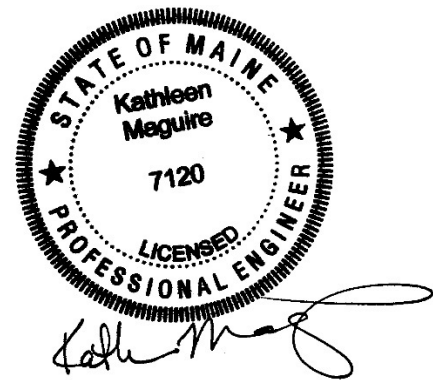


**MAINE DEPARTMENT OF TRANSPORTATION  
HIGHWAY PROGRAM  
GEOTECHNICAL SECTION  
AUGUSTA, MAINE**

**GEOTECHNICAL DATA REPORT**

**LARGE CULVERT IMPROVEMENTS  
U.S. ROUTE 1  
ROCKLAND, MAINE**

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Knox County

WIN 18794.10  
February 28, 2019

Soils Report 2019-08

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- Sheet 2 - Boring Location Plan

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- Appendix A – Boring Logs
- Appendix B – Laboratory Test Results

## **1.0 INTRODUCTION**

This Large Culvert on U.S. Route 1 in Rockland was originally scoped for Replacement by Project Development. During design the project scope was changed to Large Culvert Improvement with removal of a failing gabion wall.

The purpose of this Geotechnical Data Report is to document subsurface information collected at the culvert. This report presents the results of a limited geotechnical investigation performed at the existing culvert and the results of a limited laboratory testing program conducted on soil samples recovered during the geotechnical investigation. U.S. Route 1 is a Highway Corridor Priority 1 road.

## **2.0 GEOLOGIC SETTING**

The culvert is located on U.S. Route 1 approximately 0.12 of a mile northeasterly of Waldo Avenue as shown on Sheet 1 – Location Map.

The Maine Geologic Survey (MGS) map titled Surficial Geology, Rockland Quadrangle, Maine, Open-File No. 10-8 (2010) indicates the surficial soils at the culvert consist of Presumpscot Formation. The Presumpscot Formation in this area consists of glaciomarine silt, clay, and sand deposited on the late-glacial sea floor. This area is likely to include areas of till exposed at the ground surface.

The MGS map Bedrock Geology of Maine (1985) cites bedrock at the culvert as interbedded pelite and sandstone of the Ogier Point Formation.

## **3.0 SUBSURFACE INVESTIGATION**

Subsurface conditions were explored by drilling one (1) probe (HB-ROCK-101) and one (1) test boring (HB-ROCK-102) at opposite, diagonal corners of the existing culvert. The Northern Test Boring drill crew drilled the boring and probe on June 13, 2017. The exploration locations are shown on Sheet 2 – Boring Location Plan.

Probe HB-ROCK-101 was drilled using solid stem auger techniques. No soil samples were obtained in the probe. Boring HB-ROCK-102 was drilled using hollow stem auger techniques. Soil samples were obtained in the boring at 5-foot intervals using Standard Penetration Test (SPT) methods. The bedrock was cored in the boring using an NQ 2-inch core barrel and the Rock Quality Designation (RQD) of the core was calculated. Probe HB-ROCK-101 encountered a refusal surface at a depth of approximately 15.7 feet below ground surface (bgs). The exact nature of the refusal surface was not determined in the probe. Boring HB-ROCK-102 encountered bedrock at a depth of approximately 14.8 feet bgs. Details and sampling methods used, field data obtained, and soil conditions encountered are presented in the boring logs provided in Appendix A – Boring Logs.

The MaineDOT geotechnical engineer selected the boring and probe locations, drilling methods, designated type and depth of sampling techniques, reviewed boring logs, and

identified field testing requirements. A NorthEast Transportation Training and Certification Program (NETTCP) certified Subsurface Investigator logged the subsurface conditions encountered. The borings were located in the field using taped measurements at the completion of the drilling program.

#### **4.0 LABORATORY TESTING**

A laboratory testing program was conducted on the soil samples recovered from the test boring to assist in soil classification, evaluation of engineering properties of the soils, and geologic assessment of the project site. Laboratory testing consisted of one (1) standard grain size analysis with natural water content and two (2) grain size analyses with hydrometer and natural water content. The results of soil tests are included as Appendix B – Laboratory Test Results. Moisture content information and other soil test results are also shown on the boring logs provided in Appendix A – Boring Logs.

#### **5.0 CLOSURE**

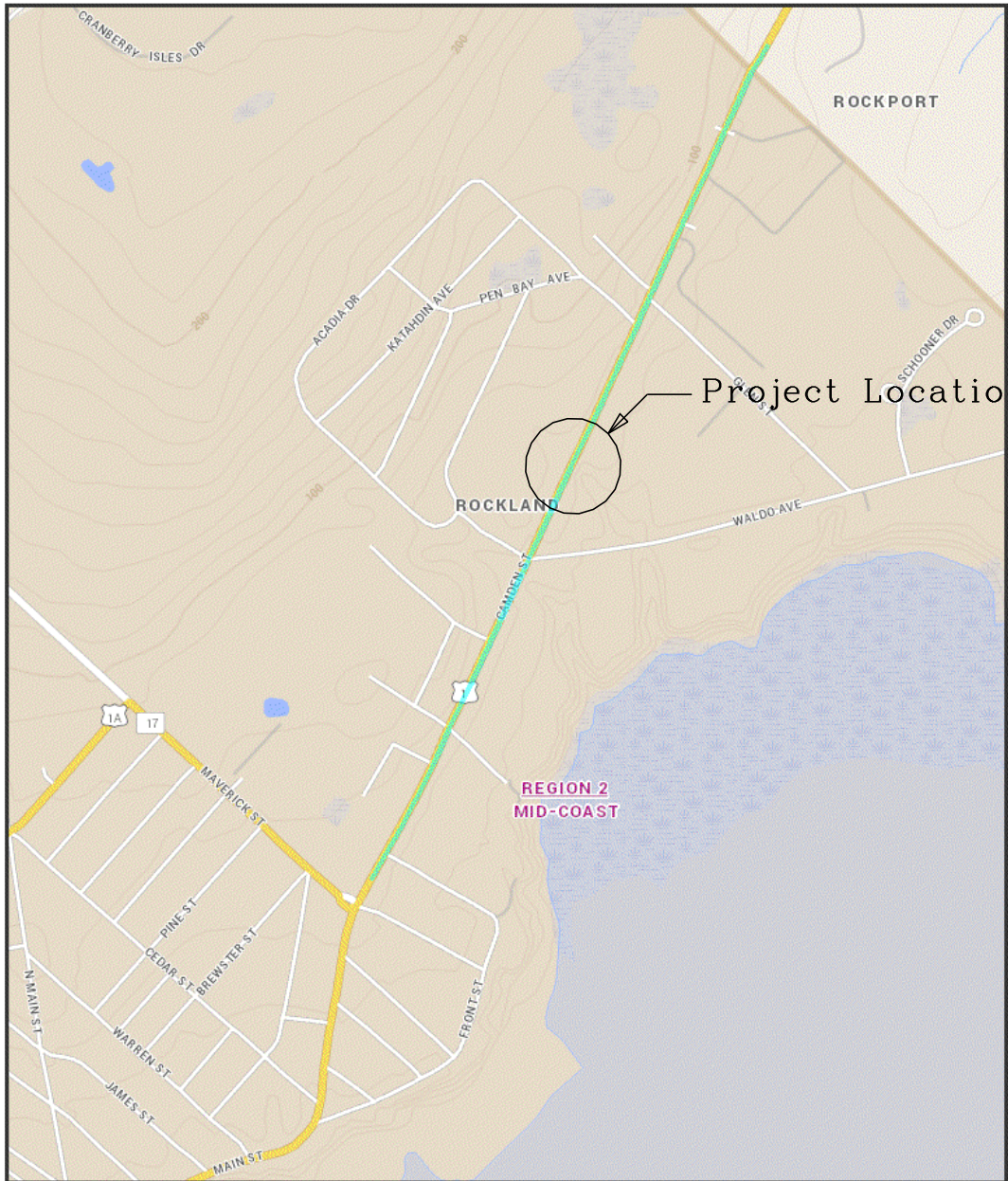
This Geotechnical Data Report has been prepared to document the geotechnical work conducted at a large culvert on U.S. Route 1 in Rockland, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

MaineDOT conducted a limited number of soil explorations at discrete locations at the culvert and a limited number of laboratory tests. No interpretations or conclusions have been derived from this geotechnical information. Data provided may not be representative of the subsurface conditions between boring locations.

## **Sheets**



# ROCKLAND, MAINE

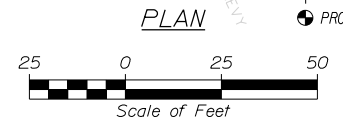
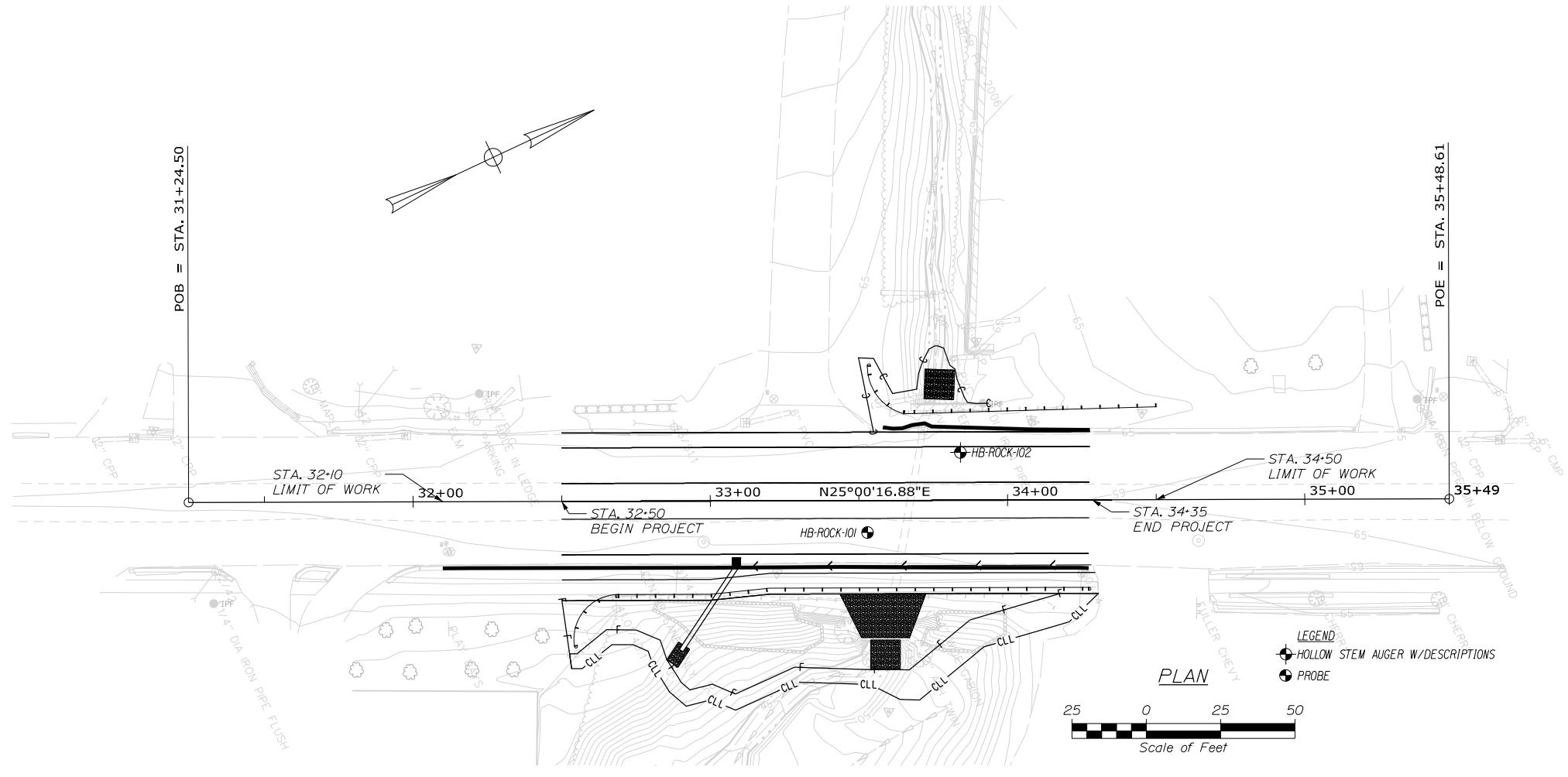


The Maine Department of Transportation provides this publication for information only. Reliance upon this information is at user risk. It is subject to revision and may be incomplete depending upon changing conditions. The Department assumes no liability if injuries or damages result from this information. This map is not intended to support emergency dispatch.

0.15 Miles  
1 inch = 0.16 miles

Date: 11/30/2018  
Time: 9:23:37 AM

SHEET NUMBER  <b>1</b>	ROCKLAND CAMDEN ST., ROUTE 1	STATE OF MAINE DEPARTMENT OF TRANSPORTATION	
		NHPP-1879(410)	
OF 2	LOCATION MAP	WIN 018794.10	HIGHWAY PLANS



**ROCKLAND  
CAMDEN ST., ROUTE 1 LARGE CULVERT  
BORING LOCATION PLAN  
WITH BORING LOGS**

PROJ. MANAGER	M. KIRKMAN	BY		DATE	
CHECKED-REVIEWED					SIGNATURE
DESIGNS-DETAILED	C. RUSSELL	T. WHITE		NOV. 2018	
DESIGNS-DETAILED					P.E. NUMBER
REVISIONS 1					DATE
REVISIONS 2					
REVISIONS 3					
REVISIONS 4					
FIELD CHANGES					

## **Appendix A**

Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM				MODIFIED BURMISTER SYSTEM																																																					
MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	Descriptive Term	Portion of Total (%)																																																				
COARSE-GRAINED SOILS  (more than half of material is larger than No. 200 sieve size)	GRAVELS  (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS	GW Well-graded gravels, gravel-sand mixtures, little or no fines.	<u>trace</u> 0 - 10 <u>little</u> 11 - 20 <u>some</u> 21 - 35 <u>adjective (e.g. sandy, clayey)</u> 36 - 50	<b>TERMS DESCRIBING DENSITY/CONSISTENCY</b> <u>Coarse-grained soils</u> (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Density is rated according to standard penetration resistance (N-value).  <table border="0"> <tr> <td><u>Density of Cohesionless Soils</u></td> <td><u>Standard Penetration Resistance N-Value (blows per foot)</u></td> </tr> <tr> <td>Very loose</td> <td>0 - 4</td> </tr> <tr> <td>Loose</td> <td>5 - 10</td> </tr> <tr> <td>Medium Dense</td> <td>11 - 30</td> </tr> <tr> <td>Dense</td> <td>31 - 50</td> </tr> <tr> <td>Very Dense</td> <td>&gt; 50</td> </tr> </table> <u>Fine-grained soils</u> (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to undrained shear strength as indicated.  <table border="0"> <tr> <td><u>Consistency of Cohesive soils</u></td> <td><u>SPT N-Value (blows per foot)</u></td> <td><u>Approximate Undrained Shear Strength (psf)</u></td> <td><u>Field Guidelines</u></td> </tr> <tr> <td>Very Soft</td> <td>WOH, WOR, WOP, &lt;2</td> <td>0 - 250</td> <td>Fist easily penetrates</td> </tr> <tr> <td>Soft</td> <td>2 - 4</td> <td>250 - 500</td> <td>Thumb easily penetrates</td> </tr> <tr> <td>Medium Stiff</td> <td>5 - 8</td> <td>500 - 1000</td> <td>Thumb penetrates with moderate effort</td> </tr> <tr> <td>Stiff</td> <td>9 - 15</td> <td>1000 - 2000</td> <td>Indented by thumb with great effort</td> </tr> <tr> <td>Very Stiff</td> <td>16 - 30</td> <td>2000 - 4000</td> <td>Indented by thumbnail</td> </tr> <tr> <td>Hard</td> <td>&gt;30</td> <td>over 4000</td> <td>Indented by thumbnail with difficulty</td> </tr> </table> <u>Rock Quality Designation (RQD):</u> RQD (%) = $\frac{\text{sum of the lengths of intact pieces of core} * > 4 \text{ inches}}{\text{length of core advance}}$ *Minimum NQ rock core (1.88 in. OD of core)  Correlation of RQD to Rock Mass Quality <table border="0"> <tr> <td><u>Rock Mass Quality</u></td> <td><u>RQD (%)</u></td> </tr> <tr> <td>Very Poor</td> <td>≤25</td> </tr> <tr> <td>Poor</td> <td>26 - 50</td> </tr> <tr> <td>Fair</td> <td>51 - 75</td> </tr> <tr> <td>Good</td> <td>76 - 90</td> </tr> <tr> <td>Excellent</td> <td>91 - 100</td> </tr> </table> <u>Desired Rock Observations (in this order, if applicable):</u> Color (Munsell color chart) Texture (aphanitic, fine-grained, etc.) Rock Type (granite, schist, sandstone, etc.) Hardness (very hard, hard, mod. hard, etc.) Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.) Geologic discontinuities/jointing: -dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.) -spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet) -tightness (tight, open, or healed) -infilling (grain size, color, etc.) Formation (Waterville, Ellsworth, Cape Elizabeth, etc.) RQD and correlation to rock mass quality (very poor, poor, etc.) ref: ASTM D6032 and AASHTO Standard Specification for Highway Bridges, 17th Ed. Table 4.4.8.1.2A Recovery (inch/inch and percentage) Rock Core Rate (X.X ft - Y.Y ft (min:sec))	<u>Density of Cohesionless Soils</u>	<u>Standard Penetration Resistance N-Value (blows per foot)</u>	Very loose	0 - 4	Loose	5 - 10	Medium Dense	11 - 30	Dense	31 - 50	Very Dense	> 50	<u>Consistency of Cohesive soils</u>	<u>SPT N-Value (blows per foot)</u>	<u>Approximate Undrained Shear Strength (psf)</u>	<u>Field Guidelines</u>	Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily penetrates	Soft	2 - 4	250 - 500	Thumb easily penetrates	Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort	Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort	Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail	Hard	>30	over 4000	Indented by thumbnail with difficulty	<u>Rock Mass Quality</u>	<u>RQD (%)</u>	Very Poor	≤25	Poor	26 - 50	Fair	51 - 75	Good	76 - 90	Excellent	91 - 100
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Good	76 - 90																																																								
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FINE-GRAINED SOILS  (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS  (liquid limit less than 50)	ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.																																																							
		CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.																																																							
		OL Organic silts and organic silty clays of low plasticity.																																																							
	SILTS AND CLAYS  (liquid limit greater than 50)	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.																																																							
CH Inorganic clays of high plasticity, fat clays.																																																									
OH Organic clays of medium to high plasticity, organic silts.																																																									
HIGHLY ORGANIC SOILS	Pt Peat and other highly organic soils.																																																								
<b>Desired Soil Observations (in this order, if applicable):</b> Color (Munsell color chart) Moisture (dry, damp, moist, wet) Density/Consistency (from above right hand side) Texture (fine, medium, coarse, etc.) Name (sand, silty sand, clay, etc., including portions - trace, little, etc.) Gradation (well-graded, poorly-graded, uniform, etc.) Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic) Structure (layering, fractures, cracks, etc.) Bonding (well, moderately, loosely, etc., ) Cementation (weak, moderate, or strong) Geologic Origin (till, marine clay, alluvium, etc.) Groundwater level				<b>Sample Container Labeling Requirements:</b> WIN Blow Counts Bridge Name / Town Sample Recovery Boring Number Date Sample Number Personnel Initials Sample Depth																																																					
<b>Maine Department of Transportation            Geotechnical Section            Key to Soil and Rock Descriptions and Terms            Field Identification Information</b>																																																									



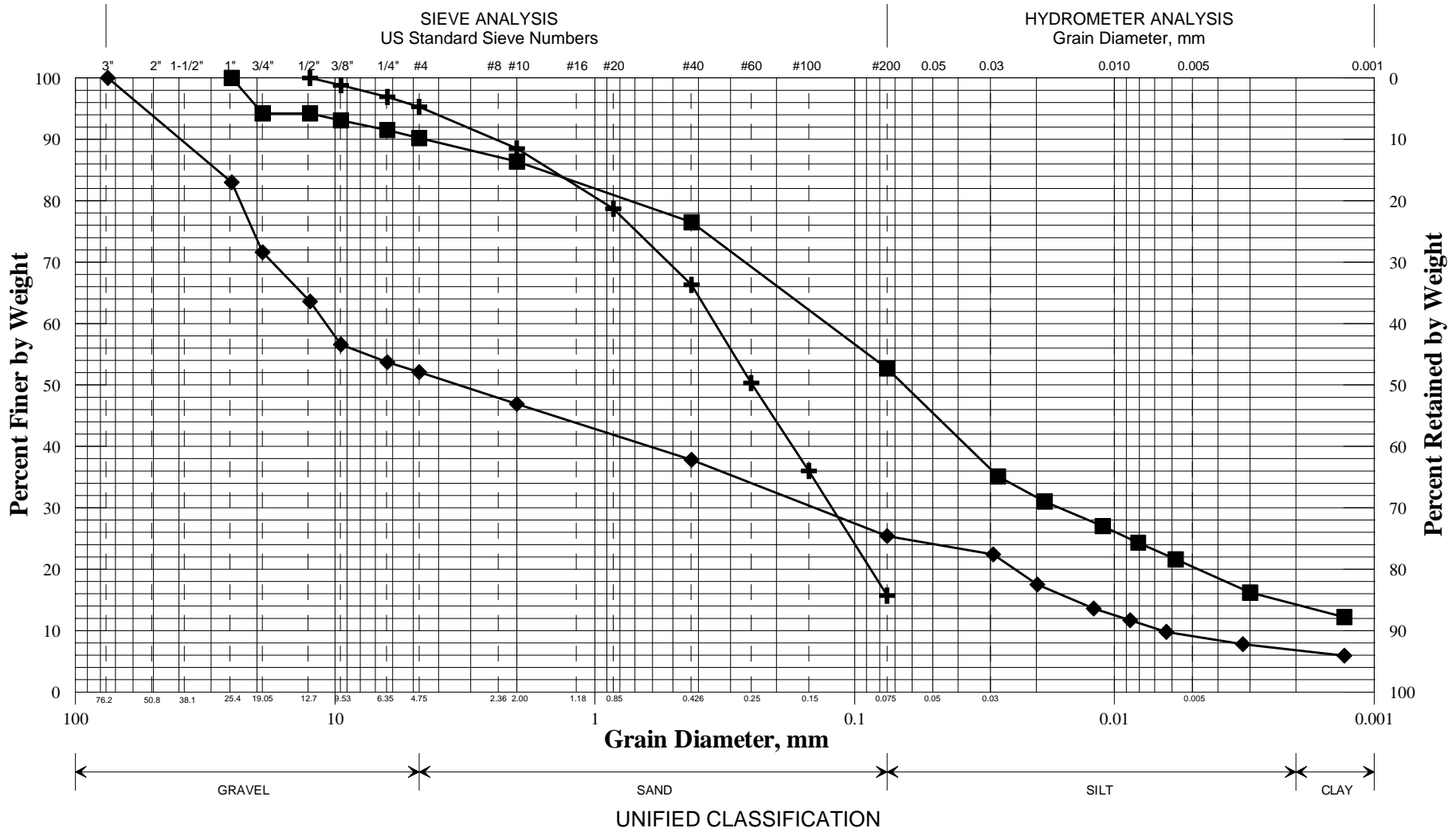


## **Appendix B**

Laboratory Test Results



**State of Maine Department of Transportation**  
**GRAIN SIZE DISTRIBUTION CURVE**



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+	HB-ROCK-102/1D	33+84.6	10.5 LT	1.0-3.0	SAND, little silt, trace gravel.	6.4			
◆	HB-ROCK-102/2D	33+84.6	10.5 LT	5.0-7.0	GRAVEL, some sand, little silt, trace clay.	7.4			
■	HB-ROCK-102/3D	33+84.6	10.5 LT	10.0-12.0	Sandy SILT, little clay, trace gravel.	14.5			
●									
▲									
×									

WIN	
018794.10	
Town	
Rockland, Rockport	
Reported by/Date	
WHITE, TERRY A	7/21/2017