Maine Department of Transportation
Highway Program

GEOTECHNICAL DESIGN REPORT

For the Reconstruction of:

I-95, EXIT 113 and OLD BELGRADE ROAD
AUGUSTA, MAINE

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1.0 INTRODUCTION

The Augusta I-95, Exit 113 & Old Belgrade Road project begins at the intersection of Old Belgrade Road and Route 27 and extends approximately 2.2 miles easterly to just beyond the existing I-95 northbound on/off ramps. The purpose of this project is to relieve congestion and improve mobility at Exit 112 (I-95) by providing another access point to I-95 from the rapidly developing North Augusta area and Route 27.

The scope of work for this project includes reconstruction of existing roads, constructing new alignments, constructing roundabouts on the west side of I-95 and on the east side of I-95, and reconstructing the I-95 north and southbound on/off ramps. A pedestrian trail will be constructed from the new hospital entrance to just east of the west side roundabout.

Route 27 will be widened from Gabriel Drive to just north of the intersection with Old Belgrade Road, and Bog Road will be reconstructed between Route 27 and Old Belgrade Road. Old Belgrade Road will be reconstructed from Route 27 to just beyond Stony Brook and two new pipes will replace two existing pipes at the Stony Brook crossing.

Just to the east of Stony Brook, a new alignment for Old Belgrade Road will be constructed and will lead to the roundabout on the west side of I-95. Approaches to this roundabout will include Old Belgrade Road to the west (Route 3) and east, I-95 south bound on and off ramps, and Route 3. Old Belgrade Road to the west of the roundabout will be renamed Route 3. A section of Old Belgrade Road at the west side roundabout location will be discontinued and converted to a cul-de-sac for local use.

A second roundabout will be constructed on the east side of I-95. Approaches to this roundabout include Route 3 to the east and west, and I-95 northbound on and off ramps.

The construction of the east and west side roundabouts and approaches involves realigning the I-95, Exit 113 northbound and southbound on/off ramps. Roundabout construction, approach work and realigned on/off ramps are within the limits and footprint of the Kennebec River Crossing Project. Geotechnical recommendations as outlined in Geotechnical Report No. 2003-05C (REPORT ON GEOTECHNICAL EVALUATION - KENNEBEC RIVER CROSSING PROJECT- CONTRACT NO. 1, PIN 556.21- AUGUSTA, MAINE and REPORT ON INTERSTATE 95 BRIDGE - KENNEBEC RIVER CROSSING PROJECT - (000556.20/STP-0556(20)X) - AUGUSTA, MAINE) by Haley & Aldrich, Inc. (2001, 2003) were referenced and followed for these section of the proposed project. Additional subsurface information was collected by MaineDOT as part of the Exit 113 project to confirm that the existing underlying soils and conditions were similar to those on the Kennebec River Crossing project. The Haley & Aldrich evaluation for the factor of safety against a global sheer failure for a 40-ft high embankment with 2H:1V side slopes was 1.7 to 1.9 and it was stated in the above report that this would be typical for the Kennebec River Crossing project (within the limits of Pin 556.20). Settlement was also evaluated for the worst case situation where large embankment fills are placed on the thickest underlying marine CLAY-SILT deposits. Settlement for a 26-ft embankment fill placed on a 36-ft thick

CLAY-SILT layer was estimated to be approximately 3”, with expected settlements at other locations to be less.

Due to the complexity of this project, this report is presented by specific sections of the project. These stand alone sections include: Route 27, Bog Road, Old Belgrade Road (Route 3), West Side Roundabout, East Side Roundabout, and the Pedestrian Trail. All further references to the Kennebec River Crossing project in this report will be to the information as presented in the Haley & Aldrich report (2003-05C). Relevant sections of that report are included in Appendix F and metric units have been converted to US Customary units.

2.0 ROUTE 27

The scope of work for Route 27 will consist of widening the roadway to create additional turning lanes on the north bound side of the roadway. The entire roadway width will be overlayed with 1 ½” of new HMA.

2.1 Subsurface Investigations

Pavement cores were collected at Stations 200+90, 208+25, and 220+00. Cores were collected in the north and southbound shoulders and travel lanes. The following table lists the locations and the thickness of the existing HMA:

Table 1: Route 27- HMA Cores

Station (ft)	Offset (ft)	Pavement Thickness (in)
200+90	16.0 Rt.	9.75
200+90	6.0 Rt.	14.50
200+90	6.0 Lt.	11.00
200+90	16.0 Lt.	5.50
208+25	16.0 Rt.	3.00
208+25	6.0 Rt.	9.75
208+25	6.0 Lt.	8.00
208+25	16.0 Lt.	3.25
220+00	16.0 Rt.	5.00
220+00	6.0 Rt.	9.00
220+00	6.0 Lt.	7.75
220+00	16.0 Lt.	3.25

No base or subbase information was collected at this time due to the scope of the project. Plans showing core locations and a Pavement Core Summary Sheet for this section are located in Appendix B(Geoplans) and C(Boring Logs) respectively.

2.2 As-Built Plans

As-built plans from 1953 (Project No. F031-1(3)) indicate that the pavement structure was constructed with 24” to 36” of gravel base course and 3” of macadam surface course. The roadway was constructed with 12’ wide travel lanes and 8’ wide shoulders and had a superelevated section. The shoulders were surfaced with a 2’ wide bituminous surface

treatment and the remaining 6' width was gravel. Since the original construction, several overlays have been placed on the roadway and shoulders. By specification, the existing base gravel is similar to Aggregate Subbase Course-Gravel, Type D.

2.3 Pavement Structure Widening Recommendations

Pavement structures that are widened usually perform the best when the new pavement matches the material and layer thickness of the existing pavement structure. Because of the excessively thick and variable existing HMA layer, a less thick HMA layer can be considered for the widened areas. Using a thinner HMA layer is justified because the widened areas that will be turn only lanes will be subjected to less traffic loadings than the travel lanes. If a pavement design determines the HMA and base/subbase gravel thicknesses, the appropriate Subgrade Resilient Modulus (Mr) to use for the pavement design is 4200 psi.

3.0 BOG ROAD

The scope of work for Bog Road between Route 27 and Old Belgrade Road is reconstruction. This section of Bog Road currently allows 2-way traffic, but will be converted to one-way travel only upon completion of this project. Reconstruction includes new base aggregate, new HMA, paved shoulders, and drainage improvements in the form of ditching or a closed drainage system.

3.1 Existing Conditions

This section of Bog Road gets a considerable amount of turning truck traffic off of Route 27. Prior to recent overlay, there was severe rutting in the right wheel path on the northbound lane and evidence of subgrade damage. The current roadway consists of 12' travel lanes and variable width gravel shoulders. As-built plans from 1978 indicate that Bog Road was reconstructed, but the plan set lacks typical sections, so it is unknown what pavement structure materials were placed or if the roadway was originally constructed as a bathtub section. Travel lanes were 10 feet wide and shoulders were gravel. It is expected that the existing travel lane widths have been gradually widened with overlay projects done since 1978. Current right wheel paths probably are located over the old shoulder.

3.2 Geology

The Maine Surficial Geology map for the Augusta Quadrangle indicates that the natural surface soils consist of Presumpscot Formation. Presumpscot Formation consists of marine silt, clay and fine sands and typically has poor bearing strength when wet, poor drainage properties, and is frost susceptible. The Maine Surficial Geology map for the Augusta Quadrangle is located in Appendix E as well as NRCS Soil Survey maps for various subsurface conditions.

3.3 Subsurface Investigations

No subsurface investigations were conducted at this location.

3.4 Recommendations

Due to the right wheel path rutting, the existing pavement structure offers poor support for heavy, slow moving loads. Reconstruction of the pavement structure and providing adequate subsurface drainage by daylighting subbase gravel or by installing underdrain is recommended.

The appropriate Subgrade Resilient Modulus (Mr) to use for the Bog Road pavement design based on the proposed design and the existing subgrade soil type is 3600 psi.

4.0 OLD BELGRADE ROAD

The scope of work for the section of Old Belgrade Road from the intersection with Route 27 to the west side roundabout is reconstruction which includes new base/subbase aggregate, new HMA, paved shoulders, and drainage improvements in the form of ditching or a closed drainage system.

The proposed roadway template will consist of two 11-foot travel lanes and 5-foot paved shoulders from Route 27 to the new hospital entrance. The proposed roadway template from the hospital entrance to the west side roundabout approach will consist of four 12-foot travel lanes and 5-foot paved shoulders. The intersection of Old Belgrade Road and Route 27 will be reconfigured to improve sight distance and to allow large trucks to safely turn on and off of Old Belgrade Road. Two large pipes where Stone Brook crosses Old Belgrade Road will be resized and replaced. From these pipes to the entrance of the west side roundabout, a new alignment will be constructed just to the north of the existing alignment. The existing alignment in this section will be discontinued and a cul-de-sac will be constructed to allow access to properties currently using the existing alignment for access.

4.1 Existing Conditions

Old Belgrade Road currently consists of two 11-foot travel lanes and variable width gravel shoulders. An overlay was placed recently between Route 27 and the new hospital entrance, therefore the existing pavement distress is not visible at this time. Ditching to remove stormwater is present in some locations with the largest run located between design Stations 531+50 and 546+50. Exposed bedrock exists between Station 515+00 and 525+00.

As-built plans from 1978 indicate that the roadway was originally constructed with varying thicknesses of gravel. Travel lanes were 10 feet wide and shoulders were gravel. Surfacing is not shown on the plans, so the original thickness and mix type is unknown. No typicals were located in our archives, so it is also unknown if the roadway was originally constructed as a bathtub section. Based on the lack of ditching or other drainage provisions, a bathtub pavement section is assumed to exist.

As-built plans also indicate that 120 cubic yards of rock was excavated between 500 feet north of the Middle Road and the Middle Road.

4.2 Geology

The Maine Surficial Geology map for the Augusta Quadrangle indicates that the natural surface soils consist of Presumpscot Formation, Till, and Eolian deposits. Presumpscot Formation (marine clay, silt, and sand) is located in the area between Route 27 and Middle Road and from Brackett Cemetery to approximately 700 feet east of Stone Brook. Eolian deposits (windblown sands) are located from Middle Road to Brackett Cemetery. Glacial Till (mix of sand, gravel, cobbles, silt, clay) is located at approximately 700 feet east of Stone Brook to the west side roundabout entrance. The Maine Surficial Geology map for the Augusta Quadrangle is located in Appendix E as well as NRCS Soil Survey maps for various subsurface conditions.

4.3 Subsurface Investigations

Subsurface information was collected at twelve locations along Old Belgrade Road and the new alignment to the west side roundabout. Nine borings using solid stem augers were drilled in the existing roadway between Route 27 and to just beyond where the new alignment veers off the existing Old Belgrade Road. Two borings using hollow stem augers and split spoon samplers were drilled at the twin pipe location (one upstream of the inlet, one downstream of the outlet). Three borings using hollow stem augers with split spoon samplers were drilled in the new alignment section.

Borings were drilled to depths ranging from approximately 2.3’ to 20’ below ground surface. Samples were collected directly off the auger flights at each layer change in borings where solid stem augers were used, and at 2’ intervals in borings where hollow stem augers and split spoon samplers were used. Plans showing boring locations and boring logs for this section are located in Appendix B (Geoplans) and C (Boring Logs) respectively.

4.4 Subsurface Conditions

Subsurface materials and soils encountered in the test borings include hot mix asphalt, roadway fills, marine deposits (silty sands and silty clays), sand deposits, and bedrock.

4.4.1 Station 500+00 to 551+00

This section is located between Route 27 and where the new alignment to the west side roundabout begins. All borings (HB-AUG-102 to HB-AUG-110) were drilled in the existing roadway with information collected primarily for pavement design purposes.

The existing pavement structure consists of multiple layers of HMA underlain by aggregate. The HMA ranges from 5½” to 7¾” in thickness and the aggregate is variable in thickness ranging from 7” to 31”. The subgrade is predominately a mix of sand and silt, with the possibility that bedrock is at subgrade in the general vicinity of Station 516+00 to 525+00. Refusal was encountered at 2.3’ below the ground surface at Station 516+69.

Groundwater was not encountered in any borings, but subgrade soils were wet at Stations 504+63, 534+20, and 539+88.

4.4.2 Station 547+50 to 548+00
This section is located where Stony Brook passes under Old Belgrade Road. Boring information was collected at an upstream and downstream location (HB-AUG-210, HB-AUG-209) for the purpose of design and installation of new twin 96” reinforced concrete pipes (RCP).

The soils encountered in the upstream and downstream borings include a 1’ to 2’ layer of peat at the surface, a 3’ to 5.5’ layer of silty sand, a 3.5’ layer of weather marine clay-silt on the upstream side of the roadway only, and a 10’ layer of soft marine clay-silt on both the upstream and down stream side of the roadway. There is a thin layer of gravelly sand over bedrock at both locations with refusal depths at 18.5’ below the ground surface on the upstream side, and 19.2’ on the downstream side.

Shallow groundwater was encountered in both borings and ranges from 1’ to 3’ below the ground surface. Groundwater levels were measured at the time of drilling and do not represent stabilized groundwater levels. Groundwater levels also fluctuate with season, precipitation, temperature, and construction activities, so what was measured at the time of drilling may be different than what is encountered during construction.

4.4.3 Station 551+00 to 555+00
This section is located from where the new alignment begins and extends to the entrance of the west side roundabout. The proposed alignment will require cuts and minor fills. Three borings (HB-AUG-206, HB-AUG-207, HB-AUG-208) were drilled in this section. Soils encountered in the borings include topsoil, silty sands, and weathered marine clay and silt.

Groundwater was not observed in any of the borings, but boring logs indicate that wet soils were encountered at 9.5’ below the ground surface at Station 553+00.

4.5 Laboratory and Field Testing Results
Laboratory tests were performed on eleven representative samples to determine the gradation, water content, and Atterberg limits. Vane shear tests were conducted in the field to determine the shear strength of the underlying clay-silts at the twin pipe location. Laboratory test results are located in Appendix D.

4.5.1 Old Belgrade Road (Station 500+00 to 546+00)
Lab testing of roadway aggregate samples collected along Old Belgrade Road indicates that the existing material does not meet the MaineDOT specification for Aggregate Subbase Course gravel, Type D or Type E. All samples tested significantly exceeded the requirements for the #200 sieve (0% to 7% passing). The roadway aggregate is classified as SM and SW-SM under the Unified Classification System and A-1-b under the AASHTO Classification System. The Frost Classification is 0 to II and considered non to slightly frost susceptible.

Testing indicates that the existing roadway aggregate layer has a water content ranging from 2.8% to 5.1%. The natural marine clay-silt subgrade soils throughout this section of the project have water contents that range between 26% and 42%.

4.5.2 Stony Brook Pipe (Station 546+00 to 550+00)
Lab test results of the samples collected at the twin pipe location indicate that the underlying soils are predominately marine deposits composed of silt, clay, and small amounts of fine sand. These deposits are classified as CL and CL-ML under the USCS Classification System, and A-4, A-6, and A-7-6 under the AASHTO Classification system. These marine clay-silt deposits are all moderately to highly frost susceptible.

Atterberg limits tests were also performed on samples collected at the new twin pipe location. Atterberg Limits are used to correlate soil physical properties as well as for soil identification. Liquid Limits (water content at which a fine-grained soil will behave as a Liquid) range between 23 and 41, Plastic Limits (lower limit of the water contents where a soil remains in a plastic state) between 18 and 20, and Plasticity Indexes between 5 and 21 (low to medium plasticity). Natural water contents range between 23% and 36.2%.

Field Vane Shear tests indicate that the undisturbed shear strength of the underlying soft clay-silt layer ranges between 446 psf and 625 psf, and 134 psf if disturbed. The degree of sensitivity of the clay-silt ranges from 3.3 (low sensitivity) to 4.7 (medium-low sensitivity).

4.5.3 New Alignment (Station 550+00 to 555+00)
Testing of the materials in the new alignment section indicates that the underlying natural soils are predominately marine deposits composed of silt, clay, and small amounts of fine sand. These deposits are classified as CL-ML under the USCS Classification System, and A-4 under the AASHTO Classification system. The underlying till consists of a mix of sand, gravel, and silt. This deposit is classified as GM under the USCS Classification System, and A-1-b under the AASHTO Classification system. The marine clay-silt deposits are moderately to highly frost susceptible.

4.6 Recommendations
4.6.1 Old Belgrade Road Recommendations (Station 500+00 to 546+00)
Most of the existing subbase/base samples were wet indicating that water is being trapped within the pavement structure. Water within the pavement structure will reduce the strength of the subbase and subgrade as well as produce frost heaving issues. The existing roadway predominately has no ditching and any ditching that does exist is shallow. The lack of ditching and wet pavement structure materials indicates that the roadway is most probably constructed as a bathtub section. Because the existing gravel material does not meet MaineDOT's specification for subbase aggregate, is high in fines, and is thin for a significant portion of the project, rebasing the existing Old Belgrade Road is recommended.

Based on the designed vertical and horizontal alignments, the existing subgrade should consist of sands and silty sands. Bedrock may be encountered at subgrade in the general

vicinity of Middle Road (Station 521+00 to 527+00). Where bedrock is encountered in the subgrade and is adjacent to frost susceptible soils, 20:1 transitions are recommended to reduce the potential for frost heaves to develop.

The proposed design consists of minor cuts and fills. Soils excavated in this section are suitable to be used as fill. Existing subbase/base aggregate should not be reused as new subbase aggregate, but is acceptable as a fill material elsewhere on this proejct.

The appropriate Subgrade Resilient Modulus to use for the pavement design in this section is 4200 psi. A 30" total pavement section depth is recommended to reduce the effects of frost.

4.6.2 Stony Brook Pipe Recommendations (Station 546+00 to 550+00)
The proposed design at the Stony Brook location includes replacing two existing culverts and widening the roadway embankment on the south side (right of centerline) of the roadway. The new twin pipes will be 8 feet in diameter and embedded 2 feet for environmental reasons. There will be approximately 3 feet of fill over the pipes which will include the new pavement structure. The roadway embankment will be widened approximately 30 feet on the westerly side of the roadway, and the new embankment will be 13 feet in height and have 3H:1V side slopes. The new embankment will support the roadway as well as a new pedestrian trail. Only minor changes will be made to the existing embankment on the north side of the roadway.

The new embankment on the south side of the roadway will be placed on peat and marine deposits. Borings indicate that a 2-foot thick peat deposit exists at the surface. Removing this material and replacing it with granular borrow is recommended to prevent extreme settlements of the new roadway embankment and pedestrian trail. Peat should be mucked and disposed of as per Standard Specification Section 203.05 – Roadway Excavation. The marine deposits underlying the new pipe location include a 5.5' layer of silty sand over a 10' layer of clay-silt and 1.7' layer of glacial till. Refusal was encountered directly under the glacial till layer at a depth 19.2' below the existing ground surface. Groundwater was encountered at 3' below the existing ground surface.

Geotechnical borings and lab testing information from the construction of the I-95, Exit 113 interchange (Kennebec River Crossing Project, Report #2003-05C) were used to evaluate settlements of the new embankment. The soil properties from the field and lab testing data from this project were compared to the same information from the Kennebec River Crossing Project to determine if the underlying soils were similar. Based on the available information, the predicted settlements from the proposed embankment loading is 0.33" to 2.1". The clay-silt soils at this location are considered overconsolidated. Any embankment settlement is expected to occur during or immediately after embankment construction.

The appropriate Subgrade Resilient Modulus to use for the pavement design in this section is 5100 psi, however to keep a consistent pavement structure on Old Belgrade Road (the new Route 3) using 4200 psi is appropriate. A 30" total pavement section depth is recommended to also for consistency.

4.6.3 New Alignment Recommendations (Station 550+00 to 555+00)
The proposed construction for the new alignment involves cuts up to 7' in depth at the beginning of the new alignment gradually transitioning to minor fills towards the west side roundabout approach. All marine clay-silt deposits in this section are susceptible to significant strength loss when excavated if wet and are prone to "pumping" when construction or traffic loads are applied. Geotextiles placed on the subgrade or undercutting of the subgrade may be necessary to improve the stability of the subgrade in the cut sections if the marine soils are wet. A non-woven reinforcement/stabilization geotextile place on the subgrade is the recommended geotextile to use if unstable subgrade conditions are encountered during construction.

At the time of this report, there are large piles of fill material in the vicinity of Station 553+50. It is uncertain if this fill will still be there at the time of construction, but if so, it is suitable for embankment fill material. All other soils removed from this location are suitable for embankment fill material, but may require moisture conditioning to reduce the water content or need to be mixed with granular material prior to placement to achieve compaction.

The appropriate Subgrade Resilient Modulus to use for the pavement design in this section is 4200 psi. A 30" total pavement section depth is recommended to provide adequate structure and to reduce the effects of frost.

5.0 WEST SIDE ROUNDABOUT
The scope of work for the roundabout on the western side of I-95 is new construction and includes the roundabout and approaches from Old Belgrade Road to the east and west of the roundabout, Route 3 from the east, and the I-95 south bound on/off ramps. Construction of this roundabout will require minor cuts and fills up to 20 feet in height.

5.1 Existing Conditions
The proposed west side roundabout location lies between the I-95 southbound off ramp constructed as part of the Kennebec River Crossing project, and the Old Belgrade Road. Much of the land has been used for material storage and as a lay down area for the hospital construction project and probably for the Kennebec River Crossing project. The topography is rolling, and therefore will require cuts and fills to construct the roundabout and the approaches.

5.2 Geology
The Maine Surficial Geology map for the Augusta Quadrangle indicates that the natural surface soils consist of Presumpscot Formation. Presumpscot Formation consists of marine silt, clay and fine sands and typically has poor bearing strength when wet, poor drainage properties, and is frost susceptible. The Maine Surficial Geology map for the Augusta Quadrangle is located in Appendix E as well as NRCS Soil Survey maps for various subsurface conditions.

5.3 Subsurface Investigations

Subsurface information was collected at five locations (HB-AUG-201 through HB-AUG-205) using hollow stem augers and split spoon samplers. Information was collected to a depth of two times the embankment fill height or cut depth unless refusal came first. Soil samples were collected from the split spoon sampler at each layer change. Plans showing boring locations and boring logs for this section are located in Appendix B (Geoplans) and C (Boring Logs) respectively.

5.4 Subsurface Conditions

The soils underlying the west side roundabout and approach locations consist of silty sands and stiff, weathered marine silts and clays, both over till or bedrock. No groundwater was encountered in any borings, but wet soils were encountered at approximately 4' below the surface at most locations. Refusal was encountered at Station 308+10 (5.3'depth), 400+70 (14.8' depth), 557+47 (14.5'depth), and 559+44 (9.8'depth).

5.5 Laboratory Testing

Laboratory tests were performed on five representative samples to determine the gradation, water content, and on three samples to determine the Atterberg limits. All lab test results are located in Appendix D.

Testing indicates that the underlying natural soils are predominately marine deposits in composed of silt, clay, and small amounts of fine sand. The deposits at testing locations are classified as CL under the USCS Classification System, and A-6 under the AASHTO Classification system. The marine clay-silt deposits are moderately to highly frost susceptible.

Atterberg limits tests were performed on three marine clay-silt samples collected at the immediate roundabout location. Atterberg Limits are used to correlate soil physical properties as well as for soil identification. Liquid Limits (water content at which a fine-grained soil will behave as a liquid) range between 30% to 35%, Plastic Limits (lower limit of the water contents where a soil remains in a plastic state) are between 18% and 21%, and Plasticity Indexes are between 11 and 14 (medium plasticity). Natural water contents range between 21% and 29%.

5.6 Recommendations

Construction of this roundabout and the approaches will require embankment fills up to 16' in height, with 4:1 side slopes on the roundabout and all approaches. Fill sections include sliver fills, minor widening of the existing embankment, and new embankment construction. Based on the underlying soils and the information from the Kennebec River Crossing project (40' high embankments, 2H:1V slopes, F.S = 1.7 to 1.9, settlement = 3 in, overconsolidated marine CLAY-SILT) embankments with a maximum height of 16' with 4H:1V side slopes are considered stable against a global shear failure. Settlement of the new embankment should be minimal and any settlement will occur during or immediately after embankment construction. A field inspection was conducted on the embankments on the I-95 southbound on and off ramps that were constructed in the Kennebec River Crossing project. There is no indication that the existing embankments

are unstable or that any settlement has occurred. Therefore it is assumed that the analysis and recommendations as presented in Report No. 2006-05C are reasonable for the west side roundabout and approach construction.

To improve compaction of and to prevent the sliver fills from sliding, benching the exiting embankment is recommended if the existing side slopes are 2H:1V or steeper. If existing slopes are flatter that 2H:1V, scarifying the existing embankment soils to improve interlocking between the existing soils and new fill materials is recommended.

All marine clay-silt deposits in this section are susceptible to significant strength loss when excavated if they are wet and are prone to "pumping" when construction or traffic loads are applied. Geotextiles placed on the subgrade surface or undercutting of the subgrade may be necessary to improve the stability of the subgrade in cut sections if the marine soils are wet. A non-woven reinforcement/stabilization geotextile placed on the subgrade is the recommended geotextile to use if unstable subgrade conditions are encountered.

The appropriate Subgrade Resilient Modulus to use for the pavement design in this section is 5100 psi. A 30" total pavement section depth is recommended to provide an adequate structural section.

6.0 EAST SIDE ROUNDABOUT & I-95 NORTH ON/OFF RAMPS

The scope of work for the roundabout on the eastern side of I-95 includes reconstruction of the existing Route 3 and of the I-95 northbound on/off ramps. The I-95 northbound on/off ramps will require realignment to match into the roundabout approaches and with I-95 northbound. Construction of this roundabout and the on/off ramps will require minor cuts and fills up to 25 feet in height with 4:1 side slopes. Most fills areas involve widening the existing roadway and ramp embankments.

6.1 Existing Conditions

The roundabout on the east side of I-95 lies entirely within the footprint of the east side I-95 bridge approach and the northbound on/off ramps constructed as part of the Kennebec River Crossing project. The original construction for this section of the Kennebec River Crossing project consisted predominately of fill with embankments up to a height of 30 feet and side slopes as steep as 2H:1V. All existing roadways are paved with HMA over PMRAP, and base and subbase aggregate. Ramps and shoulders are paved with HMA over base and subbase aggregate. There is a large quantity of guardrail at the shoulder and the median strip on Route 3. The bridge that Route 3 crosses over I-95 is located at the western edge of east side roundabout project limits, but is not affected by this project.

6.2 Geology

The Maine Surficial Geology map for the Augusta Quadrangle indicates that the natural surface soils predominately are Presumpscot Formation with the exception of the southern end of the I-95 northbound off ramp which consists of till. Presumpscot Formation consists of marine silt, clay and fine sands and typically has poor bearing strength when wet, poor drainage properties, and is frost susceptible. Till consists of a

mix of silt, sand, gravel, cobbles, and boulders. Till is a good pavement foundation soil, but tends to be moderately to highly frost susceptible. There is also tends to be wide range of drainage properties which is dependent on the quantity of silt and fine sand in the matrix. The Maine Surficial Geology map for the Augusta Quadrangle is located in Appendix E as well as NRCS Soil Survey maps for various subsurface conditions.

6.3 Subsurface Investigations

Subsurface information was collected at five locations (HB-AUG-212 through HB-AUG-217) using solid stem and hollow stem augers with split spoon samplers. Information was collected to a depth of approximately 20 feet or refusal, which ever was encountered first. Soil samples were collected at each layer change in a split spoon sampler with the hollow stem augers, and directly off the auger flights with the solid stem augers. Plans showing boring locations and boring logs for this section are located in Appendix B (Geoplans) and C (Boring Logs) respectively.

6.4 Subsurface Conditions

The soils underlying the west side roundabout and approach locations consist of construction fill, silty sands, stiff, weathered marine silts and clays, soft, un-weathered marine silts and clays, and till. No groundwater was encountered in any borings at the time of drilling, but wet soils were encountered at approximately 8’ to 10’ below the surface at some locations. Refusal was encountered at Station 152+88B (12.9’ depth), 161+30A (16.6’ depth), 158+90A (8.6’ depth), and 157+67A (16.8’ depth).

6.5 Laboratory Testing

Laboratory tests were performed on seven representative samples to determine the gradation, water content, and on three samples to determine the Atterberg limits. All testing results are located in Appendix D.

Testing indicates that the underlying natural soils are predominately marine deposits in that are composed of silty sand and silt and clay with small amounts of fine sand. The deposits at testing locations are classified as SM, CL, and CL-ML under the USCS Classification System, and A-2-4, A-6, and A-4 under the AASHTO Classification system. Natural water contents range from 8.7% to 31.7%. All samples tested are moderately to highly frost susceptible.

Atterberg limits tests were performed on three marine clay-silt samples collected at the immediate roundabout location. Atterberg Limits are used to correlate soil physical properties as well as for soil identification. Liquid Limits (water content at which a fine-grained soil will behave as a liquid) range between 28% to 34%, Plastic Limits (lower limit of the water contents where a soil remains in a plastic state) are between 19% and 20%, and Plasticity Indexes are between 9 and 15 (medium plasticity). Natural water contents range between 21% and 29%.

6.6 Recommendations

The design and construction of the east side roundabout and I-95 on/off ramps recommendations are presented separately in the following sections.

6.6.1 Roundabout and Approach Recommendations

Construction of the east side roundabout and the approaches will require sliver fills constructed on the existing Route 3 embankment with 4H:1V side slopes. Settlement should be minimal and any settlement will occur during or immediately after embankment construction. To improve compaction and to prevent the sliver fills from sliding, benching the existing embankment is recommended if the existing side slopes are 2H:1V or steeper. If existing slopes are flatter that 2H:1V, scarifying the existing embankment soils to improve interlocking between the existing soils and new fill materials is recommended.

The appropriate Subgrade Resilient Modulus to use for the pavement design in this section is 5100 psi. A 30" total pavement section depth is recommended to reduce the effects of frost on the roundabout and approaches.

6.6.2 I-95 Northbound Exit 113- Off Ramp Recommendations

Construction of the northbound off ramp will require relocating the ramp from the existing location and moving the ramp towards the east. To construct the new ramp embankment, sliver and wider fills will be placed on the existing ramp embankment. The deepest fill section is 16', but this is located at the lowest point of the existing drainage ditch. The proposed side slopes for the new embankment are 4H:1V. A field inspection was conducted on the embankment on the I-95 northbound off ramp that was constructed in the Kennebec River Crossing project. There is no indication that the existing embankment is unstable or that any settlement has occurred. Therefore it is assumed that the analysis and recommendations as presented in Report No. 2006-05C are reasonable for the west side roundabout and approach construction.

To improve compaction of and to prevent the sliver fills from sliding, benching the exiting embankment is recommended if the existing side slopes are 2H:1V or steeper. If existing slopes are flatter that 2H:1V, scarifying the existing embankment soils to improve interlocking between the existing soils and new fill materials is recommended. The appropriate Subgrade Resilient Modulus to use for the pavement design in this section is 5100 psi. A 30" total pavement section depth is recommended to reduce the effects of frost on the roundabout and approaches.

6.6.3 I-95 Northbound Exit 113 - On Ramp Recommendations

Construction of the northbound on ramp will require embankment fills up to 25' in height, with 4H:1V side slopes. Fill sections include major widening of the existing embankment and new embankment construction. Based on the underlying soils and the information from the Kennebec River Crossing project (40' high embankments, 2H:1V side slopes, F.S. = 1.7 to 1.9) embankments with a maximum height of 25' with 4H:1V side slopes will be stable against a global shear failure. Settlement of a 25' high embankment is estimated at 1.85". Any settlement should occur during or immediately after embankment construction. A field inspection was conducted on the embankments on the I-95 northbound on ramp that was constructed in the Kennebec River Crossing project. There is no indication that the existing embankment is unstable or that any settlement has occurred. Therefore it is assumed that the analysis and recommendations

as presented in Report No. 2006-05C are reasonable for the west side roundabout and approach construction.

To improve compaction of and to prevent the sliver fills from sliding, benching the exiting embankment is recommended if the existing side slopes are 2H:1V or steeper. If existing slopes are flatter that 2H:1V, scarifying the existing embankment soils to improve interlocking between the existing soils and new fill materials is recommended.

The appropriate Subgrade Resilient Modulus to use for the pavement design in this section is 5100 psi. A 30” total pavement section depth is recommended to provide an adequate structural section.

6.7 Reuse of Soils - I-95 NB On/Off Ramp Embankments

The existing embankment materials on the I-95, Exit 113 on and off ramps consist of fills, subbase aggregate, base course aggregate, and hot mix asphalt (HMA). The following table is a summary of the existing pavement structure materials:

Table 2: Existing Pavement Materials I-95 NB On/Off Ramps

Travel lane	Thickness (mm)	Thickness (in)	Rounded (in)
HMA	200	7.9	8
Base Agg	100	3.9	4
Subbase	550	21.7	22
Total	850	33.5	34

Shoulder	Thickness (mm)	Thickness (in)	Rounded (in)
HMA	80	3.1	3
Base Agg	220	8.7	9
Subbase	550	21.7	22
Total	850	33.5	34

Materials testing conducted during construction of this section of the Kennebec River Crossing project indicate that the existing base aggregate meets the requirements of Type A Aggregate Base Course-Crushed gravel and the existing subbase meets the requirements of Aggregate Subbase Course Gravel. The existing base and subbase material from any of the I-95 exit ramps is reusable as subbase aggregate anywhere on the project. Because the base aggregate layer is fairly thin, it may be very difficult to separate the base and subbase aggregate during excavation, therefore I recommend considering the in-place aggregate as subbase aggregate only.

There is an 8” existing HMA layer in the travel lanes on both ramps as well as 3” on the inside and outside shoulders. This HMA is considered high quality and can be reused to manufacture PMRAP for MaineDOT maintenance projects or by the contractor in HMA mixes.

The existing embankment materials on the I-95 Exit 113 on and off ramps consist of variable depth fills. Plan sheets from Geotechnical Report No. 2003-05C show the original ground surface and the proposed surface elevation of the new embankment fills. Table 3 lists the depth of the fills as per the Kennebec River Crossing report.

Table 3: I-95 NB On/Off Ramps –Existing Fill Depths (excludes Pavement Structure)

NB On/Off Ramp As-built Station	Embankment Ht. (m)	Embankment Ht. (ft)	Embankment Fill Depth (ft)
400+220	0.6	1.97	1.12
400+240	0.8	2.62	1.77
400+260	1.2	3.94	3.09
400+280	1.4	4.59	3.74
400+300	1.6	5.25	4.40
400+320	1.8	5.91	5.06
400+340	1.3	4.27	3.42
400+360	0.8	2.62	1.77
400+380	0.8	2.62	1.77
400+400	0.8	2.62	1.77
400+420	1.5	4.92	4.07
400+440	2.2	7.22	6.37
400+460	2.9	9.51	8.66
400+480	3.4	11.15	10.30
400+500	4.4	14.44	13.59
400+520	5.2	17.06	16.21
400+540	6.0	19.69	18.84
400+560	6.0	19.69	18.84
400+580	5.1	16.73	15.88
400+600	4.5	14.76	13.91
400+620	4.0	13.12	12.27
400+640	3.3	10.83	9.98
300+100	0.6	1.97	1.12
300+120	0.8	2.62	1.77
300+140	1.1	3.61	2.76
300+160	1.5	4.92	4.07
300+180	1.8	5.91	5.06
300+200	2.5	8.20	7.35
300+220	2.3	7.55	6.70
300+240	2.3	7.55	6.70
300+260	3.5	11.48	10.63
300+280	4.2	13.78	12.93
300+300	5.4	17.72	16.87
300+320	5.7	18.70	17.85
300+340	3.2	10.50	9.65
300+360	1.8	5.91	5.06
300+380	2.0	6.56	5.71

Existing embankment fill material is suitable for reuse in the construction of the new ramp embankments as well as other locations within the project limits.

7.0 PEDESTRIAN TRAIL

A pedestrian trail will be constructed on the south side of the new roadway starting at the hospital entrance and continue easterly to a new cul-de-sac, then run adjacent to the Old Belgrade Road approach located on the easterly side of the roundabout.

7.1 Existing Conditions

The new trail location will be constructed in the existing Old Belgrade Road roadbed and an adjacent 2.5H:1V slope on the south side of Old Belgrade Road. The slope is heavily vegetated with grasses and small trees.

7.2 Geology

The Maine Surficial Geology map for the Augusta Quadrangle indicates that the natural surface soils consist of Presumpscot Formation and Glacial Till. Presumpscot Formation (marine clay, silt, and sand) is located in the area between the hospital entrance and approximately 700 feet east of Stone Brook. Glacial Till (mix of sand, gravel, cobbles, silt, clay) is located at approximately 700 feet east of Stone Brook to the west side roundabout entrance. The Maine Surficial Geology map for the Augusta Quadrangle is located in Appendix E as well as NRCS Soil Survey maps for various subsurface conditions.

7.3 Subsurface Investigations

No subsurface investigations were conducted specifically for the pedestrian trail.

7.4 Recommendations

The construction of the pedestrian trail will require placing fills as the trail crosses from the hospital entrance over Stony Brook crosses (discussed in Section 4.6.2 - Stony Brook Pipe Recommendations section). Cuts of the existing embankment will be required easterly of Stony Brook in order to construct drainage ditches for the trail. Cuts will be approximately 6’ deep and excavated soils will consist of silty sands and weathered marine silts and clays.

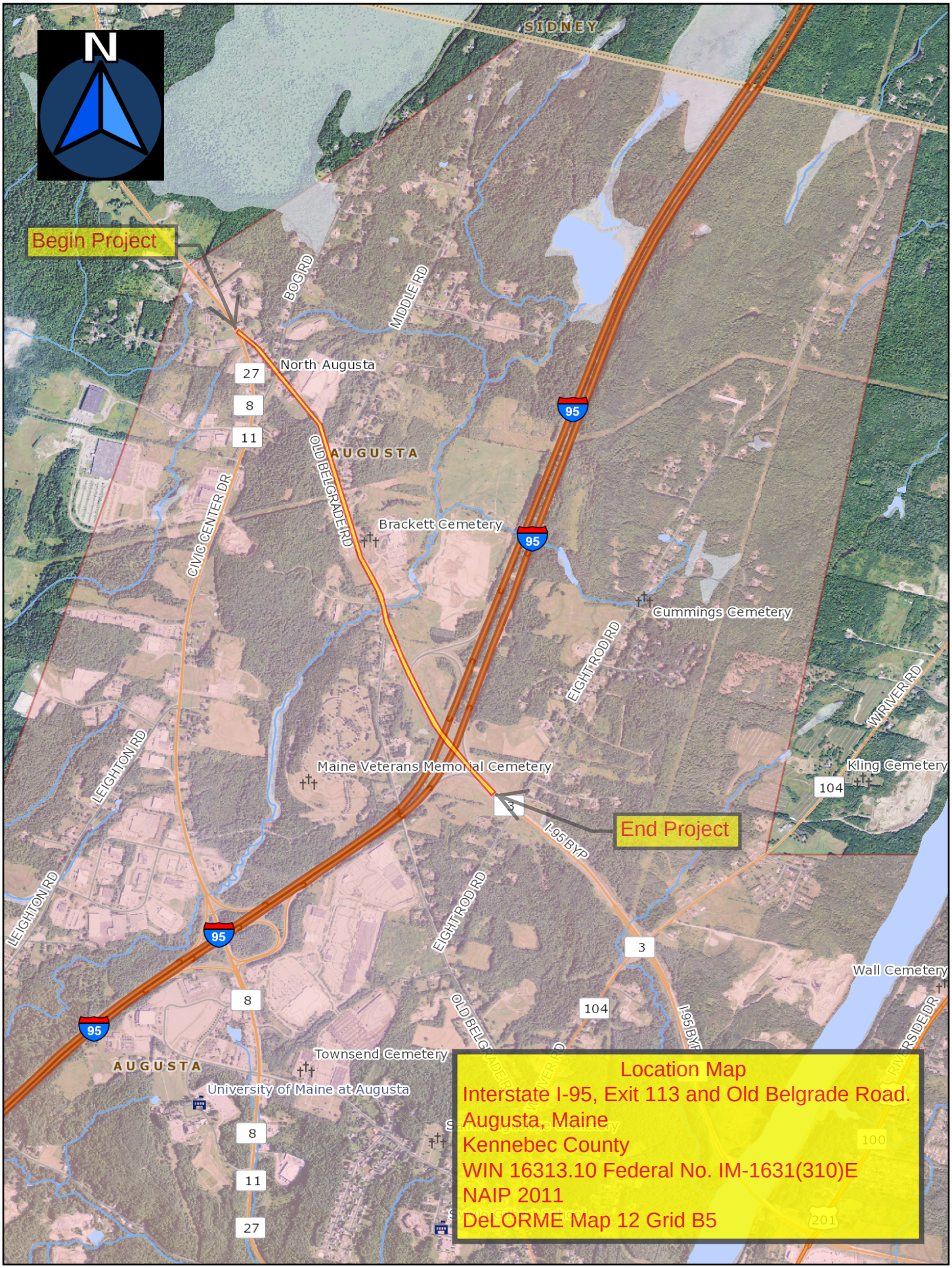
Fine sand layers were encountered in the weathered marine silts and clay deposits in the adjacent borings for the west side roundabout approaches, therefore seeps in these sand layers may be present during excavation for ditches and back slopes. The existing embankment is thickly vegetated, so evidence of existing seeps is not visible at this time. If seeps are encountered, placing riprap with a granular filter beneath it from the toe of the slope to just above the seep is recommended to prevent sloughing of the surface soil on the slope.

8.0 CLOSURE

This report has been prepared for the use of the MaineDOT Highway Program for specific application for the proposed reconstruction of I-95, Exit 113, Old Belgrade Road, Bog Road, and a portion of Route 27 in Augusta. No other intended use or warranty is implied. In the event that any changes in the nature, design or locations of the proposed project are planned, this report should be reviewed by a geotechnical engineer to assess

the appropriateness of the conclusions and recommendations and to modify the recommendation as appropriate to reflect the changes in design. Further, the analyses and recommendations are based in part upon limited soils explorations at discrete locations at this site. If variations from the conditions encountered during the investigation appear evident during construction, it may also become necessary to re-evaluate the recommendations made in this report.

APPENDIX A
LOCATION MAP



Map Scale 1:24000

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

APPENDIX B

GEOPLANS

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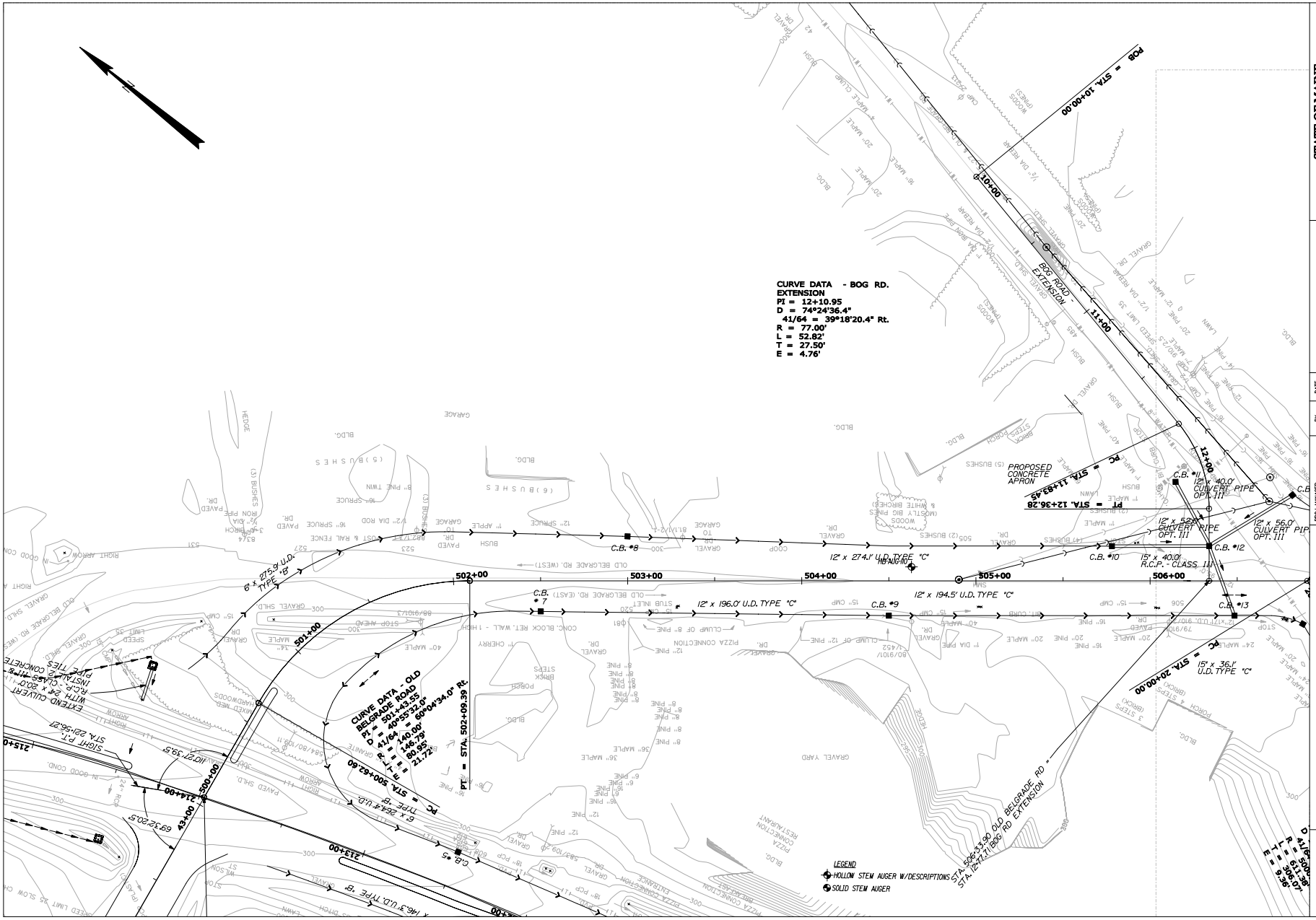

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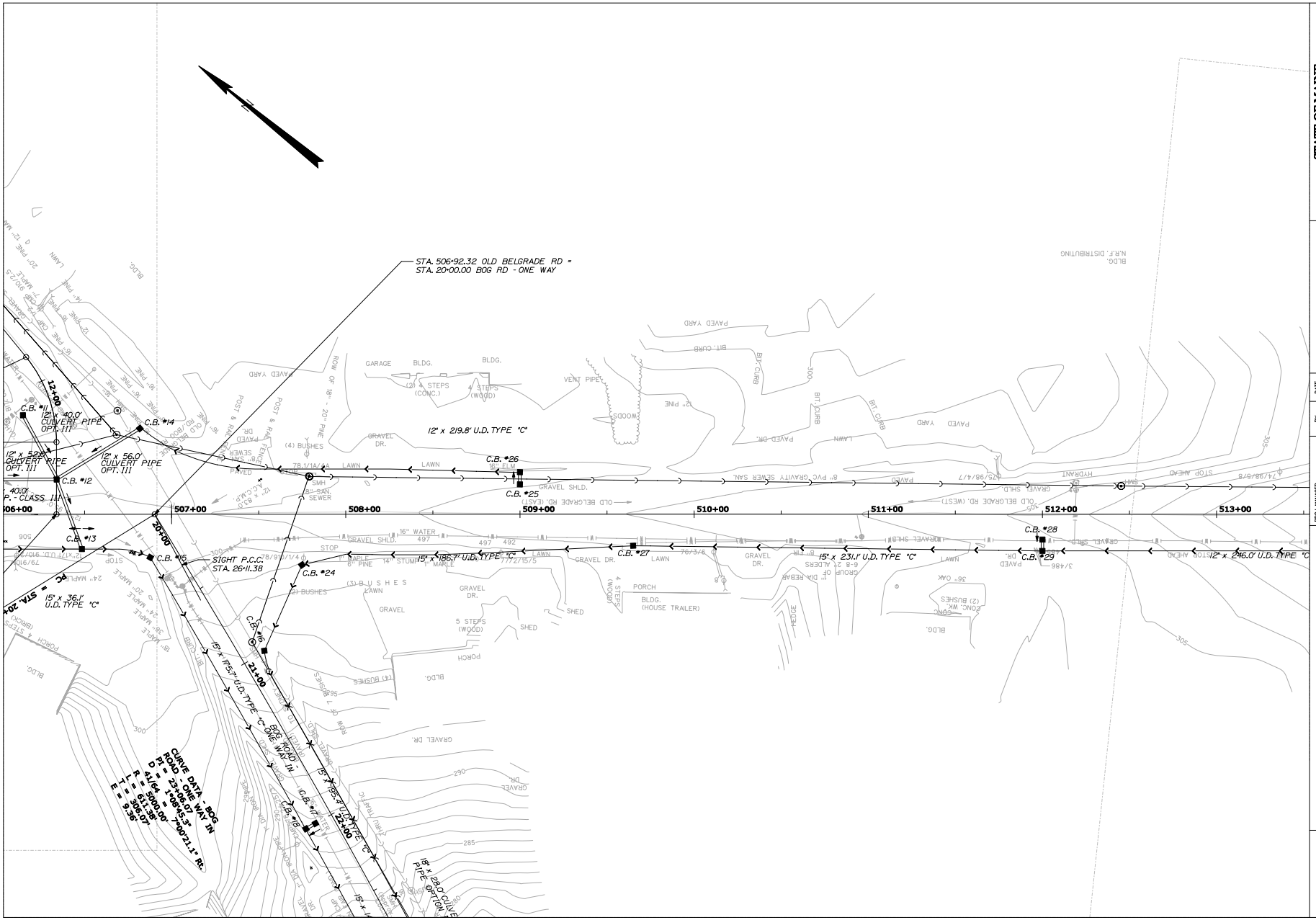

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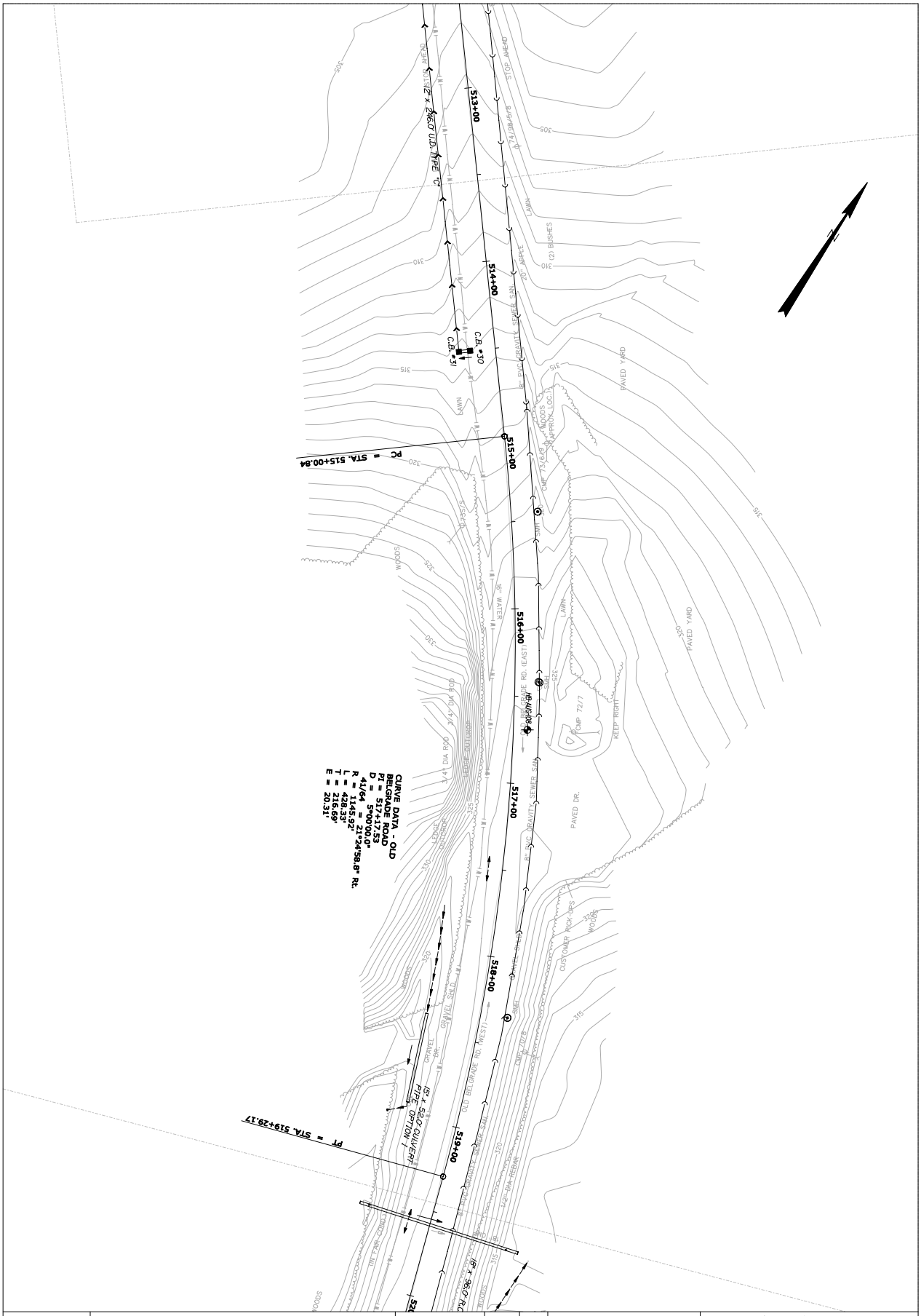

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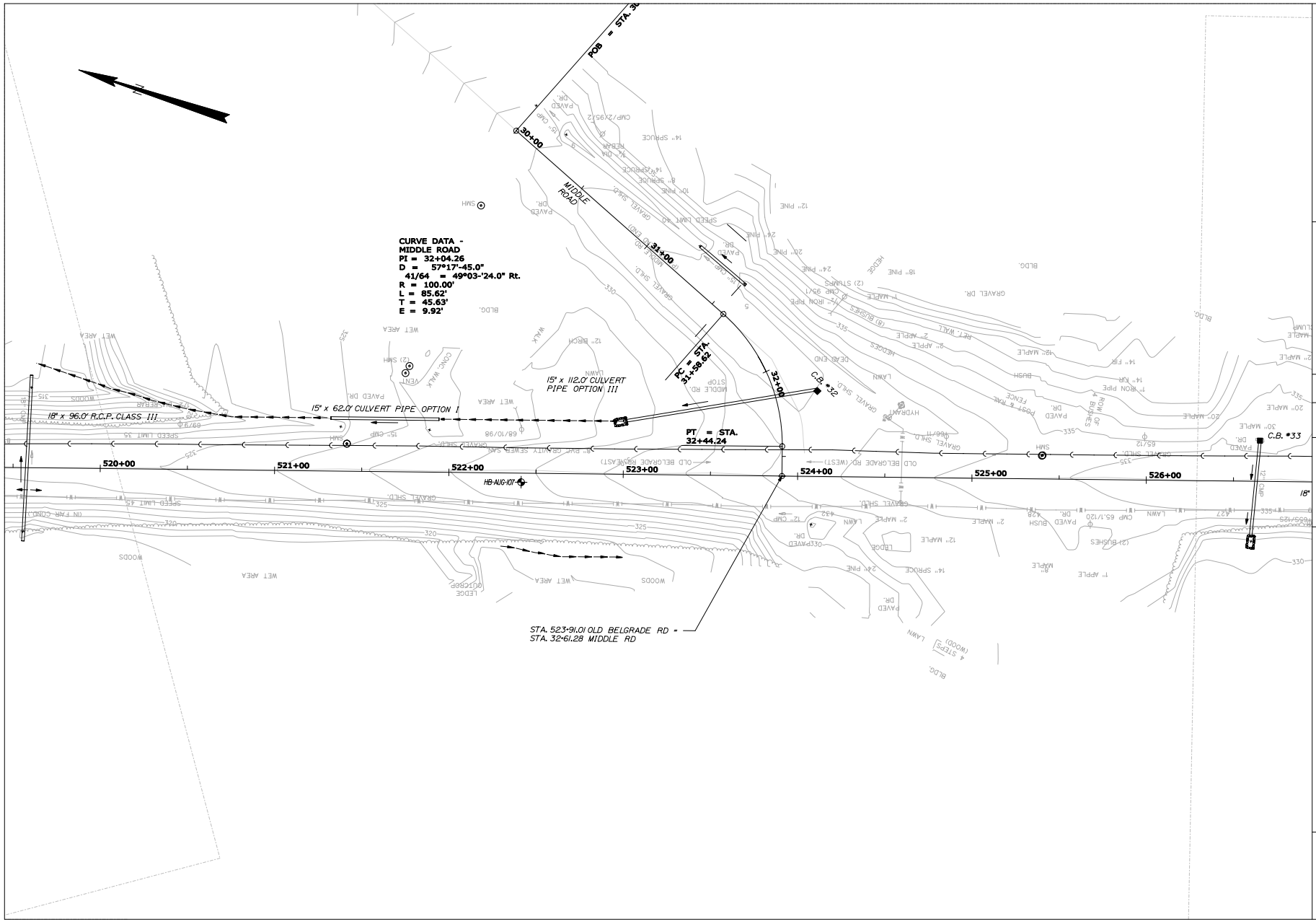

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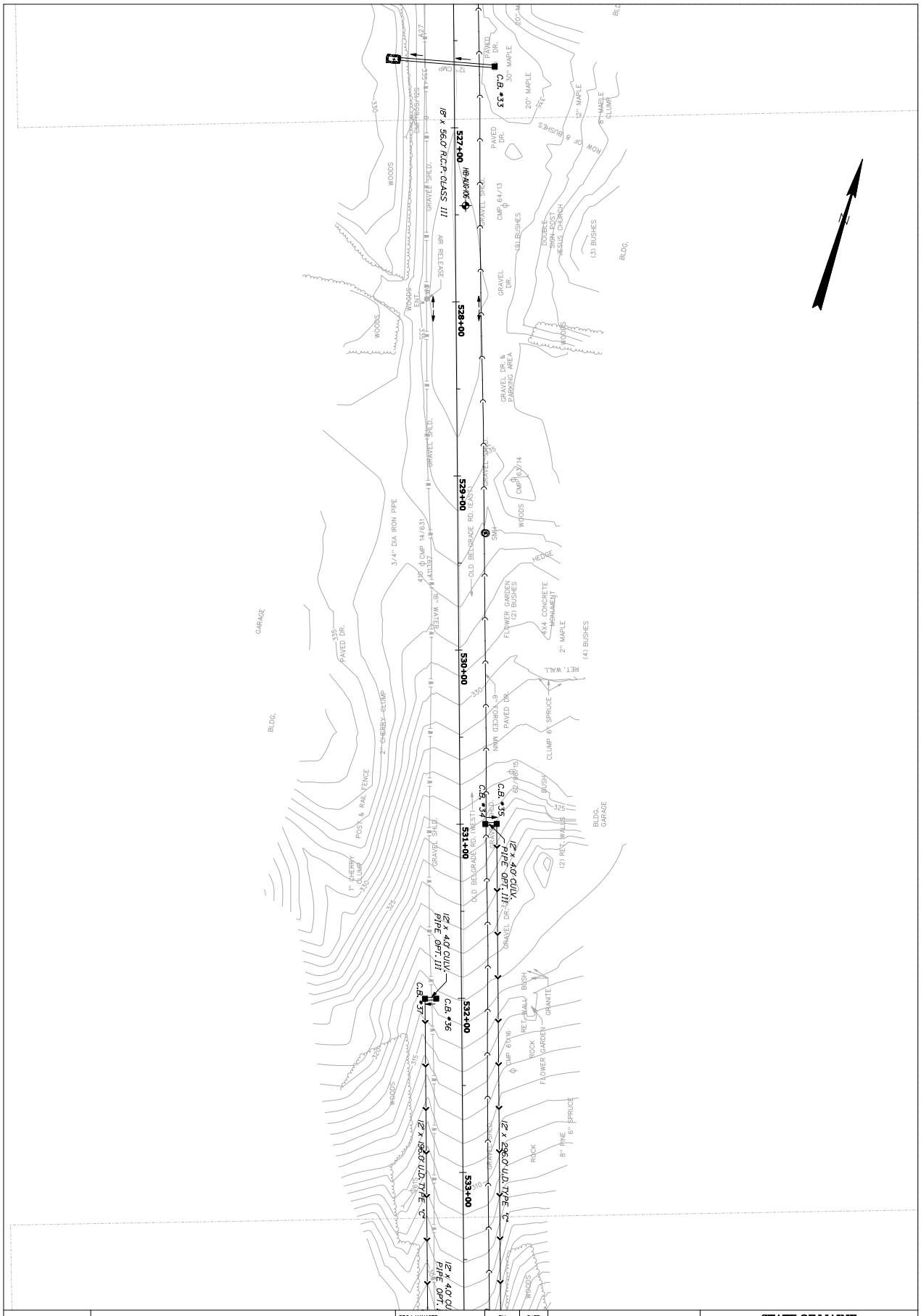

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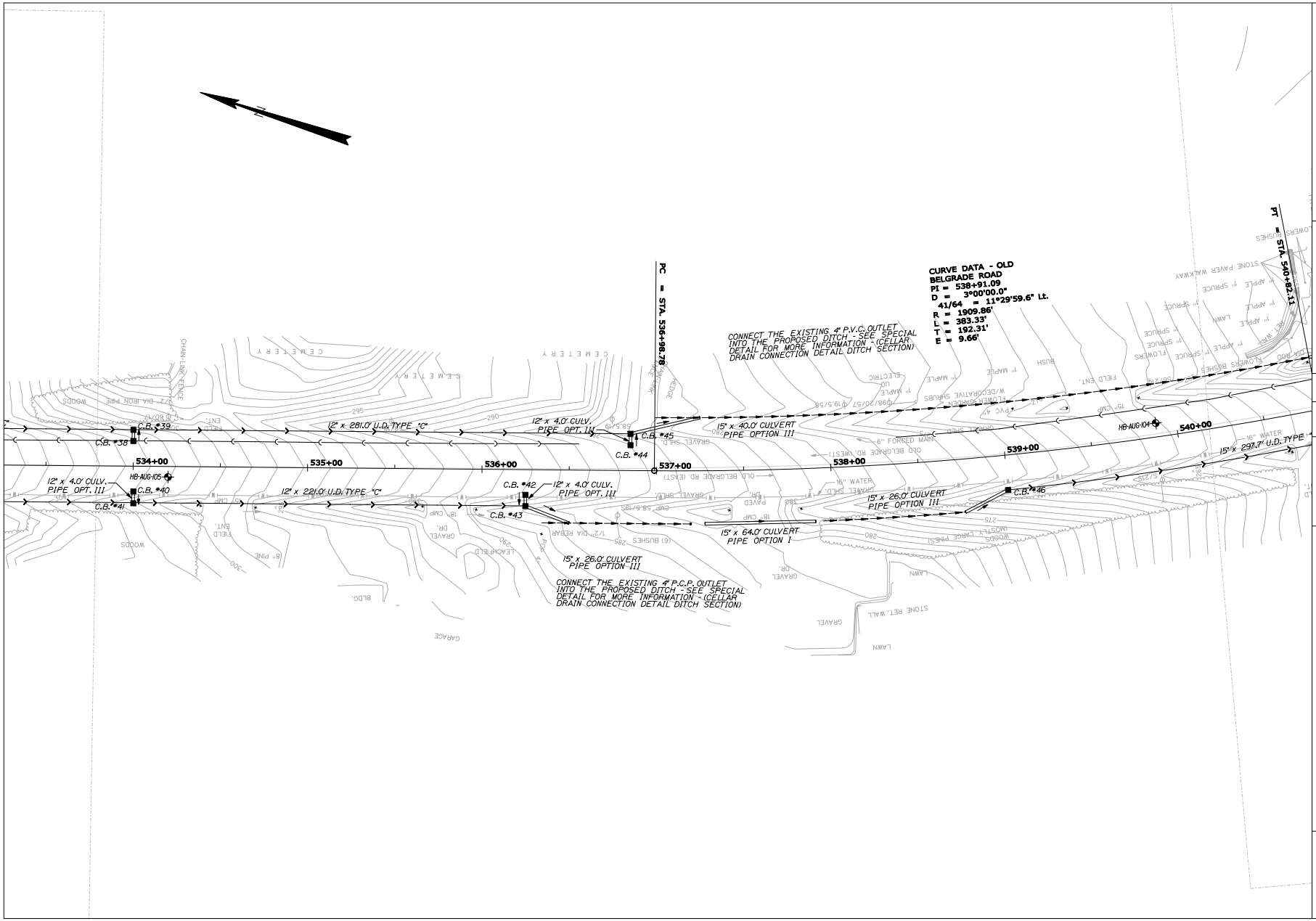

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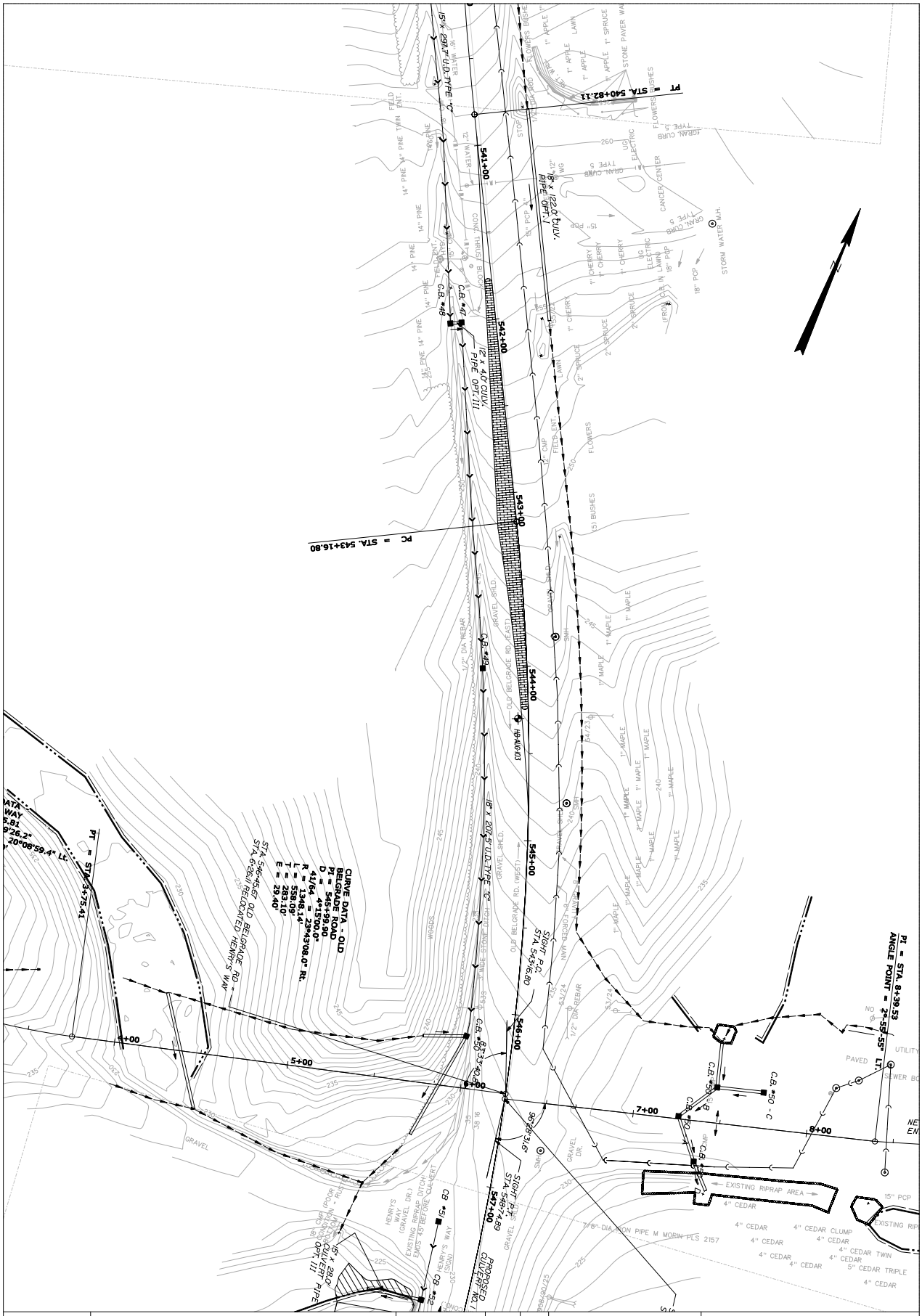

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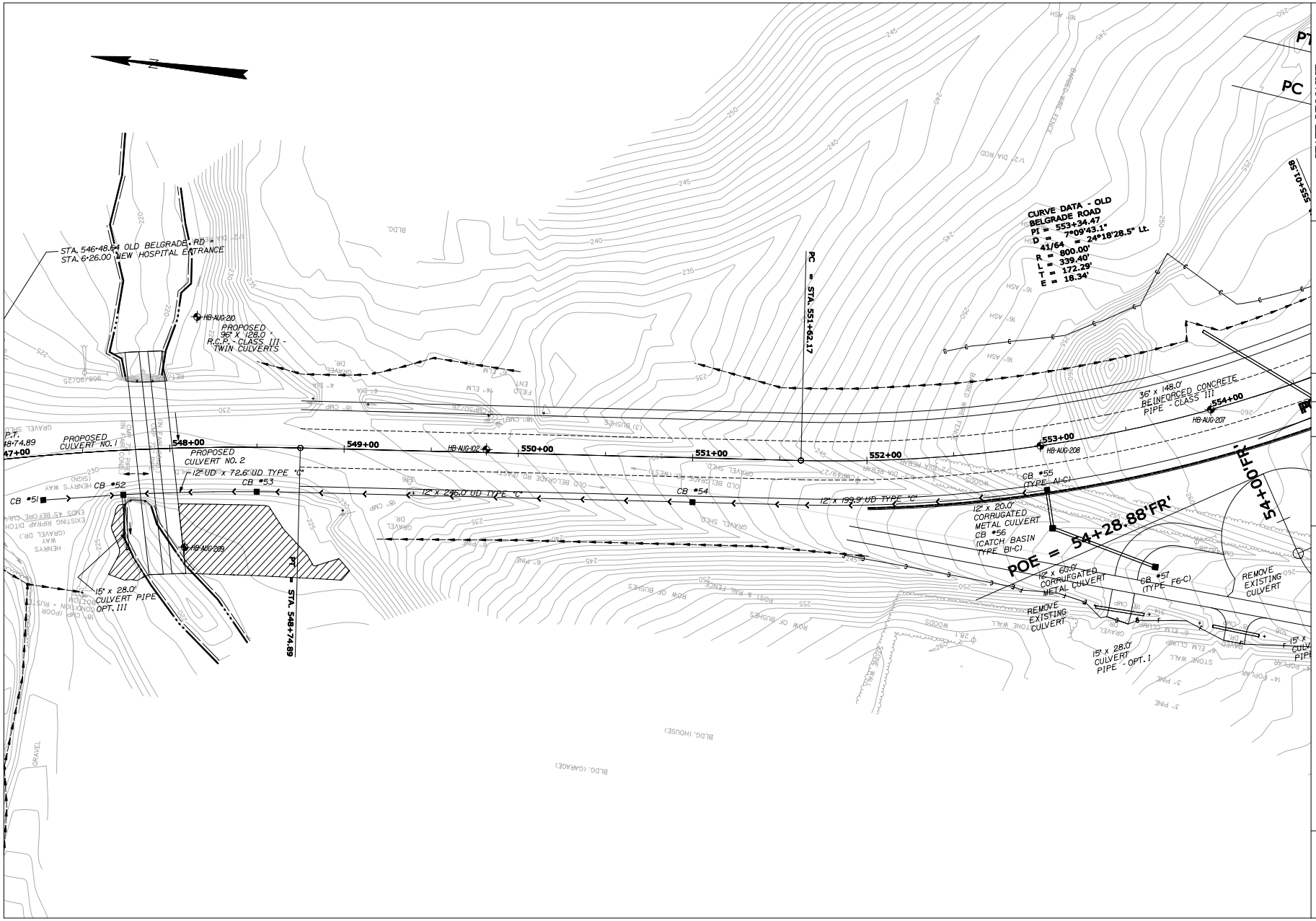

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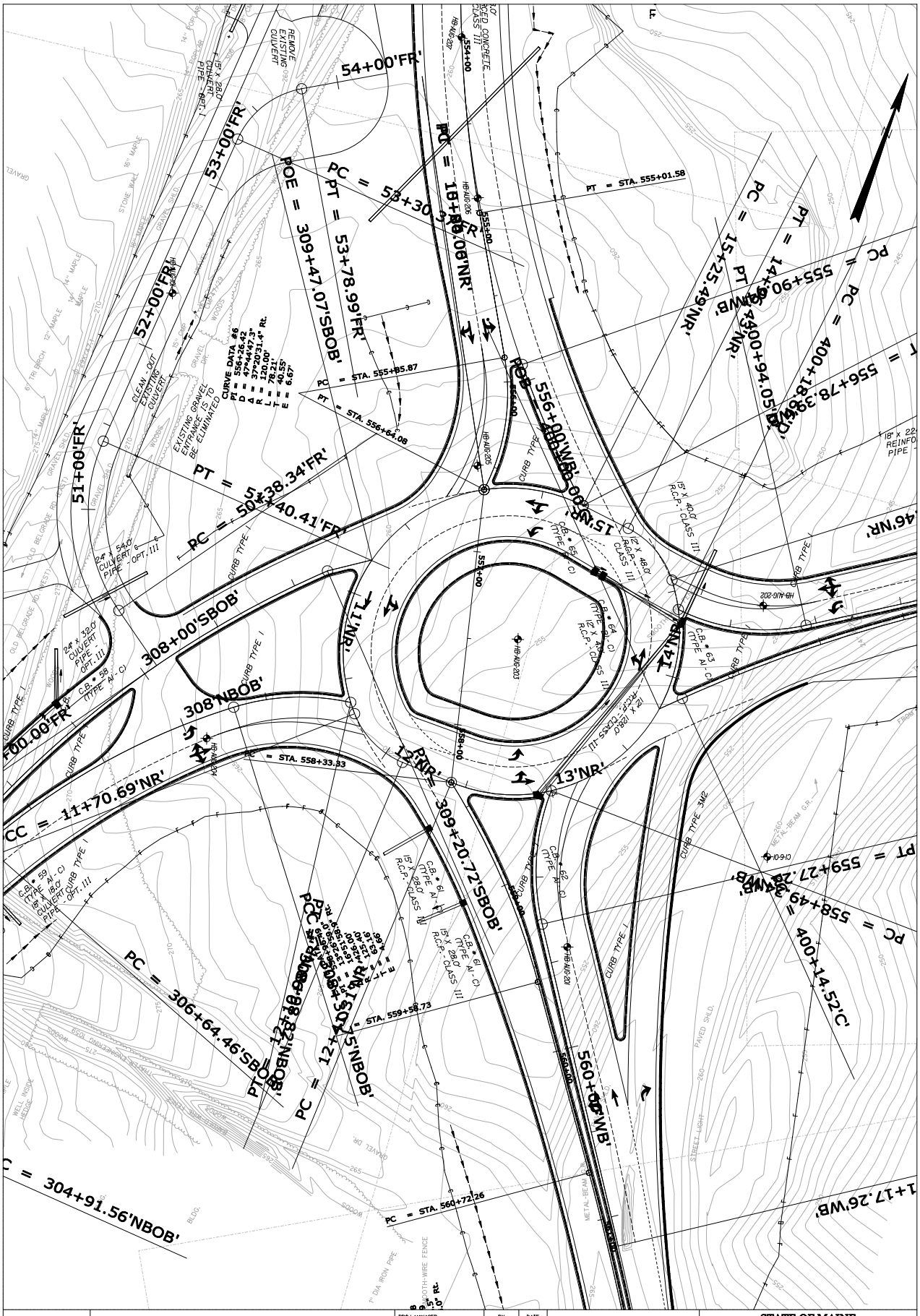

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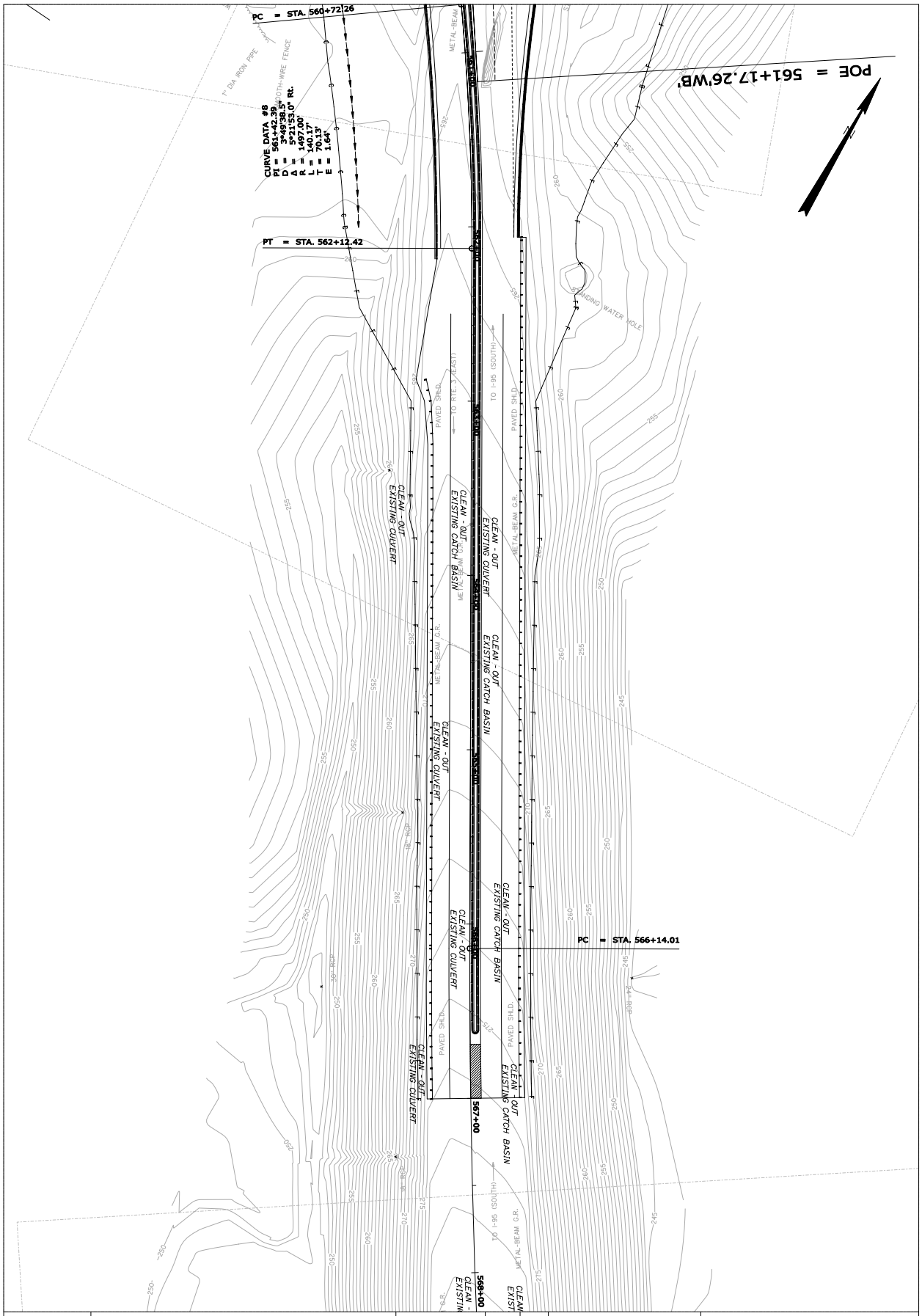

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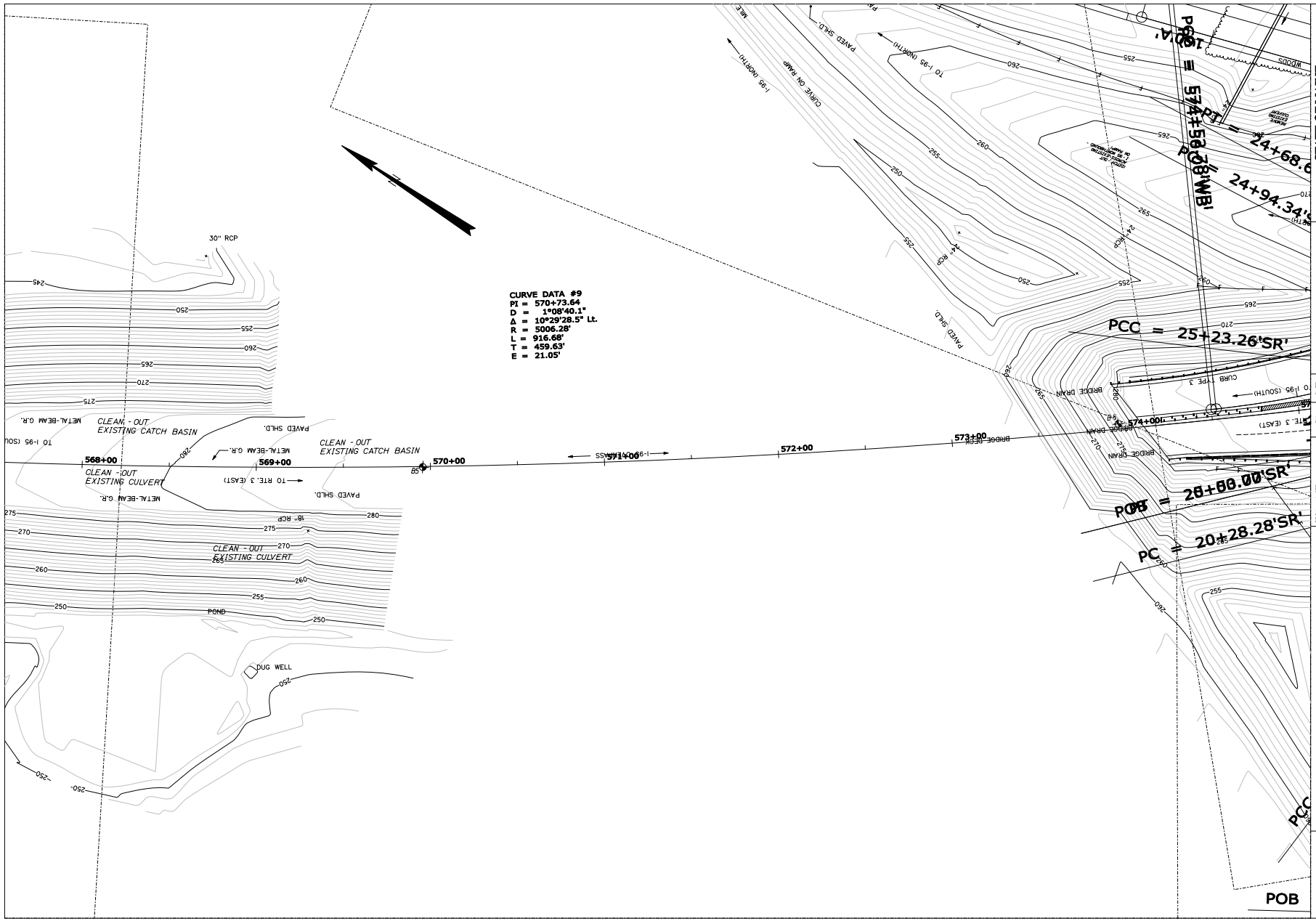

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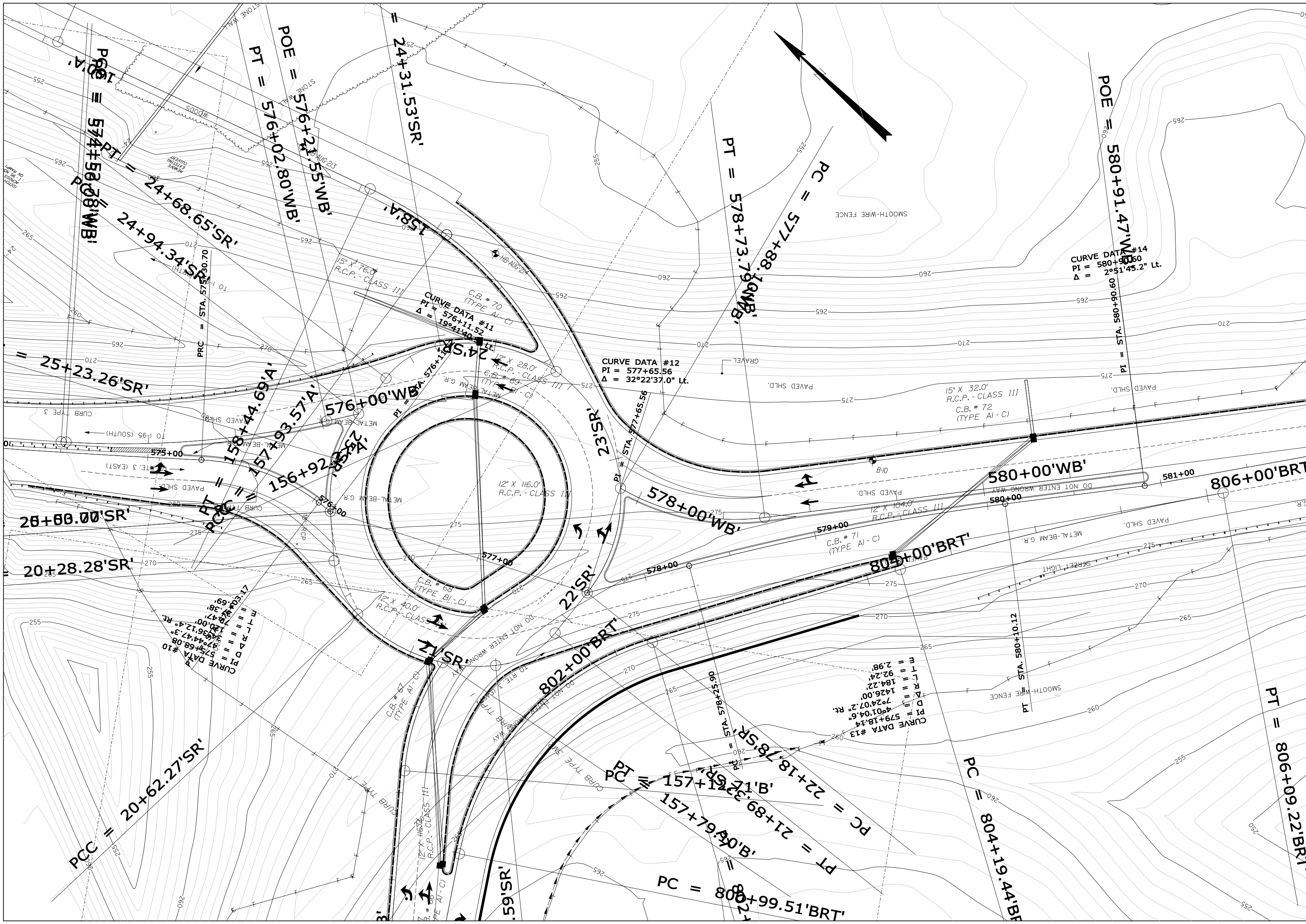

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SIGNATURE

P.E. NUMBER

DATE

AUGUSTA
I-95 Exit 113-Routes 8\11\27

GEOPLANS

SHEET NUMBER 12 OF 17

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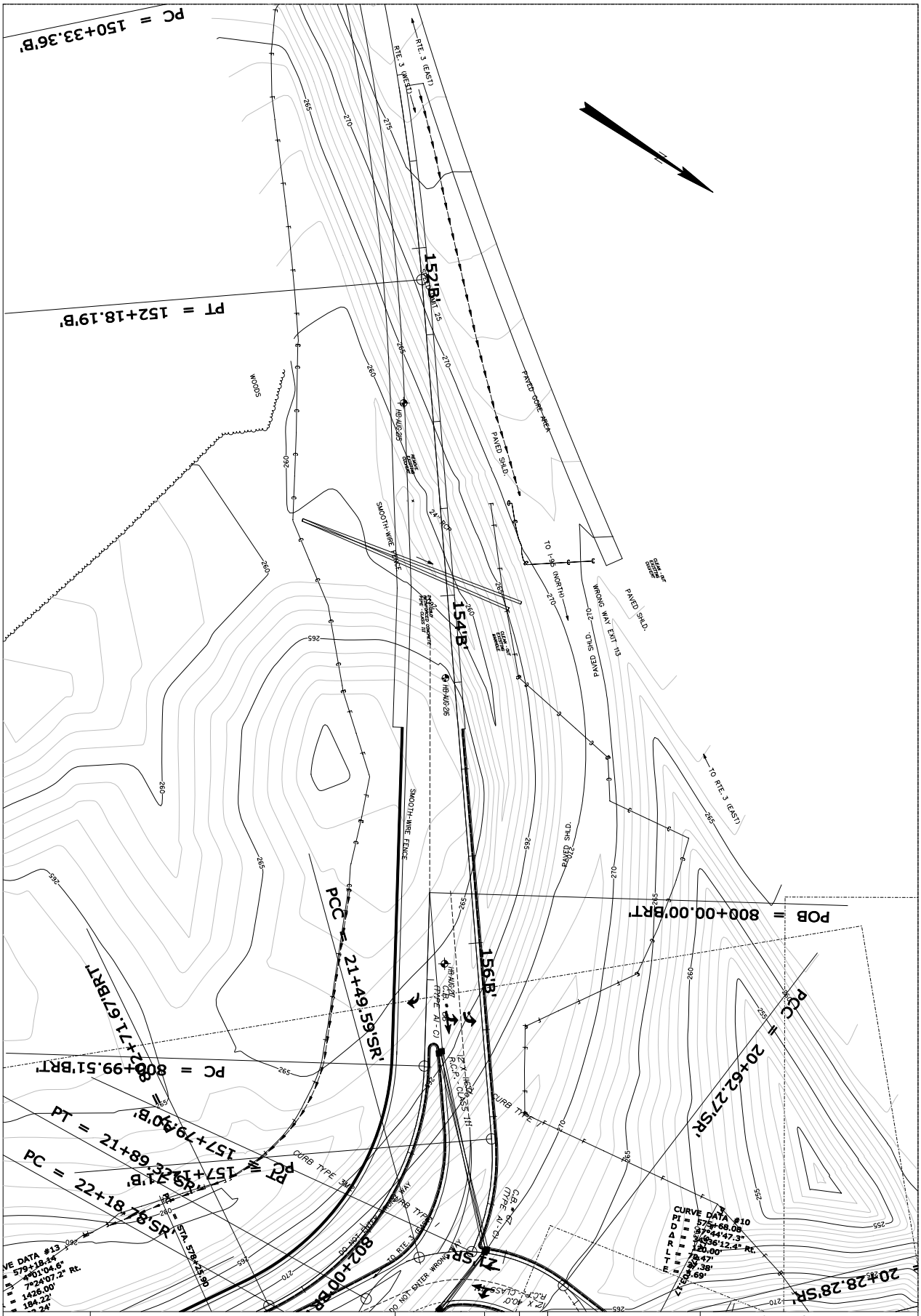


PROJ. MANAGER		BY	DATE	
DESIGN-DETAILED	K.GROSS	T.WHITE	APR 2012	
CHECKED-REVIEWED				SIGNATURE
DESIGN2-DETAILED2				
DESIGN3-DETAILED3				
REVISIONS 1				P.E. NUMBER
REVISIONS 2				
REVISIONS 3				DATE
REVISIONS 4				
FIELD CHANGES				

AUGUSTA
I-95 Exit 113-Routes 8\11\27

GEOPLANS

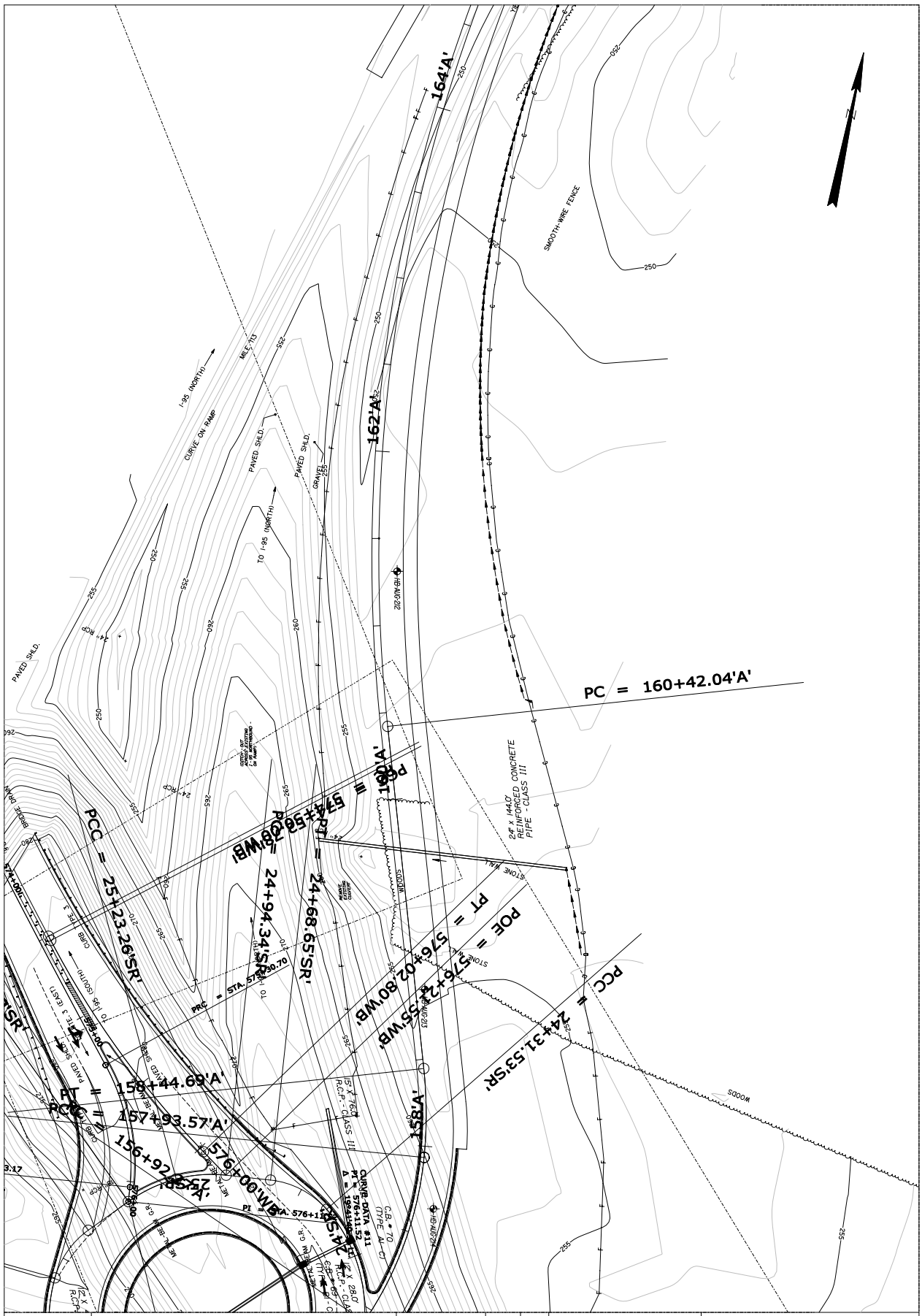
SHEET NUMBER 13 OF 17

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

FEDERAL AID PROJ. NO. IM-1631(310)E

WIN 16313.10

HIGHWAY PLANS



SHEET NUMBER 14 OF 17	AUGUSTA I-95 Exit 113-Routes 8\11\27 GEOPLANS		STATE OF MAINE DEPARTMENT OF TRANSPORTATION FEDERAL AID PROJ. NO. IM-1631(310)E WIN 16313.10 HIGHWAY PLANS

PROJ. MANAGER		BY	DATE	
DESIGN-DETAILED	K.GROSS	T.WHITE	APR 2012	
CHECKED-REVIEWED				SIGNATURE
DESIGN2-DETAILED2				
DESIGN3-DETAILED3				P.E. NUMBER
REVISIONS 1				
REVISIONS 2				DATE
REVISIONS 3				
REVISIONS 4				
FIELD CHANGES				

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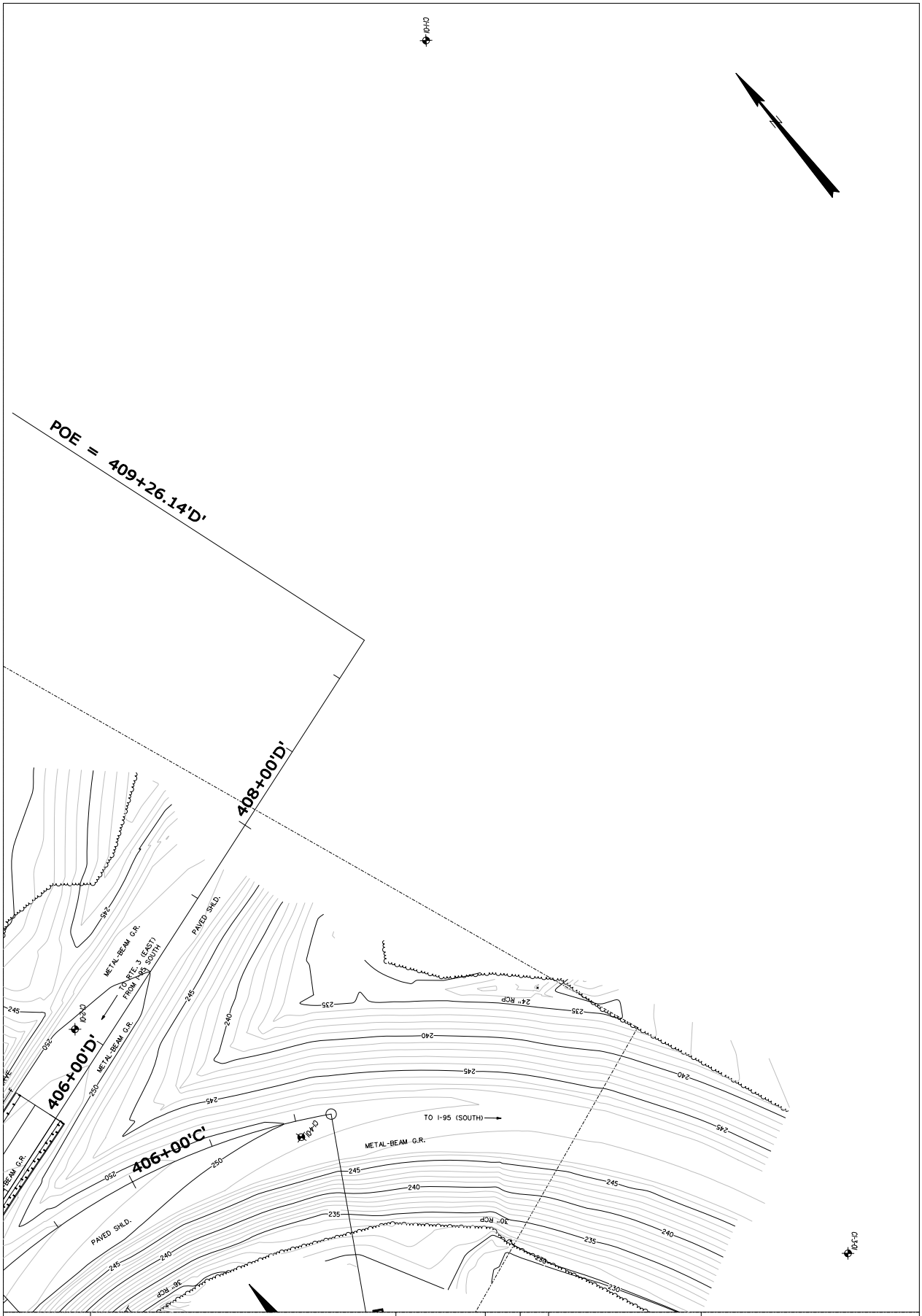

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		CHECKED-REVIEWED			
		DESIGN2-DETAILED2			
		DESIGN3-DETAILED3			
		REVISIONS 1			
		REVISIONS 2			
		REVISIONS 3			
		REVISIONS 4			
		FIELD CHANGES			

SIGNATURE

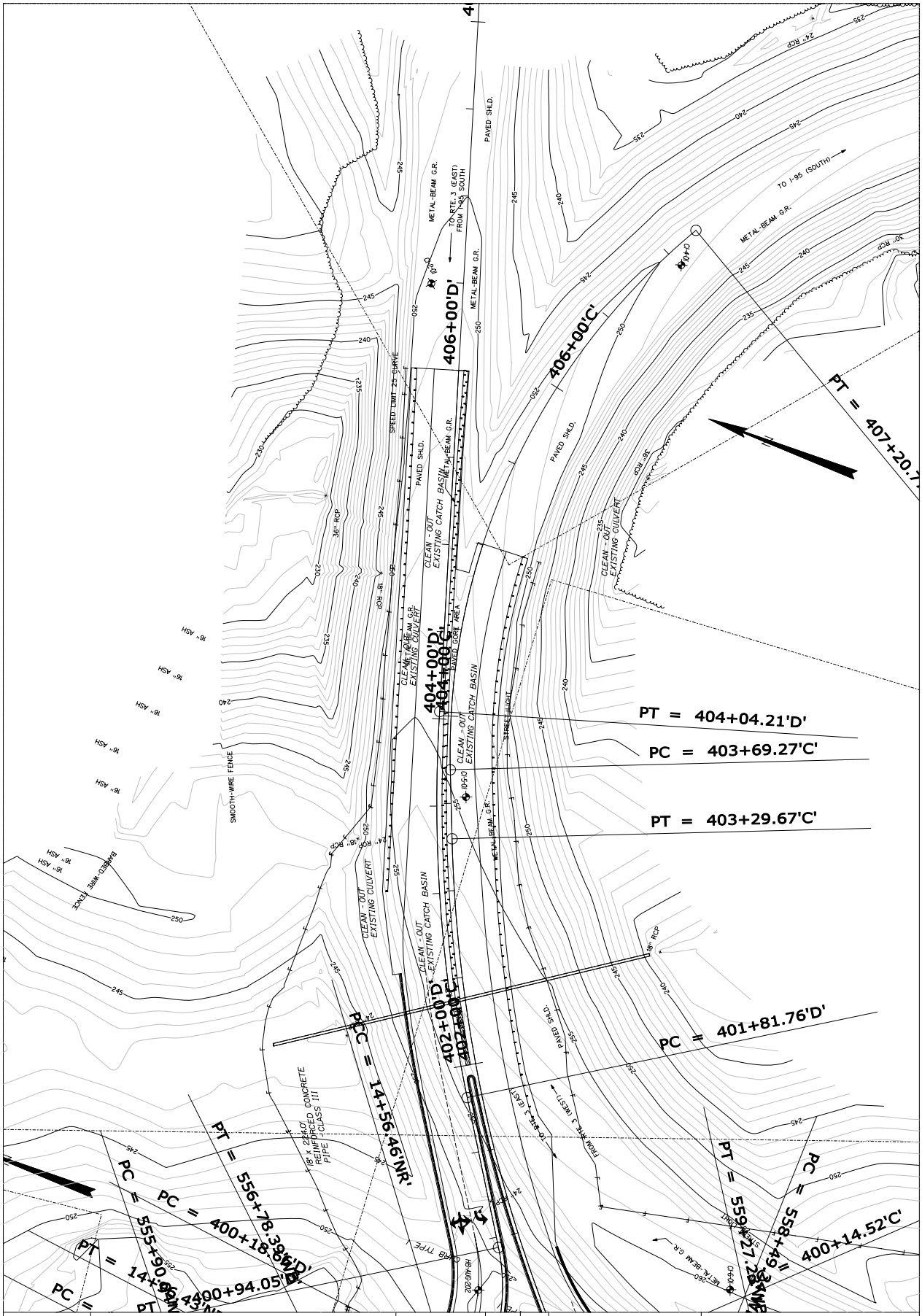
P.E. NUMBER

DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

FEDERAL AID PROJ. NO. IM-1631(310)E

WIN 16313.10 HIGHWAY PLANS



PROJ. MANAGER		BY	DATE	
DESIGN-DETAILED	K.GROSS	T.WHITE	APR 2012	
CHECKED-REVIEWED				SIGNATURE
DESIGN2-DETAILED2				
DESIGN3-DETAILED3				
REVISIONS 1				P.E. NUMBER
REVISIONS 2				
REVISIONS 3				DATE
REVISIONS 4				
FIELD CHANGES				

AUGUSTA
I-95 Exit 113-Routes 8\11\27

GEOPLANS

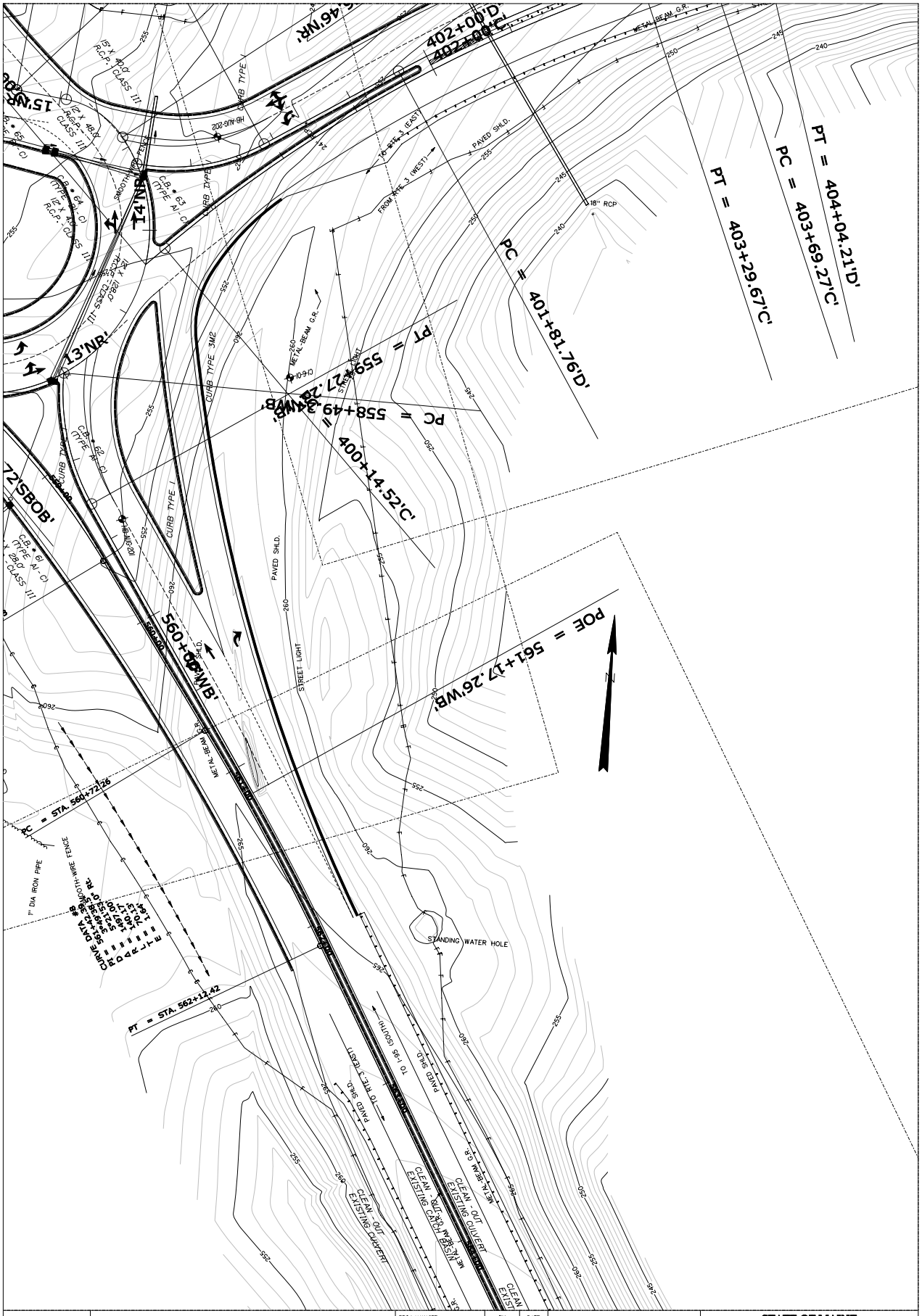
SHEET NUMBER 16 OF 17

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

FEDERAL AID PROJ. NO. IM-1631(310)E

WIN 16313.10

HIGHWAY PLANS



SHEET NUMBER 17 OF 17	AUGUSTA I-95 Exit 113-Routes 8\11\27 GEOPLANS	PROJ. MANAGER _____ BY DATE DESIGN-DETAILED K.GROSS T.WHITE APR 2012 CHECKED-REVIEWED _____ DESIGN2-DETAILED2 _____ DESIGN3-DETAILED3 _____ REVISIONS 1 _____ REVISIONS 2 _____ REVISIONS 3 _____ REVISIONS 4 _____ FIELD CHANGES _____	SIGNATURE P.E. NUMBER DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

FEDERAL AID PROJ. NO. IM-1631(310)E

WIN 16313.10 HIGHWAY PLANS

APPENDIX C
BORING LOGS

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-101
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	555+16.8, 181.7 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 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		0.50 - 2.40			SSA	-0.50		PAVEMENT.	
									0.50 Brown, damp, fine to coarse SAND, little gravel, trace silt.	G#209217 A-1-b, SM WC=4.2%
	S14		2.40 - 8.00				-2.40		2.40 Brown, wet, clayey-SILT, trace fine to medium sand.	
5										
							-8.00		8.00 **Bottom of Exploration at 8.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from Existing Centerline of Road.

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: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-102
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	549+81.6, 1.8 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 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					SSA	-0.45		PAVEMENT, (Core). 0.45	
									Brown, damp, fine to coarse SAND, little gravel, trace silt. ≅S9	
							-3.00		3.00	
									Grey-brown, moist, silty fine to medium SAND ≅S12	
5										
							-7.00		7.00	
									Bottom of Exploration at 7.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from Existing Centerline of Road.

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: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-103
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	544+29.8, 6.0 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						SSA	-0.60		PAVEMENT.	
									0.60 Brown, damp, fine to coarse SAND, little gravel, trace silt. ≥S9	
	S12		2.80 - 8.00				-2.80		2.80 Grey-brown, moist, silty fine to medium SAND.	
5										
							-8.00		8.00 **Bottom of Exploration at 8.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from Existing Centerline of Road.

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: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-104
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	539+88.3, 8.0 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.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	PC-4					SSA	-0.50	PAVEMENT, (Core). 0.50	
							-1.40	Brown, damp, fine to coarse SAND, little gravel, trace silt. ≅S9 1.40	
								Brown, moist, fine to medium SAND, little silt. ≅S10	
5							-6.00	6.00	
								Olive, wet, stiff, clayey-SILT. ≅S3	
							-8.00	8.00	
								Bottom of Exploration at 8.00 feet below ground surface. NO REFUSAL	
10									
15									
20									
25									

Remarks:

Offsets are from Existing Centerline of Road.

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: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-105
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	534+20, 6.0 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.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	S9		0.60 - 1.40			SSA	-0.60	PAVEMENT.	
								0.60 Brown, damp, fine to coarse SAND, little gravel, trace silt.	G#209216 A-1-b, SW-SM WC=3.2%
	S10		1.40 - 4.50				-1.40	1.40 Brown, moist, fine to medium SAND, little silt.	
	S11		4.50 - 8.00				-4.50	4.50 Brown, wet, silty fine to medium SAND, little organics.	
5									
							-8.00	8.00	
10									
15									
20									
25									

Bottom of Exploration at 8.00 feet below ground surface.
NO REFUSAL

Remarks:

Offsets are from Existing Centerline of Road.

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: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-106
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	527+44.8, 6.0 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

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.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	PC-3		0.65 - 1.20			SSA	-0.65	PAVEMENT, (Core). 0.65	
	S7						-1.20	Brown, damp, fine to coarse SAND, little gravel, little silt. 1.20	G#209215 A-1-b, SW-SM WC=2.8%
	S8		1.20 - 8.00					Brown, moist, fine to medium SAND, trace silt.	
5									
							-8.00	8.00	
								Bottom of Exploration at 8.00 feet below ground surface. NO REFUSAL	
10									
15									
20									
25									

Remarks:

Offsets are from Existing Centerline of Road.

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: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-107
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	522+41.5, 5.2 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

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.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	S5		0.50 - 2.10			SSA	-0.50	PAVEMENT.	
								0.50 Brown, damp, gravelly, fine to coarse SAND, little silt.	G#209214 A-1-b, SM WC=3.1%
	S6		2.10 - 8.00				-2.10	2.10 Brown, moist, fine to medium SAND, little gravel, little silt.	
5									
							-8.00	8.00 **Bottom of Exploration at 8.00 feet below ground surface.** NO REFUSAL	
10									
15									
20									
25									

Remarks:

Offsets are from Existing Centerline of Road.

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* 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: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-108
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	516+69, 8.0 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	PC-2 S4		0.50 - 2.30			SSA	-0.50		PAVEMENT, (Core). 0.50	
									Brown, damp, fine to coarse SAND, some gravel, little silt.	G#209213 A-1-b, SM WC=5.1%
							-2.30		2.30	
									Bottom of Exploration at 2.30 feet below ground surface. REFUSAL	
5										
10										
15										
20										
25										

Remarks:

Offsets are from Existing Centerline of Road.

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.

Boring No.: HB-AUG-108

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-109
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	510+11, 6.0 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.

Remarks:

Did not drill, overhead wires.

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.

Boring No.: HB-AUG-109

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-110
WIN: 16313.10

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	Giguere/Giles	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	5/5/10-5/5/10	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	504+63, 8.0 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

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.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	PC-1		0.50 - 2.00			SSA	-0.50	PAVEMENT, (Core).	
	S1							Brown, damp, fine to coarse SAND, some gravel, little silt.	G#209212 A-1-b, SM WC=3.7%
							-2.00		
	S2		2.00 - 4.80					Brown, wet, silty fine to medium SAND.	
	S3		4.80 - 8.00				-4.80		
5								Olive, wet, stiff, clayey-SILT.	
							-8.00		
								Bottom of Exploration at 8.00 feet below ground surface. NO REFUSAL	
10									
15									
20									
25									

Remarks:

Offsets are from Existing Centerline of Road.

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: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-201
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	255.0	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	559+44, 21.8 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	254.70		Topsoil, sod. 0.30	
	1D	24/20	1.50 - 3.50	3/3/3/5	6	8				Light brown, wet, medium stiff, fine to medium sandy-SILT, trace clay.	
								251.00		4.00	
5	2D	24/22	5.00 - 7.00	6/7/8/11	15	19				Olive, moist, stiff, clayey-SILT, little fine sand.	
										Gravelly soil on auger	
	MD	0/0	9.80 - 9.80	25(0")	---			245.20		9.80	
10										**Bottom of Exploration at 9.80 feet below ground surface.** Spoon REFUSAL	
15											
20											
25											

Remarks:

Auto Hammer #283

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.

Boring No.: HB-AUG-201

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-202
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	250.0	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	104+20, 91.8 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	249.70	Topsoil, sod. 0.30	
	1D	24/24	2.00 - 4.00	3/5/7/7	12	15			Olive, moist, stiff, SILT, little fine sand.	G#261997 A-6, CL WC=20.8% LL=30 PL=19 PI=11
5	2D	24/18	5.00 - 7.00	5/5/5/5	10	13		244.50	5.50 Olive-brown, wet, stiff, clayey-SILT, some fine sand.	
								242.00	8.00	
10	3D	24/20	10.00 - 12.00	3/5/5/5	10	13			Olive-grey, wet, stiff, clayey-SILT.	G#261999 A-6, CL WC=28.7% LL=35 PL=21 PI=14
								237.00	13.00 Coarse GRAVEL.	
15								235.20	14.80 **Bottom of Exploration at 14.80 feet below ground surface.** REFUSAL	
20										
25										

Remarks:

Auto Hammer #283

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.

Boring No.: HB-AUG-202

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-203
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	255.4	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	557+47, 28.9 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	255.10	Topsoil, sod. 0.30	
	1D	24/14	2.00 - 4.00	4/4/4/8	8	10			Olive-brown, moist, loose, silty, fine to medium SAND, roots.	
								250.90	4.50	
5	2D	24/24	5.00 - 7.00	5/7/8/11	15	19			Olive, wet, stiff, clayey-SILT, trace fine sand.	G#261998 A-6, CL WC=21.9% LL=31 PL=18 PI=13
								247.90	7.50	
10	3D	24/22	10.00 - 12.00	2/3/3/4	6	8			Olive-brown, wet, medium stiff, clayey SILT, trace fine sand.	
								242.90	12.50	
									GRAVELLY.	
								240.90	14.50	
15									**Bottom of Exploration at 14.50 feet below ground surface.** REFUSAL	
20										
25										

Remarks:

Auto Hammer #283

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.

Boring No.: HB-AUG-203

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-204
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	265.7	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	558+24, 142.5 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	265.40		Topsoil, sod. 0.30	
	1D	24/18	1.00 - 3.00	6/4/6/7	10	13				Brown, moist, loose, fine to medium SAND, trace silt.	
								261.70		4.00	
5	2D	3.6/3.6	5.00 - 5.30	50(3.6')	---			260.40		Brown, moist, very dense, silty, fine to medium SAND, some gravel. Weathered Rock in spoon tip. 5.30	
10										**Bottom of Exploration at 5.30 feet below ground surface.** Spoon and Auger REFUSAL	
15											
20											
25											

Remarks:

Auto Hammer #283

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: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-205
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	258.8	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	556+53, 9.3 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	258.50	Topsoil, sod. 0.30	
	1D	24/22	1.50 - 3.50	4/4/6/6	10	13			Olive-brown, moist, loose, silty, fine SAND.	
	2D	24/22	4.50 - 6.50	3/4/5/6	9	12		254.00	4.80 Olive, wet, stiff, clayey-SILT, trace fine sand.	
5										
	3D	24/24	9.50 - 11.50	2/3/3/4	6	8			Similar to above, except medium stiff.	
10								247.30	11.50 **Bottom of Exploration at 11.50 feet below ground surface.** NO REFUSAL	
15										
20										
25										

Remarks:

Auto Hammer #283

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

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Boring No.: HB-AUG-205

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-206
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	261.0	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	554+93, 0.3 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	260.70	Topsoil, sod. 0.30	
	1D	24/16	1.50 - 3.50	8/8/8/7	16	20			Olive-brown, moist, medium dense, silty, fine to medium SAND, trace clay.	
5	2D	24/24	5.00 - 7.00	4/4/7/7	11	14		256.50	4.50 Olive-brown, moist, stiff, clayey-SILT, trace fine sand.	
10	3D	24/19	10.00 - 12.00	9/22/28/22	50	64		251.50	9.50 Brown, moist, very dense, fine to coarse SAND, some garvel, trcae silt.	G#262000 A-2-b, GM WC=6.8%
15								249.00	12.00 **Bottom of Exploration at 12.00 feet below ground surface.** NO REFUSAL	
20										
25										

Remarks:

Auto Hammer #283
Moved boring 7.0 ft towards HB-AUG-107, elevation was 3.5 ft lower.

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.

Boring No.: HB-AUG-206

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-207
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	260.0	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	554+00, CL	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA			Brown, silty, fine SAND, on auger.	
								259.00		1.00	
	1D	24/24	2.00 - 4.00	5/6/8/8	14	18				Olive, moist, stiff, clayey-SILT, trace fine sand.	
5	2D	24/24	5.00 - 7.00	4/4/5/5	9	12				Similar to above, except medium stiff.	G#244676 A-4, CL-ML WC=26.5%
10	3D	24/24	10.00 - 12.00	5/5/4/5	9	12				Similar to above.	
								248.00		12.00	
										Bottom of Exploration at 12.00 feet below ground surface. NO REFUSAL	
15											
20											
25											

Remarks:

Auto Hammer #283

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.

Boring No.: HB-AUG-207

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-208
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	255.9	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	553+00, CL	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							HSA	255.60		Topsoil, sod. 0.30	
	1D	24/21	1.00 - 3.00	2/4/5/7	9	12				Olive, wet, stiff, clayey-SILT, trace fine sand.	
5	2D	24/24	5.00 - 7.00	3/4/5/5	9	12				Similar to above.	
								246.40		9.50	
10	3D	24/20	10.00 - 12.00	2/3/3/4	6	8				Olive, wet, medium stiff, clayey-SILT, trace fine sand.	
								243.90		12.00	
										Bottom of Exploration at 12.00 feet below ground surface. NO REFUSAL	
15											
20											
25											

Remarks:

Auto Hammer #283

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

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Boring No.: HB-AUG-208

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-209
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	222.2	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/16/2012-1/16/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	548+07, 57.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	3.0 ft bgs
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/8	0.00 - 2.00	4/1/1/1	2	3	HSA		Dark brown, wet, PEAT, roots, silt.	
								220.20	2.00	
5	2D	24/18	5.00 - 7.00	3/3/3/2	6	8			Grey, wet, loose, silty, fine to medium SAND.	
								214.70	7.50	
10	3D	24/24	10.00 - 12.00	Hydraulic Push	---				Grey, very wet, very soft, silty-CLAY. Auger to 9.5 ft bgs, pulled auger, took vane tests then sampled 3D. 55x110 mm vane raw torque readings: V1: 10.0/3.0 ft-lbs V2: 14.0/3.0 ft-lbs	G#244677 A-6, CL WC=33.4% LL=29 PL=19 PI=10
	V1		10.63 - 11.00	Su=446/134 psf						
	V2		11.63 - 12.00	Su=625/134 psf						
15	4D	24/24	15.00 - 17.00	1/1/1/2	2	3			Similar to above.	G#244678 A-7-6, CL WC=36.2% LL=41 PL=20 PI=21
								204.70	17.50	
									Dense gravelly sand on auger.	
								203.00	19.20	
20									**Bottom of Exploration at 19.20 feet below ground surface.** REFUSAL	
25										

Remarks:

Auto Hammer #283

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: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-210
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	222.7	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/17/2012-1/17/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	548+17, 75.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	1.0 ft bgs
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/18	0.00 - 2.00	5/1/1/1	2	3	HSA	222.00	Organic silt, PEAT.	
									0.70 Olive brown, wet, very loose, silty, fine SAND, some clay, roots.	G#244679 A-4, CL-ML WC=41.3%
								218.70	4.00	
5	2D	24/24	5.00 - 7.00	2/2/2/2	4	5			Olive-brown, wet, soft, clayey-SILT.	G#244680 A-4, CL-ML WC=29.3% LL=23 PL=18 PI=5
								215.20	7.50	
10	3D	24/20	10.00 - 12.00	1/1/1/1	2	3			Grey, wet, very soft, silty-CLAY, trace fine sand.	
15	4D	24/24	15.00 - 17.00	1/1/1/3	2	3			Similar to above.	
								205.00	17.70	
								204.20	Dense gravelly SAND on auger. 18.50	
20									**Bottom of Exploration at 18.50 feet below ground surface.** REFUSAL	
25										

Remarks:

Auto Hammer #283

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

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Boring No.: HB-AUG-210

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-211
WIN: 16313.10

Driller:	**Elevation (ft.)**	**Auger ID/OD:**
Operator:	**Datum:**	**Sampler:**
Logged By:	**Rig Type:**	**Hammer Wt./Fall:**
Date Start/Finish:	**Drilling Method:**	**Core Barrel:**
Boring Location:	**Casing ID/OD:**	**Water Level*:**
Hammer Efficiency Factor:	**Hammer Type:** Automatic ☐ Hydraulic ☐ Rope & Cathead ☐	

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0										**Bottom of Exploration at 0.00 feet below ground surface.** COULD NOT GET TO BORING LOCATION	
5											
10											
15											
20											
25											

Remarks:

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

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Boring No.: HB-AUG-211

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-212
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	251.1	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/19/2012-1/19/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	4016+00, 70.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/20	0.00 - 2.00	4/5/5/6	10	13	HSA	250.80	Topsoil, sod. (0.30)	
									Olive-brown, moist, loose, silty, fine SAND, trace clay, roots.	G#244681 A-4, CL-ML WC=24.8%
								247.10	(4.00)	
5	2D	24/24	5.00 - 7.00	2/3/2/4	5	6			Olive-grey, wet, medium stiff, clayey-SILT, trace fine sand.	G#244682 A-4, CL-ML WC=31.1%
10	3D	24/24	10.00 - 12.00	2/2/2/3	4	5			Grey, wet, soft, clayey-SILT, trace fine sand.	
15	4D	19.2/18	15.00 - 16.60	3/3/3/25(1.2")	6	8			Similar to above.	
								235.10	(16.00)	
								234.50	Grey, wet, silty, fine to medium SAND, trace gravel. (16.60)	
20									**Bottom of Exploration at 16.60 feet below ground surface.** Spoon REFUSAL	
25										

Remarks:

Auto Hammer #283

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.

Boring No.: HB-AUG-212

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-213
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	254.6	**Auger ID/OD:**	5" Dia.
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Visual
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	1/19/2012-1/19/2012	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4018+65, 85.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	254.30		Topsoil. 0.30	
										Olive-brown, moist, clayey-SILT, trace fine sand.	
5											
								246.00		8.60	
										Bottom of Exploration at 8.60 feet below ground surface. REFUSAL	
10											
15											
20											
25											

Remarks:

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

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Boring No.: HB-AUG-213

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-214
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	261.4	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/19/2012-1/19/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	4020+00, 60.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/18	0.00 - 2.00	8/9/11/9	20	26	HSA	261.10	Topsoil, sod. (0.30)	
									Olive-brown, wet, medium dense, silty, fine to coarse SAND, litle gravel, (Fill).	
5	2D	24/24	5.00 - 7.00	3/4/4/5	8	10		255.90	(5.50) Light brown, moist, loose, silty, fine SAND, little clay.	
								253.40	(8.00)	
10	3D	24/24	10.00 - 12.00	3/4/3/4	7	9			Olive-brown, wet, medium stiff, clayey- SILT, trace fine sand.	G#244683 A-6, CL WC=31.7% LL=34 PL=19 PI=15
15	4D	21.6/14	15.00 - 16.80	6/19/18/50(3.6")	37	47		246.40	(15.00) Brown, wet, dense, fine to coarse SAND, some gravel, trace silt.	G#244684 A-2-4, SM WC=8.7%
								244.60	(16.80) **Bottom of Exploration at 16.80 feet below ground surface.** Spoon and Auger REFUSAL	
20										
25										

Remarks:

Auto Hammer #283

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: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-215
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	262.4	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/19/2012-1/19/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	3005+35, 45.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/20	0.00 - 2.00	5/4/4/4	8	10	HSA	262.10	Topsoil, sod. (0.30)	
									Olive-brown, moist, medium stiff, sandy SILT, trace clay, roots. (3.00)	
								259.40		
5	2D	24/24	5.00 - 7.00	5/7/9/9	16	20			Olive-brown, moist, very stiff, clayey- SILT, trace fine sand.	
10	3D	24/24	10.00 - 12.00	3/3/3/3	6	8			Olive-grey, wet, medium stiff, clayey- SILT, some fine sand.	
								249.50	(12.90)	
15									**Bottom of Exploration at 12.90 feet below ground surface.** REFUSAL	
20										
25										

Remarks:

Auto Hammer #283
Moved boring 15.0 ft south, same line.

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.

Boring No.: HB-AUG-215

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-216
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	266.0	**Auger ID/OD:**	5" Dia.
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	1/19/2012-1/19/2012	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	3007+00, 70.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			Similar to HB-AUG-117.	
5											
10											
15											
20								246.00		20.00 **Bottom of Exploration at 20.00 feet below ground surface.** NO REFUSAL	
25											

Remarks:

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

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

Boring No.: HB-AUG-216

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: I-95, Exit 113 and Old Belgrade Road
Location: Augusta, Maine

Boring No.: HB-AUG-217
WIN: 16313.10

Driller:	Northern Test Boring	**Elevation (ft.)**	264.3	**Auger ID/OD:**	2.25"/6.25"
Operator:	Mike/Adam	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	Diedrich D-50 Track	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	1/19/2012-1/19/2012	**Drilling Method:**	Hollow Stem Auger	**Core Barrel:**	N/A
Boring Location:	3009+00, 60.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.768	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
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-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/19	0.00 - 2.00	9/5/7/6	12	15	HSA	264.00	Topsoil, sod. (0.30)	G#244685 A-4, CL-ML WC=20.3%
									Olive-brown, moist, medium dense, silty, fine SAND.	
5	2D	24/24	5.00 - 7.00	5/6/6/7	12	15			Olive-brown, moist, stiff, clayey-SILT, trace fine sand.	
								255.80	(8.50)	
10	3D	24/24	10.00 - 12.00	2/2/2/3	4	5			Olive, wet, soft, clayey- SILT, trace fine sand.	G#244686 A-4, CL WC=27.9% LL=28 PL=19 PI=9
15	4D	24/20	15.00 - 17.00	1/2/2/1	4	5		248.80	(15.50) Grey, wet, soft, clayey-SILT, trace fine sand.	G#244687 A-4, CL WC=31.0% LL=29 PL=20 PI=9
20	5D	24/24	20.00 - 22.00	2/2/2/2	4	5			Similar to above, except with 1/2" sand layer.	
								242.30	(22.00) **Bottom of Exploration at 22.00 feet below ground surface.** NO REFUSAL	
25										

Remarks:

Auto Hammer #283

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.

Boring No.: HB-AUG-217

State of Maine - Department of Transportation

Pavement Core Summary Sheet

Town(s): Augusta Project Number: 16313.10

Station (Feet)	Offset (Feet)	Pavement Depth (Inches)	Unbound Pavement	PC-Number	Saved Core	Comments / Date Route 27 6/16/2011
200+90	16.0 Rt.	9.75		1	yes	
200+90	6.0 Rt.	14.50		2	no	
200+90	6.0 Lt.	11.00		3	no	
200+90	16.0 Lt.	5.50		4	no	
208+25	16.0 Rt.	3.00		5	yes	
208+25	6.0 Rt.	9.75		6	no	
208+25	6.0 Lt.	8.00		7	yes	
208+25	16.0 Lt.	3.25		8	no	
220+00	16.0 Rt.	5.00		9	no	
220+00	6.0 Rt.	9.00		10	no	
220+00	6.0 Lt.	7.75		11	yes	
220+00	16.0 Lt.	3.0 to 3.25		12	no	core had two thicknesses

Logged By: J. Godin

6" Dia. Core

APPENDIX D
LABORATORY TESTING

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Augusta Work Number: 16313.10

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-AUG-110, S1	504+63	8.0 Lt.	0.5-2.0	209212	1	3.7			SM	A-1-b	II
HB-AUG-108, S4	516+69	8.0 Lt.	0.5-2.3	209213	1	5.1			SM	A-1-b	II
HB-AUG-107, S5	522+41.5	5.2 Rt.	0.5-2.1	209214	1	3.1			SM	A-1-b	II
HB-AUG-106, S7	527+44.8	6.0 Lt.	0.65-1.2	209215	1	2.8			SW-SM	A-1-b	0
HB-AUG-105, S9	534+20	6.0 Rt.	0.6-1.4	209216	1	3.2			SW-SM	A-1-b	0
HB-AUG-101, S13	555+16.8	181.7 Rt.	0.5-2.4	209217	1	4.2			SM	A-1-b	II
HB-AUG-202, 1D	401+74"D"	13.9 Lt	2.0-4.0	261997	2	20.8	30	11	CL	A-6	IV
HB-AUG-202, 3D	401+74"D"	13.9 Lt	10.0-12.0	261999	2	28.7	35	14	CL	A-6	III
HB-AUG-203, 2D	557+47	28.9 Lt.	5.0-7.0	261998	2	21.9	31	13	CL	A-6	III
HB-AUG-206, 3D	554+93	0.3 Lt.	10.0-12.0	262000	2	6.8			GM	A-1-b	I
HB-AUG-207, 2D	554+00	CL	5.0-7.0	244676	2	26.5			CL-ML	A-4	IV
HB-AUG-209, 3D	548+07	57.0 Rt.	10.0-12.0	244677	3	33.4	29	10	CL	A-6	IV
HB-AUG-209, 4D	548+07	57.0 Rt.	15.0-17.0	244678	3	36.2	41	21	CL	A-7-6	III
HB-AUG-210, 1D	548+17	75.0 Lt.	0.70-2.0	244679	3	41.3			CL-ML	A-4	IV
HB-AUG-210, 2D	548+17	75.0 Lt.	5.0-7.0	244680	3	29.3	23	5	CL-ML	A-4	IV
HB-AUG-212, 1D	161+30"A"	10.0 Rt.	0.30-2.0	244681	3	24.8			CL-ML	A-4	IV
HB-AUG-212, 2D	161+30"A"	10.0 Rt.	5.0-7.0	244682	3	31.1	36	13	CL	A-6	III
HB-AUG-214, 3D	157+65"A"	10.0 Rt.	10.0-12.0	244683	4	31.7	34	15	CL	A-6	III
HB-AUG-214, 4D	157+65"A"	10.0 Rt.	15.0-16.8	244684	4	8.7			SM	A-2-4	II
HB-AUG-217, 1D	156+10"B"	18.7 Rt.	0.30-2.0	244685	4	20.3			CL-ML	A-4	IV
HB-AUG-217, 3D	156+10"B"	18.7 Rt.	0.30-2.0	244686	4	27.9	28	9	CL	A-4	IV
HB-AYG-217, 4D	156+10"B"	18.7 Rt.	0.30-2.0	244687	4	31.0	29	9	CL	A-4	IV

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.

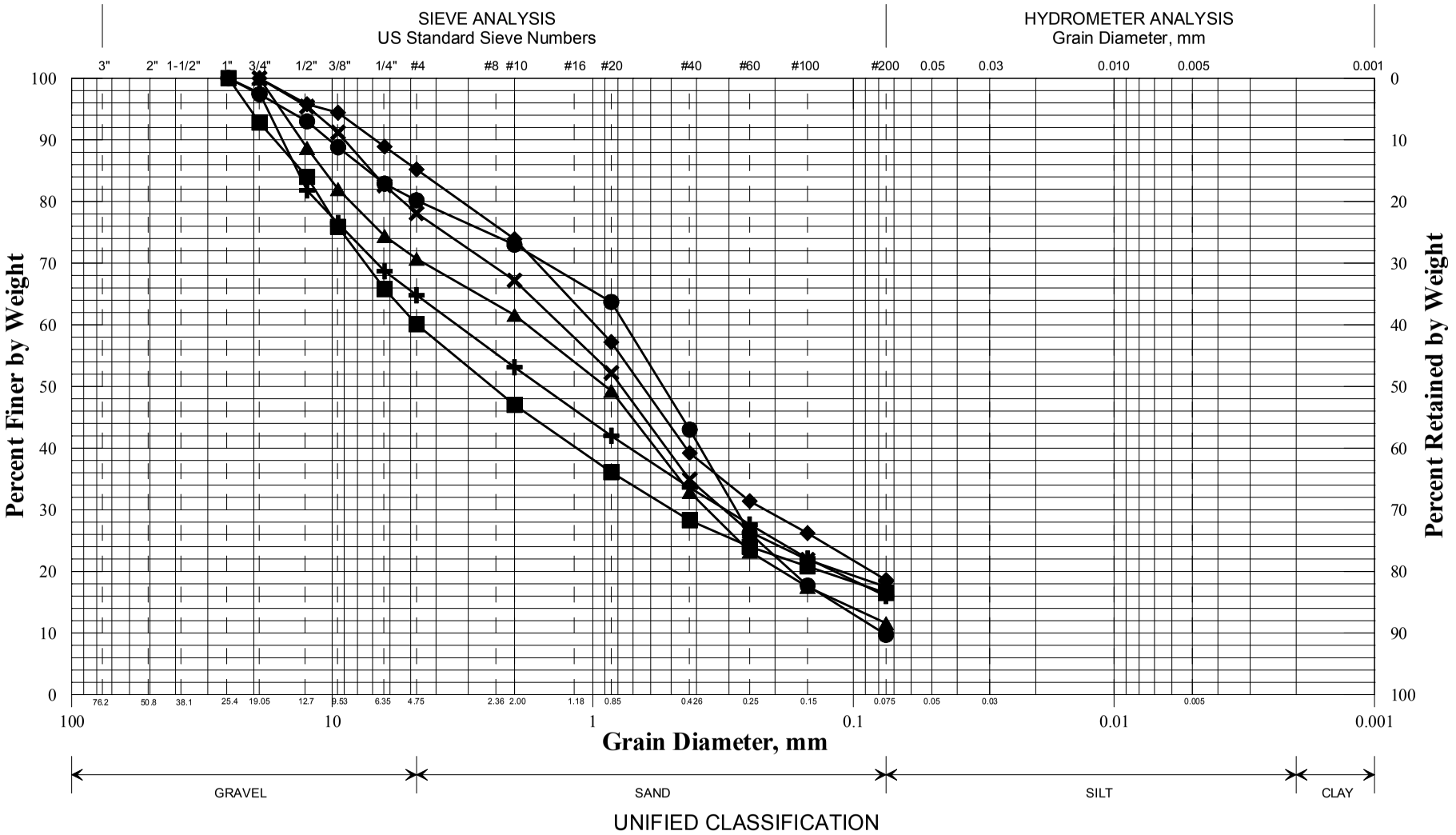
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

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 NP = Non Plastic

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

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

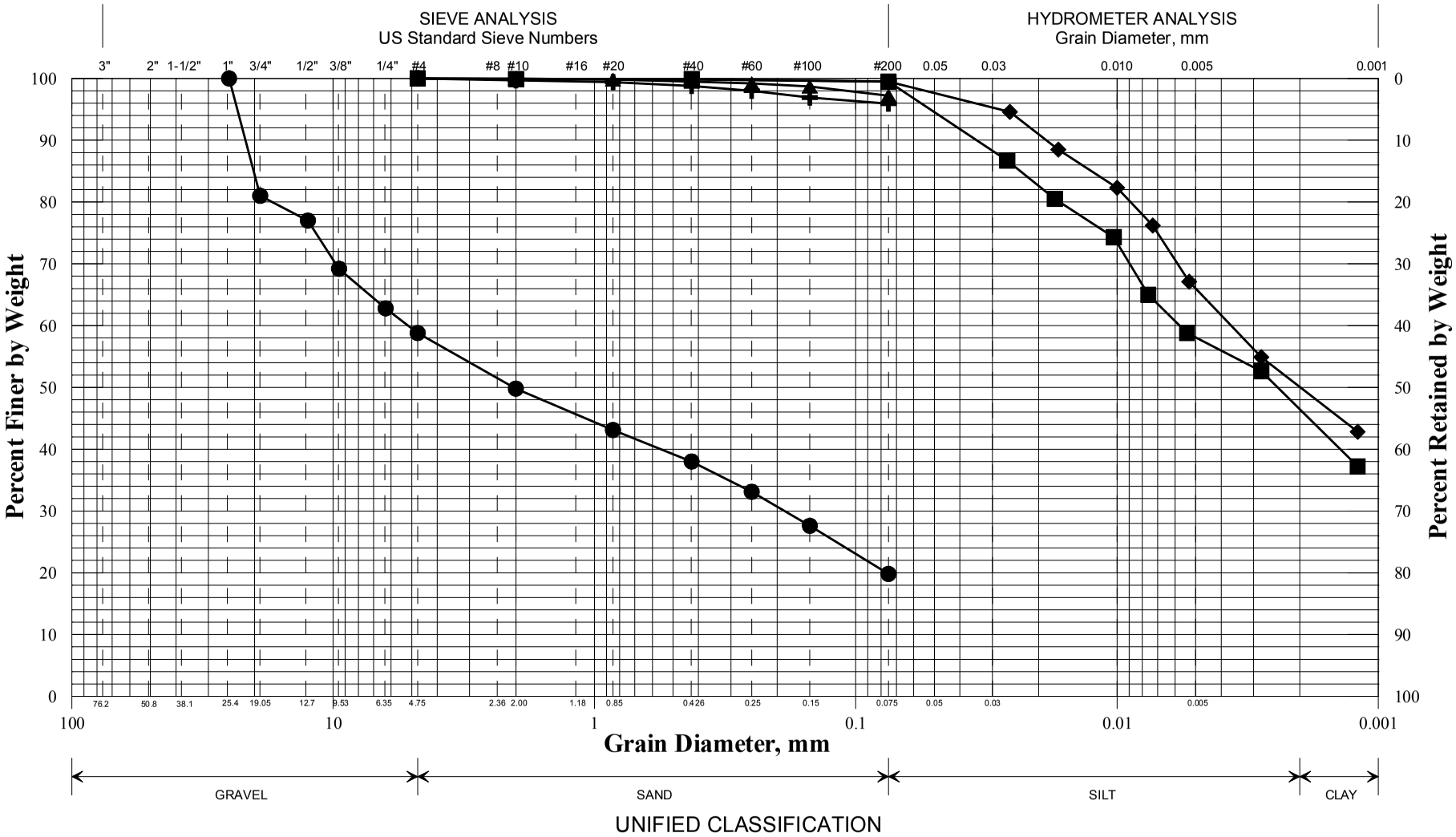


	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-AUG-110/S1	504+63	8.0 LT	0.5-2.0	SAND, some gravel, little silt.	3.7			
◆	HB-AUG-108/S4	516+69	8.0 LT	0.5-2.3	SAND, little silt, little gravel.	5.1			
■	HB-AUG-107/S5	522+41.5	5.2 RT	0.5-2.1	Gravelly SAND, little silt.	3.1			
●	HB-AUG-106/S7	527+44.8	6.0 LT	0.65-1.2	SAND, little gravel, trace silt.	2.8			
▲	HB-AUG-105/S9	534+20	6.0 RT	0.6-1.4	SAND, some gravel, little silt.	3.2			
✕	HB-AUG-101/S13	555+16.8	181.7 RT	0.5-2.4	SAND, some gravel, little silt.	4.2			

WIN
016313.10
Town
Augusta
Reported by/Date
WHITE, TERRY A 5/15/2012

SHEET 1

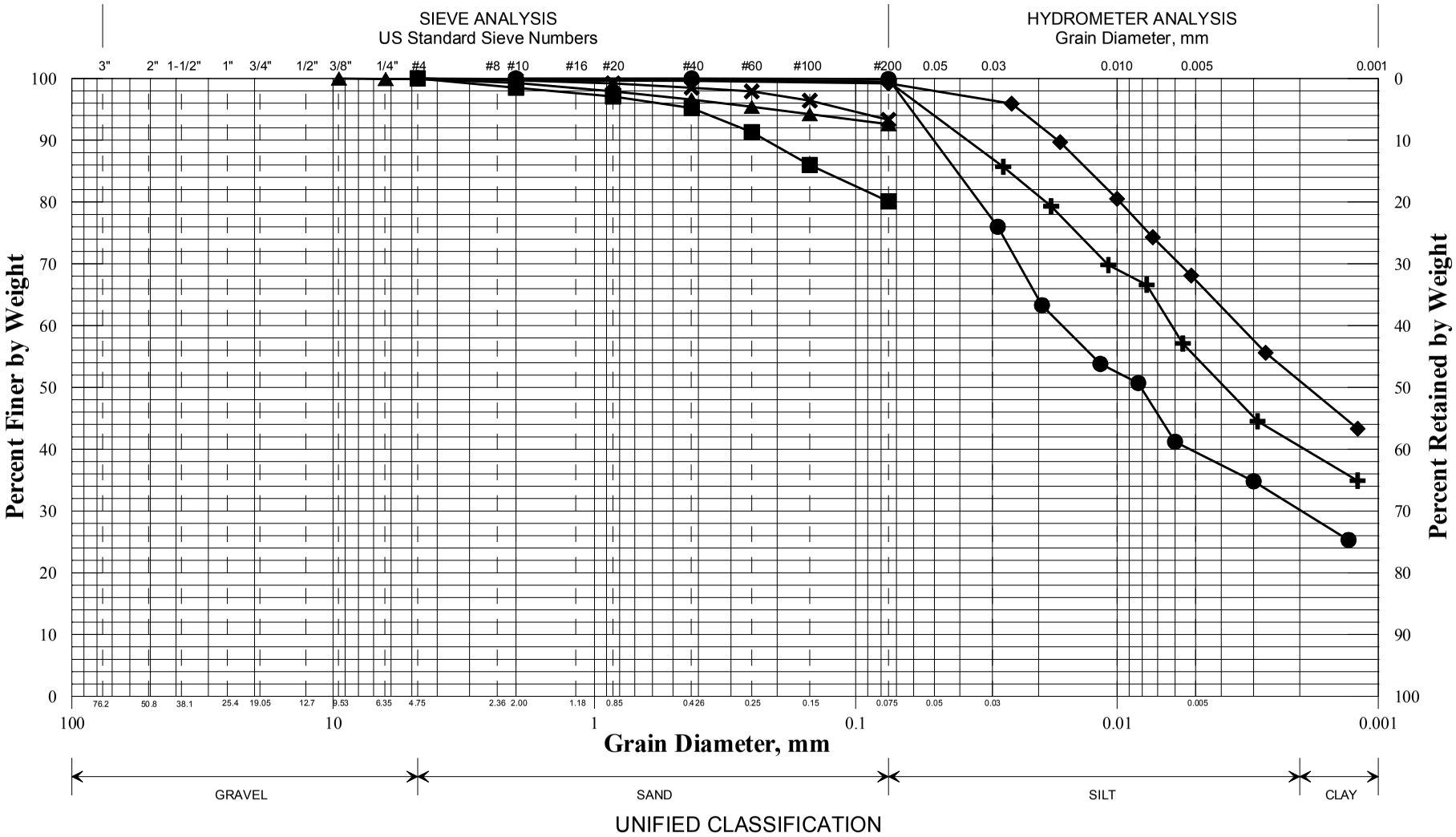
State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-AUG-202/1D	401+74 "D"	13.9 LT	2.0-4.0	SILT, trace sand.	20.8	30	19	11
◆	HB-AUG-202/3D	401+74 "D"	13.9 LT	10.0-12.0	Silty CLAY, trace sand.	28.7	35	21	14
■	HB-AUG-203/2D	557+47	28.9 LT	5.0-7.0	Clayey SILT, trace sand.	21.9	31	18	13
●	HB-AUG-206/3D	554+93	0.3 LT	10.0-12.0	Sandy GRAVEL, some silt.	6.8			
▲	HB-AUG-207/2D	554+00	CL	5.0-7.0	SILT, trace sand.	26.5			
✕									

WIN
016313.10
Town
Augusta
Reported by/Date
WHITE, TERRY A 5/15/2012

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-AUG-209/3D	548+07	57.0 RT	10.0-12.0	Clayey SILT, trace sand.	33.4	29	19	10
◆	HB-AUG-209/4D	548+07	57.0 RT	15.0-17.0	Silty CLAY, trace sand.	36.2	41	20	21
■	HB-AUG-210/1D	548+17	75.0 LT	0.7-2.0	SILT, some sand.	41.3			
●	HB-AUG-210/2D	548+17	75.0 LT	5.0-7.0	SILT, some clay, trace sand.	29.3	23	18	5
▲	HB-AUG-212/1D	161+30 "A"	10.0 RT	0.3-2.0	SILT, trace sand, trace gravel.	24.8			
✕	HB-AUG-212/2D	161+30 "A"	10.0 RT	5.0-7.0	SILT, trace sand.	31.1	36	20	16

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Augusta
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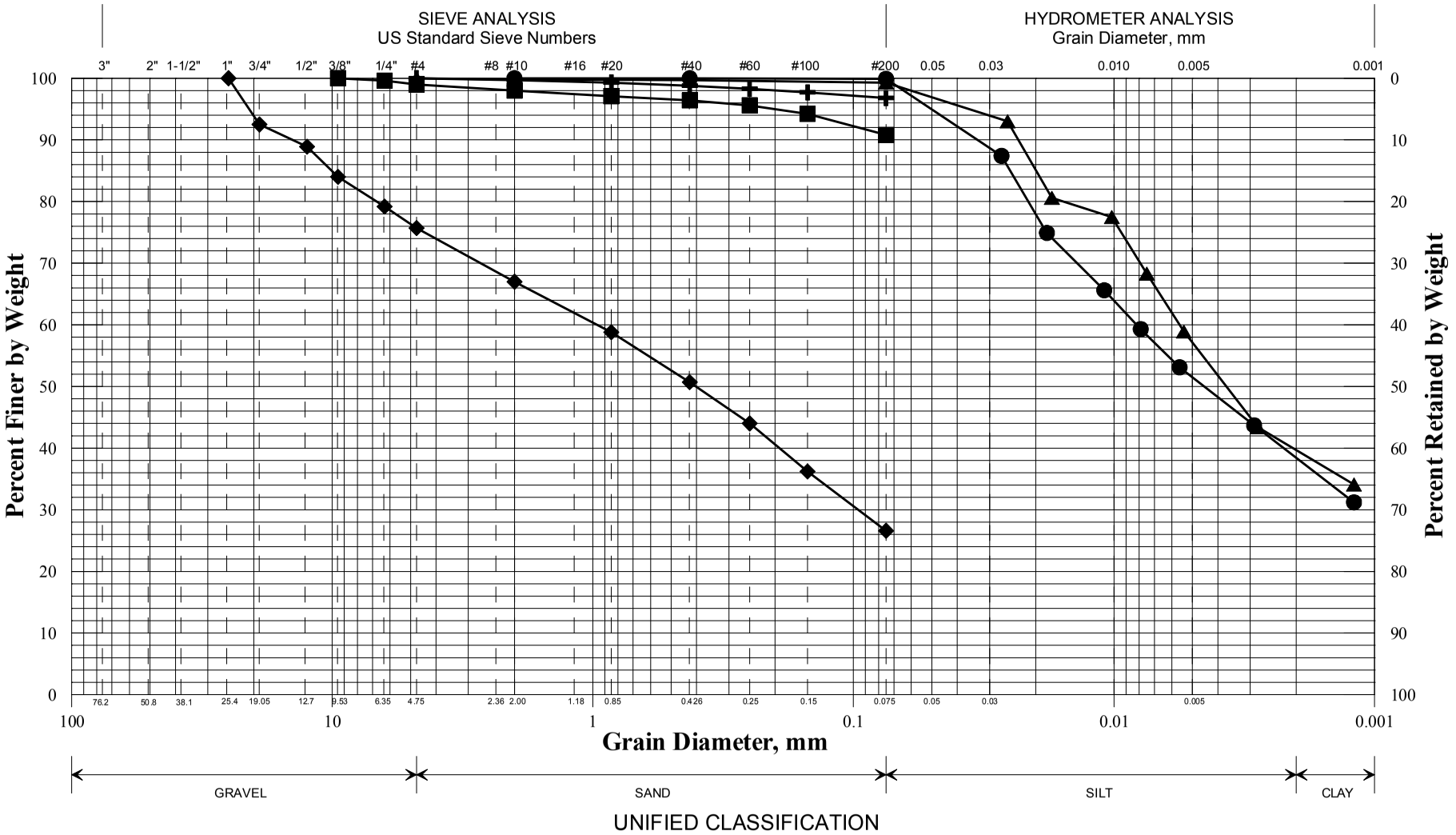
WHITE, TERRY A 5/15/2012

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-AUG-214/3D	157+65 "A"	10.0 RT	10.0-12.0	SILT, trace sand.	31.7	34	19	15
◆	HB-AUG-214/4D	157+65 "A"	10.0 RT	15.0-16.8	SAND, some silt, some gravel.	8.7			
■	HB-AUG-217/1D	156+10 "B"	18.7 RT	0.3-2.0	SILT, trace sand, trace gravel.	20.3			
●	HB-AUG-217/3D	156+10 "B"	18.7 RT	10.0-12.0	Clayey SILT, trace sand.	27.9	28	19	9
▲	HB-AUG-217/4D	156+10 "B"	18.7 RT	15.0-17.0	Clayey SILT, trace sand.	31.0	29	20	9
✕									

WIN
016313.10
Town
Augusta
Reported by/Date
WHITE, TERRY A 5/15/2012

Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
209212	HB-AUG-110/S1	GEOTECHNICAL (DISTURBED)	5/5/2010	5/10/2010

Sample Type: **GEOTECHNICAL** Location: **ROADWAY** Station: **504+63** Offset, ft: **8.0** **LT** Dbfg, ft: **0.5-2.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **GROSS, KAREN L**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	**100.0**
¾ in. [19.0 mm]	**97.6**
½ in. [12.5 mm]	**81.8**
⅜ in. [9.5 mm]	**76.5**
¼ in. [6.3 mm]	**68.7**
No. 4 [4.75 mm]	**64.8**
No. 10 [2.00 mm]	**53.1**
No. 20 [0.850 mm]	**42.0**
No. 40 [0.425 mm]	**33.6**
No. 60 [0.250 mm]	**27.6**
No. 100 [0.150 mm]	**22.1**
No. 200 [0.075 mm]	**16.0**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

3.7

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **5/25/2010**

Paper Copy: Lab File; Project File; Geotech File

Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
209213	HB-AUG-108/S4	GEOTECHNICAL (DISTURBED)	5/5/2010	5/10/2010

Sample Type: **GEOTECHNICAL** Location: **ROADWAY** Station: **516+69** Offset, ft: **8.0** **LT** Dbfg, ft: **0.5-2.3**

WIN/Town **016313.10 - AUGUSTA** Sampler: **GROSS, KAREN L**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	**100.0**
½ in. [12.5 mm]	**95.8**
⅜ in. [9.5 mm]	**94.4**
¼ in. [6.3 mm]	**88.9**
No. 4 [4.75 mm]	**85.2**
No. 10 [2.00 mm]	**73.9**
No. 20 [0.850 mm]	**57.2**
No. 40 [0.425 mm]	**39.2**
No. 60 [0.250 mm]	**31.4**
No. 100 [0.150 mm]	**26.2**
No. 200 [0.075 mm]	**18.6**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

5.1

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **5/25/2010**

Paper Copy: Lab File; Project File; Geotech File

Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
209214	HB-AUG-107/S5	GEOTECHNICAL (DISTURBED)	5/5/2010	5/10/2010

Sample Type: **GEOTECHNICAL** Location: **ROADWAY** Station: **522+41.5** Offset, ft: **5.2** **RT** Dbfg, ft: **0.5-2.1**

WIN/Town **016313.10 - AUGUSTA** Sampler: **GROSS, KAREN L**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	100.0
¾ in. [19.0 mm]	92.8
½ in. [12.5 mm]	84.0
⅜ in. [9.5 mm]	75.9
¼ in. [6.3 mm]	65.8
No. 4 [4.75 mm]	60.1
No. 10 [2.00 mm]	47.0
No. 20 [0.850 mm]	36.1
No. 40 [0.425 mm]	28.3
No. 60 [0.250 mm]	24.0
No. 100 [0.150 mm]	20.8
No. 200 [0.075 mm]	16.5

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

3.1

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **5/25/2010**

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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
209215	HB-AUG-106/S7	GEOTECHNICAL (DISTURBED)	5/5/2010	5/10/2010

Sample Type: **GEOTECHNICAL** Location: **ROADWAY** Station: **527+44.8** Offset, ft: **6.0** **LT** Dbfg, ft: **0.65-1.2**

WIN/Town **016313.10 - AUGUSTA** Sampler: **GROSS, KAREN L**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	**100.0**
¾ in. [19.0 mm]	**97.4**
½ in. [12.5 mm]	**93.0**
⅜ in. [9.5 mm]	**88.8**
¼ in. [6.3 mm]	**82.9**
No. 4 [4.75 mm]	**80.2**
No. 10 [2.00 mm]	**73.0**
No. 20 [0.850 mm]	**63.7**
No. 40 [0.425 mm]	**43.0**
No. 60 [0.250 mm]	**26.2**
No. 100 [0.150 mm]	**17.7**
No. 200 [0.075 mm]	**9.7**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

2.8

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **5/25/2010**

Paper Copy: Lab File; Project File; Geotech File

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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
209216	HB-AUG-105/S9	GEOTECHNICAL (DISTURBED)	5/5/2010	5/10/2010

Sample Type: **GEOTECHNICAL** Location: **ROADWAY** Station: **534+20** Offset, ft: **6.0** **RT** Dbfg, ft: **0.6-1.4**

WIN/Town **016313.10 - AUGUSTA** Sampler: **GROSS, KAREN L**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	**100.0**
½ in. [12.5 mm]	**88.7**
⅜ in. [9.5 mm]	**82.0**
¼ in. [6.3 mm]	**74.4**
No. 4 [4.75 mm]	**70.7**
No. 10 [2.00 mm]	**61.6**
No. 20 [0.850 mm]	**49.3**
No. 40 [0.425 mm]	**32.9**
No. 60 [0.250 mm]	**23.2**
No. 100 [0.150 mm]	**17.5**
No. 200 [0.075 mm]	**11.6**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

3.2

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **5/17/2010**

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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
209217	HB-AUG-101/S13	GEOTECHNICAL (DISTURBED)	5/5/2010	5/10/2010

Sample Type: **GEOTECHNICAL** Location: **ROADWAY** Station: **555+16.8** Offset, ft: **181. RT** Dbfg, ft: **0.5-2.4**

WIN/Town **016313.10 - AUGUSTA** Sampler: **GROSS, KAREN L**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	100.0
½ in. [12.5 mm]	95.4
⅜ in. [9.5 mm]	91.2
¼ in. [6.3 mm]	82.6
No. 4 [4.75 mm]	78.1
No. 10 [2.00 mm]	67.2
No. 20 [0.850 mm]	52.2
No. 40 [0.425 mm]	34.9
No. 60 [0.250 mm]	26.4
No. 100 [0.150 mm]	21.9
No. 200 [0.075 mm]	17.5

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

4.2

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **5/25/2010**

Paper Copy: Lab File; Project File; Geotech File

Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
261997	HB-AUG-202/1D	GEOTECHNICAL (DISTURBED)	1/16/2012	2/8/2012

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **401+74 "D** Offset, ft: **13.9 LT** Dbfg, ft: **2.0-4.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	100.0
No. 10 [2.00 mm]	99.7
No. 20 [0.850 mm]	99.4
No. 40 [0.425 mm]	98.8
No. 60 [0.250 mm]	98.0
No. 100 [0.150 mm]	96.9
No. 200 [0.075 mm]	95.9

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %: **30**

Plastic Limit (T 90), %: **19**

Plasticity Index (T 90), %: **11**

Specific Gravity, Corrected to 20°C (T 100):

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %: **20.8**

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

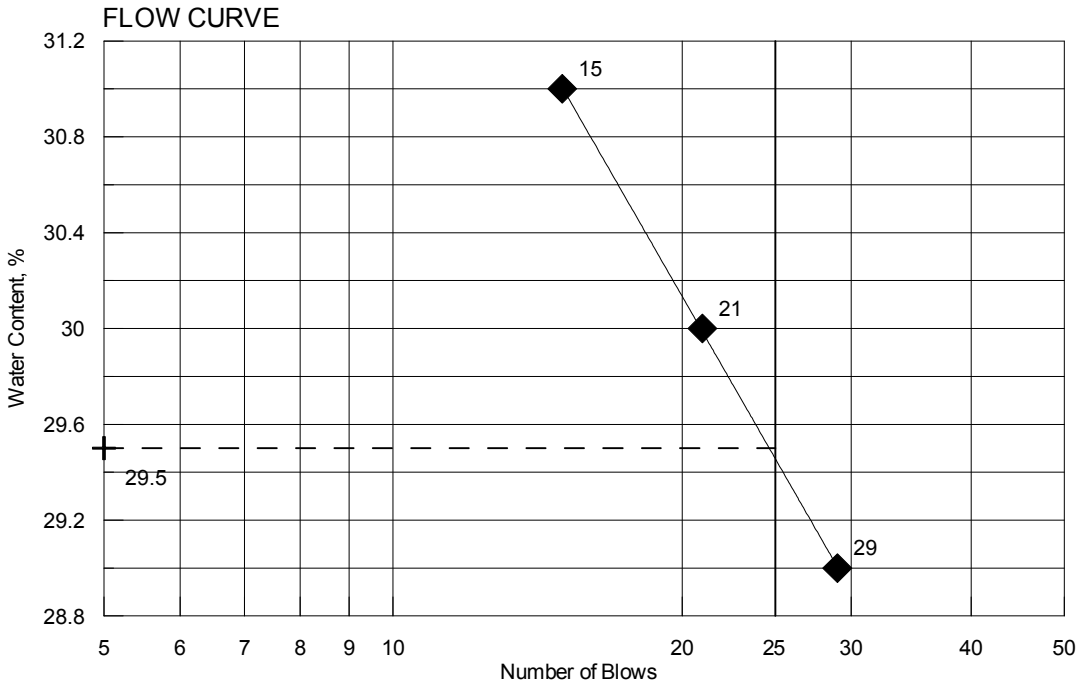
Comments:

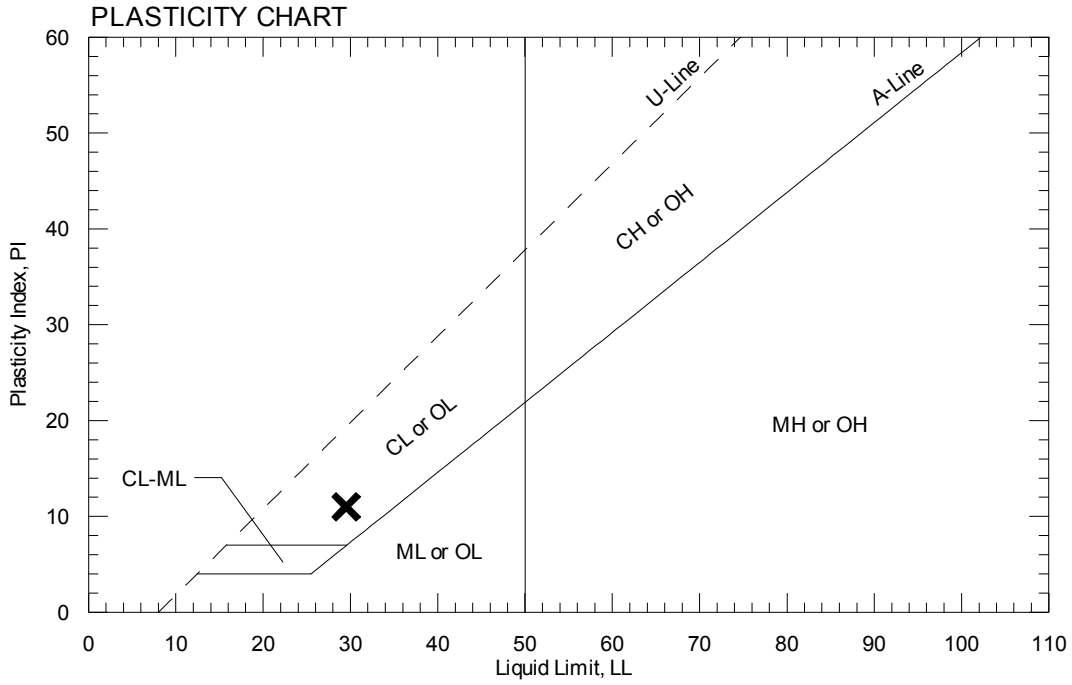
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/27/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	261997
WIN	016313.10	Water Content, %	20.8
Sampled	1/16/2012	Liquid Limit @ 25 blows (T 89), %	30
Boring No./Sample No.	HB-AUG-202/1D	Plastic Limit (T 90), %	19
Station	401+74 "D"	Plasticity Index (T 90), %	11
Depth	2.0-4.0	Tested By	BBURR





Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
261999	**HB-AUG-202/3D**	**GEOTECHNICAL (DISTURBED)**	**1/16/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **401+74 "D** Offset, ft: **13.9 LT** Dbfg, ft: **10.0-12.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 88)

Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**99.9**
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	**99.8**
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	**99.5**
[0.0257 mm]	**94.6**
[0.0168 mm]	**88.5**
[0.0100 mm]	**82.3**
[0.0073 mm]	**76.2**
[0.0053 mm]	**67.1**
[0.0028 mm]	**54.9**
[0.0012 mm]	**42.8**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
35
Plastic Limit (T 90), %
21
Plasticity Index (T 90), %
14
Specific Gravity, Corrected to 20°C (T 100)
2.65

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
28.7

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

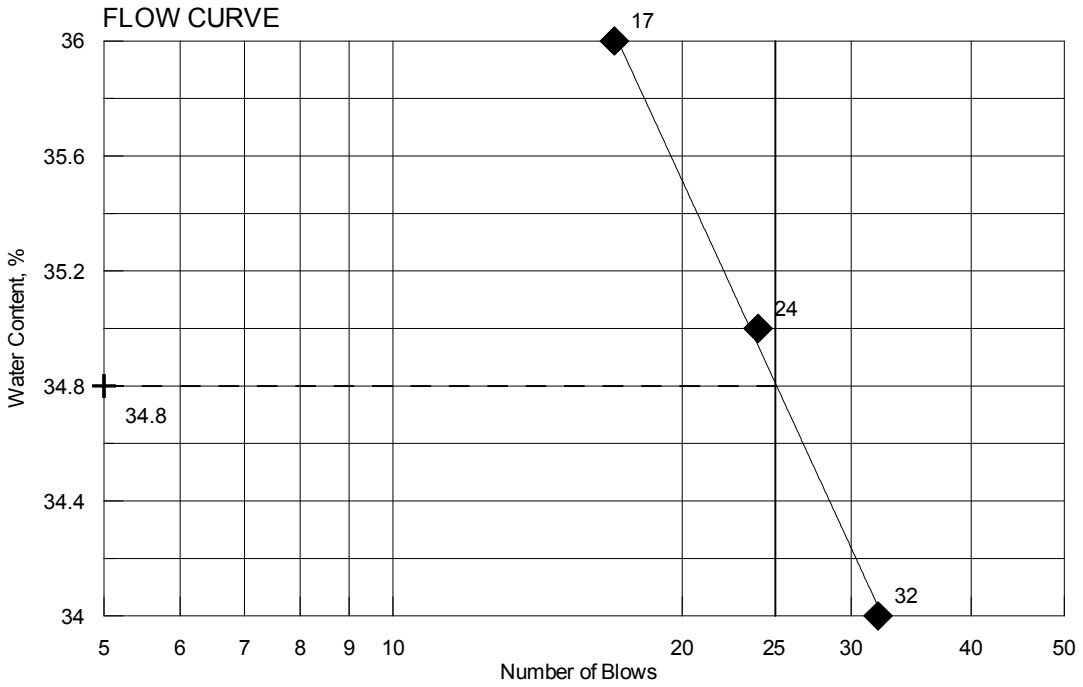
Comments:

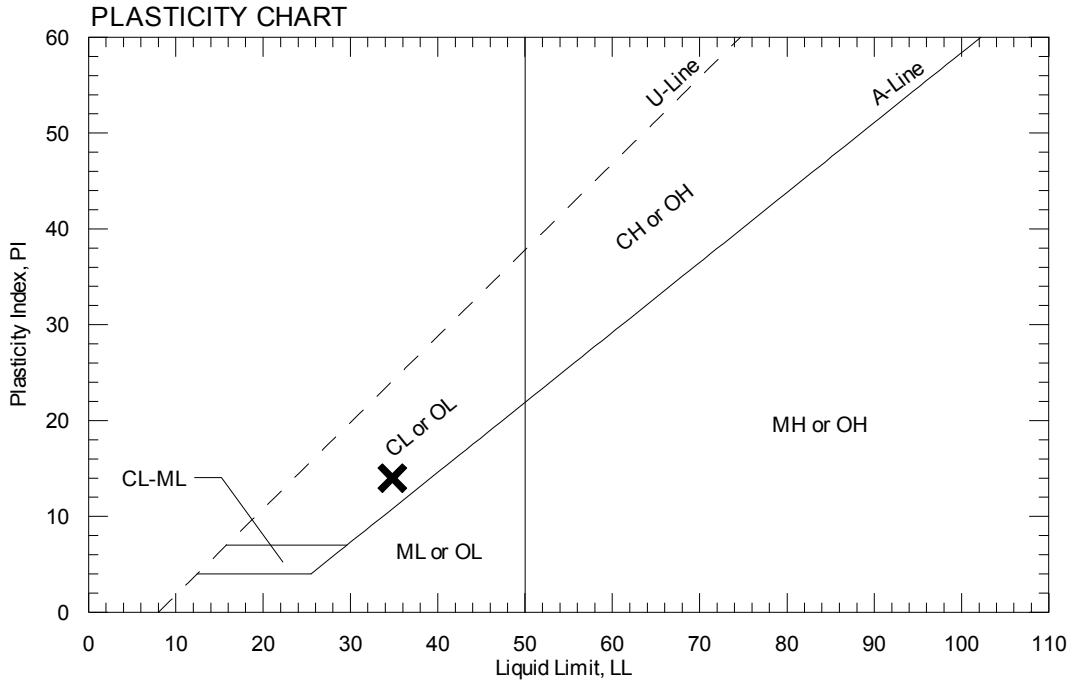
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/28/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	261999
WIN	016313.10	Water Content, %	28.7
Sampled	1/16/2012	Liquid Limit @ 25 blows (T 89), %	35
Boring No./Sample No.	HB-AUG-202/3D	Plastic Limit (T 90), %	21
Station	401+74 "D"	Plasticity Index (T 90), %	14
Depth	10.0-12.0	Tested By	BBURR





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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
261998	**HB-AUG-203/2D**	**GEOTECHNICAL (DISTURBED)**	**1/16/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **557+47** Offset, ft: **28.9 LT** Dbfg, ft: **5.0-7.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 88)

Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**99.9**
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	**99.9**
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	**99.5**
[0.0263 mm]	**86.7**
[0.0173 mm]	**80.5**
[0.0103 mm]	**74.3**
[0.0076 mm]	**65.0**
[0.0054 mm]	**58.8**
[0.0028 mm]	**52.6**
[0.0012 mm]	**37.2**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
31
Plastic Limit (T 90), %
18
Plasticity Index (T 90), %
13
Specific Gravity, Corrected to 20°C (T 100)
2.68

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
21.9

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

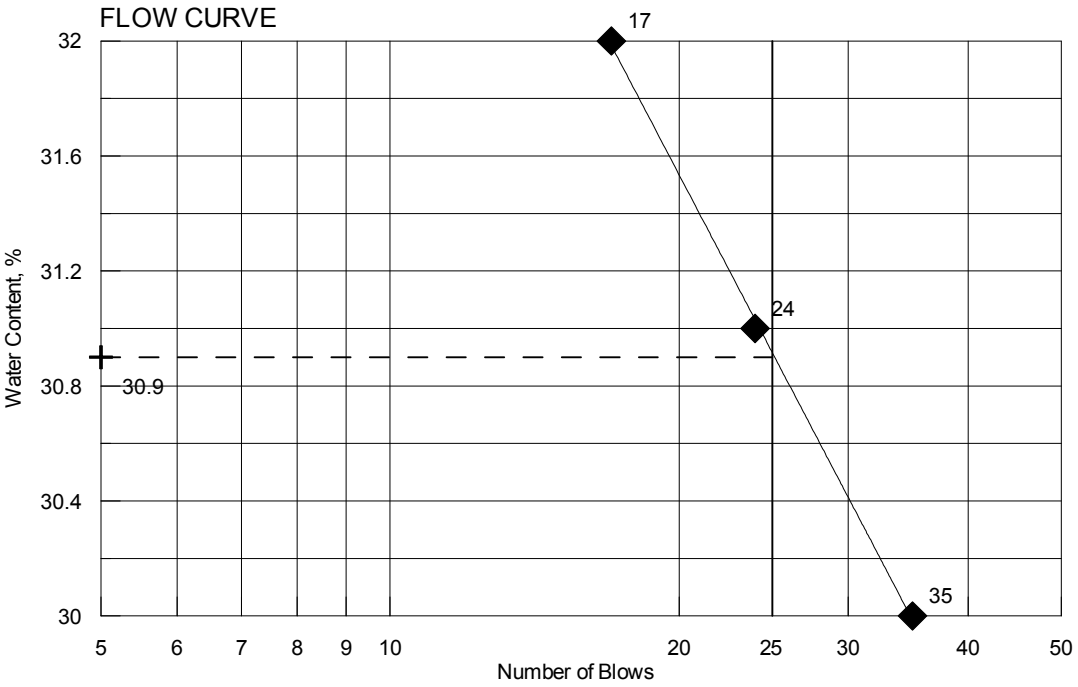
Comments:

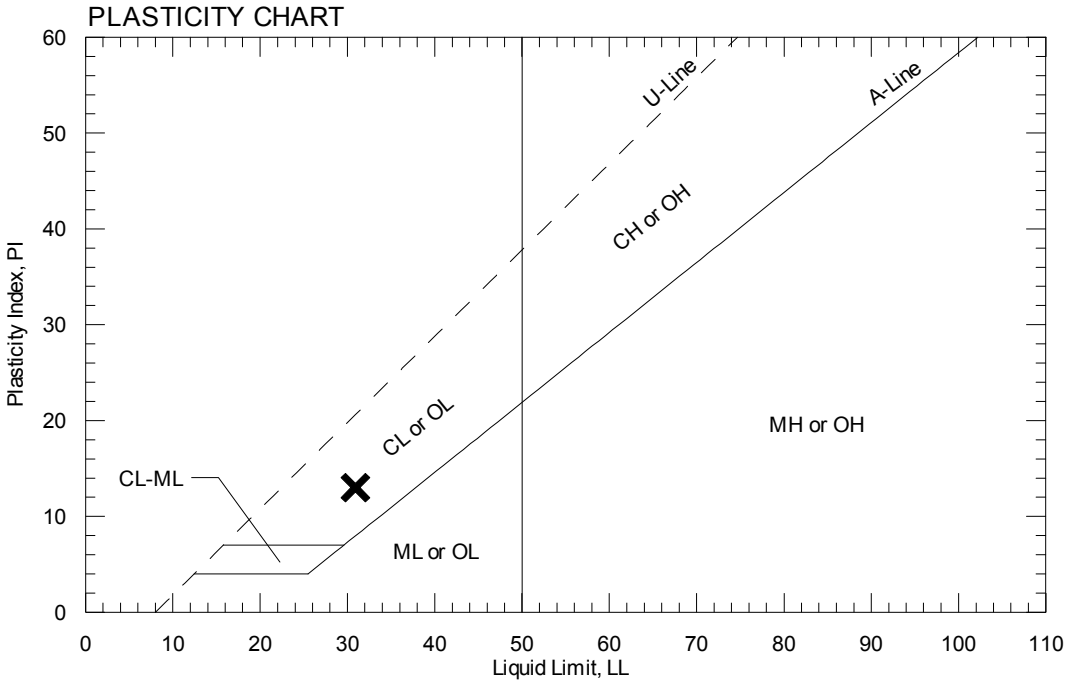
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/27/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	261998
WIN	016313.10	Water Content, %	21.9
Sampled	1/16/2012	Liquid Limit @ 25 blows (T 89), %	31
Boring No./Sample No.	HB-AUG-203/2D	Plastic Limit (T 90), %	18
Station	557+47	Plasticity Index (T 90), %	13
Depth	5.0-7.0	Tested By	BBURR





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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
262000	**HB-AUG-206/3D**	**GEOTECHNICAL (DISTURBED)**	**1/16/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **554+93** Offset, ft: **0.3** **LT** Dbfg, ft: **10.0-12.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	**100.0**
¾ in. [19.0 mm]	**81.0**
½ in. [12.5 mm]	**77.0**
⅜ in. [9.5 mm]	**69.2**
¼ in. [6.3 mm]	**62.8**
No. 4 [4.75 mm]	**58.8**
No. 10 [2.00 mm]	**49.8**
No. 20 [0.850 mm]	**43.1**
No. 40 [0.425 mm]	**38.0**
No. 60 [0.250 mm]	**33.1**
No. 100 [0.150 mm]	**27.6**
No. 200 [0.075 mm]	**19.8**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

6.8

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **2/9/2012**

Paper Copy: Lab File; Project File; Geotech File

Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244676	**HB-AUG-207/2D**	**GEOTECHNICAL (DISTURBED)**	**1/16/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **554+00** Offset, ft: **CL** Dbfg, ft: **5.0-7.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**100.0**
No. 20 [0.850 mm]	**99.8**
No. 40 [0.425 mm]	**99.5**
No. 60 [0.250 mm]	**99.2**
No. 100 [0.150 mm]	**98.7**
No. 200 [0.075 mm]	**97.2**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %

Plastic Limit (T 90), %

Plasticity Index (T 90), %

Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

26.5

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244677	**HB-AUG-209/3D**	**GEOTECHNICAL (DISTURBED)**	**1/16/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **548+07** Offset, ft: **57.0 RT** Dbfg, ft: **10.0-12.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 88)

Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**99.9**
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	**99.8**
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	**99.5**
[0.0273 mm]	**85.7**
[0.0179 mm]	**79.3**
[0.0108 mm]	**69.8**
[0.0077 mm]	**66.6**
[0.0056 mm]	**57.1**
[0.0029 mm]	**44.5**
[0.0012 mm]	**34.9**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
29
Plastic Limit (T 90), %
19
Plasticity Index (T 90), %
10
Specific Gravity, Corrected to 20°C (T 100)
2.64

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
33.4

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

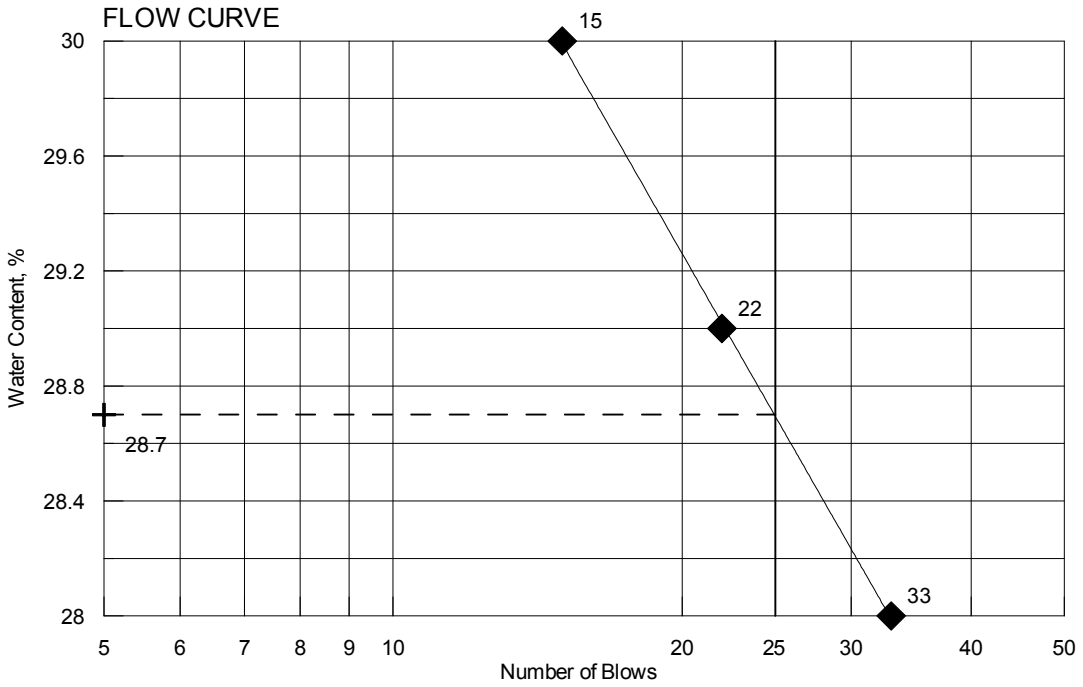
Comments:

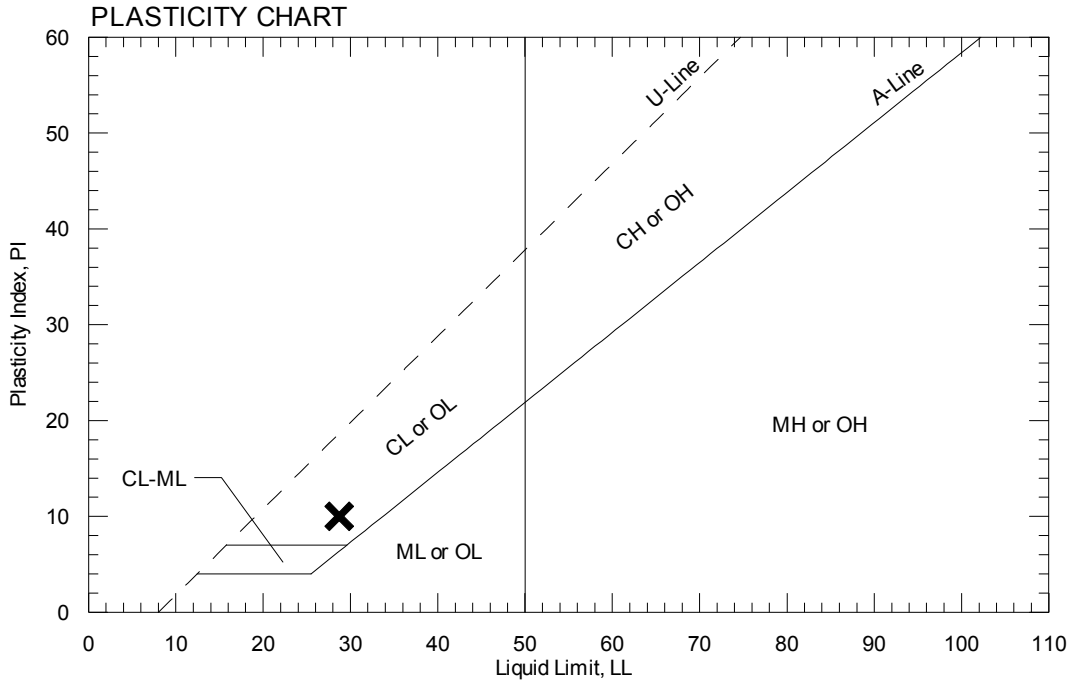
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/28/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	244677
WIN	016313.10	Water Content, %	33.4
Sampled	1/16/2012	Liquid Limit @ 25 blows (T 89), %	29
Boring No./Sample No.	HB-AUG-209/3D	Plastic Limit (T 90), %	19
Station	548+07	Plasticity Index (T 90), %	10
Depth	10.0-12.0	Tested By	BBURR





Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244678	**HB-AUG-209/4D**	**GEOTECHNICAL (DISTURBED)**	**1/16/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **548+07** Offset, ft: **57.0 RT** Dbfg, ft: **15.0-17.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 88)

Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**99.7**
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	**99.6**
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	**99.2**
[0.0253 mm]	**95.9**
[0.0165 mm]	**89.7**
[0.0100 mm]	**80.5**
[0.0073 mm]	**74.3**
[0.0052 mm]	**68.1**
[0.0027 mm]	**55.6**
[0.0012 mm]	**43.3**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
41
Plastic Limit (T 90), %
20
Plasticity Index (T 90), %
21
Specific Gravity, Corrected to 20°C (T 100)
2.69

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
36.2

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

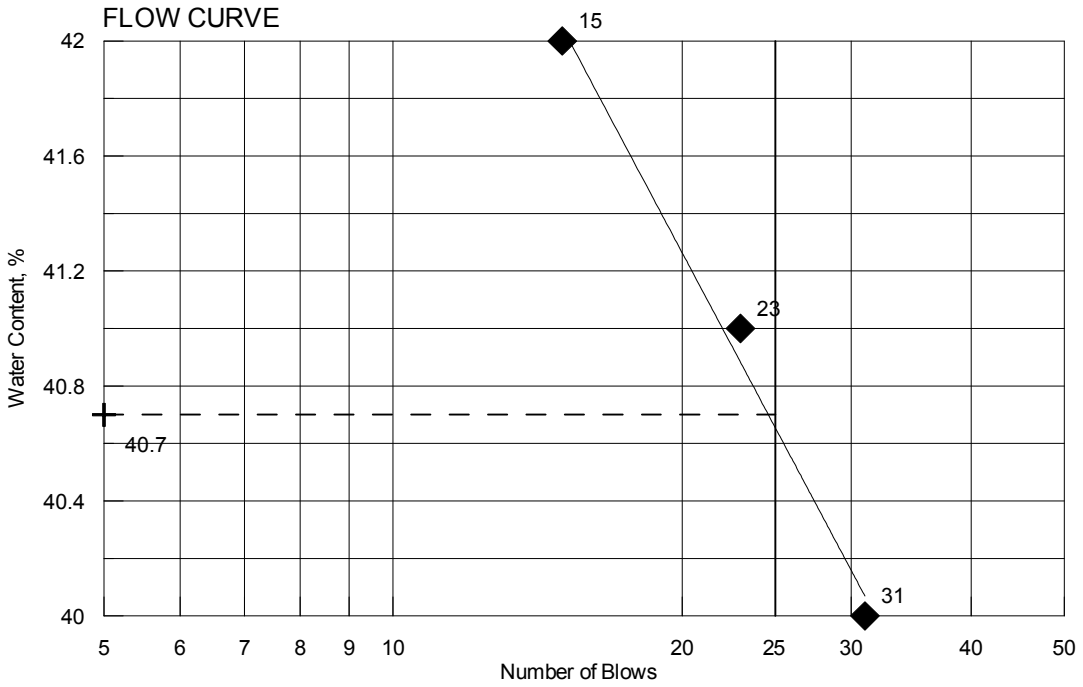
Comments:

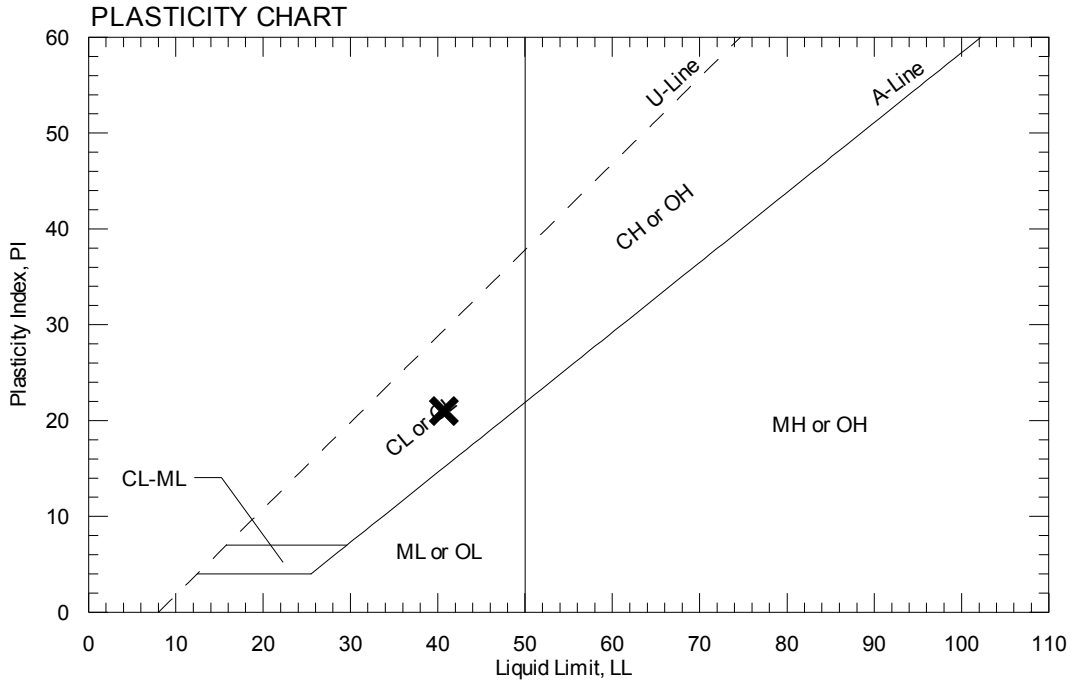
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/27/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	244678
WIN	016313.10	Water Content, %	36.2
Sampled	1/16/2012	Liquid Limit @ 25 blows (T 89), %	41
Boring No./Sample No.	HB-AUG-209/4D	Plastic Limit (T 90), %	20
Station	548+07	Plasticity Index (T 90), %	21
Depth	15.0-17.0	Tested By	BBURR





Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244679	**HB-AUG-210/1D**	**GEOTECHNICAL (DISTURBED)**	**1/17/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **548+17** Offset, ft: **75.0 LT** Dbfg, ft: **0.7-2.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**98.5**
No. 20 [0.850 mm]	**97.1**
No. 40 [0.425 mm]	**95.2**
No. 60 [0.250 mm]	**91.3**
No. 100 [0.150 mm]	**86.0**
No. 200 [0.075 mm]	**80.1**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %

Plastic Limit (T 90), %

Plasticity Index (T 90), %

Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

41.3

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

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Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244680	**HB-AUG-210/2D**	**GEOTECHNICAL (DISTURBED)**	**1/17/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **548+17** Offset, ft: **75.0 LT** Dbfg, ft: **5.0-7.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 88)

Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	**100.0**
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	**100.0**
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	**99.9**
[0.0286 mm]	**76.0**
[0.0194 mm]	**63.3**
[0.0116 mm]	**53.8**
[0.0083 mm]	**50.7**
[0.0060 mm]	**41.2**
[0.0030 mm]	**34.8**
[0.0013 mm]	**25.3**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
23
Plastic Limit (T 90), %
18
Plasticity Index (T 90), %
5
Specific Gravity, Corrected to 20°C (T 100)
2.61

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
29.3

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/28/2012**

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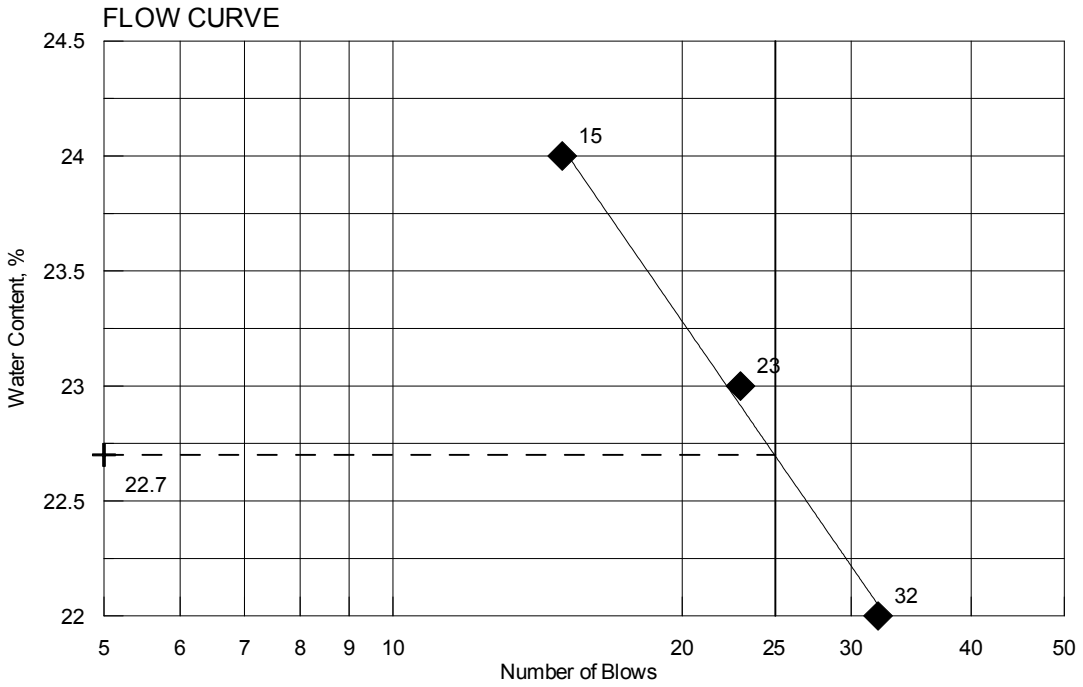
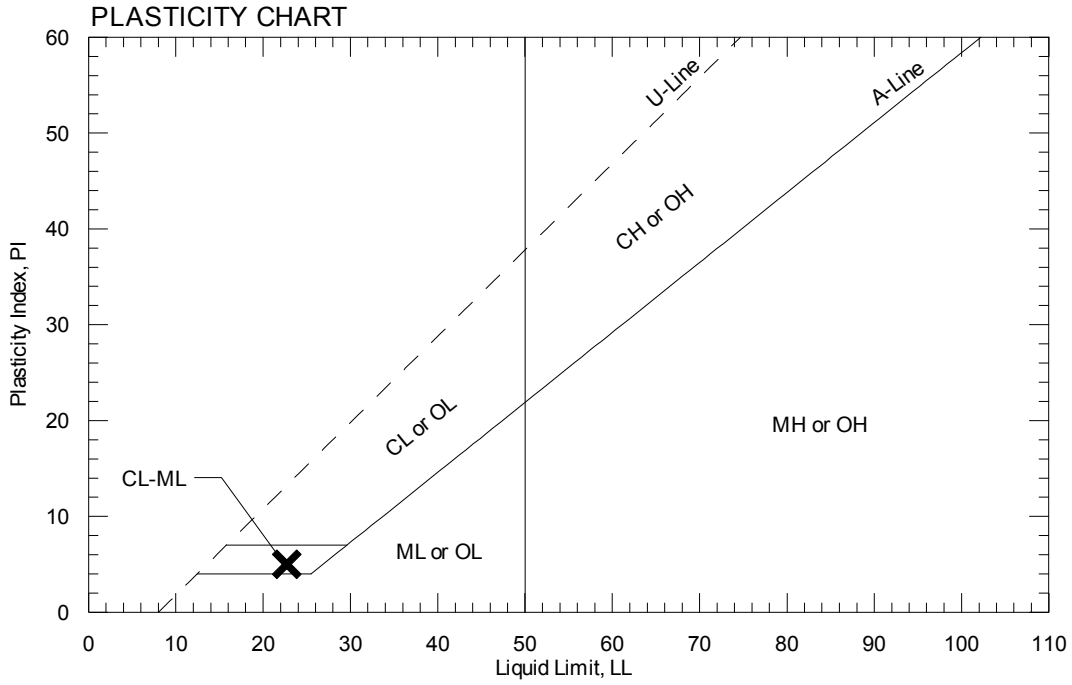
TOWN	Augusta	Reference No.	244680
WIN	016313.10	Water Content, %	29.3
Sampled	1/17/2012	Liquid Limit @ 25 blows (T 89), %	23
Boring No./Sample No.	HB-AUG-210/2D	Plastic Limit (T 90), %	18
Station	548+17	Plasticity Index (T 90), %	5
Depth	5.0-7.0	Tested By	BBURR





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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244681	**HB-AUG-212/1D**	**GEOTECHNICAL (DISTURBED)**	**1/19/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **161+30 "A** Offset, ft: **10.0** **RT** Dbfg, ft: **0.3-2.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	**100.0**
¼ in. [6.3 mm]	**99.9**
No. 4 [4.75 mm]	**99.9**
No. 10 [2.00 mm]	**99.3**
No. 20 [0.850 mm]	**97.9**
No. 40 [0.425 mm]	**96.6**
No. 60 [0.250 mm]	**95.4**
No. 100 [0.150 mm]	**94.2**
No. 200 [0.075 mm]	**92.6**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %

Plastic Limit (T 90), %

Plasticity Index (T 90), %

Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

24.8

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **2/9/2012**

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Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244682	**HB-AUG-212/2D**	**GEOTECHNICAL (DISTURBED)**	**1/19/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **161+30 "A** Offset, ft: **10.0 RT** Dbfg, ft: **5.0-7.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**99.7**
No. 20 [0.850 mm]	**99.2**
No. 40 [0.425 mm]	**98.5**
No. 60 [0.250 mm]	**97.9**
No. 100 [0.150 mm]	**96.4**
No. 200 [0.075 mm]	**93.3**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
36
Plastic Limit (T 90), %
20
Plasticity Index (T 90), %
16
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
31.1

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

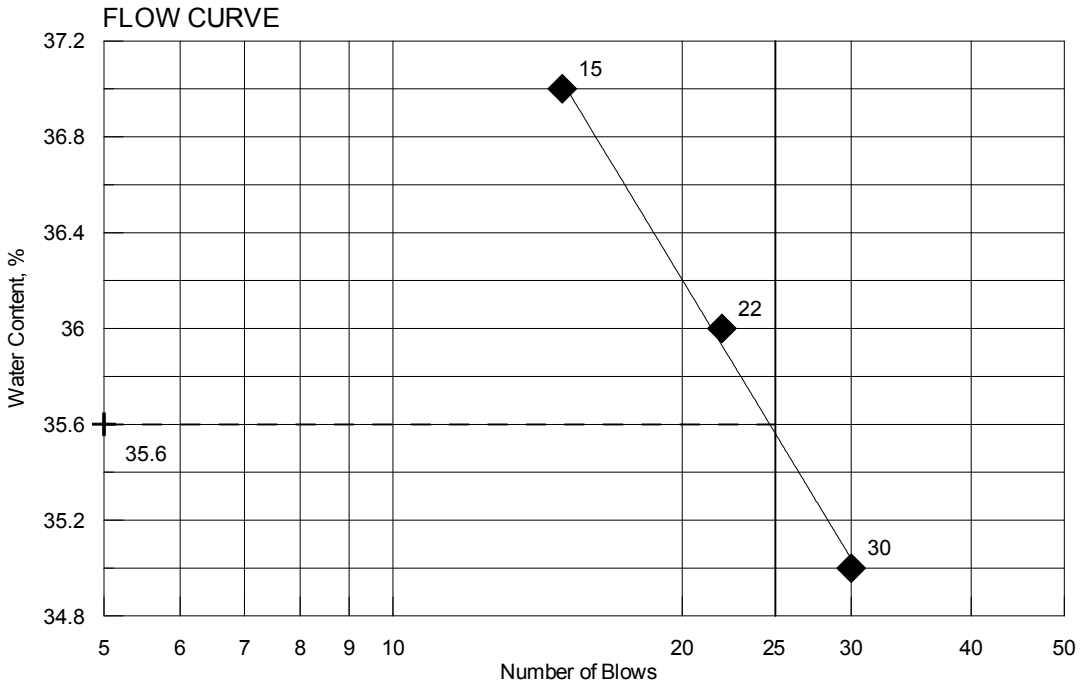
Comments:

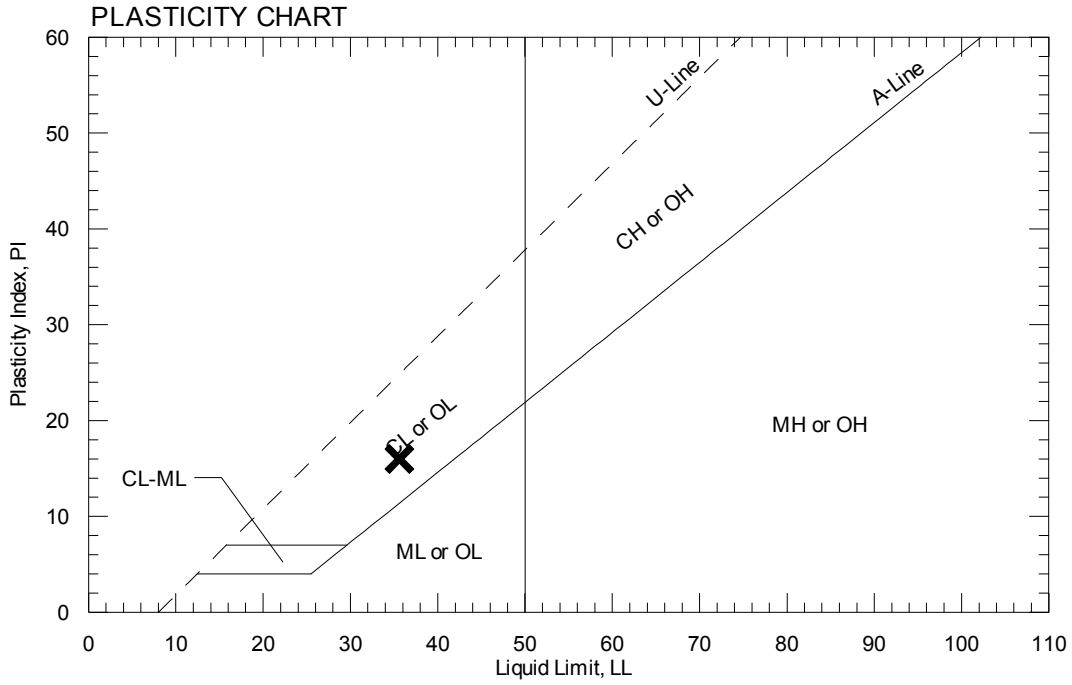
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/27/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	244682
WIN	016313.10	Water Content, %	31.1
Sampled	1/19/2012	Liquid Limit @ 25 blows (T 89), %	36
Boring No./Sample No.	HB-AUG-212/2D	Plastic Limit (T 90), %	20
Station	161+30 "A"	Plasticity Index (T 90), %	16
Depth	5.0-7.0	Tested By	BBURR





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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244683	**HB-AUG-214/3D**	**GEOTECHNICAL (DISTURBED)**	**1/19/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **157+65 "A** Offset, ft: **10.0 RT** Dbfg, ft: **10.0-12.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**99.7**
No. 20 [0.850 mm]	**99.3**
No. 40 [0.425 mm]	**98.8**
No. 60 [0.250 mm]	**98.3**
No. 100 [0.150 mm]	**97.7**
No. 200 [0.075 mm]	**96.8**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
34
Plastic Limit (T 90), %
19
Plasticity Index (T 90), %
15
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
31.7

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

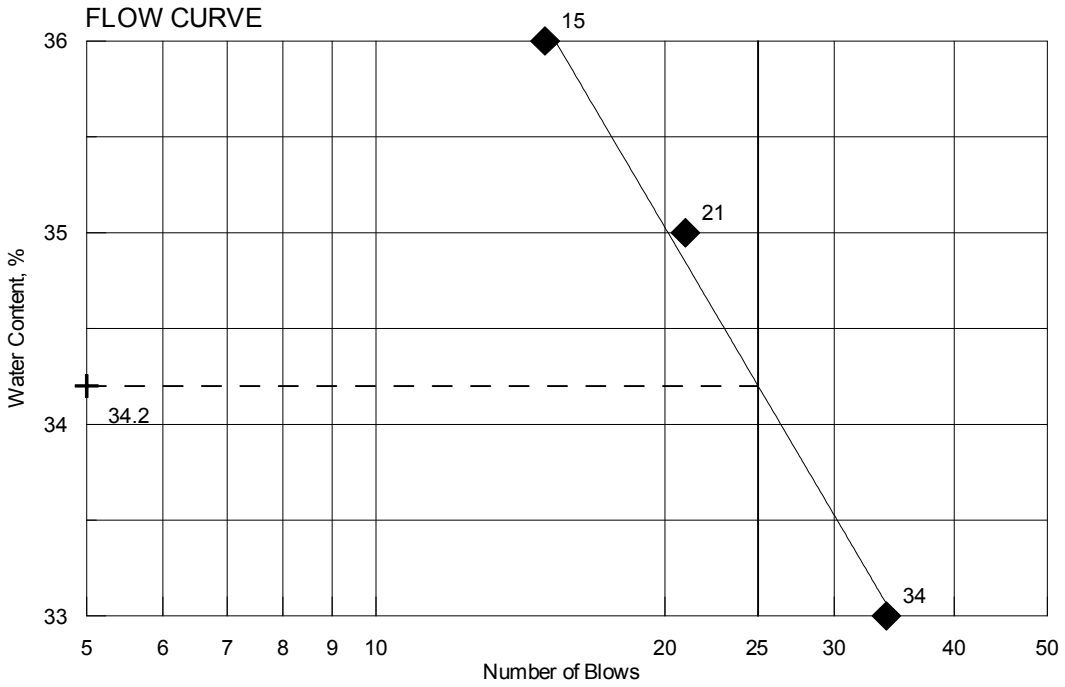
Comments:

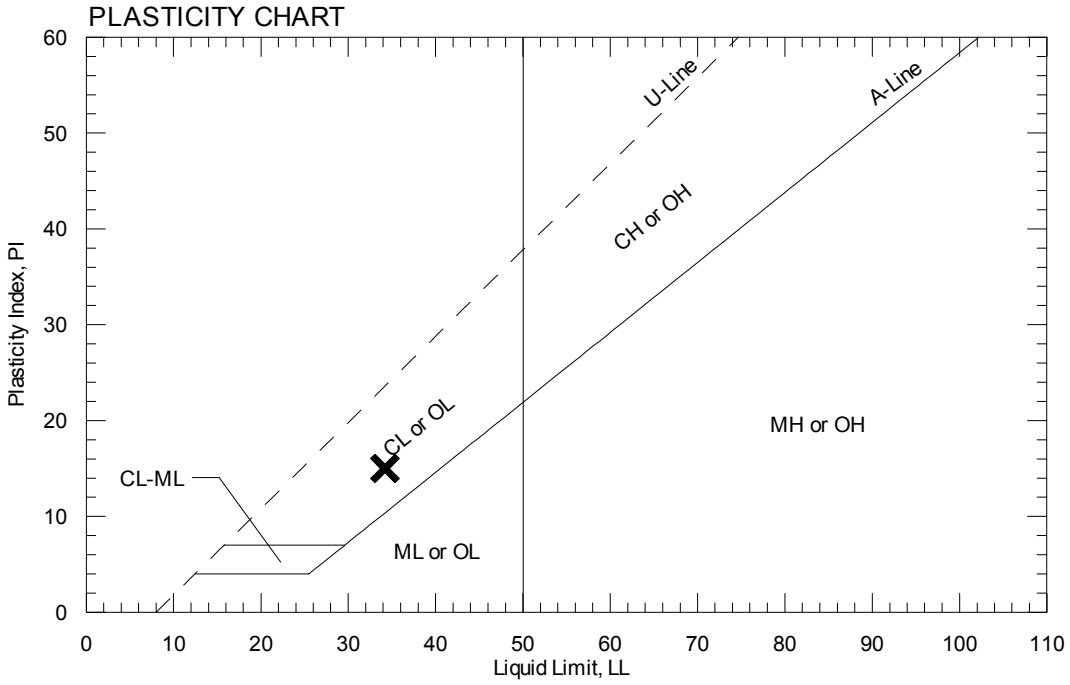
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/28/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	244683
WIN	016313.10	Water Content, %	31.7
Sampled	1/19/2012	Liquid Limit @ 25 blows (T 89), %	34
Boring No./Sample No.	HB-AUG-214/3D	Plastic Limit (T 90), %	19
Station	157+65 "A"	Plasticity Index (T 90), %	15
Depth	10.0-12.0	Tested By	BBURR





Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244684	**HB-AUG-214/4D**	**GEOTECHNICAL (DISTURBED)**	**1/19/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **157+65 "A** Offset, ft: **10.0 RT** Dbfg, ft: **15.0-16.8**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	**100.0**
¾ in. [19.0 mm]	**92.5**
½ in. [12.5 mm]	**88.9**
⅜ in. [9.5 mm]	**84.0**
¼ in. [6.3 mm]	**79.2**
No. 4 [4.75 mm]	**75.7**
No. 10 [2.00 mm]	**67.0**
No. 20 [0.850 mm]	**58.8**
No. 40 [0.425 mm]	**50.7**
No. 60 [0.250 mm]	**44.0**
No. 100 [0.150 mm]	**36.2**
No. 200 [0.075 mm]	**26.6**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %

Plastic Limit (T 90), %

Plasticity Index (T 90), %

Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

8.7

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **2/9/2012**

Paper Copy: Lab File; Project File; Geotech File

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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244685	**HB-AUG-217/1D**	**GEOTECHNICAL (DISTURBED)**	**1/19/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **156+10 "B** Offset, ft: **18.7 RT** Dbfg, ft: **0.3-2.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 27, T 11)

Wash Method

Procedure A

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	**100.0**
¼ in. [6.3 mm]	**99.6**
No. 4 [4.75 mm]	**99.0**
No. 10 [2.00 mm]	**98.0**
No. 20 [0.850 mm]	**97.1**
No. 40 [0.425 mm]	**96.4**
No. 60 [0.250 mm]	**95.6**
No. 100 [0.150 mm]	**94.2**
No. 200 [0.075 mm]	**90.8**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
Plastic Limit (T 90), %
Plasticity Index (T 90), %
Specific Gravity, Corrected to 20°C (T 100)

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %

20.3

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

Comments:

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **2/9/2012**

Paper Copy: Lab File; Project File; Geotech File

Maine DOT, Materials Testing & Exploration, 219 Hogan Road, Bangor, Maine 04401

GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244686	**HB-AUG-217/3D**	**GEOTECHNICAL (DISTURBED)**	**1/19/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **156+10 "B** Offset, ft: **18.7 RT** Dbfg, ft: **10.0-12.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 88)

Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	
No. 10 [2.00 mm]	**100.0**
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	**100.0**
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	**99.9**
[0.0270 mm]	**87.4**
[0.0181 mm]	**74.9**
[0.0109 mm]	**65.6**
[0.0079 mm]	**59.3**
[0.0056 mm]	**53.1**
[0.0029 mm]	**43.7**
[0.0012 mm]	**31.2**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
28
Plastic Limit (T 90), %
19
Plasticity Index (T 90), %
9
Specific Gravity, Corrected to 20°C (T 100)
2.64

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
27.9

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

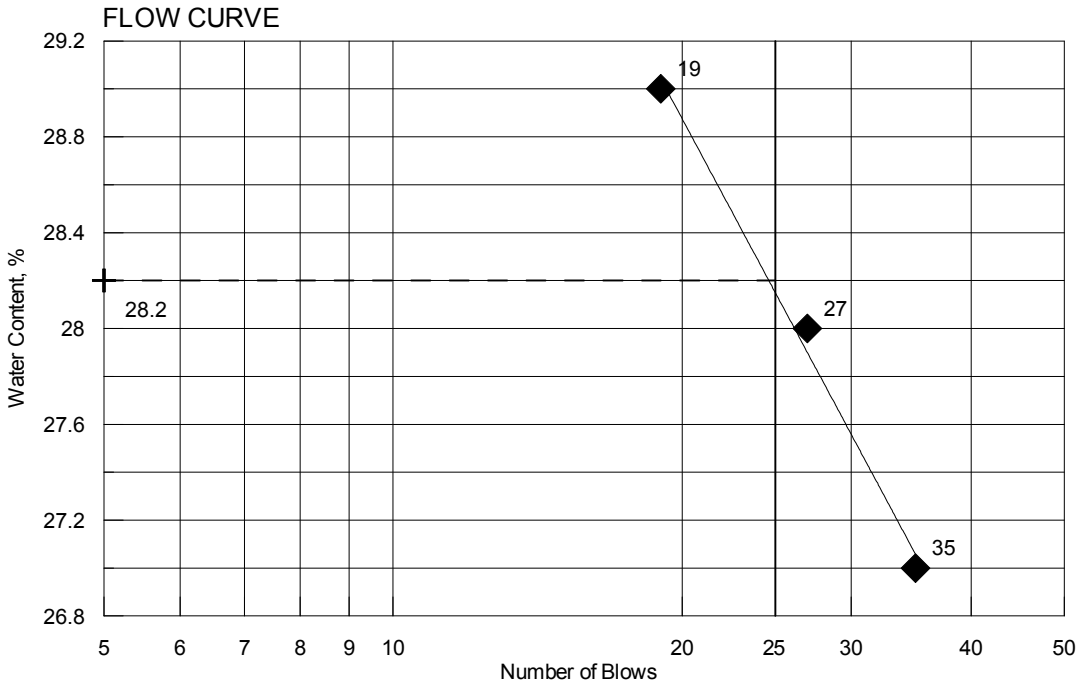
Comments:

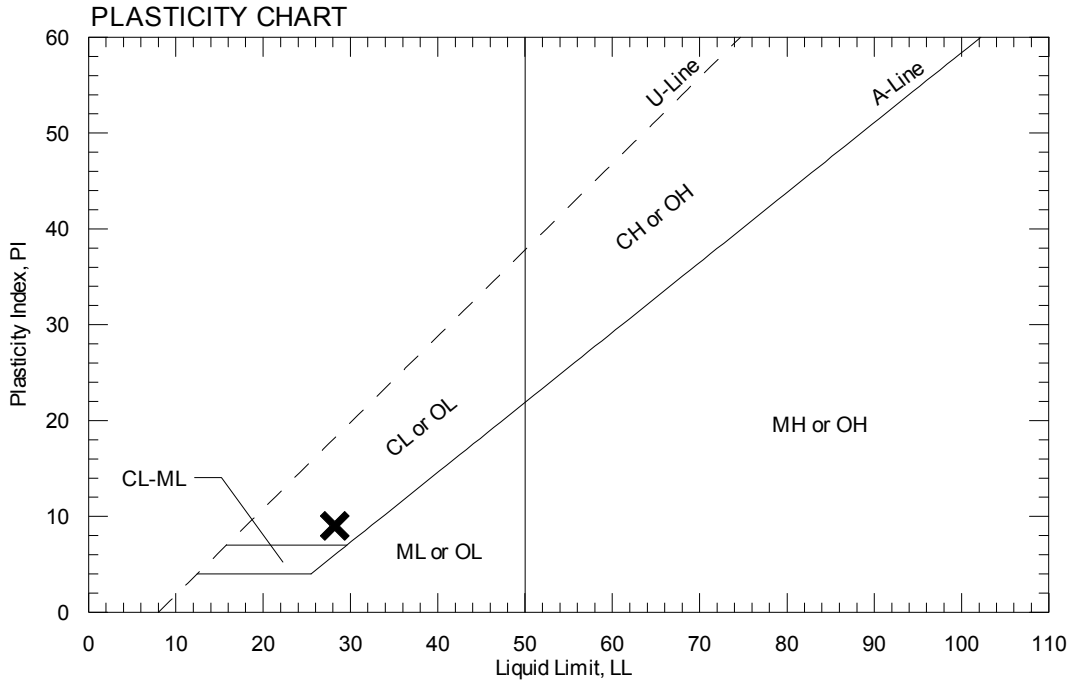
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/28/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	244686
WIN	016313.10	Water Content, %	27.9
Sampled	1/19/2012	Liquid Limit @ 25 blows (T 89), %	28
Boring No./Sample No.	HB-AUG-217/3D	Plastic Limit (T 90), %	19
Station	156+10 "B"	Plasticity Index (T 90), %	9
Depth	10.0-12.0	Tested By	BBURR





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GEOTECHNICAL TEST REPORT
Central Laboratory

SAMPLE INFORMATION

Reference No.	Boring No./Sample No.	Sample Description	Sampled	Received
244687	**HB-AUG-217/4D**	**GEOTECHNICAL (DISTURBED)**	**1/19/2012**	**2/8/2012**

Sample Type: **GEOTECHNICAL** Location: **OTHER** Station: **156+10 "B** Offset, ft: **18.7 RT** Dbfg, ft: **15.0-17.0**

WIN/Town **016313.10 - AUGUSTA** Sampler: **WILDER, BRUCE H**

TEST RESULTS

Sieve Analysis (T 88)

Wash Method

SIEVE SIZE U.S. [SI]	% Passing
3 in. [75.0 mm]	
1 in. [25.0 mm]	
¾ in. [19.0 mm]	
½ in. [12.5 mm]	
⅜ in. [9.5 mm]	
¼ in. [6.3 mm]	
No. 4 [4.75 mm]	**100.0**
No. 10 [2.00 mm]	**99.8**
No. 20 [0.850 mm]	
No. 40 [0.425 mm]	**99.7**
No. 60 [0.250 mm]	
No. 100 [0.150 mm]	
No. 200 [0.075 mm]	**99.3**
[0.0256 mm]	**93.0**
[0.0173 mm]	**80.6**
[0.0102 mm]	**77.5**
[0.0075 mm]	**68.3**
[0.0054 mm]	**58.9**
[0.0028 mm]	**43.4**
[0.0012 mm]	**34.1**

Direct Shear (T 236)

Shear Angle, °			
Initial Water Content, %			
Normal Stress, psi			
Wet Density, lbs/ft³			
Dry Density, lbs/ft³			
Specimen Thickness, in			

Consolidation (T 216)

Trimmings, Water Content, %	

	Initial	Final		Void Ratio	% Strain
Water Content, %			Pmin		
Dry Density, lbs/ft³			Pp		
Void Ratio			Pmax		
Saturation, %			Cc/C'c		

Miscellaneous Tests

Liquid Limit @ 25 blows (T 89), %
29
Plastic Limit (T 90), %
20
Plasticity Index (T 90), %
9
Specific Gravity, Corrected to 20°C (T 100)
2.68

Loss on Ignition (T 267)

Loss, %	H2O, %

Water Content (T 265), %
31.0

Vane Shear Test on Shelby Tubes (Maine DOT)

Depth taken in tube, ft	3 In.		6 In.		Water Content, %	Description of Material Sampled at the Various Tube Depths
	U. Shear tons/ft²	Remold tons/ft²	U. Shear tons/ft²	Remold tons/ft²		

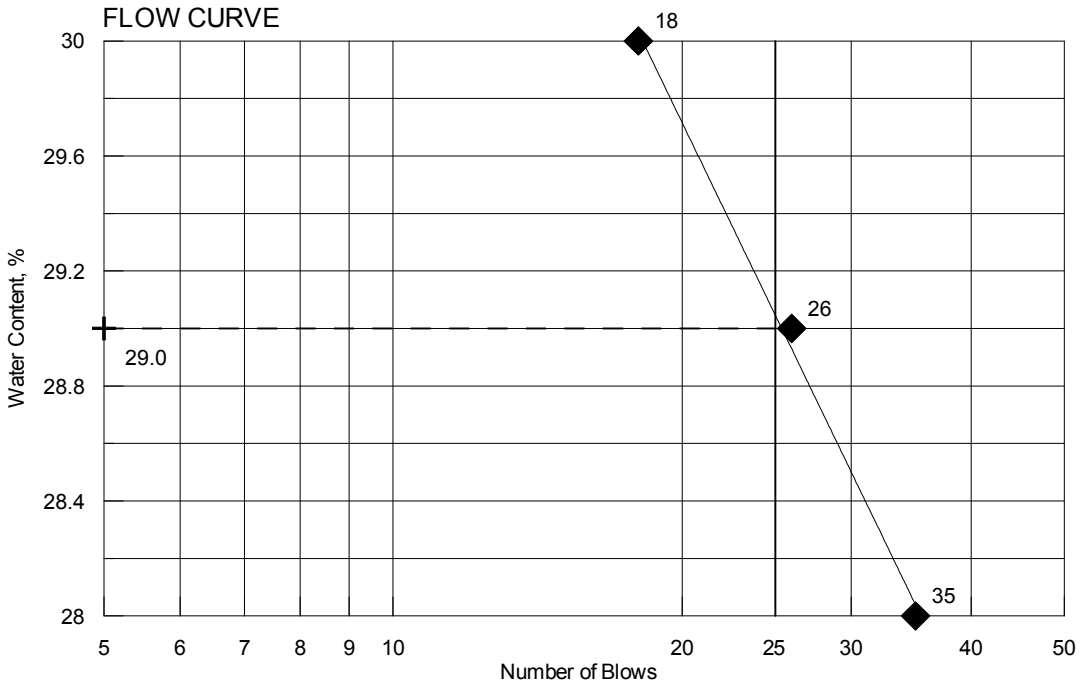
Comments:

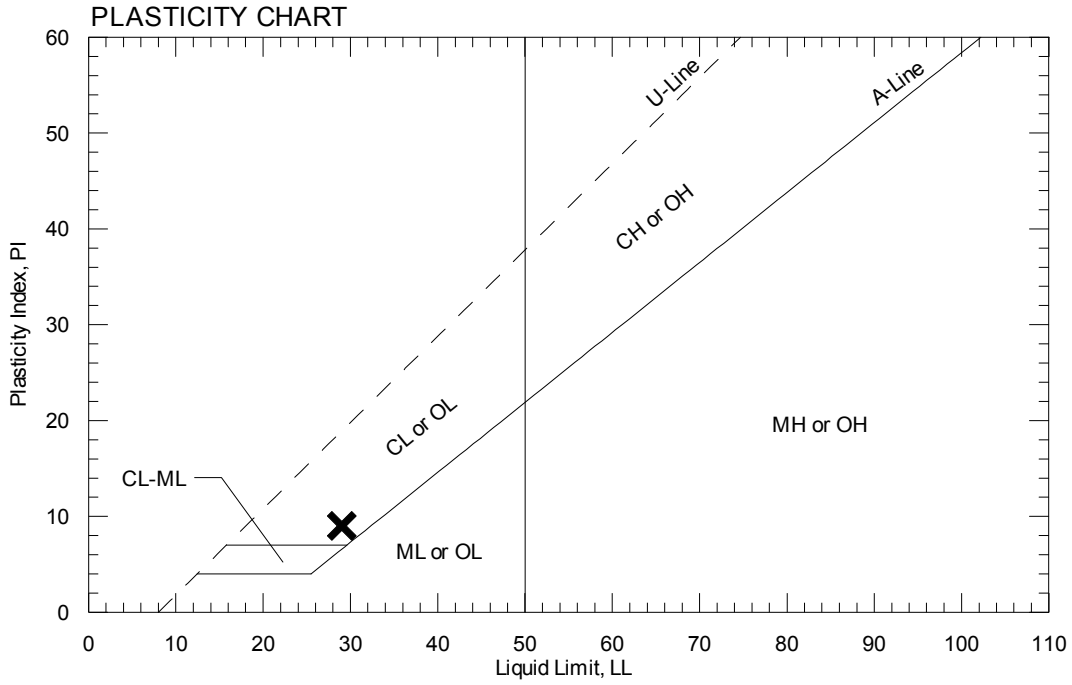
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **3/27/2012**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Augusta	Reference No.	244687
WIN	016313.10	Water Content, %	31
Sampled	1/19/2012	Liquid Limit @ 25 blows (T 89), %	29
Boring No./Sample No.	HB-AUG-217/4D	Plastic Limit (T 90), %	20
Station	156+10 "B"	Plasticity Index (T 90), %	9
Depth	15.0-17.0	Tested By	BBURR





APPENDIX E
GEOLOGY MAPS

Augusta Quadrangle, Maine

Surficial geologic mapping by
Woodrow B. Thompson

Digital cartography by:
Robert A. Johnston

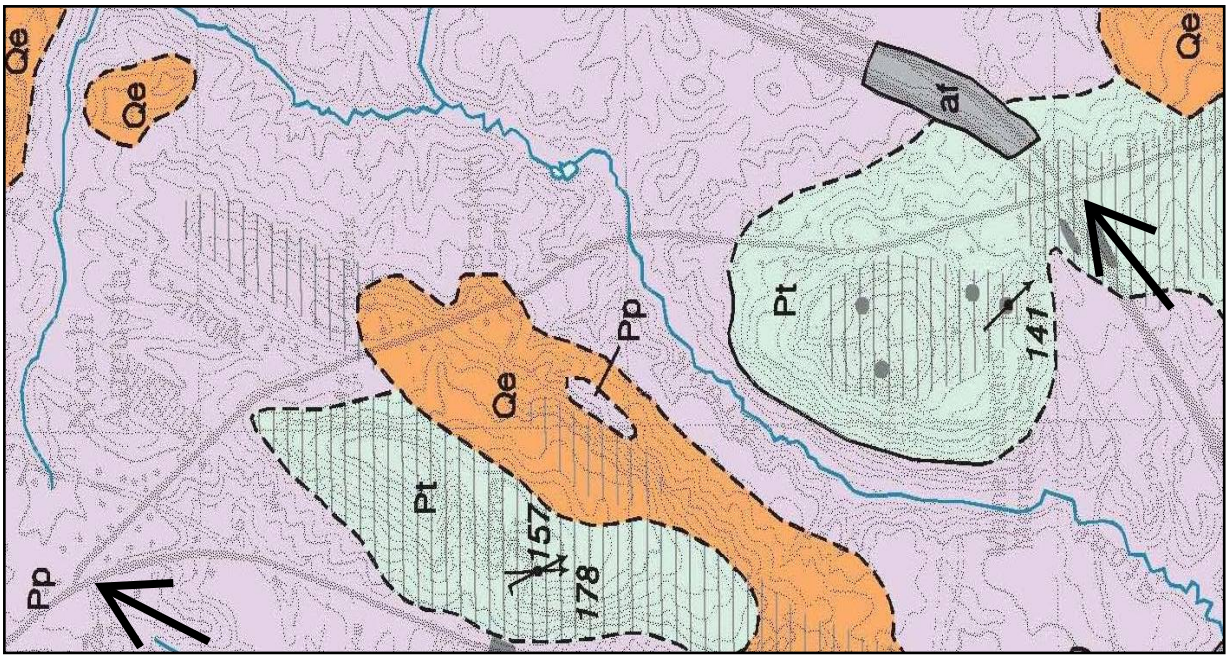
Robert G. Marvinney
State Geologist

Cartographic design and editing by:
Robert D. Tucker

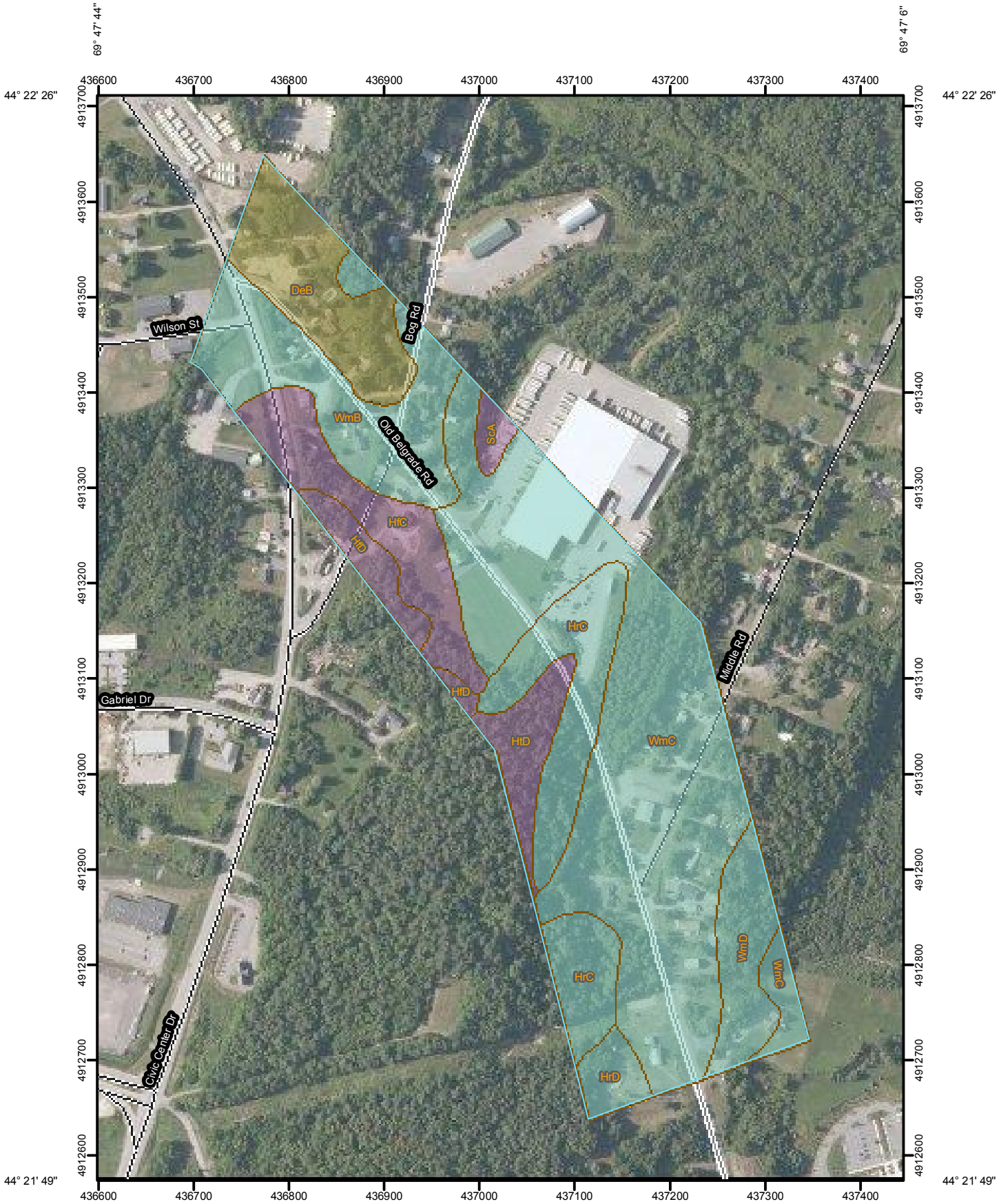
Funding for the preparation of this map was provided in part by the U.S. Geological Survey STATEMAP Program, Cooperative Agreement No. 05HQAG0068.

Maine Geological Survey
Address: 22 State House Station, Augusta, Maine 04333
Telephone: 207-287-2801 **E-mail:** mgs@maine.gov
Home page: http://www.maine.gov/doc/nrimc/mrimc.htm

Open-File No. 09-7
2009
This map supersedes Open-File Map 07-84.



Ha	**Stream alluvium** - Sand, gravel, and silt deposited on flood plains of the Kennebec River and other streams. May include some wetland deposits.
Hw	**Wetland deposits** - Peat, muck, silt, and clay in poorly drained areas.
Qst	**Stream terraces** - Sand and gravel deposited by the Kennebec River at elevations higher than the most recent flood plains.
Qe	**Eolian deposits** - Windblown sand forming dunes and patchy irregular deposits in the northeastern part of the quadrangle. Derived from wind erosion of marine sediments on the Summerhaven delta (Pmds) to the northwest.
Pmn	**Marine nearshore deposits** - Small area of gravelly sediments in the Kennebec Valley. Inferred to have formed when marine processes reworked older glacial deposits during regression of the sea.
Pp	**Presumpscot Formation** - Glaciomarine silt, clay, and sand deposited on the late-glacial sea floor.
Pmd	**Glaciomarine deltas** - Sand and gravel deposited into the sea and built up to the ocean surface. Formed at the glacier margin during recession of the late Wisconsinan ice sheet. Elevation of boundary between topset and foreset beds in each delta indicates the position of sea level when the delta was deposited. Pmdg - Granite Hill delta. Topset/foreset contact at 338 ft (103.0 m). Pmda - Augusta Airport delta. Topset/foreset contact at 344 ft (104.9 m). Pmds - Summerhaven delta. Topset/foreset contact at 356 ft (108.5 m).
Pmf	**Glaciomarine fans** - Sand and gravel deposited as submarine fans at the glacier margin during recession of the late Wisconsinan ice sheet
Pp/Pgi	**Presumpscot Formation overlying ice-contact deposits** - Areas of sand and gravel (Pgi) deposited as eskers and/or glaciomarine fans adjacent to glacial ice in the Kennebec River and Bond Brook valleys. The ice-contact deposits are overlain by variable thicknesses of glaciomarine silt, clay, and sand (Pp). These units were not mapped individually because of poor exposure and complex stratigraphy.
Pp/Pmf/ Pge	**Presumpscot Formation overlying esker and glaciomarine fan deposits.** These deposits form a complex assemblage in the Kennebec River valley. A discontinuous ridge of coarse esker gravel (Pge) in the valley bottom is generally buried by submarine fan deposits (Pmf) comprised of well-stratified sand and gravel. Variable thicknesses of glaciomarine silt, clay, and sand (Pp) overlie the sand and gravel units, and are locally overlain in turn by coarser sediments formed by wave and current action as relative sea level fell. These units could not be distinguished accurately at the scale of the map, due to their complex interrelations and limited fresh exposures. Bedrock has been exposed in some of the deeper gravel pits, and large portions of the sand and gravel units have been removed.
Pgi	**Ice-contact deposits.** Sand and gravel deposited in contact with glacial ice in northwestern part of quadrangle. Pgi sediments show local deformation resulting from melting of adjacent supporting ice masses.
Pge	**Esker** - Sand and gravel deposited by glacial meltwater streams in tunnels beneath the ice. Chevron symbols show inferred direction of former stream flow.
Pt	**Till** - Loose to very compact, poorly sorted, massive to weakly stratified mixture of sand, silt, and gravel-size rock debris deposited by glacial ice. Locally includes lenses of waterlaid sand and gravel. Boulders commonly present on ground surface.
	Bedrock outcrops/thin-drift areas - Ruled pattern indicates areas where bedrock outcrops are common and/or surficial sediments are generally less than 10 ft thick. Mapped from air photos and ground observations. Actual thin-drift areas probably are more extensive than shown. "rk" indicates large area of bedrock exposure. Dots mark locations of small individual outcrops.
af	**Artificial fill** - Variable mixtures of earth, rock, and/or man-made materials used as fill for roads and airport runways. Also includes waste heaps from rock quarries. Shown only where large enough to affect the contour pattern on the topographic map. Some recently filled areas at shopping centers and the Augusta airport are not shown here.
	Contact - Boundary between map units, dashed where approximate.
	Moraine ridge - Line shows inferred crest of moraine ridge deposited along the retreating margin of the most recent (late Wisconsinan) glacial ice sheet.
	Glacially streamlined hill - Symbol shows long axis of hill or ridge shaped by flow of glacial ice, and which is parallel to former ice-flow direction.
135	**Glacial striation locality** - Arrow shows ice-flow direction inferred from striations on bedrock. Dot marks point of observation. Number is azimuth (in degrees) of flow direction. Flagged trend is older.
	Dip of cross-bedding - Arrow shows average dip direction of cross-bedding in fluvial or deltaic deposits, which indicates direction of stream flow or delta progradation. Dot marks point of observation.
	Meltwater channel - Channel eroded by glacial meltwater stream. Arrow shows inferred direction of former stream flow.
>>>>>	**Crest of esker** - Alignment of symbols shows trend of esker ridge. Chevrons point in direction of meltwater flow. The series of chevrons in the western part of the quadrangle (not separately mapped as Pge) designates a possible esker that has been inferred from air photos and a few field observations of sand or gravel.
	Area of many large boulders, where observed. May be more extensive than shown.
344	Surveyed elevation (in feet) of contact between topset and foreset beds in glaciomarine delta. This was the local elevation of sea level when the delta was deposited.
F	Site where marine fossils have been found.

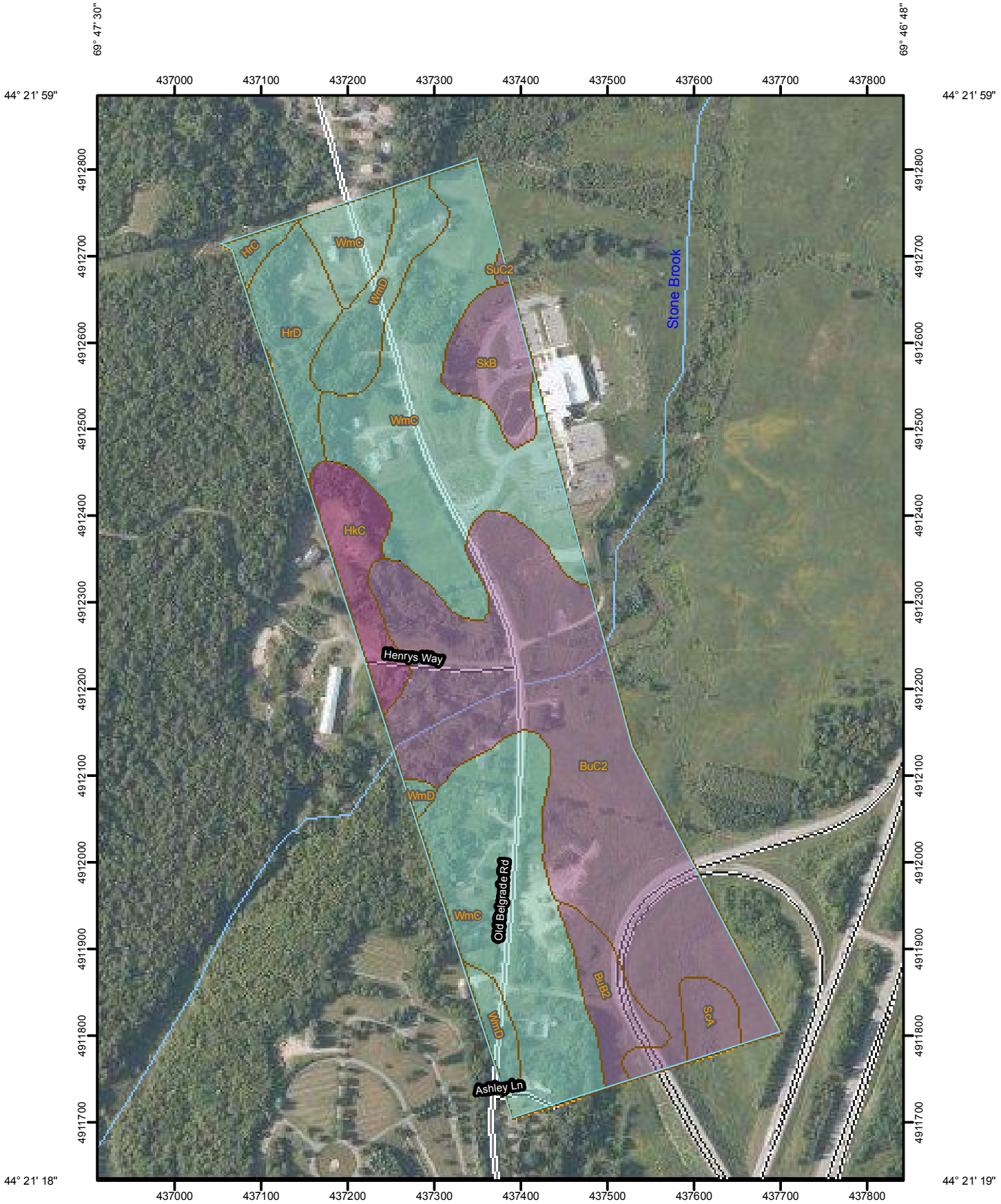


Map Scale: 1:5,430 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1,200



Map Scale: 1:5,980 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1,200

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

- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:5,980 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

Date(s) aerial images were photographed: Data not available.

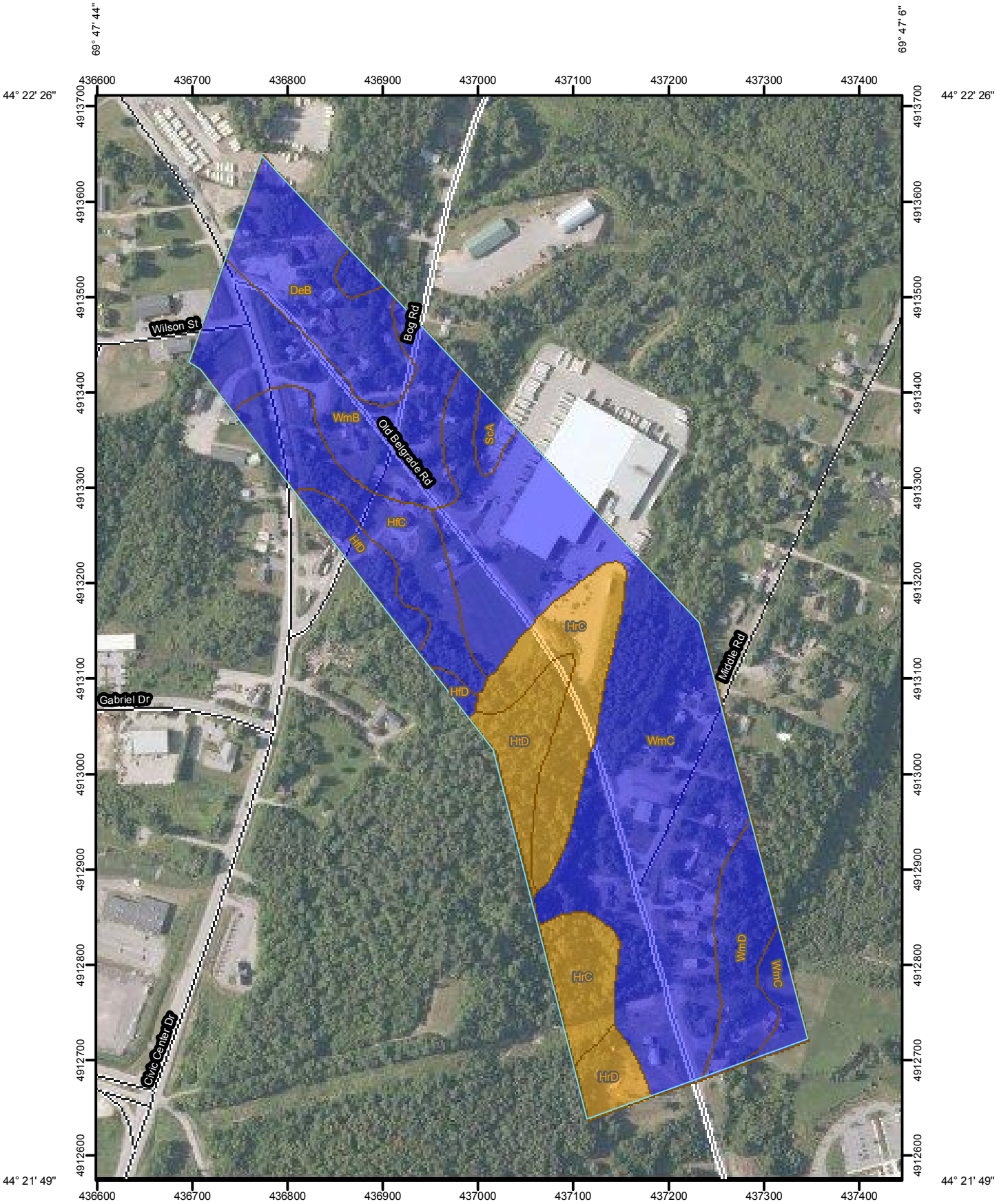
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Unified Soil Classification (Surface)

Unified Soil Classification (Surface)— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
BuB2	Buxton silt loam, 3 to 8 percent slopes, eroded	ML	2.5	3.4%
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded	ML	25.6	34.0%
HkC	Hinckley gravelly sandy loam, 8 to 15 percent slopes	GM	3.5	4.6%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	SM	0.6	0.8%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	SM	3.9	5.2%
ScA	Scantic silt loam	ML	1.3	1.7%
SkB	Scio very fine sandy loam, 3 to 8 percent slopes	ML	3.1	4.2%
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	ML	0.1	0.2%
WmC	Windsor loamy sand, 8 to 15 percent slopes	SM	30.0	39.8%
WmD	Windsor loamy sand, 15 to 30 percent slopes	SM	4.7	6.2%
Totals for Area of Interest			**75.5**	**100.0%**

Unified Soil Classification (Surface)

Unified Soil Classification (Surface)— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
DeB	Deerfield loamy fine sand, 0 to 8 percent slopes	PT	5.3	9.0%
HfC	Hartland very fine sandy loam, 8 to 15 percent slopes	ML	4.7	8.1%
HfD	Hartland very fine sandy loam, 15 to 25 percent slopes	ML	1.7	2.9%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	SM	6.9	11.9%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	SM	1.2	2.0%
HtD	Hollis-Rock outcrop complex, 15 to 30 percent slopes	ML	2.2	3.8%
ScA	Scantic silt loam	ML	0.6	1.0%
WmB	Windsor loamy sand, 3 to 8 percent slopes	SM	7.3	12.5%
WmC	Windsor loamy sand, 8 to 15 percent slopes	SM	25.3	43.4%
WmD	Windsor loamy sand, 15 to 30 percent slopes	SM	3.1	5.3%
Totals for Area of Interest			**58.3**	**100.0%**


69° 47' 44"
69° 47' 6"
44° 22' 26"
44° 21' 49"
436600
436700
436800
436900
437000
437100
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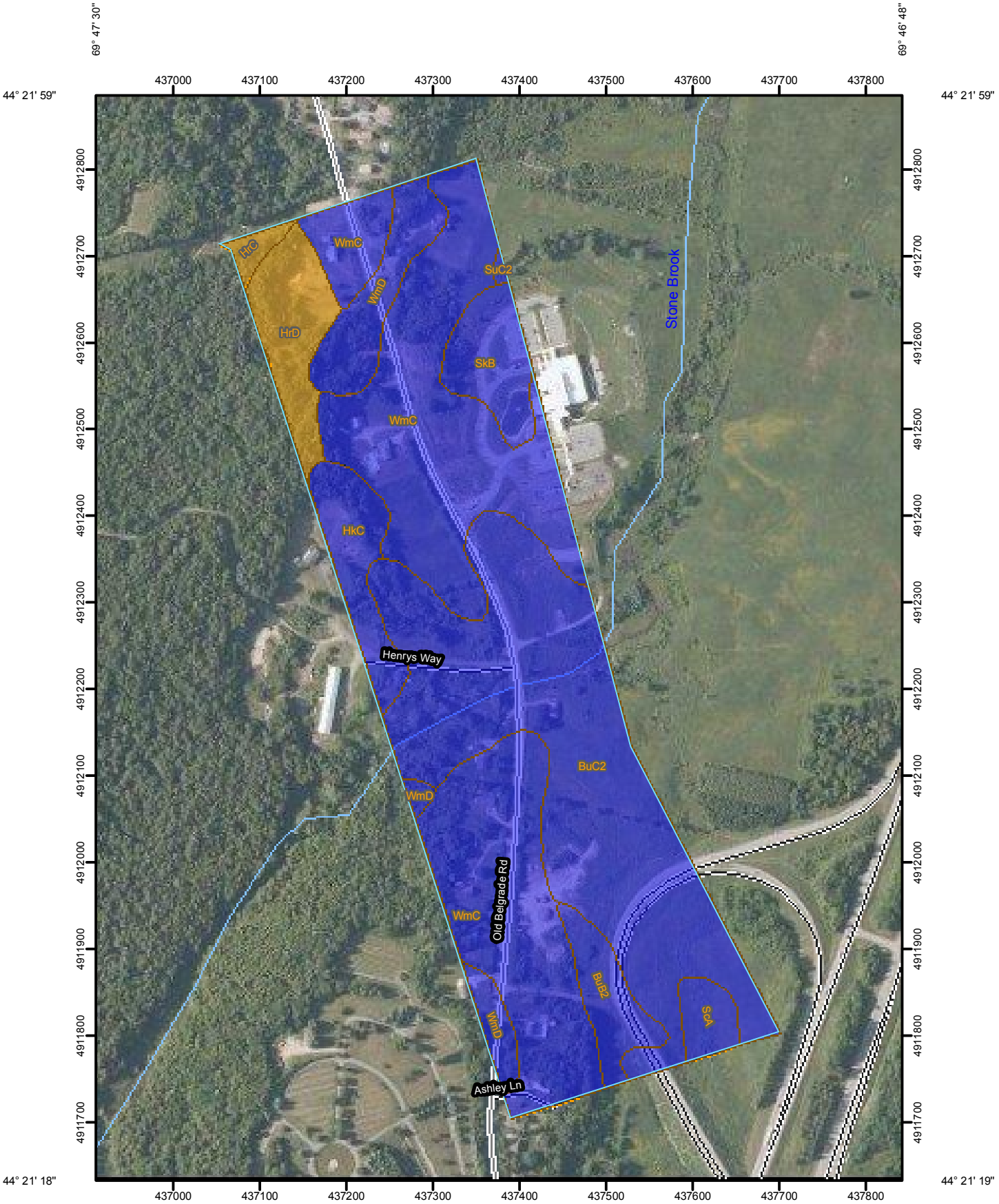
437300
437400
4913700
4913600
4913500
4913400
4913300
4913200
4913100
4913000
4912900
4912800
4912700
4912600
DeB
WmB
ScA
HfC
HfD
HrC
HtD
WmC
WmD
HrD
Wilson St
Bog Rd
Old Belgrade Rd
Middle Rd
Gabriel Dr
Civic Center Dr
Map Scale: 1:5,430 if printed on A size (8.5" x 11") sheet.
N
Meters
0 50 100 200 300
Feet
0 200 400 800 1,200



Map Scale: 1:5,980 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1,200

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:5,430 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

Date(s) aerial images were photographed: Data not available.

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.

Depth to Any Soil Restrictive Layer

Depth to Any Soil Restrictive Layer— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
DeB	Deerfield loamy fine sand, 0 to 8 percent slopes	>200	5.3	9.0%
HfC	Hartland very fine sandy loam, 8 to 15 percent slopes	>200	4.7	8.1%
HfD	Hartland very fine sandy loam, 15 to 25 percent slopes	>200	1.7	2.9%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	46	6.9	11.9%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	46	1.2	2.0%
HtD	Hollis-Rock outcrop complex, 15 to 30 percent slopes	46	2.2	3.8%
ScA	Scantic silt loam	>200	0.6	1.0%
WmB	Windsor loamy sand, 3 to 8 percent slopes	>200	7.3	12.5%
WmC	Windsor loamy sand, 8 to 15 percent slopes	>200	25.3	43.4%
WmD	Windsor loamy sand, 15 to 30 percent slopes	>200	3.1	5.3%
Totals for Area of Interest			**58.3**	**100.0%**

Description

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to any type of restrictive layer that is described for each map unit. If more than one type of restrictive layer is described for an individual soil type, the depth to the shallowest one is presented. If no restrictive layer is described in a map unit, it is represented by the "> 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Depth to Any Soil Restrictive Layer

Depth to Any Soil Restrictive Layer— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
BuB2	Buxton silt loam, 3 to 8 percent slopes, eroded	>200	2.5	3.4%
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded	>200	25.6	34.0%
HkC	Hinckley gravelly sandy loam, 8 to 15 percent slopes	>200	3.5	4.6%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	46	0.6	0.8%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	46	3.9	5.2%
ScA	Scantic silt loam	>200	1.3	1.7%
SkB	Scio very fine sandy loam, 3 to 8 percent slopes	>200	3.1	4.2%
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	>200	0.1	0.2%
WmC	Windsor loamy sand, 8 to 15 percent slopes	>200	30.0	39.8%
WmD	Windsor loamy sand, 15 to 30 percent slopes	>200	4.7	6.2%
Totals for Area of Interest			**75.5**	**100.0%**

Description

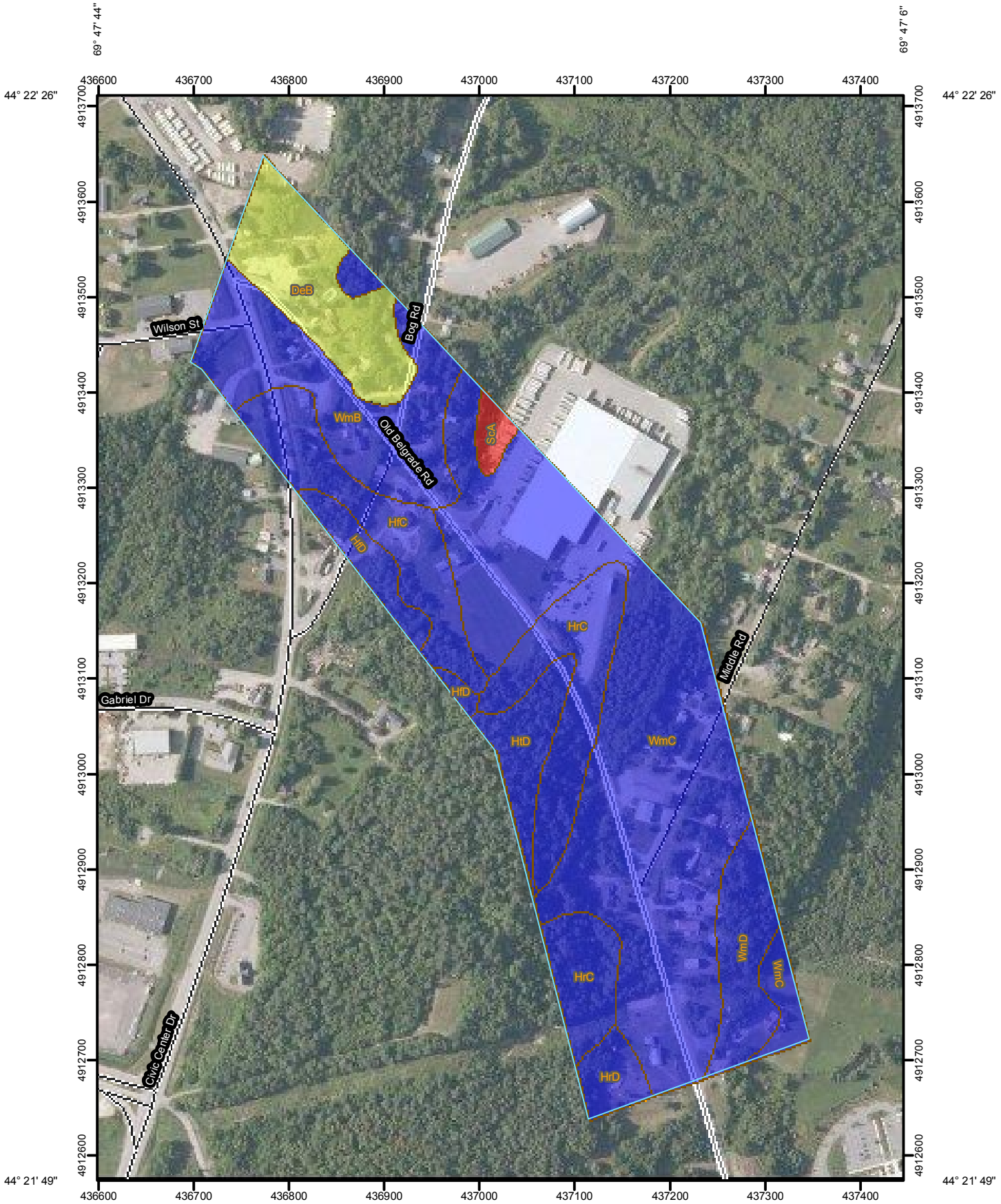
A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to any type of restrictive layer that is described for each map unit. If more than one type of restrictive layer is described for an individual soil type, the depth to the shallowest one is presented. If no restrictive layer is described in a map unit, it is represented by the "> 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

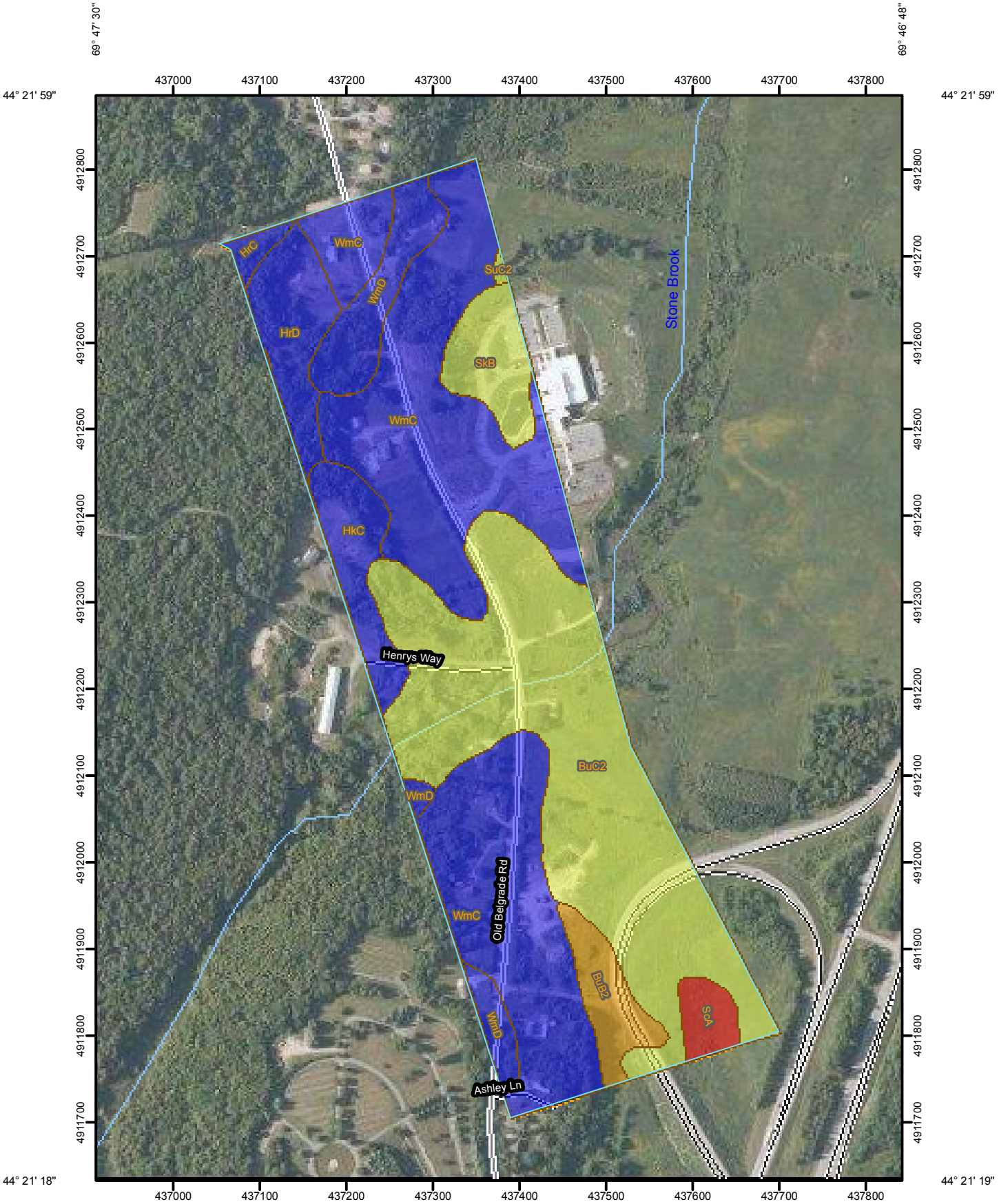


Map Scale: 1:5,430 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1,200



Map Scale: 1:5,980 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1,200

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:5,430 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

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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: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

Date(s) aerial images were photographed: Data not available.

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.

Depth to Water Table

Depth to Water Table— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
DeB	Deerfield loamy fine sand, 0 to 8 percent slopes	69	5.3	9.0%
HfC	Hartland very fine sandy loam, 8 to 15 percent slopes	>200	4.7	8.1%
HfD	Hartland very fine sandy loam, 15 to 25 percent slopes	>200	1.7	2.9%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	>200	6.9	11.9%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	>200	1.2	2.0%
HtD	Hollis-Rock outcrop complex, 15 to 30 percent slopes	>200	2.2	3.8%
ScA	Scantic silt loam	15	0.6	1.0%
WmB	Windsor loamy sand, 3 to 8 percent slopes	>200	7.3	12.5%
WmC	Windsor loamy sand, 8 to 15 percent slopes	>200	25.3	43.4%
WmD	Windsor loamy sand, 15 to 30 percent slopes	>200	3.1	5.3%
Totals for Area of Interest			**58.3**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: *None Specified*

Depth to Water Table

Depth to Water Table— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
BuB2	Buxton silt loam, 3 to 8 percent slopes, eroded	31	2.5	3.4%
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded	61	25.6	34.0%
HkC	Hinckley gravelly sandy loam, 8 to 15 percent slopes	>200	3.5	4.6%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	>200	0.6	0.8%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	>200	3.9	5.2%
ScA	Scantic silt loam	15	1.3	1.7%
SkB	Scio very fine sandy loam, 3 to 8 percent slopes	61	3.1	4.2%
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	61	0.1	0.2%
WmC	Windsor loamy sand, 8 to 15 percent slopes	>200	30.0	39.8%
WmD	Windsor loamy sand, 15 to 30 percent slopes	>200	4.7	6.2%
Totals for Area of Interest			**75.5**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

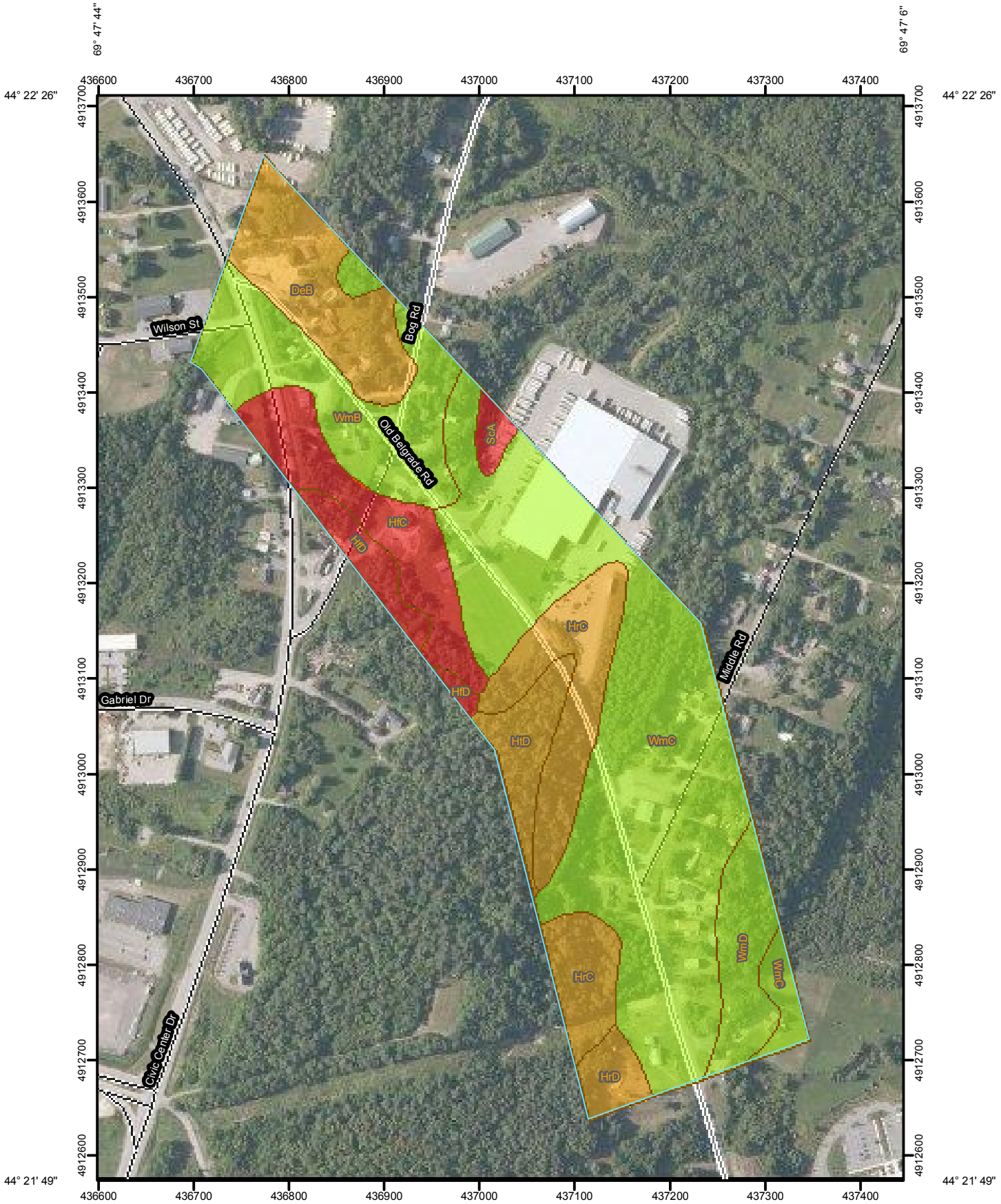
Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

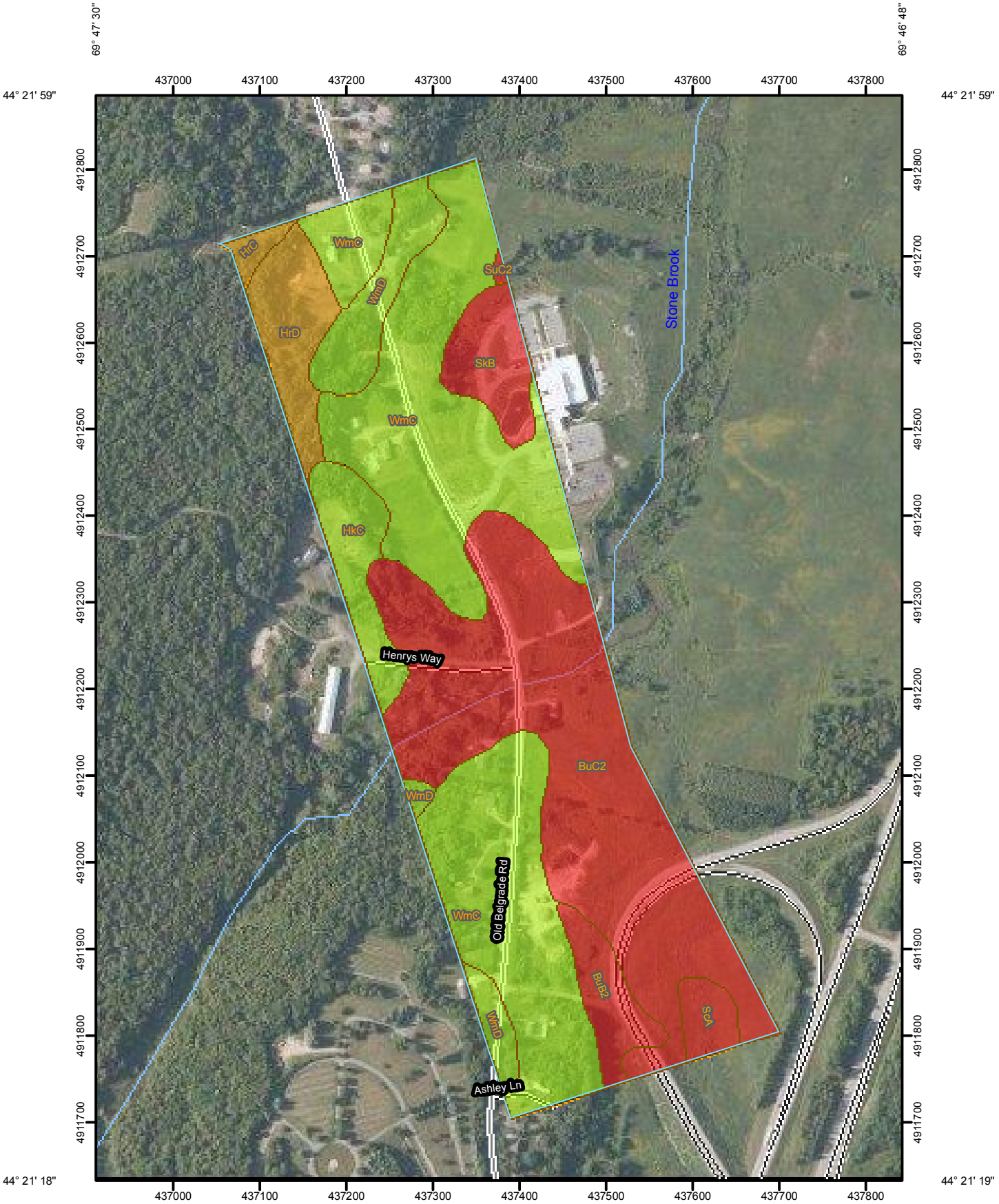


Map Scale: 1:5,430 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1,200



Map Scale: 1:5,980 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1,200

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

High

Moderate

Low

None

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:5,430 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

Date(s) aerial images were photographed: Data not available.

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.

Frost Action

Frost Action— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
DeB	Deerfield loamy fine sand, 0 to 8 percent slopes	Moderate	5.3	9.0%
HfC	Hartland very fine sandy loam, 8 to 15 percent slopes	High	4.7	8.1%
HfD	Hartland very fine sandy loam, 15 to 25 percent slopes	High	1.7	2.9%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	Moderate	6.9	11.9%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	Moderate	1.2	2.0%
HtD	Hollis-Rock outcrop complex, 15 to 30 percent slopes	Moderate	2.2	3.8%
ScA	Scantic silt loam	High	0.6	1.0%
WmB	Windsor loamy sand, 3 to 8 percent slopes	Low	7.3	12.5%
WmC	Windsor loamy sand, 8 to 15 percent slopes	Low	25.3	43.4%
WmD	Windsor loamy sand, 15 to 30 percent slopes	Low	3.1	5.3%
Totals for Area of Interest			**58.3**	**100.0%**

Description

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Frost Action

Frost Action— Summary by Map Unit — Kennebec County, Maine (ME011)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
BuB2	Buxton silt loam, 3 to 8 percent slopes, eroded	High	2.5	3.4%
BuC2	Buxton silt loam, 8 to 15 percent slopes, eroded	High	25.6	34.0%
HkC	Hinckley gravelly sandy loam, 8 to 15 percent slopes	Low	3.5	4.6%
HrC	Hollis fine sandy loam, 8 to 15 percent slopes	Moderate	0.6	0.8%
HrD	Hollis fine sandy loam, 15 to 25 percent slopes	Moderate	3.9	5.2%
ScA	Scantic silt loam	High	1.3	1.7%
SkB	Scio very fine sandy loam, 3 to 8 percent slopes	High	3.1	4.2%
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	High	0.1	0.2%
WmC	Windsor loamy sand, 8 to 15 percent slopes	Low	30.0	39.8%
WmD	Windsor loamy sand, 15 to 30 percent slopes	Low	4.7	6.2%
Totals for Area of Interest			**75.5**	**100.0%**

Description

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash.

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
DeB—Deerfield loamy fine sand, 0 to 8 percent slopes												
Deerfield	0-1	*Moderately decomposed plant material	PT	—	0	0	99-100	99-100	60-100	53-89	—	—
	1-8	*Loamy fine sand	SW-SM, SM, SP-SM	A-4, A-1, A-2, A-3	0	0	95-100	95-100	45-80	5-40	0-14	NP
	8-26	*Loamy sand, Sand, loamy fine sand	SM, SP-SM, SW-SM	A-2, A-3, A-4, A-1	0	0	80-100	75-100	45-80	5-40	0-14	NP
	26-65	*Loamy sand, Fine sand, coarse sand	SM, SP-SM, SW-SM	A-1, A-2, A-3	0	0	80-100	75-100	45-75	5-30	0-14	NP

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
HfC—Hartland very fine sandy loam, 8 to 15 percent slopes												
Hartland	0-7	*Very fine sandy loam	CL-ML, ML	A-6, A-4	0	0	100	85-100	80-100	70-95	20-40	2-12
	7-15	*Very fine sandy loam, Silt loam	CL-ML, ML	A-4	0	0	100	85-100	80-100	70-95	15-25	NP-5
	15-28	*Silt loam, Very fine sandy loam	CL-ML, ML	A-4	0	0	100	85-100	80-100	70-95	15-25	NP-5
	28-65	*Very fine sandy loam, Silt loam, sandy loam	ML, SC-SM, SM, CL-ML	A-2, A-4	0	0	100	85-100	80-100	25-95	15-25	NP-5
HfD—Hartland very fine sandy loam, 15 to 25 percent slopes												
Hartland	0-7	*Very fine sandy loam	CL-ML, ML	A-4, A-6	0	0	100	85-100	80-100	70-95	20-40	2-12
	7-15	*Very fine sandy loam, Silt loam	ML, CL-ML	A-4	0	0	100	85-100	80-100	70-95	15-25	NP-5
	15-28	*Silt loam, Very fine sandy loam	ML, CL-ML	A-4	0	0	100	85-100	80-100	70-95	15-25	NP-5
	28-65	*Very fine sandy loam, Silt loam, sandy loam	ML, SC-SM, SM, CL-ML	A-2, A-4	0	0	100	85-100	80-100	25-95	15-25	NP-5

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
HrC—Hollis fine sandy loam, 8 to 15 percent slopes												
Hollis	0-5	*Fine sandy loam	SM, ML	A-1, A-2, A-4	0	0-15	80-95	70-90	40-85	20-80	15-35	NP-6
	5-18	*Gravelly fine sandy loam, Loam, silt loam	SM, GM, ML	A-2, A-4, A-1	0	0-20	65-95	60-90	35-85	20-80	15-30	NP-4
	18-22	*Bedrock	—	—	0	—	—	—	—	—	—	—
HrD—Hollis fine sandy loam, 15 to 25 percent slopes												
Hollis	0-5	*Fine sandy loam	ML, SM	A-1, A-2, A-4	0	0-15	80-95	70-90	40-85	20-80	15-35	NP-6
	5-18	*Gravelly fine sandy loam, Loam, silt loam	GM, ML, SM	A-1, A-2, A-4	0	0-20	65-95	60-90	35-85	20-80	15-30	NP-4
	18-22	*Bedrock	—	—	0	—	—	—	—	—	—	—
HtD—Hollis-Rock outcrop complex, 15 to 30 percent slopes												
Hollis	0-5	*Fine sandy loam	ML, SM	A-1, A-2, A-4	0	0-15	80-95	70-90	40-85	20-80	15-35	NP-6
	5-18	*Gravelly fine sandy loam, Loam, silt loam	GM, ML, SM	A-4, A-1, A-2	0	0-20	65-95	60-90	35-85	20-80	15-30	NP-4
	18-22	*Bedrock	—	—	0	—	—	—	—	—	—	—
Rock outcrop	0-60	*Bedrock	—	—	—	—	—	—	—	—	—	—

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
ScA—Scantic silt loam												
Scantic	0-9	*Silt loam	MH, ML	A-5, A-7, A-4	0	0	100	95-100	90-100	70-100	36-55	5-20
	9-30	*Silty clay loam, Silt loam, clay	CL, MH	A-4, A-6, A-7	0	0	100	95-100	95-100	85-100	25-55	8-25
	30-65	*Silty clay, Silty clay loam, clay	CL, MH	A-6, A-7	0	0	100	95-100	95-100	90-100	30-60	10-25
WmB—Windsor loamy sand, 3 to 8 percent slopes												
Windsor	0-10	*Loamy sand	SM, SP-SM	A-2, A-3, A-4, A-1	0	0	95-100	95-100	45-85	5-40	0-14	NP
	10-29	*Loamy sand, Sand, loamy fine sand	SM, SP-SM	A-4, A-1, A-2, A-3	0	0	95-100	95-100	35-95	5-40	0-14	NP
	29-65	*Sand, Coarse sand, fine sand	SW-SM, SP, SP-SM	A-3, A-1, A-2	0	0-1	80-100	70-100	20-90	0-10	0-14	NP
WmC—Windsor loamy sand, 8 to 15 percent slopes												
Windsor	0-10	*Loamy sand	SM, SP-SM	A-1, A-4, A-2, A-3	0	0	95-100	95-100	45-85	5-40	0-14	NP
	10-29	*Loamy sand, Sand, loamy fine sand	SM, SP-SM	A-4, A-1, A-2, A-3	0	0	95-100	95-100	35-95	5-40	0-14	NP
	29-65	*Sand, Coarse sand, fine sand	SP, SP-SM, SW-SM	A-1, A-2, A-3	0	0-1	80-100	70-100	20-90	0-10	0-14	NP

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
WmD—Windsor loamy sand, 15 to 30 percent slopes												
Windsor	0-10	*Loamy sand	SP-SM, SM	A-2, A-3, A-4, A-1	0	0	95-100	95-100	45-85	5-40	0-14	NP
	10-29	*Loamy sand, Sand, loamy fine sand	SM, SP-SM	A-2, A-3, A-4, A-1	0	0	95-100	95-100	35-95	5-40	0-14	NP
	29-65	*Sand, Coarse sand, fine sand	SP-SM, SW-SM, SP	A-1, A-2, A-3	0	0-1	80-100	70-100	20-90	0-10	0-14	NP

Data Source Information

Soil Survey Area: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash.

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
BuB2—Buxton silt loam, 3 to 8 percent slopes, eroded												
Buxton	0-7	*Silt loam	MH, ML	A-7, A-4, A-5	0	0	98-100	95-100	95-100	85-100	36-55	5-15
	7-15	*Silty clay loam, Silt loam, silty clay	CL, MH, ML	A-4, A-6, A-7	0	0	98-100	95-100	95-100	85-100	28-55	8-25
	15-36	*Silty clay loam, Silt loam, silty clay	CL, MH, ML	A-7, A-4, A-6	0	0	98-100	95-100	95-100	85-100	28-55	8-25
	36-65	*Silty clay, Silty clay loam, clay	CL, MH	A-6, A-7	0	0	98-100	95-100	95-100	90-100	30-60	10-25
BuC2—Buxton silt loam, 8 to 15 percent slopes, eroded												
Buxton	0-7	*Silt loam	MH, ML	A-7, A-4, A-5	0	0	98-100	95-100	95-100	85-100	36-55	5-15
	7-15	*Silty clay loam, Silt loam, silty clay	CL, MH, ML	A-4, A-6, A-7	0	0	98-100	95-100	95-100	85-100	28-55	8-25
	15-36	*Silty clay loam, Silt loam, silty clay	MH, ML, CL	A-4, A-6, A-7	0	0	98-100	95-100	95-100	85-100	28-55	8-25
	36-65	*Silty clay, Silty clay loam, clay	CL, MH	A-7, A-6	0	0	98-100	95-100	95-100	90-100	30-60	10-25

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
HkC—Hinckley gravelly sandy loam, 8 to 15 percent slopes												
Hinckley	0-2	*Gravelly sandy loam	SM, SW-SM, GM, GW-GM	A-4, A-1, A-2	0	10-25	35-80	30-75	20-65	10-40	0-10	NP-2
	2-10	*Gravelly sandy loam, Gravelly coarse sandy loam, very gravelly sand	SM, GM, GP-GM, GW-GM	A-1, A-2, A-3	0-1	5-20	30-80	25-75	20-60	5-35	0-10	NP-2
	10-30	*Gravelly loamy sand, Gravelly loamy fine sand, cobbly coarse sand	SP, GM, SM	A-1	0-1	5-20	30-80	25-75	20-50	2-20	0-14	NP
	30-65	*Stratified very gravelly coarse sand, Very gravelly loamy sand, very cobbly sand	GW, SW	A-1-a	0-1	10-45	20-55	15-50	10-30	0-5	0-14	NP
HrC—Hollis fine sandy loam, 8 to 15 percent slopes												
Hollis	0-5	*Fine sandy loam	SM, ML	A-1, A-2, A-4	0	0-15	80-95	70-90	40-85	20-80	15-35	NP-6
	5-18	*Gravelly fine sandy loam, Loam, silt loam	SM, GM, ML	A-2, A-4, A-1	0	0-20	65-95	60-90	35-85	20-80	15-30	NP-4
	18-22	*Bedrock	—	—	0	—	—	—	—	—	—	—

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
HrD—Hollis fine sandy loam, 15 to 25 percent slopes												
Hollis	0-5	*Fine sandy loam	ML, SM	A-1, A-2, A-4	0	0-15	80-95	70-90	40-85	20-80	15-35	NP-6
	5-18	*Gravelly fine sandy loam, Loam, silt loam	GM, ML, SM	A-1, A-2, A-4	0	0-20	65-95	60-90	35-85	20-80	15-30	NP-4
	18-22	*Bedrock	—	—	0	—	—	—	—	—	—	—
ScA—Scantic silt loam												
Scantic	0-9	*Silt loam	MH, ML	A-5, A-7, A-4	0	0	100	95-100	90-100	70-100	36-55	5-20
	9-30	*Silty clay loam, Silt loam, clay	CL, MH	A-4, A-6, A-7	0	0	100	95-100	95-100	85-100	25-55	8-25
	30-65	*Silty clay, Silty clay loam, clay	CL, MH	A-6, A-7	0	0	100	95-100	95-100	90-100	30-60	10-25
SkB—Scio very fine sandy loam, 3 to 8 percent slopes												
Scio	0-10	*Very fine sandy loam	CL-ML, ML	A-6, A-4	0	0	90-100	85-100	70-100	60-90	20-40	2-12
	10-22	*Silt loam, Very fine sandy loam, loamy very fine sand	CL-ML, ML	A-4	0	0	90-100	85-100	75-100	60-90	15-25	NP-5
	22-65	*Very fine sandy loam, Silt loam, sandy loam	SC-SM, SM, CL-ML, ML	A-2, A-4	0	0	90-100	85-100	65-100	30-90	15-25	NP-5

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
SuC2—Suffield silt loam, 8 to 15 percent slopes, eroded												
Suffield	0-6	*Silt loam	MH, ML	A-4, A-5, A-7	0	0	98-100	95-100	95-100	85-100	36-55	5-15
	6-18	*Silt loam, Silty clay loam, silty clay	CL, MH, ML	A-7, A-4, A-6	0	0	98-100	95-100	95-100	85-100	28-55	8-25
	18-65	*Silty clay loam, Silty clay, clay	CL, ML	A-7, A-6	0	0	98-100	95-100	95-100	90-100	30-60	10-25
WmC—Windsor loamy sand, 8 to 15 percent slopes												
Windsor	0-10	*Loamy sand	SM, SP-SM	A-1, A-4, A-2, A-3	0	0	95-100	95-100	45-85	5-40	0-14	NP
	10-29	*Loamy sand, Sand, loamy fine sand	SM, SP-SM	A-4, A-1, A-2, A-3	0	0	95-100	95-100	35-95	5-40	0-14	NP
	29-65	*Sand, Coarse sand, fine sand	SP, SP-SM, SW-SM	A-1, A-2, A-3	0	0-1	80-100	70-100	20-90	0-10	0-14	NP

Engineering Properties– Kennebec County, Maine												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
WmD—Windsor loamy sand, 15 to 30 percent slopes												
Windsor	0-10	*Loamy sand	SP-SM, SM	A-2, A-3, A-4, A-1	0	0	95-100	95-100	45-85	5-40	0-14	NP
	10-29	*Loamy sand, Sand, loamy fine sand	SM, SP-SM	A-2, A-3, A-4, A-1	0	0	95-100	95-100	35-95	5-40	0-14	NP
	29-65	*Sand, Coarse sand, fine sand	SP-SM, SW-SM, SP	A-1, A-2, A-3	0	0-1	80-100	70-100	20-90	0-10	0-14	NP

Data Source Information

Soil Survey Area: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

Water Features

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Report—Water Features

Water Features– Kennebec County, Maine										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
BuB2—Buxton silt loam, 3 to 8 percent slopes, eroded										
Buxton	D	—	January	0.6-1.5	1.0-2.0	—	—	None	—	None
	D	—	February	0.6-1.5	1.0-2.0	—	—	None	—	None
	D	—	March	0.6-1.5	1.0-2.0	—	—	None	—	None
	D	—	April	0.6-1.5	1.0-2.0	—	—	None	—	None
	D	—	May	0.6-1.5	1.0-2.0	—	—	None	—	None
	D	—	June	0.6-1.5	1.0-2.0	—	—	None	—	None
	D	—	November	0.6-1.5	1.0-2.0	—	—	None	—	None
	D	—	December	0.6-1.5	1.0-2.0	—	—	None	—	None
BuC2—Buxton silt loam, 8 to 15 percent slopes, eroded										
Buxton	C	—	January	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	February	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	March	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	April	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	May	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	November	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	December	1.5-2.5	2.0-3.0	—	—	None	—	None
HkC—Hinckley gravelly sandy loam, 8 to 15 percent slopes										
Hinckley	A	—	Jan-Dec	—	—	—	—	None	—	—

Water Features– Kennebec County, Maine										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
HrC—Hollis fine sandy loam, 8 to 15 percent slopes										
Hollis	C/D	—	Jan-Dec	—	—	—	—	None	—	—
HrD—Hollis fine sandy loam, 15 to 25 percent slopes										
Hollis	C/D	—	Jan-Dec	—	—	—	—	None	—	—
ScA—Scantic silt loam										
Scantic	D	—	January	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	February	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	March	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	April	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	May	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	June	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	October	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	November	0.0-1.0	1.0-2.0	—	—	None	—	None
	D	—	December	0.0-1.0	1.0-2.0	—	—	None	—	None
SkB—Scio very fine sandy loam, 3 to 8 percent slopes										
Scio	C	—	January	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	February	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	March	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	April	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	May	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	November	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	December	1.5-2.5	2.0-3.0	—	—	None	—	None

Water Features– Kennebec County, Maine										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
SuC2—Suffield silt loam, 8 to 15 percent slopes, eroded										
Suffield	C	—	January	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	February	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	March	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	April	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	May	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	November	1.5-2.5	2.0-3.0	—	—	None	—	None
	C	—	December	1.5-2.5	2.0-3.0	—	—	None	—	None
WmC—Windsor loamy sand, 8 to 15 percent slopes										
Windsor	A	—	Jan-Dec	—	—	—	—	None	—	—
WmD—Windsor loamy sand, 15 to 30 percent slopes										
Windsor	A	—	Jan-Dec	—	—	—	—	None	—	—

Data Source Information

Soil Survey Area: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Report—Soil Features

Soil Features– Kennebec County, Maine									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
DeB—Deerfield loamy fine sand, 0 to 8 percent slopes									
Deerfield		—	—		0	—	Moderate	Low	High
HfC—Hartland very fine sandy loam, 8 to 15 percent slopes									
Hartland		—	—		0	—	High	Low	Moderate
HfD—Hartland very fine sandy loam, 15 to 25 percent slopes									
Hartland		—	—		0	—	High	Low	Moderate
HrC—Hollis fine sandy loam, 8 to 15 percent slopes									
Hollis	Lithic bedrock	10-20	—	Indurated	0	—	Moderate	Low	High
HrD—Hollis fine sandy loam, 15 to 25 percent slopes									
Hollis	Lithic bedrock	10-20	—	Indurated	0	—	Moderate	Low	High

Soil Features– Kennebec County, Maine									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
HtD—Hollis-Rock outcrop complex, 15 to 30 percent slopes									
Hollis	Lithic bedrock	10-20	—	Indurated	0	—	Moderate	Low	High
Rock outcrop	Lithic bedrock	0	—		0	—	None		
ScA—Scantic silt loam									
Scantic		—	—		0	—	High	High	Moderate
WmB—Windsor loamy sand, 3 to 8 percent slopes									
Windsor		—	—		0	—	Low	Low	High
WmC—Windsor loamy sand, 8 to 15 percent slopes									
Windsor		—	—		0	—	Low	Low	High
WmD—Windsor loamy sand, 15 to 30 percent slopes									
Windsor		—	—		0	—	Low	Low	High

Data Source Information

Soil Survey Area: Kennebec County, Maine
Survey Area Data: Version 11, Jul 27, 2009

APPENDIX F

UNIT CONVERSIONS – HALEY AND ALDRICH REPORT
#2003-05C

2003 - 05C

REPORT ON
GEOTECHNICAL ENGINEERING EVALUATION
KENNEBEC RIVER CROSSING PROJECT
CONTRACT NO. 1, PIN 556.21
AUGUSTA, MAINE

Phase II, West Highway Segment

by

Haley & Aldrich, Inc.
South Portland, Maine

for

Maine Department of Transportation
Augusta, Maine

File No. 80765-001
November 2001

HALEY & ALDRICH

EXECUTIVE SUMMARY

The Kennebec River Crossing project is approximately 5.84 km in length and consists of two to four lanes of roadway, a grade-separated intersection with Interstate 95 at the western end of the alignment, a bridge structure over Eight Rod Road, an at-grade intersection with West River Road (Route 104), a bridge structure over the Kennebec River, an at-grade intersection with Route 201 and an at-grade intersection with Route 3 at the eastern end of the alignment. Contract No.1 of the proposed Kennebec River Crossing project includes the highway portions of the interchange with I-95 to the western bank of the Kennebec River. The roadway alignment passes through fields and wooded areas that are primarily undeveloped. The topography ranges from gently rolling to steeper, undulating hills.

The Phase II exploration program consisted of 89 test borings which were supplemental to the borings drilled for Phase I in 2000. Five observation wells were installed and monitored to obtain groundwater levels. A laboratory testing program was conducted on tube samples to determine engineering properties of the marine silty clay. Grain size analyses were also conducted to aid in soil classification for potential reuse. Soils encountered included Topsoil, Fill, Marine Deposits, Glaciofluvial Deposits, Glacial Stream Deposits, Glacial Till and Bedrock.

Laboratory tests indicated that the marine silty clay water content ranges from 22 to 39, liquid limit ranges from 33 to 41, and plastic limit ranges from 14 to 21. The clays are moderately sensitive, and the undrained shear strength of the clay, based on laboratory tests, ranges from approximately ~~16 to 75 kPa~~. An average compression ratio of 0.17 and an average recompression ratio of 0.007 were determined from consolidation tests. The OCR ranges from about 1.4 to 5. 334 to 1570 psf

The anticipated subgrade materials are Marine silty clay, clayey silt and silty fine sand, Glacial Till and bedrock. We anticipate that these materials, as well as embankment fill, are suitable for support of a properly designed and constructed roadway pavement section. We recommend that prior to placement of roadway fill, all topsoil, organic matter, debris fill and other unsuitable materials be entirely removed. Soil resilient modulus values range from approximately 3200 psi for silty sand and silty clay to 5100 psi for Glacial Till. Frost susceptibility classifications range from II to III for Glacial Till, to IV for silty sand, clayey sand, and silty clay.

2.75"

Analyses of embankment and culvert settlements indicate that the maximum total settlements would be on the order of ~~70 mm.~~ Post-construction settlements of embankments are expected to be minimal. Factors of safety for embankment stability are adequate at 1.7 to 1.9.

The embankment slopes as steep as 1 vertical to 2 horizontal (1V:2H) should be acceptable from an overall stability standpoint. However, these are relatively steep and will likely require slope protection to prevent surface erosion and sloughing.

We analyzed backslope stability in the soil cut areas of the project. The calculated factors of safety for 1V to 2H slopes range from 1.2 to 1.6, depending on the assumed elevation of the

water table. Naturally-occurring slopes with similar slope geometry conditions exist along portions of the alignment in near the Kennebec River without apparent instability. Localized areas of seepage of groundwater from the cut slopes should be anticipated, and may result in near-surface sloughing.

Excavation dewatering and control of surface water runoff will be required to prevent instability of excavation slopes and to prevent disturbance of subgrade soils.

Bedrock will be encountered generally between Station 11+310 to 11+490 and 12+480 to 12+520. Cuts as deep as 6 m below the bedrock surface are likely. Drilling and blasting techniques will be required for bedrock excavation. Typical MDOT cut slopes in rock (4V to 1H) are considered appropriate for design. However, rock face conditions should be verified during construction to confirm that the cut slope will be stable, i.e. there are no loose, unstable rock blocks exposed at the face.

Transition zones will be required in areas where the roadway subgrade changes from soil to bedrock, and bedrock to soil (generally between Station 11+310 to 11+490 and 12+480 to 12+520). Typical MDOT transition zone details are considered appropriate.

We expect that excavated Marine silty sand and Glacial Till soils can be reused for embankment construction providing that they are placed and compacted at a moisture content near optimum. Marine silt and silty clay may be used for embankment construction provided that they are placed outside limits defined by 1:1 lines sloped outward and downward from the outer limits of the gravel subbase course layer (non-critical section of embankment). Construction debris located in the vicinity of Station 12+640 was investigated by MDOT and it appears that the material can be used in non-critical sections of embankments.

Descriptions of bedrock cored in the explorations generally varied from a hard, slightly weathered GRANITE (B5, B6, and B7; and in the C1-xx-01 series, 16A and 39) to a moderately hard, slightly weathered SLATE (B16; and in the C1-xx-01 series, 8, 9, 15, 16A, 17, 18, 19, 39, 65A, 69B, and 70A), PHYLLITE (B17; and in the C1-xx-01 series, 7, 13, and 14), and SCHIST (B19; and in the C1-xx-01 series, 10 and 11).

Water was measured in completed borings at depths ranging from approximately 0.15 m above ground surface (artesian condition in B4) to 14.2 m below ground surface. However, these measurements were made immediately upon completion of the borings and probably do not represent stabilized groundwater. Water level data are presented in Tables I and II. Groundwater was measured in the Phase II observation wells from 1 to 12 days after installation of the wells. Groundwater depths ranged from 4.21 to 10.42 m below ground surface. The corresponding elevation of water in these wells ranged from El. 57.9 m to El. 66.2 m. Observations wells from Phase I explorations were also measured during Phase II explorations. Observation well B17OW was measured on 26 August 2001 at a depth of 4.5 m below ground surface (corresponds to El. 69.5 m). This is close to the measured depth of 4.2 m below ground surface measured in 2000. The well installed in B23OW was dry on 30 August 2001 which means that the depth to water was greater than 12.1 m below the ground surface at that location. Groundwater levels are expected to fluctuate with season, precipitation, temperature, construction activity in the area and other factors.

The subsurface conditions encountered in the test borings are summarized on the profiles included in this report as Figure Nos. 2 through 18.

RESULTS OF LABORATORY AND FIELD TESTING

The results of the field testing (field vane shear tests) are indicated on the boring logs, and the results of the laboratory testing are included in Appendix C of this report.

Measured water contents within the marine silty clay/clayey silt subunit ranged from approximately 22 to 39 percent; measured liquid limits ranged from about 33 to 41, and plastic limits from about 14 to 21. The USCS classification of these samples is CL, and the AASHTO classification is A-6 and A-7-6. The natural water content of some portions of the clay was close to or above the liquid limit. Therefore, these portions are considered to be moderately sensitive in-situ, that is, the clay would be expected to experience strength loss upon remolding or significant strain. Measured saturated unit weights ranged from about 17.9 to 19.8 kN/cu m. The undrained shear strength of the marine clay, based on lab and field tests, ranged from approximately ~~16 to 75 kPa.~~ 334 to 1570 psf

Consolidation tests were performed on specimens obtained from thin wall tube samples in Phase I explorations. Tests performed on samples from B5, B8, B12 and B13 indicate that the clays and silts are overconsolidated. The encountered thickness of the marine silt and clay deposits from these samples ranged from approximately 1.8 m in B13 to 4.6 m in B12.

5227 psf

Phase II explorations encountered up to 13.84 m of marine silt and clay (in C1-1-01). The test results indicate that the maximum previous stress for the samples ranged from about 140 kPa in B12 to ~~250 kPa~~ in B5. The average compression ratio (CR) is about 0.17 and the average recompression ratio (RR) ranges from about 0.006 to 0.008.

The approximate distribution of maximum past pressure with depth is shown on sheets C-7 through C-9 in relation to the predicted in-situ vertical effective stress. The overconsolidation ratio, OCR, calculated as the maximum past pressure divided by the in-situ effective stress, ranged from approximately 3 to 5 (estimated) within the stiff upper olive-brown clayey silt to between 3 and 1.4 near the bottom of the subunit. Consolidation test curves for each test are presented in Appendix C.

Grain size analyses were performed on samples collected during Phase II explorations. Results of grain size analyses are grouped by soil deposit and are included in Appendix C. The Marine Silt grouping shows that approximately 85 percent passes the #200 sieve (fines – silt and clay fraction), with about 15 percent retained in the coarse to fine sand range. The Marine Sand grouping shows two distinct envelopes of gradation. Two samples were primarily fine sand with only 7 to 12 percent fines. The other five contained between approximately 40 percent and 60 percent fines.

The Glaciofluvial deposit samples contained approximately 12 percent fines. One sample contained over 50 percent gravel, while the other contained only 7 percent gravel. The remainder of each sample consisted of coarse to fine sand.

Glacial Till deposits encompassed a broad range of grain sizes, with each grain size sample containing gravel, sand and silt.

Grain-size samples were grouped according to soil type and classified in the USCS and AASHTO systems. The classifications are presented below.

Soil Type	USCS Classification	AASHTO Classification
Marine Silt	ML	A-4
Marine silty Sand	SM, ML, SP-SM	A-2-4, A-3, A-4
Glaciofluvial	GM, SP-SM	A-1-a, A-1-b
Glacial Till	SM, GP-GM	A-1-a, A-1-b, A-2-4, A-4

fragments should be covered with a minimum of 300 mm of granular soil graded to fill surface voids in the rock fragment subgrade. The pavement should then be designed in accordance with recommendations for a glacial till subgrade condition.

Frost Susceptibility Classification

Unit	Frost Group
Silty and Clayey Sand	IV
Silty Clay	III to IV
Glacial Till	II to III

The frost susceptibility classification is based on MDOT criteria.

The freezing index and frost penetration estimates for 762 mm of pavement and base are as follows:

		Total Frost Penetration (mm)		Frost Penetration into Subgrade(mm)	
Freezing Index (degree-F days)		Non-granular Subgrade	Granular Subgrade	Non-granular Subgrade	Granular Subgrade
Mean	1000	1020	1420	260	660
Design	1600	1270	2080	510	1320

Transition Zones

Transition zones will be required in areas where the roadway subgrade changes from soil to bedrock, and bedrock to soil (generally between Station 11+310 to 11+490 and 12+480 to 12+520). Typical transition zone details are considered appropriate and are included as Figures No. 19 and 20.

Underdrains

Based on cross-section information provided by HNTB, ditches will be provided on each side of the roadway in cut areas. We do not anticipate that underdrains will be required where ditches are provided.

Embankment Fill Areas

Based on the presently proposed vertical alignment, there are a number of areas within the limits of Contract No. 1 where substantial thickness of fill will be required. The approximate

limits of the embankment fills with a general description of the maximum fill thickness and the generalized subsurface conditions are summarized as follows:

Approximate Limits (Station)	Approximate Fill Height (m)	Generalized Soil Conditions
300+040 to 300+400 (I-95 Ramp C)	~~5.5~~ 18'	Topsoil 0 to 2 m Fill 1 to 2 m Marine silty Sand 1 to 10 m Marine silty Clay Glacial Till
400+040 to 400+640 (I-95 Ramp D)	~~6~~ 19.7'	Topsoil 0 to 2+ m Fill 0 to 1 m Marine silty Sand 0 to 10 m Marine silty Clay
200+245 to 200+495 (I-95 Ramp B)	~~9~~ 29.5'	Topsoil 1 to 3 m Marine silty Sand 5 to 10 m Marine silty Clay Glacial Till
100+460 to 100+710 (I-95 Ramp A)	~~7~~ 23'	Topsoil 0 to 2 m Fill 0 to 2 m silty Sand 1 to 10 m silty Clay Glacial Till
9+900 to 10+060	5	Topsoil 1 to 4 m Marine silty Sand 2 to 4 m Marine silty Clay Glacial Till
10+180 to 10+550	~~11~~ 36'	Topsoil 1 m Marine silty Sand 5 m Marine silty Clay Glacial Till
10+720 to 11+130	~~8~~ 26.2'	Topsoil 1 to 2 m Marine silty Sand 7 to 9 m Marine silty Clay Glacial Till

11+600 to 11+755	10	Topsoil 0 to 1 m Marine Silt 0 to 7 m Marine silty Clay 0 to 3 m Marine silty Sand Glacial Till
11+955 to 12+010	6	Topsoil 0 to 2 m Marine silty Sand 0 to 2 m Marine silty Clay Glacial Till/Bedrock
12+030 to 12+080	4	Topsoil 1 to 6 m Marine silty Sand 0 to 4 m Marine silty Clay Glacial Till/Bedrock
12+085 to 12+255	9	Topsoil 0 to 7 m Marine silty Sand Glacial Till/Bedrock
12+370 to 12+390	4	Topsoil 0 to 3 m Marine silty Clay 0 to 2 m Marine silty Sand Glacial Till/Bedrock
12+800 to 12+840	4	Topsoil 0 to 1 m Fill 0 to 2 m Glaciofluvial sand and gravel 3 to 6 m Marine silty Clay 3 to 5 m Marine sandy Clay/clayey Sand

The fill areas are also indicated in Figure Nos. 2 through 18. Proposed embankment side slopes are 1:2 where guardrails are provided and 1:4 where no guardrail is provided.

The imposed loading from the construction of the embankments is expected to result in minimal ground surface settlement from densification and consolidation of the underlying soils. An assessment of ground surface settlement was made in the areas where the maximum-height embankments are proposed. We calculated that the ground surface in the vicinity of Station 11+015 (fill height approximately ~~8 m~~, and approximately ~~11 m~~ of Marine silty Clay/clayey Silt) would undergo settlement less than approximately ~~70 mm~~. We expect that settlements at other locations on the project will be less than this. Because the silt and clay soils are significantly overconsolidated, we expect that most of this settlement would

26.2' 2.75" 36'

occur during and immediately after construction of the embankment. Post-construction settlement is expected to be minimal.

Culvert Settlement Estimates

Culverts will be provided beneath proposed embankment fill along the alignment. We evaluated settlements at culvert locations where the explorations indicate that compressible Marine silt and clay soils are present. The results of these calculations are summarized below.

Culvert Location	Fill Height (m)	Total Settlement (mm)
200+275 (Ramp B)	3	<50
200+455 (Ramp B)	7-9	<50
100+585 (Ramp A)	4.5-5	<50
100+670 (Ramp A)	6-7	<50
10+250	9-10	<50
10+420	12	63
10+910	7-8	55
11+015	7-8	68

Not included on this list are culverts which are planned for locations where explorations indicate there are little or no cohesive soils, or where cuts are planned rather than fills. We expect that settlements at these other locations will be minimal.

Embankment Stability

Evaluations were made of the stability of the embankments. The calculated factor of safety for a rotational shear failure of a nominal 12-m high earthfill embankment with 1:2 side slopes, constructed in the vicinity of Station 10+520 is on the order of 1.7 to 1.9. We believe that this range of calculated factor of safety against a global shear failure is typical for the project and is acceptable.

It is our opinion that embankments constructed with 1:2 side slopes will be acceptable from an overall stability standpoint. However, these are relatively steep slopes and will require slope protection to prevent surface erosion and sloughing, especially if the timing of the project is such that the grass seed does not have sufficient time to take root into the embankment material. One method of minimizing surface erosion uses fiber reinforcement of topsoil and scarification of the embankment surface. A second method is to make small benches or serrations in the slopes and fill these slopes with topsoil. A third method to protect the surface material is to cover the embankments with erosion protection mats.

Reuse of Excavated Soils and Bedrock

It is understood that to the extent possible, excavated materials will be reused as embankment fill. We anticipate that excavated marine silty sand, silty clay, and processed bedrock materials may be reused as fill in the manner described below:

Marine Silty Sand – Contractors should be made aware the marine silty sand subunit is highly susceptible to strength loss when wet, and that moisture conditioning will probably be required. Contractors should expect that prior to placement and compaction it may be necessary to spread out and dry portions of the marine silty sand that are excessively moist. We recommend that the contract documents include moisture conditioning activities as part of the project earthwork requirements. Grain size analyses performed as part of the Phase II laboratory testing program indicate that marine sand (or silty sand) may be used as common borrow in accordance with State of Maine (MDOT) Standard Specifications, Section 703.18.

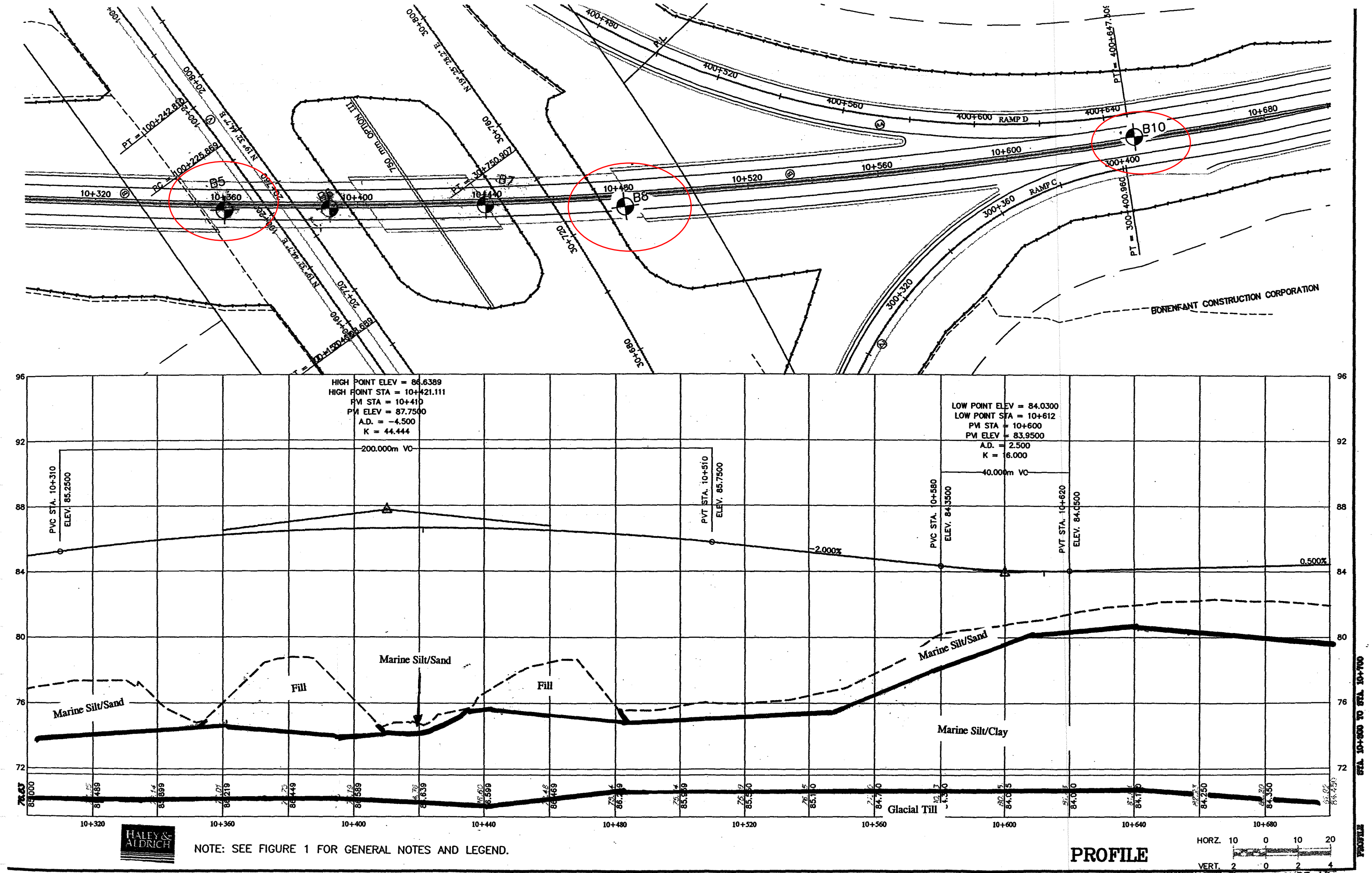
Marine Silt and Silty Clay – We anticipate that a significant volume of silt and silty clay will be excavated within the limits of the Contract No. 1 alignment. The clay is typically sensitive and susceptible to strength loss when disturbed. Therefore, we do not recommend the reuse of the clay directly beneath the roadway. The clay should only be allowed as fill outside the limits defined by 1:1 lines sloped outward and downward from the outer limits of the gravel subbase course layer. The clay will be difficult to place and compact if it is wet. It may be necessary to place alternating layers/lifts of clay then granular fill in order to create a stable embankment.

Glaciofluvial – We anticipate that excavated Glaciofluvial deposits (sand and gravel) may be reused as granular borrow in accordance with MDOT Standard Specifications, Section 703.19, Granular Borrow, Material for Embankment Construction. Glaciofluvial deposits should also be suitable as common borrow.

Glacial Till – Glacial Till should be suitable for reuse as common borrow in accordance with MDOT Standard Specifications, Section 703.18, Common Borrow. Contractors should expect that prior to placement and compaction it may be necessary to spread out and dry portions of the Glacial Till that are excessively moist. We recommend that the contract documents include moisture conditioning activities as part of the project earthwork requirements.

Bedrock – We anticipate that excavated bedrock may be reused on the project as riprap or processed for crushed stone or gravel for use as slope protection, rock borrow or drainage layers.

The accumulation of construction debris located in the vicinity of Station 12+640 was investigated by MDOT and the results of that investigation will be reported by the


B5
B6
B7
B8
B10
10+320
10+360
10+400
10+440
10+480
10+520
10+560
10+600
10+640
10+680
300+320
300+360
300+400
400+480
400+520
400+560
400+600
400+640
RAMP D
RAMP C
750 mm OPTION III
PT = 100+242.869
RC = 100+225.869
PT = 300+750.907
PT = 400+647.305
PT = 300+400.986
N 19° 32' 44.7" E
N 19° 25' 28.3" E
BONENFANT CONSTRUCTION CORPORATION
HIGH POINT ELEV = 86.6389
HIGH POINT STA = 10+421.111
PVI STA = 10+410
PVI ELEV = 87.7500
A.D. = -4.500
K = 44.444
200.000m VC
PVC STA. 10+310
ELEV. 85.2500
PVT STA. 10+510
ELEV. 85.7500
-2.000%
LOW POINT ELEV = 84.0300
LOW POINT STA = 10+612
PVI STA = 10+600
PVI ELEV = 83.9500
A.D. = 2.500
K = 16.000
40.000m VC
PVC STA. 10+580
ELEV. 84.3500
PVT STA. 10+620
ELEV. 84.0500
0.500%
Marine Silt/Sand
Fill
Marine Silt/Sand
Fill
Marine Silt/Sand
Marine Silt/Clay
Glacial Till
96
92
88
84
80
76
72
76.63
HALEY & ALDRICH
NOTE: SEE FIGURE 1 FOR GENERAL NOTES AND LEGEND.
PROFILE
HORZ. 10 0 10 20
VERT. 2 0 2 4
AUGUSTA (REV. 8)
FIGURE 10

HALEY & ALDRICH	South Portland, Maine	TEST BORING REPORT	BORING NO. B5

PROJECT: Kennebec River Crossing Project
LOCATION: Augusta, Maine
CLIENT: Maine Dept. of Transportation CONTRACTOR: Maine Test Borings, Inc.

FILE NO. 80765-000
SHEET NO. 1 OF 3
LOCATION Sta. 0+360, CL

ITEM	CASING	DRIVE SAMPLER	CORE BARREL	DRILLING EQUIPMENT & PROCEDURES
TYPE	HW	SS	NX	RIG TYPE Mobil B53 Bombardier
INSIDE DIAMETER (CM)	10	3	5	BIT TYPE Roller bit
HAMMER WEIGHT (KG)	136	64	-	DRILL MUD
HAMMER FALL (CM)	61	76	-	OTHER - Solid stem auger 0-1.52m.; NW Casing from 7.22-10.49m.

ELEVATION 75.90
DATUM NGVD
START 17 May 2000
FINISH 17 May 2000
DRILLER M. Porter
H&A REP S. Wiercinski

DEPTH (M)	CASING BLOWS PER 0.30M	SAMPLER BLOWS PER 0.15M	SAMPLE NUMBER & REC. (CM)	SAMPLE DEPTH (M)	ELEV./ DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
0.0		1	S1	0.00	75.77	Loose, dark brown loamy fine sandy SILT, trace roots
		2	38	0.61	0.12	-TOPSOIL-
		4				Loose, brown silty fine SAND
		4				-FILL-
1.0					74.52	
					1.37	Medium stiff, gray clayey SILT
	12	4	S2	1.52	74.34	Stiff, gray-brown mottled clayey SILT, frequent fine sand partings
		5	41	2.13	1.55	
		10				
2.0	19	11				-MARINE DEPOSIT-
	27					
3.0	14	4	S3	3.05		Medium stiff, gray-brown finely stratified clayey SILT and silty CLAY layers, occasional fine sand partings
		3	61	3.66		
	12	3				
		2				-MARINE DEPOSIT-
	14					
4.0	14					
	14					
	22	PUSH	U1	4.57		Medium stiff to stiff, gray silty CLAY, trace fine sand
			61	5.18		
5.0	14					
	17					
	18					
					69.95	
6.0	109				5.94	Very stiff, gray silty CLAY, little coarse to fine angular gravel, trace coarse to fine sand with occasional fine sand partings
	17	14	S4	6.10		
		13	41	6.71		
	45	13				-GLACIAL TILL-
		33				
	94					
7.0	265				68.67	
					7.22	Note: Cored through boulder, then continued boring with 8cm. casing
	207/.3				68.34	

SEE BORING LOG SHEETS IN THE 16313.10 PLAN SET FOR ALL ELEVATION AND UNIT CONVERSIONS FOR ALL OF THE FOLLOWING BORING LOGS.

WATER LEVEL DATA

DATE	TIME	ELAPSED TIME (HR)	DEPTH (M) TO: BOTTOM OF CASING	BOTTOM OF HOLE	WATER
5/17/00	0709	0.2		1.52	0.79
5/17/00	1740	10.5	10.58	13.90	0.61
5/17/00	1811	11.0	0.00	7.77	0.61

SAMPLE IDENTIFICATION

O OPEN END ROD
T THIN WALL TUBE
U UNDISTURBED SAMPLE
S SPLIT SPOON

SUMMARY

OVERBURDEN (M)	10.49
ROCK CORED (M)	3.23
SAMPLES	4S, 1U, 3C

H&A METRIC LOG

M_PORHA 80765-000

HALEY & ALDRICH	South Portland, Maine	TEST BORING REPORT	BORING NO. B5 FILE NO. 80765-000 SHEET NO. 2 OF 3

DEPTH (M)	CASING BLOWS PER 0.30M	SAMPLER BLOWS PER 0.15M	SAMPLE NUMBER & REC. (CM)	SAMPLE DEPTH (M)	ELEV./ DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
					7.56	Note: Advanced roller bit to 9.14m. Washed through many cobbles and boulders and advanced casing to 9.14m.
	-					
8.0	-					
	44					
	32					
9.0	34					
	7	31 35 36	S5 18	9.14 9.60		Very dense, brown gravelly coarse to fine SAND, trace silt
	27					-GLACIAL TILL-
10.0	64					
	36					
	115/.7				65.41 10.49	Top of Bedrock at 10.49m. See Core Boring Report

H&A	METRIC LOG

M_PORHA 80765-000

HALEY & ALDRICH	South Portland, Maine	CORE BORING REPORT	BORING NO. B5 FILE NO. 80765-000 SHEET NO. 3 OF 3

DEPTH (M)	DRILLING RATE MIN./0.30M	RUN NO.	DEPTH (M)	RECOVERY/RQD M	RECOVERY/RQD %	WEATHERING	ELEV./DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
								Top of Bedrock at 10.49m. Advanced roller bit to 10.67 Begin NX rock core
10.0							65.4 10.5	
	1.5	C1	10.7 11.7	1.1 0.5	100 43	Fr.-Mod.		C1: Very hard to hard freshly to moderately weathered white to gray fine grained GRANITE. Primary joint set is low angle, extremely close to moderate, rough, undulating, discolored, open. Secondary joint set is high angle, extremely close to moderate, rough, stepped and undulating, tight, discolored.
11.0	1							
	1							
	2	C2	11.7 12.4	0.7 0.5	100 71	Fr.-Mod.		C2: Very hard to hard freshly to moderately weathered white to gray fine grained GRANITE. Primary joint set is high angle and low angle, very close to wide, rough, undulating, tight to open, discolored.
12.0	1							
	2	C3	12.4 13.9	1.5 1.3	100 86	Fr.-Sl.		C3: Very hard to hard freshly to moderately weathered white to gray fine grained GRANITE. Primary joint set is low angle, very close to moderate, rough, undulating, discolored, tight to open.
	2							
13.0	2							
	2							
	2							
	1						62.0 13.9	Bottom of Exploration at 13.90m.

METRIC

80765-000

HALEY & ALDRICH

South Portland, Maine

TEST BORING REPORT

BORING NO. **B8**

PROJECT: Kennebec River Crossing Project
LOCATION: Augusta, Maine
CLIENT: Maine Dept. of Transportation CONTRACTOR: Maine Test Borings, Inc.

FILE NO. 80765-000
SHEET NO. 1 OF 3
LOCATION Sta. 0+482, CL

ITEM	CASING	DRIVE SAMPLER	CORE BARREL	DRILLING EQUIPMENT & PROCEDURES
TYPE	HW	SS	NX	RIG TYPE Mobil B53 Bombardier
INSIDE DIAMETER (CM)	10	3	5	BIT TYPE Roller bit
HAMMER WEIGHT (KG)	136	64	-	DRILL MUD
HAMMER FALL (CM)	61	76	-	OTHER - Solid stem auger 0-1.52m.

ELEVATION 75.59
DATUM NGVD
START 19 May 2000
FINISH 19 May 2000
DRILLER M. Porter
H&A REP S. Wiercinski

DEPTH (M)	CASING BLOWS PER 0.30M	SAMPLER BLOWS PER 0.15M	SAMPLE NUMBER & REC. (CM)	SAMPLE DEPTH (M)	ELEV./ DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
0.0					75.50	Water
		1	S1	0.09	0.09	Very loose, dark brown fine sandy SILT, roots
		1	41	0.70	75.32	
		3			0.27	
		4			74.89	-TOPSOIL-
					0.70	Loose, brown to gray silty fine SAND
1.0						-MARINE DEPOSIT-
	12	4	S2	1.52		Stiff, brown mottled clayey SILT, frequent fine sand partings and layers
		5	61	2.13		
2.0	15	6				
		7			73.30	
	9				2.29	
	9					
	10					
3.0	16	Push	U1	3.05		Medium stiff to stiff, gray silty CLAY
			61	3.66		-MARINE DEPOSIT-
	15					
	17					
4.0	16					
	12					
	53	WOH	S3	4.57	70.81	Medium stiff to stiff, gray silty CLAY
		12	38	5.18	4.79	Dense, gray silty coarse to fine SAND, little gravel, trace clay
5.0	218	31				
		44				-GLACIAL TILL-
	99					
	95		C1	5.64		Cored through Glacial Till, cobbles and boulders from 5.64m. to 7.86m.
			84	6.64		
6.0	136					
			C2	6.64		
			46	7.47		
7.0						

WATER LEVEL DATA

DATE	TIME	ELAPSED TIME (HR)	DEPTH (M) TO: BOTTOM OF CASING	BOTTOM OF HOLE	WATER
5/19/00			5.49	10.00	0.00

SAMPLE IDENTIFICATION

O OPEN END ROD
T THIN WALL TUBE
U UNDISTURBED SAMPLE
S SPLIT SPOON

SUMMARY

OVERBURDEN (M)	7.86
ROCK CORED (M)	4.36
SAMPLES	3S,1U,4C

H&A **METRIC LOG**

NJ_PORHA 80765-000

HALEY & ALDRICH

South Portland, Maine

TEST BORING REPORT

BORING NO. B8
FILE NO. 80765-000
SHEET NO. 2 OF 3

DEPTH (M)	CASING BLOWS PER 0.30M	SAMPLER BLOWS PER 0.15M	SAMPLE NUMBER & REC. (CM)	SAMPLE DEPTH (M)	ELEV./ DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
			C3	7.47	67.73	
			56	7.86	7.86	Top of Bedrock at 7.86m. Advanced roller bit to 8.47m. See Core Boring Report

H6A METRIC LOG

M_PORHA 80765-000

HALEY & ALDRICH

South Portland, Maine

CORE BORING REPORT

BORING NO. B8
FILE NO. 80765-000
SHEET NO. 3 OF 3

DEPTH (M)	DRILLING RATE MIN./0.30M	RUN NO.	DEPTH (M)	RECOVERY/RQD M	RECOVERY/RQD %	WEATHERING	ELEV./DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
7.0								
								Top of Bedrock at 7.86m. Advanced roller bit to 8.47m. Begin NX rock core
	3						67.7 / 7.9	
8.0	2							
	3							
		C4	8.5 / 10.0	1.3 / 1.2	83 / 80			Very hard, fresh, gray fine grained GRANITE. Primary joint set is low angle, very close to moderate, rough, undulating and planar, fresh, open. No secondary joint set.
	2							
9.0	3							
	2							
	2							
	2						65.6 / 10.0	
								Bottom of Exploration at 10.0m.

METRIC

80765-000

HALEY & ALDRICH

South Portland, Maine

TEST BORING REPORT

BORING NO. **B10**

PROJECT: Kennebec River Crossing Project
LOCATION: Augusta, Maine
CLIENT: Maine Dept. of Transportation CONTRACTOR: Maine Test Borings, Inc.

FILE NO. 80765-000
SHEET NO. 1 OF 2
LOCATION Sta. 0+640, CL

ITEM	CASING	DRIVE SAMPLER	CORE BARREL	DRILLING EQUIPMENT & PROCEDURES
TYPE	HSA	SS		RIG TYPE Mobil B53 Bombardier
INSIDE DIAMETER (CM)	6	3		BIT TYPE
HAMMER WEIGHT (KG)		64	-	DRILL MUD
HAMMER FALL (CM)		76	-	OTHER - FV= Field vane shear test 5.1cm.x17.8cm.

ELEVATION 81.90
DATUM NGVD
START 22 May 2000
FINISH 22 May 2000
DRILLER M. Porter
H&A REP S. Wiercinski

DEPTH (M)	CASING BLOWS PER 0.30M	SAMPLER BLOWS PER 0.15M	SAMPLE NUMBER & REC. (CM)	SAMPLE DEPTH (M)	ELEV./ DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
0.0					81.69	Loose, dark brown fine sandy SILT, roots -TOPSOIL-
		1 2 2 2	S1 41	0.15 0.76	0.21	Loose, brown silty fine SAND -MARINE DEPOSIT-
1.0					80.83 1.07	
		3 4 7 7	S2 61	1.52 2.13		Stiff, brown-gray mottled clayey SILT
2.0						
3.0		3 4 7 7	S3 61	3.05 3.66		Stiff, brown-gray mottled clayey SILT
4.0						
		3 5 5 3	S4 61	4.57 5.18	76.96 4.94	Stiff, brown-gray mottled clayey SILT, ocasional fine sand partings -MARINE DEPOSIT-
5.0						Stiff, brown silty CLAY, finely stratified throughout
6.0		WOR WOH WOH 1	S5 61	6.10 6.71	75.77 6.13	Soft to medium stiff, brown silty CLAY, finely stratified throughout Soft to medium stiff, gray silty CLAY -MARINE DEPOSIT-
7.0						

WATER LEVEL DATA

DATE	TIME	ELAPSED TIME (HR)	DEPTH (M) TO: BOTTOM OF CASING	BOTTOM OF HOLE	WATER
5/22/00	1615	0.0	12.19	12.19	NE
5/22/00	1645	0.5		9.48	2.71

SAMPLE IDENTIFICATION

O OPEN END ROD
T THIN WALL TUBE
U UNDISTURBED SAMPLE
S SPLIT SPOON

SUMMARY

OVERBURDEN (M)	12.19
ROCK CORED (M)	
SAMPLES	8S

H&A **METRIC LOG**

M_PORHA 80765-000

HALEY & ALDRICH

South Portland, Maine

TEST BORING REPORT

BORING NO. B10
FILE NO. 80765-000
SHEET NO. 2 OF 2

DEPTH (M)	CASING BLOWS PER 0.30M	SAMPLER BLOWS PER 0.15M	SAMPLE NUMBER & REC. (CM)	SAMPLE DEPTH (M)	ELEV./ DEPTH (M)	VISUAL DESCRIPTION AND REMARKS
		WOR WOR WOR WOR	S6 61	7.62 8.23		Soft to medium stiff gray silty clay FV1: 7.62m.-7.83m. Su=17.7 KPa FV2: 7.83m.-8.05m. Su=47.8 KPa
8.0						
9.0						
		WOR WOH WOH 3	S7 61	9.14 9.75		Soft to medium stiff, gray silty CLAY, frequent fine sand partings -MARINE DEPOSIT-
10.0						
		WOR WOH 1 3	S8 61	10.67 11.28		Stiff gray silty CLAY, frequent fine sand partings FV3:10.7m.-10.9m. Su= 53.1 KPa FV4:10.9m.-11.1m. (couldn't turn vane)
11.0					70.62 11.28	Auger action indicates GLACIAL TILL DEPOSIT- gravelly coarse to fine SAND recovered from auger flights
12.0					69.71 12.19	Bottom of Exploration at 12.19m. Auger refusal

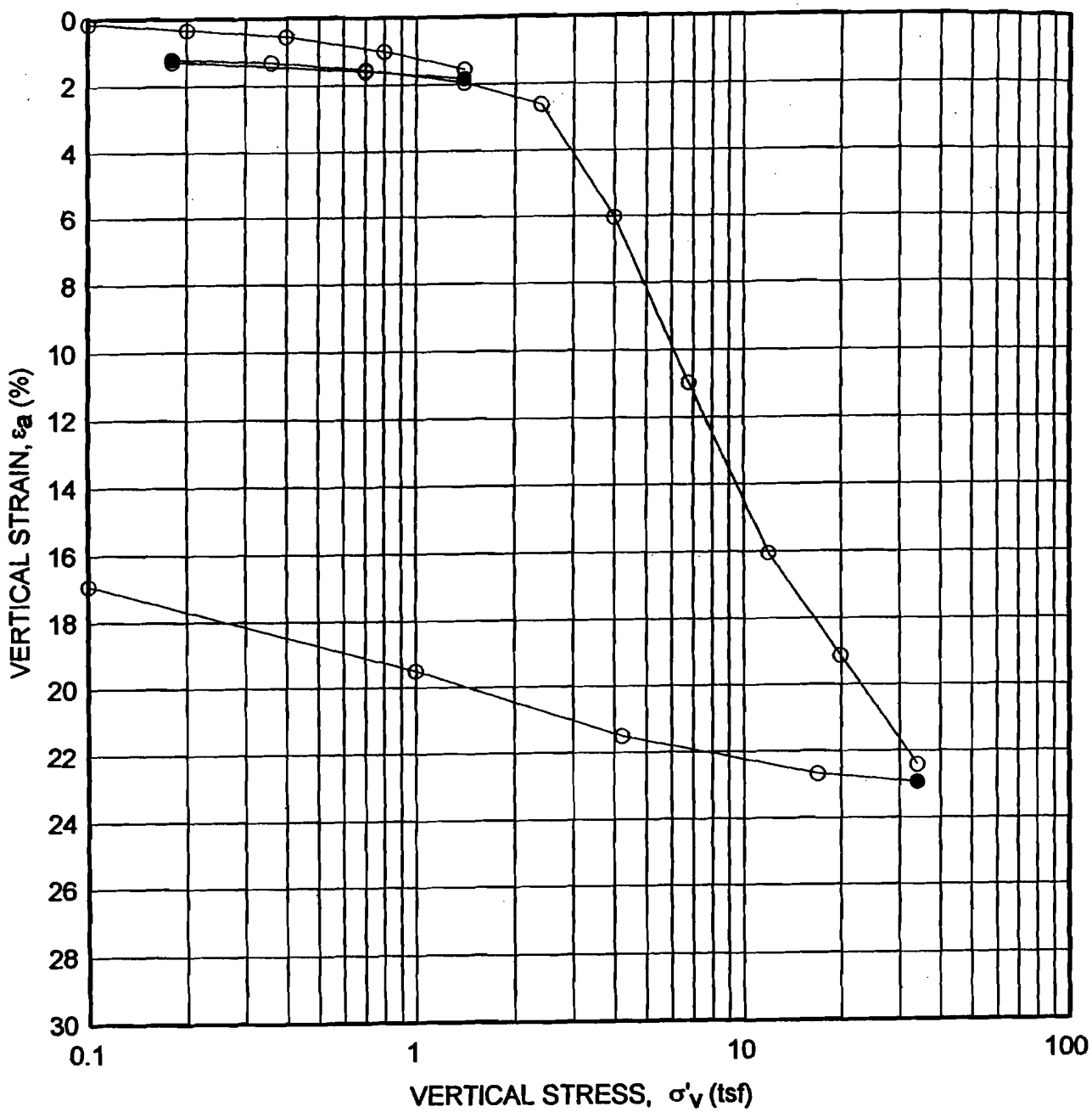
H&A METRIC LOG

M_PORHA 80765-000

GEOTECHNICAL LABORATORY SOIL TEST RESULTS - TUBE SAMPLES

Proposed Augusta Bypass Project
Augusta, ME

Test	Description	USCS	Depth (ft)	Test No.	Nat. Water Cont. (%)	Atterberg Limits (%) Liq. Limit Wl	Plas. Limit Wp	Plas. Index Ip	Index Value (tsf) Tor-vane	Shear Vane	Rem. Shear Vane	Pkt Pen. PP/2	Stress History Precons Press (tsf) / Test Qual	CR / RR	Total Unit Wt. (pcf)	Undr. Shear Str. cu (tsf)	Remarks
Boring:	**B05**																
Sample:	**U01**																
Depth (ft):	**15.0 to 17.0**																
Recovery (in.):	**24.25**																
Description	Stiff gray silty CLAY	CL	16.5														
Tube Extrusion			16.5		34.9				0.52			0.50			114.29		
Tube Extrusion			16.6		38.4				0.51			0.43					
Atterberg Limit			16.8		37.2	40.7	18.5	22.2									
Consolidation			16.8	OED001	38.9								2.6	0.140	114.60		
													Fair	0.007			
Tube Extrusion			16.9		33.8				0.50	0.43	0.12	0.37					
Boring:	**B08**																
Sample:	**U01**																
Depth (ft):	**10.0 to 12.0**																
Recovery (in.):	**23.75**																
Description	Medium stiff gray silty CLAY	CL	11.5														
Tube Extrusion			11.5		30.2				0.52			0.44			119.45		
Tube Extrusion			11.6		32.5				0.45			0.36					
Atterberg Limit			11.8		29.2	35.8	19.6	16.2									
Consolidation			11.8	OED002	34.0								2.1	0.129	119.00		
													Good	0.005			
Tube Extrusion			11.9		32.0				0.50	0.42	0.11	0.31					



Boring No.: B05
Sample No.: U01
Depth (ft): 16.75

Test No.: OED01

Atterberg Limits (%)

Wl: 40.7
Wp: 18.5
Ip: 22.2

Sample Description: Stiff gray silty CLAY

	Water Content (%)	Void Ratio, e
Initial:	38.8	1.178
Final:	28.6	0.824

Preconsolidation Pressure (tsf): 2.6
Compression Ratio, CR: 0.140
Recompression Ratio, RR: 0.007

6 July 2000 ; J:\OED\80765000\OED01\0770OD.WB2

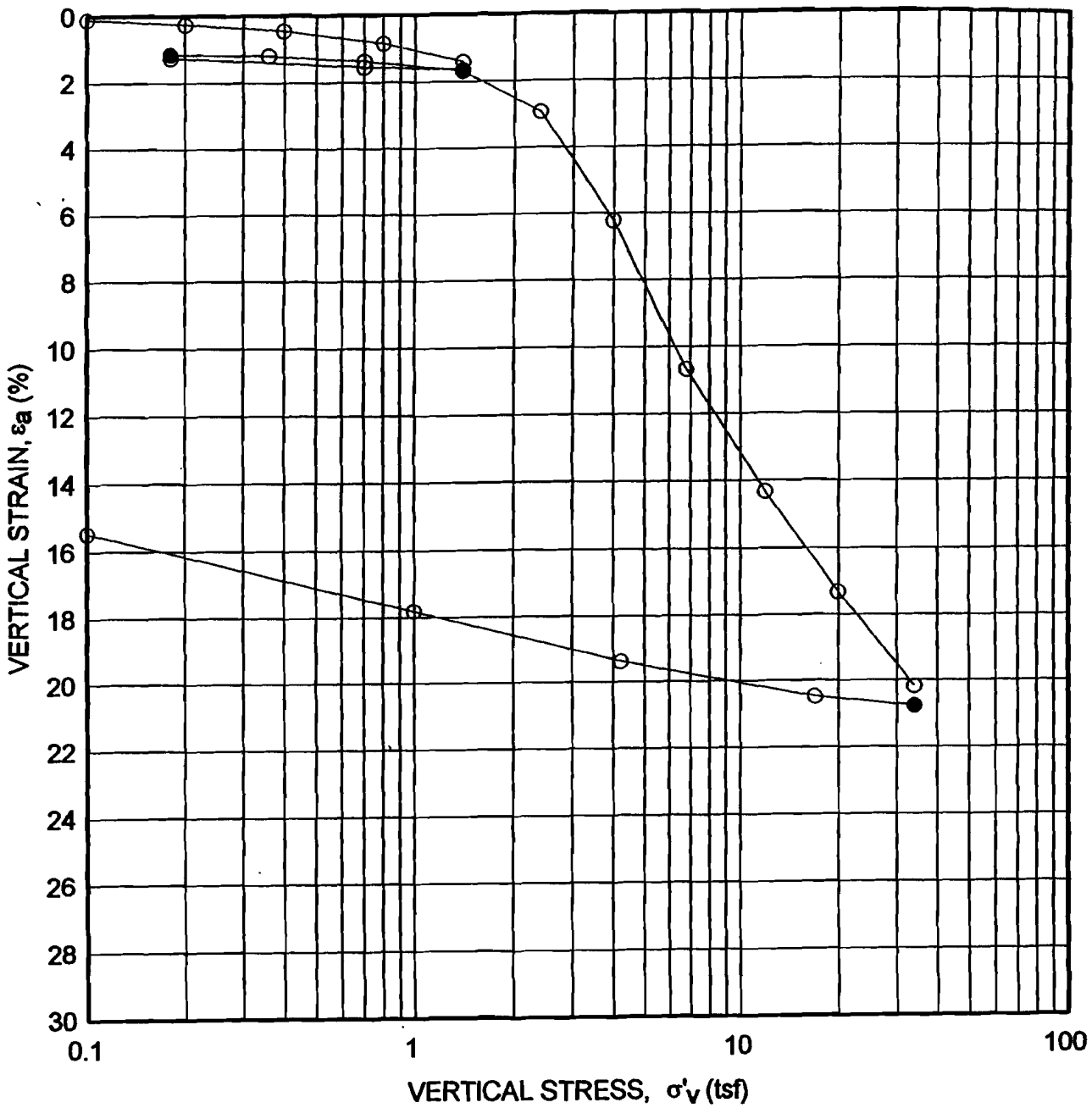
HALEY & ALDRICH, INC.

Augusta River Crossing Project
Augusta, Maine

CONSOLIDATION TEST

FILE NO. 80765-000

MAY, 2000



Boring No. : B08
Sample No. : U01
Depth (ft) : 11.75

Test No. : OED02

Atterberg Limits (%)

Wl : 35.8
Wp : 19.6
Ip : 16.2

Sample Description : Stiff to medium stiff gray silty CLAY

	Water Content (%)	Void Ratio, e
Initial :	34.0	1.044
Final :	25.5	0.741

Preconsolidation Pressure (tsf) : 2.1
Compression Ratio, CR : 0.129
Recompression Ratio, RR : 0.005

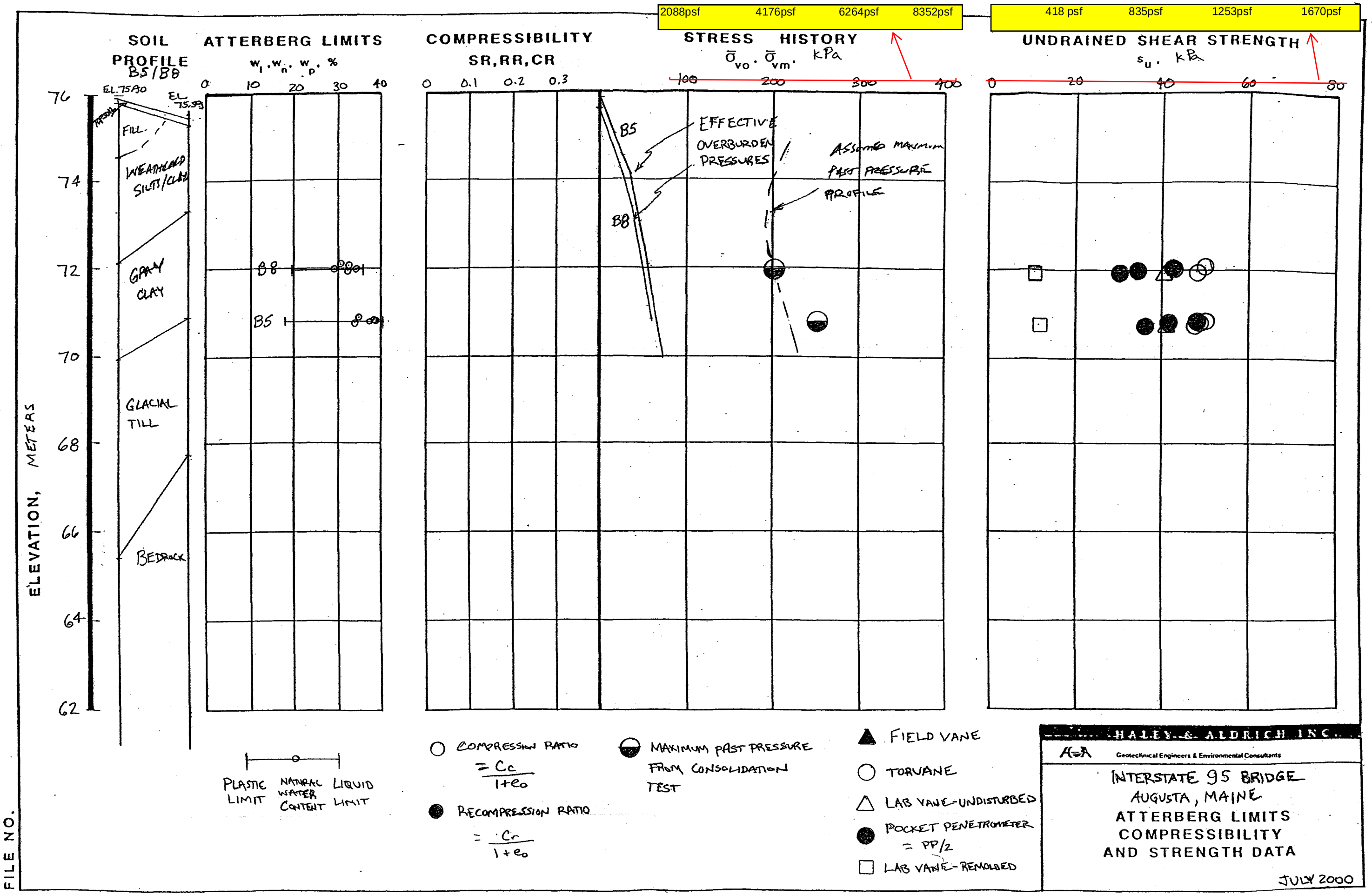
6 July 2000 ; J:\OED\80765000\OED02\0771OD.WB2

HALEY & ALDRICH, INC.

Augusta River Crossing Project
Augusta, Maine

CONSOLIDATION TEST

FILE NO. 80765-000 JUNE 2000


SOIL PROFILE
B5/B8
ATTERBERG LIMITS
w_l, w_n, w_p, %
COMPRESSIBILITY
SR, RR, CR
STRESS HISTORY
$\bar{\sigma}_{vo}, \bar{\sigma}_{vm}$, kPa
2088psf 4176psf 6264psf 8352psf
UNDRAINED SHEAR STRENGTH
s_u, kPa
418 psf 835psf 1253psf 1670psf
ELEVATION, METERS
76 74 72 70 68 66 64 62
EL. 75.80
EL. 75.93
FILL
WEATHERED SILTY CLAY
GRAY CLAY
GLACIAL TILL
BEDROCK
B8
B5
EFFECTIVE OVERBURDEN PRESSURES
ASSUMED MAXIMUM PAST PRESSURE PROFILE
PLASTIC LIMIT
NATURAL WATER CONTENT
LIQUID LIMIT
COMPRESSION RATIO $= \frac{C_c}{1+e_o}$
RECOMPRESSION RATIO $= \frac{C_r}{1+e_o}$
MAXIMUM PAST PRESSURE FROM CONSOLIDATION TEST
FIELD VANE
TORVANE
LAB VANE-UNDISTURBED
POCKET PENETROMETER $= PP/2$
LAB VANE-REMOLDED
HALEY & ALDRICH, INC.
Geotechnical Engineers & Environmental Consultants
INTERSTATE 95 BRIDGE
AUGUSTA, MAINE
ATTERBERG LIMITS
COMPRESSIBILITY
AND STRENGTH DATA
JULY 2000
FILE NO.