Maine Department of Transportation
Highway Program

GEOTECHNICAL SERIES 100 REPORT
Highway Reconstruction
Cummings Road (INV RD 0580397)
South Portland, Maine

Prepared by:
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Cumberland County

Soils Report No. 2012-130

WIN 19091.00
AC-STP-1909(100)X
August 8, 2012

Map Scale 1:24000

MaineDOT

Highway Program

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Memorandum

To: Ernie Martin
From: Karen Gross
Date: 10/04/11
Subject: South Portland, Cummings Rd.
WIN 19091.00

The preliminary investigations for the Cummings Road project have been completed. The following is my assessment of the existing roadway pavement materials and recommendations for the pavement design and construction. The current scope of this project is to rehabilitate this section of roadway to improve mobility, safety, and ride quality.

Existing Conditions

Cummings Road (INV RD 0580397) is located in South Portland and is classified as a minor arterial. The project begins at the intersection with Running Hill Road and extends 0.73 miles to the north to the Westbrook town line. Traffic volumes are considered high with the current AADT of 17,040 vehicles per day, with approximately 680 heavy trucks per day.

A site visit was done in the summer to observe existing roadway, pavement, and drainage conditions. The existing pavement has been overlayed with a maintenance surface treatment, therefore pavement surface distress was not visible at that time. Pavement management data indicates that this roadway had moderate to severe pavement distress with a poor ride quality prior to the overlay. Longitudinal and transverse cracking was prevalent and the major distress was rutting it the right wheel path in both directions.

Wetlands exist along both sides of the roadway for most of the project length, with the largest area located between the north and south entrances of Gannett Drive. The roadway visually appears to be at the same elevation as the wetland at this location. Adjacent parking lots in the Gannett Drive area are showing signs of settlement with depressions and cracking prevalent throughout.

Shoulders are variable in width and unpaved throughout most of the project. Based on the roadway condition prior to the maintenance overlay and the unpaved shoulders, I am assuming the roadway is constructed as a full width box section with no drainage provisions for the pavement structure (a “bathtub” section).

Subsurface Investigations and Assessment

Twelve solid stem auger borings were completed in the roadway with the purpose of collecting existing pavement material types and thicknesses and depth to groundwater or wet soils. Borings were staggered between the northbound and southbound lanes. Locations are reported in reference to utility pole locations since design stationing is not available at this time.

Hot Mix Asphalt

The existing HMA ranges from 5” to 11” in thickness. A layer of deteriorated asphalt was encountered at the bottom of the HMA at some locations.

Subbase/Base Gravel

The existing subbase gravel ranges from 12” to 39” in thickness. A buried roadway was encountered at several locations at approximately 3’ below the existing surface. This old roadway appeared to be a material known as penetrated gravel that was used predominately in the 1950’s. It is approximately 6” in

thickness as indicated in the borings, but augering through this material can make it difficult to measure because it is easily pulverized. In almost all cases, this old penetrate gravel was placed on the subgrade. It could have been placed as a subgrade stabilizer also.

Five representative subbase samples were tested to determine the grain size distribution. All the samples tested were similar enough to say that the existing subbase is all the same material. This material exceeds the requirements of the percentage passing the #200 sieve and therefore does not meet MaineDOT specifications for subbase or base gravel.

Subgrade

The existing subgrade consists predominately of a weathered marine CLAY-SILT. This type of subgrade offers poor pavement structure support especially when wet. It also is moderately frost susceptible with the detrimental effects mainly occurring during the spring thaw when the subgrade is wet from melting ice lenses. The appropriate subgrade resilient modulus value to use for the pavement design is 3700 psi.

Refusal was encountered at Pole #32 close to the north entrance of Gannett Road. The road rises here, so I am assuming it is a knob of bedrock in this area.

Groundwater

Groundwater was encountered at 4.0' below the surface at Pole #18 which is in the wetland area between the Gannett Drive entrances. This water level was measured during the drilling process so does not reflect a stable groundwater level. We soil samples were also encountered in this general area indicating that there is water within the pavement structure.

Recommendations

The following is a list of my preliminary recommendations. These recommendations do not consider changes of the alignments that may be necessary to meet safety requirements.

- The existing roadway gravel does not meet MaineDOT gravel specification requirements and therefore should be removed and replaced with new subbase material that meets those requirements. This would require full construction for the entire project.

- There is currently no positive drainage of the pavement structure. Underdrain or ditching should be used on the entire project length to ensure positive drainage and improve pavement performance in all seasons.

- Shallow bedrock was encountered in a boring at the northern Gannett Drive entrance. Bedrock probes should be done in this area if excavation will be required for drainage structures or alignment changes.

- To improve long term pavement performance, the section of roadway between the Gannett Drive entrances (wetland area) should come up in elevation to ensure positive drainage of the pavement structure.

- If budget is the driving factor for the scope of this project, Full Depth Recycling with a stabilizer added would be an appropriate treatment for this roadway location. This process works well with a "dirtier" underlying material, but requires little change to the vertical alignment since this treatment is done in-place. FDR with foamed asphalt or cement are two processes currently used by MaineDOT. There is a sufficient quantity/thickness of HMA to stabilize 6". This process also allows the existing HMA to remaining place longer thus minimizing the maintenance of traffic needs for the contractor during construction. This alone might lower the price of this process since there is a large volume of commuter traffic on this road.

- If FDR with a stabilizer is considered for this project, boxing out the existing shoulders and placing well draining subbase or base material will be essential for FDR performance. The box

section should extend into the existing roadway core to ensure all unsuitable shoulder material is removed.

- If FDR with stabilizer is considered for this project, the pre-stabilized reclaimed material in the wetland area will need to be picked up and stockpiled prior to the addition of any new subbase gravel. It will then need to be brought back and placed, shaped, and graded prior to the FDR stabilization process.

- The pavement structure design that meets the requirements of a 12-year design life and considers the in-place gravel is 3" of HMA over 6" of FDR w/stabilizer. The total shoulder box out depth should be 28" to match the pavement structure design and reduce differential frost heaving of the shoulder.

Please let me know if I can clarify anything in this memo or if I can provide you with any additional information. All supporting information is attached for your reference and records.

Attachments
Boring Summary Sheet
Boring Logs
Lab Testing Summary Sheet
Grain Size Distribution Curves
Darwin Pavement Design Report
Traffic Data
Soil Support Chart
Resilient Modulus Chart
Project e-mails

BORING SUMMARY (Preliminary)
Cummings Road, 19091.00

Boring No.	Design Station	Offset (ft)*	Exploration Depth (ft)	Refusal Depth (ft)	Depth to water (ft)	Pavement Thickness				Subbase Classification (USCS & AASHTO)	Subgrade Type	Comments
						HMA (in)	Unbound (in)	Subbase (in)	Total (in)			
HB-SOPO-101	Pole 41	4 L	5.0			7		31.4	38.4	A-1-b/SM	CLAY-SILT	old roadway 3.2' to 3.8'
HB-SOPO-102	Pole 39	7 R	5.0			6		28.8	34.8		CLAY-SILT	
HB-SOPO-103	Pole 16	9 L	5.0			7		32.6	39.6		CLAY-SILT	old roadway 3.3' to 3.8'
HB-SOPO-104	Pole 18	8.5 R	5.0		4.0	6.5		16.3	22.8	A-1-b/SM	CLAY-SILT	
HB-SOPO-105	Pole 35	9 L	5.0		WET SOILS @ 0.58	5	2	32.6	39.6		CLAY-SILT	old roadway 3.3' to 3.9'
HB-SOPO-106	Pole 33	9.5 R	5.0			7		30.2	37.2		SAND, silt, gravel	
HB-SOPO-107	Pole 32	7.5 L	4.5	4.5	WET SOILS @ 3.1	7		30.2	37.2	A-1-b/SM	CLAY-SILT	
HB-SOPO-108	Pole 30	9.5 R	5.0			10		22.4	32.4		CLAY-SILT	old roadway 2.7' to 3.0'
HB-SOPO-109	Pole 28	8.5 L	5.0			11		19.0	30.0		CLAY-SILT	old roadway 0.92' to 2.5'
HB-SOPO-110	Pole 26	8.0 R	5.0			6		12.0	18.0	A-1-b/SM	CLAY-SILT	old roadway 1.7' to 2.7'
HB-SOPO-111	Pole 25	9.0 L	5.0			7.5	2.5	22.4	32.4	A-1-b/SM	CLAY-SILT	
HB-SOPO-112	Pole 23	8.0 R	5.0			7		17.0	24.0		CLAY-SILT	

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-101, B1
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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
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		0.58 - 3.20			SSA	-0.58		7" PAVEMENT.	
							0.58		Brown, damp, fine to coarse SAND, some gravel, little silt.	G#239989 A-1-b, SM WC=4.3%
	S2		3.80 - 5.00				-3.20		3.20	
							-3.80		Old Roadway layer.	
5							-5.00		3.80 Olive, moist, clayey-SILT, trace fine sand. 5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 41
Offsets are from Existing Roadway CL.

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: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-102, B2
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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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
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	S3		0.50 - 2.90			SSA	-0.50		6" PAVEMENT.	
									0.50	
									Brown, moist, fine to coarse SAND, little gravel, trace silt.	
	S4		2.90 - 5.00							
							-2.90		2.90	
									Olive-brown, moist, clayey-SILT, little fine sand, trace organics.	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 39
Offsets are from Existing Roadway CL.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-103, B3
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	9.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
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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
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	-0.58		7" PAVEMENT.	
									0.58	
									Brown, moist, fine to coarse SAND, little gravel, trace silt. ≅S5	
							-3.30		3.30	
							-3.80		Old Roadway layer.	
									3.80	
5							-5.00		Olive-brown, moist, clayey-SILT, little fine sand, trace organics. ≅S4	
									5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 16
Offsets are from Existing Roadway CL.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-104, B4
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	8.5 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	4.0 ft bgs.

Definitions:
D = Split Spoon Sample
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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
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	S5		0.54 - 1.90			SSA	-0.54		6½" PAVEMENT.	
									0.54	
	S6		1.90 - 5.00						Brown, wet, fine to coarse SAND, little gravel, little silt.	G#239990 A-1-b, SM WC=7.4%
							-1.90		1.90	
									Olive-brown, wet, clayey-SILT, trace fine sand, trace organics.	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 18
Offsets are from Existing Roadway CL.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-105, B5
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	9.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
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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
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						SSA	-0.42		5" PAVEMENT.	
							-0.58		0.42	
									2" Unbound PAVEMENT.	
									0.58	
									Brown, wet, fine to coarse SAND, little gravel. ≅S5	
							-3.30		3.30	
							-3.90		Old Roadway layer.	
									3.90	
5							-5.00		Olive-brown, wet, clayey-SILT, trace fine sand, trace organics. ≅S6	
									5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 35
Offsets are from Existing Roadway CL.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-106, B6
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	9.5 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
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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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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	S7		0.58 - 3.10			SSA	-0.58		7" PAVEMENT.	
							0.58		Brown, damp, fine to coarse SAND, little gravel, trace silt.	
	S8		3.10 - 5.00				-3.10		Olive, moist, clayey-SILT, trace fine sand.	
5							-5.00		**Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 33
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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-107, B7
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7.5 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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U = Thin Wall Tube Sample
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V = Insitu Vane Shear Test
SSA = Solid Stem Auger

Definitions:
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T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
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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	S9		0.58 - 3.10			SSA	-0.58		7" PAVEMENT.	
							0.58		Brown, damp, fine to coarse SAND, little silt, little gravel.	G#239991 A-1-b, SM WC=6.2%
	S10		3.10 - 4.50				-3.10		Brown, wet, fine to medium SAND, some silt, little gravel.	G#239992 A-2-4, SM WC=10.9%
5							-4.50		**Bottom of Exploration at 4.50 feet below ground surface.** REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 32
Offsets are from Existing Roadway CL.

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: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-108, B8
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	9.5 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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
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						SSA	-0.83		10" PAVEMENT.	
							0.83		Brown, damp, fine to coarse SAND. ≅S9	
	S11		2.70 - 3.00				-2.70			
	S12		3.00 - 5.00				-3.00		Old Roadway layer.	G#239994 A-4, ML WC=26.1%
							3.00		Olive-brown, moist, SILT, trace sand, trace gravel.	
5							-5.00		**Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10							5.00			
15										
20										
25										

Remarks:

Pole 30
Offsets are from Existing Roadway CL.

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: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-109, B9
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	8.5 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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
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	-0.92		11" PAVEMENT.	
									0.92 Old Roadway layer. ≅S11	
							-2.50		2.50 Olive, moist, clayey-SILT, trace fine sand. ≅S8	
5							-5.00		5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 28
Offsets are from Existing Roadway CL.

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: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-110,
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	8.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

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	S13		0.71 - 1.70			SSA	-0.50		6" PAVEMENT. 0.50	G#239993 A-1-b, SM WC=5.2%
							-0.71		2½" Unbound PAVEMENT. 0.71	
							-1.70		Brown, damp, fine to coarse SAND, some gravel, little silt. 1.70	
	S14		2.70 - 5.00				-2.70		Old Roadway layer. 2.70	
									Olive, moist, clayey-SILT, trace fine sand.	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 26
Offsets are from Existing Roadway CL

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: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-111,
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	9.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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
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	S15		0.63 - 2.50			SSA	-0.63		7½" PAVEMENT.	
							0.63		Brown, damp, fine to coarse SAND, little gravel, little silt.	G#239995 A-1-b, SM WC=7.3%
							-2.50		Olive, moist, clayey-SILT, trace fine sand. ≅S14	
5							2.50			
							-5.00			
							5.00		**Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 25
Offsets are from Existing Roadway CL.

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: Highway Reconstruction for a portion of Cummings Road
Location: South Portland, Maine

Boring No.: HB-SOPO-112,
PIN: 19091.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	8/25/11-8/25/11	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	8.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Split Spoon Sample
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
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	-0.58		7" PAVEMENT.	
									Brown, damp, fine to coarse SAND, some gravel, trace silt. ≅S15	
							-2.00		Olive, moist, clayey-SILT, trace fine sand. ≅S14	
5							-5.00		**Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Pole 23
Offsets are from Existing Roadway CL.

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

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Boring No.: HB-SOPO-112, B12

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): South Portland Work Number: 19091.00

Boring & Sample Identification Number	Station (Feet)	Offset (Feet)	Depth (Feet)	Reference Number	G.S.D.C. Sheet	W.C. %	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
HB-SOPO-101, S1		4.0 Lt.	0.58-3.2	239989	1	4.3			SM	A-1-b	II
HB-SOPO-104, S5		8.5 Rt.	0.54-1.9	239990	1	7.4			SM	A-1-b	II
HB-SOPO-107, S9		7.5 Lt.	0.58-3.1	239991	1	6.2			SM	A-1-b	II
HB-SOPO-107, S10		7.5 Lt.	3.1-4.5	239992	1	10.9			SM	A-2-4	II
HB-SOPO-108, S12		9.5 Rt.	3.0-5.0	239994	2	26.1			ML	A-4	IV
HB-SOPO-110, S13		8.0 Rt.	0.71-1.7	239993	2	5.2			SM	A-1-b	II
HB-SOPO-111, S15		9.0 Lt.	0.63-2.5	239995	2	7.3			SM	A-1-b	II

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MaineDOT and Corps of Engineers Classification Systems.

GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

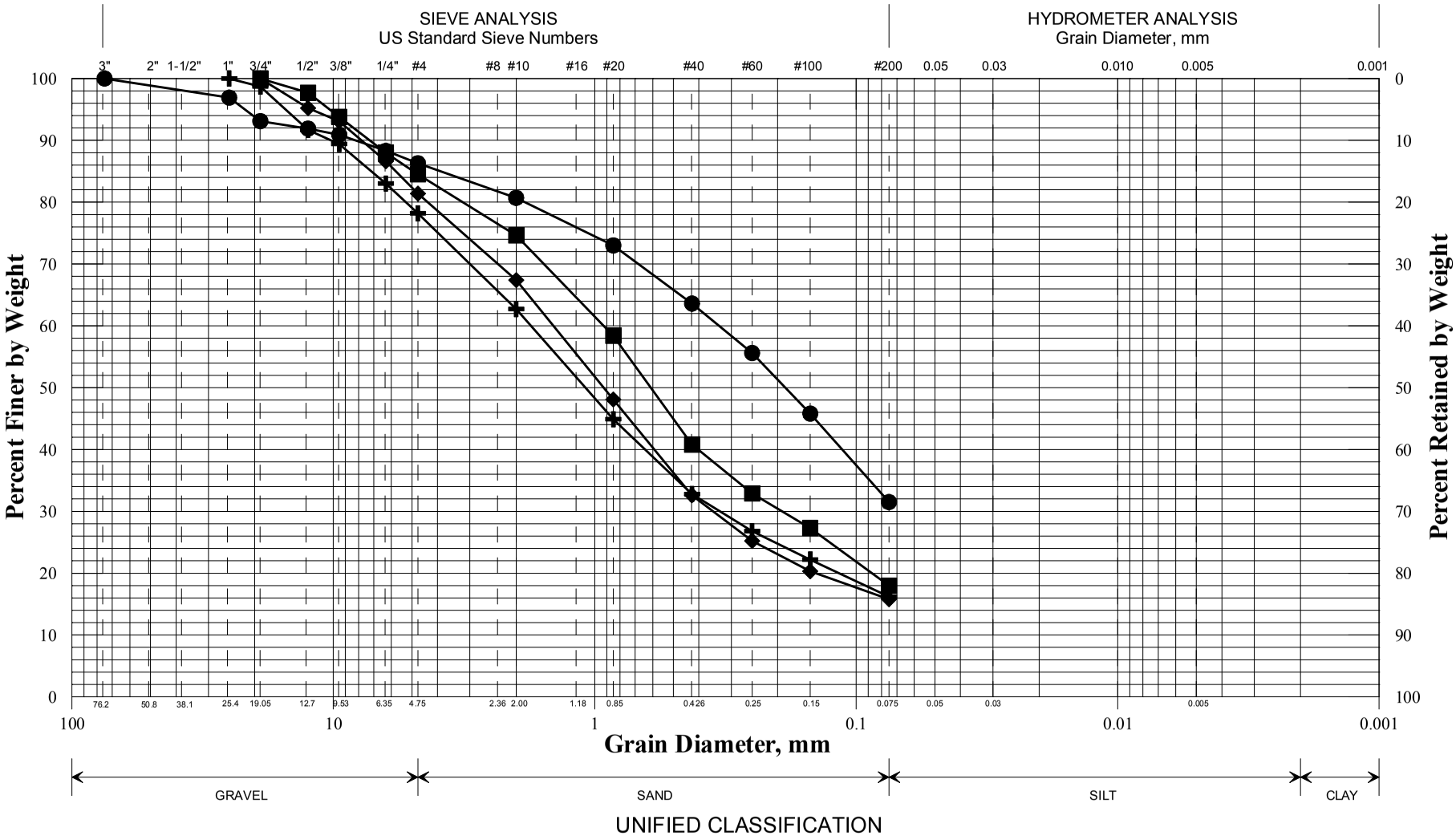
WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

State of Maine Department of Transportation

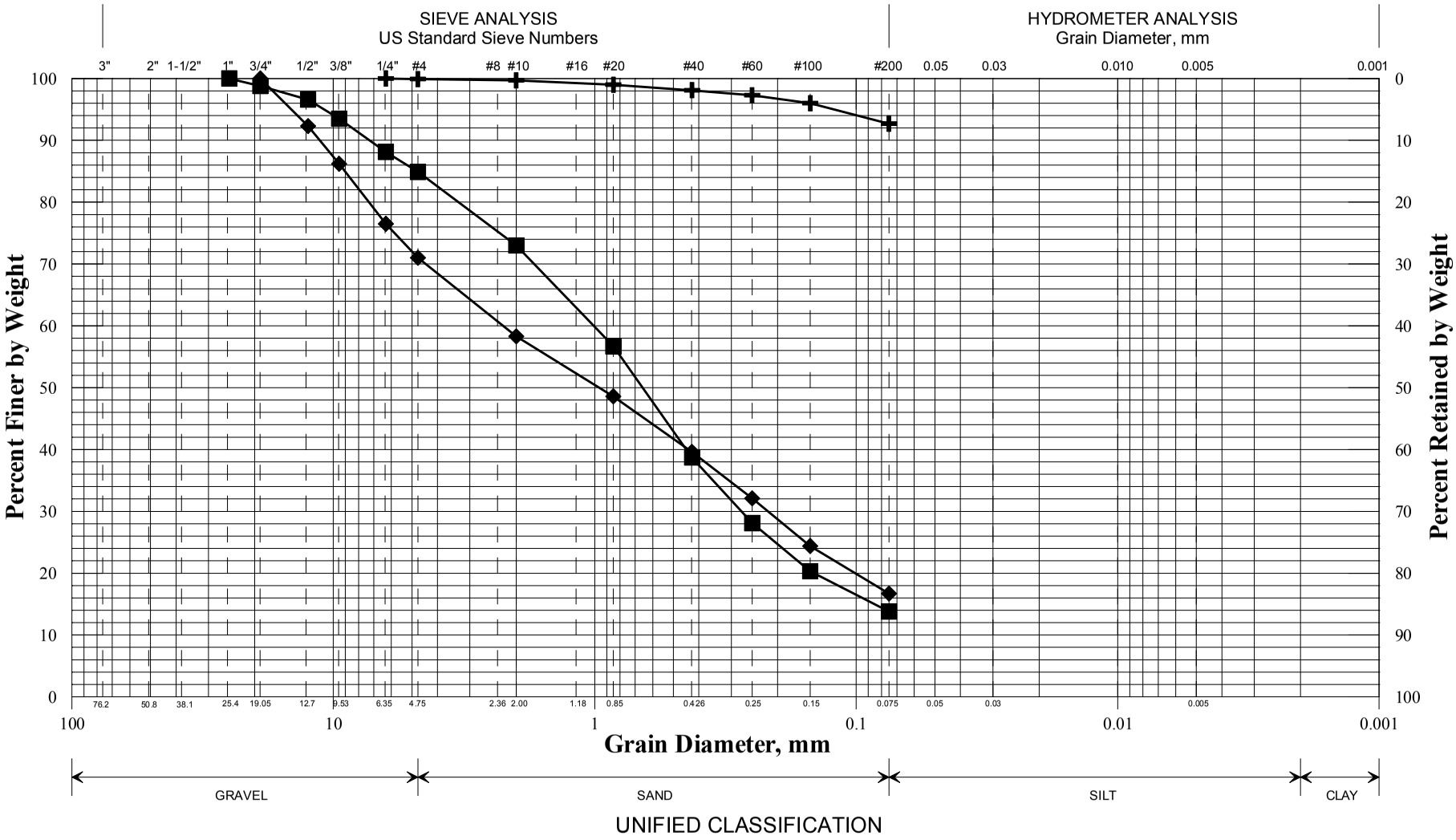
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-SOPO-101/S1	POLE 41	4.0 LT	0.58-3.2	SAND, some gravel, little silt.	4.3			
◆	HB-SOPO-104/S5	POLE 18	8.5 RT	0.54-1.9	SAND, little gravel, little silt.	7.4			
■	HB-SOPO-107/S9	POLE 32	7.5 LT	0.58-3.1	SAND, little silt, little gravel.	6.2			
●	HB-SOPO-107/S10	pole 32	7.5 LT	3.1-4.5	SAND, some silt, little gravel.	10.9			
▲									
✖									

WIN
019091.00
Town
South Portland, Westbrook
Reported by/Date
WHITE, TERRY A 9/12/2011

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-SOPO-108/S12	POLE 30	9.5 RT	3.0-5.0	SILT, trace sand, trace gravel.	26.1			
◆	HB-SOPO-110/S13	POLE 26	8.0 RT	0.71-1.7	SAND, some gravel, little silt.	5.2			
■	HB-SOPO-111/S15	POLE 25	9.0 LT	0.63-2.5	SAND, little gravel, little silt.	7.3			
●									
▲									
✕									

WIN
019091.00
Town
South Portland, Westbrook
Reported by/Date
WHITE, TERRY A 9/12/2011

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product
State of Maine

Flexible Structural Design Module

Cummings Rd, INV RD 0580397
South Portland
WIN 19091.00

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,550,520
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	3,700 psi
Stage Construction	1
Calculated Design Structural Number	4.59 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	HMA	0.44	1	3	-	1.32
2	stabilized base	0.26	1	6	-	1.56
3	existing subbase	0.09	1	19	-	1.71
Total	-	-	-	28.00	-	4.59

STATE OF MAINE

FILE: Portland

INTERDEPARTMENTAL MEMORANDUM

Date of Request: 6/13/2011 Return: 6/16/2011

Latest Date Needed By asap

To: **Ed Hanscom** Dept.: MDOT, Bureau of Planning

From: **Mike Barden** Dept.: Highway Design

Subject: **Request for Traffic Information** Project Manager: **Ernie Martin**

TOWN(S): S. Portland P.I.N. **19091.00** Consultant Proj

COUNTY: Cumberland ROUTE: Cummings Road

LOCATION/ DESCRIPTION: Preliminary engineering and right-of-way work for Highway Reconstruction: Beginning at Running Hill Road and continuing northerly for 0.73 mile to the Westbrook City Line. Rebuild the existing travel lanes and add paved shoulders.

	Roadway Changes or Relocation (Attach Sketch)	Turning Movement needed (Provide Locations under Comments)	Other Please Describe Under Comments
Please Check Box if Applicable:			

Prep By: MAM

Description of Sections	Sec. 1 Cummings Road @ South Portland/Westbrook Town Line	Sec. 2 South Portland Cummings Road N/O Running Hill Road		Sec. 1 Cummings Road @ South Portland/Westbrook Town Line	Sec. 2 South Portland Cummings Road N/O Running Hill Road
1 Latest AADT (Year)	15080 (2007)	17040 (2007)		15080 (2007)	17040 (2007)
2 Current **2013** AADT	15080	17040		15080	17040
3 Future **2025** AADT	16890	19080			
4 Future **2033** AADT				18100	20450
5 DHV - % of AADT	10%	10%	%	10%	10%
6 Design Hourly Volume	1689	1908		1810	2045
7 % Heavy Trucks (AADT)	5%	4%	%	5%	4%
8 % Heavy Trucks (DHV)	4%	4%	%	4%	4%
9 Direct.Dist. (DHV)	58%	58%	%	58%	58%
10 18-KIP Equivalent P 2.0	371	369		384	382
11 18-KIP Equivalent P 2.5	354	352		366	364

Notes or Remarks: 18-Kip ESALS is based on 12 & 20 year life or highest Future year

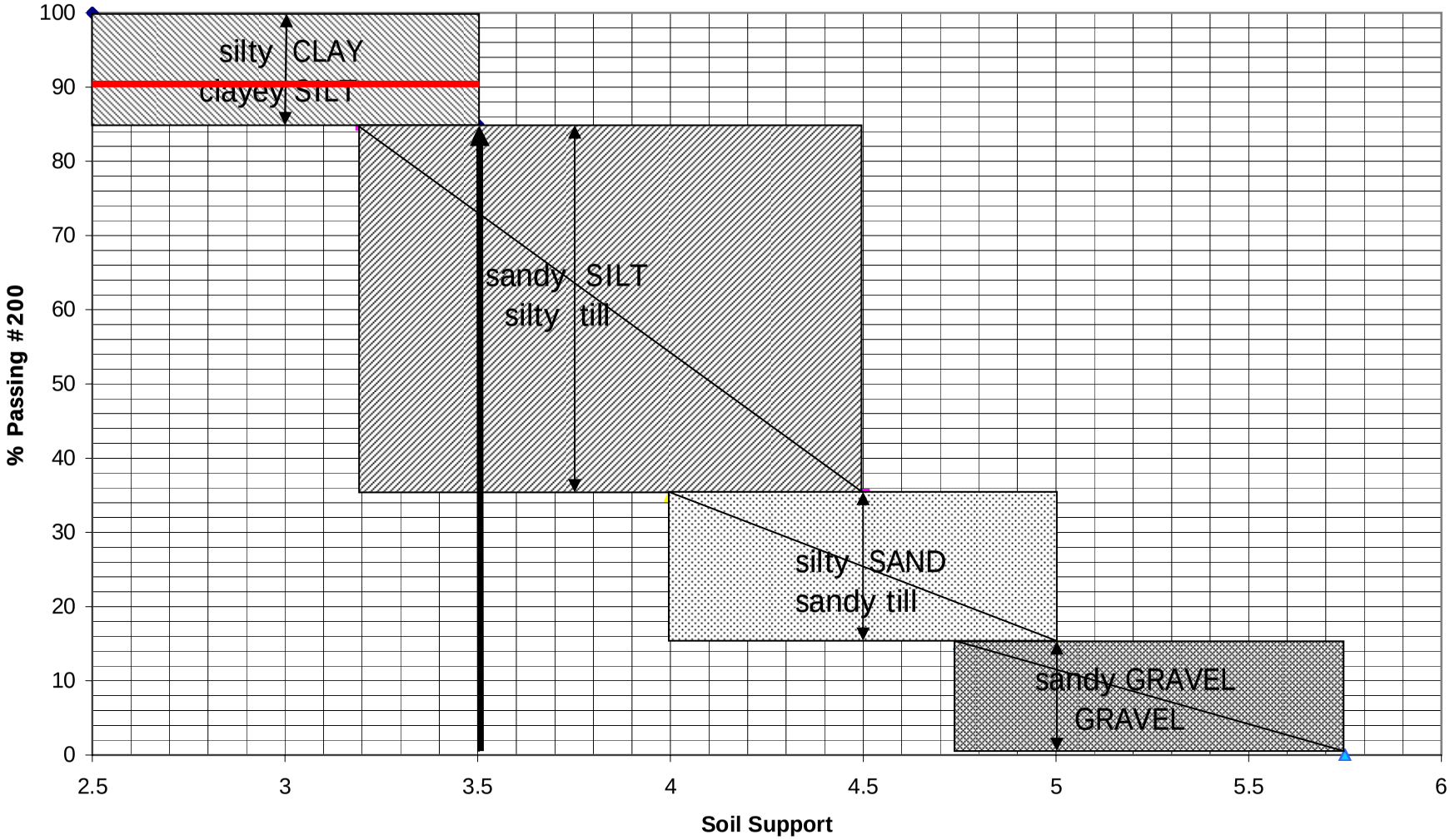
PLEASE PROVIDE: (1) PIN NUMBER, (2) THE CURRENT & FUTURE YEARS FOR WHICH YOU WANT AADT CALCULATED, AND SEND TO MIKE MORGAN. (A LOCATION MAP IS NO LONGER NEEDED.)

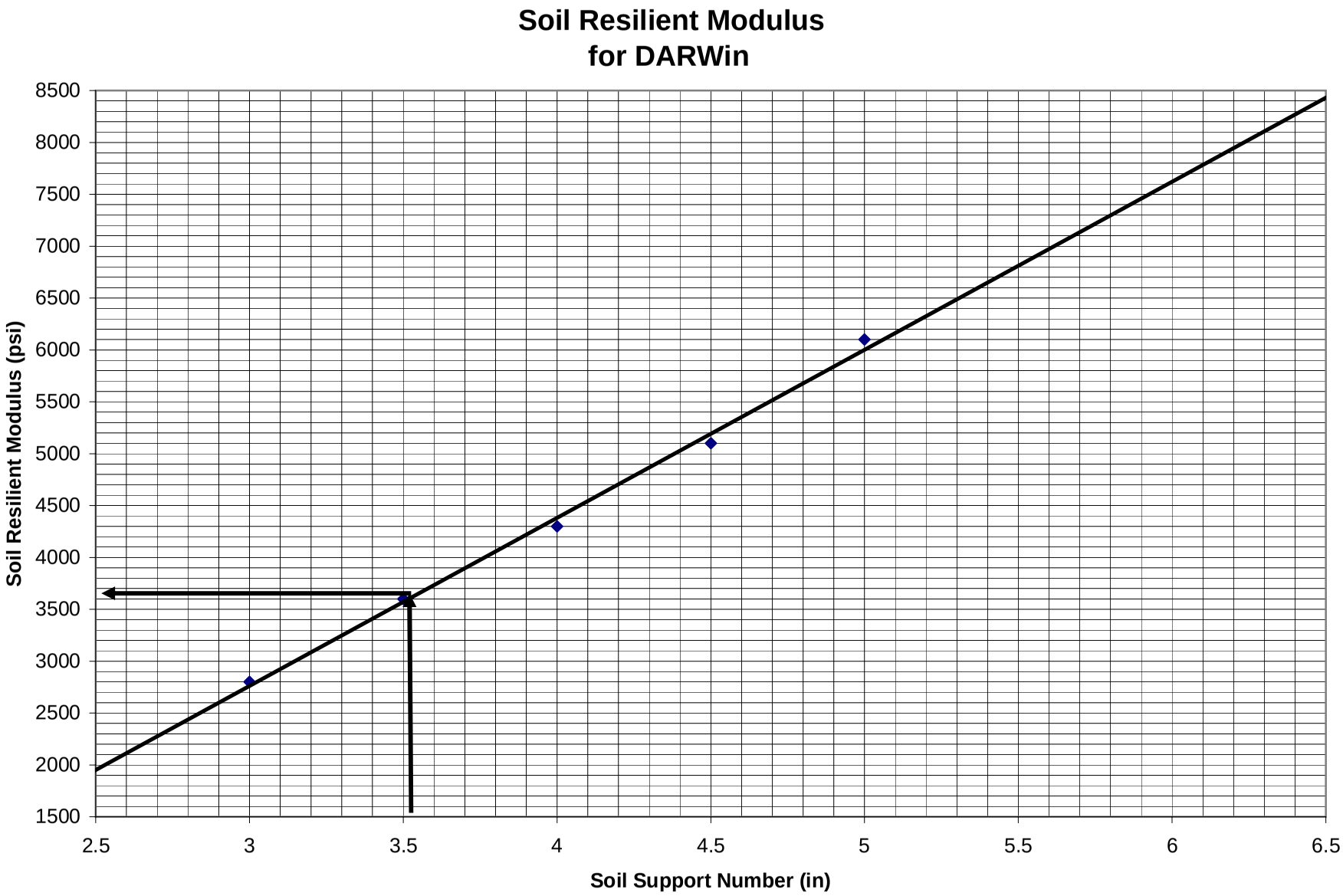
TRAFFIC REQUESTS WILL BE FILLED ON A FIRST COME / SERVE BASIS. PLEASE SEND WHEN PROJECT KICKS OFF!!

Need Only Data Items Numbered

Comments: 2007 AADTs and 2007 vehicle classification data was used as 2010 data was lower.

Guidelines for Selection
of Soil Support Values for Pavement Design




Soil Resilient Modulus
for DARWin
Soil Resilient Modulus (psi)
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
2.5
3
3.5
4
4.5
5
5.5
6
6.5
Soil Support Number (in)

Gross, Karen

From: Gross, Karen
Sent: Thursday, August 25, 2011 3:03 PM
To: 'Luther, Thad'
Cc: Martin, Ernest; Santy, Gary
Subject: RE: Cummings Road Kick-Off Meetings geotech

Hi everyone,

The Cummings Road project was drilled this morning and I went to physically see what the drillers were encountering under the pavement. I wanted to send you all a preliminary assessment of what I saw so that it may help you with your design.

We encountered about 7" to 10" of HMA. Most locations had a deteriorated bottom layer of asphalt which tells me there have been issues on this road for a long time. All locations had 20" or more of gravel and it appeared to be a good quality. It was a little dirty at some locations, but lab test results will tell us better what the percent fines are.

The subgrade throughout the project is marine clay-silt....no real surprise there with all the wetland plants along the roadway. The swamp area has a subgrade that consists of a very soft clay-silt with some marine organics. There is about 3 feet of gravel in the swamp, and given the low elevation of the roadway there, my guess is that the road has settled into that very soft clay over time. I also checked the parking lots that surround the swamp and they are all displaying signs of settlement also.

We hit groundwater at about 4' below the roadway surface. No water was encountered in any of the other borings I saw, but I missed a few near the Westbrook town line. I also did not find the area that you mentioned where water was running out of the ground, but I was 100% sure where it was.

We encountered an old layer of penetrated gravel about 2 1/2' down in the borings around North Gannett Dr. it looks like at one time the roadway was built almost directly on top of the clay soils.

I will have the completed boring logs next week and I should have the test results back in a few weeks. I'll keep you all updated as I receive the information.

Karen

Karen Gross
Pavement Design/Quality
Highway Program
Maine Department of Transportation
207-624-3352

From: Luther, Thad [mailto:thad.luther@stantec.com]
Sent: Wednesday, August 24, 2011 9:33 AM
To: Gross, Karen
Cc: Martin, Ernest; Santy, Gary
Subject: Cummings Road Kick-Off Meetings geotech

Karen,

It was great meeting you today. Looking forward to working with you.

On the way home, Gary and I were talking about ways to meet the team's project goals. One thing we came up with was the possibility of a second reduced level of rehabilitation for general areas if the borings show higher quality material.

As discussed today, setting the vertical geometry to avoid wetland impacts, minimize driveway reconstruction while raising grade to improve the design life of the roadway is going to be a balancing act. North of North Gannett Drive, raising grade will be the most difficult due to driveway impacts. In addition to raising grade being problematic, removing and replacing material to improve the subbase may create utility impacts.

If the borings indicate that the roadway structure is in better shape in this area, a second reduced pavement section may be beneficial in finding the balance that the project team is looking for.

If you have any questions of concerns, don't hesitate to let me know.

Thanks,
Thad

Gross, Karen

From: Gross, Karen
Sent: Thursday, September 15, 2011 9:24 AM
To: Martin, Ernest
Subject: So. Portland, Cummings Road

Ernie,

I received the lab testing data for the samples we collected on Cummings Road. I'm afraid it is bad news regarding the quality of the existing base/subbase gravel. All the samples tested did not meet the requirements of Type D subbase gravel. They did meet the requirements of the No. 40 and ¼ in sieves for Type E subbase, but exceeded the requirements on the #200 sieve (the fine particles) by up to 180%. The subgrade tested as silt, which was expected.

Here is a summary of the test results as compared to the specification:

Type D subbase

Sieve size	Std. Spec - % Passing	S1	S5	S9	S13	S15	Meet Spec?
#200	0 - 7	16.2	15.8	18	16.7	13.8	No
#40	0 - 30	32.8	32.6	40.8	39.6	38.7	No
1/4 in	25 - 70	83	86.6	88	76.5	88.1	No

Type E subbase

Sieve size	Std. Spec - % Passing	S1	S5	S9	S13	S15	Meet Spec?
#200	0 - 7	16.2	15.8	18	16.7	13.8	No
#40	0 - 50	32.8	32.6	40.8	39.6	38.7	Yes
1/4 in	25 - 100	83	86.6	88	76.5	88.1	Yes

I just want to comment on sample size and methods used to collect the samples. I'm not always sure that a 16 oz. cup size of material truly represents the gradation of the existing material. Plus, samples that collect on augers tend to be the finer material and the larger stones are not included. This can severely skew the gradation of the existing material to the finer side. Also, if you auger through very deteriorated HMA, it creates a lot of fines. These can get mixed into the existing subbase and also can skew the testing results. I highly recommend doing test pits and large bag samples if we are on the fence with leaving the existing subbase in place or not. I have gone out on other projects with the same scenario and just about the same % passing the No. 200 sieve, and bag samples tested as meeting our Type D subbase. If Utilities plans on doing test pits, it might be a great time to grab a larger sample for testing.

So in summary, we have a sufficient thickness of subbase gravel, but it does not meet our specifications for Type D subbase and it is fairly dirty. As I mention before, some of the in-place recycling processes benefit from the underlying gravel being on the "dirty" side, so that would be an option. The price may be high for in-place recycling since the project is so short.

Let me know how you want me to proceed.

KG

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