears undisturbed. MARINE SILT-CLAY	CL-ML WC=26.1% -#200=89.2%
	3D	24/22	4.0 - 6.0	3-5-6-7	11	12			3D: Olive brown, slightly mottled, stiff, SILT & CLAY, with one seam fine Sandy SILT.	
5										
	4D	24/23	6.0 - 8.0	3-4-5-6	9	10			4D: Olive brown, slightly mottled, stiff, CLAY & SILT.	
	5D	24/24	8.0 - 10.0	WOH/24"	0	0			Olive brown, CLAY & SILT, little fine Sand; changing at 8.3 ft to: 5D: Grey, Silty CLAY, with one 1-inch seam of fine to coarse Sandy SILT, little to some Gravel at 9.7 ft.	
10	6D	24/15	10.0 - 12.0	WOR-1-3-6	4	5			6D: Grey, wet, Silty CLAY, with occasional seams fine to coarse Sandy SILT, little to some fine Gravel; grading at 11.5 ft to:	
								50.5	—11.5— Grey, wet, fine to coarse Sandy SILT, some Gravel. TILL	
								50.0	—12.0— **Bottom of Exploration at 12.0 feet below ground surface.** No refusal.	
15										
20										
25										

Remarks:

Adjacent ditch invert elev. 58 (est'd).
One-inch dia. groundwater level observation well installed in borehole upon test boring completion:
12 to 6 ft bentonite chips / 6 to 2 ft filter sand / 2 to 0.5 ft bentonite chips
5 to 2 ft slotted well screen / roadbox

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Pavement Distress
MeTPK Exit 45 to Exit 46
LOCATION: South Portland, ME

Boring No.: HB-PAVE-103
Proj. No.: 17-034

Driller:	New England Boring Contractors	**Elevation (ft.)**	68 (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Royal	**Datum:**		**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	10/2/17; 2245-2310	**Drilling Method:**	Hollow Stem Auger	**Hammer Type:**	auto
Boring Location:	2260+00, 7.4 ft LT of wht line (shoulder)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.677
		Auger ID/OD:	2.25" ID/ 5.88" OD	**Water Level*:**	dry

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

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N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0								67.5		6 in HMA — 0.5	
	1D	24/13	1.0 - 3.0	8-7-7-19	14	16		65.4		1D: Brown tan, damp, m. dense, fine to medium SAND, trace to little Silt, trace fine Gravel, trace coarse Sand. FILL Changing at 2.6 ft to: — 2.6	
	2D	11/9	3.0 - 3.9	14-50/5"	-			65.0		Grey, fine to coarse SAND, some Gravel, little to some Silt, with pieces broken rock. TILL — 3.0	
								63.7		2D: Grey brown, dry to damp, GRAVEL, some fine to coarse Sand, trace to little Silt; coarser fraction appears to be broken rock. WEATHERED ROCK — 4.3	
5								62.8		4.3 ft: Top of sound rock based on drilling behavior. — 5.2	
										Bottom of Exploration at 5.2 feet below ground surface. Auger refusal.	
10											
15											
20											
25											

Remarks:

Adjacent ditch invert elev. 66.5 (est'd); rock exposed in steep backslope.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Pavement Distress
MeTPK Exit 45 to Exit 46
LOCATION: South Portland, ME

Boring No.: HB-PAVE-103A
Proj. No.: 17-034

Driller:	New England Boring Contractors	**Elevation (ft.)**	68.5 (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Royal	**Datum:**		**Sampler:**	n/a
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53	**Hammer Wt./Fall:**	n/a
Date Start/Finish:	10/2/17; 2315-2335	**Drilling Method:**	Solid Stem Auger Probe	**Hammer Type:**	auto
Boring Location:	2260+00, 3.0 ft RT of wht line (travel lane, outside wheel rut)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.677
		Auger ID/OD:	4.5" OD	**Water Level*:**	dry

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
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S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0										13 in HMA (weathered layer at approx 6 in)	
								67.4		1.1	
								65.6		2.9	
								65.1		2.9 ft: Apparent transition from granular fill to native (weathered rock). 3.4	
										3.4 ft: Top of sound rock based on drilling behavior.	
5								63.7		4.8	
										Bottom of Exploration at 4.8 feet below ground surface. Auger refusal.	
10											
15											
20											
25											

Remarks:

Adjacent ditch invert elev. 66.5 (est'd); rock exposed in steep backslope.
Exploration advanced as a probe without SPT / sampling; logged based on auger cuttings and drilling behavior.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Pavement Distress MeTPK Exit 45 to Exit 46
LOCATION: South Portland, ME

Boring No.: HB-PAVE-104
Proj. No.: 17-034

Driller:	New England Boring Contractors	**Elevation (ft.)**	68 (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Royal	**Datum:**		**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	10/2/17, 2350- 10/3/17, 0050	**Drilling Method:**	Hollow Stem Auger	**Hammer Type:**	auto
Boring Location:	2252+85, 9.0 ft LT of wht line (off EP)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.677
		Auger ID/OD:	2.25" ID/ 5.88" OD	**Water Level*:**	13.9' (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	1D	24/14	0.0 - 2.0	7-10-7-7	17	19				1D: Dark brown, damp, fine to coarse SAND, some Gravel, little Silt; changing at 1.2 ft to:	
								66.8		1.2 Brown tan, fine to medium SAND, trace to little Silt, trace fine Gravel, trace coarse Sand. FILL	
	2D	24/17	2.0 - 4.0	4-4-4-4	8	9				2D: Brown tan, damp to wet, loose, fine to medium SAND, trace to little Silt, trace Gravel, trace coarse Sand.	A-3 SP-SM WC=14.7% -#200=10.1%
								63.8		4.2	
5	3D	24/22	4.0 - 6.0	3-7-10-12	17	19				3D: Olive brown, mottled, desiccated to 4.8 ft, v. stiff, Clayey SILT, trace fine Sand. MARINE SILT-CLAY	CL-ML WC=26.2% -#200=88.4%
	4D	24/24	6.0 - 8.0	7-8-9-13	17	19				4D: Olive brown, mottled, desiccated, v. stiff, Clayey SILT, with pockets of mica and one 1-1/2-inch seam Silty fine to coarse SAND.	
	5D	24/22	8.0 - 10.0	5-10-12-14	22	25				5D: Olive brown, slightly mottled, v. stiff, SILT & CLAY, trace fine Sand, with partings of Silty fine SAND.	
10	6D	24/21	10.0 - 12.0	3-5-8-10	13	15				6D: Olive brown, stiff, SILT & CLAY, trace fine Sand, with partings of Silty fine SAND.	
	7D	24/24	12.0 - 14.0	7-9-8-8	17	19				7D: Olive brown grey, v. stiff, CLAY & SILT, trace fine Sand, with partings and seams wet, fine to medium SAND.	
								54.0		14.0 **Bottom of Exploration at 14.0 feet below ground surface.** No Refusal.	
15											
20											
25											

Remarks:

Adjacent ditch invert elev. 66.5 (est'd).

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.

PROJECT: Pavement Distress MeTPK Exit 45 to Exit 46
LOCATION: South Portland, ME

Boring No.: HB-PAVE-105
Proj. No.: 17-034

Driller:	New England Boring Contractors	**Elevation (ft.)**	67 (est'd)	**Core Barrel:**	n/a
Operator:	Enos/ Royal	**Datum:**		**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	Mobile Drill B-53	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	10/3/17, 0100-0230	**Drilling Method:**	Hollow Stem Auger	**Hammer Type:**	auto
Boring Location:	2248+75, 9.6 ft LT of wht line (off EP)	**Casing ID/OD:**	n/a	**Hammer Efficiency:**	0.677
		Auger ID/OD:	2.25" ID/ 5.88" OD	**Water Level*:**	8.3' (open)

IN-SITU SAMPLING AND TESTING:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

ADDITIONAL DEFINITIONS:
N-uncorrected = N value
N_{60} = N value corrected for hammer efficiency
hammer efficiency = calculated hammer efficiency
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)

ADDITIONAL DEFINITIONS:
WOH = weight of 140lb. hammer
WOR = weight of rods
-- = not recorded

BOREHOLE ADVANCEMENT METHODS:
SSA/HSA=solid/hollow stem auger
RC=roller cone/OPEN/PUSH=hydraulic push

LABORATORY TEST RESULTS:
AASHTO / USCS soil classifications
-#200 = percent fines WC = water content (%)
CONSOL= 1-D consolidation test
UU=Unconsolidated undrained triaxial test
LL=Liquid Limit / PL=Plastic Limit / PI=Plasticity Index
UCT qp = peak compressive strength of rock

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N-60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0	1D	24/14	0.0 - 2.0	9-10-10-8	20	23		65.8		1D: Dark brown, damp, fine to coarse SAND, some Gravel, little Silt; changing at 1.2 ft to:	
										1.2 — Brown tan, wet, fine to medium SAND, trace to little Silt, trace Gravel, trace coarse Sand. FILL	
	2D	24/19	2.0 - 4.0	2-3-4-6	7	8		64.1		Brown tan, wet, fine to medium SAND, trace to little Silt, trace Gravel, trace coarse Sand; bottom of sand wet; changing at 2.9 ft to:	
										2.9 — 2D: Olive brown, mottled, desiccated, Clayey SILT, trace fine Sand; appears reworked at 3.8 ft.	
5	3D	24/18	4.0 - 6.0	5-9-9-14	18	20				3D: Olive brown, mottled, desiccated, v. stiff, Clayey SILT, trace fine Sand; appears reworked.	
	4D	24/24	6.0 - 8.0	9-12-13-15	25	28				4D: Olive brown, slightly mottled, v. stiff, Clayey SILT, trace fine Sand; appears undisturbed below 6.7 ft. MARINE SILT-CLAY	
	5D	24/22	8.0 - 10.0	4-6-8-10	14	16				5D: Olive brown, slightly mottled, stiff, SILT & CLAY, with multiple partings and seams of fine Sandy SILT.	
10	6D	24/24	10.0 - 12.0	1-3-3-3	6	7				6D: olive brown grading to grey at 11.3 ft, m. stiff, CLAY & SILT, with partings of fine Sandy SILT, grading to Silty CLAY.	
	7D	24/15	12.0 - 14.0	3-3-20-8	23	26		53.4		7D: Grey, Silty CLAY; changing at 13.6 ft to:	
										13.6 — Grey, Silty GRAVEL, some fine to coarse Sand. TILL	
15	8D		14.0 - 16.0	1-6-18-31	24	27		51.0		8D: Grey brown grading to red tan, wet, m. dense, Silty fine to coarse SAND, some Gravel.	
										16.0 — **Bottom of Exploration at 16.0 feet below ground surface.** No refusal.	
20											
25											

Remarks:

Adjacent ditch invert elev. 66 (est'd).

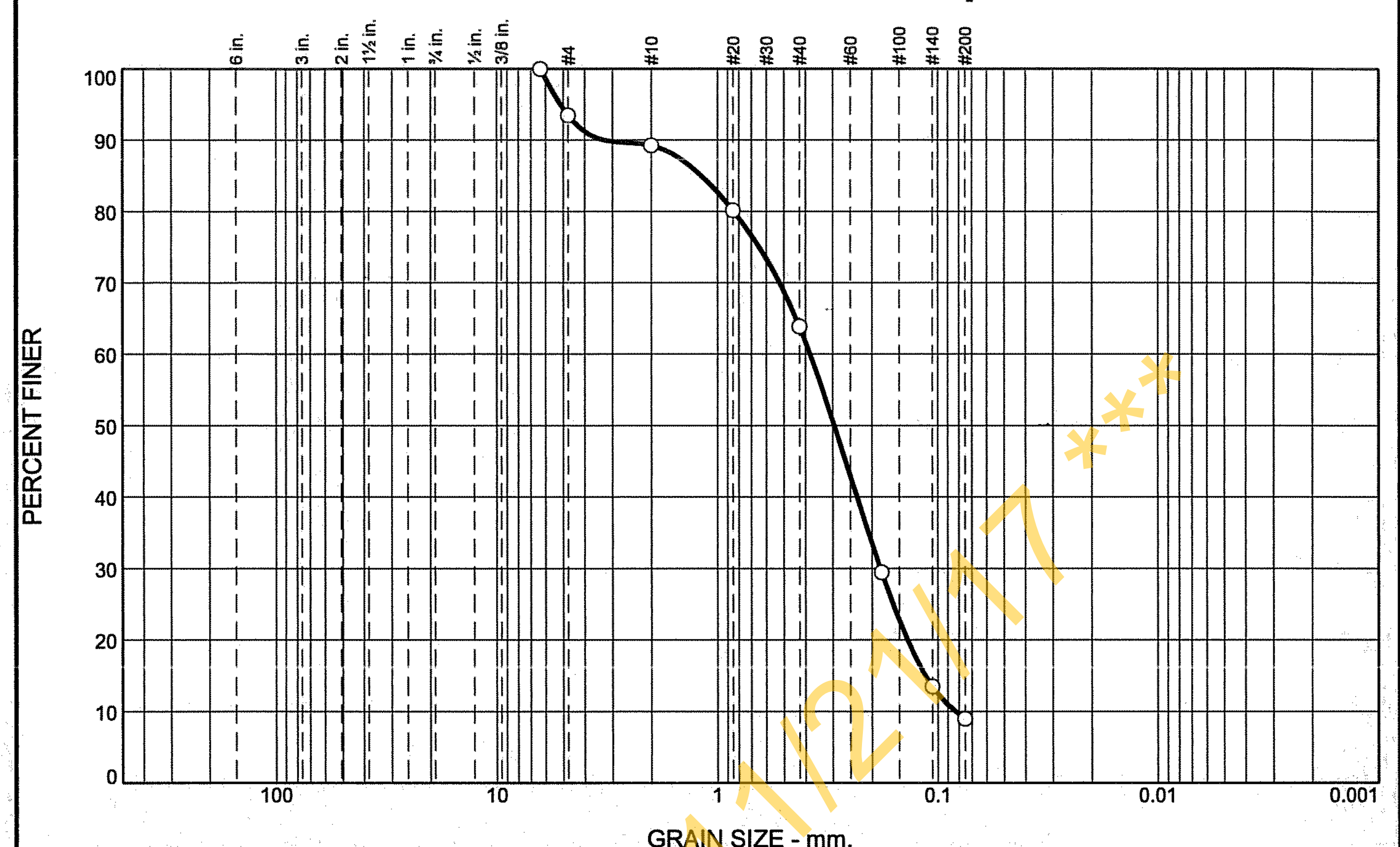
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

APPENDIX B

RESULTS OF SOILS LABORATORY TESTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.5	4.2	25.4	54.9	9.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	93.5		
#10	89.3		
#20	80.2		
#40	63.9		
#80	29.5		
#140	13.5		
#200	9.0		

* (no specification provided)

Soil Description

Poorly Graded Sand with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.2667 D_{85}= 1.1809 D_{60}= 0.3800
D_{50}= 0.2950 D_{30}= 0.1825 D_{15}= 0.1138
D_{10}= 0.0825 C_u= 4.60 C_c= 1.06

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 13.9%

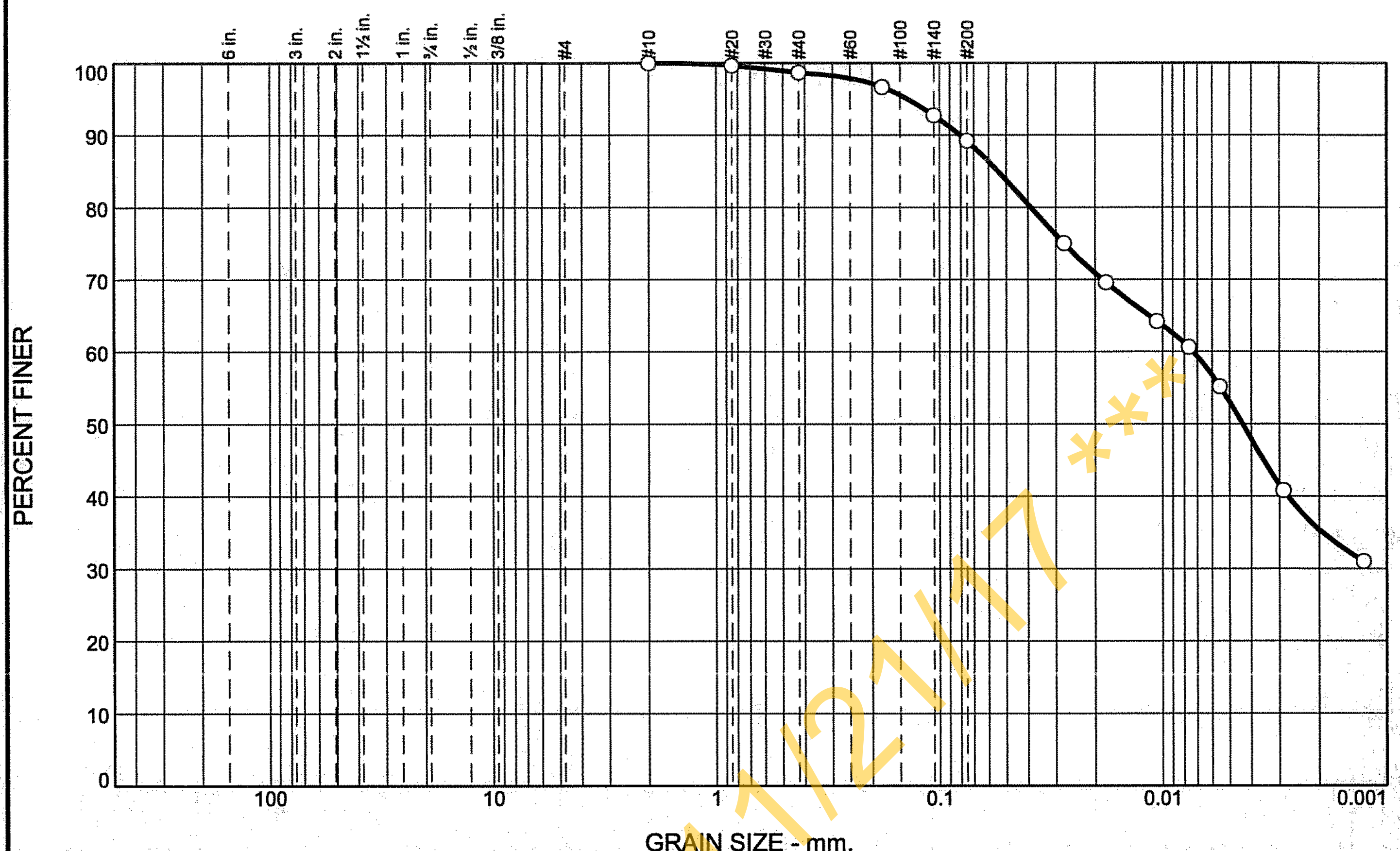
Location: HB-Pave-102 - South Portland, ME
Sample Number: 2D **Depth:** 2'-4' (2'-3.1') **Date:** 10/16/17

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

Client: Schonewald Engineering Associates
Project: Maine Turnpike Pavement Distress
Project No: 1368-007 **Lab No.** 14734a

Tested By: JJB **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.3	9.5	36.1	53.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.7		
#40	98.7		
#80	96.7		
#140	92.7		
#200	89.2		
0.0275 mm.	75.0		
0.0179 mm.	69.6		
0.0106 mm.	64.2		
0.0076 mm.	60.6		
0.0055 mm.	55.2		
0.0029 mm.	40.8		
0.0013 mm.	31.0		

* (no specification provided)

Soil Description

Silty Clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0804 D_{85}= 0.0544 D_{60}= 0.0073
D_{50}= 0.0044 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO=

Remarks

Moisture Content: 26.1%

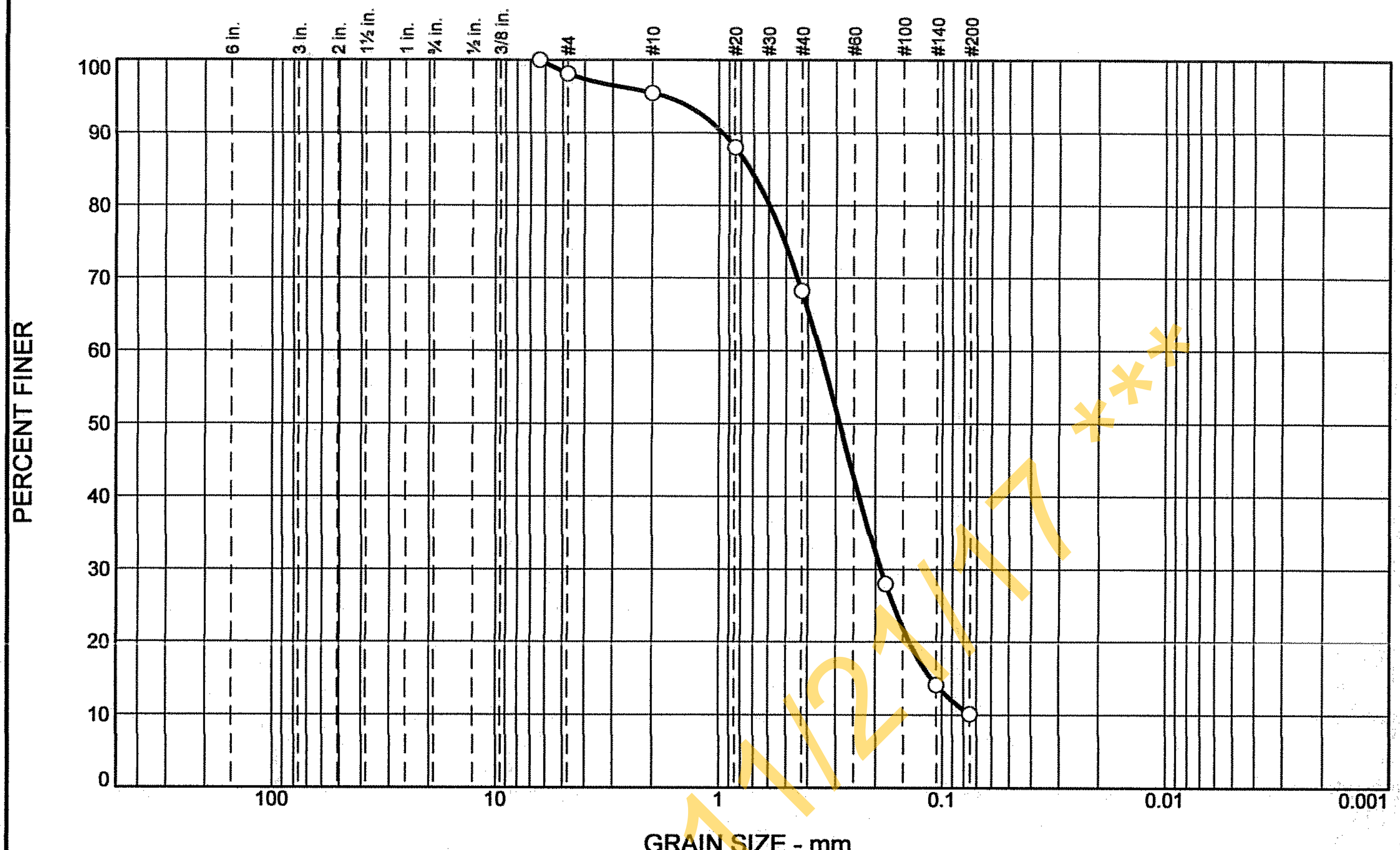
Location: HB-Pave-102 - South Portland, ME
Sample Number: 2D-A **Depth:** 2'-4' (3.1'-4') **Date:** 10/16/17

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

Client: Schonewald Engineering Associates
Project: Maine Turnpike Pavement Distress
Project No: 1368-007 **Lab No.** 14734b

Tested By: JJB **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.9	2.6	27.2	58.2	10.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	98.1		
#10	95.5		
#20	88.0		
#40	68.3		
#80	28.0		
#140	14.1		
#200	10.1		

* (no specification provided)

Soil Description

Poorly Graded Sand with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9675 D_{85}= 0.7286 D_{60}= 0.3538
D_{50}= 0.2891 D_{30}= 0.1893 D_{15}= 0.1118
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 14.7%

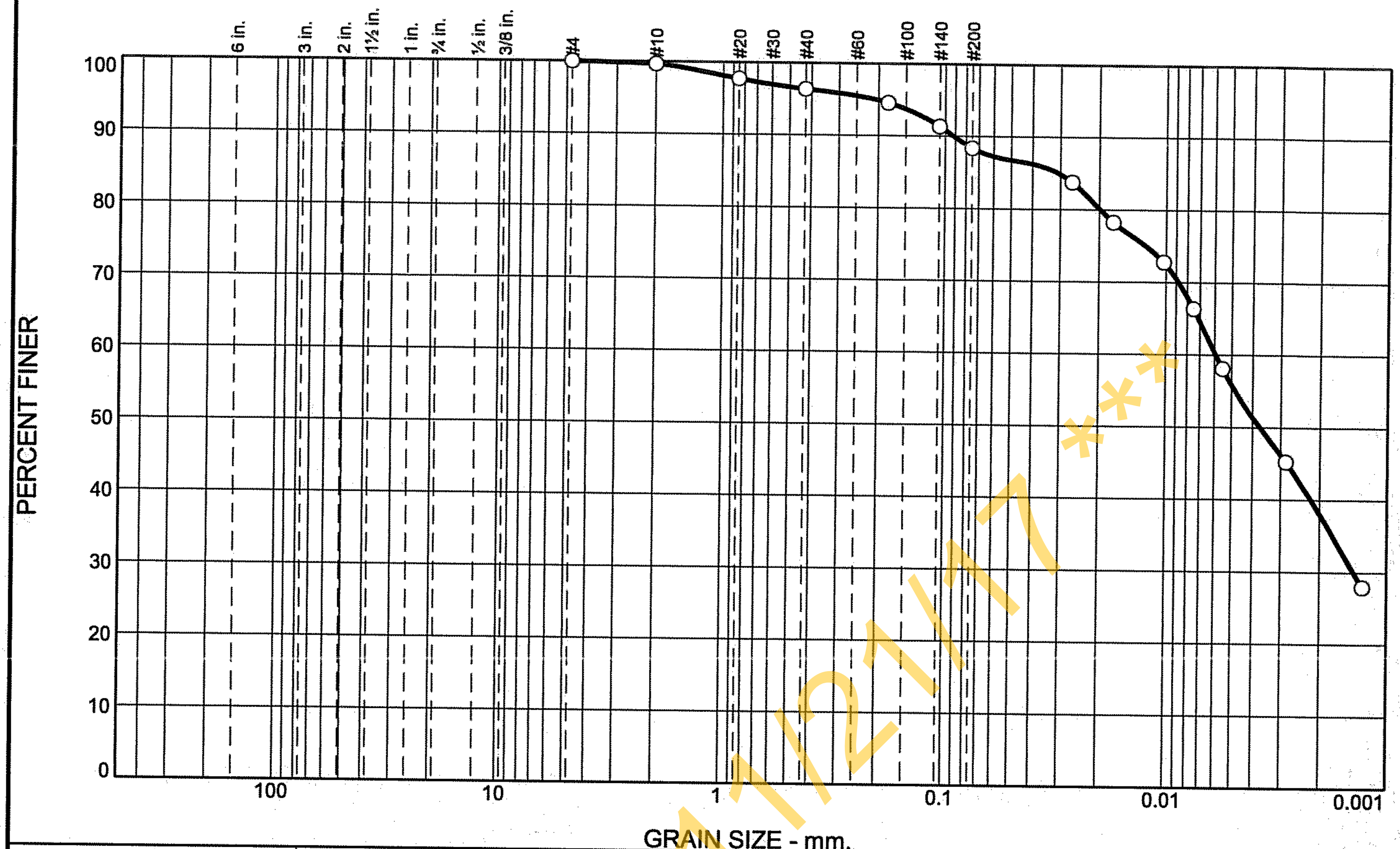
Location: HB-Pave-104 - South Portland, ME
Sample Number: 2D **Depth:** 2'-4' **Date:** 10/16/17

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

Client: Schonewald Engineering Associates
Project: Maine Turnpike Pavement Distress
Project No: 1368-007 **Lab No.** 14735a

Tested By: JJB **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	3.3	8.0	32.5	55.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	97.7		
#40	96.4		
#80	94.6		
#140	91.4		
#200	88.4		
0.0265 mm.	83.8		
0.0173 mm.	78.3		
0.0102 mm.	72.8		
0.0075 mm.	66.4		
0.0055 mm.	58.1		
0.0028 mm.	45.3		
0.0013 mm.	28.0		

* (no specification provided)

Soil Description

Silty Clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0913 D_{85}= 0.0306 D_{60}= 0.0059
D_{50}= 0.0037 D_{30}= 0.0014 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO=

Remarks

Moisture Content: 26.2%

Location: HB-Pave-104 - South Portland, ME
Sample Number: 3D **Depth:** 4'-6' **Date:** 10/16/17

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

Client: Schonewald Engineering Associates
Project: Maine Turnpike Pavement Distress
Project No: 1368-007 **Lab No.** 14735b

Tested By: JJB **Checked By:** MTG MTG