Maine Department of Transportation
Highway Program

GEOTECHNICAL REPORT
Intersection Improvements
Dunstan Corner (Route 1/Route 9/Payne Road)
Scarborough, Maine

Prepared by:
Karen Gross
Geotechnical Design Engineer

Cumberland County

Soils Report No. 2011-115

PIN 17343.00
STP-1734(300)X
September 15, 2011

MaineDOT

Highway Program

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Memorandum

To: Ernie Martin
From: Karen Gross
Date: 09/15/11
Subject: Geotechnical Information
PIN 17343.00
Scarborough, Dunstan Corner
(Intersection of Rt. 1/Payne Rd/Rt. 9)

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All subsurface investigations and lab testing have been completed for the Dunstan Corner project in Scarborough. The primary focus of these investigations was to determine the types and thicknesses of the existing pavement materials on Route 1 and Pine Point Road, and the types of subsurface soils that will be encountered in the new alignment.

Background Information

Dunstan Corner consists of two closely spaced intersections on U.S. Route 1. The first intersection is with Pine Point Road (Rt. 9) and Broadturn Road, and the second intersection is with Payne Road. Route 1 is classified as a non-NHS minor arterial at this location. The proposed scope of work includes reconfiguring the intersections to improve mobility, relief congestion, and reduce the number of crashes. The scope also includes modifications to Payne Road to discourage the use of this road as a commuter route. The project is located in an urban area with all the properties within the limits considered commercial. The immediate surrounding topography is considered flat.

As-built plans from 1939 indicate that Route 1 was originally constructed with three 10’ wide, 40’ long, continuously reinforced concrete slabs. The slabs were constructed at variable thicknesses, ranging from 7" inches thick at the center of the slab, and widening to 9" thick at the outside of the slabs. The 1939 plans proposed widening the southbound pavement with a continuously reinforced slab, 12’ wide and 40’ long, and the same thicknesses as the existing slabs. Therefore, the total width of the concrete pavement now existing on Rt. 1 is expected to be 42’. Twelve inches of gravel base was placed under the widened section of concrete pavement. The gravel base thickness under the original slabs is unknown. These as-builts also indicate that the roadway was constructed with a “bathtub” section.

As-built plans from 1982 indicate that there were intersection improvements made at Dunstan Corner. These improvements included variable width widenings of the existing pavement to add turn lanes on Route 1, closed system drainage upgrades, a bituminous overlay, and the realignment of Payne Road. Widenings on Route 1 were constructed with 24” of Aggregate

Subbase Course-Gravel (ASCG) and 6″ of Hot Mix Asphalt (HMA). Shim and a 1 ¼″ overlay were placed over the concrete pavement.

As-built plans from 1999 indicate that there improvements were again made at Dunstan Corner, but there is no information on these plans to what was used for pavement materials. The only note that is relevant to the pavement is that at locations where the concrete pavement was removed, HMA was used to match the existing pavement structure.

Other construction information available includes a widening for a right turn lane from Route 1 onto Broadturn Road, a 3/4″ HMA overlay that was placed in 2008, and another 3/4″ polymer-modified HMA overlay that was placed in 2010.

Observations of the existing pavement condition were made prior to the placement of the 3/4″ HMA overlay in 2010. The pavement was moderately distressed throughout the project limits. Cracking from the longitudinal and transverse concrete pavement joints reflecting up through the asphalt surface was the predominant distress type. Minor rutting was also visible on Route 1 (northbound and southbound) at the intersection Pine Point Road and Broadturn Road, on Route 1 northbound at the intersection with Payne Road, and on Pine Point Road westbound at the intersection with Route 1.

Geology

The Maine Surficial Geology map for the Old Orchard Beach Quadrangle shows that marine regressive sand deposits are present at the Dunstan Corner location. These deposits consist predominately of sand, but can be interbedded with fine-grained marine silts and clays.

The Soil Survey of Cumberland County indicates that the surficial soils within the project limits are of the Windsor Series (WmB). This type of soil consists of sand and small quantities of silt, and typically has a high permeability rate. The groundwater table and bedrock is anticipated to be at a depth greater than 6 feet below the existing ground surface.

Bordering the Windsor soils are soils that consist predominately of silt and clay (Melrose Series [MeC] and Suffield Series [SuD2]). Although the map shows the soils within the project as WmB, there is a strong possibility that the new Payne Road alignment will consist of slower draining silt and clay soils. The Soil Survey maps showing the location of the soil types and the anticipated depth to the groundwater table are attached at the end of this memo. Table 1 summarizes the soils information as shown in the Soil Survey.

Table 1: Soil Survey Summary

Soil Unit	Unified Classification	AASHTO Classification	Depth to Groundwater	Depth to Bedrock	Frost Action	Permeability	Restrictive Soil Features
WmB	SM, SP-SM, SP	A-2, A-3	> 6'	> 6'	Low	>6.3 in/hr	Cut slopes unstable

The Maine Design Freezing Index for this site is approximately 1200. For snow free pavement, the anticipated depth of frost penetration beneath the pavement structure is 67" for sand

deposits. Natural soils under Route 1 are not considered frost susceptible, therefore the formation of ice lens and associated frost heaving/thaw weakening damage to the pavement is not probable. If the soils on the new Payne Road alignment have higher silt and clay contents, the frost action rating will be moderate to high.

Subsurface Investigations and Lab Testing

Seventeen borings were drilled (November 2011) in the roadway to determine the subsurface material types, to confirm the existence of a concrete roadway, and to collect representative samples and depths of the existing base/subbase gravels. Borings were drilled to a depth of 5' below the ground surface or to refusal, which ever was encountered first. Four borings were drilled on the new alignment to determine the material types. These borings were drilled to a depth of 10′ below the ground surface or to refusal, which ever was encountered first. Pavement cores were also collected at seven locations to confirm the HMA and concrete thicknesses, and material quality.

Boring and core information indicates that the pavement structure on Route 1 consists of an HMA/concrete composite pavement in some areas, and a flexible pavement (HMA) in other areas. Pine Point Road, Payne Road, and Broadturn Road are all flexible pavements (HMA). The Table 2 lists the asphalt, concrete, and subbase gravel thicknesses found in the subsurface investigations. No shallow refusals were encountered in any borings.

Table 2: Existing Pavement Structure Summary

Road	Design Station	Offset from Design CL (ft)	Pavement Thickness			Total Pavement Thickness (in)
			HMA (in)	Concrete (in)	Subbase (in)	
Rt. 1	101+50	32.2 L	4.8	7.2	18.0	30.0
Rt. 1	101+50	14.0 L	2.4	9.6	18.0	30.0
Rt. 1	101+49	14.0 R	7.2		35.0	42.2
Rt. 1	103+50	22.3 L	4.8	7.2	23.0	35.0
Rt. 1	103+50	1.3 L	7.2		22.8	30.0
Rt. 1	103+49	18.7 R	8.4		21.6	30.0
Rt. 1	105+74	31.1 L	4.8	7.2	23.0	35.0
Rt. 1	105+74	14.9 L	3.0	6.6	25.2	34.8
Rt. 1	105+75	16.8 R	8.4		21.6	30.0
Rt. 1	108+00	4.7 L	4.8	7.2	24.0	36.0
Rt. 1	108+00	23.1 L	7.2	10.8	16.8	34.8
Rt. 1	108+00	13.3 R	4.8	7.2	31.0	43.0
Rt. 1	111+50	2.6 R	7.2	9.6	13.2	30.0
Rt. 1	111+50	34.4 L	4.8	7.2	24.0	36.0
Rt. 1	113+49	1.2 R	4.8	7.2	12.0	24.0
Rt. 1	113+49	33.8 L	4.8	8.4	16.8	30.0
Payne Rd	900+93	6.1 L	7.2		22.8	30.0
Pine Point Rd	750+77	15.3 L	4.8			
Broadturn Rd	748+39	5.3 R	10.8			

Laboratory testing was completed on eleven samples to determine the grain size distribution, water content, the Unified and AASHTO classification, and the Frost Susceptibility Rating of the existing subbase and subgrade.

The subbase samples test results indicate that the existing material on Route 1 has a Unified classification of SM and an AASHTO classification of A-1-B or A-2-4. The existing subbase material does not meet the MaineDOT requirements for base or subbase aggregate.

The subgrade samples tested have a Unified classification of SM and CL-ML, and an AASHTO classification of A-2-4. I am concluding that the CLAY-SILT (CL-ML) encountered at Station 105+74 is a thin interbedded layer as described by the Maine Surficial Geology information. Samples that were not tested visually appeared to be a silty SAND (SM). The subgrade soils are considered slightly to moderately frost susceptible. Test results confirm the information in the Soil Survey and on the Surficial Geology map.

The native soils encountered in the borings on the proposed new Payne Road alignment consist of layers of sand and silty CLAY with varying amounts of sand. The new subgrade considering a total pavement structure of 30" will consist of the silty CLAY soils. A boring that was done for a previous alignment indicates that the silty clay is stiff.

Test results indicate that there are moderately high water contents in the soils beneath the concrete pavement on Route 1 and in the soils where the new Payne Road alignment will be constructed.

Ground penetrating radar (GPR) data was collected to determine the location of the concrete pavement on Route 1 as well as the depth of the HMA layer over the concrete, and HMA depths where there is no underlying concrete pavement. In general, the concrete pavement is located to the left of the existing roadway centerline from the start of the project to design station 105+00, in the center of the roadway from station 105+00 to 108+00, to the right of the centerline from station 108+00 to 113+00, and in the center of the roadway from station 113+00 to the end of the project. The total width of the concrete pavement as shown in the GPR data is 42'. It appears that the existing underground utilities (water and telephone) consistently follow the edge of the concrete pavement. Geoplans showing the location of the concrete pavement are attached at the end of this memo.

Design Recommendations

Due to budgetary constraints, the scope for this project will be to leave the existing concrete and HMA pavement in place and widened Route 1 by matching into it as well as the previously sections widened with HMA. The following recommendations are based on the scope only and do not consider the quality of the existing pavement materials. Also included are recommendations for the new alignment construction.

Route 1 and Pine Point Road Widenings

Matching into the existing Route 1 pavement is the current scope. The new Route 1 alignment appears to be shifted predominately to the right side of the project (existing northbound lane).

This means the new widening will be matched onto both a concrete/HMA composite pavement and an all HMA pavement depending on the location. Regardless of the method and materials used for the widening, a crack will develop between the new and old pavements. The base and subbase gravel design as shown in the pavement design memo dated 1/03/2011 is recommended for the widenings (8.5" HMA, 11.5" base gravel, and 10" subbase) to at least ensure that the widenings will be structurally adequate. The appropriate subgrade resilient modulus to use for the pavement design on Route 1 is 4000 psi.

The lab test data indicates that the existing base/subbase soils are wet. This probably indicates a poorly functioning subsurface drainage system and the presence of a "bathtub" pavement section. Because the natural sandy soils is interbedded with low permeability marine silts and clays, underdrain installation is recommended wherever possible to ensure drainage of the pavement structure.

New Payne Road Alignment

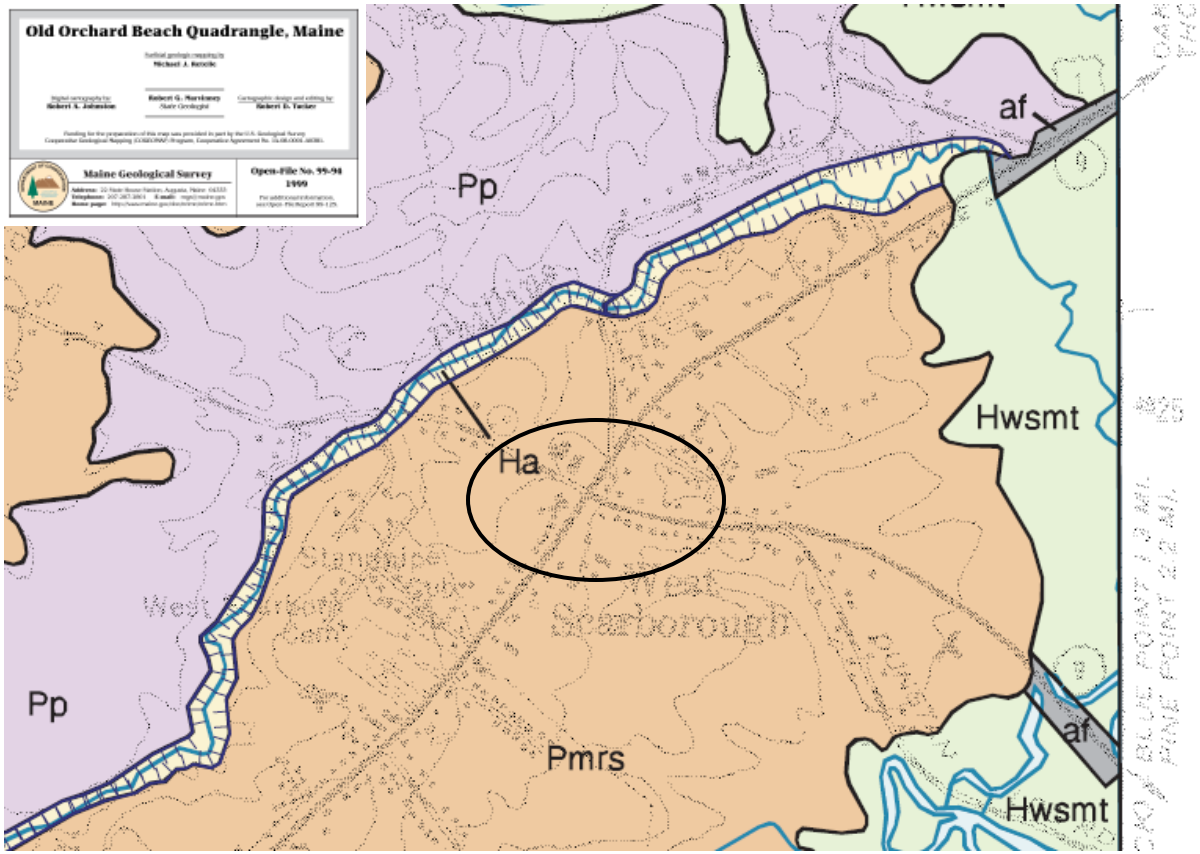
The existing subgrade soils are expected to consist of marine silt, clay, and sand. Since these soils are considered to be moderately frost susceptible, a 30" pavement section is recommended to reduce the effects of frost action. Boring information indicates that these soils will be stiff, but if they become saturated during construction, there may be bearing capacity and pumping issues. Undercutting the subgrade and replacing these soils with a granular material is recommended. Stabilization/reinforcement geotextiles (Item 620.54) can also be used in place of undercutting. This approach may be more cost effective than undercutting because they install easily and will reduce hauling at this high traffic location. Geotextiles will also act as a separation layer and prevent the new subbase material from being contaminated by fine particles migrating upwards from the underlying natural soils. The subgrade resilient modulus value to use for design based on the above recommendations is 4000 psi.

Keeping this type of subgrade soil dry is essential in ensuring long-term pavement performance. Underdrain installation or daylighting the subbase gravel onto the inslope is highly recommended.

All supporting documentation is attached for your reference. Please let me know if I can provide you any additional information for this project.

Attachments:

Maine Surficial Geology Map (Old Orchard Beach Quadrangle)
Soil Survey of Cumberland County (Soil Type, Frost Action, Depth to Water)
Design Freezing Index/Frost Depth Chart
Boring Summary Sheet
Boring Logs
Laboratory Testing Summary Sheet
Grain Size Curves
Subgrade Resilient Modulus Charts
Preliminary Pavement Design Memo (1/03/2011)
Geoplans



Hd **Dune deposits** - Sand dunes adjacent to modern beaches.

Pa **Alluvium** - Coarse to fine alluvial sand in high terraces and overlying Presumpscot Formation clays, north and south of the Nonesuch River.

Pmn **Marine nearshore deposits** - Sand and gravel deposits formed as beaches and shallow marine sand bodies during marine submergence and regression.

→ Pmrs **Marine regressive sand deposits** - Sand deposited in marine waters during regression of the sea from the coastal zone. Sand is commonly interbedded with fine-grained sediments of the Presumpscot Formation.

Pp **Presumpscot Formation** - Fine-grained silt and clay with minor marine fossils and dropstones deposited in deeper, quiet water during the marine submergence of the coastal zone.

Pmf **Marine fan** - Layered gravel and sand deposited in wedge or mound form at the glacier margin during marine submergence.

Unified Soil Classification (Surface)—Cumberland County and Part of Oxford County, Maine
(Dunstan Corner)

Map Scale: 1:4,640 if printed on A size (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 150 300 600 900

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:4,640 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

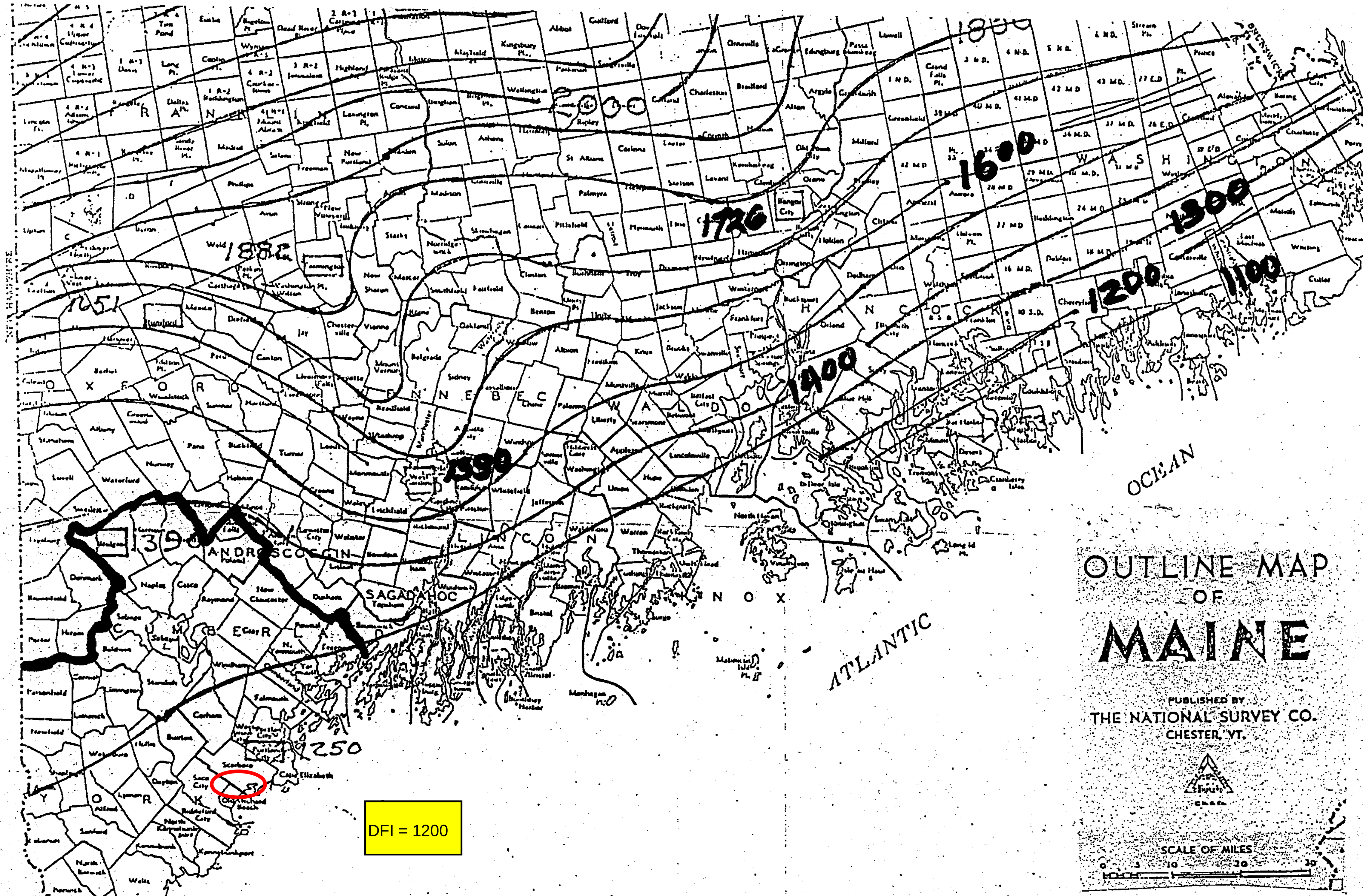
Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 7, Jan 8, 2009

Date(s) aerial images were photographed: 4/29/1998

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



EXTRAPOLATIONS BASED ON
1. COLDEST YEAR IN 10, 1958-67 FIG. 7
2. FORT KENT. DATA, COLDEST YEAR IN 21
3. PLANT HARDINESS ZONE MAP, USDA MISCELLANEOUS PUBLICATION NO. 814

MAINE
DESIGN FREEZING INDE

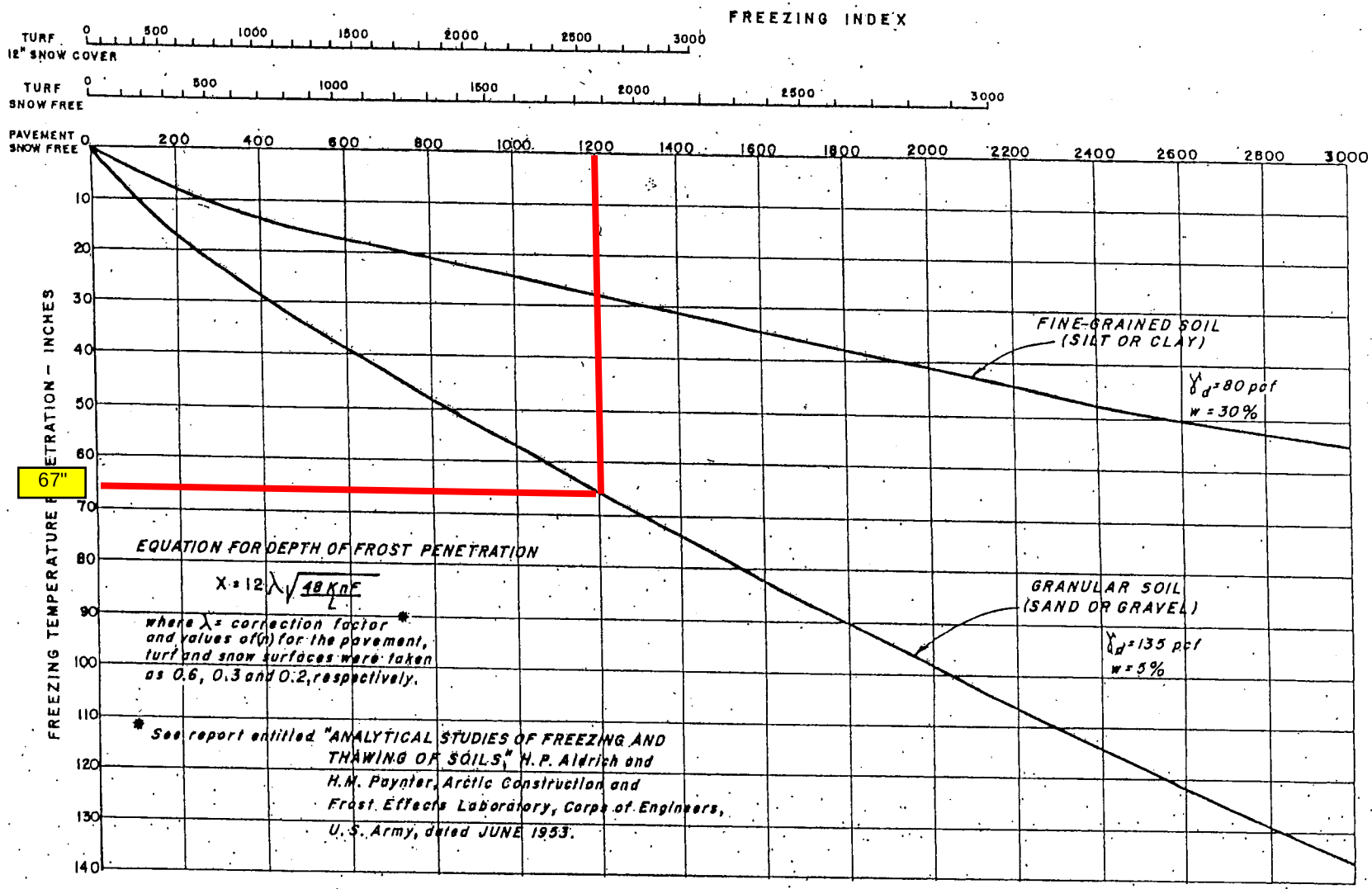


Figure 13-3 RELATIONSHIP BETWEEN FREEZING INDEX AND FREEZING TEMPERATURE PENETRATION FOR VARIOUS SURFACE CONDITIONS FOR GRANULAR AND FINE-GRAINED SOILS.

BORING SUMMARY (Preliminary)
Scarborough, PIN 17343.00

Boring No.	Road	Field #	Design Station	Offset (ft) from Design CL	Exploration Depth (ft)	Depth to water (ft)	Pavement Thickness			Total Pavement Thickness (in)	Subbase Classification (USCS & AASHTO)	Subgrade Type	Refusal Depth (ft)
							HMA (in)	Concrete (in)	Subbase (in)				
HB-SCARB-105	Rt. 1	B01	101+50	32.2 L	5.0	2.5 - wet soil	4.8	7.2	18.0	30.0	SM/A-2-4	silty SAND	xxx
HB-SCARB-116	Rt. 1	B02/PC1	101+50	14.0 L	5.0	2.5 - wet soil	2.4	9.6	18.0	30.0		CLAY SILT	xxx
HB-SCARB-106	Rt. 1	B03	101+49	14.0 R	5.0		7.2		35.0	42.2		silty SAND	xxx
HB-SCARB-104	Rt. 1	B04	103+50	22.3 L	5.0	2.9 - wet soil	4.8	7.2	23.0	35.0		CLAY SILT	xxx
HB-SCARB-115	Rt. 1	B05	103+50	1.3 L	5.0	2.5 - wet soil	7.2		22.8	30.0		CLAY SILT	xxx
HB-SCARB-107	Rt. 1	B06/PC2	103+49	18.7 R	5.0	2.5 - wet soil	8.4		21.6	30.0		CLAY SILT	xxx
HB-SCARB-103	Rt. 1	B07	105+74	31.1 L	5.0	2.9 - wet soil	4.8	7.2	23.0	35.0	SM/A-2-4 (L) SM/A-1-b (R)	silty SAND	xxx
HB-SCARB-114	Rt. 1	B08/PC3	105+74	14.9 L	5.0	2.9 - wet soil	3.0	6.6	25.2	34.8		silty SAND	xxx
HB-SCARB-108	Rt. 1	B09	105+75	16.8 R	5.0	2.5 - wet soil	8.4		21.6	30.0		silty SAND	xxx
HB-SCARB-113	Rt. 1	B10	108+00	4.7 L	5.0		4.8	7.2	24.0	36.0		SAND	xxx
HB-SCARB-109	Rt. 1	B11/PC4	108+00	23.1 L	5.0		7.2	10.8	16.8	34.8		CLAY SILT	xxx
HB-SCARB-102	Rt. 1	B12	108+00	13.3 R	5.0	3.6- wet soil	4.8	7.2	31.0	43.0		silty SAND	xxx
HB-SCARB-110	Rt. 1	B13	111+50	2.6 R	5.0		7.2	9.6	13.2	30.0	SM/A-2-4	silty SAND	xxx
HB-SCARB-101	Rt. 1	B14/PC5	111+50	34.4 L	5.0	3 - wet soil	4.8	7.2	24.0	36.0		CLAY SILT	xxx
HB-SCARB-111	Rt. 1	B15	113+49	1.2 R	5.0	2 - wet soil	4.8	7.2	12.0	24.0		CLAY SILT	xxx
HB-SCARB-112	Rt. 1	B16	113+49	33.8 L	5.0	2.5 - wet soil	4.8	8.4	16.8	30.0		CLAY SILT	xxx
HB-SCARB-118	new alignment	B19	805+52	9.5 R	10.0								xxx
HB-SCARB-119	new alignment	B20	803+27	6.9 L	10.0								xxx
HB-SCARB-120	new alignment	B21	802+00	12.9 R	10.0								xxx
HB-SCARB-121	new alignment	B22	800+50	5.0 R	10.0								xxx
HB-SCARB-117	Payne Rd	B23	900+93	6.1 L	5.0		7.2		22.8	30.0		CLAY SILT	xxx
	Pine Point Rd	C1	750+77	15.3 L			4.8						
	Broadturn Rd	C2	748+39	5.3 R			10.8						

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-101
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	54.5	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	111+50, 34.4 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	PC-5		0.00 - 1.00			SSA	54.10		PAVEMENT, core taken. 0.40	
	S1		1.00 - 3.00				53.50		CONCRETE, core taken. 1.00	
									Brown, damp, fine to coarse SAND, some gravel, trace silt.	
	S2		3.00 - 5.00				51.50		3.00	
5									Olive, wet, Clayey-SILT.	
							49.50		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-14

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-102
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	57.3	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	108+00, 13.3 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 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	56.90		PAVEMENT. — 0.40	
							56.30		CONCRETE. — 1.00	
	S3		1.00 - 3.60						Brown, damp, fine to coarse SAND, some gravel, trace silt.	
	S4		3.60 - 5.00				53.70		3.60	
5									Brown, wet, silty, fine to medium SAND.	
							52.30		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-12

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-103
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	59.5	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	105+74, 31.1 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						SSA	59.10		PAVEMENT. 0.40	
							58.50		CONCRETE. 1.00	
	S5		1.00 - 2.90						Brown, damp, fine to coarse SAND, little gravel, trace silt.	G#209222 A-2-4, SM WC=12.0%
	S6		2.90 - 5.00				56.60		2.90	
									Olive, wet, silty, fine to medium SAND.	G#209223 A-2-4, SM WC=17.1%
5							54.50		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-7

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

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

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-104
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	62.2	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	103+50, 22.3 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	61.80		PAVEMENT. — 0.40	
							61.20		CONCRETE. — 1.00	
	S7		1.00 - 2.90						Brown, damp, fine to coarse SAND, some gravel, trace silt.	
	S8		2.90 - 5.00				59.30		2.90	
									Olive-brown, wet, Clayey-SILT, trace fine sand.	
5							57.20		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-4

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-105
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	64.0	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	101+50, 32.2 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						SSA	63.60		PAVEMENT. 0.40	
							63.00		CONCRETE. 1.00	
	S9		1.00 - 2.50						Brown, damp, fine to coarse SAND, some gravel, trace silt.	G#209224 A-2-4, SM WC=6.9%
	S10		2.50 - 5.00				61.50		2.50	
									Olive, wet, Clayey-SILT.	G#209225 A-4, CL-ML WC=19.9%
5							59.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-1

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-106
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	64.0	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	101+49, 14.0 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	S11		0.60 - 3.50			SSA	63.40		PAVEMENT. 0.60 Light brown, dry, fine to coarse SAND, little gravel.	
	S12		3.50 - 5.00				60.50		3.50 Brown, moist, silty, fine to medium SAND.	
5							59.00		5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-3

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-107
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	61.9	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	103+49, 18.7 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	PC-2		0.00 - 0.70			SSA	61.20		PAVEMENT, core taken.	
	S13		0.70 - 2.50						0.70 — Brown, damp, fine to coarse SAND, some gravel, trace silt.	
	S14		2.50 - 5.00				59.40		2.50 — Olive, wet, Clayey-SILT.	
5							56.90		5.00 — **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-6

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-108
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	59.2	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	105+75, 16.8 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	S15		0.70 - 2.50			SSA	58.50		PAVEMENT. 0.70	
									Light brown, damp, fine to coarse SAND, little gravel, trace silt.	G#245487 A-1-b, SM WC=1.9%
	S16		2.50 - 5.00				56.70		2.50 Brown, wet, silty, fine to medium SAND.	
5							54.20		5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-9

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-109
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	57.1	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	108+00, 23.1 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	PC-4		0.00 - 1.50			SSA	56.50		PAVEMENT, core taken. 0.60	
	S17		1.50 - 2.90				55.60		CONCRETE, core taken. 1.50	
	S18		2.90 - 5.00						Light brown, damp, fine to coarse SAND, little gravel, trace silt.	
							54.20		2.90	
5							52.10		Olive-brown, 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:

B-11

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-110
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	54.0	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	111+50, 2.6 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	53.40		PAVEMENT.	
									0.60	
	S19		1.40 - 2.50				52.60		CONCRETE.	G#245488 A-2-4, SM WC=8.2%
									1.40	
	S20		2.50 - 5.00				51.50		Brown, damp, fine to coarse SAND, little gravel, trace silt.	G#245489 A-2-4, SM WC=10.4%
									2.50	
5							49.00		Brown, moist, fine to coarse SAND, some silt.	
									5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-13

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-111
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	54.0	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	113+49, 1.2 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	53.60		PAVEMENT. 0.40	
							53.00		CONCRETE. 1.00	
	S21		1.00 - 2.00				52.00		Brown, damp, fine to coarse SAND, little gravel, trace silt. 2.00	
	S22		2.00 - 5.00						Olive-grey, wet, Clayey-SILT, trace fine sand.	
5							49.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-15

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-112
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	54.4	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	113+49, 33.8 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	54.00		PAVEMENT. 0.40	
							53.30		CONCRETE. 1.10	
									Brown, damp, fine to coarse SAND, some gravel, trace silt. ≅S1	
							51.90		2.50 Olive, wet, Clayey-SILT. ≅S2	
5							49.40		5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-16

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-113
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	57.3	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	108+00, 4.7 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	56.90		PAVEMENT. 0.40	
							56.30		CONCRETE. 1.00	
	S23		1.00 - 5.00						Brown, damp, gravelly, fine to coarse SAND, trace silt.	
5							52.30		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-10

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-114
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	59.4	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	105+74, 14.9 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	PC-3		0.00 - 0.80			SSA	59.15		PAVEMENT, core taken. 0.25	
							58.60		CONCRETE, core taken. 0.80	
									Brown, damp, fine to coarse SAND, little gravel, trace silt. ≅S5	
							56.50		2.90	
									Olive, wet, silty, fine to medium SAND. ≅S6	
5							54.40		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-8

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-115
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	62.1	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	103+50, 1.3 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	61.50		PAVEMENT. 0.60	
									Brown, damp, fine to coarse SAND, some gravel, trace silt. ≅S13	
							59.60		2.50	
									Olive, wet, Clayey-SILT. ≅S14	
5							57.10		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-5

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-116
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	64.0	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	101+50, 14.0 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	PC-1		0.00 - 1.00			SSA	63.80		PAVEMENT, core taken. — 0.20	
							63.00		CONCRETE, core taken. — 1.00	
									Brown, damp, fine to coarse SAND, some gravel, trace silt. ≅S9	
							61.50		— 2.50	
									Olive, wet, Clayey-SILT. ≅S10	
5							59.00		— 5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-2

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-117
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	58.2	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/28/10-11/28/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	900+93, 6.1 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

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	S24		0.60 - 2.50			SSA	57.60		PAVEMENT. 0.60	
									Brown, damp, fine to coarse SAND, little gravel, trace silt.	
	S25		2.50 - 5.00				55.70		2.50 Olive-brown, moist, Clayey-SILT, trace fine sand.	
5							53.20		5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

B-17, Payne Road
B-18, Sta. 601+00, 6.0 ft Rt. not drilled, wires overhead.

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-118
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	50.0	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/30/10-11/30/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	805+52, 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	S26		0.10 - 2.20			SSA	49.90		PAVEMENT. 0.10	
									Brown, moist, gravelly, fine to coarse SAND, trace silt.	
	S27		2.20 - 10.00				47.80		2.20	G#245490 A-6, CL WC=21.1% LL=38 PL=22 PI=16
									Olive-grey, moist, Clayey-SILT.	
5										
10							40.00		10.00	
									Bottom of Exploration at 10.00 feet below ground surface. NO REFUSAL	
15										
20										
25										

Remarks:

B-19, New Alignment

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-119
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	53.5	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/30/10-11/30/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	803+27, 6.9 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	53.40		PAVEMENT. 0.10	
									Brown, moist, gravelly, fine to coarse SAND, trace silt. ≅S26	
							51.70		1.80	
									Olive-grey, moist, Clayey-SILT. ≅S27	
5										
10							43.50		10.00	
									Bottom of Exploration at 10.00 feet below ground surface. NO REFUSAL	
15										
20										
25										

Remarks:

B-20, New Alignment

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-120
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	56.9	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/30/10-11/30/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	802+00, 12.9 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	56.70		TOPSOIL, sod.	
									0.20	
									Olive-grey, moist, Clayey-SILT. ≅S27	
							52.90		4.00	
5	S28		4.00 - 7.50						Black, moist, gravelly, fine to coarse SAND, trace silt, (Fill).	G#245491 A-1-b, SW-SM WC=10.9%
	S29		7.50 - 10.00				49.40		7.50	
									Olive-grey, wet, Clayey-SILT, little fine sand.	G#245492 A-1-b, SM WC=20.1%
10							46.90		10.00	
									Bottom of Exploration at 10.00 feet below ground surface. NO REFUSAL	
15										
20										
25										

Remarks:

B-21, New Alignment

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: Dunston Corner
Location: Scarborough, Maine

Boring No.: HB-SCAR-121
WIN: 17343.00

Driller:	MaineDOT	**Elevation (ft.)**	55.2	**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/30/10-11/30/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	800+50, 5.0 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	S30		0.30 - 10.00			SSA	54.90		TOPSOIL, sod.	G#245493 A-6, CL WC=23.4% LL=32 PL=19 PI=13
									0.30 — Olive-grey, moist, Clayey-SILT.	
5										
10							45.20		10.00 — **Bottom of Exploration at 10.00 feet below ground surface.** NO REFUSAL	
15										
20										
25										

Remarks:

B-22, New Alignment

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.

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Scarborough Project Number: 17343.00

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-SCAR-103, S5	105+74	31.1 Lt.	1.0-2.9	209222	1	12.0			SM	A-2-4	II
HB-SCAR-103, S6	105+74	31.1 Lt.	2.9-5.0	209223	1	17.1			SM	A-2-4	II
HB-SCAR-105, S9	101+50	32.2 Lt.	1.0-2.5	209224	1	6.9			SM	A-2-4	II
HB-SCAR-105, S10	101+50	32.2 Lt.	2.5-5.0	209225	1	19.9			CL-ML	A-4	IV
HB-SCAR-108, S15	105+75	16.8 Rt.	0.7-2.5	245487	1	1.9			SM	A-1-b	II
HB-SCAR-110, S19	111+50	2.6 Rt.	1.4-2.5	245488	2	8.2			SM	A-2-4	II
HB-SCAR-110, S20	111+50	2.6 Rt.	2.5-5.0	245489	2	10.4			SM	A-2-4	II
HB-SCAR-118, S27	805+52	9.5 Rt.	2.2-10.0	245490	2	21.1	38	16	CL	A-6	III
HB-SCAR-120, S28	802+00	12.9 Rt.	4.0-7.5	245491	2	10.9			SW-SM	A-1-b	0
HB-SCAR-120, S29	802+00	12.9 Rt.	7.5-10.0	245492	2	20.1			SM	A-1-b	II
HB-SCAR-121, S30	800+50	5.0 Rt.	0.3-10.0	245493	2	23.4	32	13	CL	A-6	III
Borings are in Boring and Sample order rather than Station order.											

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)

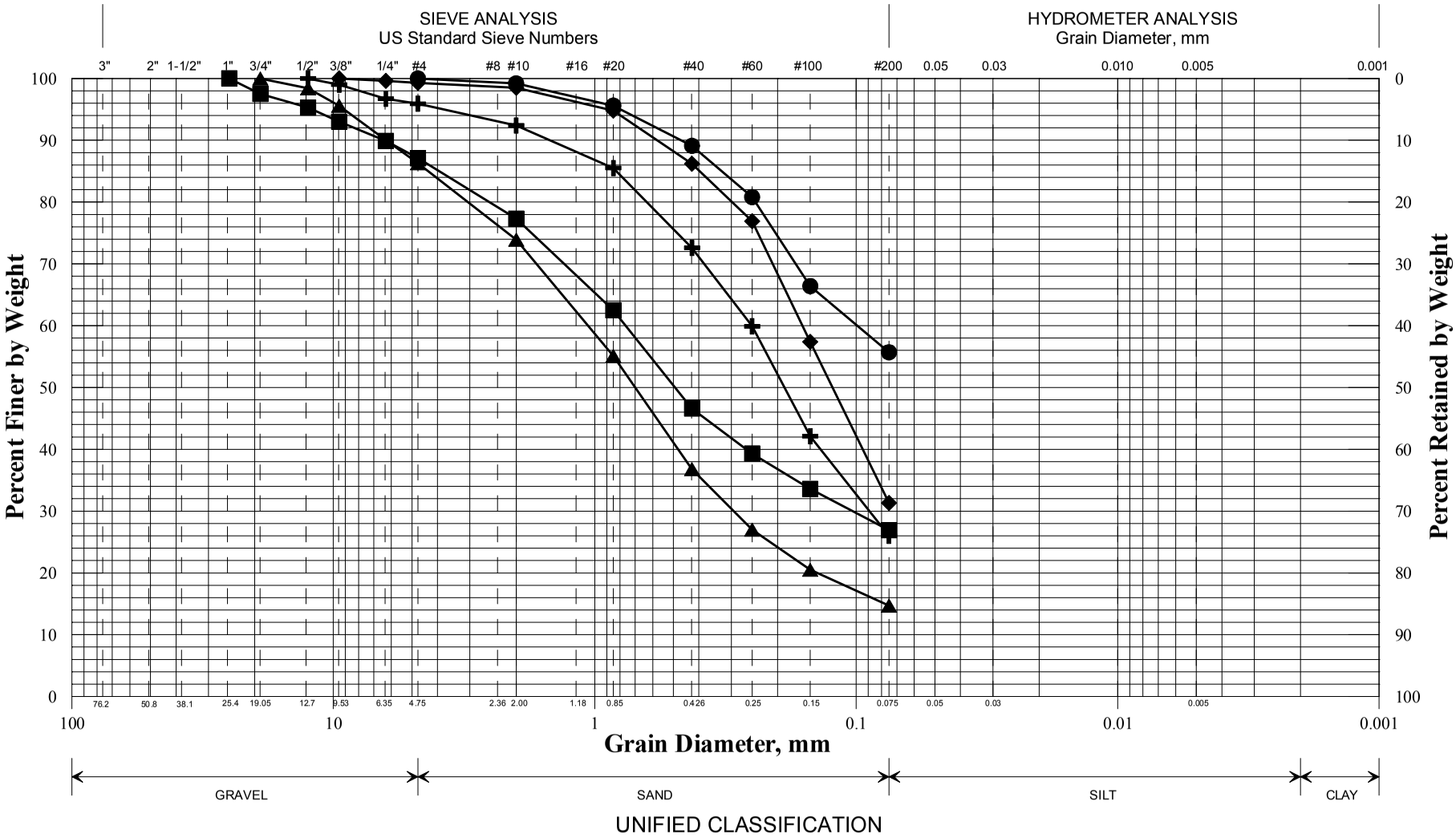
WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

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

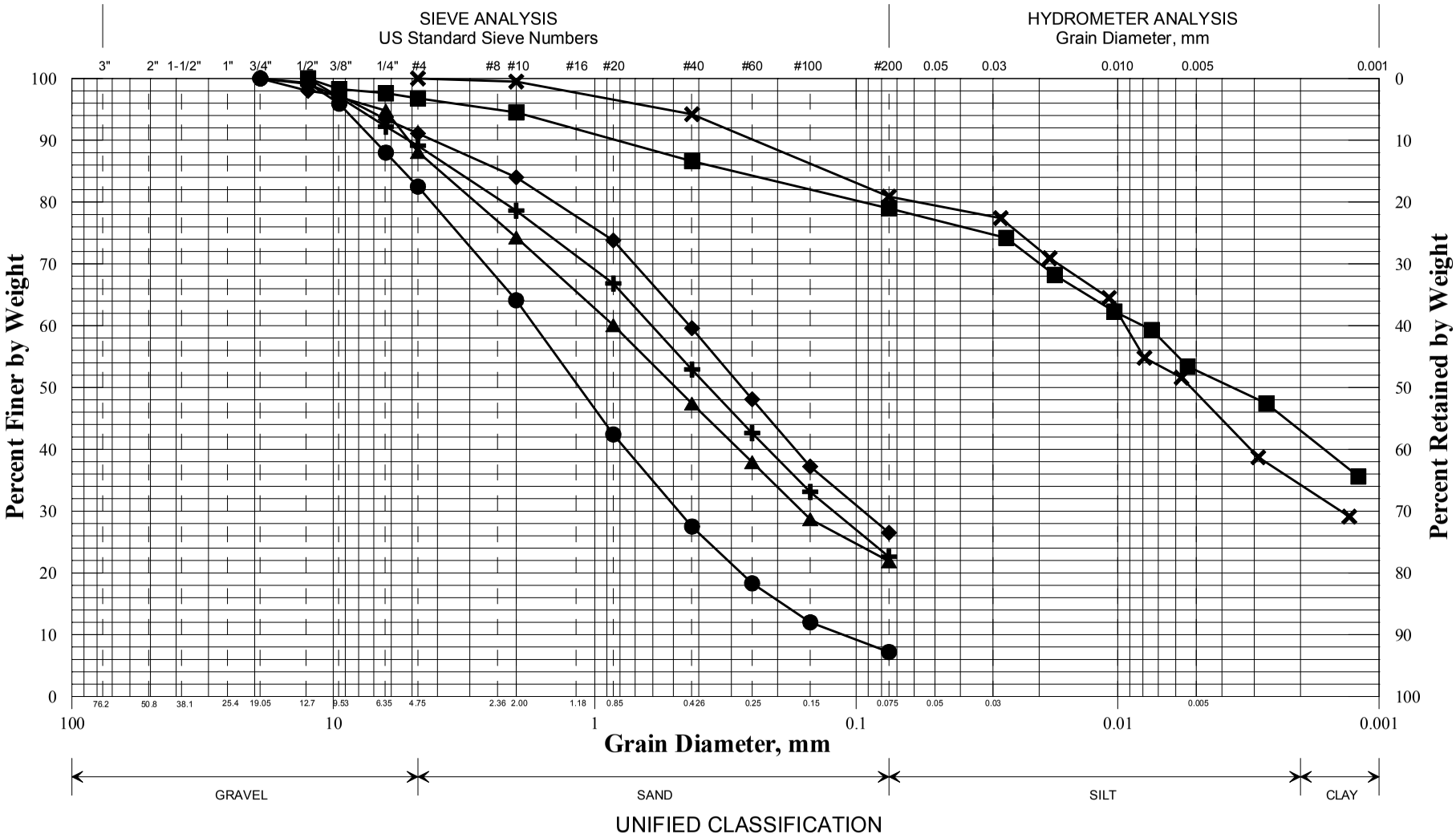


	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-SCAR-103/S5	105+74	31.1 LT	1.0-2.9	SAND, some silt, trace gravel.	12.0			
◆	HB-SCAR-103/S6	105+74	31.1 LT	2.9-5.0	SAND, some silt, trace gravel.	17.1			
■	HB-SCAR-105/S9	101+50	32.2 LT	1.0-2.5	SAND, some silt, little gravel.	6.9			
●	HB-SCAR-105/S10	101+50	32.2 LT	2.5-5.0	Sandy SILT.	19.9			
▲	HB-SCAR-108/S15	105+75	16.8 RT	0.7-2.5	SAND, little silt, little gravel.	1.9			
✖									

WIN
017343.00
Town
Scarborough
Reported by/Date
WHITE, TERRY A 1/18/2011

State of Maine Department of Transportation

GRAIN SIZE DISTRIBUTION CURVE

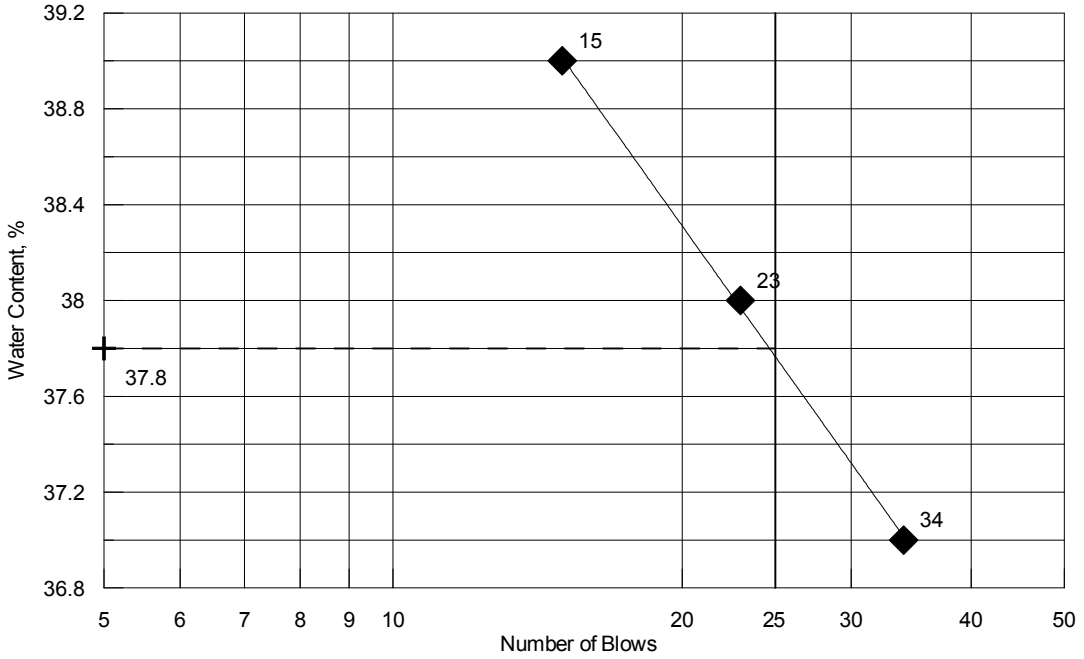


	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-SCAR-110/S19	111+50	2.6 RT	1.4-2.5	SAND, some silt, some gravel.	8.2			
◆	HB-SCAR-110/S20	111+50	2.6 RT	2.5-5.0	SAND, some silt, little gravel.	10.4			
■	HB-SCAR-118/S27	805+52	9.5RT	2.2-10.0	Silty CLAY, little sand, trace gravel.	21.1	38	19	16
●	HB-SCAR-120/S28	802+00	12.9 RT	4.0-7.5	Gravelly SAND, trace silt.	10.9			
▲	HB-SCAR-120/S29	802+00	12.9 RT	7.5-10.0	SAND, some gravel, some silt.	20.1			
✕	HB-SCAR-121/S30	800+50	5.0 RT	0.3-10.0	SILT, some clay, little sand, trace gravel.	23.4	32	19	13

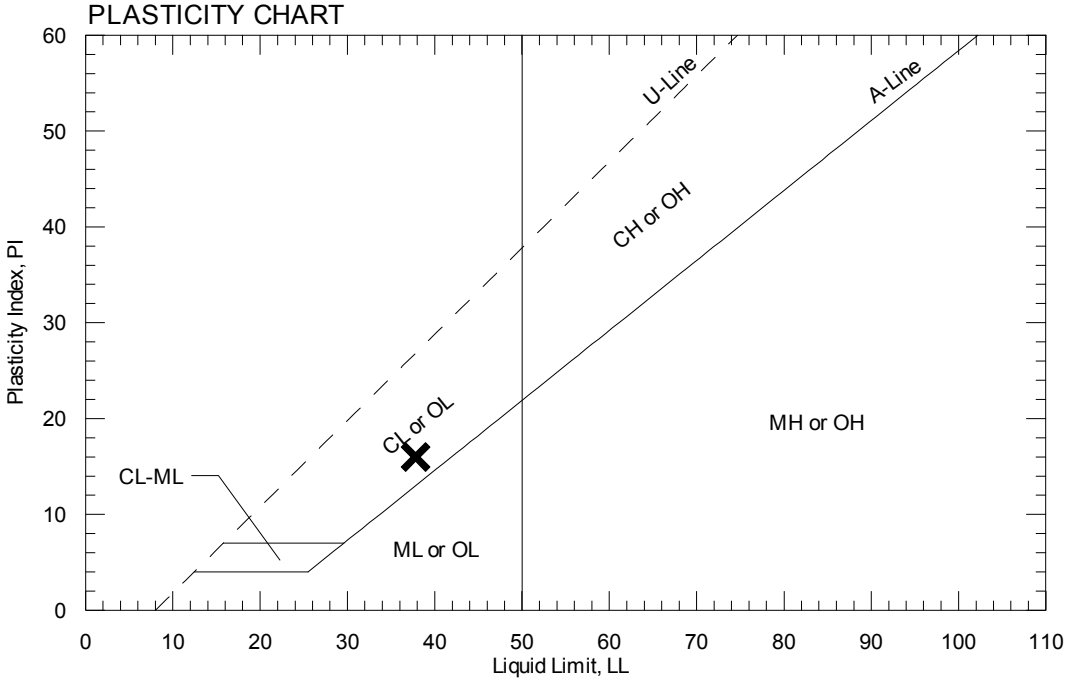
WIN
017343.00
Town
Scarborough
Reported by/Date
WHITE, TERRY A 2/3/2011

TOWN	Scarborough	Reference No.	245490
WIN	017343.00	Water Content, %	21.1
Sampled	11/28/2010	Plastic Limit	19
Boring No./Sample No.	HB-SCAR-118/S27	Liquid Limit	38
Station	805+52	Plasticity Index	16
Depth	2.2-10.0	Tested By	BBURR

FLOW CURVE

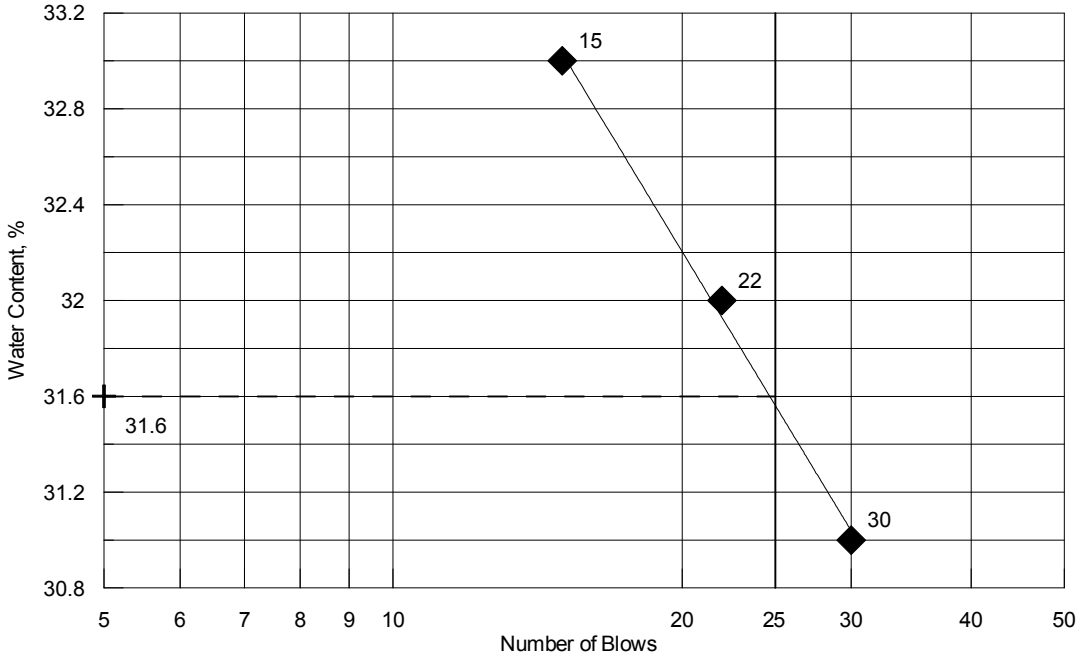


PLASTICITY CHART



TOWN	Scarborough	Reference No.	245493
WIN	017343.00	Water Content, %	23.4
Sampled	11/28/2010	Plastic Limit	19
Boring No./Sample No.	HB-SCAR-121/S30	Liquid Limit	32
Station	800+50	Plasticity Index	13
Depth	0.3-10.0	Tested By	BBURR

FLOW CURVE



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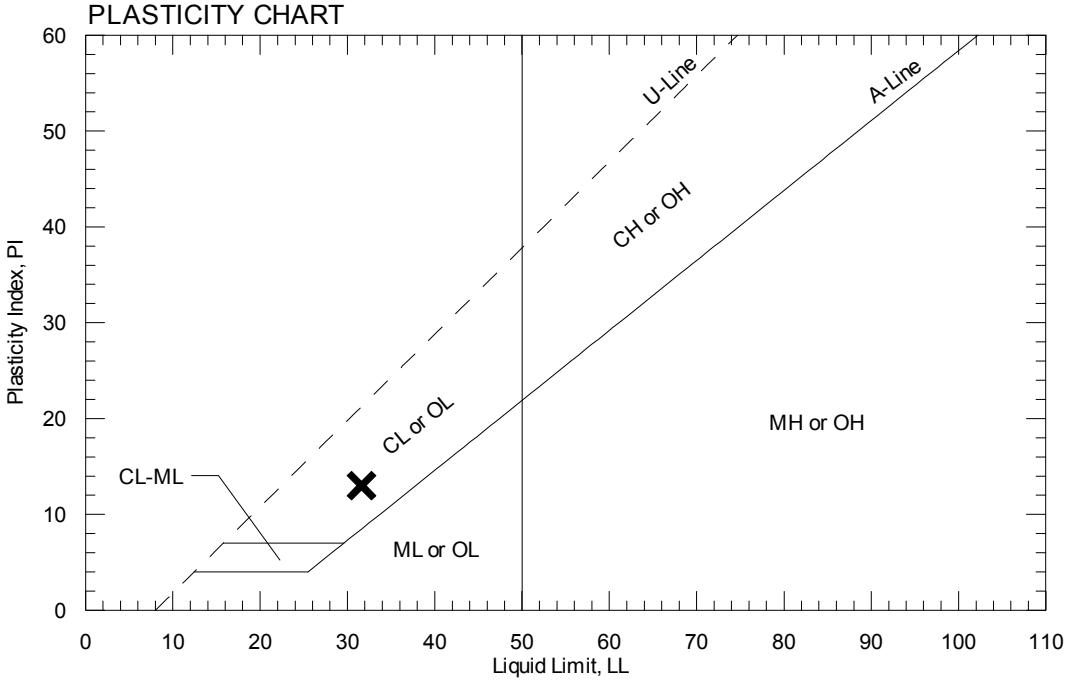


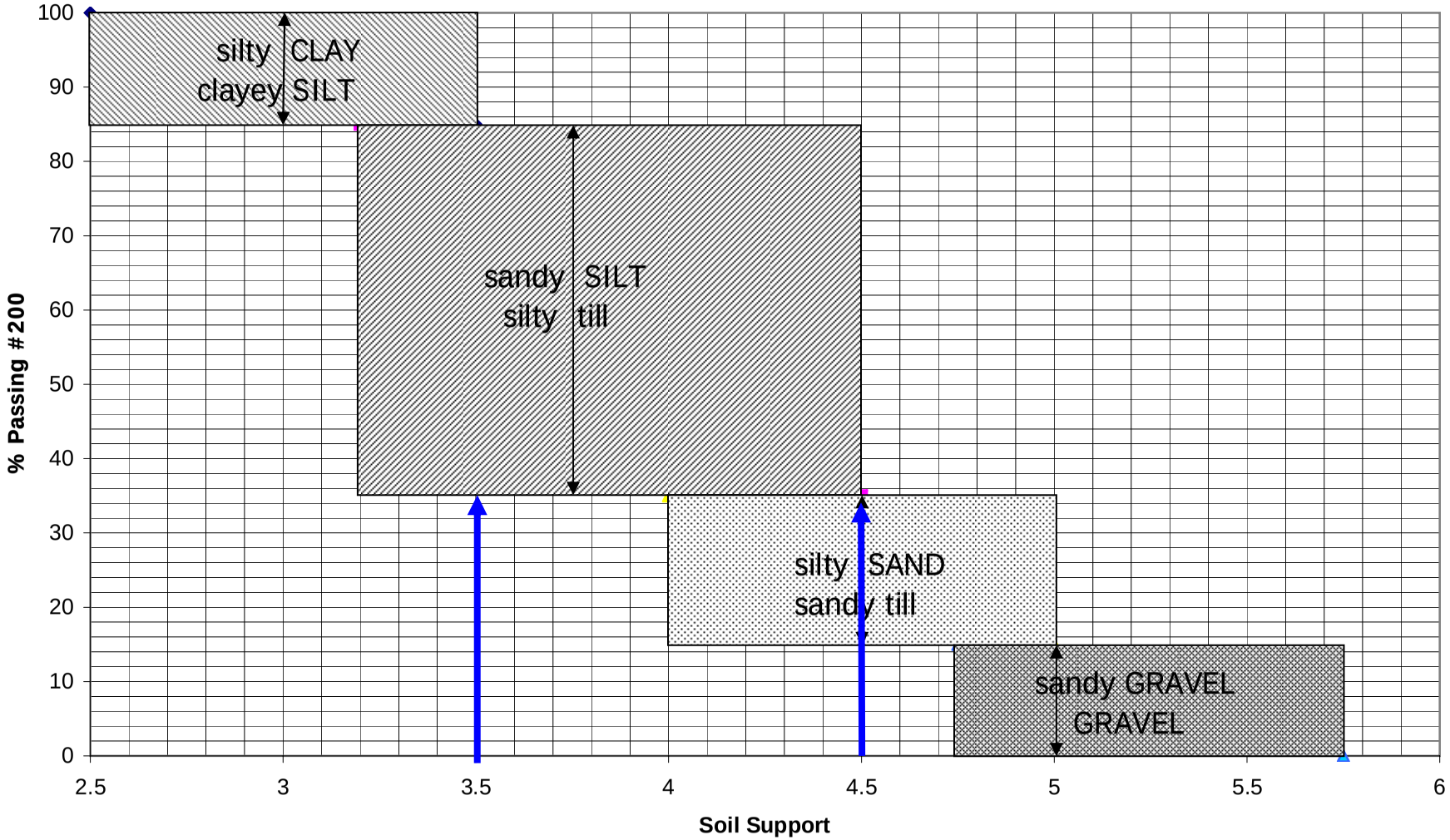
State of Maine - Department of Transportation

Pavement Core Summary Sheet

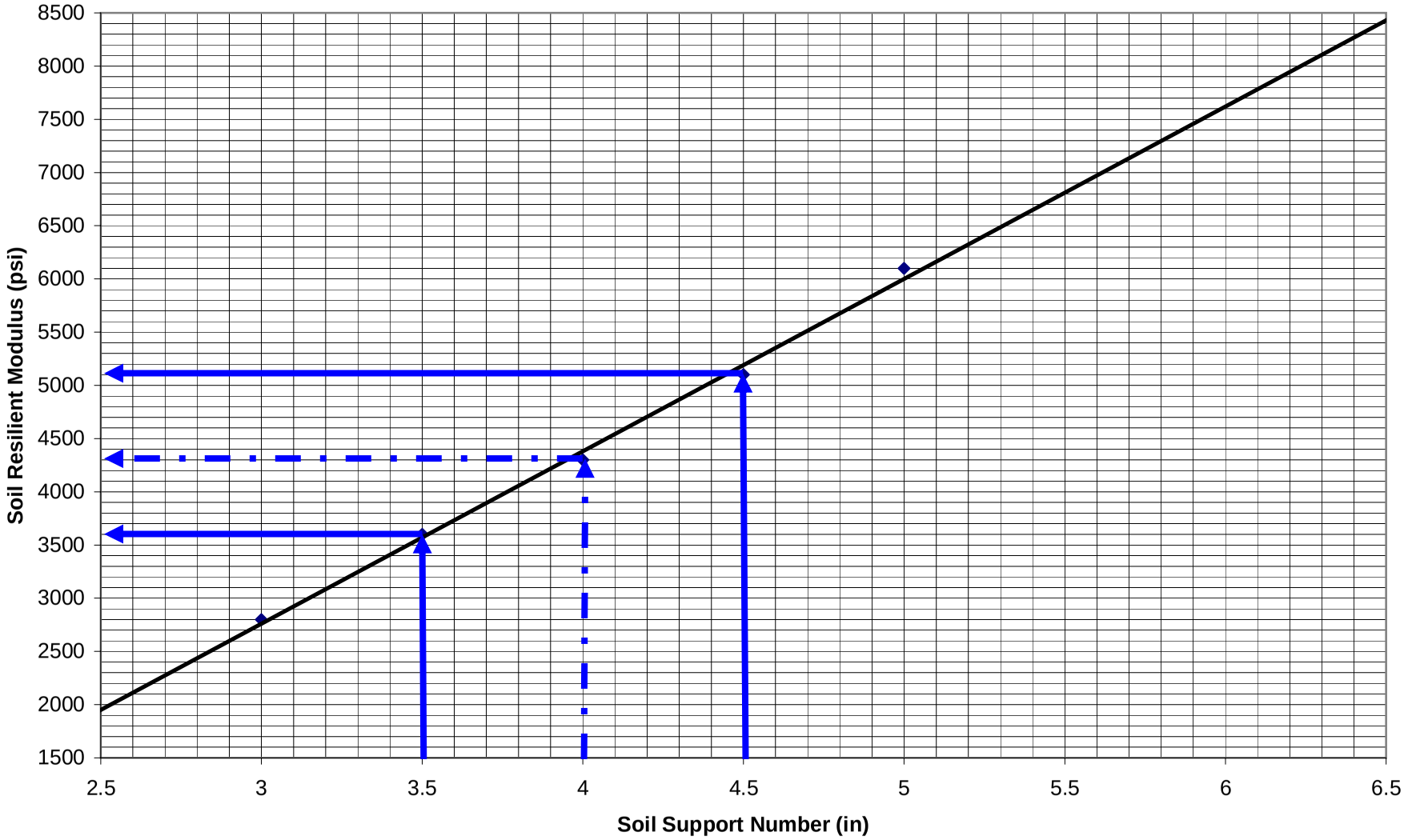
Town(s): Scarborough Project Number: 17343.00

Station (Feet)	Offset (Feet)	Pavement Depth (Feet)	Concrete (Feet)	PC-Number	Saved Core	Comments / Date 11/28,30/2010
101+50	14.0 Lt.	0.0-0.2	0.2-1.0	1	yes	HB-SCAR-116, B-2
103+49	18.7 Rt.	0.0-0.7	---	2	yes	HB-SCAR-107, B-6
105+74	14.9 Lt.	0.0-0.25	0.25-0.8	3	yes	HB-SCAR-114, B-8
108+00	23.1 Lt.	0.0-0.6	0.6-1.5	4	yes	HB-SCAR-109, B-11
111+50	34.4 Lt.	0.0-0.4	0.4-1.0	5	yes	HB-SCAR-101, B-14
Pine Point Road						
750+76.9	15.3 Lt.	0.0-0.4	---	C-1	yes	
Broadturn Road						
748+39	5.3 Rt.	0.0-0.9	---	C-2	yes	Mobile Entrance, see Geoplans

Guidelines for Selection of Soil Support Values for Pavement Design



Soil Resilient Modulus for DARWin



MaineDOT

Highway Program

Brad Foley, Program Manager
Rich Crawford & Heath Cowan, Assistant Program Managers
Phone: 624-3480 Fax: 624-3481

Memorandum

To: Don Ettinger, HNTB
c.c.: Ernie Martin
From: Karen Gross
Date: 1/03/11
Subject: Preliminary Pavement Design
Dunstan Corner, Scarborough
PIN 17343.00

I have completed the preliminary pavement designs for the Dunstan Corner improvement project. All designs are based on the traffic data for each leg of the intersection, a 20-year performance period, and a 30" total pavement structure section. The designs also are based on full construction, but the calculated thicknesses can also be applied to widening and overlay areas.

The pavement design was performed using the 1993 AASHTO pavement design method and the AASHTOWare DARWin software. Inputs for initial and terminal serviceability, and overall standard deviation were as recommended in Chapter 13 of the Highway Design Guide. A value of 4.5 was used for initial serviceability, 2.5 for terminal serviceability, and 0.45 for the overall standard deviation.
The subgrade resilient modulus was determined from subgrade soils encountered in borings, correlated to soil support values and associated resilient modulus values known in Maine. The resilient modulus value used for all designs was 4000 psi.

Because each leg had different traffic volumes, the asphalt and gravel thicknesses varied throughout the project limits. I did designs for each leg using subbase gravel only and using a combination of base and subbase gravel. Using base gravel in the pavement structure allows us to reduce the HMA thickness (the highest cost item).

Table 1 shows the recommended pavement designs for each leg of the intersection using subbase gravel only:

Table 1: Subbase Gravel Designs

Material	**Rt. 1** (ESAL's = 7,628,500)	**Pine Point Rd.** (ESAL's = 2,722,900)	**New Connector** (ESAL's = 1,496,500)	**Payne Rd.** (ESAL's = 445,300)
HMA (in)	10	7	5.5	4
base gravel (in)				
subbase gravel (in)	20	23	24.5	26
Total Thickness (in)	30	30	30	30

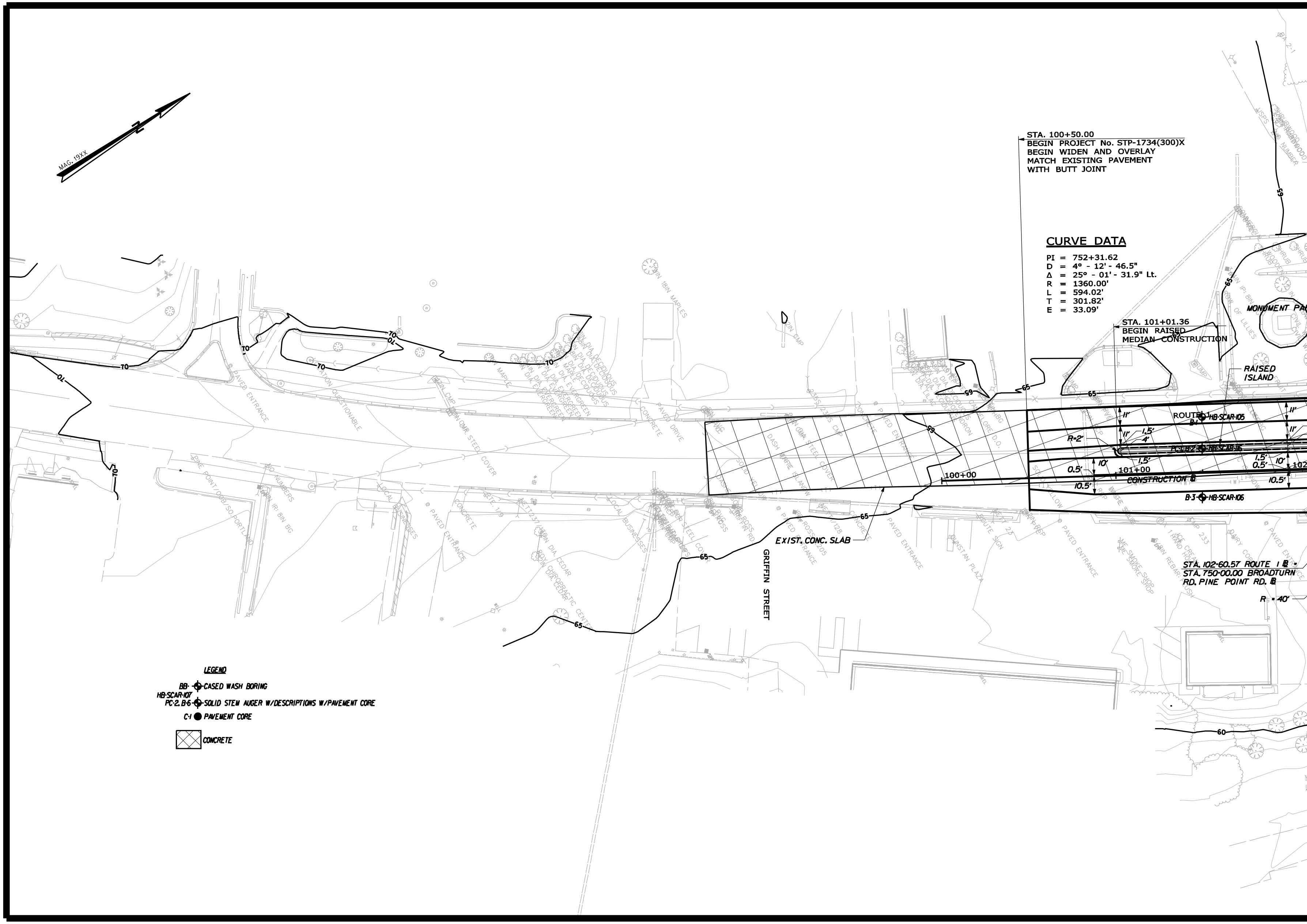
Base gravel along with subbase gravel was considered on Route 1, Pine Point Rd., and the new connector. The addition of base gravel was not considered on Payne Road since we have the MaineDOT recommended minimum allowable thickness of HMA using subbase gravel. Table 2 shows the recommended pavement designs for each leg of the intersection using base and subbase gravel:

Table 2: Base and Subbase Gravel Designs

Material	Rt. 1 (ESAL's = 7,628,500)	Pine Point Rd. (ESAL's = 2,722,900)	New Connector (ESAL's = 1,496,500)	Payne Rd. (ESAL's = 445,300)
HMA (in)	8.5	6	5	4
base gravel (in)	11.5	10	6	
subbase gravel (in)	10	14	18	26
Total Thickness (in)	30	30	30	30

I recommend that a cost analysis is done for each design scenario before a final decision id made on what we want to use for the pavement structure. I also recommend that the cost analysis includes the use of a polymer-modified HMA for the surface layer on all legs. This PMHMA resists rutting that results from large traffic volumes acceleration / deceleration at traffic signals. The overlay was done in the summer of 2010 is a PMHMA.

Please let me know if you would like any additional designs calculated.



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1734(300)X

PIN 17343.00

HIGHWAY PLANS

PROJ. MANAGER	BY	DATE
DESIGN-DETAILED	K.GROSS	
CHECKED-REVIEWED	T.WHITE	DEC 2010
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

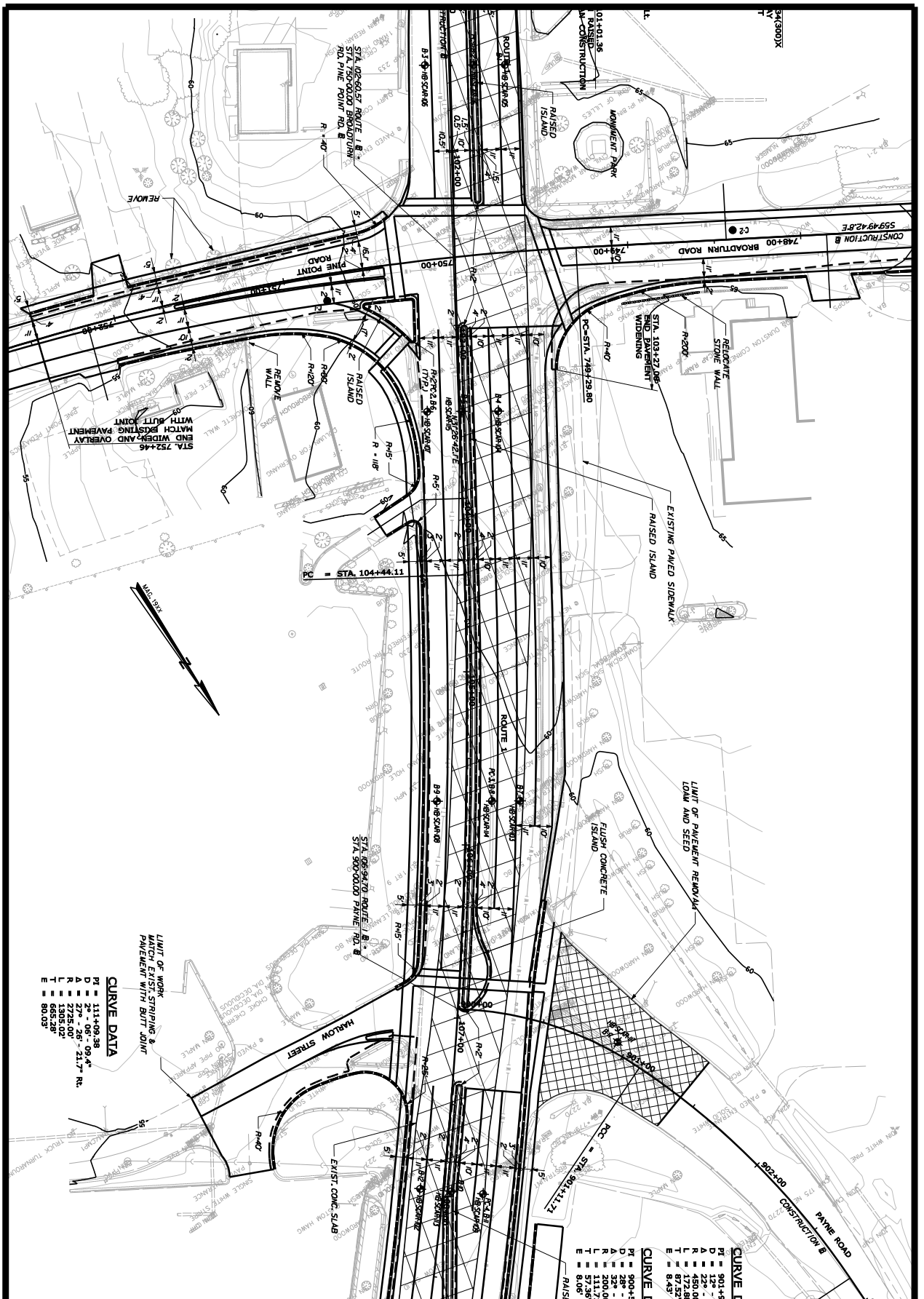
DATE

SCARBOROUGH
DUNSTAN CORNER

GEOPLANS

SHEET NUMBER
1
OF 9

Filename: ...\geotech\msta\002_Geoplan2.dgn Division: GEOTECH Username: terry.white Date:9/20/2011



SCARBOROUGH
DUNSTAN CORNER

GEOPLANS

		BY	DATE
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DESIGN-DETAILED	K.CROSS	T.WHITE	DEC 2010
CHECKED-REVIEWED			
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.R. NUMBER

DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

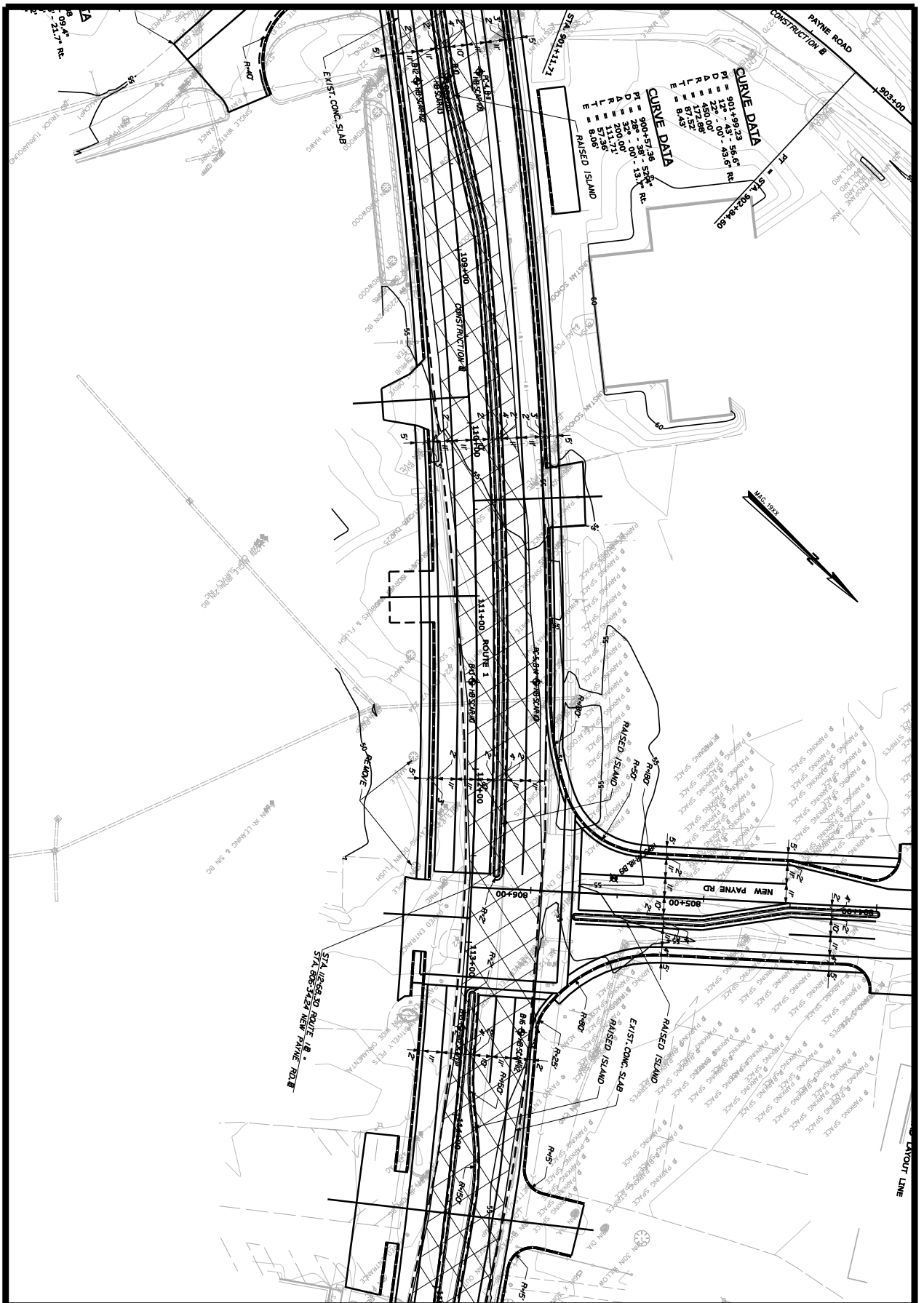
STP-1734(300)X

PIN
17343.00

HIGHWAY PLANS

SHEET NUMBER 2 OF 9

Filename: ...\geotech\msta\003_Geoplan3.dgn Division: GEOTECH Username: terry.white Date:9/20/2011



SHEET NUMBER 3 OF 9

SCARBOROUGH
DUNSTAN CORNER

GEOPLANS

PROJ. MANAGER		BY	DATE
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CHECKED-REVIEWED			
DESIGN2-DETAILED2			
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.R. NUMBER

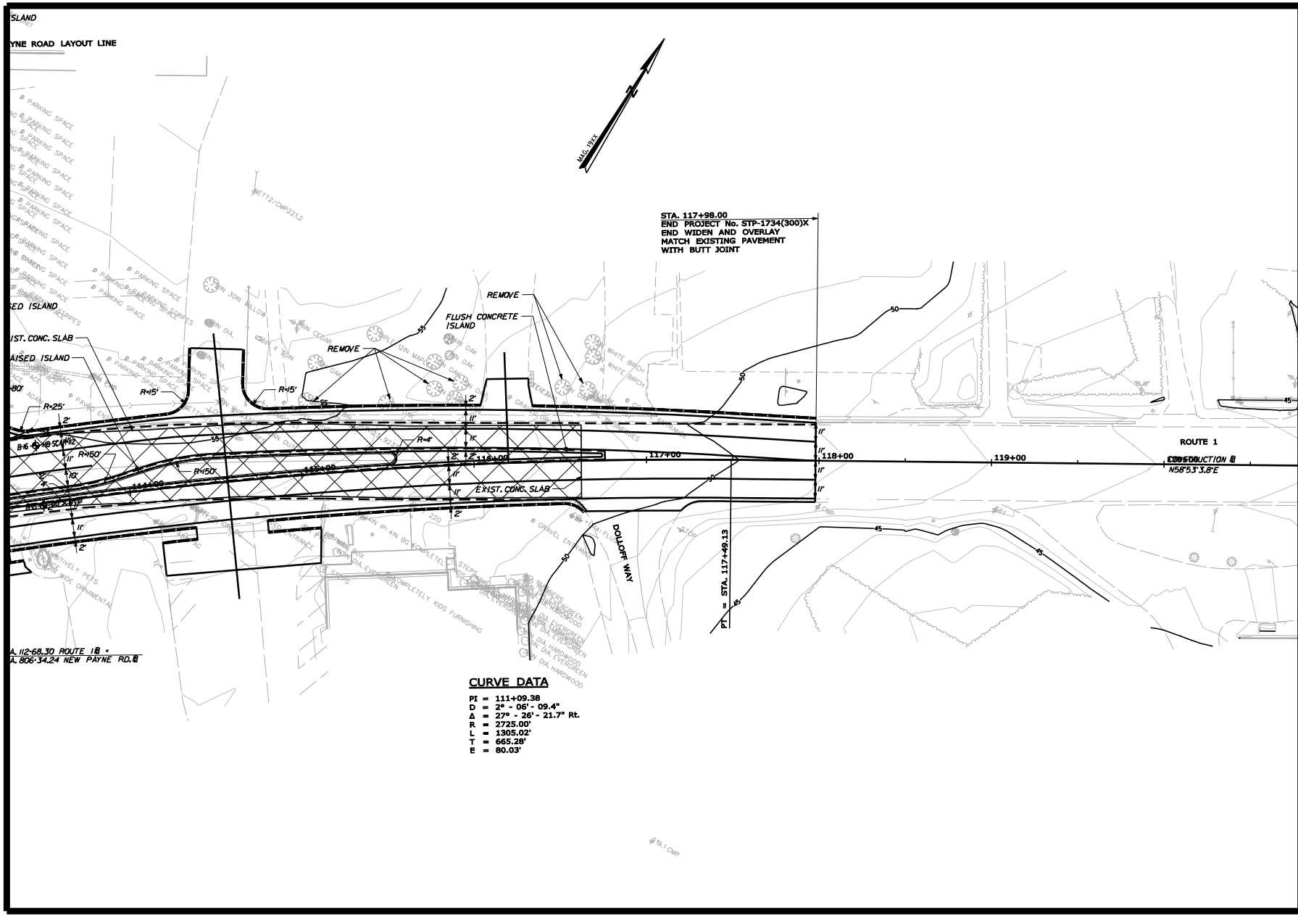
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1734(300)X

PIN
17343.00

HIGHWAY PLANS



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1734(300)X

PIN 17343.00

HIGHWAY PLANS

	BY	DATE	SIGNATURE
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DESIGN DETAILED	------	------	DATE
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REVISIONS 2	------	------	
REVISIONS 3	------	------	
REVISIONS 4	------	------	
FIELD CHANGES	------	------	

SCARBOROUGH
DUNSTAN CORNER

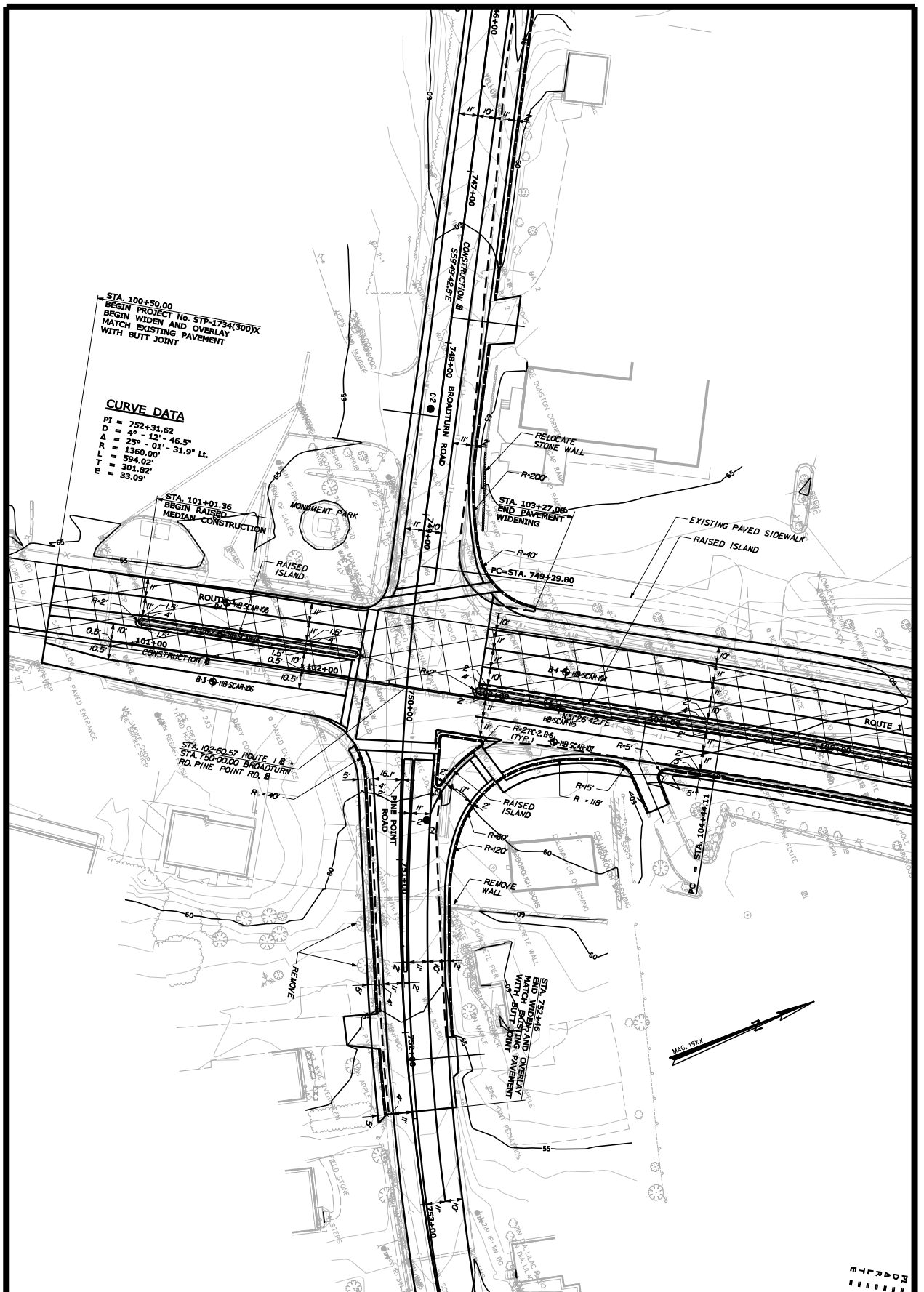
GEOPLANS

SHEET NUMBER

4

OF 9

Filename: ...\geotech\mrsto\004_Geoplan4.dgn Division: GEOTECH Username: terry.white Date:9/20/2011



SHEET NUMBER 5 OF 9

SCARBOROUGH
DUNSTAN CORNER

GEOPLANS

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DESIGN3-DETAILED3	_____	_____	_____
REVISIONS 1	_____		_____
REVISIONS 2	_____		_____
REVISIONS 3	_____		_____
REVISIONS 4	_____		_____
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

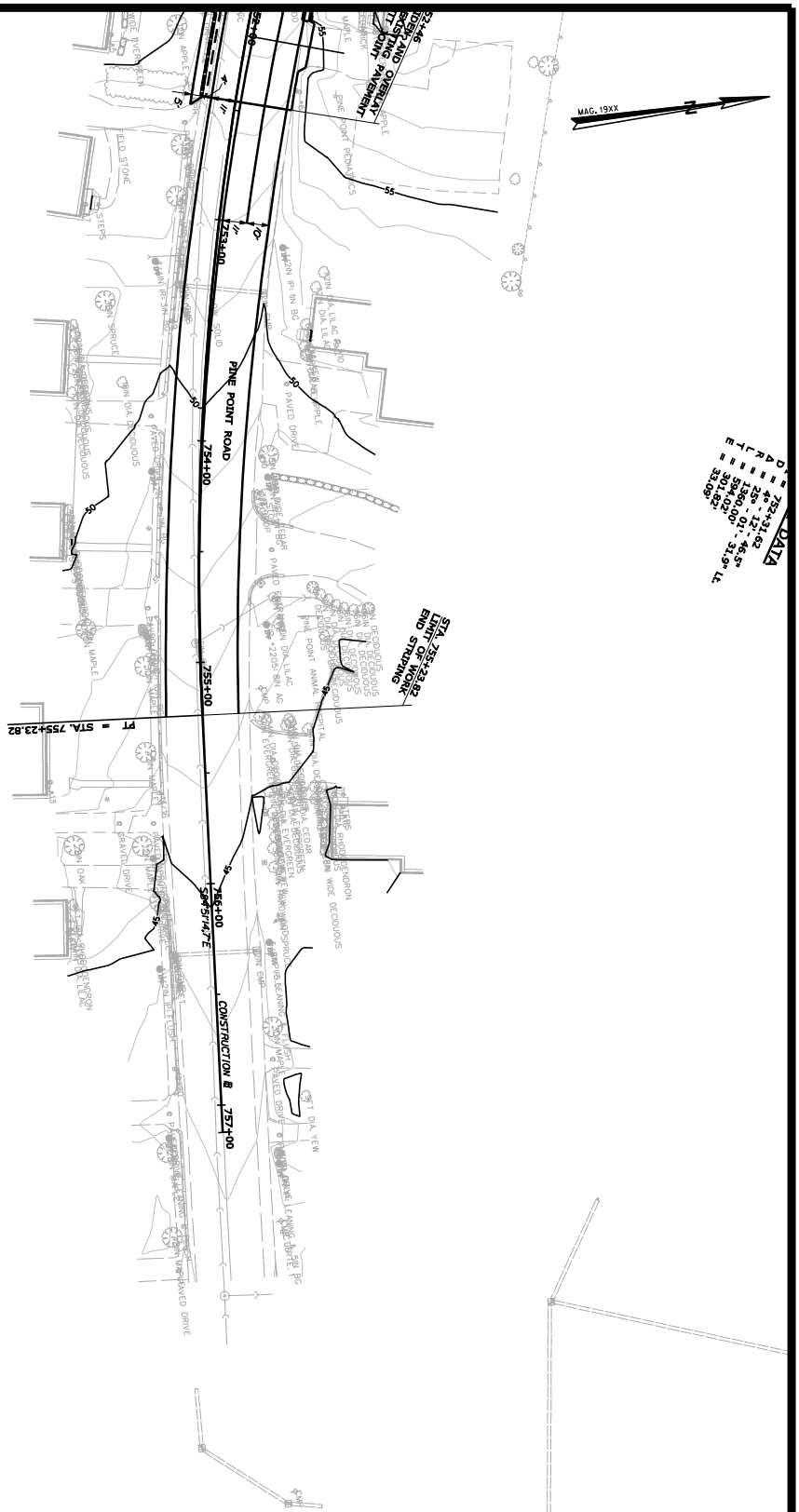
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1734(300)X

PIN
17343.00

HIGHWAY PLANS



SHEET NUMBER 6 OF 9

SCARBOROUGH
DUNSTAN CORNER

GEOPLANS

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CHECKED-REVIEWED	-----	-----	-----
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DESIGN3-DETAILED3	-------	-------	-------
REVISIONS 1	-------		-------
REVISIONS 2	-------		-------
REVISIONS 3	-------		-------
REVISIONS 4	-------		-------
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

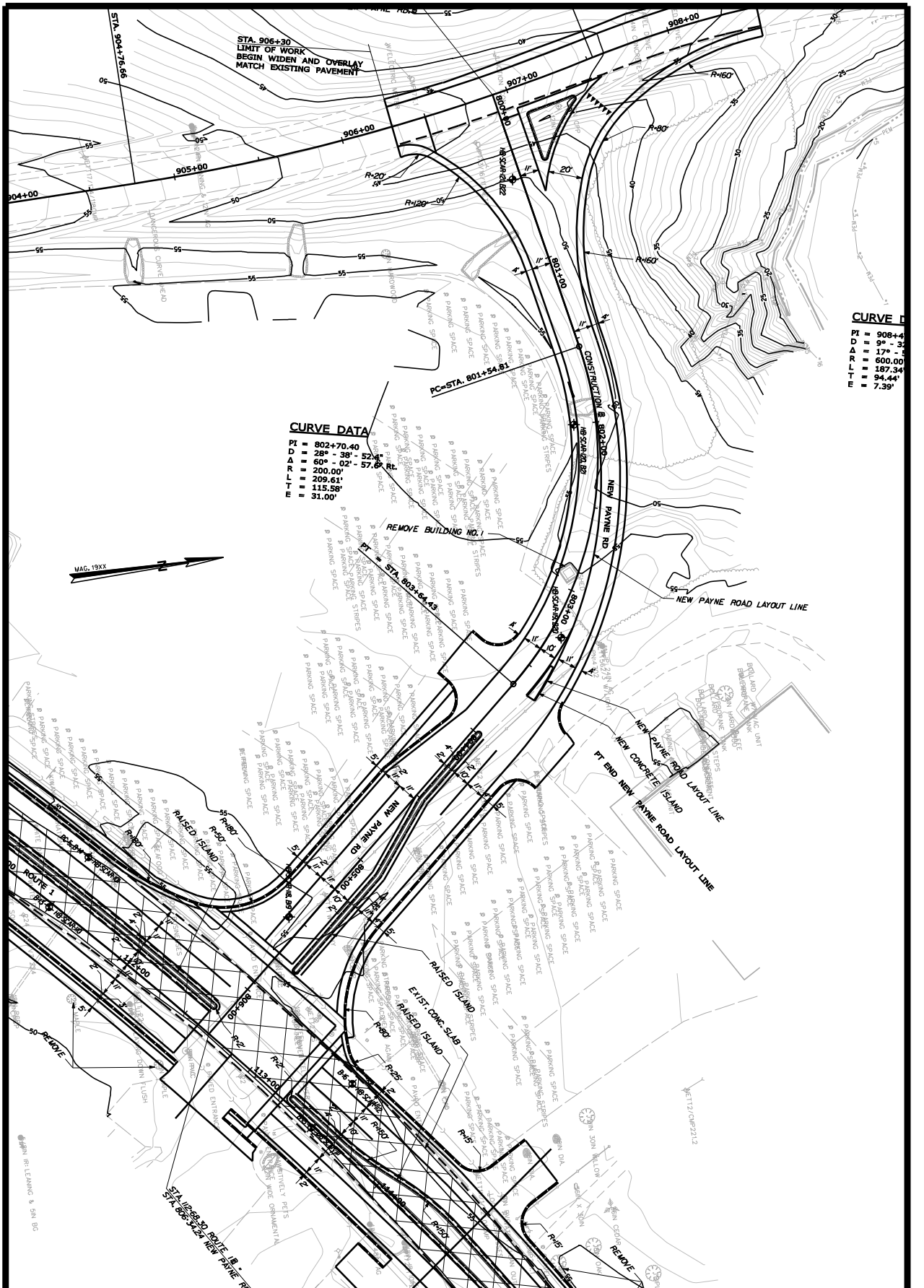
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1734(300)X

PIN
17343.00

HIGHWAY PLANS



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REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.R. NUMBER

DATE

SHEET NUMBER 2 OF 9

SCARBOROUGH
DUNSTAN CORNER

GEOPLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1734(300)X

PIN
17343.00

HIGHWAY PLANS

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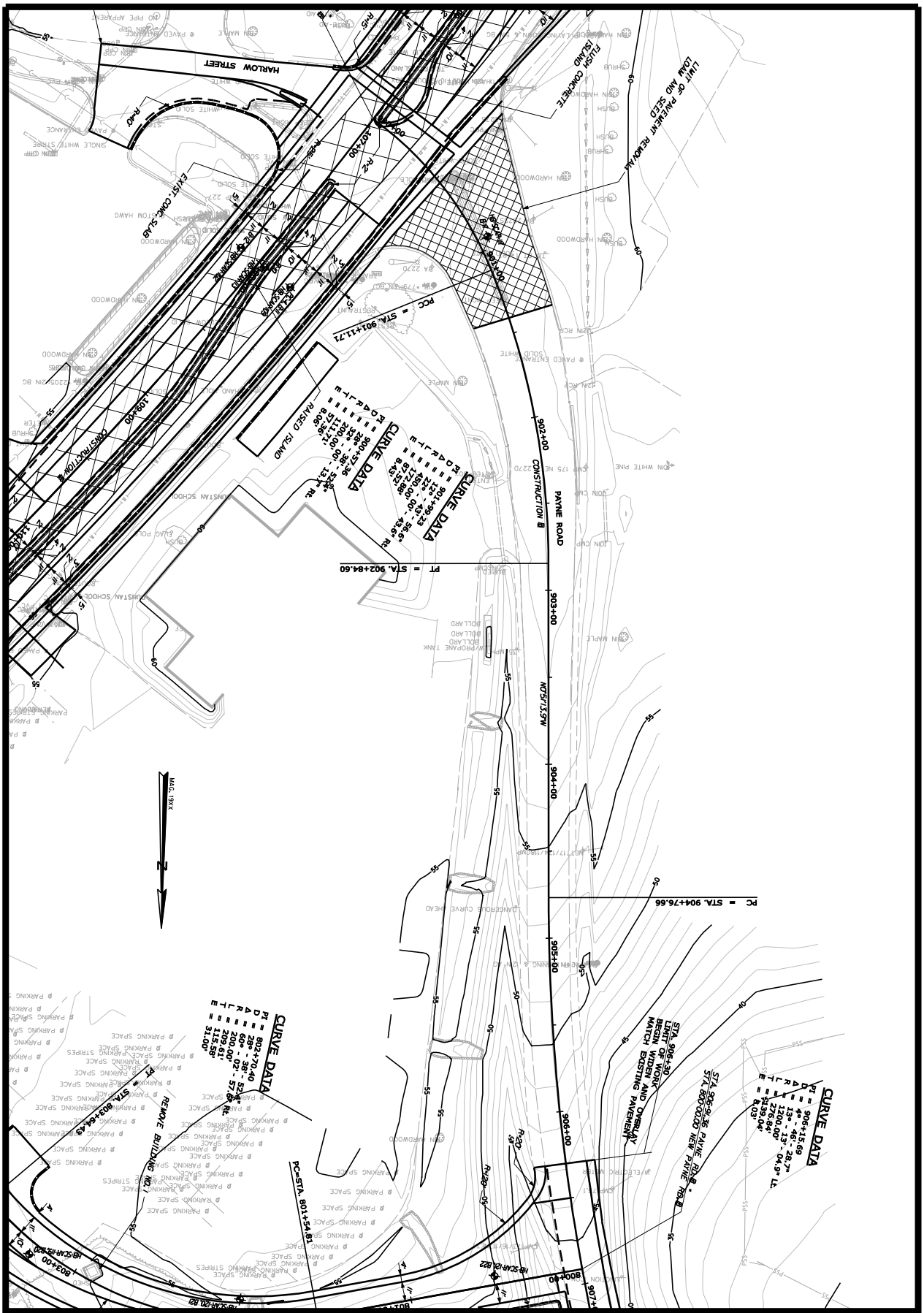
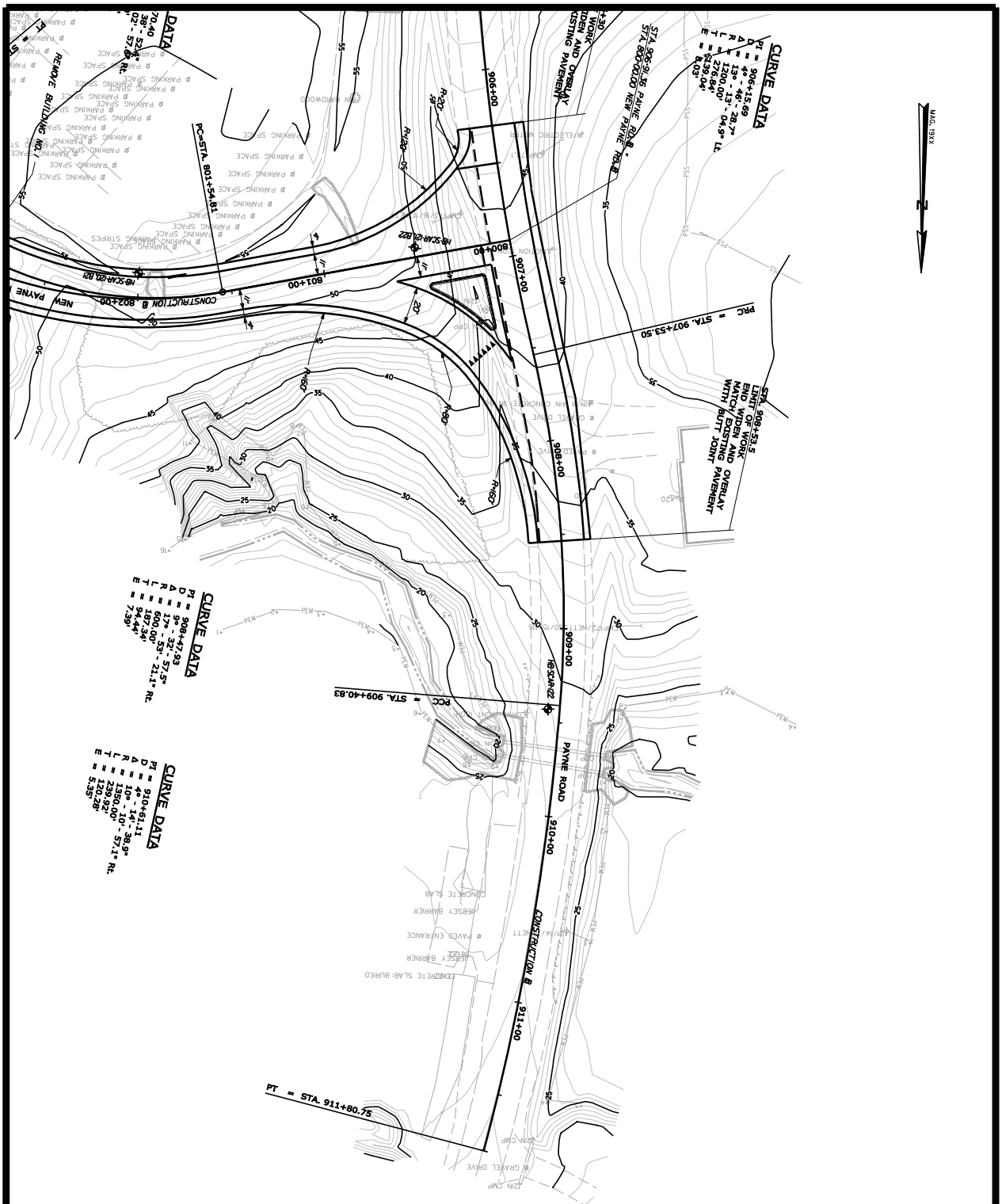


SHEET NUMBER 8 OF 9	SCARBOROUGH DUNSTAN CORNER **GEOPLANS**	PROJ. MANAGER _____ / BY / DATE DESIGN-DETAILED K.CROSS T.WHITE DEC 2010 CHECKED-REVIEWED _____ _____ _____ DESIGN2-DETAILED2 _____ _____ _____ DESIGN3-DETAILED3 _____ _____ _____ REVISIONS 1 _____ _____ REVISIONS 2 _____ _____ REVISIONS 3 _____ _____ REVISIONS 4 _____ _____ FIELD CHANGES _____ _____ SIGNATURE P.R. NUMBER DATE	STATE OF MAINE DEPARTMENT OF TRANSPORTATION STP-1734(300)X PIN 17343.00 HIGHWAY PLANS



SHEET NUMBER 6 OF 9	SCARBOROUGH DUNSTAN CORNER	PROJ. MANAGER	STATE OF MAINE DEPARTMENT OF TRANSPORTATION
		DESIGN-DETAILED K.CROSS T.WHITE DEC 2010	STP-1734(300)X
		CHECKED-REVIEWED	SIGNATURE
		DESIGN2-DETAILED2	P.E. NUMBER
		DESIGN3-DETAILED3	
		REVISIONS 1	DATE
		REVISIONS 2	
		REVISIONS 3	
		REVISIONS 4	
		FIELD CHANGES	
	GEOPLANS		PIN 17343.00 HIGHWAY PLANS