

**STATE OF MAINE**  
**MAINE DEPARTMENT OF TRANSPORTATION**  
Letter of Transmittal

**To:** Albert Godfrey, TMSI  
Terry White, Geotechnical Highway Program  
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Project Resident, Highway Program (Unknown as of 12/8/2017)

**Author:** Cody Russell, Geotechnical Highway Program

**Subject:** Geotechnical Data Report, State Route 27, Belgrade, Maine

**Document Type:** 24

**Date:** 12/8/2017

**Soils Report No.:** 2017-45

**Bridge #:** N/A

**Route:** 27

**WIN:** 018253.00

**Town:** Belgrade

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Attached is one (1) copy of Soils Report 2017-45, "GEOTECHNICAL DATA REPORT:  
For the Highway Improvement on: STATE ROUTE 27, BELGRADE, MAINE" dated:  
December 8, 2017.

This report is available in TEDOCS as Document # 1670354.

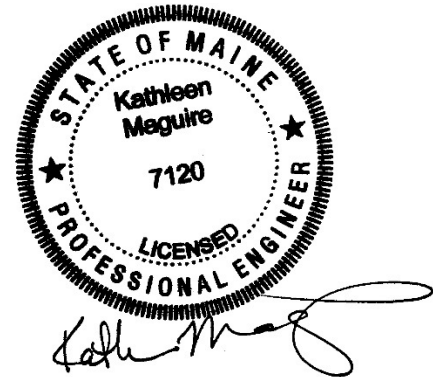
att: 1 of 2017-45

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

**GEOTECHNICAL DATA REPORT**

*For the Highway Improvements on:*  
**STATE ROUTE 27  
BELGRADE, MAINE**

*Prepared by:*  
Cody Russell, E.I.  
Assistant Geotechnical Engineer



*Reviewed by:*  
Kathleen Maguire, P.E.  
Senior Geotechnical Engineer

Kennebec County  
WIN 18253.00

December 8, 2017

Soils Report 2017-45  
Fed No. STP-1825(300X)

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## **1.0 INTRODUCTION**

The purpose of this Geotechnical Data Report is to document subsurface information collected to support highway improvements on State Route 27 in Belgrade, Maine. This report presents the results of a limited geotechnical investigation performed along the project site and the results of a limited laboratory testing program conducted on soil samples recovered during the geotechnical investigation. State Route 27 is a Highway Corridor Priority 2 road.

## **2.0 GEOLOGIC SETTING**

The project begins at the intersection of West Road and Route 27 and extends northerly 0.36 of a mile to the southerly end of Belgrade Lakes Bridge as shown on Sheet 1 – Location Map.

The Maine Geologic Survey (MGS) map titled Reconnaissance Surficial Geology of the Norridgewock Quadrangle, Maine, Open-File No. 87-93 (1987) indicates the surficial soils along the project consist of till. Till deposits consists of a homogenous mixture of sand, silt, clay, and stones, rarely with stratifications. Till generally overlies bedrock, but may overlie or include sand and gravel. Till deposits may include two varieties basal till and ablation till. Basal till is fine grained and very compact, with low permeability and poor drainage. Ablation till is loose, sandy, and stony, with moderate permeability and fair to good drainage.

The MGS map “Bedrock Geologic Map of Maine” (1985) cites bedrock as Devonian granite of the Rome/Norridgewock Pluton.

## **3.0 SUBSURFACE INVESTIGATION**

Subsurface conditions were explored by drilling six (6) test borings along the project. The MaineDOT drill crew drilled borings HB-BEL-101 through HB-BEL-106 on November 9, 2012 using solid stem auger techniques. The exploration locations are shown on Sheets 2 through 5 – Boring Location Plans.

Soil samples were obtained in all of the borings using Standard Penetration Test (SPT) methods. The boring depths ranged from approximately 6.4 to 12.0 feet below ground surface (bgs). A refusal surface was encountered at a depth of approximately 6.4 feet bgs in boring HB-BEL-103. The exact nature of the refusal surface was not determined in the boring. No refusal surface was encountered any of the other borings. Details and sampling methods used, field data obtained, and soil and bedrock conditions encountered are presented in the boring logs provided in Appendix A – Boring Logs.

A Northeast Transportation Training and Certification Program (NETTCP) Certified Subsurface Inspector logged the subsurface conditions encountered in the borings. The MaineDOT geotechnical engineer selected the boring location and drilling methods, designated type and depth of sampling techniques, reviewed boring logs and identified field testing requirements. 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 selected soil samples recovered from the test borings to assist in soil classification, evaluation of engineering properties of the soils, and geologic assessment of the project site. Laboratory testing consisted of six (6) standard grain size analyses with 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 for the use of the MaineDOT Highway Program for specific application to the proposed highway improvements on State Route 27 in Belgrade, 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 along the project and a limited number of laboratory tests. MaineDOT shall not be responsible for the Bidder's or Contractor's interpretations, estimates, or conclusions derived from the geotechnical information. Data provided may not be representative of the subsurface conditions between boring locations.

## **Sheets**

# BELGRADE, MAINE

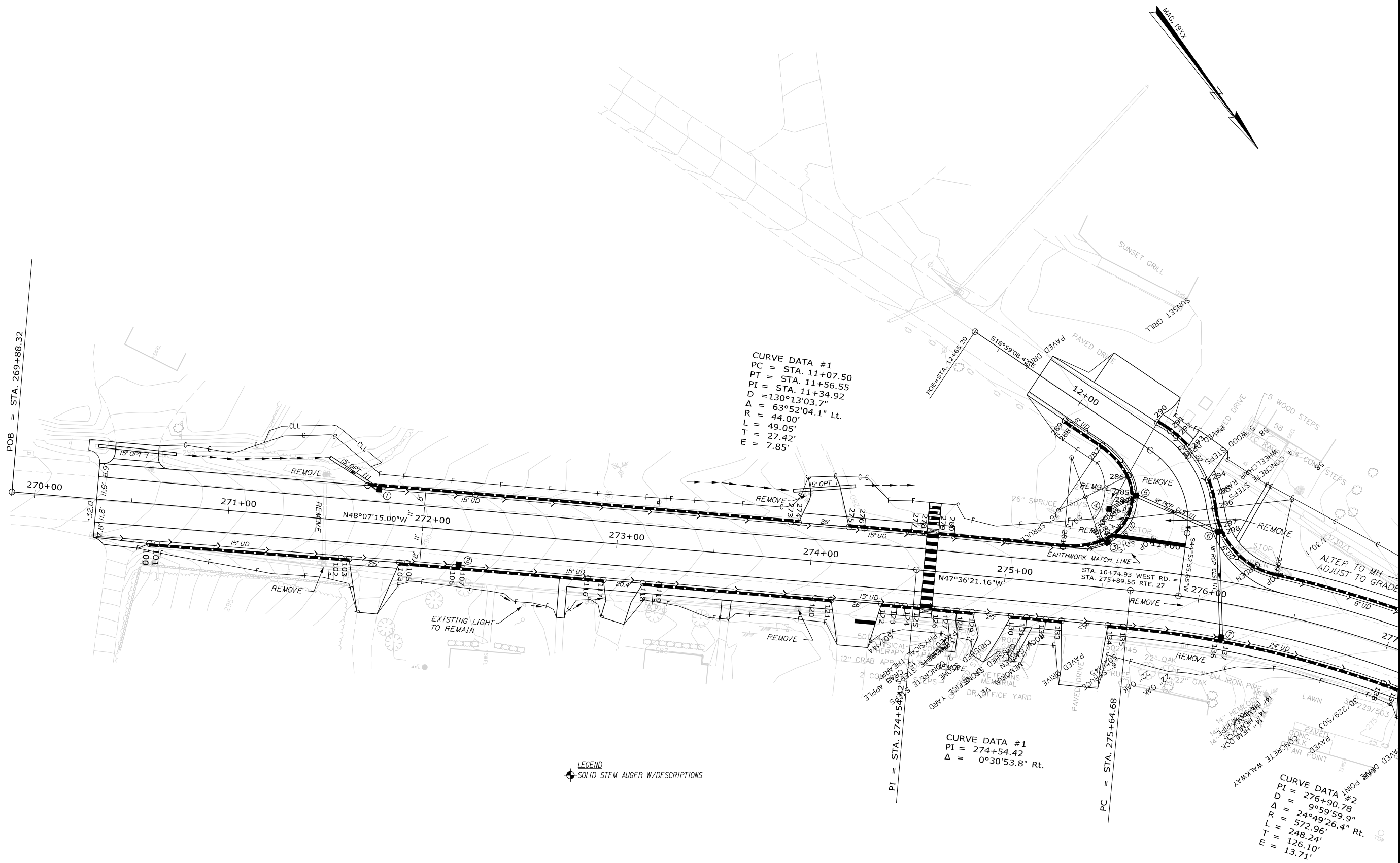


The Maine Department of Transportation provides this publication for information only. Reliance upon this information is at user risk. It is subject to revision and may be incomplete depending upon changing conditions. The Department assumes no liability if injuries or damages result from this information.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

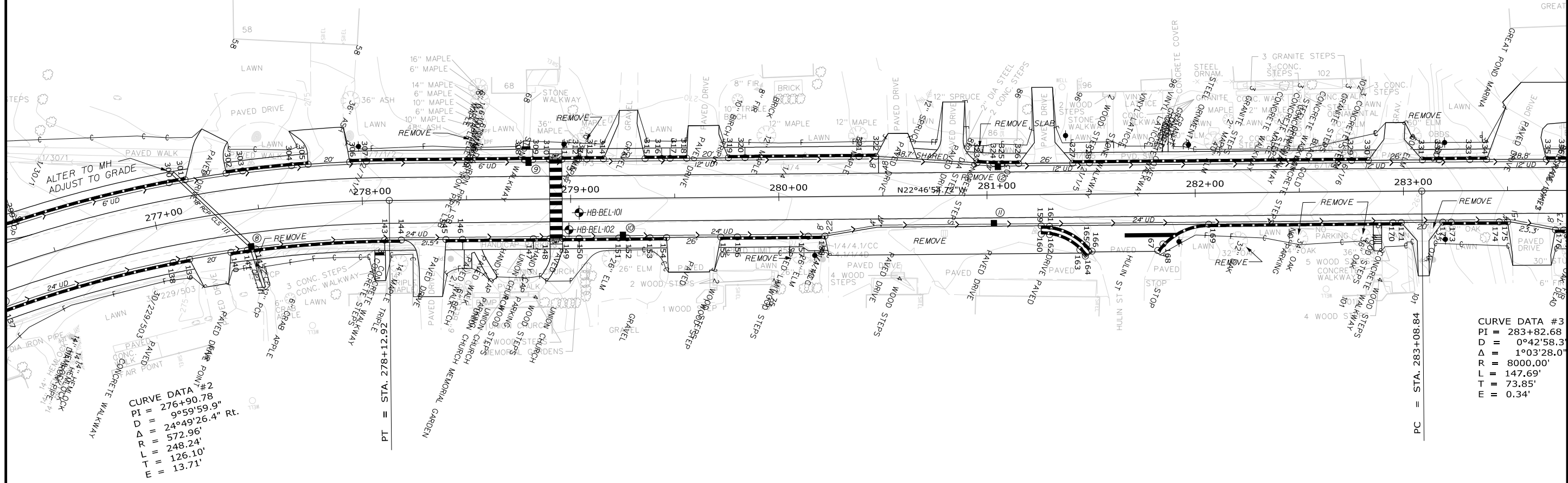
0.5 Miles  
1 inch = 0.56 miles

Date: 11/9/2017  
Time: 10:59:35 AM

SHEET NUMBER  <b>1</b>	BELGRADE ROUTE 27  KENNEBEC COUNTY	STATE OF MAINE DEPARTMENT OF TRANSPORTATION	
		STP-1825(300)X	
OF 5	LOCATION MAP	WIN 18253.00	HIGHWAY PLANS



STATE OF MAINE DEPARTMENT OF TRANSPORTATION		STP-1825(300)X	
WIN 18253.00		HIGHWAY PLANS	
BELGRADE ROUTE 27		BORING LOCATION PLAN	
SHEET NUMBER		2	
OF 5			
PROJ. MANAGER	E. MARTIN	BY	
CHECKED-REVIEWED	N. MATHON	DATE	
DESIGN-DETAILED	C. RUSSELL	SIGNATURE	
DESIGNS-DETAILED	T. WHITE	NOV. 2017	
REVISIONS 1		P.E. NUMBER	
REVISIONS 2		DATE	
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

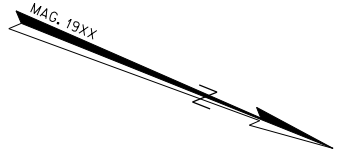
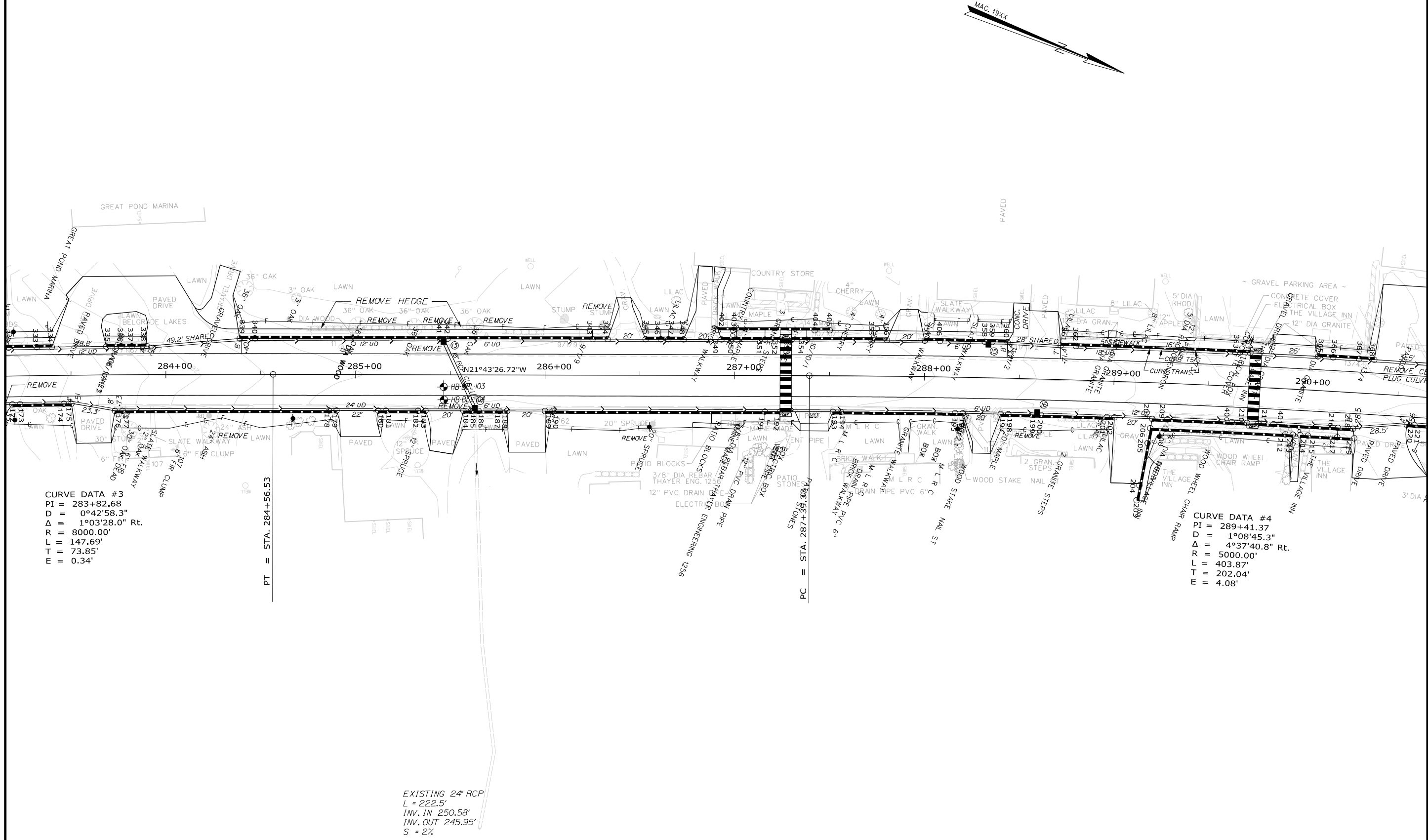


**CURVE DATA #2**  
 PI = 276+90.78  
 D = 9°59'59.9"  
 $\Delta$  = 24°49'26.4" Rt.  
 R = 572.96'  
 L = 248.24'  
 T = 126.10'  
 E = 13.71'

**CURVE DATA #3**  
 PI = 283+82.68  
 D = 0°42'58.3"  
 $\Delta$  = 1°03'28.0"  
 R = 8000.00'  
 L = 147.69'  
 T = 73.85'  
 E = 0.34'

PC = STA. 283+08.84

STATE OF MAINE DEPARTMENT OF TRANSPORTATION		STP-1825(300)X	
W/IN 18253.00		HIGHWAY PLANS	
BELGRADE ROUTE 27		BORING LOCATION PLAN	
SHEET NUMBER		DATE	
3		NOV 2017	
3		P.E. NUMBER	
OF 5		DATE	
3		FIELD CHANGES	
3		REVISIONS 4	
3		REVISIONS 3	
3		REVISIONS 2	
3		REVISIONS 1	
3		DESIGNS DETAILED	
3		DESIGNS DETAILED C. RUSSELL	
3		CHECKED-REVIEWED N. MATHION	
3		DESIGN-DETAILED	
3		BY E. MARTIN	
3		DATE	



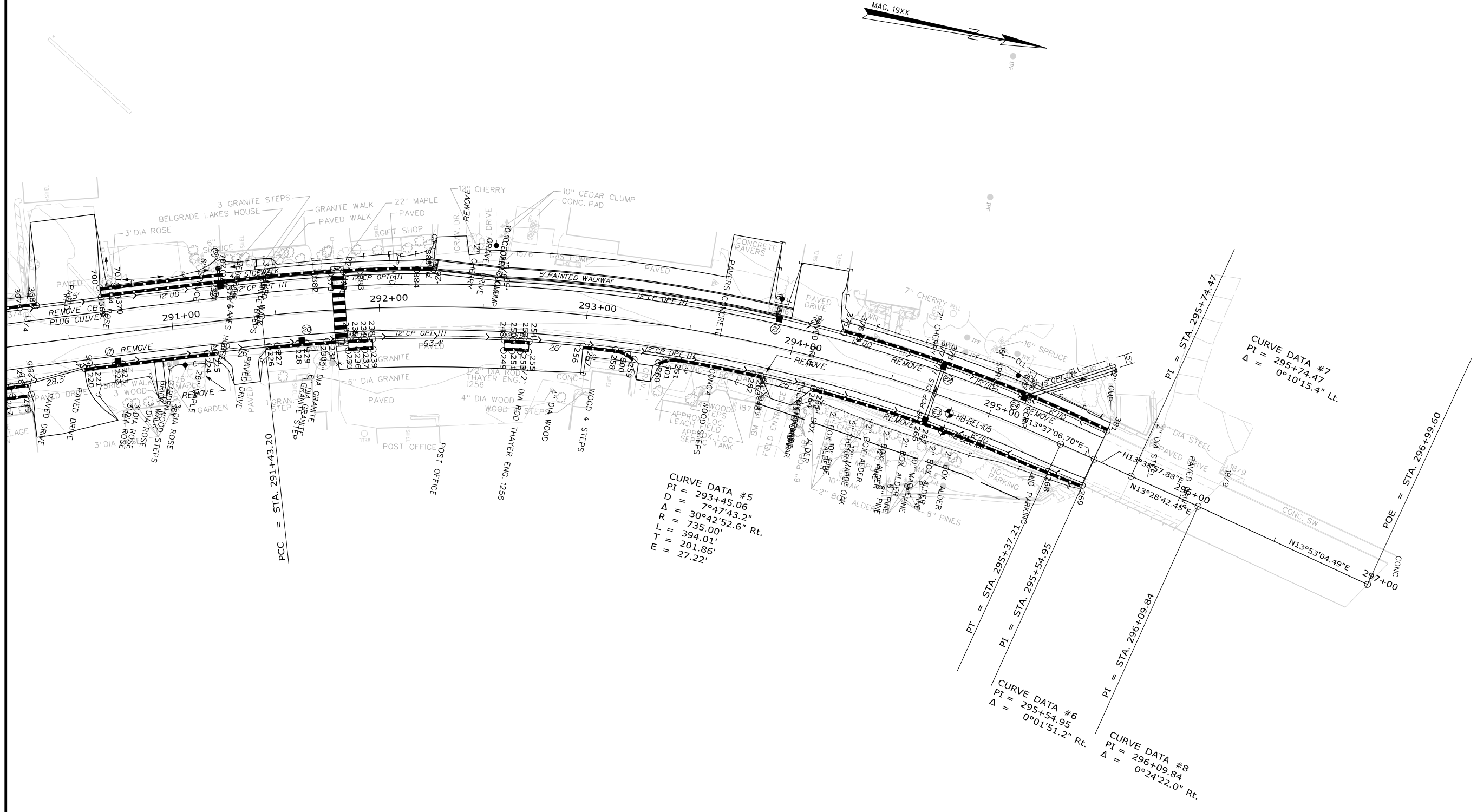
**CURVE DATA #3**  
 PI = 283+82.68  
 D = 0°42'58.3"  
 Δ = 1°03'28.0" Rt.  
 R = 8000.00'  
 L = 147.69'  
 T = 73.85'  
 E = 0.34'

PT STA. 284+56.53

**CURVE DATA #4**  
 PI = 289+41.37  
 D = 1°08'45.3"  
 Δ = 4°37'40.8" Rt.  
 R = 5000.00'  
 L = 403.87'  
 T = 202.04'  
 E = 4.08'

EXISTING 24" RCP  
 L = 222.5'  
 INV. IN 250.58'  
 INV. OUT 245.95'  
 S = 2%

STATE OF MAINE DEPARTMENT OF TRANSPORTATION		STP-1825(300)X	
W/IN 18253.00		HIGHWAY PLANS	
BELGRADE ROUTE 27		BORING LOCATION PLAN	
SHEET NUMBER <b>4</b>		OF 5	
PROJ. MANAGER	E. MARTIN	BY	DATE
DESIGN-DETAILED	N. MATHON	CHECKED-REVIEWED	T. WHITE
DESIGNS-DETAILED	C. RUSSELL	DESIGNS-DETAILED	NOV. 2017
REVISIONS 1		P.E. NUMBER	
REVISIONS 2		DATE	
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			



BELGRADE ROUTE 27  BORING LOCATION PLAN		STATE OF MAINE DEPARTMENT OF TRANSPORTATION  STP-1825(300)X  WIN 18253.00 HIGHWAY PLANS	
SHEET NUMBER		DATE	
5		NOV 2017	
OF 5		SIGNATURE	P.E. NUMBER
PROJ. MANAGER E. MARTIN	BY T. WHITE	DESIGN-DETAILED N. MATHON	DATE NOV 2017
CHECKED-REVIEWED	DESIGNS-DETAILED	DESIGNS-DETAILED	P.E. NUMBER
REVISIONS 1	REVISIONS 2	REVISIONS 3	DATE
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. GP Poorly-graded gravels, gravel sand mixtures, little or no fines.	trace little some adjective (e.g. sandy, clayey)	0 - 10 11 - 20 21 - 35 36 - 50																																																				
		GRAVEL WITH FINES (Appreciable amount of fines)	GM Silty gravels, gravel-sand-silt mixtures. GC Clayey gravels, gravel-sand-clay mixtures.	<b>TERMS DESCRIBING DENSITY/CONSISTENCY</b> <b>Coarse-grained soils</b> (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="1"> <thead> <tr> <th>Density of Cohesionless Soils</th> <th>Standard Penetration Resistance N-Value (blows per foot)</th> </tr> </thead> <tbody> <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> </tbody> </table> <b>Fine-grained soils</b> (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="1"> <thead> <tr> <th>Consistency of Cohesive soils</th> <th>SPT N-Value (blows per foot)</th> <th>Approximate Undrained Shear Strength (psf)</th> <th>Field Guidelines</th> </tr> </thead> <tbody> <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> </tbody> </table> <b>Rock Quality Designation (RQD):</b> 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="1"> <thead> <tr> <th>Rock Mass Quality</th> <th>RQD (%)</th> </tr> </thead> <tbody> <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> </tbody> </table> <b>Desired Rock Observations (in this order, if applicable):</b> 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))			Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)	Very loose	0 - 4	Loose	5 - 10	Medium Dense	11 - 30	Dense	31 - 50	Very Dense	> 50	Consistency of Cohesive soils	SPT N-Value (blows per foot)	Approximate Undrained Shear Strength (psf)	Field Guidelines	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	Rock Mass Quality	RQD (%)	Very Poor	≤25	Poor	26 - 50	Fair	51 - 75	Good	76 - 90	Excellent
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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.	<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																																																						
		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.	<b>Sample Container Labeling Requirements:</b> WIN Blow Counts Bridge Name / Town Sample Recovery Boring Number Date Sample Number Personnel Initials Sample Depth																																																						
CH Inorganic clays of high plasticity, fat clays.																																																									
SILTS AND CLAYS  (liquid limit greater than 50)	OH Organic clays of medium to high plasticity, organic silts.																																																								
	HIGHLY ORGANIC SOILS	Pt Peat and other highly organic soils.																																																							
<b>Maine Department of Transportation  Geotechnical Section  Key to Soil and Rock Descriptions and Terms  Field Identification Information</b>																																																									

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS				<b>Project:</b> A 0.36 mile portion of Route 27 <b>Location:</b> Belgrade, Maine				<b>Boring No.:</b> HB-BEL-101 <b>WIN:</b> 18253.00							
<b>Driller:</b> MaineDOT				<b>Elevation (ft.):</b> 271.7				<b>Auger ID/OD:</b> 5" Dia.							
<b>Operator:</b> Enos/Giles				<b>Datum:</b> NAVD88				<b>Sampler:</b> Standard Split Spoon							
<b>Logged By:</b> B. Wilder				<b>Rig Type:</b> CME 45C				<b>Hammer Wt./Fall:</b> 140#/30"							
<b>Date Start/Finish:</b> 11/9/12-11/9/12				<b>Drilling Method:</b> Solid Stem Auger				<b>Core Barrel:</b> N/A							
<b>Boring Location:</b> 279+04, 6.7 ft Rt.				<b>Casing ID/OD:</b> N/A				<b>Water Level*:</b> None Observed							
<b>Hammer Efficiency Factor:</b> 0.756				<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
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 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = 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 Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.			
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows								
0	PC-1		0.00 - 0.71					270.99		8½" PAVEMENT, core taken.					
	1D	24/18	1.00 - 3.00	13/10/7/12	17	21		270.70		Brown, damp, fine to coarse SANDY GRAVEL.	G#266726 A-2-4, SM WC=10.7%				
										Light brown, damp, medium dense, fine to coarse SAND, some silt, little gravel.					
5	2D	24/20	5.00 - 7.00	8/11/13/14	24	30		266.90		Olive brown, moist, medium dense, Silty fine to coarse SAND, trace gravel.	G#266727 A-4, SM WC=10.8%				
10	3D	24/20	10.00 - 12.00	11/15/17/28	32	40		261.20		Olive, moist, dense, Silty fine to medium SAND, little gravel, (Till).					
								259.70		<b>Bottom of Exploration at 12.00 feet below ground surface.</b> NO REFUSAL					
15															
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.

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: A 0.36 mile portion of Route 27 Location: Belgrade, Maine				Boring No.: HB-BEL-102 WIN: 18253.00							
Driller: MaineDOT				Elevation (ft.): 271.6				Auger ID/OD: 5" Dia.							
Operator: Enos/Giles				Datum: NAVD88				Sampler: Standard Split Spoon							
Logged By: B. Wilder				Rig Type: CME 45C				Hammer Wt./Fall: 140#/30"							
Date Start/Finish: 11/9/12-11/9/12				Drilling Method: Solid Stem Auger				Core Barrel: N/A							
Boring Location: 279+00, 14.9 ft Rt.				Casing ID/OD: N/A				Water Level*: None Observed							
Hammer Efficiency Factor: 0.756				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
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 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = 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 Information							Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.				
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows								
0								271.35	▨	3" PAVEMENT.					
								270.60	▨	Brown, damp, Gravelly fine to coarse SAND, (Fill).					
	1D/A	24/18	1.00 - 3.00	2/3/3/4	6	8		270.10	▨	1D (1.0-1.5 ft) Brown, damp, loose, Gravelly fine to coarse SAND, little silt.					
									▨	1D/A (1.5-3.0 ft) Brown, moist, loose, Silty fine to medium SAND.					
5								266.60	▨	Olive, moist, medium dense, Silty fine to coarse SAND, little gravel, (Till).					
	2D	24/22	5.00 - 7.00	8/11/12/16	23	29		264.60	▨						
									▨	<b>Bottom of Exploration at 7.00 feet below ground surface.</b> NO REFUSAL					
10									▨						
15									▨						
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.

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS				<b>Project:</b> A 0.36 mile portion of Route 27 <b>Location:</b> Belgrade, Maine				<b>Boring No.:</b> HB-BEL-103 <b>WIN:</b> 18253.00							
<b>Driller:</b> MaineDOT				<b>Elevation (ft.):</b> 257.4				<b>Auger ID/OD:</b> 5" Dia.							
<b>Operator:</b> Enos/Giles				<b>Datum:</b> NAVD88				<b>Sampler:</b> Standard Split Spoon							
<b>Logged By:</b> B. Wilder				<b>Rig Type:</b> CME 45C				<b>Hammer Wt./Fall:</b> 140#/30"							
<b>Date Start/Finish:</b> 11/9/12-11/9/12				<b>Drilling Method:</b> Solid Stem Auger				<b>Core Barrel:</b> N/A							
<b>Boring Location:</b> 285+47, 6.5 ft Rt.				<b>Casing ID/OD:</b> N/A				<b>Water Level*:</b> None Observed							
<b>Hammer Efficiency Factor:</b> 0.756				<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
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 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = 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 Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.			
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows								
0	PC-2		0.00 - 0.42					SSA	256.98		5" PAVEMENT, core taken.				
	1D	24/19	1.00 - 3.00	7/11/9/7	20	25			253.40		Brown, damp, medium dense, fine to coarse SAND, some silt, little gravel, layer of old pavement.	G#266728 A-2-4, SM WC=7.7%			
5	2D	16.8/15	5.00 - 6.40	9/16/50(4.8")	---				251.00		Olive, moist, dense, fine to coarse SAND, some silt, some gravel, (Till).	G#266729 A-2-4, SM WC=10.7%			
											<b>Bottom of Exploration at 6.40 feet below ground surface. SPOON and AUGER REFUSAL</b>				

**Remarks:**

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS	<b>Project:</b> A 0.36 mile portion of Route 27  <b>Location:</b> Belgrade, Maine	<b>Boring No.:</b> HB-BEL-104  <b>WIN:</b> 18253.00
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<b>Driller:</b> MaineDOT	<b>Elevation (ft.):</b> 257.1	<b>Auger ID/OD:</b> 5" Dia.
<b>Operator:</b> Enos/Giles	<b>Datum:</b> NAVD88	<b>Sampler:</b> Standard Split Spoon
<b>Logged By:</b> B. Wilder	<b>Rig Type:</b> CME 45C	<b>Hammer Wt./Fall:</b> 140#/30"
<b>Date Start/Finish:</b> 11/9/12-11/9/12	<b>Drilling Method:</b> Solid Stem Auger	<b>Core Barrel:</b> N/A
<b>Boring Location:</b> 285+47, 13.1 ft Rt.	<b>Casing ID/OD:</b> N/A	<b>Water Level*:</b> None Observed

**Hammer Efficiency Factor:** 0.756      **Hammer Type:** Automatic     Hydraulic     Rope & Cathead

Definitions:      R = Rock Core Sample      S<sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)      T<sub>v</sub> = Pocket Torvane Shear Strength (psf)  
 D = Split Spoon Sample      SSA = Solid Stem Auger      S<sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf)      WC = Water Content, percent  
 MD = Unsuccessful Split Spoon Sample Attempt      HSA = Hollow Stem Auger      q<sub>p</sub> = Unconfined Compressive Strength (ksf)      LL = Liquid Limit  
 U = Thin Wall Tube Sample      RC = Roller Cone      N-uncorrected = Raw Field SPT N-value      PL = Plastic Limit  
 MU = Unsuccessful Thin Wall Tube Sample Attempt      WOH = Weight of 140lb. Hammer      Hammer Efficiency Factor = Rig Specific Annual Calibration Value      PI = Plasticity Index  
 V = Field Vane Shear Test,    PP = Pocket Penetrometer      WOR/C = Weight of Rods or Casing      N<sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency      G = Grain Size Analysis  
 MV = Unsuccessful Field Vane Shear Test Attempt      WO1P = Weight of One Person      N<sub>60</sub> = (Hammer Efficiency Factor/60%)\*N-uncorrected      C = Consolidation Test

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows					
0								256.85		3" PAVEMENT.		
	1D	24/19	1.00 - 3.00	4/7/4/6	11	14		256.10		Brown, damp, Gravelly fine to coarse SAND.	-0.25	
										Olive, moist, medium dense, Silty fine to medium SAND, some gravel.	1.00	
5	2D	24/12	5.00 - 7.00	4/6/5/9	11	14		252.10		Olive brown, moist, medium dense, Gravelly fine to coarse SAND, some silt, (Fill). Piece of black plastic on auger.	5.00	
								250.10		<b>Bottom of Exploration at 7.00 feet below ground surface. NO REFUSAL</b>	7.00	
10												
15												
20												
25												

**Remarks:**

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS				<b>Project:</b> A 0.36 mile portion of Route 27 <b>Location:</b> Belgrade, Maine				<b>Boring No.:</b> HB-BEL-105 <b>WIN:</b> 18253.00										
<b>Driller:</b> MaineDOT				<b>Elevation (ft.):</b> 251.0				<b>Auger ID/OD:</b> 5" Dia.										
<b>Operator:</b> Enos/Giles				<b>Datum:</b> NAVD88				<b>Sampler:</b> Standard Split Spoon										
<b>Logged By:</b> B. Wilder				<b>Rig Type:</b> CME 45C				<b>Hammer Wt./Fall:</b> 140#/30"										
<b>Date Start/Finish:</b> 11/9/12-11/9/12				<b>Drilling Method:</b> Solid Stem Auger				<b>Core Barrel:</b> N/A										
<b>Boring Location:</b> 294+82, 6.6 ft Rt.				<b>Casing ID/OD:</b> N/A				<b>Water Level*:</b> None Observed										
<b>Hammer Efficiency Factor:</b> 0.756				<b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>														
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 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = 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.)	<b>Sample Information</b>										Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.				
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N <sub>60</sub>	Casing Blows											
	0														250.67		4" PAVEMENT, core taken.	
	1D	24/18	1.00 - 3.00	23/18/15/15	33	42											Brown, damp, dense, fine to coarse SAND, some gravel, little silt.	G#266730 A-1-b, SW-SM WC=2.5%
	5														246.20		Cobble from 4.8-5.1 ft bgs. Brown, damp, dense, Sandy GRAVEL, little silt. (Fill).	G#266731 A-1-a, GW-GM WC=3.4%
	2D	24/5	5.00 - 7.00	20/16/11/17	27	34												
	10														243.50		Olive brown, wet, medium dense, Silty fine to medium SAND.	
	3D	24/23	10.00 - 12.00	5/9/9/9	18	23												
	12.00														239.00		<b>Bottom of Exploration at 12.00 feet below ground surface.</b> NO REFUSAL	
	15																	
	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.

<b>Maine Department of Transportation</b> Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: A 0.36 mile portion of Route 27 Location: Belgrade, Maine				Boring No.: HB-BEL-106 WIN: 18253.00							
Driller: MaineDOT				Elevation (ft.): 250.7				Auger ID/OD: 5" Dia.							
Operator: Enos/Giles				Datum: NAVD88				Sampler: Standard Split Spoon							
Logged By: B. Wilder				Rig Type: CME 45C				Hammer Wt./Fall: 140#/30"							
Date Start/Finish: 11/9/12-11/9/12				Drilling Method: Solid Stem Auger				Core Barrel: N/A							
Boring Location: 294+82, 15.7 ft Rt.				Casing ID/OD: N/A				Water Level*: None Observed							
Hammer Efficiency Factor: 0.756				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
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 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf) S <sub>u(lab)</sub> = Lab Vane Undrained Shear Strength (psf) q <sub>p</sub> = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected				T <sub>v</sub> = 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 Information							Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.				
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in. Shear Strength (psf) or RQD (%))	N-uncorrected	N <sub>60</sub>	Casing Blows								
0							SSA	250.45		3" PAVEMENT.					
	1D	24/20	1.00 - 3.00	22/16/12/20	28	35					Brown, moist, dense, Gravelly fine to coarse SAND, little silt.	-0.25			
5								245.70		Grey, wet, stiff, SILT, some fine to medium sand, trace clay.	5.00				
	2D	24/18	5.00 - 7.00	7/8/4/5	12	15		243.70		<b>Bottom of Exploration at 7.00 feet below ground surface. NO REFUSAL</b>	7.00				
10															
15															
20															
25															

**Remarks:**

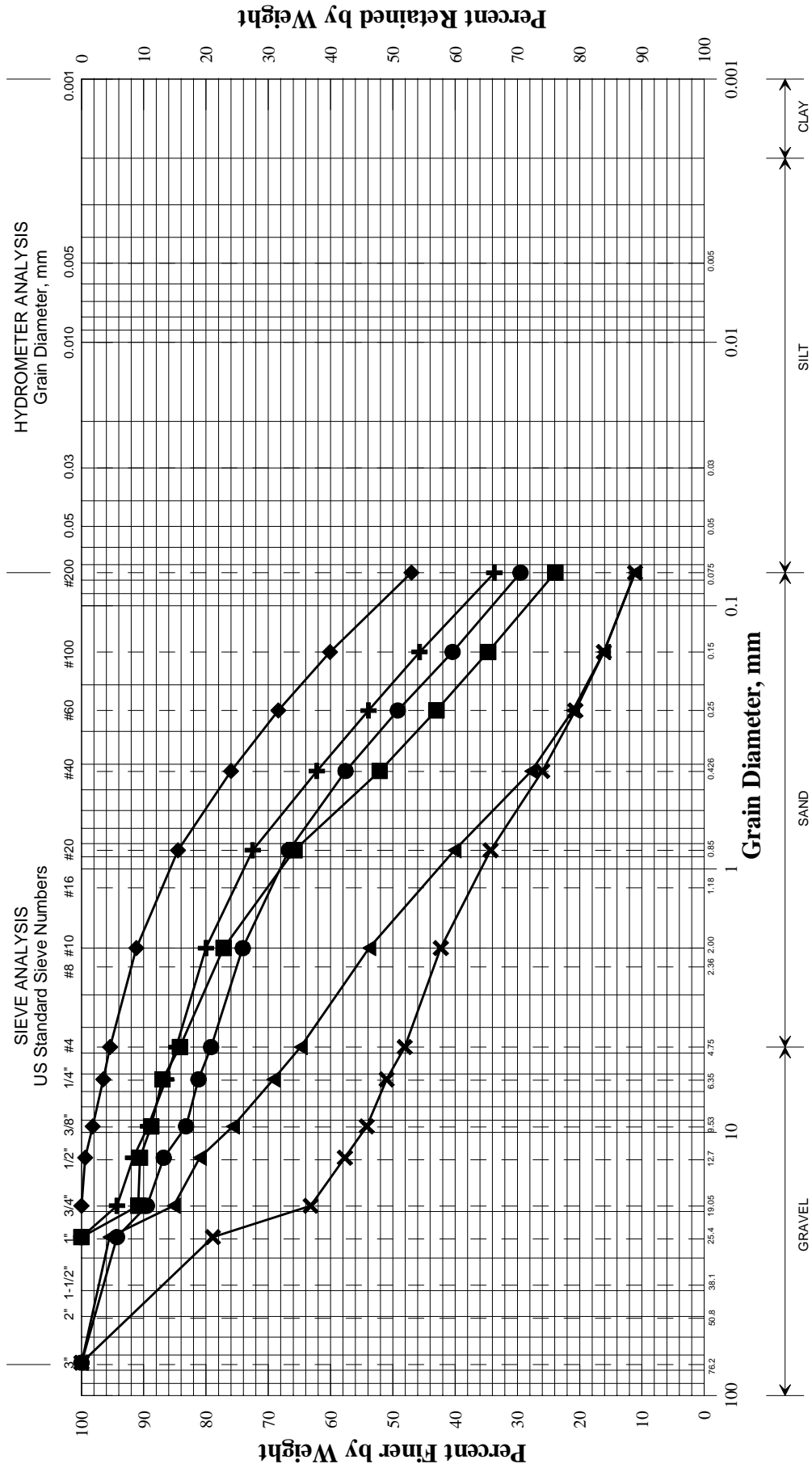
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.  
 \* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

## **Appendix B**

Laboratory Test Results



State of Maine Department of Transportation  
GRAIN SIZE DISTRIBUTION CURVE



UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+ HB-BEL-101/1D	279+04	6.7 RT	1.0-3.0	SAND, some silt, little gravel.	10.7			
◆ HB-BEL-101/2D	279+04	6.7 RT	5.0-7.0	Silty SAND, trace gravel.	10.8			
■ HB-BEL-103/1D	285+47	6.5 RT	1.0-3.0	SAND, some silt, little gravel.	7.7			
● HB-BEL-103/2D	285+47	6.5 RT	5.0-6.4	SAND, some silt, some gravel.	10.7			
▲ HB-BEL-105/1D	294+82	6.6 RT	1.0-3.0	SAND, some gravel, little silt.	2.5			
× HB-BEL-105/2D	294+82	6.6 RT	5.0-7.0	Sandy GRAVEL, little silt.	3.4			

WIN	018253.00
Town	Belgrade, Rome
Reported by/Date	WHITE, TERRY A 11/28/2012