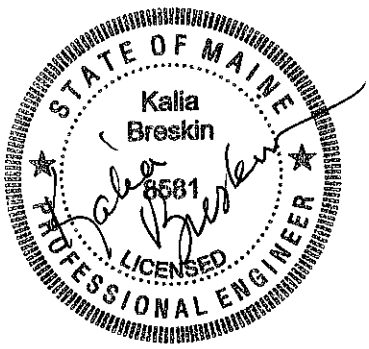
MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY/BRIDGE PROGRAM
GEOTECHNICAL SECTION
AUGUSTA, MAINE

GEOTECHNICAL DESIGN REPORT

For the Construction of:

LARGE CULVERT REPLACEMENT
LOGGIN ROAD (ROUTE 139)
WINTERPORT, MAINE

Prepared by:
Kalia Breskin, P.E.
Senior Geotechnical Engineer



Waldo County
WIN 19255.00

Soils Report No. 2013-127

August 26, 2013

GEOTECHNICAL DESIGN SUMMARY

The purpose of this report is to present subsurface information and make geotechnical recommendations for the replacement of a five-foot diameter culvert which carries an unnamed tributary under Loggin Road (Route 139) in Winterport. Loggin Road is a Priority 4 Highway Corridor. The proposed replacement structure will be six-foot diameter concrete pipe culvert. No changes to the horizontal or vertical alignment of the roadway are proposed, but the pavement structure will be widened to match the surrounding lane and shoulder widths. The new structure will be 80-feet wide with eleven foot lanes and four foot shoulders. Side slopes at the culvert ends will be riprap covered, with a maximum slope of 1H:1V.

Subsurface Investigation – One boring and two probes were drilled for this project on December 20, 2012 by the MaineDOT drill crew. One boring was drilled using a solid stem auger with Standard Penetration Tests and split-spoon sampling in a cased wash-boring. An additional two probes were drilled using solid stem augers to investigate depth to bedrock. Two borings were extended to depths well below the culvert invert. One boring was stopped at a depth of 11.6 feet below ground surface (bgs) by refusal on a boulder. All borings were located in the field using a tape during the exploration program. All boring logs are included in this report as Appendix A – Boring Logs.

Subsurface Conditions – Subsurface conditions found in the boring included a layer of fill soils overlying layers of native soils.

> Fill – Fill soils consisted of brown, moist, silty fine to coarse sand. The Fill thickness was approximately 9-feet in boring SB-WIN-101. The corrected Standard Penetration Test (SPT) N-value in the fill was 5 blows per foot, which indicates that the fill is loose.
>
> Native Soils – Native sandy soils was encountered beneath the fill in boring SB-SEB-101 below elevation 21-feet. Native soils in this boring consist of olive-gray to gray, moist to wet silty fine to coarse sand with little silt. Densities varied, with corrected SPT N-values of 35, 56, 32 and 60 indicating medium dense to dense soils. No refusal was encountered in this boring. A boulder refusal was encountered at a depth of 11.6-feet bgs in SB-WIN 102, and SB-WIN-102A was extended to a depth of 20-feet bgs with no refusal encountered.
>
> Groundwater – Groundwater was observed at a depth of 7.5 feet bgs in boring SB-WIN-101. This was at approximate streambed elevation. Groundwater levels surrounding the stream may fluctuate seasonally depending on precipitation.

Existing Pavement Structure – No borings were done in the travel lanes, however the shoulder was covered with 2-inches of Hot Mix Asphalt. No difference was observed between the subbase gravel and the fill in a sample taken from 1-foot to 3-feet bgs in SB-WIN-101. No laboratory testing was done on this soil.

Scour and Riprap – Plain riprap inlet and outlet aprons shall be constructed to minimize future scour at this structure. Riprap conforming to Standard Specifications 610 and 703 shall be placed at as flat a slope as is practicable at this site.

Construction Considerations – If large boulders are encountered within the construction limits for this project, the boulders must be removed and the excavation backfilled with granular borrow or soils from the surrounding excavation, similar to soils at the same depth within the excavation. Very large stones should not be used as part of the backfill for this construction. If pockets of silt exist within the native soils, the soils could become difficult to work with when wet. Surface water should be controlled to allow the Contractor to maintain the integrity of excavated slopes during construction.

Attachments

Sheets

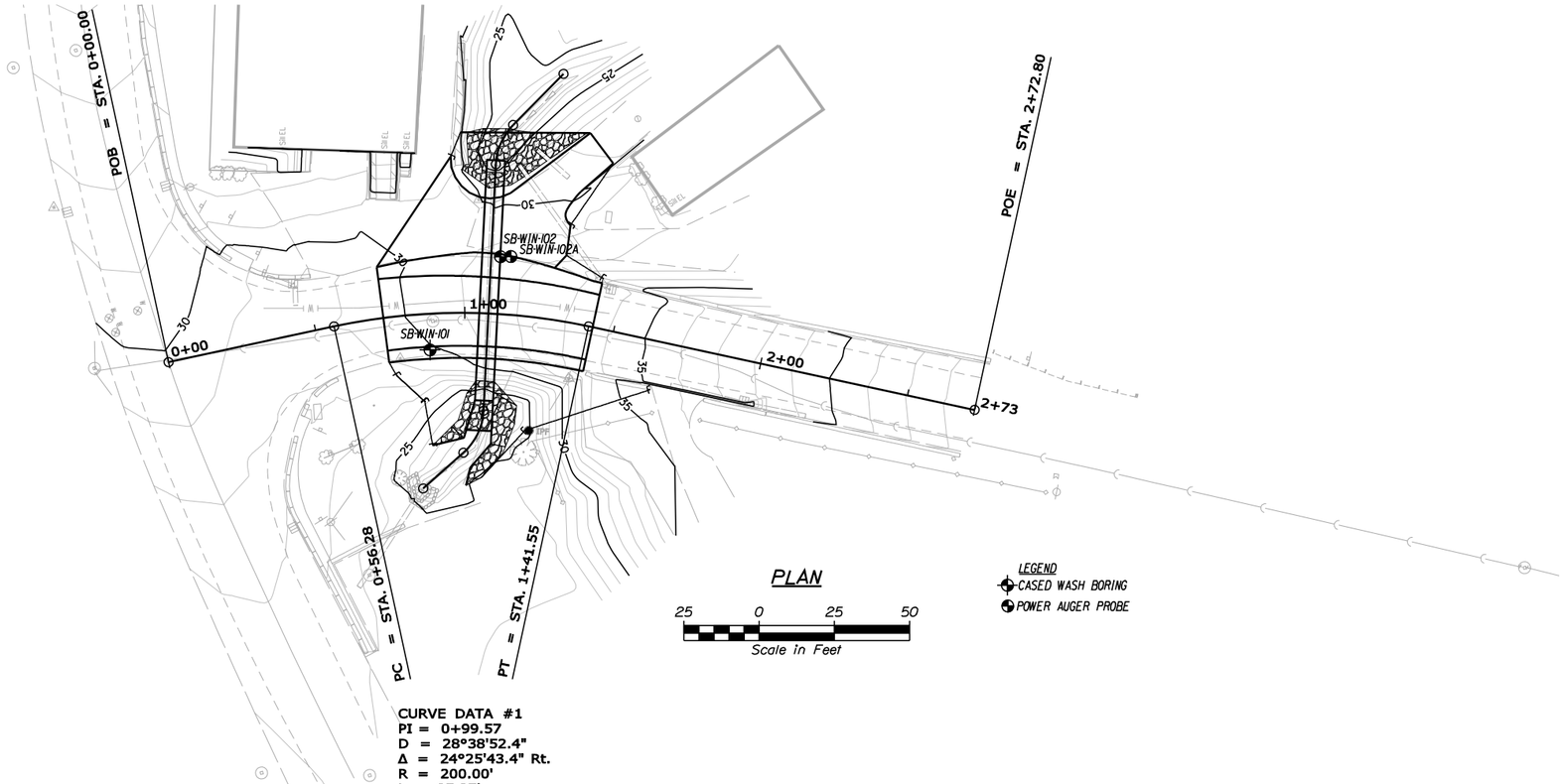
Sheet 1 - Location Map
Sheet 2 – GeoPlan and Cross Section

Appendices

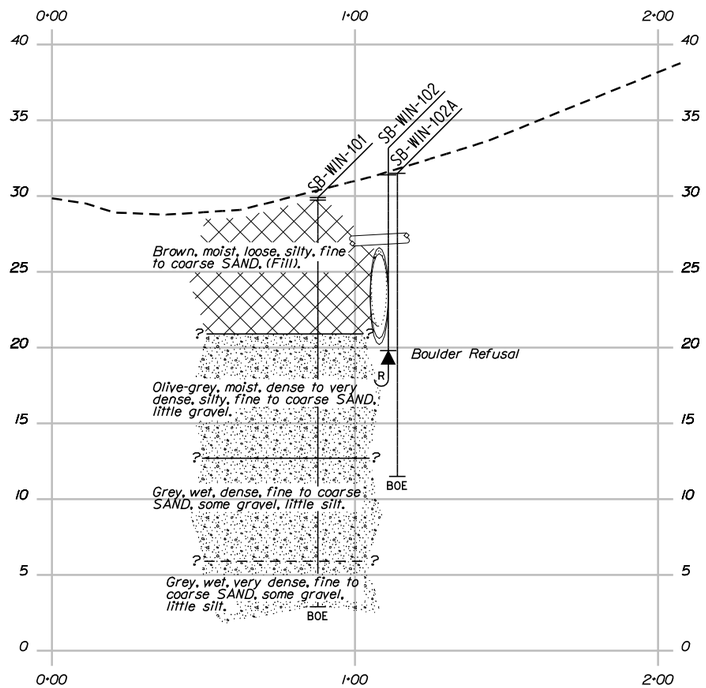
Appendix A - Boring Logs

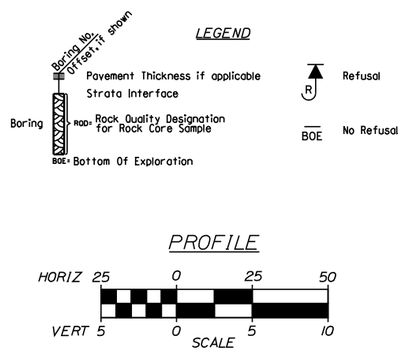
Location Map
Route 139 Strut Replacement
Winterport, Maine
Waldo County
WIN 19255.00
USGS 7.5' Series Topographic
Hampden Quadrangle
DeLORME Map 23 Grid D1

Map Scale 1:24000



CURVE DATA #1
PI = 0+99.57
D = 28°38'52.4"
Δ = 24°25'43.4" Rt.
R = 200.00'
L = 85.27'
T = 43.29'
E = 4.63'





Note: This generalized interpretive soil profile is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and have been developed by interpretations of widely spaced explorations and samples. Actual soil transitions may vary and are probably more erratic. For more specific information refer to the exploration logs.

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

019255.00

WIN
19255.00

HIGHWAY PLANS

	BY	DATE
PROJ. MANAGER	S. SMITH	
DESIGN-DETAILED	S.Paul	------
CHECKED-REVIEWED	------	------
DESIGN2-DETAILED2	K.BRESKIN	AUG 2013
DESIGN3-DETAILED3	T.WHITE	------
REVISIONS 1	------	------
REVISIONS 2	------	------
REVISIONS 3	------	------
REVISIONS 4	------	------
FIELD CHANGES	------	------

SIGNATURE

P.E. NUMBER

DATE

WINTERPORT
ROUTE 139 STRUT

GEOPLANS & INTERPRETIVE SUBSURFACE PROFILE

SHEET NUMBER

2

OF 3

Filename: ...\MSTA\001_Geoplan&ISP1.dgn Division: GEOTECH Username: kitty.breskin Date:9/12/2013

Appendix A
Boring Logs

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 139 Strut
Location: Winterport, Maine

Boring No.: SB-WIN-101
WIN: 19255.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Solid Stem
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:	12/20/12; 08:30-13:00	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	N/A
Boring Location:		**Casing ID/OD:**	NW	**Water Level*:**	7.5 ft bgs.

Definitions:
D = Split Spoon Sample S = Sample off Auger Flight
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
R = Rock Core Sample
V = Insitu Vane Shear Test
SSA = Solid Stem Auger

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WOH = weight of 140lb. hammer
WOR = weight of rods WOC = weight of casing

Definitions:
WC = water content, percent ≅ = Similar or Equal too
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-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	S1		0.17 - 2.10			SSA	-0.17		2" PAVEMENT.	
							0.17		No description given, (Fill).	
							-2.10			
							2.10			
5	1D	24/16	5.00 - 7.00	WOH/2/3/4	5				Brown, moist, loose, silty, fine to coarse SAND, (Fill).	
							-9.00			
							9.00			
10	2D	24/18	10.00 - 12.00	11/17/18/18	35	39			Olive-grey, moist, dense, silty, fine to coarse SAND, little gravel.	
						52				
						26				
						63				
						58				
15	3D	24/16	15.00 - 17.00	11/18/38/34	56	26			Similar to above, except very dense.	
						25				
						64	-17.20			
						85	17.20			
						103				
20	4D	24/17	20.00 - 22.00	10/16/16/11	32	40			Grey, wet, dense, fine to coarse SAND, some gravel, little silt.	
						54				
						98				
						83				
						137	-24.00			
25							24.00			

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.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 139 Strut
Location: Winterport, Maine

Boring No.: SB-WIN-101
WIN: 19255.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Solid Stem
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:	12/20/12; 08:30-13:00	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	N/A
Boring Location:		**Casing ID/OD:**	NW	**Water Level*:**	7.5 ft bgs.

Definitions:
D = Split Spoon Sample S = Sample off Auger Flight
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
R = Rock Core Sample
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SSA = Solid Stem Auger

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WOH = weight of 140lb. hammer
WOR = weight of rods WOC = weight of casing

Definitions:
WC = water content, percent ≅ = Similar or Equal too
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	5D	24/16	25.00 - 27.00	20/24/36/49	60				Grey, wet, very dense, fine to coarse SAND, some gravel, little silt.	
							-27.00		27.00	
									Bottom of Exploration at 27.00 feet below ground surface. 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.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 139 Strut
Location: Winterport, Maine

Boring No.: SB-WIN-102
WIN: 19255.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Enos/Giles	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	12/20/12-12/20/2012	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:		**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample S = Sample off Auger Flight
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
R = Rock Core Sample
V = Insitu Vane Shear Test
SSA = Solid Stem Auger

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WOH = weight of 140lb. hammer
WOR = weight of rods WOC = weight of casing

Definitions:
WC = water content, percent ≅ = Similar or Equal too
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA				
5										
10										
							-11.60		**Bottom of Exploration at 11.60 feet below ground surface.** BOULDER REFUSAL	
15									11.60	
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.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 139 Strut
Location: Winterport, Maine

Boring No.: SB-WIN-102A
WIN: 19255.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Enos/Giles	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	12/20/12-12/20/2012	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:		**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample S = Sample off Auger Flight
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
R = Rock Core Sample
V = Insitu Vane Shear Test
SSA = Solid Stem Auger

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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Definitions:
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LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA				
5										
10										
15										
20							-20.00		**Bottom of Exploration at 20.00 feet below ground surface.** NO REFUSAL	
25										

20.00

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.