ROADWAY SUBGRADE INVESTIGATION REPORT SUM-77-0958L DESIGN BUILD AKRON, SUMMIT COUNTY, OHIO

S&ME Project No. 1179-14-011

Prepared for:
ODOT District 4
Akron, Ohio

Prepared by:
S&ME, Inc.
Cleveland, Ohio

October 1, 2014

October 1, 2014
1179-14-011

Mr. Thomas J. Powell, P.E.
ODOT District 4
2088 S. Arlington Road
Akron, Ohio 44306

Re: District 4 Geotechnical Services No. 2014-2
PID No. 90210
Agreement No. 18032
Task Order 04-4

Geotechnical Exploration
SUM-77-0958L Design Build
PID #98061
Summit County, Ohio

Dear Mr. Powell:

In accordance with our revised proposal dated June 5, 2014, and formal authorization by ODOT on June 25, 2014 (Encumbrance Number 726983), S&ME, Inc. (S&ME) has completed a roadway subgrade investigation and embankment and bridge widening borings for the SUM-77-0958L Design Build project in Summit County, Ohio. This report contains the information obtained from the borings as well as analyses and recommendations for design and construction of the roadway widening and remediation of the roadway subgrade. As requested by ODOT District 4, borings were performed but no recommendations were provided for the embankment widening or bridge widening. Preparation of soil plan and profile sheets was not authorized as a part of this task order.

We appreciate the opportunity to be of service. Please do not hesitate to contact our office if you have any questions concerning this report.

Respectfully submitted,
S&ME, Inc.

Kyle J. Dohlen, P.E.
Project Engineer

Eric A. Angyal, P.E.
Senior Reviewer

STATE OF OHIO
ERIC A. ANGYAL
61262
REGISTERED
PROFESSIONAL ENGINEER

Submitted: One (1) copy via email in pdf format

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1.0 INTRODUCTION

S&ME understands that ODOT District 4 (D-4) is requesting a geotechnical exploration for pavement replacement and widening of existing Ramp B-2 which connects northbound I.R. 77 with westbound I.R. 277 in Summit County, Ohio. The ramp includes an existing three-span, H-pile supported, fly-over bridge that will also be widened. Some widening may also occur along the west side of northbound I.R. 77, just south of the I.R. 277 bridge over I.R. 77, and on the north side of westbound I.R. 277 where Ramp B-2 connects to I.R. 277. Since this is a Design Build project, proposed regrading is currently unavailable for the project. The existing fly-over bridge deck is about 20 to 22 feet above southbound I.R. 77. There is currently about 20 to 36 feet of vertical grade change along the northwestern portion of the project alignment in an area where the existing embankment may need to be widened to the west into a wooded, low-lying area containing a creek. It is anticipated that little to no grade change will occur along northbound I.R. 77 to the south of I.R. 277. The project site is located in northern Summit County, Ohio. The approximate site location is provided on the Vicinity Map submitted as Plate 1 in Appendix A.

2.0 GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1 Geology

According to available resources, the project site is located within the Akron-Canton Interlobate Plateau region noted for numerous glacial remnant features. Areas containing thin to thick Wisconsinan-age glacial drift and sand deposits over Devonian to Pennsylvanian age shale, sandstone and conglomerates may also be encountered within the project limits and in the nearby vicinity. The Summit County Soil Survey (accessed through the Web Soil Survey website) information indicates that the near surface soils are identified by C.F. which is assumed to be either Construction Fill or Controlled Fill over the entire project area.

Topography maps indicate the existing ground surface elevation varies from about Elevation (El.) 1017 (MSL) to about El. 1048 (MSL) within project limits. Bedrock topography maps and a previous investigation performed by others indicate the uppermost bedrock may be encountered between El. 950 (MSL) and El. 1000 (MSL). Exposed bedrock was observed in the creek bed in the northwest portion of the site.

2.2 Site Reconnaissance

Site reconnaissance visits were made by S&ME personnel on May 23, June 3, June 14 and June 15, 2014, to observe the proposed project alignment and to field mark the borings and pavement core locations at the project site. The existing I.R. 77 ramp pavement is in fair condition, with many longitudinal and perpendicular cracks.

3.0 EXPLORATION

3.1 Available Information

S&ME was provided with a general description of the work to be performed and a hand-marked drawing identifying the proposed work areas during the preparation of our cost

proposal. These were received via email on May 16, 2014. Several other documents were also provided for preparation of the proposal, which also included the SUM-8-0932 Bridge Plan Set and the SUM-277-0.00 Plan Set.

3.2 Field Exploration

From July 21 through July 25, 2014, a total of seventeen (17) borings were performed to investigate the existing soils along the project alignment. The borings were performed to evaluate the existing subgrade of the I.R 77 ramp and to provide information for others to evaluate the global stability of the ramp embankment and to design foundations for the bridge widening. The borings were advanced to termination depths ranging from about 10.0 feet to 56.0 feet below the existing ground or pavement surface.

Boring B-001-0 through B-004-0 and B-007-0 through B-011 were advanced to evaluate the roadway subgrade. Two of the borings (Borings B-004-0 and B-007-0) along with Borings B-005-0 and B-006-0 were drilled to provide information for the proposed bridge widening. Borings B-003-1, B-007-1, B-008-1, B-009-1, B-009-2 and B-010-1 were drilled to assist with evaluating the global stability of the embankment widening along with seven (7) of the roadway subgrade borings.

In addition to the soil borings, pavement cores were performed at nine (9) locations to determine the thickness of the existing pavement sections and to help advance the borings through the pavements. The pavement cores were performed prior to soil sampling at each boring location using a portable generator powered coring machine. The pavement cores were performed with a 6-inch diameter diamond impregnated tip bit using water as a circulating/cooling fluid. The core bit was advanced through the pavement materials to the top of the existing aggregate base material. The pavement was temporarily filled with granular backfill after coring. The core holes after completion of drilling and sampling were backfilled with an equivalent thickness of asphalt and/or concrete patch that matched the surrounding pavement thickness. A table of pavement thicknesses obtained from the cores is included as Plate 28 in Appendix A.

S&ME field marked the seventeen (17) boring locations. Surveyed locations of all of the borings and cores were provided to S&ME by ODOT and the survey data has been included on the boring logs provided in Appendix A as Plates 5 through 27. These borings were performed in general accordance with the August 2013 update of the ODOT "*Specifications for Geotechnical Explorations*" (*SGE*). A Plan of Borings showing the locations of the borings is included as Plate 2 of Appendix A.

The borings were drilled with a truck or an ATV-mounted drill rig using 3-¼ I.D. hollow stem augers or 4-½-inch O.D. continuous flight augers. When bedrock was encountered in the four (4) structure borings a NQ2 rock core barrel was used to core the bedrock. Disturbed, but representative, samples were procured by lowering a 2-inch O.D. split-barrel sampler to the bottom of the boring and then driving the sampler into the soil with blows from a 140-pound hammer freely falling 30 inches (ASTM D 1586 – Standard Penetration Test, SPT). Bedrock was cored in four (4) borings of the seventeen (17) borings. Bedrock and SPT samples were examined immediately after recovery and representative portions were preserved in storage boxes or airtight glass jars, as

applicable. Six (6) feet of continuous SPT sampling was attempted beginning beneath the existing pavement section or at the existing ground surface in nine (9) of the borings used for pavement subgrade recommendations SPT samples were then obtained at 2.5-foot followed by 5-foot sampling intervals until auger refusal occurred or bedrock coring was attempted.

Upon completion of each boring, water levels and/or seepage observations were measured and the borings were backfilled and/or sealed in accordance with ODOT *SGE* requirements. As previously noted for all borings that were advanced through existing pavements, the pavement was repaired with an equal thickness of asphalt patch and/or quickset concrete.

In the field, experienced personnel performed observed the following specific duties: observed pavement coring operations performed by others; preserved all recovered samples; prepared a log of each boring and core; made seepage and groundwater observations; obtained hand-penetrometer measurements in soil samples exhibiting cohesion; and coordinated with the Project Engineer so that the program of explorations could be modified, if necessary, because of unanticipated conditions. All samples were transported to the laboratory of S&ME for further identification and testing.

3.3 Laboratory Testing Program

In the laboratory, all soil samples were visually identified and tested for natural moisture content, with liquid/plastic limit determinations, grain-size analyses and/or Loss-on-Ignition (LOI) tests being performed on selected samples from each boring. TEX-145-E sulfate tests were performed on nine (9) roadway subgrade samples by Advanced Analytics Laboratories, Inc. The results of laboratory index tests are recorded numerically on individual boring logs. The sulfate test results are included on the boring logs and on Plate 41 in Appendix A.

The bedrock cores were identified in the laboratory and seven (7) unconfined compressive strength tests were performed on portions of the cores. There are submitted as Plate 34 through 40 in Appendix A. Photos of the nine (9) retrieved asphalt cores are submitted as Plates 29 through 34 in Appendix A.

Based on the results of the laboratory testing program, soil and bedrock descriptions contained on the field logs of the borings were modified, as necessary, and laboratory-corrected boring logs are included as Plates 5 through 27 in Appendix A. Shown on these logs are: descriptions of the soil and rock stratigraphy encountered; depths from which samples were preserved; sampling efforts (blow-counts) required to obtain the specimens in the borings; calculated N_{60} values; laboratory testing results; seepage and groundwater observations; and, values of hand-penetrometer measurements made in soil samples exhibiting cohesion. For your reference, hand-penetrometer values are roughly equivalent to the unconfined compressive strength of the cohesive fraction of the soil sample. Percent recovery, RQD, and unconfined compression strength test results are shown for the bedrock cores.

Soils have been classified in general accordance with Section 603 of the ODOT *SGE*, and described in general accordance with Section 602. An explanation of the symbols and terms used on the boring logs, definitions of the special adjectives used to denote the minor soil components, and information pertaining to sampling and identification are presented on Plate 3 of Appendix A. Group Indices (ODOT Classification) determined from the results of the laboratory testing program are also provided on the boring logs. Plate 4 of Appendix A shows symbols and terms used for the bedrock cores.

4.0 EXPLORATION FINDINGS

Please refer to the boring logs, pavement core photographs, and summary table submitted in Appendix A for a summary of the pavement, soil, bedrock and groundwater/seepage conditions encountered at the boring locations. Inferences should not be made to the subsurface conditions in the areas between or away from the borings and cores without performance of additional borings or other field verification.

4.1 Existing Pavement Thicknesses and Surficial materials

Three (3) to seven (7) inches total of sod and topsoil were encountered at the ground surface at Boring B-001-0, B-003-1, B-005-0, B-007-1, B-008-1, B009-1, B-009-2, and B-010-1. The roadway pavements generally consisted of 3 to 9 inches of asphalt overlying 3 to 12 inches of granular base. In Borings B-003-0 and B-006-0, 8 to 8.5 inches of concrete was encountered between the asphalt and granular base layers. A summary of the pavement material encountered at each location is included in the Table of Pavement Thicknesses presented on Plate 28 in Appendix A as well as on the individual boring logs.

4.2 General Subsurface Conditions

Beginning beneath the pavement/base or topsoil layers, soils visually identified as fill were encountered in 14 of the borings and the fill generally consisting of stiff to hard SANDY SILT (A-4a), SILT (A-4b) and/or SILT AND CLAY (A-6a) with occasional medium-dense to very-dense GRAVEL WITH SAND (A-1-b) and/or COARSE AND FINE SAND (A-3a). Fill or possible fill soils were encountered to depths ranging from three (3) to 38 feet below existing grades.

Soils identified as being natural generally consisted of stiff to hard SANDY SILT (A-4a), SILT (A-4b) and/or SILT AND CLAY (A-6a) with occasional medium-dense to very-dense GRAVEL WITH SAND (A-1-b), GRAVEL WITH SAND AND SILT (A-2-4), FINE SAND (A-3) and/or COARSE AND FINE SAND (A-3a) to the boring termination depths, auger penetration refusal or until bedrock was encountered. Cobbles and/or boulders were encountered at various depths at many of the boring locations.

Bedrock was encountered in six (6) borings at depths ranging from 12.5 to 41 feet below existing grades. Four (4) additional borings are assumed to have encountered refusal in bedrock, however, no recovery was obtained in attempted samples to verify this assumption. Those four borings include B-007-1, B-008-0, B-008-1 and B-009. Borings that were extended into bedrock generally encountered either sandstone or sandstone interbedded with shale. Boring B-004-0 encountered a void in the bedrock during coring from 47 to 49 feet depth.

Seepage or groundwater was encountered during drilling in eight (8) borings ranging between 1.5 and 19.9 feet below existing grade. See the boring logs in Appendix A for additional notes regarding observed water levels in the borings.

5.0 ANALYSES AND RECOMMENDATIONS

5.1 Roadway Subgrade

5.1.1 Subgrade Support Parameters

The recommendations provided in this section are in accordance with the August 2013 update of the ODOT Office of Geotechnical Engineering (OGE) GB1 document and are for roadway areas where less than 3 feet of new fill will be required to attain the proposed subgrade level. The Subgrade Analysis table, submitted as Plate 1 in Appendix B of this report, was developed using the GB1 spreadsheet (Ver. 12.00, updated 12/30/11) distributed by (OGE), to summarize the soil type by ODOT/HRB classification, group indices, depth, SPT blow-counts, and Atterberg Limit values for the soils encountered in the nine (9) borings performed for this investigation to develop roadway recommendations.

The average California Bearing Ratio (CBR) is computed by the ODOT GB1 spreadsheet for the anticipated subgrade soils encountered in the roadway borings during this investigation. S&ME calculated the CBR values for the overall project area and for both of the ramps that will be involved in the widening. The results of the GB1 spreadsheets are included in the following table. S&ME recommends that the following CBR values, based on the GB1 spreadsheet output, be used for pavement design. Based on the provided CBR values and using equation 203.1 of Section 203.1 of the 2008 ODOT Pavement Design Manual, the following value of Resilient Modulus (M_R) should be used during new pavement section design for this project:

Alignment	CBR	Resilient Modulus (M_R), psi
Global	8	9,600
Ramp B	8	9,600
Ramp B2	9	10,800

These subgrade support values may be used during the pavement design for this project provided that the entire proposed pavement subgrade is prepared in strict accordance with Item 204 of the 2013 ODOT "*Construction and Materials Specifications"* (CMS) and that all borrow soil placed within 3 feet of the final subgrade level of a new fill embankment is capable of providing average subgrade support parameters which meet or exceed the above values.

5.1.2 Unsuitable Subgrade Materials

Silt (A-4b)

Soil samples which were classified as silt (A-4b) were encountered in Boring B-008 within the first sample of the boring and extended to a depth of 2.5 feet. According to the ODOT GB1 document, silt deposits should be removed to a depth of at least three (3) feet below the anticipate subgrade level and replaced with Item 204 embankment. Silt was also encountered at various depths in three (3) other borings on site, but not within three (3) feet of proposed subgrade. If, during construction, silt deposits are encountered within the project limits during earthwork or proof rolling operations, S&ME recommends that test pits or hand sampling methods be used to further investigate and delineate the extent and depth of the silt deposits so that they can be properly removed. According to GB1, if the embankment is chemically (cement) stabilized to a depth of 16 inches, the A-4b soils may not have to be removed.

Organic Soil (A-8a or A-8b)

No soil samples encountered within this investigation were classified as A-8a or A-8b. If soils identified as organic are encountered during construction, the ODOT GB1 document recommends that any organic A-8a or A-8b soils should be completely removed. If complete undercut and replacement is not feasible, a minimum undercut of 24 inches is permitted depending on the subgrade stability. The undercut soils should be replaced with properly compacted new fill in accordance with ODOT Item 204 Embankment.

Rock, Shale or Coal

No rock samples were encountered within the expected roadway profile in this investigation. Rock was encountered in the borings for the structure widening investigation for this project. At the time of this investigation the proposed roadway profile was unavailable to S&ME. However, GB1 states that if rock is encountered within 24 inches of the bottom of the pavement, it is to be removed according to Item 204.05 and replaced with Item 204 Embankment.

5.1.3 ODOT GB1 Subgrade Remediation Analyses and Recommendations

In accordance with Section C of the 2013 ODOT GB1, a comparison of the laboratory-measured moisture content with the estimated optimum moisture content of the subgrade soil is an indicator of the need for subgrade treatment, in addition to the classification of the soils encountered at and slightly below the anticipated subgrade elevation. However, Figure B of the GB1 document and the GB1 spreadsheet (made available by ODOT on their website) do not generally incorporate this moisture content comparison into the recommended undercuts or chemical stabilization treatment depths. To reduce the subgrade soil moisture content, GB1 recommends establishing drainage for new construction areas and re-establishing drainage in pavement rehabilitation areas. ODOT also recommends consideration be given to installing new underdrains in advance of or at the start of rehabilitation projects. According to the Subgrade Analysis spreadsheet in Appendix B, three (3) of the borings contained samples with the existing moisture contents of the subgrade soils exceeding the estimated optimum moisture contents by more than 3%.

GB1 specifies that the average of the lowest N_{60} value for each boring be used to select the method and depth of subgrade remediation. GB1 currently describes two acceptable options to remediate the soil subgrade: 1) undercutting; and, 2) chemical stabilization. The Subgrade Analysis spreadsheet in Appendix B summarizes the laboratory-measured moisture content for samples within each boring location with respect to the estimated optimum moisture contents, the lowest N_{60} value obtained from the Standard Penetration Tests performed at each boring and the depth of undercut/replacement recommended per GB1 guidelines. Based on the results from the GB1 spreadsheet, S&ME recommends that undercuts of the magnitude listed in Table 5-1 be used for cost estimating and plan design purposes.

Table 5-1 Local Stabilization Options

Alignment	Estimated Begin Station	Estimated End Station	Road	Undercut (Remove & Replace) Depth (in)	Cement Stabilization Depth (in)
I.R. 77	496+50	500+50	IR 77 NB Median	24	16
I.R. 77, Ramp B2	6+60	7+57**	IR 77 NB Ramp B2	27	16
I.R. 77, Ramp B2	10+95	12+82	IR 77 NB Ramp B2	30*	16
I.R. 77, Ramp B	20+58	22+57	IR 77 NB Ramp B	14	12

*A-4b (Silt) encountered. Either cement stabilize or undercut where within 36 inches of proposed subgrade.
Note: Areas requiring no stabilization per GB1 should be reworked to provide a stable subgrade in accordance with Item 204.

Estimate undercuts vary from 14 to 30 inches within the different portions of the alignment included in this investigation. Actual depths required to be undercut should be based on proof-roll tests completed in accordance with Item 204. Consideration could be given to the use of geogrid where undercutting depths are in excess of 12 inches or where shallow underground utilities may exist. Generally, 12 inches of reduction of undercutting depth may be achieved if geogrid is used. The GB1 document indicates that for undercuts greater than 16 inches, a geotextile fabric is to be placed at the base of the excavation, with the geogrid placed in the middle of the granular material. However, undercuts with geogrid should be no less than 12 inches deep. Geogrid cannot be used in the area of B-008 due to the A-4b soils.

The GB1 document also recommends that global stabilization be considered if more than 30% of the subgrade area will require stabilization. This approach should be considered as approximately 44% of the borings suggest the subgrade area requires stabilization. Based on information contained in the GB1 spreadsheet, the site has an average low SPT blowcount (N_{60L}) of 10.8 for the entire project site. Using the average project N_{60L} value, and considering the presence of A-4b soils, a global cement stabilization depth of 16 inches is recommended.

Regarding chemical stabilization, the ODOT GB1 document restricts the use of any kind of chemical stabilization in soils with sulfate contents greater than 3,000 ppm. No subgrade samples tested for this project had a sulfate content higher than 3,000 ppm in an area where the GB1 analysis indicated the need for stabilization, thus it appears that chemical stabilization (cement) may be used for global stabilization of the project alignment due to the range of plasticity indexes for the encountered soils.

If global stabilization is selected, localized areas may require additional depth of undercut and/or chemical stabilization. These areas should be identified during proof-rolling operations. While the average N_{60L} for the project is above the typical range generally assumed to benefit from the use of geogrid (i.e. N_{60L} of 6 or less), consideration could be given to the use of geogrid (where allowed) to reduce the depth of undercut required to stabilize the subgrade, as determined during proof-roll test results. Areas demonstrating rutting or squeezing should be undercut and replaced with approved Item 204 material. Throughout the entire project area final determination of the depth and limits of the undercut required will be determined based on the results of proof-rolling, it is recommended that undercut quantities deeper than that required for global stabilization be included in the construction documents as a contingency quantity.

6.0 FINAL CONSIDERATIONS

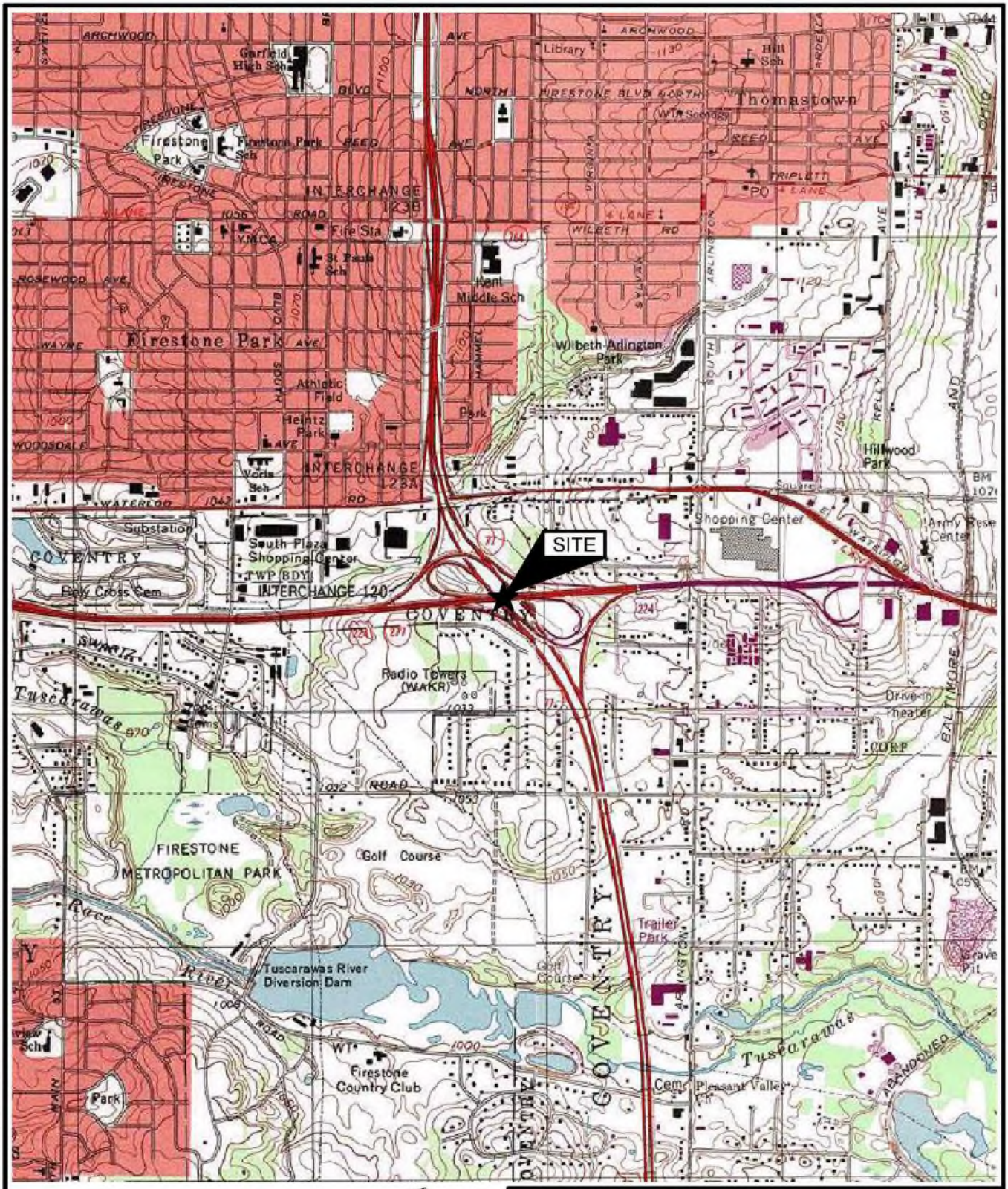
The recommendations submitted in this report are based on the available subsurface information obtained by S&ME and the project information provided by ODOT District 4. If deviations from the subsurface conditions noted in this report or any subsequent reports are encountered during construction, S&ME should be notified immediately to determine if changes to our recommendations are required. If S&ME is not notified of such changes, S&ME cannot be responsible for the impact of those changes on the project.

APPENDIX A

APPENDIX A

Plate No.

Appendix A General Project Information and Boring Logs



USGS Mapping:
Akron West, OH

0 2000 4000

SCALE IN FEET

VICINITY MAP

SUM-77-0958L WIDENING
AKRON, OHIO

Project: 1179-14-011	
Drawing Date: 9-4-2014	
Last Updated: 9-4-2014	
Drawn By: KJD	
Approved By: BKS	
Scale: GRAPHIC	1:1

S&ME
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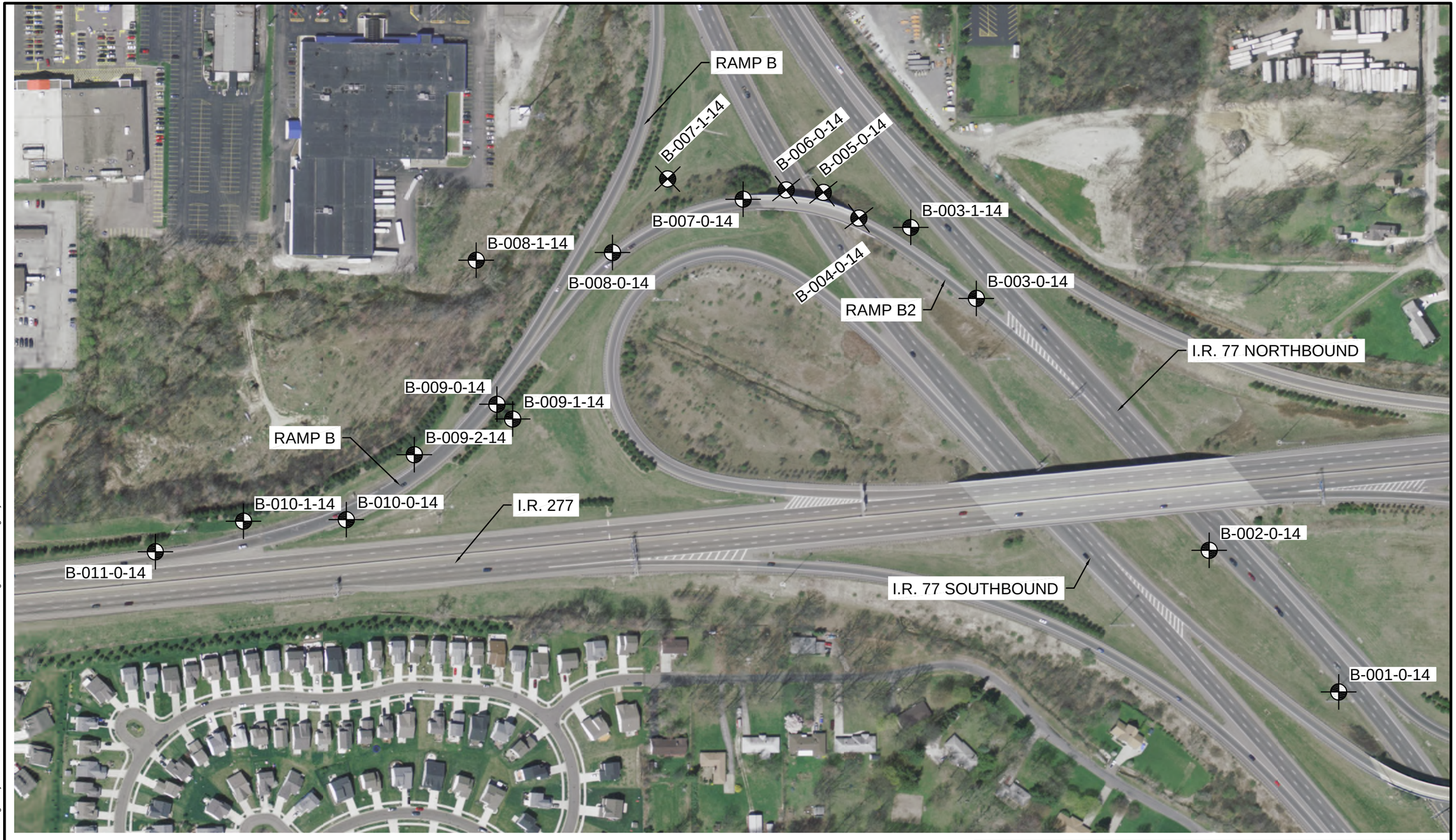
ENGINEERING FIRM. 03530

PLATE 1

Images: ~ n2240495.tif ~ TOPOImap_Akron_West.TIF
Xrefs:
File Last Updated: Sep 04, 2014
Plot Info: 9-4-2014 @ 10:29am By: kdahlen
S&ME Filename: Q:\DEPTS\CADD\Drawings\Projects - BST\20141179-14-011 - SUM-77-0958L Widening\PLANS\Proposed POB.dwg Layout: V-Map



0 200 400

SCALE IN FEET

LEGEND

B-001-0-14 BORING NUMBER AND LOCATION

PLAN OF BORINGS

SUM-77-0958L Widening
Summit County, Ohio

S&ME
WWW.SMEINC.COM

Project: 1179-14-011	Drawn By: KJD		
Drawing Date: 9-4-2014	Approved By: EAA		
Last Updated: 9-10-2014	Scale: GRAPHIC	1:1	ENGINEERING FIRM. 03530

PLATE 2

EXPLANATION OF SYMBOLS AND TERMS USED ON BORING LOGS FOR SAMPLING AND DESCRIPTION OF SOIL

SAMPLING DATA

 - Indicates sample was attempted within this depth interval.

2
3
5 - The number of blows required for each 6-inch increment of penetration of a "Standard" 2-inch O.D. split-barrel sampler, driven a distance of 18 inches by a 140-pound hammer freely falling 30 inches (SPT). The raw "blowcount" or "N" is equal to the sum of the second and third 6-inch increments of penetration.

N_{60} - Corrected Blowcount = [(Drill Rod Energy Ratio) / (0.60 Standard)] X N

SS - Split-barrel sampler, any size.

ST - Shelby tube sampler, 3″ O.D., hydraulically pushed.

R - Refusal of sampler in very-hard or dense soil, or on a resistant surface.

50-0.3′ - Number of blows (50) to drive a split-barrel sampler a certain distance (0.3 feet), other than the normal 6-inch increment.

DEPTH DATA

W - Depth of water or seepage encountered during drilling.

▼ AD - Depth to water in boring after drilling (AD) is terminated.

▼ 5 days - Depth to water in monitoring well or piezometer in boring a certain number of days (5) after termination of drilling.

TR - Depth to top of rock.

SOIL DESCRIPTIONS

Soils have been classified in general accordance with Section 603 of the most recent ODOT SGE, and described in general accordance with Section 602, including the use of special adjectives to designate approximate percentages of minor components as follows:

Adjective	Percent by Weight
trace	1 to 10
little	10 to 20
some	20 to 35
"and"	35 to 50

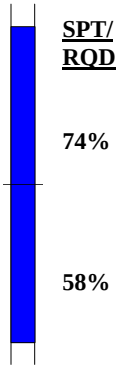
The following terms are used to describe density and consistency of soils:

Term (Granular Soils)	Blows per foot (N_{60})
Very-loose	Less than 5
Loose	5 to 10
Medium-dense	11 to 30
Dense	31 to 50
Very-dense	Over 50

Term (Cohesive Soils)	Qu (tsf)
Very-soft	Less than 0.25
Soft	0.25 to 0.5
Medium-stiff	0.5 to 1.0
Stiff	1.0 to 2.0
Very-stiff	2.0 to 4.0
Hard	Over 4.0

EXPLANATION OF SYMBOLS AND TERMS USED ON BORING LOGS FOR SAMPLING AND DESCRIPTION OF ROCK

SAMPLING DATA



When bedrock is encountered and rock core samples are attempted, the length of core recovered and lost during the core run is reported in the "REC" column. The type of rock core barrel utilized is recorded under the heading "Sampling Method" at the top of the boring log, and also in the "SAMPLE ID" column. Rock-core barrels can be of either single- or double-tube construction, and a special series of double-tube barrels, designated by the suffix M, may also be used to obtain maximum core recovery in very-soft or fractured rock. Four basic groups of barrels are used most often in subsurface investigations for engineering purposes, and these groups and the diameters of the cores obtained are as follows:

AX, AW, AXM, AWM	-	1-1/8 inches
BX, BW, BXM, BWM	-	1-5/8 inches
NX, NW, NXM, NWM	-	2-1/8 inches
NQ, NQ2	-	1-7/8 inches

Rock Quality Designation (RQD) is expressed as a percentage and is obtained by summing the total length of all core pieces which are at least 4 inches long and then dividing this sum by, either, the total length of core run or the length of the core run in a particular bedrock stratum. The RQD value is reported as a percentage in the "SPT/RQD" column. It has been found that there is a reasonably good relationship between the RQD value and the general quality of rock for engineering purposes. This relationship is shown as follows:

RQD - %	General Quality
0 - 25	Very-poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

ROCK HARDNESS

Recovered bedrock samples are described in general accordance with Section 605 of the 2007 ODOT SGE and subsequent revisions, where necessary. The following terms are used to describe rock hardness:

Term	Meaning
Very Weak	Rock can be excavated readily with the point of a pick and carved with a knife. Pieces 1 inch or greater in thickness can be broken by finger pressure. Can be scratched with a fingernail.
Weak	Rock can be grooved or gouged readily by a knife or pick, and can be excavated in small fragments with moderate blows from a pick point. Small, thin pieces may be broken with finger pressure.
Slightly Strong	Rock can be grooved or gouged 0.05 inches deep with firm pressure from a knife or pick point, and can be excavated in small chips to pieces of 1 inch maximum size using hard blows from the point of a geologist's pick.
Moderately Strong	Rock can be scratched with a knife or pick. Grooves or gouges to ¼ inch deep can be excavated by hard blows of a geologist's pick. Requires moderate hammer blows to detach a hand specimen.
Strong	Rock can be scratched with a knife or pick only with difficulty. Requires hard hammer blows to detach a hand specimen. Sharp and resistant edges are present on hand specimens.
Very Strong	Rock cannot be scratched by a knife or sharp pick. Breaking of hand specimens requires repeated hard blows of a geologist's hammer.
Extremely Strong	Rock cannot be scratched by a knife or sharp pick. Chipping of hand specimens requires repeated hard blows of a geologist's hammer.

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 494+47, 15.0 LT	EXPLORATION ID B-001-0-14
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: I.R. 77	
PID: 98061 BR ID: N/A	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 1031.2 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 7/21/14 END: 7/21/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.024237 N, 81.499717 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 1031.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL - 6 INCHES	1030.7																	
FILL: Very-stiff to hard brown mottled with gray **SANDY SILT**, little to some clay, trace to little fine gravel, contains few roots and few coal fragments, dry.	1027.2		6 9 11	25	67	SS-1	3.5-4.5+	13	9	22	33	23	26	16	10	12	A-4a (4)	
			8 9 12	27	100	SS-2	3.5-4.5+	8	8	25	39	20	23	16	7	14	A-4a (5)	
Very-stiff to hard brown becoming gray **SANDY SILT**, little clay, little fine to coarse gravel, damp.			4 5 5	13	94	SS-3	2.5-4.5+	-	-	-	-	-	-	-	-	17	A-4a (V)	
		AD	4 5 5	13	67	SS-4	3.5-4.5+	20	7	20	38	15	18	15	3	12	A-4a (4)	
		W																
	1021.2	EOB	3 5 6	14	100	SS-5	4.0-4.5+	-	-	-	-	-	-	-	-	9	A-4a (V)	

NOTES:
- Seepage encountered at 8.5' during drilling.
- After removal of augers, boring caved at 8.0' and water was measured at 6.5'.
- Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 399 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 5

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 498+45.4, 21.8 LT	EXPLORATION ID B-002-0-14
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: I.R. 77	
PID: 98061 BR ID: N/A	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 1035.2 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 7/21/14 END: 7/21/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.025052 N, 81.500678 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
GRAVEL - 12 INCHES	1035.2																	
	1034.2																	
FILL: Stiff to very-stiff brown **SANDY SILT**, little clay, little fine gravel, contains few roots and few coal fragments, damp.		W	2 3 3	8	67	SS-1	1.5-2.5	12	14	31	30	13	20	16	4	14	A-4a (2)	
	1031.2		2 2 3	6	100	SS-2	1.5-2.8	-	-	-	-	-	-	-	-	14	A-4a (V)	
Hard brown **SANDY SILT**, "and" fine to coarse gravel, little clay, contains few roots and few shale fragments, damp.			7 8 9	22	100	SS-3	4.0-4.5+	41	3	15	26	15	22	16	6	11	A-4a (1)	
	1028.2		9 12 32	56	100	SS-4	4.0-4.5+	-	-	-	-	-	-	-	-	13	A-4a (V)	
Very-stiff to hard gray **SILT AND CLAY**, some fine gravel, little fine to coarse sand, contains few silt seams, damp.																		
	1025.2	EOB	4 6 8	18	100	SS-5	3.5-4.5+	27	9	6	31	27	30	17	13	9	A-6a (6)	

NOTES:
- Seepage encountered at 1.5' during drilling.
- After removal of augers, boring caved at 8.5' and was observed to be dry.
- Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 71.0 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 9

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 4+66.1, 15.7 RT	EXPLORATION ID B-003-0-14
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: N/A	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 1043.8 (MSL) EOB: 15.0 ft.	PAGE 1 OF 1
START: 7/21/14 END: 7/21/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.026500 N, 81.502406 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	1043.8																	
ASPHALT - 5 7/8 INCHES	1043.3																	
CONCRETE - 8 1/2 INCHES	1042.6																	
GRANULAR BASE - 5 1/2 INCHES	1042.1																	
Very-stiff to hard brown mottled with gray **SILT AND CLAY**, "and" fine to coarse sand, little fine gravel, contains few decayed organic pockets (slightly organic) and few iron-stained pockets, damp. - Encountered possible cobbles at 4.0'. - Loss-on-Ignition for Sample SS-2 = 2.23%.	1038.8	1 2 3 4 5	3 6 8	18	67	SS-1	3.5-4.5+	11	8	30	31	20	25	14	11	12	A-6a (4)	
			6 7 9	20	100	SS-2	2.5-4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
Very-dense brown **COARSE AND FINE SAND**, some fine to coarse gravel, trace silt, trace clay, dry.	1037.3	6	8 34 17	65	100	SS-3		30	7	48	9	6	NP	NP	NP	6	A-3a (0)	
Dense brown **SANDY SILT**, little to some clay, little fine to coarse gravel, dry.	1035.3	7	7 16 20	46	67	SS-4		-	-	-	-	-	-	-	-	9	A-4a (V)	
Medium-dense brown **GRAVEL WITH SAND**, little silt, trace clay, contains few iron-stained pockets, dry.	1032.8	8 9	10 17 14	39	100	SS-5		46	7	27	12	8	NP	NP	NP	6	A-1-b (0)	
Very-stiff brown **SANDY SILT**, little fine gravel, trace clay, contains few silty clay seams, damp.	1028.8	10 11 12 13 14 15	18 9 11	25	100	SS-6		-	-	-	-	-	-	-	-	9	A-4a (V)	
		W EOB	5 8 5	16	67	SS-7	3.0-3.5	-	-	-	-	-	-	-	-	14	A-4a (V)	

NOTES:
- Seepage encountered at 14.5' during drilling.
- After removal of augers, boring caved at 13.0'.
- Encountered possible cobbles at 4.0'.
- Loss on Ignition for Sample SS-2 = 2.23%
- Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 94.4 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 7

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / B. SCHEIDERER	DRILL RIG: ATV D50 (AW)	STATION / OFFSET: 6+60.2, 51.4 RT	EXPLORATION ID B-003-1-14
TYPE: EMBANKMENT WIDENING	SAMPLING FIRM / LOGGER: S&ME / J. PENNELL	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/19/13	ELEVATION: 1039.8 (MSL) EOB: 30.0 ft.	PAGE 1 OF 2
START: 7/22/14 END: 7/22/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 41.026908 N, 81.502893 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 1039.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL - 3 INCHES	1039.5																	
FILL: Very-stiff dark brown **SILT AND CLAY**, some fine to coarse sand, some fine to coarse gravel, contains few roots and organic pockets, damp.	1037.3		2 2 6	10	44	SS-1	2.0-3.0	21	8	19	30	22	30	17	13	14	A-6a (5)	
Medium-dense to dense brown **GRAVEL WITH SAND**, trace to little clay, trace silt, damp. - Encountered possible cobbles at 2.5'.			10 16 12	36	67	SS-2		-	-	-	-	-	-	-	-	10	A-1-b (V)	
			6 10 14	31	56	SS-3		-	-	-	-	-	-	-	-	10	A-1-b (V)	
	1029.5	W	12 10 10	26	56	SS-4		44	7	31	8	10	NP	NP	NP	10	A-1-b (0)	
Stiff to hard gray and brown **SILT AND CLAY**, trace fine to coarse sand, trace fine gravel, contains few iron-stained pockets, few fine sand pockets, damp to moist.	1024.5		4 3 3	8	89	SS-5	1.0-3.0	-	-	-	-	-	-	-	-	19	A-6a (V)	
			3 7 9	21	78	SS-6	4.5+	5	3	6	35	51	33	18	15	16	A-6a (10)	
Stiff to very-stiff brown **SANDY SILT**, little clay, trace fine gravel, contains few iron-stained pockets, wet.	1017.9	W	4 3 4	9	67	SS-7	1.5-2.0	-	-	-	-	-	-	-	-	19	A-4a (V)	
			2 4 6	13	89	SS-8	1.3-2.5	10	6	21	46	17	20	18	2	19	A-4a (6)	
Medium-dense gray **COARSE AND FINE SAND**, little fine gravel, trace silt, trace clay, wet.	1012.3		3 6 8	18	33	SS-9		-	-	-	-	-	-	-	-	12	A-3a (V)	
Hard gray **SILT AND CLAY**, some fine to coarse sand, trace fine gravel, contains many shale fragments, dry.	1009.8	EOB	18 15 13	36	72	SS-10	4.5+	-	-	-	-	-	-	-	-	12	A-6a (V)	

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 8

PID: 98061	BR ID: N/A	PROJECT: SUM-77-0958L WIDENING	STATION / OFFSET: 6+60.2, 51.4 RT	START: 7/22/14	END: 7/22/14	PG 2 OF 2	**B-003-1-14**

MATERIAL DESCRIPTION AND NOTES	ELEV. 1009.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED

NOTES:
- Seepage encountered at 8.5' and 16.0' during drilling.
- After removal of augers, boring caved at 14.0' and was observed to be dry.
- Encountered possible cobbles at 2.5'.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS

PLATE 9

S&ME JOB: 1179-14-011

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 7+57.7, 17.1 RT	EXPLORATION ID B-004-0-14
TYPE: BRIDGE WIDENING	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: 7702671	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/19/13	ELEVATION: 1054.7 (MSL) EOB: 56.0 ft.	PAGE 1 OF 2
START: 7/21/14 END: 7/22/14	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 76	LAT / LONG: 41.026965 N, 81.503282 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 1054.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
ASPHALT - 5 1/2 INCHES	1054.2																	
GRANULAR BASE - 12 INCHES	1053.2																	
FILL: Very-stiff dark gray **SANDY SILT**, little to some clay, little fine gravel, slightly organic, contains few slag and coal fragments, moist.		1	1 2 3	6	33	SS-1	2.1-3.0	11	9	29	29	22	26	17	9	17	A-4a (3)	
- Loss-on-Ignition for Sample SS-1 = 2.87%.	1049.2	5	2 2 2	5	67	SS-2	2.5-3.0	14	9	27	31	19	23	15	8	14	A-4a (3)	
FILL: Medium-stiff gray and brown **SANDY SILT**, little clay, trace fine gravel, contains few organic pockets, moist.	1047.7	6	0 1 1	3	100	SS-3	0.6-1.0	-	-	-	-	-	-	-	-	20	A-4a (V)	
FILL: Medium-stiff to stiff brown **SANDY SILT**, little clay, little fine gravel, contains few slag and coal fragments, moist.		8	1 1 2	4	67	SS-4	0.7-1.0	12	9	30	29	20	24	16	8	15	A-4a (3)	
		9	0 1 1	3	33	SS-5	1.0-1.6	-	-	-	-	-	-	-	-	15	A-4a (V)	
- Gravel encountered at 11.5'.	1041.7	12	0 1 3	5	100	SS-6	1.0-1.5	-	-	-	-	-	-	-	-	17	A-4a (V)	
FILL: Very-stiff to hard brown **SANDY SILT**, little to some clay, little fine gravel, contains few sandstone and coal fragments, damp.	1039.2	14	9 13 23	46	67	SS-7	4.0-4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
Dense to very-dense brown **GRAVEL WITH SAND**, trace silt, trace clay, contains large broken gravel pieces, damp.		17	16 31 19	63	67	SS-8		44	7	35	8	6	NP	NP	NP	8	A-1-b (0)	
		19	30 18 13	39	67	SS-9		-	-	-	-	-	-	-	-	8	A-1-b (V)	
		22	14 20 10	38	67	SS-10		45	7	35	6	7	NP	NP	NP	9	A-1-b (0)	
- Becoming medium-dense at 23.0'.		24	10 8 4	15	67	SS-11		-	-	-	-	-	-	-	-	8	A-1-b (V)	
	1029.2																	
Hard gray **SILT AND CLAY**, some fine to coarse sand, dry.	1028.2	26	8	-	100	SS-12A	4.5	-	-	-	-	-	-	-	-	13	A-6a (V)	
Very-stiff to hard brown **SILT AND CLAY**, some fine to coarse sand, trace fine gravel, slightly organic, contains few gray silt pockets and few iron-stained pockets, damp.		27	12 12	30	50	SS-12B	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		29	6 10 15	32	100	SS-13	4.5+	5	4	17	42	32	29	16	13	13	A-6a (9)	

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 10

S&ME JOB: 1179-14-011

PID: 98061	BR ID: 7702671	PROJECT: SUM-77-0958L WIDENING	STATION / OFFSET: 7+57.7, 17.1 RT	START: 7/21/14	END: 7/22/14	PG 2 OF 2	**B-004-0-14**

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
Very-stiff to hard brown **SILT AND CLAY**, some fine to coarse sand, trace fine gravel, slightly organic, contains few gray silt pockets and few iron-stained pockets, damp. *(continued)*	1024.7	31–37																
	1016.7	38	4 8 8	20	100	SS-14	3.5-4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
Very-dense brown **GRAVEL WITH SAND**, possible highly weathered sandstone bedrock, moist.	1013.7	39–40	11 21 20	52	67	SS-15		-	-	-	-	-	-	-	-	12	A-1-b (V)	
SANDSTONE, light brown, slightly weathered, moderately strong, fine grained, very thickly bedded, 35 degree bedding angle, moderately fractured; RQD = 11%, LOSS = 57%.		TR 41–46	10		50	NQ2-16											Rock (V) CORE	
- Unconfined compression test on sample from 46.4' to 47.0' = 3,967 psi. - Encountered void from 47.0' to 49.0'.	1003.8	47–51	13		40	NQ2-17											Rock (V) CORE	
Interbedded **SANDSTONE** (77%) and **SHALE** (23%); RQD = 42%, LOSS = 1%; sandstone, gray, slightly weathered, moderately strong, very fine to fine, moderately fractured; shale gray, weathered, very weak, thinly bedded, arenaceous, fractured.		52–55	42		98	NQ2-18											Rock (V) CORE	
- Unconfined compression test on sample from 55.2' to 55.7' = 4,409 psi.	998.7	EOB 56																

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 24.5' and was observed to be dry.
- Encountered void during core run from 47.0' to 49.0'.
- Loss on Ignition for Sample SS-1 = 2.87%.
- Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 144 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PUMPED BENTONITE AND CEMENT GROUT MIXTURE; PLACED PLASTIC HOLE PLUG DEVICE

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINTW\PROJECTS\1179-14-011.GPJ

PLATE 11

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / B. SCHEIDERER	DRILL RIG: ATV D50 (AW)	STATION / OFFSET: 8+39.4, 44.4 RT	EXPLORATION ID B-005-0-14
TYPE: BRIDGE WIDENING	SAMPLING FIRM / LOGGER: S&ME / J. PENNELL	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: 7702671	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/19/13	ELEVATION: 1030.8 (MSL) EOB: 35.8 ft.	PAGE 1 OF 2
START: 7/22/14 END: 7/22/14	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 77	LAT / LONG: 41.027114 N, 81.503547 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL - 3 INCHES	1030.5																	
FILL: Hard brown **SANDY SILT**, some clay, little fine to coarse gravel, contains few roots, few glass fragments, few decayed organic pokcets, dry.	1027.9		3 10 12	28	72	SS-1	4.5+	19	9	26	25	21	24	16	8	11	A-4a (2)	
Stiff to very-stiff gray **SANDY SILT**, little clay, little fine gravel, moist.	1025.6		4 5 4	12	56	SS-2	1.0-2.5	13	7	33	31	16	20	15	5	15	A-4a (2)	
Very-stiff to hard brown mottled with gray **SILT AND CLAY**, some fine to coarse sand, trace fine to coarse gravel, contains many gray and orange silt pockets, few decayed organic pockets, few sand pockets, damp.	1020.8		2 2 5	9	89	SS-3	2.0-3.6	-	-	-	-	-	-	-	-	19	A-6a (V)	
			5 6 7	17	94	SS-4	3.0-4.5+	8	5	16	42	29	33	19	14	20	A-6a (9)	
Very-soft to medium-stiff brown **SANDY SILT**, some clay, trace fine gravel, damp to moist.	1017.8	W	3 5 9	18	33	SS-5	0.0-1.0	-	-	-	-	-	-	-	-	18	A-4a (V)	
Hard brown **SANDY SILT**, some clay, trace fine gravel, damp.	1015.1		3 6 10	21	100	SS-6	4.0-4.5+	4	6	23	46	21	21	18	3	17	A-4a (6)	
Dense to very-dense brown **GRAVEL WITH SAND**, trace silt, possible broken up sandstone bedrock, moist.	1005.0	W	13 20 13	42	78	SS-7		-	-	-	-	-	-	-	-	16	A-1-b (V)	
			15 49 37	110	89	SS-8		-	-	-	-	-	-	-	-	15	A-1-b (V)	
			34 24 18	54	78	SS-9		-	-	-	-	-	-	-	-	18	A-1-b (V)	
SANDSTONE, light brown, slightly weathered, moderately strong, very fine to coarse, very thickly bedded, conglomeritic, iron-stained, fractured to moderately fractured, RQD = 45%, LOSS = 4%.		TR	48		94	NQ2-10											Rock (V) CORE	

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 12

PID: 98061	BR ID: 7702671	PROJECT: SUM-77-0958L WIDENING	STATION / OFFSET: 8+39.4, 44.4 RT	START: 7/22/14	END: 7/22/14	PG 2 OF 2	**B-005-0-14**

MATERIAL DESCRIPTION AND NOTES	ELEV. 1000.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
SANDSTONE, light gray, unweathered, moderately strong, very fine to fine, very thickly bedded, iron-stained, fractured to slightly fractured, dark gray arenaceous shale and seam from 33.1 to 33.4; RQD = 70%, LOSS = 0%. - Unconfined compression test on sample from 33.8' to 34.4' = 5,439 psi.	1000.7	31 – 32 – 33 – 34 – 35	72		100	NQ2-11											Rock (V) CORE	
	995.0	EOB	38		100	NQ2-12											Rock (V) CORE	

NOTES:
- Seepage encountered at 11.0' during drilling.
- Groundwater encountered at 16.5' during drilling.
- After removal of augers, boring caved at 11.5'.
- Encountered auger penetration refusal at 25.8'.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE AND CEMENT GROUT MIXTURE

PLATE 13

S&ME JOB: 1179-14-011

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 9+10.4, 36.8 RT	EXPLORATION ID B-006-0-14
TYPE: BRIDGE WIDENING	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: 7702671	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/19/13	ELEVATION: 1036.1 (MSL) EOB: 36.8 ft.	PAGE 1 OF 2
START: 7/24/14 END: 7/24/14	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 76	LAT / LONG: 41.027130 N, 81.503826 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	1036.1																	
ASPHALT - 6 1/8 INCHES	1035.6																	
CONCRETE - 8 INCHES	1034.9																	
GRANULAR BASE - 3 INCHES	1034.6																	
FILL: Hard brown **SANDY SILT**, some fine to coarse gravel, little clay, contains few brick fragments and few black sand pockets, damp.			7 4 8	15	33	SS-1	4.0-4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
			4 9 8	22	100	SS-2	4.5+	23	9	26	25	17	24	14	10	10	A-4a (1)	
	1030.1																	
POSSIBLE FILL: Hard brown **SANDY SILT**, some clay, trace fine gravel, contains few iron-stained pockets, damp. - Encountered possible cobble at 6.0'.			5 9 15	30	67	SS-3		-	-	-	-	-	-	-	-	11	A-4a (V)	
	1026.6		6 9 23	-	100	SS-4A	4.5+	9	6	28	30	27	24	15	9	11	A-4a (4)	
Dense light brown **COARSE AND FINE SAND**, trace fine gravel, trace silt, trace clay, dry.	1025.1			41	100	SS-4B		-	-	-	-	-	-	-	-	8	A-3a (V)	
Very-stiff to hard gray becoming brown **SANDY SILT**, some clay, trace fine gravel, contains many gray silt pockets and few iron-stained pockets, damp to moist.			3 8 9	22	100	SS-5	4.5+	1	7	24	39	29	27	17	10	14	A-4a (7)	
		AD	2 6 9	19	100	SS-6	2.5-4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
	1020.1																	
Very-stiff to hard brown **SILT**, some clay, little fine to coarse sand, trace fine gravel, contains few iron-stained pockets and few gray and brown silty clay seams, damp to moist.			2 3 6	11	67	SS-7	3.0-3.5	-	-	-	-	-	-	-	-	20	A-4b (V)	
		W	2 4 7	14	100	SS-8	3.5-4.0	8	7	12	50	23	25	20	5	21	A-4b (8)	
			2 4 5	11	33	SS-9	4.5	-	-	-	-	-	-	-	-	17	A-4b (V)	
	1012.6																	
Stiff gray **SANDY SILT**, some clay, trace fine gravel, contains few fine sand seams, damp.		W	1 2 4	8	100	SS-10	1.0-2.0	-	-	-	-	-	-	-	-	14	A-4a (V)	
	1009.6																	
SANDSTONE, brown and pink severely weathered.	1009.4	TR	50-0.2'	-	100	SS-11		-	-	-	-	-	-	-	-	-	A-1-b (V)	
SANDSTONE, light brown interbedded with reddish-brown, unweathered, slightly strong, well cemented, very fine to fine, very thickly bedded, conglomeritic, fractured to moderately fractured, thin seam of coarse sand and fine gravel at 34.9'; RQD = 63%, LOSS = 2%			55		97	NQ2-12											Rock (V) CORE	

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 14

PID: 98061	BR ID: 7702671	PROJECT: SUM-77-0958L WIDENING	STATION / OFFSET: 9+10.4, 36.8 RT	START: 7/24/14	END: 7/24/14	PG 2 OF 2	**B-006-0-14**

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
- Unconfined compression test on sample from 27.4' to 27.9' = 3,252 psi. **SANDSTONE**, light brown interbedded with reddish-brown, unweathered, slightly strong, well cemented, very fine to fine, very thickly bedded, conglomeritic, fractured to moderately fractured, thin seam of coarse sand and fine gravel at 34.9'; RQD = 63%, LOSS = 2%. *(continued)* - Unconfined compression test on sample from 34.1' to 34.8' = 3,289 psi.	1006.1	31 32 33 34 35 36	70		100	NQ2-13											Rock (V) CORE	
	999.3	EOB																

NOTES:
- Seepage encountered at 24.0'.
- Groundwater encountered at 19.9' during drilling.
- After removal of augers water was measured at 14.8'.
- Encountered possible cobbles at 6.0'.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PUMPED BENTONITE AND CEMENT GROUT MIXTURE; PLACED PLASTIC HOLE PLUG DEVICE

PLATE 15

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 9+94.8, 17.2 RT	EXPLORATION ID B-007-0-14
TYPE: BRIDGE WIDENING	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: 7702671	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 2/19/13	ELEVATION: 1058.4 (MSL) EOB: 54.4 ft.	PAGE 1 OF 2
START: 7/22/14 END: 7/22/14	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 76	LAT / LONG: 41.027080 N, 81.504150 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
ASPHALT - 3 INCHES	1058.4																	
GRANULAR BASE - 9 INCHES	1058.1																	
FILL: Medium-dense brown **COARSE AND FINE SAND**, little silt, little clay, little fine gravel, contains few roots and few iron-stained pockets, damp.	1057.4	1																
		2	3 6 6	15	67	SS-1		13	11	46	17	13	NP	NP	NP	10	A-3a (0)	
FILL: Very-stiff to hard brown **SANDY SILT**, little clay, little fine to coarse gravel, contains few sand seams, damp.	1055.4	3	6 5 7	15	100	SS-2	3.5-4.5	-	-	-	-	-	-	-	-	12	A-4a (V)	
		4																
		5	2 3 7	13	67	SS-3	4.0-4.5+	18	7	33	25	17	23	14	9	11	A-4a (1)	
FILL: Very-stiff to hard brown **SILT AND CLAY**, some fine to coarse sand, little fine to coarse gravel, contains few iron-stained pockets and gray fine sand pockets, damp.	1052.4	6	6 5 6	14	100	SS-4	3.0-4.5	-	-	-	-	-	-	-	-	12	A-6a (V)	
		7																
		8																
		9	7 5 6	14	0	--		-	-	-	-	-	-	-	-	-		
		10			100	SS-5	2.0	-	-	-	-	-	-	-	-	12	A-6a (V)	
		11																
		12	3 4 5	11	33	SS-6	4.0-4.5+	14	8	23	31	24	28	16	12	13	A-6a (5)	
	1045.4	13																
FILL: Stiff to hard brown **SILT AND CLAY**, little fine to coarse sand, trace fine gravel, moist.		14	2 3 4	9	100	SS-7	2.6-4.5	-	-	-	-	-	-	-	-	13	A-6a (V)	
	1041.9	15																
		16	2 4 6	-	100	SS-8A	1.0-2.5 / 4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		17		13	100	SS-8B		-	-	-	-	-	-	-	-	14	A-4a (V)	
FILL: Very-stiff to hard brown **SANDY SILT**, little clay, little fine gravel, contains few roots, few silt pockets and fine sand seams, damp.		18																
		19	3 4 5	11	67	SS-9	2.5-4.5+	11	6	34	33	16	18	15	3	13	A-4a (3)	
		20																
		21																
		22	3 4 6	13	67	SS-10	2.0-3.5	-	-	-	-	-	-	-	-	13	A-4a (V)	
	1034.9	23																
FILL: Very-stiff to hard brown **SANDY SILT**, little clay, little fine gravel, contains few roots, few coal fragments, and few sandstone fragments, damp.		24	2 7 8	19	100	SS-11	3.5-4.0	-	-	-	-	-	-	-	-	12	A-4a (V)	
		25																
		26																
		27	7 9 11	25	67	SS-12	4.5+	13	6	28	33	20	22	15	7	12	A-4a (4)	
		28																
		29	3 5 8	16	67	SS-13	3.5-4.5+	-	-	-	-	-	-	-	-	14	A-4a (V)	

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 16

S&ME JOB: 1179-14-011

PID: 98061	BR ID: 7702671	PROJECT: SUM-77-0958L WIDENING	STATION / OFFSET: 9+94.8, 17.2 RT	START: 7/22/14	END: 7/22/14	PG 2 OF 2	**B-007-0-14**

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
FILL: Very-stiff to hard brown **SANDY SILT**, little clay, little fine gravel, contains few roots, few coal fragments, and few sandstone fragments, damp. *(continued)*	1028.4	31 32 33																
Hard dark-brown **SANDY SILT**, some clay, contains possible topsoil pockets, strong chemical odor, damp.	1024.9	34 35 36	6 10 13	29	33	SS-14	2.0-4.5+	-	-	-	-	-	-	-	-	8	A-4a (V)	
Very-stiff brown mottled with gray and orange **SANDY SILT**, little clay, trace fine gravel, contains many gray silt seams, moist.	1021.4	37 38 39 40	3 5 6	14	100	SS-15	2.5-3.0	3	4	24	49	20	23	17	6	19	A-4a (7)	
SANDSTONE, red and pink, severely weathered.	1017.4	TR 41 42 43 44	50-0.1'	-	100	SS-16		-	-	-	-	-	-	-	-	-	A-3a (V)	
SANDSTONE, reddish-brown, slightly weathered, slightly to moderately strong, well cemented, fine to coarse, very thickly bedded, fractured; RQD = 13%, LOSS = 23%. - Unconfined compression test on sample from 47.4' to 47.9' = 2,752 psi.	1014.0	45 46 47 48 49	10		93	NQ2-17											Rock (V) CORE	
- Unconfined compression test on sample from 49.4 to 49.8' = 3,766 psi. - Poorly cemented from 49.5' to 53.9' with some portions disintegrating to fine sand. - Vertical fracture from 50.2' to 50.6'.	1004.0	50 51 52 53 EOB 54	15		62	NQ2-18											Rock (V) CORE	

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 43.4'.
-Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 241 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PUMPED BENTONITE AND CEMENT GROUT MIXTURE; PLACED PLASTIC HOLE PLUG DEVICE

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 17

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / B. SCHEIDERER	DRILL RIG: ATV D50 (AW)	STATION / OFFSET: 11+23.8, 93.6 RT	EXPLORATION ID B-007-1-14
TYPE: EMBANKMENT WIDENING	SAMPLING FIRM / LOGGER: S&ME / J. PENNELL	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/19/13	ELEVATION: 1027.2 (MSL) EOB: 15.8 ft.	PAGE 1 OF 1
START: 7/22/14 END: 7/22/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 41.027201 N, 81.504716 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
	1027.2																	
TOPSOIL - 3 INCHES	1026.9																	
FILL: Very-stiff to hard brown **SANDY SILT**, some fine gravel, little clay, contains few roots and few coal fragments, damp.			5 6 8	18	61	SS-1	2.5-4.5+	25	9	27	23	16	21	15	6	12	A-4a (1)	
	1022.2		7 5 3	10	39	SS-2	3.5-4.5+	-	-	-	-	-	-	-	-	10	A-4a (V)	
Medium-dense brown **GRAVEL WITH SAND**, trace silt, trace clay, damp. - Encountered possible cobbles at 7.2'.	1018.5		3 5 13	23	61	SS-3		48	14	24	9	5	NP	NP	NP	9	A-1-b (0)	
Stiff to very-stiff brown **SANDY SILT**, some clay, some fine to coarse gravel, moist.	1017.2		3 6 8	18	33	SS-4	1.5-3.6	-	-	-	-	-	-	-	-	14	A-4a (V)	
Very-dense brown **GRAVEL WITH SAND AND SILT**, trace clay, damp.			6 18 48	85	100	SS-5		32	3	46	12	7	NP	NP	NP	8	A-2-4 (0)	
	1011.4		37 38 25	81	94	SS-6		-	-	-	-	-	-	-	-	9	A-2-4 (V)	
		EOB	50-0.1'	-	0	--		-	-	-	-	-	-	-	-	-		

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 6.5' and was observed to be dry.
- Encountered possible cobbles at 7.2'.
- Encountered auger penetration refusal at 15.8'.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 18

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 12+81.5, 17.4 RT	EXPLORATION ID B-008-0-14
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B2	
PID: 98061 BR ID: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/19/13	ELEVATION: 1052.7 (MSL) EOB: 40.0 ft.	PAGE 1 OF 2
START: 7/23/14 END: 7/23/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.026786 N, 81.505137 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
ASPHALT - 4 1/2 INCHES	1052.7																	
GRANULAR BASE - 7 INCHES	1052.3																	
FILL: Very-stiff brown **SILT**, some clay, some fine to coarse sand, trace fine gravel, contains few gray silt seams, damp.	1051.7	1	2 4 7	14	100	SS-1	2.0-3.0	3	4	19	51	23	26	17	9	22	A-4b (8)	
FILL: Dense brown **GRAVEL WITH SAND**, little silt, trace clay, damp.	1050.2	2																
FILL: Stiff brown **SANDY SILT**, some clay, trace fine gravel, contains few sand seams and few organic pockets, damp.	1048.7	3	15 20 12	41	100	SS-2		34	24	25	11	6	NP	NP	NP	8	A-1-b (0)	
FILL: Medium-dense brown **GRAVEL WITH SAND**, little clay, trace silt, damp.	1047.2	4	2 7 8	19	67	SS-3	1.0-2.0	-	-	-	-	-	-	-	-	15	A-4a (V)	
	1044.7	5																
FILL: Very-stiff to hard brown **SILT**, some clay, little fine to coarse sand, trace fine gravel, contains few roots, damp.		6	8 7 7	18	67	SS-4		-	-	-	-	-	-	-	-	12	A-1-b (V)	
		7																
		8																
		9	1 1 6	9	33	SS-5	4.5+	-	-	-	-	-	-	-	-	13	A-4b (V)	
		10																
		11																
		12	3 5 9	18	100	SS-6	4.0-4.5+	2	4	16	54	24	25	19	6	16	A-4b (8)	
	1039.7	13																
FILL: Hard brown **SANDY SILT**, little to some clay, little fine gravel, contains few fine sand seams and few gray silt seams, few very-stiff zones, damp.		14	10 11 14	32	100	SS-7	4.5+	-	-	-	-	-	-	-	-	11	A-4a (V)	
		15																
		16																
		17	6 6 11	22	100	SS-8	4.5+	12	10	29	29	20	25	15	10	13	A-4a (3)	
		18																
		19	4 6 11	22	100	SS-9	2.5-4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
		20																
		21																
		22	3 5 8	16	67	SS-10	4.0-4.5+	13	8	26	32	21	23	14	9	11	A-4a (4)	
	1029.7	23																
FILL: Very-stiff to hard brown becoming dark brown **SANDY SILT**, some clay, trace fine gravel, contains few coal fragments and few slag fragments, damp.		24	3 6 9	19	67	SS-11	4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
		25																
		26																
		27																
		28																
- Loss-on-Ignition for Sample SS-12 = 3.41%.		29	6 7 8	19	67	SS-12	3.5-4.5+	-	-	-	-	-	-	-	-	13	A-4a (V)	

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:53 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 19

S&ME

PID: 98061	BR ID: N/A	PROJECT: SUM-77-0958L WIDENING	STATION / OFFSET: 12+81.5, 17.4 RT	START: 7/23/14	END: 7/23/14	PG 2 OF 2	**B-008-0-14**

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
FILL: Very-stiff to hard brown becoming dark brown **SANDY SILT**, some clay, trace fine gravel, contains few coal fragments and few slag fragments, damp. *(continued)*	1022.7	31 32 33																
FILL: Stiff to very-stiff brown **SANDY SILT**, little clay, little fine gravel, contains few slag, wood and brick fragments, damp.	1019.2	34 35 36 37	3 4 4	10	67	SS-13	1.5-2.5	13	9	24	37	17	30	22	8	20	A-4a (4)	
Very-dense brown **GRAVEL WITH SAND**, possible sandstone bedrock or cobble.	1014.7	38 39	50-0.3'	-	100	SS-14		-	-	-	-	-	-	-	-	-	A-1-b (V)	
	1012.7	EOB 40																

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 37.5' and was observed to be dry.
- Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 285 ppm.
- Loss-on-Ignition for Sample SS-12 = 3.41%

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PUMPED BENTONITE AND CEMENT GROUT MIXTURE; PLACED PLASTIC HOLE PLUG DEVICE

PLATE 20

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 12+37.7, 171.1 RT	EXPLORATION ID B-008-1-14
TYPE: EMBANKMENT WIDENING	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B	
PID: 98061 BR ID: N/A	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 1015.9 (MSL) EOB: 13.5 ft.	PAGE 1 OF 1
START: 7/24/14 END: 7/24/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.026750 N, 81.506162 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL - 7 INCHES	1015.9																	
FILL: Very-stiff brown **SILT AND CLAY**, some fine to coarse sand, trace fine gravel, contains few iron-stained pockets and few gray silt pockets, damp.	1015.3		3 2 4	8	67	SS-1	2.5-4.0	7	8	24	37	24	30	16	14	16	A-6a (7)	
			2 2 3	6	67	SS-2	3.0-3.7	-	-	-	-	-	-	-	-	14	A-6a (V)	
FILL: Medium-dense brown **GRAVEL WITH SAND**, trace silt, trace clay, contains few glass fragments and few brick fragments, damp.	1010.4		7 7 8	19	100	SS-3		36	14	37	9	4	NP	NP	NP	6	A-1-b (0)	
Possible Fill: Medium-dense brown **COARSE AND FINE SAND**, some fine to coarse gravel, trace silt, trace clay, contains few organic pockets, moist.	1007.9		8 5 5	13	67	SS-4		30	15	42	9	4	NP	NP	NP	12	A-3a (0)	
Dense brown **GRAVEL WITH SAND**, little silt, little clay, wet.	1005.4	W	4 9 21	38	67	SS-5		-	-	-	-	-	-	-	-	17	A-1-b (V)	
	1002.4	EOB																

NOTES:
- Seepage encountered at 11' during drilling.
- After removal of augers, boring caved at 7.1' and was observed to be dry.
- Encountered auger penetration refusal at 13.5'.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:54 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 21

S&ME JOB: 1179-14-011

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 14+72.6, 28.2 LT	EXPLORATION ID B-009-0-14
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B	
PID: 98061 BR ID: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/19/13	ELEVATION: 1046.4 (MSL) EOB: 26.1 ft.	PAGE 1 OF 1
START: 7/24/14 END: 7/25/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.025929 N, 81.506019 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	1046.4																	
ASPHALT - 9 INCHES	1045.6																	
GRANULAR BASE - 9 INCHES	1044.9																	
FILL: Very-stiff to hard brown **SANDY SILT**, little to some clay, trace fine to coarse gravel, contains few coal, brick and siltstone fragments, few fine sand seams, few gray silt seams, damp.		1																
		2	2 5 16	27	100	SS-1	4.5+	10	8	24	39	19	23	16	7	11	A-4a (5)	
		3	7 16 21	47	100	SS-2	4.5+	-	-	-	-	-	-	-	-	8	A-4a (V)	
		4	14 12 12	30	67	SS-3	3.0-4.5+	3	5	25	46	21	22	16	6	11	A-4a (6)	
		5	6 4 4	10	0	SS		-	-	-	-	-	-	-	-	-		
		6	8	-	100	SS-4	3.0-4.5+/	-	-	-	-	-	-	-	-	15	A-4a (V)	
		7	4 5 10	19	100	SS-5	2.5-4.5+	-	-	-	-	-	-	-	-	16	A-4a (V)	
		8																
		9	3 4 7	14	100	SS-6	4.5+	10	4	20	46	20	22	17	5	13	A-4a (6)	
		10																
		11	7 10 12	28	100	SS-7	4.0-4.5	-	-	-	-	-	-	-	-	15	A-4a (V)	
	1030.9	12																
Medium-dense light brown **COARSE AND FINE SAND**, little fine to coarse gravel, little silt, trace clay, damp.		13	4 8 9	22	67	SS-8		15	11	54	12	8	NP	NP	NP	6	A-3a (0)	
	1028.4	14																
Hard brown **SANDY SILT** some clay, trace fine gravel, contains few iron-stained pockets, damp.	1026.9	15	3 6 8	18	100	SS-9	4.0-4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
Very-dense light brown **COARSE AND FINE SAND**, some fine to coarse gravel, trace silt, trace clay, damp.		16																
		17	8 18 25	54	67	SS-10		34	1	54	6	5	NP	NP	NP	4	A-3a (0)	
		18																
		19	7 22 30	66	67	SS-11		-	-	-	-	-	-	-	-	8	A-3a (V)	
	1020.4	20																
Very-dense brown **GRAVEL** (sandstone fragments) damp.	1020.3	EOB	50-0.1/	-	100	SS-12		-	-	-	-	-	-	-	-	-	A-1-a (V)	

NOTES:
- No seepage encountered during drilling.
- Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 374 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS WITH CEMENT

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:54 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\WPROJECTS\1179-14-011.GPJ

PLATE 22

S&ME JOB: 1179-14-011

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / B. SCHEIDERER	DRILL RIG: ATV D50 (AW)	STATION / OFFSET: 14+76.7, 72.8 LT	EXPLORATION ID B-009-1-14
TYPE: EMBANKMENT WIDENING	SAMPLING FIRM / LOGGER: S&ME / J. PENNELL	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B	
PID: 98061 BR ID: N/A	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 1035.3 (MSL) EOB: 15.0 ft.	PAGE 1 OF 1
START: 7/21/14 END: 7/21/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 41.025844 N, 81.505901 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 1035.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL - 3 INCHES	1035.0																	
Very-stiff to hard brown **SANDY SILT**, some clay, little fine gravel, contains few silt pockets and few iron-stained pockets, damp.		1	5 8 10	23	72	SS-1	4.5+	-	-	-	-	-	-	-	-	14	A-4a (V)	
		2																
		3																
		4	5 6 6	15	100	SS-2	2.5-4.0	11	8	20	40	21	23	17	6	15	A-4a (5)	
		5																
		6																
		7	5 8 7	19	67	SS-3	2.5-3.5	-	-	-	-	-	-	-	-	16	A-4a (V)	
	1027.5	8																
Medium-dense light gray **FINE SAND**, some fine to coarse gravel, trace silt, trace clay, dry.		9	8 12 7	24	67	SS-4		32	0	59	6	3	NP	NP	NP	9	A-3 (0)	
	1025.0	10																
Medium-dense brown **GRAVEL WITH SAND**, trace silt, trace clay, dry.		11	8 6 8	18	56	SS-5		-	-	-	-	-	-	-	-	6	A-1-b (V)	
	1022.8	12																
SANDSTONE, red, severely weathered.	TR	13																
		14	4 5 19	31	56	SS-6		50	1	42	4	3	NP	NP	NP	9	Visual (V)	
	1020.3	15	EOB															

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 7.8' and was observed to be dry.
- Encountered possible cobbles at 7.3'.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:54 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 23

S&ME JOB: 1179-14-011

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / B. SCHEIDERER	DRILL RIG: ATV D50 (AW)	STATION / OFFSET: 16+67.3, 23.0 RT	EXPLORATION ID B-009-2-14
TYPE: EMBANKMENT WIDENING	SAMPLING FIRM / LOGGER: S&ME / J. PENNELL	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B	
PID: 98061 BR ID: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/19/13	ELEVATION: 1039.8 (MSL) EOB: 18.2 ft.	PAGE 1 OF 1
START: 7/22/14 END: 7/22/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 41.025648 N, 81.506644 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
1039.8																		
TOPSOIL - 4 INCHES	1039.5																	
FILL: Very-stiff to hard brown **SANDY SILT**, some clay, little fine gravel, contains few gray and brown silt pockets, few roots, iron-stained pockets and slag fragments, dry to damp.		1	3 5 6	14	89	SS-1	4.5+	-	-	-	-	-	-	-	-	13	A-4a (V)	
		2																
		3																
		4	5 5 7	15	100	SS-2	3.0-4.5+	11	9	22	34	24	24	16	8	12	A-4a (5)	
		5																
		6	7 12 17	37	100	SS-3	4.5+	-	-	-	-	-	-	-	-	11	A-4a (V)	
	1031.8	7																
Hard brown **SANDY SILT**, little clay, little fine gravel, contains few silt pockets and few iron-stained pockets, damp.		8	7 17 19	46	100	SS-4	4.5+	-	-	-	-	-	-	-	-	11	A-4a (V)	
		9																
		10	12 12 17	37	100	SS-5	4.5+	14	8	28	30	20	22	14	8	10	A-4a (3)	
	1026.8	11																
Medium-dense brown **SILT**, little fine to coarse sand, little clay, trace fine gravel, contains few silty clay seams, dry to damp.		12	3 4 11	19	39	SS-6		-	-	-	-	-	-	-	-	8	A-4b (V)	
		13																
		14	4 6 9	19	44	SS-7		5	3	14	63	15	23	22	1	22	A-4b (8)	
	1022.1	15																
SANDSTONE	1021.6	TR 16																
		EOB 17																
		18	50-0.0"	-		--		-	-	-	-	-	-	-	-	-		

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 9.5' and was observed to be dry.
- Encountered auger penetration refusal at 18.2'.
- Depth to top of rock based on driller observation. Attempted sample at 18.2' with no recovery.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:54 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 24

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 18+58.3, 21.0 LT	EXPLORATION ID B-010-0-14
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B	
PID: 98061 BR ID: N/A	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 1040.5 (MSL) EOB: 19.6 ft.	PAGE 1 OF 1
START: 7/24/14 END: 7/24/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.025282 N, 81.507161 W	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
ASPHALT - 6 3/4 INCHES	1040.5																	
GRANULAR BASE - 9 INCHES	1039.9																	
FILL: Hard brown **SANDY SILT**, some clay, little fine gravel, contains few iron-stained pockets, damp.	1039.1	1																
		2	3 6 9	19	100	SS-1	4.5+	11	11	26	29	23	24	16	8	11	A-4a (3)	
		3																
		4	21 26 34	76	100	SS-2	4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
		5	26 26 26	66	100	SS-3	4.5+	12	10	24	31	23	24	15	9	11	A-4a (4)	
		6																
		7	8 14 16	38	100	SS-4	4.5+	-	-	-	-	-	-	-	-	10	A-4a (V)	
	1032.5	8																
FILL: Hard brown and gray **SANDY SILT**, some clay, little fine gravel, contains few coal fragments, damp.		9	10 11 11	28	67	SS-5	4.0-4.5+	-	-	-	-	-	-	-	-	11	A-4a (V)	
	1030.0	10																
Very-stiff hard brown **SANDY SILT**, little clay, little fine gravel, contains few iron-stained pockets, damp.		11																
		12	11 10 7	22	100	SS-6	3.0-4.5	11	13	38	23	15	17	14	3	8	A-4a (1)	
	1027.5	13																
Very-stiff gray **SANDY SILT**, some clay, little fine gravel, damp.		14	4 5 6	14	100	SS-7	2.0-4.0	-	-	-	-	-	-	-	-	13	A-4a (V)	
	1025.0	15																
Hard brown **SANDY SILT**, some clay, little fine gravel, contains few shale fragments and few iron-stained pockets, damp.		16																
		17	4 9 40	62	100	SS-8	4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
	1023.0	18																
Very-dense brown **SANDY SILT**, trace clay, trace fine gravel, damp.		19	30 36 50-0.1'	-	100	SS-9		8	5	42	36	9	NP	NP	NP	10	A-4a (2)	
	1020.9	EOB																

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 14.8' and was observed to be dry.
-Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 128 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS WITH CEMENT

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:54 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 25

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / B. SCHEIDERER	DRILL RIG: ATV D50 (AW)	STATION / OFFSET: 20+64, 39.1 RT	EXPLORATION ID B-010-1-14
TYPE: EMBANKMENT WIDENING	SAMPLING FIRM / LOGGER: S&ME / J. PENNELL	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP B	
PID: 98061 BR ID: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/19/13	ELEVATION: 1036.4 (MSL) EOB: 20.5 ft.	PAGE 1 OF 1
START: 7/22/14 END: 7/22/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 41.025280 N, 81.507933 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 1036.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL - 5 INCHES	1036.0																	
Hard brown **SILT AND CLAY,** some fine to coarse sand, trace fine gravel, contains few roots, few light brown silt pockets, and few iron-stained pockets, damp.			5 5 6	14	33	SS-1	4.0-4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
	1031.1		5 8 9	22	78	SS-2	4.5+	8	5	22	41	24	27	16	11	14	A-6a (6)	
Stiff to very-stiff brown **SILT AND CLAY**, little fine to coarse sand, trace fine gravel, contains few silt pockets, few iron-stained pockets, and few fine sand seams, damp to moist.			7 7 7	18	0	--		-	-	-	-	-	-	-	-	-		
			9	-	100	SS-3	1.6-2.5	-	-	-	-	-	-	-	-	15	A-6a (V)	
	1026.0		3 3 4	9	89	SS-4	2.0-3.0	-	-	-	-	-	-	-	-	15	A-6a (V)	
Hard brown **SANDY SILT**, some clay, trace fine gravel, contains few siltstone fragments and few iron-stained pockets, damp.			6 8 9	22	100	SS-5	4.5+	6	7	17	45	25	25	17	8	15	A-4a (7)	
			7 12 14	33	89	SS-6	4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
	1019.9		7	-	100	SS-7A	4.5+	-	-	-	-	-	-	-	-	14	A-4a (V)	
Medium-dense brown **COARSE AND FINE SAND**, some silt, trace clay, trace fine gravel, damp.	1018.5		7 7 7	18	67	SS-7B		3	2	66	23	6	NP	NP	NP	15	A-3a (0)	
Stiff gray **SANDY SILT,** some clay, little fine gravel, moist.			3 5 4	12	0	--		-	-	-	-	-	-	-	-	-		
	1015.9	EOB	5	-	100	SS-8	1.0-2.0	-	-	-	-	-	-	-	-	13	A-4a (V)	

NOTES:
- No seepage encountered during drilling.
- After removal of augers, boring caved at 10.6' and was observed to be dry.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:54 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINTW\PROJECTS\1179-14-011.GPJ

PLATE 26

S&ME JOB: 1179-14-011

S&ME

PROJECT: SUM-77-0958L WIDENING	DRILLING FIRM / OPERATOR: S&ME / D. GODWIN	DRILL RIG: TRUCK 55 (AW)	STATION / OFFSET: 22+57.4, 5.1 RT
TYPE: EMBANKMENT WIDENING	SAMPLING FIRM / LOGGER: S&ME / D. FRITZE	HAMMER: SAFETY HAMMER	ALIGNMENT: RAMP B
PID: 98061 BR ID: N/A	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 1033.2 (MSL) EOB: 15.0 ft.
START: 7/22/14 END: 7/22/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76	LAT / LONG: 41.025112 N, 81.508598 W

EXPLORATION ID **B-011-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
ASPHALT - 8 3/4 INCHES	1033.2 / 1032.4																	
GRANULAR BASE - 3 1/4 INCHES	1032.2																	
Very-stiff to hard brown becoming dark gray **SANDY SILT**, little clay, trace fine gravel, contains few iron-stained pockets, few decayed organic pockets, damp.		1	4 3 6	11	67	SS-1	4.0-4.5+	9	8	19	46	18	22	17	5	15	A-4a (6)	
		2																
		3	3 4 5	11	33	SS-2	2.5-4.5+	-	-	-	-	-	-	-	-	12	A-4a (V)	
		4	4 -	-	100	SS-3A	3.5-4.5+/	5	8	32	36	19	29	21	8	19	A-4a (4)	
	1028.2	5	5 6	14	100	SS-3B	1.0	-	-	-	-	-	-	-	-	19	A-4a (V)	
Medium-stiff to stiff brown **SANDY SILT**, some clay, trace fine gravel, contains few iron-stained pockets and few decayed organic pockets, damp to moist.		6	2 2 3	6	67	SS-4	1.6	-	-	-	-	-	-	-	-	14	A-4a (V)	
		7																
		8																
		9	2 2 3	6	67	SS-5	0.8-1.0	-	-	-	-	-	-	-	-	-	A-4a (V)	
	1022.7	10																
Hard brown **SANDY SILT**, some clay, trace fine gravel, contains few gray silty clay seams and few iron-stained pockets, dry.		11	3 8 8	20	100	SS-6	3.0-4.5+	-	-	-	-	-	-	-	-	17	A-4a (V)	
	1019.7	12																
Medium-dense brown **FINE SAND**, some coarse sand, trace silt, trace clay, trace fine gravel, wet.	1018.2	13																
		14	7 8 8	20	100	SS-7		1	33	56	5	5	NP	NP	NP	16	A-3 (0)	
	EOB	15																

W

NOTES:
- Seepage encountered at 9.5' during drilling.
- After removal of augers, boring caved at 12.1' and was observed to be dry.
- Sulfate content (per TEX-145-E) performed on sample from first sampling interval = 163 ppm.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; PLACED PLASTIC HOLE PLUG DEVICE; PLACED SOIL CUTTINGS

S&ME (8.5X11) LOG - WITH PLATES - OH DOT.GDT - 9/29/14 13:54 - M:\RESOURCES\GEO\01 - LABORATORY\02 - GINT\PROJECTS\1179-14-011.GPJ

PLATE 27

PAVEMENT CORE MEASUREMENT SHEET

Identified by: KJD

Date Identified: 7/24/2014

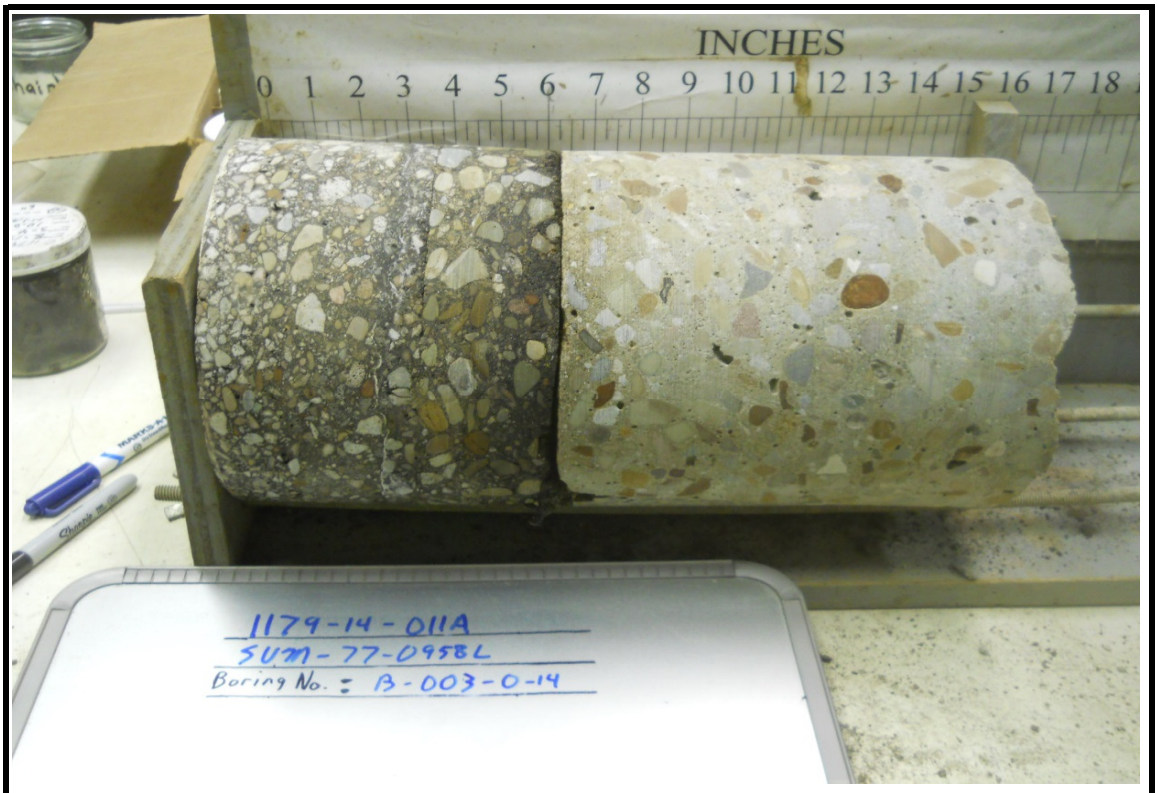
Project Number: **1179-14-011**

Project Name: **SUM-77-0958L**

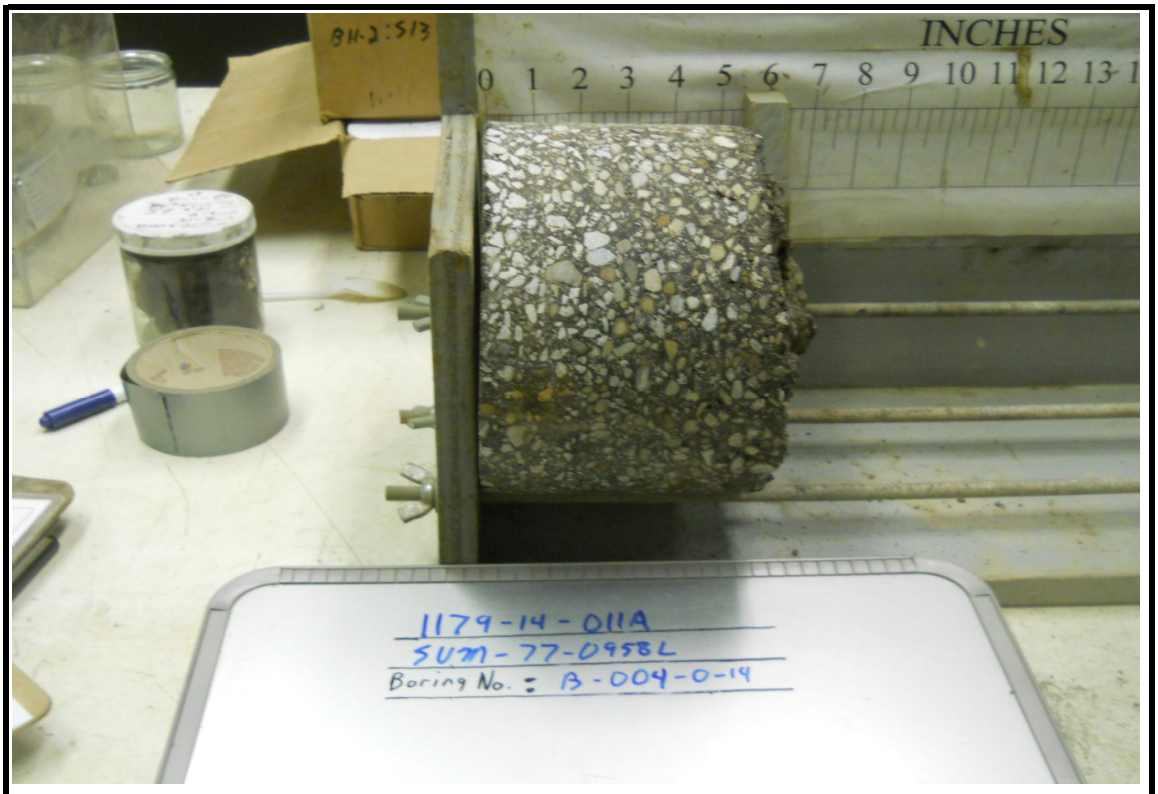
Client: ODOT

S&ME, Inc. - Cleveland 8555 Sweet Valley Drive, Suite S Valley View, Ohio 44125-4210

Boring / Core ID	Asphalt (in.)	Concrete (in.)	Total Core Length (in.)	Notes: (slag concrete, reinforced concrete, # of courses, highly broken up, etc.)
B-003-0-14	5 7/8	8 1/2	14 3/8	4 Asphalt Courses, Reinforced Concrete
B-004-0-14	5 1/2	0	5 1/2	2 Asphalt Courses
B-006-0-14	6 1/8	8	14 1/8	2-3 Asphalt Courses
B-007-0-14	3	0	3	2 Asphalt Courses
B-008-0-14	4 1/2	0	4 1/2	2-3 Asphalt Courses
B-009-0-14	9	0	9	Approximately 5 Asphalt Courses, Last Course Highly Broken up
B-010-0-14	6 3/4	0	6 3/4	Approximately 3 Asphalt Courses
B-010-1-14	9	0	9	Approximately 4 Asphalt Courses
B-011-0-14	8 3/4	0	8 3/4	4 Asphalt Courses



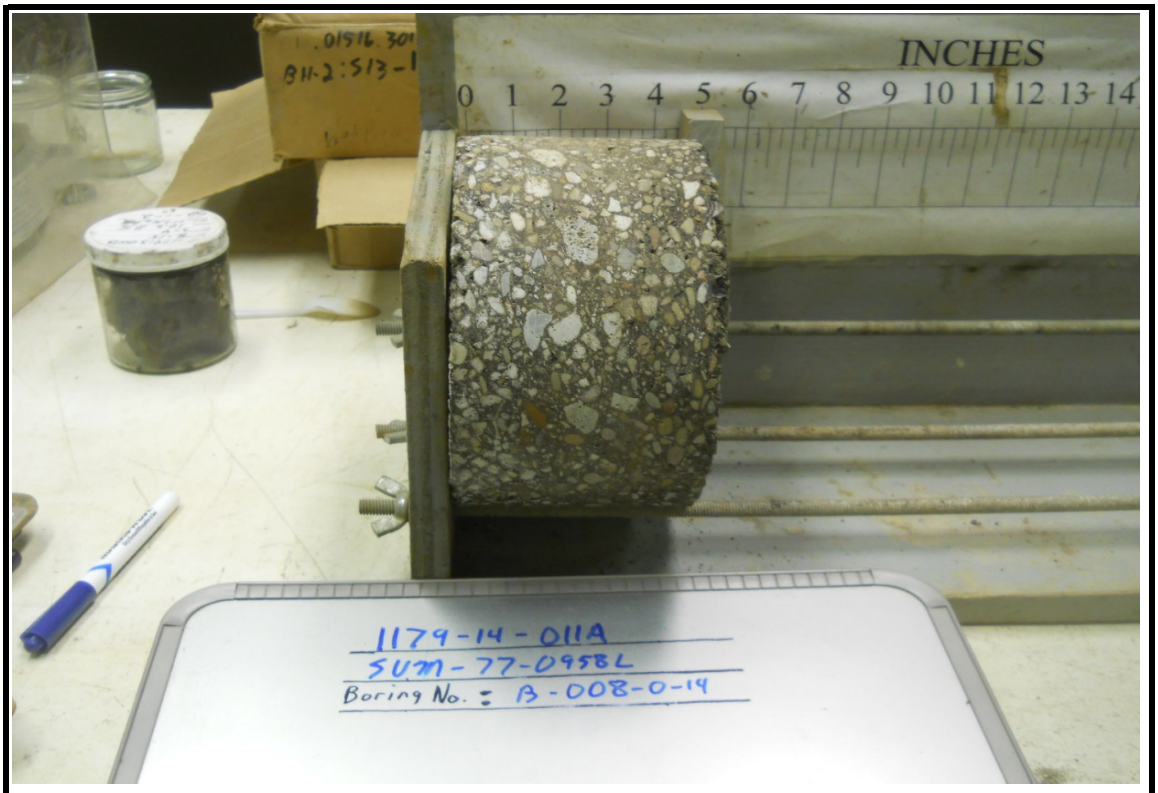
1	**Photographer:**	KJD	**Remarks:**	Asphalt and Concrete Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-003-0-14	



2	**Photographer:**	KJD	**Remarks:**	Asphalt Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-004-0-14	

3	**Photographer:**	KJD	**Remarks:**	Asphalt and Concrete Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-006-0-14	

4	**Photographer:**	KJD	**Remarks:**	Asphalt Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-007-0-14	

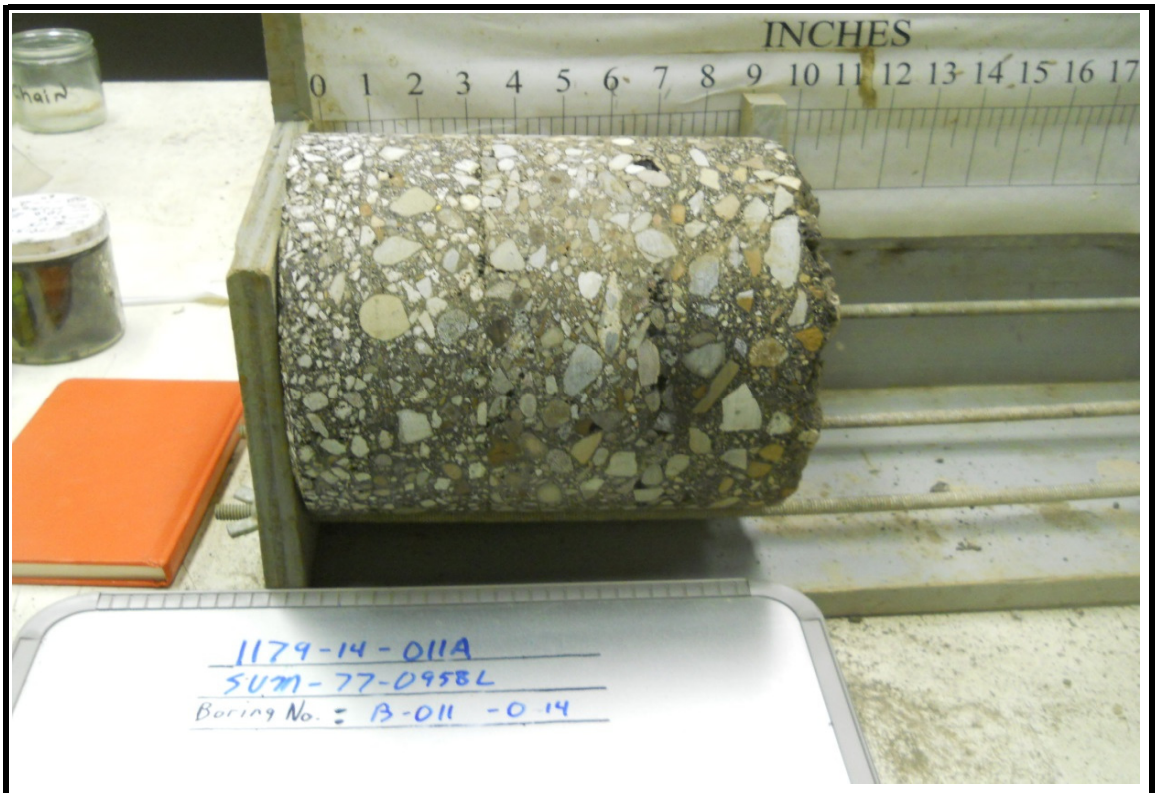


5	**Photographer:**	KJD	**Remarks:**	Asphalt Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-008-0-14	

6	**Photographer:**	KJD	**Remarks:**	Asphalt Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-009-0-14	

7	**Photographer:**	KJD	**Remarks:**	Asphalt Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-010-0-14	

8	**Photographer:**	KJD	**Remarks:**	Asphalt Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-010-1-14	



9	**Photographer:**	KJD	**Remarks:**	Asphalt Pavement Core
	Date Taken:	7/24/2014		
	Location / Orientation:		B-011-0-14	

No Photo Taken

10	**Photographer:**		**Remarks:**	
	Date Taken:			
	Location / Orientation:			

UNCONFINED COMPRESSION TEST REPORT

ASTM D7012 METHOD C

PROJECT INFORMATION

CLIENT:	ODOT
PROJECT NUMBER:	1179-14-011A
PROJECT NAME:	SUM-77-0958L
PROJECT LOCATION:	Akron, Summit, OH

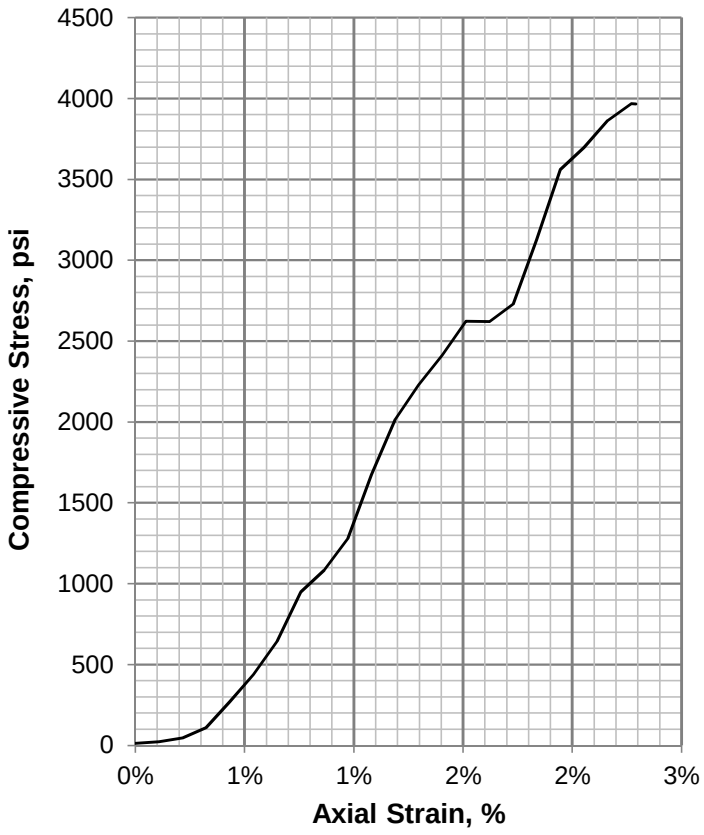
SAMPLE INFORMATION

BORING ID:	B-004-0-014
SAMPLE NUMBER:	S-17
SAMPLE DEPTH:	46.4' - 47.0'
DATE OF TEST:	8/6/2014

SAMPLE DESCRIPTION: Light Brown Sandstone

SPECIMEN MEASUREMENTS

MOISTURE CONTENT:	3.99%	
AVERAGE DIAMETER:	1.9798	in.
AVERAGE HEIGHT:	4.6265	in.
HEIGHT/DIAMETER RATIO:	2.34	
WET DENSITY:	153.69	pcf
DRY DENSITY:	147.79	pcf
SPECIFIC GRAVITY:	2.75	(est.)
SATURATION:	67.87%	(est.)
VOID RATIO:	0.1616	(est.)



TEST RESULTS

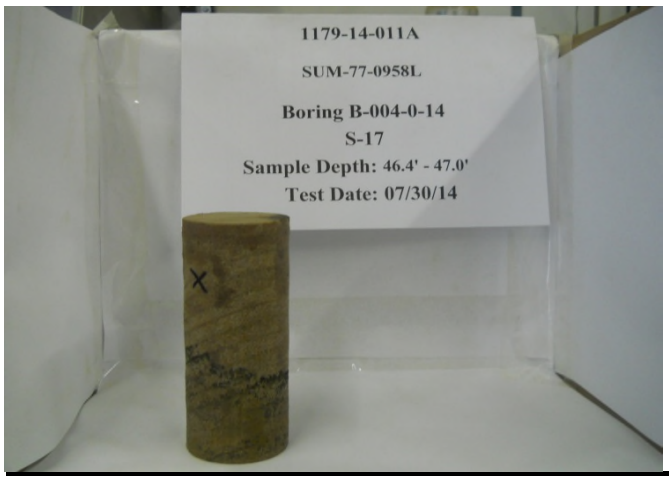
MAXIMUM LOAD:	**12497**	lbs
UNCONFINED STRENGTH:	**3967**	psi
STRAIN RATE:	**1%**	%/min
STRAIN AT FAILURE:	**2.27%**	%

ADDITIONAL TESTING REMARKS:

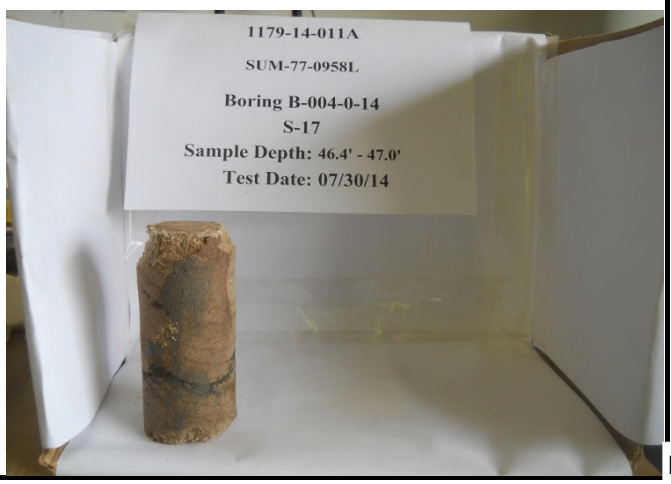
TESTED BY: KJD

CHECKED BY: BKS

SPECIMEN BEFORE TESTING



SPECIMEN AFTER TESTING



UNCONFINED COMPRESSION TEST REPORT

ASTM D7012 METHOD C

PROJECT INFORMATION

CLIENT:	ODOT
PROJECT NUMBER:	1179-14-011A
PROJECT NAME:	SUM-77-0958L
PROJECT LOCATION:	Akron, Summit, OH

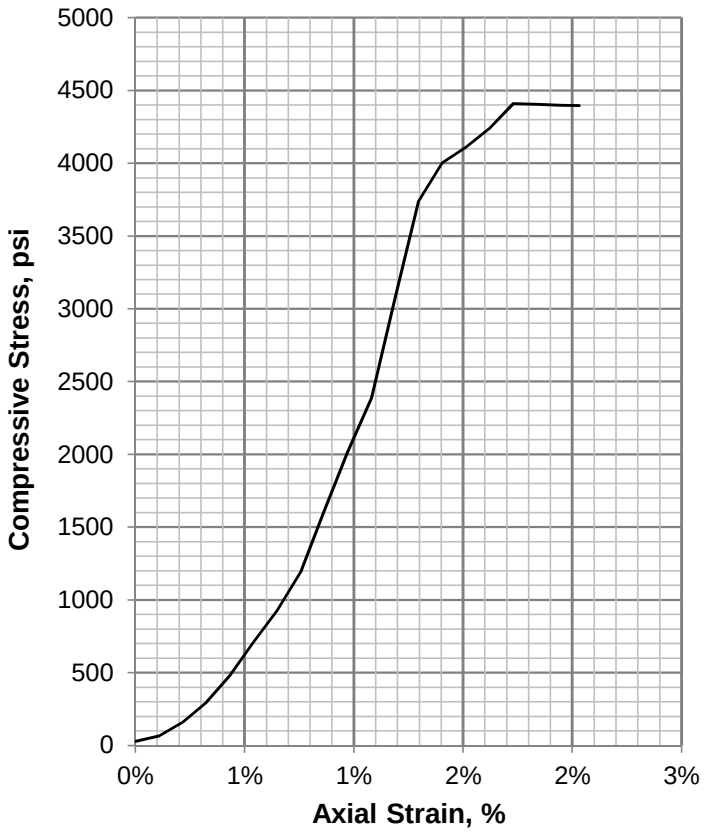
SAMPLE INFORMATION

BORING ID:	B-004-0-014
SAMPLE NUMBER:	S-18
SAMPLE DEPTH:	55.2' - 55.7'
DATE OF TEST:	8/6/2014

SAMPLE DESCRIPTION: Light Gray Sandstone

SPECIMEN MEASUREMENTS

MOISTURE CONTENT:	3.99%	
AVERAGE DIAMETER:	1.9798	in.
AVERAGE HEIGHT:	4.6265	in.
HEIGHT/DIAMETER RATIO:	2.34	
WET DENSITY:	153.69	pcf
DRY DENSITY:	147.79	pcf
SPECIFIC GRAVITY:	2.75	(est.)
SATURATION:	67.87%	(est.)
VOID RATIO:	0.1616	(est.)



TEST RESULTS

MAXIMUM LOAD:	**13812**	lbs
UNCONFINED STRENGTH:	**4409**	psi
STRAIN RATE:	**1%**	%/min
STRAIN AT FAILURE:	**1.73%**	%

ADDITIONAL TESTING REMARKS:

TESTED BY: KJD

CHECKED BY: BKS

SPECIMEN BEFORE TESTING

SPECIMEN AFTER TESTING

UNCONFINED COMPRESSION TEST REPORT

ASTM D7012 METHOD C

S&ME ENGINEERING INTEGRITY

PROJECT INFORMATION

CLIENT:	ODOT
PROJECT NUMBER:	1179-14-011A
PROJECT NAME:	SUM-77-0958L
PROJECT LOCATION:	Akron, Summit, OH

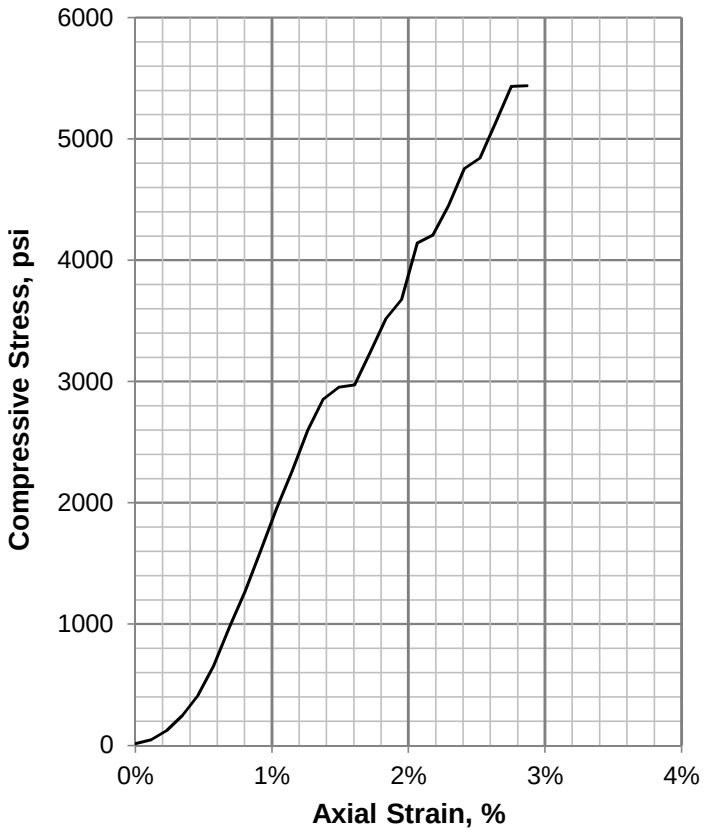
SAMPLE INFORMATION

BORING ID:	B-005-0-14
SAMPLE NUMBER:	S-12
SAMPLE DEPTH:	33.8' - 34.4'
DATE OF TEST:	8/6/2014

SAMPLE DESCRIPTION: Light Gray Sandstone

SPECIMEN MEASUREMENTS

MOISTURE CONTENT:	4.09%	
AVERAGE DIAMETER:	1.9770	in.
AVERAGE HEIGHT:	4.3578	in.
HEIGHT/DIAMETER RATIO:	2.20	
WET DENSITY:	150.23	pcf
DRY DENSITY:	144.33	pcf
SPECIFIC GRAVITY:	2.75	(est.)
SATURATION:	59.29%	(est.)
VOID RATIO:	0.1895	(est.)



TEST RESULTS

MAXIMUM LOAD:	**17190**	lbs
UNCONFINED STRENGTH:	**5439**	psi
STRAIN RATE:	**1%**	%/min
STRAIN AT FAILURE:	**2.87%**	%

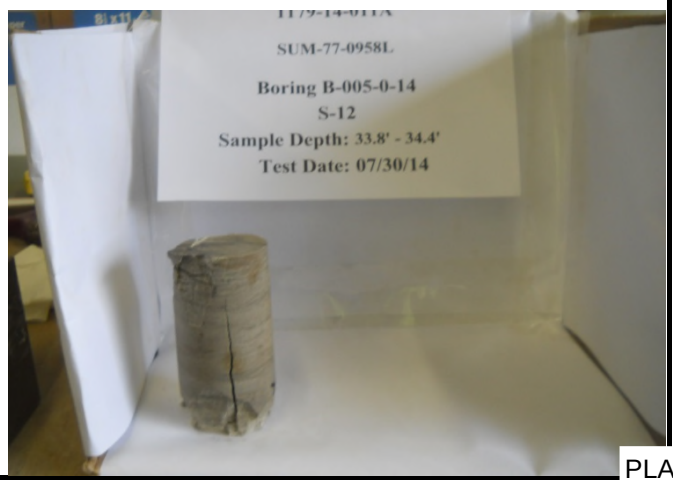
ADDITIONAL TESTING REMARKS:

TESTED BY: KJD

CHECKED BY: BKS

SPECIMEN BEFORE TESTING

SPECIMEN AFTER TESTING



UNCONFINED COMPRESSION TEST REPORT

ASTM D7012 METHOD C

PROJECT INFORMATION

CLIENT:	ODOT
PROJECT NUMBER:	1179-14-011A
PROJECT NAME:	SUM-77-0958L
PROJECT LOCATION:	Akron, Summit, OH

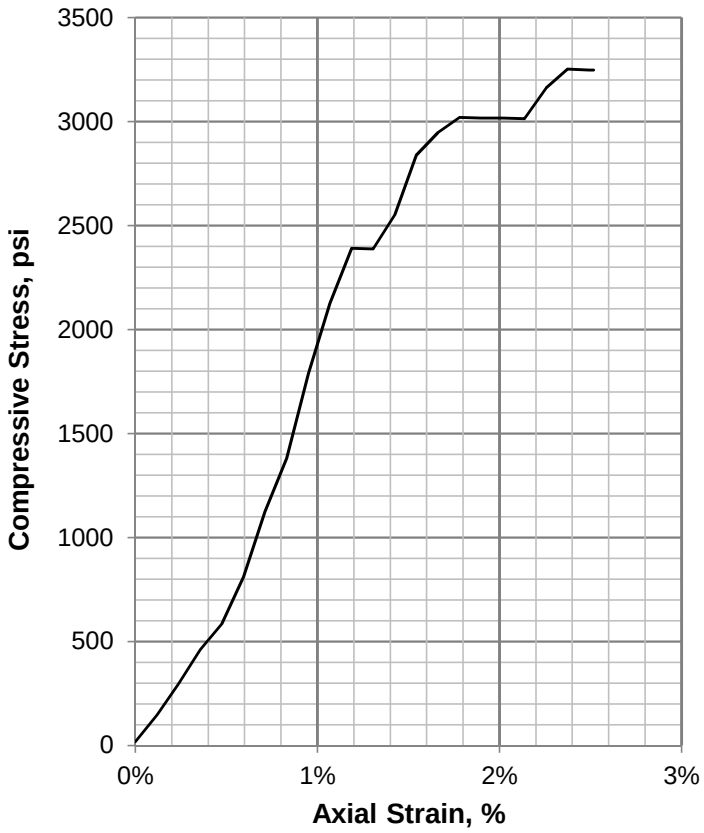
SAMPLE INFORMATION

BORING ID:	B-006-0-14
SAMPLE NUMBER:	S-13
SAMPLE DEPTH:	27.4' - 27.9'
DATE OF TEST:	8/6/2014

SAMPLE DESCRIPTION: Light Brown Sandstone

SPECIMEN MEASUREMENTS

MOISTURE CONTENT:	7.40%	
AVERAGE DIAMETER:	1.9818	in.
AVERAGE HEIGHT:	4.2105	in.
HEIGHT/DIAMETER RATIO:	2.12	
WET DENSITY:	143.10	pcf
DRY DENSITY:	133.24	pcf
SPECIFIC GRAVITY:	2.75	(est.)
SATURATION:	70.57%	(est.)
VOID RATIO:	0.2886	(est.)



TEST RESULTS

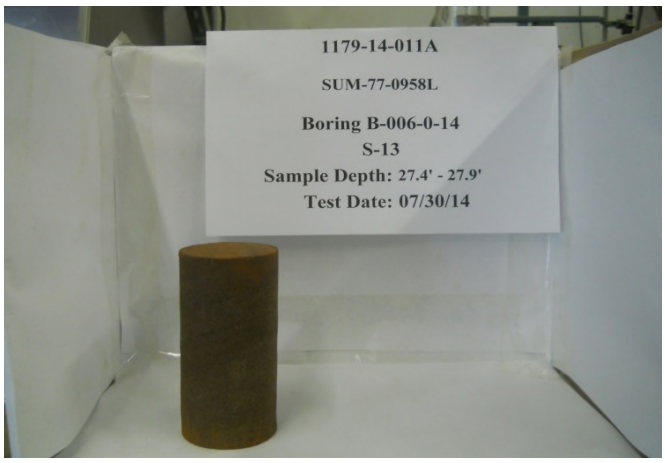
MAXIMUM LOAD:	**10277**	lbs
UNCONFINED STRENGTH:	**3252**	psi
STRAIN RATE:	**1%**	%/min
STRAIN AT FAILURE:	**2.38%**	%

ADDITIONAL TESTING REMARKS:

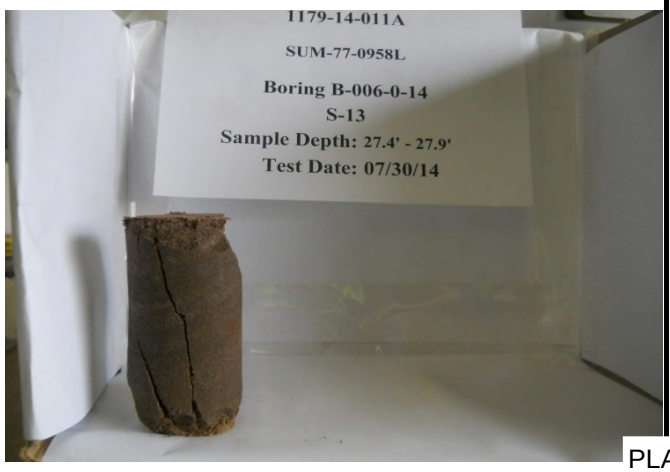
TESTED BY: KJD

CHECKED BY: BKS

SPECIMEN BEFORE TESTING



SPECIMEN AFTER TESTING



UNCONFINED COMPRESSION TEST REPORT

ASTM D7012 METHOD C

S&ME ENGINEERING INTEGRITY

PROJECT INFORMATION

CLIENT:	ODOT
PROJECT NUMBER:	1179-14-011A
PROJECT NAME:	SUM-77-0958L
PROJECT LOCATION:	Akron, Summit, OH

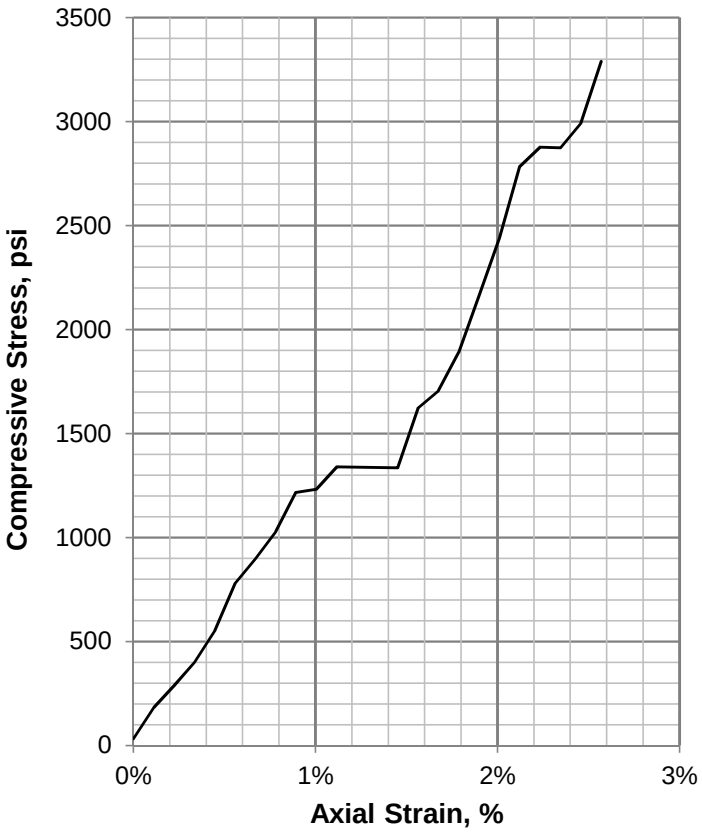
SAMPLE INFORMATION

BORING ID:	B-006-0-14
SAMPLE NUMBER:	S-14
SAMPLE DEPTH:	34.1' - 34.8'
DATE OF TEST:	8/6/2014

SAMPLE DESCRIPTION: Light Brown Sandstone

SPECIMEN MEASUREMENTS

MOISTURE CONTENT:	7.72%	
AVERAGE DIAMETER:	1.9863	in.
AVERAGE HEIGHT:	4.4765	in.
HEIGHT/DIAMETER RATIO:	2.25	
WET DENSITY:	138.41	pcf
DRY DENSITY:	128.49	pcf
SPECIFIC GRAVITY:	2.75	(est.)
SATURATION:	63.17%	(est.)
VOID RATIO:	0.3361	(est.)



TEST RESULTS

MAXIMUM LOAD:	**10461**	lbs
UNCONFINED STRENGTH:	**3289**	psi
STRAIN RATE:	**1%**	%/min
STRAIN AT FAILURE:	**2.57%**	%

ADDITIONAL TESTING REMARKS:

TESTED BY: KJD

CHECKED BY: BKS

SPECIMEN BEFORE TESTING

SPECIMEN AFTER TESTING

UNCONFINED COMPRESSION TEST REPORT

ASTM D7012 METHOD C

PROJECT INFORMATION

CLIENT:	ODOT
PROJECT NUMBER:	1179-14-011A
PROJECT NAME:	SUM-77-0958L
PROJECT LOCATION:	Akron, Summit, OH

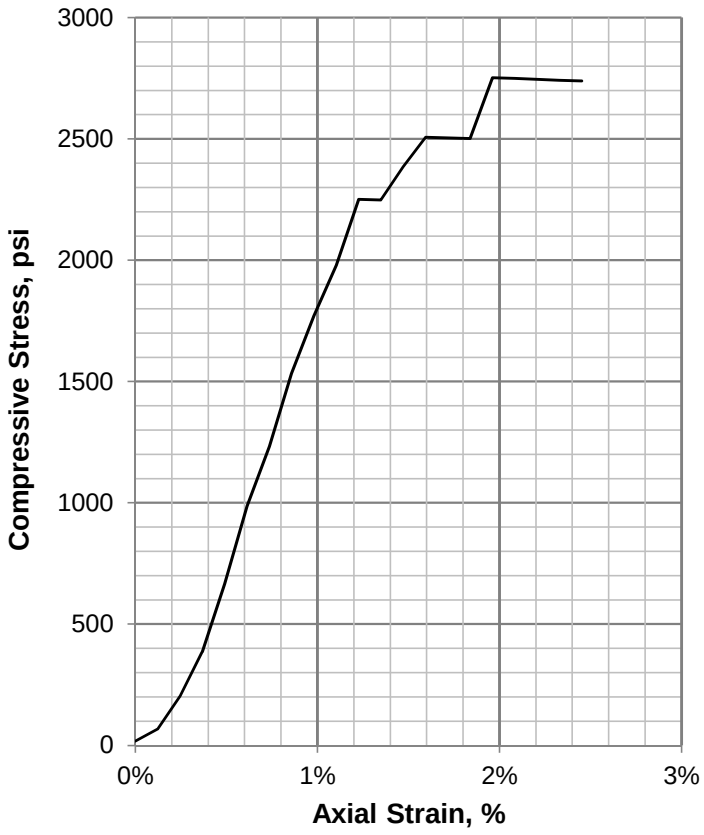
SAMPLE INFORMATION

BORING ID:	B-007-0-14
SAMPLE NUMBER:	S-17
SAMPLE DEPTH:	47.4' - 47.9'
DATE OF TEST:	8/6/2014

SAMPLE DESCRIPTION: Light Gray Sandstone

SPECIMEN MEASUREMENTS

MOISTURE CONTENT:	7.31%	
AVERAGE DIAMETER:	1.9888	in.
AVERAGE HEIGHT:	4.0780	in.
HEIGHT/DIAMETER RATIO:	2.05	
WET DENSITY:	139.74	pcf
DRY DENSITY:	130.23	pcf
SPECIFIC GRAVITY:	2.75	(est.)
SATURATION:	63.14%	(est.)
VOID RATIO:	0.3183	(est.)



TEST RESULTS

MAXIMUM LOAD:	**8722**	lbs
UNCONFINED STRENGTH:	**2752**	psi
STRAIN RATE:	**1%**	%/min
STRAIN AT FAILURE:	**1.96%**	%

ADDITIONAL TESTING REMARKS:

TESTED BY: KJD

CHECKED BY: BKS

SPECIMEN BEFORE TESTING

SPECIMEN AFTER TESTING

UNCONFINED COMPRESSION TEST REPORT

ASTM D7012 METHOD C

PROJECT INFORMATION

CLIENT:	ODOT
PROJECT NUMBER:	1179-14-011A
PROJECT NAME:	SUM-77-0958L
PROJECT LOCATION:	Akron, Summit, OH

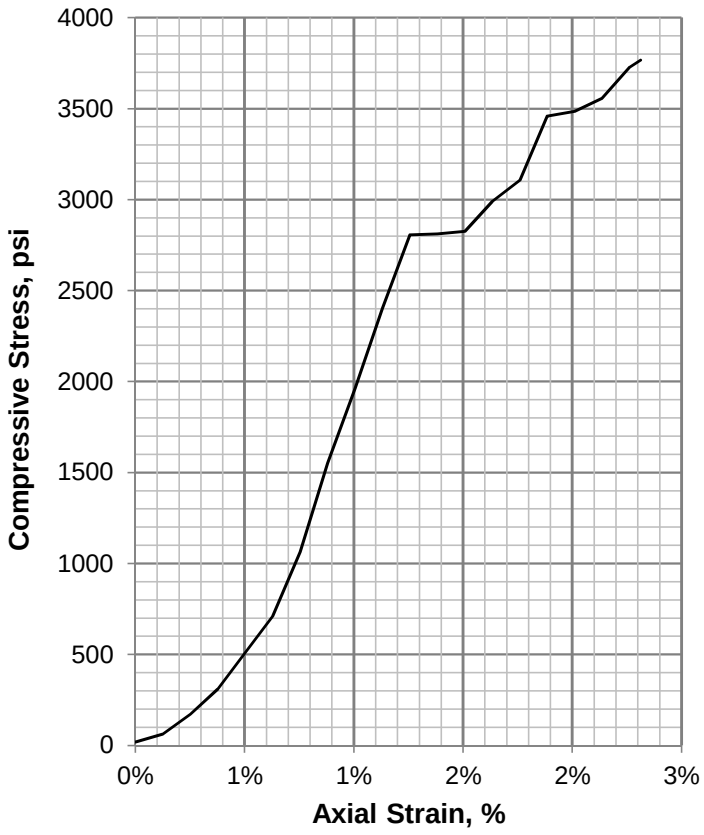
SAMPLE INFORMATION

BORING ID:	B-007-0-14
SAMPLE NUMBER:	S-18
SAMPLE DEPTH:	49.4' -49.8'
DATE OF TEST:	8/6/2014

SAMPLE DESCRIPTION: Light Brown Sandstone

SPECIMEN MEASUREMENTS

MOISTURE CONTENT:	6.21%	
AVERAGE DIAMETER:	1.9943	in.
AVERAGE HEIGHT:	3.9775	in.
HEIGHT/DIAMETER RATIO:	1.99	
WET DENSITY:	138.47	pcf
DRY DENSITY:	130.37	pcf
SPECIFIC GRAVITY:	2.75	(est.)
SATURATION:	53.89%	(est.)
VOID RATIO:	0.3169	(est.)



TEST RESULTS

MAXIMUM LOAD:	**12044**	lbs
UNCONFINED STRENGTH:	**3766**	psi
STRAIN RATE:	**1%**	%/min
STRAIN AT FAILURE:	**2.31%**	%

ADDITIONAL TESTING REMARKS:

TESTED BY: KJD

CHECKED BY: BKS

SPECIMEN BEFORE TESTING

SPECIMEN AFTER TESTING

ADVANCED ANALYTICS LABORATORIES, INC.
1025 CONCORD AVENUE
COLUMBUS, OHIO 43212
(614) 299-9922 FAX (614) 299-4002
Analysis & Testing - Quality Control Programs - Research & Development

S&ME, Inc. [Cleveland)
8555 Sweet Valley Drive, Suite S
Valley View, OH 44125

Project: 1179-14-017
P.O. Number: [none]
Project Manager: Brian Sears

Date Received: 8/5/14
Date Reported: 8/14/14

ANALYTICAL RESULTS

Sulfate by TxDOT-145-E

TxDOT-145-E

AALI I.D.	Client I.D.	Sulfate	Units	Reporting Limit	Date Collected	Date Analyzed	Notes
1408023-01	**B-001-0-14**	**399**	mg/kg	10.0	7/21/14	8/13/14	
1408023-02	**B-002-0-14**	**71.0**	mg/kg	10.0	7/21/14	8/13/14	
1408023-03	**B-003-0-14**	**94.4**	mg/kg	10.0	7/21/14	8/13/14	
1408023-04	**B-004-0-14**	**144**	mg/kg	10.0	7/21/14	8/13/14	
1408023-05	**B-007-0-14**	**241**	mg/kg	10.0	7/22/14	8/13/14	
1408023-06	**B-008-0-14**	**285**	mg/kg	10.0	7/23/14	8/13/14	
1408023-07	**B-009-0-14**	**374**	mg/kg	10.0	7/24/14	8/13/14	
1408023-08	**B-010-0-14**	**128**	mg/kg	10.0	7/24/14	8/13/14	
1408023-09	**B-011-0-14**	**163**	mg/kg	10.0	7/22/14	8/13/14	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit

L. Eve Karnitis, President

PLATE 41

APPENDIX B

APPENDIX B

Plate No.

Calculations

Subgrade Analysis

V. 12.00 12/30/11

Design CBR 8

Global Options		
320	R&R	No
206	CS	Option
	LS	No
	LKD	No
206	Depth	14

Classification Counts by Sample																		
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	3	0	2	0	0	0	0	34	2	0	5	0	0	0	0	0
		7%		4%					74%	4%		11%					
0%	11%								89%								

Surface Class		
2-5	0	
4b	1	11%
5	0	
7-5	0	
7-6	0	
8a	0	
8b	0	
R	0	

% Borings		
N_{60L} <= 5	11%	
<=10	56%	
>=20	0%	
M+	67%	
R	0%	

% Surface	
44%	
11%	44%

Rig	ER
A	76
B	
C	
D	
E	
F	
G	
H	

Total Borings	9
PID	98061
Location	Akron, Ohio

UC @ Surface
20.8
36
12

	N_{60}	N_{60L}	PI	Clay	M	M_{OPT}	GI
Average	21.8	10.8	7.8	17.7	12.8	10.5	4.09
Maximum	76	19	30 21	13 51	27 74	22	16 8
Minimum	3	3	18 14	3 9	6 15	6	6 0

	Boring					Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Comments	Problem		Undercuts		Analysis
#	B #	Boring Location	Depth	To	Cut Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	
1	B-001-0-14	IR 77 NB Median	1.0	2.5	0.0	1.0	2.5	9	11	20	A	25		26	16	10	33	23	56	12	11	4a	4	Sulfate = 399 ppm					
		Sta 494+47.0, 15.0' LT	2.5	4.0		2.5	4.0	9	12	21		27		23	16	7	39	20	59	14	11	4a	5						
		N: 496176.79	4.0	5.5		4.0	5.5	5	5	10		13								17	10	4a	5			MN		12	
		E: 2244487.71	5.5	7.0		5.5	7.0	5	5	10		13		18	15	3	38	15	53	12	10	4a							
			8.5	10.0		8.5	10.0	5	6	11		14	13							9	10	4a							
2	B-002-0-14	IR 77 NB Median	1.0	2.5	0.0	1.0	2.5	3	3	6	A	8		20	16	4	30	13	43	14	11	4a	2	Sulfate = 71 ppm		N		18	
		Sta 498+45.4, 21.8' LT	2.5	4.0		2.5	4.0	2	3	5		6								14	10	4a	5			N		24	Exc. To 24" or Cement Stabilization to 16"
		N: 496470.45	4.0	5.5		4.0	5.5	8	9	17		22		22	16	6	26	15	41	11	11	4a	1						
		E: 2244219.22	5.5	7.0		5.5	7.0	12	32	44		56								13	10	4a							
			8.5	10.0		8.5	10.0	6	8	14		18	6	30	17	13	31	27	58	9	14	6a							
3	B-003-0-14	IR 77 NB, Ramp B2	2.0	3.5	-1.5	0.5	2.0	6	8	14	A	18		25	14	11	31	20	51	12	14	6a	4	Sulfate = 94.9 ppm					
		Sta 4+66.1, 15.7' RT	3.5	5.0		2.0	3.5	7	9	16		20								14	14	6a	8						
		N: 496992.73	5.0	6.5		3.5	5.0	34	17	51		65		NP	NP	NP	9	6	15	6	8	3a	0						
		E: 2243736.44	6.5	8.0		5.0	6.5	16	20	36		46								9	10	4a	5						
			8.5	10.0		7.0	8.5	17	14	31		39	18	NP	NP	NP	12	8	20	6	6	1b							
4	B-004-0-14	IR 77 NB, Ramp B2	2.5	4.0	-2.0	0.5	2.0	2	3	5	A	6		26	17	9	29	22	51	17	12	4a	3	Sulfate = 144 ppm		N		24	
		Sta 7+57.7, 17.1' RT	4.0	5.5		2.0	3.5	2	2	4		5		23	15	8	31	19	50	14	10	4a	3			N		27	Exc. To 27" or Cement Stabilization to 16"
		N: 497159.27	5.5	7.0		3.5	5.0	1	1	2		3								20	10	4a	5			N		40	
		E: 2243492.72	7.0	8.5		5.0	6.5	1	2	3		4		24	16	8	29	20	49	15	11	4a	3			N		30	
			8.5	10.0		6.5	8.0	1	1	2		3	3							15	10	4a				N		40	
5	B-007-0-14	IR 77 NB, Ramp B2	1.5	3.0	-1.5	0.0	1.5	6	6	12	A	15		NP	NP	NP	17	13	30	10	8	3a	0	Sulfate = 241 ppm					
		Sta 9+94.8, 17.2' RT	3.0	4.5		1.5	3.0	5	7	12		15								12	10	4a	5						
		N: 497198.38	4.5	6.0		3.0	4.5	3	7	10		13		23	14	9	25	17	42	11	10	4a	1						
		E: 2243252.8	6.0	7.5		4.5	6.0	5	6	11		14								12	14	6a	8						
			8.5	10.0		7.0	8.5	5	6	11		14	13							12	14	6a							
6	B-008-0-14	IR 77 NB, Ramp B2	1.0	2.5	-1.0	0.0	1.5	4	7	11	A	14		26	17	9	51	23	74	22	12	4b	8	Sulfate = 285 ppm	4b	MN	36	12	
		Sta 12+81.5, 17.4' RT	2.5	4.0		1.5	3.0	20	12	32		41		NP	NP	NP	11	6	17	8	6	1b	0						
		N: 497088.05	4.0	5.5		3.0	4.5	7	8	15		19								15	10	4a	5						
		E: 2242981.75	5.5	7.0		4.5	6.0	7	7	14		18								12	6	1b	0			M			Exc. To 30" or Cement Stabilization to 16"
			8.5	10.0		7.5	9.0	1	6	7		9	9							13	10	4b			4b	N	36	16	
7	B-009-0-14	IR 77 NB, Ramp B	1.5	3.0	-1.5	0.0	1.5	5	16	21	A	27		23	16	7	39	19	58	11	11	4a	5	Sulfate = 374 ppm					
		Sta 14+72.6, 28.2' LT	3.0	4.5		1.5	3.0	16	21	37		47								8	10	4a	5						
		N: 496773.24	4.5	6.0		3.0	4.5	12	12	24		30		22	16	6	46	21	67	11	11	4a	6						
		E: 2242742.08	6.0	7.5		4.5	6.0	8		8		10								15	10	4a	5			N		15	
			8.5	10.0		7.0	8.5	5	10	15		19	10							16	10	4a				M			
8	B-010-0-14	IR 77 NB, Ramp B	1.5	3.0	-1.5	0.0	1.5	6	9	15	A	19		24	16	8	29	23	52	11	11	4a	3	Sulfate = 128 ppm					
		Sta 18+58.3, 21.0' LT	3.0	4.5		1.5	3.0	26	34	60		76								12	10	4a	5						
		N: 496533.95	4.5	6.0		3.0	4.5	26	26	52		66		24	15	9	31	23	54	11	10	4a	4						
		E: 2242429.71	6.0	7.5		4.5	6.0	14	16	30		38								10	10	4a	5						
			8.5	10.0		7.0	8.5	11	11	22		28	19							11	10	4a							
9	B-011-0-14	IR 77 NB, Ramp B	1.0	2.5	-1.5	-0.5	1.0	3	6	9	A	11		22	17	5	46	18	64	15	12	4a	6	Sulfate = 163 ppm		N		14	
		Sta 22+57.4, 5.1' RT	2.5	4.0		1.0	2.5	4	5	9		11								12	10	4a	5			N		14	
		N: 496467.44	4.0	4.5		2.5	3.0	5	6	11		14		29	21	8	36	19	55	19	16	4a	4						Exc./Replace 14" or Cement Stabilization 12"
		E: 2242033.74	4.5	5.5		3.0	4.0	5	6	11		14								19	10	4a	5			MN		12	
			5.5	7.0		4.0	5.5	2	3	5		6								14	10	4a	5			N		24	
			8.5	10.0		7.0	8.5	2	3	5		6	6								10	4a				N		24	

PLATE 1

Subgrade Analysis

V. 12.00 12/30/11

Design CBR 8

Global Options		
320	R&R	No
206	CS	Option
	LS	No
	LKD	No
206	Depth	14

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	0	0	0	0	0	0	0	25	0	0	1	0	0	0	0	0
									96%			4%					
0%	0%								100%								

Surface Class	
2-5	0
4b	0
5	0
7-5	0
7-6	0
8a	0
8b	0
R	0

% Borings	
N_{60L}<= 5	0%
<=10	60%
>=20	0%
M+	80%
R	0%

% Surface	
120%	
0%	40%

UC @ Surface
3.2
18
0

Rig	ER
A	76
B	
C	
D	
E	
F	
G	
H	

Total Borings	5
PID	98061
Location	Akron, Ohio

	N_{60}	N_{60L}			PI		Clay		M	M_{OPT}		GI
Average	24.0	10.8			7.2		19.7		12.8	10.8		4.21
Maximum	76	19	30	21	13	46	27	67	19	16		6
Minimum	6	6	18	15	3	26	13	41	8	10		0

	Boring					Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Comments	Problem		Undercuts		Analysis
#	B #	Boring Location	Depth	To	Cut Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	
1	B-001-0-14	IR 77 NB Median	1.0	2.5	0.0	1.0	2.5	9	11	20	A	25		26	16	10	33	23	56	12	11	4a	4	Sulfate = 399 ppm					
		Sta 494+47.0, 15.0' LT	2.5	4.0		2.5	4.0	9	12	21		27		23	16	7	39	20	59	14	11	4a	5						
		N: 496176.79	4.0	5.5		4.0	5.5	5	5	10		13								17	10	4a	5			MN		12	
		E: 2244487.71	5.5	7.0		5.5	7.0	5	5	10		13		18	15	3	38	15	53	12	10	4a							
			8.5	10.0		8.5	10.0	5	6	11		14	13							9	10	4a							
2	B-002-0-14	IR 77 NB Median	1.0	2.5	0.0	1.0	2.5	3	3	6	A	8		20	16	4	30	13	43	14	11	4a	2	Sulfate = 71 ppm		N		18	
		Sta 498+45.4, 21.8' LT	2.5	4.0		2.5	4.0	2	3	5		6								14	10	4a	5			N		24	Exc. To 24" or Cement Stabilization to 16"
		N: 496470.45	4.0	5.5		4.0	5.5	8	9	17		22		22	16	6	26	15	41	11	11	4a	1						
		E: 2244219.22	5.5	7.0		5.5	7.0	12	32	44		56								13	10	4a							
			8.5	10.0		8.5	10.0	6	8	14		18	6	30	17	13	31	27	58	9	14	6a							
3	B-009-0-14	IR 77 NB, Ramp B	1.5	3.0	-1.5	0.0	1.5	5	16	21	A	27		23	16	7	39	19	58	11	11	4a	5	Sulfate = 374 ppm					
		Sta 14+72.6, 28.2' LT	3.0	4.5		1.5	3.0	16	21	37		47								8	10	4a	5						
		N: 496773.24	4.5	6.0		3.0	4.5	12	12	24		30		22	16	6	46	21	67	11	11	4a	6						
		E: 2242742.08	6.0	7.5		4.5	6.0	8		8		10								15	10	4a	5			N		15	
			8.5	10.0		7.0	8.5	5	10	15		19	10							16	10	4a				M			
4	B-010-0-14	IR 77 NB, Ramp B	1.5	3.0	-1.5	0.0	1.5	6	9	15	A	19		24	16	8	29	23	52	11	11	4a	3	Sulfate = 128 ppm					
		Sta 18+58.3, 21.0' LT	3.0	4.5		1.5	3.0	26	34	60		76								12	10	4a	5						
		N: 496533.95	4.5	6.0		3.0	4.5	26	26	52		66		24	15	9	31	23	54	11	10	4a	4						
		E: 2242429.71	6.0	7.5		4.5	6.0	14	16	30		38								10	10	4a	5						
			8.5	10.0		7.0	8.5	11	11	22		28	19							11	10	4a							
5	B-011-0-14	IR 77 NB, Ramp B	1.0	2.5	-1.5	-0.5	1.0	3	6	9	A	11		22	17	5	46	18	64	15	12	4a	6	Sulfate = 163 ppm		N		14	
		Sta 22+57.4, 5.1' RT	2.5	4.0		1.0	2.5	4	5	9		11								12	10	4a	5			N		14	
		N: 496467.44	4.0	4.5		2.5	3.0	5	6	11		14		29	21	8	36	19	55	19	16	4a	4						Exc./Replace 14" or Cement Stabilization 12"
		E: 2242033.74	4.5	5.5		3.0	4.0	5	6	11		14								19		4a	0						
			5.5	7.0		4.0	5.5	2	3	5		6								14	10	4a	5			N		24	
			8.5	10.0		7.0	8.5	2	3	5		6	6								10	4a				N		24	

Subgrade Analysis

V. 12.00 12/30/11

Design CBR 9

Global Options		
320	R&R	No
206	CS	Option
	LS	No
	LKD	No
206	Depth	14

Classification Counts by Sample																		
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	3	0	2	0	0	0	0	9	2	0	4	0	0	0	0	0
		15%		10%					45%	10%		20%					
0%	25%								75%								

Surface Class		
2-5	0	
4b	1	25%
5	0	
7-5	0	
7-6	0	
8a	0	
8b	0	
R	0	

% Borings	
N_{60L}<= 5	25%
<=10	50%
>=20	0%
M+	50%
R	0%

% Surface	
175%	
25%	50%

Rig	ER
A	76
B	
C	
D	
E	
F	
G	
H	

Total Borings	4
PID	98061
Location	Akron, Ohio

	N_{60}	N_{60L}	PI	Clay	M	M_{OPT}	GI
Average	19.1	10.8	9.0	15.4	12.8	10.3	3.63
Maximum	65	18	26	17	11	51	23	74	22	14	8
Minimum	3	3	23	14	8	9	6	15	6	6	0

UC @ Surface
5.5
36
0

	Boring					Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Comments	Problem		Undercuts		Analysis
#	B #	Boring Location	Depth	To	Cut Fill	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	
1	B-003-0-14	IR 77 NB, Ramp B2	2.0	3.5	-1.5	0.5	2.0	6	8	14	A	18		25	14	11	31	20	51	12	14	6a	4	Sulfate = 94.9 ppm					
		Sta 4+66.1, 15.7' RT	3.5	5.0		2.0	3.5	7	9	16		20								14	14	6a	8						
		N: 496992.73	5.0	6.5		3.5	5.0	34	17	51		65		NP	NP	NP	9	6	15	6	8	3a	0						
		E: 2243736.44	6.5	8.0		5.0	6.5	16	20	36		46								9	10	4a	5						
			8.5	10.0		7.0	8.5	17	14	31		39	18	NP	NP	NP	12	8	20	6	6	1b							
2	B-004-0-14	IR 77 NB, Ramp B2	2.5	4.0	-2.0	0.5	2.0	2	3	5	A	6		26	17	9	29	22	51	17	12	4a	3	Sulfate = 144 ppm		N		24	Exc. To 27" or Cement Stabilization to 16"
		Sta 7+57.7, 17.1' RT	4.0	5.5		2.0	3.5	2	2	4		5		23	15	8	31	19	50	14	10	4a	3			N		27	
		N: 497159.27	5.5	7.0		3.5	5.0	1	1	2		3								20	10	4a	5			N		40	
		E: 2243492.72	7.0	8.5		5.0	6.5	1	2	3		4		24	16	8	29	20	49	15	11	4a	3			N		30	
			8.5	10.0		6.5	8.0	1	1	2		3	3							15	10	4a				N		40	
3	B-007-0-14	IR 77 NB, Ramp B2	1.5	3.0	-1.5	0.0	1.5	6	6	12	A	15		NP	NP	NP	17	13	30	10	8	3a	0	Sulfate = 241 ppm					
		Sta 9+94.8, 17.2' RT	3.0	4.5		1.5	3.0	5	7	12		15								12	10	4a	5						
		N: 497198.38	4.5	6.0		3.0	4.5	3	7	10		13		23	14	9	25	17	42	11	10	4a	1						
		E: 2243252.8	6.0	7.5		4.5	6.0	5	6	11		14								12	14	6a	8						
			8.5	10.0		7.0	8.5	5	6	11		14	13							12	14	6a							
4	B-008-0-14	IR 77 NB, Ramp B2	1.0	2.5	-1.0	0.0	1.5	4	7	11	A	14		26	17	9	51	23	74	22	12	4b	8	Sulfate = 285 ppm	4b	MN	36	12	Exc. To 30" or Cement Stabilization to 16"
		Sta 12+81.5, 17.4' RT	2.5	4.0		1.5	3.0	20	12	32		41		NP	NP	NP	11	6	17	8	6	1b	0						
		N: 497088.05	4.0	5.5		3.0	4.5	7	8	15		19								15	10	4a	5						
		E: 2242981.75	5.5	7.0		4.5	6.0	7	7	14		18								12	6	1b	0			M			
			8.5	10.0		7.5	9.0	1	6	7		9	9							13	10	4b			4b	N	36	16	

APPENDIX C

APPENDIX C

Plate No.

ODOT OGE Design Checklists

III.C. Subgrade Checklist

C-R-S: SUM-77-0958L	PID: 98061	Reviewer: KJD	Date: 9-17-2014

If you do not have any subgrade work on the project, you do not have to fill out this checklist.

Y N X	1	Has the subsurface investigation adequately characterized the soil or rock according to Geotechnical Bulletin 1: Plan Subgrades (GB1)?	
Y N X	2	If soils classified as A-2-5, A-4b, A-5, A-7-5, A-8a, or A-8b, or having a LL>65, are present at the proposed subgrade (soil profile), do the plans specify that these materials need to be removed and replaced or chemically stabilized?	A-4b materials were identified in one boring in the expected subgrade profile. Plan information will be provided by ODOT to contractors.
Y N X		a If these materials are to be removed and replaced, have the station limits, depth, and lateral limits for the planned removal been provided?	The contractors for this design build project will be determining this information.
Y N X	3	If there is any rock, shale, or coal present at the proposed subgrade (CMS 204.05), do the plans specify the removal of the material?	Bedrock was not encountered within the expected subgrade profile of the roadway borings.
Y N X		a If removal of any rock, shale, or coal is required, have the station limits, depth, and lateral limits for the planned removal of the material at proposed subgrade been provided?	N/A
Y N X	4	In accordance with GB1, do the SPT values and existing moisture contents for the proposed subgrade soils indicate the need for subgrade stabilization?	Areas were identified that will require remediation. See GB1 Table in Appendix B.
Y N X		a If removal and replacement is applicable, has the detail of subgrade removal been shown on the plans, including depth of removal, station limits, lateral extent, replacement material, and plan notes (Item 204 – Subgrade Compaction and Proof Rolling)?	The contractors for this design build project will be determining this information.
Y N X		b If chemical stabilization is applicable, has the detail of this treatment been shown on the plans, including depth, percentage of chemical, station limits, lateral extent, and plan notes?	To be performed by others. See GB1 Table in Appendix B.
		Indicate type of subgrade treatment specified: □ cement treatment □ lime treatment □ lime kiln dust □ other	Materials to be used will be identified by the contractor. Cement is a feasible option per GB1.
Y N X	5	If drainage or groundwater is an issue with the proposed subgrade, has an appropriate drainage system (e.g., pipe, underdrains) been provided?	Groundwater was not encountered in significant quantities during our exploration.
Y N X	6	Has an appropriate quantity of Proof Rolling been included in the plans (CMS 204.06)?	The contractors for this design build project will be determining this information.
Y N X	7	Has a design CBR value been provided?	A CBR value of 9 has been recommended.

III.C. Subgrade Checklist

Notes:

Stage 1: