REPORT OF ROADWAY EXPLORATION – FINAL
LAW-7-2.17 Chesapeake Bypass
PID 75923

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Prepared by:
Stantec Consulting Services, Inc.

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Prepared by: 

Signature

Eric M. Kistner, PE

Printed Name

Reviewed by: 

Signature

Jared Musselman, PE

Printed Name

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Executive Summary

The Ohio Department of Transportation plans to reroute State Route (SR) 7 in Lawrence County, Ohio around the town of Chesapeake. The project consists of the construction of a new two-lane divided highway, traveling north of the town of Chesapeake, Ohio. This new road will connect the existing four-lane section of SR 7 on the east side of Chesapeake to the existing SR 7 north of the town of Proctorville, near SR 775. The beginning and ending stations for the project are 114+57.60 and 408+12.36, respectively, for an alignment length of approximately 5.5 miles. The alignment is characterized by deep cuts and fills and nine proposed bridges. This report summarizes the results of the exploration and analyses performed for the roadway design for the project.

Stantec performed a site reconnaissance and exploration from May 17, 2011 to May 10, 2013. A total of 119 borings were performed, 11 of which were structural foundation borings discussed in depth in separate Structural Foundation Exploration Reports. The remainder of the borings, along with the results of a previously performed exploration by BBC&M Engineering, were used to create the analyses and recommendations included in this roadway report. The BBC&M exploration consisted of 110 borings performed in several phases between October 1998 and May 2002. Six additional borings along Ramps I and K were performed by Stantec in 2021. Due to the long duration of the design of the project, an additional site reconnaissance was performed in April 2022 to observe existing slope stability.

The findings of the explorations show that in the valleys and floodplains, a relatively thin layer of cohesive soil lies above generally non-cohesive coarse-grained soils. Groundwater was generally encountered in the coarse grained soils. In the hilly portions of the project, generally cohesive silts and clays were encountered above bedrock consisting of mudstone, shale, sandstone, and siltstone. A layer of weathered rock was typically encountered above competent bedrock. The laboratory testing program for the project consisted of soil classification, shear strength and consolidation testing, along with rock durability and strength tests.

New roadway embankments will be constructed for this project, along with areas of cut excavations. Stability analyses were performed for the proposed embankments. Generally the results showed that for embankments taller than 20 feet, 3H:1V (horizontal to vertical) slopes will be required to satisfy long term slope stability factor of safety requirements. Short-term stability is also an issue, and a controlled rate-of-fill is recommended to achieve adequate short-term factors of safety. Reinforced soils slopes are typically recommended when there is a need to use slopes steeper than 3H:1V for slopes taller than 20 feet. Cut slopes were designed by using the results of the rock testing program, existing topography, and Stantec's past experience with similar projects. The designed cut slope configurations are shown in the geotechnical plan set included in the appendices of the report. Additional analyses and recommendations are also included for cut slopes, embankments, and general construction.

1 Introduction

The Ohio Department of Transportation plans to reroute State Route (SR) 7 in Lawrence County, Ohio around the town of Chesapeake. The project was separated into 3 phases; 1A, 1B and 2. BBC&M Engineering performed the initial geotechnical exploration and analyses for the three phases. Phases 1A and 1B have been completed and are currently in use. During construction of the first two phases, several landslides and slope failures occurred, leading to a postponement and realignment of Phase 2. Stantec Consulting Services Inc. (Stantec) was contracted to perform the design and geotechnical exploration for Phase 2 of the realignment.

The project consists of the construction of a new two-lane divided highway with truck climbing lanes, traveling north of the town of Chesapeake, Ohio. This new road will connect the existing four-lane section of SR 7 on the east side of Chesapeake to the existing SR 7 north of the town of Proctorville, near SR 775. The beginning and ending stations for the project are 114+57.60 and 437+16.83, respectively, for an alignment length of 6.1 miles. The alignment is characterized by deep cuts and fills and eight proposed bridges. Embankment fills as high as approximately 120 feet, and cuts as deep as approximately 140 feet are planned.

This report summarizes the results of the exploration and analyses performed for the roadway design for the project. A soil profile and cross sections showing the boring locations and graphical boring logs, along with laboratory testing results, stability analysis results, and cut slope recommendations are included in the appendices of the report. Also in the appendices are the results of the undisturbed soil sample and rock core testing, along with slope stability and associated analyses. The analyses and recommendations for the structures are included in separate reports.

2 Geology and Observation

2.1 Geology

The Quaternary Geology of Ohio Map (ODGS, 1999) indicates that the alignment is underlain by Cenozoic-age colluvium derived from local bedrock in unglaciated areas and includes scattered areas of residuum, weathered material, landslides, and bedrock outcrop. Along the streams and creeks in the region, alluvium and alluvial terraces can also be encountered. According to the Web Soil Survey (NRCS), the project is underlain by many soil types, but predominantly those of the Upshur-Gilpin complex (UgF) and Vandalia silty clay loam unit (VaD3). The UgF complex consists of 40 to 70 percent slopes, while the VaD3 unit consists of 15 to 25 percent, severely eroded slopes. Both units would classify as A-6 according to the American Association of State Highway and Traffic Officials method. Consequently, the suitability of the alignment for local roads and streets is very limited, indicating the soils

have one or more features that are unfavorable. The main features of concern are slippage and steepness.

The Physiographic Regions of Ohio Map (Ohio Division of Geological Survey (ODGS), 1998) shows that the alignment is underlain by the Ironton and Marietta Plateaus within the Appalachian Plateau. The Ironton Plateau is described as moderately high relief dissected plateau. Coarse grained, coal-bearing rock sequences are common, along with lacustrine clay-filled Teays River valley remnants. The bedrock includes Pennsylvanian-age sandstones, siltstones, shales, and coal from the Pottsville, Allegheny, and Conemaugh Groups. The Marietta Plateau is a dissected plateau of mostly fine-grained rocks. Red shales and red soils are relatively common, along with landslides. The bedrock includes Pennsylvanian-age Upper Conemaugh Group through Permian-age Dunkard Group cyclic sequences of red and gray shales, siltstones, sandstones, limestones, and coals.

The Bedrock Geologic Map of Ohio (ODGS, 2006), shows that the alignment is underlain by Pennsylvanian-age sedimentary rocks, mainly shale, sandstone, siltstone, mudstone, limestone, and some coal. The Reconnaissance Bedrock Geology of the Huntington, Ohio Quadrangle Map (ODNR, 1996) indicates that the alignment is underlain by bedrock of the Pennsylvanian-age Monongahela and Conemaugh Formations. These formations consist of shale, siltstone, limestone, sandstone, mudstone, and coal. They are described as nonbedded to massive, with colors of gray, green, red, brown, and black. The Conemaugh formation is further described as containing multicolored mudstones and having rapid vertical and horizontal changes of rock types.

2.2 Hydrology and Hydrogeology

Several creeks and streams dissect the project, including Symmes Creek, Bent Creek and Indian Guyan Creek. The streams and creeks in the area all flow to the Ohio River, located south of the project boundary. During high flood events, the Ohio River can influence the flood elevations of the local creeks, with the 100-year flood elevation of the Ohio River being near 555 feet.

Surface water migrates in natural drainage swales and diversions along the hillsides. These drainage features often migrate through colluvium deposits on the hillside. The surface waters are often diverted by the colluvium, large boulders and other debris that are commonly situated on the hillside, often creating an irregular and highly erosional drainage flow.

Groundwater migrates through both primary and secondary porosity at the site. Groundwater seeps into the colluvium, residual soils and/or unconsolidated material on the hillside. Some of that water migrates along the top of bedrock, saturating the interface between the top of bedrock and unconsolidated material, until the groundwater seeps into the bedrock or into a fracture or joint. Below top of bedrock, the water migrates through the fractures, joints, bedding planes and other voids in the bedrock. The groundwater eventually intercepts the existing groundwater table in the area or exits to the surface at a lower elevation.

2.3 Project Observations

A review of the Ohio Karst Areas map (ODNR) indicates that no known karst features are located near the project limits. The Ohio Geological Survey Abandoned Underground Mine Locator website application indicates that there are no known abandoned underground coal mines in the project vicinity.

Lawrence County is known for being susceptible to landslides and slope failures because of the hilly terrain. Near Station 219+00, evidence of a previous failure, consisting of a head scarp and toe bulge, was observed on the slope south of the proposed alignment. Along other side roads around the alignment, signs of failures, such as repaired pavement, pavement cracking, pile and lagging retaining walls, and leaning guard rail sections and utility poles were observed during the exploration.

No oil or gas wells were observed during the field reconnaissance. A water tower was observed near Station 370+00, south of the alignment, along with a large diameter water main near Station 282+00. The water pipe was located by the water company because of the close proximity to Boring B-043-0-11, and it appeared that it ran in a general east to west direction.

An additional field reconnaissance was performed in April, 2022 to observe the project alignment and note of any newly developed geohazards or significant changes in site conditions. The reconnaissance was performed by traveling along the existing roadways along the alignment and stopping at periodic intervals to observe and document offroad sections of the proposed alignment. Landslides were identified by observing head scarps, toe bulges, uneven or cracking pavement sections, and disturbed vegetation of the surrounding slopes. Approximately 15 new locations were identified along or near the proposed alignment that showed evidence of recent or ongoing slope instability. The majority of the observed locations occurred along Henson Hollow Road, near the eastern end of the project (Station 137+00 to Station 170+00). Most of the areas appear to be shallow failure or shorter slopes, and no locations were identified as significant failures that would affect the proposed alignment. The geohazards identified are shown on the soil profile sheets in Appendix A.

3 Exploration

The borings performed for the project were completed by two companies, BBC&M and Stantec. BBC&M completed the first phase of the exploration from October 1998 to May 2002; advancing 110 borings along the project length. The borings advanced by BBC&M were advanced with hollow-stem augers and standard penetration test (SPT) samples were obtained. It was assumed that a cathead-operated SPT hammer was used. Rock coring was performed using NX- or NXM-size coring equipment. These borings were renumbered using the current ODOT Specifications for Geotechnical Explorations (SGE) guidelines. The year that the BBC&M borings were drilled was not available for all of the borings, so a year of 1999 was assumed when renumbering them.

After redesigning and realignment, Stantec advanced 64 supplemental borings to aid in analysis and design between May 17 and July 7, 2011. From April 22 to May 10, 2013, 47 additional borings were advanced to obtain necessary information for structures, ramps, and sideroads by Horn and Associates, Inc. Seven additional borings were advanced between April 6 and June 29, 2021 based upon design changes and additions by NEAS. The site plan and profile sheets showing the locations and graphical representations of the borings are included in Appendix A.

The Stantec borings were advanced using track-mounted and truck-mounted drill rigs equipped with $3^1/_4$-inch inside-diameter hollow-stem augers and calibrated automatic hammers with energy ratios (ER) of 81.9 and 74.4 percent, respectively. Horn and Associates used track and truck mounted drilled rigs with calibrated automatic hammers with ER's ranging from 62.0 to 88.7 percent. NEAS utilized a track mounted drill rig with an ER of 81.9 percent. NQ-size rock coring equipment was used to obtain rock core samples where necessary. Borings were advanced in general accordance with the SGE. For the roadway borings, standard penetration tests (SPT) were obtained at 2.5-foot intervals to a depth of 10 feet, unless noted otherwise. For the embankment and cut slope borings, SPT and undisturbed Shelby Tube (ST) samples were obtained at 2.5-foot intervals to a depth of 30 feet and 5-feet intervals below that or to auger refusal on bedrock. For the cut slope borings, rock coring was then performed to reach a predetermined depth, generally 10 feet below the proposed grade, or as necessary to overlap subsurface data with other borings along the cross section. The drilling operations were supervised in the field by a geotechnical engineer. Subsurface soil materials were logged by the engineer during the drilling process with particular attention given to the soils' color, consistency and moisture content. Rock core samples were also logged by the engineer with the description, recovery percentage and rock quality designation (RQD) recorded on the boring logs. Surveying and mapping of the site and boring stations, offsets, and elevations were provided by Stantec survey crews.

The soil samples were transported to Stantec's materials testing laboratory where a visual classification and natural water content (WC) test was performed on each sample. Engineering classification testing (sieve and hydrometer testing, ASTM D422, Atterberg limit testing, ASTM D 4318) was performed on selected samples that reflected primary soil horizons. Additional testing for soil strength and compressibility were conducted on ST samples, consisting of unconfined compressive (UC) strength (AASHTO T 208), consolidated-undrained (CU) triaxial (ASTM D 4767-04), and one-dimensional consolidation (ASTM D 2435-96). To aid in rock cut slope design, unconfined compression (ASTM D 7012) and slake durability index (SDI) (ASTM D 4644) tests were performed on selected rock core samples representing the rock types encountered during drilling. Laboratory testing was performed in accordance with ODOT standards.

4 Findings

4.1 General

The locations of the borings are presented in the plan view provided in Appendix A. Graphical representations of the Stantec borings are shown in the profile view and cross sections in Appendix A. The graphical borings previously prepared by BBC&M for its explorations were brought into the current soil profile and cross sections. These borings may not have been prepared in accordance with current ODOT CAD standards, and it was not in Stantec's scope of work to convert them into current CAD standards. Graphic logs for some of the BBC&M borings, in particular the structure borings, were not available for our use. Some of these graphic logs (one boring at each structure) have been created by Stantec and are shown on the soil profile to provide more continuity of soil conditions across the profile.

In the Soil Summary provided in Appendix A, the classification testing results are provided for the soil samples collected by Stantec, along with the visual description of those samples not tested. At the time of this report, limited soil classification/description information for the BBC&M borings was available, and that information is also included in the Soil Summary. The results of the undisturbed and rock core sample testing program can be found in subsequent sheets in the plan set.

4.2 Soil

In general, the borings performed in the valleys and floodplains consisted of cohesive fine-grained soils near the surface overlying non-cohesive fine-grained or coarse-grained sands and gravels at greater depths. The fine-grained soils, consisting of silt and clay (A-6a), silty clay (A-6b), clay (A-7-6), and cohesive sandy silt (A-4a) ranged in thickness from a few feet to more than ten feet. The consistency generally ranged from medium to very stiff with occasional soft layers. The coarse-grained soils consisted of gravel with sand (A-1-b), fine sand (A-3), coarse and fine sand (A-3a), non-cohesive sandy silt, and few layers of silt (A-4b). The density of the sands and gravels ranged from very loose to dense, with most being medium dense to dense. Groundwater was typically encountered within the coarse grained soil layers.

Above the floodplains in the more hilly areas of the alignment, the soils encountered consisted mainly of fine-grained silts and clays, classifying as silt and clay, silty clay, clay, elastic clay (A-7-5) and cohesive sandy silt. Few layers of gravel with sand, silt and clay (A-2-6) and gravel with sand and silt (A-2-4) were also encountered. The soils are colluvial or residual in nature, and ranged in thickness from a few feet to tens of feet. The consistency of the residual and colluvial soils ranged from soft to hard, generally increasing with increasing depth. Groundwater was typically not encountered in the overburden soil in the hilly terrain.

Several CU triaxial and UC strength tests were performed on undisturbed samples representing many of the fine-grained soils encountered along the project length. The results of the tests correlated well with the N-values measured in SPT samples obtained near the ST samples. The unconfined compressive

strengths of the soils tested ranged from 380 to 3733 psf, with unit weights varying from 111 to 138 pcf. A comparison of the results shows a trend of higher strengths in the colluvial soils from the eastern end of the alignment than the more alluvial soils typically found near the western end of the alignment. The triaxial tests performed produced effective stress cohesion (c') values ranging from 160 to 480 psf and effective stress friction angles (Φ') of 19.9 to 33.8 degrees. Data sheets for the undisturbed testing performed on recovered samples are provided in the geotechnical plan set included in Appendix A.

4.3 Bedrock

Bedrock was encountered in the majority of the borings, typically at shallower depths in the hilly terrain than in the floodplains. Where bedrock was encountered, a one- to two-foot thick layer of weathered rock was typically augered through before reaching more competent rock. The bedrock encountered consisted of varying layers of mudstone, siltstone, shale, and sandstone. The mudstone was red or red-brown to gray in color, thick, and typically weak to slightly strong; much of it was able to be augered through with the hollow stem augers. Several pressure relief-induced slickensides were noted in the mudstone layers at various depths and random orientations. The shale was described as brown to gray in color, slightly to moderately weathered, laminated, and weak to moderately strong. Few slickensides were noted in the shale samples. The siltstone and sandstone was typically slightly weathered, moderately strong to strong, and thin to thick bedded with higher RQD values than the other rock units. The siltstone was further described as tan to gray and typically arenaceous. The sandstone was further described as tan to gray in color and fine-grained, with some samples being medium to coarse-grained. Photographs of the rock core samples recovered are included in Appendix C.

In anticipation that excavated mudstone and shale would be the primary material available for use as fill, two samples of the Conemaugh Shale (mudstone and non-durable shale) were recompacted and three CU triaxial tests were performed. The tests were run with a moisture content of approximately two percent below optimum moisture content, at optimum moisture, and at two percent above optimum moisture. P-q plots were developed for total and effective stress conditions that included the failure points from all three tests. These plots resulted in a cohesion of 320 pounds per square foot for total stress and angles of internal friction of 21 and 29 degrees for total and effective stress, respectively. A cohesion of zero was used for effective stress condition. The results of these tests were used in the analyses for the embankment sections discussed in Section 5.2.

Unconfined compressive strength testing and SDI testing was performed on several rock core samples, representing the predominant rock types encountered in the exploration. In general, the results of the testing were as expected, with the sandstone showing higher compressive strength and durability values than the other rock types, while the majority of the shale and mudstone was weaker and more susceptible to weathering. For the sandstone, the results of the tests varied from 118 to 659 tons per square-foot (tsf) with an average of 410 tsf. The siltstone samples tested resulted in strength values of 637 to 757 tsf, with an average of 697 tsf. Lower values of 28 and 58 tsf were recorded in testing performed in 2021. The shale and mudstone were weaker, with strength values ranging from 111 to 376 tsf for the shale and 1 to 82 tsf for the mudstone, with averages of 246 and 44 tsf, respectively. The results of the unconfined tests are shown on the graphical logs in Appendix A, and test sheets are presented in Appendix D.

A summary of the SDI tests are included in Appendix D and also on the graphic boring logs in the plan and profiles and cross section provided in Appendix A. The SDI values for the sandstone ranged from 8.6 to 97.8 percent, with an average of 81.1 percent. Two additional tests on sandstone performed in 2021 for Ramp K yielded 92.4 and 97.5 percent. The siltstone samples tested showed even higher values, ranging from 88.3 to 98.5 percent, with an average of 94.7 percent. An additional test on siltstone performed in 2021 for Ramp K yielded 91.0 percent. As expected, the shale and mudstone SDI values were lower, ranging from 6.5 to 96.8 percent for the shale and 0.1 to 6.4 percent for the mudstone, with averages of 62.9 and 1.3 percent, respectively. An additional test run on claystone in 2021 for a sample along Ramp K yielded 51.4 percent.

5 Analysis

5.1 Cut Slopes

ODOT's Geotechnical Bulletin 3 (GB3) guidelines, results of the UC and SDI laboratory testing, existing natural slopes, and experience on similar projects were used to establish recommendations for cut slope configurations within various soil and bedrock types. The resulting cut slopes designs, based on these recommendations, are shown on the applicable cross sections in Appendix A.

Generally, it is recommended that 3H:1V slopes be used in claystone/mudstone encountered on cut slopes that are considered through-cuts, meaning that it daylights beyond the top of the existing slope, if present. It is recommended that 4H:1V slopes be used for sidehill cut situation where the cut daylights on an existing slope.

It is recommended that sandstone and durable siltstone be constructed at 1.5H:1V slopes. Slopes constructed at 2H:1V are recommended on some cut slopes where the primary bedrock unit is shale that exhibits a higher durability than the claystone/mudstone previously discussed.

Diversion ditches are recommended in order to prevent large amounts of water from being allowed to flow down the down tall cut slopes due to the potential for erosion. The recommended locations of these diversion ditches are shown on the cross sections.

5.2 Embankment Stability

Critical embankment cross sections were analyzed for slope stability using the program Slope/W from GeoStudio, Inc. A minimum of one section was chosen from each embankment along the project length. Short-term analyses, using total stress shear strength parameters for foundations and embankment materials, simulate conditions that will exist during embankment construction and immediately following completion of the embankment. Long-term analyses, using effective-stress shear strength parameters, simulate conditions that will exist long after the embankment is constructed and excess pore pressures within the foundation materials have dissipated.

Rapid drawdown analyses, using effective-stress shear strength parameters, simulate the scenario of a flood saturating the embankment up to an elevation of the maximum possible flood, and then quickly receding removing the resisting pressure of the water. A flood elevation of 557 feet was used based upon calculated maximum 100-year flood elevations of the Ohio River near the project location. It was assumed that floodwaters would not be sustained long enough to saturate the entire embankment below that elevation. Therefore, for embankments constructed on relatively flat existing ground, the phreatic surface was modeled as being near the existing ground surface at the center, and sloping upwards toward the flood elevation at the sides. The computed factors of safety were compared to ODOT's published minimum factors of safety for embankment slopes, shown in Table 1.

Table 1. ODOT Minimum Factors of Safety for Slope Stability

Embankment Scenario	Short-Term	Long-Term	Rapid Drawdown
Roadway Embankment	1.3	1.3	1.1
Embankments Supporting Structures	1.3	1.5	1.1

The shear strength parameters for the foundation soils were derived from soil classifications, UC strength tests, CU triaxial shear tests, SPT values, and associated published correlations of such data. In general, undrained shear strengths for cohesive soils were based upon UC tests and correlations of N-values from SPT testing. The drained shear strength parameters of the cohesive soils were based upon the CU triaxial tests, while the non-cohesive soil shear strengths were based upon the corrected SPT N-values. The proposed embankment material is assumed to consist mostly of recompacted Conemaugh shale, therefore the strength properties were obtained from the triaxial tests performed on that material, as discussed in Section 4.3. Table 2 shows the shear strength values of the embankment material used in the analyses.

Table 2. Embankment Material Shear Strength Parameters

Parameter	Total Stress	Effective Stress
c or c' (psf)	320	0
Φ or Φ' (deg)	21	29
γ (pcf)	136	136

Factors of safety for 2H:1V slopes were lower than the ODOT recommended values for both short and long term conditions, thus 3H:1V slopes are recommended for embankments greater than 20 feet in height. Table 3 summarizes the results of the slope stability analyses for 3H:1V slopes, along with the stationing ranges that each cross section represents. The Slope/W analysis files showing the cross sections, shear strength parameters, and calculated factors of safety can be found in Appendix E.

Table 3. Embankment Stability Results for 3H:1V Slopes

Section	Applies to Station		Short Term FS	Long Term FS	Rapid Drawdown FS
	From	To			
136+00 left embankment	136+00	152+00	1.0	1.7	1.1*
136+00 right embankment	136+00	152+00	0.8	1.7	1.1*
160+00	152+00	174+50	1.2	1.7	1.2*
184+00	182+00	186+00	1.3	1.7	n/a
219+00	216+00	228+50	0.8	1.7	n/a
230+50 left embankment	228+50	233+50	1.4	1.7	n/a
230+50 right embankment	228+50	231+00	1.3	1.7	n/a
293+00 left embankment	289+00	302+50	0.7	1.8	1.4
293+00 right embankment	275+00	296+50	0.8	1.7	1.2*
322+00 left embankment	316+00	324+00	1.5	1.7	n/a
322+00 right embankment	316+00	324+00	1.1	1.7	1.2*
329+00	324+50	333+00	0.8	1.7	1.2*
336+00	334+50	338+50	1.1	1.5	1.3
336+00 w/ special benching	334+50	338+50	1.4	1.6	1.1*
340+00 left embankment	338+50	342+50	1.2	1.7	n/a
340+00 right embankment	338+50	342+50	1.2	1.7	n/a
371+00	364+00	383+50	1.1	1.7	n/a
CR 69 52+00 left embankment	49+00	54+00	0.7	1.6	1.1*

Note: Rapid drawdown analysis is not applicable for embankments where the existing ground surface is near or above the flood elevation of 557 feet.
*The use of rock fill is recommended below Elevation 557 for protection against rapid drawdown and was considered in this analysis.

As shown in Table 3, the proposed embankment at Station 336+00 did not meet the minimum requirements under long term conditions. This appears to be due to the geometry of the embankment and the existing slope causing a sidehill fill condition. Because of this, special benching, using ODOT's Geotechnical Bulletin 2 (GB2) for design, of the existing slope was modeled. The stability analysis performed on the benched section, as shown in Table 3, shows that the benching scheme provides a sufficient factor of safety in long term conditions. The benching scheme for Station 336+00 is shown on

the cross section in the plan set and should be incorporated into the roadway design drawings. It is recommended that this benching scheme be applied from Station 334+50 to 338+50.

A review of the slope stability analysis results indicates that the predicted short term factors of safety at many of the locations along the alignment do not meet the minimum factor of safety required by ODOT. Where the short term factor of safety is below the target value, remedial methods should be utilized for embankment construction. Controlled rate of fill placement is the recommended remedial measure and this method was analyzed for construction of these embankments. Settlement versus time relationships were used to estimate permissible construction rates. These rates were calculated assuming the gain in shear strength for the foundation soils under imposed loads should be proportional to the percent consolidation. A summary of the results of the calculations are shown in Table 4 and the calculations can be found in Appendix G.

Table 4. Summary of Permissible Construction Rates

Station Analyzed	Maximum Embankment Elevation using Normal Construction Rates (feet)	Permissible Construction Rate (feet/week)	Approximate Station Interval for Rate Construction
136+00	548	13.0	136+25 to 146+00
160+00	578	10.7	148+00 to 162+00
219+00	605	3.2	215+00 to 228+50
293+00	545	5.0	289+00 to 295+00
322+00	609	3.6	316+00 to 324+00
329+00	590	1.3	324+50 to 332+50
340+00	623	11.2	338+50 to 342+00
371+00	593	4.6	342+00 to 374+00

For the embankments from Station 334+50 to 374+00, the short term failure occurred in the proposed embankment material, therefore consolidation of the foundation soil was assumed to be independent of short term stability for these embankments. In order to calculate a construction rate, the lower part of the embankment was assumed to be the compressible layer, and the remainder of the embankment was used as the fill height as shown in the calculations in Appendix G.

Settlement platforms and piezometers should be installed to monitor settlements and pore water pressures of the foundation soils during construction. If excess pore water pressures are observed during construction, appropriate remedial construction techniques should then be initiated to maintain embankment stability. Recommendations regarding construction for these embankment intervals are presented in Section 6.3.

5.3 Reinforced Soil Slopes

Where it is not feasible to use 3H:1V slopes for embankments greater than 20 feet tall, geogrid reinforced soil slopes are recommended. The reinforced slopes were designed as 2H:1V slopes with the necessary geogrid reinforcement to achieve slope stability factors of safety required by ODOT for embankments. The 2H:1V slopes are being used for multi-span bridge spill-through slopes in order to reduce the span length from the abutments to the piers and when precast arch bridges are planned to reduce the lengths of the structures. There are also areas where right-of-way restrictions required the use of 2H:1V slopes.

The computer program ReSSA was used for the design of the reinforced soil slopes. The slopes were analyzed for short-term, long-term, and rapid drawdown (where applicable) conditions. Simplified geometry and foundation soil characterization were used because the software limitations. The Comprehensive Bishop Method was used for global slope stability estimations. A traffic surcharge load of 250 pounds per square foot was used at the crest of the slope. The guidelines in the ODOT Supplemental Specification 863 titled “Reinforced Soil Slopes” were used for selection of geogrid tensile strengths and resistance factors. The results of the analyses are included in Appendix F. The results of the analyses are summarized in the following table.

Table 5. Reinforced Soil Slope Stability Results for 2H:1V Slopes

Section	Applies to Station		Short Term FS	Long Term FS	Rapid Drawdown FS
	From	To			
135+70	134+56	136+25	1.3	1.8	1.1
198+00	195+75	199+87	0.9	1.5	1.2
203+00	201+04	204+38.5	1.5	1.6	1.1
208+00	206+25	209+25	1.7	1.5	1.4
297+68	296+75	298+58	0.9	1.7	1.1
300+81	300+06	301+00	1.1	1.8	1.1
377+50	376+60, Ramp I 376+35	378+34, Ramp I 377+94	1.1	1.5	1.4
379+50	378+64, Ramp I 378+30	379+90, Ramp I 379+75	1.4	1.5	1.3
Ramp L 384+00	380+25	389+25	1.5	1.3	n/a
SR775 55+00	54+61	55+97	1.4	1.5	1.2
SR 775 59+00	57+75	61+25	1.3	1.5	1.4

The stability analyses in Table 5 indicate that the estimated short term factors of safety at several of the reinforced slope locations do not meet the minimum factor of safety required by ODOT. Controlled rate of fill placement is the recommended remedial measure and this method was analyzed for construction of these embankments. Settlement versus time relationships were used to estimate permissible construction rates. These rates were calculated assuming the gain in shear strength for the foundation

soils under imposed loads should be proportional to the percent consolidation. A summary of the results of the calculations are shown in Table 6 and the calculations can be found in Appendix G.

Table 6. Summary of Permissible Construction Rates (With Use of Reinforced Soil Slopes)

Station Analyzed	Maximum Embankment Elevation using Normal Construction Rates (feet)	Permissible Construction Rate (feet/week)	Approximate Station Interval for Rated Construction
198+00	565	6.1	196+75 to 199+87
297+68	549	16.4	296+75 to 298+58
300+81	549	16.3	300+06 to 301+00
377+50	573	8.2	376+60 to 378+34, Ramp I 376+35 to 377+94

5.4 Ramp K Retaining Wall

A retaining wall is proposed between Ramp J and K at the SR 775 Interchange. The proposed length of the retaining wall is approximately 402 feet. The wall ranges in height from approximately 4 to 17 feet (top of wall to base of footing), creating a grade separation that varies from 2 to 15 feet. The wall is planned to consist of a cast-in-place reinforced concrete wall on a spread footing. The wall is located within a large cut, with the top of the wall ranging from about 5 to 80 feet below existing grade. The elevation of the proposed wall is in the range of 595 to 625 feet. Three borings (B-097-0-12, B-098-0-12, and B-102-0-12) were advanced along the wall in 2012. Stantec completed two additional borings (B-097-1-20 and B-098-1-20) along the retaining wall alignment in June 2021. Design calculations were performed for the retaining wall, and are included in Appendix I.

In the elevation range of 595 to 625 feet (the approximate range of the retaining wall from spread footing up to the top of the wall), the borings indicate that both the retained and foundation material for the wall will consist of mudstone/claystone or sandstone bedrock. It was assumed that the bedrock would be excavated at a safe temporary 1:1 slope during wall construction and backfilled with select granular fill after wall construction. It is recommended that parameters used for the retained soil reflect the select granular fill. The parameters recommended for the foundation soils represent the anticipated mudstone/claystone bedrock at the spread footing bearing elevation, modelled more like a very stiff clay. The table below presents the recommended earth pressure and bearing capacity parameters for the retaining wall design for sliding, overturning, eccentricity, and bearing capacity.

Table 7. Recommended Design Parameters for Ramp K Retaining Wall Design

Parameter	Recommended Value
Retained Soil Unit Weight (pcf)	130
Retained Soil Drained Friction Angle (degrees)	34
Active Earth Pressure Coefficient (K_a)	0.28
Foundation Soil Undrained Cohesion (ksf)	4.0
Nominal Bearing Resistance (ksf)	20.6*
Factored Bearing Resistance (ksf)	9.3**

*Calculated as undrained cohesion x 5.14 (bearing capacity factor)
**Calculated as nominal bearing capacity resistance x 0.55 (resistance factor)

There is potential for the mudstone/claystone bedrock behind the retaining wall to swell when exposed to water. It is recommended that a minimum distance of 3 feet be excavated behind the wall at the base of the 1:1 cut slope. Backfill behind the wall should consist of porous granular backfill wrapped with geotextile filter fabric or a geotextile strip drain against the back face of the wall. Granular structural backfill should be used to for the remainder of the backfill. The granular backfill should allow any swell pressure from the mudstone/claystone to dissipate and not affect the loading of the wall.

5.5 Settlement

Settlement analyses were performed at bridge approach embankments to estimate the anticipated settlement in the foundation soils and embankment soils and the time rate of the settlement. These results are shown in the geotechnical reports for the particular structures under separate covers.

5.6 Culvert Camber Analysis

A culvert camber analysis has been conducted for three culvert locations associated with the project. The goal of these analyses is to estimate settlement along the culvert profiles to assist in culvert design. Settlement was determined using Settle3 software and project consolidation tests. Table 8 summarizes the estimated settlement along each culvert from the culvert inlet. Analysis output is provided in Appendix J.

Table 8. Boring Summary for Culvert Camber Analysis

Culvert Section	Distance from Inlet (feet)	Estimated Settlement (inches)
128+00	0	1.2
	30	4.6
	60	6.9
	90	7.6
	120	7.7
	150	5.2
	181	1.2
162+96	0	1.4
	63	5.2
	126	7.8
	189	8.3
	252	6.7
	315	4.4
	377	1.3
229+62	0	1.7
	71	6.7
	142	9.1
	213	9.9
	284	8.6
	355	6.4
	426	1.7

6 Recommendations and Conclusions

6.1 General

6.1.1 It is recommended that the project specifications refer to the Ohio Department of Transportation Construction and Materials Specifications (CMS), current edition. The use of special notes referring to the CMS should be included as necessary in relating the construction documents to the specific conditions within the project limits.

6.1.2 The conclusions and recommendations offered are primarily based on data and indicated subsurface conditions from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar conditions by competent member of the engineering profession. No warranties can be made regarding the continuity of conditions between borings.

6.2 Cut Slopes

6.2.1 The Contractor should conduct excavation operations in such a manner that durable sandstone and siltstone obtained from the roadway excavation is stockpiled separately or otherwise manipulated so that ample quantities are available for those areas requiring this material as shown in the plans. Durable bedrock should not be wasted unless prior approval is obtained from the Engineer. Durable bedrock refers to sandstone or siltstone with a minimum slake durability of 90 percent that is not friable and cannot be broken from hand pressure.

6.2.2 Weak claystone will be encountered at ditch grade along portions of the proposed alignment. This material can be expected to erode when exposed in ditches with relatively steep grades (greater that 2 percent). It is recommended that in areas where the weak shale or claystone is exposed at ditch grades exceeding two percent, the ditch be lined with crushed stone or appropriate erosion protection matting to reduce the potential for erosion.

6.2.3 In order to assist in creating a better transition from cuts to fills and to collect drainage from beneath pavements in cut intervals, transverse drains should be installed that thus reducing the possibility of saturating embankment materials. Transverse drains should be constructed that are a minimum of 24 inches deep below subgrade, wrapped with geotextile filter fabric, and include a perforated pipe underdrain. These should be installed at the following approximate stations: 175+00, 182+00, 190+50, 213+00, 237+00, 288+00, 302+50, 333+50, 344+00, and 362+50.

6.3 Embankments

6.3.1 It is recommended that 3H:1V slopes be used for embankments along the alignment. It is Stantec's understanding that the roadway embankments for this project will be constructed using material from cut areas. A review of the subsurface conditions encountered within the cut intervals indicates that the excavated material will consist primarily of non-durable shale and mudstone, along with a lesser

amount of durable and non-durable sandstone and siltstone. While coal was not encountered in large quantities in the explorations, it is possible that some coal may be encountered during excavation. Coal should not be used as fill material for the embankments. Durable sandstones and siltstones should be utilized at the bottoms of fill areas to provide a stable base for embankment construction, as further explained in Section 6.3.2. Thicker layers of this material should be utilized at the bases of embankments subject to rapid drawdown conditions below an elevation of 557 feet.

6.3.2 Any saturated, soft and unstable areas encountered within embankment foundation limits and/or other areas as specified by the Engineer should be drained and stabilized using broken durable sandstone from cut areas. Type D geotextile fabric (CMS Item 712.09) and “choking stone” should be placed over the durable sandstone. A minimum two-foot working platform should be constructed in such areas. This material may require end-dumping. The materials should be placed as directed by the Engineer based on site and climatic conditions during construction.

6.3.3 It is recommended that the rate of embankment construction be controlled in order to maintain adequate short term slope stability of the roadway embankments, as discussed in Section 5. Normal construction rates can be used up to the elevations given, then a controlled rate of fill be used above that elevation to final grade. Piezometers are recommended to be installed prior to embankment construction to monitor the pore water pressures of the foundation soils. Based upon the piezometer readings, the construction of the embankments may be restricted and, if necessary, halted until excess pore pressures have dissipated. The following recommended piezometer locations are preliminary and may be modified prior to construction. The number of piezometers installed at each location and the elevations at which they are installed are dependent upon the subsurface conditions present. A minimum of one piezometer should be installed for each compressible horizon at the recommended location. Additional piezometers should be installed in locations where there may be a concern for foundation instability beneath the embankment fill at the direction of the Engineer.

Table 9. Piezometer Installation Locations

Station	Offset (feet)	Elevation of Piezometer Tip
136+00	60 Left	520
160+00	60 Right	550
219+00	190 Right	575
293+00	60 Left	525
297+68	Centerline	520
300+81	Centerline	525
322+00	60 Right	570
322+00	190 Right	535
329+00	190 Right	570
340+00	160 Left	580
371+00	120 Left	568

377+00	25 Left	530

6.3.4 Special benching should be constructed for the embankment from Stations 334+50 to 338+50 to aid in long term stability of the embankment. The benches should be constructed one at a time beginning with the lowest bench. Each bench should be backfilled prior to excavation of the next bench. See the cross-section at Station 336+00 for details of the benching design.

6.3.5. Where 3H:1V slopes are not feasible, reinforced soils slopes should be designed for 1.5H:1V or 2H:1V slopes. Primary geogrid reinforcement should be used to support the embankment on the steepened slope, and secondary reinforcement near the face of the slope should be used to protect against sloughing and shallow instability.

6.4 Subgrade Stabilization

6.4.1. Stantec compiled the information for the at-grade or near-grade soils, along with the soils data from borings performed in cut-sections. This information was input to ODOT's Subgrade Analysis spreadsheet, provided in Appendix H. From this spreadsheet, an average CBR value was calculated for pavement design was calculated. Based on the results, CBR of 6 is recommended.

6.4.2.

Subgrade analyses were originally completed as part of the Report of Roadway Exploration – Updated Draft dated June 15, 2022. Updated analyses were completed to the most current version of the Ohio Department of Transportation (ODOT) Subgrade Analysis Spreadsheet. The goal was to compare the original results to the new analyses and determine if the use of geogrid could reduce the amount of undercutting required in key areas outlined in the previous report. Table 8 summarizes the undercut and replace subgrade stabilization recommendations outlined in the previous roadway report and provides comparison to the updated recommendations.

Table 10. Boring Summary

Alignment and Section	Previous Recommendation	Updated Recommendation
SR 7 from Station 114+58 to 124+50	No subgrade stabilization necessary	No subgrade stabilization necessary
SR 7 from Station 384+00 to end of alignment	21-inch undercut with geotextile	12-inch undercut with geogrid or geotextile
Ramp D Access Station 117+50 to end of alignment	36-inch undercut due to silt (A-4b, unsuitable soil)	36-inch undercut due to silt (A-4b, unsuitable soil)
Lynn Lane	12-inch undercut with geotextile	12-inch undercut with geogrid or geotextile

Alignment and Section	Previous Recommendation	Updated Recommendation
Ramp C Station 119+55 to 121+50	24-inch undercut with geotextile	12-inch undercut with geogrid or 18-inch undercut with geotextile
CR 118 Station 13+00 to 14+76	30-inch undercut with geotextile	18-inch undercut with geogrid or 24-inch undercut with geotextile
SR 775 Station 45+43 to 48+50	14-inch undercut with geotextile	12-inch undercut with geogrid or geotextile

A design CBR of 6 for pavement design was estimated based on the global subgrade analysis, which was the same result from the older analysis spreadsheet. Excavations for subgrade stabilization should extend 18 inches beyond the edge of the surface of the pavement. Item 204 Geogrid and/or Geotextile Fabric should be placed according to section 204.07 of the ODOT Construction and Material Specifications (C&MS). The excavated material should be replaced with Item 204 Granular Material Type B or C. Type B should be used if underdrains are required. The excavations should be drained to an underdrain, catch basin, or pipe.

6.4.3. Where bedrock is exposed at the subgrade elevation, undercut and replacement should be performed in accordance with CMS 204.05 so that a more consistent and less rigid material underlies the pavement section. An undercut depth of 6 inches below subgrade extending 1 foot beyond the shoulders should be performed. The excavated material should be replaced with Granular Material Type B, following the gradation of CMS 703.17 and compacted according to CMS 204.03. It is estimated that the bedrock undercut will be required at the following locations:

- Mainline Station 187+00 to 189+00
- Mainline Station 213+00 to 215+00
- Mainline Station 302+50 to 315+00
- Mainline Station 333+50 to 334+00
- Mainline Station 344+50 to 362+00
- SR 243 Station 11+50 to 16+50
- CR 69 Station 9+90 to 10+00
- CR 69 Station 32+50 to 36+00
- CR 69 Station 45+00 to 48+00
- Ramp J Station 387+50 to 391+20
- Ramp K Station 385+80 to 397+50

7 References

Hopkins, T.C. and Beckham, T.L. (1998) "Embankment Construction Using Shale," Research Report KTC-98-2, University of Kentucky Transportation Center, College of Engineering, Lexington Kentucky.

Naval Facilities Engineering Command, *Design Manuals*, 1986.

Ohio Department of Natural Resources, *Reconnaissance Bedrock Geology of the Huntington, Ohio Quadrangle Map*, 1996.

Ohio Division of Geological Survey, *Bedrock Geologic map of Ohio*, 2006.

Ohio Division of Geological Survey, *Physiographic Regions of Ohio Map*, 1998.

Ohio Division of Geological Survey, *Quaternary Geology of Ohio*, 1999.

United States Department of Agriculture, Natural Resources Conservation Services, *Web Soil Survey of Lawrence County, Ohio, 2011*

Appendix A

Soil Profile Drawings

PROJECT DESCRIPTION
THIS PROJECT CONSISTS OF THE GEOTECHNICAL EXPLORATION FOR THE CONSTRUCTION OF THE NEW STATE ROUTE (SR) 7 TWO-LANE HIGHWAY, WITH OPTION OF EXPANDING TO FOUR-LANE, TRAVELING NORTH OF THE TOWN OF CHESAPEAKE IN LAWRENCE COUNTY, OHIO. THE NEW ROADWAY WILL CONNECT THE EXISTING SR 7 EAST OF CHESAPEAKE AT STATION 114+57.60 TO SR 7 NEAR PROCTORVILLE, OHIO AT STATION 408+12.36. EIGHT BRIDGES, ALONG WITH SIDE ROAD CONNECTORS AND IMPROVEMENTS ARE INCLUDED IN THE PROJECT.

PREVIOUS EXPLORATION
BBCM ENGINEERING CONDUCTED AN EXPLORATION FOR THE PROJECT CONSISTING OF 110 BORING BETWEEN JUNE AND SEPTEMBER, 1999. THE FINDINGS FOR THESE BORINGS ARE INCLUDED IN THE PLAN SET. ADDITIONALLY, BBCM COMPLETED LANDSLIDE BORINGS BETWEEN 2000 AND 2005. AVAILABLE INFORMATION FOR THESE BORINGS IS INCLUDED IN THE PLAN SET.

GEOLOGY
THE PROJECT AREA IS LOCATED IN THE UNGLACIATED APPALACHIAN PLATEAU REGION OF OHIO. THE TOPOGRAPHY ALONG THE PROJECT LENGTH IS CHARACTERIZED BY UPLAND HILLS, ALONG WITH THE OHIO RIVER AND SMALLER RIVER AND STREAM FLOODPLAINS. THE SOILS IN THE UPLAND HILLS CONSIST OF COLLUVIUM DERIVED FROM THE UNDERLYING BEDROCK. IN THE FLOODPLAINS, SOILS CONSIST OF MIXED DEPOSITS OF COLLUVIAL AND ALLUVIAL/OUTWASH DEPOSITS. LANDSLIDES ARE PREVELANT IN THE AREA.

BEDROCK IN THE PROJECT AREA CONSISTS OF THE PENNSYLVANIAN-AGE MONONGAHELA AND CONEMAUGH FORMATIONS. THESE FORMATIONS CONSIST OF SHALE, SILTSTONE, LIMESTONE, SANDSTONE, MUDSTONE AND COAL. THE DEPTH TO BEDROCK IS GENERALLY SHALLOW IN THE HILLY TERRAIN, WITH OUTCROPS PRESENT IN PLACES. ALONG THE FLOODPLAINS, BEDROCK IS GENERALLY ENCOUNTERED AT GREATER DEPTHS.

SUBSURFACE EXPLORATION
A TOTAL OF 126 BORINGS WERE ADVANCED DURING THE STANTEC EXPLORATION DURING THREE SEPARATE MOBILIZATIONS FROM MAY 17, 2011 TO JUNE 29, 2021. OF THOSE BORINGS, 103 WERE ADVANCED FOR THE PURPOSE OF EVALUATING ROADWAY, CUT-SLOPE, AND EMBANKMENT STABILITY, WITH THE REMAINING 16 BEING FOR STRUCTURAL FOUNDATION PURPOSES. THE BORINGS WERE ADVANCED USING TRACK-MOUNTED AND TRUCK-MOUNTED DRILL RIGS USING 3.25-INCH I.D. HOLLOW-STEM AUGERS. STANDARD PENETRATION TEST (SPT) SAMPLES WERE OBTAINED USING CALIBRATED AUTOMATIC HAMMERS WITH ENERGY RATIOS (ER) OF 81.9, 74.4, 85.9, 62.0, 88.7 AND 81.7 PERCENT. FOR THE ROADWAY BORINGS, A MINIMUM OF 4 SPT TESTS WERE PERFORMED AT 2.5-FOOT INTERVALS. FOR THE CUT-SLOPE AND EMBANKMENT BORINGS, SPT AND UNDISTURBED SHELBY TUBE (ST) TESTS WERE PERFORMED AT 2.5-FOOT INTERVALS TO A DEPTH OF 30 FEET AND AT 5-FOOT INTERVALS BELOW THAT, OR UNTIL BEDROCK WAS ENCOUNTERED. FOR THE CUT-SLOPE BORINGS, ROCK CORING WAS PERFORMED USING NQ-SIZED CORING EQUIPMENT DOWN TO A PREDETERMINED DEPTH BASED UPON THE DEPTH OF THE PROPOSED CUT. FOR THE STRUCTURE BORINGS, SPT AND ST SAMPLES WERE OBTAINED AT 2.5-FOOT INTERVALS TO REFUSAL ON BEDROCK, AND THEN A MINIMUM OF 10 FEET OF BEDROCK WAS CORED. AT THE COMPLETION OF DRILLING OPERATIONS, BORINGS WERE BACKFILLED WITH AUGER CUTTINGS WHEN NO WATER WAS ENCOUNTERED OR WITH CEMENT-BENTONITE GROUT WHEN NECESSARY. ASPHALT COLD PATCH WAS USED TO PATCH PAVEMENT WHERE NECESSARY.

EXPLORATION FINDINGS
IN GENERAL, ALONG THE FLOODPLAINS, SOILS CONSISTED OF A RELATIVELY THIN LAYER OF COHESIVE SILT AND CLAY (A-6a), SILTY CLAY (A-6b) AND SANDY SILT (A-4a) OVERLYING NON-COHESIVE GRAVEL WITH SAND (A-1-b), COARSE AND FINE SAND (A-3a) FINE SAND (A-3) AND SANDY SILT. ALONG THE HILLY AREAS, THE SOILS CONSISTED MAINLY OF COHESIVE SILT AND CLAY, SILTY CLAY, CLAY (A-7-6) ELASTIC CLAY (A-7-5) AND SANDY SILT. GRAVEL WITH SAND SILT AND CLAY (A-2-6), GRAVEL WITH SAND AND SILT (A-2-4) AND SILT (A-4b) WERE ALSO ENCOUNTERED IN LESSER AMOUNTS ACROSS THE PROJECT LENGTH.

THE BEDROCK ENCOUNTERED CONSISTED OF SHALE, MUDSTONE, SANDSTONE AND SILTSTONE. TYPICALLY AND LAYER OF WEATHERED ROCK WITH A THICKNESS OF A FEW FEET WAS ENCOUNTERED ABOVE COMPETENT ROCK. IN GENERAL, THE SANDSTONE AND SILTSTONE WAS DESCRIBED AS SLIGHTLY TO UNWEATHERED AND STRONG, WHILE THE SHALE AND MUDSTONE WAS DESCRIBED AS SLIGHTLY TO HIGHLY WEATHERED AND WEAK TO SLIGHTLY STRONG. SLICKENSIDES WERE NOTED IN MANY OF THE SHALE AND MUDSTONE LAYERS.

SPECIFICATIONS
THIS GEOTECHNICAL EXPLORATION WAS PERFORMED IN ACCORDANCE WITH THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, OFFICE OF GEOTECHNICAL ENGINEERING, SPECIFICATIONS FOR GEOTECHNICAL EXPLORATION (SGE) JANUARY 20, 2012 REVISION.

AVAILABLE INFORMATION
THE SOIL, BEDROCK, AND GROUNDWATER INFORMATION COLLECTED FOR THIS SUBSURFACE EXPLORATION THAT CAN BE CONVENIENTLY DISPLAYED ON THE GEOTECHNICAL PROFILE SHEETS HAS BEEN PRESENTED. GEOTECHNICAL REPORTS, IF PREPARED, ARE AVAILABLE FOR REVIEW ON THE OFFICE OF CONTRACT SALE WEBSITE.

LEGEND

STANTEC & BBC&M BORINGS

DESCRIPTION	ODOT CLASS	CLASSIFIED MECH.	CLASSIFIED VISUAL
GRAVEL AND/OR STONE FRAGMENTS	A-1-a	2	2
GRAVEL AND/OR STONE FRAGMENTS WITH SAND	A-1-b	14	20
GRAVEL WITH SAND AND SILT	A-2-4	14	14
GRAVEL WITH SAND, SILT AND CLAY	A-2-6	10	16
FINE SAND	A-3	2	3
COARSE AND FINE SAND	A-3a	24	40
SANDY SILT	A-4a	52	67
SILT	A-4b	12	15
SILT AND CLAY	A-6a	98	104
SILTY CLAY	A-6b	105	159
ELASTIC CLAY	A-7-5	5	0
CLAY	A-7-6	104	100
ROCK		0	116
	TOTAL	442	540
WEATHERED SHALE / MUDSTONE / SILTSTONE			VISUAL
SHALE / SANDSTONE			VISUAL
PAVEMENT OR BASE = X = APPROXIMATE THICKNESS			VISUAL
SOD AND TOPSOIL = X = APPROXIMATE THICKNESS			VISUAL

PROJECT BORING LOCATION - PLAN VIEW.

HISTORICAL BORING LOCATION - PLAN VIEW.

DRIVE SAMPLE AND/OR ROCK CORE BORING PLOTTED TO VERTICAL SCALE ONLY. HORIZONTAL BAR INDICATES A CHANGE IN STRATIGRAPHY.

WC INDICATES WATER CONTENT IN PERCENT.

N_{60} INDICATES STANDARD PENETRATION RESISTANCE NORMALIZED TO 60% DRILL ROD ENERGY RATIO.

N INDICATES STANDARD PENETRATION RESISTANCE.

⊖ WATER CONTENT NEARLY EQUAL TO OR GREATER THAN LIQUID LIMIT.

● INDICATES A NON-PLASTIC MATERIAL WITH A HIGH WATER CONTENT.

▼— INDICATES FREE WATER.

W— INDICATES FREE WATER.

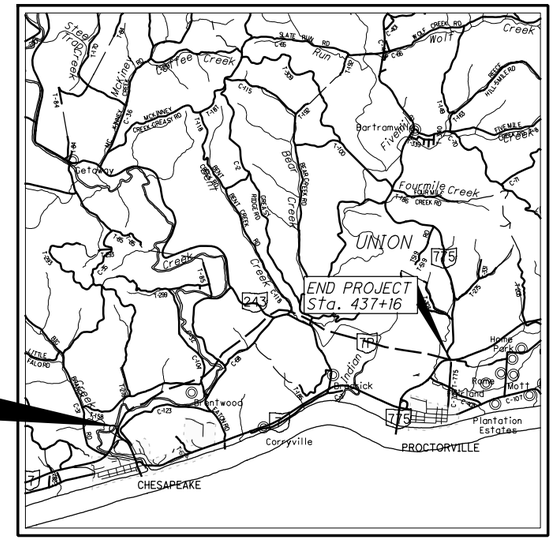
SS INDICATES A SPLIT SPOON SAMPLE.

ST INDICATES A SHELBY TUBE SAMPLE.

NP INDICATES A NON-PLASTIC SAMPLE.

TR INDICATES TOP OF ROCK.

RECON. - JS 5/11 & JM 4/22
DRILLING - BBCM, 10/98-5/05, STANTEC 5/17/11-6/29/21
DRAWN - MJ 7/2011-6/2022 & 07/2024
REVIEWED - EMK 07/2024



LOCATION MAP
SCALE IN MILES
0 1 2 3 4

PARTICLE SIZE DEFINITIONS

BOULDERS	COBBLES	GRAVEL	COARSE SAND	FINE SAND	SILT	CLAY
	12"	3"	2.0 mm (No. 10 SIEVE)	0.42 mm (No. 40 SIEVE)	0.074 mm (No. 200 SIEVE)	0.005 mm

D_{50} VALUES

BORING NO.	DEPTH (FEET)	ELEVATION (FEET)	D_{50} VALUE
B-010-1-12	9.5-11.0	520.9-519.4	0.18 mm
	11.0-12.5	519.4-517.9	0.027 mm
	12.5-14.0	517.9-516.4	1.3 mm
	14.0-15.5	516.4-514.9	0.15 mm
B-010-2-12	9.5-11.0	519.5-518.0	0.09 mm
	11.0-12.5	518.0-516.5	0.09 mm
	12.5-14.0	516.5-515.0	0.17 mm
	14.0-15.5	515.0-513.5	0.24 mm
B-050-0-11	0.0-3.0	532.4-529.4	0.11 mm
	3.0-4.5	529.4-527.9	0.083 mm
	4.5-7.5	527.9-524.9	0.031 mm
	7.5-12.5	524.9-519.9	0.16 mm
	12.5-17.0	519.9-515.4	0.24 mm
	17.0-24.6	515.4-507.8	0.007 mm
	24.6-36.5	507.8-495.9	0.009 mm

DESIGN AGENCY
STANTEC CONSULTING SERVICES INC.
CINCINNATI, OHIO

PID NO. 75923

SOIL PROFILE - ROADWAY

LAW-7-2.17

1 / 206

1042
1247

INDEX OF SHEETS

LOCATION FROM STA.	TO STA.	PLAN VIEW SHEET	PROFILE SHEET	CROSS SECTION SHEET	CUT Max/Min	FILL Max/Min
LAW-7-2.17						
114+57.60	137+00	44	45	-	17	42
STRUCTURE - LAW-7-2.51		46	46			
137+00	162+00	47	48	-	-	32
162+00	187+00	49	50	-	23	50
NOISE WALL - B1						
24+40	29+20	50A	50A			
29+20	34+00	50B	50B			
34+00	38+80	50C	50C			
38+80	43+60	50D	50D			
187+00	212+00	51	52	-	30	55
NOISE WALL - B1						
43+60	48+40	52A	52A			
STRUCTURE - LAW-7-3.70		53	53			
STRUCTURE - LAW-7-3.76		54	54			
STRUCTURE - LAW-7-3.87		55	55			
212+00	237+00	56	57	-	10	83
NOISE WALL - B2						
14+80	19+60	57A	57A			
19+60	24+40	57B	57B			
237+00	262+00	58	59	-	-	25
262+00	287+00	60	61	-	5	37
STRUCTURE - LAW-7-5.10		62	62			
287+00	312+00	63	64	-	65	55
STRUCTURE - LAW-7-5.63		65	65			
312+00	337+00	66	67	-	45	95
337+00	361+00	68	69	-	128	52
361+00	387+00	70	71	-	17	87
STRUCTURE - LAW-7-7.13		72	72			
387+00	412+00	73	74	-	-	1
NOISE WALL - D						
24+40	29+20	74A	74A			
29+20	34+00	74B	74B			
34+00	34+72	74C	74C			
412+00	437+16	75	76	-	-	-
136+00		-	-	77	-	36
159+00		-	-	78	-	26
160+00		-	-	79	-	26
176+00		-	-	80	32	-
184+00		-	-	80A	8	54
197+50		-	-	81	2	50
202+50		-	-	82	-	54
215+00		-	-	83	32	12
219+00		-	-	84	2	40
228+50		-	-	85	6	60
229+50		-	-	85A	6	74
237+50		-	-	86	20	-
242+00		-	-	87	8	26
245+50		-	-	88	-	26
253+00		-	-	89	-	30
256+00		-	-	90	10	32
274+00		-	-	91	10	26
288+50		-	-	92	18	20
293+00		-	-	93	-	52
297+00		-	-	94	-	45
301+50		-	-	95	22	22
311+00		-	-	96	107	-
313+00		-	-	97	70	-
322+00		-	-	98	18	50
329+00		-	-	99	25	48
334+00		-	-	100	36	-
336+00		-	-	101	-	90
340+00		-	-	102	-	125
349+00		-	-	103	115	-
359+50		-	-	104	102	-

INDEX OF SHEETS (CONTINUED)

LOCATION FROM STA.	TO STA.	PLAN VIEW SHEET	PROFILE SHEET	CROSS SECTION SHEET	CUT Max/Min	FILL Max/Min
371+00		-	-	105	-	71
374+00		-	-	106	-	71
394+50		-	-	107	-	2
395+50		-	-	108	-	2
396+00		-	-	109	-	2
396+50		-	-	110	-	1
397+49.13		-	-	111	-	2
398+50		-	-	112	-	2
405+00		-	-	113	-	2
414+00		-	-	114	-	2
415+50		-	-	115	-	2
419+50		-	-	116	-	2
423+00		-	-	117	-	2
424+00		-	-	118	-	2
425+00		-	-	119	-	1
426+00		-	-	120	-	2
436+50		-	-	121	-	1
SR 7 RAMP C						
116+00.00	127+10.00	122	122	-	-	5
123+50		-	-	123	-	8
SR 7 RAMP D						
115+00.00	121+00.00	124	124	-	-	5
SR 7 RAMP I						
370+00.00	381+00.00	125	125	-	-	5
376+00		-	-	126	-	90
379+98.45		-	-	126	-	51
STRUCTURE - LAW-7-7.11P		127	127			
SR 7 RAMP J						
384+00.00	391+00.00	128	128	-	20	100
SR 7 RAMP K						
385+00.00	396+00.00	129	129	-	5	90
396+00.00	403+54.87	130	130	-	8	10
388+00		-	-	131	90	-
392+00		-	-	132	25	-
RAMP J & K RETAINING WALL						
385+75.00	389+75.00	133	133	-	90	-
SR 7 RAMP L						
379+57.36	392+40.09	134	134	-	-	80
LYNN LANE						
10+00	14+00	135	135	-	2	4
SR 243						
10+82.95	21+54.00	136	136	-	21	14
11+50		-	-	137	-	-
13+00		-	-	137	-	-
CR 69						
10+00	24+00	138	138	-	19	14
24+00	38+00	139	139	-	14	15
38+00	51+00	140	140	-	17	10
51+00	56+73.01	141	141	-	8	13
15+00		-	-	142	-	-
24+00		-	-	142	-	-
33+50		-	-	143	-	-
42+00		-	-	143	-	-
46+50		-	-	144	-	-
CR 118						
10+12.21	14+76.01	145	145	-	-	11
CR 2						
10+07.28	17+58.28	146	146	-	6	3
SR 775						
45+42.93	57+00	147	147	-	-	24
57+00	70+45.38	148	148	-	-	35
54+00		-	-	149	-	-
59+00		-	-	149	-	-
67+00		-	-	150	-	-
STRUCTURE - LAW-775-01.05		151	151			

INDEX OF SHEETS (CONTINUED)

STRUCTURE BORING LOGS/LANDSLIDE BORING LOGS/CPT SOUNDING LOGS, SHEETS 152-206(O)

BEDROCK TEST SUMMARY

BORING ID	SAMPLE ELEVATION	SAMPLE DEPTH	Qu (PSI)	SDI (%)	LITHOLOGY
B-010-1-12	492.9' – 492.5'*	37.5' – 37.9'*	222	-	SHALE
B-010-2-12	473.9' – 473.5'*	55.1' – 55.5'*	11,042	-	SHALE
B2-316-0-02	501.5' – 502.0'	38.8' – 39.3'	194	-	SHALE
B13-1-0-00	524.5' – 523.9'	23.3' – 23.9'	189	-	SANDSTONE
B13-3-0-00	511.8' – 511.3'	30.0' – 30.5'	172	-	SHALE
SL-1-0-04	584.3' – 583.7'	31.4' – 32.0'	63	-	SHALE
SL-5-0-04	528.8' – 528.3'	42.5' – 43.0'	100	-	SHALE
SL-8-0-04	551.0' – 550.7'	71.5' – 71.8'	1,211	-	SHALE
B-026-0-11	592.7' – 592.3'	19.3' – 19.7'	8,580	-	SANDSTONE
B-053-0-11	687.1' – 686.6'	14.1' – 14.6'	-	67.8	SANDSTONE
B-053-0-11	677.8' – 677.2'	23.4' – 24.0'	-	93.7	SANDSTONE
B-053-0-11	677.2' – 676.8'	24.0' – 24.4'	5,400	-	SANDSTONE
B-053-0-11	674.4' – 674.0'	26.8' – 27.2'	1,637	-	SANDSTONE
B-053-0-11	673.8' – 673.2'	27.4' – 28.0'	-	78.2	SANDSTONE
B-053-0-11	662.5' – 661.9'	38.7' – 39.3'	-	0	SHALE
B-053-0-11	659.6' – 659.0'	41.6' – 42.2'	1,546	-	SHALE
B-053-0-11	658.5' – 657.9'	42.7' – 43.3'	-	88.8	SHALE
B-053-0-11	656.0' – 655.5'	45.2' – 45.7'	-	84.7	SHALE
B-053-0-11	650.8' – 650.4'	50.4' – 50.8'	8,840	-	LIMESTONE
B-053-0-11	650.4' – 649.5'	50.8' – 51.7'	-	96.1	SANDSTONE
B-053-0-11	641.5' – 641.0'	59.7' – 60.2'	-	56.7	SHALE
B-053-0-11	633.8' – 633.2'	67.4' – 68.0'	-	0	SHALE
B-053-0-11	621.8' – 621.2'	79.4' – 80.0'	-	45.4	SHALE
B-058-0-11	687.1' – 686.6'	50.1' – 50.6'	-	85.3	SANDSTONE
B-058-0-11	686.6' – 686.0'	50.6' – 51.2'	4,750	-	SANDSTONE
B-058-0-11	683.7' – 683.1'	53.5' – 54.1'	-	85.3	SHALE
B-058-0-11	673.5' – 672.8'	63.7' – 64.4'	643	-	CLAYSTONE
B-058-0-11	670.7' – 670.2'	66.5' – 67.0'	-	0	SHALE
B-058-0-11	661.1' – 660.4'	76.1' – 76.8'	1,766	-	SHALE
B-058-0-11	660.4' – 659.9'	76.8' – 77.3'	-	88.3	SHALE
B-059-0-11	806.4' – 806.0'	13.0' – 13.4'	4,020	-	SANDSTONE
B-059-0-11	805.8' – 805.1'	13.6' – 14.3'	-	94.9	SHALE
B-059-0-11	802.8' – 802.3'	16.6' – 17.1'	-	92.3	SHALE
B-059-0-11	799.9' – 799.4'	19.5' – 20.0'	-	38.8	SHALE
B-059-0-11	792.6' – 792.2'	26.8' – 27.2'	16	-	CLAYSTONE
B-059-0-11	792.0' – 791.4'	27.4' – 28.0'	-	0.2	SHALE
B-059-0-11	783.7' – 783.2'	35.7' – 36.2'	-	8.6	SHALE
B-059-0-11	783.2' – 782.8'	36.2' – 36.6'	727	-	CLAYSTONE
B-059-0-11	781.2' – 780.8'	38.2' – 38.6'	1,025	-	CLAYSTONE
B-059-0-11	779.5' – 778.9'	39.9' – 40.5'	-	96.6	SHALE
B-059-0-11	778.3' – 777.9'	41.1' – 41.5'	4,060	-	SHALE
B-059-0-11	769.4' – 768.8'	50.0' – 50.6'	-	85.3	SANDSTONE
B-059-0-11	768.8' – 768.2'	50.6' – 51.2'	5,170	-	SANDSTONE
B-059-0-11	756.6' – 756.1'	62.8' – 63.3'	-	6.5	SHALE
B-059-0-11	754.2' – 753.6'	65.2' – 65.8'	-	17.7	SHALE
B-059-0-11	749.3' – 748.7'	70.1' – 70.7'	-	0.1	SHALE
B-059-0-11	743.3' – 742.9'	76.1' – 76.5'	2,641	-	SHALE
B-059-0-11	742.8' – 742.3'	76.6' – 77.1'	-	98.5	SHALE

BORING ID	SAMPLE ELEVATION	SAMPLE DEPTH	Qu (PSI)	SDI (%)	LITHOLOGY
B-066-0-11	791.3' – 790.7'	25.3' – 25.9'	-	95.4	SHALE
B-066-0-11	787.4' – 787.0'	29.2' – 29.6'	5,980	-	SANDSTONE
B-066-0-11	787.0' – 786.4'	29.6' – 30.2'	-	72.7	SHALE
B-066-0-11	781.3' – 780.7'	35.3' – 35.9'	328	-	CLAYSTONE
B-066-0-11	780.4' – 779.8'	36.2' – 36.8'	-	6.4	SHALE
B-069-0-11	782.6' – 782.0'	15.1' – 15.7'	-	95.6	SANDSTONE
B-069-0-11	781.5' – 781.1'	16.2' – 16.6'	7,860	-	SANDSTONE
B-069-0-11	778.2' – 777.6'	19.5' – 20.1'	-	89.1	SHALE
B-069-0-11	769.8' – 769.2'	27.9' – 28.5'	-	1.9	SHALE
B-069-0-11	765.2' – 764.7'	32.5' – 33.0'	413	-	CLAYSTONE
B-069-0-11	756.9' – 756.3'	40.8' – 41.4'	-	92.6	SHALE
B-069-0-11	751.9' – 751.5'	45.8' – 46.2'	10,520	-	LIMESTONE
B-069-0-11	738.9' – 738.3'	59.6' – 60.2'	-	81.7	SHALE
B-069-0-11	735.4' – 735.0'	62.3' – 62.7'	1,138	-	CLAYSTONE
B-069-0-11	720.0' – 719.6'	77.7' – 78.1'	3,450	-	SHALE
B-069-0-11	719.4' – 718.8'	78.3' – 78.9'	-	96.6	SHALE
B-069-0-11	710.7' – 709.9'	87.0' – 87.8'	-	0.5	SHALE
B-069-0-11	703.9' – 703.5'	93.8' – 94.2'	5,220	-	SHALE
B-069-0-11	702.4' – 701.8'	95.3' – 95.9'	-	96.8	SANDSTONE
B-069-0-11	685.2' – 684.7'	112.5' – 113.0'	9,160	-	SANDSTONE
B-069-0-11	684.2' – 683.7'	113.5' – 114.0'	-	97.8	SANDSTONE
B-069-0-11	673.2' – 672.8'	124.5' – 124.9'	8,480	-	SANDSTONE
B-069-0-11	672.6' – 672.1'	125.1' – 125.6'	-	97.6	SANDSTONE
B-069-0-11	665.5' – 661.9'	132.2' – 135.8'	-	0.9	SHALE
B-069-0-11	655.7' – 655.1'	142.0' – 142.6'	-	77.8	SHALE
B-069-0-11	655.0' – 664.7'	142.7' – 143.0'	5,230	-	SHALE
B-073-0-12	546.1' – 545.5'	31.6' – 32.2'	-	90.4	SHALE
B-083-1-12	708.4' – 707.9'	36.5' – 37.0'	-	62.5	SANDSTONE
B-083-1-12	690.2' – 689.7'	54.7' – 55.2'	-	90	SHALE
B-087-0-12	597.4' – 596.9'	18.0' – 18.5'	-	84.4	SHALE
B-087-1-12	607.1' – 606.5'	47.4' – 48.0'	-	59.6	SHALE
B-088-0-12	607.0' – 606.4'	38.6' – 39.2'	-	92.8	SHALE
B-089-0-12	639.3' – 638.7'	26.7' – 27.3'	-	82.3	SHALE
B-089-0-12	632.6' – 632.2'	33.4' – 34.0'	-	39.3	SHALE
B-098-0-12	623.2' – 622.6'	73.7' – 74.3'	-	93.1	SHALE
B-098-1-12	699.0' – 698.4'	36.3' – 36.9'	-	86.9	SHALE
B-102-0-12	600.2' – 599.7'	31.0' – 31.5'	-	90.8	SHALE
B-098-1-20	664.9' – 664.2'	16.8' – 17.5'	-	51.4	CLAYSTONE
B-098-1-20	652.7' – 651.7'	29.0' – 30.0'	-	92.4	SANDSTONE
B-098-1-20	641.4' – 640.2'	40.3' – 41.5'	-	97.5	SANDSTONE
B-098-1-20	608.5' – 608.1'	73.2' – 73.6'	801	-	SILTSTONE
B-106-1-20	589.5' – 589.2'	33.3' – 33.6'	31	-	CLAYSTONE
B-106-2-20	648.7' – 648.4'	14.3' – 14.6	3,661	-	SANDSTONE
B-106-2-20	628.7' – 628.0'	34.3' – 35.0'	-	91	SILTSTONE
B-106-2-20	625.8' – 625.4'	37.2' – 37.6'	385	-	SILTSTONE

* Data estimated from historic boring log

SCOUR SAMPLES (BRIDGE LAW-7-07.11)

EXPLOR. ID	ELEVATION (FT.)	D_{50} VALUE (mm)	T_C VALUE (psf)	D_{50} EQUIV (mm)	EROSION CATEGORY (EC)
B-13-2-0-99 (PIER 1)	543.3'-535.8'	0.7223	0.0677	3.2411	3.255
	535.8'-532.3'	0.0143	0.0428	2.0502	2.211
	532.3'-529.8'	0.0121	0.1194	5.7170	3.075
	529.8'-522.8'	0.0164	0.0477	2.2863	2.868
B-13-3-0-99 (PIER 2)	544.6'-540.1'	0.0241	0.0640	3.0636	3.550
	540.1'-538.6'	0.0122	0.1789	8.5668	3.337
	538.6'-531.6'	0.0185	0.1888	9.0398	3.168
	531.6'-524.1'	0.0112	0.1910	9.1463	3.413

DESIGN AGENCY
STANTEC CONSULTING SERVICES INC.
CINCINNATI, OHIO

PID NO. 75923

SOIL PROFILE - ROADWAY

LAW-7-2.17

SUMMARY OF SOIL TEST DATA
STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-001-0-11	2.5 -4.0	SS-1	87	0	0	2	48	50	43	21	22	15	A-7-6 (13)
STA. 114+91, 25' LT.	5.0 - 6.5	SS-2	73				SAME AS SS-1					14	A-7-6 (VISUAL)
NORTHING=158261.6	7.5 - 9.0	SS-3	100	3	4	6	41	46	38	16	22	10	A-6b (13)
EASTING=1980663.9	10.0 - 11.5	SS-4	100				SAME AS SS-3					9	A-6b (VISUAL)
R-202-0-99	6.0 - 7.5	SS-2	-	-	-	-	-	-	34	23	11	12	EST. A-6a
STA. 120+00, 40' LT.													
NORTHING=158745.8													
EASTING=1980716.2													
R-203-0-99	8.5 - 10.0	SS-3	-	6	6	8	41	39	41	25	16	17	A-7-6 (11)
STA. 124+00, 40' RT.													
NORTHING=159086.2													
EASTING=1980940.7													
R-204-0-99	8.5 - 10.0	SS-3	-	-	-	-	-	-	44	25	19	23	EST. A-7-6
STA. 128+00, 40' LT.	18.5 - 20.0	SS-5	-	-	-	-	-	-	45	25	20	27	EST. A-7-6
NORTHING=159476.8													
EASTING=1981057.4													
B-003-0-11	0.0 - 1.5	SS-1	100				SAME AS SS-2					23	A-6a (VISUAL)
STA. 135+96, 118' RT.	2.5 -4.0	SS-2	100	0	0	6	63	31	39	25	14	30	A-6a (10)
NORTHING=160021.9	5.0 - 7.0	ST-3	100	0	0	10	63	27	33	23	10	30	A-4b (8)
EASTING=1981740.7	7.5 - 9.0	SS-4	87				SAME AS SS-5					12	A-4a (VISUAL)
	10.0 - 11.5	SS-5	100	0	5	48	32	15	23	17	6	25	A-4a (2)
	12.5 - 14.0	SS-6	100				SAME AS SS-5					25	A-4a (VISUAL)
	15.0 - 16.5	SS-7	100				SAME AS SS-8					26	A-1-b (VISUAL)
	17.5 - 19.0	SS-8	100	0	60	28	9	3	NP	NP	NP	22	A-1-b (0)
	20.0 - 21.5	SS-9	100				SAME AS SS-8					25	A-1-b (VISUAL)
	25.0 - 26.5	SS-10	100				SAME AS SS-11					26	A-4a (VISUAL)
	30.0 - 31.5	SS-11	67	0	4	29	45	22	25	15	10	20	A-4a (6)
	35.0 - 36.0	SS-12	7				SAME AS SS-11					14	A-4a (VISUAL)
B-002-0-11	0.0 - 1.5	SS-1	100				SAME AS SS-2					26	A-6a (VISUAL)
STA. 135+97, 122' LT.	2.5 -4.0	SS-2	100	0	0	16	51	33	36	22	14	32	A-6a (10)
NORTHING=160184.2	5.0 - 7.0	ST-3	75	0	1	20	39	40	38	22	16	43	A-6b (10)
EASTING=1981564.6	7.5 - 9.0	SS-4	67				SAME AS ST-3					-	A-6b (VISUAL)
	10.0 - 11.5	SS-5	20				SAME AS SS-7					33	A-1-b (VISUAL)
	12.5 - 14.0	SS-6	87				SAME AS SS-7					39	A-1-b (VISUAL)
	15.0 - 16.5	SS-7	100	1	65	27	4	3	NP	NP	NP	25	A-1-b (0)
	17.5 - 19.0	SS-8	100				SAME AS SS-7					24	A-1-b (VISUAL)
	20.0 - 21.5	SS-9	33				SAME AS SS-10					25	A-3a (VISUAL)
	25.0 - 26.5	SS-10	100	3	41	37	12	7	NP	NP	NP	21	A-3a (0)
	30.0 - 31.5	SS-11	100				SAME AS SS-10					18	A-3a (VISUAL)
R-205-0-99	6.0 - 7.5	SS-2	-	-	-	-	-	-	46	28	18	28	EST. A-7-6
STA. 139+49, 45' RT.	7.5 - 9.0	SS-3	-	0	1	26	49	24	31	22	9	27	A-4a (8)
NORTHING=160311.1	33.5 - 35.0	SS-8	-	-	-	-	-	-	30	20	10	20	EST. A-4a
EASTING=1981845.5													
R-206-0-99	23.5 - 25.0	SS-6	-	0	0	24	44	32	31	22	9	27	A-4a (8)
STA. 143+50, 40' LT.													
NORTHING=160631.0													
EASTING=1982100.4													

SUMMARY OF SOIL TEST DATA
STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
R-207-0-99	13.5 - 15.0	SS-4	-	0	0	24	52	24	28	20	8	22	A-4b (8)
STA. 147+50, 40' RT.	23.5 - 25.0	SS-6	-	-	-	-	-	-	32	20	12	16	EST. A-6b
NORTHING=160786.5													
EASTING=1982477.3													
B-004-0-11	0.0 - 1.5	SS-1	80	10	12	15	29	34	43	23	20	21	A-7-6 (10)
STA. 150+00, 74' LT.	2.5 -4.0	SS-2	53				SAME AS SS-1					21	A-7-6 (VISUAL)
NORTHING=161014.7	5.0 - 6.5	SS-3	13				SAME AS SS-1					18	A-7-6 (VISUAL)
EASTING=1982730.4	7.5 - 9.0	SS-4	67	17	15	12	24	32	36	18	18	17	A-6b (7)
	10.0 - 12.0	ST-5	0				SAME AS SS-4					-	A-6b (VISUAL)
	12.5 - 14.0	SS-6	100	0	8	13	32	47	40	18	22	19	A-6b (13)
	15.0 - 16.5	SS-7	93				SAME AS SS-6					16	A-6b (VISUAL)
	17.5 - 19.0	SS-8	93				SAME AS SS-9					18	A-7-6 (VISUAL)
	20.0 - 21.5	SS-9	100	5	11	9	29	46	41	21	20	15	A-7-6 (12)
B-005-0-11	0.0 - 1.5	SS-1	87				SAME AS SS-2					20	A-6a (VISUAL)
STA. 153+86, 82' LT.	2.5 -4.0	SS-2	100	0	14	23	37	26	28	17	11	14	A-6a (6)
NORTHING=161184.1	5.0 - 6.5	SS-3	100				SAME AS SS-2					12	A-6a (VISUAL)
EASTING=198084.7	7.5 - 9.0	SS-4	100				SAME AS SS-5					12	A-3a (VISUAL)
	10.0 - 11.5	SS-5	100	0	11	57	18	14	NP	NP	NP	11	A-3a (0)
	12.5 - 14.0	SS-6	87				SAME AS SS-5					12	A-3a (VISUAL)
	15.0 - 16.5	SS-7	33				SAME AS SS-8					13	A-6a (VISUAL)
	17.5 - 19.0	SS-8	100	6	14	25	27	28	29	14	15	12	A-6a (6)
	20.0 - 21.5	SS-9	100				SAME AS SS-8					21	A-6a (VISUAL)
R-209-0-99	3.0 - 4.5	SS-1	-	1	6	10	42	41	44	24	20	20	A-7-6 (13)
STA. 155+50, 40' RT.													
NORTHING=161120.7													
EASTING=1983194.0													
R-210-0-99	3.0 - 4.5	SS-1	-	0	1	3	55	41	40	26	14	25	A-6a (10)
STA. 159+50, 40' LT.	18.5 - 20.0	SS-5	-	-	-	-	-	-	35	24	11	12	EST. A-6a
NORTHING=161327.3													
EASTING=1983545.5													
B-006-0-11	2.5 -4.0	SS-1	100				SAME AS ST-2					25	A-6a (VISUAL)
STA. 160+00, 19' LT.	5.0 - 7.0	ST-2	100	0	1	3	48	48	34	22	12	20	A-6a (9)
NORTHING=161331.3	7.5 - 9.0	SS-3	100				SAME AS SS-4					20	A-6a (VISUAL)
EASTING=1983687.4	10.0 - 11.5	SS-4	100	0	4	13	49	34	31	16	15	19	A-6a (10)
	12.5 - 14.0	SS-5	100				SAME AS SS-4					15	A-6a (VISUAL)
	15.0 - 16.5	SS-6	100				SAME AS SS-7					16	A-6b (VISUAL)
	17.5 - 19.0	SS-7	100	0	2	22	30	46	35	18	17	18	A-6b (11)
	20.0 - 21.5	SS-8	80				SAME AS SS-7					19	A-6b (VISUAL)
	25.0 - 26.5	SS-9	67	0	12	57	19	12	NP	NP	NP	18	A-3a (0)
	30.0 - 31.5	SS-10	67				COMBINED WITH SS-9					15	A-3a (0)
B-007-0-11	0.0 - 1.5	SS-1	100				SAME AS SS-2					20	A-2-4 (VISUAL)
STA. 160+03, 175' RT.	2.5 -4.0	SS-2	100	19	23	24	19	15	27	18	9	12	A-2-4 (0)
NORTHING=161149.0	5.0 - 6.5	SS-3	7				SAME AS SS-2					25	A-2-4 (VISUAL)
EASTING=1983754.0	7.5 - 9.0	SS-4	100				SAME AS ST-5					24	A-6b (VISUAL)
	10.0 - 12.0	ST-5	100	0	0	1	34	65	39	23	16	25	A-6b (10)
	12.5 - 14.0	SS-6	100				SAME AS ST-5					27	A-6b (VISUAL)
	15.0 - 16.5	SS-7	100	5	25	29	26	15	27	18	9	16	A-4a (1)
	17.5 - 19.0	SS-8	100				SAME AS SS-10					16	A-7-6 (VISUAL)
	20.0 - 21.5	SS-9	100				SAME AS SS-10					17	A-7-6 (VISUAL)
	25.0 - 26.5	SS-10	100	0	3	15	29	53	50	23	27	29	A-7-6 (17)
	30.0 - 31.5	SS-11	87				SAME AS SS-10					24	A-7-6 (VISUAL)

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
R-211-0-99	6.0	7.5	SS-2	-	-	-	-	-	-	52	31	21	19	EST. A-7-5
STA. 162+50, CENTERLINE	8.5	10.0	SS-3	-	-	-	-	-	-	61	25	36	18	EST. A-7-6
NORTHING=161387.6														
EASTING=1983842.0														
R-212-0-99	3.0	4.5	SS-1	-	10	12	18	34	26	35	22	13	19	A-6a (6)
STA. 167+25, 40' RT.	23.5	25.0	SS-6	-	-	-	-	-	-	51	29	22	24	EST. A-7-6
NORTHING=161505.2														
EASTING=1984304.0														
R-2P1-0-99	3.0	3.6	SS-1	-	12	8	30	30	20	-	-	-	-	EST. A-4a
STA. 179+30, 2' RT.	6.0	7.5	SS-2	-	0	4	41	29	26	32	21	11	14	A-6a (4)
NORTHING=161951.6	13.5	15.0	SS-4	-	1	2	4	40	53	41	24	17	15	A-7-6 (11)
EASTING=1985423.7	28.5	29.3	S-7	-	5	2	2	39	52	32	19	13	7	A-6a (9)
B-008-0-11	0.0	1.5	SS-1	100	0	17	13	38	32	44	23	21	21	A-7-6 (12)
STA. 183+86, 111' RT.	2.5	4.0	SS-2	73				SAME AS SS-1					34	A-7-6 (VISUAL)
NORTHING=162099.9	5.0	7.0	ST-3	80	0	1	2	31	66	49	22	27	24	A-7-6 (17)
EASTING=1985968.9	7.5	9.0	SS-4	93	0	1	5	50	44	41	22	19	14	A-7-6 (12)
	10.0	11.5	SS-5	86				SAME AS SS-4					10	A-7-6 (VISUAL)
	12.5	14.0	SS-6	63				SHALE, TAN, SEVERELY WEATHERED					-	ROCK (VISUAL)
	15.0	16.5	SS-7	75				SAME AS SS-6					-	ROCK (VISUAL)
B-009-0-11	0.0	1.5	SS-1	67				SAME AS SS-2					13	A-6a (VISUAL)
STA. 183+93,233' RT.	2.5	4.0	SS-2	100	7	21	24	25	23	32	17	15	19	A-6a (4)
NORTHING=162004.5	5.0	6.5	SS-3	100				SAME AS SS-2					13	A-6a (VISUAL)
EASTING=1986045.8	7.5	9.0	SS-4	100				SAME AS SS-5					16	A-6a (VISUAL)
	10.0	11.5	SS-5	100	0	4	26	40	30	30	18	12	17	A-6a (8)
	12.5	14.0	SS-6	100	2	2	15	43	38	32	17	15	22	A-6a (10)
	15.0	16.5	SS-7	87	2	7	35	35	21	30	19	11	17	A-6a (5)
	17.5	19.0	SS-8	93				SANDSTONE, BROWN, SEVERELY WEATHERED					13	ROCK (VISUAL)
	20.0	21.5	SS-9	100				SAME AS SS-8					19	ROCK (VISUAL)
R-217-0-99	3.0	4.5	SS-1	-	-	-	-	-	-	50	30	20	17	EST. A-7-5
STA. 191+50, 40' LT.														
NORTHING=162716.6														
EASTING=1986362.0														
B-010-0-11	0.0	1.5	SS-1	100				SAME AS SS-1					25	A-6a (VISUAL)
STA.197+89,183' LT.	2.5	4.0	SS-2	100	0	6	14	45	35	39	24	15	29	A-6a (10)
NORTHING=163268.7	5.0	7.0	ST-3	100	1	4	14	40	41	36	21	15	21	A-6a (10)
EASTING=1986820.0	7.5	9.0	SS-4	100	0	0	2	40	58	51	27	24	29	A-7-6 (16)
	10.0	11.5	SS-5	100				SAME AS SS-4					30	A-7-6 (VISUAL)
	12.5	14.5	ST-6	50	0	1	9	46	44	40	22	18	34	A-6b (11)
	15.0	16.5	SS-7	100				SAME AS SS-9					39	A-1-b (VISUAL)
	17.5	19.0	SS-8	100				SAME AS SS-9					18	A-1-b (VISUAL)
	20.0	21.5	SS-9	100	18	32	32	12	6	NP	NP	NP	20	A-1-b (0)
B-012-0-11	0.0	1.5	SS-1	100				SAME AS SS-2					27	A-4a (VISUAL)
STA. 201+90, 197' RT.	2.5	4.0	SS-2	100	0	0	31	48	21	28	20	8	23	A-4a (7)
NORTHING=163223.1	5.0	7.0	ST-3	100	0	0	52	34	14	NP	NP	NP	24	A-4a (3)
EASTING=1987368.9	7.5	9.0	SS-4	100				SAME AS SS-5					30	A-3a (VISUAL)
	10.0	11.5	SS-5	100	0	11	73	11	5	NP	NP	NP	28	A-3a (0)
	12.5	14.0	SS-6	100				SAME AS SS-5					-	A-3a (VISUAL)
	15.0	16.5	SS-7	100				SAME AS SS-8					23	A-3a (VISUAL)
	17.5	19.0	SS-8	100	1	36	43	12	8	NP	NP	NP	23	A-3a (0)
	20.0	21.5	SS-9	100				SAME AS SS-8					25	A-3a (VISUAL)
	25.0	26.5	SS-10	100				SAME AS SS-11					21	A-3a (VISUAL)
	30.0	31.5	SS-11	100	10	27	44	14	5	NP	NP	NP	13	A-3a (0)

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-011-0-11	0.0	1.5	SS-1	67				SAME AS SS-2					23	A-4a (VISUAL)
STA. 202+02, 232' LT.	2.5	4.0	SS-2	100	0	0	39	43	18	NP	NP	NP	23	A-4a (5)
NORTHING=163580.3	5.0	7.0	ST-3	100	0	0	63	21	16	NP	NP	NP	17	A-4a (0)
EASTING=1987131.3	7.5	9.0	SS-4	100	0	0	73	17	10	NP	NP	NP	21	A-3a (0)
	10.0	11.5	SS-5	100				SAME AS SS-4					20	A-3a (VISUAL)
	12.5	14.0	SS-6	100	0	0	90	7	3	NP	NP	NP	27	A-3 (0)
	15.0	16.5	SS-7	100				SAME AS SS-6					26	A-3 (VISUAL)
	17.5	19.0	SS-8	100				SAME AS SS-9					24	A-3a (VISUAL)
	20.0	21.5	SS-9	100	12	15	55	11	7	NP	NP	NP	24	A-3a (0)
	25.0	26.5	SS-10	100				SAME AS SS-9					25	A-3a (VISUAL)
	30.0	31.5	SS-11	100				SAME AS SS-9					16	A-3a (VISUAL)
R-218-0-99	8.5	10.0	SS-3	-	-	-	-	-	-	41	23	18	22	EST. A-7-6
STA. 209+49, 32' RT.														
NORTHING=163710.6														
EASTING=1987843.1														
R-220-0-99	3.0	4.5	SS-1	-	-	-	-	-	-	33	17	16	15	EST. A-6b
STA. 217+49, 11' RT.	8.5	10.0	SS-3	-	-	-	-	-	-	38	24	14	10	EST. A-6a
NORTHING=163967.1														
EASTING=1988597.4														
B-017-0-11	0.0	1.5	SS-1	33				SAME AS SS-3					11	A-6a (VISUAL)
STA. 218+77, 270' RT.	2.5	4.0	SS-2	73				SAME AS SS-3					15	A-6a (VISUAL)
NORTHING=163760.3	5.0	6.5	SS-3	100	15	12	24	26	23	35	21	14	22	A-6a (4)
EASTING=1988880.0	8.0	9.5	SS-4	73				SAME AS SS-5					6	A-2-4 (VISUAL)
	10.0	11.5	SS-5	100	44	14	19	12	11	26	19	7	14	A-2-4 (0)
	12.5	14.0	SS-6	93				SAME AS SS-5					15	A-2-4 (VISUAL)
	15.0	16.5	SS-7	100	12	24	34	20	10	NP	NP	NP	16	A-3a (0)
	17.5	19.0	SS-8	100				SAME AS SS-7					15	A-3a (VISUAL)
	20.0	21.5	SS-9	80				SAME AS SS-10					18	A-4a (VISUAL)
	25.0	26.5	SS-10	100	0	3	27	37	33	29	19	10	19	A-4a (7)
	30.0	31.5	SS-11	100				SAME AS SS-10					20	A-4a (VISUAL)
B-015-0-11	0.0	1.5	SS-1	47				SAME AS SS-2					22	A-6a (VISUAL)
STA. 218+91, 79' LT.	2.5	4.0	SS-2	80	7	13	22	26	32	33	18	15	19	A-6a (7)
NORTHING=164099.9	5.0	6.5	SS-3	73				SAME AS SS-2					14	A-6a (VISUAL)
EASTING=1988798.0	7.5	9.0	SS-4	100	9	7	12	30	42	41	19	22	16	A-7-6 (12)
	10.0	11.5	SS-5	100				SAME AS SS-4					17	A-7-6 (VISUAL)
	12.5	14.0	SS-6	67	2	8	28	29	33	30	17	13	12	A-6a (7)
	15.0	16.5	SS-7	71				SHALE, SEVERELY WEATHERED					7	ROCK (VISUAL)
B-016-0-11	0.0	1.5	SS-1	100	6	6	21	31	36	37	21	16	15	A-6b (9)
STA. 218+94,12' RT.	2.5	4.0	SS-2	80				SAME AS SS-1					19	A-6b (VISUAL)
NORTHING=163913.6	5.0	7.0	ST-3	95	8	8	7	35	42	42	25	17	14	A-7-6 (11)
EASTING=1988854.0	7.5	9.0	SS-4	100				SAME AS ST-3					26	A-7-6 (VISUAL)
	10.0	11.5	SS-5	100	1	7	7	29	56	42	23	19	16	A-7-6 (12)
	12.5	14.0	SS-6	100				SAME AS SS-5					15	A-7-6 (VISUAL)
R-221-0-99	8.5	10.0	SS-3	-	-	-	-	-	-	44	23	21	18	EST. A-7-6
STA.221+45, 84' LT.														
NORTHING=164167.1														
EASTING=1988953.0														

DRAWN MSJ
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SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

1045/1247

SUMMARY OF SOIL TEST DATA
STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-018-0-11	0.0	1.5	SS-1	13				SAME AS ST-3					15	A-6b (VISUAL)
STA. 225+07, 3′ RT.	2.5	4.0	SS-2	40				SAME AS ST-3					19	A-6b (VISUAL)
NORTHING=164190.0	5.0	7.0	ST-3	100	10	7	13	37	33	37	19	18	18	A-6b (10)
EASTING=1989413.2	7.5	9.0	SS-4	87				SAME AS ST-3					19	A-6b (VISUAL)
	10.0	11.5	SS-5	73	15	12	29	25	19	24	14	11	11	A-6a (2)
	12.5	14.0	SS-6	60				SAME AS SS-5					17	A-6a (VISUAL)
	15.0	15.7	ST-7	100	14	1	2	35	48	41	20	21	18	A-7-6 (13)
	15.7	16.1	SS-8	100			SHALE,SEVERELY WEATHERED						5	ROCK(VISUAL)
R-223-0-99	6.0	7.5	SS-2	-	5	10	31	33	21	30	19	11	15	A-6a (4)
STA. 227+75, 222′ RT.														
NORTHING=164046.9														
EASTING=1989647.3														
B-019-0-11	0.0	1.5	SS-1	67				SAME AS SS-2					32	A-7-6 (VISUAL)
STA. 228+76, CENTERLINE	2.5	4.0	SS-2	67	0	0	2	35	63	49	24	25	19	A-7-6 (16)
NORTHING=164298.4	5.0	7.0	ST-3	100	10	0	5	40	45	42	22	20	15	A-7-6 (12)
EASTING=1989765.7	7.5	9.0	SS-4	100	0	3	4	50	43	40	23	17	16	A-6b (11)
	10.0	11.1	SS-5	100			SHALE,SEVERELYWEATHERED						10	ROCK (VISUAL)
B-021-0-11	0.0	1.5	SS-1	100	14	5	10	23	48	44	22	22	22	A-7-6 (13)
STA. 230+85, 275′ RT.	2.5	4.0	SS-2	100	3	9	18	49	21	31	21	10	8	A-4a (7)
NORTHING=164138.3	5.0	6.5	SS-3	100	17	11	12	32	28	35	22	13	8	A-6a (6)
EASTING=1990087.1	7.5	9.0	SS-4	100				SAME AS SS-3					8	A-6a (VISUAL)
B-020-0-11	0.0	1.5	SS-1	67	18	10	19	28	25	30	20	10	18	A-4a (4)
STA. 231+17, 233′ LT.	2.5	4.0	SS-2	100				SAME AS SS-3					9	A-2-4 (VISUAL)
NORTHING=164599.1	5.0	7.0	SS-3	100	43	16	9	20	12	32	22	10	6	A-2-4 (0)
EASTING=1989870.4	7.5	9.0	SS-4	100				SAME AS SS-3					14	A-2-4 (VISUAL)
	10.0	11.5	SS-5	100	5	2	3	30	60	44	24	20	12	A-7-6 (13)
	12.5	14.0	SS-6	100				SAME AS SS-5					15	A-7-6 (VISUAL)
	15.0	16.5	SS-7	100				SAME AS SS-8					14	A-6b (VISUAL)
	17.5	19.0	SS-8	100	0	1	5	45	49	39	22	17	9	A-6b (11)
	20.0	21.5	SS-9	100				SAME AS SS-8					10	A-6b (VISUAL)
B-022-0-11	0.0	1.5	SS-1	100				SAME AS SS-2					23	A-4a (VISUAL)
STA. 235+95,44′ RT.	2.5	4.0	SS-2	73	6	9	15	44	26	34	24	10	17	A-4a (7)
NORTHING=164674.6	5.0	6.5	SS-3	87				SAME AS SS-2					25	A-4a (VISUAL)
EASTING=1990381.0	7.5	9.0	SS-4	100				SAME AS SS-5					11	A-6a (VISUAL)
	10.0	11.5	SS-5	100	0	0	3	48	49	37	22	15	12	A-6a (10)
	12.5	14.0	SS-6	80				SAME AS SS-5					13	A-6a (VISUAL)
	15.0	16.5	SS-7	100				SAME AS SS-8					13	A-7-6 (VISUAL)
	17.5	19.0	SS-8	100	2	1	3	42	52	43	22	21	14	A-7-6 (13)
	20.0	21.5	SS-9	100				SAME AS SS-8					10	A-7-6 (VISUAL)
R-226-0-99	18.5	20.0	SS-4	-	3	2	1	94		-	-	-	12	EST. A-7-6
STA. 237+60, 215′ RT.														
NORTHING=164684.7														
EASTING=1990531.7														
R-227-0-99	23.5	25.0	SS-5	-	10	16	22	27	25	27	20	7	14	A-4a (3)
STA. 241+40, 363′ LT.														
NORTHING=165346.5														
EASTING=1990332.2														
R-229-0-99	3.0	4.5	SS-1	-	21	11	12	33	23	37	23	14	13	A-6a (6)
STA. 245+77, 97′ LT.														
NORTHING=165511.2														
EASTING=1990817.1														

SUMMARY OF SOIL TEST DATA
STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-023-0-11	0.0	1.5	SS-1	67	52	8	14	14	12	35	20	15	8	A-2-6 (1)
STA. 247+64, 12′ RT.	2.5	4.0	SS-2	87	48	11	17	13	11	29	19	10	20	A-2-4 (0)
NORTHING=165607.4	5.0	5.7	SS-3	100				SAME AS SS-2					10	A-2-4 (VISUAL)
EASTING=1991090.8	7.5	8.0	SS-4	100				SHALE, SEVERELY WEATHERED					6	ROCK (VISUAL)
	10.0	10.8	SS-5	100				SAME AS SS-4					5	ROCK (VISUAL)
R-232-0-99	8.5	10.0	SS-3	-	-	-	-	-	-	42	21	21	22	EST. A-7-6
STA. 250+61, 44′ RT.	18.5	20.0	SS-5	-	0	3	21	40	36	31	19	12	27	A-6a (9)
NORTHING=165792.0														
EASTING=1991235.6														
R-233-0-99*	06.00	07.50	SS-1	11	-	-	-	VISUAL	-	-	-	-	-	A-7-6(VISUAL)
STA. 253+75, 29′ RT.	08.50	10.00	SS-2	12	-	-	-	VISUAL	-	-	-	-	18	A-6a(VISUAL)
NORTHING=166032.0	11.0	12.50	SS-3	15	-	-	-	VISUAL	-	-	-	-	-	A-7-6(VISUAL)
EASTING=1991432.2	13.5	15.00	SS-4	14	-	-	-	VISUAL	-	-	-	-	-	A-7-6(VISUAL)
B-026-0-11	0.0	1.5	SS-1	100				SAME AS SS-2					21	A-6a (VISUAL)
STA. 255+99, 82′ RT.	2.5	4.0	SS-2	100	15	14	17	31	23	33	21	12	22	A-6a (5)
NORTHING=166140.5	5.0	6.5	SS-3	100				SAME AS SS-2					21	A-6a (VISUAL)
EASTING=1991719.6	7.5	9.0	SS-4	100				SAME AS SS-2					21	A-6a (VISUAL)
	10.0	11.5	SS-5	100	1	3	5	43	48	46	21	25	13	A-7-6 (15)
	12.5	14.0	SS-6	93				SAME AS SS-5					10	A-7-6 (VISUAL)
	15.0	16.5	SS-7	100				SAME AS SS-5					9	A-7-6 (VISUAL)
	17.5	18.3	SS-8	100				SAME AS SS-5					8	A-7-6 (VISUAL)
B-3SP-1-99	7.0	8.5	SS-3	-	0	11	22	38	29	30	19	11	15	A-6a (7)
STA. 256+47, 66′ LT.	14.5	16.0	SS-6	-	-	-	-	-	-	29	16	13	23	EST. A-6a
NORTHING=166280.6	24.5	26.0	SS-9	-	7	4	9	40	40	32	19	13	6	A-6a (9)
EASTING=1991583.1														
B-029-0-11	2.5	4.0	SS-1	100	0	11	24	36	29	29	17	12	13	A-6a (7)
STA. 261+96, 14′ RT.	5.0	6.5	SS-2	100				SAME AS SS-1					11	A-6a (VISUAL)
NORTHING=166464.9	7.5	9.0	SS-3	100	8	16	23	33	20	26	16	10	13	A-4a (3)
EASTING=1992202.7	10.0	11.5	SS-4	100				SAME AS SS-3					13	A-4a (VISUAL)
	12.5	14.0	SS-5	87	7	14	22	32	25	27	14	13	15	A-6a (6)
	15.0	16.5	SS-6	87	9	20	16	33	22	27	17	10	13	A-4a (4)
	17.5	19.0	SS-7	100				SAME AS SS-6					18	A-4a (VISUAL)
	20.0	21.5	SS-8	100	6	13	41	24	16	NP	NP	NP	14	A-4a (1)
B-037-0-11	2.5	4.0	SS-1	100	0	8	19	32	41	37	19	18	22	A-6b (11)
STA. 271+55, 221′ RT.	5.0	6.5	SS-2	67				SAME AS SS-1					26	A-6b (VISUAL)
NORTHING=166301.5	7.5	9.0	SS-3	93	8	21	30	22	19	27	14	13	11	A-6a (2)
EASTING=1993113.9	10.0	10.5	SS-4	73				SAME AS SS-3					20	A-6a (VISUAL)
B-041-0-11	0.0	1.5	SS-1	53	12	6	17	33	32	35	18	17	19	A-6b (9)
STA. 277+97, 3′ LT.	2.5	4.0	SS-2	67		SANDSTONE, BROWN, SEVERELY WEATHERED							11	ROCK (VISUAL)
NORTHING=166425.3														
EASTING=1993782.3														
B-043-0-11	0.0	1.5	SS-1	80				SAME AS SS-2					15	A-7-6 (VISUAL)
STA. 282+04, 10′ RT.	2.5	4.0	SS-2	100	7	8	7	38	40	44	22	22	17	A-7-6 (14)
NORTHING=166365.8	5.0	6.5	SS-3	100	11	12	6	30	41	38	21	17	17	A-6b (10)
EASTING=1994184.7	7.5	8.5	SS-4	100				SAME AS SS-3					7	A-6b (VISUAL)
B-044-0-11	0.0	1.5	SS-1	100	28	7	6	29	30	40	20	20	14	A-6b (9)
STA. 286+94, CENTERLINE	2.5	4.0	SS-2	67	2	2	3	35	58	49	25	24	22	A-7-6 (15)
NORTHING=166347.8	5.0	6.5	SS-3	100				SAME AS SS-3					10	A-7-6 (VISUAL)
EASTING=1994675.1														

*DATA FOR BORING WAS ESTIMATED FROM GRAPHIC LOG PROVIDED IN PROFILE, ORIGINAL BORING LOG WAS NOT LOCATED

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-048-0-11	0.0	1.5	SS-1	87				SAME AS SS-1					31	A-6b (VISUAL)
STA. 292+96, 195' RT.	2.5	-4.0	SS-2	100	3	1	20	38	38	39	19	20	24	A-6b (12)
NORTHING=166123.9	5.0	6.5	SS-3	100	1	0	34	39	26	29	18	11	25	A-6a (6)
EASTING=1995266.6	7.5	9.5	ST-4	100	0	6	63	18	13	NP	NP	NP	26	A-3a (0)
	10.0	11.5	SS-5	100				SAME AS ST-4					24	A-3a (VISUAL)
	12.5	14.0	SS-6	100	15	19	47	11	8	NP	NP	NP	29	A-3a (0)
	15.0	16.5	SS-7	100	10	16	29	21	24	22	14	8	31	A-4a (2)
	17.5	19.0	SS-8	67				SAME AS SS-7					26	A-4a (VISUAL)
	20.0	22.0	ST-9	35	0	0	4	48	48	31	19	12	27	A-6a (9)
	25.0	26.5	SS-10	100				SAME AS ST-9					27	A-6a (VISUAL)
	30.0	31.5	SS-11	35	0	2	7	45	46	33	20	13	25	A-6a (9)
	35.0	36.5	SS-12	88				SAME AS SS-11					23	A-6a (VISUAL)
	40.0	40.7	SS-13	100				SHALE, GRAY,SEVERELY WEATHERED					14	ROCK (VISUAL)
B-047-0-11	0.0	1.5	SS-1	80				SAME AS SS-2					36	A-7-6 (VISUAL)
STA. 293+00, 12' RT.	2.5	-4.0	SS-2	100	0	2	4	38	56	51	27	24	32	A-7-6 (16)
NORTHING=166305.9	5.0	6.5	SS-3	100	10	1	3	24	62	66	32	34	50	A-7-5 (20)
EASTING=1995279.4	7.5	9.0	SS-4	80				SAME AS SS-5					44	A-7-6 (VISUAL)
	10.0	11.5	SS-5	100	1	4	7	36	52	49	23	26	39	A-7-6 (16)
	12.5	14.0	SS-6	33				SAME AS SS-8					26	A-4a (VISUAL)
	15.0	16.5	SS-7	80				SAME AS SS-8					26	A-4a (VISUAL)
	17.5	19.0	SS-8	100	6	17	35	26	16	19	12	7	27	A-4a (1)
	20.0	21.5	SS-9	73				SAME AS SS-8					28	A-4a (VISUAL)
	25.0	26.5	SS-10	100				SAME AS SS-8					20	A-4a (VISUAL)
	30.0	31.5	SS-11	100	23	27	27	16	7	NP	NP	NP	13	A-1-b (0)
	35.0	36.5	SS-12	100				SAME AS SS-11					21	A-1-b (VISUAL)
	38.7	39.2	SS-13	100				SHALE, SEVERELY WEATHERED					-	ROCK (VISUAL)
B-047-1-11	4.5	6.5	ST-1	100	7	2	3	20	68	66	29	37	40	A-7-6 (20)
STA. 293+00, 13' RT.														
NORTHING=166305.9														
EASTING=1995279.4														
B-047-2-11	4.5	6.5	ST-1	100	0	1	1	19	79	66	30	36	46	A-7-5 (20)
STA. 293+00, 14' RT.	6.5	8.5	ST-2	100	0	8	14	24	54	44	21	23	30	A-7-6 (14)
NORTHING=166305.9														
EASTING=1995279.4														
R-241-0-99	8.5	10.0	SS-3	-	0	0	44	36	20	26	21	5	26	A-4a (4)
STA. 294.47, 143' RT.														
NORTHING=166160.3														
EASTING=1995331.2														
B-052-0-11	0.0	1.5	SS-1	87	36	5	22	19	18	29	18	11	13	A-6a (1)
STA. 305+98, 7' RT.	2.5	-4.0	SS-2	67				SHALE, BROWN, SEVERELY WEATHERED					5	ROCK (VISUAL)
NORTHING=166247.0														
EASTING=1996576.6														
B-053-0-11	0.0	1.5	SS-1	73	1	4	6	30	59	52	24	28	24	A-7-6 (18)
STA. 313+13, 262' LT.	2.5	-4.0	SS-2	27				COMBINED WITH SS-1					26	A-7-6 (18)
NORTHING=166480.0	5.0	6.5	SS-3	67				MUDSTONE, RED AND GRAY, SEVERELY WEATHERED					15	ROCK (VISUAL)
EASTING=1997294.3	7.5	8.7	SS-4	100				SAME AS SS-3					8	ROCK (VISUAL)
	10.0	10.4	SS-5	100				SAME AS SS-3					8	ROCK (VISUAL)
	12.0	12.5	SS-6	100				SAME AS SS-3					4	ROCK (VISUAL)
R-244-0-99	8.5	10.0	SS-2	-	-	-	-	-	-	26	16	10	15	EST. A-4a
STA. 314+50, 20' LT.														
NORTHING=166223.8														
EASTING=1997340.2														

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
R-246-0-99	8.8	10.0	SS-3	-	3	10	10	32	45	43	27	16	13	A-7-6 (11)
STA. 321+71, 23' LT.														
NORTHING=166170.5														
EASTING=1998061.6														
B-054-0-11	0.0	1.5	SS-1	73				SAME AS SS-1					9	A-7-6 (VISUAL)
STA. 321+91, 200' LT.	2.5	-4.0	SS-2	100	2	8	6	38	46	46	25	21	20	A-7-6 (14)
NORTHING=166348.4	5.0	6.5	SS-3	33				SAME AS SS-1					10	A-7-6 (VISUAL)
EASTING=1998200.5	7.5	9.0	SS-4	67				SAME AS SS-5					11	A-7-6 (VISUAL)
	10.0	11.5	SS-5	67	1	1	2	39	57	43	21	22	14	A-7-6 (13)
	12.5	14.0	SS-6	87				SAME AS SS-5					15	A-7-6 (VISUAL)
B-055-0-11	0.0	1.5	SS-1	67				SAME AS SS-2					26	A-7-6 (VISUAL)
STA. 321+94, 283' RT.	2.5	-4.0	SS-2	100	7	2	7	26	58	54	26	28	29	A-7-6 (18)
NORTHING=165872.2	5.0	6.5	SS-3	87	27	10	16	19	28	36	17	19	15	A-6b (5)
EASTING=1998119.2	7.5	9.0	SS-4	100	8	12	10	25	45	53	20	33	45	A-7-6 (17)
	10.0	10.6	SS-5	50				SHALE, SEVERELY WEATHERED					5	ROCK (VISUAL)
	12.5	13.0	SS-6	100				SAME AS SS-5					6	ROCK (VISUAL)
	15.0	15.6	SS-7	100				SAME AS SS-5					5	ROCK (VISUAL)
B-055-1-11	4.0	6.0	ST-1	100	13	1	6	21	59	51	27	24	24	A-7-6 (16)
STA. 321+94, 282' RT.														
NORTHING=165872.2														
EASTING=1998119.2														
B-055-2-11	3.0	5.0	ST-1	100	0	0	6	21	73	58	30	28	29	A-7-5 (19)
STA. 321+94, 281' RT.	5.0	7.0	ST-2	100	29	12	15	18	26	38	21	17	16	A-6b (4)
NORTHING=165872.2														
EASTING=1998119.2														
B-055-3-11	4.0	6.0	ST-1	100	8	1	4	23	64	51	27	24	23	A-7-6 (16)
STA. 321+94, 280' RT.														
NORTHING=165872.2														
EASTING=1998119.2														
R-248-0-99	6.0	7.5	SS-2	-	-	-	-	-	-	51	24	27	16	EST. A-7-6
STA. 328+42, 57' RT.														
NORTHING=165906.6														
EASTING=1998677.7														
B-056-0-11	0.0	1.5	SS-1	87				SAME AS SS-2					19	A-6b (VISUAL)
STA. 328+92, 152' RT.	2.5	-4.0	SS-2	100	16	15	10	27	32	40	19	21	16	A-6b (9)
NORTHING=165807.8	5.0	6.5	SS-3	20				SAME AS SS-2					19	A-6b (VISUAL)
EASTING=1998772.2	7.5	9.0	SS-4	33				SAME AS SS-2					16	A-6b (VISUAL)
	10.0	11.5	SS-5	87	0	3	15	37	45	36	18	18	12	A-6b (11)
	12.5	14.0	SS-6	73				SAME AS SS-5					7	A-6b (VISUAL)
B-057-0-11	0.0	1.5	SS-1	80				SAME AS ST-3					19	A-6b (VISUAL)
STA. 329+15, 321' RT.	2.5	-4.0	SS-2	100				SAME AS ST-3					20	A-6b (VISUAL)
NORTHING=165644.4	4.0	6.0	ST-3	70	11	14	10	27	38	39	20	19	20	A-6b (10)
EASTING=1998721.8	7.5	9.0	SS-4	100				SAME AS ST-5					21	A-6b (VISUAL)
	10.0	12.0	ST-5	50	0	0	11	40	49	39	20	19	21	A-6b (12)
	12.5	14.0	SS-6	100				SAME AS ST-5					24	A-6b (VISUAL)
	15.0	16.5	SS-7	100				SAME AS SS-8					24	A-6b (VISUAL)
	17.5	19.0	SS-8	100	0	0	6	54	40	39	22	17	24	A-6b (11)
	20.0	21.5	SS-9	100				SAME AS SS-8					14	A-6b (VISUAL)
	25.0	26.5	SS-10	67				SHALE, SEVERELY WEATHERED					10	ROCK (VISUAL)
B-057-1-11	4.0	6.0	ST-1	100	22	7	11	26	34	37	18	19	17	A-6b (9)
STA. 329+15, 320' RT.	6.0	8.0	ST-2	100	33	4	8	24	31	39	20	16	18	A-6b (8)
NORTHING=165644.4	8.0	10.0	ST-3	100	0	2	4	38	56	47	24	23	22	A-7-6 (15)
EASTING=1998721.8														

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

1047
1247

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-059-0-11	0.0 - 1.5	SS-1	67				SAME AS SS-2					31	A-2-6 (VISUAL)
STA. 334+12, 698' LT.	2.5 -4.0	SS-2	93	60	11	5	12	12	34	19	15	7	A-2-6 (0)
NORTHING=166273.9	5.0 - 6.5	SS-3	67				SAME AS SS-2					16	A-2-6 (VISUAL)
EASTING=1999675.4	7.5 - 9.0	SS-4	87	0	10	14	26	50	54	29	25	20	A-7-6 (17)
B-058-0-11	0.0 - 1.5	SS-1	80	7	13	14	30	36	37	21	16	17	A-6b (9)
STA. 334+27, 285' LT.	2.5 -4.0	SS-2	53				SAME AS SS-1					16	A-6b (VISUAL)
NORTHING=165921.7	5.0 - 6.5	SS-3	100	54	18	7	14	7	30	17	13	7	A-2-6 (0)
EASTING=1999458.9	7.5 - 9.0	SS-4	47				SAME AS SS-3					10	A-2-6 (VISUAL)
	10.0 - 10.8	SS-5	100				SAME AS SS-3					8	A-2-6 (VISUAL)
	12.5 - 14.0	SS-6	40				SAME AS SS-3					6	A-2-6 (VISUAL)
	15.0 - 16.5	SS-7	33				SAME AS SS-8					6	A-2-6 (VISUAL)
	17.5 - 19.0	SS-8	73	62	11	7	13	7	31	16	15	11	A-2-6 (0)
	20.0 - 21.5	SS-9	93				SAME AS SS-8					6	A-2-6 (VISUAL)
	25.0 - 25.8	SS-10	100				MUDSTONE, SEVERELY WEATHERED					5	ROCK (VISUAL)
	30.0 - 31.5	SS-11	100				SAME AS SS-10					5	ROCK (VISUAL)
	35.0 - 35.9	SS-12	100				SAME AS SS-10					8	ROCK (VISUAL)
	40.0 - 40.9	SS-13	89				SAME AS SS-10					8	ROCK (VISUAL)
	45.0 -45.4	SS-14	100				SAME AS SS-10					7	ROCK (VISUAL)
B-060-0-11	0.0 - 1.5	SS-1	73				SAME AS SS-2					15	A-6b (VISUAL)
STA. 335+71, 175' RT.	2.5 -4.0	SS-2	100	4	10	15	35	36	40	21	19	19	A-6b (11)
NORTHING=165459.7	5.0 - 7.0	ST-3	100	7	4	11	32	46	36	16	20	16	A-6b (12)
EASTING=1999321.0	7.5 - 9.0	SS-4	100				SAME AS SS-5					14	A-6b (VISUAL)
	10.0 - 11.5	SS-5	100	6	9	7	42	36	36	17	19	13	A-6b (12)
	12.5 - 14.0	SS-6	100				SAME AS SS-5					14	A-6b (VISUAL)
	15.0 - 16.5	SS-7	100				MUDSTONE, SEVERELY WEATHERED					9	ROCK (VISUAL)
	17.5 - 19.0	SS-8	100				SAME AS SS-7					10	ROCK (VISUAL)
	20.0 - 21.5	SS-9	100				SAME AS SS-7					12	ROCK (VISUAL)
	25.0 - 26.5	SS-10	100				SAME AS SS-7					11	ROCK (VISUAL)
B-061-0-11	0.0 - 1.5	SS-1	100	1	1	3	39	56	54	28	26	27	A-7-6 (17)
STA. 336+17, 517' RT.	2.5 -4.0	SS-2	100				SAME AS SS-1					31	A-7-6 (VISUAL)
NORTHING=165151.3	5.0 - 6.5	SS-3	73				SAME AS SS-1					31	A-7-6 (VISUAL)
EASTING=1999166.9	7.5 - 9.5	ST-4	95	0	0	7	46	47	44	24	20	25	A-7-6 (13)
	10.0 - 11.5	SS-5	100				SAME AS ST-4					26	A-7-6 (VISUAL)
	12.5 - 14.0	SS-6	100				SAME AS ST-4					16	A-7-6 (VISUAL)
R-250-0-99	3.0 - 4.5	SS-1	-	12	11	10	32	35	38	20	18	14	A-6b (10)
STA. 336+43, 35' RT.	8.5 - 10.0	SS-3	-	-	-	-	-	-	29	17	12	9	EST. A-6a
NORTHING=165527.3													
EASTING=1999370.7													
R-251-0-99	3.0 - 4.5	SS-1	-	-	-	-	-	-	44	20	24	12	EST. A-7-6
STA.338+78, 60' LT.	6.0 - 7.5	SS-2	-	0	1	4	59	36	37	22	15	12	A-6a (10)
NORTHING=165473.7													
EASTING=1999618.5													
B-063-0-11	0.0 - 1.5	SS-1	33				SAME AS ST-3					23	A-6b (VISUAL)
STA. 340+04, 171' LT.	2.5 -4.0	SS-2	87				SAME AS ST-3					17	A-6b (VISUAL)
NORTHING=165502.1	5.0 - 6.0	ST-3	100	20	2	5	36	37	36	15	21	24	A-6b (12)
EASTING=1999873.6	7.5 - 9.0	SS-4	100				SAME AS ST-3					7	A-6b (VISUAL)
	10.0 - 11.5	SS-5	67				SAME AS SS-6					8	A-6b (VISUAL)
	12.5 - 14.0	SS-6	73	1	1	2	45	51	37	18	19	12	A-6b (12)
	15.0 - 16.5	SS-7	100				SAME AS SS-6					12	A-6b (VISUAL)
	17.5 - 18.5	SS-8	100				SHALE, SEVERELY WEATHERED					9	ROCK (VISUAL)
	20.0 - 21.0	SS-9	100				SAME AS SS-8					11	ROCK (VISUAL)

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% GRAVEL	% SAND	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-064-0-11	0.0 - 1.5	SS-1	73	0	5	12	46	37	39	19	20	21	A-6b (12)
STA. 340+06, 175' RT.	2.5 -4.0	SS-2	27				SAME AS SS-1					18	A-6b (VISUAL)
NORTHING=165214.6	5.0 - 6.5	SS-3	20				SAME AS SS-1					11	A-6b (VISUAL)
EASTING=1999680.8	7.5 - 9.0	SS-4	33				SAME AS SS-1					17	A-6b (VISUAL)
	10.0 - 11.5	SS-5	80	0	0	3	27	70	47	16	31	13	A-7-6 (17)
	12.5 - 14.0	SS-6	100				SAME AS SS-5					7	A-7-6 (VISUAL)
	15.0 - 16.5	SS-7	100				SAME AS SS-8					8	A-7-6 (VISUAL)
	17.5 - 19.0	SS-8	100	2	2	2	41	53	41	20	21	9	A-7-6 (13)
	20.0 - 21.5	SS-9	100				SANDSTONE, SEVERELY WEATHERED					7	ROCK (VISUAL)
	25.0 - 26.5	SS-10	100				SAME AS SS-9					11	ROCK (VISUAL)
B-062-0-11	0.0 - 1.5	SS-1	67	5	12	24	33	26	28	16	12	17	A-6a (6)
STA. 340+07, 326' LT.	2.5 -4.0	SS-2	67				SAME AS SS-1					14	A-6a (VISUAL)
NORTHING=165628.7	5.0 - 7.0	ST-3	75	7	2	10	37	44	33	19	14	19	A-6a (10)
EASTING=1999963.9	7.5 - 9.5-0	SS-4	100				SAME AS SS-5					16	A-6b (VISUAL)
	10.0 - 11.5	SS-5	87	0	1	10	39	50	38	17	21	13	A-6b (12)
	12.5 - 13.3	SS-6	63				SANDSTONE, SEVERELY WEATHERED					3	ROCK (VISUAL)
B-065-0-11	0.0 - 1.5	SS-1	87				SAME AS SS-2					17	A-6b (VISUAL)
STA. 340+19, 382' RT.	2.5 -4.0	SS-2	80	11	9	10	37	33	39	19	20	17	A-6b (11)
NORTHING=165036.8	5.0 - 6.5	SS-3	87				SAME AS SS-2					17	A-6b (VISUAL)
EASTING=1999575.8	7.5 - 9.0	SS-4	73				SAME AS SS-5					14	A-6b (VISUAL)
	10.0 - 11.5	SS-5	100	4	3	4	38	51	39	18	21	10	A-6b (12)
	12.5 - 14.0	SS-6	87				SAME AS SS-8					12	A-7-6 (VISUAL)
	15.0 - 16.5	SS-7	93				SAME AS SS-8					14	A-7-6 (VISUAL)
	17.5 - 19.0	SS-8	100	0	0	3	38	59	43	19	24	12	A-7-6 (14)
	20.0 - 21.5	SS-9	100				SAME AS SS-8					10	A-7-6 (VISUAL)
B-067-0-11	0.0 - 1.5	SS-1	67	6	14	14	35	31	38	22	16	15	A-6b (9)
STA. 348+94, 243' RT.	2.5 - 3.6	SS-2	91				SANDSTONE, SEVERELY WEATHERED					12	ROCK (VISUAL)
NORTHING=164659.5													
EASTING=2000376.8													
B-066-0-11	0.0 - 1.5	SS-1	67				SAME AS SS-2					16	A-7-6 (VISUAL)
STA. 349+26, 626' LT.	2.5 -4.0	SS-2	73	0	8	16	32	44	45	21	24	20	A-7-6 (15)
NORTHING=165360.0	5.0 - 6.5	SS-3	87				SAME AS SS-2					12	A-7-6 (VISUAL)
EASTING=2000891.9	7.5 - 9.0	SS-4	87	0	20	18	45	17	29	20	9	9	A-4a (5)
	10.0 - 11.5	SS-5	73				SAME AS SS-4					18	A-4a (VISUAL)
	12.5 - 14.0	SS-6	87				SHALE, SEVERELYWEATHERED					13	ROCK (VISUAL)
	15.0 - 15.6	SS-7	100				SAME AS SS-6					23	ROCK (VISUAL)
B-070-0-11	0.0 - 1.5	SS-1	67	0	13	14	36	37	38	20	18	17	A-6b (11)
STA. 358+89, 287' LT.	2.5 -4.0	SS-2	87				SAME AS SS-1					14	A-6b (VISUAL)
NORTHING=164616.6	5.0 - 6.5	SS-3	80	5	14	11	33	37	40	22	18	17	A-6b (10)
EASTING=2001497.8	7.5 - 9.0	SS-4	93				SAME AS SS-3					15	A-6b (VISUAL)
	10.0 - 10.8	SS-5	100				SHALE, SEVERELY WEATHERED					24	ROCK (VISUAL)
B-068-0-11	0.0 - 1.5	SS-1	100	0	7	12	53	28	27	17	10	18	A-4b (8)
STA. 359+03, 461' RT.	2.5 -4.0	SS-2	100	11	16	13	41	19	33	20	13	13	A-6a (6)
NORTHING=163938.3	5.0 - 6.1	SS-3	91				SANDSTONE, SEVERELY WEATHERED					13	ROCK (VISUAL)
EASTING=2001183.6													
B-069-0-11	0.0 - 1.5	SS-1	80				SAME AS SS-2					16	A-6b (VISUAL)
STA. 359+62, 105' RT.	2.5 -4.0	SS-2	100	1	12	20	34	33	35	19	16	21	A-6b (9)
NORTHING=164232.4	5.0 - 6.5	SS-3	53				SAME AS SS-2					22	A-6b (VISUAL)
EASTING=2001392.9	7.5 - 8.2	SS-4	100				SHALE, SEVERELY WEATHERED					13	ROCK (VISUAL)
	10.0 - 10.3	SS-5	100				SAME AS SS-4					6	ROCK (VISUAL)
R-255-0-99	18.5 - 20.0	SS-5	-	7	8	14	48	23	30	22	8	7	A-4a (7)
STA. 362+43, 40' LT.													
NORTHING=164239.7													
EASTING=2001621.2													

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-072-0-11	0.0 - 1.5	SS-1	100	9	22	18	32	19	32	22	10	21	A-4a (3)
STA. 371+03, 131' LT.	2.5 -4.0	SS-2	73				SAME AS SS-1					13	A-4a (VISUAL)
NORTHING=163976.8	5.0 - 6.5	SS-3	67				SAME AS SS-1					21	A-4a (VISUAL)
EASTING=2002531.1	7.5 - 9.0	SS-4	87	0	1	2	65	32	35	19	16	25	A-6b (10)
	10.0 - 11.5	SS-5	80				SAME AS SS-4					19	A-6b (VISUAL)
	12.5 - 14.0	SS-6	100	0	1	9	51	39	35	19	16	19	A-6b (10)
	15.0 - 16.5	SS-7	100				SAME AS SS-6					17	A-6b (VISUAL)
	17.5 - 19.5	ST-8	55	3	3	11	42	41	35	19	16	19	A-6b (10)
	20.0 - 21.5	SS-9	100				SAME AS ST-8					18	A-6b (VISUAL)
B-071-0-11	0.0 - 1.5	SS-1	33				SAME AS SS-3					14	A-6b (VISUAL)
STA. 371+07, 264' LT.	2.5 -4.0	SS-2	73				SAME AS SS-3					15	A-6b (VISUAL)
NORTHING=164096.1	5.0 - 6.5	SS-3	87	2	8	23	38	29	37	20	17	18	A-6b (9)
EASTING=2002589.8	7.5 - 9.0	SS-4	100				SAME AS SS-3					21	A-6b (VISUAL)
	10.0 - 11.5	SS-5	100				SAME AS SS-6					18	A-6b (VISUAL)
	12.5 - 14.0	SS-6	100	0	4	23	33	40	36	17	19	14	A-6b (11)
	15.0 - 16.5	SS-7	100				SAME AS SS-6					15	A-6b (VISUAL)
	17.5 - 19.0	SS-8	100				SAME AS SS-6					16	A-6b (VISUAL)
	20.0 - 21.5	SS-9	100				SAME AS SS-6					20	A-6b (VISUAL)
B-073-0-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					21	A-4a (VISUAL)
STA. 374+00, 260' LT.	3.5 - 5.0	SS-2	100	0	2	36	36	26	23	13	10	24	A-4a (5)
NORTHING= 163972.1	6.0 - 7.5	SS-3	100				SAME AS SS-2					25	A-4a (VISUAL)
EASTING= 2002855.4	8.5 - 10.0	SS-4	100				SAME AS SS-2					24	A-4a (VISUAL)
	11.0 - 11.8	SS-5	100				SHALE, GRAY SEVERELY WEATHERED					10	ROCK (VISUAL)
	13.5 - 14.2	SS-6	100				SHALE, GRAY SEVERELY WEATHERED					10	ROCK (VISUAL)
R-119-0-99	13.5 - 15.0	SS-4	-	0	0	6	69	25	30	20	10	27	A-4b (8)
STA. 384+83, 43' RT.													
NORTHING=163346.9													
EASTING=2003677.3													
B-074-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-3					11	A-6b (VISUAL)
STA. 387+00, CENTERLINE	3.5 - 5.0	SS-2	100				SAME AS SS-3					11	A-6b (VISUAL)
NORTHING= 163382.4	6.0 - 7.5	SS-3	100	23	10	14	36	17	30	16	14	16	A-6b (5)
EASTING= 2003987.8	8.5 - 10.0	SS-4	100				SAME AS SS-3					21	A-6b (VISUAL)
R-120-0-99	3.5 - 5.0	SS-2	-	0	2	7	41	50	46	21	25	17	A-7-6 (15)
STA. 388+25, 44' LT.													
NORTHING=163419.7													
EASTING=2004021.8													
B-075-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					13	A-6b (VISUAL)
STA. 391+00, CENTERLINE	3.5 - 5.0	SS-2	100	19	10	12	28	31	36	15	21	14	A-6b (9)
NORTHING= 163409.7	6.0 - 7.5	SS-3	100				SAME AS SS-2					18	A-6b (VISUAL)
EASTING= 2004386.4	8.5 - 10.0	SS-4	100				SAME AS SS-2					14	A-6b (VISUAL)
R-121-0-99	1.0 - 2.5	SS-1	-	5	10	18	32	35	41	22	19	15	A-7-6 (10)
STA. 392+43, 44' RT.													
NORTHING=163385.9													
EASTING=2004446.8													
B-076-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					14	A-6b (VISUAL)
STA. 395+00, CENTERLINE	4.0 - 5.5	SS-2	100	4	12	9	33	42	38	19	19	17	A-6b (12)
NORTHING= 163505.6	6.0 - 7.5	SS-3	100				SAME AS SS-2					14	A-6b (VISUAL)
EASTING= 2004774.2	8.0 - 9.5	SS-4	100	7	24	24	33	12	19	14	5	6	A-4a (2)

SUMMARY OF SOIL TEST DATA

STATE ROUTE 7 MAINLINE

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
R-122-0-99	6.0 - 7.5	SS-2	-	0	5	6	26	63	45	24	21	14	A-7-6 (13)
STA. 396+48, 45' LT.													
NORTHING=163591.5													
EASTING=2004807.5													
B-077-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					14	A-6b (VISUAL)
STA. 399+00, CENTERLINE	4.0 - 5.5	SS-2	100	14	17	10	27	32	36	20	16	14	A-6b (7)
NORTHING= 163649.9	6.0 - 7.5	SS-3	100				SAME AS SS-2					16	A-6b (VISUAL)
EASTING= 2005147.3	8.0 - 9.5	SS-4	100				SAME AS SS-2					16	A-6b (VISUAL)
R-123-0-99	3.5 - 5.0	SS-2	-	34	34	22	10		-	-	-	-	A-1-b (0)
STA. 400+41, 58' RT.													
NORTHING=163640.6													
EASTING=2005210.5													
B-078-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					12	A-6a (VISUAL)
STA. 403+00, CENTERLINE	4.0 - 5.5	SS-2	100	18	9	14	32	27	34	20	14	15	A-6a (6)
NORTHING= 163797.7	6.0 - 7.5	SS-3	100				SAME AS SS-2					19	A-6a (VISUAL)
EASTING= 2005519.0	8.0 - 9.5	SS-4	100				SAME AS SS-2					13	A-6a (VISUAL)
R-124-0-99	6.0 - 7.5	SS-2	-	12	10	7	26	45	45	20	25	15	A-7-6 (14)
STA. 404+38, 48' LT.													
NORTHING=163885.0													
EASTING=2005540.9													
S-103-0-99	8.5 - 10.0	SS-2	-	3	3	3	32	59	43	25	18	14	A-7-6 (12)
STA. 404+76, 194' LT.													
NORTHING=164035.2													
EASTING=2005524.9													
B-079-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-3					15	A-6b (VISUAL)
STA. 407+00, CENTERLINE	4.0 - 4.2	SS-2	100				SAME AS SS-3, COBBLE AT 4.2'					8	A-6b (VISUAL)
NORTHING= 163939.2	6.0 - 7.5	SS-3	100	12	14	9	26	39	40	18	22	14	A-6b (11)
EASTING= 2005893.1	8.0 - 9.5	SS-4	100				SAME AS SS-3					12	A-6b (VISUAL)
R-125-0-99	6.0 - 7.5	SS-2	-	5	23	13	32	27	35	18	17	11	A-6b (8)
STA. 408+52, 7' LT.													
NORTHING=163991.5													
EASTING=2005944.2													

LABORATORY TESTING DATA NOT AVAILABLE FOR THE FOLLOWING BORINGS: R-208-0-99, S-201-0-99, R-213-0-99, R-214-0-99, R-215-0-99, R-216-0-99, R-219-0-99, R-222-0-99, R-224-0-99, R-225-0-99, R-228-0-99, R-234-0-99, R-235-0-99, R-236-0-99, R-239-0-99, R-242-0-99, R-243-0-99, R-245-0-99, R-247-0-99, R-248-0-99, R-249-0-99, R-252-0-99, R-253-0-99, R-254-0-99, R-256-0-99, R-257-0-99, S-202-0-99, S-203-0-99, S-204-0-99, S-205-0-99, S-206-0-99, S-207-0-99, S-3P1-0-99, S-208-0-99, S-212-0-99, S-210-0-99, S-209-0-99, R-230-0-99, R-231-0-99, S-4P2-0-99, S-214-0-99, S-215-0-99, S-216-0-99, S-701-0-99

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp C

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-075-0-12	0.0 - 1.5	SS-1	100				SAME AS SS-3					17	A-6b (VISUAL)
STA. 120+00, CENTERLINE	4.0 - 5.5	SS-2	100				SAME AS SS-3					15	A-6b (VISUAL)
NORTHING= 158900.7	6.0 - 7.5	SS-3	100	5	8	10	38	39	35	18	17	16	A-6b (11)
EASTING= 1980610.6	8.0 - 9.5	SS-4	100				SAME AS SS-3					12	A-6b (VISUAL)
B-076-0-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					26	A-6b (VISUAL)
STA. 123+50, CENTERLINE	4.0 - 5.5	SS-2	100	5	5	12	44	34	36	20	16	20	A-6b (10)
NORTHING= 159115.5	6.5 - 8.0	SS-3	100				SAME AS SS-2					28	A-6b (VISUAL)
EASTING= 1980883.8	9.0 - 11.0	ST-4	79	0	0	11	48	41	34	19	15	-	A-6a (10)
	11.5 - 13.0	SS-5	100				SAME AS ST-4					27	A-6a (VISUAL)
	14.0 - 15.5	SS-6	100				SAME AS ST-4					39	A-6a (VISUAL)
	17.0 - 18.5	SS-7	100				SAME AS SS-8					24	A-4a (VISUAL)
	19.0 - 20.5	SS-8	100	13	23	28	22	14	22	15	7	18	A-4a (0)
	21.5 - 23.0	SS-9	100				SAME AS SS-8					18	A-4a (VISUAL)
	24.0 - 25.5	SS-10	100				SAME AS SS-8					16	A-4a (VISUAL)
	26.5 - 28.0	SS-11	100				SAME AS SS-8					24	A-4a (VISUAL)
	29.0 - 30.5	SS-12	100				SAME AS SS-8					21	A-4a (VISUAL)
B-077-0-12	0.0 - 1.5	SS-1	100				SILTY CLAY WITH SAND, BROWN, MOIST					24	A-6b (VISUAL)
STA. 123+50, 80' LT.	4.0 - 5.5	SS-2	100				SAME AS SS-1					15	A-6b (VISUAL)
NORTHING= 159167.9	6.5 - 8.0	SS-3	100	4	9	12	52	23	32	19	13	10	A-6a (9)
EASTING= 1980823.3	9.0 - 10.5	SS-4	100				SAME AS SS-3					13	A-6a (VISUAL)
	11.5 - 13.0	SS-5	100				SAME AS SS-3					13	A-6a (VISUAL)
	14.0 - 15.5	SS-6	100				SAME AS SS-3					15	A-6a (VISUAL)
	16.5 - 18.0	SS-7	100	28	20	18	21	13	25	16	9	14	A-2-4 (0)
	19.0 - 20.5	SS-8	100				SAME AS SS-9					15	A-3a (VISUAL)
	21.5 - 23.0	SS-9	100	0	36	48	10	6	NP	NP	NP	22	A-3a (0)
	24.0 - 25.5	SS-10	100				SAME AS SS-9					22	A-3a (VISUAL)
	26.5 - 28.0	SS-11	100				SAME AS SS-9					20	A-3a (VISUAL)
	29.0 - 30.5	SS-12	100				SAME AS SS-9					14	A-3a (VISUAL)
	31.5 - 33.0	SS-13	100	38	21	23	13	5	NP	NP	NP	14	A-1-b (0)
	34.0 - 35.1	SS-14	100				SHALE, GRAY, SEVERELY WEATHERED					13	ROCK (VISUAL)

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp D Access Road

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-078-0-12	0.0 - 1.5	SS-1	100	1	1	5	70	23	26	22	4	20	A-4b (8)
STA. 120+17, 0.1' RT.	4.5 - 6.0	SS-2	100				SAME AS SS-1					29	A-4b (VISUAL)
NORTHING= 157909.0	6.5 - 8.0	SS-3	100				SAME AS SS-1					26	A-4b (VISUAL)
EASTING= 1981095.2	8.5 - 10.0	SS-4	100				SAME AS SS-1					25	A-4b (VISUAL)
EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-079-0-12	0.0 - 1.5	SS-1	100				SAME AS SS-3					28	A-4b (VISUAL)
STA. 117+71, 4.7' LT.	3.0 - 4.5	SS-2	100				SAME AS SS-3					29	A-4b (VISUAL)
NORTHING= 158103.4	5.5 - 7.0	SS-3	100	0	0	8	62	30	27	18	9	21	A-4b (8)
EASTING= 1980944.3	8.0 - 9.5	SS-4	100				SAME AS SS-3					27	A-4b (VISUAL)
	10.5 - 12.0	SS-5	100				SAME AS SS-3					27	A-4b (VISUAL)
	16.0 - 14.5	SS-6	100				SAME AS SS-3					28	A-4b (VISUAL)
	15.5 - 17.0	SS-7	100	4	7	15	43	31	29	16	13	16	A-6a (9)
	18.0 - 19.5	SS-8	100				SAME AS SS-7					18	A-6a (VISUAL)
	20.5 - 22.0	SS-9	100				SAME AS SS-7					17	A-6a (VISUAL)
	23.0 - 24.5	SS-10	100				SAME AS SS-7					18	A-6a (VISUAL)

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp D Access Road (Continued)

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
R-201-0-99	3.0 - 4.5	SS-1	-	0	0	1	70	29	33	25	8	28	A-4a (8)
STA. 117+12, 4.0' RT.													
NORTHING= 158129.5													
EASTING= 1980806.1													
B-080-0-12	0.0 - 1.5	SS-1	100	3	3	8	45	41	40	21	19	15	A-6b (12)
STA. 115+58, 225.8' LT.	4.0 - 4.9	SS-2	100			SAME AS SS-3, COBBLE AT 4.9'						9	A-6a (VISUAL)
NORTHING= 158426.4	6.0 - 7.5	SS-3	100	5	7	13	41	34	34	20	14	9	A-6a (10)
EASTING= 1980839.5	8.0 - 8.5	SS-4	100			SAME AS SS-3, COBBLE AT 8.5						7	A-6a (VISUAL)

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp I

B-073-1-20	0.0-1.5	SS-1	93	3	5	10	42	40	44	24	20	24 A-7-6 (13)
STA. 376+06, 113' RT.	2.5-4.0	SS-2	87				SAME AS SS-1					24 A-7-6 (VISUAL)
NORTHING=163435.2	5.0-5.5	SS-3	100				SANDSTONE, BROWN TO GRAY, SEVERELY WEATHERED					4 Rock (VISUAL)
EASTING=2002803.2	7.5-8.1	SS-4	100				SAME AS SS-3					5 Rock (VISUAL)
	10.0-10.5	SS-5	100				SAME AS SS-3					4 Rock (VISUAL)
B-073-2-20	2.5-4.0	SS-1	47	75	9	7	6	3 NP	NP	NP		1 A-1-a (0)
STA. 379+17, 144' RT.	5.0-6.5	SS-2	72				SAME AS SS-1					1 A-1-a (VISUAL)
NORTHING=163235.0	7.5-9.0	SS-3	53				SAME AS SS-1					1 A-1-a (VISUAL)
EASTING=2003027.0	10.0-11.5	SS-4	67	1	3	11	48	37	42	24	18	26 A-7-6 (12)
	12.5-14.5	ST-1	100	2	4	22	43	29	36	20	16	24 A-6b (10)
	14.5-16.5	ST-2	100	1	4	14	49	32	38	21	17	22 A-6b (11)
	16.5-18.0	SS-5	53				SAME AS ST-2					22 A-6b (VISUAL)
	20.0-22.0	ST-3	100	12	4	17	41	26	34	20	14	19 A-6a (8)
	22.5-24.0	SS-6	100	17	35	23	14	11	31	17	14	21 A-2-6 (0)
	25.0-26.5	SS-7	100	12	23	37	19	9	21	15	6	21 A-3a (0)
	27.5-29.0	SS-8	72	27	20	22	24	7	24	19	5	18 A-2-4 (0)
	30.0-31.5	SS-9	87	11	16	21	41	11	25	19	6	17 A-4a (3)
	32.5-34.0	SS-10	87	2	3	18	62	15 NP	NP	NP		19 A-4b (8)
	35.0-37.0	ST-4	100	0	0	9	74	17	25	21	4	23 A-4b (8)

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp J

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-100-0-12	3.5 - 5.0	SS-1	100	0	1	2	66	31	29	22	7	25	A-4b (8)
STA. 384+50, CENTERLINE	6.0 - 7.5	SS-2	100				SAME AS SS-1					22	A-4b (VISUAL)
NORTHING= 163468.2	8.5 - 8.8	SS-3	100				SAME AS SS-1					26	A-4b (VISUAL)
EASTING= 2003749.0													
B-101-0-12	0.0 - 1.5	SS-1	100	43	12	10	20	15	32	22	10	10	A-2-4 (0)
STA. 386+50, CENTERLINE	3.5 - 5.0	SS-2	100	43	12	10	20	15	32	22	10	23	A-2-4 (0)
NORTHING= 163456.2	6.0 - 7.5	SS-3	100				SAME AS SS-1					23	A-2-4 (VISUAL)
EASTING= 2003948.3	8.5 - 10.0	SS-4	100				SAME AS SS-1					19	A-2-4 (VISUAL)
B-102-0-12	0.0 - 0.9	SS-1	100	8	21	6	40	25	37	23	14	6	A-6a (8)
STA. 389+50, 20' LT.	3.5 - 3.9	SS-2	100	8	21	6	40	25	37	23	14	6	A-6a (8)
NORTHING= 163644.0													
EASTING= 2004117.9													

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp K

B-097-1-20	0.0-1.5	SS-1	33	1	1	4	42	52	50	25	25	20 A-7-6 (16)
STA. 386+46, 23' RT.	2.5-2.9	SS-2	100				SANDSTONE, BLUISH GRAY, HIGHLY WEATHERED				-	Rock (VISUAL)
NORTHING=163897.8	5.0-5.4	SS-3	80				SAME AS SS-2					7 Rock (VISUAL)
EASTING=2003924.3												
B-098-1-20	0.0-1.5	SS-1	61				SAME AS SS-3					7 A-4a (VISUAL)
STA. 386+46, 15' RT.	2.5-4.0	SS-2	67				SAME AS SS-3					6 A-4a (VISUAL)
NORTHING=163811.6	5.0-6.5	SS-3	67	8	10	20	47	15	32	22	10	5 A-4a (5)
EASTING=2004125.9	7.5-8.3	SS-4	100				CLAYSTONE, RED, SEVERLY WEATHERED				-	Rock (VISUAL)
	10.0-10.8	SS-5	70				SAME AS SS-4					5 Rock (VISUAL)
B-106-1-20	0.0-1.7	ST-1	60	14	12	13	28	33	40	20	20	12 A-6b (9)
STA. 392+31, 21' RT.	2.5-4.0	SS-1	94	33	13	14	24	16	34	21	13	8 A-6a (2)
NORTHING=163643.8	5.0-6.5	SS-2	44				SAME AS SS-2					12 A-6a (VISUAL)
EASTING=2004456.0	7.5-9.0	SS-3	100	9	9	8	32	42	45	21	24	16 A-7-6 (14)
	10.0-11.5	SS-4	78				SAME AS SS-3					13 A-7-6 (VISUAL)
	12.5-13.3	SS-5	100				SANDSTONE, TAN, SEVERLY WEATHERED					13 Rock (VISUAL)
	15.0-15.3	SS-6	100				SAME AS SS-5					10 Rock (VISUAL)
	17.5-17.9	SS-7	100				SAME AS SS-5					5 Rock (VISUAL)
	20.0-20.4	SS-8	100				SAME AS SS-5					5 Rock (VISUAL)
	22.5-22.9	SS-9	80				SAME AS SS-5				-	Rock (VISUAL)
B-106-2-20	0.0-1.5	SS-1	78				SAME AS B-106-3-20 ST-1					13 A-6b (VISUAL)
STA. 392+10, 170' LT.	5.0-5.4	SS-2	100				SANDSTONE, TAN TO GRAY, SEVERLY WEATHERED					5 Rock (VISUAL)
NORTHING=163834.1												
EASTING=2004479.0												
B-106-3-20	0.0-2.0	ST-1	100	1	4	8	60	27	35	18	17	14 A-6b (11)
STA. 392+10, 170' LT.	2.5-4.5	ST-2	46				SAME AS ST-1				-	A-6b (VISUAL)
NORTHING=163834.1												
EASTING=2004479.0												

SUMMARY OF SOIL TEST DATA
State Route 7, RAMP K

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-097-0-12	0.0 - 1.5	SS-1	100				SILT AND CLAY, HARD, GRAY					13	A-6a (VISUAL)
STA. 385+00, CENTERLINE	4.5 - 6.0	SS-2	100	4	1	60	25	10	NP	NP	NP	18	A-3a (0)
NORTHING= 163979.4	6.5 - 8.0	SS-3	100				SAME AS SS-2					20	A-3a (VISUAL)
EASTING= 2003835.0	8.5 - 10.0	SS-4	100	4	11	13	42	30	31	18	13	16	A-6a (9)
B-098-0-12	0.0 - 1.5	SS-1	100				SAME AS SS-4					22	A-6b (VISUAL)
STA. 388+0, 40' LT.	3.5 - 5.0	SS-2	100				SAME AS SS-4					-	A-6b (VISUAL)
NORTHING= 163847.8	6.0 - 7.5	SS-3	100				SAME AS SS-4					16	A-6b (VISUAL)
EASTING= 2004107.6	8.5 - 10.0	SS-4	100	0	5	6	49	40	35	19	16	8	A-6b (10)
	11.0 - 11.4	SS-5	100				SANDSTONE, GRAY, HIGHLY WEATHERED					5	ROCK (VISUAL)
B-098-1-12	0.0 - 1.5	SS-1	100	2	5	7	53	33	33	20	13	12	A-6a (9)
STA. 388+00, 300' LT.	4.0 - 4.6	SS-2	100				SAME AS SS-1					8	A-6a (VISUAL)
NORTHING= 164065.0													
EASTING= 2004250.6													

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp L

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-103-0-12	1.5 - 3.0	SS-1	100	15	12	9	32	32	36	21	15	17	A-6a (8)
STA. 380+65, CENTERLINE	3.0 - 4.5	SS-2	100	15	12	9	32	32	36	21	15	17	A-6a (8)
NORTHING= 163204.6	6.0 - 7.5	SS-3	100				SAME AS SS-1					16	A-6a (VISUAL)
EASTING= 2003385.5	8.5 - 10.0	SS-4	100				SAME AS SS-1					12	A-6a (VISUAL)
	11.0 - 12.5	SS-5	100				SAME AS SS-1					17	A-6a (VISUAL)
	13.5 - 15.0	SS-6	100				SAME AS SS-1					16	A-6a (VISUAL)
	16.0 - 17.5	SS-7	100				SAME AS SS-8					12	A-6a (VISUAL)
	18.5 - 20.0	SS-8	100	26	17	10	25	22	34	21	13	14	A-6a (3)
R-110-0-99	8.5 - 10.0	SS-3	-	0	0	3	73	24	27	21	8	24	A-4b (8)
STA. 383+24, 79' RT.	33.5 - 34.3	SS-8	-	15	55	26	4		-	-	-	-	A-1-b (0)
NORTHING=163095.1													
EASTING=2003558.7													
R-118-0-99	8.5 - 10.0	SS-3	-	0	1	2	64	33	38	22	16	25	A-6b (10)
STA. 386+74, 68' RT.													
NORTHING=163173.0													
EASTING=2003911.3													

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

1051
1247

SUMMARY OF SOIL TEST DATA
State Route 7, Ramp L (Continued)

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-104-0-12	0.0 - 1.5	SS-1	100	36	9	10	19	26	36	18	18	22	A-6b (4)
STA. 389+12, 11' RT.	4.0 - 5.5	SS-2	100				SAME AS SS-1					19	A-6b (VISUAL)
NORTHING= 163286.9	6.5 - 8.0	SS-3	100				SAME AS SS-4					25	A-7-6 (VISUAL)
EASTING=2004220.7	9.0 - 10.5	SS-4	100	0	3	4	40	53	48	26	22	25	A-7-6 (14)

SUMMARY OF SOIL TEST DATA
Lynn Lane

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-013-0-11	0.0 - 1.5	SS-1	93				SAME AS SS-1					23	A-6b (VISUAL)
STA.10+90, 41' LT.	2.5 -4.0	SS-2	100	0	0	1	35	64	39	21	18	23	A-6b (11)
NORTHING=163776.5	5.0 - 6.5	SS-3	100				SAME AS SS-1					26	A-6b (VISUAL)
EASTING=1987386.3	7.5 - 9.0	SS-4	100	1	1	4	35	59	38	21	17	21	A-6b (11)
	10.0 - 11.5	SS-5	100				SAME AS SS-4					24	A-6b (VISUAL)
B-014-0-11	2.5 -4.0	SS-1	100	0	0	0	36	64	41	20	21	22	A-7-6 (13)
STA. 13+93, 3' RT.	5.0 - 6.5	SS-2	100				SAME AS SS-1					24	A-7-6 (VISUAL)
NORTHING=163931.9	7.5 - 9.0	SS-3	100	0	1	1	49	49	34	20	14	26	A-6a (10)
EASTING=1987663.2	10.0 - 11.5	SS-4	87				SAME AS SS-3					22	A-6a (VISUAL)

SUMMARY OF SOIL TEST DATA
State Route 243

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-083-1-12	0.0 - 1.1	SS-1	100	35	15	18	19	13	25	18	7	6	A-2-4 (0)
STA. 13+00, 300' LT.	2.5 - 2.7	SS-2	100				COMBINED WITH SS-1					6	A-2-4 (0)
NORTHING= 166070.3	5.0 - 5.5	SS-3	100				COMBINED WITH SS-1					7	A-2-4 (0)
EASTING= 1990907.7													
B-025-0-11	2.5 -4.0	SS-1	100	28	21	24	13	14	27	16	11	13	A-2-6 (0)
STA. 17+03, 46' RT.	5.0 - 6.0	SS-2	50				SAME AS SS-1					12	A-2-6 (VISUAL)
NORTHING=166580.9	7.5 - 9.0	SS-3	100				SAME AS SS-1					10	A-2-6 (VISUAL)
EASTING=1991026.9	10.0 - 11.5	SS-4	100	0	1	3	38	58	48	22	26	24	A-7-6 (16)
B-084-0-12	1.5 - 3.0	SS-1	100				SAME AS SS-2					16	A-4a (VISUAL)
STA. 18+00, CENTERLINE	3.5 - 5.0	SS-2	100	0	11	47	19	23	25	17	8	16	A-4a (1)
NORTHING= 166639.7	6.0 - 7.5	SS-3	100	0	10	42	22	26	23	14	9	17	A-4a (3)
EASTING= 1990936.3	8.5 - 10.0	SS-4	100				SAME AS SS-3					17	A-4a (VISUAL)

SUMMARY OF SOIL TEST DATA
County Road 69

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-085-0-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					24	A-4a (VISUAL)
NORTHING= 166377.5	5.0 - 6.5	SS-3	100				SAME AS SS-2					19	A-4a (VISUAL)
EASTING= 1991124.7	7.5 - 9.0	SS-4	100	6	21	25	19	29	31	20	11	24	A-6a (3)
	10.0 - 10.7	SS-5	100				SHALE, GRAY SEVERELY WEATHERED					11	ROCK (VISUAL)

SUMMARY OF SOIL TEST DATA
County Road 69 (Continued)

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-024-0-11	0.0 - 1.5	SS-1	67	6	11	15	33	35	38	20	18	12	A-6b (10)
STA. 10+95, 7' LT.	2.5 -4.0	SS-2	100				SAME AS SS-1					12	A-6b (VISUAL)
NORTHING=166250.3	5.0 - 6.5	SS-3	100				SAME AS SS-5					7	A-6b (VISUAL)
EASTING=1991259.8	7.5 - 8.5	SS-4	100				SAME AS SS-5					6	A-6b (VISUAL)
	10.0 - 11.5	SS-5	100	0	5	11	48	36	40	21	19	11	A-6b (12)
	12.5 - 14.0	SS-6	100				SHALE, SEVERELY WEATHERED					8	ROCK (VISUAL)
B-027-0-11	0.0 - 1.5	SS-1	80				SAME AS SS-2					14	A-6b (VISUAL)
STA. 13+87, 12' LT	2.5 -4.0	SS-2	87	10	18	22	23	27	36	18	18	14	A-6b (6)
NORTHING=166381.8	5.0 - 6.5	SS-3	100	1	2	4	42	51	35	17	18	11	A-6b (11)
EASTING=1991520.1	7.5 - 9.0	SS-4	93				SAME AS SS-4					11	A-6b (VISUAL)
	10.0 - 10.8	SS-5	100				SANDSTONE, TAN, SEVERELY WEATHERED					11	ROCK (VISUAL)
B-086-0-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					14	A-6a (VISUAL)
STA. 15+00, 30' LT.	2.5 - 4.0	SS-2	100	18	25	10	30	17	33	22	11	12	A-6a (3)
NORTHING= 166480.1	5.0 - 6.5	SS-3	100				SAME AS SS-2					12	A-6a (VISUAL)
EASTING= 1991613.5	7.5 - 8.8	SS-4	100	5	3	7	47	38	33	20	13	12	A-6a (9)
B-086-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					24	A-6b (VISUAL)
STA. 15+00, 260' LT.	2.5 - 4.0	SS-2	100	6	10	10	37	37	38	19	19	18	A-6b (11)
NORTHING= 166707.3	5.0 - 6.5	SS-3	100	6	10	10	37	37	38	19	19	12	A-6b (11)
EASTING= 1991577.7	7.5 - 9.0	SS-4	100				SAME AS SS-5					13	A-7-6 (VISUAL)
	10.0 - 11.5	SS-5	100	8	2	3	34	53	42	19	23	13	A-7-6 (14)
	12.5 - 13.4	SS-6	100				SAME AS SS-5					10	A-7-6 (VISUAL)
B-028-0-11	0.0 - 1.5	SS-1	67	14	12	9	31	34	39	20	19	11	A-6b (10)
STA. 18+53, 7' RT.	2.5 -4.0	SS-2	73				COMBINED WITH SS-1					14	A-6b (10)
NORTHING=166533.7	5.0 - 6.5	SS-3	33				SAME AS SS-5					21	A-6a (VISUAL)
EASTING=1991961.0	7.5 - 9.0	SS-4	67				SAME AS SS-5					18	A-6a (VISUAL)
	10.0 - 11.5	SS-5	100	8	2	18	44	28	29	18	11	11	A-6a (8)
B-030-0-11	0.0 - 1.5	SS-1	80	13	19	9	29	30	35	22	13	12	A-6a (6)
STA. 22+85, 9' LT.	2.5 -4.0	SS-2	100	5	6	12	38	39	38	20	18	11	A-6b (11)
NORTHING=166649.0	5.0 - 6.5	SS-3	100	8	3	9	44	36	33	18	15	11	A-6a (10)
EASTING=1992376.2	7.5 - 9.0	SS-4	100				SAME AS SS-3					10	A-6a (VISUAL)
	10.0 - 11.5	SS-5	100				SHALE,SEVERELY WEATHERED					4	ROCK (VISUAL)
B-087-0-12	0.0 - 1.5	SS-1	100	38	21	10	19	12	33	21	12	10	A-2-6 (0)
STA. 24+00, 120' LT.	4.5 - 5.2	SS-2	100				SAME AS SS-1					7	A-2-6 (VISUAL)
NORTHING= 166776.6													
EASTING= 1992476.9													
B-087-1-12	0.0 - 1.5	SS-1	100				SAME AS SS-2					35	A-6b (VISUAL)
STA. 24+00, 350' LT.	4.5 - 6.0	SS-2	100	19	4	3	32	42	39	21	18	14	A-6b (11)
NORTHING= 167004.5	7.0 - 8.5	SS-3	100				SAME AS SS-4					13	A-6b (VISUAL)
EASTING= 1992446.4	9.5 - 11.0	SS-4	100	0	0	3	45	52	40	22	18	12	A-6b (11)
	12.0 - 13.3	SS-5	100				SAME AS SS-4					10	A-6b (VISUAL)
	14.5 - 15.7	SS-6	100				MUDSTONE, RED & GRAY, MOD. WEATHERED, WEAK					9	ROCK (VISUAL)
	17.0 - 18.4	SS-7	100				SAME AS SS-6					9	ROCK (VISUAL)
	19.5 - 20.3	SS-8	100				SAME AS SS-6					10	ROCK (VISUAL)
	21.5 - 22.2	SS-9	100				SAME AS SS-6					9	ROCK (VISUAL)

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

SUMMARY OF SOIL TEST DATA
County Road 69 (Continued)

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
STA. 31+67, 5' RT.	6.5	8.5	ST-2	100	2	3	8	44	43	36	21	15	13	A-6a (10)
NORTHING= 166657.3	8.5	9.5	ST-3	100	18	5	10	38	29	31	17	14	12	A-6a (8)
EASTING= 1993168.5														
B-088-0-12	0.0	1.5	SS-1	100				SAME AS SS-2					17	A-6b (VISUAL)
STA. 33+50, 120' LT.	5.0	6.5	SS-2	100	6	3	5	46	40	39	19	20	16	A-6b (12)
NORTHING= 166766.0	7.5	9.0	SS-3	100				SAME AS SS-2					12	A-6b (VISUAL)
EASTING= 1993455.7	10.0	11.5	SS-4	100				SAME AS SS-5					10	A-6b (VISUAL)
	12.5	14.0	SS-5	100	0	3	8	44	45	38	20	18	8	A-6b (11)
B-042-0-11	0.0	1.5	SS-1	80	0	1	3	35	61	52	26	26	19	A-7-6 (17)
STA. 39+30, 5' LT.	2.5	3.6	SS-2	91			SHALE, TAN, SEVERELY WEATHERED						11	ROCK (VISUAL)
NORTHING=166574.4														
EASTING=1994014.6														
B-089-0-12	0.0	1.5	SS-1	100				SAME AS SS-2					23	A-7-6 (VISUAL)
STA. 46+50, 110' LT.	2.5	4.0	SS-2	100	1	2	6	50	41	41	19	22	17	A-7-6 (13)
NORTHING= 166611.1	4.5	6.0	SS-3	100				SAME AS SS-2					13	A-7-6 (VISUAL)
EASTING= 1994738.0	7.5	9.0	SS-4	100				SAME AS SS-5					10	A-7-6 (VISUAL)
	9.5	11.0	SS-5	100	6	1	3	43	47	42	19	23	11	A-7-6 (14)
	12.5	13.9	SS-6	100			SHALE, RED, SEVERELY WEATHERED						12	ROCK (VISUAL)
B-045-0-11	0.0	1.5	SS-1	53				SAME AS SS-2					27	A-6b (VISUAL)
STA. 46+85, 8' LT.	2.5	-4.0	SS-2	100	8	4	5	38	45	38	18	20	12	A-6b (12)
NORTHING=166506.9	5.0	6.5	SS-3	73				SAME AS SS-2					19	A-6b (VISUAL)
EASTING=1994766.2	7.5	9.0	SS-4	100	2	1	3	46	48	39	20	19	8	A-6b (12)
	10.0	11.5	SS-5	67				SAME AS SS-4					8	A-6b (VISUAL)
B-046-0-11	0.0	1.5	SS-1	80				AGGREGATE BASE MATERIAL					8	A-1-b (VISUAL)
STA. 51+18, 7' RT.	2.5	-4.0	SS-2	80	18	8	8	32	34	39	23	16	25	A-6b (9)
NORTHING=166467.8	5.0	6.5	SS-3	100				SAME AS SS-2					25	A-6b (VISUAL)
EASTING=1995198.2	7.5	9.0	SS-4	100	3	1	1	33	62	38	21	17	28	A-6b (11)
	10.0	11.5	SS-5	100				SAME AS SS-4					27	A-6b (VISUAL)
B-049-0-11	0.0	1.5	SS-1	100				SAME AS SS-2					26	A-7-6 (VISUAL)
STA. 54+86, 4' RT.	2.5	-4.0	SS-2	100	4	11	8	38	39	43	18	25	19	A-7-6 (15)
NORTHING=166450.4	5.0	6.5	SS-3	100				SAME AS SS-2					22	A-7-6 (VISUAL)
EASTING=1995565.5	7.5	9.0	SS-4	100	0	4	5	40	51	42	23	19	26	A-7-6 (12)
	10.0	11.5	SS-5	100				SAME AS SS-4					27	A-7-6 (VISUAL)

LABORATORY TESTING DATA NOT AVAILABLE FOR THE FOLLOWING BORINGS: S-213-0-99, R-237-0-99, R-238-0-99, R-240-0-99

SUMMARY OF SOIL TEST DATA
County Road 118

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-090-0-12	0.0	1.5	SS-1	100	4	14	16	40	26	34	21	13	26	A-6a (7)
STA. 11+00, CENTERLINE														
NORTHING= 166775.9														
EASTING= 1992826.5														
B-031-0-11	0.0	1.5	SS-1	40				SAME AS SS-2					20	A-6a (VISUAL)
STA. 14+42, 9' RT.	5.0	5.6	SS-3	100				SAME AS SS-2					8	A-6b (VISUAL)
NORTHING=167040.7														
EASTING=1993491.0														

LABORATORY TESTING DATA NOT AVAILABLE FOR THE FOLLOWING BORING: S-214-0-99

SUMMARY OF SOIL TEST DATA
State Route 775

EXPLORATION NO., STATION & OFFSET	FROM	TO	SAMPLE ID	% REC	% AGG	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS
B-092-0-12	1.0	2.5	SS-1	100	35	13	9	20	23	34	18	16	18	A-6b (3)
STA. 46+00, CENTERLINE	4.5	6.0	SS-2	100				SAME AS SS-1					16	A-6b (VISUAL)
NORTHING= 162560.5	6.5	8.0	SS-3	100				SAME AS SS-1					18	A-6b (VISUAL)
EASTING= 2002840.3	8.5	10.0	SS-4	100				SAME AS SS-1					10	A-6b (VISUAL)
R-108-0-99	13.5	15.0	SS-4	-	5	22	12	37	24	33	21	12	19	A-6a (6)
STA. 47+72, 17' RT.	28.5	30.0	SS-7	-	0	37	58	5		-	-	-	-	A-3 (0)
NORTHING=162687.1														
EASTING=2002861.7														
B-093-0-12	1.0	2.5	SS-1	100				SAME AS SS-2					12	A-6b (VISUAL)
STA. 50+00, CENTERLINE	4.5	6.0	SS-2	100	23	11	9	27	30	37	21	16	11	A-6b (7)
NORTHING= 162894.6	6.5	8.0	SS-3	100				SAME AS SS-2					16	A-6b (VISUAL)
EASTING= 2003060.3	8.5	10.0	SS-4	100				SAME AS SS-2					14	A-6b (VISUAL)
R-109-0-99	3.5	5.0	SS-2	-	1	1	25	52	21	32	23	9	28	A-4b (8)
STA. 51+82, 13' RT.														
NORTHING=163032.0														
EASTING=2003082.4														
B-094-0-12	1.5	3.0	SS-1	100				SAME AS SS-2					10	A-6a (VISUAL)
STA. 53+91, 19' RT.	3.0	4.5	SS-2	100	20	23	11	25	21	34	20	14	10	A-6a (3)
NORTHING= 163210.8	6.0	7.5	SS-3	100	20	23	11	25	21	34	20	14	8	A-6a (3)
EASTING=2003291.2	8.5	10.0	SS-4	100				SAME AS SS-2					12	A-6a (VISUAL)
	11.0	12.5	SS-5	100				SAME AS SS-2					11	A-6a (VISUAL)
	13.5	15.0	SS-6	100				SAME AS SS-2					11	A-6a (VISUAL)
	16.0	17.5	SS-7	100				SAME AS SS-10					11	A-6a (VISUAL)
	18.5	20.0	SS-8	100				SAME AS SS-10					14	A-6a (VISUAL)
	21.0	21.3	SS-9	100				SAME AS SS-10					13	A-6a (VISUAL)
	23.5	25.0	SS-10	100	10	8	13	36	33	33	19	14	12	A-6a (8)
	26.0	27.5	SS-11	100	10	8	13	36	33	33	19	14	8	A-6a (8)
	28.5	30.0	SS-12	100				SAME AS SS-10					11	A-6a (VISUAL)
	31.0	32.5	SS-13	100				SAME AS SS-10					10	A-6a (VISUAL)
R-117-0-99	3.5	5.0	SS-1	-	0	1	37	45	17	-	-	-	16	EST. A-6a
STA. 60+44, 5' RT.	8.6	9.8	SS-3	-	0	1	6	75	18	33		8	28	A-4b (8)
NORTHING=163756.8	23.5	25.0	SS-6	-	0	0	6	70	24	26		7	21	A-4a (8)
EASTING=2003549.9														
R-116-0-99	3.0	4.5	SS-1	-	10	4	30	35	21	24		10	12	A-4a (4)
STA. 64+58, 1.4' LT.	8.5	10.0	SS-3	-	0	0	58	42		-	-	-	-	EST. A-4a
NORTHING=164104.1														
EASTING=2003773.9														
B-095-0-12	0.0	1.5	SS-1	100				SAME AS SS-3					28	A-6b (VISUAL)
STA. 67+00, 110' RT.	3.5	5.0	SS-2	100				SAME AS SS-3					13	A-6b (VISUAL)
NORTHING= 164252.7	6.0	7.5	SS-3	100	6	4	3	39	48	39	22	17	13	A-6b (11)
EASTING= 2004086.6	8.5	10.0	SS-4	100				SAME AS SS-3					11	A-6b (VISUAL)
	11.0	11.9	SS-5	100			SHALE, BROWN, SEVERELY WEATHERED						6	ROCK (VISUAL)
B-096-0-12	1.5	3.0	SS-1	100	0	3	25	49	23	25	21	4	18	A-4a (7)
STA. 68+50, CENTERLINE	4.5	6.0	SS-2	100				SAME AS SS-1					22	A-4a (VISUAL)
NORTHING= 164438.6	6.5	8.0	SS-3	100				SAME AS SS-1					19	A-4a (VISUAL)
EASTING= 2004079.6	8.5	10.0	SS-4	100				SAME AS SS-1					15	A-4a (VISUAL)

DRAWN MSJ | CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

1053
1247

BORINGS CONVERTED TO LAT/LONG COORDINATES

R-201-0-99 Lat38.434143 Long-82.457043
B-001-0-11 Lat38.434506 Long-82.457540
R-202-0-99 Lat38.435835 Long-82.457356
R-203-0-99 Lat38.436770 Long-82.456572
R-204-0-99 Lat38.437842 Long-82.456164
B-003-0-11 Lat38.439338 Long-82.453778
B-002-0-11 Lat38.439784 Long-82.454392
R-205-0-99 Lat38.440132 Long-82.453411
R-206-0-99 Lat38.441010 Long-82.452521
R-207-0-99 Lat38.441436 Long-82.451205
B-004-0-11 Lat38.442062 Long-82.450321
B-005-0-11 Lat38.442507 Long-88.449391
R-209-0-99 Lat38.442353 Long-82.448702
R-210-0-99 Lat38.442919 Long-82.447475
B-006-0-11 Lat38.442930 Long-82.446979
B-007-0-11 Lat38.442429 Long-82.446747
R-211-0-99 Lat38.443084 Long-82.446439
R-212-0-99 Lat38.443406 Long-82.444826
R-2P1-0-99 Lat38.444630 Long-82.440916
B-008-0-11 Lat38.445036 Long-82.439012
B-009-0-11 Lat38.444774 Long-82.438744
R-217-0-99 Lat38.446729 Long-82.437638
B-010-0-11 Lat38.448243 Long-82.436038
B-012-0-11 Lat38.448118 Long-82.434122
B-011-0-11 Lat38.449099 Long-82.434950
R-218-0-99 Lat38.449455 Long-82.432465
R-220-0-99 Lat38.450158 Long-82.429831
B-017-0-11 Lat38.449589 Long-82.428845
B-015-0-11 Lat38.450522 Long-82.429130
B-016-0-11 Lat38.450010 Long-82.428935
R-221-0-99 Lat38.450706 Long-82.428589

B-018-0-11 Lat38.450768 Long-82.426982
R-223-0-99 Lat38.450375 Long-82.426165
B-019-0-11 Lat38.451065 Long-82.425751
B-021-0-11 Lat38.450624 Long-82.424629
B-020-0-11 Lat38.451890 Long-82.425384
B-022-0-11 Lat38.452096 Long-82.423601
R-226-0-99 Lat38.452124 Long-82.423075
R-227-0-99 Lat38.453941 Long-82.423770
R-229-0-99 Lat38.454392 Long-82.422076
B-023-0-11 Lat38.454656 Long-82.421120
R-232-0-99 Lat38.455162 Long-82.420614
R-233-0-99 Lat38.455821 Long-82.419926
B-026-0-11 Lat38.456118 Long-82.418923
B-3SP-1-99 Lat38.456503 Long-82.419399
B-029-0-11 Lat38.457007 Long-82.417235
B-037-0-11 Lat38.456556 Long-82.414054
B-041-0-11 Lat38.456895 Long-82.411719
B-043-0-11 Lat38.456730 Long-82.410314
B-044-0-11 Lat38.456679 Long-82.408602
B-048-0-11 Lat38.456063 Long-82.406538
B-047-0-11 Lat38.456563 Long-82.406492
B-047-1-11 Lat38.456563 Long-82.406492
B-047-2-11 Lat38.456563 Long-82.406492
R-241-0-99 Lat38.456163 Long-82.406312
B-052-0-11 Lat38.456397 Long-82.401963
B-053-0-11 Lat38.457035 Long-82.399456
R-244-0-99 Lat38.456331 Long-82.399297
R-246-0-99 Lat38.456183 Long-82.396778
B-054-0-11 Lat38.456671 Long-82.396292
B-055-0-11 Lat38.455363 Long-82.396578
B-055-1-11 Lat38.455363 Long-82.396578
B-055-2-11 Lat38.455363 Long-82.396578

B-053-0-11 Lat38.457035 Long-82.399456
R-244-0-99 Lat38.456331 Long-82.399297
R-246-0-99 Lat38.456183 Long-82.396778
B-054-0-11 Lat38.456671 Long-82.396292
B-055-0-11 Lat38.455363 Long-82.396578
B-055-1-11 Lat38.455363 Long-82.396578
B-055-2-11 Lat38.455363 Long-82.396578
B-055-3-11 Lat38.455363 Long-82.396578
R-248-0-99 Lat38.455456 Long-82.394628
B-056-0-11 Lat38.455184 Long-82.394298
B-057-0-11 Lat38.454736 Long-82.394475
B-057-1-11 Lat38.454736 Long-82.394475
B-059-0-11 Lat38.456461 Long-82.391143
B-058-0-11 Lat38.455495 Long-82.391810
B-060-0-11 Lat38.454227 Long-82.392383
B-061-0-11 Lat38.453381 Long82.392923
R-250-0-99 Lat38.454412 Long-82.392210
R-251-0-99 Lat38.454264 Long-82.391345
B-063-0-11 Lat38.454341 Long-82.390454
B-064-0-11 Lat38.453553 Long-82.391128
B-062-0-11 Lat38.454689 Long-82.390138
B-065-0-11 Lat38.453065 Long-82.391495
B-067-0-11 Lat38.452026 Long-82.388700
B-066-0-11 Lat38.453948 Long-82.386899
B-070-0-11 Lat38.451950 Long-82.384786
B-068-0-11 Lat38.450043 Long-82.385887
B-069-0-11 Lat38.450850 Long-82.385154
R-255-0-99 Lat38.450869 Long-82.384357
B-072-0-11 Lat38.450144 Long-82.381182
B-071-0-11 Lat38.450472 Long-82.380976
B-073-0-11 Lat38.450130 Long-82.380049
R-119-0-99 Lat38.448411 Long-82.377183

B-074-0-11 Lat38.448507 Long-82.376098
R-120-0-99 Lat38.448609 Long-82.375980
B-075-0-11 Lat38.448580 Long-82.374707
R-121-0-99 Lat38.448515 Long-82.374496
B-076-0-11 Lat38.448843 Long-82.373352
R-122-0-99 Lat38.449078 Long-82.373236
B-077-0-11 Lat38.449237 Long 9.000000
R-123-0-99 Lat38.449211 Long-82.371828
B-078-0-11 Lat38.449641 Long-82.370750
R-124-0-99 Lat38.449881 Long-82.370673
S-103-0-99 Lat38.450293 Long-82.370729
B-079-0-11 Lat38.450028 Long-82.369444
R-125-0-99 Lat38.450172 Long-82.369265
B-075-0-12 Lat38.436261 Long-82.457725
B-076-0-12 Lat38.436850 Long-82.456771
B-077-0-12 Lat38.436994 Long-82.456982
B-078-0-12 Lat38.433537 Long-82.456035
B-079-0-12 Lat38.434071 Long-82.456561
B-080-0-12 Lat38.434958 Long-82.456926
B-073-0-20 Lat38.448656 Long-82.380234
B-073-1-20 Lat38.448106 Long-82.379454
B-100-0-12 Lat38.448743 Long-82.376932
B-101-0-12 Lat38.448710 Long-82.376236
B-102-0-12 Lat38.449225 Long-82.375643
B-097-1-20 Lat38.449922 Long-82.376318
B-098-1-20 Lat38.449685 Long-82.375614
B-106-1-20 Lat38.449223 Long-82.374463
B-106-2-20 Lat38.449745 Long-82.374381
B-106-3-20 Lat38.449745 Long-82.374381
B-103-0-12 Lat38.448021 Long-82.378202
R-110-0-99 Lat38.447720 Long-82.377598
B-118-0-99 Lat38.447932 Long-82.376367

B-104-0-12 Lat38.448244 Long-82.375286
B-013-0-11 Lat38.449637 Long-82.434060
B-014-0-11 Lat38.450063 Long-82.433092
B-083-1-12 Lat38.455927 Long-82.421758
B-025-0-11 Lat38.457329 Long-82.421340
B-084-0-12 Lat38.457490 Long-82.421656
B-085-0-12 Lat38.456770 Long-82.420999
B-024-0-11 Lat38.456421 Long-82.420528
B-027-0-11 Lat38.456781 Long-82.419619
B-086-0-12 Lat38.457051 Long-82.419292
B-086-1-12 Lat38.457675 Long-82.419417
B-028-0-11 Lat38.457197 Long-82.418079
B-030-0-11 Lat38.457512 Long-82.416628
B-087-0-11 Lat38.457863 Long-82.416276
B-087-0-11 Lat38.458488 Long-82.416382
unknown Lat38.457533 Long-82.413862
B-088-0-11 Lat38.457831 Long-82.412859
B-042-0-11 Lat38.457303 Long-82.410908
B-089-0-11 Lat38.457402 Long-82.408382
B-045-0-11 Lat38.457116 Long-82.408284
B-046-0-11 Lat38.457007 Long-82.406775
B-049-0-11 Lat38.456959 Long-82.405493
B-090-0-11 Lat38.457860 Long-82.415056
B-031-0-11 Lat38.458585 Long-82.412734
B-092-0-12 Lat38.446255 Long-82.380109
R-108-0-99 Lat38.446602 Long-82.380033
B-093-0-12 Lat38.447171 Long-82.379339
R-109-0-99 Lat38.447548 Long-82.379261
B-094-0-12 Lat38.448038 Long-82.378531
R-117-0-99 Lat38.449537 Long-82.377626
R-116-0-99 Lat38.450489 Long-82.376842
B-095-0-12 Lat38.450896 Long-82.375749

B-096-0-12 Lat38.451407 Long-82.375773
B-097-0-12 Lat38.450147 Long-82.376629
B-098-0-12 Lat38.449784 Long-82.375678
B-098-1-12 Lat38.450380 Long-82.375178

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

LAW-7-2.17

13 / 206

1054
1247

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UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-076-0-12

ALIGNMENT, STATION & OFFSET: STA. 123+50, CENTERLINE

SAMPLE ID: ST-4 DEPTH: 9.4' - 9.9' LAB NO.: 11

SPECIMEN DATA

DIAMETER: 2.832 in WET DENSITY: 121.1 pcf

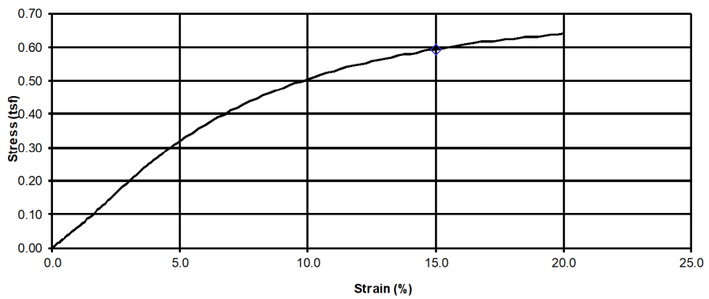
HEIGHT: 2.1 in DRY DENSITY: 93.1 pcf

VISUAL DESCRIPTION: LEAN CLAY, BROWN, MOIST FIRM

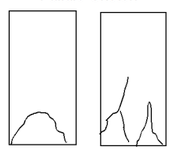
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	11	48	41	34	19	15	-

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) .6

Torvane Reading (kg/cm^2) .21

Comments

Cut two cons from 9.9' - 10.4'

Put out for class

REMARKS: Qu = 0.59 tsf @ 15.0% STRAIN

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-003-0-11

ALIGNMENT, STATION & OFFSET: STA. 135+96, 118.0' RT.

SAMPLE ID: ST-3 DEPTH: 5.0' - 5.5' LAB NO.: 428A

SPECIMEN DATA

DIAMETER: 2.866 in WET DENSITY: 113.7 pcf

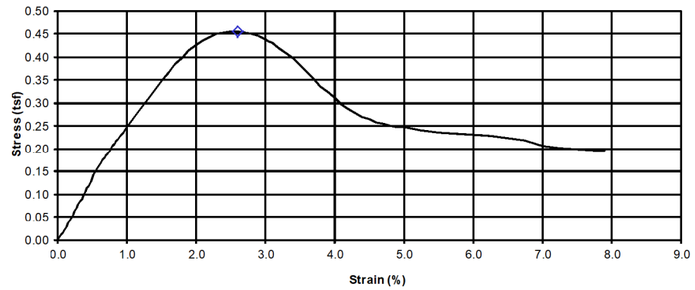
HEIGHT: 2.1 in DRY DENSITY: 87.8 pcf

VISUAL DESCRIPTION: MEDIUM STIFF, BROWN SILT, SOME CLAY, LITTLE SAND, MOIST

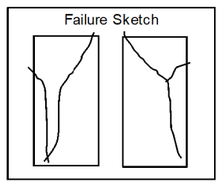
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	10	63	27	33	23	10	30

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 1.0

Torvane Reading (kg/cm^2) 2.5

Comments

Has been put out for class

REMARKS: Qu = 0.46 tsf @ 2.6% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

1055 1247

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-003-0-11

ALIGNMENT, STATION & OFFSET: STA. 135+96, 118.0' RT.

SAMPLE ID: ST-3 DEPTH: 5.0' - 7.0' LAB NO.: 428B

SPECIMEN DATA

DIAMETER: 2.895 in WET DENSITY: 114.4 pcf

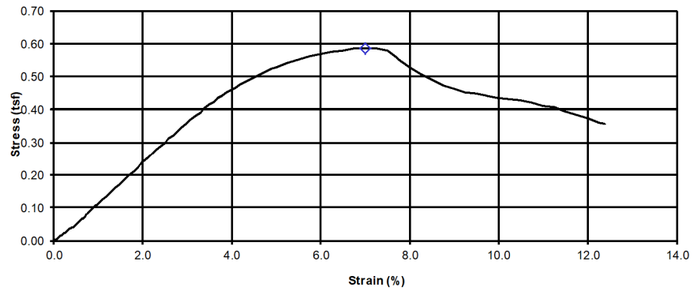
HEIGHT: 6.062 in DRY DENSITY: 88.3 pcf

VISUAL DESCRIPTION: MEDIUM STIFF, BROWN SILT, SOME CLAY, LITTLE SAND, MOIST

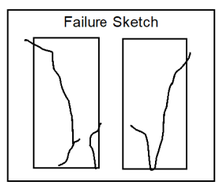
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	10	63	27	33	23	10	30

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 1.0

Torvane Reading (kg/cm^2) 2.5

Comments

REMARKS: Qu = 0.59tsf @ 7.0% STRAIN

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-008

ALIGNMENT, STATION & OFFSET: STA. 183+86, 111.1' RT.

SAMPLE ID: ST-3 DEPTH: 5.0' - 5.5' LAB NO.: 479A

SPECIMEN DATA

DIAMETER: 2.884 in WET DENSITY: 130.3 pcf

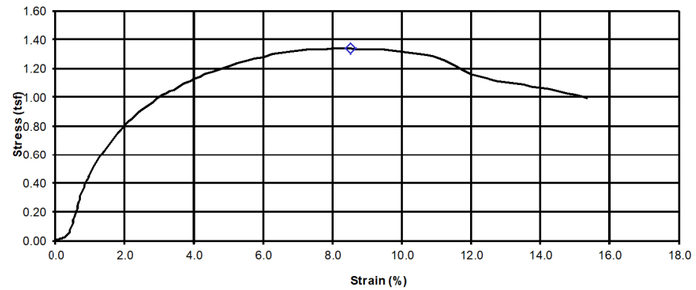
HEIGHT: 5.940 in DRY DENSITY: 103.3 pcf

VISUAL DESCRIPTION: VERY STIFF TO HARD, RED-BROWN, CLAY, SOME SILT, TRACE SAND, DAMP

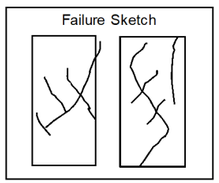
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	1	2	31	66	49	22	27	19

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 2.75

Torvane Reading (kg/cm^2) 6.0

Comments

REMARKS: Qu = 1.34tsf @ 8.5% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-008

ALIGNMENT, STATION & OFFSET: STA. 183+86, 111.1' RT.

SAMPLE ID: ST-3 DEPTH: 5.5' - 6.0' LAB NO.: 479B

SPECIMEN DATA

DIAMETER: 2.890 in WET DENSITY: 128.1 pcf

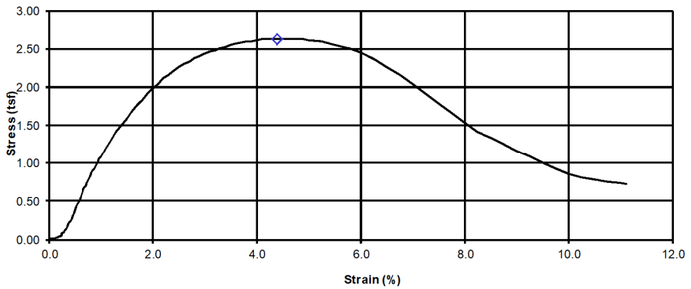
HEIGHT: 5.855 in DRY DENSITY: 104.2 pcf

VISUAL DESCRIPTION: VERY STIFF TO HARD, RED-BROWN, CLAY, SOME SILT, TRACE SAND, DAMP

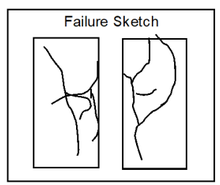
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	1	2	31	66	49	22	27	21

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 2.75

Torvane Reading (kg/cm^2) 6.0

Comments

REMARKS: Qu = 2.63tsf @ 4.4% STRAIN

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-010-1-12

ALIGNMENT, STATION & OFFSET: STA. 199+84, 30.0' RT.

SAMPLE ID: ST-4 DEPTH: 7.7' - 8.3 LAB NO.: 5

SPECIMEN DATA

DIAMETER: 2.879 in WET DENSITY: 115.5

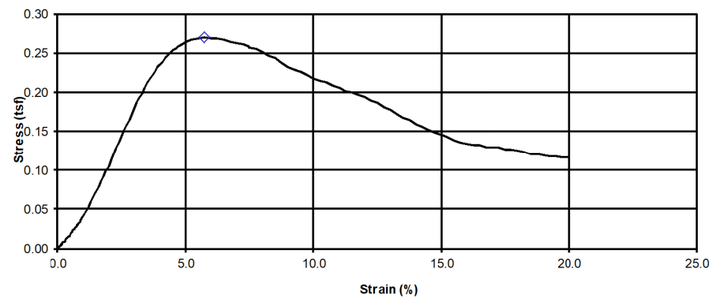
HEIGHT: 6.052 DRY DENSITY: 88.9

VISUAL DESCRIPTION: LEAN CLAY, BROWN, WET, SOFT

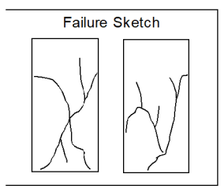
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	22	43	35	35	19	16	30

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 0

Torvane Reading (kg/cm^2) .04

Comments

Cut con from 8.35' - 8.6'

Rough cut saved 7.1' - 7.7'

1F

REMARKS: Qu = 0.27f @ 5.7 STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

1057
1247

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UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-010-2-12

ALIGNMENT, STATION & OFFSET: STA. 200+80, 50.0' LT.

SAMPLE ID: ST-4 DEPTH: 8.1' -8.6' LAB NO.: 6

SPECIMEN DATA

DIAMETER: 2.843 in WET DENSITY: 121.1 pcf

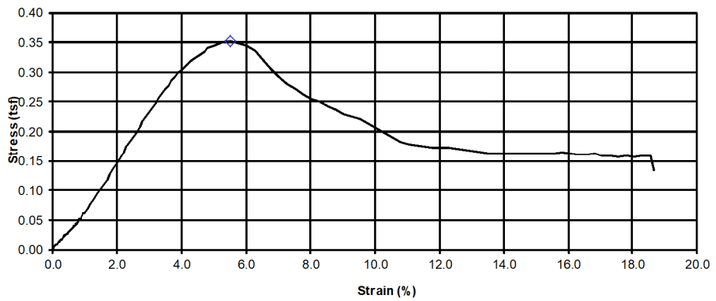
HEIGHT: 6.019 in DRY DENSITY: 96.4 pcf

VISUAL DESCRIPTION: LEAN CLAY, BROWN, MOIST, FIRM

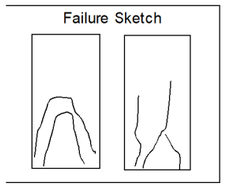
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	22	50	28	33	19	14	26

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 1.0

Torvane Reading (kg/cm^2) .27

Comments

Extra 6" untrimmed sample (7.6' - 8.1')

1F

7.1' - 7.6' put out for class

REMARKS: Qu = 0.35tsf @ 5.5% STRAIN

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-016

ALIGNMENT, STATION & OFFSET: STA. 218+94, 120.0' RT.

SAMPLE ID: ST-3 DEPTH: 5.0' - 5.5' LAB NO.: 513A

SPECIMEN DATA

DIAMETER: 2.827 in WET DENSITY: 128.1 pcf

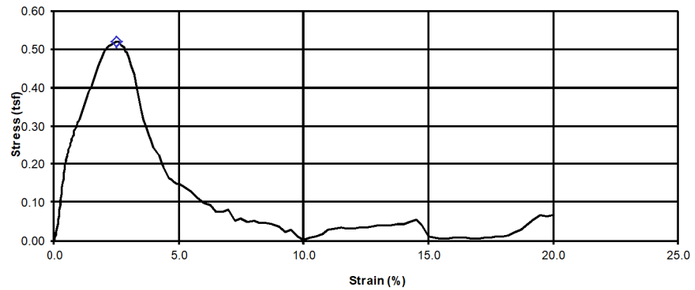
HEIGHT: 6.165 in DRY DENSITY: 112.5 pcf

VISUAL DESCRIPTION: HARD, MOTTLED BROWN AND GRAY, CLAY, SOME SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP

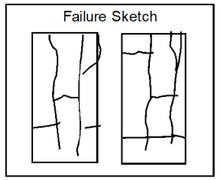
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
8	8	7	35	42	42	25	17	14

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 3.75

Torvane Reading (kg/cm^2) 1.5

Comments

Fragile

REMARKS: Qu = 0.52tsf @ 2.5% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

1058
1247

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UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-016

ALIGNMENT, STATION & OFFSET: STA. 218+94, 120.0' RT.

SAMPLE ID: ST-3 DEPTH: 5.5' - 6.0' LAB NO.: 513B

SPECIMEN DATA

DIAMETER: 2.799 in WET DENSITY: 125.2 pcf

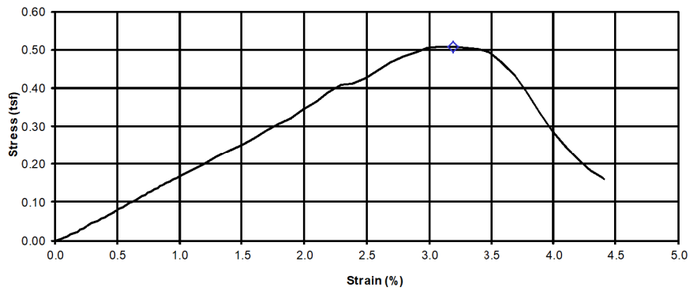
HEIGHT: 6.113 in DRY DENSITY: 110.6 pcf

VISUAL DESCRIPTION: HARD, MOTTLED BROWN AND GRAY, CLAY, SOME SILT, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP

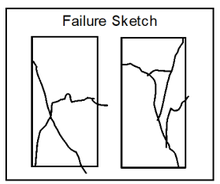
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
8	8	7	35	42	42	25	17	14

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 3.75

Torvane Reading (kg/cm^2) 1.5

Comments

REMARKS: Qu = 0.51tsf @ 3.2% STRAIN

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-018

ALIGNMENT, STATION & OFFSET: STA. 225+07, 3.0' RT.

SAMPLE ID: ST-3 DEPTH: 5.6' - 6.1' LAB NO.: 246B

SPECIMEN DATA

DIAMETER: 2.862 in WET DENSITY: 134.0 pcf

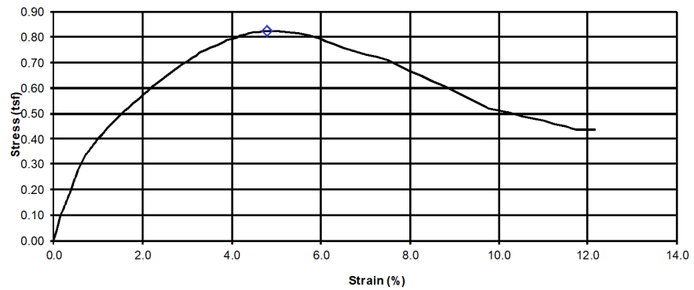
HEIGHT: 6.090 in DRY DENSITY: 113.6 pcf

VISUAL DESCRIPTION: SOFT TO MEDIUM STIFF, GRAY TO MOTTLED BROWN AND GRAY, SILTY CLAY, SOME SAND, TRACE GRAVEL, DAMP TO MOIST

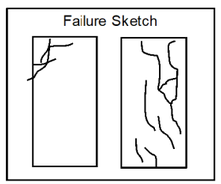
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
10	7	13	37	33	37	19	18	18

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 1.75

Torvane Reading (kg/cm^2) N/A

Comments

One + 1 1/2" shale rock found in center of specimen after testing.

REMARKS: Qu = 0.82tsf @ 4.8% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

18 /206

1059
1247

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UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-019

ALIGNMENT, STATION & OFFSET: STA. 228+76, ℄

SAMPLE ID: ST-3 DEPTH: 5.4′ - 5.9′ LAB NO.: 530A

SPECIMEN DATA

DIAMETER: 2.893 in WET DENSITY: 136.2 pcf

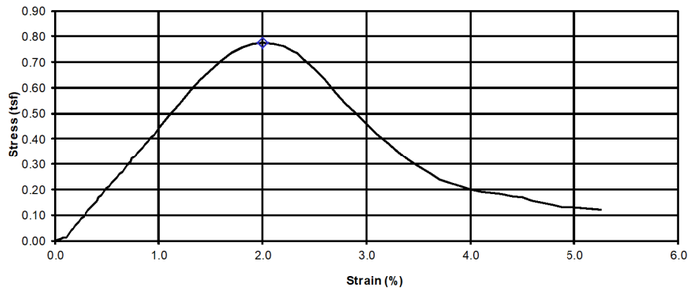
HEIGHT: 6.171 in DRY DENSITY: 116.9 pcf

VISUAL DESCRIPTION: STIFF, BROWN GRADING TO RED-BROWN, CLAY AND SILT, TRACE SAND AND GRAVEL, DAMP

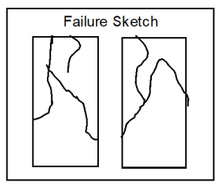
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
10	0	5	40	45	42	22	20	15

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 3.5

Torvane Reading (kg/cm^2) 2.5

Comments

Very Fragile

REMARKS: Qu = 0.77tsf @ 2.0% STRAIN

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-019

ALIGNMENT, STATION & OFFSET: STA. 228+76, ℄

SAMPLE ID: ST-3 DEPTH: 5.9′ - 6.4′ LAB NO.: 530B

SPECIMEN DATA

DIAMETER: 2.895 in WET DENSITY: 137.5 pcf

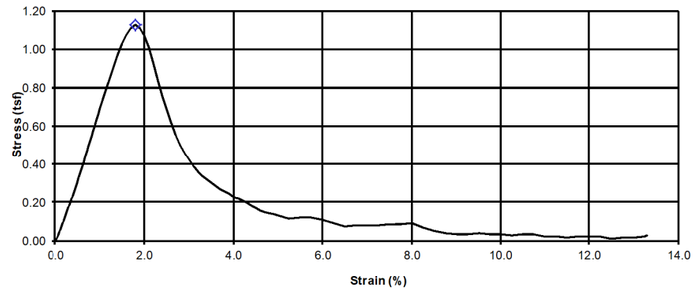
HEIGHT: 6.194 in DRY DENSITY: 121.6 pcf

VISUAL DESCRIPTION: STIFF, BROWN GRADING TO RED-BROWN, CLAY AND SILT, TRACE SAND AND GRAVEL, DAMP

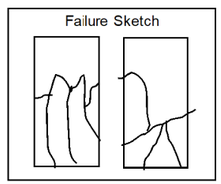
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
10	0	5	40	45	42	22	20	13

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 3.5

Torvane Reading (kg/cm^2) 2.5

Comments

Very fragile

REMARKS: Qu = 1.13tsf @ 1.8% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

19 206

1060 1247

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UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-034

ALIGNMENT, STATION & OFFSET: STA. 271+00, 128.0' LT.

SAMPLE ID: ST-7 DEPTH: 13.0' - 13.5' LAB NO.: 28

SPECIMEN DATA

DIAMETER: 2.843 in WET DENSITY: 126.0 pcf

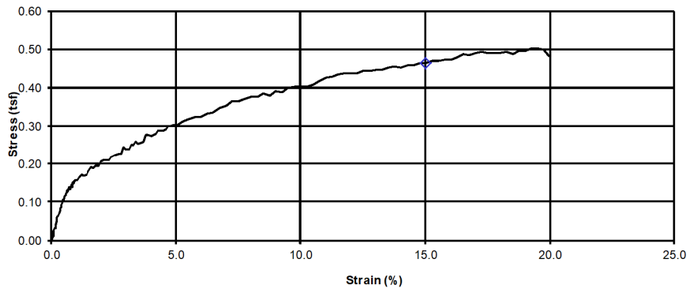
HEIGHT: 6.007 in DRY DENSITY: 98.4 pcf

VISUAL DESCRIPTION: MEDIUM STIFF, GRAY, CLAY, LITTLE SILT, TRACE SAND AND GRAVEL, MOIST

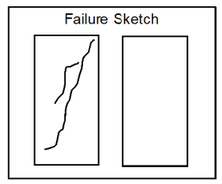
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
6	4	5	17	68	42	20	22	29

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) 0.35

Comments

REMARKS: Qu = 0.47tsf @ 15.0% STRAIN

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-034

ALIGNMENT, STATION & OFFSET: STA. 271+00, 128.0' LT.

SAMPLE ID: ST-10 DEPTH: 20.8' - 21.3' LAB NO.: 31B

SPECIMEN DATA

DIAMETER: 2.813 in WET DENSITY: 129.2 pcf

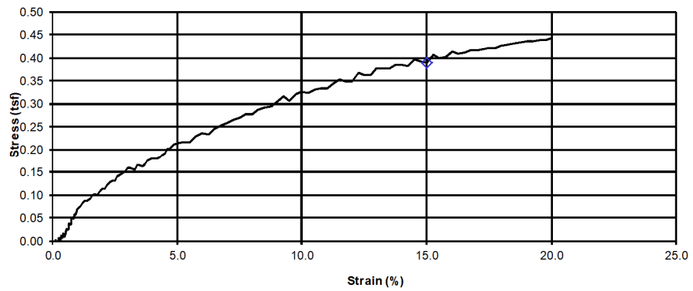
HEIGHT: 6.027 in DRY DENSITY: N/A

VISUAL DESCRIPTION: STIFF TO VERY STIFF, GRAY, SILTY CLAY, TRACE SAND AND GRAVEL, MOIST

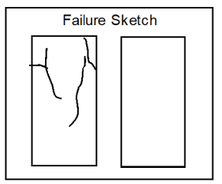
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
4	2	5	43	46	40	20	20	25

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 0.39tsf @ 15.0% STRAIN

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-048

ALIGNMENT, STATION & OFFSET: STA. 292+96, 195.0' RT.

SAMPLE ID: ST-4 DEPTH: 7.5' - 8.0' LAB NO.: 84A

SPECIMEN DATA

DIAMETER: 2.879 in WET DENSITY: 123.5 pcf

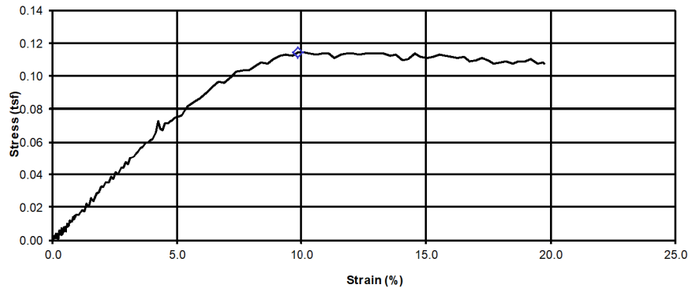
HEIGHT: 5.779 in DRY DENSITY: 97.8 pcf

VISUAL DESCRIPTION: LOOSE, BROWN, COARSE AND FINE SAND, LITTLE SILT AND CLAY, MOIST TO WET

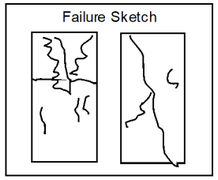
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	6	63	18	13	NP	NP	NP	26

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 0.25

Torvane Reading (kg/cm^2) 1.0

Comments

REMARKS: Qu = 0.11tsf @ 9.9% STRAIN

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-048

ALIGNMENT, STATION & OFFSET: STA. 292+96, 195.0' RT.

SAMPLE ID: ST-4 DEPTH: 8.3' - 8.8' LAB NO.: 84B

SPECIMEN DATA

DIAMETER: 2.907 in WET DENSITY: 120.3 pcf

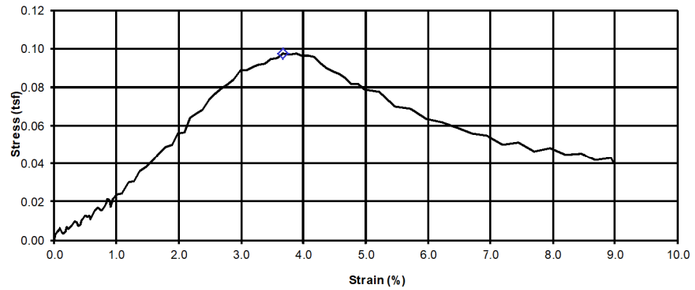
HEIGHT: 5.887 in DRY DENSITY: 95.7 pcf

VISUAL DESCRIPTION: LOOSE, BROWN, COARSE AND FINE SAND, LITTLE SILT AND CLAY, MOIST TO WET

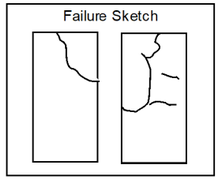
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	6	63	18	13	NP	NP	NP	26

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 1.0

Torvane Reading (kg/cm^2) 0.7

Comments

REMARKS: Qu = 0.10tsf @ 3.7% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-048

ALIGNMENT, STATION & OFFSET: STA. 292+96, 195.0' RT.

SAMPLE ID: ST-9 DEPTH: 20.0' - 20.5' LAB NO.: 89

SPECIMEN DATA

DIAMETER: 2.884 in WET DENSITY: 124.2 pcf

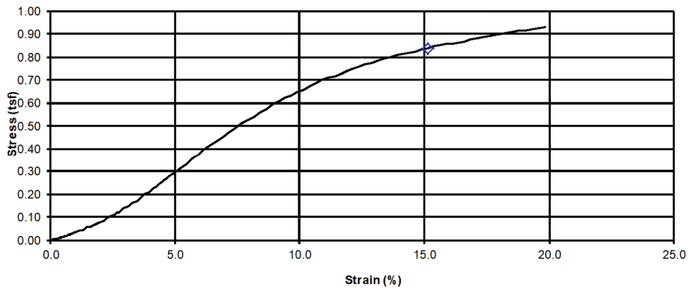
HEIGHT: 5.951 in DRY DENSITY: 97.6 pcf

VISUAL DESCRIPTION: STIFF, GRAY, SILT AND CLAY, TRACE SAND, MOIST

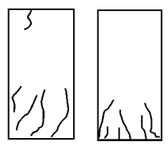
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	4	48	48	31	19	12	27

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 0.75

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 0.84tsf @ 15.1% STRAIN

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-047-2

ALIGNMENT, STATION & OFFSET: STA. 293+00, 12.0' RT.

SAMPLE ID: ST-1 DEPTH: 5.4'- 5.9' LAB NO.: 559B

SPECIMEN DATA

DIAMETER: 2.884 in WET DENSITY: 110.7 pcf

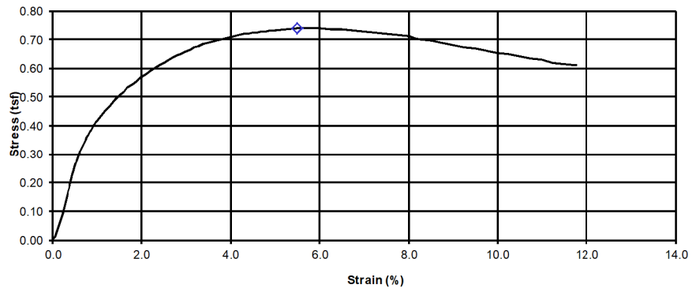
HEIGHT: 6.056 in DRY DENSITY: 79.8 pcf

VISUAL DESCRIPTION: MEDIUM STIFF, LIGHT BROWN, ELASTIC CLAY, LITTLE SILT, TRACE SAND, MOIST

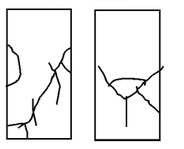
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	1	1	19	79	66	30	36	46

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 1.75

Torvane Reading (kg/cm^2) 6.5

Comments

REMARKS: Qu = 0.74tsf @ 5.5% STRAIN

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

1063
1247

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-057-1

ALIGNMENT, STATION & OFFSET: STA. 329+15, 321.0' RT.

SAMPLE ID: ST-1 DEPTH: 4.0' - 4.5' LAB NO.: 564A

SPECIMEN DATA

DIAMETER: 2.871 in WET DENSITY: 125.4 pcf

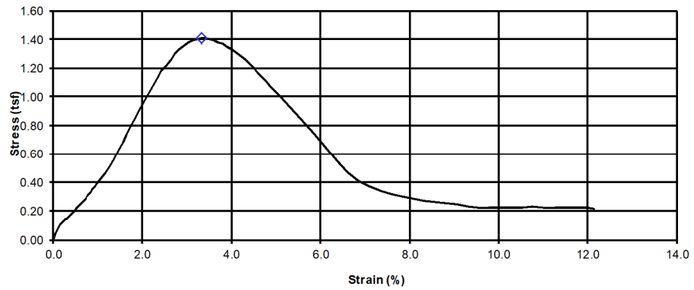
HEIGHT: 6.170 in DRY DENSITY: 106.2 pcf

VISUAL DESCRIPTION: STIFF, BROWN SILTY CLAY, SOME GRAVEL, LITTLE SAND, DAMP TO MOIST

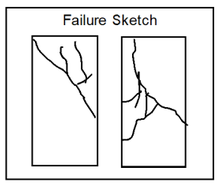
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
22	7	11	26	34	37	18	19	17

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 4

Torvane Reading (kg/cm^2) 4

Comments

REMARKS: Qu = 1.41tsf @ 3.3% STRAIN

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-057-1

ALIGNMENT, STATION & OFFSET: STA. 329+15, 321.0' RT.

SAMPLE ID: ST-1 DEPTH: 4.5' - 5.0' LAB NO.: 564B

SPECIMEN DATA

DIAMETER: 2.876 in WET DENSITY: 125.4 pcf

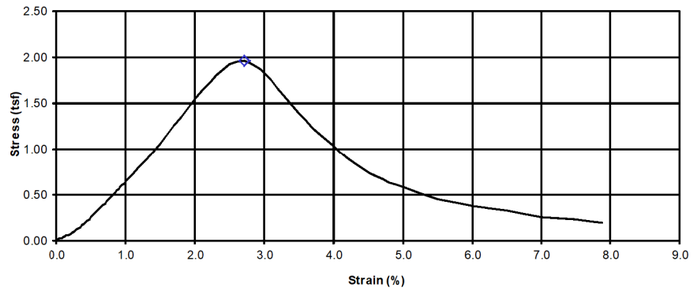
HEIGHT: 6.187 in DRY DENSITY: 109.7 pcf

VISUAL DESCRIPTION: STIFF, BROWN SILTY CLAY, SOME GRAVEL, LITTLE SAND, DAMP TO MOIST

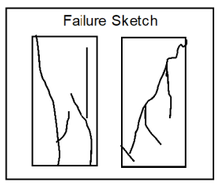
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
22	7	11	26	34	37	18	19	18

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 4

Torvane Reading (kg/cm^2) 4

Comments

REMARKS: Qu = 1.95tsf @ 2.7% STRAIN

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-057-1

ALIGNMENT, STATION & OFFSET: STA. 329+15, 321.0' RT.

SAMPLE ID: ST-1 DEPTH: 5.0' - 5.5' LAB NO.: 564C

SPECIMEN DATA

DIAMETER: 2.888 in WET DENSITY: 129.2 pcf

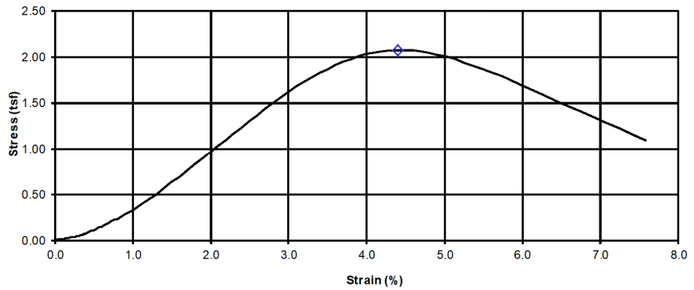
HEIGHT: 6.095 in DRY DENSITY: 109.7 pcf

VISUAL DESCRIPTION: STIFF, BROWN SILTY CLAY, SOME GRAVEL, LITTLE SAND, DAMP TO MOIST

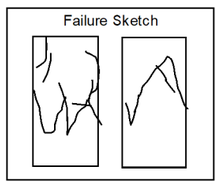
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
22	7	11	26	34	37	18	19	22

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 4

Torvane Reading (kg/cm^2) 4

Comments

REMARKS: Qu = 2.07tsf @ 4.4% STRAIN

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-057-1

ALIGNMENT, STATION & OFFSET: STA. 329+15, 321.0' RT.

SAMPLE ID: ST-3 DEPTH: 8.5' - 9.0' LAB NO.: 566B

SPECIMEN DATA

DIAMETER: 2.888 in WET DENSITY: 123.4 pcf

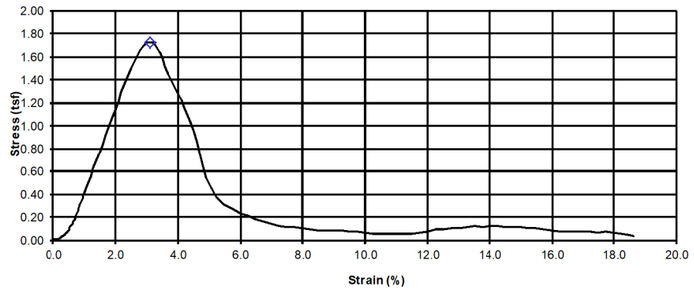
HEIGHT: 5.822 in DRY DENSITY: 100.6 pcf

VISUAL DESCRIPTION: STIFF, BROWN, CLAY AND SILT, TRACE SAND, DAMP

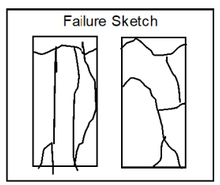
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	2	4	38	56	47	24	23	22

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 1.73tsf @ 3.1% STRAIN

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-057-1

ALIGNMENT, STATION & OFFSET: STA. 329+15, 321.0' RT.

SAMPLE ID: ST-3 DEPTH: 9.0' - 9.5' LAB NO.: 566C

SPECIMEN DATA

DIAMETER: 2.892 in WET DENSITY: 124.3 pcf

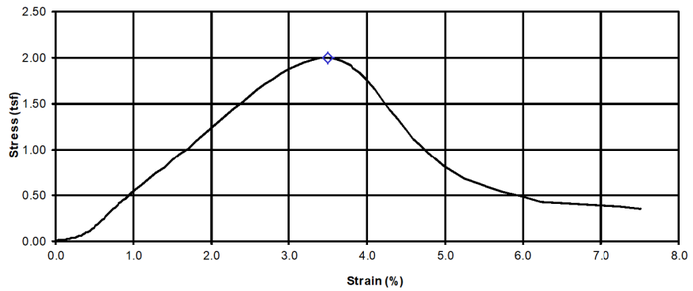
HEIGHT: 6.026 in DRY DENSITY: 101.5 pcf

VISUAL DESCRIPTION: STIFF, BROWN, CLAY AND SILT, TRACE SAND, DAMP

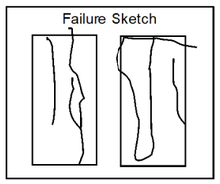
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	2	4	38	56	47	24	23	22

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 1.99tsf @ 3.5% STRAIN

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-060

ALIGNMENT, STATION & OFFSET: STA. 335+71, 175.0' RT.

SAMPLE ID: ST-3 DEPTH: 5.1' - 5.6' LAB NO.: 297A

SPECIMEN DATA

DIAMETER: 2.854 in WET DENSITY: 126.1 pcf

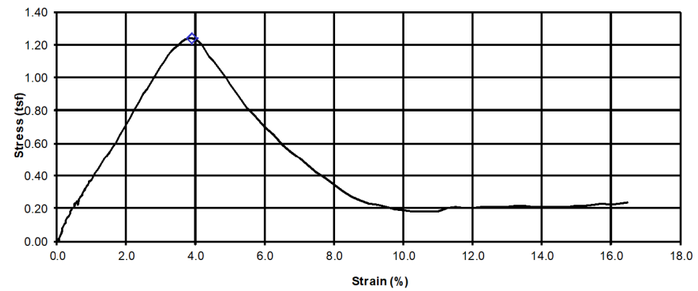
HEIGHT: 6.150 in DRY DENSITY: 108.7 pcf

VISUAL DESCRIPTION: STIFF TO VERY STIFF, BROWN, SILTY CLAY, LITTLE TO SOME SAND, TRACE GRAVEL, DAMP TO MOIST

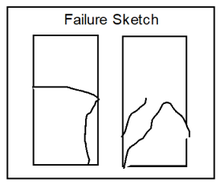
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
7	4	11	32	46	36	16	20	16

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 2.75

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 1.24tsf @ 3.9% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-060

ALIGNMENT, STATION & OFFSET: STA. 335+71, 175.0' RT.

SAMPLE ID: ST-3 DEPTH: 5.6' - 6.1' LAB NO.: 297B

SPECIMEN DATA

DIAMETER: 2.868 in WET DENSITY: 128.4 pcf

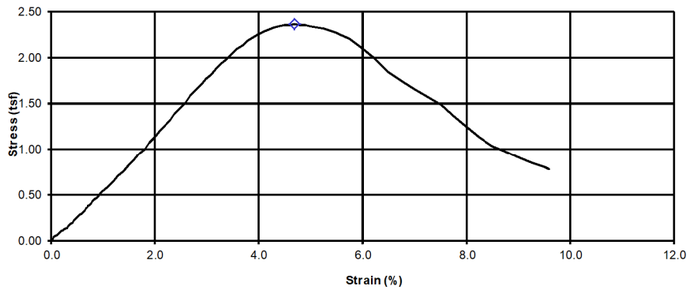
HEIGHT: 6.063 in DRY DENSITY: 109.9 pcf

VISUAL DESCRIPTION: STIFF TO VERY STIFF, BROWN, SILTY CLAY, LITTLE TO SOME SAND, TRACE GRAVEL, DAMP TO MOIST

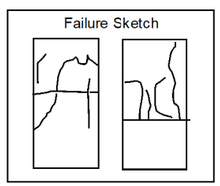
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
7	4	11	32	46	36	16	20	16

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 3.5

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 2.36tsf @ 4.7% STRAIN

UNCONFINED COMPRESSION TEST OF COHESIVE SOIL (AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-061

ALIGNMENT, STATION & OFFSET: STA. 336+17, 517.0' RT.

SAMPLE ID: ST-4 DEPTH: 7.5' - 8.0' LAB NO.: 158A

SPECIMEN DATA

DIAMETER: 2.868 in WET DENSITY: 119.7 pcf

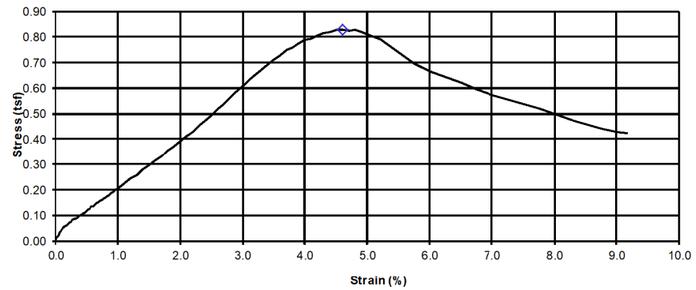
HEIGHT: 5.993 in DRY DENSITY: 93.7 pcf

VISUAL DESCRIPTION: MEDIUM STIFF, BROWN, CLAY AND SILT, TRACE SAND, DAMP TO MOIST

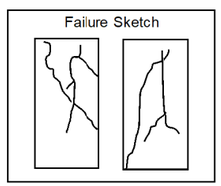
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	7	46	47	44	24	20	25

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 3.25

Torvane Reading (kg/cm^2) 8.5

Comments

REMARKS: Qu = 0.83tsf @ 4.6% STRAIN

DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY LABORATORY TEST DATA

LAW-7-2.17

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-061

ALIGNMENT, STATION & OFFSET: STA. 336+17, 517.0' RT.

SAMPLE ID: ST-4 DEPTH: 8.4' - 8.9' LAB NO.: 158B

SPECIMEN DATA

DIAMETER: 2.867 in WET DENSITY: 122.4 pcf

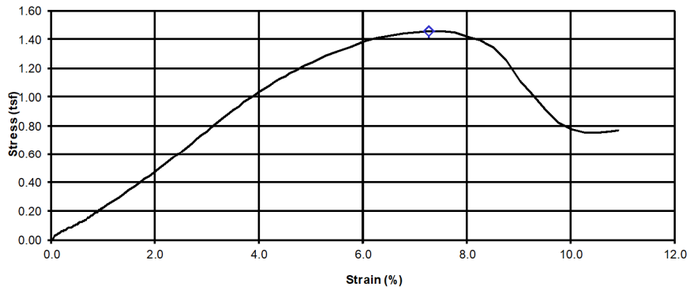
HEIGHT: 5.986 in DRY DENSITY: 98.0 pcf

VISUAL DESCRIPTION: MEDIUM STIFF, BROWN, CLAY AND SILT, TRACE SAND, DAMP TO MOIST

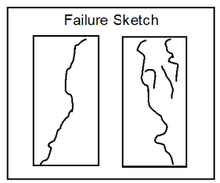
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
0	0	7	46	47	44	24	20	25

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) 2.5

Torvane Reading (kg/cm^2) 7.0

Comments

REMARKS: Qu = 1.46tsf @ 7.3% STRAIN

UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-072

ALIGNMENT, STATION & OFFSET: STA. 371+03, 131.0' LT.

SAMPLE ID: ST-8 DEPTH: 17.5' - 18.0' LAB NO.: 347A

SPECIMEN DATA

DIAMETER: 2.881 in WET DENSITY: 129.7 pcf

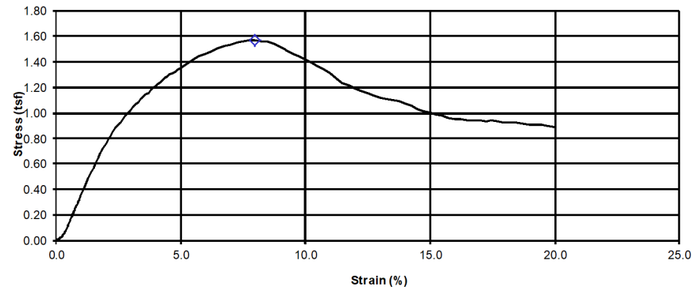
HEIGHT: 5.968 in DRY DENSITY: 111.3 pcf

VISUAL DESCRIPTION: MEDIUM STIFF TO STIFF, BROWN, SILTY CLAY, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST

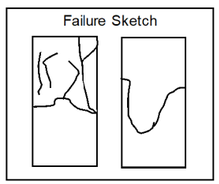
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
3	3	11	42	41	35	19	16	19

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 1.57tsf @ 8.0% STRAIN

DRAWN MSJ
CHECKED ELMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

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UNCONFINED COMPRESSION TEST
OF COHESIVE SOIL
(AASHTO T 028)

PROJECT DESIGNATION: LAW-7-2.17 PID 75923

EXPLORATION ID: B-072

ALIGNMENT, STATION & OFFSET: STA. 371+03, 131.0' LT.

SAMPLE ID: ST-8 DEPTH: 18.0' - 18.5' LAB NO.: 347B

SPECIMEN DATA

DIAMETER: 2.883 in WET DENSITY: 132.8 pcf

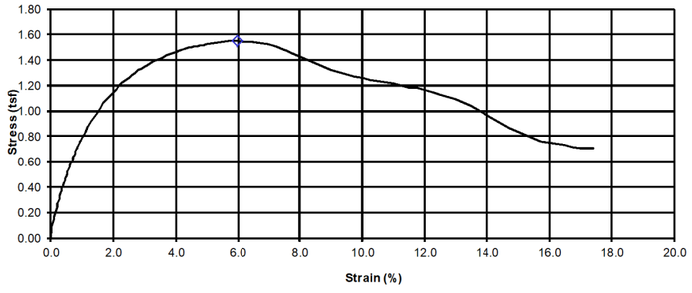
HEIGHT: 6.046 in DRY DENSITY: 110.1 pcf

VISUAL DESCRIPTION: MEDIUM STIFF TO STIFF, BROWN, SILTY CLAY, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST

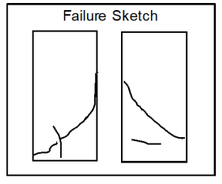
PHYSICAL CHARACTERISTICS

% AGG	% CS	% FS	% Silt	% Clay	LL	PL	PI	WC
3	3	11	42	41	35	19	16	19

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A

Torvane Reading (kg/cm^2) N/A

Comments

REMARKS: Qu = 1.55†sf @ 6.0% STRAIN

Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: LAW-7-2.17, Boring Location: B-073-2-20, ST-1, Depth: 13.0 - 13.5ft)

Tested Date: 4/23/2021

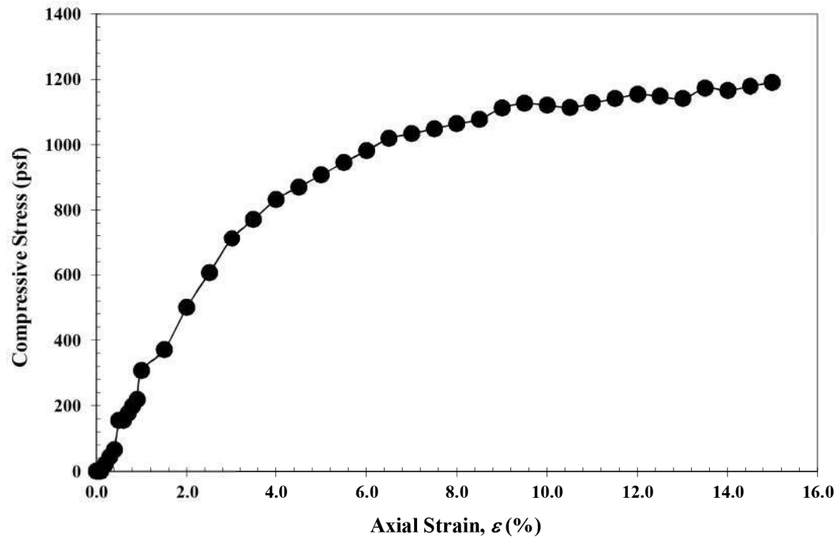
Specimen Properties

Average Dia., D_{avg} (in):	2.87
Average Height H_{avg} (in):	5.69
Area, A (in^2):	6.48
Volume, V (in^3):	36.87
Wet Mass of Specimen (lb):	2.8
Moisture Content (%):	21.9
Dry Mass of Specimen (lb):	2.3
Wet Unit Weight, γ (lb/ft^3):	129.0
Dry Unit Weight, γ_d (lb/ft^3):	105.8

Final Specimen Figure

Results

Unconfined Compressive Strength (psf):	**1191**
Strain (%):	**15.0**



Notes: Medium stiff, brown, SILTY CLAY, some sand, trace gravel, moist. Please note that this specimen exceeded equipment strain limitations and testing was stopped at 15.0% strain. Please also note that the specimen top surface had differing strengths causing the surface to exceed 5.0% slope.

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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: LAW-7-2.17, Boring Location: B-073-2-20, ST-3, Depth: 20.5 - 21.0ft)

Tested Date: 4/14/2021

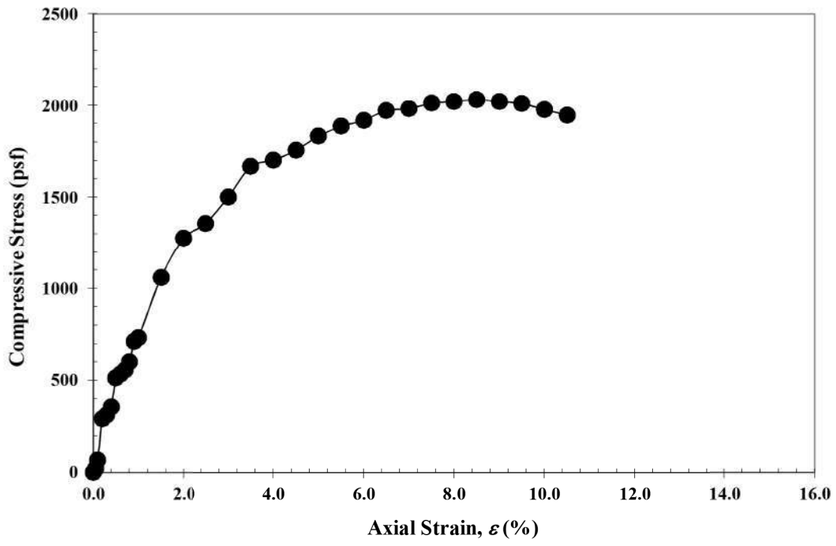
Specimen Properties

Average Dia., D_{avg} (in):	2.86
Average Height H_{avg} (in):	5.74
Area, A (in^2):	6.42
Volume, V (in^3):	36.88
Wet Mass of Specimen (lb):	2.8
Moisture Content (%):	20.8
Dry Mass of Specimen (lb):	2.3
Wet Unit Weight, γ (lb/ft^3):	131.6
Dry Unit Weight, γ_d (lb/ft^3):	108.9

Final Specimen Figure

Results

Unconfined Compressive Strength (psf):	**2032**
Strain (%):	**8.5**



Notes: Stiff, brown mottled with dark brown, SILT AND CLAY, some sand, little gravel, moist. Please note that when the specimen was split after compression, at least two pieces of gravel exceeding 1/6 sepcimen diameter were observed, including one piece (located mid-specimen) measuring approximately 2"x1.5"x1.25", and the results reported may differ from a specimen that meets the maximum particle size allowance of D2166.

Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: LAW-7-2.17, Boring Location: B-073-2-20, ST-4, Depth: 36.5 - 37.0ft)

Tested Date: 4/23/2021

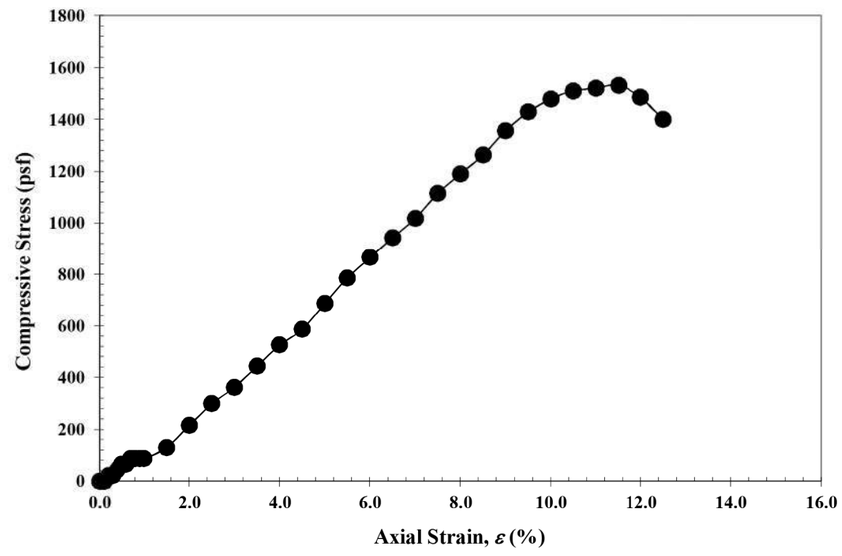
Specimen Properties

Average Dia., D_{avg} (in):	2.89
Average Height H_{avg} (in):	5.66
Area, A (in^2):	6.57
Volume, V (in^3):	37.17
Wet Mass of Specimen (lb):	2.8
Moisture Content (%):	23.0
Dry Mass of Specimen (lb):	2.3
Wet Unit Weight, γ (lb/ft^3):	129.0
Dry Unit Weight, γ_d (lb/ft^3):	104.9

Final Specimen Figure

Results

Unconfined Compressive Strength (psf):	**1533**
Strain (%):	**11.5**



Notes: Medium stiff, gray, SILT, little clay, trace sand, trace gravel, moist.

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

DRAWN MSJ CHECKED EMK

29/206

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Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: LAW-7-2.17, Boring Location: B-106-1-20, ST-1, Depth: 0.9 - 1.4ft)

Tested Date: 7/8/2021

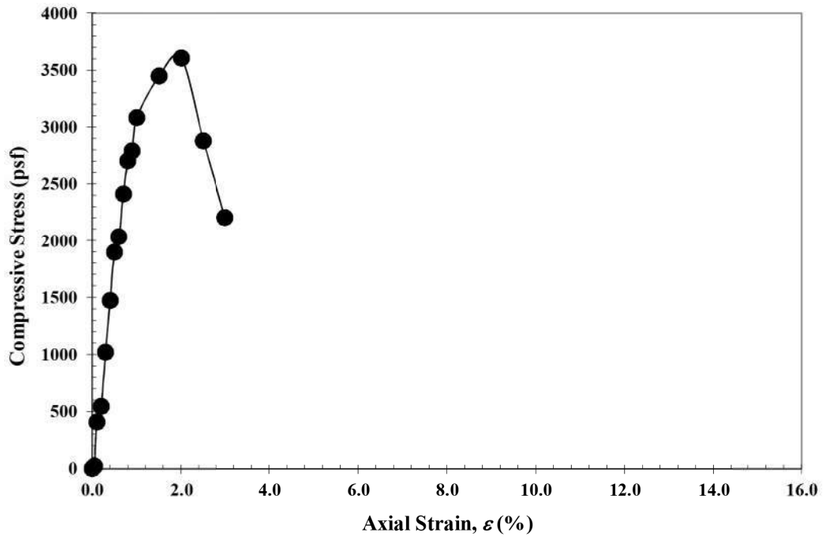
Specimen Properties

Average Dia., D_{avg} (in):	2.84
Average Height, H_{avg} (in):	5.76
Area, A (in^2):	6.34
Volume, V (in^3):	36.48
Wet Mass of Specimen (lb):	2.8
Moisture Content (%):	12.7
Dry Mass of Specimen (lb):	2.5
Wet Unit Weight, γ (lb/ft^3):	131.3
Dry Unit Weight, γ_d (lb/ft^3):	116.5

Final Specimen Figure

Results

Unconfined Compressive Strength (psf):	**3608**
Strain (%):	**2.0**



Notes: Stiff, brown and reddish brown, SILTY CLAY, some sand, little gravel and stone fragments, damp. Contains multiple stone fragments exceeding 1/6 specimen diameter and the results reported may differ from a specimen that meets the maximum particle size allowance of D2166

Unconfined Compressive Strength of Cohesive Soil (ASTM D2166)

(Project: LAW-7-2.17, Boring Location: B-106-3-20, ST-2, Depth: 2.7 - 3.2ft)

Tested Date: 7/22/2021

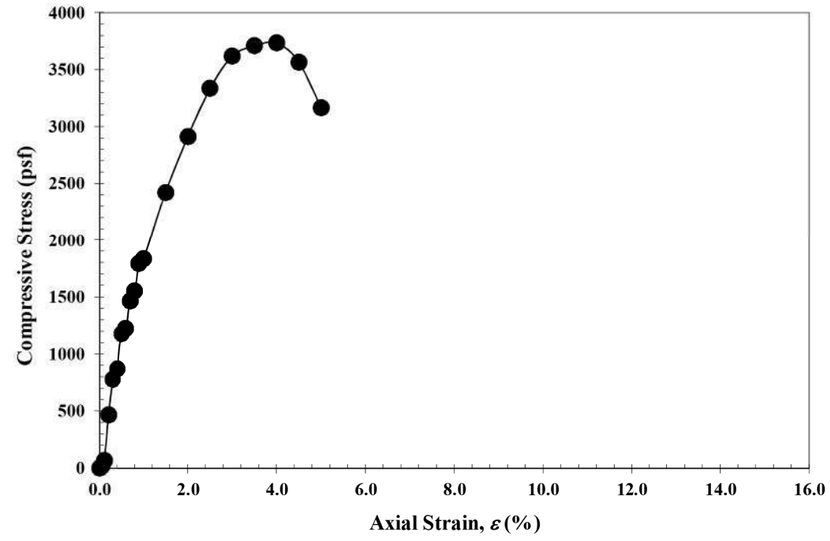
Specimen Properties

Average Dia., D_{avg} (in):	2.86
Average Height, H_{avg} (in):	5.75
Area, A (in^2):	6.44
Volume, V (in^3):	37.04
Wet Mass of Specimen (lb):	2.8
Moisture Content (%):	14.1
Dry Mass of Specimen (lb):	2.5
Wet Unit Weight, γ (lb/ft^3):	130.6
Dry Unit Weight, γ_d (lb/ft^3):	114.5

Final Specimen Figure

Results

Unconfined Compressive Strength (psf):	**3733**
Strain (%):	**4.0**



Notes: Stiff, brown, SILTY CLAY, little sand, trace gravel, damp.

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CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

1071
1247

Consolidated-Undrained Triaxial Compression Test (AASHTO T 297 / ASTM D4767)

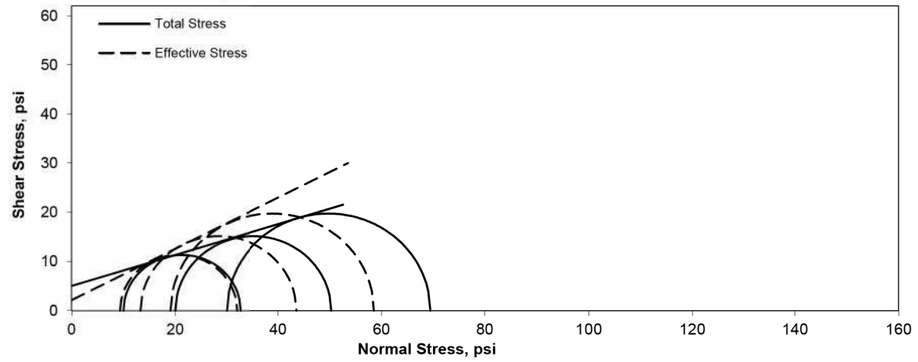
Project: LAW-7-2.17 Project ID: 75923
Sample ID: B-073-2-20 / ST-2 (@14.5-16.5') Page: 1/2
Description: Stiff, brown, SILTY CLAY, little sand, trace gravel, damp

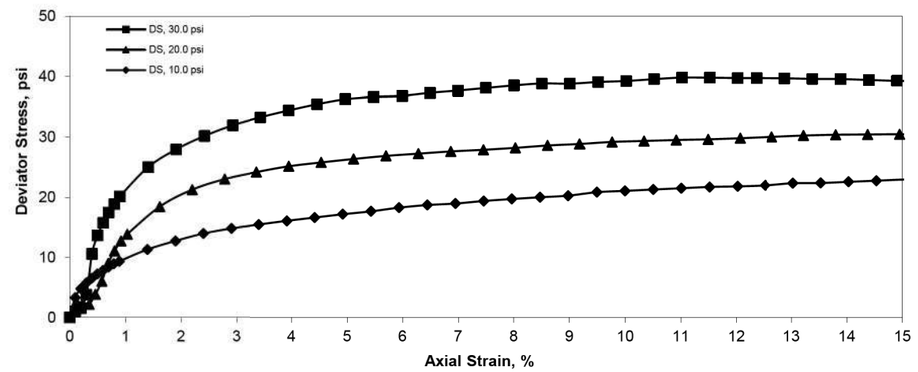
Sample No.	Height (in)	Diameter (in)	Moisture (%)	Bulk Density (pcf)	Dry Density (pcf)	Void Ratio
1	5.75	2.87	23.5%	128.4	104.0	0.603
2	5.00	2.86	24.1%	147.2	118.6	0.404
3	5.75	2.86	25.6%	125.7	100.1	0.664

Liquid Limit: 38 Plastic Limit: 21

Failure Criterion: Maximum Deviator Stress

	Total	Effective
C, psi	5.0	2.2
ϕ, deg	17.4	27.5
Tan (ϕ)	0.31	0.52





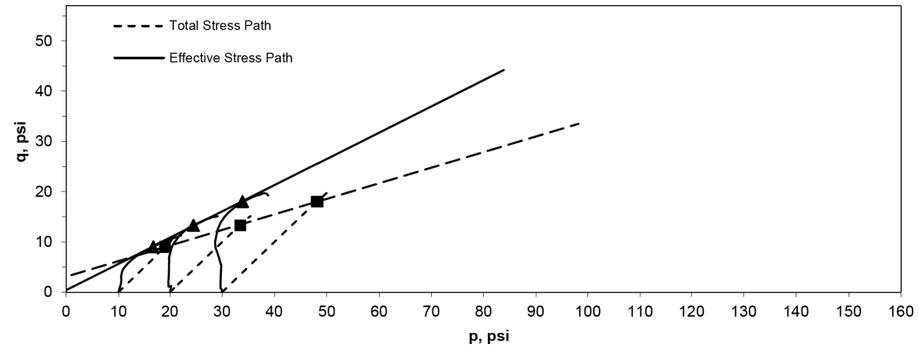
Assumed Specific Gravity Gs = 2.67

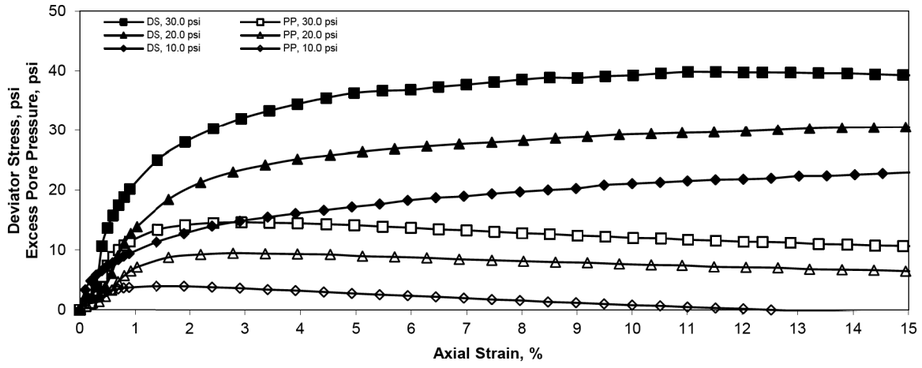
Consolidated-Undrained Triaxial Compression Test (AASHTO T 297 / ASTM D4767)

Project: LAW-7-2.17 Project ID: 75923
Sample ID: B-073-2-20 / ST-2 (@14.5-16.5') Page: 2/2
Description: Stiff, brown, SILTY CLAY, little sand, trace gravel, damp

Failure Criterion: Maximum Effective Principal Stress Ratio

	Total	Effective
c, psi	3.2	0.4
φ, deg	18.1	31.5
Tan (φ)	0.33	0.61





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

31/206

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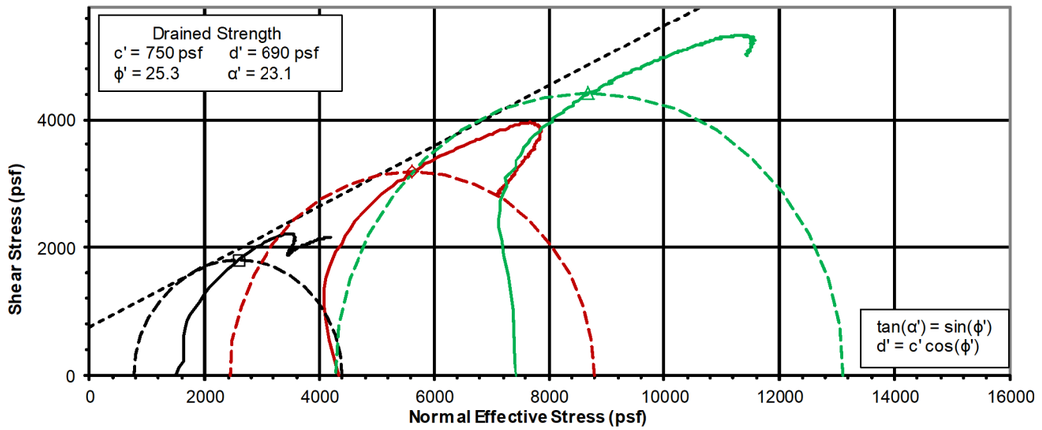
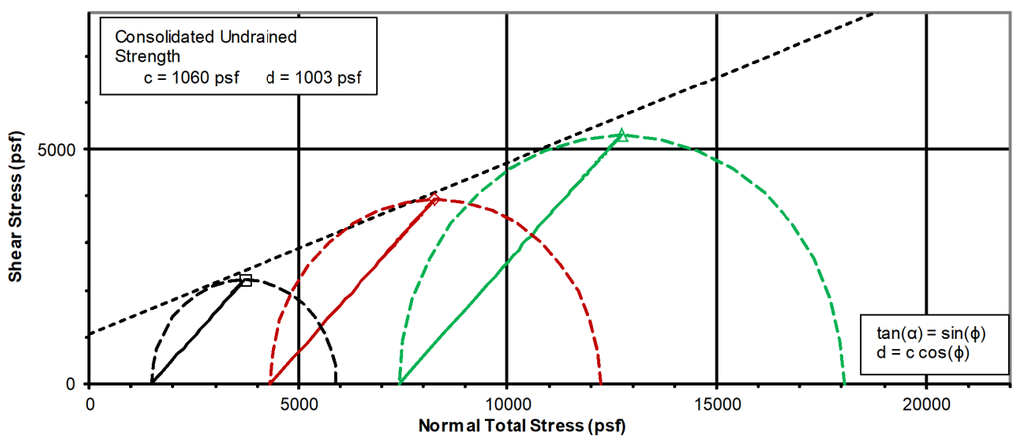
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 3

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	456A	B-006-0-11, 5.0'-5.5'	Lean Clay (CL), brown, moist, firm	2.75			
B	456B	B-006-0-11, 5.5'-6.0'	Lean Clay (CL), brown, moist, firm	2.75			
C	456C	B-006-0-11, 6.0'-6.5'	Lean Clay (CL), brown, moist, firm	2.75			



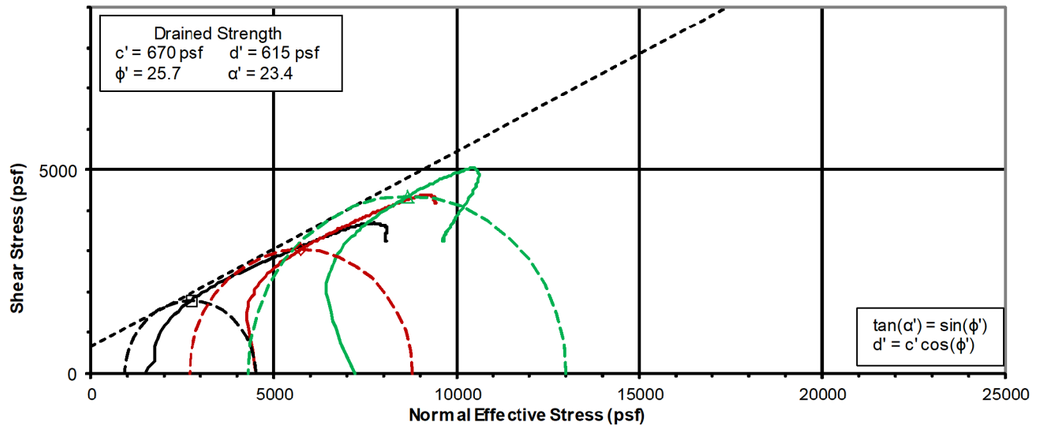


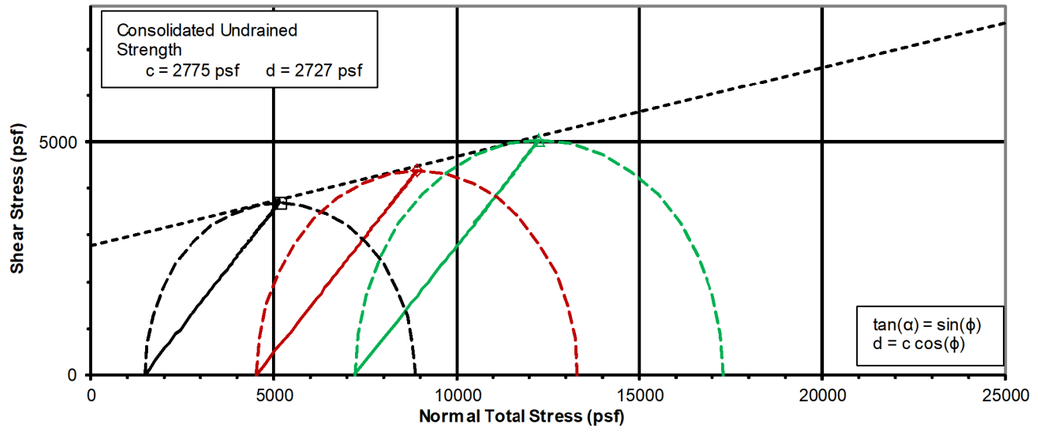
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 4

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	470A	B-007-0-11, 10.0'-10.5'	Lean Clay (CL), brown, moist, firm	2.72			
B	470B	B-007-0-11, 10.5'-11.0'	Lean Clay (CL), brown, moist, firm	2.72			
C	470C	B-007-0-11, 11.0'-11.5'	Lean Clay (CL), brown, moist, firm	2.72			





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

32/206

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1247

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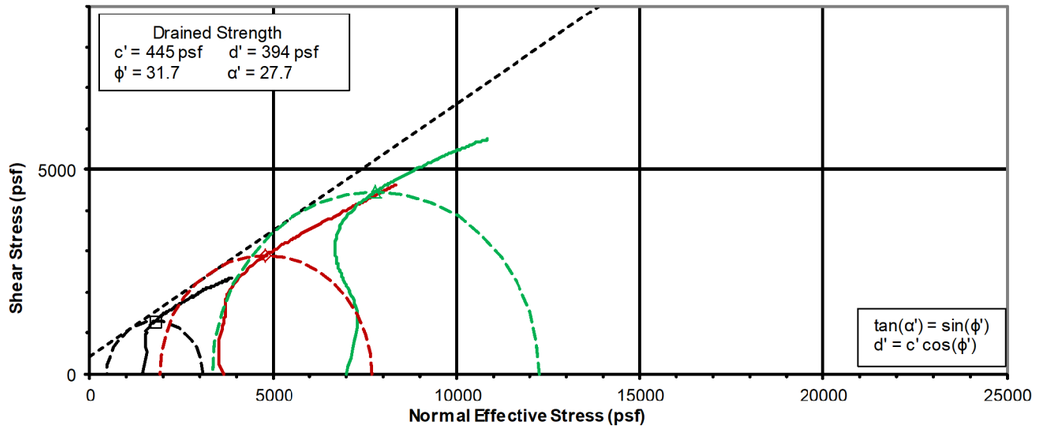
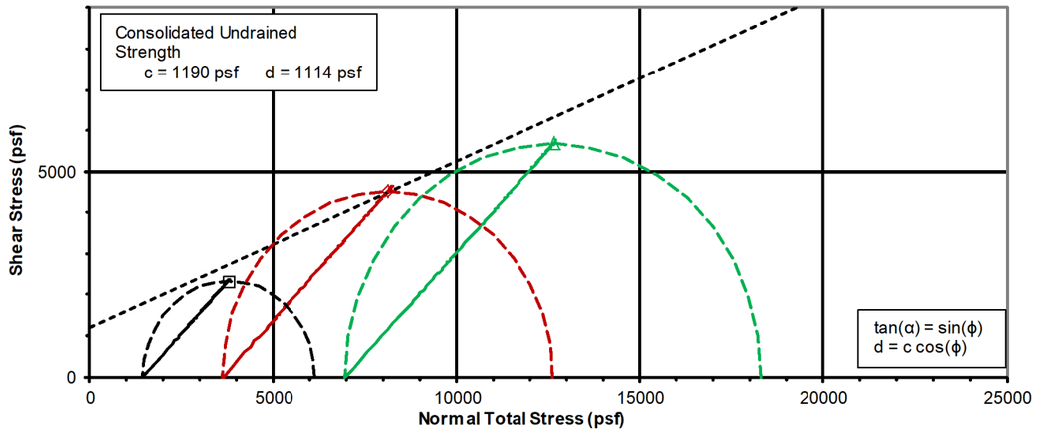
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 2A_3_2

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	2A	B-009-1-12, 7.2'-7.7'	Clayey Sand (SC), brown, moist, firm	2.70	27	17	10
B	3	B-009-1-12, 12.6'-13.2'	Clayey Sand (SC), brown, moist, firm	2.70	28	16	12
C	2	B-009-1-12, 7.7'-8.2'	Clayey Sand (SC), brown, moist, firm	2.70	27	17	10



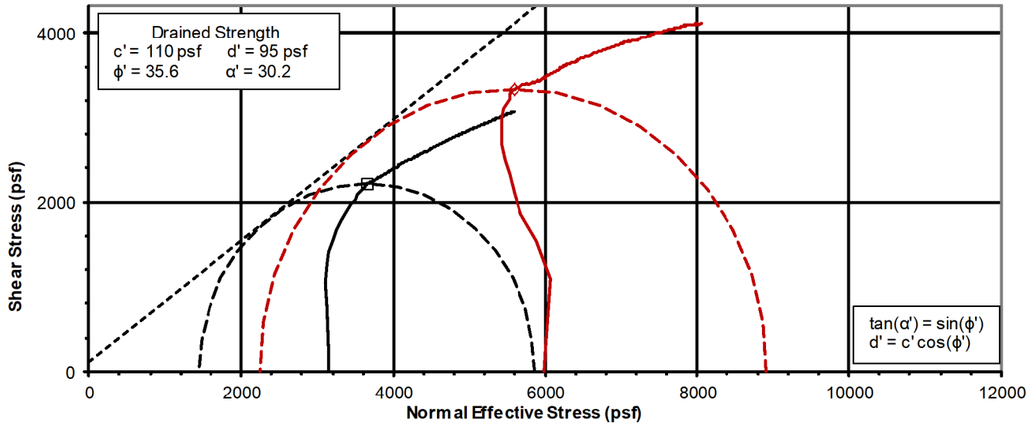


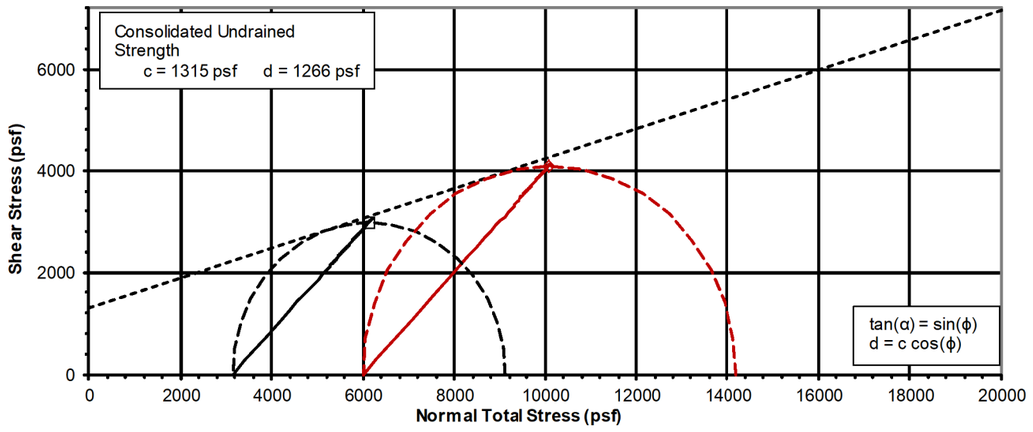
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 5

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	486A	B-010-0-11, 5.0'-5.5'	Lean Clay (CL), brown, moist, firm, Mn	2.73			
B	486B	B-010-0-11, 5.5'-6.0'	Lean Clay (CL), brown, moist, firm, Mn	2.73			





SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

33/206

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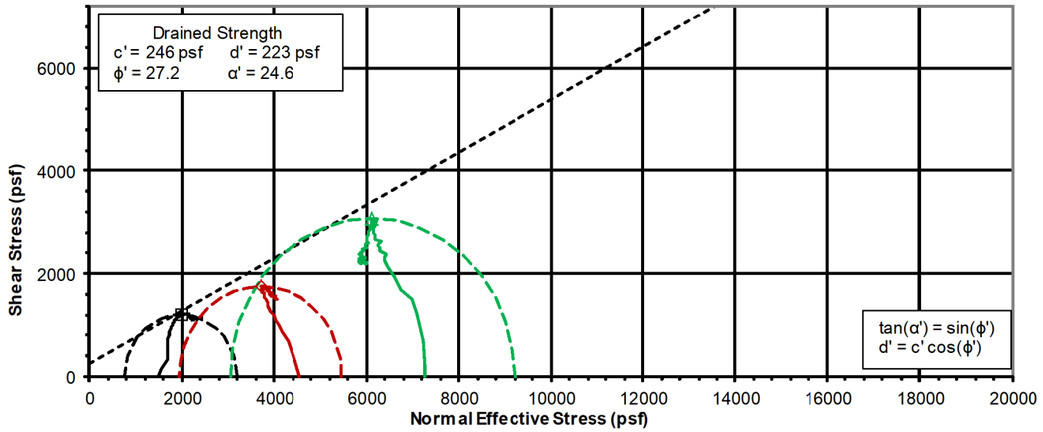
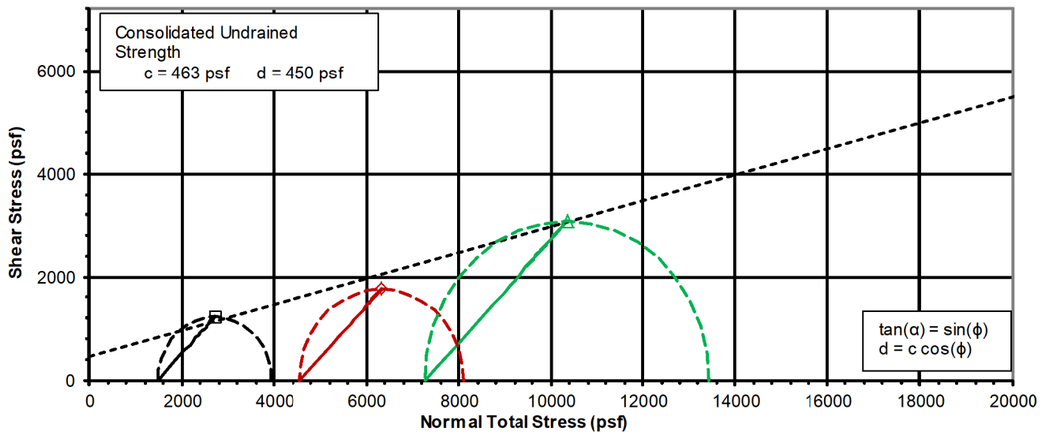
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 7

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	559A	B-047-2-11, 4.5'-5.0'	Lean Clay (CL), gray brown, moist, firm	2.71			
B	558A	B-047-1-11, 4.7'-5.2'	Lean Clay (CL), gray brown, moist, firm	2.71			
C	558B	B-047-1-11, 5.2'-5.7'	Lean Clay (CL), gray brown, moist, firm, Mn	2.71			



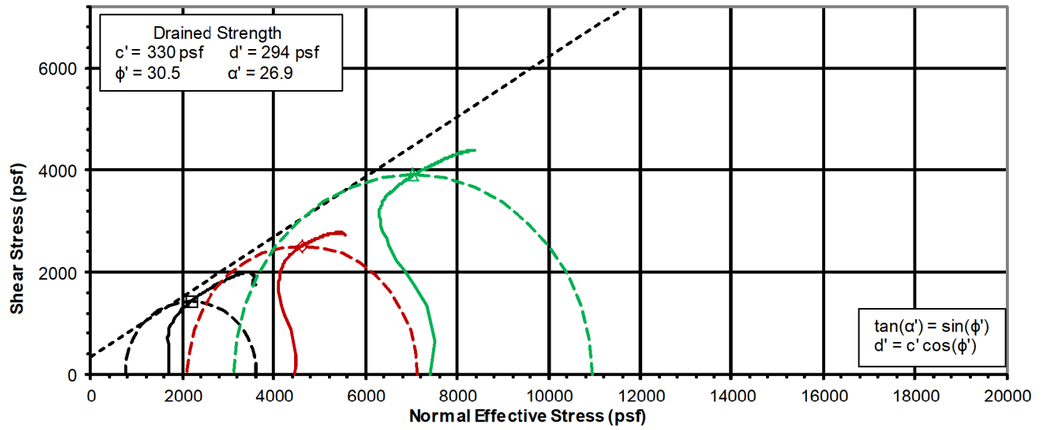


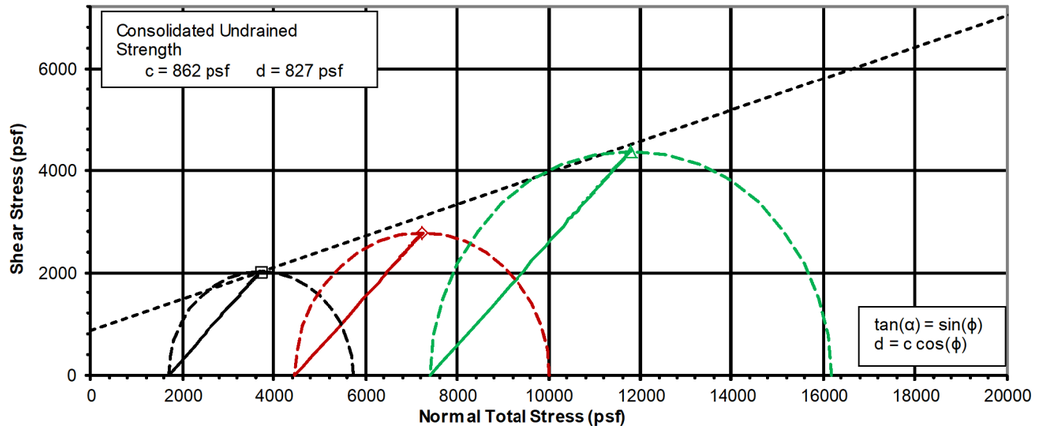
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 8

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	560A	B-047-2-11, 6.5'-7.0'	Lean Clay with Sand (CL), gray brown, moist, firm	2.73	44	21	23
B	560B	B-047-2-11, 7.0'-7.5'	Lean Clay with Sand (CL), gray brown, moist, firm	2.73			
C	560C	B-047-2-11, 7.5'-8.0'	Lean Clay with Sand (CL), gray brown, moist, firm	2.73			





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

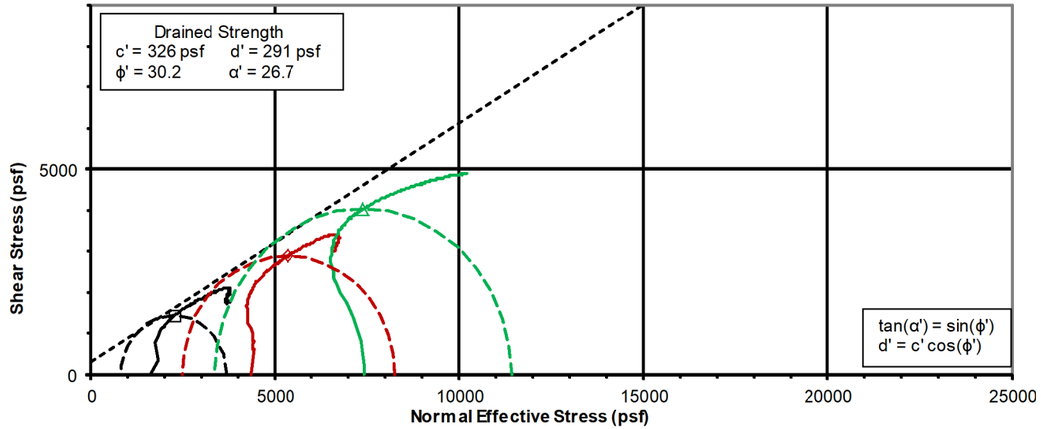
LAW-7-2.17

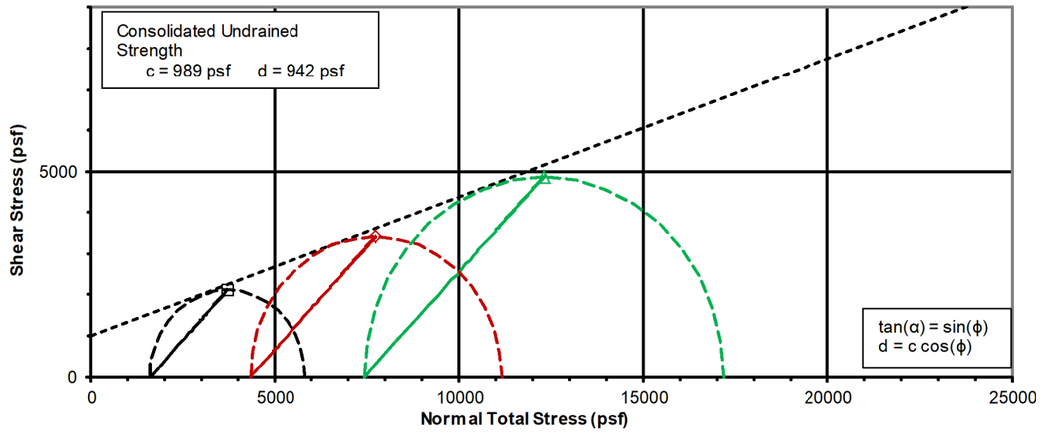
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 9

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	561B	B-055-1-11, 3.5'-4.0'	Lean Clay (CL), brown, moist, hard	2.72			
B	563B	B-055-2-11, 4.7'-5.2'	Fat Clay (CH), brown, moist, firm	2.72	51	27	24
C	563C	B-055-2-11, 5.2'-5.7'	Lean Clay with Gravel (CL), brown, moist, firm	2.72			



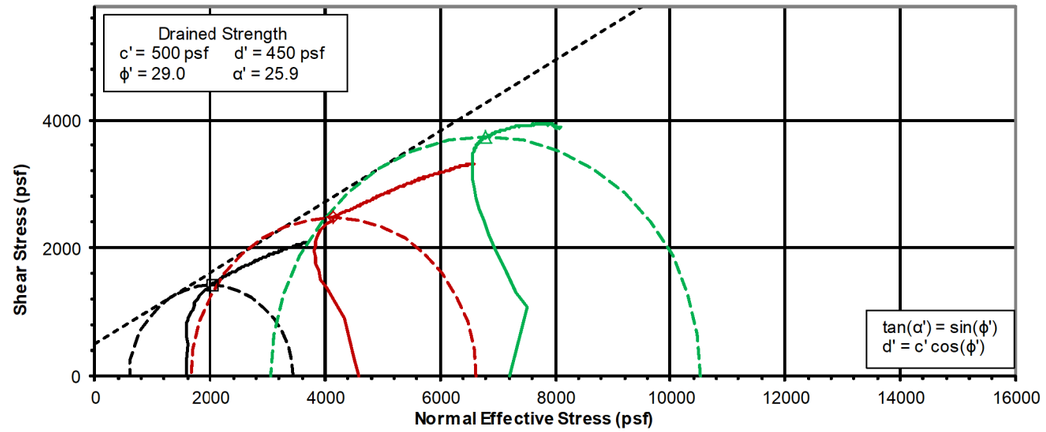


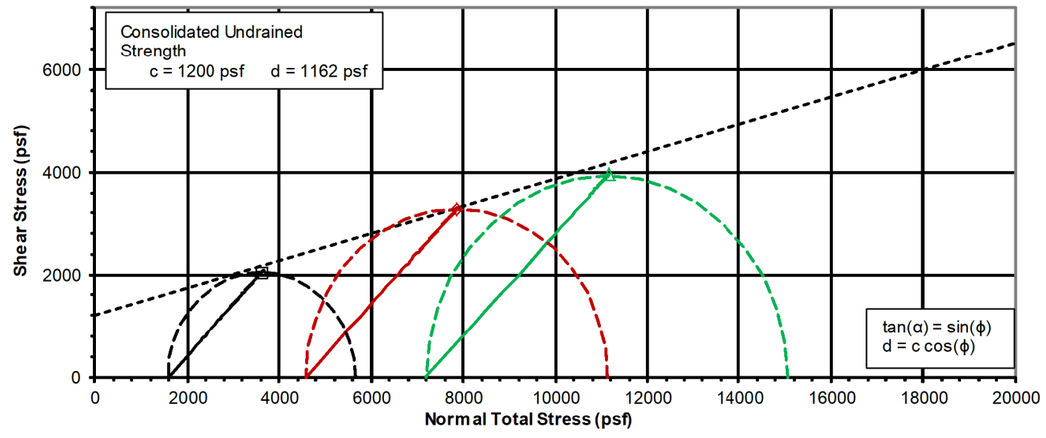
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 1

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	147A	B-057-0-11, 4.0'-4.5'	Sandy Lean Clay (CL), brown, moist, firm	2.73	39	20	19
B	147B	B-057-0-11, 4.7'-5.2'	Sandy Lean Clay (CL), brown, moist, firm	2.73	39	20	19
C	149	B-057-0-11, 10.0'-10.7'	Lean Clay (CL), brown, moist, firm	2.73	39	20	19





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

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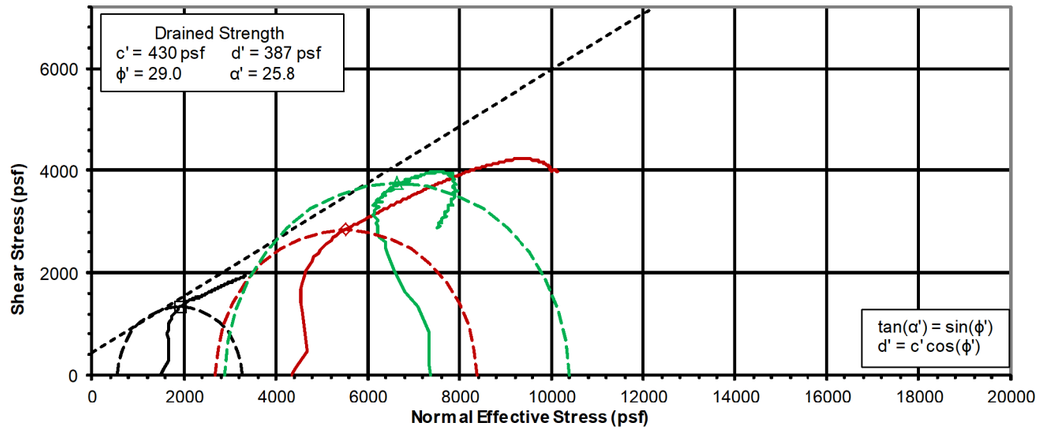
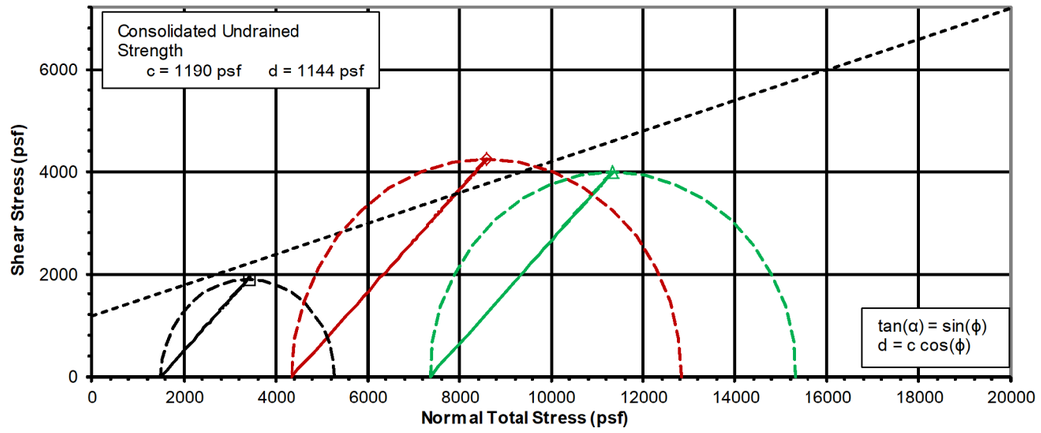
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 10

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	565A	B-057-1-11, 6.1'-6.6'	Lean Clay (CL), brown, moist, firm, sandstone ar	2.78			
B	565B	B-057-1-11, 6.8'-7.3'	Lean Clay (CL), brown, moist, firm, weathered sa	2.78			
C	566A	B-057-1-11, 8.0'-8.5'	Lean Clay (CL), brown, moist, firm, weathered sh	2.78			



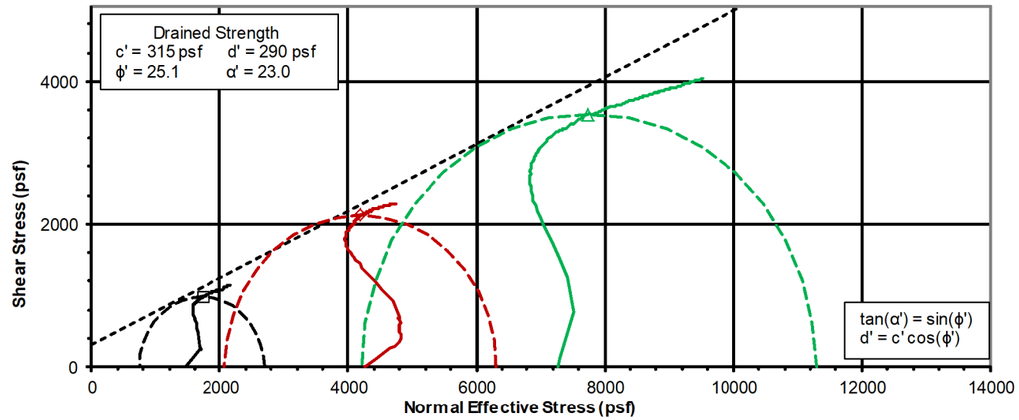


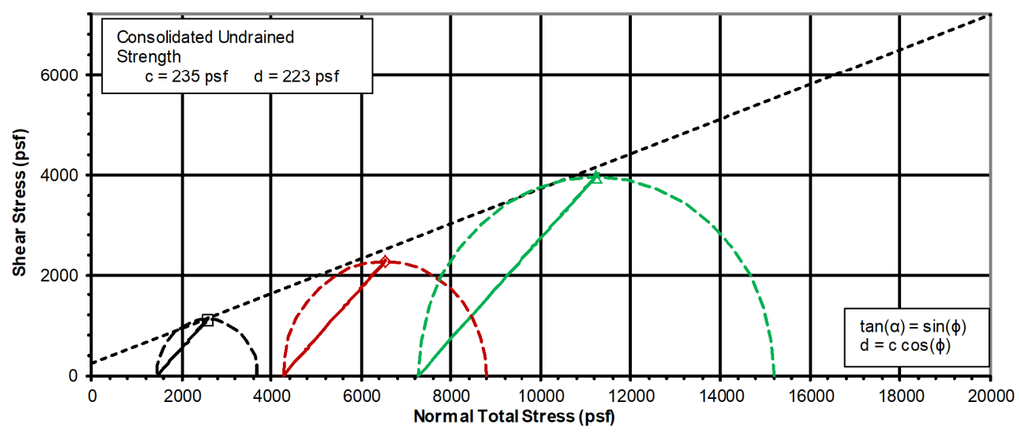
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 2

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	206	B-063-0-11, 5.0'-6.0'	Lean Clay with Gravel (CL), red brown, moist, firr	2.75	36	15	21
B	200A	B-062-0-11, 5.1'-5.6'	Lean Clay with Sand (CL), red brown, moist, firm	2.76	33	19	14
C	200B	B-062-0-11, 5.6'-6.1'	Lean Clay with Sand (CL), red brown, moist, firm	2.76	33	19	14





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CHECKED EMK

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

36/206

1077
1247

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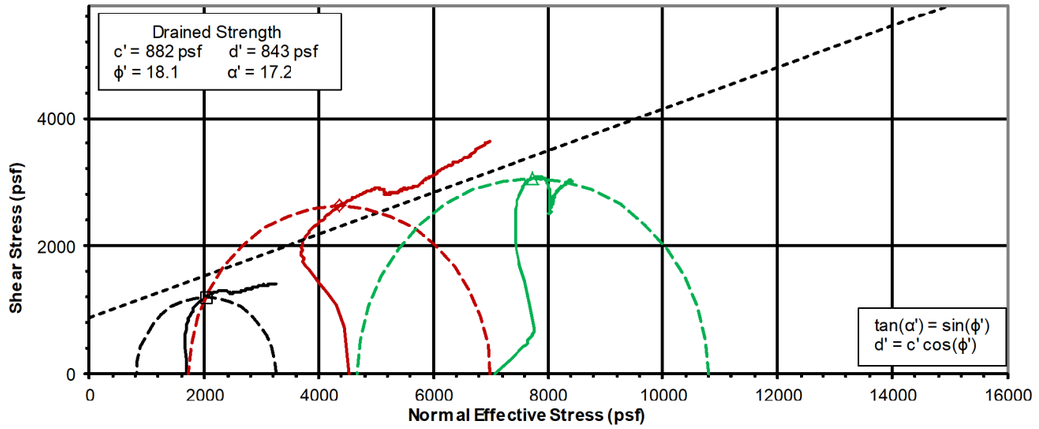
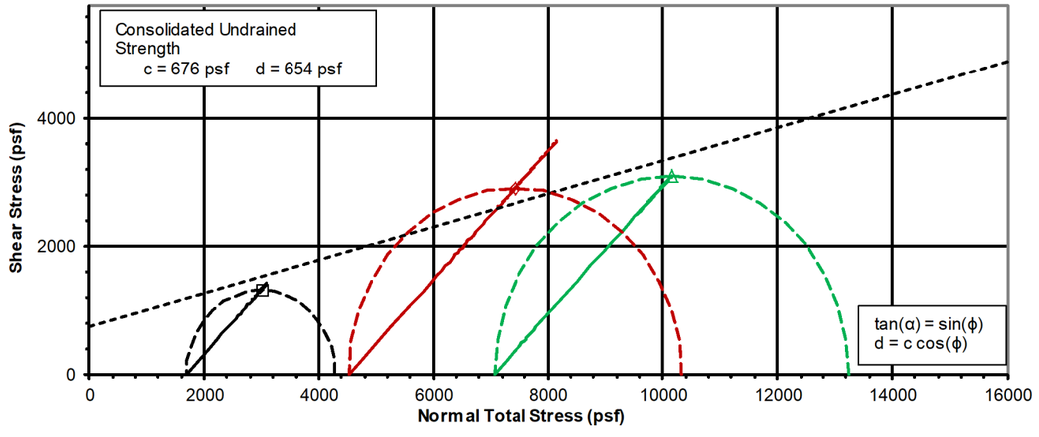
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 6

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	555B	B-036-1-11, 5.0'-5.5'	Lean Clay (CL), light brown, moist, firm to hard	2.75			
B	556A	B-036-1-11, 6.5'-7.0'	Lean Clay (CL), red brown, moist, firm	2.75			
C	556B	B-036-1-11, 7.4'-7.9'	Lean Clay (CL), red brown, moist, firm	2.75			



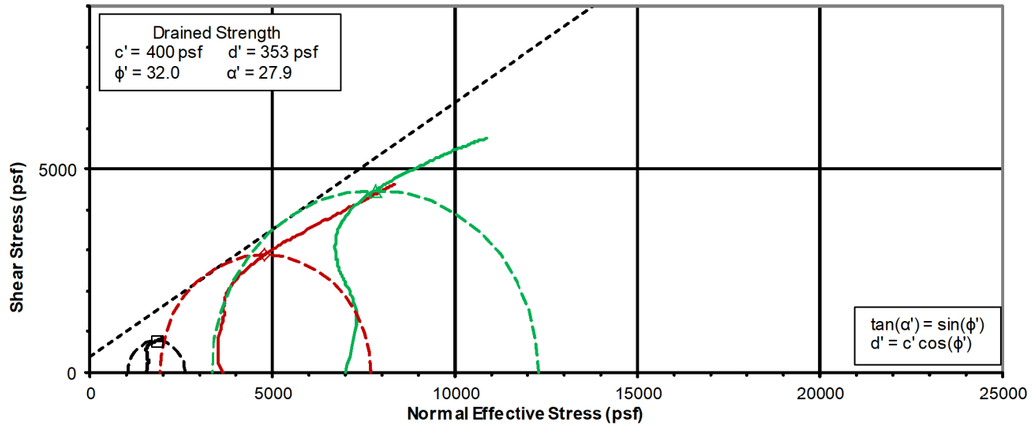


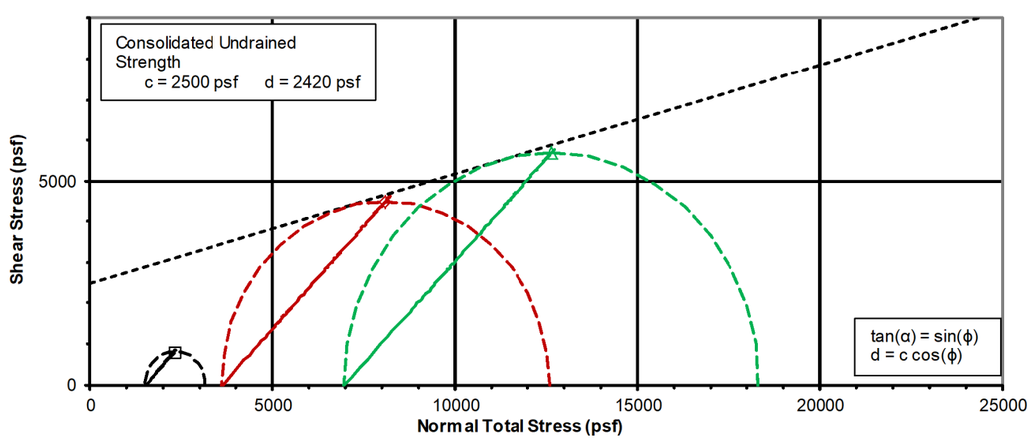
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 12@11.5%

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	2A@11.5	Embankment @ 11.5%	Mudstone, reddish brown to gray (non-bedded)	2.70	33	19	14
B	2B@11.5	Embankment @ 11.5%	Mudstone, reddish brown to gray (non-bedded)	2.70	33	19	14
C	2C@11.5	Embankment @ 11.5%	Mudstone, reddish brown to gray (non-bedded)	2.70	33	19	14





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

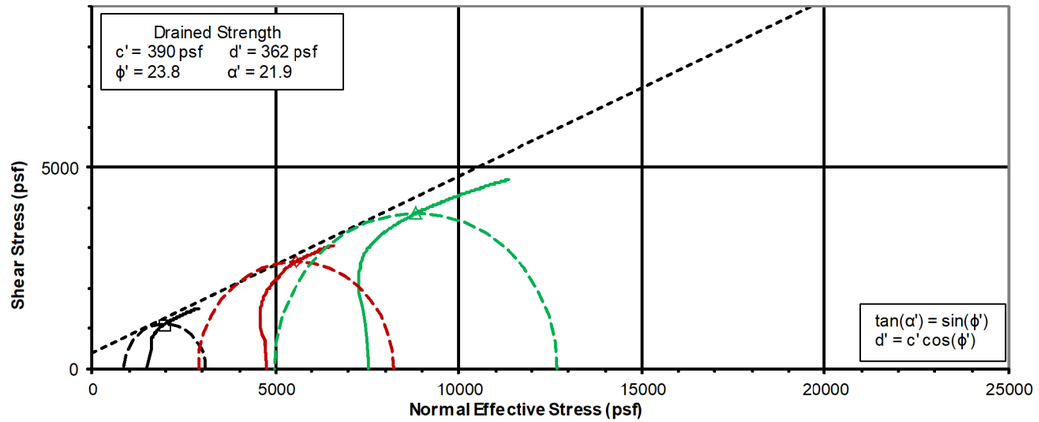
LAW-7-2.17

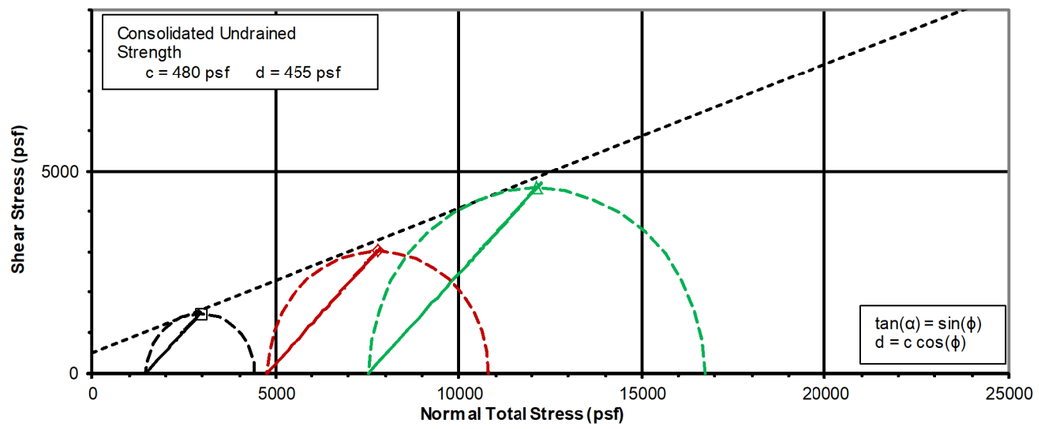
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 11

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	611	Embankment @ 13.5% MC	Mudstone, reddish brown to gray, non-bedded	2.71			
B	611	Embankment @ 13.5% MC	Mudstone, reddish brown to gray, non-bedded	2.71			
C	611	Embankment @ 13.5% MC	Mudstone, reddish brown to gray, non-bedded	2.71			



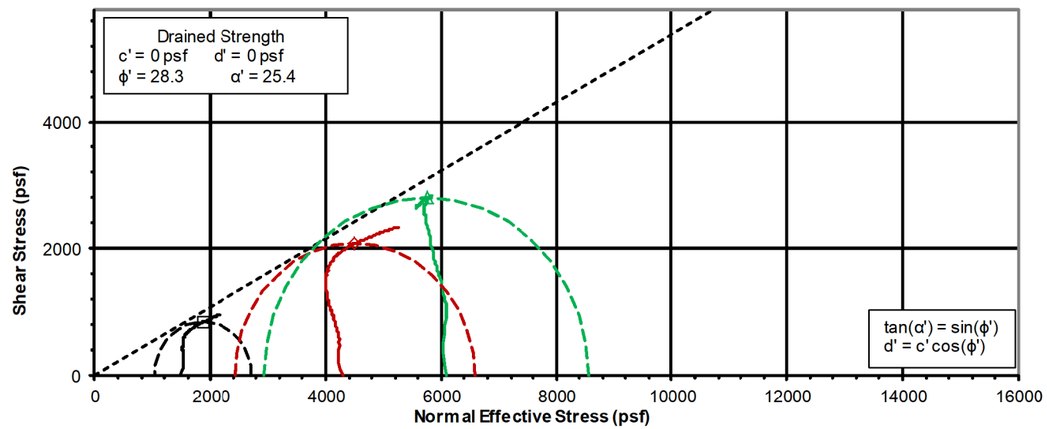


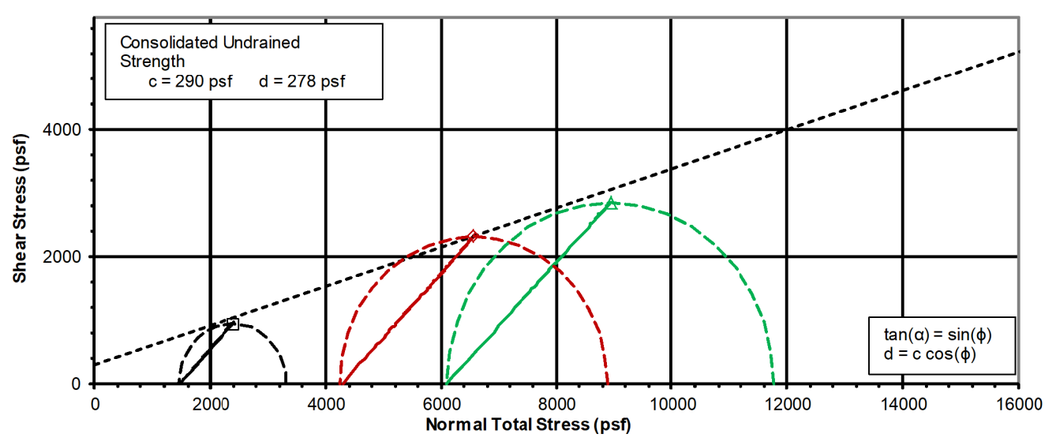
CONSOLIDATED UNDRAINED TRIAXIAL TEST
ASTM D4767-04

Project Name LAW-7-2.17

Project 173608714
Set ID 12@15.5%

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	2A@15.5	Embankment @ 15.5% MC	Mudstone, reddish brown to gray, non-bedded	2.70	33	19	14
B	2A@15.5	Embankment @ 15.5% MC	Mudstone, reddish brown to gray, non-bedded	2.70	33	19	14
C	2A@15.5	Embankment @ 15.5% MC	Mudstone, reddish brown to gray, non-bedded	2.70	33	19	14





SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

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LAW-7-2.17

38/206

1079/1247

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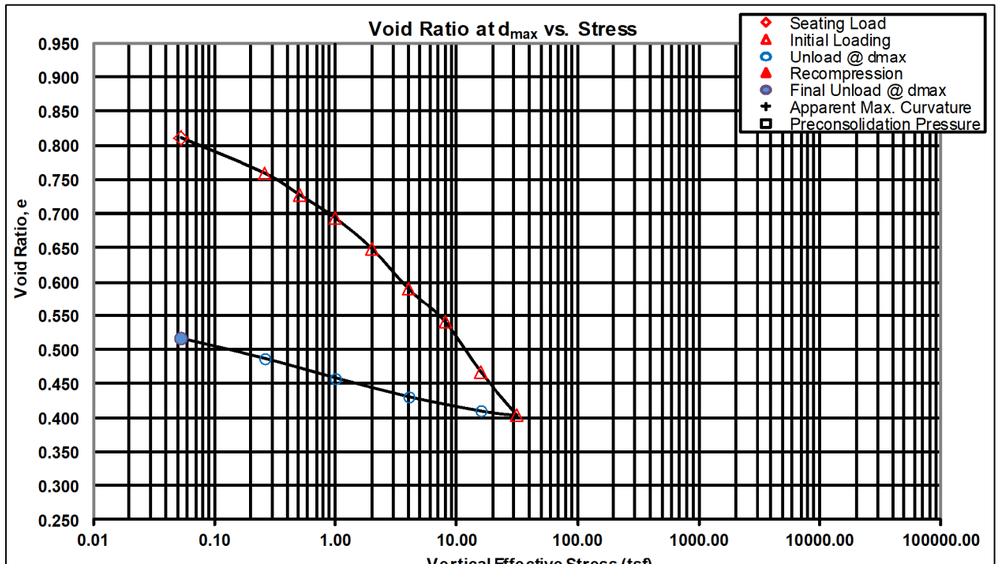
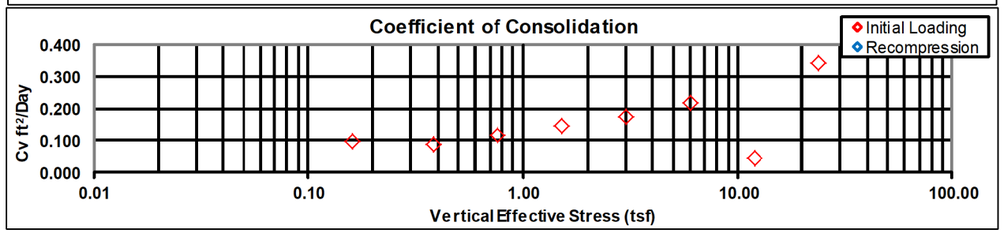
ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

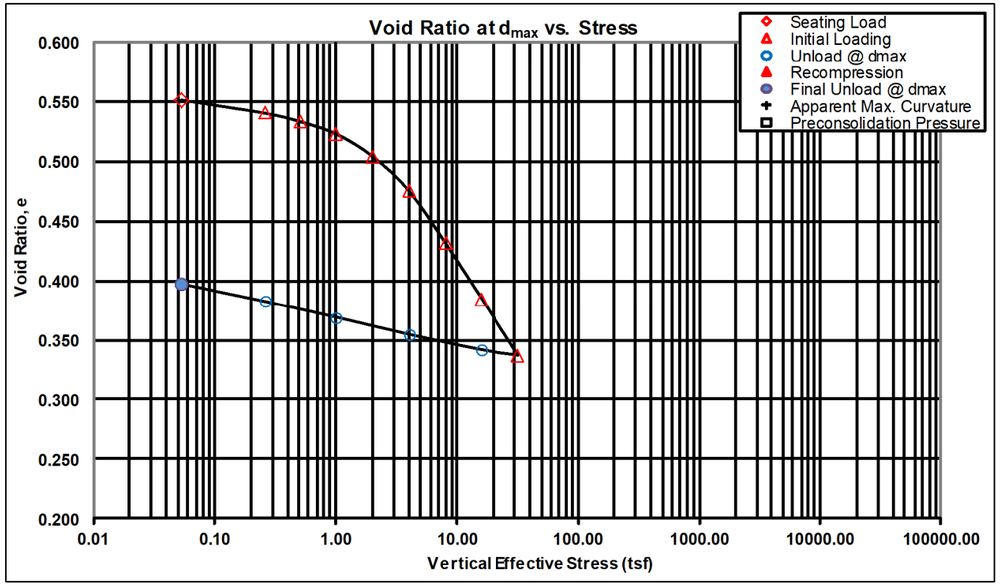
Project Name LAW-7-2.17 | Project No. 173608714
Source B-076-0-12, 9.9'-10.15' | Lab ID 11
Description Lean Clay (CL), brown, moist, firm | Date Received 06/05/2013
Specimen Type Undisturbed

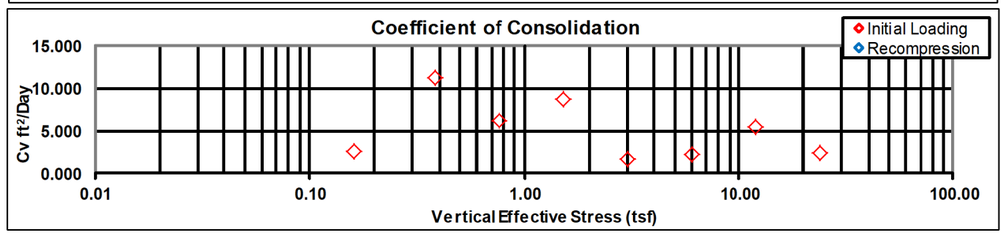




ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

Project Name LAW-7-2.17 | Project No. 173608714
Source B-009-1-12, 13.2'-13.5' | Lab ID 3
Description Clayey Sand (SC), brown, moist, firm | Date Received 06/05/2013
Specimen Type Undisturbed





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

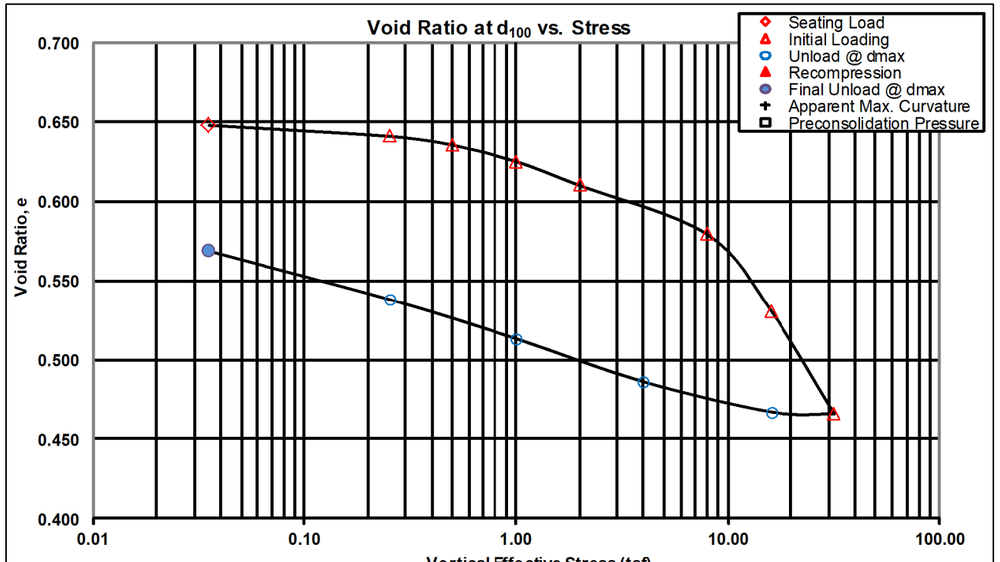
LAW-7-2.17

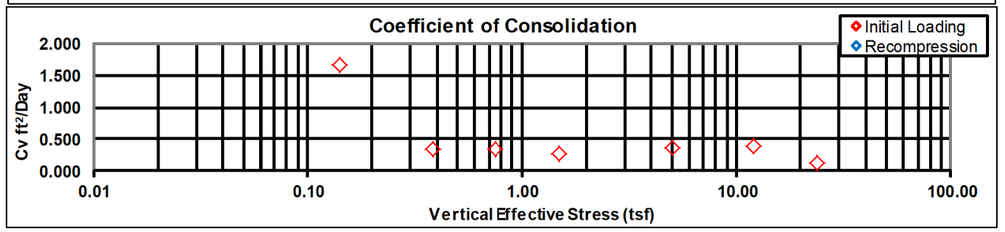
1080
1247

ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

Project Name LAW-7-2.17
Source B-010-0-11, 5.0'-7.0'
Description Lean Clay with Sand (CL), brown, moist, firm, Mn
Specimen Type Undisturbed

Project No. 173608714
Lab ID 486C
Date Received 06/25/2011

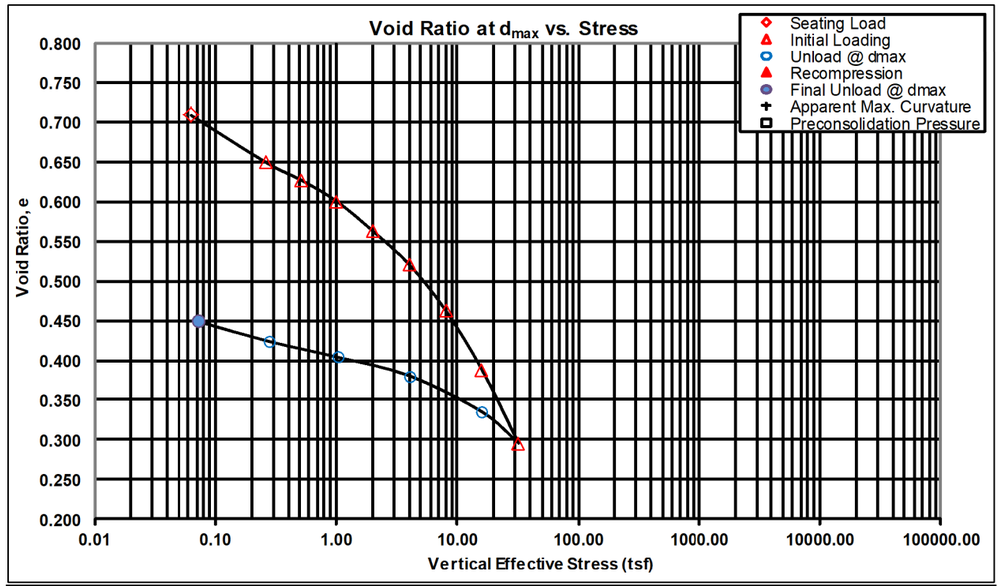


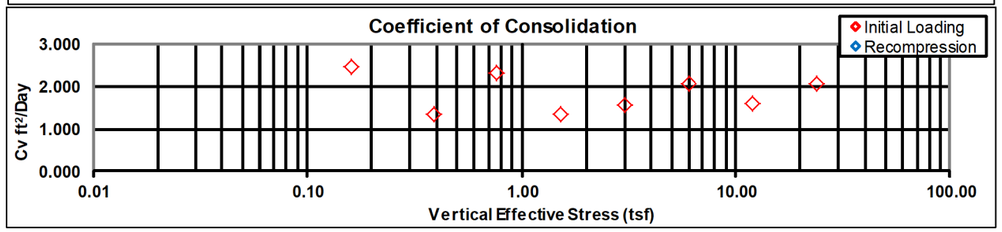


ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

Project Name LAW-7-2.17
Source B-010-1-12, 8.35'-8.6'
Description Lean Clay with Sand (CL), gray brown, wet, soft
Specimen Type Undisturbed

Project No. 173608714
Lab ID 5
Date Received 06/05/2013





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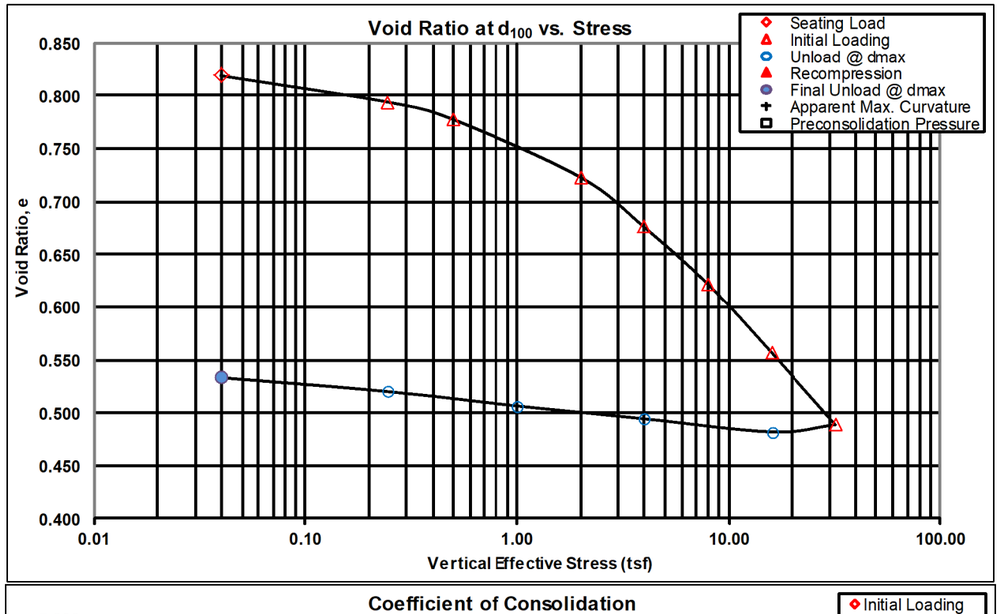
SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

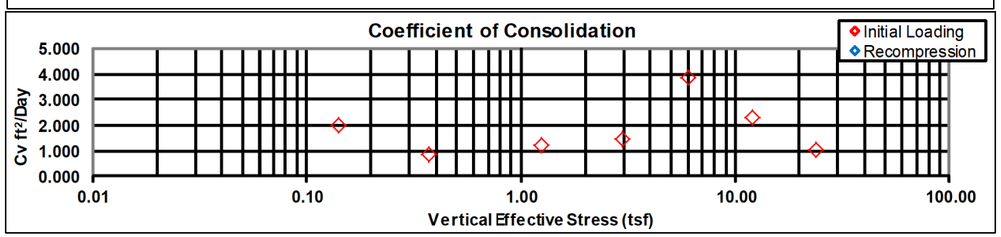
LAW-7-2.17

1081
1247

ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

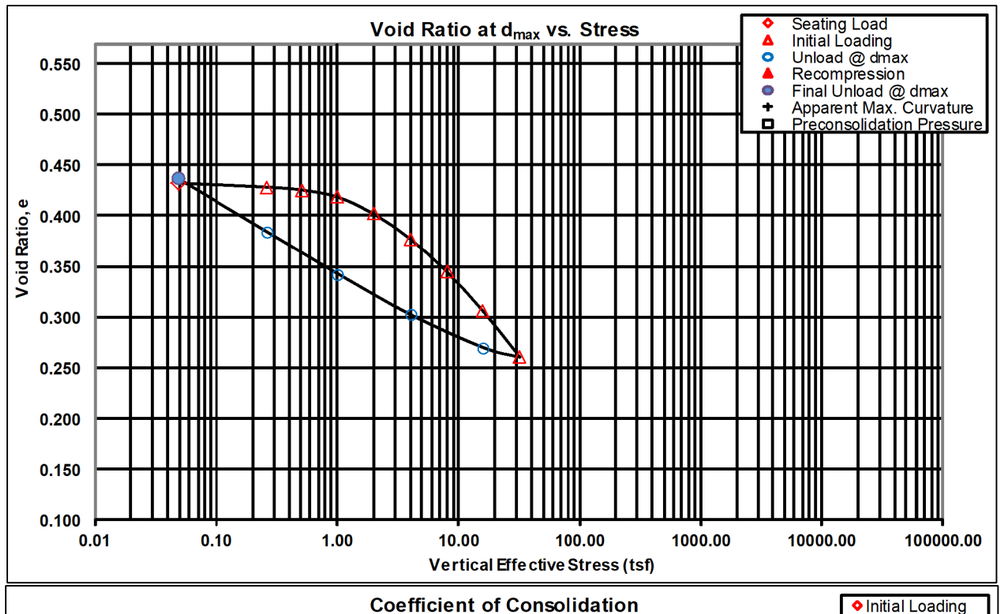
Project Name LAW-7-2.17 | Project No. 173608714
Source B-012-0-11, 5.0'-7.0' | Lab ID 495
Description Silty Sand (SP), brown, moist, soft | Date Received 07/02/2011
Specimen Type Undisturbed

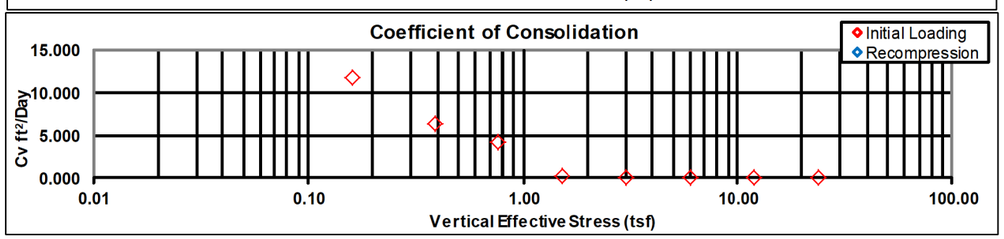




ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

Project Name LAW-7-2.17 | Project No. 173608714
Source B-019-2-12, 5.8'-6.1' | Lab ID 10
Description Lean Clay (CL), red brown, moist, firm | Date Received 06/05/2013
Specimen Type Undisturbed





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

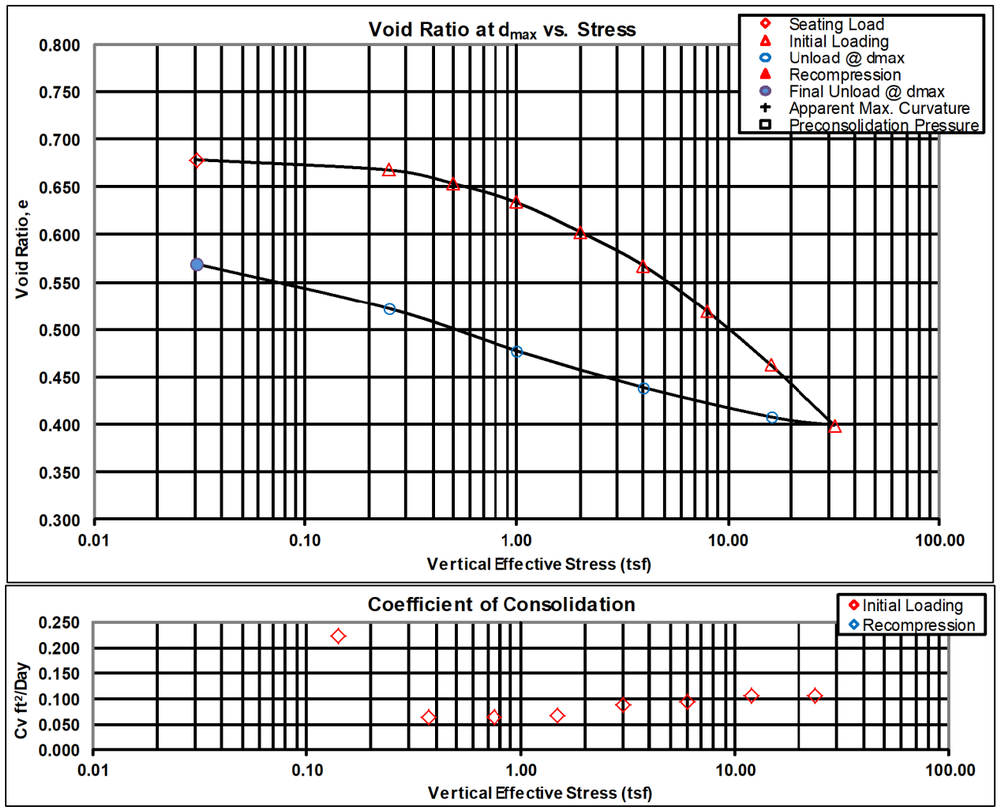
LAW-7-2.17

41/206

1082
1247

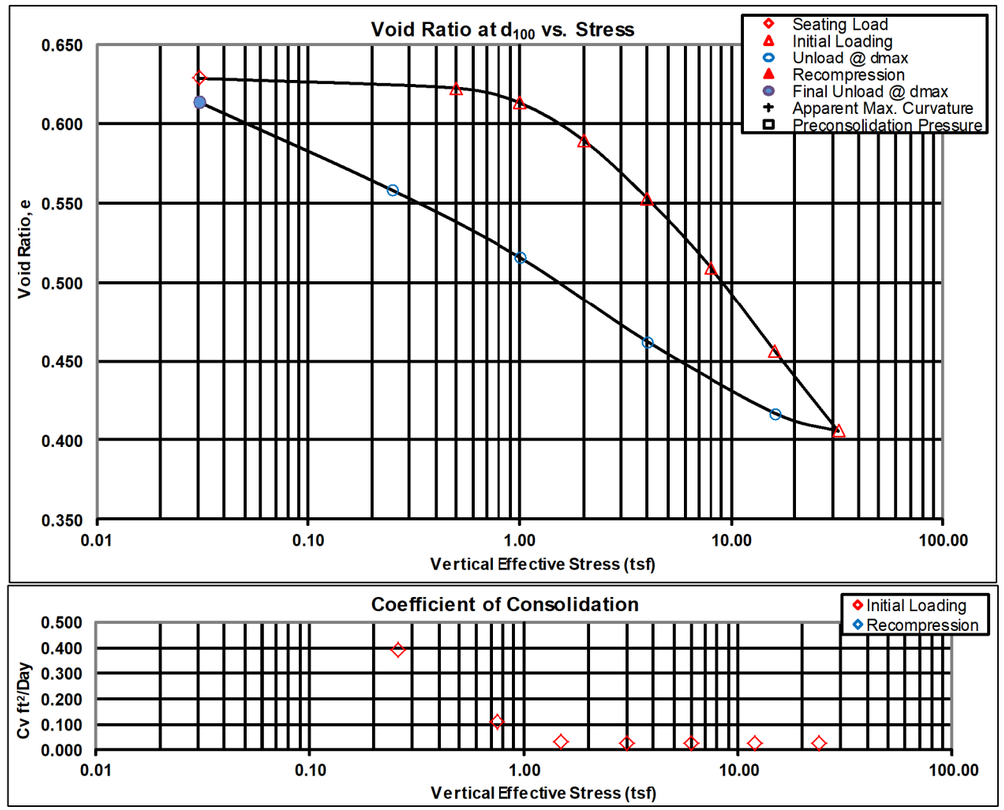
ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

Project Name LAW-7-2.17 | Project No. 173608714
Source B-034-0-11, 20.0'-22.0', TI - 21.4'-21.9' | Lab ID 31A
Description Lean Clay (CL), gray, moist, firm, layers of sandstone | Date Received 05/24/2011
Specimen Type Undisturbed



ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

Project Name LAW-7-2.17 | Project No. 173608714
Source B-036-1-11, 4.5'-6.5' | Lab ID 555A
Description Lean Clay with Sand (CL), light brown, moist, firm to hard | Date Received 07/18/2011
Specimen Type Undisturbed



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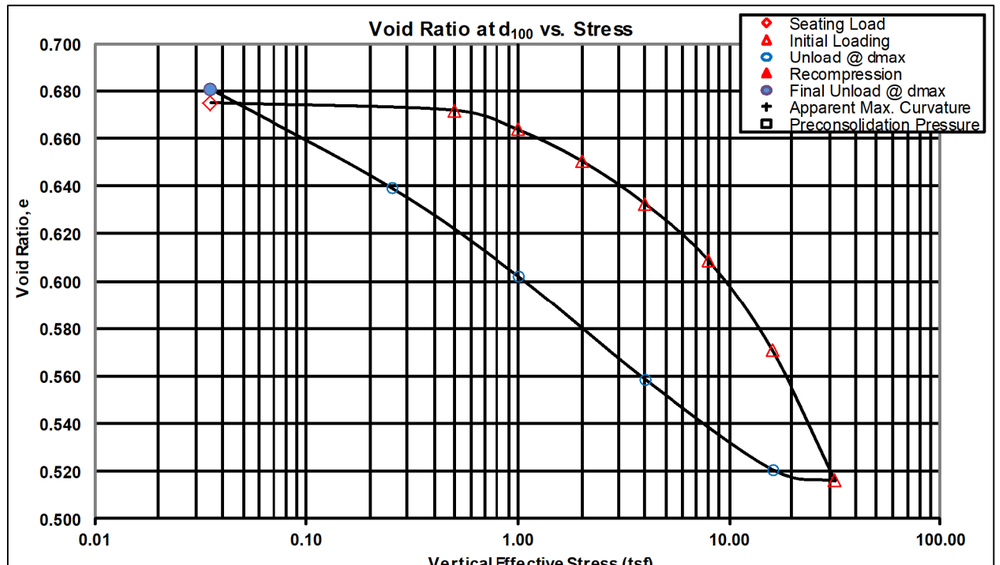
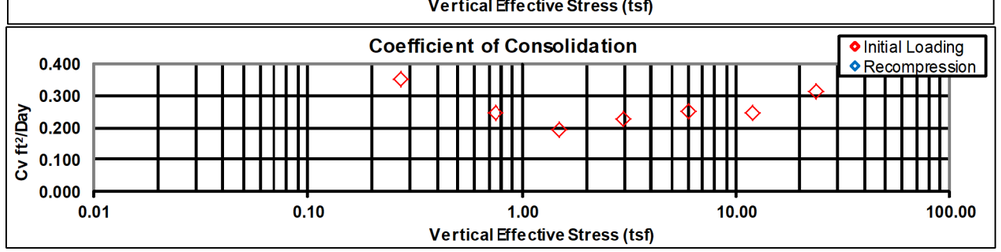
SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

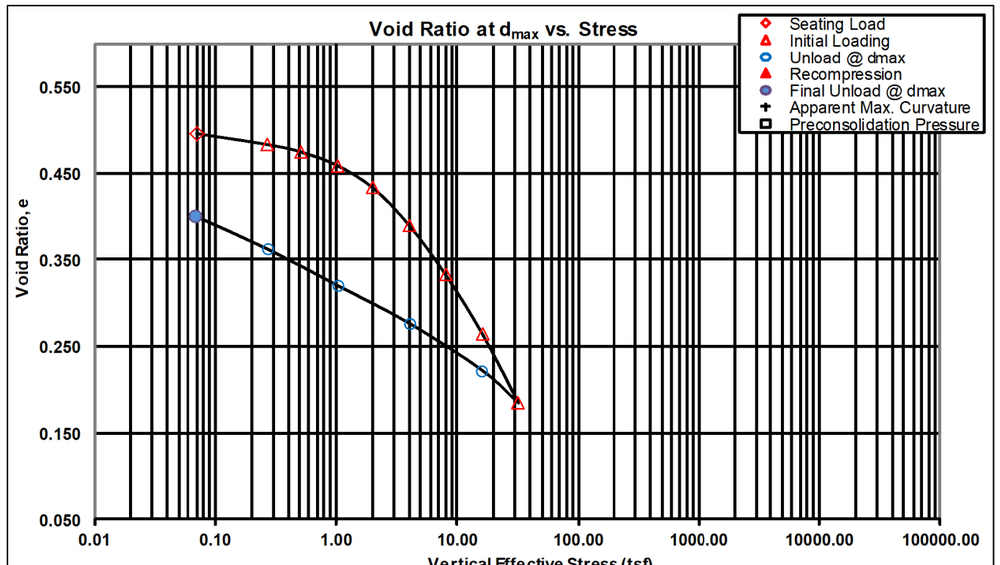
Project Name LAW-7-2.17 | Project No. 173608714
Source B-038-0-11, 10.0'-12.0' | Lab ID 57
Description Lean Clay (CL), brown, moist, firm | Date Received 05/31/2011
Specimen Type Undisturbed

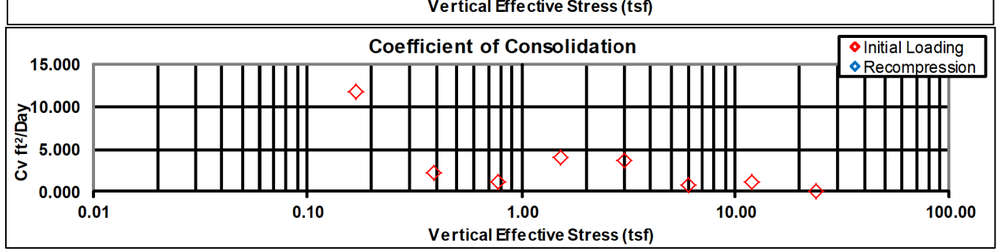




ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

Project Name LAW-7-2.17 | Project No. 173608714
Source Bulk Core 1, 9.0'-11.0' (Embankment) | Lab ID 12
Description Lean Clay with Sand (CL), gray brown, moist, firm | Date Received 06/05/2013
Specimen Type Compacted





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SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

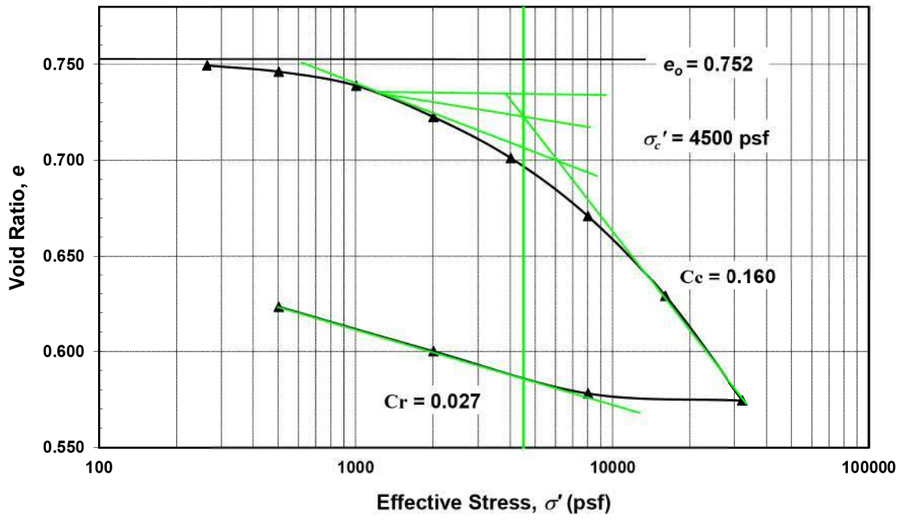
Consolidation Test

Project Name: LAW-7-2.17 — Prepared by: LR
Source: B-001-1-23 ST-5 12.5'-14.5' (13.8'-13.9' sampled) — Checked by: ZM
Description: Very stiff, brown and orangish brown, CLAY, "and" silt, trace sand trace gravel, moist. — Date: 7/9/2024
Test Specification: ASTM D 2435
Initial Void Ratio: 0.752 — Initial Bulk Unit Weight (lb/ft^3): 123
In-situ Vertical Effective Stress (psf): 1650 — Dry Unit Weight (lb/ft^3): 96

Compression and Swelling Index

Compression Index (Cc): 0.160 — Preconsolidation Pressure (σ_c') (psf): **4500**
Recompression Index (Cr): 0.027 — Over-Consolidation Ratio (OCR): **2.7**

Consolidation Curve



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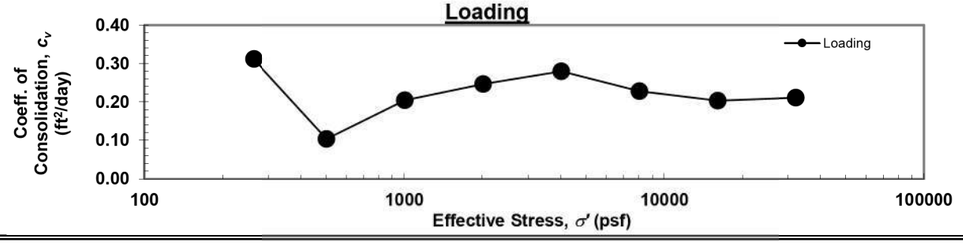


ONE-DIMENSIONAL CONSOLIDATION OF SOILS
ASTM D2435-96

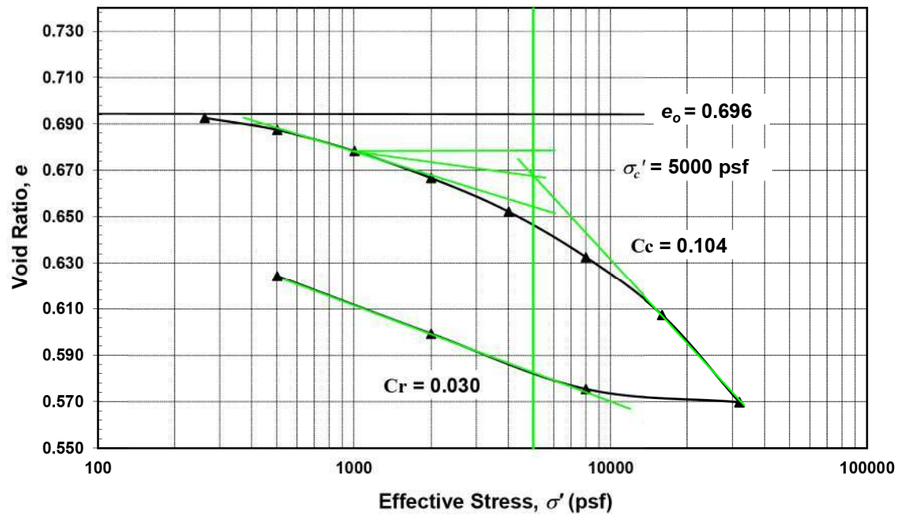
Consolidation Test

Project Name: LAW-7-2.17 — Prepared by: LR
Source: B-007-1B-23 ST-1 8.0'-10.0' (9.3'-9.4' sampled) — Checked by: ZM
Description: Hard, brown, SILT, "and" clay, trace sand, trace gravel, moist. — Date: 7/9/2024
Test Specification: ASTM D 2435
Initial Void Ratio: 0.696 — Initial Bulk Unit Weight (lb/ft^3): 125
In-situ Vertical Effective Stress (psf): 1110 — Dry Unit Weight (lb/ft^3): 99

Compression and Swelling Index

Compression Index (Cc): 0.104 — Preconsolidation Pressure (σ_c') (psf): **5000**
Recompression Index (Cr): 0.030 — Over-Consolidation Ratio (OCR): **4.5**

Consolidation Curve



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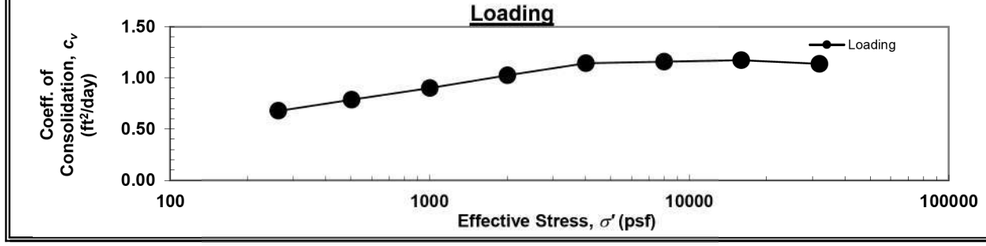

SOIL PROFILE - ROADWAY
LABORATORY TEST DATA

LAW-7-2.17

43A/206

1084A
1247

DRAWN MSJ
CHECKED EMK

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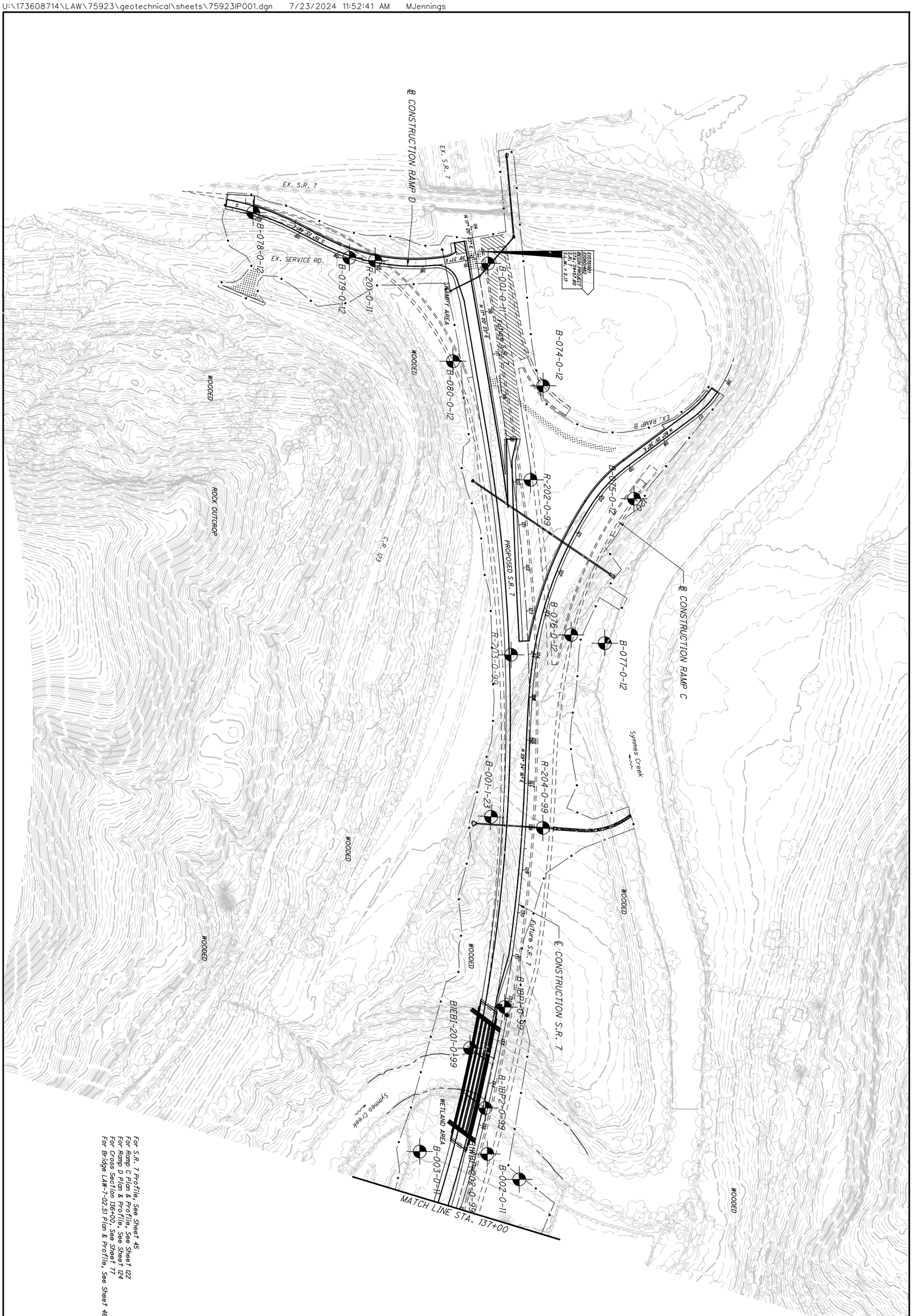
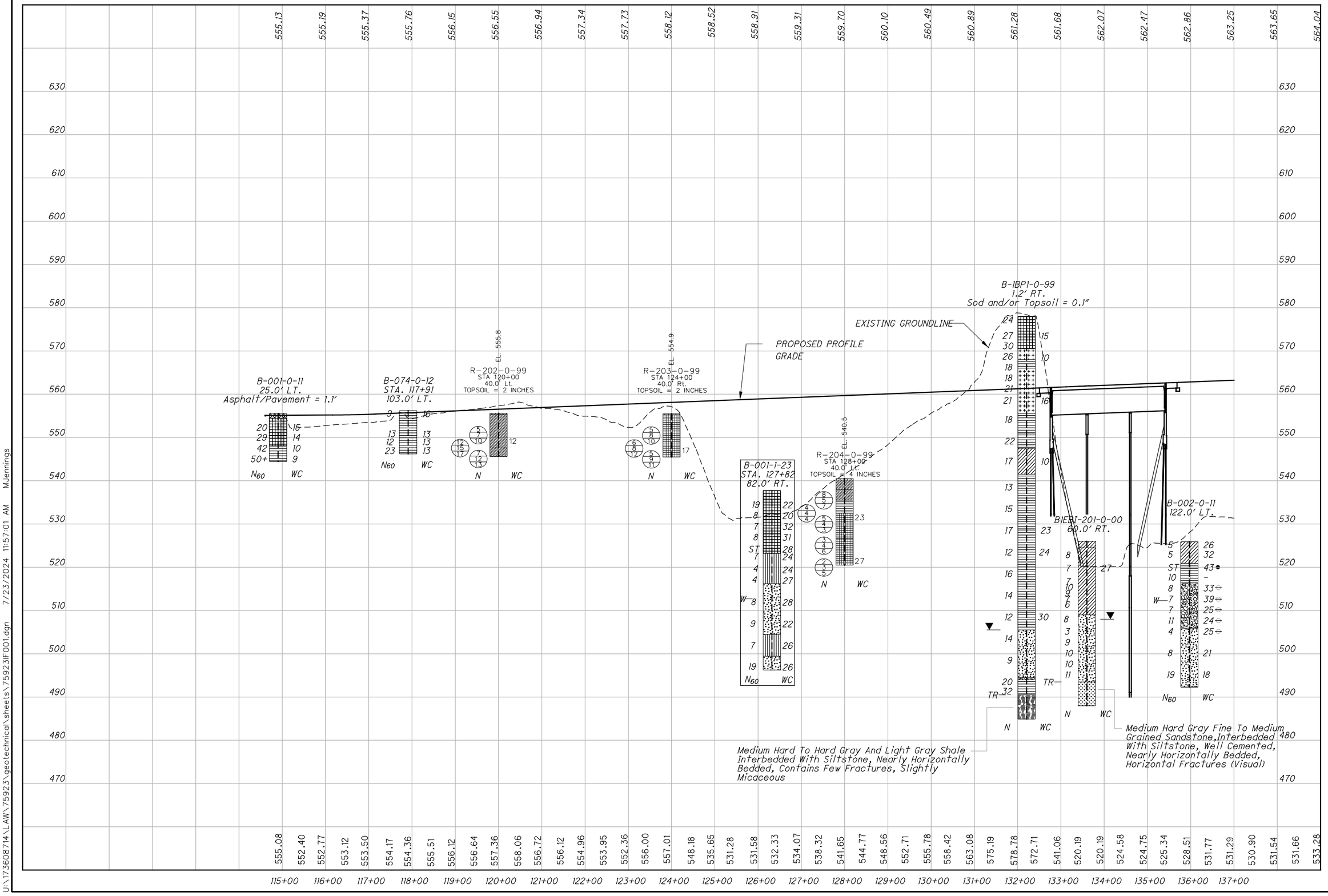


For S.R. 7 Profile, See Sheet #5
For Ramp C Plan & Profile, See Sheet 122
For Ramp D Plan & Profile, See Sheet 124
For Cross Section 136+00, See Sheet 77
For Bridge LAW-7-02.51 Plan & Profile, See Sheet 16

1085 1247	44 206	LAW-7-2.17	SOIL PROFILE - ROADWAY STA. 114+57.60 - 137+00	DRAWN MSJ CHECKED EMK	0 50 100 200 HORIZONTAL SCALE IN FEET



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0 50 100 200
HORIZONTAL SCALE IN FEET

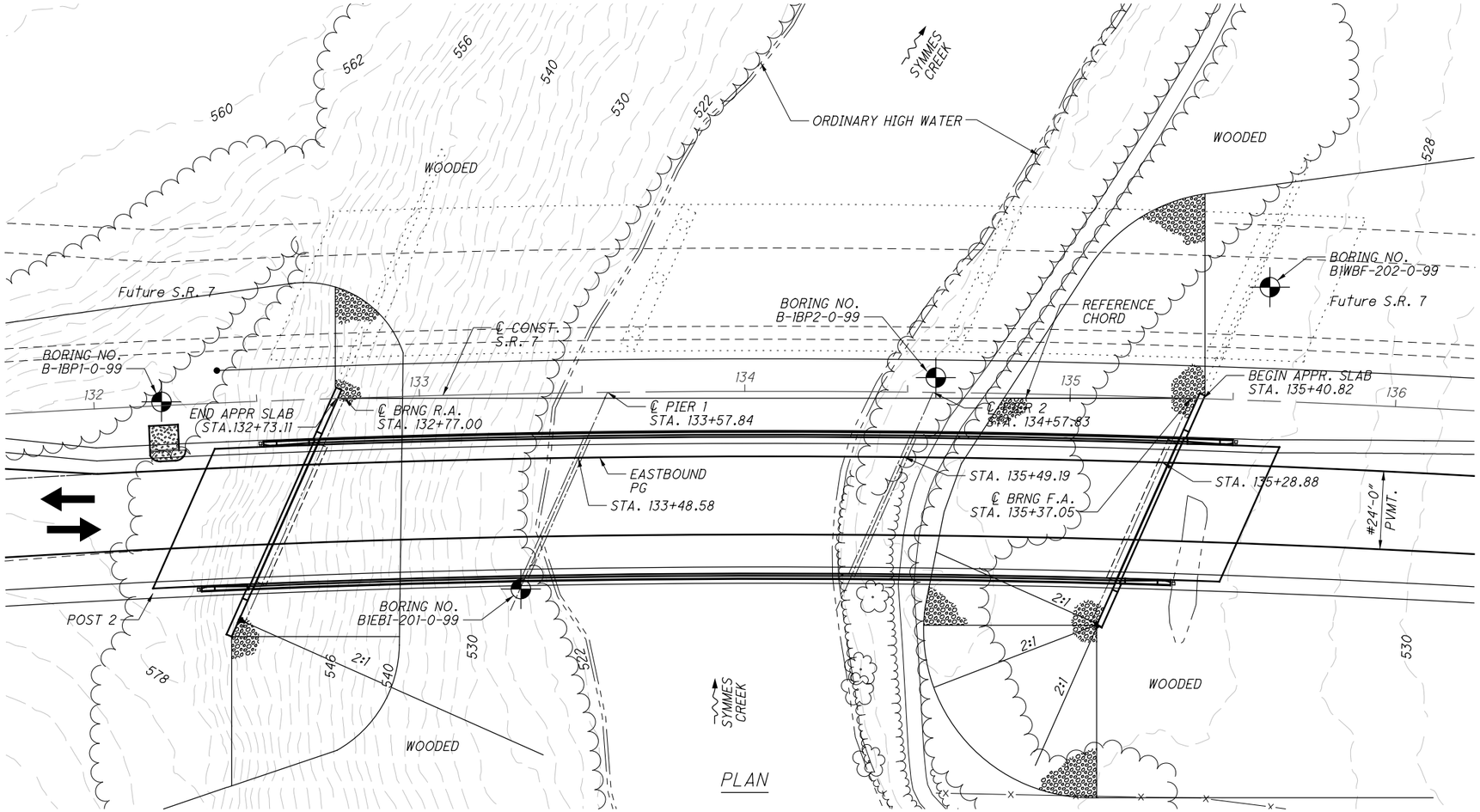
DRAWN MSJ
CHECKED EMK

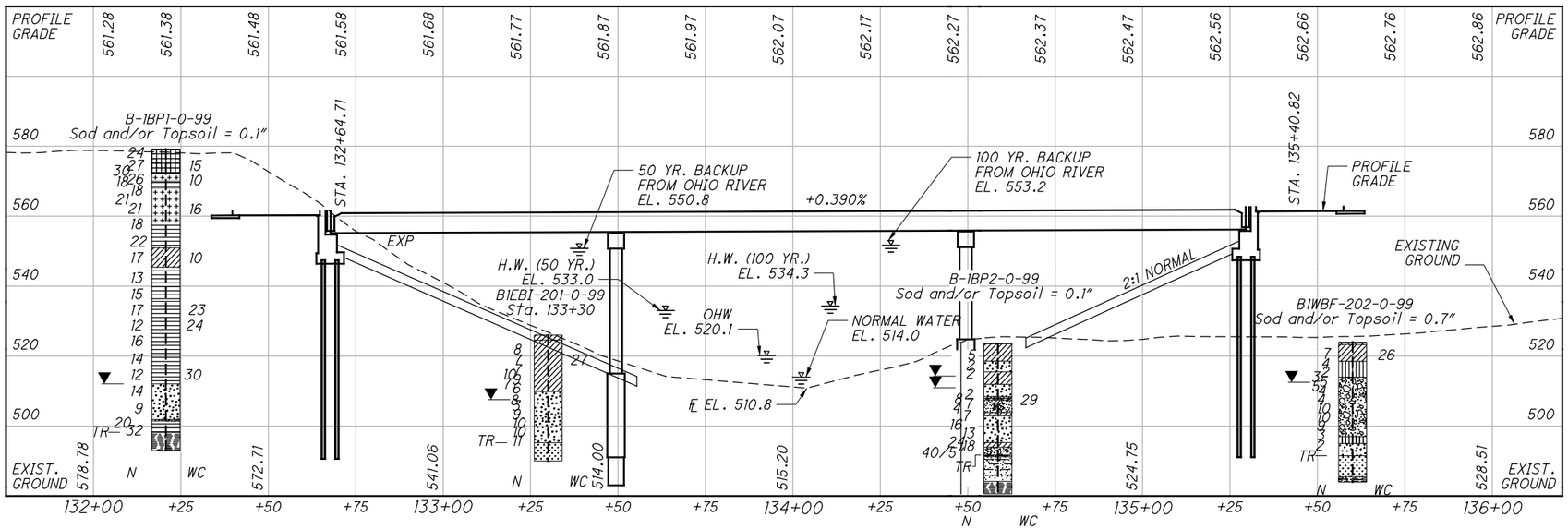
SOIL PROFILE - ROADWAY
STA. 114+57.60 - 137+00

LAW-7-2.17

45 / 206

1086
1247





HORIZONTAL SCALE IN FEET
0 10 20 40
DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-7-2.51
S.R. 7 OVER SYMMES CREEK

LAW-7-2.17

46/206

1087/1247

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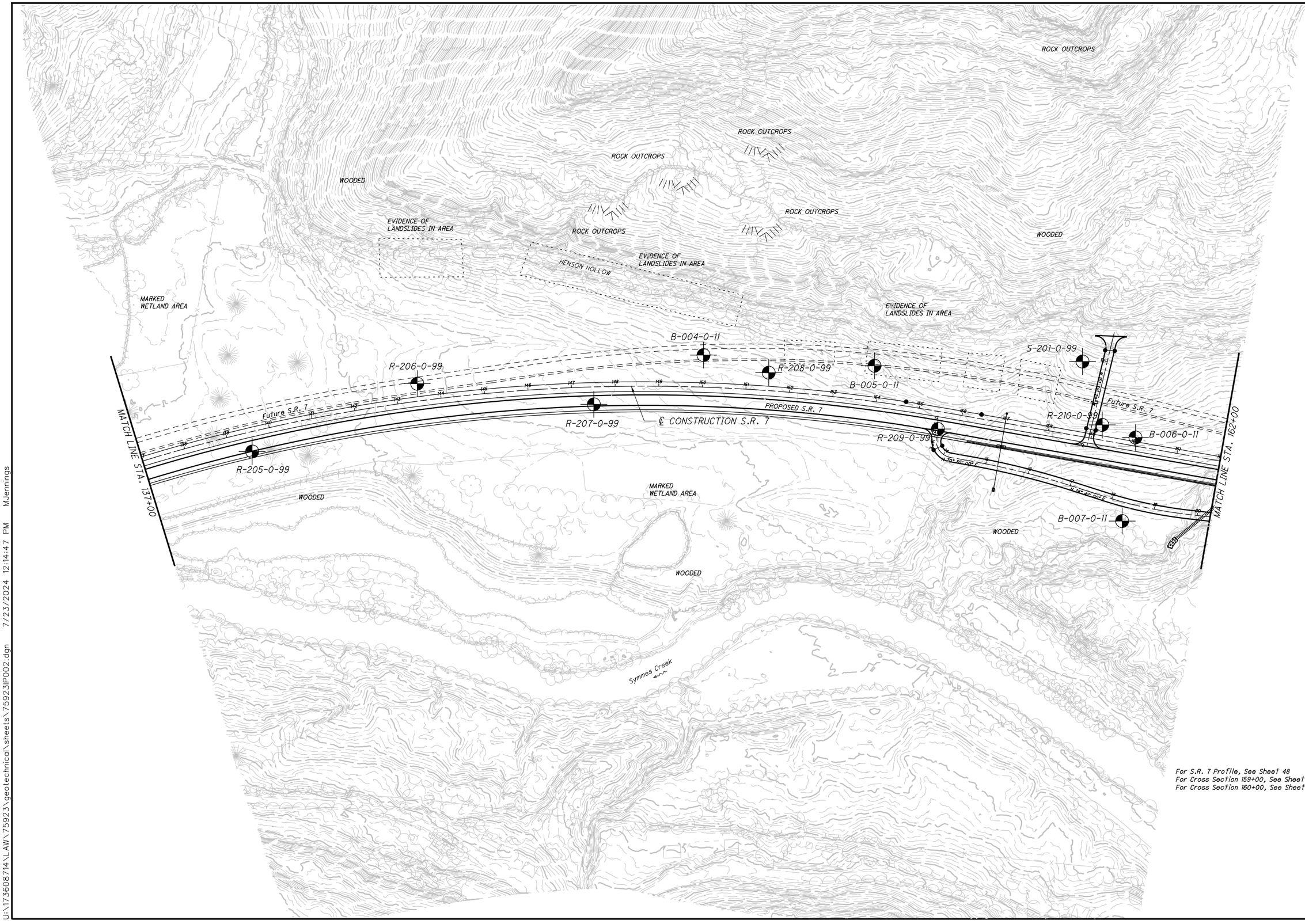

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HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

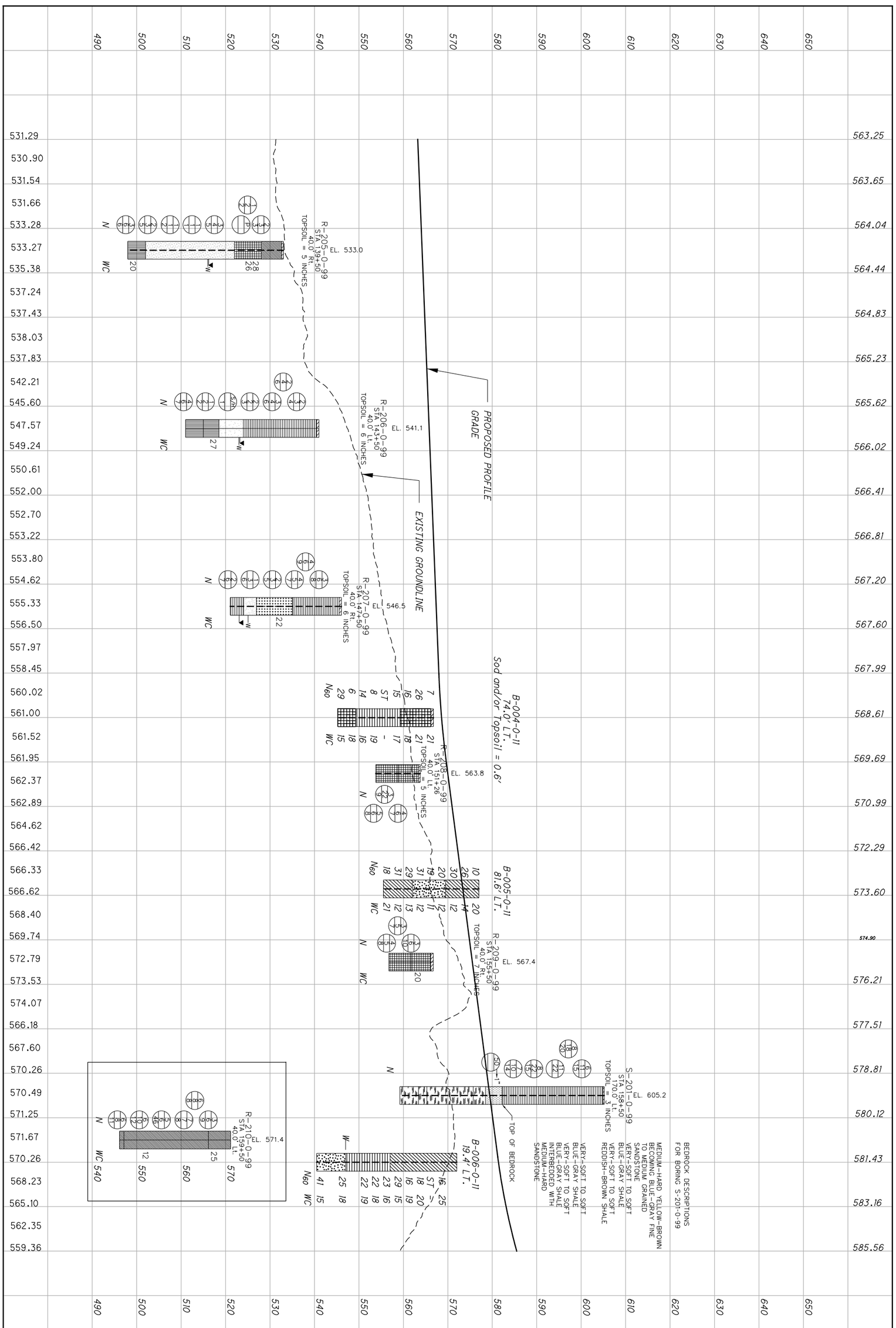
SOIL PROFILE - ROADWAY
STA. 137+00 - 162+00

LAW-7-2.17

47 / 206

1088 / 1247

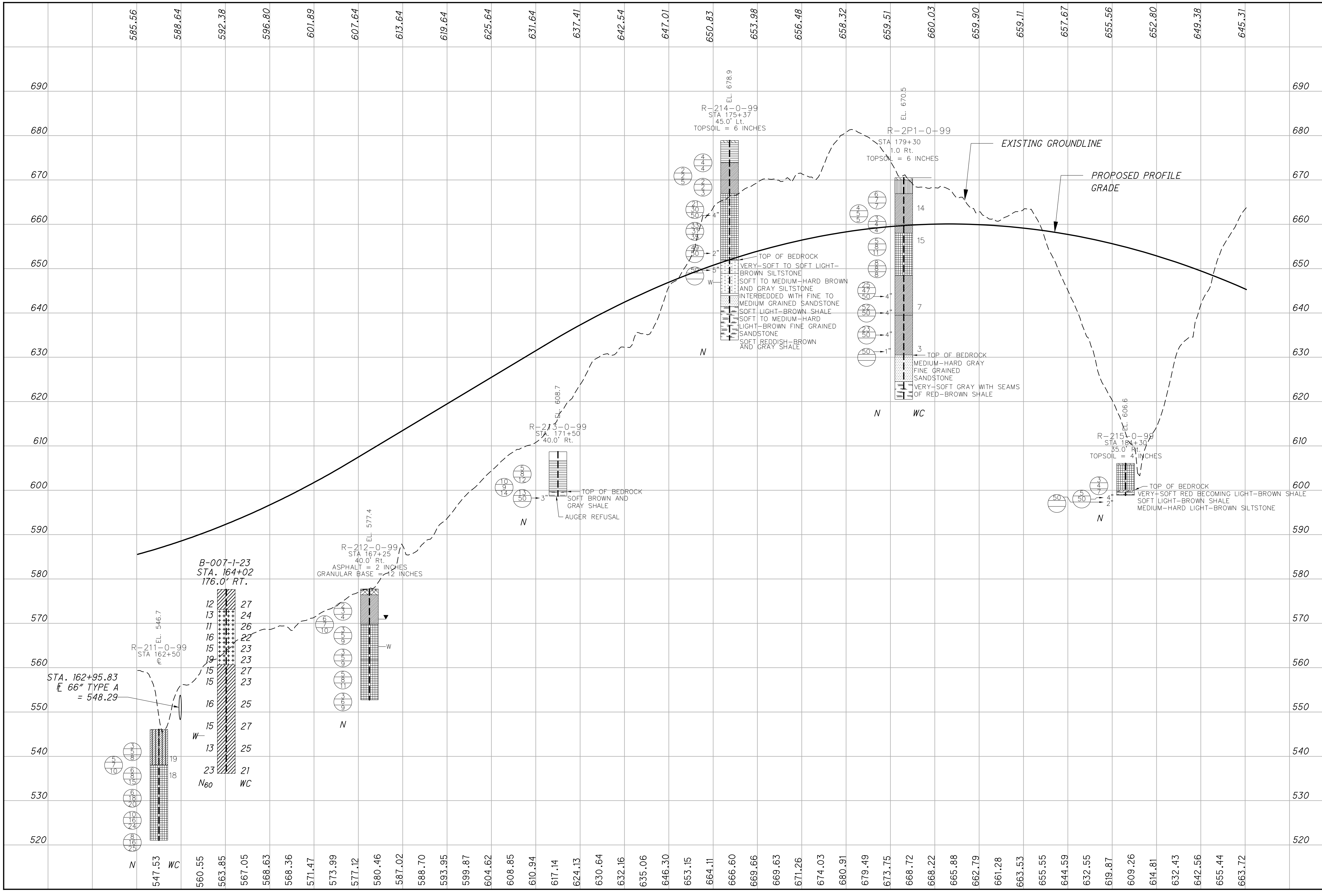
U:\173608714\LAW\75923\geotechnical\sheets\75923IF002.dgn 7/23/2024 12:16:00 PM MJennings



1247 / 1089	48 / 206	LAW-7-2.17	SOIL PROFILE - ROADWAY STA. 137+00 - 162+00	DRAWN MSJ CHECKED EMK	0 100 50 200 HORIZONTAL SCALE IN FEET

U:\173608714\LAW\75923\geotechnical\sheets\75923IP003.dgn 7/23/2024 12:22:22 PM MJennings

1090 / 1247	49 / 206	LAW-7-2.17	SOIL PROFILE - ROADWAY STA. 162+00 - 187+00	DRAWN MSJ CHECKED EMK	0 100 50 200 HORIZONTAL SCALE IN FEET



EXISTING GROUNDLINE
PROPOSED PROFILE GRADE
R-211-0-99
STA 162+50
EL. 546.7
STA. 162+95.83
℄ 66" TYPE A
= 548.29
B-007-1-23
STA. 164+02
176.0' RT.
N60
WC
R-212-0-99
STA 167+25
40.0' Rt.
ASPHALT = 2 INCHES
GRANULAR BASE = 12 INCHES
EL. 577.4
R-213-0-99
STA. 171+50
40.0' Rt.
EL. 608.7
TOP OF BEDROCK
SOFT BROWN AND GRAY SHALE
AUGER REFUSAL
R-214-0-99
STA 175+37
45.0' Lt.
TOPSOIL = 6 INCHES
EL. 678.9
TOP OF BEDROCK
VERY-SOFT TO SOFT LIGHT-BROWN SILTSTONE
SOFT TO MEDIUM-HARD BROWN AND GRAY SILTSTONE INTERBEDDED WITH FINE TO MEDIUM GRAINED SANDSTONE
SOFT LIGHT-BROWN SHALE
SOFT TO MEDIUM-HARD LIGHT-BROWN FINE GRAINED SANDSTONE
SOFT REDDISH-BROWN AND GRAY SHALE
R-2P1-0-99
STA 179+30
1.0 Rt.
TOPSOIL = 6 INCHES
EL. 670.5
TOP OF BEDROCK
MEDIUM-HARD GRAY FINE GRAINED SANDSTONE
VERY-SOFT GRAY WITH SEAMS OF RED-BROWN SHALE
R-215-0-99
STA 184+30
35.0' Rt.
TOPSOIL = 4 INCHES
EL. 606.6
TOP OF BEDROCK
VERY-SOFT RED BECOMING LIGHT-BROWN SHALE
SOFT LIGHT-BROWN SHALE
MEDIUM-HARD LIGHT-BROWN SILTSTONE
585.56 588.64 592.38 596.80 601.89 607.64 613.64 619.64 625.64 631.64 637.41 642.54 647.01 650.83 653.98 656.48 658.32 659.51 660.03 659.90 659.11 657.67 655.56 652.80 649.38 645.31
547.53 560.55 563.85 567.05 568.63 568.36 571.47 573.99 577.12 580.46 587.02 588.70 593.95 599.87 604.62 608.85 610.94 617.14 624.13 630.64 632.16 635.06 646.30 653.15 664.11 666.60 669.66 669.63 671.26 674.03 680.91 679.49 673.75 668.72 668.22 665.88 662.79 661.28 663.53 655.55 644.59 632.55 619.87 609.26 614.81 632.43 642.56 655.44 663.72
162+00 163+00 164+00 165+00 166+00 167+00 168+00 169+00 170+00 171+00 172+00 173+00 174+00 175+00 176+00 177+00 178+00 179+00 180+00 181+00 182+00 183+00 184+00 185+00 186+00 187+00
520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690

0 50 100 200
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

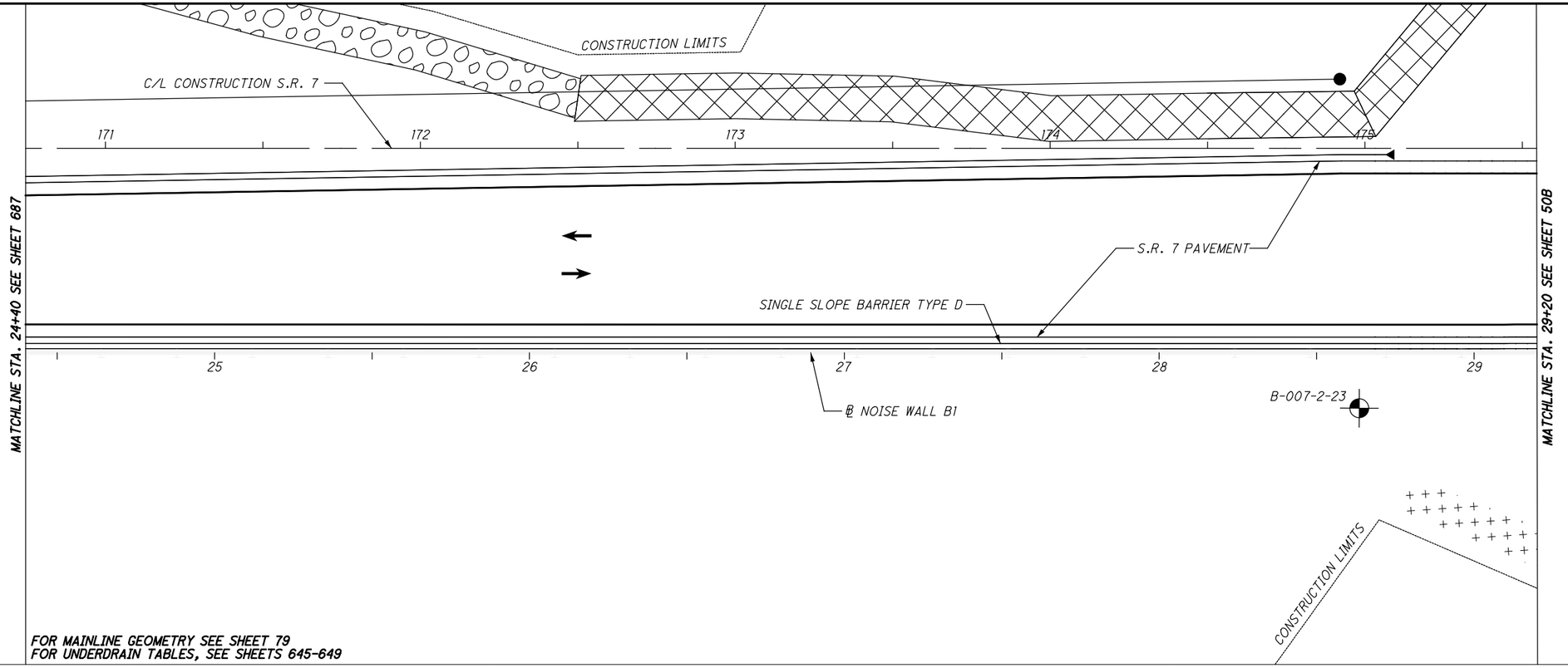
SOIL PROFILE - ROADWAY
STA. 162+00 - 187+00

LAW-7-2.17

50/206

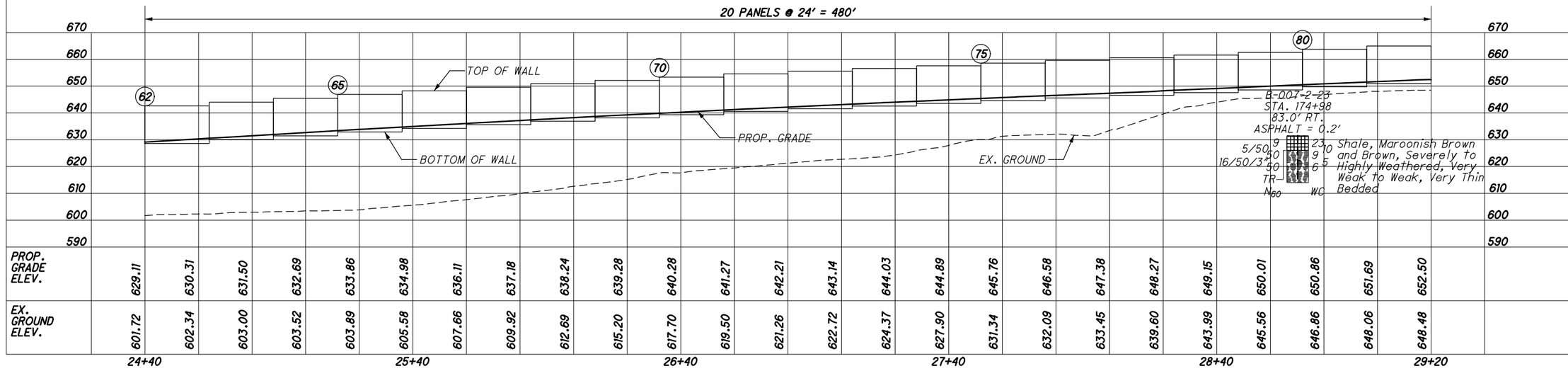
1091/1247

U:\173608714\LAW\75923\geotechnical\sheets\75923IF003.dgn 7/23/2024 12:23:09 PM MJennings



FOR MAINLINE GEOMETRY SEE SHEET 79
FOR UNDERDRAIN TABLES, SEE SHEETS 645-649

PANEL NO.	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
TOP OF WALL ELEV.	642.61	644.05	645.48	646.90	648.26	649.61	650.89	652.16	653.38	654.57	655.57	656.57	657.57	658.57	659.57	660.57	661.57	662.57	663.77	664.97
BOTTOM OF WALL ELEV.	628.61	630.05	631.48	632.90	634.26	635.61	636.89	638.16	639.38	640.57	641.57	642.57	643.57	644.57	645.57	646.57	647.57	648.57	649.77	650.97
PROP. GRADE ELEV.	629.11	630.31	631.50	632.69	633.86	634.98	636.11	637.18	638.24	639.28	640.28	641.27	642.21	643.14	644.03	644.89	645.76	646.58	647.38	648.27	649.15	650.01	650.86	651.69	652.50
EX. GROUND ELEV.	601.72	602.34	603.00	603.52	603.89	605.58	607.66	609.92	612.69	615.20	617.70	619.50	621.26	622.72	624.37	627.90	631.34	632.09	633.45	639.60	643.99	645.56	646.86	648.06	648.48



24+40 25+40 26+40 27+40 28+40 29+20

HORIZONTAL SCALE IN FEET
0 10 20 40

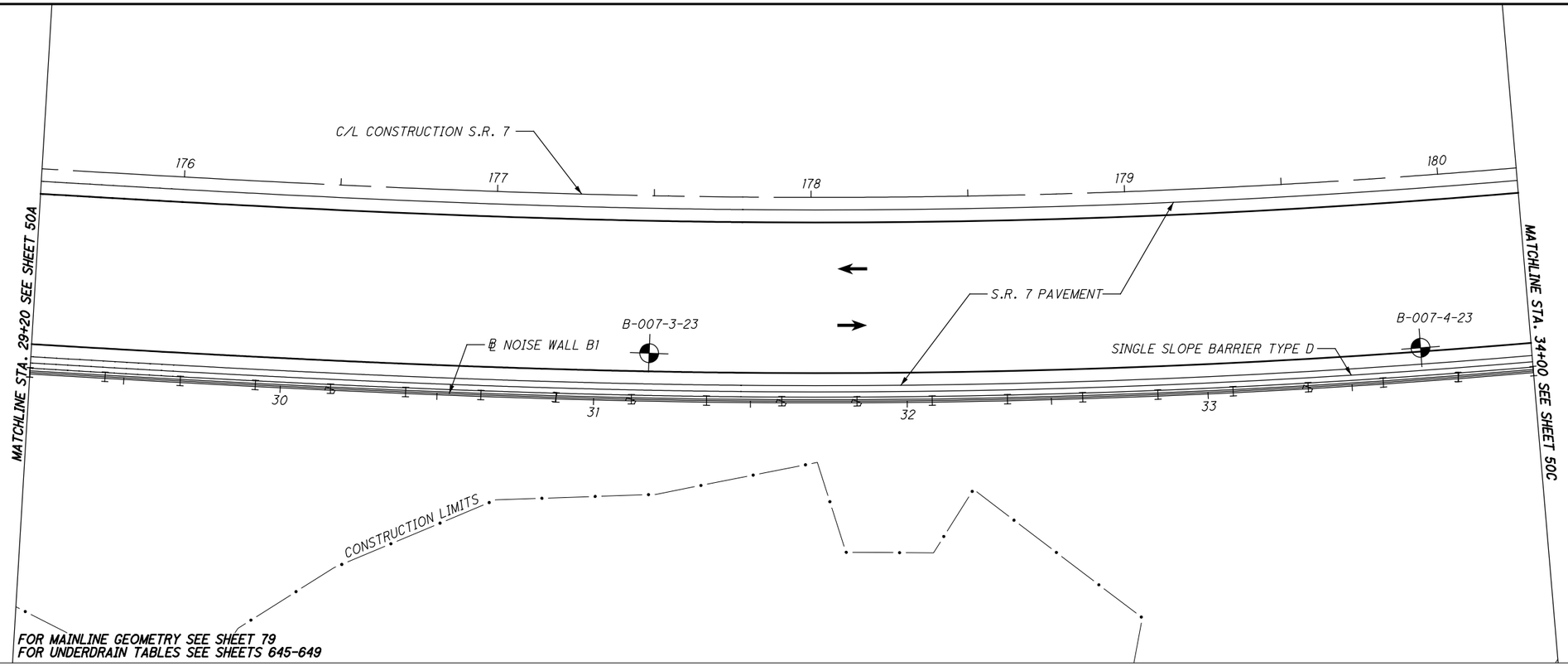
DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL B1 - STA. 24+40 TO 29+20

LAW-7-2.17

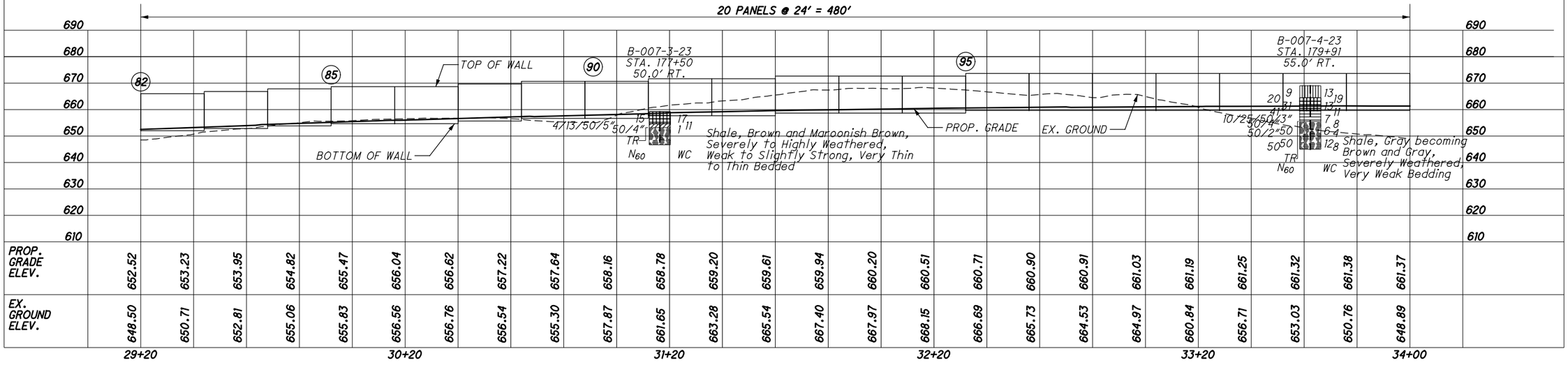
50A/206

1091A
1247



FOR MAINLINE GEOMETRY SEE SHEET 79
FOR UNDERDRAIN TABLES SEE SHEETS 645-649

TOP OF WALL ELEV.	666.02	666.87	667.87	668.67	668.67	669.67	670.67	670.67	671.67	671.67	672.67	672.67	672.67	673.67	673.67	673.67	673.67	673.67	673.67	673.67	
BOTTOM OF WALL ELEV.	652.02	652.87	653.87	654.67	654.67	655.67	656.67	656.67	657.67	657.67	658.67	658.67	658.67	659.67	659.67	659.67	659.67	659.67	659.67	659.67	
PANEL NO.	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100		



PROP. GRADE ELEV.	652.52	653.23	653.95	654.82	655.47	656.04	656.62	657.22	657.64	658.16	658.78	659.20	659.61	659.94	660.20	660.51	660.71	660.90	660.91	661.03	661.19	661.25	661.32	661.38	661.37	
EX. GROUND ELEV.	648.50	650.71	652.81	655.06	655.83	656.56	656.76	656.54	655.30	657.87	661.65	663.28	665.54	667.40	667.97	668.15	666.69	665.73	664.53	664.97	660.84	656.71	653.03	650.76	648.89	

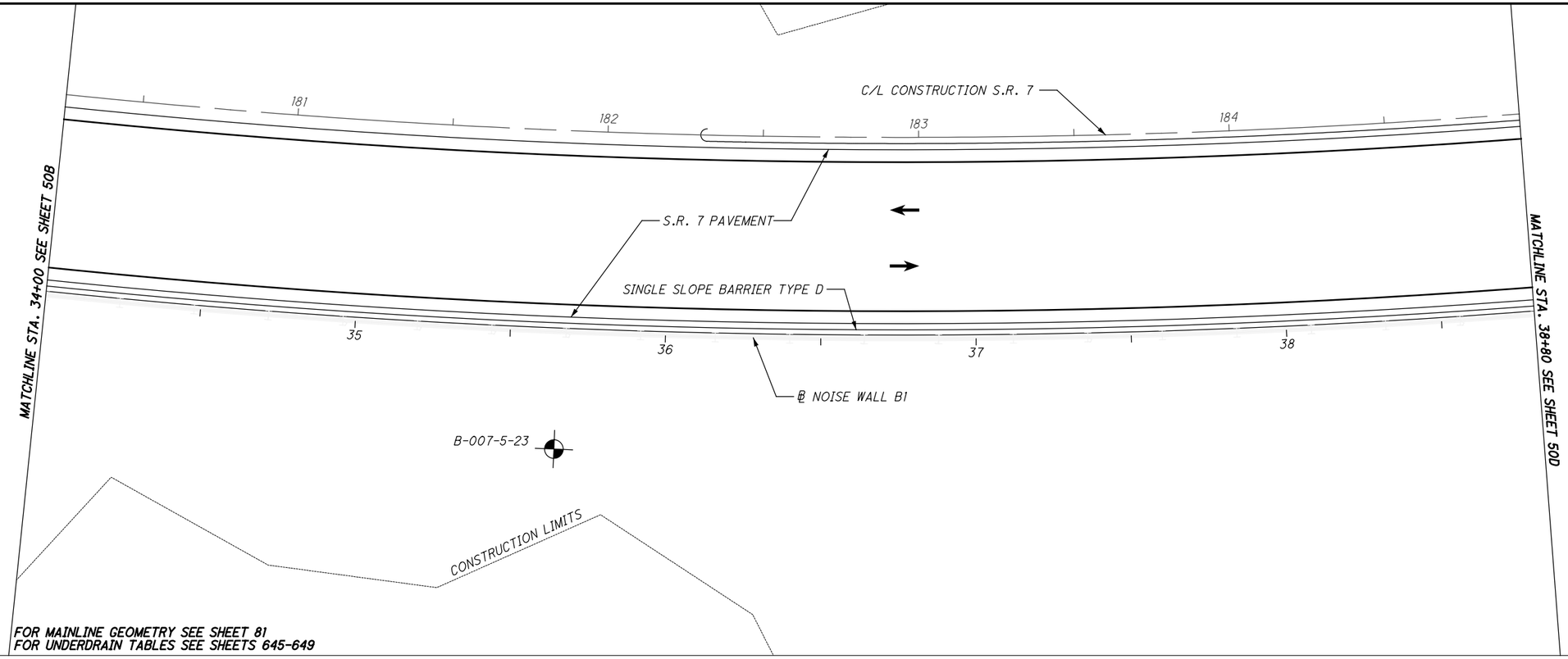
29+20 30+20 31+20 32+20 33+20 34+00

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL B1 - STA. 29+20 TO 34+00

LAW-7-2.17

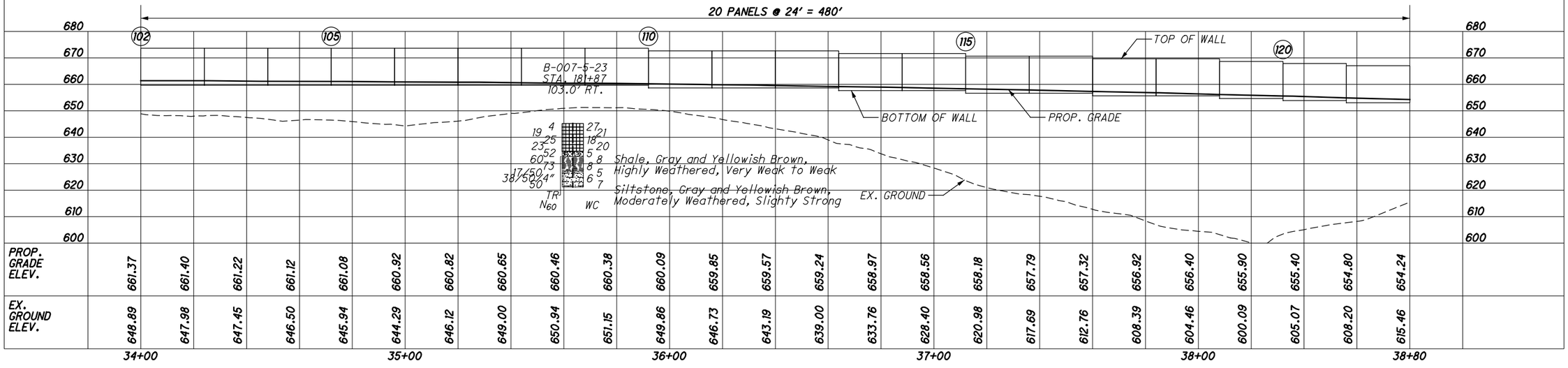
50B/206

1091B
1247



FOR MAINLINE GEOMETRY SEE SHEET 81
FOR UNDERDRAIN TABLES SEE SHEETS 645-649

PANEL NO.	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
TOP OF WALL ELEV.	673.67	673.67	673.67	673.67	673.67	673.67	673.67	673.67	672.67	672.67	672.67	671.67	671.67	670.67	670.67	669.67	669.67	668.67	667.87	667.07
BOTTOM OF WALL ELEV.	659.67	659.67	659.67	659.67	659.67	659.67	659.67	659.67	658.67	658.67	658.67	657.67	657.67	656.67	656.67	655.67	655.67	654.67	653.87	653.07
PROP. GRADE ELEV.	661.37	661.40	661.22	661.12	661.08	660.92	660.82	660.65	660.46	660.38	660.09	659.85	659.57	659.24	658.97	658.56	658.18	657.79	657.32	656.92	656.40	655.90	655.40	654.80	654.24
EX. GROUND ELEV.	648.89	647.98	647.45	646.50	645.94	644.29	646.12	649.00	650.94	651.15	649.86	646.73	643.19	639.00	633.76	628.40	620.98	617.69	612.76	608.39	604.46	600.09	605.07	608.20	615.46



34+00 35+00 36+00 37+00 38+00 38+80

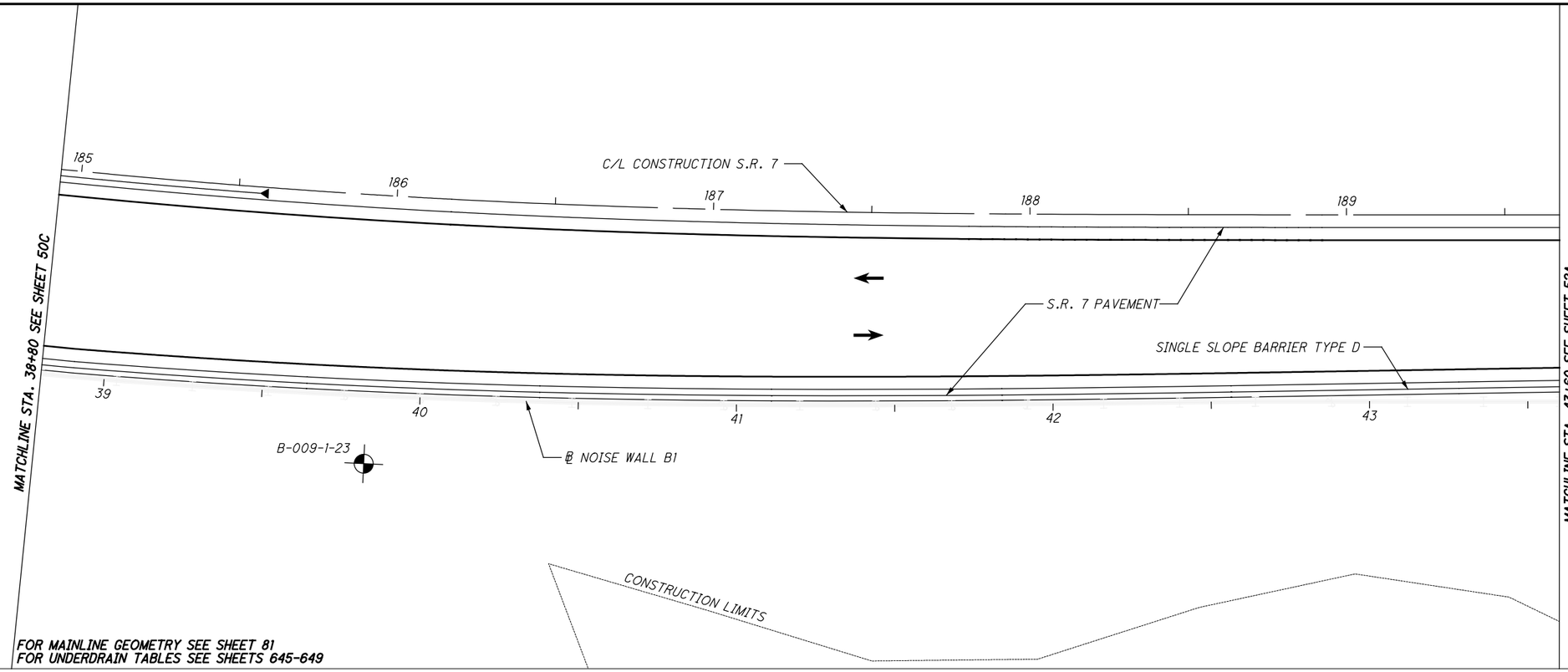
HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL B1 - STA. 34+00 TO 38+80

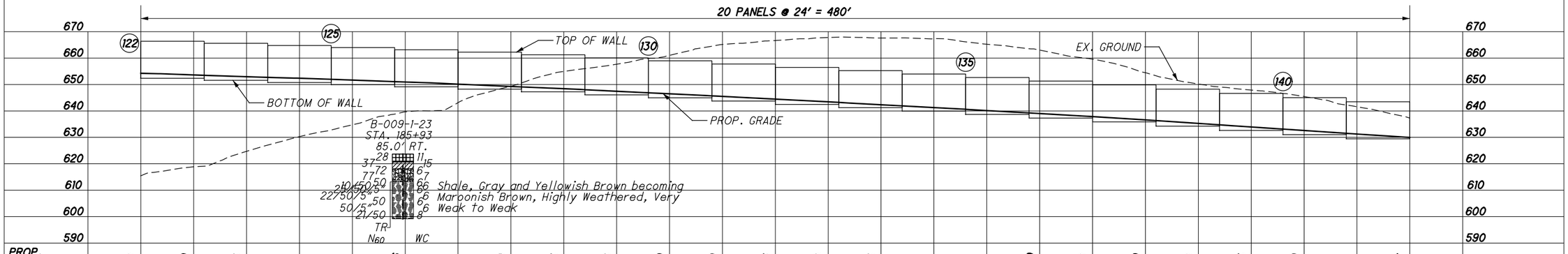
LAW-7-2.17

10910
1247



FOR MAINLINE GEOMETRY SEE SHEET 81
FOR UNDERDRAIN TABLES SEE SHEETS 645-649

TOP OF WALL ELEV.	666.37	665.57	664.77	663.97	663.17	662.27	661.27	660.07	658.97	657.77	656.47	655.27	653.97	652.67	651.29	649.84	648.25	646.64	645.03	643.47
BOTTOM OF WALL ELEV.	652.37	651.57	650.77	649.97	649.17	648.27	647.27	646.07	644.97	643.77	642.47	641.27	639.97	638.67	637.29	635.84	634.25	632.64	631.03	629.47
PANEL NO.	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141



PROP. GRADE ELEV.	654.24	653.60	652.95	652.41	651.67	650.96	650.16	649.29	648.45	647.46	646.50	645.50	644.46	643.44	642.35	641.26	640.15	639.00	637.84	636.60	635.28	633.95	632.60	631.26	629.97
EX. GROUND ELEV.	615.46	618.87	624.74	630.28	634.74	639.64	643.13	649.33	654.96	657.67	661.02	665.17	666.65	667.80	667.61	667.37	665.26	663.01	659.59	654.47	650.23	647.92	645.45	641.60	637.32

38+80 39+80 40+80 41+80 42+80 43+60

HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL B1 - STA. 38+80 TO 43+60

LAW-7-2.17

50D/206

1091D
1247

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For S.R. 7 Profile, See Sheet 52
For Noise Wall Plan/Profile, See Sheet 52A
For Low-7-3.70 Plan & Profile, See Sheet 53
For Low-7-3.76 Plan & Profile, See Sheet 54
For Low-7-3.87 Plan & Profile, See Sheet 55
For Lynn Lane Plan & Profile, See Sheet 135
For Cross Section 197+50, See Sheet 81
For Cross Section 202+50, See Sheet 82

1092 1247	51 206	LAW-7-2.17	SOIL PROFILE - ROADWAY STA. 187+00 - 212+00	DRAWN MSJ CHECKED EMK	0 100 50 200 HORIZONTAL SCALE IN FEET

SOIL PROFILE - ROADWAY
STA. 187+00 - 212+00

LAW-7-2.17

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

B16-315-0-99
STA. 195+61
℄

B2-316-0-99
STA. 198+8
22.2' RT.
Sod and/or Topsoil = 0.6"

B17-318-0-02
STA.205+83, 34.6' RT.
Sod and/or Topsoil = 0.6"

R-216-0-99
STA. 187+65
54.0' Lt.
EL. 673.3
TOP OF BEDROCK
SOFT TO MEDIUM-HARD YELLOW-BROWN SHALE
MEDIUM-HARD YELLOW-BROWN FINE TO MEDIUM GRAINED SANDSTONE
MEDIUM-HARD GRAY FINE TO MEDIUM GRAINED SANDSTONE
VERY-SOFT TO SOFT REDDISH-BROWN AND GRAY SHALE
VERY-SOFT TO SOFT REDDISH-BROWN BECOMING GRAY SHALE

R-217-0-99
STA 191+50
40.0' Lt.
EL. 619.3
TOPSOIL = 3 INCHES
TOP OF BEDROCK
VERY-SOFT BROWN-GRAY SHALE

R-218-0-99
STA 209+49
32.0' Rt.
EL. 573.8
TOPSOIL = 2 INCHES

PROPOSED PROFILE GRADE

EXISTING GROUNDLINE

645.31 635.18 629.24 623.24 617.24 611.26 605.72 600.79 596.48 592.79 589.71 587.24 585.39 584.15 583.53 583.52 584.13 585.35 587.19 589.64 592.70 596.38 600.68 605.58 611.09

663.72 670.26 668.86 660.41 648.82 638.10 639.75 633.26 624.00 617.23 601.87 591.94 583.05 571.46 575.25 572.34 564.90 564.33 562.35 558.55 552.44 546.25 543.61 542.06 540.49 533.35 524.77 524.77 532.11 531.01 532.94 534.49 535.20 534.68 534.77 537.49 558.02 564.71 564.92 565.67 566.47 567.78 569.46 571.00 573.24 574.67 577.31 581.90 591.64 603.51

187+00 188+00 189+00 190+00 191+00 192+00 193+00 194+00 195+00 196+00 197+00 198+00 199+00 200+00 201+00 202+00 203+00 204+00 205+00 206+00 207+00 208+00 209+00 210+00 211+00 212+00

490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670

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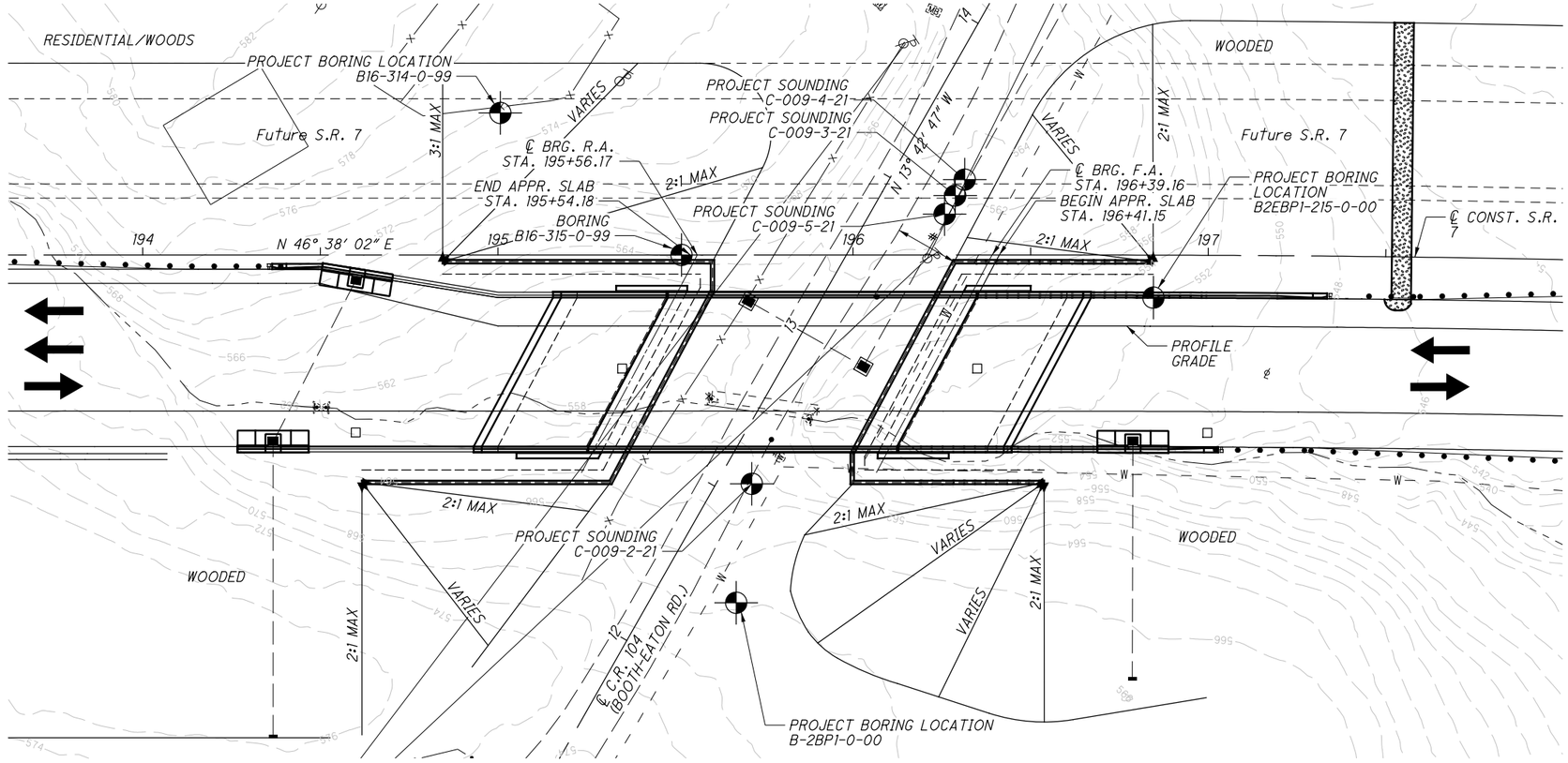
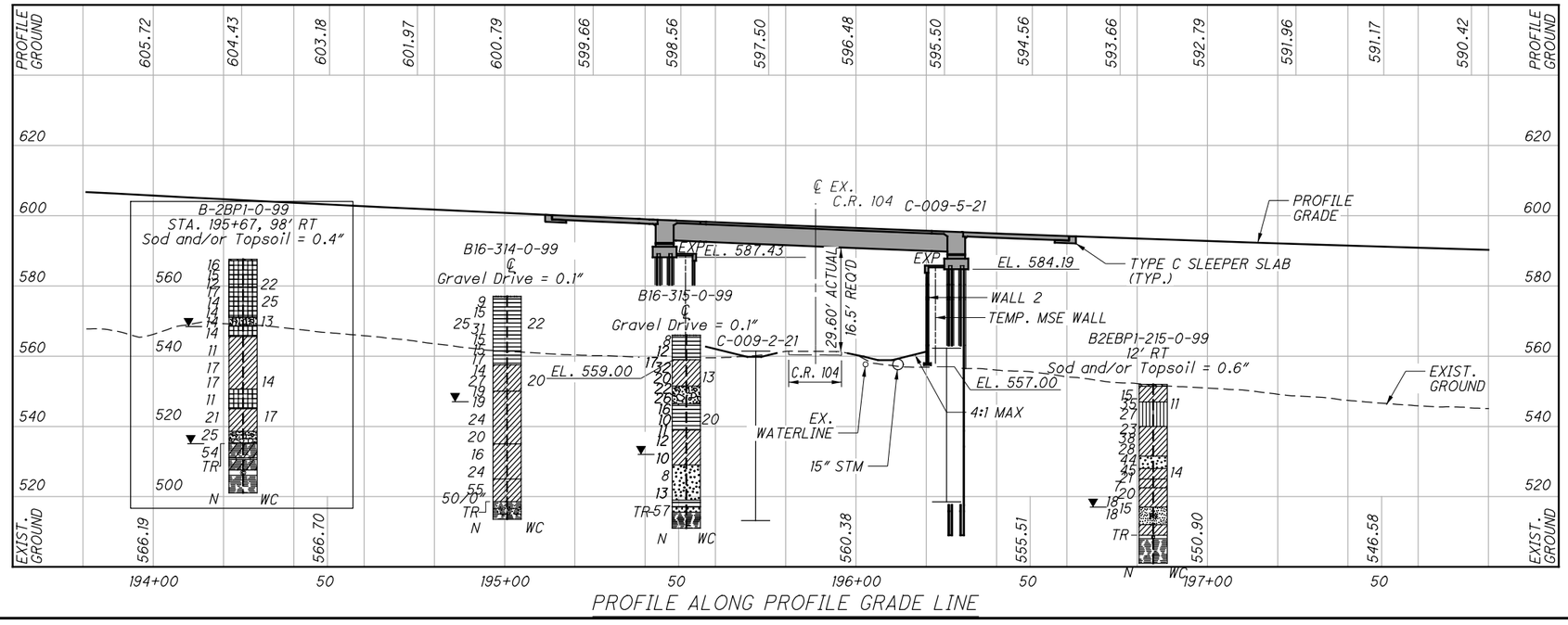
BRIDGE NO. B-16



PLAN



PROFILE ALONG PROFILE GRADE LINE

HORIZONTAL SCALE IN FEET
0 10 20 40

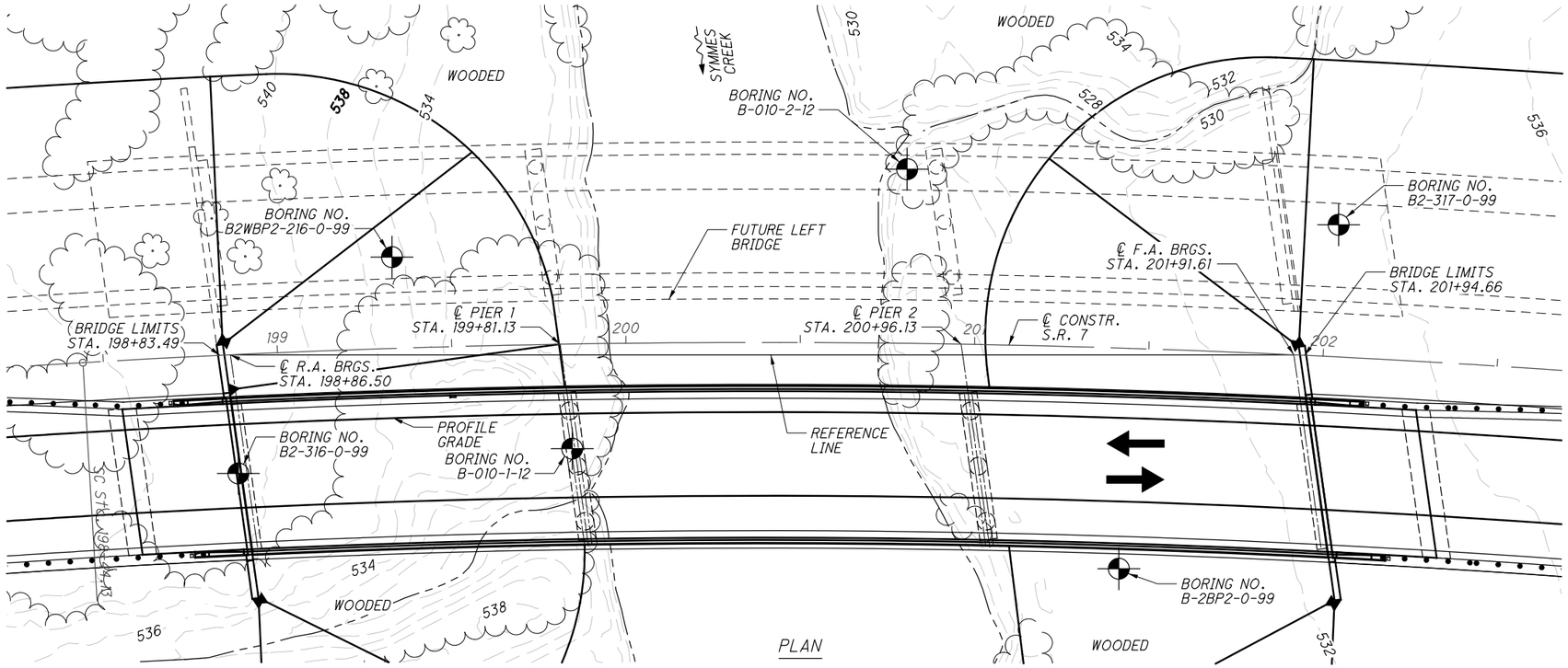
DESIGNED MSJ
CHECKED EMK

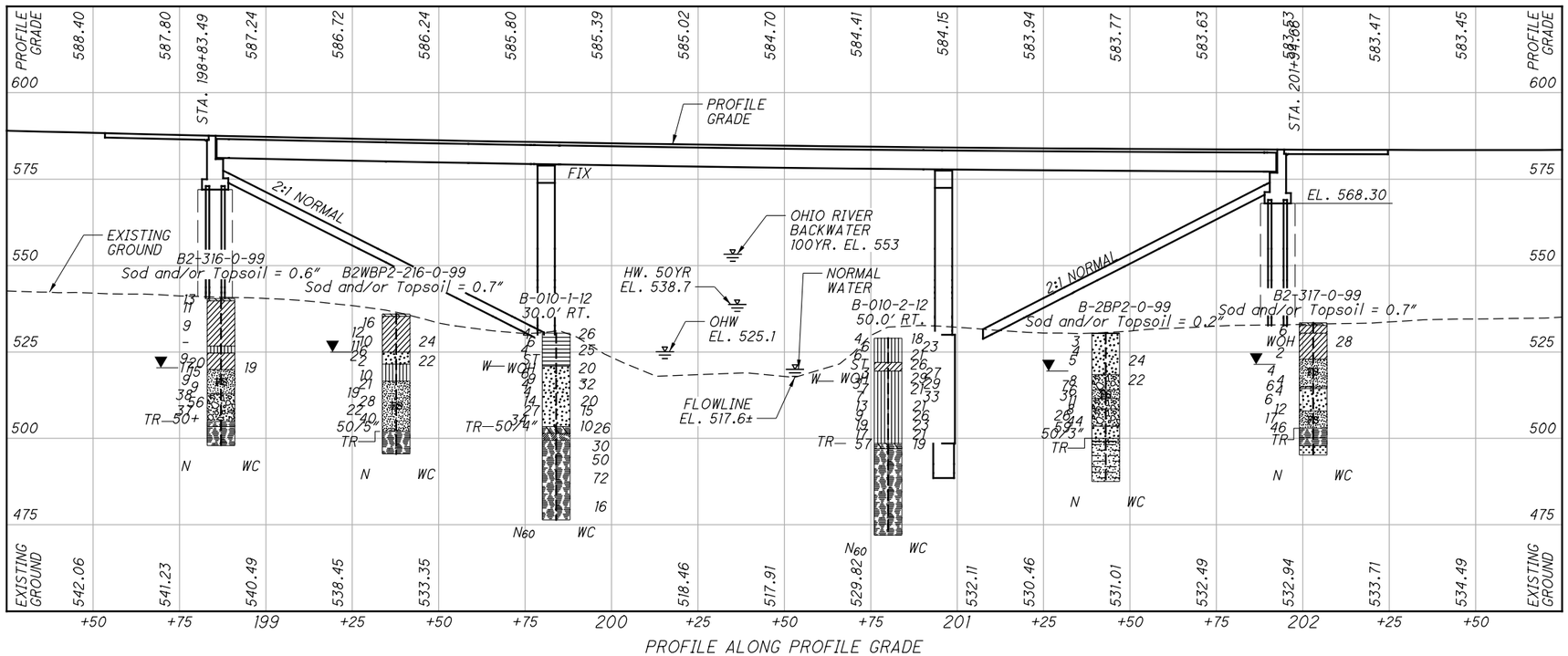
STRUCTURE FOUNDATION EXPLORATION
BRIDGE NO. LAW-7-0370
S.R. 7 OVER COUNTY ROAD 104 (BOOTHE EATON ROAD)

LAW-7-2.17

53/206

1094
1247





STRUCTURE FOUNDATION EXPLORATION
LAW-7-3.76
S.R. 7 OVER SYMMES CREEK

HORIZONTAL SCALE IN FEET
0 12.5 25 50

DRAWN MSJ
CHECKED EMK

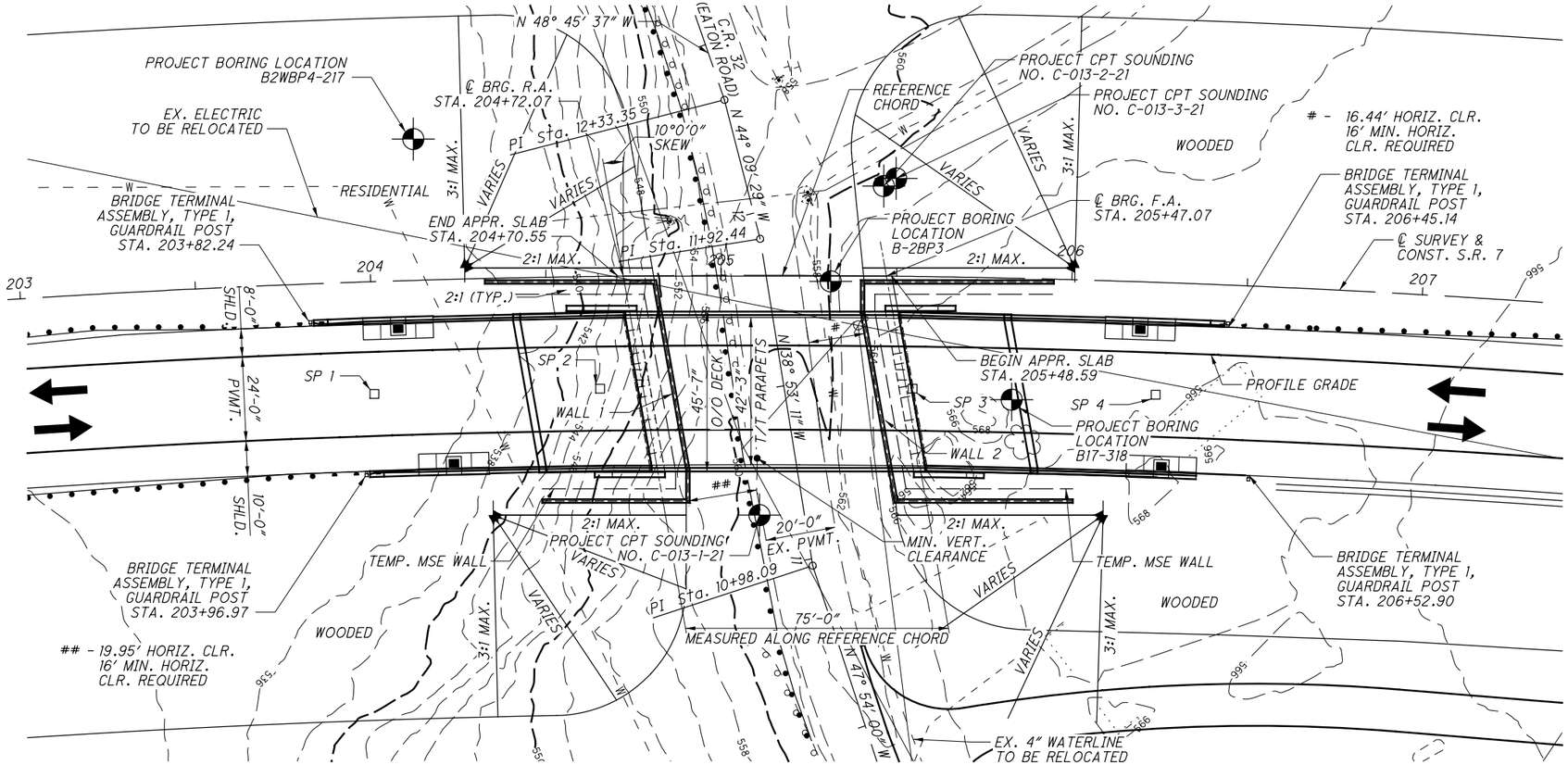
LAW-7-2.17

54/206

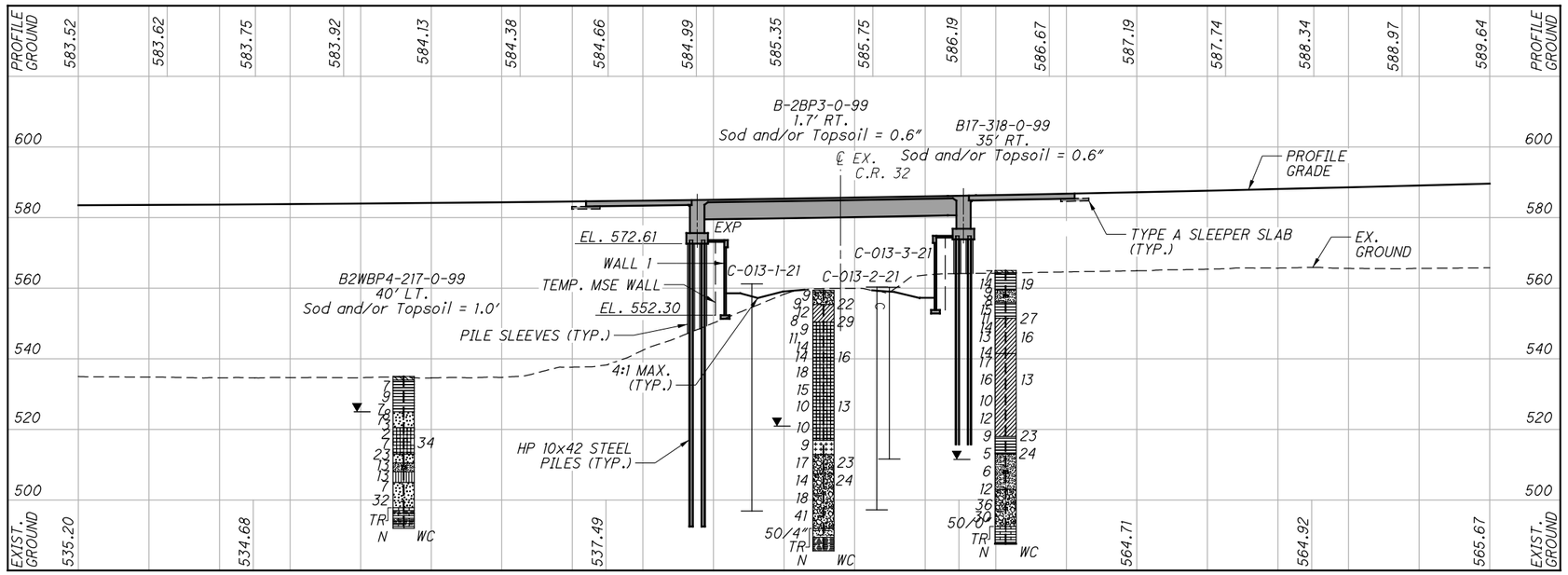
1095/1247

H:\173608714\LAW\75923\geotechnical\sheets\LAW-7-03.76\759237B001.dgn 7/23/2024 12:43:38 PM MJennings

BRIDGE NO. B-17



PLAN



PROFILE ALONG PROFILE GRADE LINE

STRUCTURE FOUNDATION EXPLORATION
BRIDGE NO. LAW-7-3.87
S.R. 7 OVER C.R. 32 (EATON ROAD)

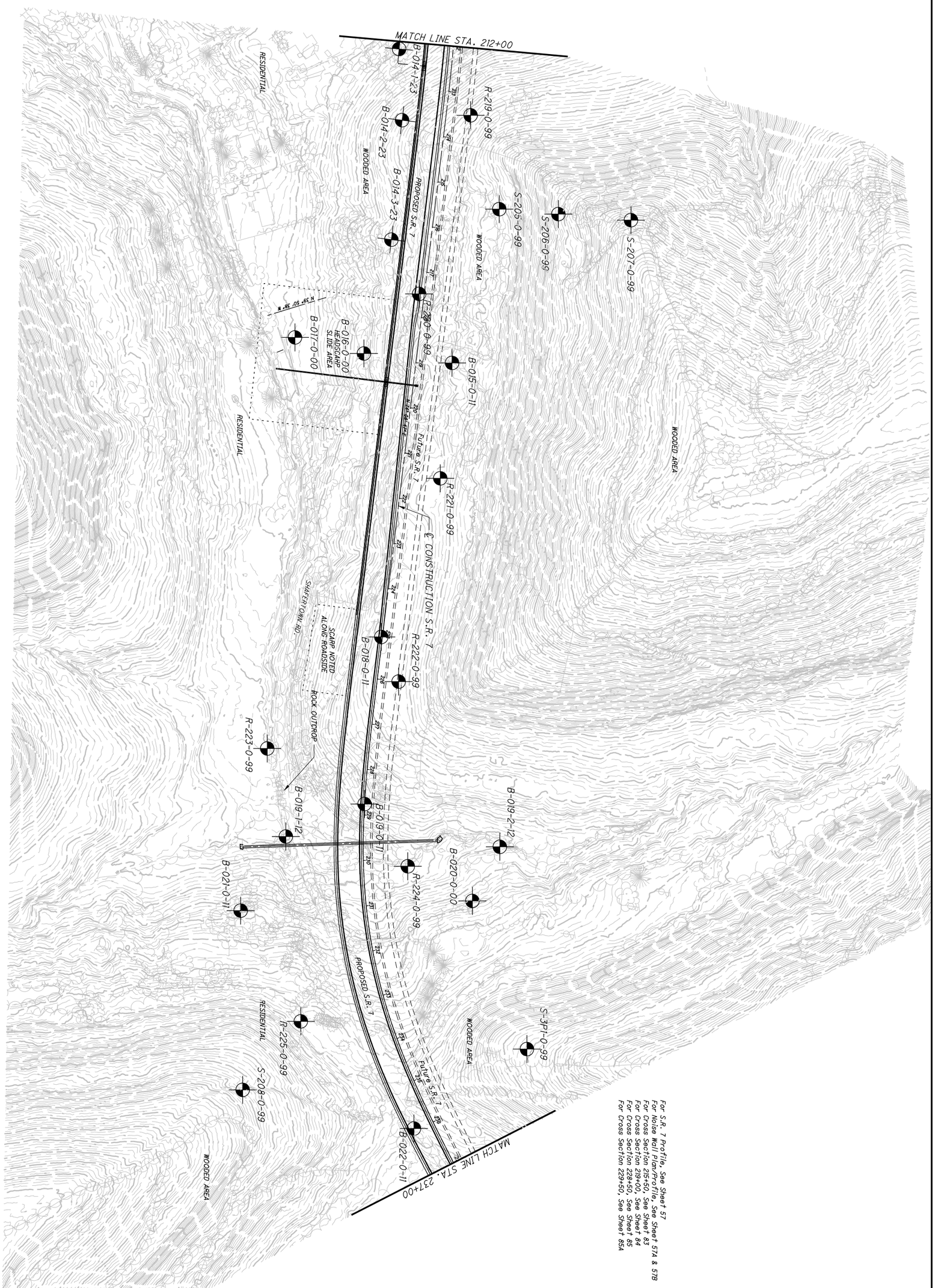
HORIZONTAL SCALE IN FEET
0 10 20 40

DESIGNED MSJ
CHECKED EMK

LAW-7-2.17

55 / 206

1096
1247



For S.R. 7 Profile, See Sheet 57
For Noise Wall Plan/Profile, See Sheet 57A & 57B
For Cross Section 215+50, See Sheet 83
For Cross Section 219+00, See Sheet 84
For Cross Section 228+50, See Sheet 85
For Cross Section 229+50, See Sheet 85A

1097 / 1247	56 / 206	LAW-7-2.17	SOIL PROFILE - ROADWAY STA. 212+00 - 237+00	DRAWN MSJ CHECKED EMK	0 100 50 200 HORIZONTAL SCALE IN FEET

611.09 616.73 622.11 627.19 631.97 636.46 640.65 644.54 648.14 651.43 654.43 657.13 659.54 661.64 663.45 664.96 666.17 667.09 667.71 668.03 668.05 667.78 667.21 666.34 665.17 663.71

720 710 700 690 680 670 660 650 640 630 620 610 600 590 580 570 560

PROPOSED PROFILE GRADE

EXISTING GROUNDLINE

R-219-0-99
STA 213+46
53.4' Lt.
TOPSOIL = 4 INCHES
EL. 654.4
TOP OF BEDROCK
VERY-SOFT REDDISH-BROWN SHALE
SOFT LIGHT-BROWN SILTSTONE
MEDIUM-HARD LIGHT-GRAY LIMESTONE
MEDIUM-HARD LIGHT-GRAY SILTSTONE INTERBEDDED WITH SANDSTONE
SOFT GRAY AND BROWN SILTSTONE INTERBEDDED WITH SHALE
N

R-220-0-99
STA 217+49
11.3' Rt.
TOPSOIL = 3 INCHES
EL. 632.4
TOP OF BEDROCK
SOFT LIGHT-BROWN SILTSTONE
MEDIUM-HARD LIGHT-BROWN AND GRAY LIMESTONE
MEDIUM-HARD LIGHT-GRAY SILTSTONE
N WC

R-221-0-99
STA 221+45
84.0' Lt.
TOPSOIL = 4 INCHES
EL. 662.9
N WC

B-018-0-11
3.0' RT.
ST
TR-50+
N_{60}
Weathered Shale
WC(Augered)

B-019-0-11
C
Sod and/or Topsoil = 0.5'
ST
TR
N_{60} WC

R-222-0-99
STA 226+00
47.3' Lt.
TOPSOIL = 4 INCHES
EL. 655.0
N

R-223-0-99
STA 227+80.1
222.6' Rt.
TOPSOIL = 2 INCHES
EL. 591.3
TOP OF BEDROCK
SOFT TO MEDIUM-HARD YELLOW-BROWN ARENACEOUS SHALE
N WC

STA. 229+61.63
℄ 60" TYPE A
= 606.24

Weathered Shale
(Augered)

R-225-0-99
STA. 233+06.3
189.3' Rt.
TOPSOIL = 5 INCHES
EL. 674.0
TOP OF BEDROCK
VERY-SOFT REDDISH-BROWN AND GRAY-BROWN SHALE
N

B-022-0-11
44.0' RT.
Sod and/or Topsoil = 0.5'
N_{60} WC

B-019-1-11
STA. 229+50
170' RT.
W
TR
11/50/2"
N_{60} WC
Weathered Shale (Augered)
Shale, Gray, Slightly To Moderately Weathered, Weak To Slightly Strong, Laminated
Sandstone, Gray, Unweathered, Very Strong, Fine Grained, Thick To Very Thick Bedded

603.51 616.08 628.76 641.51 649.09 651.49 648.87 648.31 646.51 645.17 644.53 641.23 643.22 642.13 642.14 637.04 641.68 644.58 645.82 647.16 650.09 649.04 649.87 649.67 652.34 652.65 653.34 653.98 654.42 653.57 648.30 643.47 635.61 625.85 619.14 601.64 603.25 609.53 616.67 622.44 638.79 640.94 648.54 655.83 661.52 669.07 681.48 680.00 677.47 672.26 668.53

212+00 213+00 214+00 215+00 216+00 217+00 218+00 219+00 220+00 221+00 222+00 223+00 224+00 225+00 226+00 227+00 228+00 229+00 230+00 231+00 232+00 233+00 234+00 235+00 236+00 237+00

0 50 100 200 HORIZONTAL SCALE IN FEET

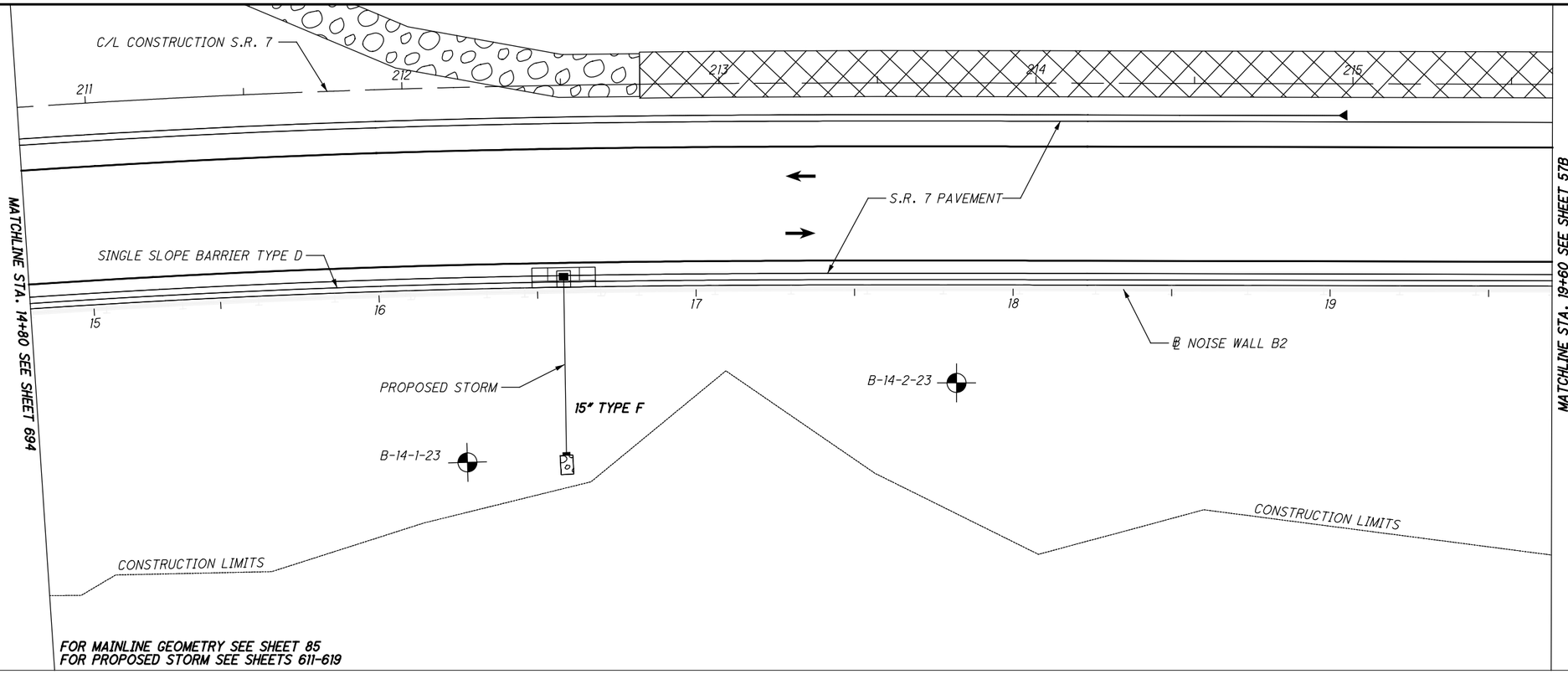
DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STA. 212+00 - 237+00

LAW-7-2.17

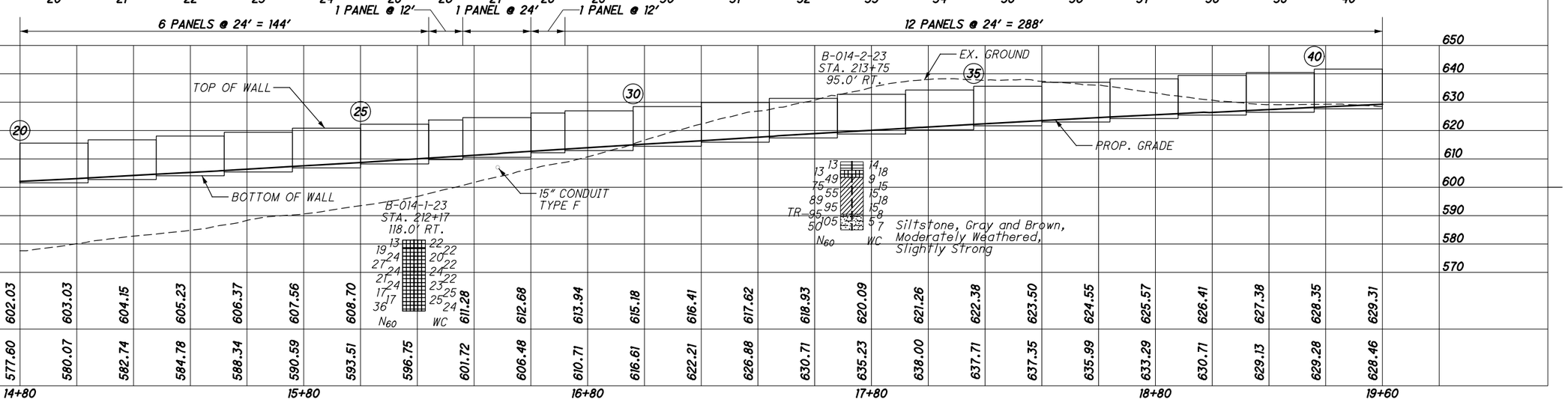
57 / 206

1098
1247



FOR MAINLINE GEOMETRY SEE SHEET 85
FOR PROPOSED STORM SEE SHEETS 611-619

TOP OF WALL ELEV.	615.53	616.73	618.03	619.39	620.82	622.21	623.72	624.53	626.18	626.94	628.44	629.91	631.37	632.81	634.30	635.65	637.00	638.25	639.48	640.48	641.66
BOTTOM OF WALL ELEV.	601.53	602.73	604.03	605.39	606.82	608.21	609.72	610.53	612.18	612.94	614.44	615.91	617.37	618.81	620.30	621.65	623.00	624.25	625.48	626.48	627.66
PANEL NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40



PROP. GRADE ELEV.	602.03	603.03	604.15	605.23	606.37	607.56	608.70	611.28	612.68	613.94	615.18	616.41	617.62	618.93	620.09	621.26	622.38	623.50	624.55	625.57	626.41	627.38	628.35	629.31
EX. GROUND ELEV.	577.60	580.07	582.74	584.78	588.34	590.59	593.51	596.75	601.72	606.48	610.71	616.61	622.21	626.88	630.71	635.23	638.00	637.71	637.35	635.99	633.29	630.71	629.13	629.28	628.46

14+80 15+80 16+80 17+80 18+80 19+60

HORIZONTAL SCALE IN FEET
0 10 20 40

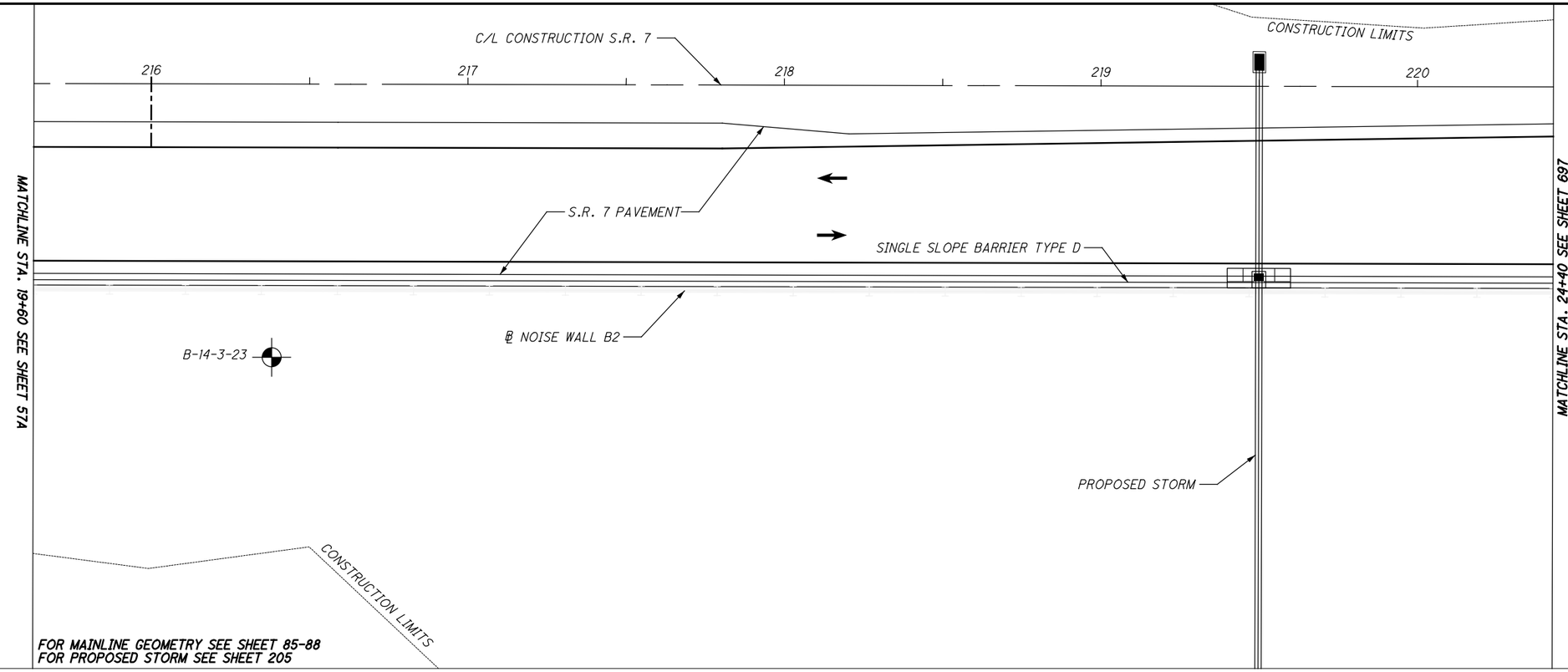
DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL B2 - STA. 14+80 TO 19+60

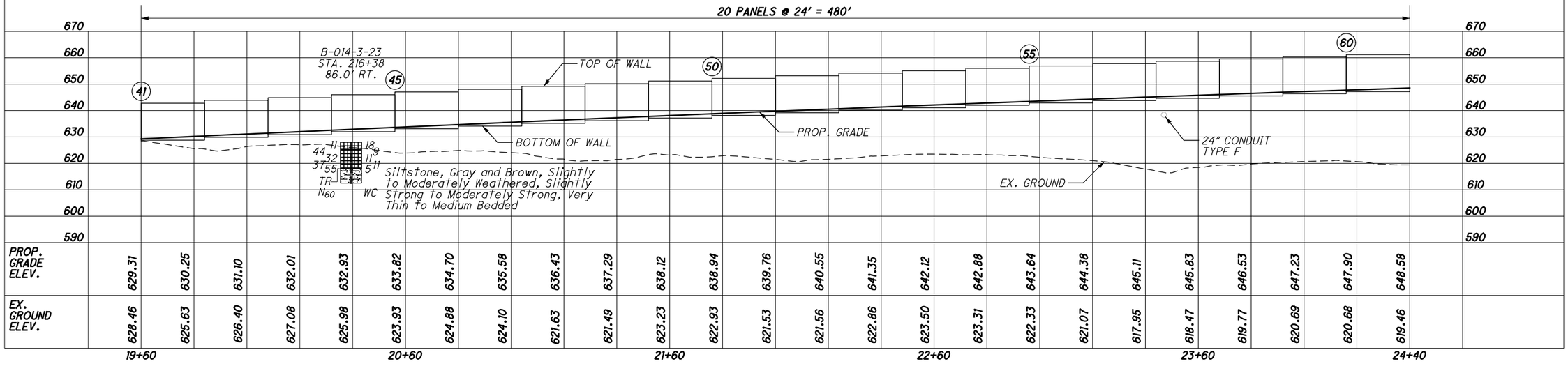
LAW-7-2.17

57A/206

1098A
1247



TOP OF WALL ELEV.	642.81	643.91	644.91	646.01	647.11	648.11	649.21	650.21	651.21	652.21	653.21	654.21	655.11	656.01	656.91	657.81	658.71	659.61	660.41	661.21
BOTTOM OF WALL ELEV.	628.81	629.91	630.91	632.01	633.11	634.11	635.21	636.21	637.21	638.21	639.21	640.21	641.11	642.01	642.91	643.81	644.71	645.61	646.41	647.21
PANEL NO.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60



PROP. GRADE ELEV.	629.31	630.25	631.10	632.01	632.93	633.82	634.70	635.58	636.43	637.29	638.12	638.94	639.76	640.55	641.35	642.12	642.88	643.64	644.38	645.11	645.83	646.53	647.23	647.90	648.58
EX. GROUND ELEV.	628.46	625.63	626.40	627.08	625.98	623.93	624.88	624.10	621.63	621.49	623.23	622.93	621.53	621.56	622.86	623.50	623.31	622.33	621.07	617.95	618.47	619.77	620.69	620.68	619.46

19+60 20+60 21+60 22+60 23+60 24+40

HORIZONTAL SCALE IN FEET
0 10 20 40

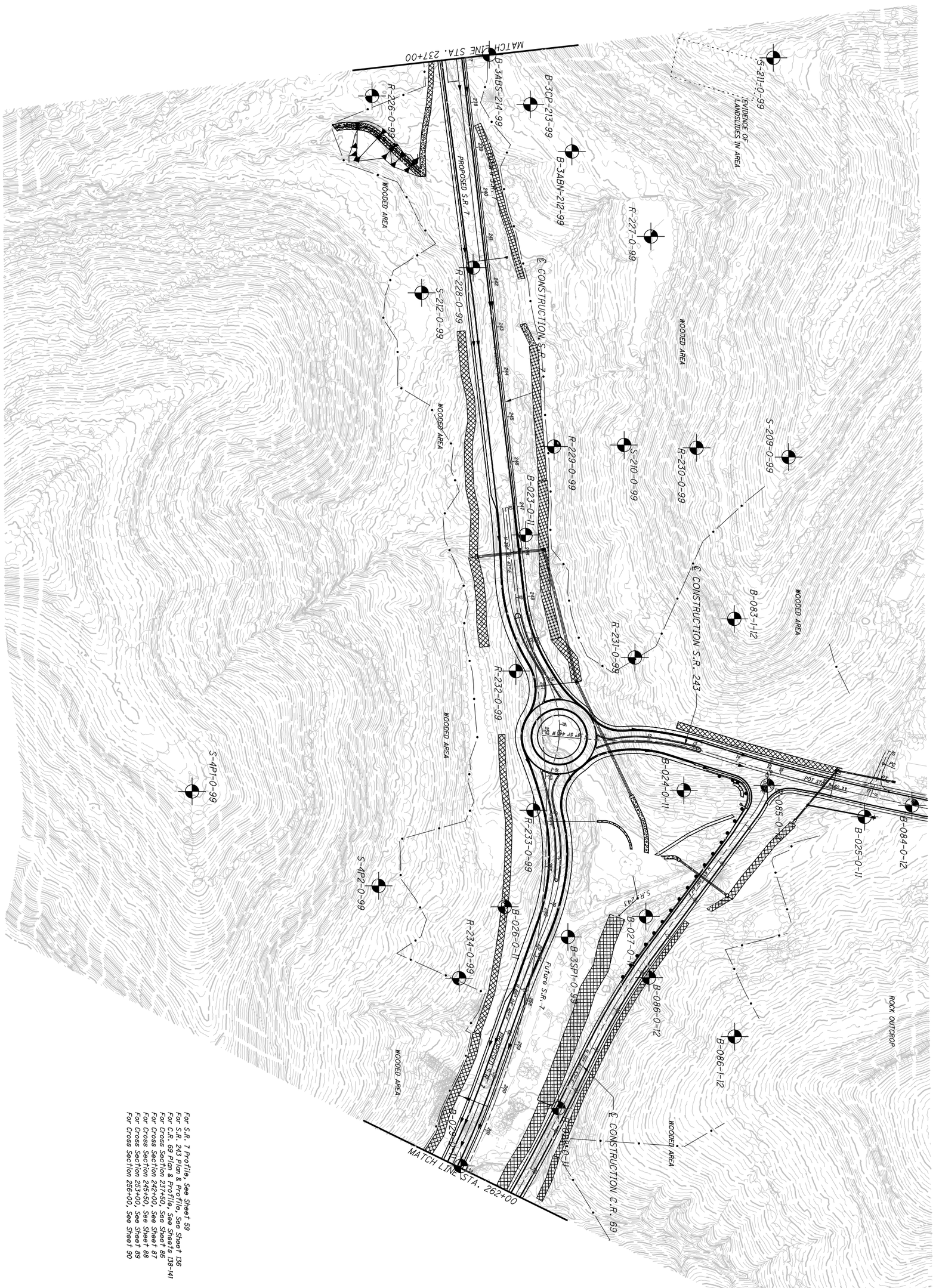
DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL B2 - STA. 19+60 TO 24+40

LAW-7-2.17

57B/206

1098B
1247



For S.R. 7 Profile, See Sheet 59
For S.R. 243 Plan & Profile, See Sheet 126
For C.R. 69 Plan & Profile, See Sheets 138-141
For Cross Section 237+50, See Sheet 86
For Cross Section 242+00, See Sheet 87
For Cross Section 245+50, See Sheet 88
For Cross Section 253+00, See Sheet 89
For Cross Section 256+00, See Sheet 90

1099 / 1247	58 / 206	LAW-7-2.17	SOIL PROFILE - ROADWAY STA. 237+00 - 262+00	DRAWN MSJ CHECKED EMK	0 100 50 200 HORIZONTAL SCALE IN FEET

SOIL PROFILE- ROADWAY
STATION 237+00 - 262+00

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

LAW-7-2.17

59/206

1100/1247

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663.71 661.94 659.88 657.53 654.87 651.92 648.71 645.46 642.21 638.96 635.71 632.46 629.21 625.96 622.71 619.46 616.21 612.96 609.71 606.46 603.21 599.96 596.71 593.46 590.21 586.96

700 690 680 670 660 650 640 630 620 610 600 590 580 570 560 550 540

R-226-0-99
STA. 237+61.5
215.0' Rt.
EL. 661.1

EXISTING GROUNDLINE

PROPOSED PROFILE GRADE

R-228-0-99
STA. 241+64
36.0' Rt.
EL. 639.1

TOP OF BEDROCK
VERY-SOFT TO SOFT YELLOW-BROWN AND GRAY SHALE INTERBEDDED WITH SANDSTONE
VERY-SOFT TO SOFT GREENISH-GRAY SHALE
MEDIUM-HARD GRAY FINE TO MEDIUM GRAINED SANDSTONE

R-229-0-99
STA. 245+77
96.0' Lt.
EL. 623.9
TOPSOIL = 4 INCHES

B-023-0-11
12.0' LT.

Weathered Shale (Augered)

R-232-0-99
STA 250+61
44.0' Rt.
EL. 597.1
ASPHALT = 5 INCHES
GRANULAR BASE = 7 INCHES

TOP OF BEDROCK
MEDIUM-HARD BLUE-GRAY ARENACEOUS SHALE

R-233-0-99
STA. 253+75
29.0' Rt.
EL. 610.3
TOPSOIL = 6 INCHES

Siltstone, Gray, Slightly Weathered, Strong, Thin Bedded, Arenaceous, Iron Staining

B-026-0-11
82.0' RT.

R-234-0-99
STA. 257+84
155.0' Rt.
EL. 617.0

TOP OF BEDROCK
VERY-SOFT TO SOFT GRAY SHALE
SOFT TO MEDIUM-HARD BLUE-GRAY SHALE INTERBEDDED WITH MEDIUM-HARD SANDSTONE

B-029-0-11
14.0' RT.
Asphalt/Pavement = 0.8'
Aggregate Base = 0.8'

668.53 662.43 659.27 656.26 651.89 646.81 640.17 633.04 630.76 628.06 635.68 632.78 631.20 625.95 625.87 626.10 623.07 619.96 616.81 613.59 610.76 610.04 609.49 607.92 604.75 602.46 596.24 597.77 592.58 594.38 587.03 594.93 596.85 602.59 608.39 611.03 599.15 591.58 587.88 587.34 585.48 581.76 580.33 578.21 576.57 571.49 570.70 569.76 568.26 566.50 564.87

237+00 238+00 239+00 240+00 241+00 242+00 243+00 244+00 245+00 246+00 247+00 248+00 249+00 250+00 251+00 252+00 253+00 254+00 255+00 256+00 257+00 258+00 259+00 260+00 261+00 262+00

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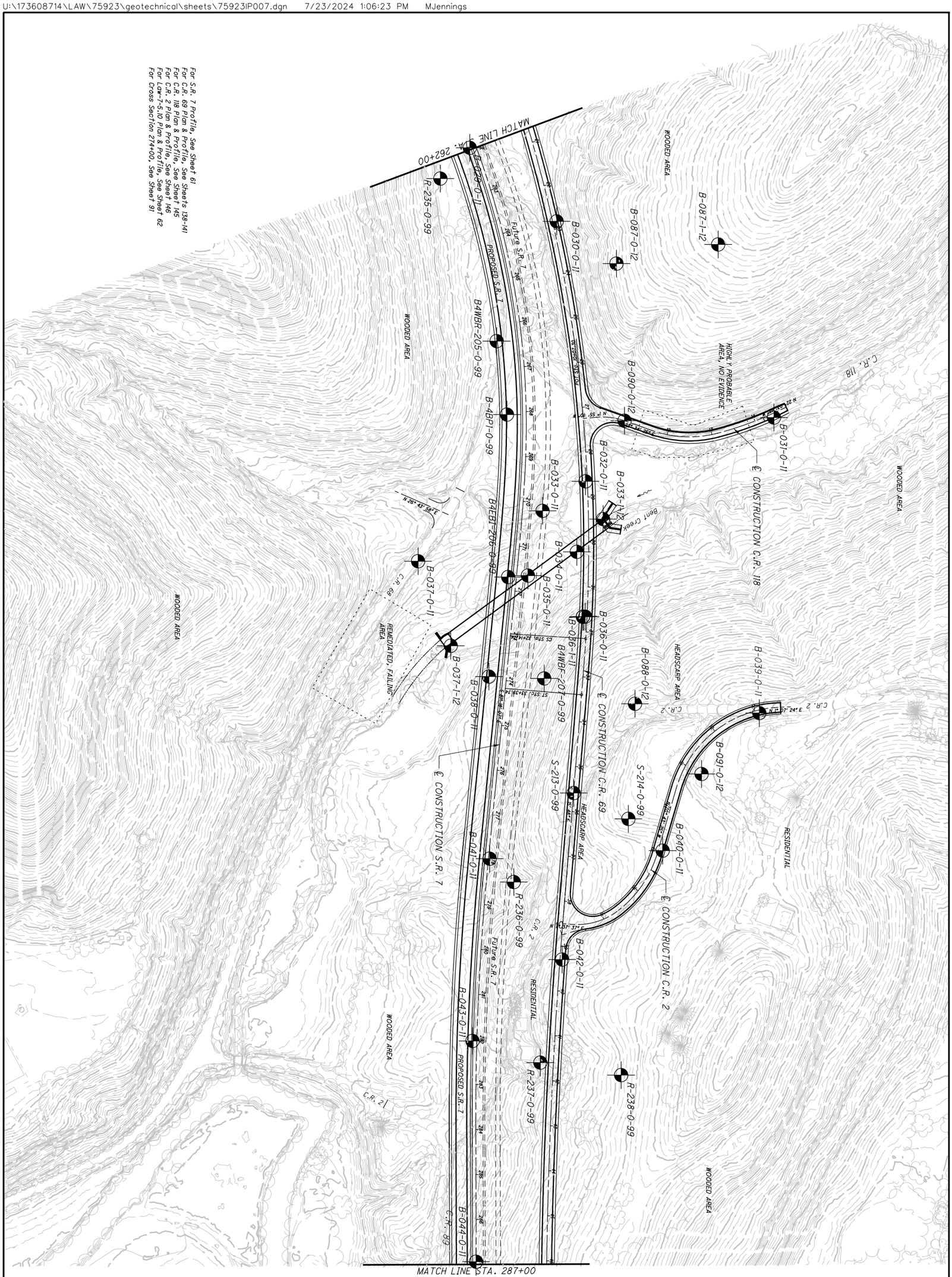


110 / 1247	60 / 206	LAW-7-2.17	SOIL PROFILE - ROADWAY STA. 262+00 - 287+00	DRAWN MSJ CHECKED EMK	0 100 50 200 HORIZONTAL SCALE IN FEET	N

B4EBI-206-0-99
STA. 271+70.4
18.0' RT.

Medium-Hard Gray And Brown Siltstone, NearlyHorizontally Bedded, Few Horizontal Fractures (Visual)

Very-Soft to Soft Gray Shale, Nearly Horizontally Bedded, Fragmental Sturcture, Many Fractures (Visual)

B-035-0-11
STA. 271+63
25.0' LT.
(BEDROCK DESCRIPTIONS)

Shale, Gray, Severely Weathered (Augered)
Shale, Gray To Gray-Brown, Slightly Weathered, Slightly To Moderately Strong, Laminated, Friable
Sandstone, Gray, Slightly Weathered, Strong, Thin Bedded
Shale, Gray To Gray-Brown, Slightly Weathered, Slightly To Moderately Strong, Laminated, Friable, Slickensides

B-037-0-11
STA. 271+55, 221.0' RT.
Asphalt/Pavement= 1.2'

R-236-0-99
STA. 278+44
60.7' Lt.
ASPHALT = 8 INCHES
GRANULAR BASE = 6 INCHES
EL. 582.8

TOP OF BEDROCK
SOFT YELLOW-BROWN SHALE
SOFT TO MEDIUM-HARD GRAY SHALE
VERY-SOFT DARK-GRAY SHALE INTERBEDDED WITH CARBONACEOUS SHALE
VERY-SOFT TO SOFT GRAY SHALE
SOFT TO MEDIUM-HARD GRAY SHALE INTERBEDDED WITH MEDIUM-HARD SANDSTONE

PROPOSED PROFILE GRADE

B-044-0-11

B-043-0-11
10.0' RT.

B-041-0-11
3.0' LT.

R-235-0-99
STA. 262+39
98.0' Rt.
EL. 575.8

TOP OF BEDROCK
VERY SOFT TO SOFT GRAY SHALE

EXISTING GROUNDLINE

B-035-0-11
STA. 271+63
25.0' LT.

B-033-0-11
44.0' LT.

B-038-0-11
39.0' RT.

Weathered Sandstone WC (Augered)

Shale, Brown, Severely Weathered (Augered)
Sandstone, Gray, Slightly To Moderately Weathered, Slightly To Moderately Strong, Laminated
Shale, Gray, Slightly To Moderately Weathered, Slightly To Moderately Strong, Laminated

13 Shale, Gray, Severely Weathered (Augered)

Shale, Gray, Moderately Weathered, Slightly Strong, Laminated, Slickensides

HORIZONTAL SCALE IN FEET
0 50 100 200

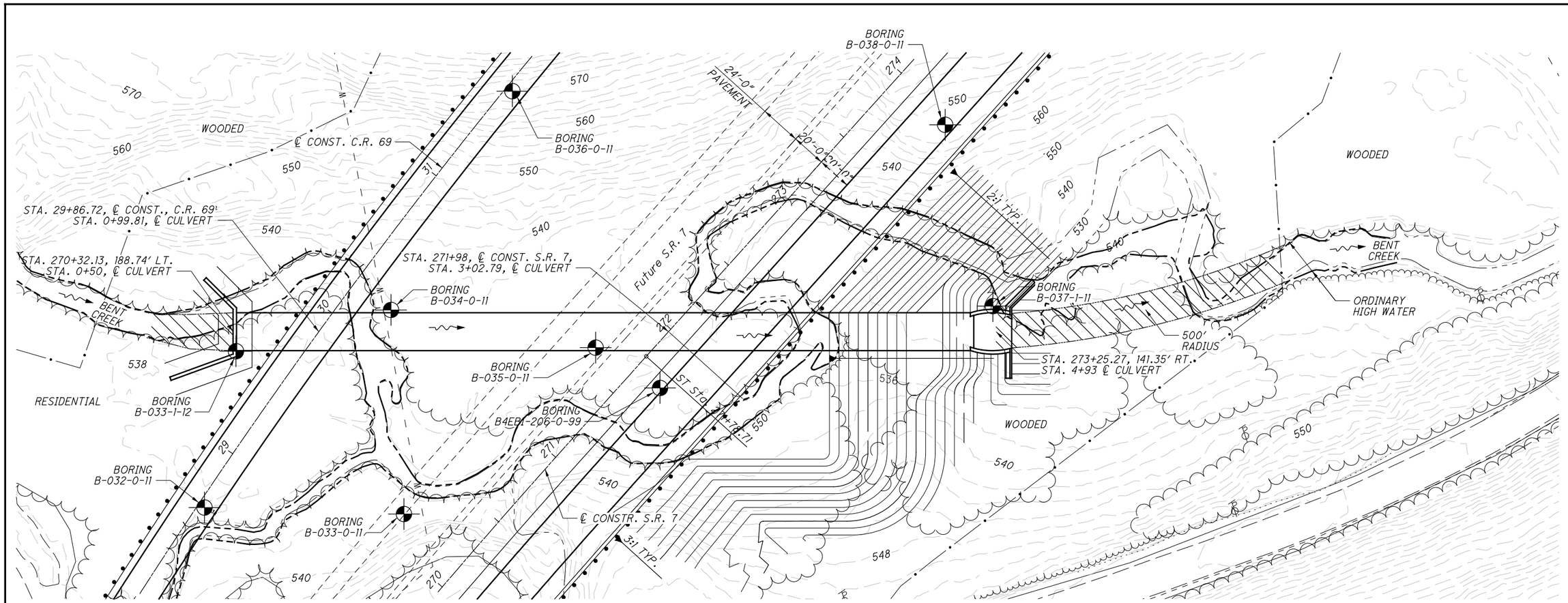
DRAWN MSJ
CHECKED EMK

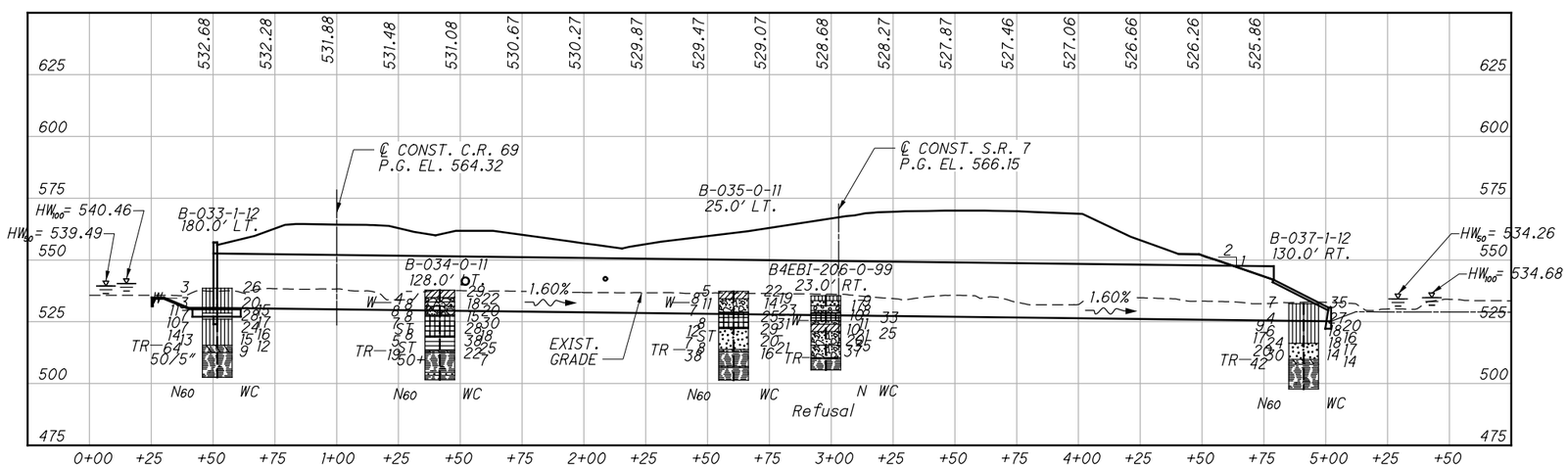
SOIL PROFILE- ROADWAY
STA. 262+00 - 287+00

LAW-7-2.17

61 / 206

1102
1247





PROFILE ALONG ℄ 22'ϕ MULTI-PLATE CULVERT

HORIZONTAL SCALE IN FEET
0 12.5 25 50

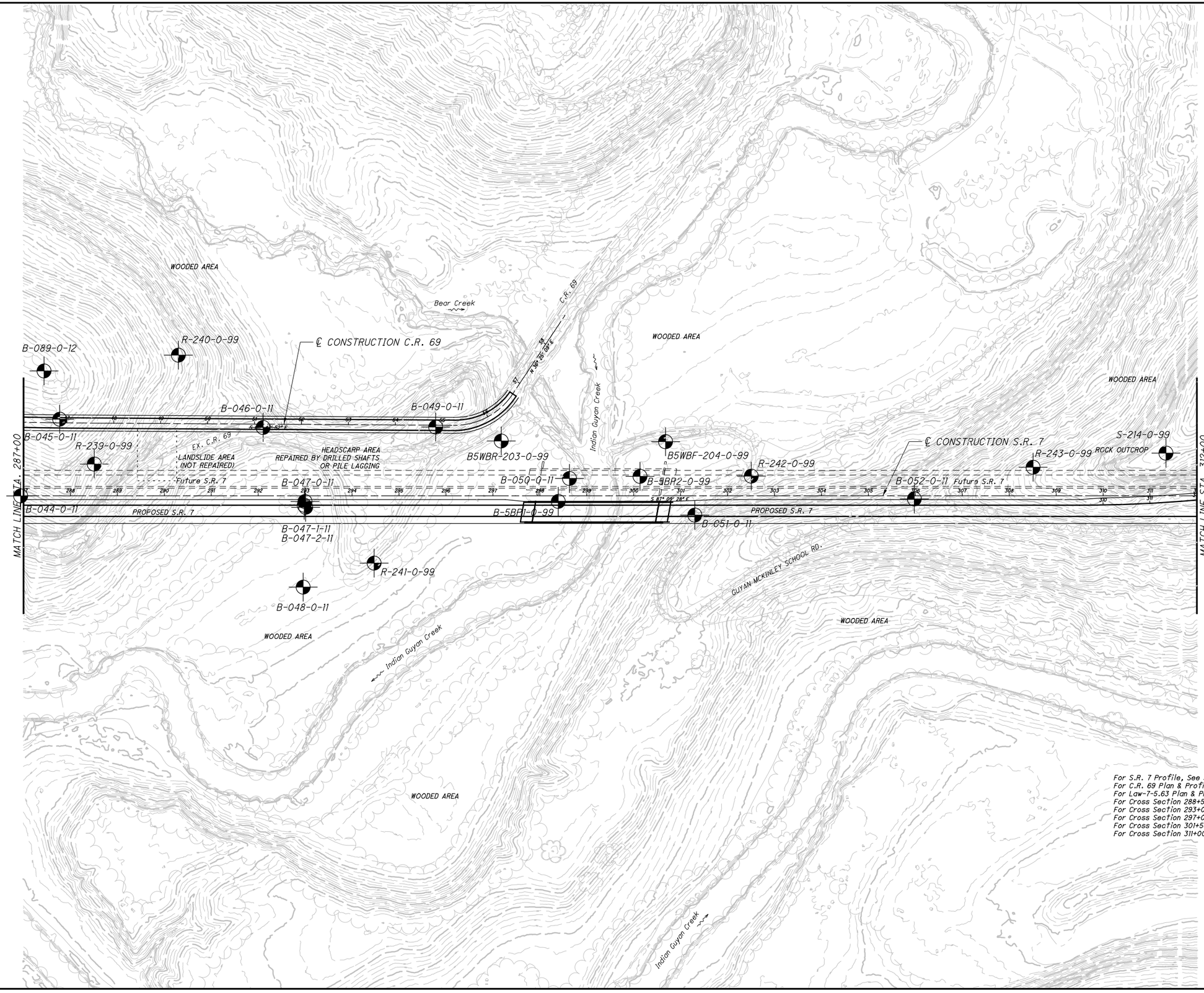
DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.10
22' DIA. CULVERT STA. 271+98

LAW-7-2.17

62/206

1103
1247



For S.R. 7 Profile, See Sheet 64
For C.R. 69 Plan & Profile, See Sheets 138-141
For Law-7-5.63 Plan & Profile, See Sheet 65
For Cross Section 288+50, See Sheet 92
For Cross Section 293+00, See Sheet 93
For Cross Section 297+00, See Sheet 94
For Cross Section 301+50, See Sheet 95
For Cross Section 311+00, See Sheet 96

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STA. 287+00 - 312+00

LAW-7-2.17

63/206

1104
1247

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SOIL PROFILE - ROADWAY
STA. 287+00 - 312+00

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

LAW-7-2.17

64 / 206

1105 / 1247

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R-239-0-99
STA. 288+50
67.7' Lt.
EL. 613.1

B-044-0-11
94.0' RT.

TOP OF BEDROCK
VERY-SOFT TO SOFT REDDISH-BROWN AND YELLOW-BROWN SHALE
SOFT TO MEDIUM-HARD GRAY AND YELLOW-BROWN SHALE INTERBEDDED WITH SANDSTONE
SOFT TO MEDIUM-HARD GRAY SHALE

WC N_{60}

PROPOSED PROFILE GRADE

EXISTING GROUNDLINE

R-241-0-99
STA. 294+46.9
143.4' Rt.
EL. 536.0
TOPSOIL = 7 INCHES

B-047-0-11
12.0' RT.

TR — 50+ N_{60} — Weathered Shale WC (Augered)

WC N

B-5BP1-0-99
12.0' RT.
Sod and/or Topsoil = 0.4'

B-5BP2-0-99
41' LT.
Sod and/or Topsoil = 0.4'

R-242-0-99
STA. 302+50
41.9' Lt.
EL. 541.7
TOPSOIL = 6 INCHES

TOP OF BEDROCK
VERY-SOFT TO SOFT GRAY SHALE

TR — Very Soft Red To Gray Shale, Nearly Horizontally Bedded, Partly Similar To Silty Clay (Visual)
Soft to Medium Hard Gray Shale, Nearly Horizontally Bedded, Many Fractures, Few Seams Of Red Shale (Visual)
Medium Hard To Hard Gray Siltstone, Nearly Horizontally Bedded, Few Diagonal Fractures With Iron Oxide Staining, Micaceous (Visual)
Medium Hard Gray Shale, Nearly Horizontally Bedded, Many Fractures, Few Seams Of Brown Shale (Visual)

N WC

Medium Hard Gray Shale, Nearly Horizontally Bedded, Many Directional Fractures (Visual)
Soft to Medium hard Green-Brown And Red Shale, Many Directional Fractures, Contains Slickensides (Visual)

B-050-0-11
STA. 298+63.1
37.0' LT.

TR — Weathered Shale (Augered)
Mudstone, Brown and Gray, Moderately Weathered, Weak to Slightly Strong, Thick Bedded, Slickensides

N_{60} WC

298+00 299+00

R-243-0-99
STA. 308+50
60.8' Lt.
EL. 638.8

TOP OF BEDROCK
VERY-SOFT TO SOFT GRAY SHALE
VERY-SOFT TO SOFT REDDISH-BROWN SHALE
MEDIUM-HARD LIGHT-BROWN FINE TO MEDIUM GRAINED SANDSTONE
MEDIUM-HARD YELLOW-BROWN SHALE
VERY-SOFT TO SOFT REDDISH-BROWN BECOMING YELLOW-BROWN SHALE

B-052-0-11
7.0' RT.

TR — Shale, Brown, Severely Weathered (Augered)
Siltstone, Light Brown, Moderately To Highly Weathered, Moderately Strong, Thin Bedded, Arenaceous, Highly Fractured
Mudstone, Red, Moderately Weathered, Weak, Thin To Medium Bedded
Siltstone, Light Brown, Slightly To Moderately Weathered, Moderately Strong to Strong, Thin Bedded, Arenaceous, Fractured
Shale, Light Brown Grading To Gray, Slightly Weathered, Moderately Strong, Laminated, Iron Staining

N_{60} WC

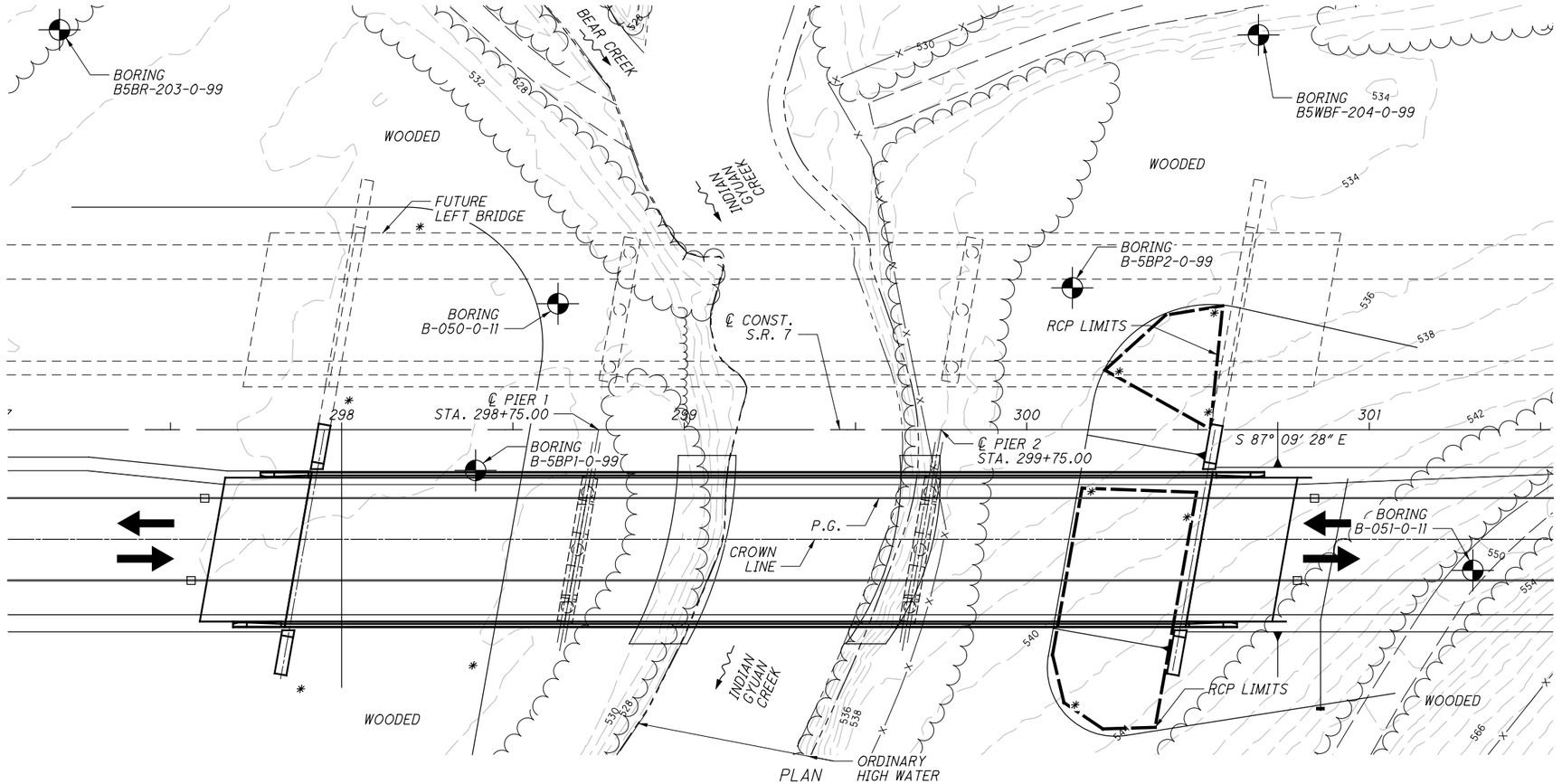
B-051-0-11
STA. 301+30.2
41.0' RT.

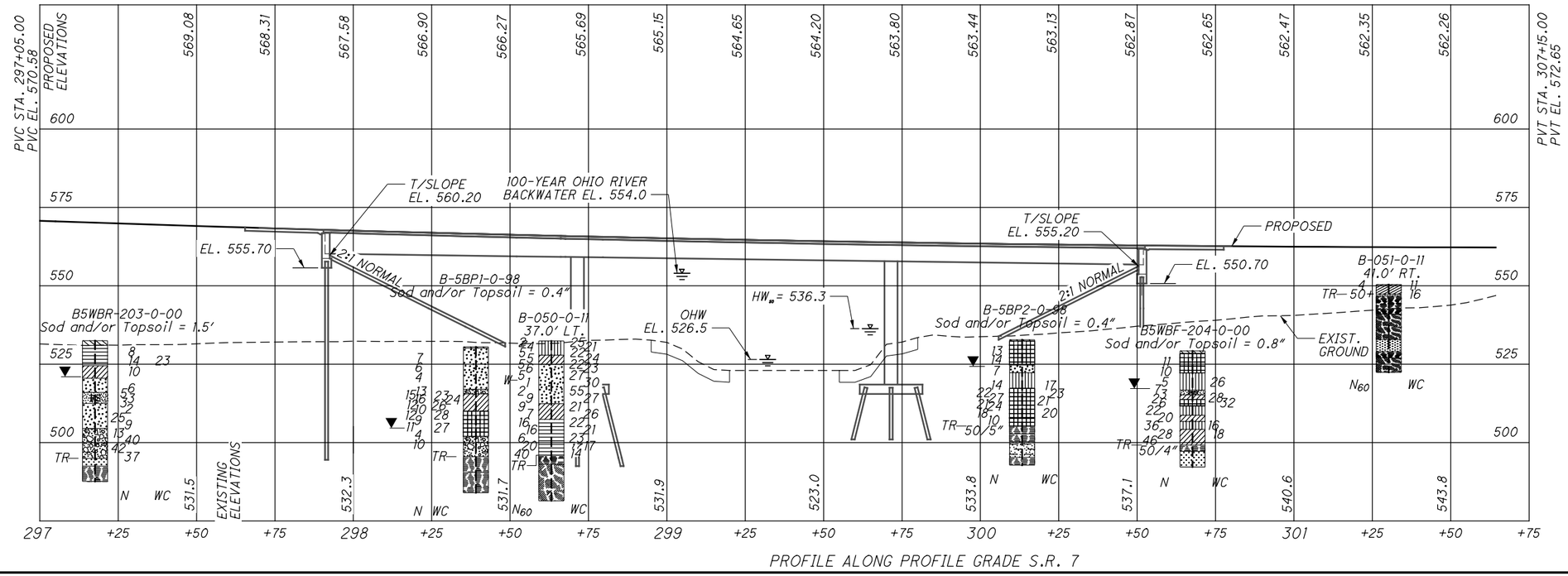
TR — Sandstone, Gray, Slightly Weathered, Strong, Fine Grained, Thin Bedded, Iron Staining
Shale, Light Brown, Slightly Weathered, Moderatley Strong, Laminated, Arenaceous
Mudstone, Red-Brown, Slightly Weathered, Weak, Thick Bedded, Slickensides
Sandstone, Gray, Slightly Weathered, Strong, Fine Grained, Thin Bedded, Iron Staining
Shale, Gray, Slightly Weathered, Slightly Strong, Laminated
Mudstone, Red-Brown, Slightly Weathered, Weak, Thick Bedded, Slickensides

N_{60} WC

301+00 302+00

287+00 288+00 289+00 290+00 291+00 292+00 293+00 294+00 295+00 296+00 297+00 298+00 299+00 300+00 301+00 302+00 303+00 304+00 305+00 306+00 307+00 308+00 309+00 310+00 311+00 312+00





HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.63
S.R. 7 OVER INDIAN GUYAN CREEK

LAW-7-2.17

65/206

1106/1247

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ROCK OUTCROP
WOODED AREA
GUYAN MCKINLEY SCHOOL RD.
B-059-0-11
S-216-0-99
B-054-0-11
WOODED AREA
ROCK OUTCROP
R-247-0-99
S-215-0-99
℄ CONSTRUCTION S.R. 7
B-058-0-11
B-053-0-11
WOODED AREA
R-245-0-99
R-246-0-99
ROCK OUTCROP
R-249-0-99
WOODED AREA
R-244-0-99
PROPOSED S.R. 7
WOODED AREA
R-248-0-99
B-056-0-11
Future S.R. 7
N 86° 20' 16" E
PROPOSED S.R. 7
R-250-0-99
MATCH LINE STA. 312+00
MATCH LINE STA. 337+00
B-055-1-11
B-055-2-11
B-055-3-11
B-055-0-11
B-057-1-11
B-057-0-11
WOODED AREA
B-060-0-11
WOODED AREA
OPEN FIELD
OPEN FIELD
WOODED AREA
B-061-0-11
WOODED AREA
Indian Guyan Creek
WOODED AREA

For S.R. 7 Profile, See Sheet 67
For Cross Section 313+00, See Sheet 97
For Cross Section 322+00, See Sheet 98
For Cross Section 329+00, See Sheet 99
For Cross Section 334+00, See Sheet 100
For Cross Section 336+00, See Sheet 101

N

0 50 100 200
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STA. 312+00 - 337+00

LAW-7-2.17

1107
1247

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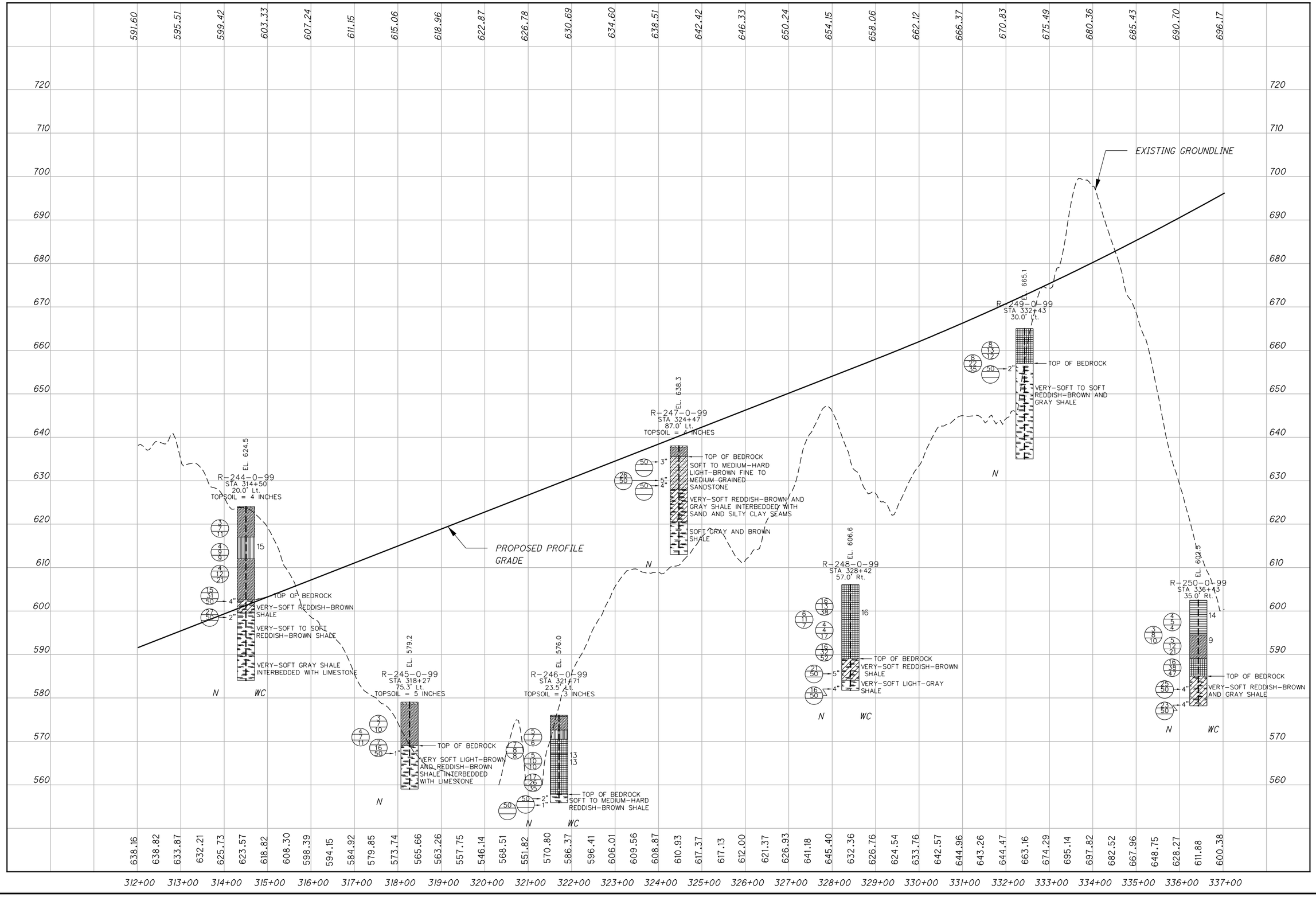

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STA. 312+00 - 337+00

LAW-7-2.17

1108
1247

For S.R. & Profile, See Sheet 69
For Cross Section 340+00, See Sheet 102
For Cross Section 349+00, See Sheet 103
For Cross Section 359+50, See Sheet 104

B-066-0-11

WOODED AREA

WOODED AREA

B-062-0-11

ROCK OUTCROP

B-063-0-11

S-701-0-99

B-070-0-11

R-251-0-99

MATCH LINE STA. 337+00

MATCH LINE STA. 362+00

℄ CONSTRUCTION S.R. 7

R-254-0-99

PROPOSED S.R. 7

R-252-0-99

R-253-0-99

PROPOSED S.R. 7

B-064-0-11

B-069-0-11

WOODED AREA

B-067-0-11

B-065-0-11

B-068-0-11

ROCK OUTCROP

WOODED AREA

WOODED AREA

ROCK OUTCROP

ROCK OUTCROF

ROCK OUTCROP

0 50 100 200
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STA. 337+00 - 362+00

LAW-7-2.17

68/206

1109
1247

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S-701-0-99 - BEDROCK DESCRIPTIONS

VERY-SOFT BROWN FINE TO MEDIUM GRAINED SANDSTONE
SOFT TO MEDIUM-HARD LIGHT-BROWN TO LIGHT-GRAY FINE TO MEDIUM GRAINED SANDSTONE
MEDIUM-HARD BROWN BECOMING GRAY SHALE
MEDIUM-HARD GRAY SILTSTONE
SOFT GRAY SHALE
MEDIUM-HARD GRAY SHALE
SOFT TO MEDIUM-HARD RED-BROWN SHALE
SOFT TO MEDIUM-HARD GRAY AND GREENISH-GRAY SHALE
SOFT TO MEDIUM-HARD GRAY SHALE
VERY-SOFT TO SOFT GRAY SHALE
MEDIUM-HARD LIGHT-GRAY TO DARK-GRAY FINE GRAINED SANDSTONE
MEDIUM-HARD GRAY SHALE INTERBEDDED WITH FINE GRAINED SANDSTONE AND SILTSTONE
MEDIUM-HARD GRAY SHALE
SOFT TO MEDIUM-HARD GRAY TO RED-BROWN SHALE
MEDIUM-HARD GRAY SILTSTONE
MEDIUM-HARD GRAY TO LIGHT-GRAY SILTSTONE
SOFT TO MEDIUM-HARD GRAY SHALE
SOFT TO MEDIUM-HARD RED-BLACK SHALE

EL. 880.3
S-701-0-99
STA 347+98
183.6 Lt.
TOPSOIL = 4 INCHES
TOP OF BEDROCK

EL. 867.5
R-254-0-99
STA. 357+93
40.0' Lt.
TOP OF BEDROCK
VERY-SOFT YELLOW-BROWN FINE TO MEDIUM GRAINED SANDSTONE
MEDIUM-HARD YELLOW-BROWN FINE TO MEDIUM GRAINED SANDSTONE
SOFT TO MEDIUM-HARD YELLOW-BROWN ARENACEOUS SHALE

EXISTING GROUNDLINE

EL. 787.6
R-253-0-99
STA. 352+43
35.0' Rt.
TOP OF BEDROCK
SOFT TO MEDIUM-HARD GRAY AND YELLOW-BROWN SHALE
SOFT TO MEDIUM-HARD GRAY SHALE INTERBEDDED WITH MEDIUM-HARD SANDSTONE

B-069-0-11
105.0' RT.
B-069-0-11
105.0' RT.
(CONTINUED)

EL. 774.5
R-252-0-99
STA. 344+43
35.0' Rt.
TOP OF BEDROCK
SOFT TO MEDIUM-HARD YELLOW-BROWN SHALE
MEDIUM-HARD GRAY FINE TO MEDIUM GRAINED ARGILLACEOUS SANDSTONE
SOFT TO MEDIUM-HARD GRAY SHALE

EL. 576.5
R-251-0-99
STA 338+85
59.0' Lt.
TOP OF BEDROCK
VERY-SOFT GRAY SHALE
SOFT GRAY LIMESTONE

B-063-0-11
171.0' LT.
Shale, Severely Weathered, (Augered)

PROPOSED PROFILE GRADE

N
WC
N_{60}
TR

880 870 860 850 840 830 820 810 800 790 780 770 760 750 740 730 720 710 700 690

600.38 603.48 592.75 578.60 561.53 577.09 597.44 603.65 630.20 659.33 681.47 704.93 716.99 730.09 747.87 770.64 781.12 800.27 829.41 849.62 851.63 842.79 837.26 832.03 829.35 822.85 825.94 824.81 818.69 810.14 802.37 798.68 793.88 801.30 806.38 810.23 814.81 819.92 824.29 828.57 838.02 856.35 864.29 843.67 829.71 817.98 782.92 775.57

337+00 338+00 339+00 340+00 341+00 342+00 343+00 344+00 345+00 346+00 347+00 348+00 349+00 350+00 351+00 352+00 353+00 354+00 355+00 356+00 357+00 358+00 359+00 360+00 361+00

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STA. 337+00 - 361+00

LAW-7-2.17

69/206

1110/1247

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B-096-0-12
B-095-0-12
℄ CONSTRUCTION S.R. 775
RESIDENTIAL
R-116-0-99
WOODED AREA
Little Paddy Creek
S-097-0-12
℄ CONSTRUCTION RAMP K
WOODED AREA
R-117-0-99
B-073-0-12
B-071-0-11
B15-3-0-99
Ex. S.R. 775
B-072-0-11
B15-2-0-99
B-6WBRP1-0-99
B-101-0-12
MATCH LINE STA. 362+00
℄ CONSTRUCTION S.R. 7
R-255-0-99
B15-1-0-99
WETLAND
B-100-0-12
SSF-103-0-99
RAMP K
PROPOSED S.R. 7
B-074-1-12
R-257-0-99
B6WBR-208-0-99
B6WBRP1-210-0-99
R-119-0-99
R-256-0-99
B6WBR-209-0-99
SSF-102-0-99
B6EBF-211-0-99
B13-2-0-99
B13-1-0-99
SSR-101-0-99
Ex. S.R. 775
WOODED AREA
℄ CONSTRUCTION RAMP I
RAMP L
B-073-1-20
WETLAND
E13-3-0-99
B13-4-0-99
R-110-0-99
℄ CONSTRUCTION RAMP L
S-103-0-12
B-073-2-20
B-094-0-12
WOODED AREA
Little Paddy Creek
RESIDENTIAL
SR 775
WOODED AREA
R-109-0-99
For S.R. 7 Profile, See Sheet 71
For Law-7-7.13 Plan & Profile, See Sheet 72
For S.R. 775, Plan & Profile, See Sheets 147-148
For Law-775-01.05 Plan & Profile S.R. 775, See Sheet 151
For Law-7-7.11 Plan & Profile Ramp I, See Sheet 127
For Ramp I Plan & Profile, See Sheet 125
For Ramp L Plan & Profile, See Sheet 134
For Cross Section 371+00, See Sheet 105
For Cross Section 374+00, See Sheet 106
S-101-0-99
B-093-0-12
ROCK OUTCROP
RESIDENTIAL
NOTE:
Certain Borings Shown on Plan View are From Previous Exploration(s). All Available Data is Shown Which Was Available From Those Reports.
ROCK OUTCROP
RESIDENTIAL
R-108-0-99

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STATION 362+00 - 387+00

LAW-7-2.17

70/206

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PROPOSED PROFILE GRADE

EXISTING GROUNDLINE

R-255-0-99
STA. 362+45
40.0' Lt.
EL. 722.2
10
7
3"
4"
N WC

R-256-0-99
STA. 368+43
35.0' Rt.
EL. 629.4
TOP OF BEDROCK
VERY-SOFT TO SOFT REDDISH-BROWN SHALE
VERY-SOFT TO SOFT GRAY SHALE
MEDIUM-HARD YELLOW-BROWN FINE TO MEDIUM GRAINED SANDSTONE
AUGER REFUSAL
2"
N

B-072-0-11
131.0' LT.

R-257-0-99
STA. 372+43
40.0' Lt.
EL. 582.5
TOP OF BEDROCK
VERY-SOFT TO SOFT YELLOW-BROWN SHALE
AUGER REFUSAL
N

B-073-1-20
RAMP I
STA. 376+06, 133.0' RT.
Sandstone, Yellowish-Brown, Moderately to Highly Weathered, Weak to Slightly Strong 15/50/1"
TR
50
50
N_{60} WC

B6WBR-208-0-99
35.0' LT.
Sod and/or Topsoil = 2.0'
WC

B6WBR-208-0-99
(CONTINUED)
TR
Refusal
N WC

B-100-0-12
STA. 384+52
68.4' LT.
50/3"
N_{60} WC

B-101-0-12
STA. 386+58
72.7' LT.
N_{60} WC

R-119-0-99
STA 384+83
42.75' Rt.
TOPSOIL = 5 INCHES
EL. 566.6
N WC

B-074-1-12
STA. 387+00
N_{60} WC

719.76 713.76 707.76 701.76 695.76 689.76 683.76 677.76 671.76 665.76 659.76 653.76 647.76 641.76 635.76 629.76 623.76 617.76 611.76 605.76 600.21 595.43 591.42 588.17 585.69 583.98 583.03 582.85 583.44

720 710 700 690 680 670 660 650 640 630 620 610 600 590 580 570 560 550 540 530

715.57 765.97 738.13 719.71 704.55 693.98 671.80 662.32 650.36 637.53 638.59 632.24 627.47 629.38 625.72 620.23 615.31 605.42 599.11 596.83 594.94 591.56 590.23 585.10 582.12 579.37 570.18 553.15 560.62 568.31 567.48 573.18 573.79 543.30 541.61 544.81 544.35 545.89 542.57 544.47 552.19 558.97 564.65 569.67 581.03 586.84 586.79 585.90 584.91 584.57 583.87 582.91 582.40 582.24 582.29 582.57

361+00 362+00 363+00 364+00 365+00 366+00 367+00 368+00 369+00 370+00 371+00 372+00 373+00 374+00 375+00 376+00 377+00 378+00 379+00 380+00 381+00 382+00 383+00 384+00 385+00 386+00 387+00

383+00 384+00 385+00 386+00 387+00

0 50 100 200
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STATION 361+00 - 387+00

LAW-7-2.17

71 / 206

1112
1247

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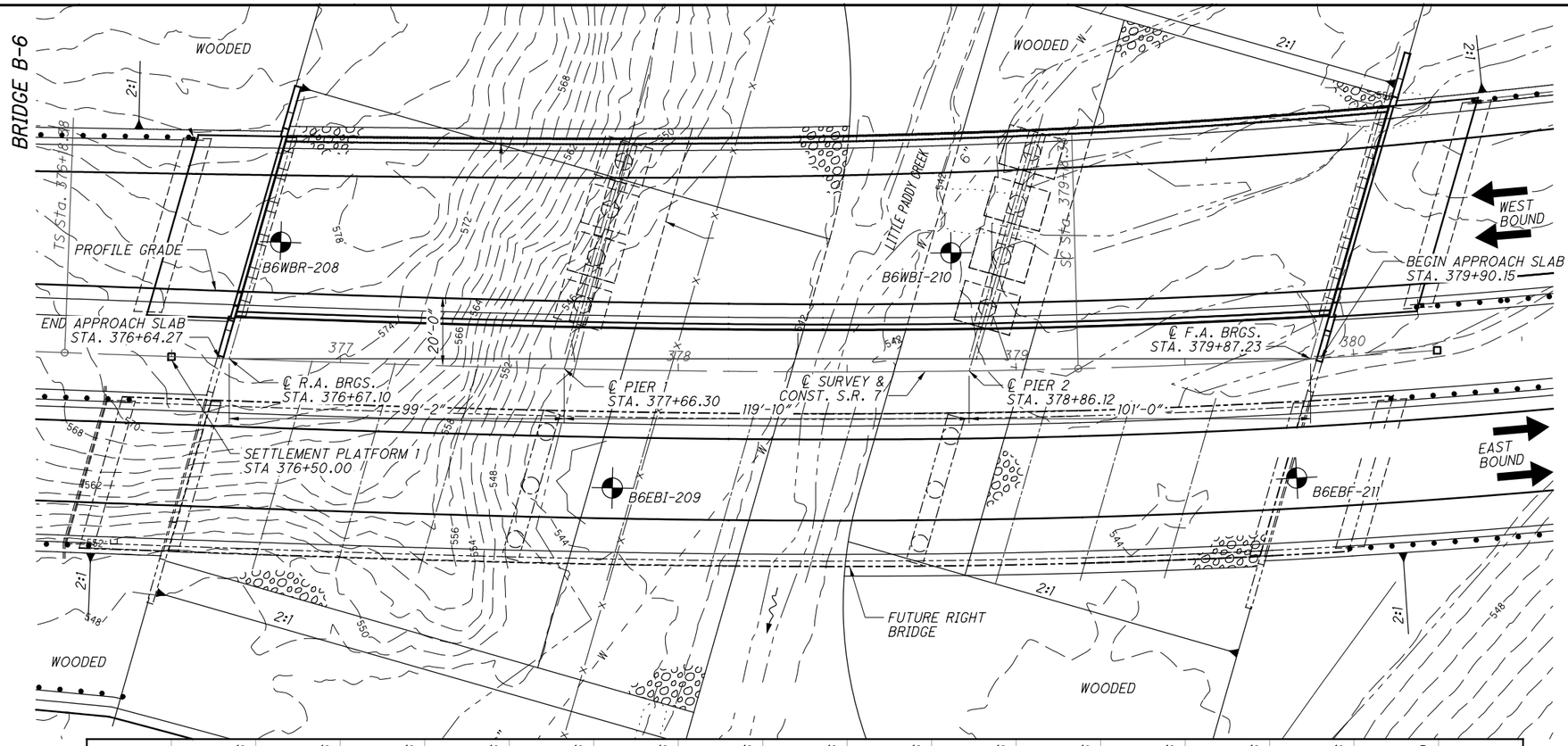

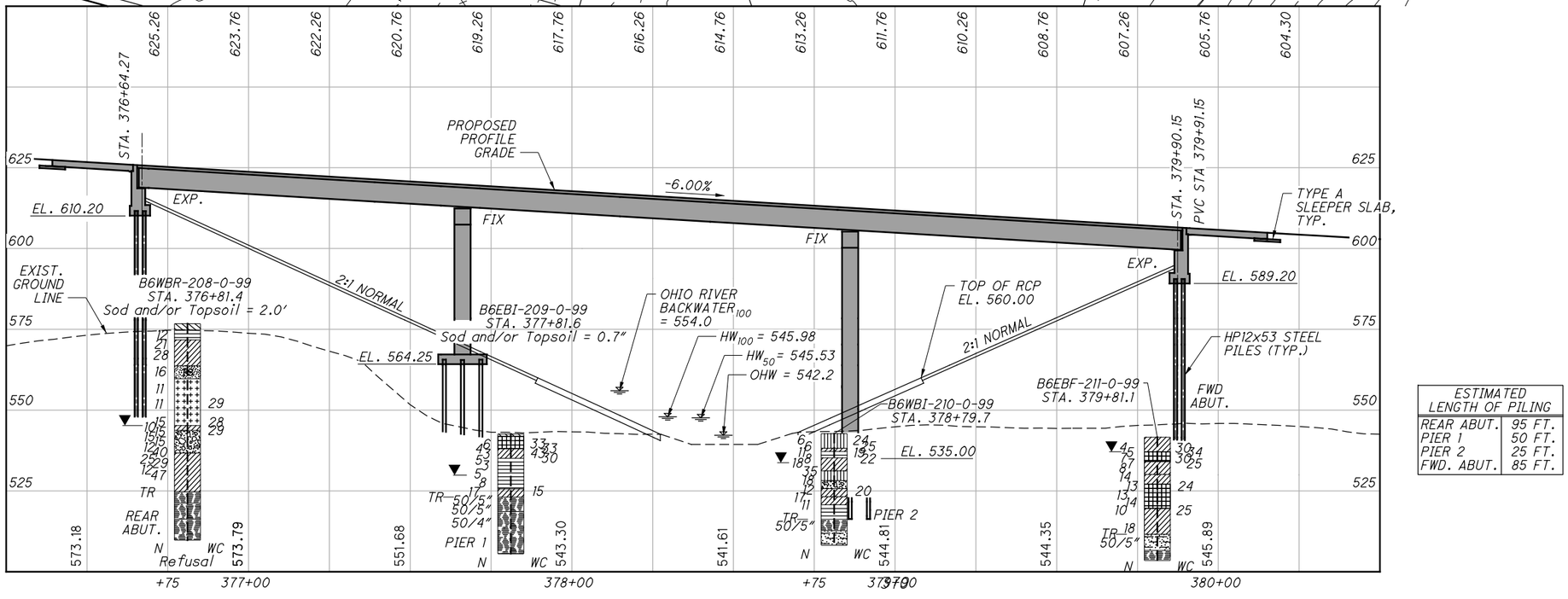

ESTIMATED LENGTH OF PILING	
REAR ABUT.	95 FT.
PIER 1	50 FT.
PIER 2	25 FT.
FWD. ABUT.	85 FT.

HORIZONTAL SCALE IN FEET
0 12.5 25 50

DRAWN MSJ
CHECKED EWK

STRUCTURE FOUNDATION EXPLORATION
LAW-7-07.13 L & R
S.R. 7 OVER LITTLE PADDY CREEK

LAW-7-2.17

NOTE:
Certain Borings Shown on Plan View are From Previous Exploration(s). All Available Data is Shown Which Was Available From Those Reports.

NOTE:
SLI-2XX-04 Locations are Presumably Where Slope Inclinometers were Installed During Landslide Repair Projects. Logs were not Recovered for these Installations.

B-098-1-12
B-098-0-12
B-098-1-20
℄ CONSTRUCTION RAMP K
℄ CONSTRUCTION RAMP J
B-102-0-12
B-106-2-20
B-106-1-20
SLI-983-0-05
SLI-982-0-05
S-102-0-99
SLI-984-0-05
SLI-981-0-05
SLI-985-0-05
B-077-1-12
B-074-1-12
B-075-1-12
R-120-0-99
℄ CONSTRUCTION S.R. 7
R-122-0-99
B-099-0-12
R-121-0-99
B-076-1-12
B-104-0-12
R-118-0-99
℄ CONSTRUCTION RAMP L
B-076-2-23
B-076-3-23
B-077-2-23
B-077-3-23
R-123-0-99
B-078-2-23
B-078-1-12
EX. S.R. 7
B-078-3-23
R-124-0-99
B-079-1-12
R-125-0-99
S-103-0-99
SLI-203-0-04
SLI-200-0-04
SLI-404-0-04
SLI-403-0-04
SL-402-0-04
SLI-405-0-04
SLI-401-0-04
MATCH LINE STA. 387+00
MATCH LINE STA. 412+00
RAMP J
RAMP K
RAMP L
PROPOSED S.R. 7
EX. S.R. 7
Field Dr.
MESA ST.
TOWER DR.
PLATEAU CT.
2ND ST.
LITTLE PADDY RD.
MIDLAND AVE.
COLE ST.
BECKART ST.
157 ST.
Paddy Creek
CLEARED HILLSIDE
ROCK OUTCROP
WOODED
RESIDENTIAL
N 63° 53' 53" E
N 69° 40' 28" E
N 68° 21' 42" E

For S.R. 7 Profile, See Sheet 74
For Noise Wall Plan/Profiles See Sheets 74A, 74B & 74C
For Ramp J Plan & Profile, See Sheet 128
For Ramp K Plan & Profile, See Sheet 129-130
For Ramp L Plan & Profile, See Sheet 134
For Cross Section 394+50, See Sheet 107
For Cross Section 395+50, See Sheet 108
For Cross Section 396+00, See Sheet 109
For Cross Section 396+50, See Sheet 110
For Cross Section 397+49.13, See Sheet 111
For Cross Section 398+50, See Sheet 112
For Cross Section 405+00, See Sheet 113

N

0 50 100 200
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
STATION 387+00 - 412+00

LAW-7-2.17

73 / 206

1114
1247

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SOIL PROFILE - ROADWAY
STATION 387+00 - 412+00

PROPOSED GRADE

EXISTING GROUNDLINE

R-120-0-99
STA 388+24
43.57' Lt.
TOPSOIL = 2 INCHES
EL. 575.1

B-074-1-12
STA. 387+00

B-099-0-12
STA. 392+20

B-075-1-12
STA. 391+00

B-104-0-12
STA. 389+25
102.6' RT.

R-121-0-99
STA 392+42.6
44.00' Rt.
EL. 574.3

R-122-0-99
STA 396+48.2
45.2' Lt.
TOPSOIL = 6 INCHES
EL. 615.7

B-076-1-12
STA. 395+00

B-077-1-12
STA. 399+00
EL. 585.2

R-123-0-99
STA 400+42.9
50.5' Rt.
TOPSOIL = 12 INCHES

B-078-1-12
STA. 403+00

R-124-0-99
STA 404+37.6
48.3' Lt.
TOPSOIL = 5 INCHES
EL. 612.8

S-103-0-99
STA. 404+76
194.4' LT.

Shale, Brown and Green, Very Soft to Medium Hard, Nearly Horizontally Bedded, Fractured

Sandstone, Gray, Medium Hard, Fine Grained, Well Cemented, Micaceous

Shale, Brown, Red and Green, Soft to Medium Hard, Nearly Horizontally Bedded, Highly Fractured

B-079-1-12
STA. 407+00

R-125-0-99
STA 408+52.3
7.1' Lt.
TOPSOIL = 6 INCHES
EL. 606.5

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

LAW-7-2.17

74 / 206

1115 / 1247

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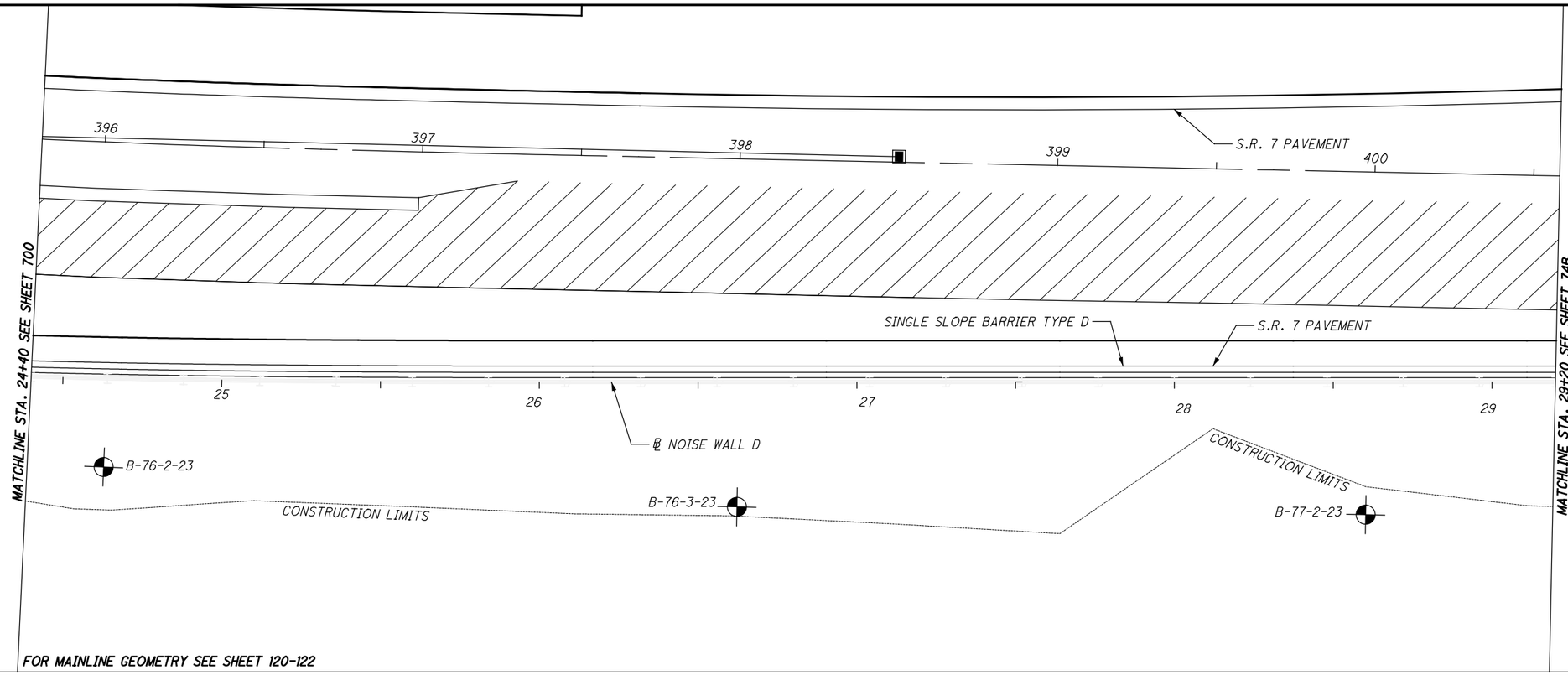
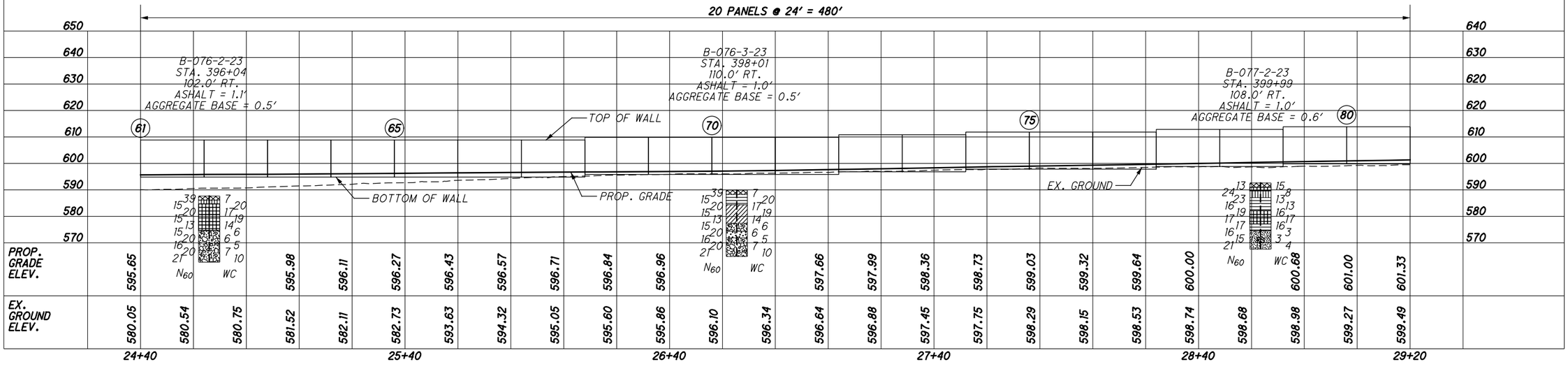


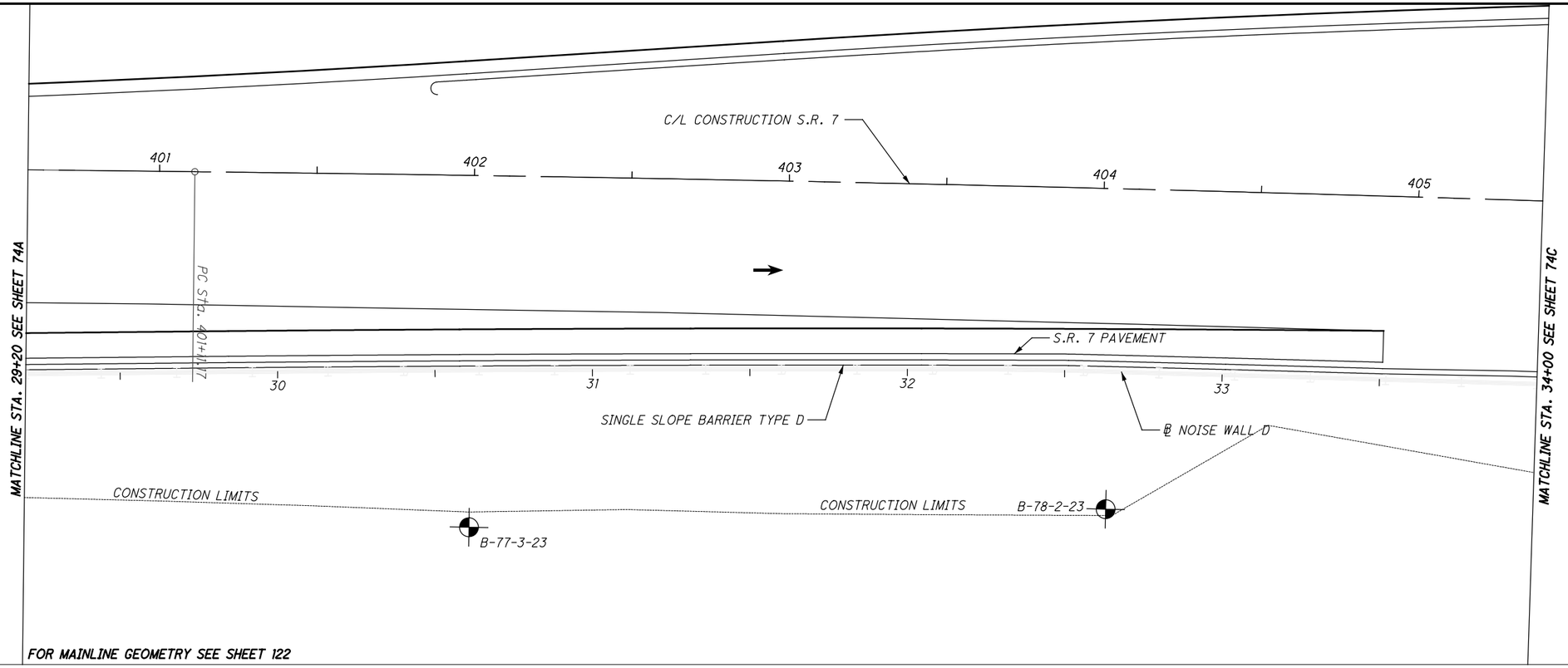
FOR MAINLINE GEOMETRY SEE SHEET 120-122

TOP OF WALL ELEV.	608.85	608.85	608.85	608.85	608.85	608.85	608.85	609.85	609.85	609.85	609.85	610.85	610.85	611.85	611.85	611.85	612.85	612.85	613.85	613.85
BOTTOM OF WALL ELEV.	594.85	594.85	594.85	594.85	594.85	594.85	594.85	595.85	595.85	595.85	595.85	596.85	596.85	597.85	597.85	597.85	598.85	598.85	599.85	599.85
PANEL NO.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80



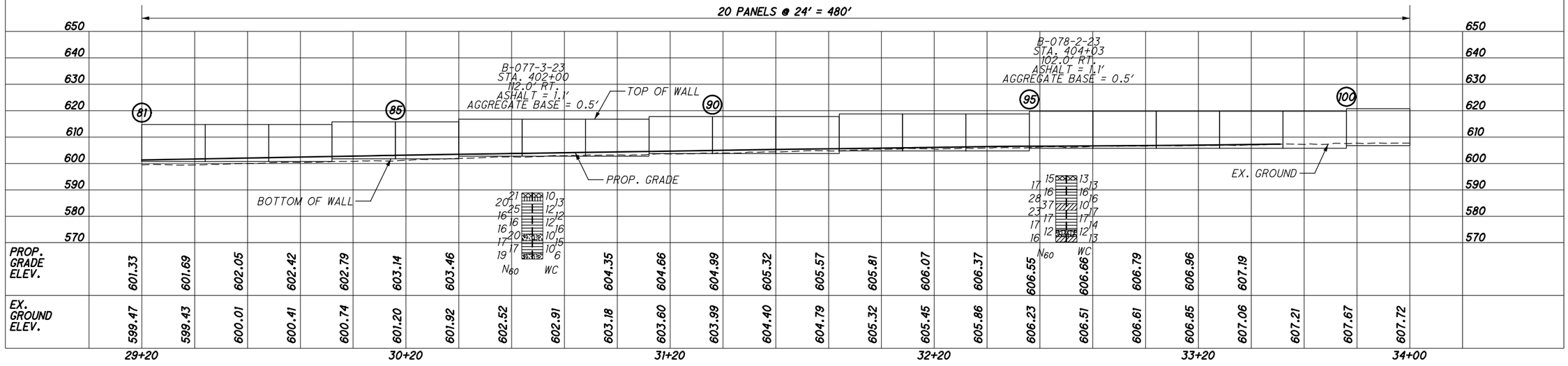
PROP. GRADE ELEV.	595.65	595.98	596.11	596.27	596.43	596.57	596.71	596.84	596.96	597.66	597.99	598.36	598.73	599.03	599.32	599.64	600.00	600.68	601.00	601.33	
EX. GROUND ELEV.	580.05	580.54	580.75	581.52	582.11	582.73	593.63	594.32	595.05	595.60	595.86	596.10	596.34	596.64	596.88	597.45	597.75	598.29	598.15	598.53	598.74	598.68	598.98	599.27	599.49

24+40 25+40 26+40 27+40 28+40 29+20



FOR MAINLINE GEOMETRY SEE SHEET 122

TOP OF WALL ELEV.	614.75	614.75	614.75	615.75	615.75	616.75	616.75	616.75	617.75	617.75	617.75	618.75	618.75	618.75	619.75	619.75	619.75	619.75	619.75	620.75
BOTTOM OF WALL ELEV.	600.75	600.75	600.75	601.75	601.75	602.75	602.75	602.75	603.75	603.75	603.75	604.75	604.75	604.75	605.75	605.75	605.75	605.75	605.75	606.75
PANEL NO.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100



PROP. GRADE ELEV.	601.33	601.69	602.05	602.42	602.79	603.14	603.46	603.35	604.35	604.66	604.99	605.32	605.57	605.81	606.07	606.37	606.55	606.66	606.79	606.96	607.19
EX. GROUND ELEV.	599.47	599.43	600.01	600.41	600.74	601.20	601.92	602.52	602.91	603.18	603.60	603.99	604.40	604.79	605.32	605.45	605.86	606.23	606.51	606.61	606.85	607.06	607.21	607.67	607.72

29+20 30+20 31+20 32+20 33+20 34+00

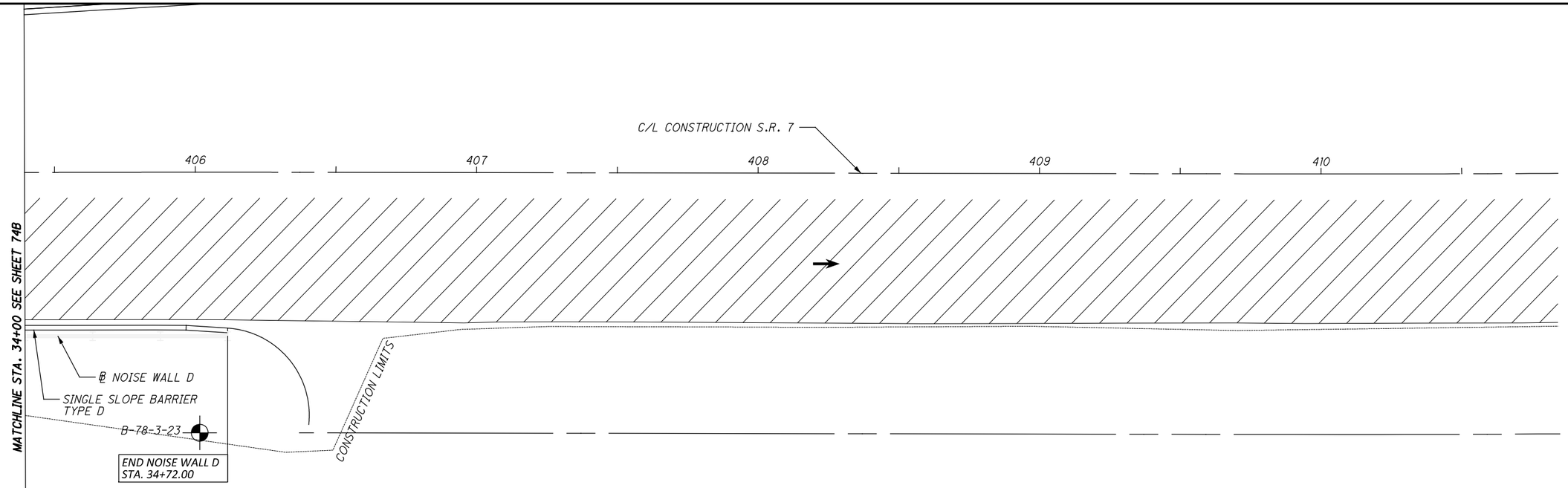
HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL D - STA. 29+20 TO 34+00

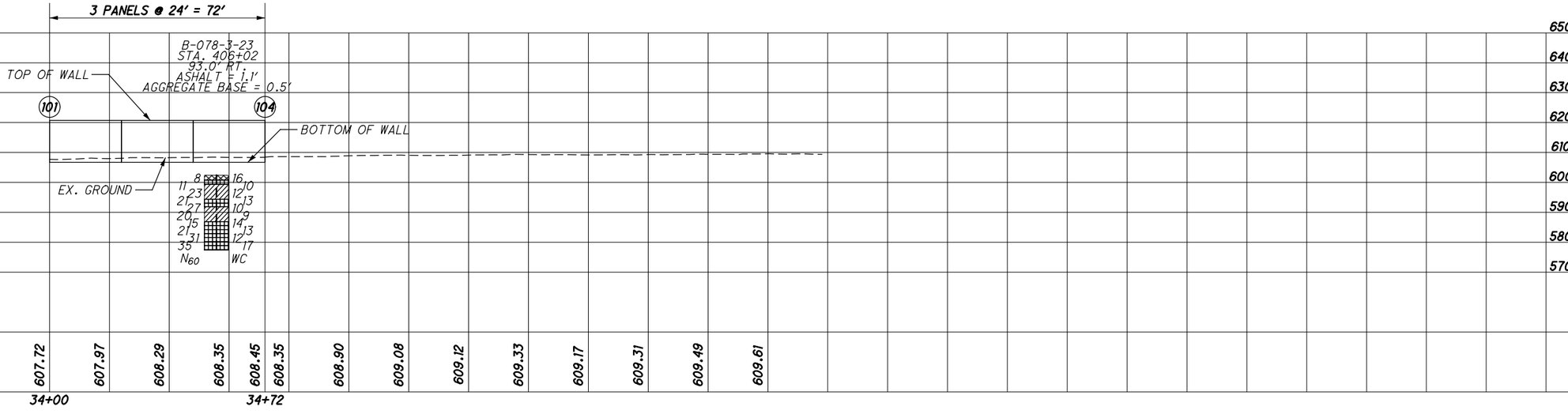
LAW-7-2.17

1115B 1247



FOR MAINLINE GEOMETRY SEE SHEET 122

TOP OF WALL ELEV.	620.75	620.75	620.75
BOTTOM OF WALL ELEV.	606.75	606.75	606.75
PANEL NO.	101	102	103



PROP. GRADE ELEV.													
EX. GROUND ELEV.	607.72	607.97	608.29	608.35	608.45	608.35	608.90	609.08	609.12	609.33	609.17	609.31	609.49	609.61

34+00 34+72

HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
NOISE WALL D - STA. 34+00 TO 34+72

LAW-7-2.17

74C/206

1115C
1247

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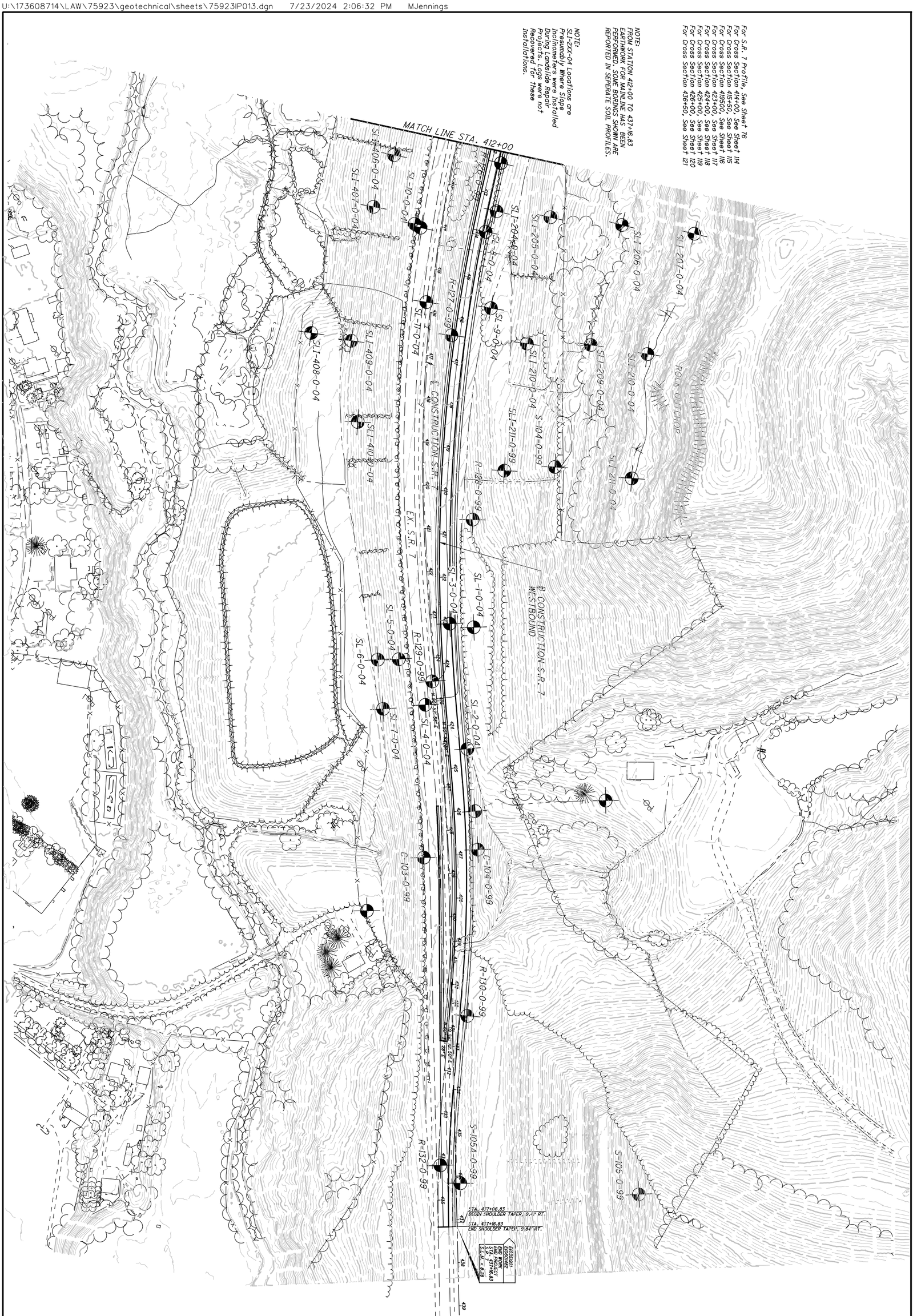

1247 / 1116	75/206	LAW-7-2.17	SOIL PROFILE - ROADWAY STATION 412+00 - 437+16.83	DRAWN MSJ CHECKED EMK	0 100 50 200 HORIZONTAL SCALE IN FEET

SOIL PROFILE - ROADWAY
STATION 412+00 - 437+16.83

HORIZONTAL SCALE IN FEET
0 50 100 200

DRAWN MSJ
CHECKED EMK

LAW-7-2.17

76 / 206

1117 / 1247

PROPOSED GRADE

EXISTING GROUNDLINE

R-126
STA 410+90.42
36.73' Lt.
TOPSOIL = 6 INCHES
EL. 623.6

R-127
STA 414+98.43
35.29' Rt.
TOPSOIL = 8 INCHES
EL. 612.9

R-128
STA 419+20.35
43.07' Lt.
TOPSOIL = 14 INCHES
EL. 631.9
TOP OF BEDROCK
MEDIUM-HARD GRAY, GREEN AND BROWN FINE-GRAINED SANDSTONE, INTERBEDDED WITH SOFT SHALE
REC = 36%
RQD = 13%
VERY-SOFT TO SOFT BROWN SHALE, INTERBEDDED WITH FINE-GRAINED SANDSTONE
REC = 18%
RQD = 8%

R-129
STA 422+97.51
37.41' Rt.
EL. 580.2

R-130
STA 430+71.51
34.95' Lt.
EL. 622.9
TOP OF BEDROCK
MEDIUM-HARD TO HARD GRAY FINE-GRAINED SANDSTONE

R-132
STA 438+21.96
29.92' Lt.
EL. 642.8
TOP OF BEDROCK
VERY-SOFT TO SOFT BROWN AND REDDISH-BROWN SHALE
SOFT GRAY SHALE

STA. 437+16.83
END GRAPHIC GRADE
END PROFILE
ELEV. 605.68

C-103
STA 427+03.2
56.77' Rt.
TOPSOIL = 7 INCHES
EL. 553.2
TOP OF ROCK
VERY-SOFT TO SOFT REDDISH-BROWN SHALE

C-104
STA 426+87.1
68.16' Lt.
TOPSOIL = 6 INCHES
EL. 574.5
TOP OF ROCK
VERY-SOFT GRAY AND BROWN SHALE

BIWBF-202-0-99
STA. 135+60
35.0' LT.
Sod and/or Topsoil = 0.7'

2:1

2:1

1:1

LA-R/W

LA-R/W

B-002-0-11
STA. 135+97
122.0' LT.

5	5	30
5	7	43
10	8	33
W 6	7	39
7	12	35
11	13	24
4	12	25
8	9	21
19	18	
N60	WC	

B-003-0-11
STA. 135+96
118.0' RT.

4	7	27
7	12	30
5	9	27
W 11	13	25
4	12	22
10	13	25
34	26	
12	20	
68	14	
N60	WC	

562.86
136+00.00
528.72

7	26	
4		
3		
4		
4		
10		
10		
9		
3		
2		
TR		
N	WC	

Medium Hard to Hard Gray Fine Grained Sandstone, Nearly Horizontally Bedded, Well Cemented, Few Diagonal Fractures

Medium Hard Gray Shale Interbedded With Siltstone, Nearly Horizontally Bedded, Well Cemented, Few Horizontal Fractures

580
560
540
520
500

260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 136+00.00

LAW-7-2.17

77 / 206

1118
1247

M.Jennings
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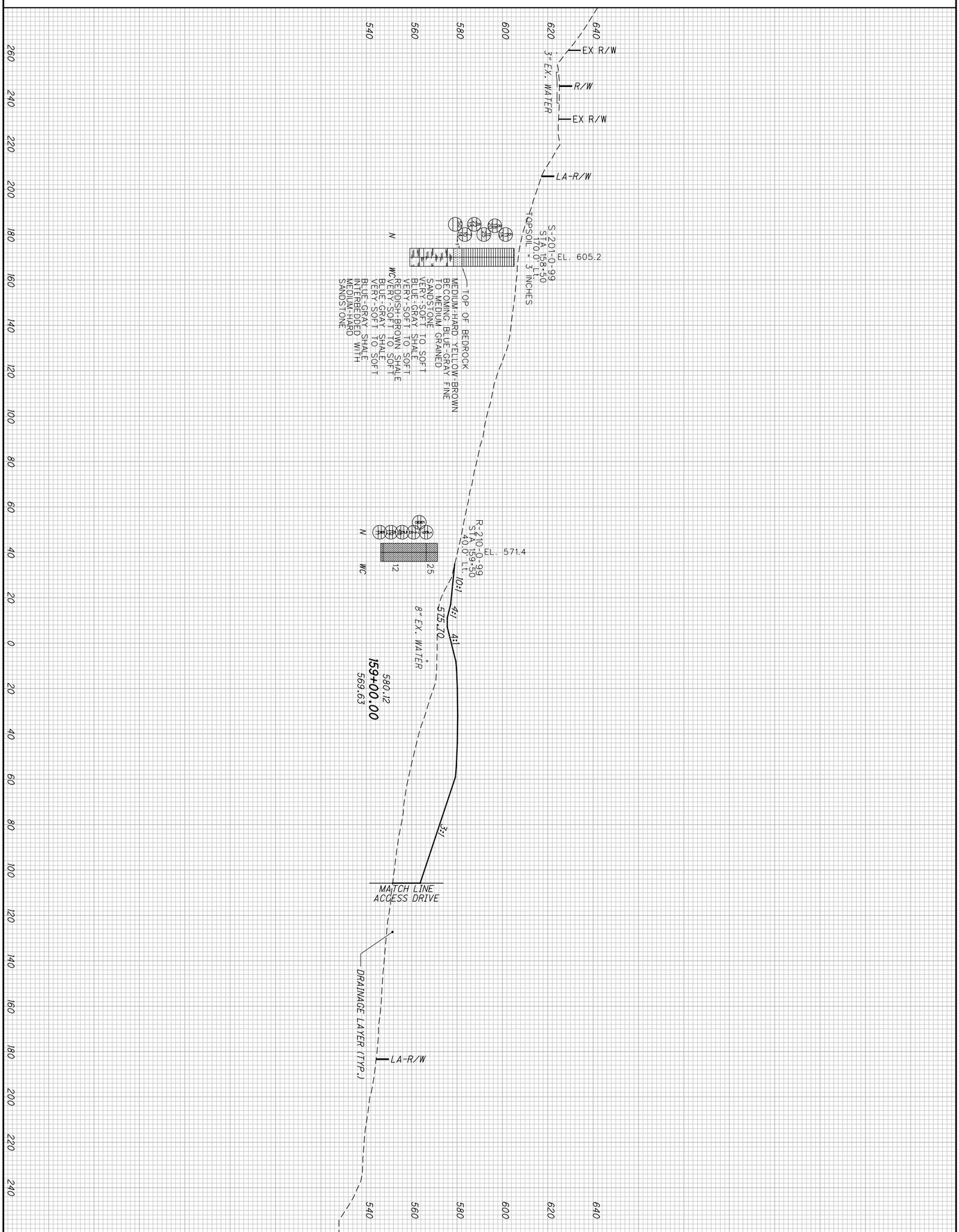

1119 12.47	78 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 159+00.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET

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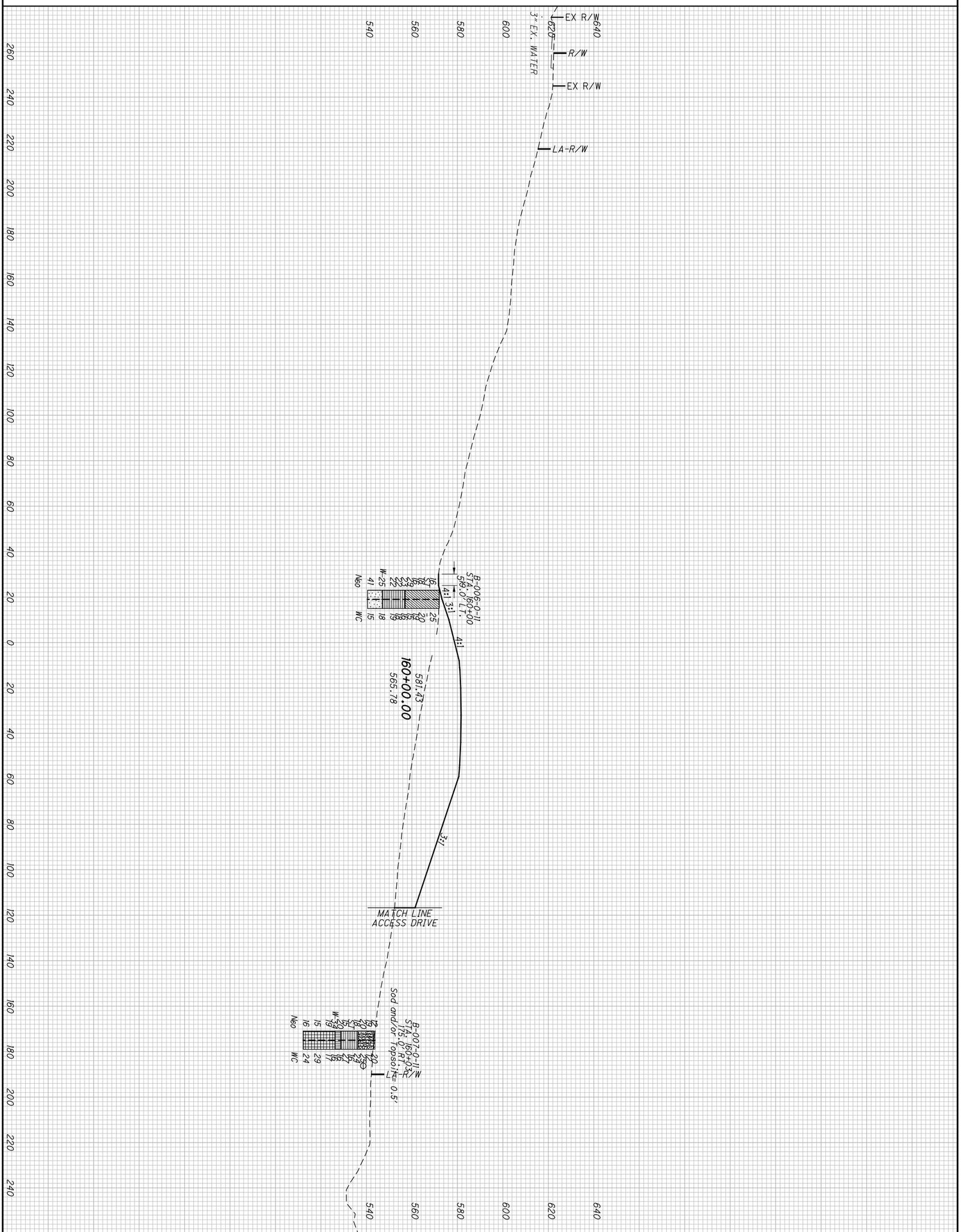
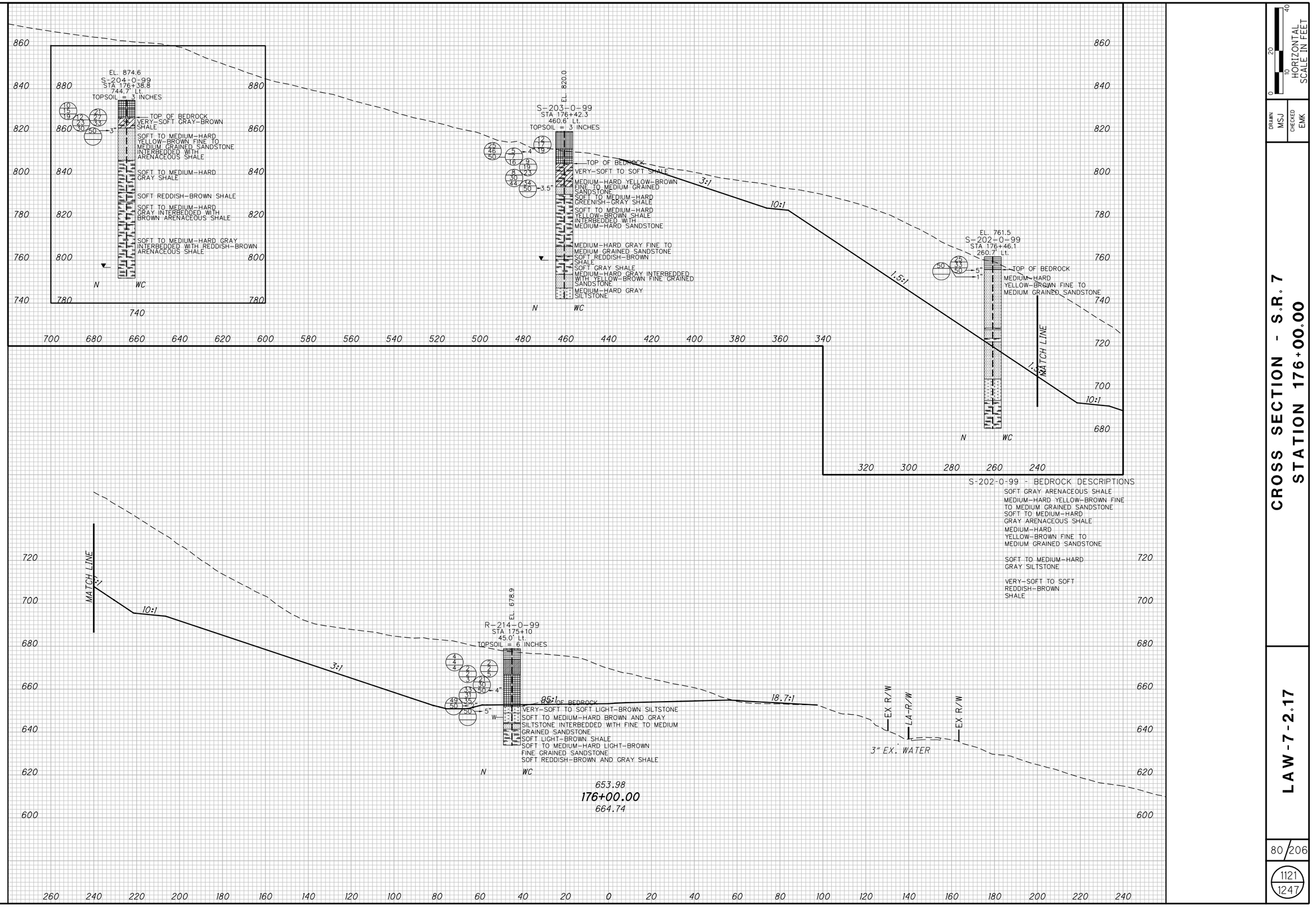


1120 / 1247	79 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 160+00.00	DRAWN MSJ CHECKED EMK 0 20 10 40 HORIZONTAL SCALE IN FEET



HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 176+00.00

LAW-7-2.17

80/206

1121
1247

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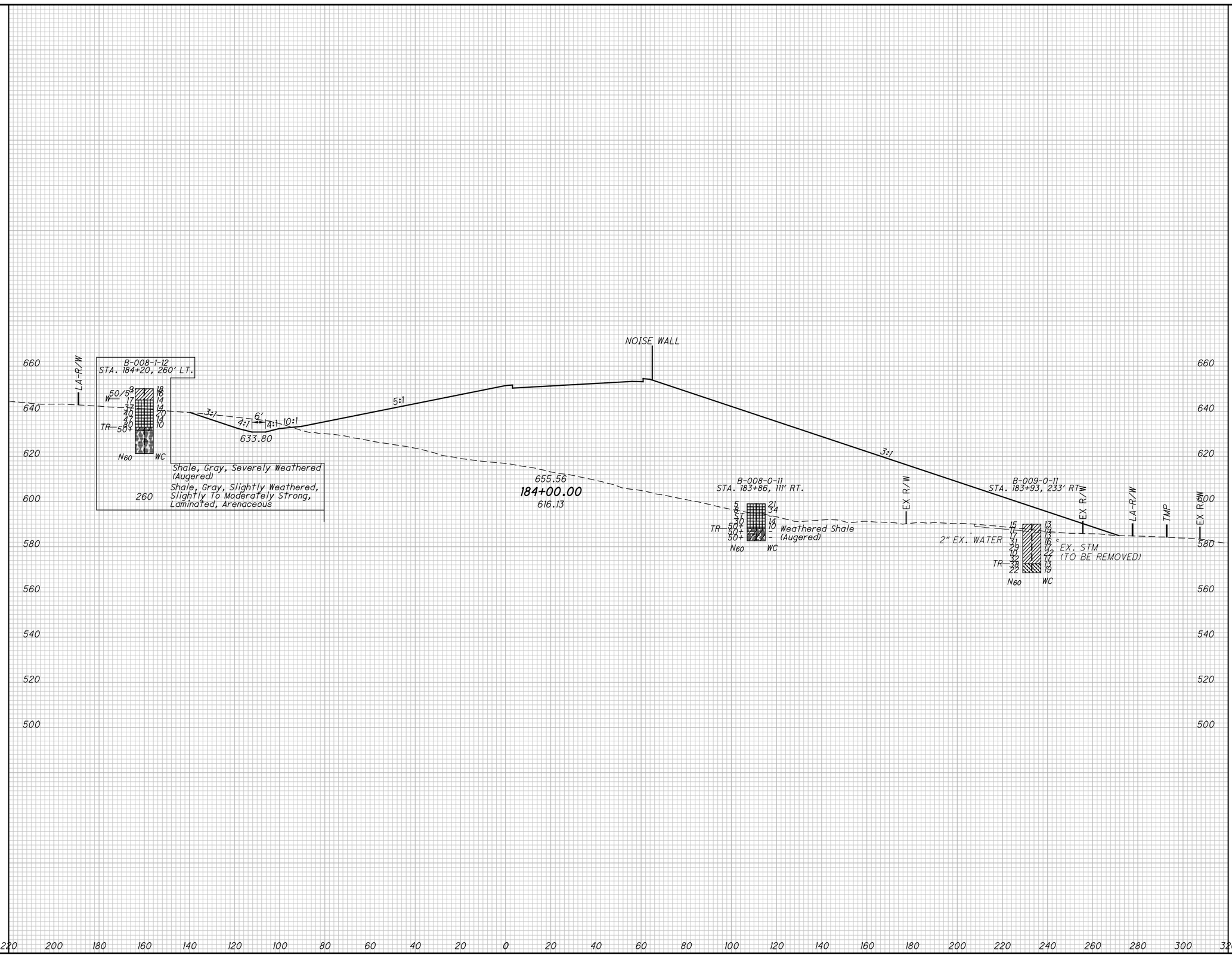

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0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 184+00.00

LAW-7-2.17

80A/206

1121A
1247

591.17
197+50.00
546.58

600 580 560 540 520 500

EX. R/W
LA-R/W

3" EX. WATER

B-010-0-11
STA. 197+89
183.0' LT.

4 8 ST 10 ST 11 27
W
N60

25 29 29 30 32 19 18 20
WC

MATCH LINE
C.R.1 104

20:1 2:1

B2EBPI-215-0-99
STA. 197+94, 10' RT.
TOPSOIL = 0.6'

15 35 27 23 18 28 44 45 27 20 18 18
H 14
TR
N
WC

Medium Hard To Hard Black Coal (Visual)
Very Soft To Soft Gray Shale, Nearly Horizontally Bedded, Similar To Hard Silty Clay, Fragmented (Visual)

1:1

4" EX. WATER

2:1 10:1 4:1 6' 4:1

562.67

LA-R/W

260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240

HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 197+50.00

LAW-7-2.17

81 / 206

1122
1247

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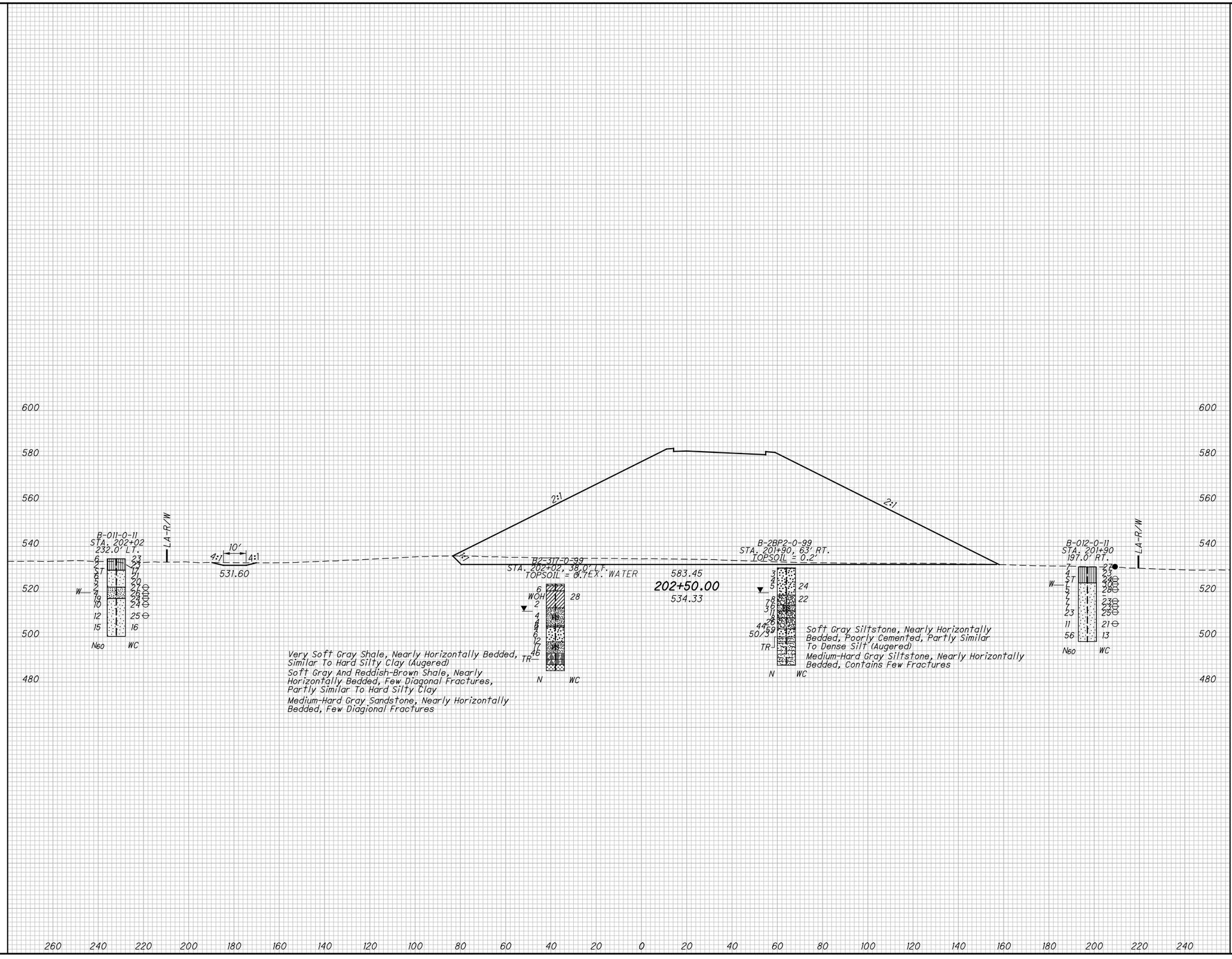

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0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 202+50.00

LAW-7-2.17

82/206

1123
1247

S-207-0-99
STA 215+50
410.0' Lt.
EL. 791.9

TOP OF BEDROCK
VERY-SOFT TO SOFT YELLOW-BROWN ARENACEOUS SHALE
SOFT GRAY SHALE
VERY-SOFT TO SOFT REDDISH-BROWN SHALE
MEDIUM-HARD YELLOW-BROWN SHALE INTERBEDDED WITH MEDIUM-HARD SANDSTONE

N

S-206-0-99
STA 215+50
250.0' Lt.
EL. 746.5

TOP OF BEDROCK
VERY-SOFT YELLOW-BROWN SHALE SOFT BECOMING MEDIUM-HARD
YELLOW-BROWN SILTSTONE
MEDIUM-HARD YELLOW-BROWN FINE GRAINED SANDSTONE
MEDIUM-HARD YELLOW-BROWN SILTSTONE INTERBEDDED WITH FINE GRAINED SANDSTONE
MEDIUM-HARD GRAY FINE TO MEDIUM GRAINED SANDSTONE
SOFT GRAY SHALE
SOFT REDDISH-BROWN SHALE SOFT TO MEDIUM-HARD
YELLOW-BROWN SHALE
SOFT GRAY SHALE
VERY-SOFT TO SOFT REDDISH-BROWN SHALE

N

S-205-0-99
STA 215+50
120.0' Lt.
EL. 674.8

TOP OF BEDROCK
VERY-SOFT TO SOFT LIGHT-BROWN SHALE
MEDIUM-HARD GRAY SANDSTONE
VERY-SOFT TO SOFT YELLOW-BROWN SHALE
SOFT TO MEDIUM-HARD YELLOW-BROWN SHALE INTERBEDDED WITH MEDIUM-HARD SANDSTONE
VERY-SOFT TO SOFT YELLOW-BROWN BECOMING REDDISH-BROWN SHALE

2.8:1
10'
4:1
4:1
4:1
627.48
629.62
215+50.00
642.16

800 780 760 740 720 700 680 660 640 620 600

400 380 360 340 320 300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 215+50.00

LAW-7-2.17

83/206

1124
1247

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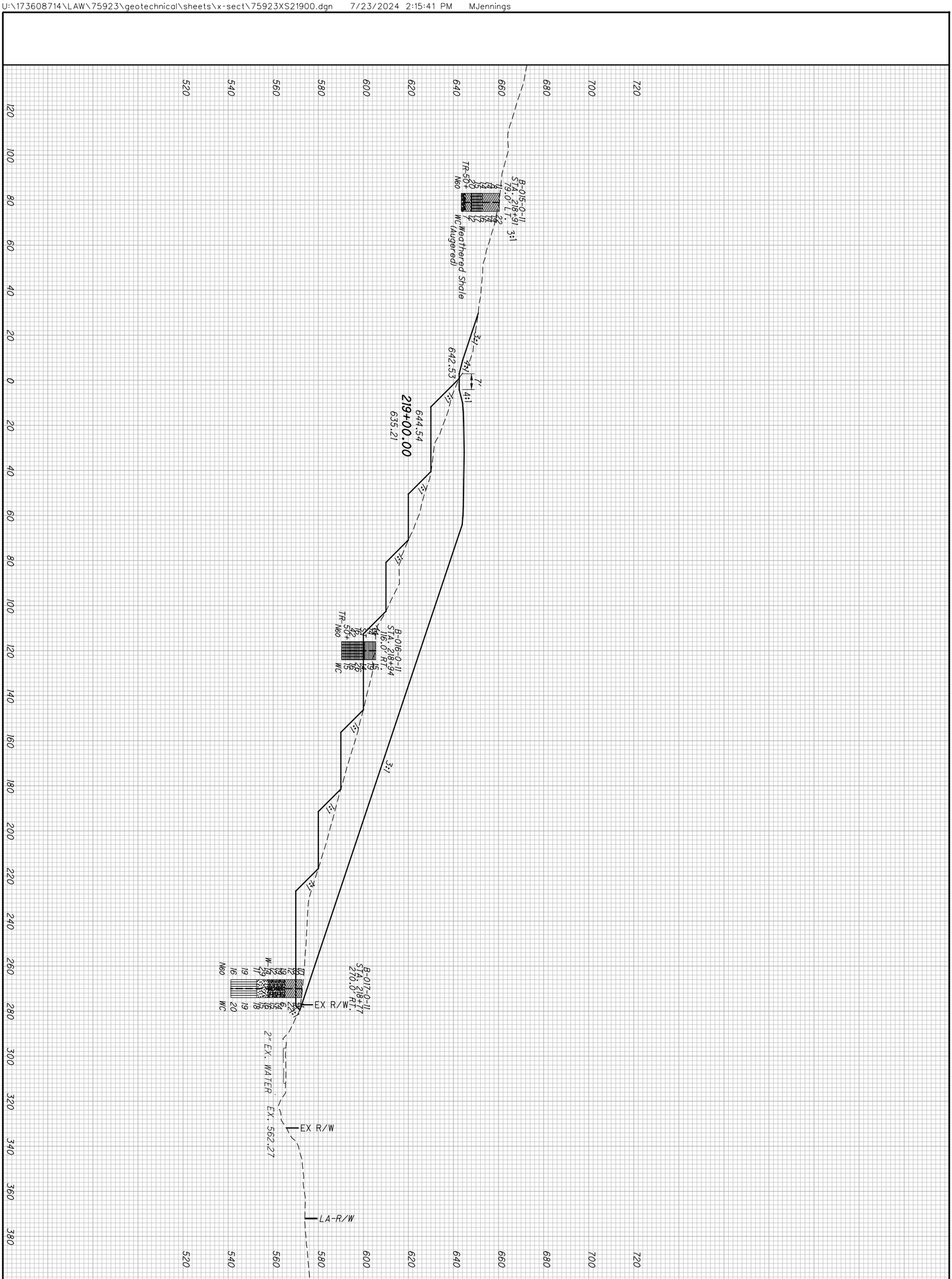

1125 / 1247	84 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 219+00.00	DRAWN MSJ CHECKED EMK 0 20 10 40 HORIZONTAL SCALE IN FEET

700
680
660
640
620
600
580
560

3:1
6'
3:1
4:1
4:1
10:1
630.97
3:1
B-019-0-11
Sta. 228+76, ℄
Sod/and or Topsoil 0.5'
666.67
228+50.00
623.42
1:1
4
11
ST
38
TR
73
32
19
15
16
10
WC
Weathered Shale
(Augered)
N60
1:1
1:1
EX R/W
EX R/W
EL. 591.3
R-223-0-99
STA 227+80.1
222.6' RT.
TOPSOIL - 2 INCHES
2" EX. WATER
5
10
6
7
5
8
15
50
3"
TOP OF BEDROCK
50
1"
SOFT TO MEDIUM-HARD
YELLOW-BROWN ARENACEOUS
SHALE
50
1"
N
WC
3:1
10:1
4:1
10'
4:1
593.70

180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320

0 10 20 40
HORIZONTAL
SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 228+50.00

LAW-7-2.17

85/206

1126
1247

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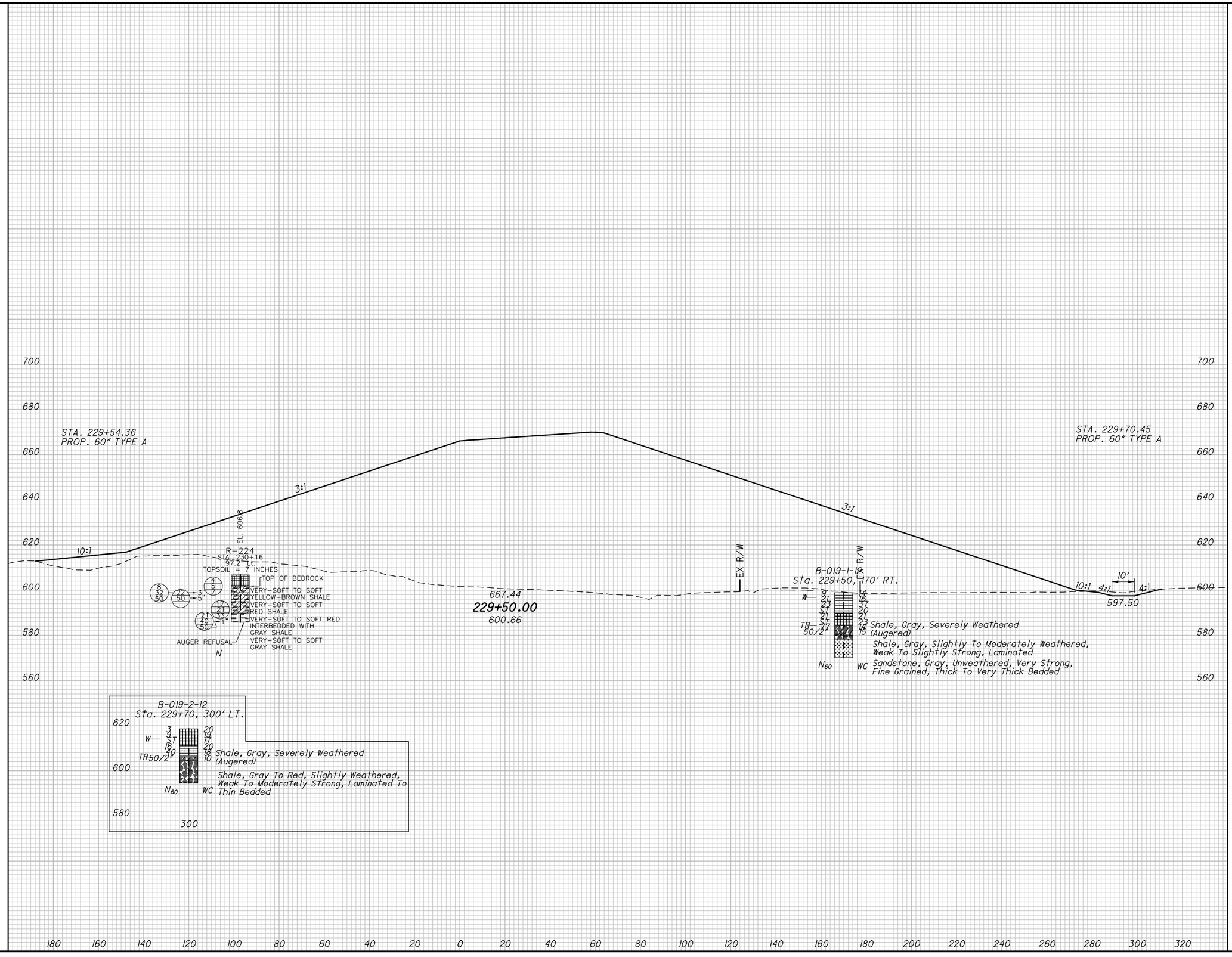

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 229+50.00

LAW-7-2.17

85A/206

1126A
1247

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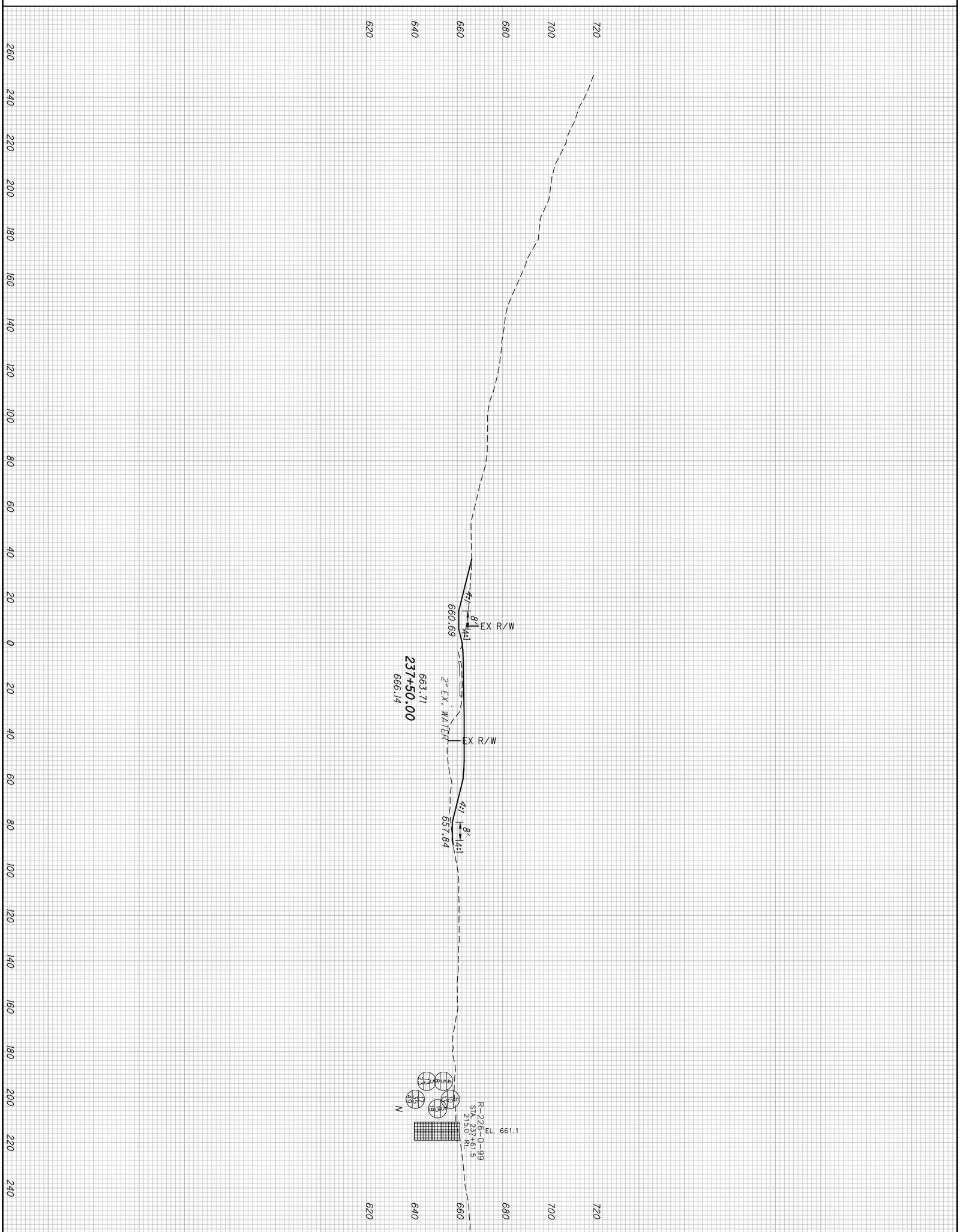

112/247	86/206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 237+50.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 242+00.00

LAW-7-2.17

87 / 206

1128
1247

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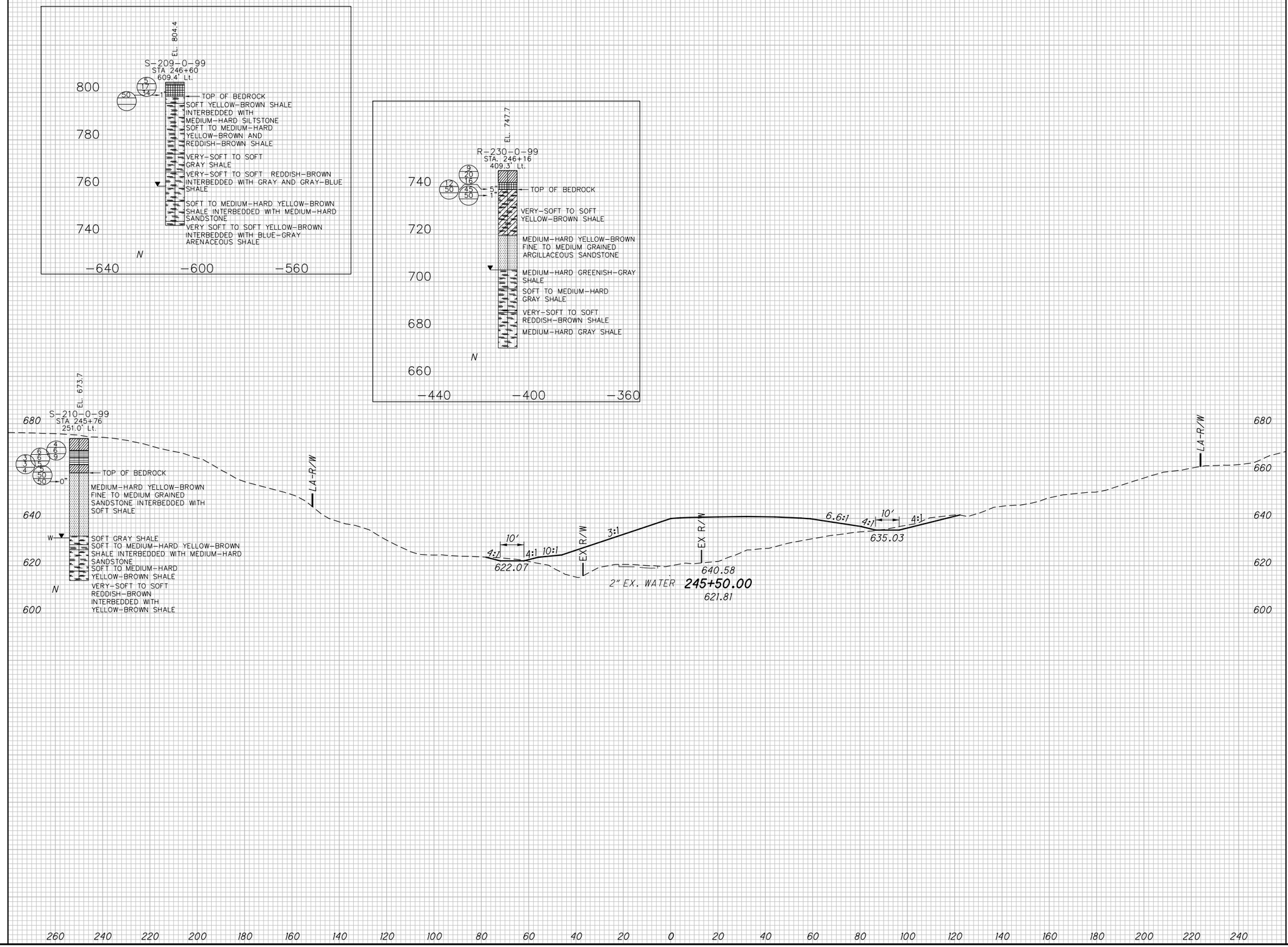


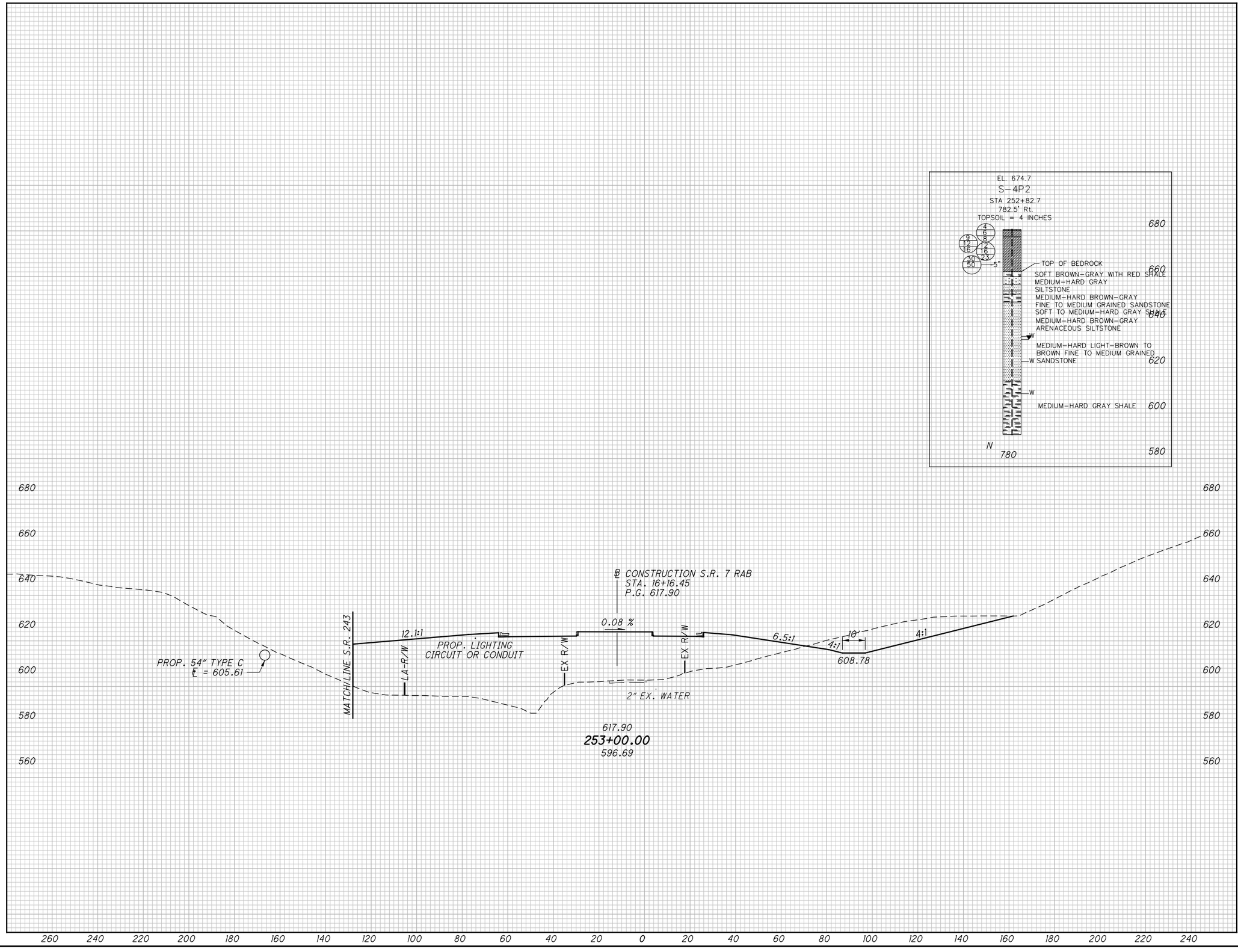
HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 245+50.00

LAW-7-2.17

88/206
1129/1247



0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 253+00

LAW-7-2.17

89 / 206

1130
1247

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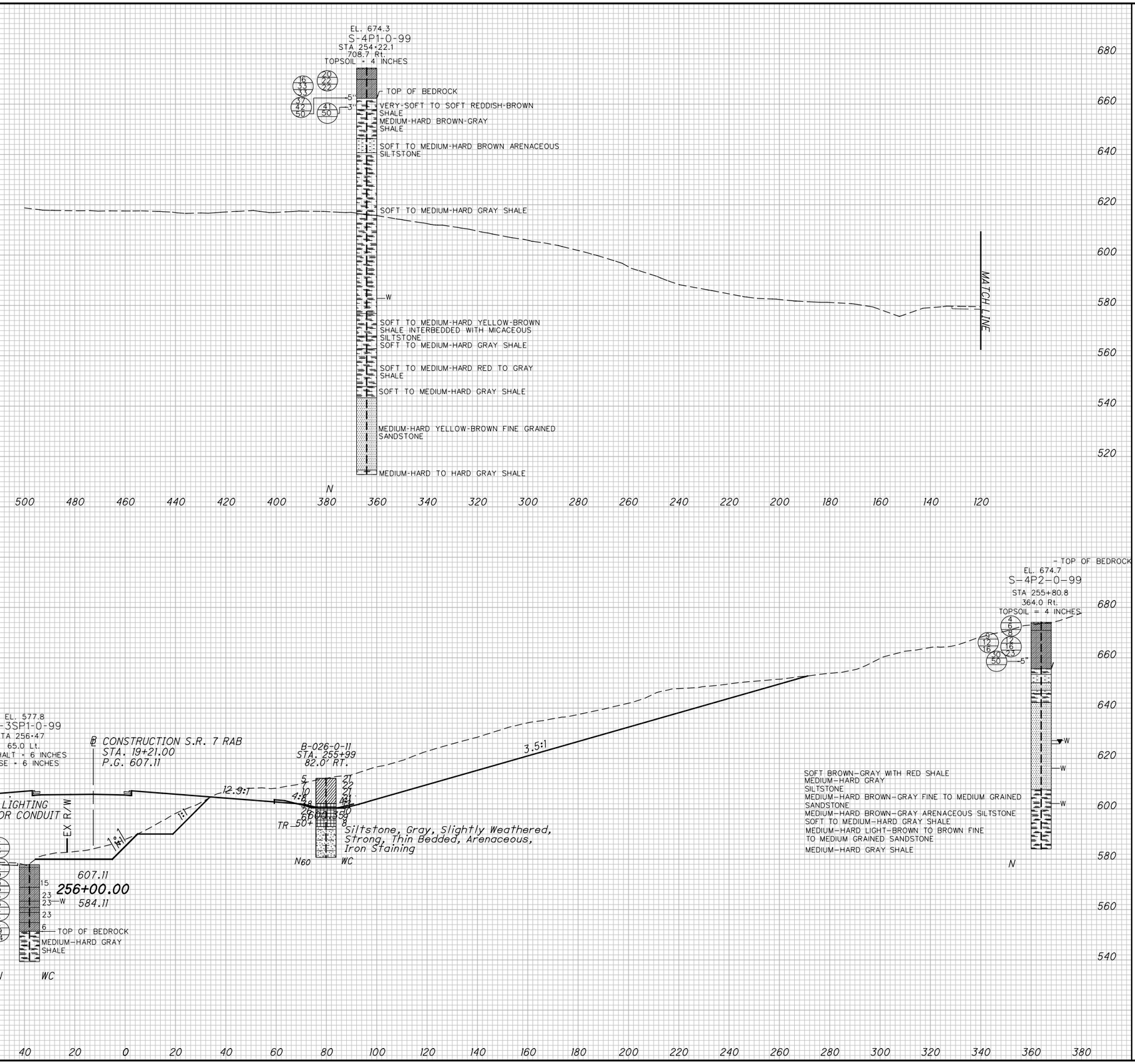

HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION- S.R. 7
STATION 256+00.00

LAW-7-2.17

90/206

1131/1247

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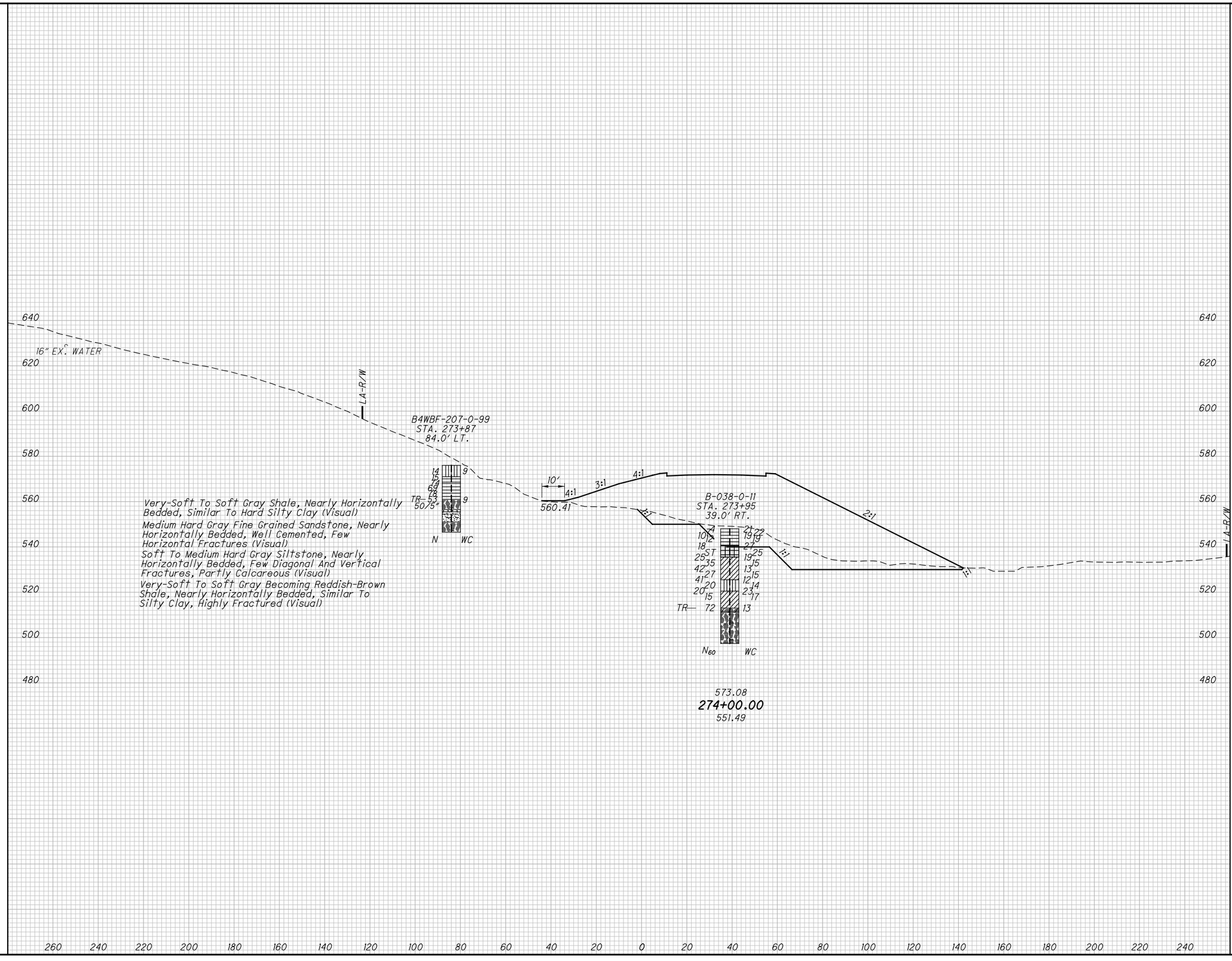

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HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 274+00.00

LAW-7-2.17

91 206

1132
1247

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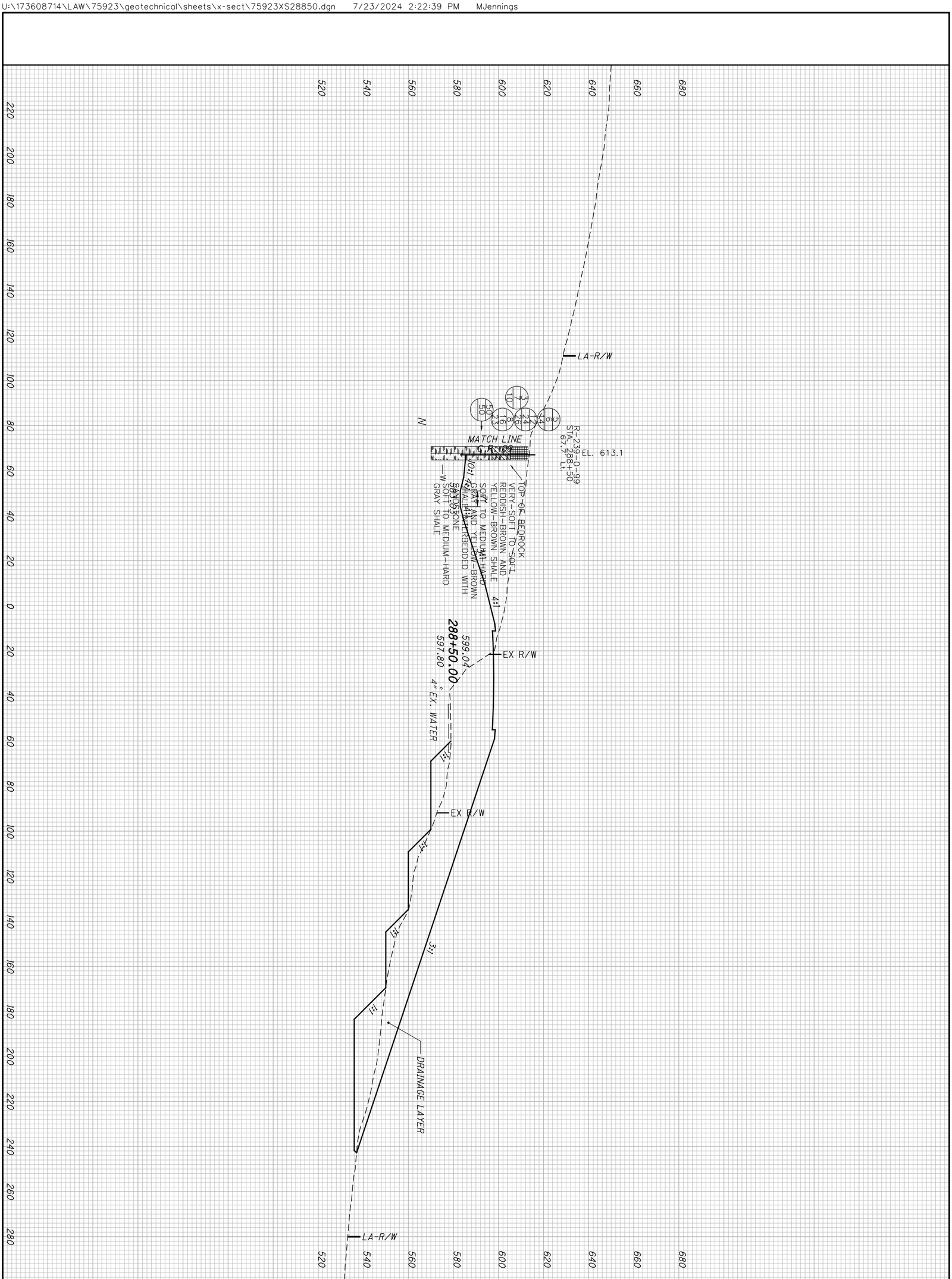

1133 / 1247	92 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 288+50.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET

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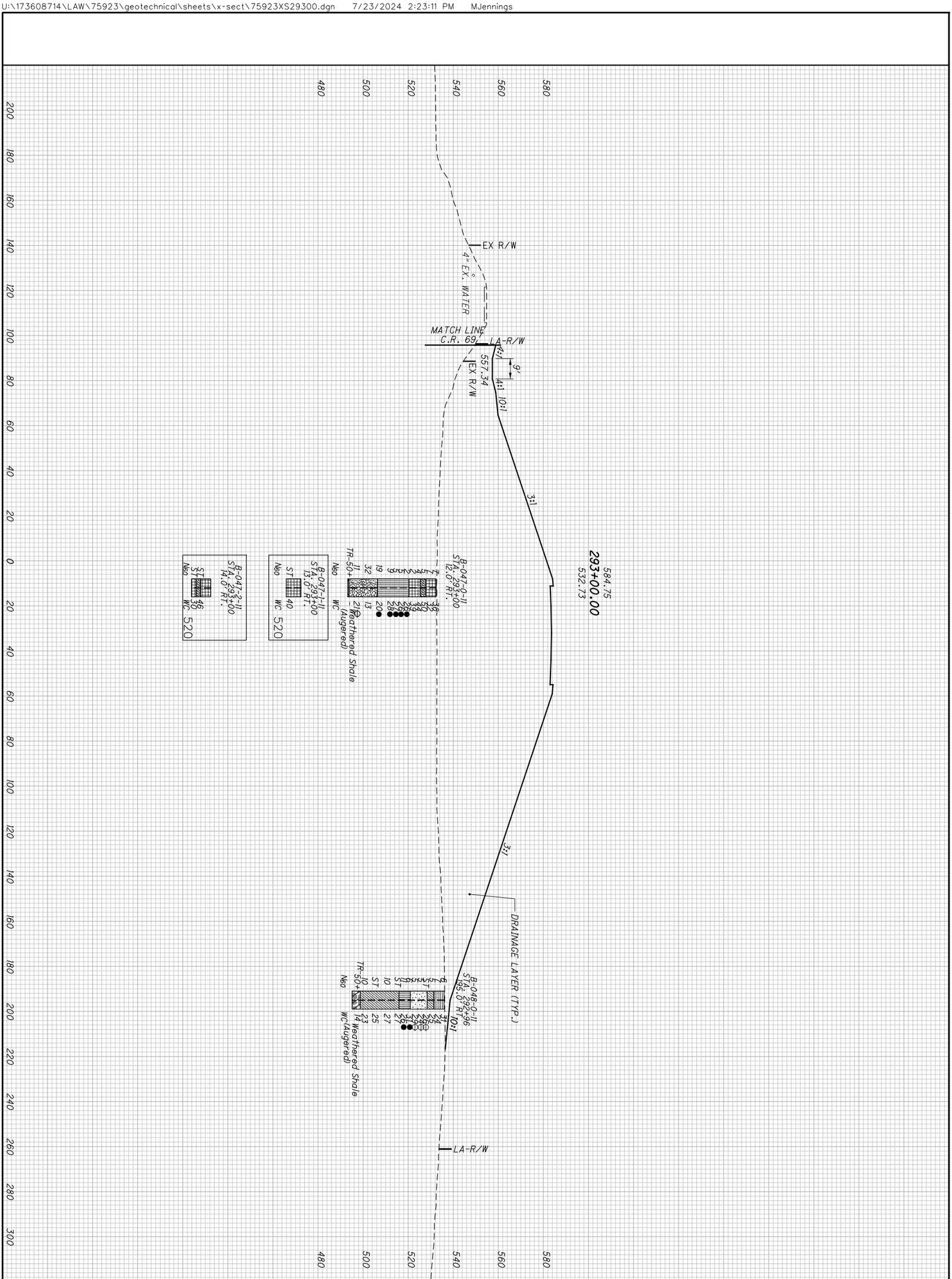
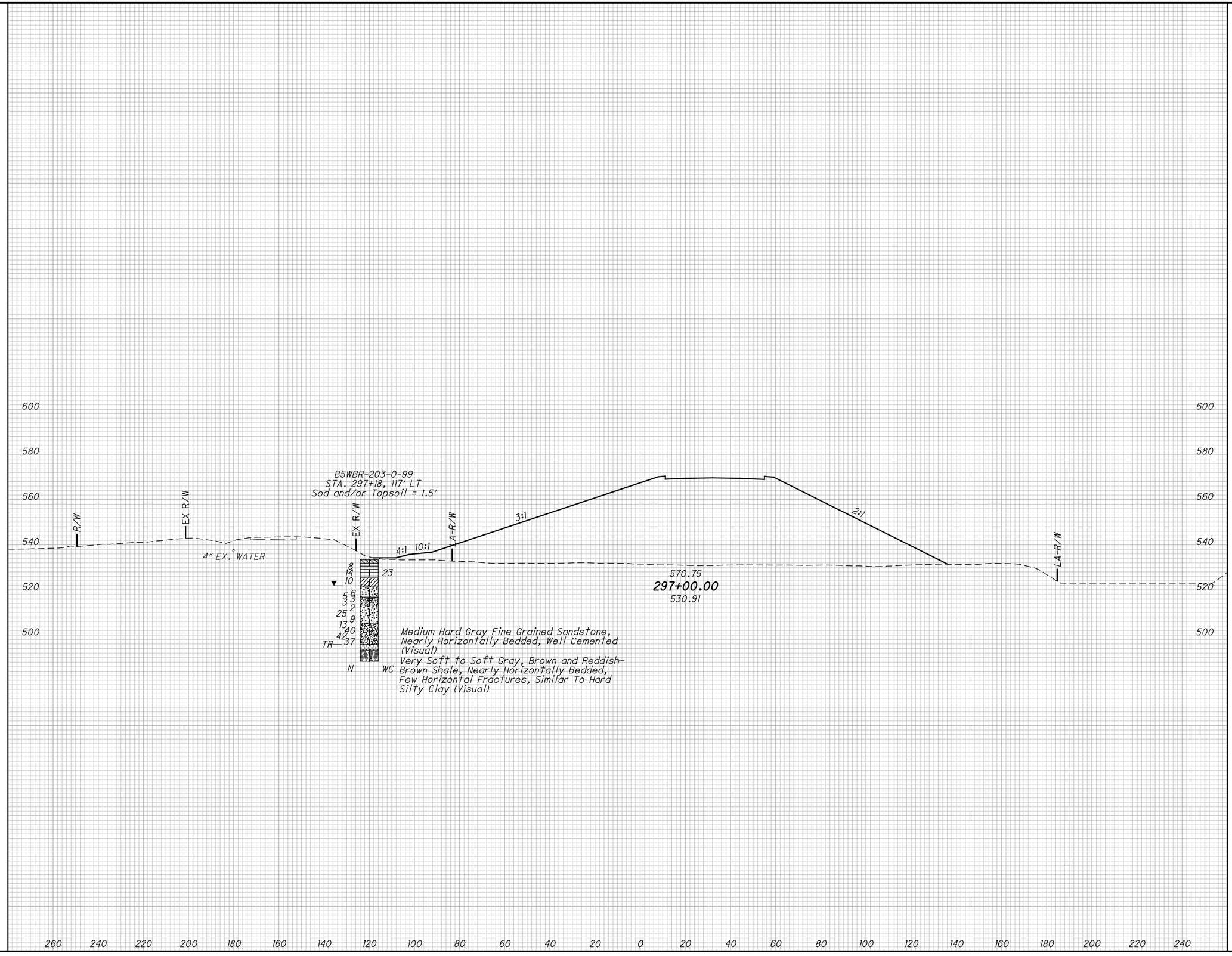


1134 / 1247	93 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 293+00.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET



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0 10 20 40
HORIZONTAL SCALE IN FEET

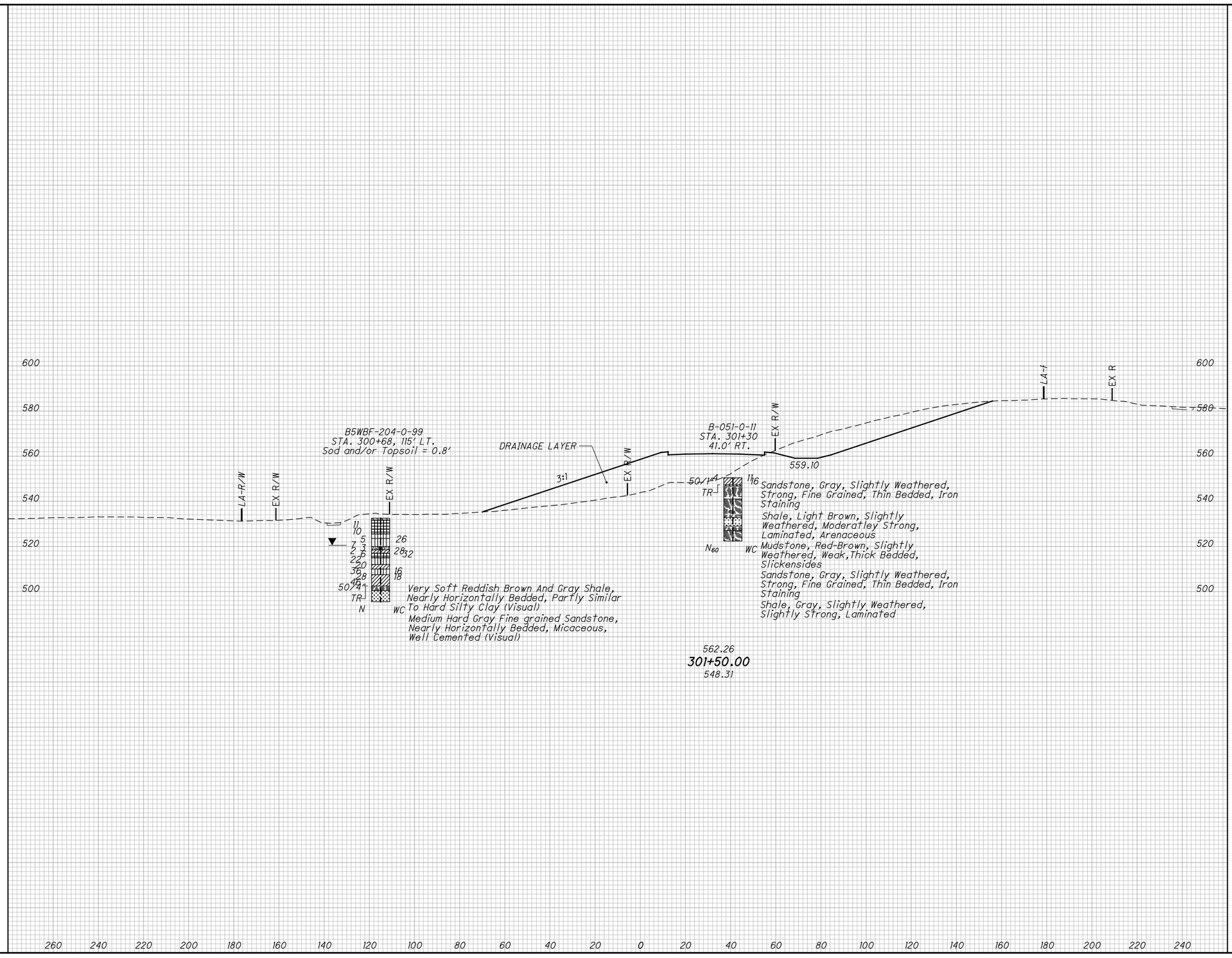
DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 297+00.00

LAW-7-2.17

94/206

1135
1247



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HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 301+50.00

LAW-7-2.17

95/206

1136/1247

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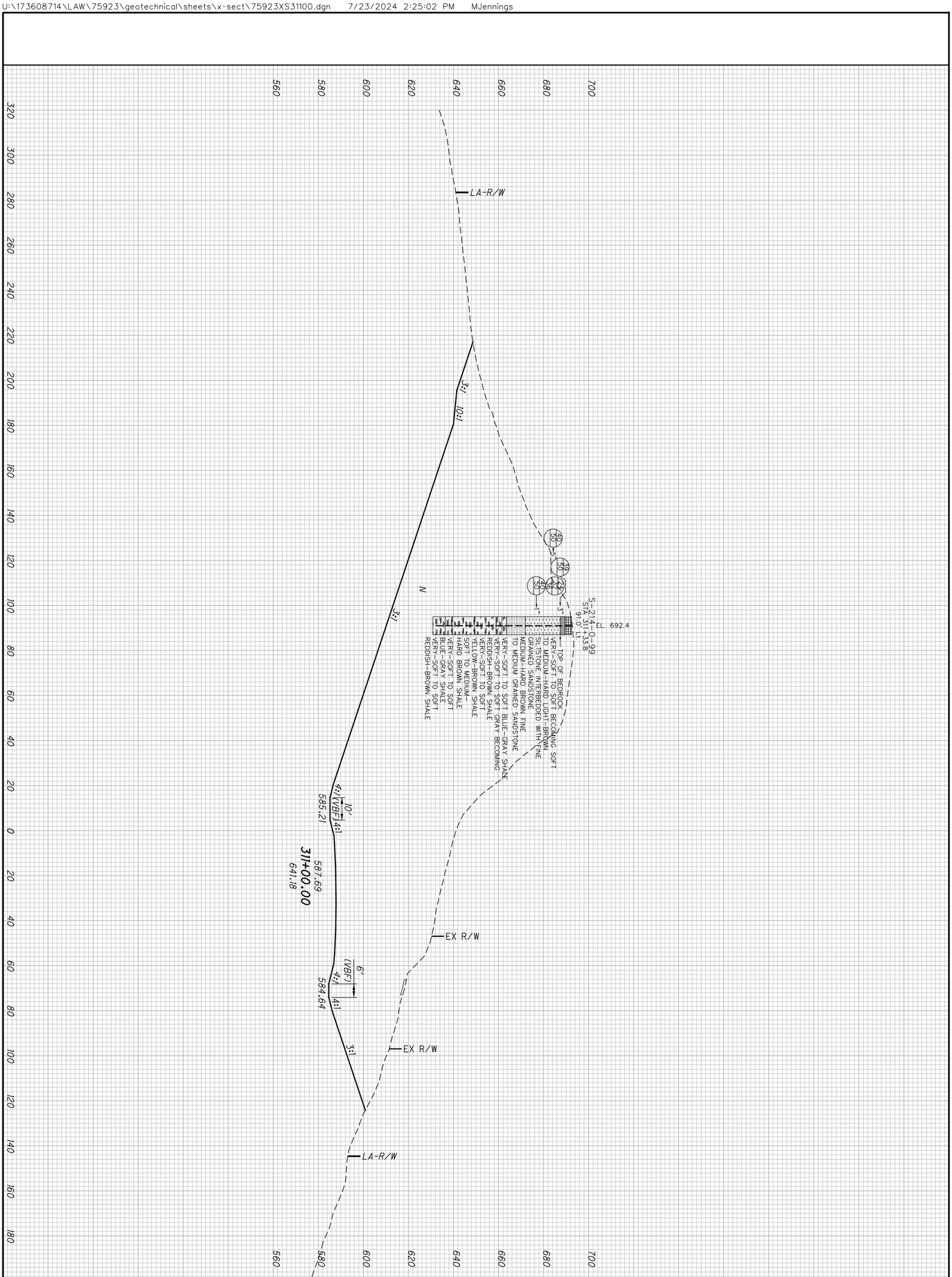
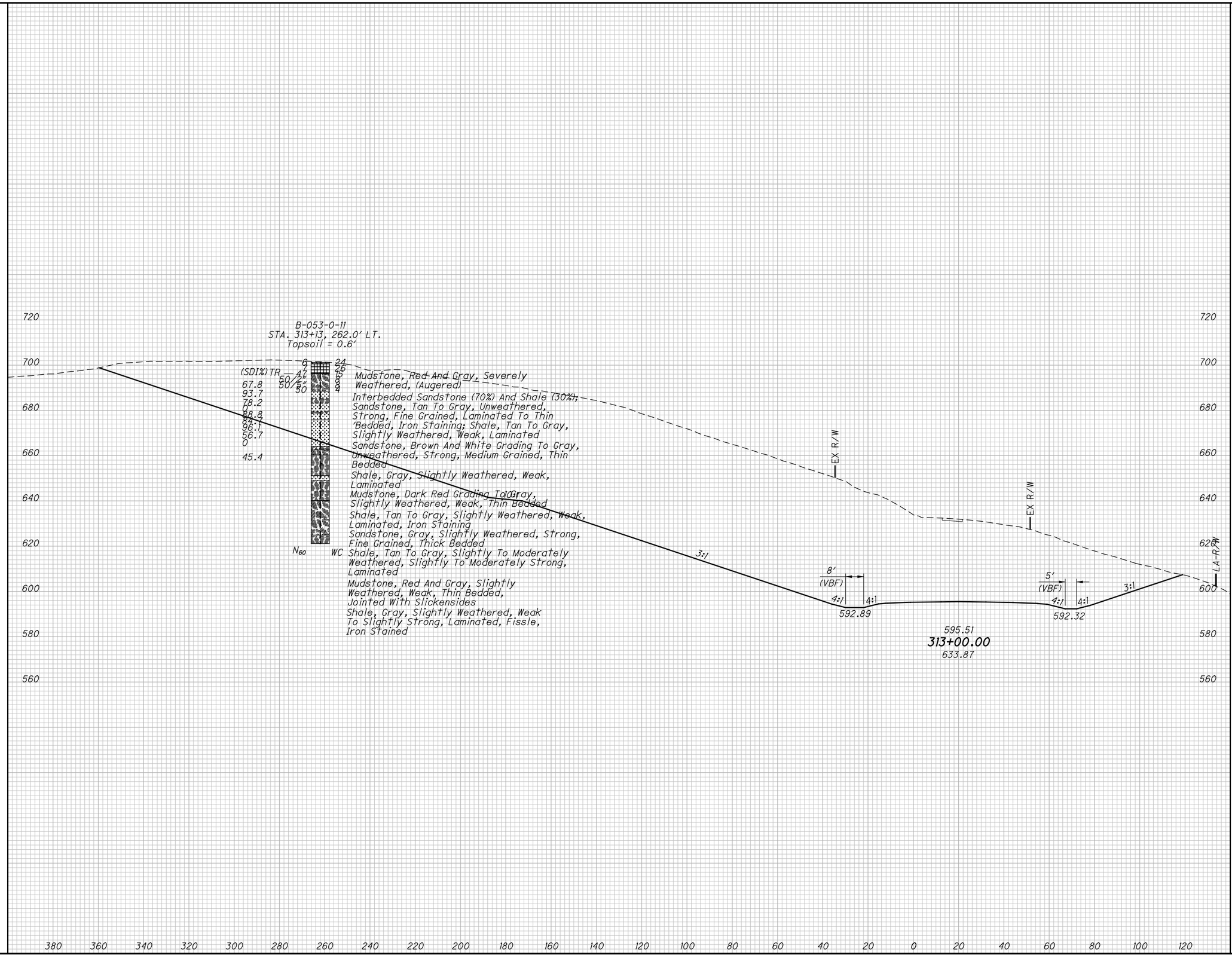


113/1247	96/206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 311+00.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET



0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 313+00.00

LAW-7-2.17

97 / 206

1138
1247

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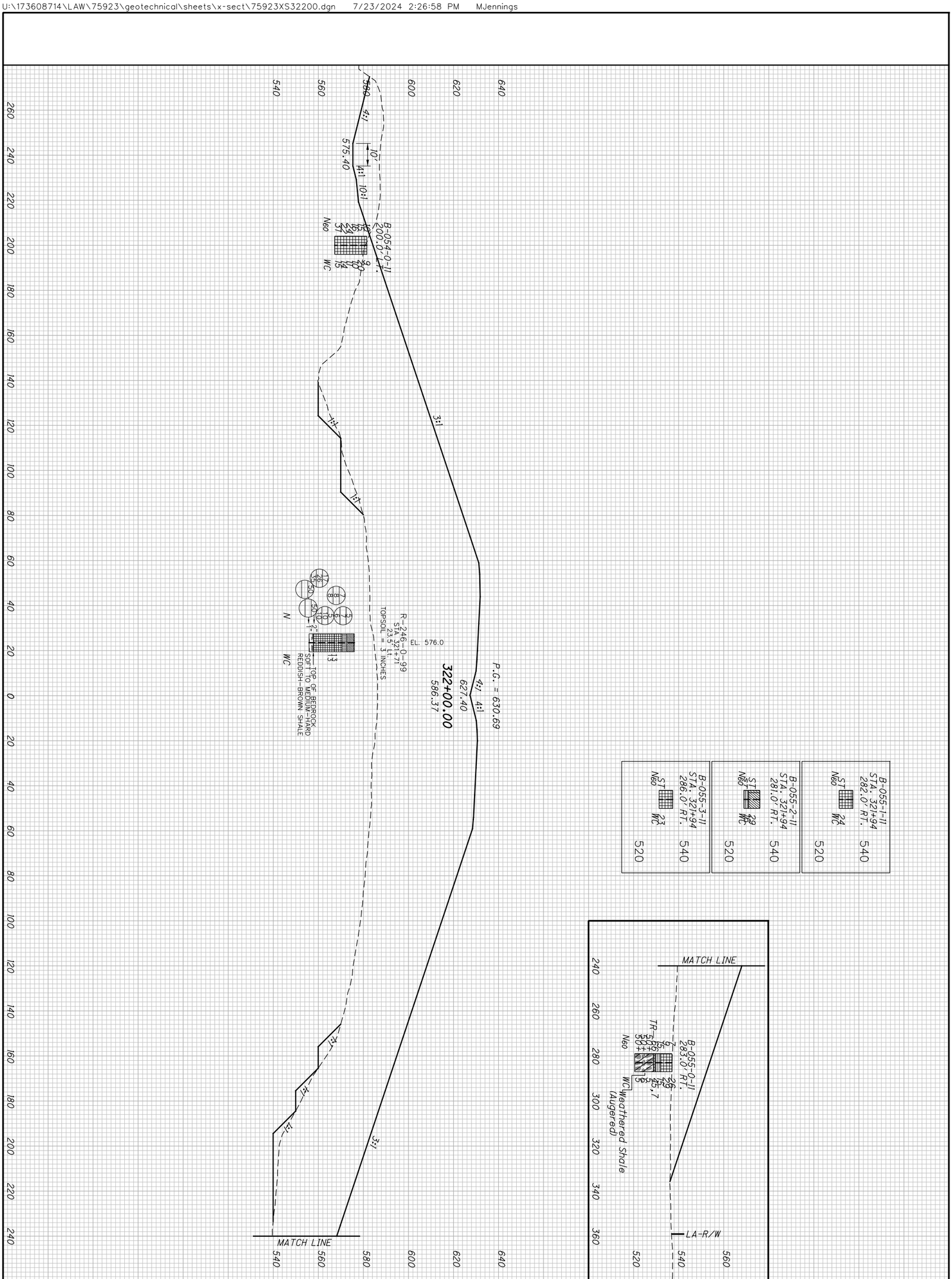


1139 / 1247	98 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 322+00.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET

HORIZONTAL SCALE IN FEET
0 10 20 40

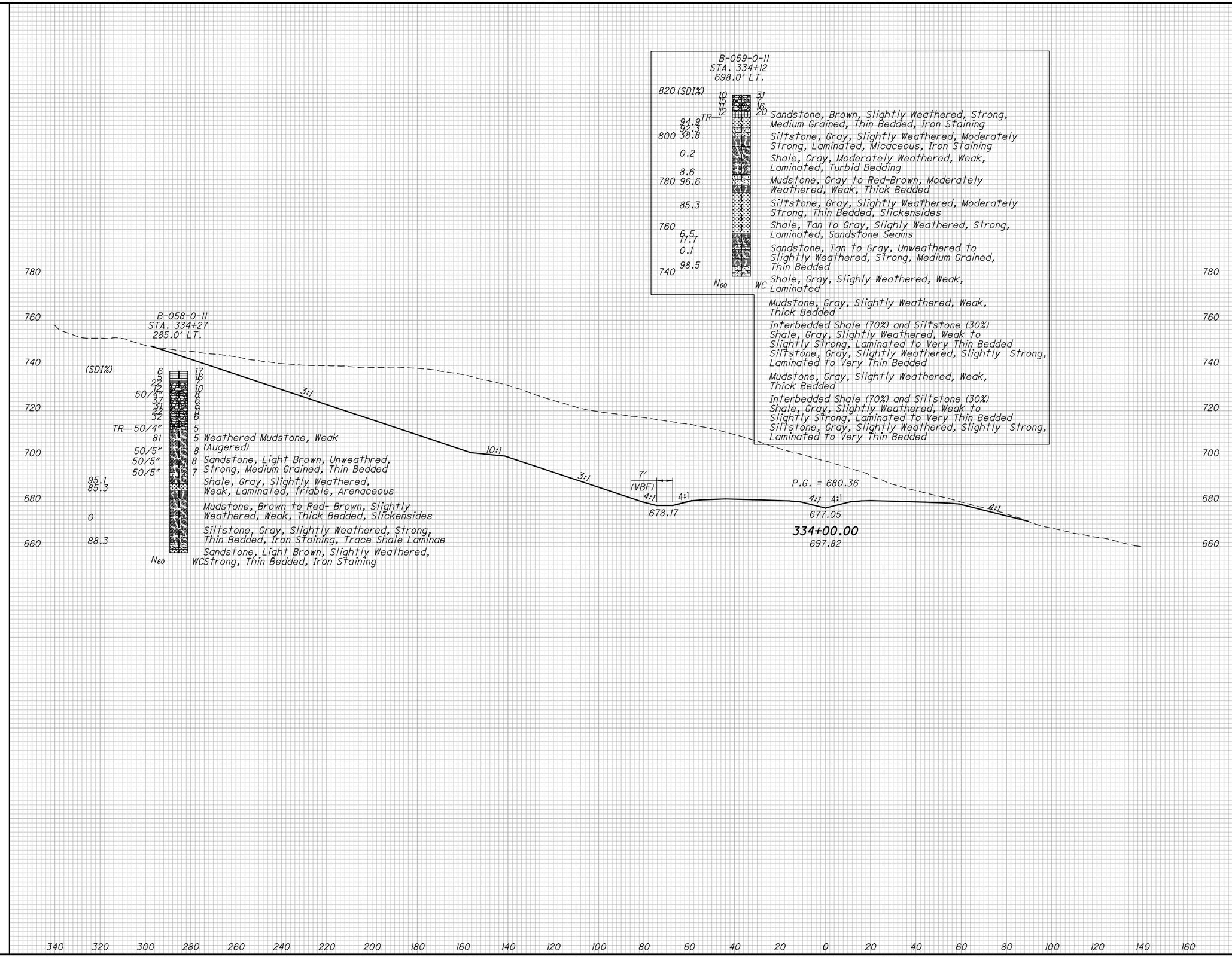
DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 329+00.00

LAW-7-2.17

99 / 206

1140 / 1247



0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 334+00.00

LAW-7-2.17

100/206

1141
1247

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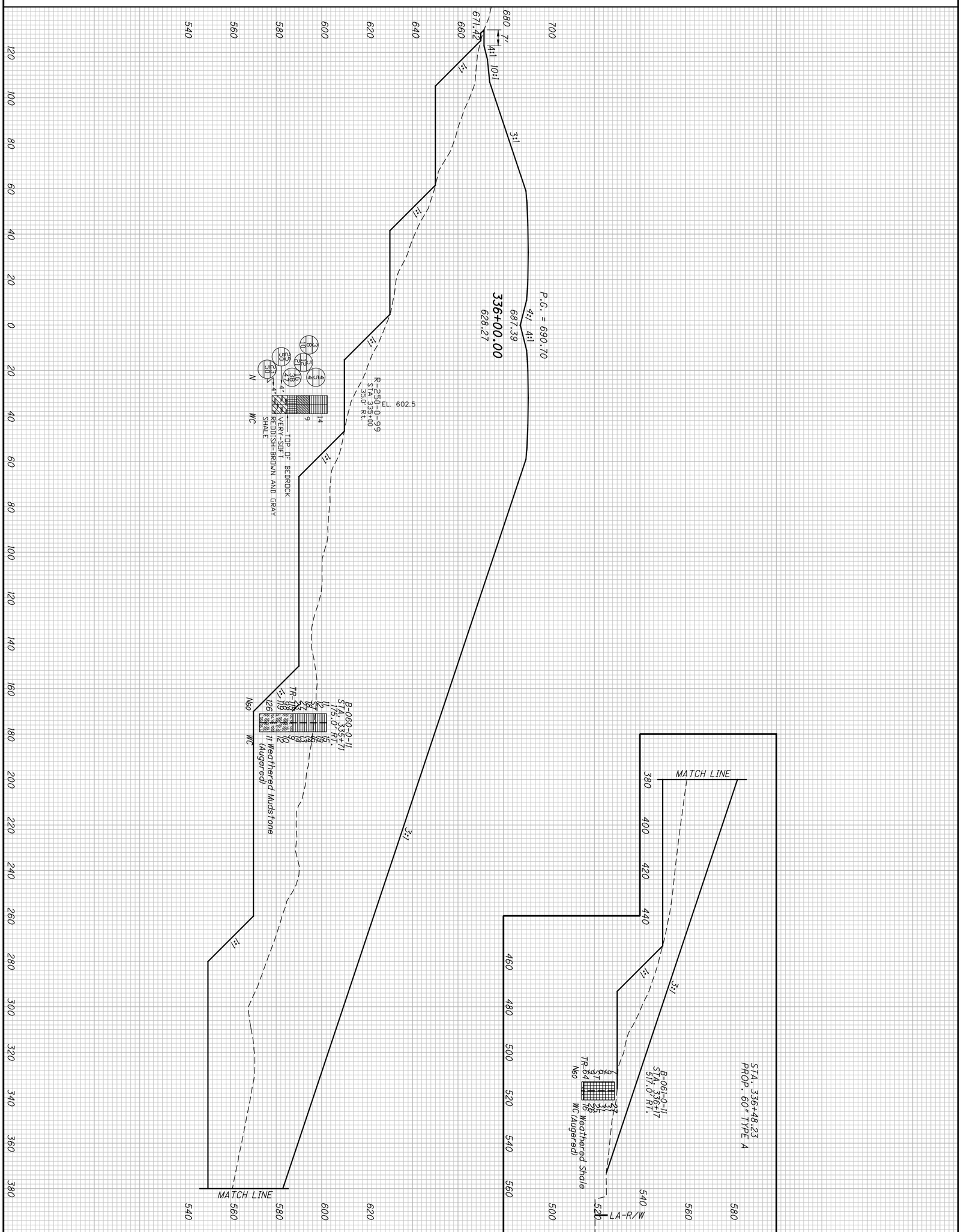
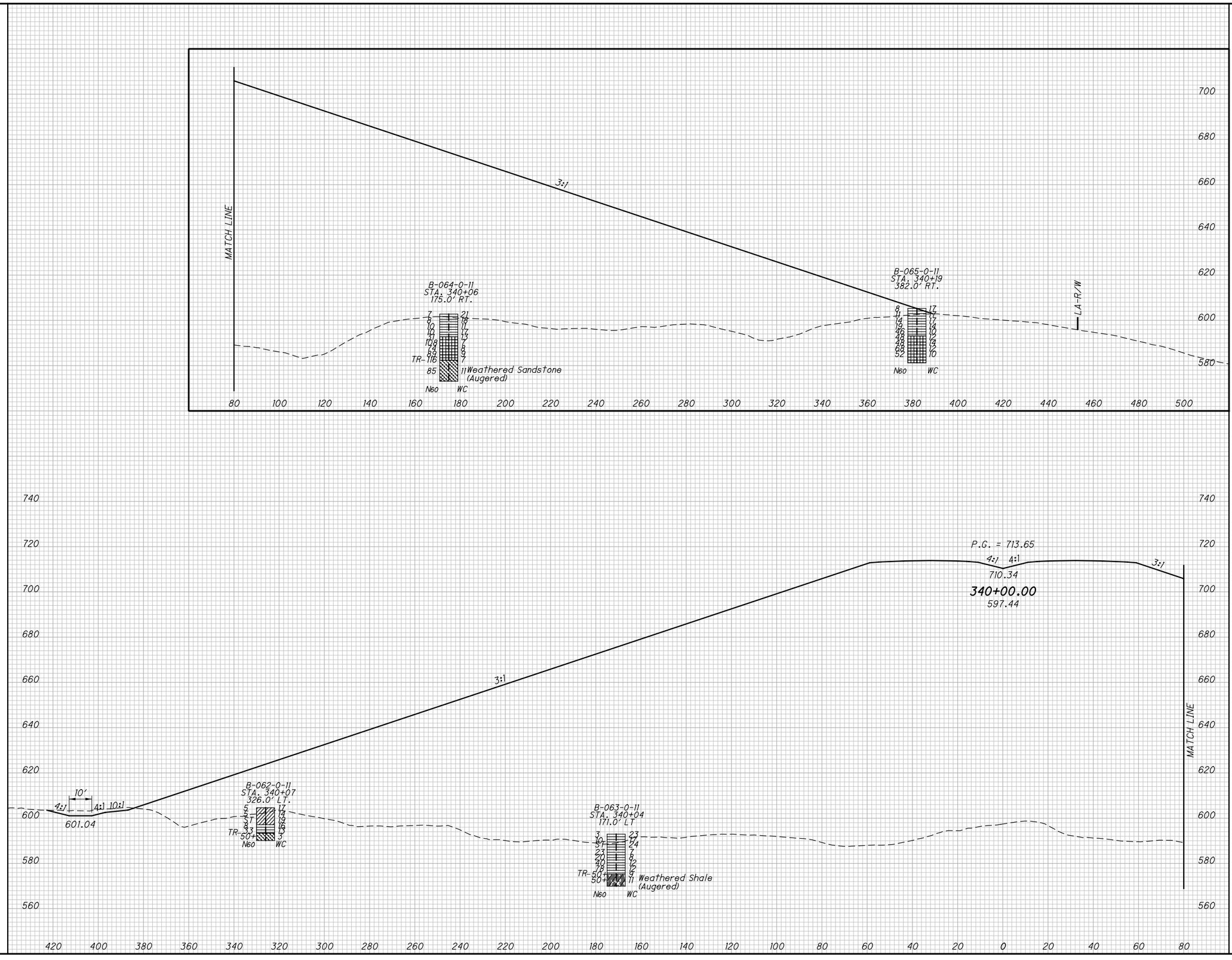


1142 / 1247	101 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 336+00.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET



HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 340+00.00

LAW-7-2.17

102/206

1143
1247

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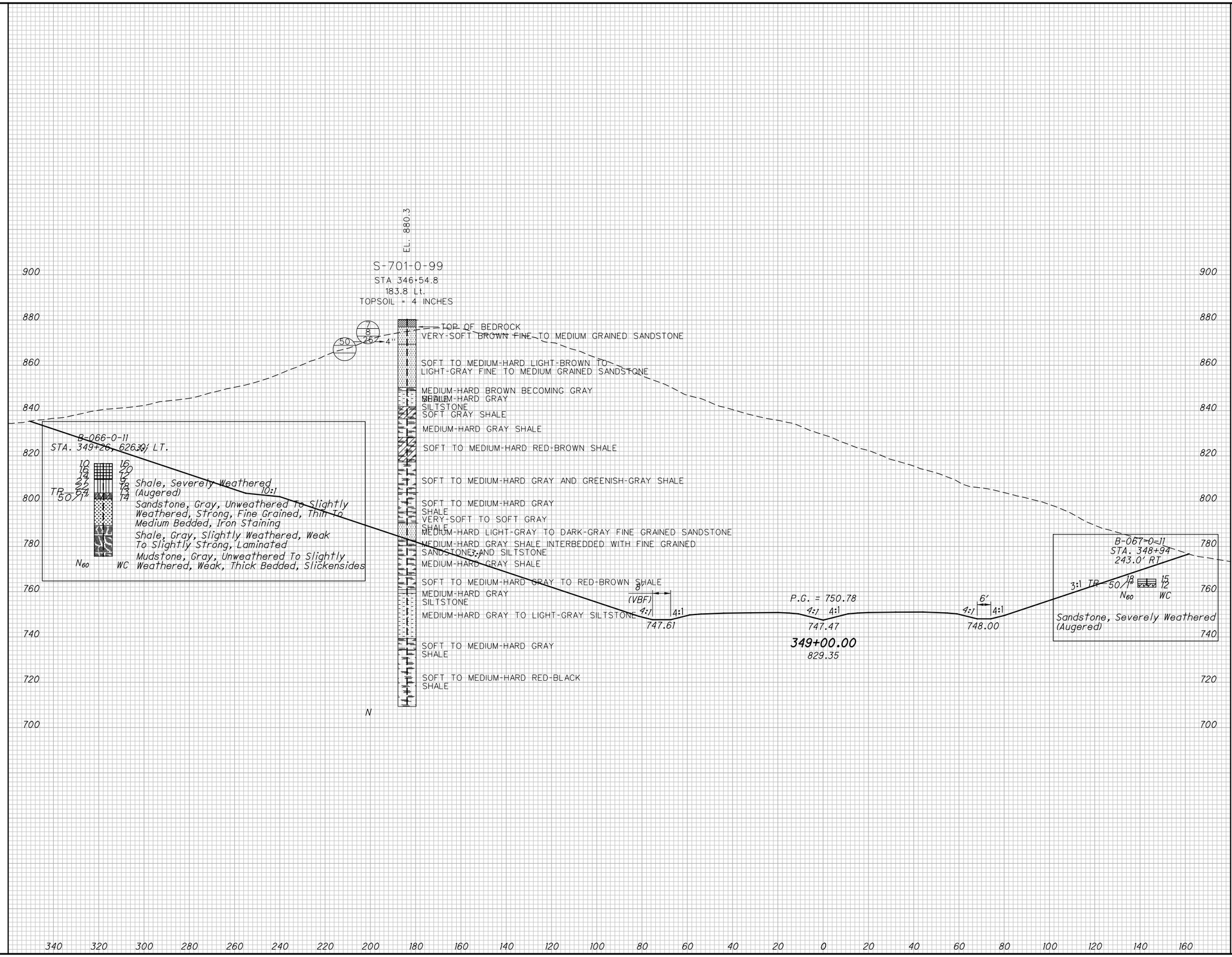


0 10 20 40
HORIZONTAL SCALE IN FEET

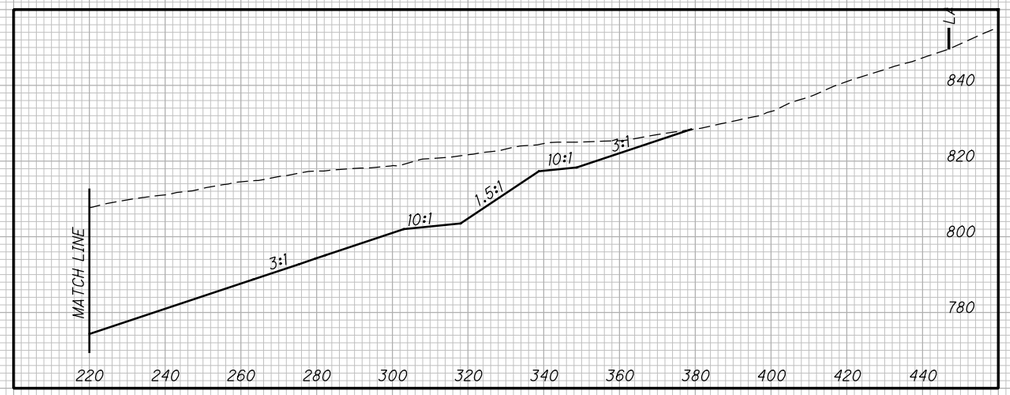
DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 349+00.00

LAW-7-2.17

103/206

1144
1247



B-070-0-11
STA. 358+89
287.0' LT.

7 17
11 14
11 17
23 24
24

Shale, Severely Weathered (Augered)

TR 50/2" N_{60} WC

B-069-0-11
STA. 359+62
105.0' RT.

7 16
10 22
29 23
50/4" 6

Shale, Severely Weathered (Augered)

TR 50/2" N_{60} WC

Sandstone, Gray, Unweathered, Strong, Fine Grained, Thin Bedded

Interbedded Siltstone (60%) And Shale (40%); Siltstone, Light and Dark Gray, Slightly Weathered, Strong, Laminated to Thin Bedded, Areneaceous; Shale, Gray, Slightly Weathered, Weak to Slightly Stong, Laminated

Mudstone, Gray to Red Brown, Slightly Weathered, Weak, Thick to Very Thick, Thin Bedded, Slickensides

Interbedded Siltstone (80%) And Shale (20%); Siltstone, Gray, Unweathered, Strong, Laminated to Thin Bedded, Areneaceous; Shale, Gray, Slightly Weathered, Weak, Laminated

Shale, Gray With Little Red, Slightly Weathered, Weak, Laminated, Slickensides and Clay Filled Fractures

Siltstone, Gray With Little Red, Slightly Weathered, Strong, Laminated to Thin Bedded, Few Laminated Shale Layers

Mudstone, Gray Grading to Dark Red, Slightly Weathered, Strong, Thin to Medium Bedded, Slickensides

Interbedded Siltstone (60%) And Shale (40%); Siltstone, Gray, Unweathered to Slightly Weathered, Strong, Laminated to Thin Bedded; Shale, Gray, Unweathered to Slightly Weathered, Slightly Stong, Laminated

Mudstone, Dark Red, Slightly to Moderately Weathered, Slightly Strong, Thin Bedded

Sandstone, Gray, Unweathered, Very Strong, Fine to Medium Grained, Thick Bedded

Interbedded Siltstone (70%) And Shale (30%); Siltstone, Gray, Unweathered, Strong, Laminated to Thin Bedded; Shale, Gray, Unweathered to Slightly Weathered, Slightly Stong, Laminated

MATCH LINE

Mudstone, Dark Red, Slightly Weathered, Weak to Slightly Strong, Thin Bedded

Interbedded Siltstone (70%) And Shale (30%); Siltstone, Gray, Unweathered to Slightly Weathered, Strong, Laminated to Thin Bedded; Shale, Gray, Unweathered to Slightly Weathered, Slightly Stong, Laminated

3:1

10'
4:1 (VBF) 4:1
725.50

P.G. = 728.60
4:1 4:1
725.29

359+50.00
817.98

9'
4:1 4:1
726.60

860
840
820
800
780
760
740
720
700
680
660
640

280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220

0 10 20 40 HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 359+50.00

LAW-7-2.17

104/206

1145
1247

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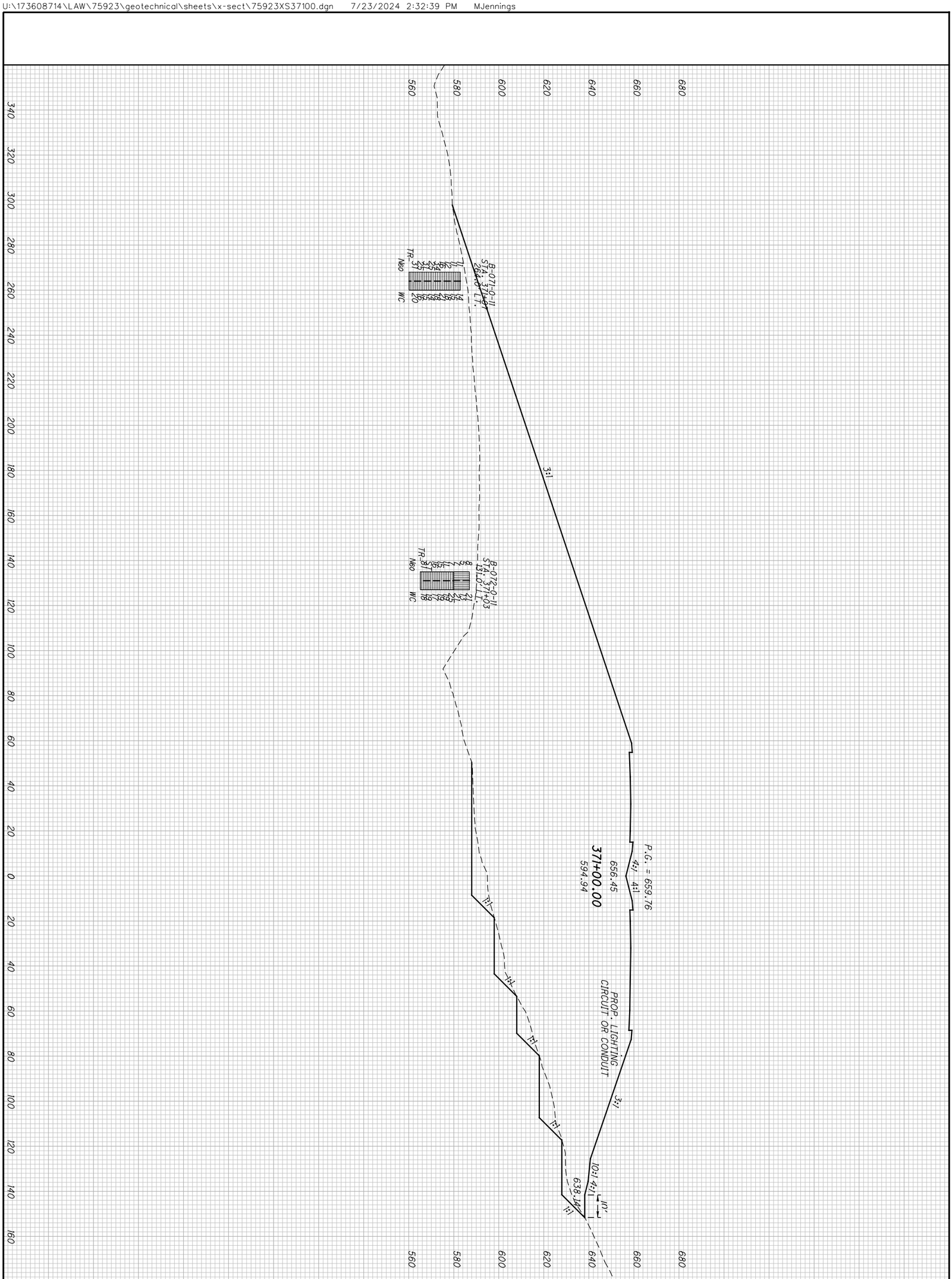
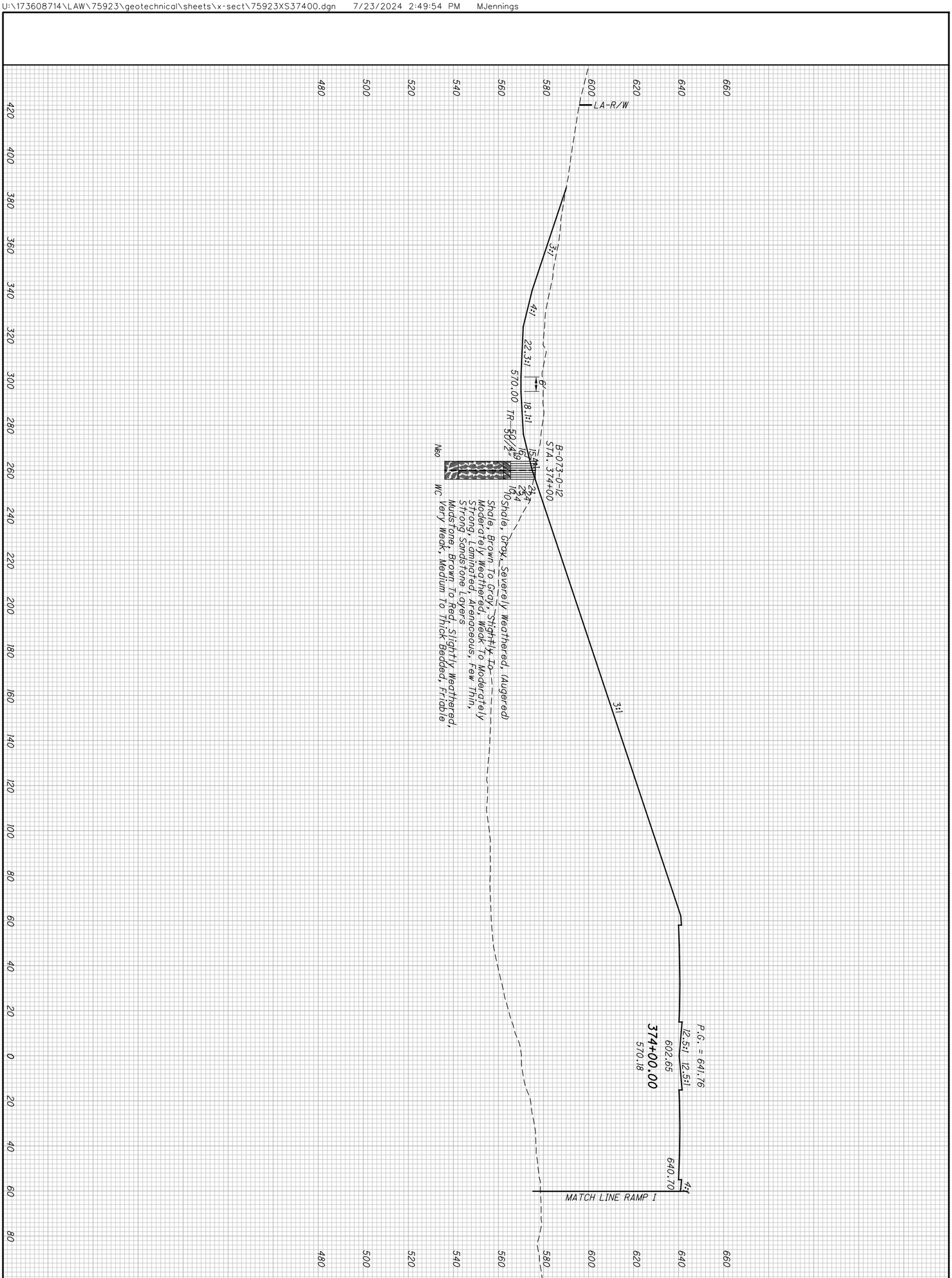
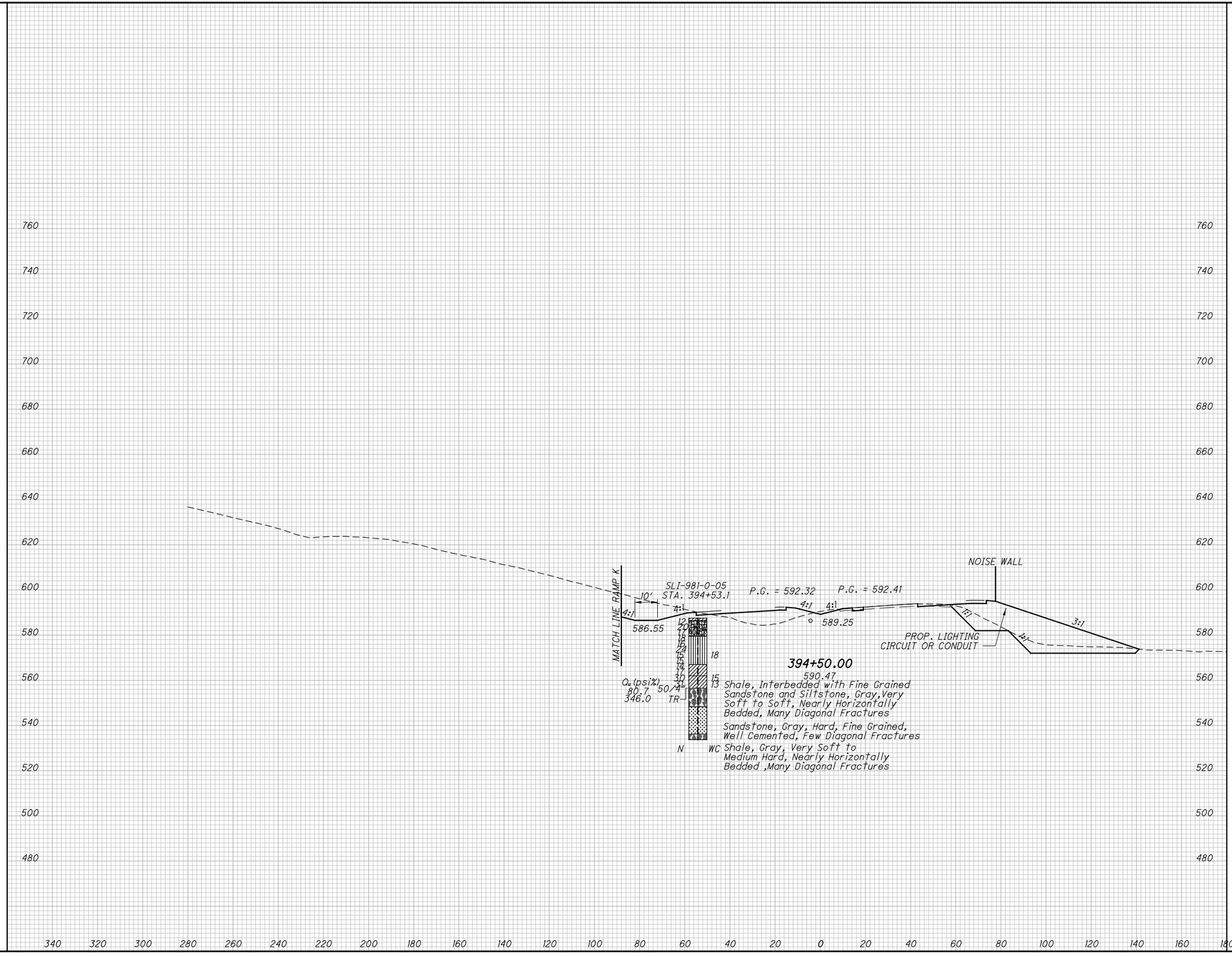


1146 / 1247	105 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 371+00.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET

U:\173608714\LAW\75923\geotechnical\sheets\x-sect\75923XS37400.dgn 7/23/2024 2:49:54 PM MJennings



1147 / 1247	106 / 206	LAW-7-2.17	CROSS SECTION - S.R. 7 STATION 374+00.00	DRAWN MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET

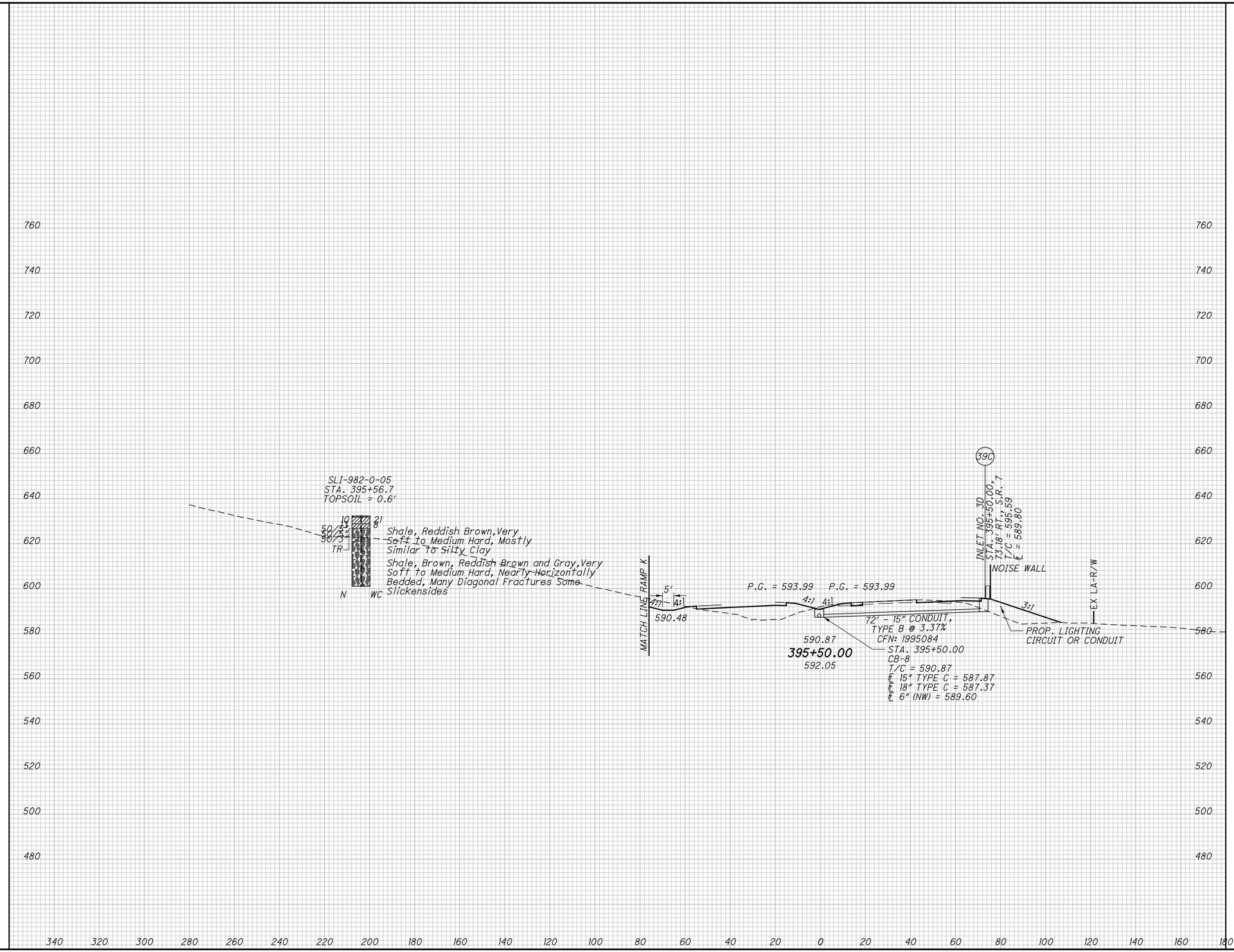


0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 394+50.00

LAW-7-2.17



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0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 395+50.00

LAW-7-2.17

108/206

1149/1247

760 740 720 700 680 660 640 620 600 580 560 540 520 500 480

760 740 720 700 680 660 640 620 600 580 560 540 520 500 480

S-102-0-99
STA. 396+22

49
25
12
TR
N

Shale, Brown, Red and Green, Soft to Medium Hard, Interbedded with Siltstone, Few Vertical Fractures, Few Sand filled Cracks

WC Shale, Gray, Soft, Horizontally Bedded, Highly Fractured, Similar to Hard Silty Clay

MATCH LINE RAMP K

5'
4:1
4:1
591.60

℄ 15" TYPE C = 588.39

P.G. = 594.82
P.G. = 594.81
4:1
4:1
591.69
396+00.00
592.94

NOISE WALL
3:1
PROP. LIGHTING CIRCUIT OR CONDUIT
EX LA-R/W

340 320 300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180

0 10 20 40
HORIZONTAL SCALE IN FEET

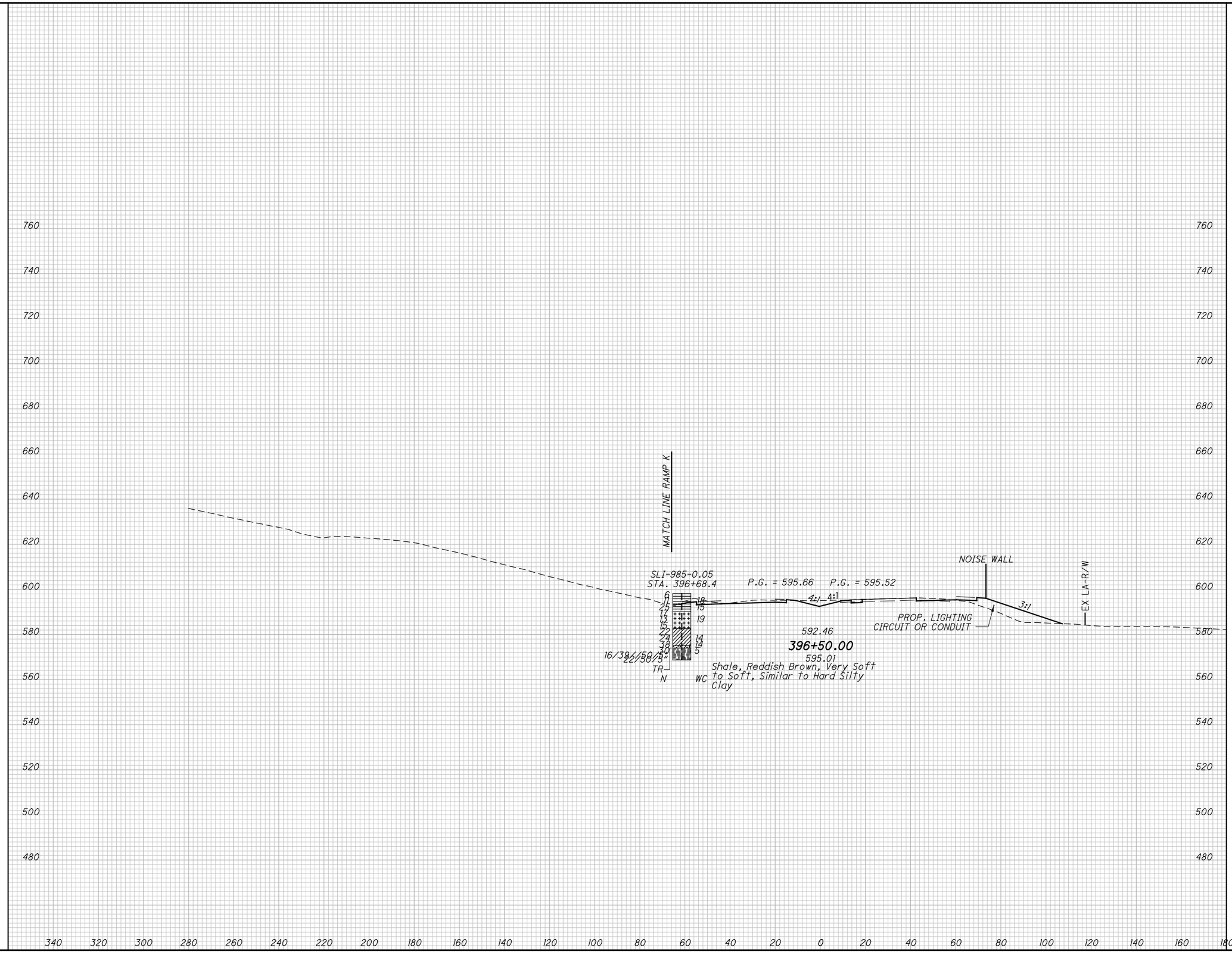
DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 396+00.00

LAW-7-2.17

109/206

1150
1247



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0 10 20 40
HORIZONTAL
SCALE IN FEET

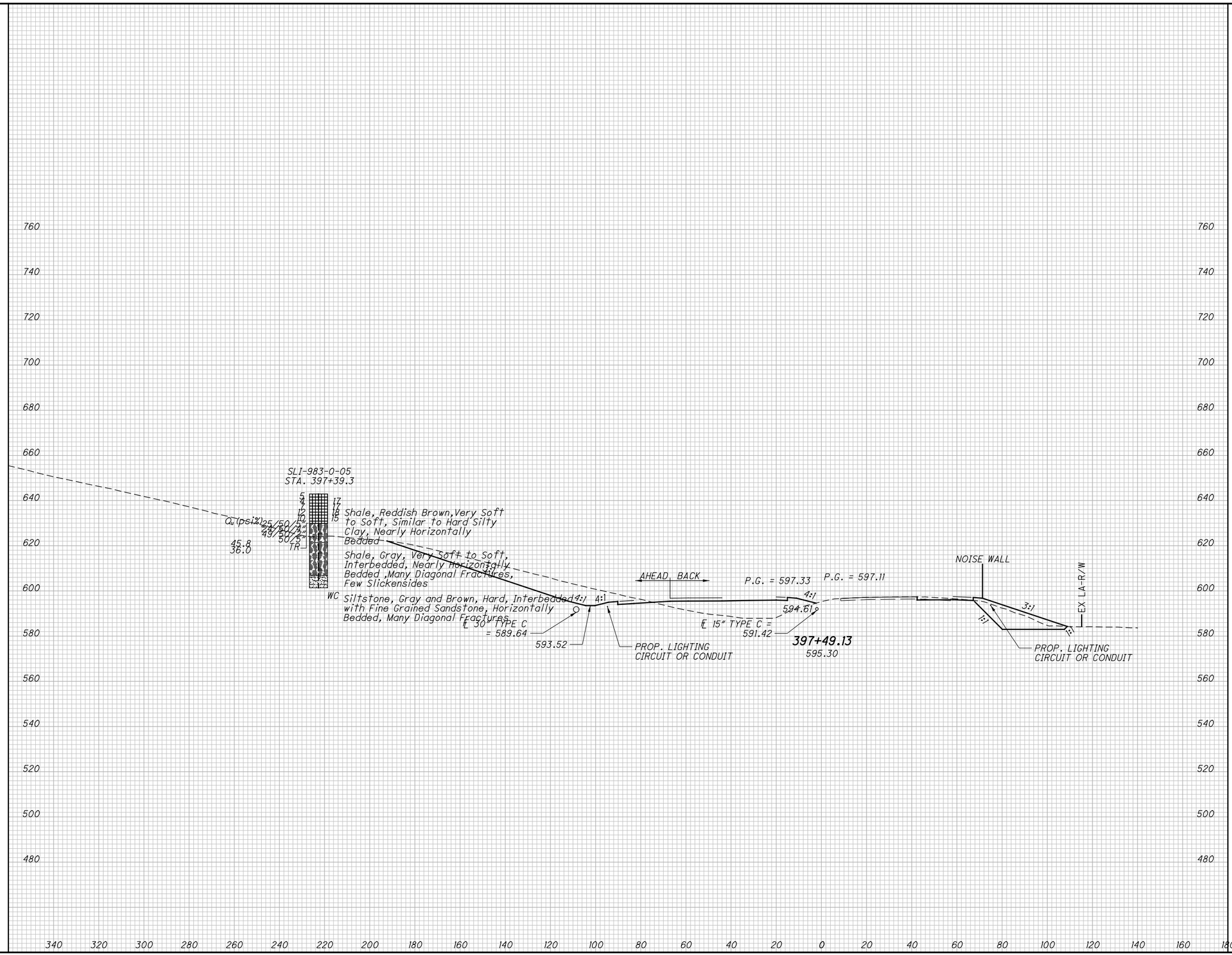
DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 396+50.00

LAW-7-2.17

110/206

1151
1247



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HORIZONTAL SCALE IN FEET
0 10 20 40

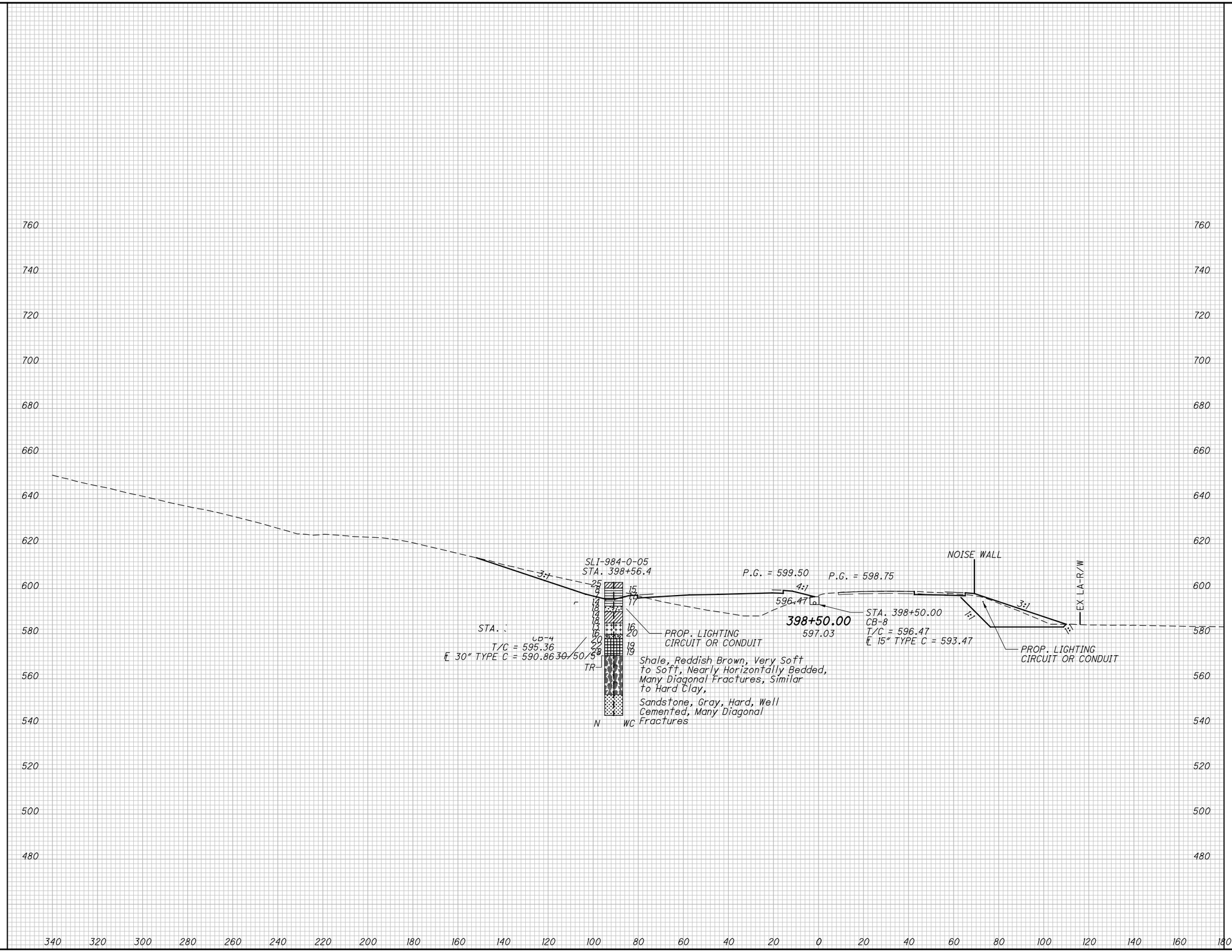
DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 397+49.13

LAW-7-2.17

111 / 206

1152 / 1247



HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 398+50.00

LAW-7-2.17

112/206

1153
1247

MJennings
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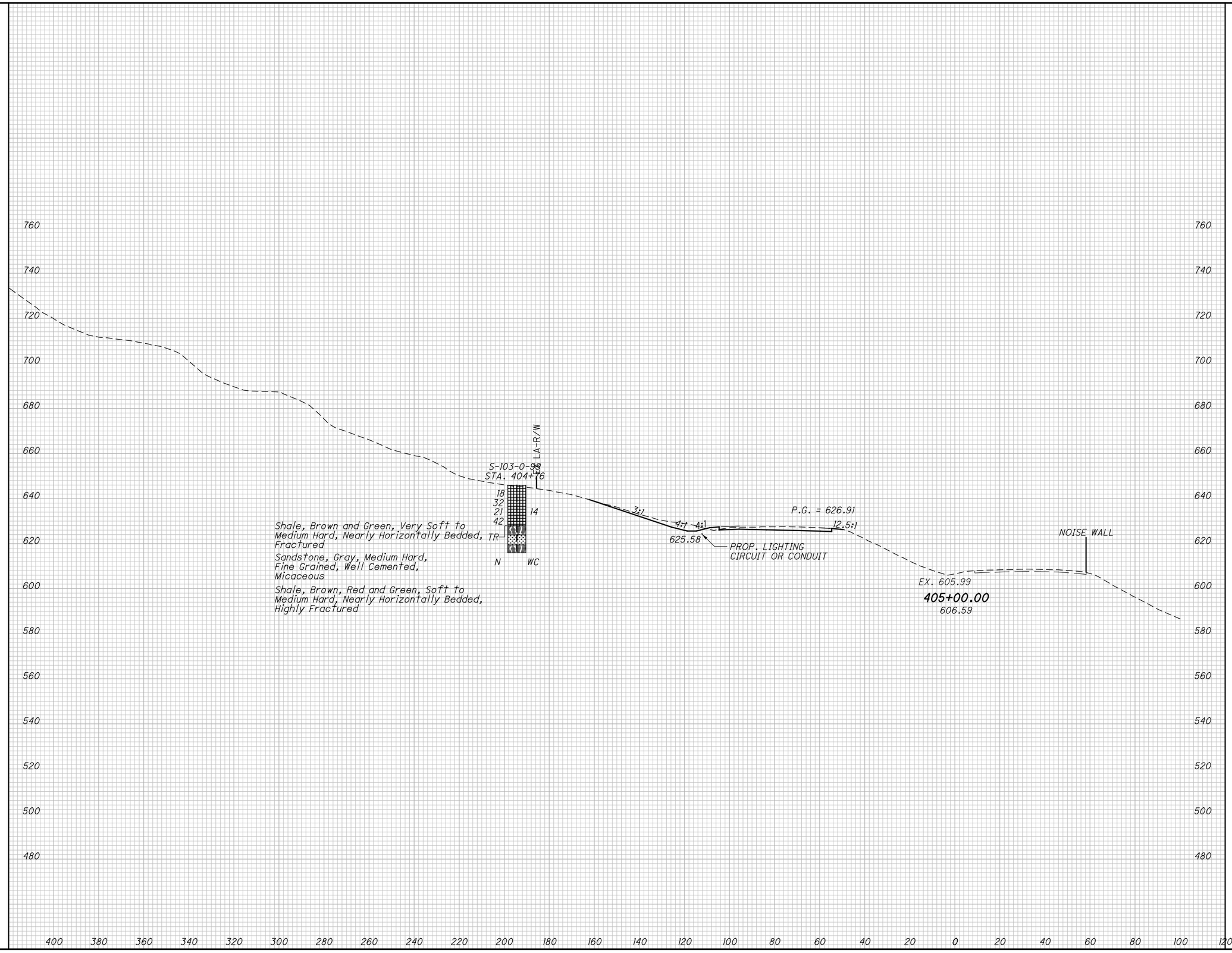


0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 405+00.00

LAW-7-2.17

760 740 720 700 680 660 640 620 600 580 560 540 520 500 480

STA. 414+42.91
EX. CB-5

EX. 621.95

SL-8-0-04
STA. 413+95.3
P.G. = 634.42
12.5:1
12.5:1

EX. 606.39

414+00.00
606.78

SL-10-0-04
STA. 414+03

Q_u(psi%)
1211.2 45/50/2

TR
Shale, Gray, Very Soft to Medium Hard, Interbedded with Fine Grained Sandstone and Siltstone, Nearly Horizontally Bedded, Many Diagonal Fractures, Micaceous

N WC
Sandstone, Gray, Hard, Fine Grained, Horizontally Bedded, Diagonal Fractures, Micaceous

TR
Sandstone, Gray, Fine to Medium Grained, Highly Fragmented, Poorly Cemented

N WC
Sandstone, Brown, Fine to Medium Grained, Nearly Horizontally Bedded, Diagonal Fractures, Micaceous, Calcareous

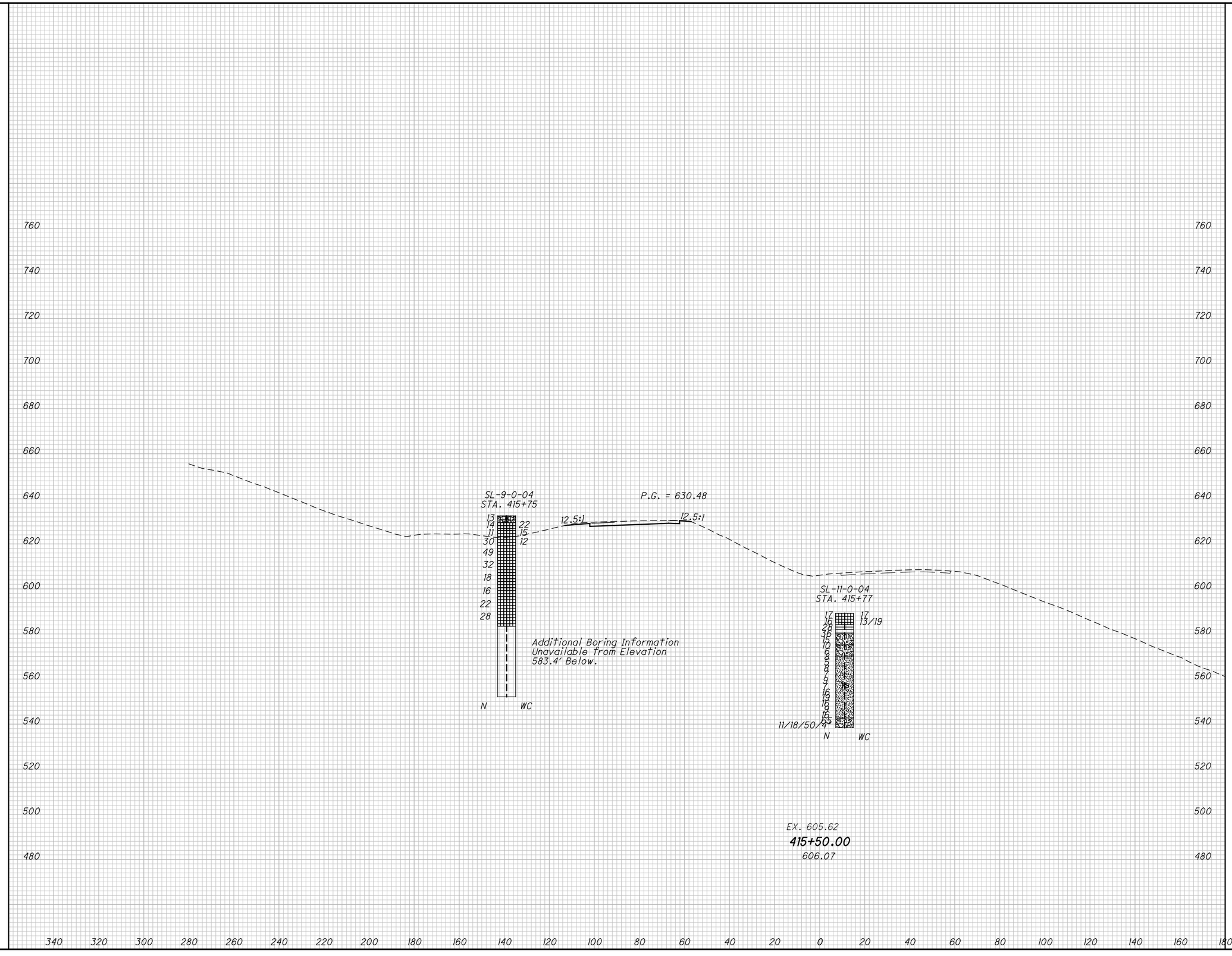
340 320 300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 414+00.00

LAW-7-2.17



0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 415+50.00

LAW-7-2.17

115/206

1156/1247

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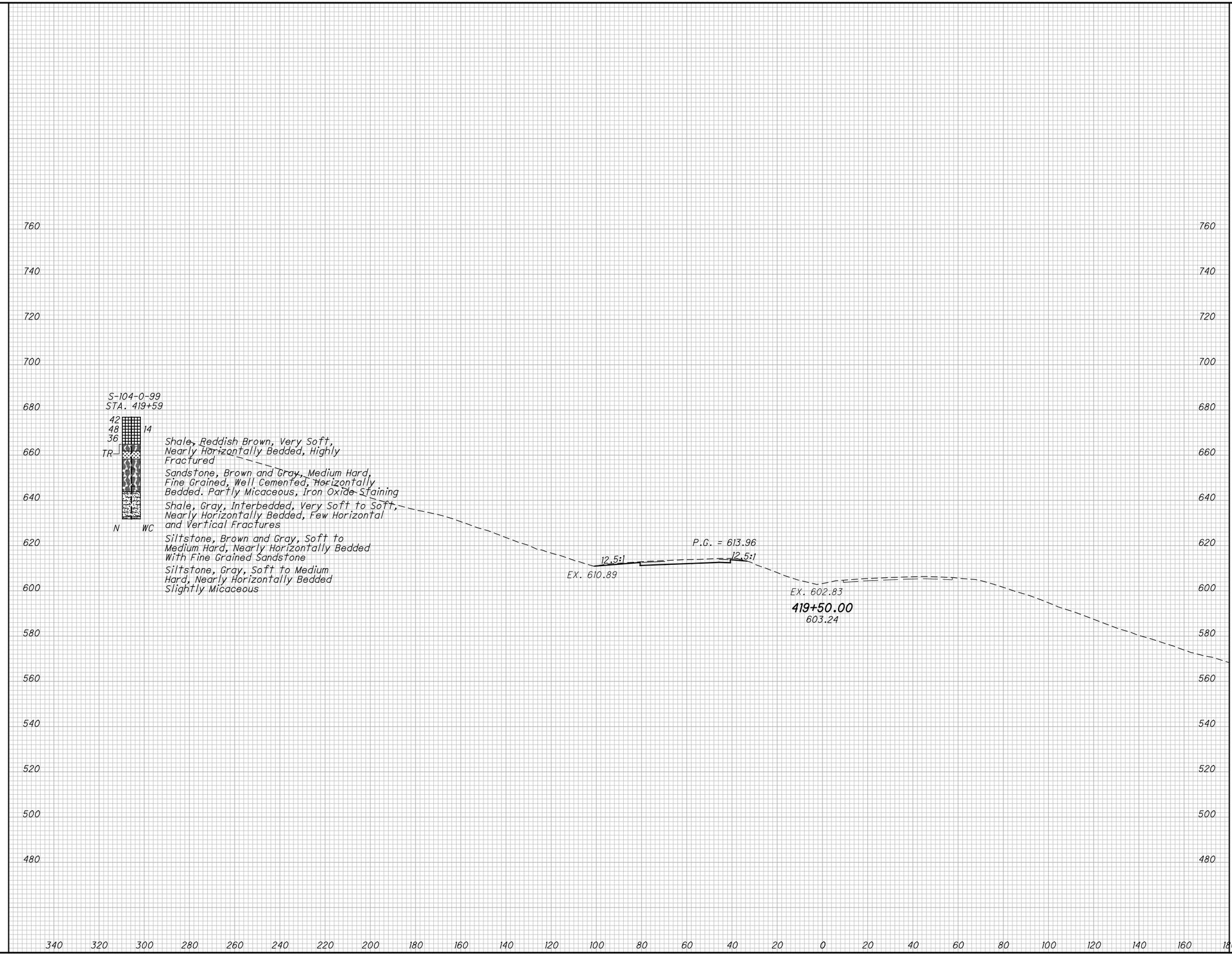

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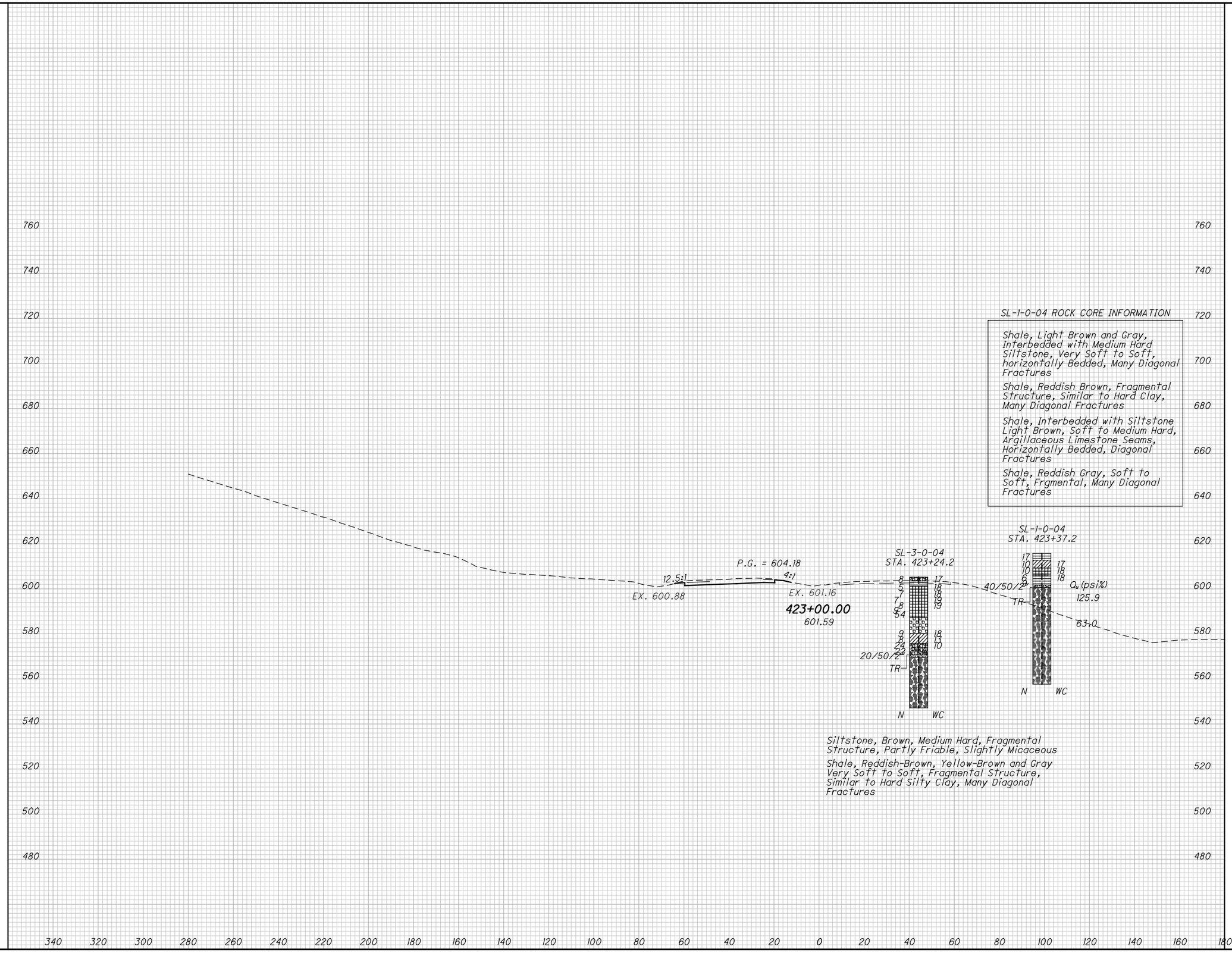
0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 419+50.00

LAW-7-2.17

1157
1247



HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 423+00.00

LAW-7-2.17

117 / 206

1158 / 1247

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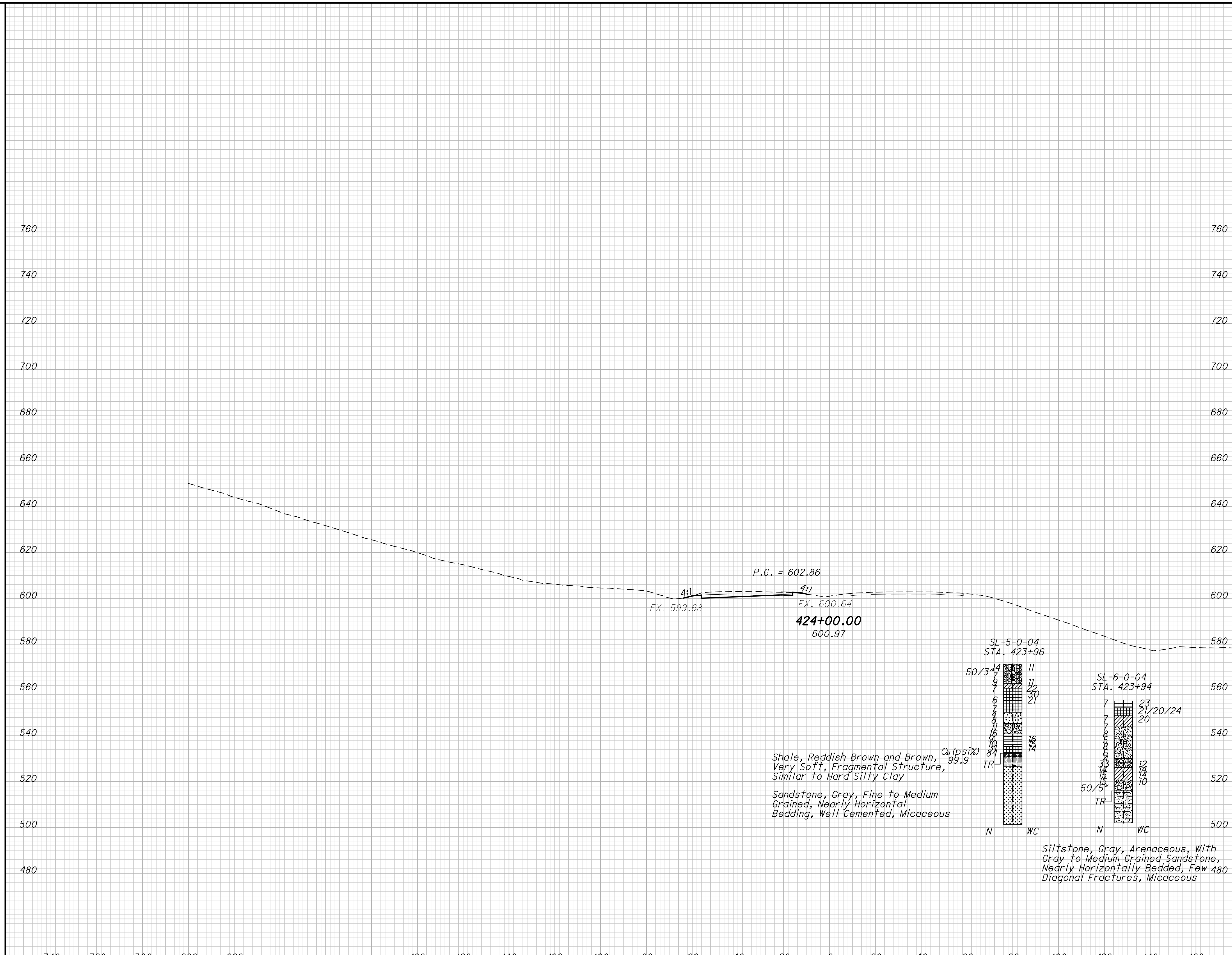

P.G. = 602.86
4:1
4:1
EX. 599.68
EX. 600.64
424+00.00
600.97
SL-5-0-04
STA. 423+96
SL-6-0-04
STA. 423+94
Shale, Reddish Brown and Brown, Very Soft, Fragmental Structure, Similar to Hard Silty Clay
Sandstone, Gray, Fine to Medium Grained, Nearly Horizontal Bedding, Well Cemented, Micaceous
Siltstone, Gray, Arenaceous, With Gray to Medium Grained Sandstone, Nearly Horizontally Bedded, Few Diagonal Fractures, Micaceous
Qu(psi%)
99.9
TR
N
WC
50/5"
760
740
720
700
680
660
640
620
600
580
560
540
520
500
480
340
320
300
280
260
180
160
140
120
100
80
60
40
20
0
20
40
60
80
100
120
140
160
180

U:\173608714\LAW\75923\geotechnical\sheets\x-sect\75923XS42400.dgn 7/23/2024 2:58:49 PM MJennings

HORIZONTAL SCALE IN FEET 0 10 20 40

DRAWN MSJ CHECKED EMK

CROSS SECTION - S.R. 7
STATION 424+00.00

LAW-7-2.17

760
740
720
700
680
660
640
620
600
580
560
540
520
500
480

P.G. = 602.18
4:1
6:1
7.5:1
EX. 598.97
600.27
SL-4-0-04
STA. 425+07
425+00.00
601.35
14/50/3
21
11
20
11
15
11
Shale, Reddish Brown, Very Soft to Soft, Many Diagonal Fractures, Few Limestone Nodules
TR
N
WC

SL-7-0-04
STA. 425+08
15/18
13
Sandstone, Gray, Hard, Fine toMedium Grained, Nearly Horizontally Bedded, Many Diagonal Fractures, Micaceous
TR
N
WC
Shale, Gray, Medium Hard to Hard,Nearly Horizontally Bedded, Few Diagonal Fractures, Micaceous

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 425+00.00

LAW-7-2.17

119/206

1160/1247

760 740 720 700 680 660 640 620 600 580 560 540 520 500 480

EX LA-R/W

SL-2-0-04
STA. 426+16.1

P.G. = 601.49

3.4:1

12.5:1

EX. 599.89

EX LA-R/W

4
10
10
8
50/2
TR

13/14
21
19

N WC

426+00.00
600.05

Shale, Interbedded with Siltstone, Yellow Brown and Gray,Very Soft to Medium Hard, Horizontally Bedded, Many Diagonal Fractures, Micaceous

Shale, Interbedded with Siltstone Reddish Brown and Gray, Very Soft to Medium Hard, Fragmental Structure, Many Diagonal Fractures, Limestone Nodules

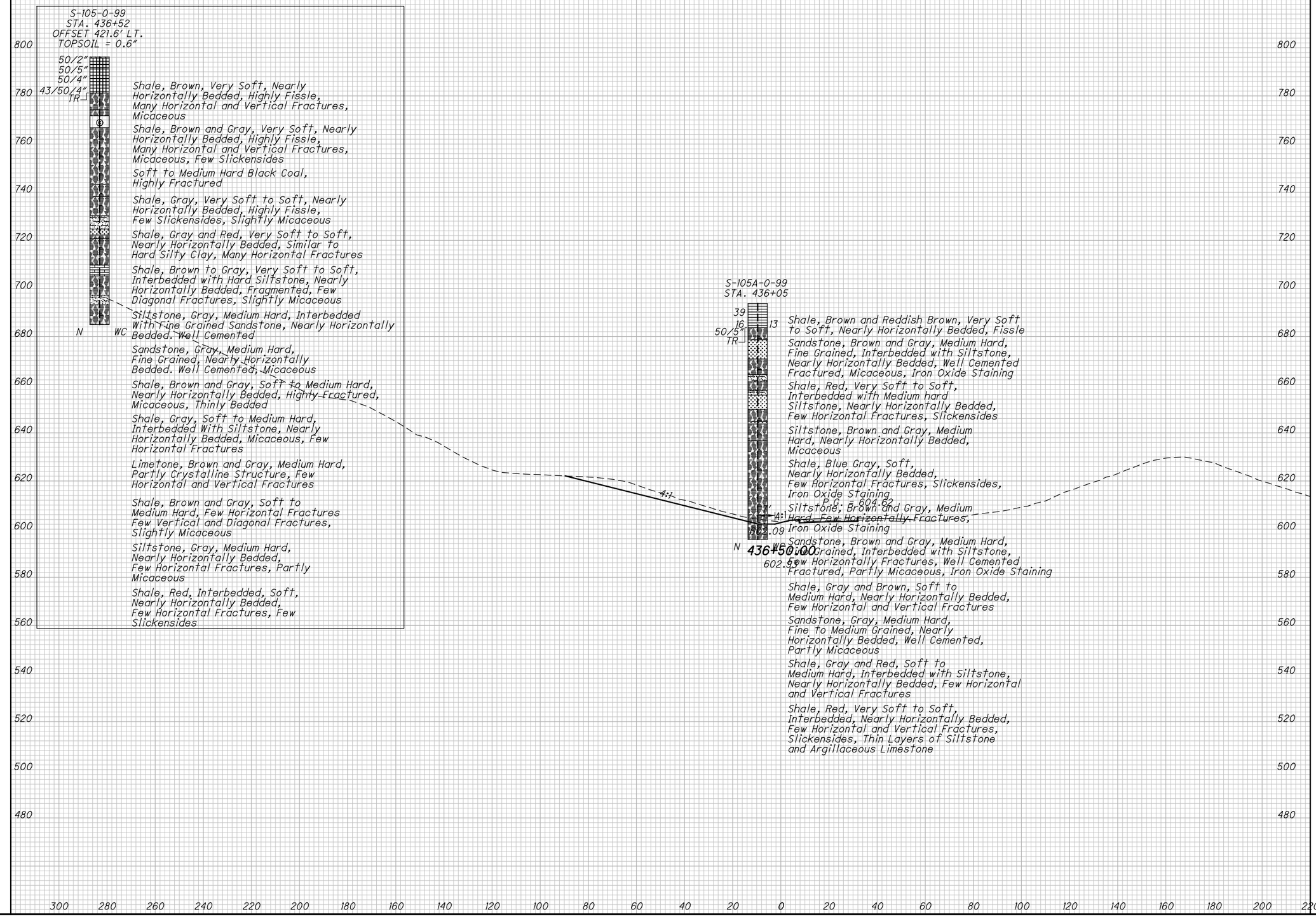
300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 426+00.00

LAW-7-2.17



0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 7
STATION 436+50.00

LAW-7-2.17

121/206

1162/1247

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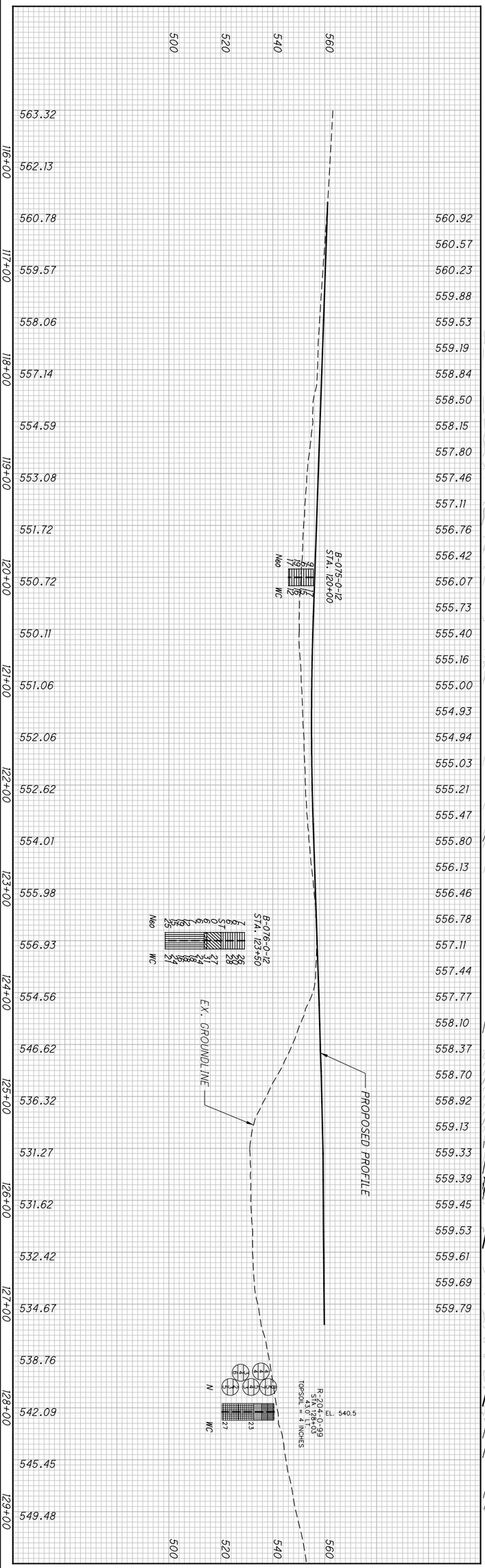
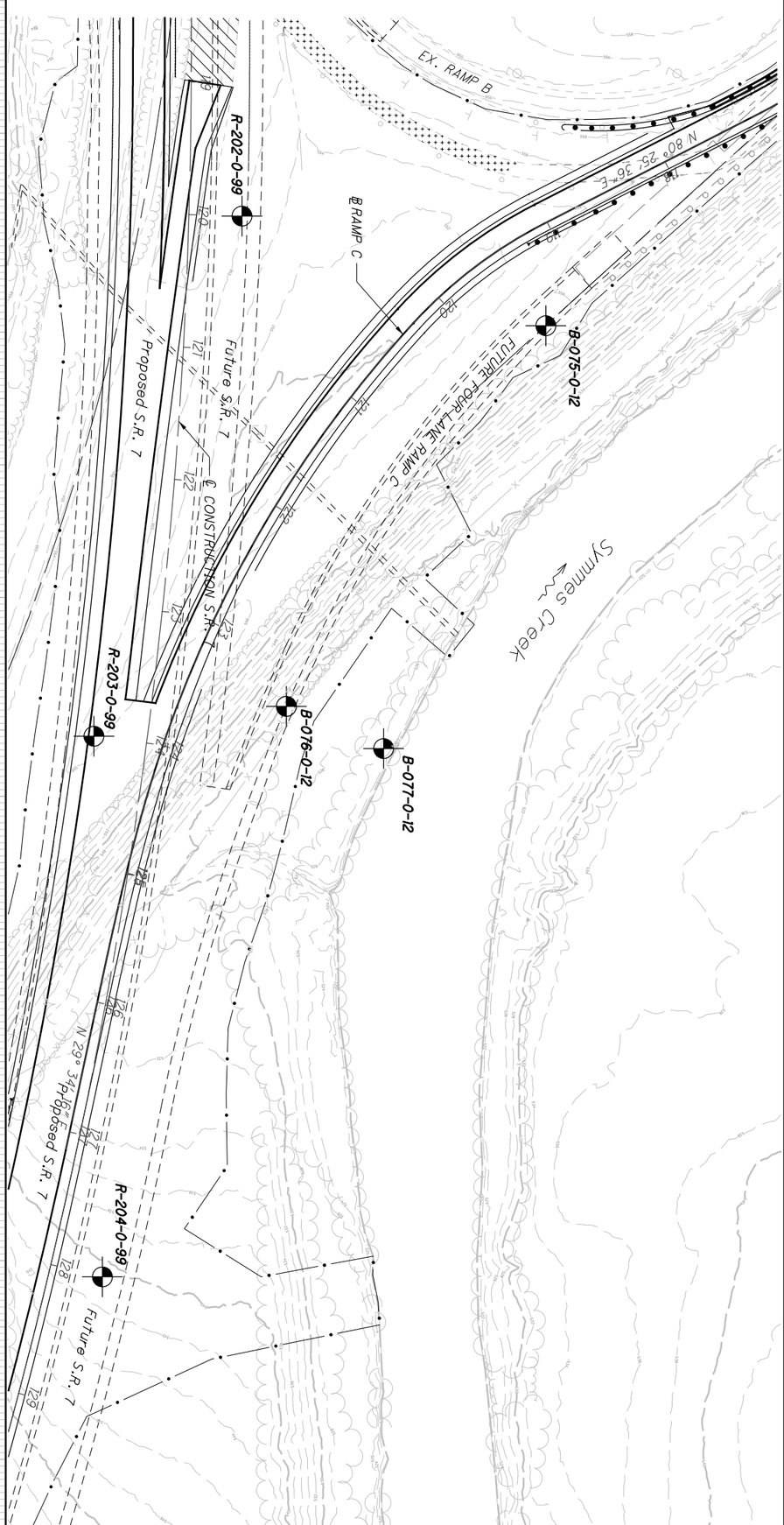


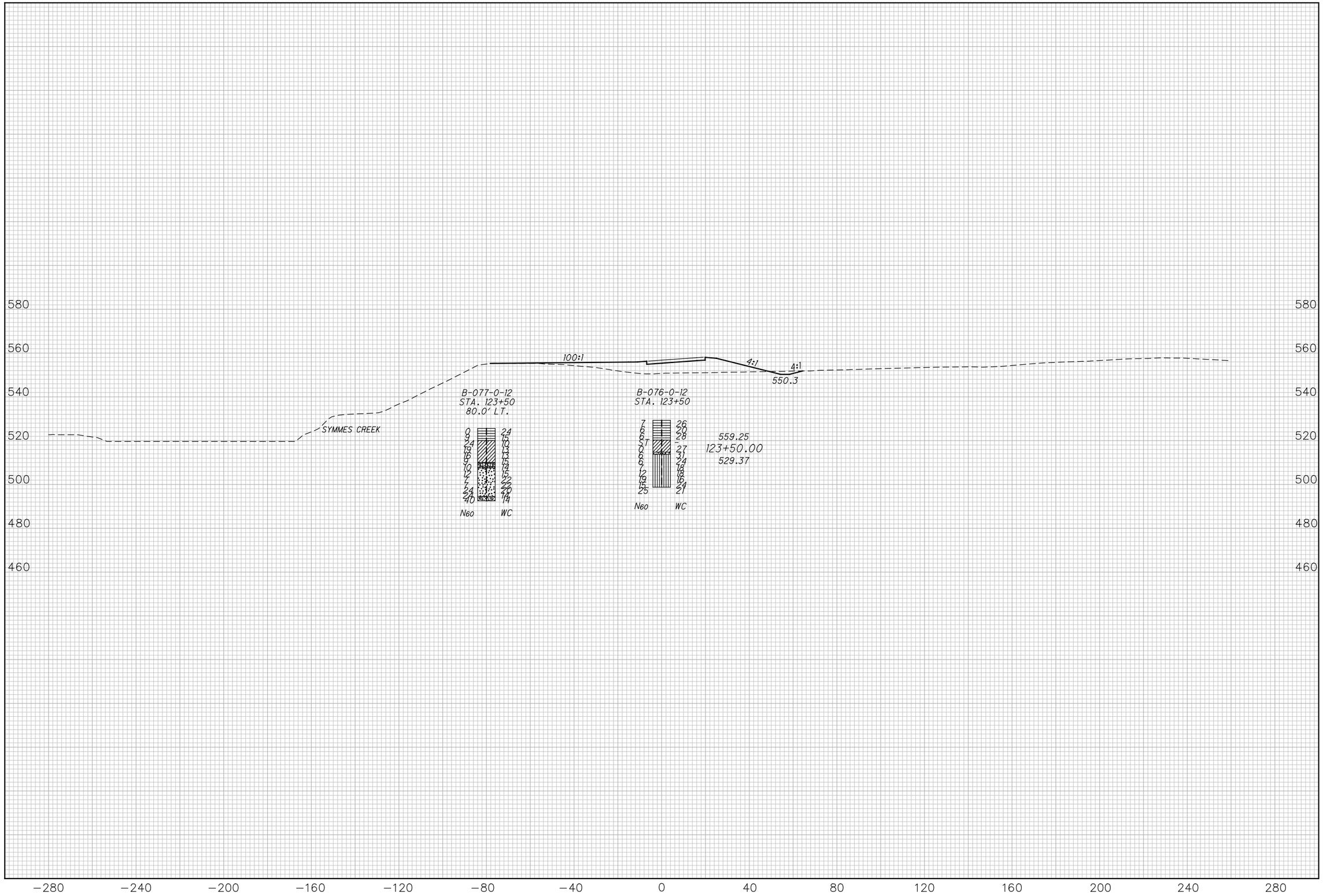


LAW-7-2.17

SOIL PROFILE - ROADWAY
RAMP C

DRAWN MSJ
CHECKED EMK

0 50 25 100
HORIZONTAL SCALE IN FEET



HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTION
RAMP C STATION 123+50

LAW-7-2.17

123/206

1164
1247

U:\173608714\LAW\75923\geotechnical\sheets\RAMP C\75923XS12350.dgn 7/23/2024 3:26:38 PM MJennings

HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
RAMP D

LAW-7-2.17

124/206

1165/1247

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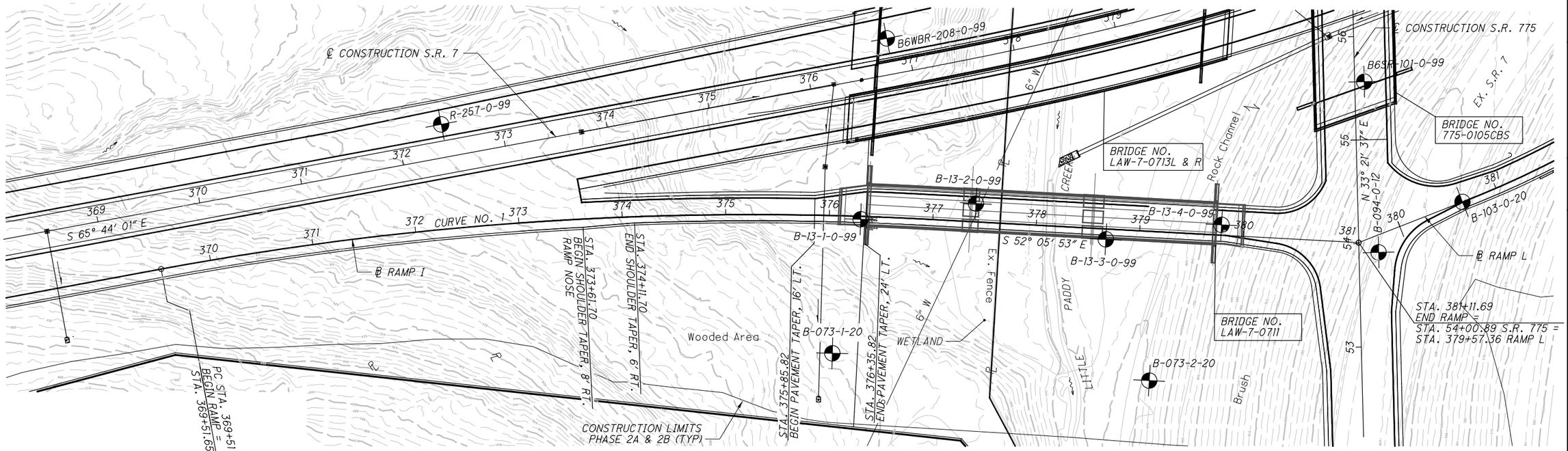
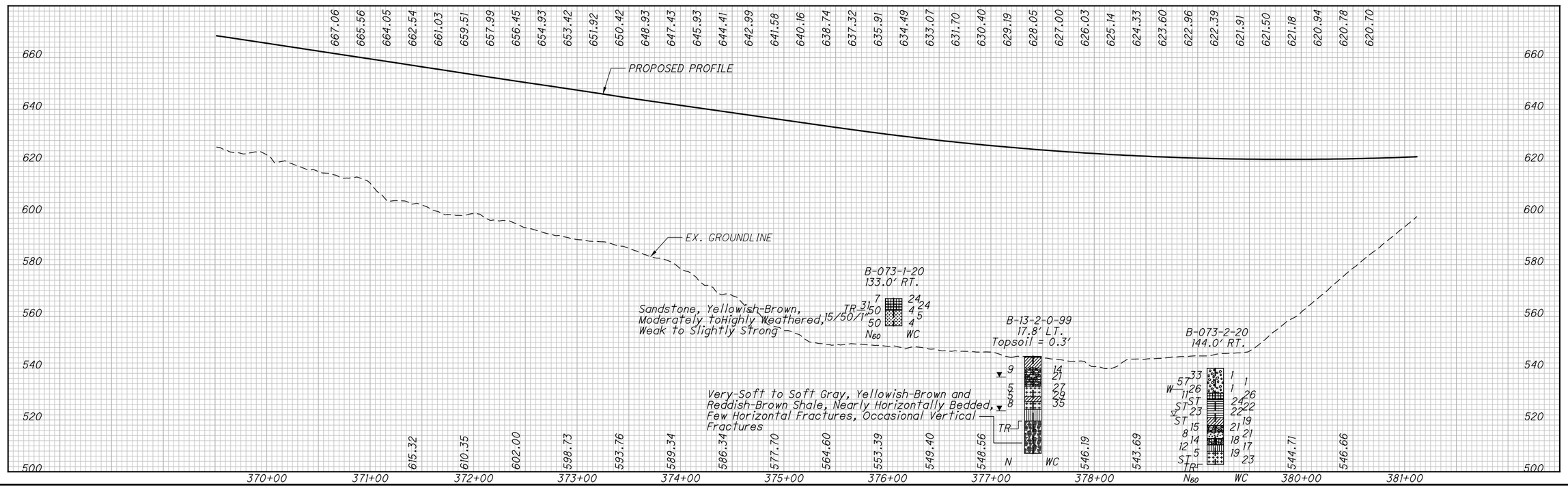


FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 70-71
FOR S.R 775 PLAN &PROFILE, SEE SHEETS 147-148
FOR RAMP L PLAN & PROFILE, SEE SHEET 134
FOR BRIDGE LAW-7-0173L & R PLAN & PROFILE, SEE SHEET 72
FOR BRIDGE LAW-7-0711 PLAN & PROFILE, SEE SHEET 127
FOR BRIDGE 775-0105CBS PLAN & PROFILE, SEE SHEET 151
FOR CROSS SECTION 376+00 RAMP I, SEE SHEET 126
FOR CROSS SECTION 379+98.45 RAMP I, SEE SHEET 126



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HORIZONTAL SCALE IN FEET
0 25 50 100

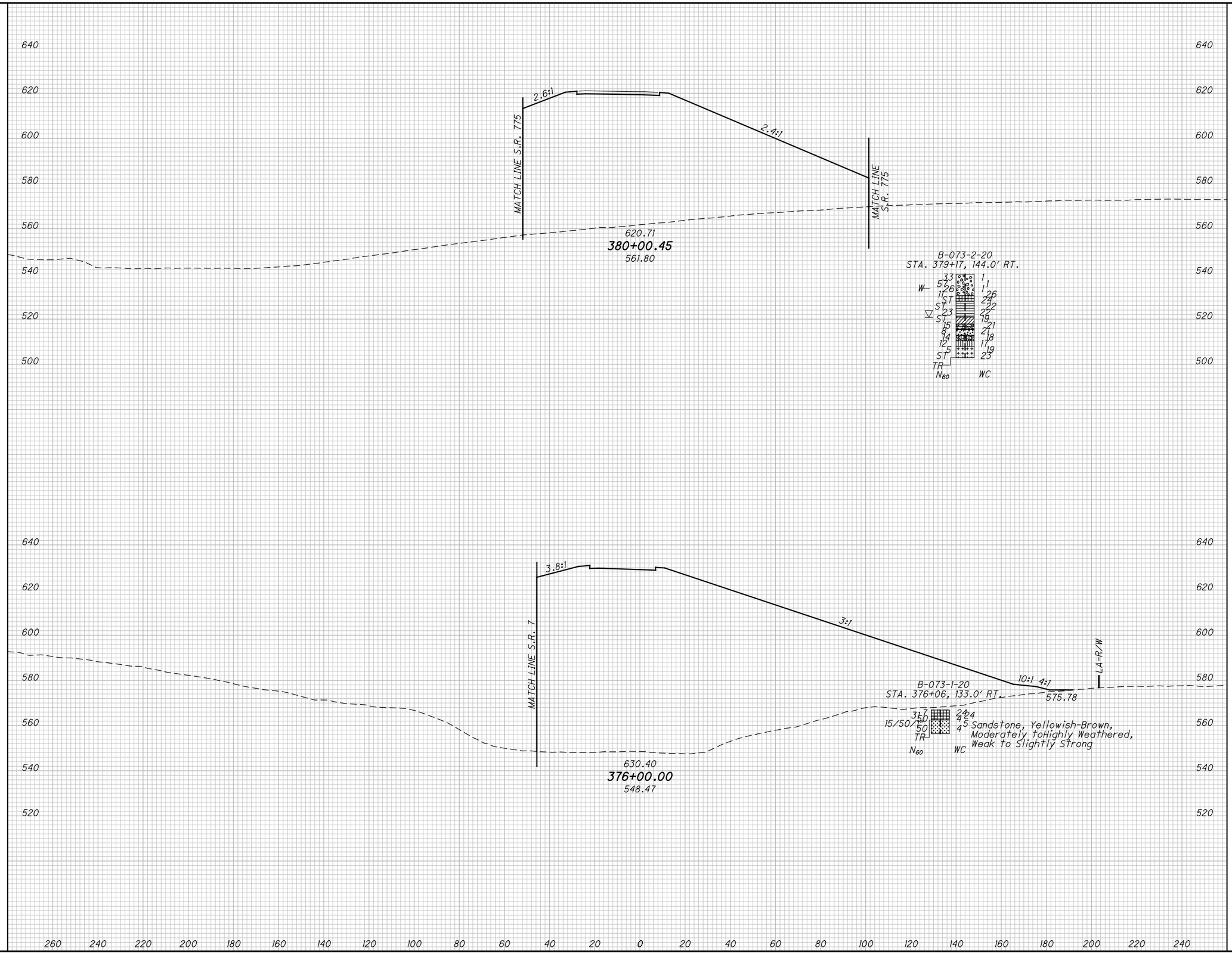
DRAWN MSJ CHECKED EMK

SOIL PROFILE - ROADWAY RAMP I

LAW-7-2.17

125/206

1166/1247



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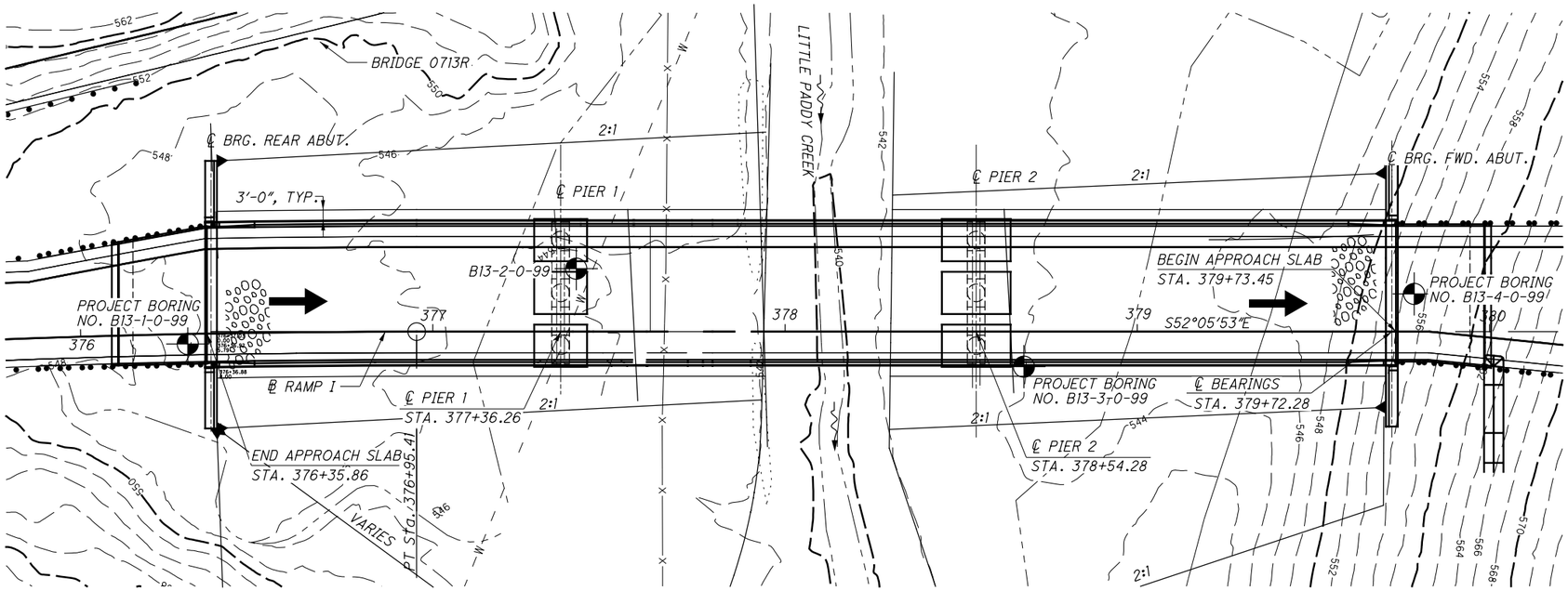
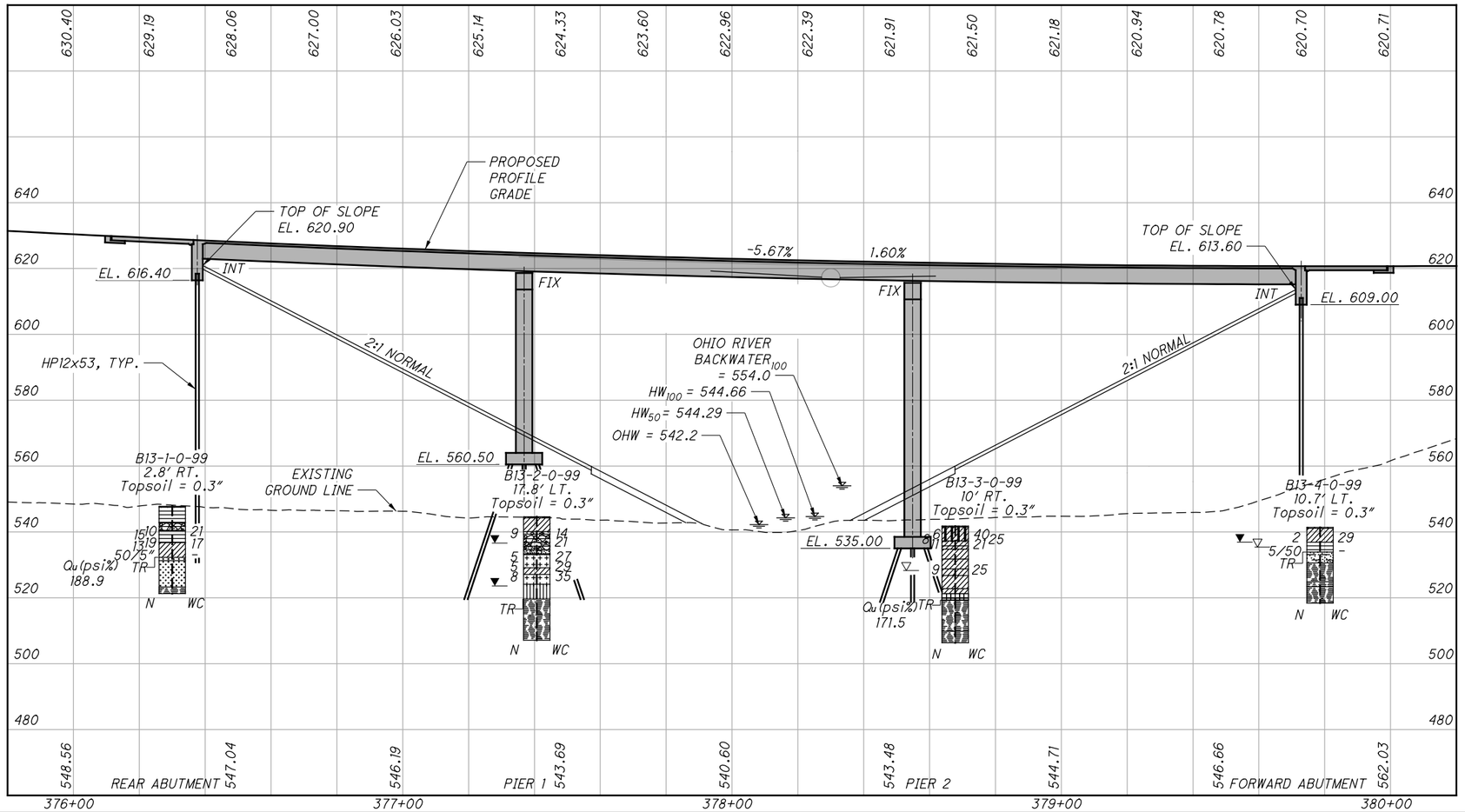
0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTIONS
STATIONS 376+00.00 & 379+98.45 - PROPOSED RAMP I

LAW-7-2.17





HORIZONTAL SCALE IN FEET
0 10 20 40

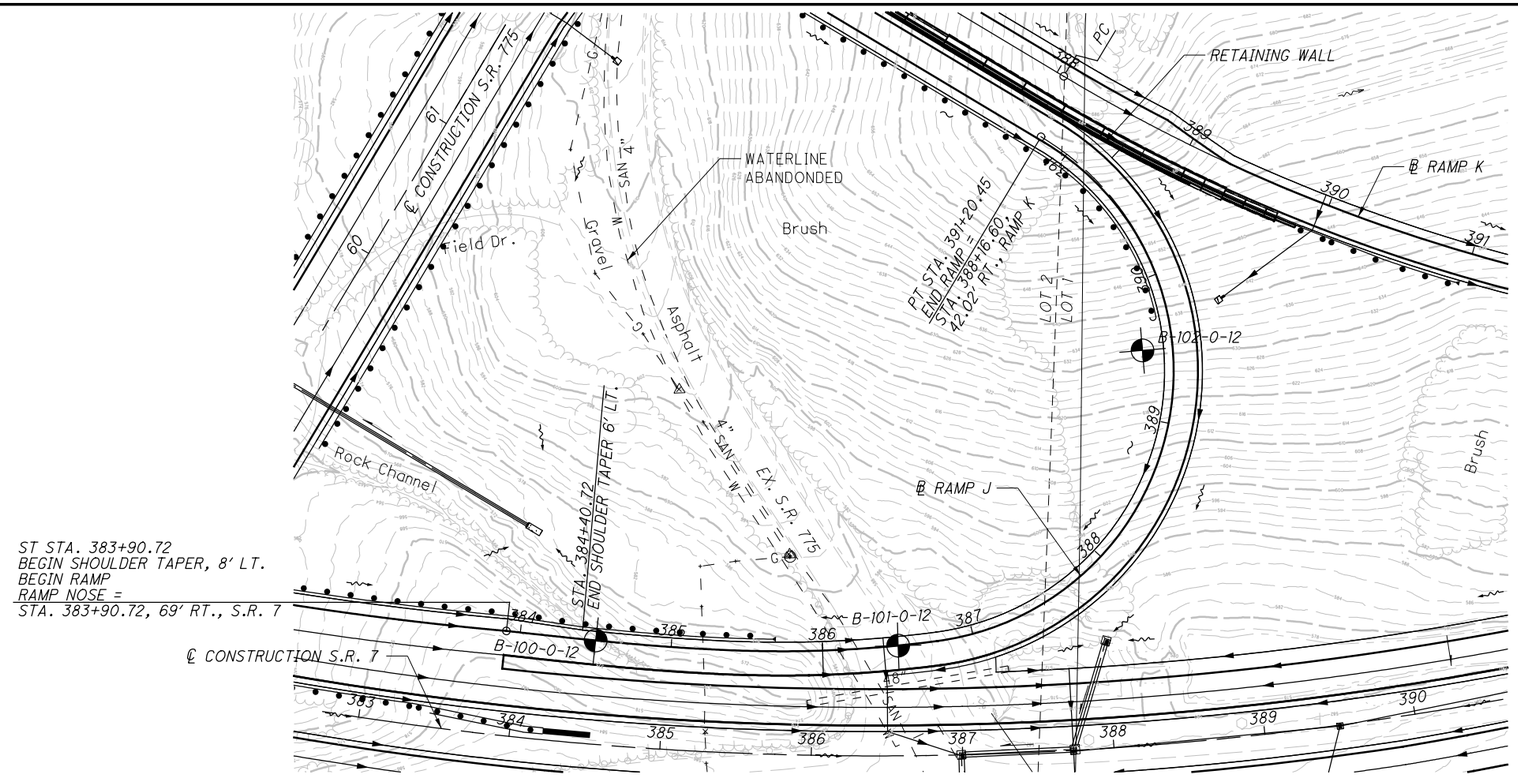
DESIGNED MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
BRIDGE NO. LAW-7-0711P
RAMP I OVER LITTLE PADDY CREEK

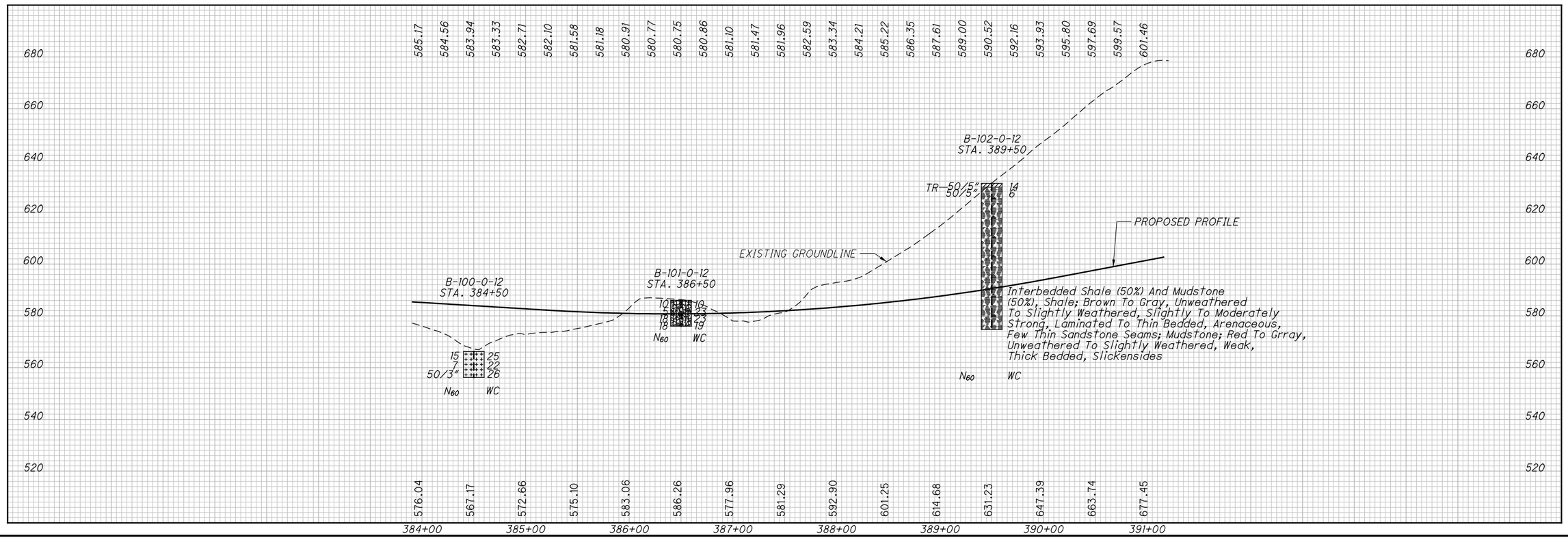
LAW-7-2.17

127/206

1168
1247



FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 70-71, 73-74
FOR S.R. 775 PLAN & PROFILE, SEE SHEET 148
FOR RAMP K PLAN & PROFILE, SEE SHEETS 129-130



SOIL PROFILE - ROADWAY
RAMP J STA. 383+90.72 TO STA. 391+20.45

DRAWN MSJ CHECKED EMK

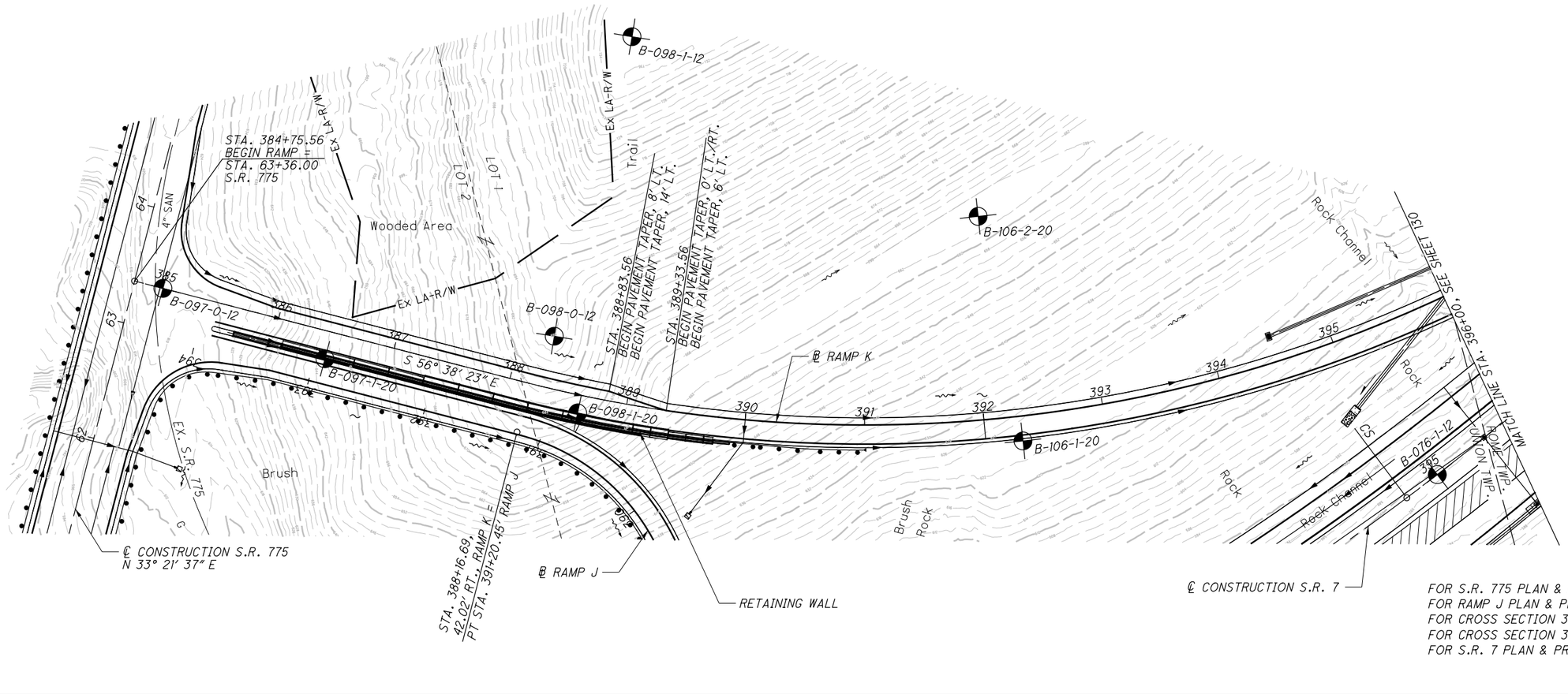
HORIZONTAL SCALE IN FEET
0 25 50 100

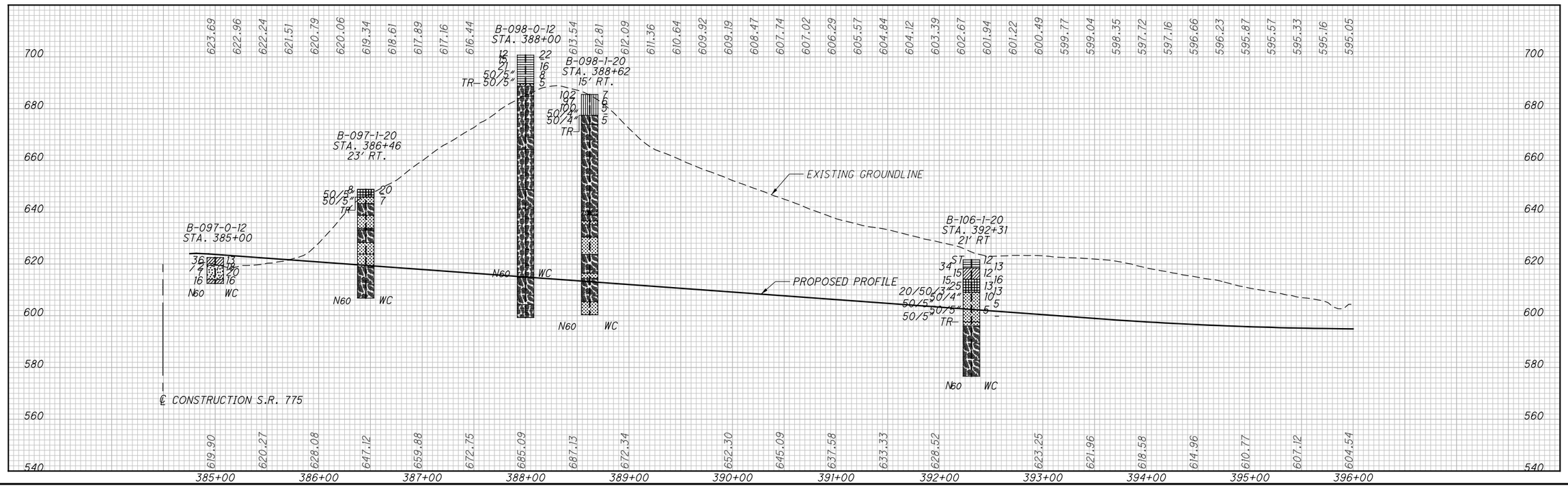
LAW-7-2.17

128/206

1169/1247

U:\173608714\LAW\75923\geotechnical\sheets\RAMP_JV75923IP001.dgn 7/24/2024 7:33:20 AM MJennings



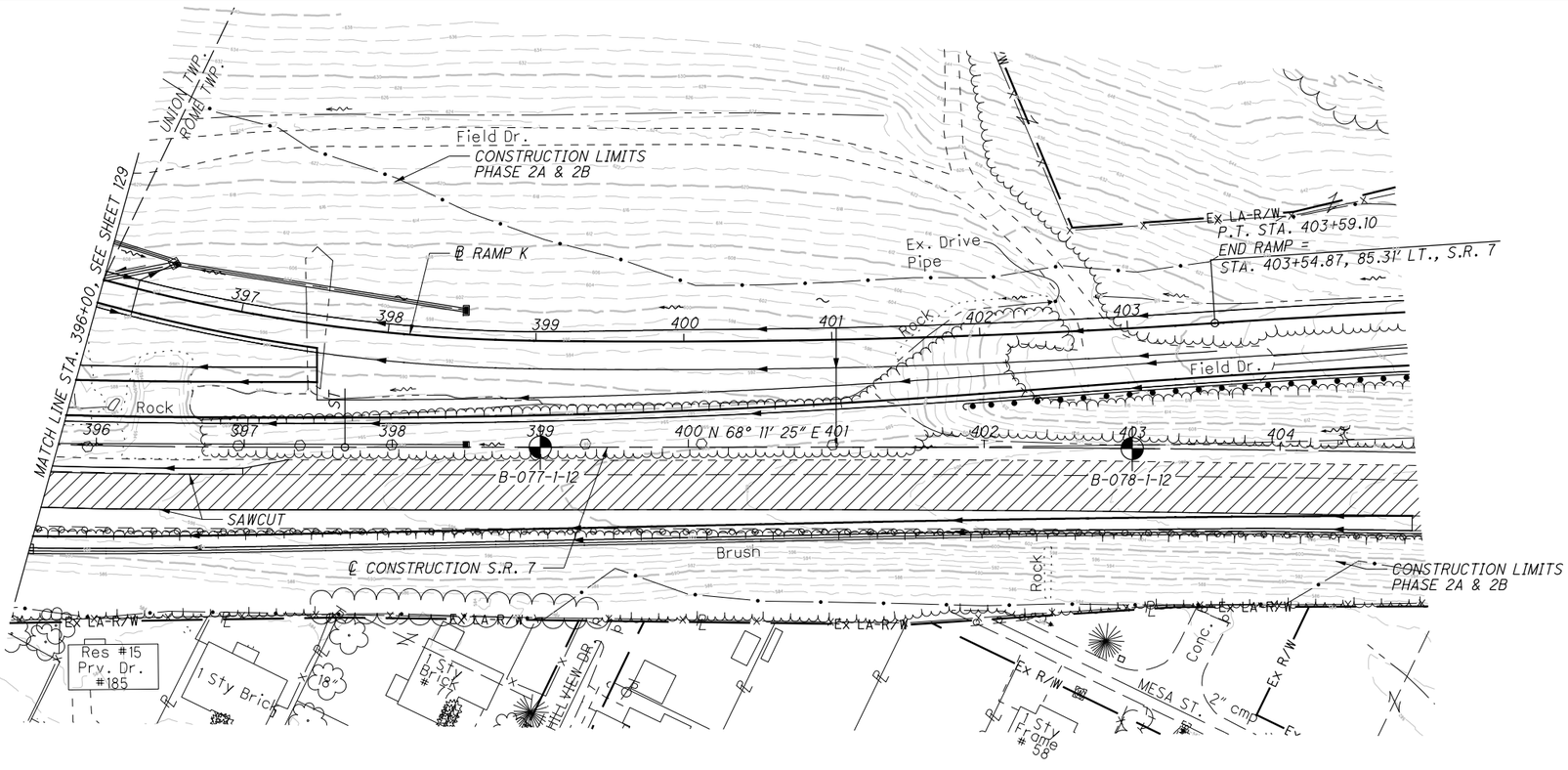


HORIZONTAL SCALE IN FEET
0 25 50 100

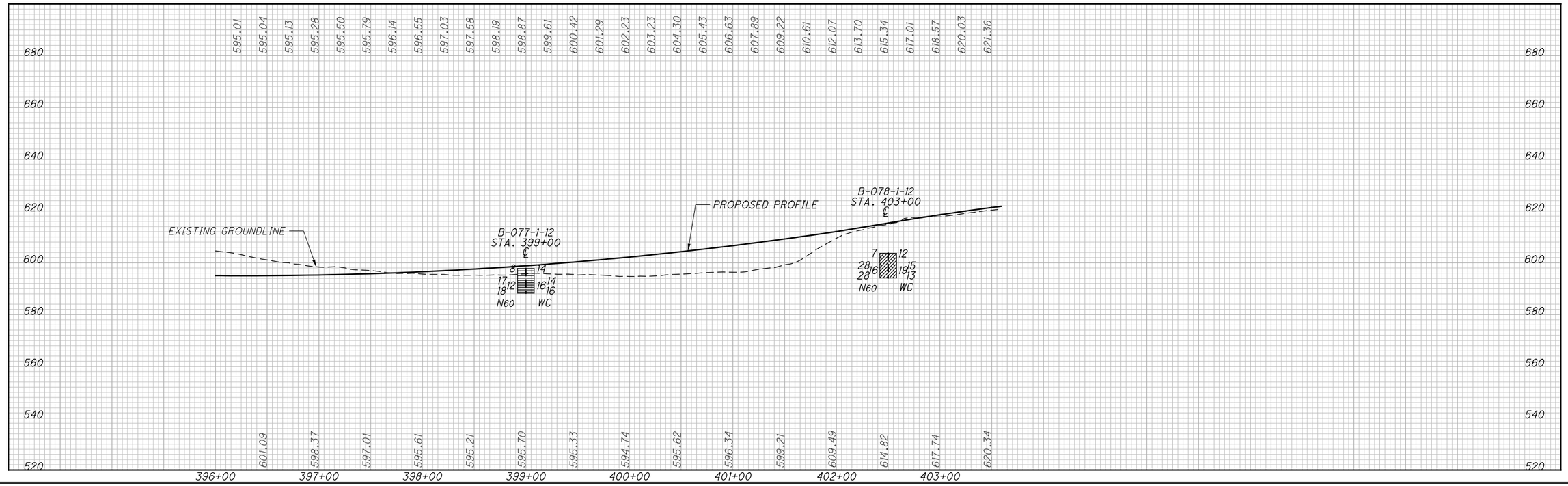
DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
RAMP K

LAW-7-2.17



FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 73-74



SOIL PROFILE - ROADWAY
RAMP K

LAW-7-2.17

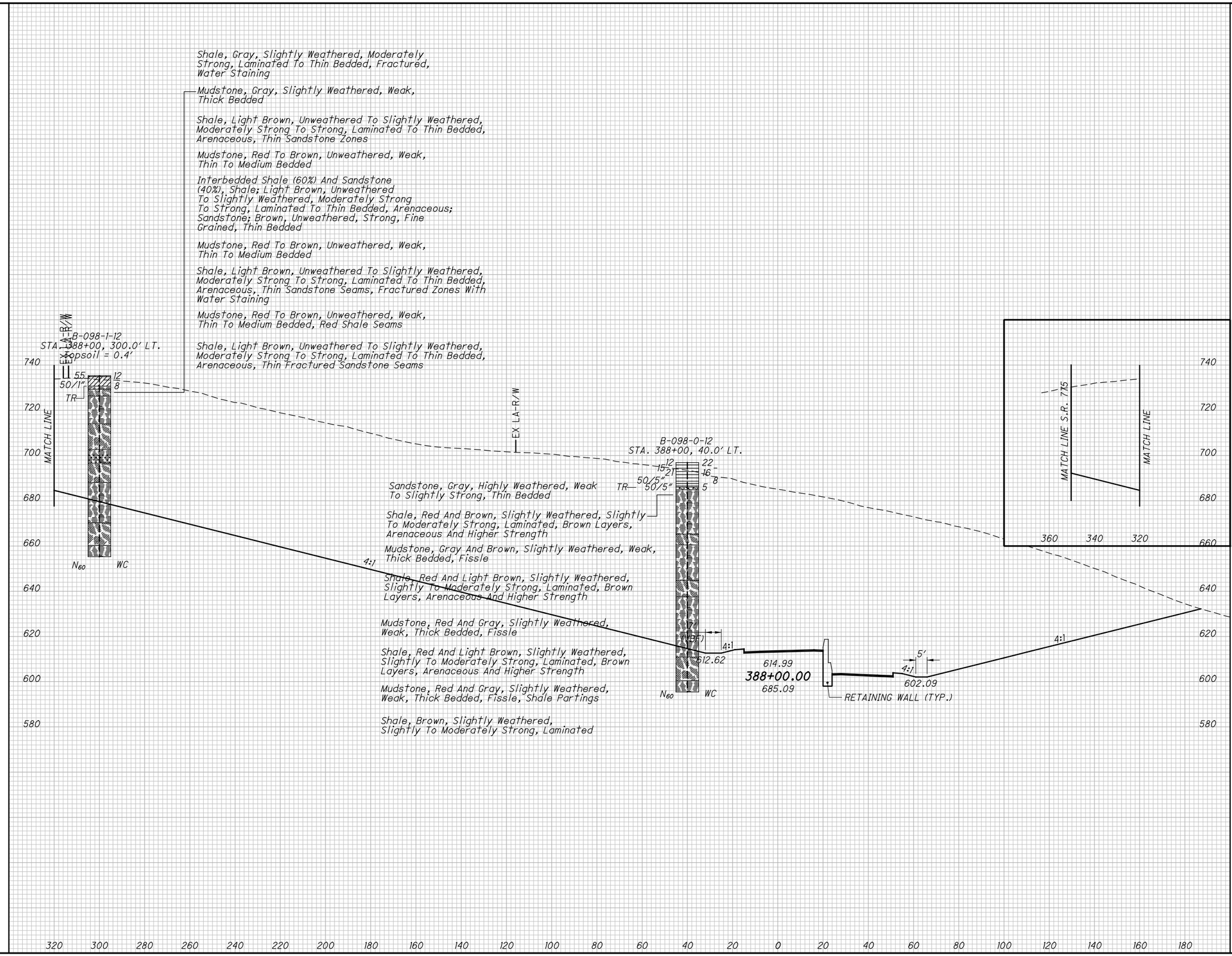
130/206

1171
1247

HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN MSJ
CHECKED EMK

U:\173608714\LAW\75923\geotechnical\sheets\RAMP K\75923IP002.dgn 7/24/2024 7:37:53 AM MJennings



HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

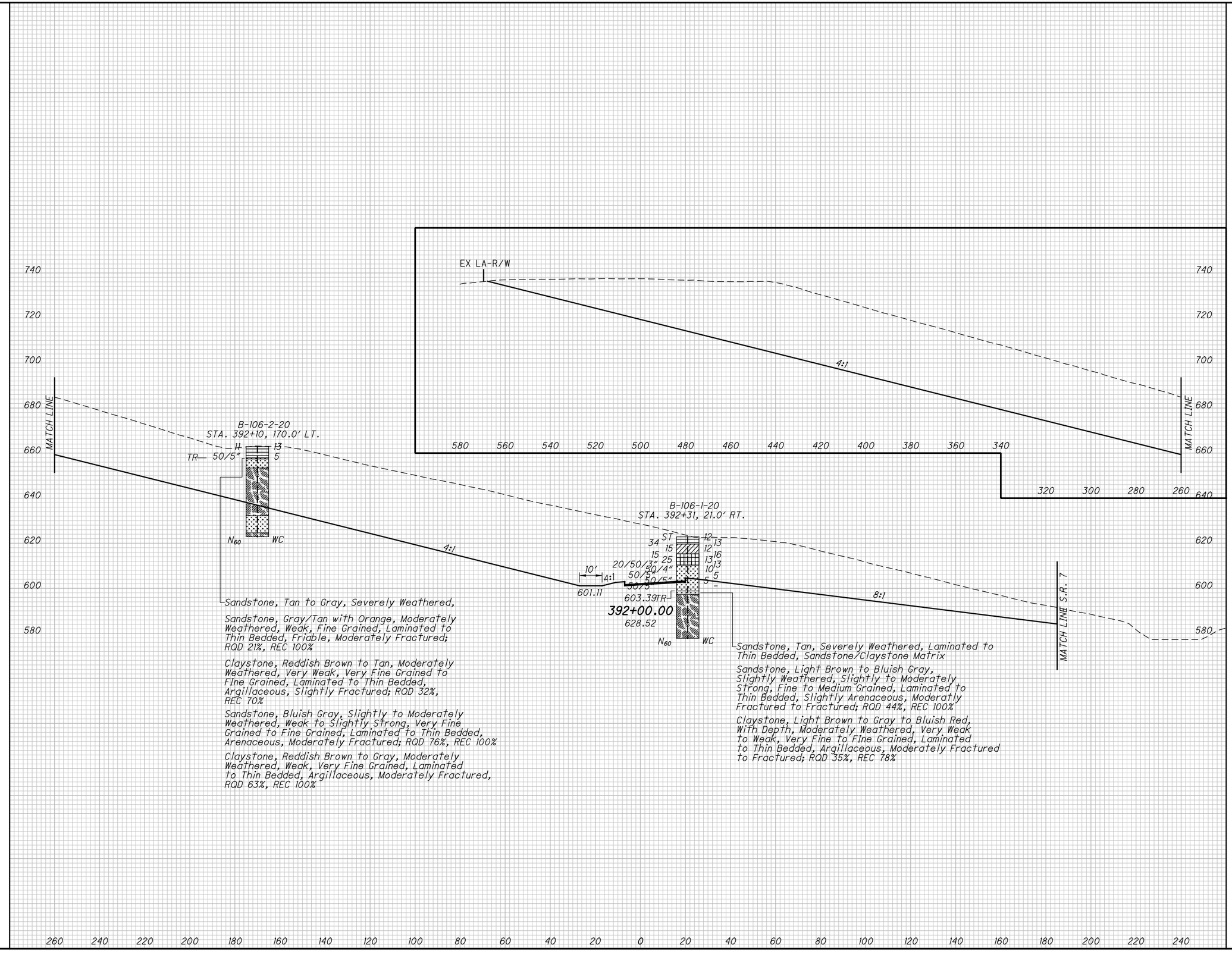
CROSS SECTION
STATION 388+00.00 - PROPOSED RAMP K

LAW-7-2.17

131/206

1172
1247

U:\173608714\LAW\75923\geotechnical\sheets\RAMP K\75923XS388+00.dgn 7/24/2024 7:38:58 AM MJennings



0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION
STATION 392+00.00 - PROPOSED RAMP K

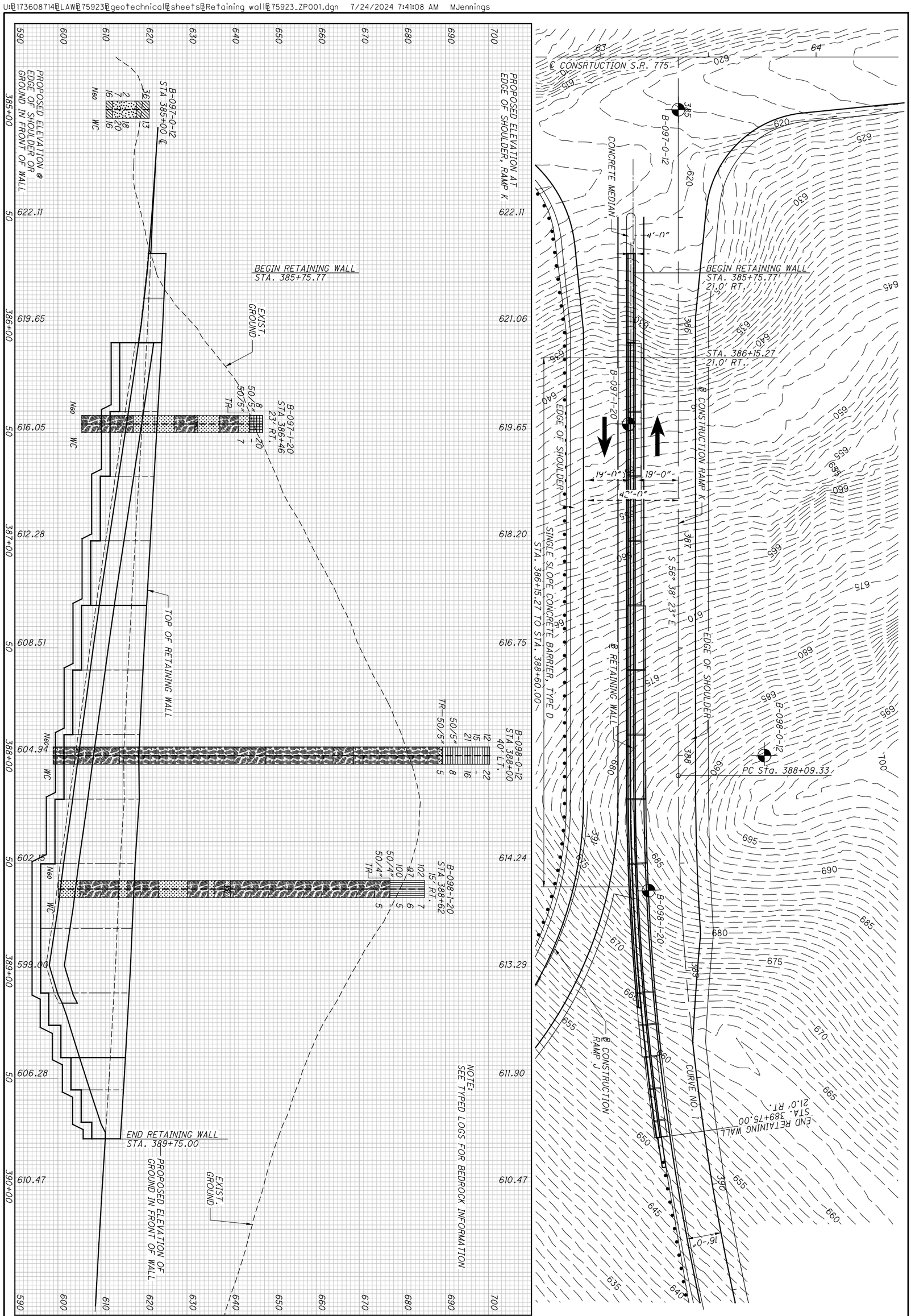
LAW-7-2.17

132/206

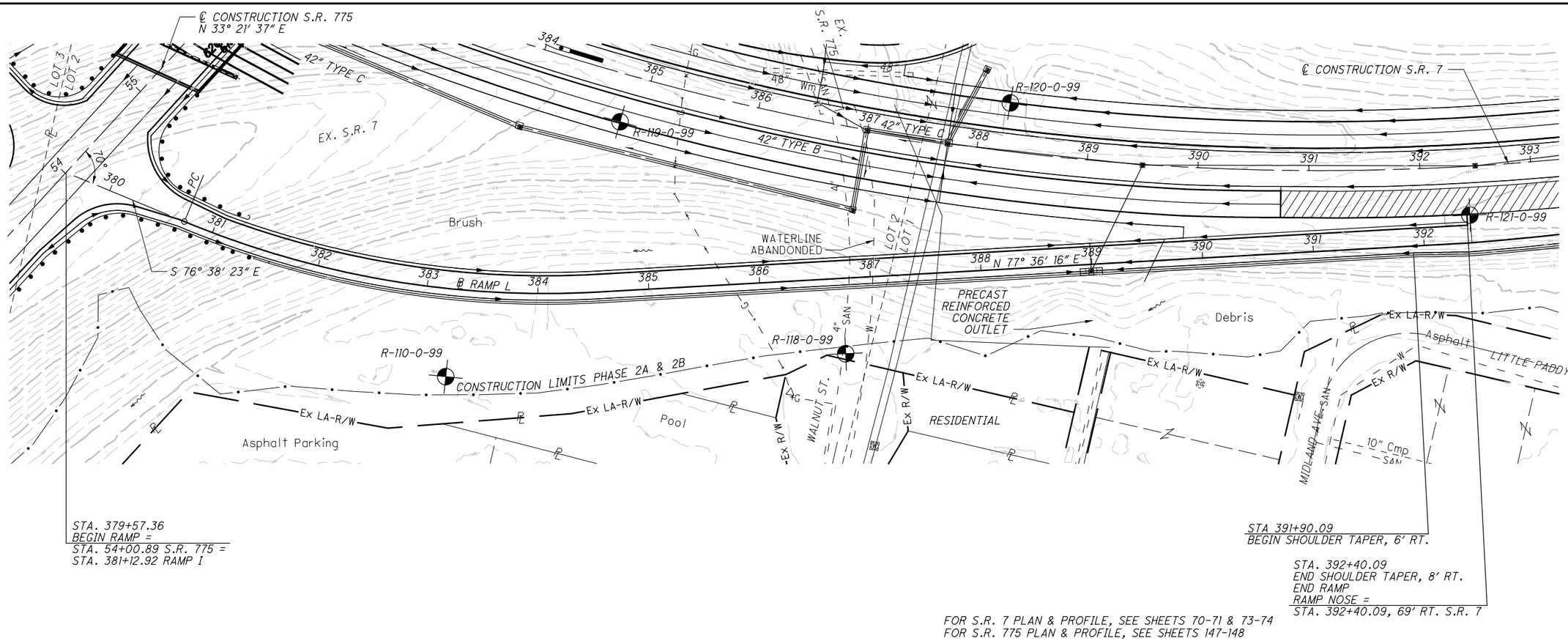
1173/1247

U:\173608714\LAW\75923\geotechnical\sheets\RAMP K\75923XS392+00.dgn 7/24/2024 7:39:41 AM MJennings

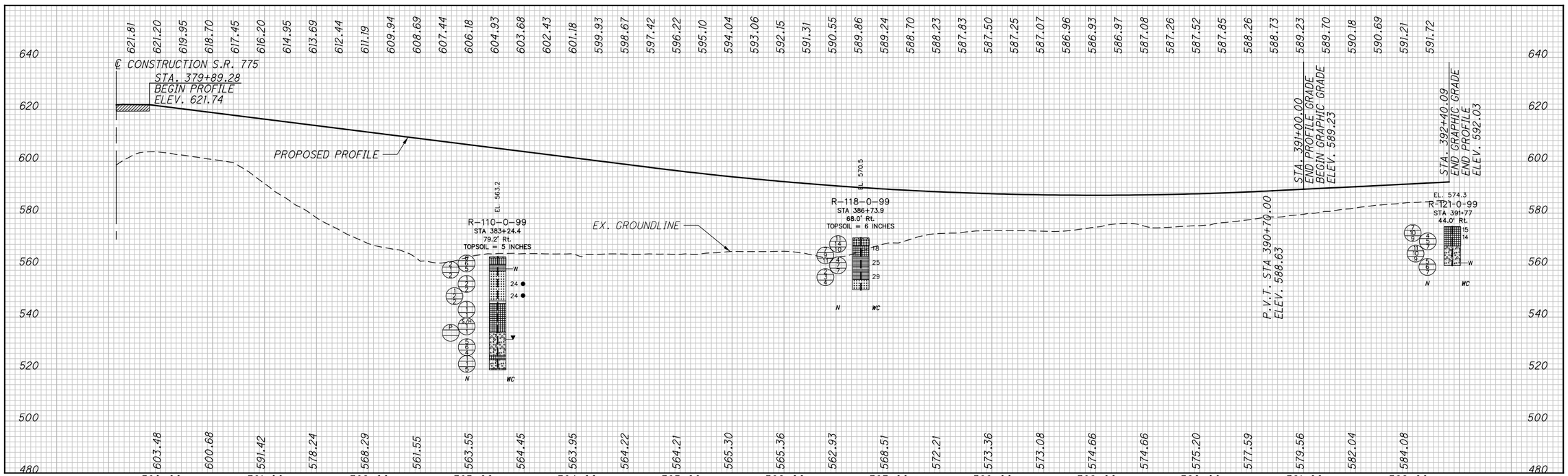
U:\1736087\14\LAW\75923\geotechnical\sheets\Retaining wall\75923_ZP001.dgn 7/24/2024 7:41:08 AM MJennings



1174 / 1247	133 / 206	**LAW-7-2.17**	**STRUCTURE FOUNDATION EXPLORATION** **RAMP J AND RAMP K RETAINING WALL**	DESIGNED MSJ CHECKED EMK	0 20 10 40 HORIZONTAL SCALE IN FEET



FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 70-71 & 73-74
FOR S.R. 775 PLAN & PROFILE, SEE SHEETS 147-148



HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN MSJ
CHECKED EMK

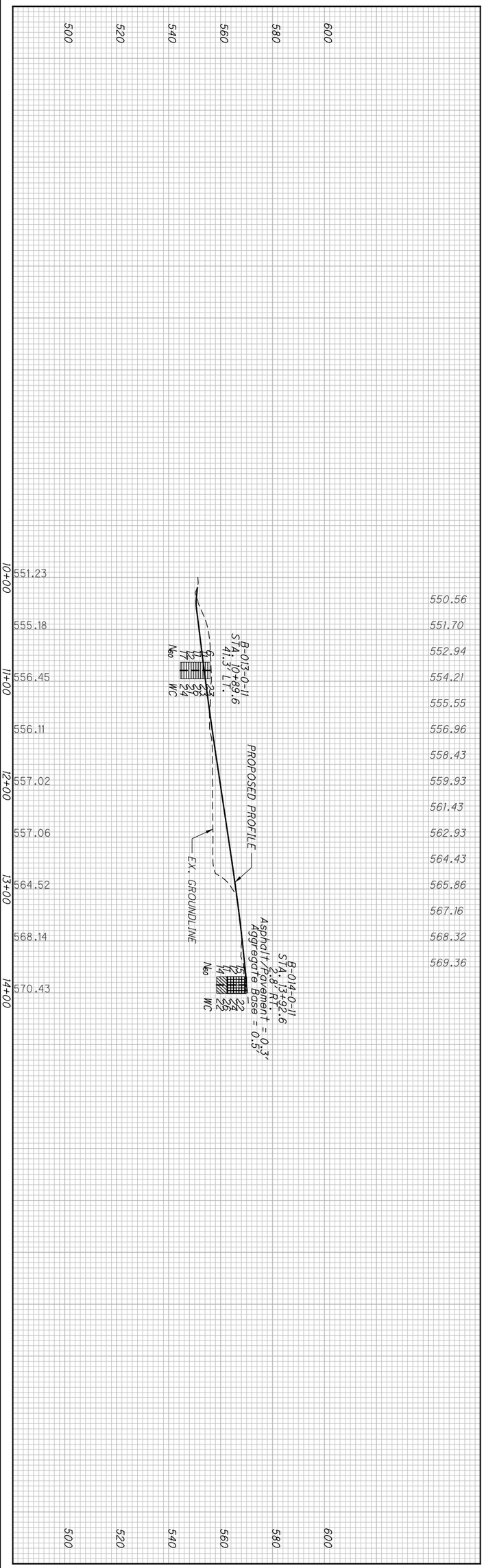
SOIL PROFILE - ROADWAY
RAMP L

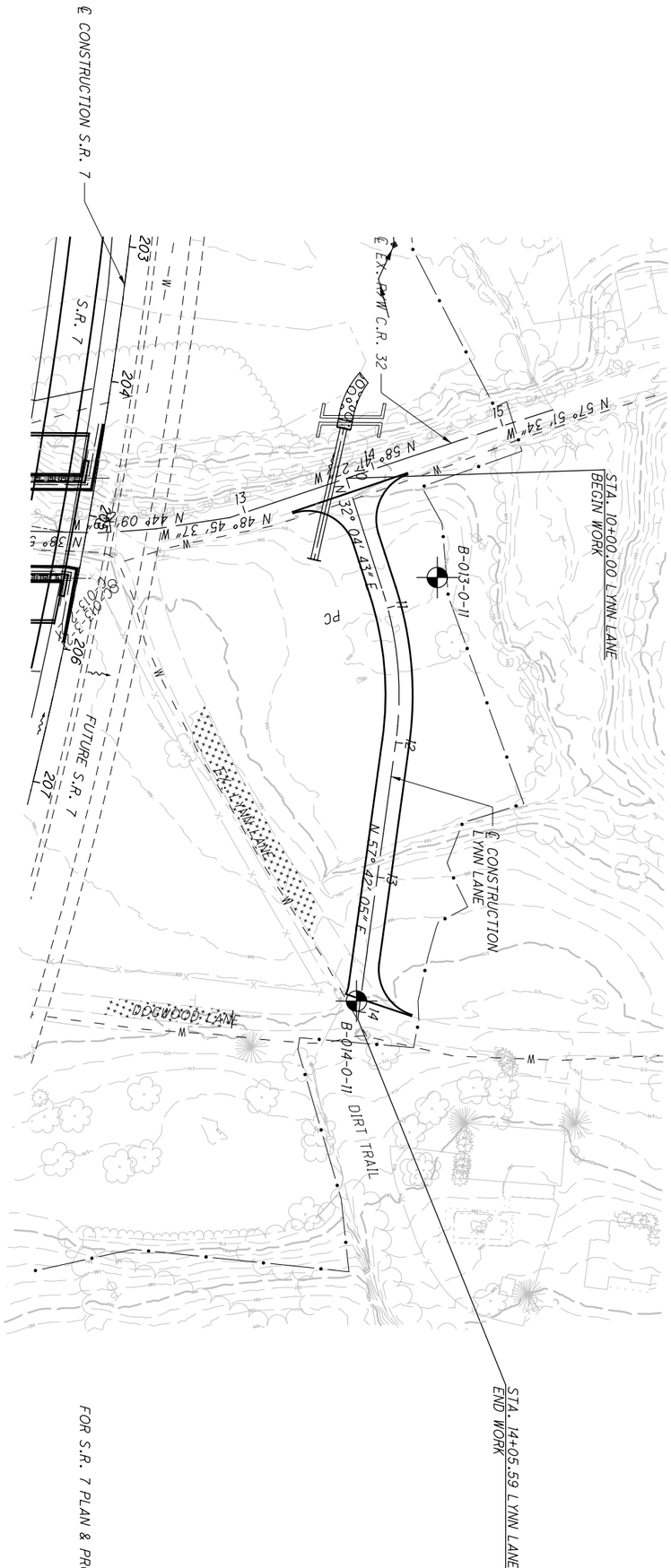
LAW-7-2.17

134/206

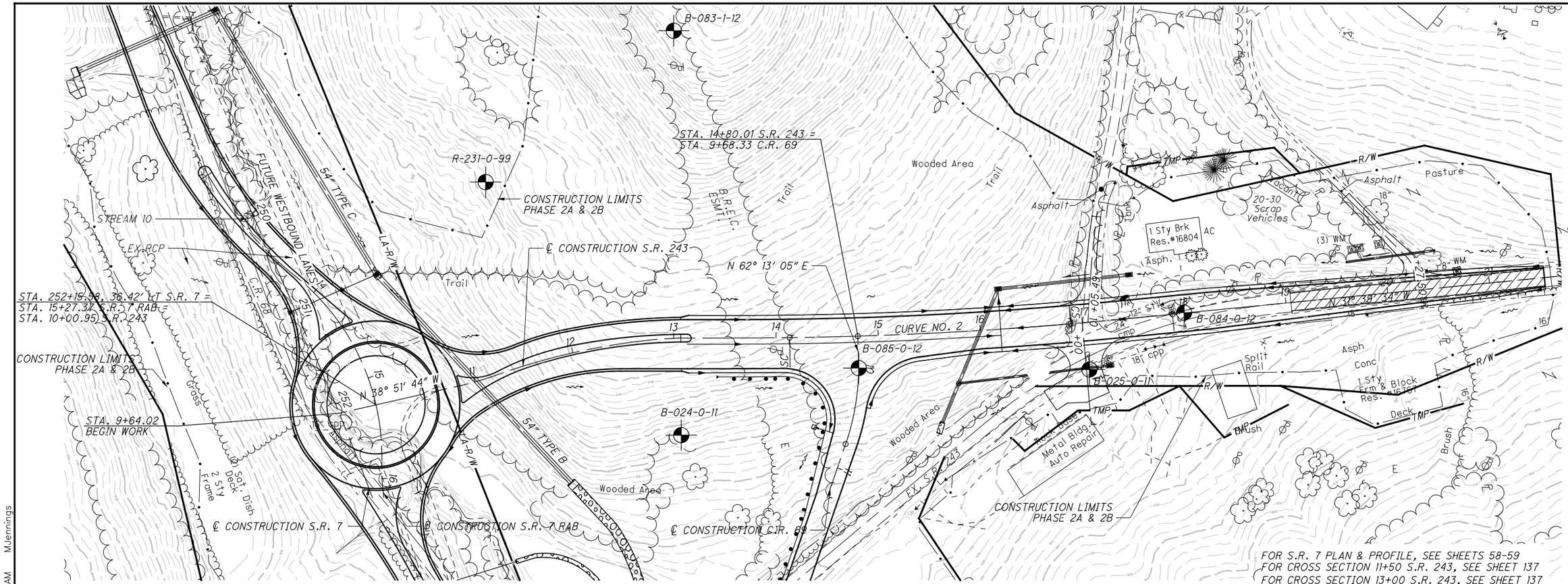
1175/1247

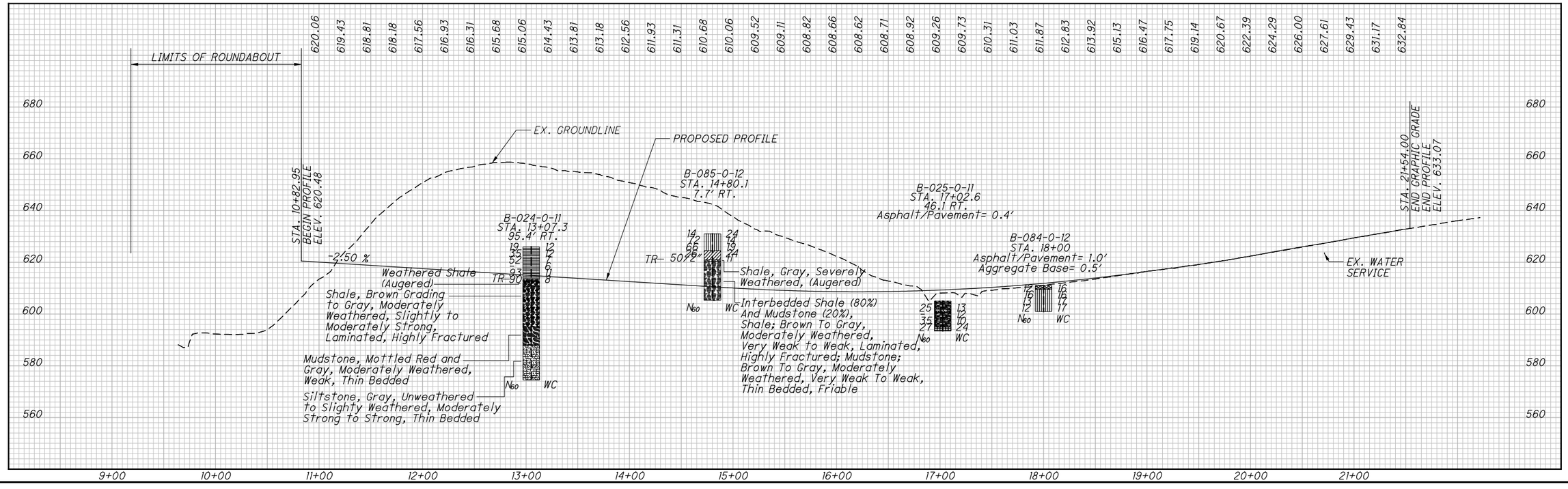
U:\173608714\LAW\75923\geotechnical\sheets\Ramp L\75923IP001.dgn 7/24/2024 7:49:39 AM MJennings





1176 / 1247	135 / 206	LAW-7-2.17	SOIL PROFILE - ROADWAY LYNN LANE STA. 10+00.00 - 14+05.59	DRAWN MSJ CHECKED EMK	0 50 25 100 HORIZONTAL SCALE IN FEET





HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN MSJ
CHECKED EMK

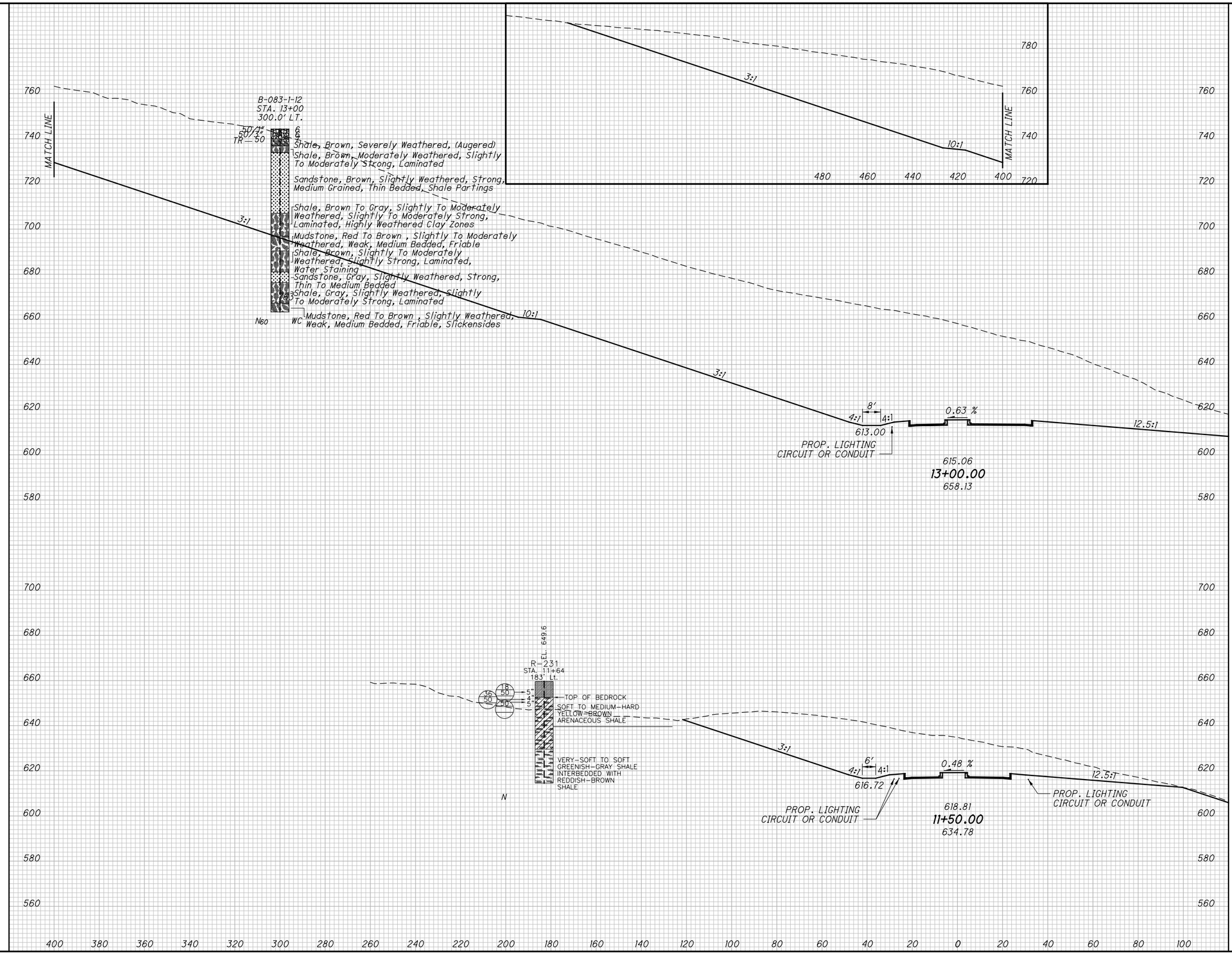
SOIL PROFILE - ROADWAY
S.R. 243 - STA. 9+64.02 - 21+54.00

LAW-7-2.17

136/206

1177
1247

U:\17360814\LAW\75923\geotechnical\sheets\SR 243\75923IP001.dgn 7/24/2024 7:52:34 AM MJennings



U:\173608714\LAW\75923\geotechnical\sheets\SR 243\75923XS.dgn 7/24/2024 7:55:42 AM MJennings

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTIONS - S.R. 243
STATIONS 11+50.00 & 13+00.00

LAW-7-2.17

137/206

1178/1247

FOR S.R. 7 PLAN & PROFILE, SEE SHEET 58-59
FOR S.R. 243 PLAN & PROFILE, SEE SHEET 136
FOR CROSS SECTION STATION 15+00, SEE SHEET 142
FOR CROSS SECTION STATION 24+00, SEE SHEET 142

B-086-1-12
B-087-1-12
B-085-0-12
B-086-0-12
B-087-0-12
B-027-0-11
B-024-0-11
B-028-0-11
B-030-0-11
N 62° 13' 05" E
Wooded Area
Ex. R/W S.R. 7
R/W
Ex R/W
N 83° 05' 31" E
N 72° 47' 57" E
N 66° 04' 40" E
Brush
Wooded Area
24"
Gravel
Car
Deck
2 Sty Brick & Frm Res. #16971
1 Sty Frm Res. #16949
Shed
Stockade
(LF)
Conc
Garage
2 Sty Brick Res. #17039
Excv. Area
Asphalt
Brick Walls
1-Sty duplex Res. 17001
LQ
Shed
48" Conc
STREAM 10
STREAM 10C
CONSTRUCTION LIMITS PHASE 2A & 2B
LA-R/W
Ex R/W
FUTURE WESTBOUND LANES
MATCH LINE STA. 24+00
STA. 9+68.33 O.R. 69
BEGIN WORK =
STA. 14+80.02 S.R. 243
℄ CONSTRUCTION S.R. 243
℄ CONSTRUCTION C.R. 69
P.R.E.C. (SMH)
W. Wire
Fence
PT
PC

SOIL PROFILE - ROADWAY
C.R. 69 STA. 9+68.33 - 24+00.00

HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN MSJ
CHECKED EMK

LAW-7-2.17

138/206
1179/1247

℄ CONSTRUCTION S.R. 243
℄ EX. R/W S.R. 243

B-085-0-12
STA. 10+00
50/6"
TR
N60
WC

B-024-0-11
STA. 10+95.4
7.3' LT.
TR-90
N60
WC

B-027-0-11
STA. 13+86.9
11.6' LT.
TR-50+
N60
WC

B-086-0-12
STA. 15+00
120.0' LT.
50/4"
TR
N60
WC

B-028-0-11
STA. 18+52.8
6.8' LT.
N60
WC

B-030-0-11
STA. 22+84.5
9.0' LT.
TR-52
N60
WC

B-085-0-12
(ROCK DESCRIPTIONS)

Shale, Gray, Severely Weathered, (Augered)

Interbedded Shale (80%) And Mudstone (20%), Shale; Brown To Gray, Moderately Weathered, Very Weak to Weak, Laminated, Highly Fractured; Mudstone; Brown To Gray, Moderately Weathered, Very Weak To Weak, Thin Bedded, Friable

Weathered Shale (Augered)

Shale, Brown Grading to Gray, Moderately Weathered, Slightly to Moderately Strong, Laminated, Highly Fractured

Mudstone, Mottled Red and Gray, Moderately Weathered, Weak, Thin Bedded

Siltstone, Gray, Unweathered to Slightly Weathered, Moderately Strong to Strong, Thin Bedded

℄ 42" TYPE A = 592.33

Weathered Sandstone (Augered)

2" EX. WATER

PROPOSED PROFILE

EX. GROUNDLINE

Sandstone, Brown, Slightly Weathered, Strong, Fine Grained, Thin Bedded, Shale Seams

Shale, Gray, Slightly Weathered, Moderately Strong To Strong, Laminated To Thin Bedded, Arenaceous

Mudstone, Gray To Red, Slightly Weathered, Weak, Thin Bedded, Friable

Shale, Gray, Slightly Weathered, Moderately Strong To Strong, Laminated To Thin Bedded, Arenaceous

Mudstone, Gray To Red, Slightly Weathered, Weak, Thin Bedded, Friable

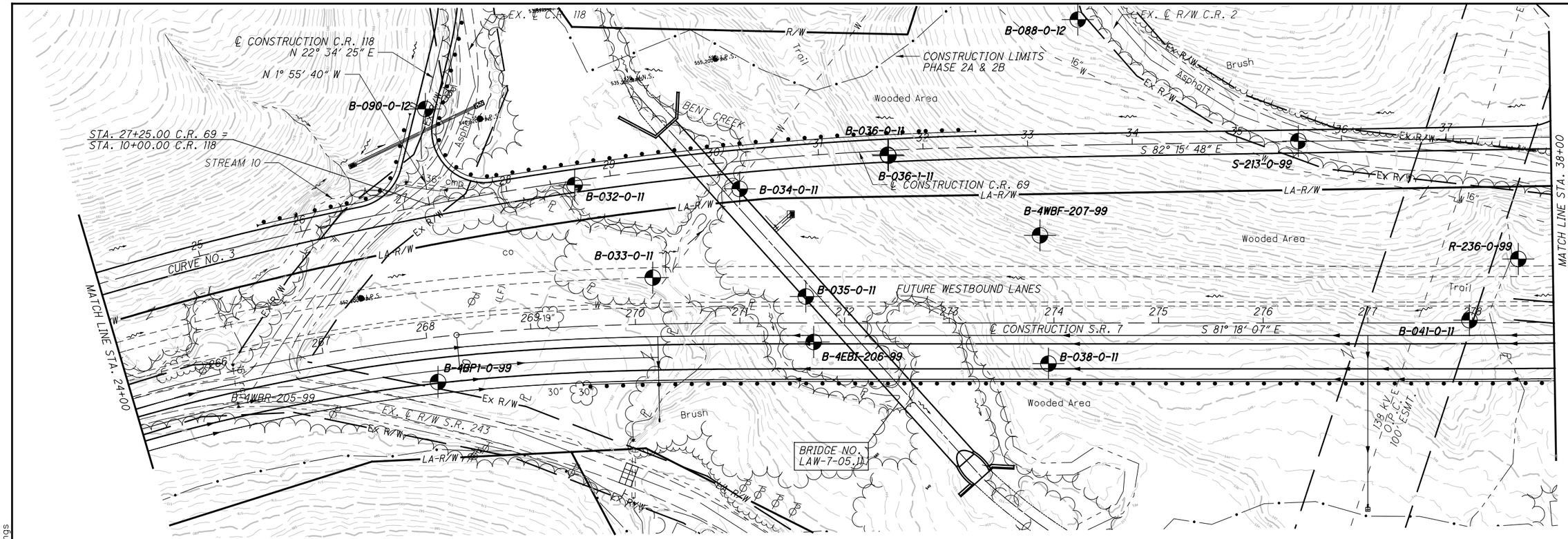
Weathered Shale (Augered)

660 640 620 600 580 560 540 520

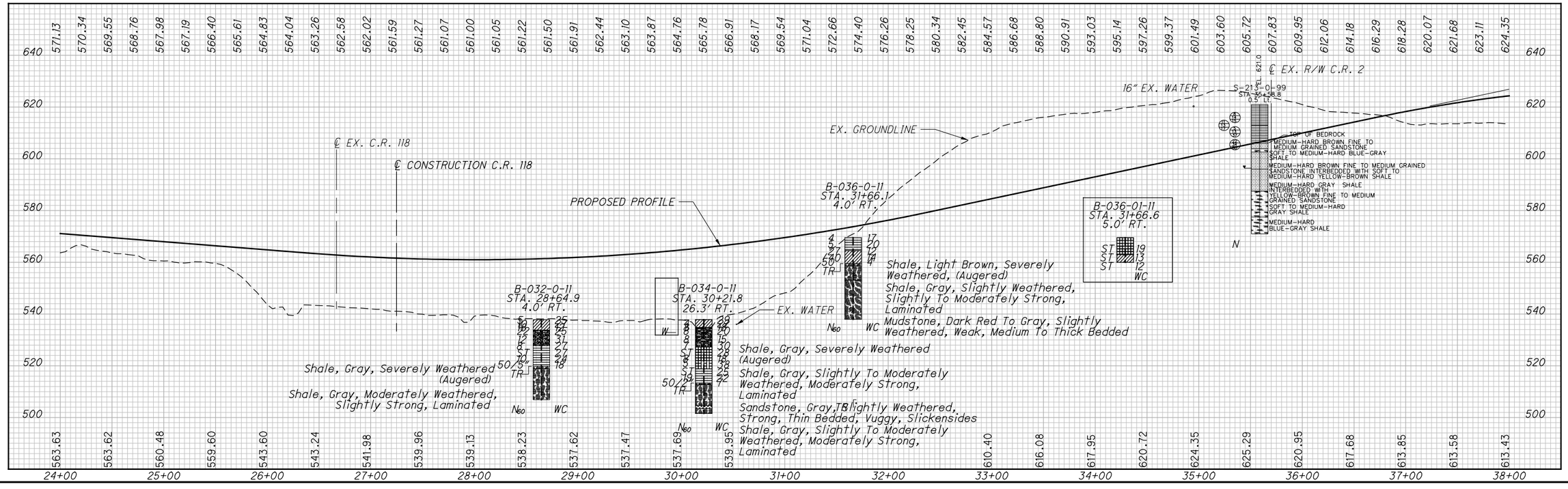
611.61 611.33 610.99 610.65 610.28 609.87 609.42 608.92 608.38 607.79 607.16 606.49 605.77 605.00 604.21 603.43 602.64 601.85 601.06 600.27 599.49 598.70 597.91 597.12 596.34 595.55 594.76 593.97 593.18 592.40 591.61 590.82 590.03 589.25 588.46 587.67 586.88 586.09 585.31 584.52 583.73 582.94 582.16 581.37 580.58 579.79 579.00 578.22 577.43 576.64 575.85 575.07 574.28 573.49 572.70 571.92 571.13

630.70 617.12 602.74 596.60 589.32 587.36 588.52 599.01 604.28 603.47 594.47 589.40 586.65 584.21 581.84 573.19 564.28 561.16 560.37 557.28 559.09 559.61 561.61 562.22 563.52 564.73 563.38 563.91 563.63

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00



FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 60-61
FOR C.R. 118 PLAN AND PROFILE, SEE SHEET 145
FOR CROSS SECTION STATION 33+50, SEE SHEET 143
FOR BRIDGE LAW-7-05.10 PLAN & PROFILE, SEE SHEET 61
FOR C.R. 2 PLAN & PROFILE, SEE SHEET 146



HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
C.R. 69 STA. 24+00.00 - 38+00.00
LAW-7-2.17

139/206
1180/1247

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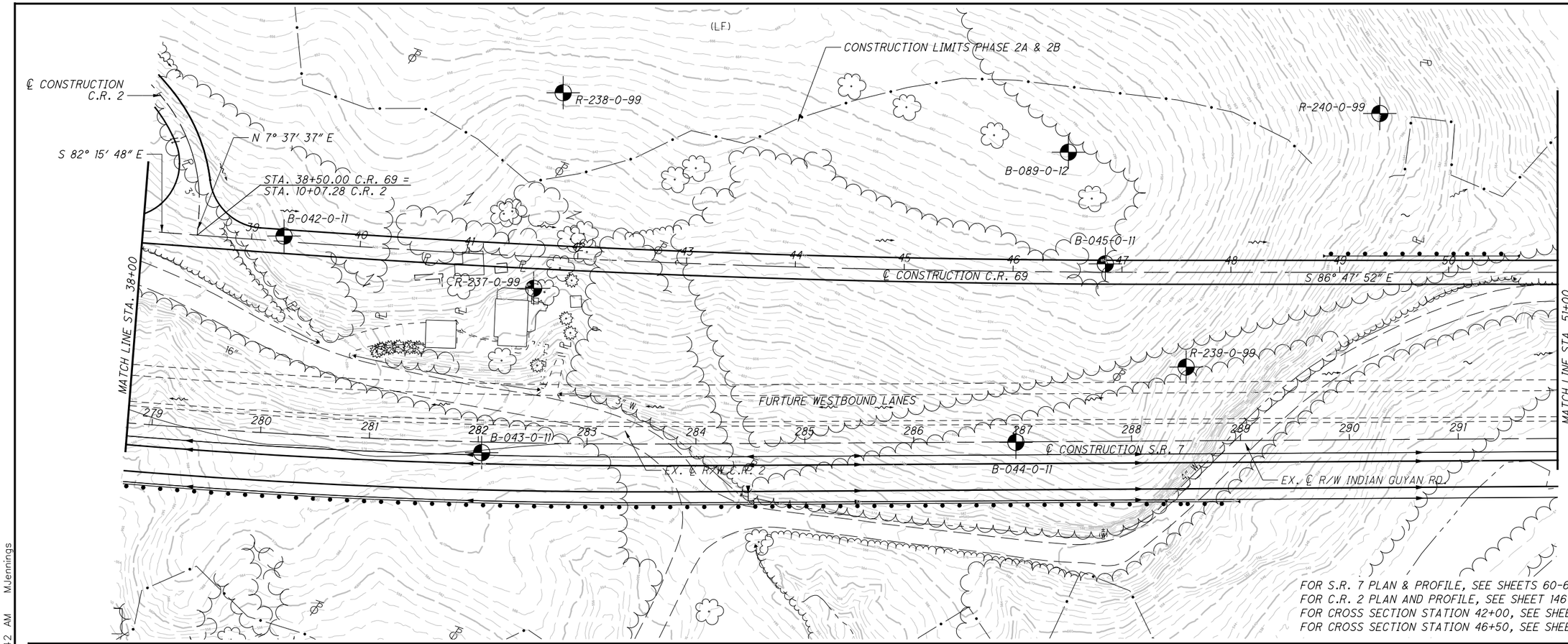
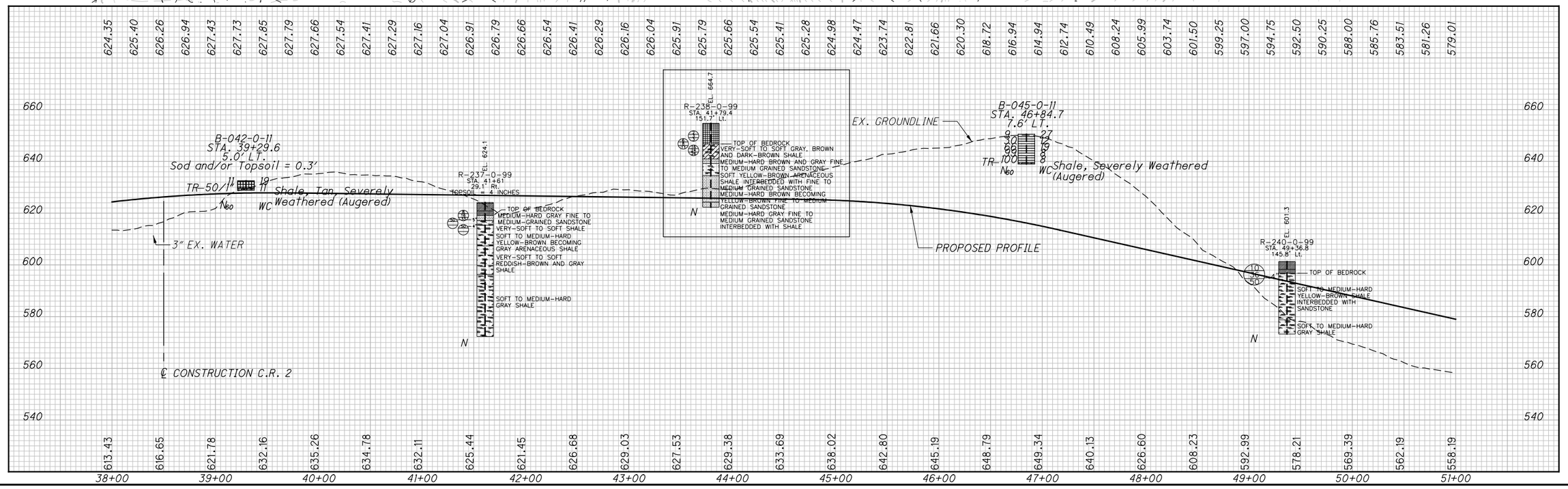


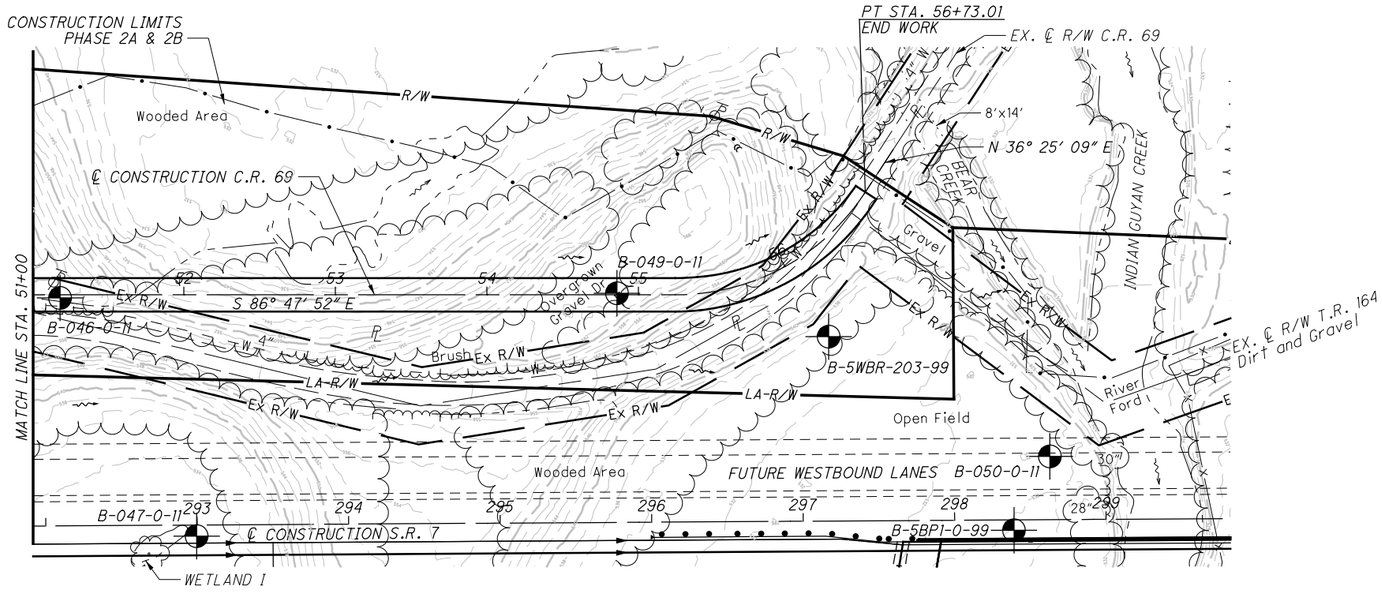
FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 60-61 & 63-64
FOR C.R. 2 PLAN AND PROFILE, SEE SHEET 146
FOR CROSS SECTION STATION 42+00, SEE SHEET 143
FOR CROSS SECTION STATION 46+50, SEE SHEET 144



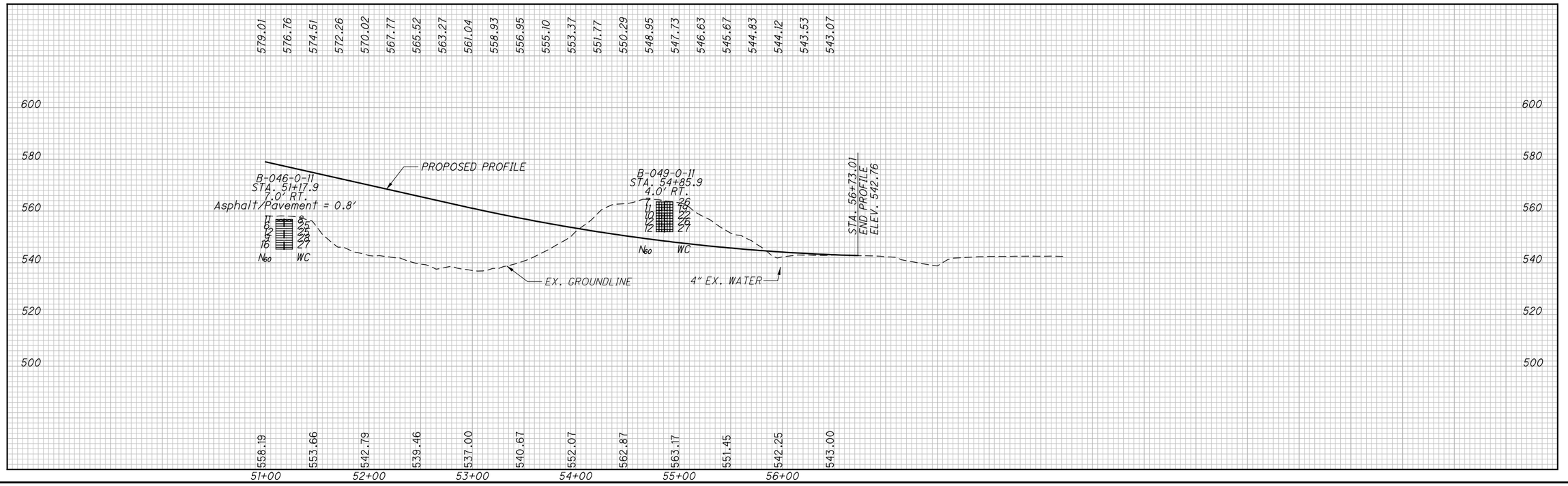
HORIZONTAL SCALE IN FEET
0 25 50 100
DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
C.R. 69 STA. 38+00.00 - 51+00.00

LAW-7-2.17



FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 63-64
FOR LAW-7-5.63 PLAN & PROFILE, SEE SHEET 65

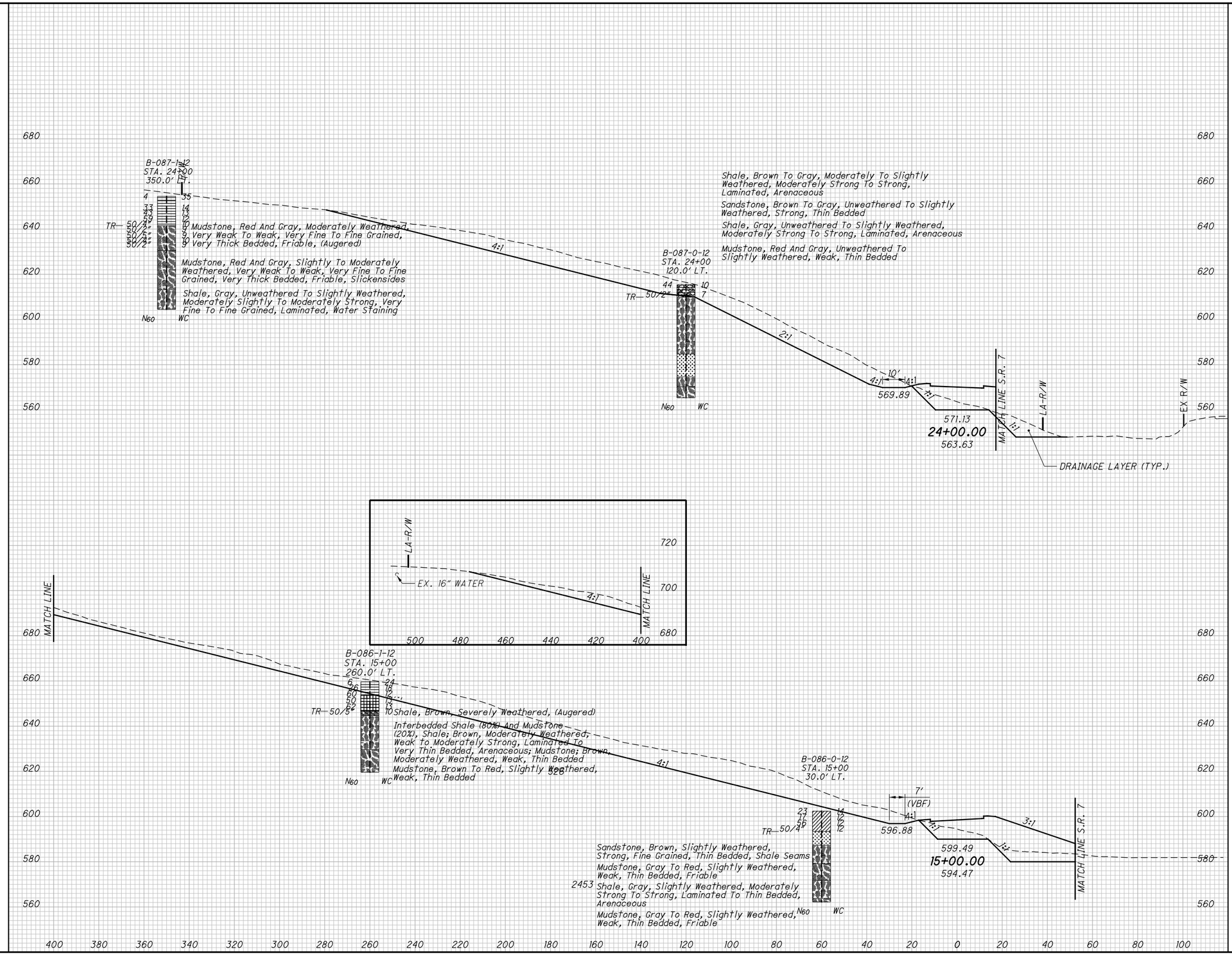


HORIZONTAL SCALE IN FEET
0 25 50 100

DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
C.R. 69 STA. 51+00.00 - 56+73.01

LAW-7-2.17



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0 10 20 40
HORIZONTAL SCALE IN FEET

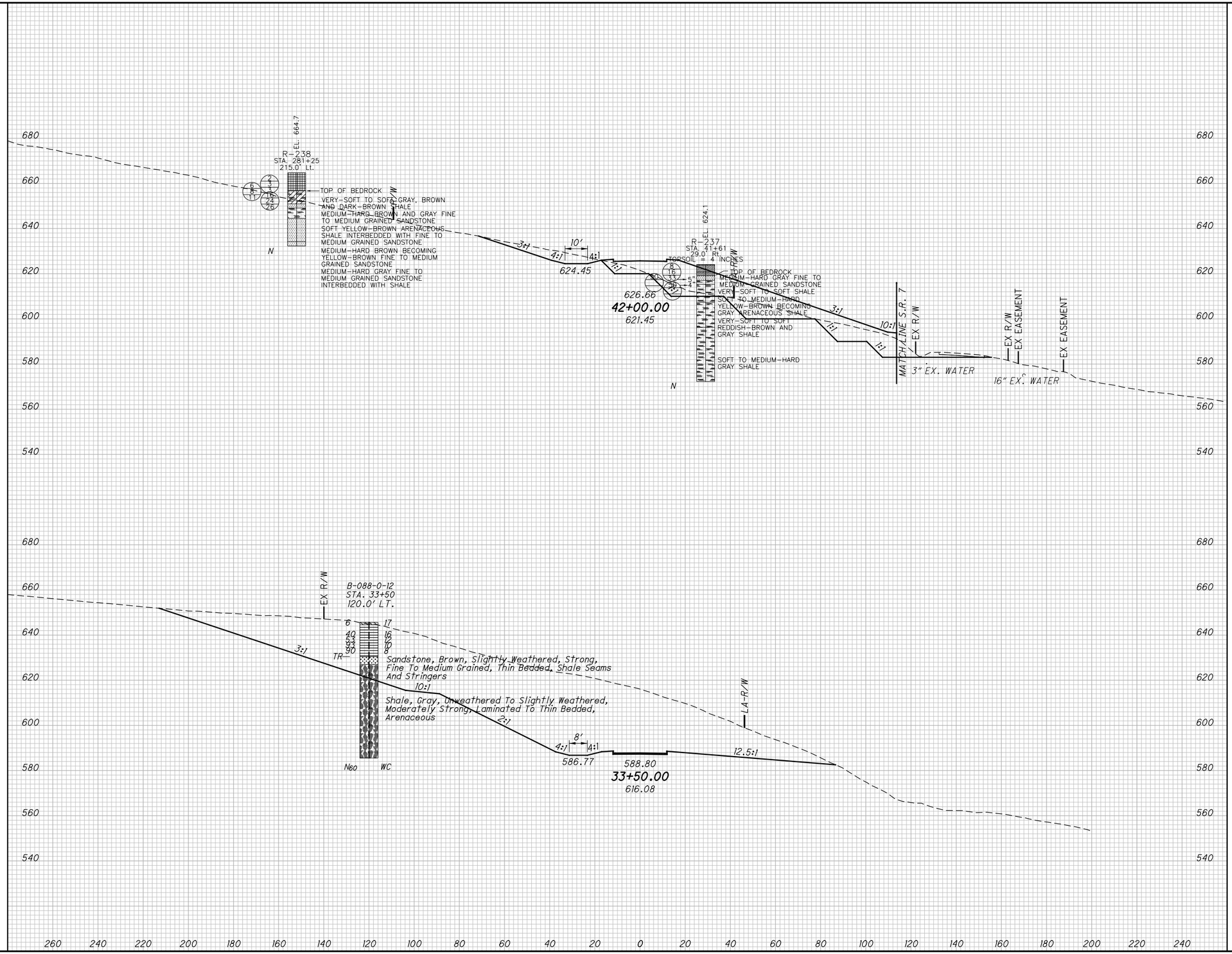
DRAWN MSJ
CHECKED EMK

CROSS SECTIONS - C.R. 69
STATIONS 15+00.00 & 24+00.00

LAW-7-2.17

142/206

1183/1247



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0 10 20 40
HORIZONTAL SCALE IN FEET

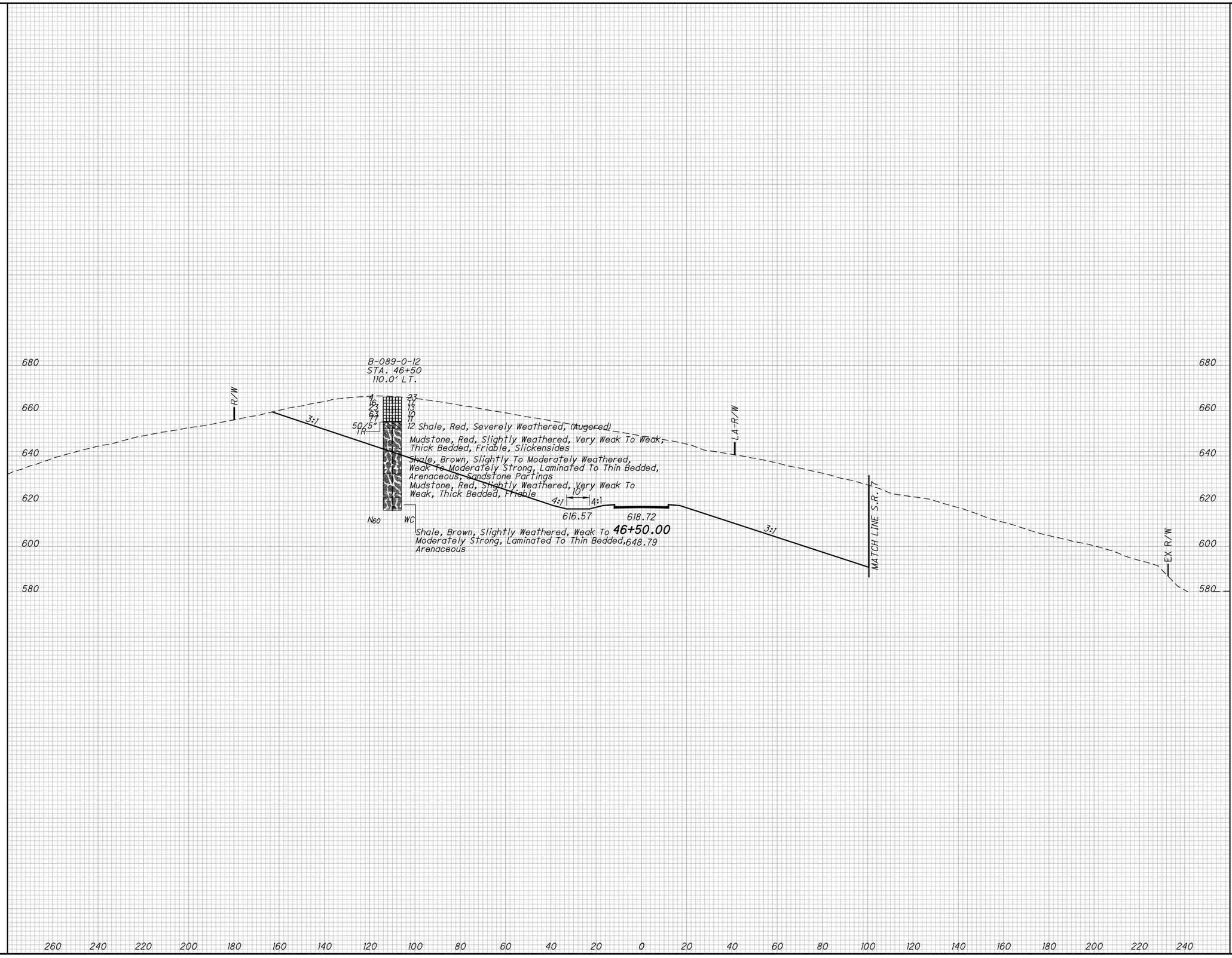
DRAWN MSJ
CHECKED EMK

CROSS SECTIONS - C.R. 69
STATIONS 33+50.00 & 42+00.00

LAW-7-2.17

143/206

1184/1247



0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - C.R. 69
STATION 46+50.00

LAW-7-2.17

144/206
1185/1247

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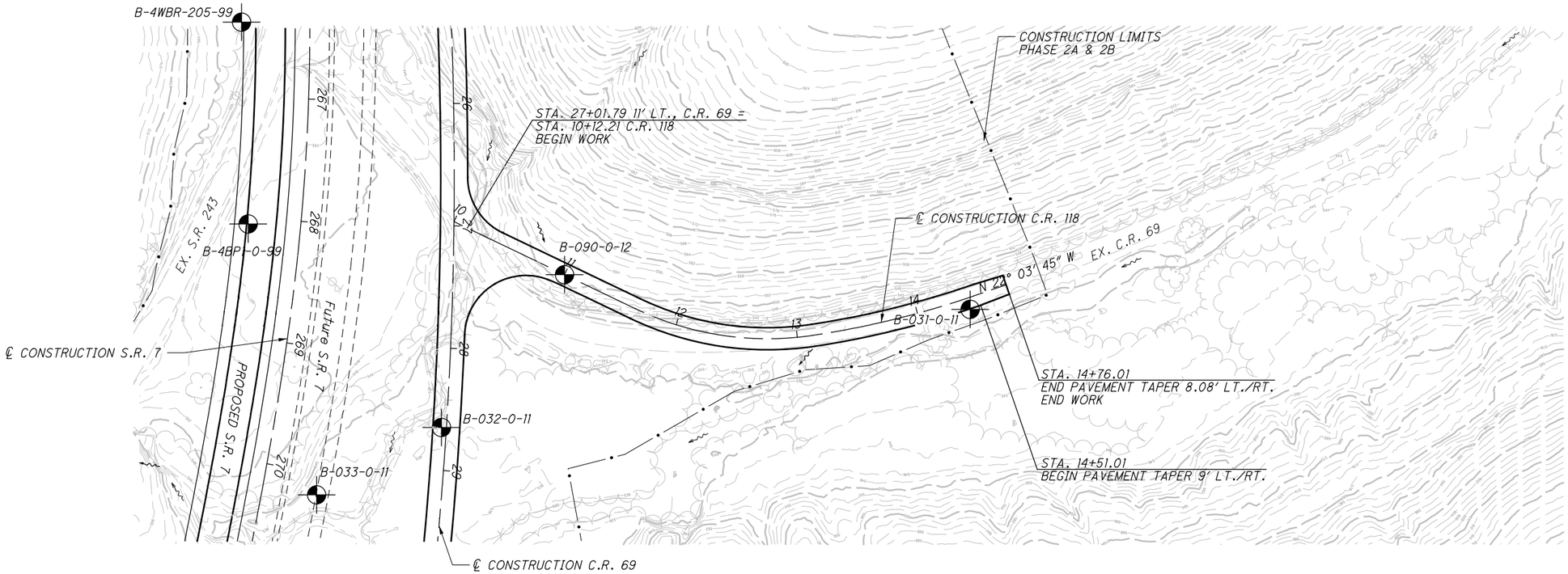
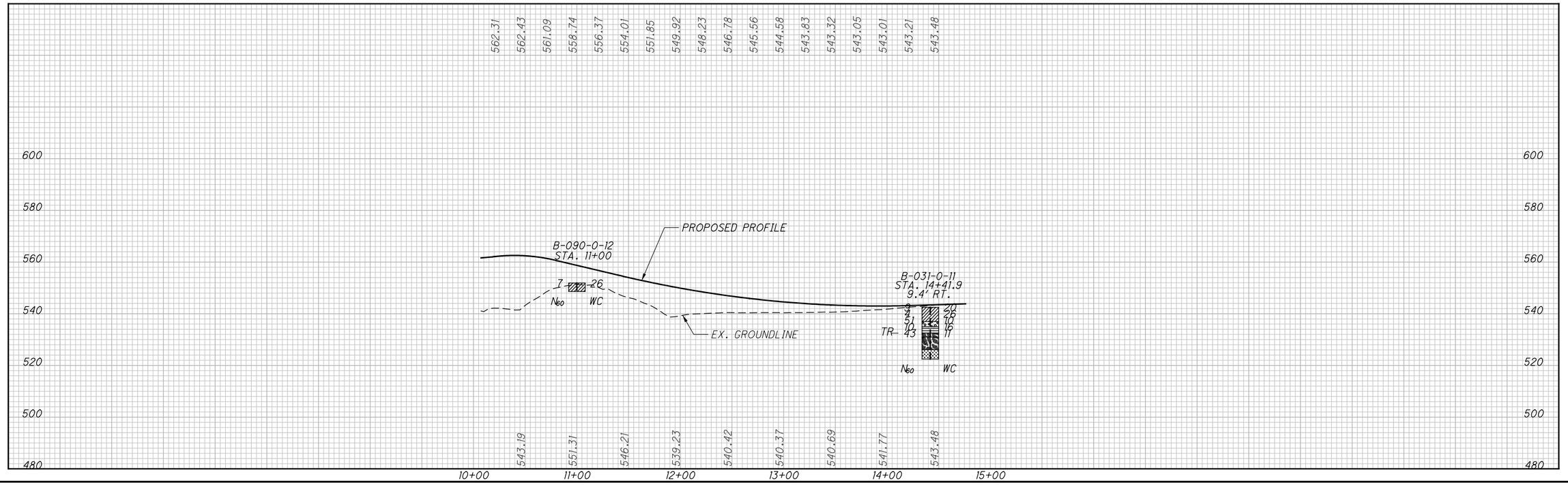


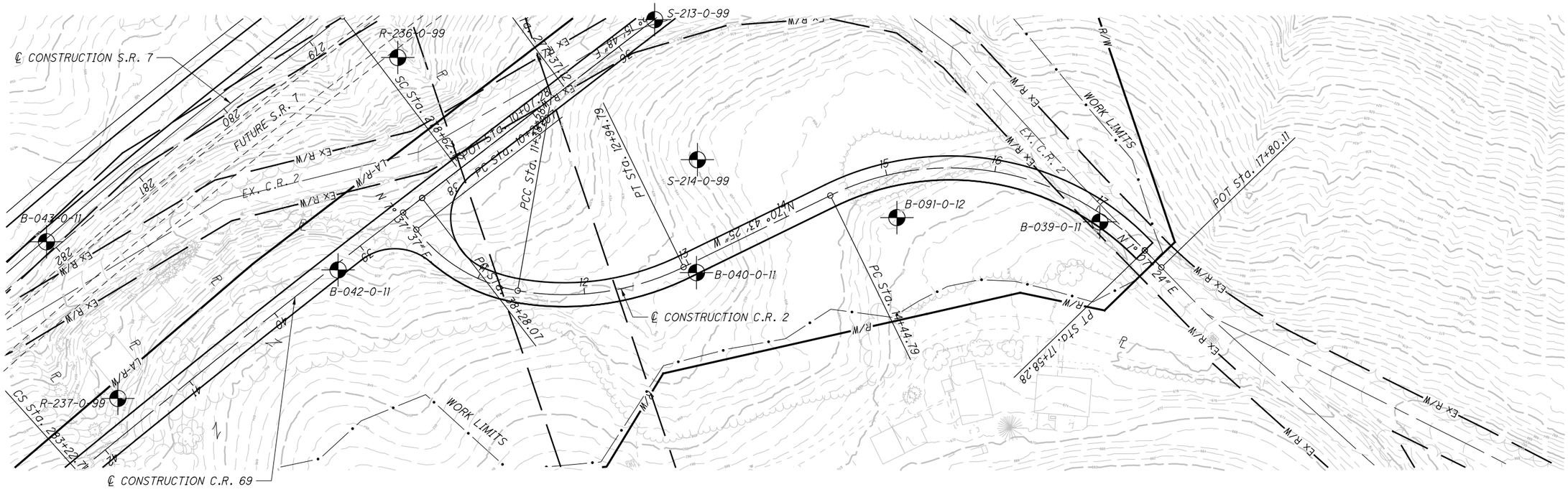
FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 60-61
FOR C.R. 69 PLAN & PROFILE, SEE SHEETS 138-141



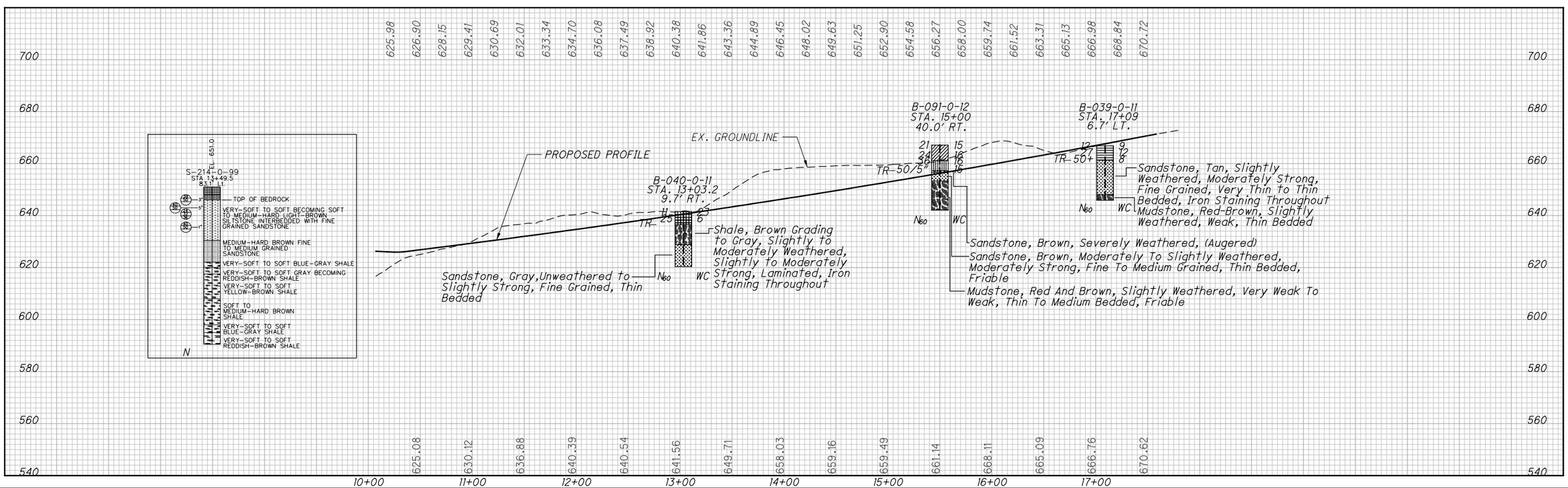
HORIZONTAL SCALE IN FEET
0 25 50 100
DRAWN MSJ
CHECKED EMK

SOIL PROFILE - ROADWAY
C.R. 118 - STA. 10+00 - 14+76.01

LAW-7-2.17



FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 60-61
FOR C.R. 69 PLAN & PROFILE, SEE SHEETS 138-141



SOIL PROFILE - ROADWAY
C.R. 2 STA. 10+07.28 - 17+58.28

LAW-7-2.17

146/206

1187/1247

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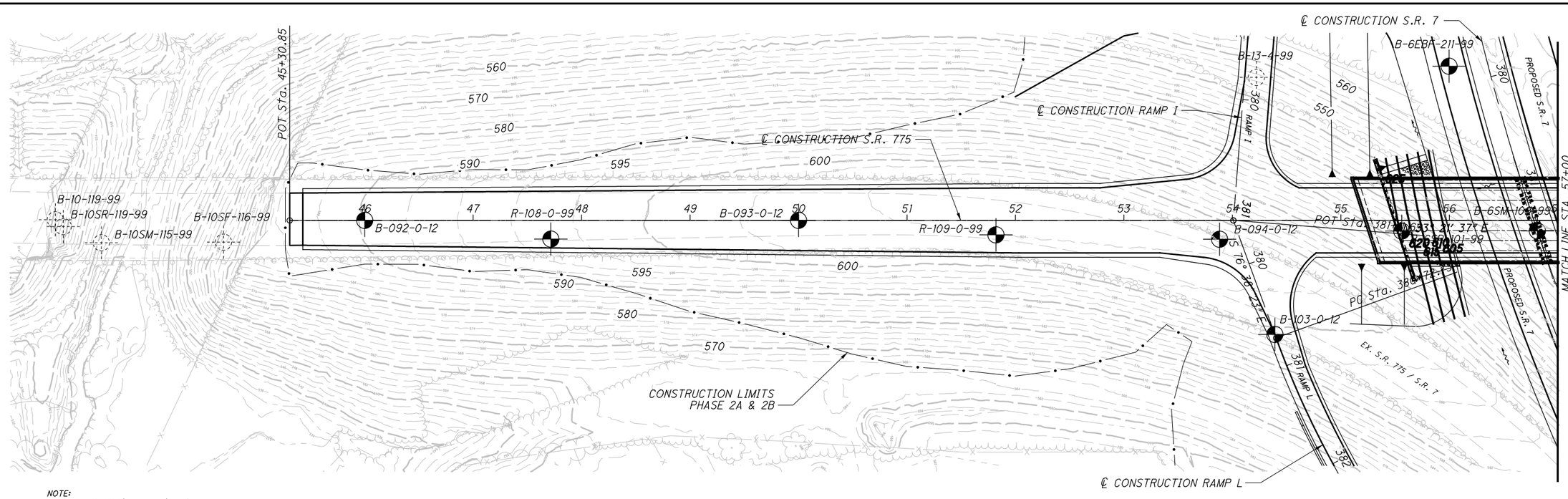
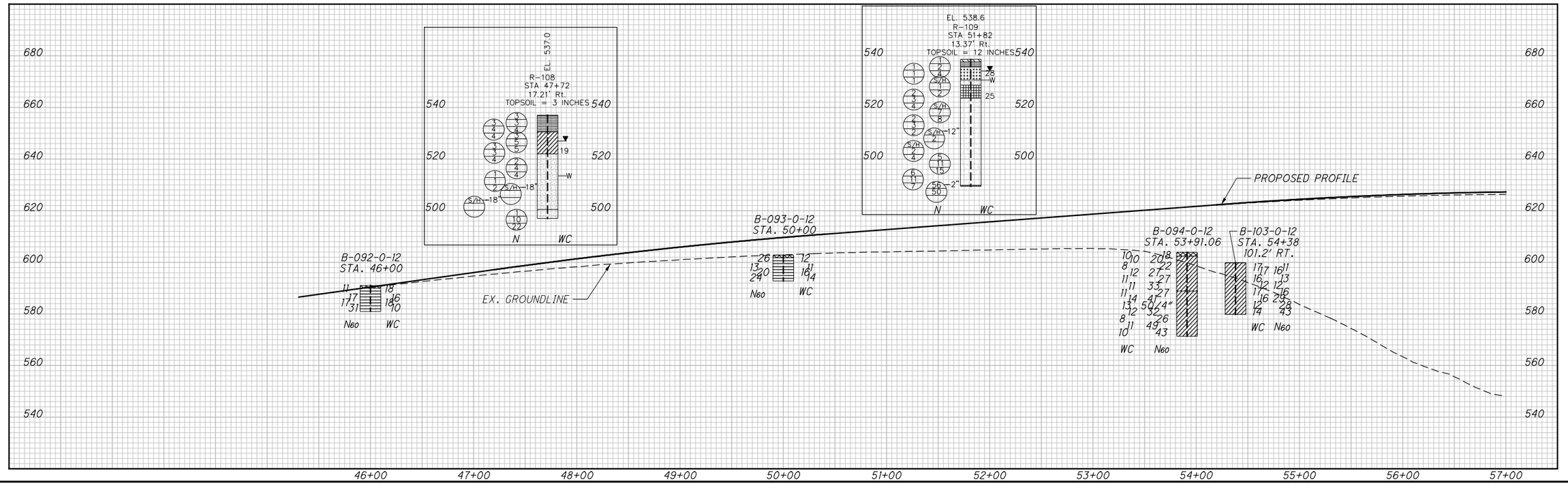


NOTE:
Borings B-10-99 Shown on Plan View are From Previous Exploration Law 7-7.25 By BBCM Dated 10/30/2000. All Available Data is Shown Which Was Available From Those Reports.

FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 70-71
FOR S.R. 775 BRIDGE LAW-775-1.05, SEE SHEET 151
FOR RAMP I PLAN AND PROFILE, SEE SHEET 125
FOR RAMP L PLAN AND PROFILE, SEE SHEET 134



SOIL PROFILE - ROADWAY
S.R. 775 - STA. 45+42.93 - 55+00.00

DRAWN MSJ
CHECKED EMK

HORIZONTAL SCALE IN FEET
0 25 50 100

LAW-7-2.17

147/206

1188/1247

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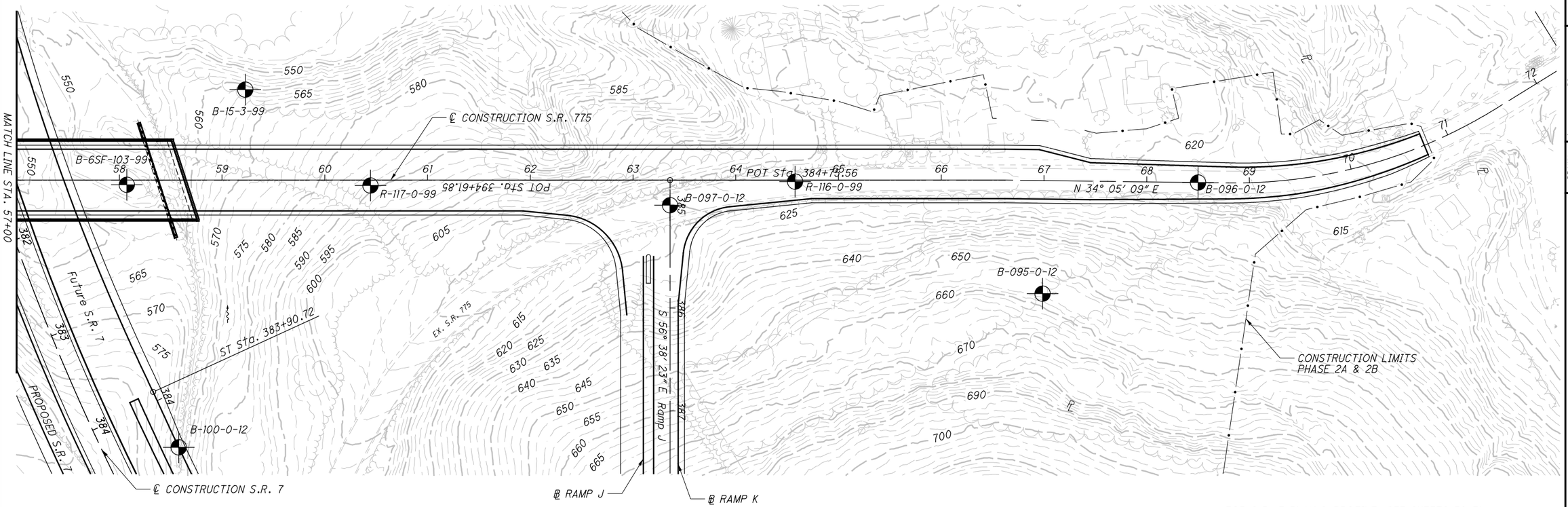
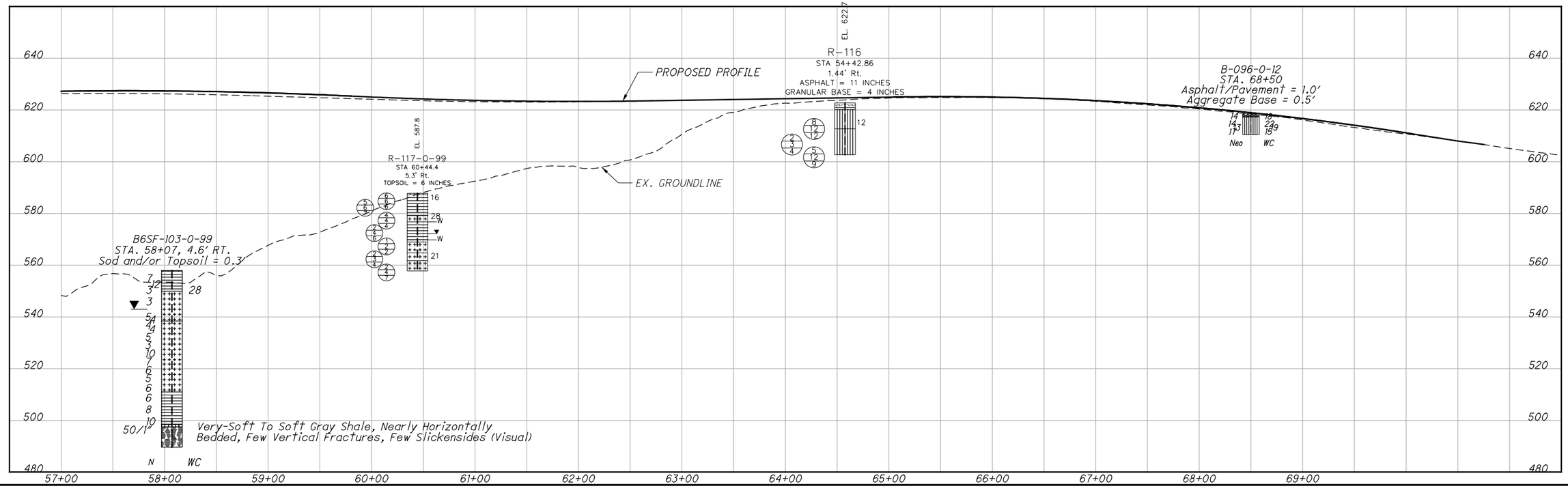


FOR S.R. 7 PLAN & PROFILE, SEE SHEETS 70-71
FOR S.R. 775 BRIDGE LAW-775-1.05, SEE SHEET 151
FOR RAMP J PLAN AND PROFILE, SEE SHEET 128
FOR RAMP K PLAN AND PROFILE, SEE SHEET 129



SOIL PROFILE - ROADWAY
S.R. 775 - STA. 57+00 - 70+45.38

DRAWN MSJ
CHECKED EMK

HORIZONTAL SCALE IN FEET
0 25 50 100

LAW-7-2.17

148/206

1189/1247

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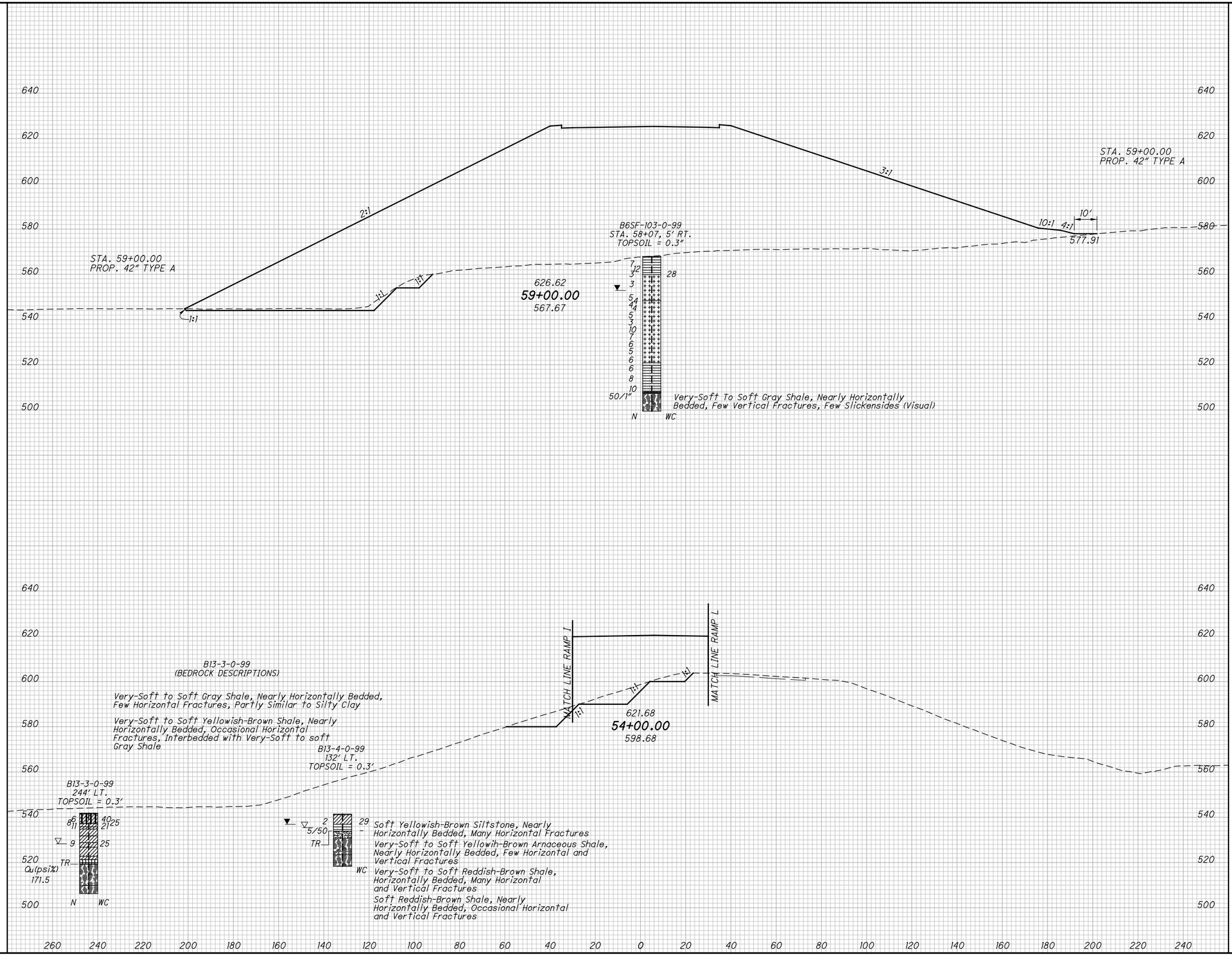

HORIZONTAL SCALE IN FEET
0 10 20 40

DRAWN MSJ
CHECKED EMK

CROSS SECTIONS - S.R. 775
STATIONS 54+00.00 & 59+00.00

LAW-7-2.17

149/206

1190
1247

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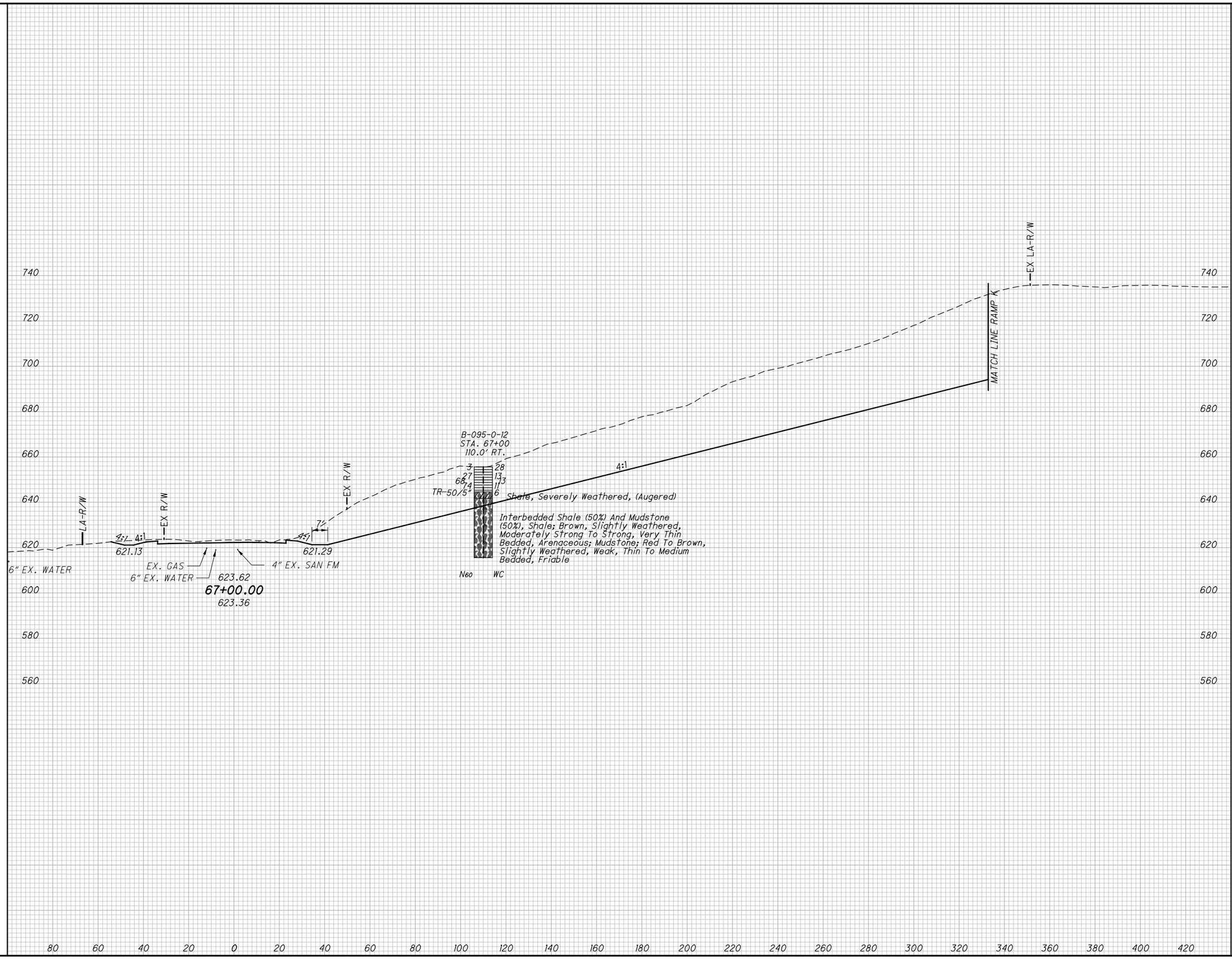

0 10 20 40
HORIZONTAL SCALE IN FEET

DRAWN MSJ
CHECKED EMK

CROSS SECTION - S.R. 775
STATION 67+00.00

LAW-7-2.17

150/206

1191/1247

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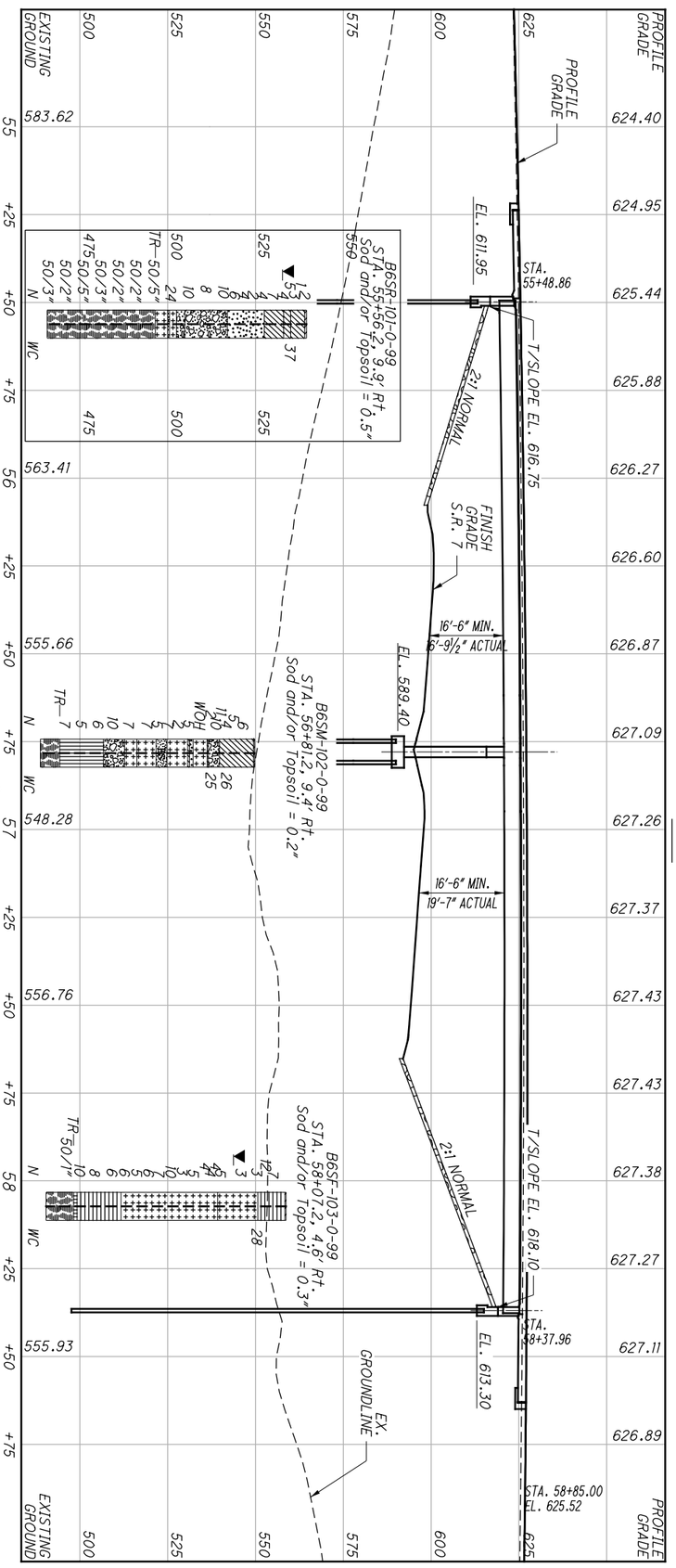
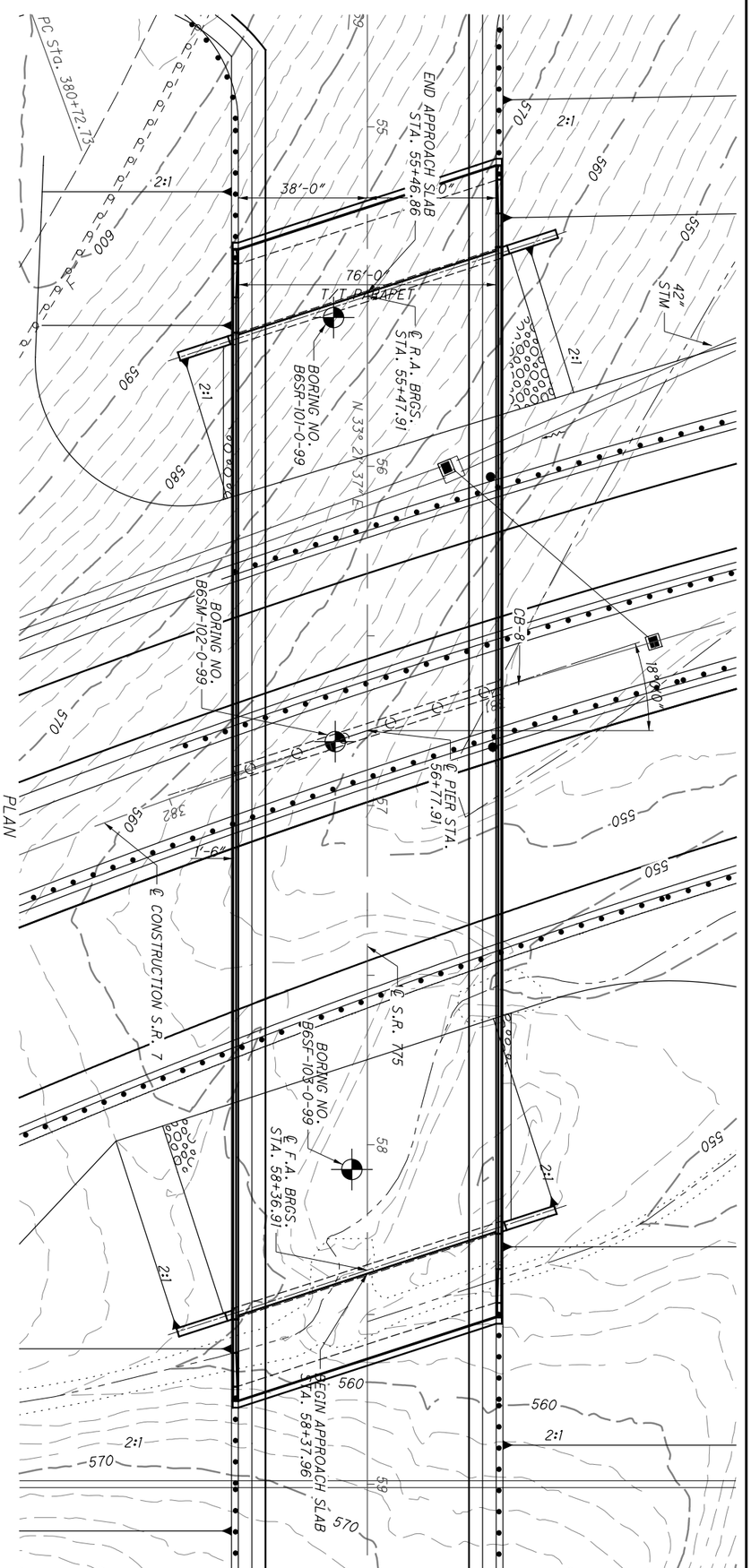
BRIDGE NO. B-14





1192 / 1247	151 / 206	**LAW-7-2.17**	**STRUCTURE FOUNDATION EXPLORATION** **LAW-775-01.05** **S.R. 775 OVER S.R. 7**	DRAWN MSJ CHECKED EMK	0 25 12.5 50 HORIZONTAL SCALE IN FEET

BRIDGE-LAW-7-02.51: STA. 132+20.7, 1.2' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-02.51

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-1BP1
LAW-7 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 3

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 132+20.7, 1.2' Lt. of Proposed SR7 Centerline
COMPLETION DEPTH: 93.1' ELEVATION: 578.1 DATE: 11/9/98 11/10/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0												TOPSOIL - 1 INCH
	1	4/12/12	4.5+									Hard light-brown mottled with gray silty clay, trace fine to coarse sand, contains few silt seams, desiccated.
5	2	11/13/14	4.5+	15	51	23	0	1	1	49	49	
	3	10/14/16	4.5+									
												A-7-6(17)
10	4	12/14/12		10								Medium-dense brown silt, little fine sand.
												Est. A-4b
	5	8/9/9	4.5+									Hard light-brown silty clay, interbedded with silt, trace fine sand, desiccated.
												Est. A-6b
	6	8/9/9										Medium-dense brown silt, interbedded with silty clay, trace fine sand.
15	7	10/11½/10										
	8	10/11½/10		16								
												Est. A-4b
20	9	8/9/9	4.25-4.5									Hard brown mottled with gray silty clay, contains silt seams, slightly desiccated.
												Est. A-6b
25												Hard brown silty clay, interbedded with silt and fine sand, desiccated.
	10A	8/11½/11	4.5+									
30	10B		4.5+									
												Est. A-6b
	11	6/9/8	4.5+	10	38	26	0	0	3	36	61	Hard brown silty clay, slightly desiccated, few traces of iron oxide staining, contains silt seams.
35												A-6a(9)

WATER LEVEL:
WATER NOTE: Caved at 22.0'
DATE: 11/10/98

JOB: 6405.1 -CONTINUED- PLATE 5

LAW-7-02.51

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-1BP1
LAW-7 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 3

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 132+20.7, 1.2' Lt. of Proposed SR7 Centerline
COMPLETION DEPTH: 93.1' ELEVATION: 578.1 DATE: 11/9/98 11/10/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION - CONTINUED
35												Hard brown silty clay, slighlty desiccated, few traces of iron oxide staining, contains silt seams.
												A-6a(9)
40	12	5/6/7	4.0-4.5+									Very-stiff to hard dark-brown mottled with gray silty clay, contains thin seams of silt.
45	13	6/7/8	3.75-4.5									
												Est. A-6b
	14A	6/8/9	3.25-3.5	23								Very-stiff gray-brown silty clay, interbedded with very-thin seams of fine sand.
50	14B		4.5+									Est. A-6b
												Very-stiff to hard gray-brown becoming gray silty clay, trace to little fine sand, few seams of gray silt.
	15	5/6/6	3.0-3.5	24								
55												
	16	7/7/9	3.25-4.5									
60												
	17	5/7/7	2.5-4.0									
65												
												Est. A-6b
	18	4/5/7	1.2-2.7	30	38	24						Stiff to very-stiff gray silty clay, few to many fine to medium sand seams, few silt seams.
70												Est. A-6b

WATER LEVEL:
WATER NOTE: Caved at 22.0'
DATE: 11/10/98

JOB: 6405.1 -CONTINUED- PLATE 6

LAW-7-02.51

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-1BP1
LAW-7 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 3

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 132+20.7, 1.2' Lt. of Proposed SR7 Centerline
COMPLETION DEPTH: 93.1' ELEVATION: 578.1 DATE: 11/9/98 11/10/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0												TOPSOIL - 1 INCH
	1	4/12/12	4.5+									Hard light-brown mottled with gray silty clay, trace fine to coarse sand, contains few silt seams, desiccated.
5	2	11/13/14	4.5+	15	51	23	0	1	1	49	49	
	3	10/14/16	4.5+									
												A-7-6(17)
10	4	12/14/12		10								Medium-dense brown silt, little fine sand.
												Est. A-4b
	5	8/9/9	4.5+									Hard light-brown silty clay, interbedded with silt, trace fine sand, desiccated.
												Est. A-6b
	6	8/9/9										Medium-dense brown silt, interbedded with silty clay, trace fine sand.
15	7	10/11½/10										
	8	10/11½/10		16								
												Est. A-4b
20	9	8/9/9	4.25-4.5									Hard brown mottled with gray silty clay, contains silt seams, slightly desiccated.
												Est. A-6b
25												Hard brown silty clay, interbedded with silt and fine sand, desiccated.
	10A	8/11½/11	4.5+									
30	10B		4.5+									
												Est. A-6b
	11	6/9/8	4.5+	10	38	26	0	0	3	36	61	Hard brown silty clay, slightly desiccated, few traces of iron oxide staining, contains silt seams.
35												A-6a(9)

WATER LEVEL:
WATER NOTE: Caved at 22.0'
DATE: 11/10/98

JOB: 6405.1 -CONTINUED- PLATE 5

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-7-02.51

LAW-7-2.17

BRIDGE-LAW-7-02.51: STA. 133+30, 60.0' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-02.51

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B1EBI-201
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 133+30, 60' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 38.0' ELEVATION: 526.0 DATE: 4/4/00

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0												Very-soft to soft brown silty clay, trace fine to coarse sand, trace fine gravel, slightly organic. Est. A-6a
	1	2 3/5	2.5-3.25									Stiff to very-stiff brown mottled with gray silty clay, trace fine to coarse sand, slightly organic, many silt seams.
5	2	2 2/5	2.0-3.5	27	36	23	0	1	4	95		
	3	2 3/4	2.0-3.5									
10	4	3 4/6	2.5-3.75				0	0	2	53	45	
	5	2 4/5	2.5-3.0				0	0	2	48	50	
	6	2 3/4	1.5-2.75				0	0	4	46	50	
15	7	2 2/4	1.0-1.75				0	0	3	49	48	A-6a (9)
	8	2 4/4										Very-loose becoming medium-dense brown and gray fine to medium sand, trace coarse sand, trace to little silt, few seams of gray silty clay.
20	9	1 1/2					0	18	65	17		
	10	4 4/5										
25	11	4 5/5										
	12	4 5/5										
30	13	4 6/5										A-3a (0)
	14	NXM REC 97% RQD 73%										Medium-hard gray fine to medium-grained sandstone, interbedded with siltstone, well cemented, nearly horizontally bedded, few horizontal fractures. Visual
35												-Encountered water at 18'
40												
45												

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.002

PLATE 8

BRIDGE-LAW-7-02.51: STA. 134+58.6, 4.6' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-02.51

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-1BP2
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 134+58.6 4.6' Lt. of Proposed SR 7 Centerline Metric
COMPLETION DEPTH: 42.5' ELEVATION: 523.6 DATE: 11/10/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0												TOPSOIL - 1 INCH
	1	3 3/2	1.75-3.5									Stiff to very-stiff brown silty clay, little fine to medium sand, contains many seams and lenses of fine to medium sand, few roots. Est. A-6a
5	2	2 1/1										Very-loose brown fine to medium sand, little clayey silt, few zones of clayey silt interbedded with fine to medium sand, partly organic. Est. A-3a
	3	1 1/1	0.5-1.0									Medium-stiff to stiff dark-gray organic silty clay, interbedded with fine to medium sand, contains decayed vegetation. Visual
10	4	1 1/1					4	44	35	17		Very-loose gray fine to medium sand, trace coarse sand, little clayey silt, contains wood fragments. A-3a(0)
	5A	2 3/5	1.0	22			7	61	23	3	6	Very-loose gray fine to medium sand, trace coarse sand, trace clayey silt.
	5B			29	31	23	0	1	8	54	37	A-1-b(0)
	5C	2 3/4					1	14	78	7		Stiff gray clayey silt, trace fine to medium sand, slightly organic. Est. A-4b
	6	2 2/2										
	7A		0.75				0	23	74	3		Loose gray fine sand, little to some medium to coarse sand, trace silt, slightly organic. A-3(0)
20	7B											
	8A		1.0				2	33	52	9	4	Medium-stiff to stiff organic silty clay, trace fine sand, contains silt and fine sand seams. Visual
	8B	2 3/4										
	9	5 8/8										Loose to medium-dense dark-gray becoming gray fine to medium sand, trace coarse sand, little clayey silt, trace fine gravel, slightly organic. A-3a(0)
25	10*	9 4/9										
	11#	9 14/10	1.5									Stiff gray silty clay, interbedded with fine to medium sand, slightly organic. Est. A-6a
	12**	8 8/10										Medium-dense gray fine to medium sand, little clayey silt. Est. A-1-b
30	13	40-5"R	4.5+									Very-soft to soft gray siltstone.
		NXM REC 100% RQD 39%										Medium-hard gray siltstone, nearly horizontally bedded, contains many diagonal fractures and fractures along bedding planes, few seams of shale. Visual
35	14											

WATER LEVEL: 9.3
WATER NOTE:
DATE: 11/10/98

JOB: 6405.1

-CONTINUED-

PLATE 9

LAW-7-02.51

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-1BP2
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 134+58.6 4.6' Lt. of Proposed SR 7 Centerline Metric
COMPLETION DEPTH: 42.5' ELEVATION: 523.6 DATE: 11/10/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
40	15	REC 100% RQD 75%										DESCRIPTION - CONTINUED
												Medium-hard gray shale, nearly horizontally bedded, contains few fractures along bedding planes. Visual
45												- Encountered water at 12.5'. - Encountered suger refusal at 32.0'. - * Blowin during driving. - # 3' of blow-in ("heave") - cleaned out prior to sampling - ** 1' of blow-in ("heave") - cleaned out before blow counts.
50												
55												
60												
65												
70												
75												

WATER LEVEL: 9.3
WATER NOTE:
DATE: 11/10/98

JOB: 6405.1

PLATE 10

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-02.51

LAW-7-2.17

153/206

1194/1247

BRIDGE-LAW-7-02.51: STA. 135+60, 35.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-02.51

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B1WBF-202
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel

LOCATION: Sta. 135+60, 35' Lt. of Proposed SR 7 Centerline

COMPLETION DEPTH: 40.0' ELEVATION: 524.0 DATE: 4/3/00

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 7 INCHES
	1		2 /3/4	0.75-1.75	26	36	24	0	1	20	79	Medium-stiff to stiff brown silty clay, trace fine to medium sand, few silt seams.
5												A-6a (9)
	2		2 /2/2									Very-loose to loose brown and gray fine to medium sand, some to "and" clayey silt, contains decayed wood fragments, slightly organic.
	3		2 /1/1									Est. A-4a
10	4		1 /1/2									Very-loose to loose brown and gray fine to coarse sand, trace to little clayey silt, trace fine gravel, contains decayed wood fragments, slightly organic.
	5		1 /2/3									
	6		2 /3/2					4	58	33	5	
15	7		2 /1/3									
	8		3 /2/2									A-1-b (0)
20	9		4 /5/5									Medium-stiff to stiff gray clayey silt, some fine to medium sand.
	10		5 /5/5									Est. A-4a
25	11		5 /5/4									Very-loose gray and brown fine to coarse sand, trace fine to coarse gravel, trace silt.
	12		1 /2/1	0.5-1.25								Est. A-3a
30	13		S/H-12" /2									Medium-hard to hard gray fine-grained sandstone, nearly horizontally bedded, well cemented, few diagonal fractures, vertical fracture at 38.0'.
35			50-0"R NXM REC 90% RQD 83%									Visual
	14											Medium-hard gray shale, interbedded with siltstone, nearly horizontally bedded, well cemented, few horizontal fractures.
40												Visual
												-Encountered water at 11.5'
45												

WATER LEVEL: ▽ ▽ ▽ ▽ ▽ ▽
WATER NOTE:
DATE:

JOB: 01106405.002

PLATE 11

GEO LAW405001.GPJ BBCM.GDT 5/10/02

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-02.51

LAW-7-2.17

154/206

1195/1247

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 196+24, 100 LT	EXPLORATION ID B-009-1-12
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 565.5 (MSL) EOB: 58.7 ft.	PAGE 1 OF 1
START: 5/1/13 END: 5/1/13	SAMPLING METHOD: SPT/ST/NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF, BROWN, **SANDY SILT**, SOME CLAY, TRACE TO NO GRAVEL, MOIST	565.5		1	4	100	SS-1	-	-	-	-	-	-	-	-	-	21	A-4a (V)	
		2.5	WOH	0	100	SS-2	-	0	0	29	44	27	29	19	10	23	A-4a (7)	
		5.0	3	6	100	SS-3	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
		7.5			92	ST-4	-	12	14	27	27	20	27	17	10	10	A-4a (2)	
	556.0																	
VERY STIFF TO HARD, BROWN, **SILT AND CLAY**, AND SAND, TRACE GRAVEL, DAMP TO MOIST		10.0	5	30	100	SS-5	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
		12.5			100	ST-6	-	9	14	28	23	26	28	16	12	-	A-6a (3)	
		15.0	4	26	100	SS-7	-	-	-	-	-	-	-	-	-	17	A-6a (V)	
		17.5	6	19	100	SS-8	-	-	-	-	-	-	-	-	-	19	A-6a (V)	
	546.0																	
VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, MOIST		20.0			100	ST-9	-	0	1	16	38	45	35	17	18	-	A-6b (11)	
		22.5	4	21	100	SS-10	-	-	-	-	-	-	-	-	-	21	A-6b (V)	
		25.0	4	16	100	SS-11	-	-	-	-	-	-	-	-	-	24	A-6b (V)	
		27.5	4	19	100	SS-12	-	-	-	-	-	-	-	-	-	20	A-6b (V)	
		30.0	3	10	100	SS-13	-	-	-	-	-	-	-	-	-	18	A-6b (V)	
	533.5																	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND CLAY, WET		W 32.5	6	20	100	SS-14	-	0	1	74	14	11	NP	NP	NP	25	A-3a (0)	
		35.0	4	14	100	SS-15	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
		37.5																
		40.0	3	23	100	SS-16	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		42.5																
	520.2	TR 45.0	6	43	100	SS-17	-	-	-	-	-	-	-	-	-	17	Rock (V)	
MUDSTONE, BROWN, SEVERELY WEATHERED, (AUGERED).		47.5																
	516.8																	
MUDSTONE, GRAY AND BROWN, SLIGHTLY WEATHERED, WEAK, THIN BEDDED, GRAY SANDSTONE SEAM 51.3' - 52.2', COAL SEAM 55.5' - 55.9'; RQD 8%, REC 94%.		50.0		17	90	NQ-1											CORE	
		52.5																
		55.0		0	98	NQ-2											CORE	
	506.8	EOB 57.5																

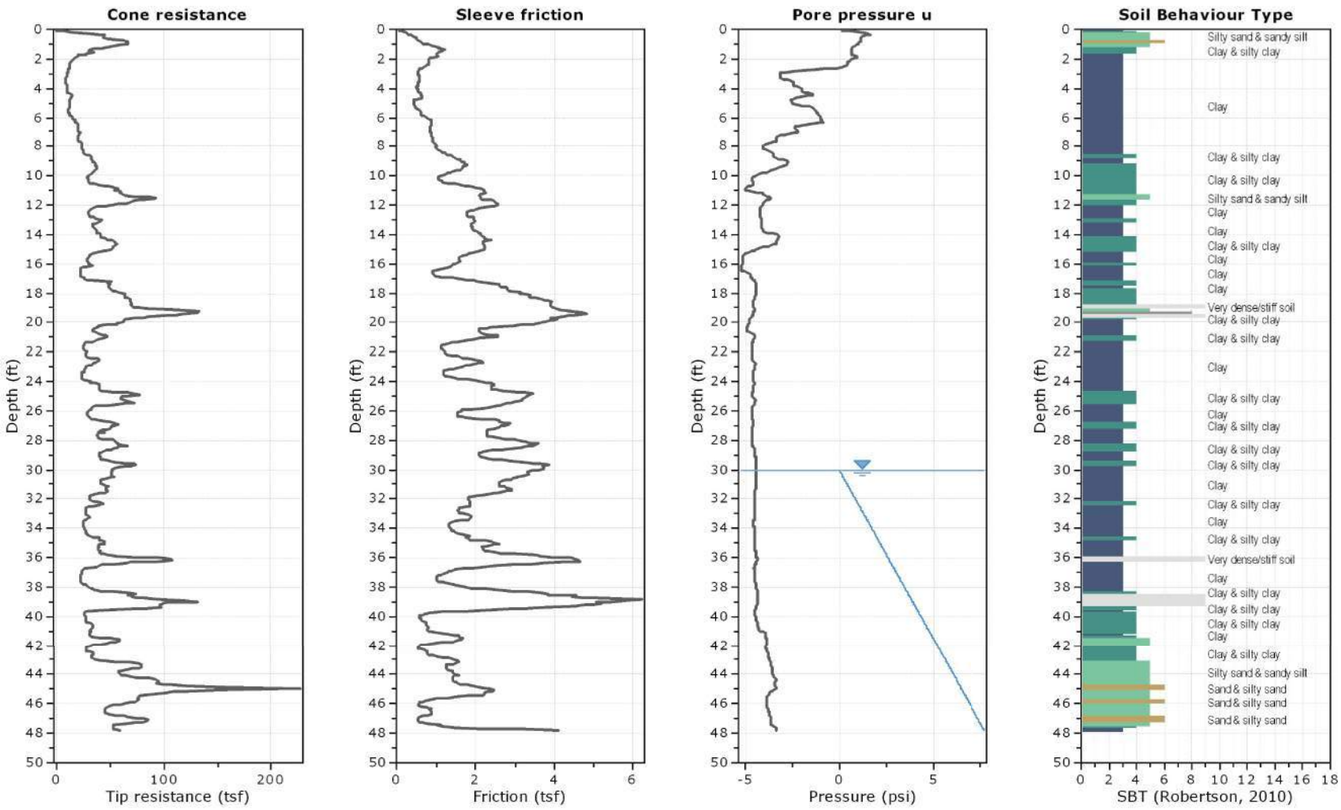
NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 100 GAL. BENTONITE GROUT

Office of Geotechnical Engineering
Geology, Exploration and, Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Project: LAW-7-2.17
Location: Lawrence County

CPT: C-009-2-21
Total depth: 47.80 ft, Date: 11/8/2021
Surface Elevation: 562.5 ft
Coords: lat 38.447334° lon -82.436009°



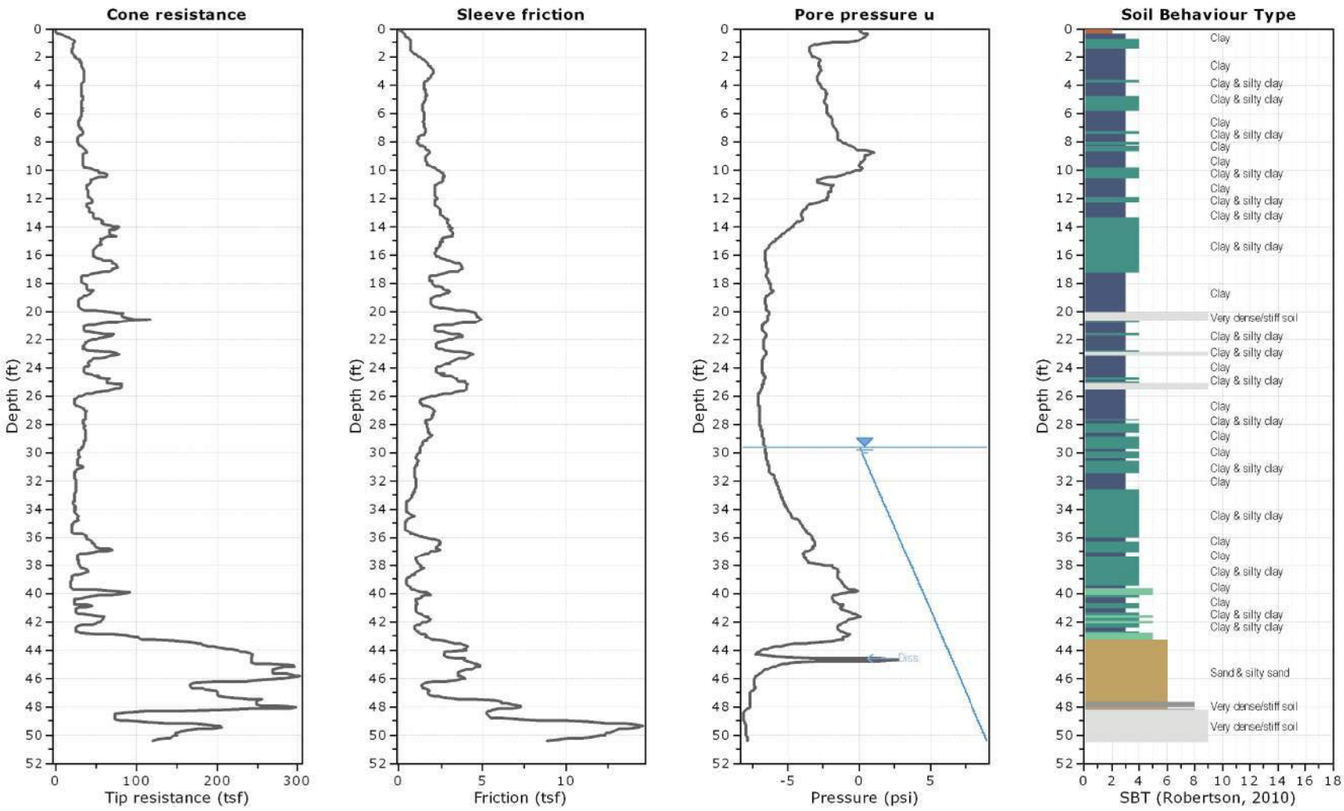
CPeT-IT v.3.6.1.5 - CPTU data presentation & interpretation software - Report created on: 11/16/2021, 6:33:55 AM
Project file: I:\gt\Projects\D09\Lawrence\LAW-7-02.17\geotechnical\explorations\CPT\CPeT-IT\LAW-7-2.17_IM.cpt

1

Office of Geotechnical Engineering
Geology, Exploration and, Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Project: LAW-7-2.17
Location: Lawrence County

CPT: C-009-3-21
Total depth: 50.36 ft, Date: 11/8/2021
Surface Elevation: 562.0 ft
Coords: lat 38.447604° lon -82.436058°



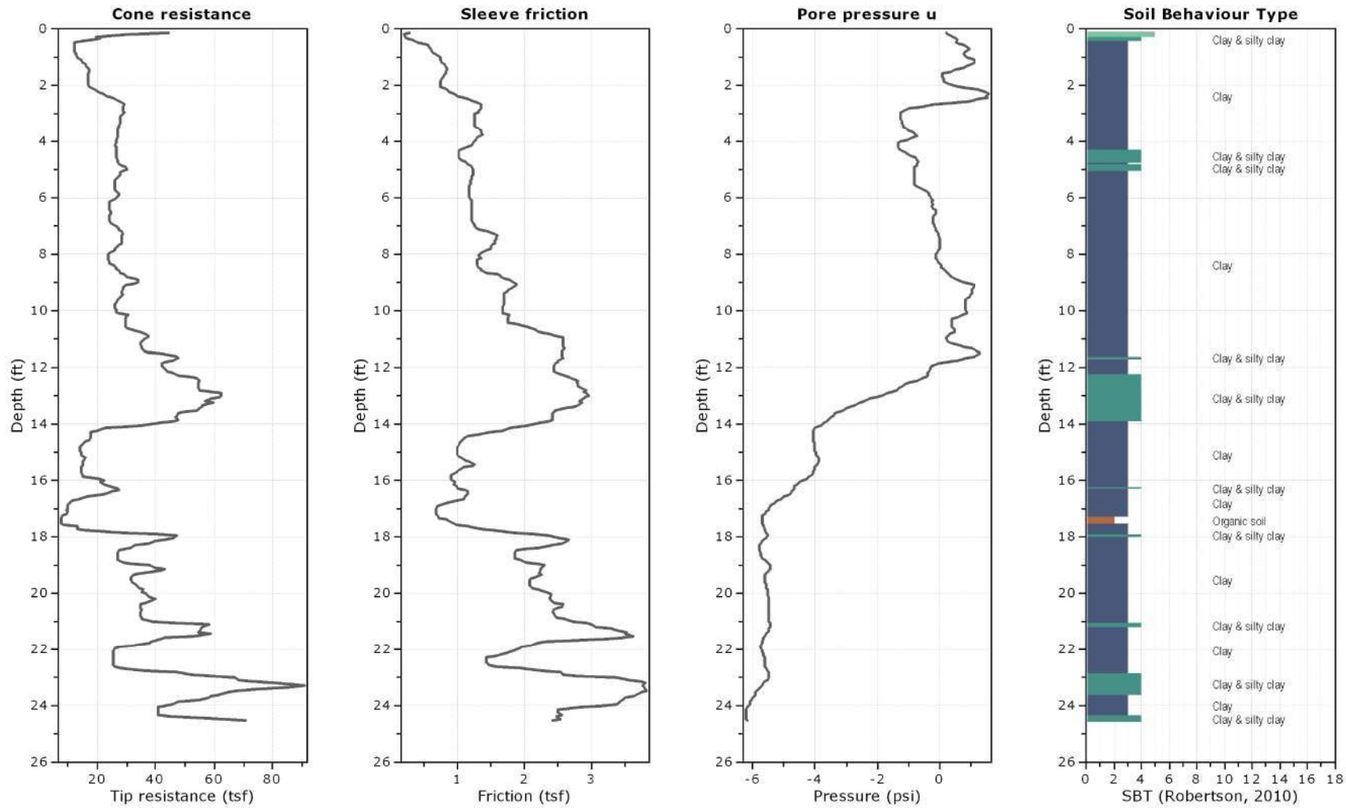
CPeT-IT v.3.6.1.5 - CPTU data presentation & interpretation software - Report created on: 11/16/2021, 6:33:55 AM
Project file: I:\gt\Projects\D09\Lawrence\LAW-7-02.17\geotechnical\explorations\CPT\CPeT-IT\LAW-7-2.17_IM.cpt

2

Office of Geotechnical Engineering
Geology, Exploration and, Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Project: LAW-7-2.17
Location: Lawrence County

CPT: C-009-4-21
Total depth: 24.52 ft, Date: 11/8/2021
Surface Elevation: 562.8 ft
Coords: lat 38.447618° lon -82.436062°

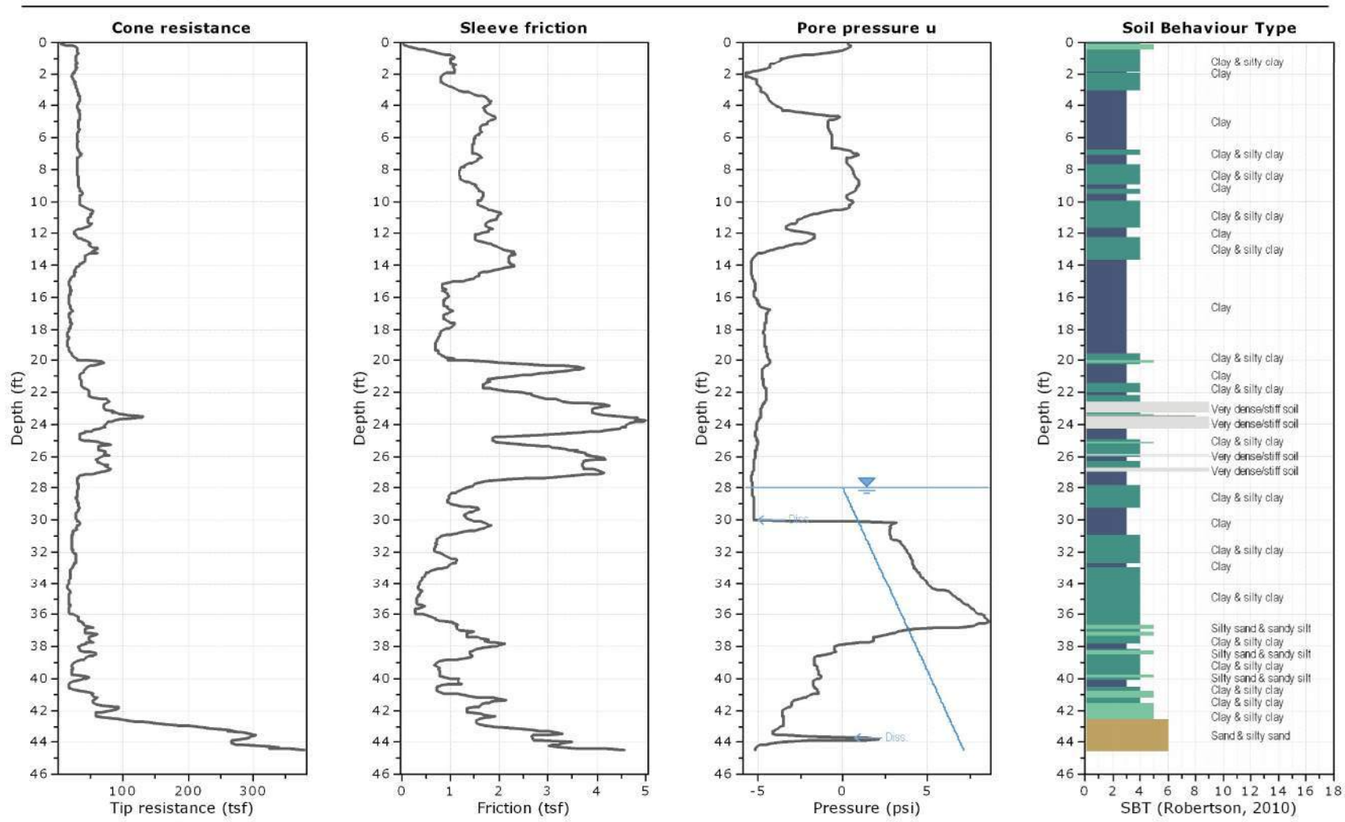


CPeT-IT v.3.6.1.5 - CPTU data presentation & interpretation software - Report created on: 11/16/2021, 6:33:56 AM
Project file: I:\gt\Projects\D09\Lawrence\LAW-7-02.17\geotechnical\explorations\CPT\CPeT-IT\LAW-7-2.17_IM.cpt
5

Office of Geotechnical Engineering
Geology, Exploration and, Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Project: LAW-7-2.17
Location: Lawrence County

CPT: C-009-5-21
Total depth: 44.51 ft, Date: 11/8/2021
Surface Elevation: 562.5 ft
Coords: lat 38.447588° lon -82.436053°



CPeT-IT v.3.6.1.5 - CPTU data presentation & interpretation software - Report created on: 11/16/2021, 6:33:56 AM
Project file: I:\gt\Projects\D09\Lawrence\LAW-7-02.17\geotechnical\explorations\CPT\CPeT-IT\LAW-7-2.17_IM.cpt
6

BRIDGE-LAW-7-3.70: STA. 195+10, 40.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-3.70

BBCM

LOG OF BORING NO. B16-314
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 3-7/8" Tricone Bit w/ Drilling Mud; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 195+10, 40' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 63.5' ELEVATION: 577+/- DATE: 5/1/02 - 5/2/02

DEPTH FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												EXISTING GRAVEL DRIVEWAY - 1 INCH
	1		2/4/5	2.6-4.5								Very-stiff to hard brown mottled with gray silty clay, trace to little fine to coarse sand, trace fine gravel, contains few silt lenses, desiccated.
5	2		4/6/9	3.7-4.5								
	3		10/12/13	4.5+	22	40	24	0	0	1	33	66
10	4		12/16/15	4.2-4.5								A-6b (10)
	5		3/6/9	4.5+								Very-stiff to hard brown silty clay, trace to little fine to coarse sand, trace fine gravel, contains silt lenses.
15	6		6/7/8	4.5+								
	7		5/7/10	3.0-4.5								Est. A-6b
20	8		4/6/8	2.7-4.5+								Very-stiff to hard reddish-brown silty clay, little to some fine to coarse sand, trace fine to coarse gravel.
	9		7/13/14	2.3-4.5								
25	10		5/8/11	3.0-3.7								Est. A-6a
	11		5/9/10	2.3-3.6								Very-stiff reddish-brown mottled with dark-gray silty clay, some fine to coarse sand, trace to little fine to coarse gravel, contains few sand pockets, few cobbles.
30		▽										
	12		10/10/14	2.2-2.7	16	31	18	15	12	32	19	22
35												A-6a (2)

WATER LEVEL: ▽ 30.0
WATER NOTE: Before Mud Rotary
DATE: 5/02/02

JOB: 01106405.002

-CONTINUED-

PLATE 5

ODOTLI 1645002.GPJ BRCM.GDT 9/9/02

LAW-7-3.70

BBCM

LOG OF BORING NO. B16-314
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 3-7/8" Tricone Bit w/ Drilling Mud; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 195+10, 40' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 63.5' ELEVATION: 577+/- DATE: 5/1/02 - 5/2/02

DEPTH FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
35												
	13		5/9/11	2.0-2.9								Very-stiff reddish-brown mottled with dark-gray silty clay, some fine to coarse sand, trace to little fine to coarse gravel, contains few sand pockets, few cobbles.
40												A-6a (2)
	14		6/6/10	1.5-2.2								Stiff to very-stiff reddish-brown silty clay interbedded with many seams and pockets of fine to medium sand, trace fine to coarse gravel.
45												
	15		3/7/17	2.0-2.7								Est. A-6a
50												Hard reddish-brown mottled with gray and brown silty clay, similar to very soft shale, little fine to coarse sand, trace fine gravel.
	16		12/21/34	4.5+								Visual
55			50-0"R									Soft to medium-hard gray shale interbedded with siltstone, nearly horizontally bedded, few diagonal fractures.
			NX									
60	17		REC 87%									Visual
			RQD 83%									
65												- No seepage or groundwater encountered before switching to mud rotary at 17.5'.
70												

WATER LEVEL: ▽ 30.0
WATER NOTE: Before Mud Rotary
DATE: 5/02/02

JOB: 01106405.002

PLATE 6

ODOTLI 1645002.GPJ BRCM.GDT 9/9/02

DRAWN M.S.J.
CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-3.70

LAW-7-2.17

158/206

1199/1247

BRIDGE-LAW-7-3.70: STA. 195+61, CENTERLINE of PROPOSED SR 7

LAW-7-3.70

BBCM

LOG OF BORING NO. B16-315
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 195+61, Centerline of Proposed SR 7 Centerline
COMPLETION DEPTH: 55.0' ELEVATION: 566+/- DATE: 5/2/02 - 5/3/02

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0												EXISTING GRAVEL DRIVEWAY - 1 INCH
	1	4/4/4	3.4-4.3									Very-stiff to hard brown mottled with gray silty clay, little to some fine to coarse sand, trace fine to coarse gravel, contains few fine to medium sand seams, desiccated, contains few roots.
5	2	4/5/7	2.1-2.9									Est. A-6b
	3	5/7/10	2.4-4.5									Very-stiff to hard brown mottled with reddish-brown silty clay, some to "and" fine to coarse sand, trace fine gravel.
10	4	13/15/17	3.2-4.5									
	5	6/7/13	3.5-4.5+	13	31	18	15	8	25	25	27	A-6a (5)
15	6	9/10/12										Medium-dense brown and reddish-brown fine to coarse sand, "and" silty clay, trace fine gravel.
	7	10/13/13										Est. A-1-b
20	8	4/5/11	2.4-3.7									Very-stiff reddish-brown mottled with gray silty clay, little to some fine to coarse sand, trace fine to coarse gravel.
	9	3/4/6	2.4-3.1	20	35	19	0	1	17	37	45	
25	10	4/4/7	1.5-3.5									A-6b (10)
	11	3/5/7	2.9-3.1									Very-stiff reddish-brown mottled with brown and gray silty clay, little becoming "and" fine to coarse sand, trace fine to coarse gravel, contains few fine sand and silt lenses.
30												Est. A-6a
	12	5/5/5	1.4-3.8									
35												

WATER LEVEL: ▽ 34.0
WATER NOTE: Before Rock Coring
DATE: 5/03/02

JOB: 01106405.002

-CONTINUED-

PLATE 7

LAW-7-3.70

BBCM

LOG OF BORING NO. B16-315
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 195+61, Centerline of Proposed SR 7 Centerline
COMPLETION DEPTH: 55.0' ELEVATION: 566+/- DATE: 5/2/02 - 5/3/02

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION - CONTINUED
35												Very-stiff reddish-brown mottled with brown and gray silty clay, little becoming "and" fine to coarse sand, trace fine to coarse gravel, contains few fine sand and silt lenses.
												Est. A-6a
40	13	2/3/5					0	1	78	21		Loose to medium-dense brown fine to medium sand, trace coarse sand, little to some silt, trace clay.
												A-3a (0)
45	14	5/6/7										Hard reddish-brown mottled with gray silty clay, little fine to coarse sand, trace fine to coarse gravel, similar to very-soft shale. Visual
	15A	4/7/50	4.5+									Soft gray fine-grained sandstone fragments.
50	15B											Visual
	15C	NX REC 82% RQD 51%										Soft to medium-hard reddish-brown and light-gray shale, nearly horizontally bedded, few diagonal and vertical clay filled fractures.
55	16											Visual
												- Encountered seepage from 38.5' to 45.0'.
60												- Lost partial water circulation below 52.0' while rock coring.
65												
70												

WATER LEVEL: ▽ 34.0
WATER NOTE: Before Rock Coring
DATE: 5/03/02

JOB: 01106405.002

PLATE 8

DRAWN M.S.J.
CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-3.70

LAW-7-2.17

159/206

1200/1247

BRIDGE-LAW-7-3.70: STA. 195+76, 98.0' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-3.70

BBCM

LOG OF BORING NO. B-2BP1
LAW-7, PRELIMINARY SUBSURFACE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock-core Barrel
LOCATION: Sta. 195+76, 98' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 66.5' ELEVATION: 567.6(ft) DATE: 10/29/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0												TOPSOIL - 4 INCHES
	1	5/7/9	4.5+									Hard brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel. Est. A-7-6
5	2	5/7/8	4.5+									Hard brown becoming brown mottled with gray silty clay, trace fine to coarse sand.
	3	4/5/7	4.5+	22	44	23	0	1	5	24	70	
10	4	5/7/10	4.5+									
	5	5/5/9	4.5+	25								A-7-6(13)
15	6	4/6/8	4.5+									Medium-dense brown fine to coarse sand, some clayey silt, little fine to coarse gravel.
	7	7/7/7		13	24	17	26	12	28	14	20	A-2-4(0)
20	8	4/6/8	3.2-4.2									Very-stiff to hard brown mottled with dark-brown silty clay, trace fine sand, contains silt seams and lenses. Est. A-7-6
25	9	3/4/7	3.0-4.0	18								Very-stiff to hard brown mottled with gray silty clay, some fine to coarse sand, little becoming some fine to coarse gravel.
30	10	6/7/10	4.5+									Est. A-6a
35												

WATER LEVEL: 19.2
WATER NOTE: After Rock Coring
DATE: 10/29/98

JOB: 01106405.001

-CONTINUED-

PLATE 9

LAW-7-3.70

BBCM

LOG OF BORING NO. B-2BP1
LAW-7, PRELIMINARY SUBSURFACE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock-core Barrel
LOCATION: Sta. 195+76, 98' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 66.5' ELEVATION: 567.6(ft) DATE: 10/29/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION - CONTINUED
35	11	3/6/11	2.5-2.75	14	29	17						Very-stiff to hard brown mottled with gray silty clay, some fine to coarse sand, little becoming some fine to coarse gravel. Est. A-6a
40	12	3/4/7	2.7-3.2									Very-stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel. Est. A-7-6
45	13	7/9/12	2.5-4.5+	17								Very-stiff to hard brown silty clay, "and" fine to coarse sand, little fine to coarse gravel. Est. A-6a
50	14	5/13/12										Medium-dense brown fine to coarse gravel, some fine to coarse sand, little silty clay. Est. A-2-6
55	15	8/21/33										Very-soft to soft gray weathered shale, nearly horizontally bedded, partly similar to hard silty clay. Visual
60	16	NXM REC 98% RQD 98% NXM REC										Medium-hard light-gray limestone, nearly horizontally bedded. Visual
		REC 93% RQD 57% REC										Very-soft gray weathered shale, nearly horizontally bedded, partly similar to hard silty clay, becoming carbonaceous with depth. Visual
65	17											Medium-hard black coal, nearly horizontally bedded. Visual
70												Very-soft to soft gray weathered shale, partly similar to silty clay, nearly horizontally bedded with many fractures. Visual
												- Encountered water at 52.5'.

WATER LEVEL: 19.2
WATER NOTE: After Rock Coring
DATE: 10/29/98

JOB: 01106405.001

PLATE 10

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-3.70

LAW-7-2.17

BRIDGE-LAW-7-3.70, STA. 196+94, 12.0' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-3.70

BBCM

LOG OF BORING NO. B2EBP1-215
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 196+94, 12' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 51.0' ELEVATION: 552+/- DATE: 4/5/00

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 6 INCHES
	1	3 /5 /10	3.0-4.25								Very-stiff to hard brown silty clay, trace fine to coarse sand, trace fine to coarse gravel, slightly organic. Est. A-6a
5	2	8 /15 /20		11	27	19	7	24	33	36	Medium-dense to dense brown, gray and reddish-brown fine to coarse sand, "and" clayey silt, trace to little fine to coarse gravel, few silt seams, contains sandstone and shale fragments. Est. A-4a (0)
	3	7 /13 /14									
10	4	5 /10 /13	4.5+								Very-stiff to hard brown mottled with gray and reddish-brown silty clay, little to some fine to coarse sand, trace to little fine to coarse gravel, contains sandstone and shale fragments.
15	5	7 /14 /24	4.5+								
	6	4 /9 /19	2.0-4.5+								Est. A-6a
	7	7 /18 /26	3.0-4.5+								
20	8	9 /18 /27		14	26	21	13	22	31	34	Dense brown and gray fine to coarse sand, some clayey silt, trace fine gravel. A-3a (0)
25	9	3 /9 /12	2.0-4.5+								Very-stiff to hard brown silty clay, little fine to coarse sand, trace fine to coarse gravel, contains sandstone fragments. Est. A-6a
	10	2 /2 /5	0.5-1.25								Medium-stiff to stiff brown mottled with gray silty clay, trace fine to medium sand. Est. A-6a
30	11	4 /6 /14	3.0-4.5+								Very-stiff to hard brown mottled with gray silty clay, trace fine to medium sand, few silt seams.
	12	5 /8 /10	2.0-3.0								Est. A-6a
35											

WATER LEVEL:
WATER NOTE:
DATE:

DGOTLJ 1640062.CPJ BBCM.GDT 4/8/02

JOB: 01106405.002

-CONTINUED-

PLATE 11

LAW-7-3.70

BBCM

LOG OF BORING NO. B2EBP1-215
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 196+94, 12' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 51.0' ELEVATION: 552+/- DATE: 4/5/00

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
35	13	3 /6 /9					0	10	84	6	Medium-dense becoming very-loose brown fine to medium sand, trace coarse sand, trace fine gravel, trace to little clayey silt. A-3 (0)
	14	S/D-18"									Hard (est.) gray mottled with brown silty clay, similar to very-soft shale.
40											Medium-hard to hard black coal. Visual
45	15	REC 87% RQD 40% REC 80% RQD 67%									Very-soft to soft gray shale, nearly horizontally bedded, similar to hard silty clay, fragmented below 50.5'. Visual
	16										-Encountered water at 35.0
50											
55											
60											
65											
70											

WATER LEVEL:
WATER NOTE:
DATE:

DGOTLJ 1640062.CPJ BBCM.GDT 4/8/02

JOB: 01106405.002

PLATE 12

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-7-3.70

LAW-7-2.17

161/206

1202/1247

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 199+84, 30 RT	EXPLORATION ID B-010-1-12
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 530.4 (MSL) EOB: 54.0 ft.	PAGE 1 OF 1
START: 5/1/13 END: 5/2/13	SAMPLING METHOD: SPT/ST/NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **SILTY CLAY**, SOME SAND, MOIST	530.4		1 / 1 / 2	4	100	SS-1	-	-	-	-	-	-	-	-	-	26	A-6b (V)	
		2.5	1 / 2 / 2	6	100	SS-2	-	-	-	-	-	-	-	-	-	26	A-6b (V)	
		5.0	1 / 1 / 2	4	100	SS-3	-	-	-	-	-	-	-	-	-	25	A-6b (V)	
		7.5			100	ST-4	-	0	0	22	43	35	35	19	16	30	A-6b (10)	
	520.9	W																
LOOSE TO MEDIUM DENSE, BROWN AND GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT AND CLAY, TRACE GRAVEL, WET		10.0	WOH / WOH / 2	3	100	SS-5	-	0	26	50	16	8	-	-	-	20	A-3a (V)	
			2 / 2 / 2	6	100	SS-6	-	2	37	41	13	7	NP	NP	NP	50	A-3a (0)	
INCREASED GRAVEL		12.5	3 / 3 / 3	9	100	SS-7	-	46	20	28	4	2	-	-	-	-	A-3a (V)	
ENCOUNTERED WOOD FROM 14.1' - 15.5'		15.0	WOH / 1 / 2	4	100	SS-8	-	2	17	51	19	11	-	-	-	32	A-3a (V)	
		17.5	WOH / 1 / 2	4	100	SS-9	-	-	-	-	-	-	-	-	-	72	A-3a (V)	
		20.0	1 / 4 / 6	14	100	SS-10	-	10	27	30	21	12	21	17	4	20	A-3a (0)	
INCREASED DENSITY		22.5	9 / 9 / 10	27	100	SS-11	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
		25.0	13 / 10 / 14	34	100	SS-12	-	-	-	-	-	-	-	-	-	16	A-3a (V)	
	503.4	TR																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).		27.5	38 / 50/4"	-	100	SS-13	-	-	-	-	-	-	-	-	-	10	Rock (V)	
	501.4																	
MUDSTONE, GRAY, MODERATELY WEATHERED, WEAK, THIN BEDDED, FRIABLE; RQD 0%, REC 50%.	499.4	30.0	0		34	NQ-1											CORE	
SHALE, GRAY, UNWEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, TOP 3' HIGHLY WEATHERED, THIN SANDSTONE SEAMS THROUGHOUT; RQD 46%, REC 85%.		32.5																
		35.0	42		78	NQ-2											CORE	
UCR Qu=16 tsf		37.5																
		40.0	70		100	NQ-3											CORE	
		42.5																
		45.0	70		100	NQ-4											CORE	
		47.5																
		50.0	30		100	NQ-5											CORE	
	476.4	52.5 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 100 GAL. BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 200+80, 50 LT	EXPLORATION ID B-010-2-12
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 529.0 (MSL) EOB: 57.0 ft.	PAGE 1 OF 1
START: 5/2/13 END: 5/2/13	SAMPLING METHOD: SPT/ST/NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **SANDY SILT**, SOME CLAY, MOIST	529.0		1 1 2	4	100	SS-1	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
		2.5	1 2 2	6	100	SS-2	-	-	-	-	-	-	-	-	-	23	A-4a (V)	
		5.0	1 2 2	6	100	SS-3	-	0	0	25	49	26	28	18	10	21	A-4a (8)	
	522.0																	
SOFT, BROWN, **SILT AND CLAY**, SOME SAND, MOIST	519.5	7.5			100	ST-4	-	0	0	22	50	28	33	19	14	26	A-6a (10)	
LOOSE TO MEDIUM DENSE, BROWN AND GRAY, **SANDY SILT**, TRACE TO LITTLE CLAY, TRACE GRAVEL, WET		10.0	1 1 1	3	100	SS-5	-	0	0	54	30	16	NP	NP	NP	27	A-4a (2)	
WOOD FRAGMENTS IN SAMPLE FROM 9.5' - 12.5'		W 12.5	WOH WOH 3	4	100	SS-6	-	1	2	52	30	15	-	-	-	29	A-4a (V)	
			2 1 1	3	100	SS-7	-	7	17	51	17	8	-	-	-	29	A-4a (V)	
		15.0	3 2 3	7	100	SS-8	-	5	31	43	14	7	-	-	-	21	A-4a (V)	
		17.5	1 2 3	7	100	SS-9	-	-	-	-	-	-	-	-	-	33	A-4a (V)	
		20.0	3 4 5	13	100	SS-10	-	-	-	-	-	-	-	-	-	21	A-4a (V)	
		22.5	3 3 3	9	100	SS-11	-	-	-	-	-	-	-	-	-	26	A-4a (V)	
		25.0	4 6 7	19	100	SS-12	-	-	-	-	-	-	-	-	-	23	A-4a (V)	
		27.5	3 5 7	17	100	SS-13	-	1	3	47	30	19	NP	NP	NP	21	A-4a (3)	
	498.5	TR 30.0	6 15 25	57	100	SS-14	-	-	-	-	-	-	-	-	-	19	A-4a (V)	
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	497.0																	
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, TOP 3' HIGHLY WEATHERED, THIN SANDSTONE SEAMS THROUGHOUT; RQD 48%, REC 92%.		32.5 35.0	48		80	NQ-1											CORE	
		37.5 40.0	48		92	NQ-2											CORE	
		42.5 45.0	53		100	NQ-3											CORE	
		47.5 50.0	8		87	NQ-4											CORE	
		52.5																
UCR Qu=765 tsf		55.0	80		100	NQ-5											CORE	
	472.0	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 100 GAL. BENTONITE GROUT

BRIDGE-LAW-7-03.76: STA. 198+87, 35.0' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-03.76

BBCM

LOG OF BORING NO. B2-316
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 4-1/2" O.D. Continuous-flight Auger; 3-7/8" Tricone Bit w/ Drilling Mud; 2" and 2-1/2" O.D. Split-barrel Samplers; NX Rock Core Barrel
LOCATION: Sta. 198+87, 35' Rt. of Proposed S.R. 7 Centerline
COMPLETION DEPTH: 42.5' ELEVATION: 540.3 DATE: 5/17/02

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 6 INCHES
	1		4/6/7	1.4-2.3								Stiff to very-stiff brown mottled with gray silty clay, little to some fine to coarse sand, trace fine to coarse gravel, desiccated.
5	2		4/5/6	1.6-2.9								
	3		3/4/5	1.4-2.5								
10	3B		/8									
	4A	S/H						0	1	63	36	Est. A-6a
15	4B		6/9/1									Very-loose to loose brown and gray fine to medium sand, trace coarse sand, "and" clayey silt, contains few silt pockets. A-4a (0)
	5		3/4/5	1.5-3.4								Stiff to very-stiff brown, reddish-brown and gray silty clay, little to some fine to coarse sand, trace fine gravel, contains few silt seams.
	6		6/9/11	2.6-3.7								
20	7A		5/7/10	1.4-2.1	19	29	18	0	0	29	71	A-6a (8)
	7B		7									
	8		8/7									Loose to medium-dense brown fine to medium sand, trace coarse sand, little silt, contains few silty clay seams.
	9		4/4/5									
25												Est. A-3
	10		3/3/6									Dense to very-dense brown fine to coarse sand, some fine to coarse gravel, trace silt, partly similar to sandstone.
30	11		14/15/23									
	12		23/25/31									
35	13		13/15/22									Est. A-1-b
	14		9/29/45									Very-soft gray shale, nearly horizontally bedded, similar to hard silty clay.
			REC 92% RQD 50%									Visual
40	15											Soft to medium-hard gray shale, nearly horizontally bedded, highly fractured from 37.5' to 38.5', few horizontal and diagonal fractures from 38.5' to 41.5', many horizontal fractures from 41.5' to 42.5'. Qu = 194.3 psi between 38.8' and 39.3'.
												Visual
45												- Encountered seepage from 12.5' to 16.0'.
												- Encountered water at 20.0'.
50												

WATER LEVEL: ▽ 11.8 ▼ 11.0
WATER NOTE: Before Mud Rotary After Mud Rotary
DATE: 5/17/02 5/17/02

JOB: 01106405.002

PLATE 5

BRIDGE-LAW-7-03.76: STA. 199+33.7, 26.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-03.76

BBCM

LOG OF BORING NO. B2WBP2-216
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 199+33.7, 26' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 40.5' ELEVATION: 536+/- DATE: 4/5/00

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 7 INCHES
	1		4/7/9	2.0-4.5+								Stiff to hard brown mottled with gray and dark-brown silty clay, little to some fine to medium sand, few silt and fine sand seams.
5	2		4/6/6	2.0-3.0								
	3		3/4/6	1.0-2.5	24	34	22	0	2	25	73	
10	4		3/4/7	2.0-3.0				0	1	12	55 32	A-6a (8)
	5		2/3/3					0	46	47	7	Very-loose to loose brown and gray fine to medium sand, trace to little silt, contains decayed wood, slightly organic.
	6		1/1/1					1	3	66	30	Est. A-3a
15	7		2/1/1		22	22	17	0	1	51	48	Very-loose to loose brown and gray fine to medium sand, "and" clayey silt.
	8		4/5/5									A-4a (8)
	9		4/7/14									Medium-dense to dense brown and gray fine to medium sand, trace coarse sand, trace fine gravel, trace to little clayey silt, contains sandstone and shale fragments, contains decayed wood fragments, slightly organic.
20	10		8/10/9									
	11		9/10/18									
25	12		14/10/12									
	13		19/10/30									Est. A-3
30	14		50-5"R									Very-soft to soft gray shale, highly fractured, similar to hard clayey silt, few seams of hard gray fine-grained sandstone.
	15		NQ REC 43% RQD 0%									Visual
35												-Encountered water at 11.0'
40												

WATER LEVEL: ▽ ▼
WATER NOTE:
DATE:

B: 01106405.002

PLATE 6

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-03.76

LAW-7-2.17

164/206

1205/1247

BRIDGE-LAW-7-03.76: STA. 201+43, 63.0' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-03.76

BBCM

LOG OF BORING NO. B-2BP2
LAW-7, PRELIMINARY SUBSURFACE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock-core Barrel
LOCATION: Sta. 201+43, 63' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 43.0' ELEVATION: 530.5(ft) DATE: 10/27/98 - 10/28/98

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 2 INCHES
	1		1/1/2									Very-loose to loose brown fine to medium sand, trace coarse sand, trace fine gravel, trace to little clayey silt.
5												
	2		2/2/2					0	19	65	7 / 9	
	3		2/3/2									A-3a(0)
10												Loose brown fine to medium sand, trace coarse sand, trace fine gravel, trace clayey silt.
	4		3/3/5					4	56	28	8 / 4	
	5		2/3/4					1	53	41	5	A-1-b(0)
	6		2/3/3					0	48	50	2	Very-loose brown and gray fine to medium sand, trace coarse sand, trace fine gravel, trace silt.
15	7		1/1/2		24			2	45	50	3	- Contains decayed wood fragments from 18.0' to 19.0'.
	8		4/5/6									A-3(0)
												Medium-dense light-gray fine to medium sand, trace coarse sand, little fine to coarse gravel, trace silt.
20	9		3/2/6									Est. A-1-b
												Loose to medium-dense brown fine to medium sand, trace coarse sand, trace fine gravel, little clayey silt.
25	10		7/11/15		18			7	51	30	5 / 7	
	11		8/13/31									A-1-b(0)
												Medium-dense to dense brown and gray fine to medium sand, trace coarse sand, trace fine gravel, trace silt.
30	12A 12B		3/9/50									Est. A-3a
	13		50-3"R									Soft gray siltstone, nearly horizontally bedded, poorly cemented, partly similar to dense silt.
			NXM									Visual
35	14		REC 100% RQD 100%									Medium-hard gray siltstone, nearly horizontally bedded, contains few fractures.
40	15		REC 100% RQD 92%									- From 41.0' to 42.5': Soft to medium-hard light-gray shale with carbonaceous seams.
												Visual
45												- Encountered seepage at 8.5'.
												- Encountered water at 11.0'.
50												

WATER LEVEL: ▽ ▼ ▼ ▼ ▽ ▼
WATER NOTE:
DATE:

OB: 01106405.001

PLATE 7

BRIDGE-LAW-7-03.76: STA. 202+03, 38.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-03.76

BBCM

LOG OF BORING NO. B2-317
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 4-1/2" O.D. Continuous-flight Auger; 3-7/8" Tricone Bit w/ Drilling Mud; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 202+03, 38' Lt. of Proposed S.R. 7 Centerline
COMPLETION DEPTH: 38.2' ELEVATION: 533.4 DATE: 5/6/02 - 5/7/02

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 7 INCHES
	1		3/3/3	1.75-2.25								Stiff to very-stiff reddish-brown silty clay, little fine to medium sand, contains many silt seams and lenses.
5												Est. A-6a
	2		S/H S/H S/H	0.0-0.3	28	31	20		0	26	50 / 24	Very-soft to medium-stiff reddish-brown silty clay, some fine to medium sand, contains many silt seams.
	3		S/H S/H1/2	0.5-0.8								A-6a (8)
10												Loose brown and gray fine to coarse sand, trace fine gravel, trace silt.
	4		S/H1/3									
15												Est. A-3
	5		3/2/2									Very-soft gray silty clay, trace fine to medium sand, contains few silt seams.
	6A 6B		2/3/3	0.0								Est. A-6a
20	7		2/1/3						13	20	50 / 17	Loose gray fine to coarse sand, trace fine to coarse gravel, little silt, contains seam of silty clay from 24.2' to 24.3'.
	8		1/3/3									A-3a (0)
	9		4/3/3									Medium-dense to dense brown and gray fine to coarse sand, trace to little fine to coarse gravel, trace to little silt.
25												Est. A-3
	10		6/6/6									Very-soft gray shale, nearly horizontally bedded, similar to hard silty clay.
	11		4/7/10									Visual
30	12		10/20/26									Soft gray and reddish-brown shale, nearly horizontally bedded, few diagonal fractures, partly similar to hard silty clay.
			REC									Visual
35	13		71% RQD 47%									Medium-hard gray sandstone, nearly horizontally bedded, few diagonal fractures.
												Visual
40												
												- Encountered water at 12.0'.
45												- Encountered auger refusal at 33.2'.
50												

WATER LEVEL: ▽ 15.0 ▼ ▼ ▼ ▽ ▼
WATER NOTE:
DATE: 5/06/02

OB: 01106405.002

PLATE 8

DRAWN M.S.J.
CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-03.76

LAW-7-2.17

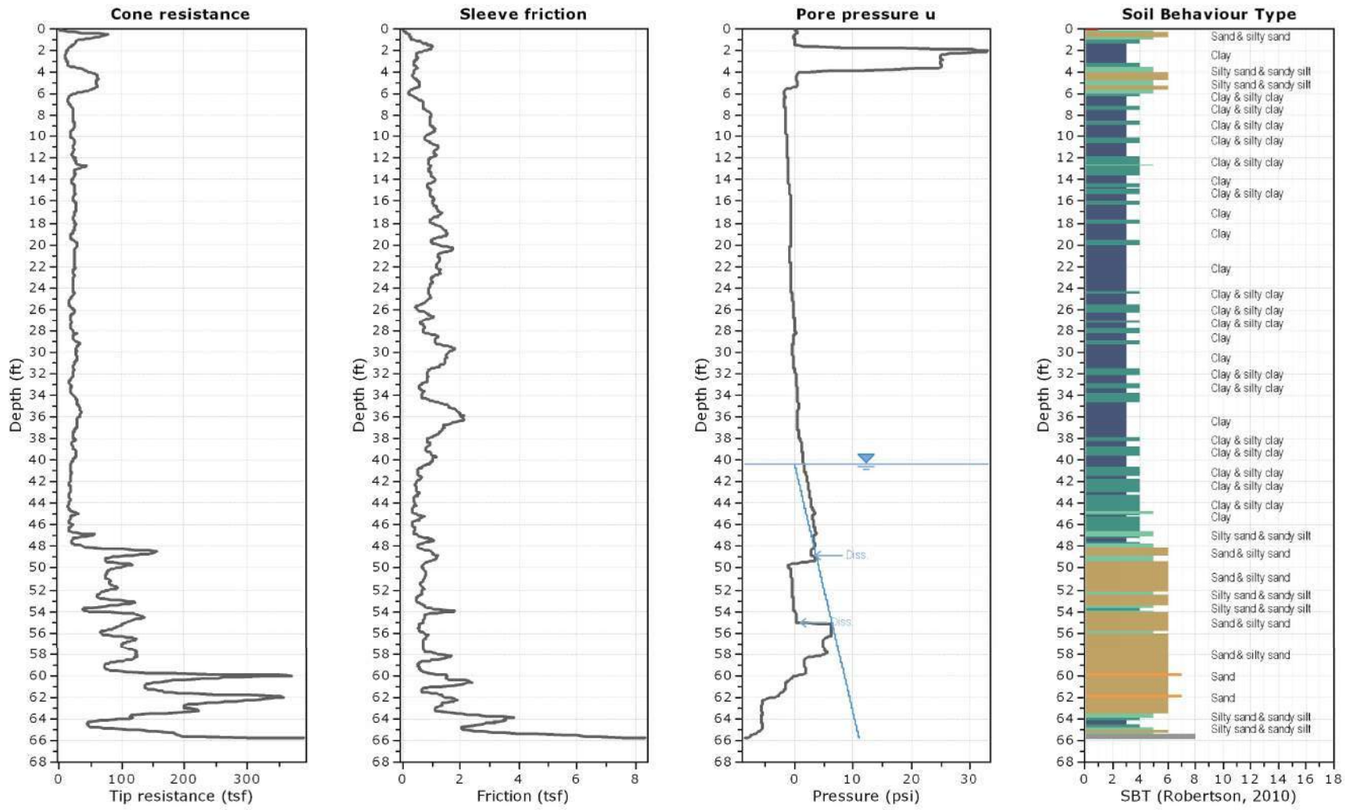
165/206

1206
1247

Office of Geotechnical Engineering
Geology, Exploration and, Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Project: LAW-7-2.17
Location: Lawrence County

CPT: C-013-1-21
Total depth: 65.82 ft, Date: 11/9/2021
Surface Elevation: 561.3 ft
Coords: lat 38.44887° lon -82.433455°



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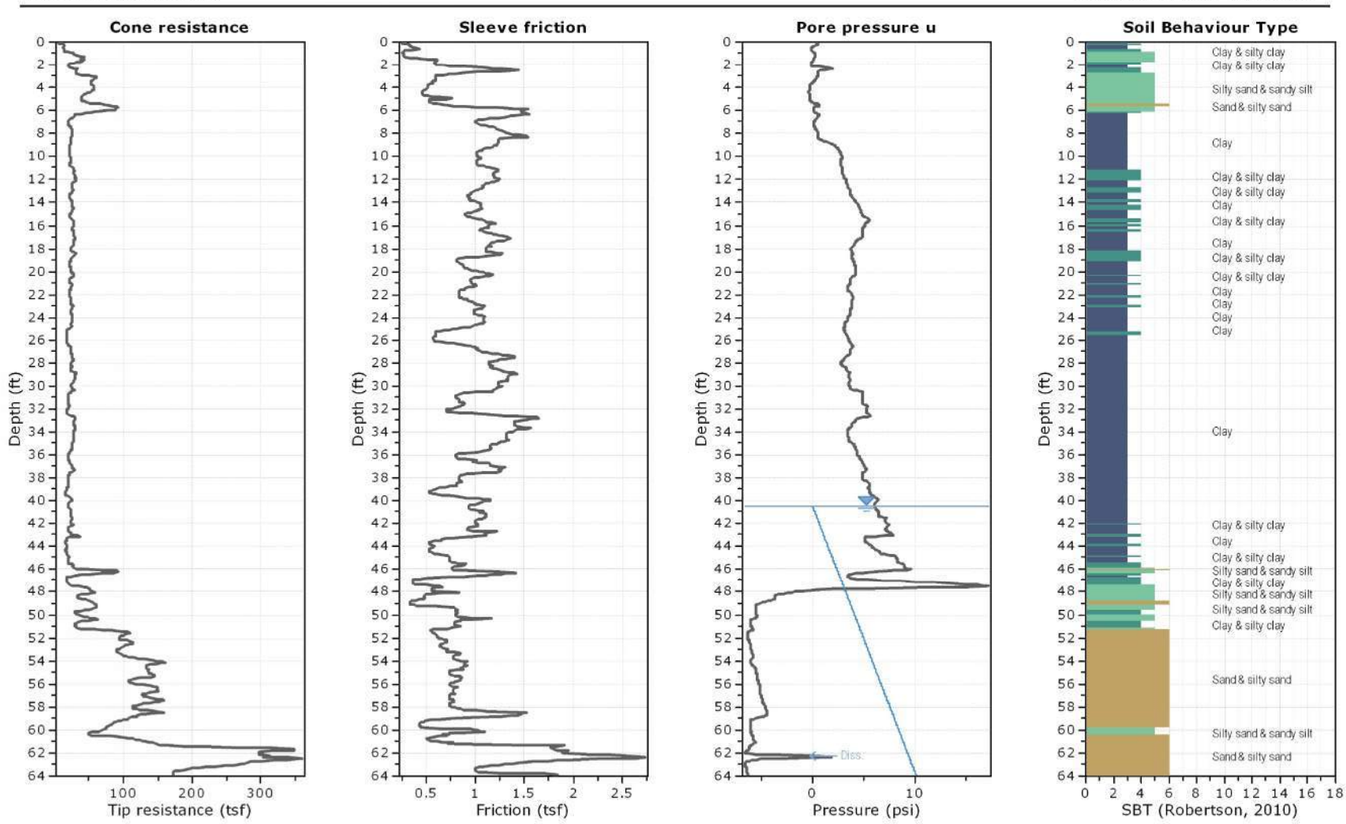
10

Office of Geotechnical Engineering
Geology, Exploration and, Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Project: LAW-7-2.17
Location: Lawrence County

CPT: C-013-2-21
Total depth: 63.87 ft, Date: 11/9/2021
Surface Elevation: 560.7 ft
Coords: lat 38.449142° lon -82.43351°



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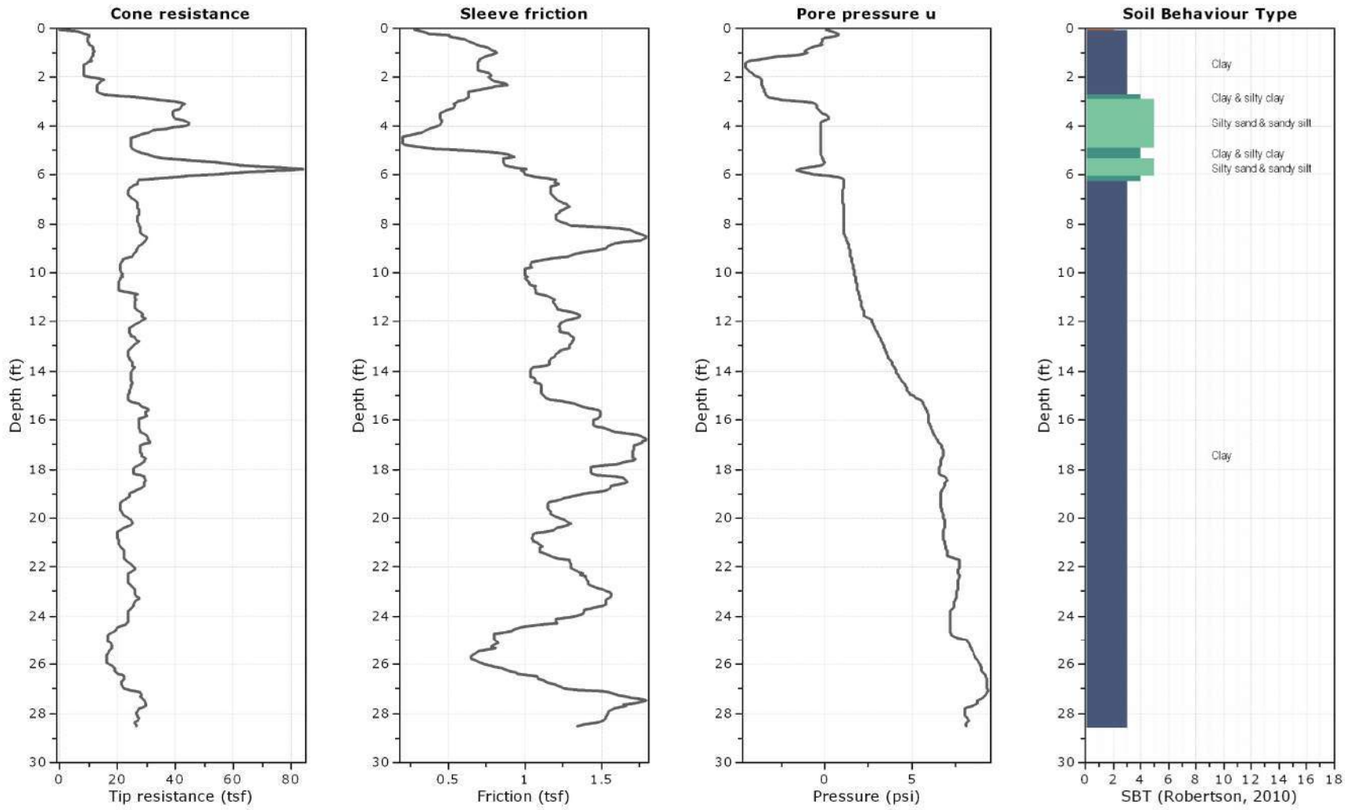
14

Office of Geotechnical Engineering
Geology, Exploration and, Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

CPT: C-013-3-21
Total depth: 28.54 ft, Date: 11/9/2021
Surface Elevation: 560.5 ft
Coords: lat 38.449152° lon -82.433503°

Project: LAW-7-2.17
Location: Lawrence County



CPeT-IT v.3.6.1.5 - CPTU data presentation & interpretation software - Report created on: 11/16/2021, 6:33:58 AM
Project file: I:\gt\Projects\D09\Lawrence\LAW-7-02.17\geotechnical\explorations\CPT\CPeT-IT\LAW-7-2.17_IM.cpt

BRIDGE-LAW-7-03.87: STA. 204+13.4, 40.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-03.87

BBCM

LOG OF BORING NO. B2WBP4-217
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 204+13.4, 40' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 43.0' ELEVATION: 535+/- DATE: 4/6/00

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 12 INCHES
	1		3 /12/5	2.5-3.25								Very-stiff brown mottled with gray and dark-brown silty clay, little fine to medium sand, few roots.
5												Est. A-6b
	2		3 /4/5	2.5-3.5								
	3		2 /3/4	0.5-1.75								Medium-stiff to stiff brown mottled with gray silty clay, little fine sand.
10	4		2 /4/4									Est. A-6b
	5		2 /2/5					0	4	74	22	Loose becoming very-loose brown and gray fine to medium sand, some silt, few seams of silty clay.
	6		1 /2/1									A-3a (0)
15	7		2 /3/1									Medium-stiff to stiff gray silty clay, trace to little fine to medium sand, slightly organic.
	8		1 /3/4	0.75-1.5	34	42	25	0	1	7	92	
20	9		2 /6/17	0.5-1.5								A-7-6 (11)
	10		2 /6/7									Medium-dense gray fine to medium sand, some clayey silt, contains seam of silty clay.
25	11		4 /5/8									Est. A-3a
	12		4 /3/4									Medium-dense gray and brown fine to medium sand, little silt, contains seam of silty clay.
30												Est. A-3
	13		12/15/17									Loose gray, brown, and black fine to medium sand, "and" silty clay.
35												Est. A-4a
			50-0"R REC 80% RQD 40%									Medium-dense to dense gray and black fine to coarse sand, trace fine gravel, trace silt, slightly organic.
40	14											Est. A-3a
												Medium-hard to hard gray and dark-gray limestone interbedded with shale, nearly horizontally bedded, many horizontal and diagonal fractures.
45												Visual
												-Encountered water at 10.0'

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.002

PLATE 5

BRIDGE-LAW-7-03.87: STA. 205+31.2, 1.7' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-03.87

BBCM

LOG OF BORING NO. B-2BP3
LAW-7, PRELIMINARY SUBSURFACE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock-core Barrel
LOCATION: Sta. 205+31.2, 1.7' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 73.8' ELEVATION: 559.4(ft) DATE: 11/3/98

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 6 INCHES
	1		3 /4/5									Loose brown fine to medium sand, trace coarse sand, little silt.
5	2		3 /4/5	2.75-3.5	22	34	21	0	1	6	46 47	Est. A-1-b
	3		3 /5/7	2.5-3.5								Very-stiff brown mottled with gray silty clay, little fine to medium sand.
10	4		3 /3/5	3.25-4.1	29							A-6a(9)
	5		3 /4/5	2.25-3.5								Very-stiff to hard brown with gray seams of silty clay, contains silt seams, laminated.
15	6		4 /5/6	3.0-4.25	25							Est. A-7-6
	7		4 /6/8	2.75-4.2								Very-stiff to hard brown silty clay, trace fine sand with silt lenses.
20	8		4 /6/8	3.5-4.5	24							Est. A-7-6
	9		2 /3/5	1.75-3.7								Stiff to very-stiff gray silty clay, trace fine to medium sand, contains silt seams.
25												Est. A-7-6
	10		3 /6/9	3.75-4.5								Very-stiff to hard gray silty clay, trace fine to medium sand.
30												
	11		3 /4/6	2.5-4.5	13	41	22	0	0	3	33 64	
35												
	12		3 /4/6	2.75-3.7								A-7-6(12)
40												Stiff gray silty clay, interbedded with silt.
	13		2 /4/5	1.0-1.7								Est. A-6b
45												

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.001

-CONTINUED-

PLATE 6

LAW-7-03.87

BBCM

LOG OF BORING NO. B-2BP3
LAW-7, PRELIMINARY SUBSURFACE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock-core Barrel
LOCATION: Sta. 205+31.2, 1.7' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 73.8' ELEVATION: 559.4(ft) DATE: 11/3/98

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
45												Stiff gray silty clay, interbedded with silt.
												Est. A-6b
50	14		S/D-18"									Very-loose gray fine to medium sand, trace coarse sand, trace silt.
												Est. A-1-b
55	15		10/6/8									Medium-dense to dense gray fine to medium sand, trace fine gravel, trace silt, slightly organic.
								2	48	43	5 2	
60	16		8 /10/8									A-1-b(0)
	17		12/18/23									Very-soft gray siltstone, neary horizontally bedded, few fractures.
65												Visual
												Soft to medium-hard gray shale, nearly horizontally bedded, few to many fractures.
70	18		50-4"R NXM REC 60% RQD 60%									Visual
	19											Medium-hard light-gray shale, becoming arenaceous and micaceous with depth, nearly horizontally bedded, few fractures.
75												Visual
												- Encountered water at 38.5'.
80												
85												
90												

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.001

PLATE 7

DRAWN M.S.J.
CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-03.87

LAW-7-2.17

168/206

1209/1247

BRIDGE-LAW-7-03.87: STA. 205+83.6, 34.6' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-03.87

BBCM

LOG OF BORING NO. B17-318
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 205+83.6, 34.6' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 77.4' ELEVATION: 565+/- DATE: 4/29/02 - 4/30/02

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 6 INCHES
	1		2/3/4	1.8-2.1								Stiff becoming hard brown mottled with gray silty clay, little to some fine to coarse sand, trace fine gravel, contains few silt lenses, few roots.
5	2		5/7/7	3.8-4.5+	19	38	20	0	2	21	40	37
												A-6b (11)
	3		3/4/5									Loose brown fine to medium sand, trace coarse sand, trace silty clay.
												Est. A-3
10	4A 4B		4/4/4	1.4-2.8								Stiff to very-stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel.
	5		6/7/8	2.4-3.0								
15	6		5/5/6	1.8-3.0	27	35	22	0	1	1	44	54
	7		5/6/8	3.6-4.5								Stiff becoming hard brown silty clay, trace fine to coarse sand, contains many silt seams and few fine sand lenses.
20	8		5/5/8	2.3-4.5								
	9		5/6/8	2.4-3.3								
												A-6a (9)
25	10		5/8/9	2.6-4.5								Stiff to hard gray mottled with brown silty clay, trace to little fine to coarse sand, trace fine gravel, contains many silt seams and few pockets of fine to coarse sand.
	11A 11B		5/7/9	1.4-3.3 2.4-4.5								
30												
35	12		3/4/6	1.5-3.7								
40	13		3/5/7	2.2-4.5								
45	14		3/4/5	1.4-3.6								Est. A-6a

WATER LEVEL: ▽ 41.0
WATER NOTE: After Rock Coring
DATE: 4/30/02

JOB: 01106405.002

-CONTINUED-

PLATE 8

LAW-7-03.87

BBCM

LOG OF BORING NO. B17-318
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: Sta. 205+83.6, 34.6' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 77.4' ELEVATION: 565+/- DATE: 4/29/02 - 4/30/02

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
45												Stiff to hard gray mottled with brown silty clay, trace to little fine to coarse sand, trace fine gravel, contains many silt seams and few pockets of fine to coarse sand.
												Est. A-6a
50	15		2/2/3	0.7-1.5	29	36	19	0	0	10	29	61
												Medium-stiff to stiff gray silty clay, little fine to coarse sand, contains seam of fine to medium sand.
												A-6b (11)
55	16		2/3/3									Loose to medium-dense gray and brown fine to medium sand, trace coarse sand, trace silt, contains thin seam of silty clay at 53.9'.
												Est. A-3
60	17		5/4/8									Dense brown and gray fine to coarse sand, trace to little fine to coarse gravel, trace silt.
												Est. A-1-b
65	18		15/22/14									Medium-hard gray coarse-grained sandstone.
												Visual
70	19		21/15/15									Soft gray limestone, nearly horizontally bedded, few horizontal fractures, highly fractured from 72.6' to 73.2'.
												Visual
75	20		50-0"R NX REC 82% RQD 50%									
80												- Encountered seepage from 4.5' to 8.8'.
												- Encountered water at 53.5'.
85												- Encountered heaving sands at 58.5', (changed to mud rotary drilling techniques).
												- Lost partial mud circulation below 75.4' while rock coring.
90												

WATER LEVEL: ▽ 41.0
WATER NOTE: After Rock Coring
DATE: 4/30/02

JOB: 01106405.002

PLATE 9

DRAWN M.S.J. | CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-03.87

LAW-7-2.17

PROJECT: LAW – 7 – 2.17 | DRILLING FIRM / OPERATOR: STANTEC / S.B. | DRILL RIG: CME 45 TRACK | STATION / OFFSET: 269+48, 135 LT | EXPLORATION ID B-032-0-11
TYPE: STRUCTURE | SAMPLING FIRM / LOGGER: STANTEC / J.M. | HAMMER: CME AUTOMATIC | ALIGNMENT:
PID: 75923 BR ID: LAW-7-05.10 | DRILLING METHOD: 3.25" HSA / NQ | CALIBRATION DATE: 2/24/10 | ELEVATION: 537.7 (MSL) EOB: 30.9 ft. | PAGE 1 OF 1
START: 5/18/11 END: 5/18/11 | SAMPLING METHOD: SPT / ST | ENERGY RATIO (%): 81.9 | LAT / LONG: Not Recorded

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
MEDIUM STIFF TO STIFF, BROWN, SILT AND CLAY, SOME SAND, TRACE GRAVEL, MOIST	537.7		2	5	67	SS-1	–	5	4	20	47	24	36	21	15	25	A-6a (9)	
			3	10	53	SS-2	–	–	–	–	–	–	–	–	–	27	A-6a (V)	
	533.7	2.5	4	18	60	SS-3	–	–	–	–	–	–	–	–	–	12	A-6a (V)	
MEDIUM DENSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT, LITTLE CLAY, WET		W	8	22	33	SS-4	–	42	16	19	13	10	25	15	10	25	A-2-4 (0)	
		5.0	12															
		7.5	6	12	7	SS-5	–	–	–	–	–	–	–	–	–	31	A-2-4 (V)	
	527.7		5															
MEDIUM STIFF TO STIFF, GRAY, SILTY CLAY, LITTLE SAND AND GRAVEL, SAND SEAMS, MOIST		10.0	2	8	67	SS-6	–	–	–	–	–	–	–	–	–	27	A-6b (V)	
		12.5			100	ST-7	–	10	5	8	19	58	37	20	17	27	A-6b (11)	
		15.0	2	10	73	SS-8	–	–	–	–	–	–	–	–	–	24	A-6b (V)	
	519.7	17.5	4															
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	518.7	TR	50/5"	–	67	SS-9	–	–	–	–	–	–	–	–	–	18	Rock (V)	
SHALE, GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG, LAMINATED; RQD 67%, REC 92%.		20.0	18		55	NQ-1											CORE	
		22.5																
		25.0	78		100	NQ-2											CORE	
		27.5																
	506.8	30.0																
		EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW – 7 – 2.17 | DRILLING FIRM / OPERATOR: STANTEC / S.B. | DRILL RIG: CME 45 TRACK | STATION / OFFSET: 270+18, 44 LT | EXPLORATION ID B-033-0-11
TYPE: STRUCTURE | SAMPLING FIRM / LOGGER: STANTEC / J.M. | HAMMER: CME AUTOMATIC | ALIGNMENT:
PID: 75923 BR ID: LAW-7-05.10 | DRILLING METHOD: 3.25" HSA / NQ | CALIBRATION DATE: 2/24/10 | ELEVATION: 536.4 (MSL) EOB: 35.4 ft. | PAGE 1 OF 1
START: 5/17/11 END: 5/18/11 | SAMPLING METHOD: SPT / ST | ENERGY RATIO (%): 81.9 | LAT / LONG: Not Recorded

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
LOOSE TO MEDIUM DENSE, BROWN AND GRAY, GRAVEL WITH SAND, SILT, AND CLAY, MOIST TO WET	536.4		WOH	4	60	SS-1	–	–	–	–	–	–	–	–	–	20	A-2-6 (V)	
			2	11	53	SS-2	–	–	–	–	–	–	–	–	–	22	A-2-6 (V)	
		2.5	4	12	73	SS-3	–	37	10	19	18	16	31	16	15	15	A-2-6 (1)	
		5.0	5	7	67	SS-4	–	–	–	–	–	–	–	–	–	20	A-2-6 (V)	
		7.5	3	10	67	SS-5	–	21	21	24	14	20	26	14	12	28	A-2-6 (0)	
	526.4		6															
STIFF, GRAY, SILT AND CLAY, AND SAND, TRACE GRAVEL, MOIST TO WET		W 10.0	5	15	100	SS-6	–	–	–	–	–	–	–	–	–	24	A-6a (V)	
		12.5			100	ST-7	–	6	10	27	23	34	26	14	12	23	A-6a (5)	
	521.4																	
MEDIUM DENSE, BLUE GRAY, GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT, TRACE CLAY, MOIST		15.0	8	19	100	SS-8	–	30	25	22	14	9	21	14	7	15	A-2-4 (0)	
		17.5	5	12	67	SS-9	–	–	–	–	–	–	–	–	–	17	A-2-4 (V)	
		20.0	4	14	53	SS-10	–	–	–	–	–	–	–	–	–	16	A-2-4 (V)	
	513.2	22.5	24	74	67	SS-11	–	–	–	–	–	–	–	–	–	13	Rock (V)	
		TR	30															
SHALE, BROWN, SEVERELY WEATHERED, (AUGERED).	511.0		50/5"	–	100	SS-12	–	–	–	–	–	–	–	–	–	16	Rock (V)	
SANDSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, THIN BEDDED; RQD 90%, REC 100%.	510.0																	
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED; RQD 67%, REC 89%.		25.0	70		90	NQ-1											CORE	
		27.5																
		30.0																
		32.5																
	501.0	35.0																
		EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / R.C.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 270+25, 180 LT	EXPLORATION ID B-033-1-12
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: HORN / R.C.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 538.5 (MSL) EOB: 36.0 ft.	PAGE 1 OF 1
START: 4/23/13 END: 4/24/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST	538.5	W	WOH WOH 2	3	100	SS-1	-	-	-	-	-	-	-	-	-	26	A-4a (V)	
		2.5																
		5.0	1 1 1	3	100	SS-2	-	-	-	-	-	-	-	-	-	20	A-4a (V)	
		7.5	4 5 3	11	100	SS-3	-	13	23	24	17	23	23	15	8	15	A-4a (1)	
	528.5																	
MEDIUM STIFF, BROWN, **SILTY CLAY**, TRACE GRAVEL AND SAND, MOIST	526.0	10.0	1 2 3	7	100	SS-4	-	1	5	5	23	66	38	21	17	28	A-6b (11)	
MEDIUM STIFF TO STIFF, BROWN, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST TO WET		12.5	2 4 3	10	100	SS-5	-	13	26	20	18	23	25	15	10	17	A-4a (1)	
		15.0	2 2 3	7	100	SS-6	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
		17.5	2 3 7	14	100	SS-7	-	-	-	-	-	-	-	-	-	16	A-4a (V)	
		20.0	6 4 5	13	100	SS-8	-	-	-	-	-	-	-	-	-	15	A-4a (V)	
	515.5	TR																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).		22.5	10 21 24	64	100	SS-9	-	-	-	-	-	-	-	-	-	12	Rock (V)	
	512.5	25.0	22 50/5"	-	100	SS-10	-	-	-	-	-	-	-	-	-	9	Rock (V)	
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, THIN BEDDED, CALCAREOUS, SMALL ZONES OF GRAY SANDSTONE; RQD 49%, REC 94%.		27.5	57		100	NQ-1											CORE	
		30.0																
		32.5	48		88	NQ-2											CORE	
	502.5	35.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 100 GAL. BENTONITE GROUT

PROJECT: LAW – 7 – 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 271+00, 128 LT	EXPLORATION ID B-034-0-11
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT:	
PID: 75923 BR ID: LAW-7-05.10	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 537.8 (MSL) EOB: 36.2 ft.	PAGE 1 OF 1
START: 5/19/11 END: 5/19/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
VERY SOFT TO SOFT, BROWN, SILT AND CLAY, AND SAND, MOIST	537.8		WOH WOH	–	67	SS-1	–	0	2	34	41	23	34	20	14	29	A-6a (7)	
	534.8	2.5	1	4	67	SS-2	–	–	–	–	–	–	–	–	–	22	A-6a (V)	
LOOSE, BROWN, GRAVEL WITH SAND, SILT, AND CLAY, MOIST			3 2	8	87	SS-3	–	–	–	–	–	–	–	–	–	18	A-2-6 (V)	
		W 5.0	4 3	8	100	SS-4	–	38	21	19	12	10	28	16	12	20	A-2-6 (0)	
			3 3															
		7.5	3 3	8	80	SS-5	–	–	–	–	–	–	–	–	–	15	A-2-6 (V)	
	527.3		2 3	7	100	SS-6	–	–	–	–	–	–	–	–	–	30	A-7-6 (V)	
MEDIUM STIFF, GRAY, CLAY, LITTLE SILT, TRACE SAND AND GRAVEL, MOIST		10.0			100	ST-7	–	6	4	5	17	68	42	20	22	28	A-7-6 (13)	
		12.5																
		15.0	2 3	8	100	SS-8	–	–	–	–	–	–	–	–	–	18	A-7-6 (V)	
	518.8	17.5	1 3	5	100	SS-9	–	–	–	–	–	–	–	–	–	38	A-7-6 (V)	
STIFF TO VERY STIFF, GRAY GRADING TO DARK BROWN, SILTY CLAY, TRACE SAND AND GRAVEL,, MOIST		20.0			100	ST-10	–	4	2	5	43	46	40	20	20	25	A-6b (12)	
		22.5	3 5 9	19	67	SS-11	–	–	–	–	–	–	–	–	–	22	A-6b (V)	
	513.3	TR																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	512.6	25.0	50/2"	–	100	SS-12	–	–	–	–	–	–	–	–	–	7	Rock (V)	
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG, LAMINATED; RQD 50%, REC 62%.			70		90	NQ-1											CORE	
		27.5																
		30.0	72		90	NQ-2											CORE	
	504.6	32.5																
SANDSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, THIN BEDDED, VUGGY, SLICKENSIDES; RQD 95%, REC 100%.	503.4																	
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG, LAMINATED; RQD 66%, REC 100%.	501.6	35.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17
TYPE: STRUCTURE
PID: 75923 BR ID: LAW-7-05.10
START: 5/19/11 END: 5/20/11

DRILLING FIRM / OPERATOR: STANTEC / S.B.
SAMPLING FIRM / LOGGER: STANTEC / J.M.
DRILLING METHOD: 3.25" HSA / NQ
SAMPLING METHOD: SPT / ST

DRILL RIG: CME 45 TRACK
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 2/24/10
ENERGY RATIO (%): 81.9

STATION / OFFSET: 271+63, 25 LT
ALIGNMENT:
ELEVATION: 536.2 (MSL) EOB: 35.9 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-035-0-11
PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
MEDIUM STIFF, BROWN, SILT AND CLAY, AND SAND, LITTLE GRAVEL, MOIST	536.2		2	5	60	SS-1	-	-	-	-	-	-	-	-	-	22	A-6a (V)	
	533.2		2	8	67	SS-2	-	19	14	23	26	18	28	15	13	19	A-6a (3)	
LOOSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, TRACE SILT AND CLAY, MOIST TO WET		W	3	11	40	SS-3	-	-	-	-	-	-	-	-	-	14	A-1-b (V)	
			4	7	100	SS-4	-	35	37	17	7	4	NP	NP	NP	23	A-1-b (0)	
	527.7		2	-	80	SS-5 A	-	-	-	-	-	-	-	-	-	17	A-1-b (V)	
			2		100	SS-5 B	-	-	-	-	-	-	-	-	-	33	A-7-6 (V)	
MEDIUM STIFF TO STIFF, GRAY, CLAY, SOME SILT, TRACE SAND, MOIST			3	8	100	SS-6	-	0	0	1	23	76	41	20	21	31	A-7-6 (13)	
			4	12	100	SS-7	-	-	-	-	-	-	-	-	-	29	A-7-6 (V)	
	521.2				85	ST-8	-	-	-	-	-	-	-	-	-	-	A-3a (V)	
LOOSE, GRAY, COARSE AND FINE SAND, LITTLE SILT AND CLAY, TRACE GRAVEL, WET			3	7	113	SS-9	-	3	38	31	12	16	NP	NP	NP	20	A-3a (0)	
			2	8	100	SS-10	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
	512.7	TR	8	38	100	SS-11	-	-	-	-	-	-	-	-	-	16	A-3a (V)	
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	511.7																	
SHALE, GRAY TO GRAY-BROWN, MODERATELY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, FRIABLE; RQD 58%, REC 95%.			43		79	NQ-1											CORE	
	505.9																	
SANDSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, THIN BEDDED; RQD 100%, REC 100%.	505.4		62		100	NQ-2											CORE	
SHALE, GRAY TO GRAY-BROWN, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, FRIABLE, SLICKENSIDES; RQD 58%, REC 100%.	500.3	EOB																

NOTES: NONE
ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17
TYPE: STRUCTURE
PID: 75923 BR ID: LAW-7-05.10
START: 5/20/11 END: 5/23/11

DRILLING FIRM / OPERATOR: STANTEC / S.B.
SAMPLING FIRM / LOGGER: STANTEC / J.M.
DRILLING METHOD: 3.25" HSA / NQ
SAMPLING METHOD: SPT / ST

DRILL RIG: CME 45 TRACK
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 2/24/10
ENERGY RATIO (%): 81.9

STATION / OFFSET: 272+41, 161 LT
ALIGNMENT:
ELEVATION: 569.4 (MSL) EOB: 31.4 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-036-0-11
PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
SOFT TO MEDIUM STIFF, LIGHT BROWN, SILTY CLAY, AND GRAVEL, LITTLE SAND, DAMP	569.4		1	4	60	SS-1	-	35	8	7	25	25	38	21	17	17	A-6b (5)	
	564.4		2	5	60	SS-2	-	-	-	-	-	-	-	-	-	20	A-6b (V)	
VERY STIFF TO HARD, MOTTLED RED AND BROWN, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, DAMP			10	27	40	SS-3	-	-	-	-	-	-	-	-	-	12	A-6a (V)	
	559.4	TR	11	40	93	SS-4	-	1	2	9	44	44	36	21	15	14	A-6a (10)	
SHALE, LIGHT BROWN, SEVERELY WEATHERED, (AUGERED).	558.4		50	-	100	ST-5	-	-	-	-	-	-	-	-	-	-	Rock (V)	
					100	SS-6	-	-	-	-	-	-	-	-	-	4	Rock (V)	
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED; RQD 19%, REC 100%.	553.0		19		100	NQ-1											CORE	
MUDSTONE, DARK RED TO GRAY, SLIGHTLY WEATHERED, WEAK, MEDIUM TO THICK BEDDED; RQD 0%, REC 85%.			0		90	NQ-2											CORE	
			0		76	NQ-3											CORE	
	538.0	EOB																

NOTES: 16.4' TO 26.4' - CORE SAMPLE SWELLED IN CORE BARREL, RQD UNKNOWN AFTER REMOVAL
ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / R.C.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 273+35, 130 RT	EXPLORATION ID B-037-1-12
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: HORN / R.C.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 532.3 (MSL) EOB: 34.5 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/26/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, MOIST TO WET	532.3		1 2 3	7	100	SS-1	-	-	-	-	-	-	-	-	-	35	A-4a (V)	
		2.5																
		5.0	2 2 1	4	100	SS-2	-	-	-	-	-	-	-	-	-	27	A-4a (V)	
		7.5	2 2 4	9	100	SS-3	-	2	18	26	25	29	24	15	9	20	A-4a (4)	
		10.0	3 2 2	6	100	SS-4	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
INCREASING TO VERY STIFF @ 12.5'		12.5	5 7 5	17	100	SS-5	-	-	-	-	-	-	-	-	-	16	A-4a (V)	
	516.3	15.0	5 7 10	24	100	SS-6	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
MEDIUM DENSE TO DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, LITTLE GRAVEL AND CLAY, WET		17.5	4 8 6	20	100	SS-7	-	18	21	28	22	11	23	18	5	17	A-3a (0)	
		20.0	7 10 11	30	100	SS-8	-	-	-	-	-	-	-	-	-	14	A-3a (V)	
	509.8	TR																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).		22.5	6 12 17	42	100	SS-9	-	-	-	-	-	-	-	-	-	14	Rock (V)	
	507.8																	
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG, THIN BEDDED, ARENACEOUS, FRACTURED, SOME THIN SANDSTONE ZONES; RQD 14%, REC 78%.		25.0																
		27.5	28		82	NQ-1											CORE	
		30.0																
		32.5	0		73	NQ-2											CORE	
	497.8	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 100 GAL. BENTONITE GROUT

PROJECT: LAW – 7 – 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 273+95, 39 RT	EXPLORATION ID B-038-0-11
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT:	
PID: 75923 BR ID: LAW-7-05.10	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 548.3 (MSL) EOB: 50.6 ft.	PAGE 1 OF 1
START: 5/24/11 END: 5/24/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT / RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
MEDIUM STIFF TO STIFF, BROWN, SILTY CLAY, AND SAND, TRACE GRAVEL, RELATIVE CONSISTENCY INCREASES WITH INCREASING DEPTH, MOIST	548.3	2.5	WOH 1 2	4	67	SS-1	–	–	–	–	–	–	–	–	–	21	A-6b (V)	
			2 2 3	7	60	SS-2	–	–	–	–	–	–	–	–	–	22	A-6b (V)	
		5.0	2 3 3	10	73	SS-3	–	6	9	27	27	31	35	18	17	19	A-6b (7)	
			3 3 4	12	47	SS-4	–	–	–	–	–	–	–	–	–	19	A-6b (V)	
	540.8	7.5	4 4 5															
VERY STIFF, BROWN, CLAY, SOME SILT, TRACE SAND AND GRAVEL, MOIST			4 5 8	18	87	SS-5	–	–	–	–	–	–	–	–	–	27	A-7-6 (V)	
	535.8	10.0			80	ST-6	–	2	1	3	22	72	44	23	21	25	A-7-6 (13)	
VERY STIFF TO HARD, MOTTLED BROWN AND GRAY, SILT AND CLAY, SOME SAND AND GRAVEL, MOIST		12.5	4 10 8	25	33	SS-7	–	–	–	–	–	–	–	–	–	19	A-6a (V)	
		15.0	4 11 15	35	100	SS-8	–	24	5	24	22	25	26	12	14	15	A-6a (4)	
		17.5	8 15 16	42	87	SS-9	–	–	–	–	–	–	–	–	–	13	A-6a (V)	
		20.0	2 10 10	27	53	SS-10	–	–	–	–	–	–	–	–	–	15	A-6a (V)	
	525.8	22.5	4 12 18	41	100	SS-11	–	27	8	22	22	21	24	15	9	12	A-4a (2)	
VERY STIFF TO HARD, BROWN, SANDY SILT, SOME GRAVEL AND CLAY, MOIST		25.0	2 6 9	20	100	SS-12	–	–	–	–	–	–	–	–	–	14	A-4a (V)	
	520.8	27.5	1 6 9	20	87	SS-13	–	–	–	–	–	–	–	–	–	23	A-6a (V)	
VERY STIFF, RED-BROWN, SILT AND CLAY, SOME SAND, LITTLE GRAVEL, MOIST		30.0	3 5 6	15	100	SS-14	–	16	9	15	28	32	28	14	14	17	A-6a (7)	
	513.3 TR	32.5																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	511.4	35.0	9 10 43	72	87	SS-15	–	–	–	–	–	–	–	–	–	13	Rock (V)	
SHALE, GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG, LAMINATED, SLICKENSIDES; RQD 53%, REC 80%.		37.5	30		39	NQ-1											CORE	
		40.0																
		42.5	65		100	NQ-2											CORE	
		45.0																
	497.7 EOB	47.5																
		50.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED AUGER CUTTINGS

BRIDGE-LAW-7-05.10: STA. 271+70.4, 18.2' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.10

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B4EBI-206
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 271+70.4, 18.2' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 30.0' ELEVATION: 535.0 DATE: 12/29/99 - 12/30/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												Stiff to very-stiff brown clayey silt, little fine to coarse sand, few roots. Est. A-4a
	1		2/3/6					23	26	31	20	Loose brown fine to coarse sand, little fine to coarse gravel, little silty clay, few roots. A-3a(0)
5	2		4/9/8					61	13	13	13	Medium-dense brown fine to coarse gravel, "and" fine to coarse sand, little silty clay, many sandstone fragments. A-1-a(0)
	3		2/4/4					46	21	17	16	Loose brown fine to coarse sand, some fine to coarse gravel, little silty clay, few sandstone fragments. A-1-b(0)
	4		2/4/6	1.0-2.25	33	44	25	0	0	1	99	Stiff to very-stiff gray silty clay, trace fine sand, few silt lenses. A-7-6(12)
10	5		3/5/6					17	22	26	20 15	Medium-dense gray fine to coarse sand, little silty clay, trace fine gravel, few seams of silty clay. Est. A-1-b
	6		4/4/6	1.0-2.0	25	34	20	10	0	23	23 44	Stiff gray mottled with brown silty clay, some fine to coarse sand, trace fine gravel, few silt and fine sand lenses. A-6a(8)
	7		4/10/11									Medium-dense gray fine to coarse sand, some fine to coarse gravel (sandstone fragments), some clayey silt. Est. A-1-b
15	8		4/11/9									
20	9		5/13/22									Dense gray, brown and reddish-brown fine to coarse sand, some fine to coarse gravel (sandstone fragments), little clayey silt, few zones of fine to medium sand. Est. A-1-b
	10		11/14/23									
25	11		NXM REC 45% RQD 0%									Medium-hard gray and brown siltstone, nearly horizontally bedded, few horizontal fractures. Visual
30												Very-soft to soft gray shale, nearly horizontally bedded, fragmental structure, many fractures. Visual
35												- Encountered slight seepage from 4.3' to 7.0' and at 14.5'. - Auger refusal at 25.0'.

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 12/30/99

OJODTLJ 1446960.GPJ BBCM.GDT 5/9/00

JOB: 01106405.002 PLATE 8

BRIDGE-LAW-7-05.10: STA. 273+86.7, 83.7' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.10

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B4WBF-207
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 273+86.7, 83.7' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 29.5' ELEVATION: 575.6 DATE: 1/10/00 - 1/11/00

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												Medium-dense brown fine to coarse sand, "and" clayey silt, little fine to coarse gravel. A-4a(2)
	1		6/9/5		9	32	23	20	18	19	25 18	
5	2		4/6/9	3.0-4.0								Very-stiff gray mottled with brown silty clay, little fine to coarse sand, trace fine to coarse gravel, slightly organic, few shale fragments. Est. A-6b
	3		10/37/37	4.5+								Hard gray mottled with brown and reddish-brown silty clay, similar to very-soft shale, few calcite streaks. Est. A-6b
10	4		10/28/43	4.5+								
	5		15/42/36	4.5+								
15	6		17/53		9	36	21	61	5	3	17 14	Very-soft to soft brown and gray shale, nearly horizontally bedded, similar to hard silty clay, few thin layers of siltstone. Visual
	7		50-5"R									
20	8		NXM REC 55% RQD 18%									Medium-hard gray fine-grained sandstone, nearly horizontally bedded, well cemented, few horizontal fractures, few seams of shale. Visual
												Soft to medium-hard gray siltstone, nearly horizontally bedded, few diagonal and vertical fractures, partly calcareous, few seams of very-soft shale. Visual
25	9		NXM REC 75% RQD 0%									Very-soft to soft gray becoming reddish-brown shale, nearly horizontally bedded, similar to hard silty clay, highly fractured, few limestone nodules. Visual
30												- No water encountered. - Auger refusal at 19.5'.
35												

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 01/11/00

OJODTLJ 1446960.GPJ BBCM.GDT 5/9/00

JOB: 01106405.002 PLATE 9

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.10

LAW-7-2.17

176/206

1217
1247

BRIDGE-LAW-7-05.10: STA. 266+37, 55.7' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.10

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B4WBR-205
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 266+37, 55.7' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 34.5' ELEVATION: 557.5 DATE: 12/28/99 - 12/29/99

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 14 INCHES
	1	3 9 7	2.5-3.5	23	36	23	2	9	21	31 37	Very-stiff brown silty clay, some fine to coarse sand, trace fine gravel, slightly organic, few roots. A-6a(8)
5	2	6 9 9	4.5+	13							Hard brown clayey silt, "and" fine to coarse sand, some fine to coarse gravel (sandstone and siltstone fragments), desiccated. Est. A-4a
	3	3 9 11	2.5-4.5+								Very-stiff to hard brown mottled with reddish-brown and gray silty clay, little fine to coarse sand, trace to little fine to coarse gravel (shale and sandstone fragments), few seams of clayey silt.
10											Est. A-6a
	4	3 11 10	3.0-4.5+								Very-soft to soft brown interbedded with reddish-brown shale, nearly horizontally bedded, similar to hard silty clay. Visual
15	5	11 50/3"	50-3"R								Very-soft to soft brownish-gray shale, nearly horizontally bedded. Visual
20	6	42	50-4"R								
25	7	35	NXM REC 48% RQD 27%								Soft to medium-hard gray shale, interbedded with sandstone and siltstone, nearly horizontally bedded, few very-soft seams, few seams of medium-hard limestone. Visual
30	8										- No seepage encountered. -Auger refusal at 29.5'.
35											
40											

WATER LEVEL: ▽ 21.0
WATER NOTE: Before Coring
DATE: 12/29/99

JOB: 01106405.002

PLATE 5

BRIDGE-LAW-7-05.10: STA. 268+6.2, 42.8' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.10

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-4BP1
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 268+6.2, 42.8' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 43.8' ELEVATION: 551.5 DATE: 11/16/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 8 INCHES
	1	2 3 5	2.25-3.2								Very-stiff brown silty clay, little fine to coarse sand, trace fine to coarse gravel. Est. A-6b
	2	4 6 8		13	26	18	42	15	16	11 16	
	3A 3B	3 4 5	3.75-4.5	28	66	26					Medium-dense brown fine to coarse sand, some clayey silt, some fine gravel. A-2-4(0)
5	4	6 9 9	4.0-4.5								Very-stiff to hard brown mottled with gray silty clay, trace fine to coarse sand, trace fine gravel. Est. A-7-6
	5	6 8 9	3.25-4.5	26							Very-stiff to hard gray silty clay, trace fine to coarse sand, contains few silt seams.
10	6	5 5 5	3.75-4.2								Est. A-7-6
	7	4 6 7	1.75-2.7	18	38	22					Stiff to very-stiff gray silty clay, some fine to coarse sand, little fine to coarse gravel. Est. A-6b
15	8	5 6 7	2.25-3.2								
	9	5 6 7	2.0-4.5								Very-stiff to hard brown silty clay, some fine to coarse sand, little fine gravel. Est. A-6a
20											
	10	15 34 44		24	35	24					Very-soft red shale, nearly horizontally bedded, highly weathered, partly similar to silty clay. Visual
25											Very-soft brown weathered shale, nearly horizontally bedded, partly similar to claycy silt. Visual
	11	37 60R		8							Soft to medium-hard gray siltstone, nearly horizontally bedded, contains many fractures. Visual
30											
	12	50-4"R									Medium-hard gray siltstone, interbedded with shale, nearly horizontally bedded, contains many diagonal fractures. Visual
35	13	NXM REC 69% RQD									

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 6405.1

-CONTINUED-

PLATE 6

LAW-7-05.10

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-4BP1
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 268+6.2, 42.8' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 43.8' ELEVATION: 551.5 DATE: 11/16/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
40	14	42% REC 98% RQD 87%									Soft to medium-hard gray shale, nearly horizontally bedded, contains few diagonal fractures, few iron-oxide filled fractures. Visual
	15	REC 100% RQD 100%									- Encountered water at 33.5'.
45											
50											
55											
60											
65											
70											

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 6405.1

PLATE 7

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.10

LAW-7-2.17

PROJECT: LAW – 7 – 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 301+30, 41 RT	EXPLORATION ID B-051-0-11
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT:	
PID: 75923 BR ID: LAW-7-05.63	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 550.4 (MSL) EOB: 28.0 ft.	PAGE 1 OF 1
START: 5/26/11 END: 5/26/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
SOFT, BROWN, SILT AND CLAY, SOME GRAVEL, LITTLE SAND, DAMP	550.4		2 1 2	4	53	SS-1	–	34	9	13	22	22	36	21	15	11	A-6a (3)	
	547.3	TR	7 50/1"	–	100	SS-2	–	–	–	–	–	–	–	–	–	16	A-6a (V)	
SANDSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, FINE GRAINED, THIN BEDDED, IRON STAINING; RQD 100%, REC 100%.	546.7	2.5	31		100	NQ-1											CORE	
SHALE, LIGHT BROWN, SLIGHTLY WEATHERED, MODERATELY STRONG, LAMINATED, ARENACEOUS; RQD 25%, REC 79%.	541.0	5.0 7.5	32		61	NQ-2											CORE	
MUDSTONE, RED-BROWN, SLIGHTLY WEATHERED, WEAK, THICK BEDDED, SLICKENSIDES; RQD 0%, REC 86%.	532.9	10.0 12.5 15.0 17.5	17		89	NQ-3											CORE	
SANDSTONE, LIGHT BROWN, SLIGHTLY WEATHERED, STRONG, THIN BEDDED; RQD 95%, REC 100%.	529.0	20.0																
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED; RQD 100%, REC 100%.	527.0	22.5																
MUDSTONE, RED-BROWN, SLIGHTLY WEATHERED, WEAK, THICK BEDDED, SLICKENSIDES; RQD 0%, REC 85%	522.4	EOB 25.0 27.5	47		92	NQ-4											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED AUGER CUTTINGS

PROJECT: LAW – 7 – 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 298+63, 37 LT	EXPLORATION ID B-050-0-11
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT:	
PID: 75923 BR ID: LAW-7-05.63	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 532.4 (MSL) EOB: 51.0 ft.	PAGE 1 OF 1
START: 5/23/11 END: 5/24/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 532.4	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	INST.
VERY LOOSE TO LOOSE, BROWN, SANDY SILT, LITTLE CLAY, MOIST			1	2	100	SS-1	–	–	–	–	–	–	–	–	–	25	A-4a (V)	
		2.5	1 1	4	73	SS-2	–	0	8	56	22	14	NP	NP	NP	21	A-4a (0)	
	527.9		2 1	5	87	SS-3	–	0	7	46	29	18	NP	NP	NP	22	A-4a (2)	
MEDIUM STIFF, BROWN, SILT AND CLAY, AND SAND, TRACE GRAVEL, MOIST		5.0	2 2	5	80	SS-4	–	–	–	–	–	–	–	–	–	24	A-6a (V)	
	524.9		2 2	5	100	SS-5	–	1	8	31	39	21	27	16	11	22	A-6a (5)	
VERY LOOSE TO LOOSE, BROWN GRADING TO GRAY, COARSE AND FINE SAND, LITTLE GRAVEL AND SILT, TRACE CLAY, MOIST TO WET		7.5	2 2	6	100	SS-6	–	0	17	59	14	10	NP	NP	NP	23	A-3a (0)	
		10.0	2 3	5	100	SS-7	–	–	–	–	–	–	–	–	–	27	A-3a (V)	
		W																
		12.5	2 2	1	100	SS-8	–	–	–	–	–	–	–	–	–	30	A-3a (V)	
			1 WOH															
		15.0	1 1	2	100	SS-9	–	18	18	47	10	7	NP	NP	NP	55	A-3a (0)	
		17.5	2 3	9	80	SS-10	–	–	–	–	–	–	–	–	–	27	A-3a (V)	
	512.4																	
MEDIUM STIFF TO STIFF, GRAY, SILT AND CLAY, TRACE SAND, MOIST		20.0	2 3	9	100	SS-11	–	0	2	8	47	43	31	18	13	21	A-6a (9)	
		22.5	3 3	7	100	SS-12	–	–	–	–	–	–	–	–	–	26	A-6a (V)	
	507.4																	
STIFF TO VERY STIFF, GRAY, SILTY CLAY, TRACE SAND AND GRAVEL, DAMP TO MOIST		25.0	2 5	12	87	SS-13	–	–	–	–	–	–	–	–	–	22	A-6b (V)	
		27.5	3 6	16	100	SS-14	–	2	1	9	49	39	37	19	18	21	A-6b (11)	
		30.0	2 2	6	100	SS-15	–	–	–	–	–	–	–	–	–	23	A-6b (V)	
		32.5	8 8	20	100	SS-16	–	–	–	–	–	–	–	–	–	17	A-6b (V)	
	495.9	35.0 TR	7 11	40	100	SS-17	–	–	–	–	–	–	–	–	–	14	A-6b (V)	
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED, SANDSTONE SEAM @ 36.7' TO 37.1'; RQD 54%, REC 100%.	493.1	37.5	29		100	NQ-1											CORE	
MUDSTONE, BROWN AND GRAY, MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, THICK BEDDED, SLICKENSIDES; RQD 0%, REC 91%.		40.0																
		42.5	0		84	NQ-2											CORE	
		45.0																
		47.5	0		92	NQ-3											CORE	
	481.4	50.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

BRIDGE-LAW-7-05.63: STA. 297+17.6, 116.8 Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.63

BBC&M ENGINEERING, INC.

LOG OF BORING NO. BSWBR-203
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 297+17.6, 116.8' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 44.9' ELEVATION: 532.5 DATE: 12/22/99 - 12/23/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 18 INCHES
	1		4/4/4	2.25-2.75								Very-stiff to hard brown organic silty clay, little fine to medium sand, few roots.
5	2		4/6/8	3.5-4.5+	23	43	24	0	0	11	89	Visual
	3		3/5/5	3.0-4.5+								Very-stiff to hard brown mottled with gray organic clayey silt, little fine to medium sand, few roots.
10												Visual
	4		3/3/3					0	2	68	30	Very-loose to loose brown and gray fine sand, some clayey silt, trace medium sand, few silt and clayey silt seams.
	5		2/2/3					0	3	63	34	
15	6		2/1/2					0	2	74	24	A-3a(0)
	7		2/1/2					0	33	63	4	Very-loose gray fine to medium sand, trace silt, interbedded with silt and silty clay below 19.0 feet.
												A-3(0)
20	8		2/1/1									Loose to medium-dense gray and brown fine to coarse sand, trace to little fine to coarse gravel (shale and sandstone fragments), trace clayey silt.
	9		8/9/16									Est. A-3a
25	10		2/3/6									
	11		6/6/7									
30	12		13/19/21									Dense brown and gray fine to coarse sand, little fine gravel, trace to little clayey silt, few sandstone and shale fragments.
	13		14/19/23									Est. A-1-b
	14		14/16/21									
35												

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.002

-CONTINUED-

PLATE 5

LAW-7-05.63

BBC&M ENGINEERING, INC.

LOG OF BORING NO. BSWBR-203
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 297+17.6, 116.8' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 44.9' ELEVATION: 532.5 DATE: 12/22/99 - 12/23/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
35												Dense brown and gray fine to coarse sand, little fine gravel, trace to little clayey silt, few sandstone and shale fragments.
												Est. A-1-b
40	15		70R									Medium-hard gray fine-grained sandstone, nearly horizontally bedded, well cemented.
			NXM REC 53% RQD 12%									Visual
45	16											Very-soft to soft gray, brown and reddish-brown shale, nearly horizontally bedded, few horizontal fractures, similar to hard silty clay.
												Visual
50												- Encountered water from 11.5' to 12.3'.
												-Auger refusal at 39.9'.
55												
60												
65												
70												

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.002

PLATE 6

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.63

LAW-7-2.17

180/206

1221/1247

BRIDGE-LAW-7-05.63: STA. 298+39.1, 11.9 Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.63

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-5BP1
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 298+39.1, 11.9' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 46.5' ELEVATION: 530.5 DATE: 10/12/98 10/13/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0												TOPSOIL - 4 INCHES
	1	2/3/4										Very-loose to loose brown fine to medium sand, trace coarse sand, little to some silt.
5	2	3/3/3										
	3	1/2/2										Est. A-3a
10	4	3/3/10					1	60	34	4	1	Medium-dense gray and brown fine to medium sand, trace coarse sand, trace silt.
15	5	4/5/10	2.5-2.75	23	36	21	1	3	10	34	52	A-1-b(0)
	6	5/7/9	2.5-2.75	24	36	21	0	3	5	33	59	Stiff to very-stiff gray silty clay, trace fine to coarse sand, trace fine gravel.
	7	2/5/7	1.75-2.5	26	36	23	0	2	6	31	61	
20	8	3/4/6	1.0-2.2									A-6a(10)
	9	2/5/7	2.5	28	42	23	0	1	6	29	64	Stiff to very-stiff brown mottled with gray silty clay, trace fine to coarse sand.
25	10	3/4/5	1.7-2.2									
	11	2/5/6	1.7-2.3	27								A-7-6(12)
30	12	2/2/2										Loose gray fine to medium sand, trace coarse sand, some silty clay.
	13	5/7/3					7	54	29	10		
35												A-1-b(0)

WATER LEVEL: ▽ 11.0 ▼ 9.3
WATER NOTE:
DATE: 10/12/98 10/13/98

JOB: 6405.1 -CONTINUED- PLATE 7

LAW-7-05.63

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-5BP1
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 298+39.1, 11.9' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 46.5' ELEVATION: 530.5 DATE: 10/12/98 10/13/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION - CONTINUED
40	14	50-3"R										Medium-hard gray shale, nearly horizontally bedded, many directional fractures.
	15	NXM REC 63% RQD 32%										Visual
45	16	REC 0% RQD 0%										Soft to medium-hard green-brown and red shale, many directional fractures, contains slickensides, no recovery below 41.5'.
50												Visual
55												- Encountered water at 25.9'.
60												- Sample 16 was ground up in core barrel, description based on cuttings.
65												
70												

WATER LEVEL: ▽ 11.0 ▼ 9.3
WATER NOTE:
DATE: 10/12/98 10/13/98

JOB: 6405.1 PLATE 8

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.63

LAW-7-2.17

181/206

1222/1247

BRIDGE-LAW-7-05.63: STA. 300+13.3, 41.4 Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.63

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-5BP2
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 300+13.3, 41.4' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 40.0' ELEVATION: 532.8 DATE: 10/14/98 10/15/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 4 INCHES
	1	4 / 6 / 7	4.5+								Very-stiff hard brown silty clay, trace to little fine sand, contains silt seams. - Est. A-7-6
5	2	4 / 6 / 8	2.7								
	3	3 / 4 / 3									Loose brown fine to medium sand, little silt. Est. A-3a
10											Very-stiff red brown mottled with gray clayey silt, fine to coarse sand, trace fine gravel.
15	4	4 / 6 / 8	2.5-3.75	17	26	17	7	12	18	29	34 A-4a(6)
	5	6 / 8 / 14	3.0-4.0	23	45	23	0	1	7	37	55 Very-stiff to hard brown and brown mottled with gray silty clay, trace to little fine to medium sand, trace coarse sand.
	6	8 / 10 / 17	3.0-4.0				1	2	5	35	57
20	7	5 / 9 / 12	3.5-4.5	21			1	1	13	38	47
	8	5 / 9 / 15	4.5+								
	9	5 / 7 / 11	3.0-3.75	20			0	1	17	37	45 A-7-6(14)
25	10	3 / 4 / 6	1.0-2.0								Stiff brown mottled with gray silty clay, some fine to medium sand. Est. A-7-6
	11	28 50-5"R		8	39	23					Very-soft red to gray shale, nearly horizontally bedded, partly similar to silty clay. Visual
30		NXM REC 80%									Soft to medium-hard gray shale, nearly horizontally bedded, contains many fractures, few seams of red shale. Visual
	12	RQD 69%									Medium-hard to hard gray siltstone, nearly horizontally bedded, few diagonal fractures with iron oxide staining, micaceous.
35											

WATER LEVEL: ▽ 9.5 ▼ 10.5
WATER NOTE:
DATE: 10/15/98 10/16/98

JOB: 6405.1 -CONTINUED- PLATE 9

LAW-7-05.63

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B-5BP2
LAW-7-2.17 PRELIMINARY INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 300+13.3, 41.4' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 40.0' ELEVATION: 532.8 DATE: 10/14/98 10/15/98

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
35		REC 100%									Visual
	13	RQD 55%									Medium-hard to hard gray siltstone, nearly horizontally bedded, few diagonal fractures with iron oxide staining, micaceous. Visual
40											Medium-hard gray shale, nearly horizontally bedded, contains many fractures, few seams of brown shale. Visual
											- Encountered water at 8.5'.
45											
50											
55											
60											
65											
70											

WATER LEVEL: ▽ 9.5 ▼ 10.5
WATER NOTE:
DATE: 10/15/98 10/16/98

JOB: 6405.1 PLATE 10

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.63

LAW-7-2.17

182/206

1223/1247

BRIDGE-LAW-7-05.63: STA. 300+67.7, 115.3 Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-05.63

LOG OF BORING NO. B5WBF-204
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 300+67.7, 115.3' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 37.0' ELEVATION: 529.1 DATE: 12/27/99 - 12/28/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 8 INCHES
												Very-stiff brown and reddish-brown silty clay,little fine sand, slightly organic, few roots near top of stratum.
5	1		3/5/6	3.0-3.5								Est. A-7-6
	2		3/5/5	3.0-3.5								Medium-stiff to stiff brown clayey silt, "and" fine sand, few silt and fine sand seams.
10	3		2/3/2	0.5-2.0	26	27	21	0	0	40	39	A-4a(5)
	4		2/3/4					0	4	60	36	Loose gray fine sand, "and" clayey silt, trace medium sand, few silt and fine sand seams.
	5		2/2/1					1	24	66	9	Est. A-4a
15	6		1/1/1	0.0-0.25	28	30	17	0	3	28	37	Very-loose brown fine to medium sand, trace coarse sand, trace silt.
	7		3/2/4	1.0-1.75	32	41	24		0	5	29	A-3(0)
	8		3/6/16	3.0-3.5								Very-soft gray silty clay, some fine to medium sand, few silt and fine sand seams.
20	9		4/7/13	3.0-4.5+								A-6a(8)
	10		9/17/19	3.0-4.5+	16	27	21	26	3	11	34	Stiff gray silty clay, trace fine sand, few sandstone fragments, few silt lenses.
25	11		7/13/15	4.5+	18							A-7-6(11)
	12		9/13/33	4.5+								Very-stiff gray clayey silt, some fine to coarse sand, little fine to coarse gravel, few shale and sandstone fragments.
30	13		25/4"/50-4"/R									Est. A-4a
			NXM REC 98%									Very-stiff to hard brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel, few shale and sandstone fragments.
35	14											Est. A-6a
												Very-stiff to hard brown and gray clayey silt, little fine to coarse sand, little fine to coarse gravel, few shale and sandstone fragments.
												A-4a(5)
												Hard reddish-brown and brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, becoming similar to very-soft shale.
												Est. A-6a
												Very-soft reddish brown and gray shale, nearly horizontally bedded, partly similar to hard silty clay.
												Visual
												Medium-hard gray fine-grained sandstone, nearly horizontally bedded, micaceous, well cemented.
												Visual

WATER LEVEL: ▽ ▽ ▽ ▽ ▽ ▽
WATER NOTE:
DATE:

ODOTLJ 1640902.OPJ BBCM.ODT 5/30/02

JOB: 01106405.002 -CONTINUED- PLATE 11

LAW-7-05.63

LOG OF BORING NO. B5WBF-204
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 300+67.7, 115.3' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 37.0' ELEVATION: 529.1 DATE: 12/27/99 - 12/28/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
35			RQD 95%									Medium-hard gray fine-grained sandstone, nearly horizontally bedded, micaceous, well cemented.
												Visual
40												Soft to medium-hard gray shale, nearly horizontally bedded, few horizontal fractures.
												Visual
45												- Encountered water from 12.0' to 14.0'.
												- Auger refusal at 32.0'.
50												
55												
60												
65												
70												

WATER LEVEL: ▽ ▽ ▽ ▽ ▽ ▽
WATER NOTE:
DATE:

ODOTLJ 1640900.OPJ BBCM.ODT 5/30/02

JOB: 01106405.002 PLATE 12

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-05.63

LAW-7-2.17

183/206

1224/1247

BRIDGE-LAW-7-07.13: STA. 376+81.4, 35.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-07.13

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6WBR-208
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 376+81.4, 35' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 67.0' ELEVATION: 576.7 DATE: 12/20/99 - 12/21/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 24 INCHES
	1		4 /5/7	2.0-3.5	25	39	23	0	3	3	58 / 36	Very-stiff brown silty clay, trace fine to medium sand. A-6b(10)
5	2		5 /10/11	4.5+								Hard brown mottled with gray silty clay, little fine to medium sand, contains silt filled desiccation cracks. Est. A-6a
10	3		5 /12/16	4.5+								
	4		4 /6/10									Medium-dense brown fine to medium sand, trace coarse sand, trace silty clay. Est. A-3
20	5		2 /5/6	2.5								Very-stiff brown becoming gray clayey silt, trace to little fine to medium sand, few silty clay and fine to coarse sand seams. A-4b(8)
25	6		3 /5/6	2.0-3.5	29	26	21	0	1	10	69 / 20	
30	7		4 /7/8	2.5-3.5								
	8		3 /5/5	3.0-3.5	28	27	22	0	0	2	77 / 21	
	9		4 /5/10	0.5-1.0	29							Medium-stiff brown mottled with gray silty clay, some fine to coarse sand, little fine to coarse gravel, few clayey silt seams. Est. A-6a
	10		8 /7/8					40	12	11	37	
35	11		4 /7/8					39	10	13	38	Medium-dense brown, gray and reddish-brown fine to coarse sand, "and" silt, some fine gravel, trace clay, many sandstone and shale fragments, few silt and silty clay seams.
	12		4 /4/8									Est. A-1-b
40	13		11 /18/22	4.5+								Very-stiff to hard brown, gray and reddish-brown clayey silt, some fine to coarse sand, little fine to coarse gravel (shale and sandstone fragments), desiccated. Est. A-4a
	14		7 /10/15	3.0-4.5+								

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.002

-CONTINUED-

PLATE 5

LAW-7-07.13

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6WBR-208
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 376+81.4, 35' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 67.0' ELEVATION: 576.7 DATE: 12/20/99 - 12/21/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
45	15		9 /9/20	2.5-3.5								Stiff to very-stiff reddish-brown mottled with blue-gray silty clay, little fine sand, few shale and sandstone fragments, slightly organic. A-6a(10)
50	16		3 /5/7	1.5-2.5	24	34	20	0	0	18	45 / 37	
	17		13/21/26									Very-soft to soft blue-gray mottled with reddish-brown shale, similar to hard silty clay, nearly horizontally bedded. Visual
55	18		58R									Very-soft to soft blue-gray shale, nearly horizontally bedded, partly similar to hard silty clay. Visual
	19		47/ 30R									Soft to medium-hard gray mottled with reddish-brown shale, nearly horizontally bedded, few horizontal fractures, few seams of very-soft shale. Visual
60	20		NQ REC 69% RQD 38%									- Encountered seepage from 28.5' to 31.5'. - Encountered water at 31.5'. - Auger refusal at 61.0'.
65												
70												
75												
80												
85												

WATER LEVEL:
WATER NOTE:
DATE:

JOB: 01106405.002

PLATE 6

BRIDGE-LAW-7-07.13: STA. 377+81.6, 35.0' Rt. of PROPOSED SR 7 CENTERLINE

LAW-7-07.13

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6EBI-209
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 377+81.6, 35' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 37.0' ELEVATION: 542.6 DATE: 12/16/99 - 12/17/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 7 INCHES
	1		3 /3/3	1.0-2.5	33	41	28	0	0	11	60 / 29	Stiff to very-stiff brown mottled with gray silty clay, little fine sand, desiccated, few roots, slightly organic. A-7-6(9)
5	2		2 /2/2	0.5-1.5	33	35	23	0	1	11	59 / 29	Medium-stiff to stiff gray interbedded with brown silty clay, little fine to medium sand, few roots, slightly organic. A-6a(9)
	3		2 /1/2	0.5-1.5	43							
	4		2 /2/3	0.5-1.5	30	39	23	0	1	12	52 / 35	Medium-stiff to stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine to coarse gravel, few seams of very-soft clayey silt, few pockets of fine to coarse gravel.
10	5		2 /1/2	0.5-1.5								
	6		2 /2/3	1.5								A-6b(10)
15	7		2 /5/3	0.5-1.5								
	8		4 /6/11	2.0-3.0	15	32	20	0	9	17	45 / 29	Very-stiff blue-gray mottled with reddish-brown silty clay, some fine to medium sand, trace coarse sand, trace fine gravel, few shale and sandstone fragments, partly similar to very-soft shale. A-6a(9)
20	9		22/ 50-5"R									Very-soft to soft reddish-brown and gray shale, nearly horizontally bedded, similar to hard silty clay. Visual
	10		50-5"R									
25	11		50-4"R									Soft to medium-hard gray and reddish-brown shale, nearly horizontally bedded, few seams of very-soft shale, few siltstone seams, many diagonal and vertical fractures.
30	12		NQ REC 77% RQD 25%									Visual
35												- Encountered seepage at 10.2'. - Encountered water at 12.7'. - Auger refusal at 30.0'.
40												

WATER LEVEL: 14.0
WATER NOTE: Before Coring
DATE: 12/17/99

JOB: 01106405.002

PLATE 7

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-07.13

LAW-7-2.17

BRIDGE-LAW-7-07.13: STA. 378+79.7, 35.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-07.13

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6WB1-210
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 378+79.7, 35' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 34.5' ELEVATION: 542.8 DATE: 12/15/99 - 12/16/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												Medium-stiff to stiff brown clayey silt, "and" fine to coarse sand, trace fine gravel, few roots, slightly organic.
	1		2/2/4	0.5-1.5	24	30	20	2	9	31	36	22
5												A-4a(5)
	2		2/2/4	1.5-2.5	25	35	21	2	10	25	39	24
	3		3/5/6	2.0-3.5	19	38	21	2	10	13	39	36
												Stiff to very-stiff brown silty clay, some to "and" fine to coarse sand, trace fine gravel, few roots near top of stratum, slightly organic.
	4		2/4/4	1.5-3.5	22	36	21	3	6	14	43	34
10												A-6a(7)
	5		4/5/13									Very-stiff brown silty clay, little fine to corse sand, trace fine to coarse gravel.
												A-6b(11)
	6		10/18/17	3.0-4.5+								Stiff to very-stiff brown silty clay, some fine to coarse sand, trace fine gravel.
15												A-6a(10)
	7		10/11/7									Very-stiff to hard brown mottled with gray clayey silt, little to some fine to coarse sand, trace fine gravel (sandstone fragments).
												Est. A-4a
	8		4/4/8	1.5-3.0	20							Medium-dense brown fine to coarse gravel (sandstone fragments), some fine to coarse sand, little silty clay, desiccated.
20												Est. A-1-b
	9		7/8/9	0.75-1.5	24	32	20	8	2	17	42	31
												Stiff to very-stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine to coarse gravel (sandstone and siltstone fragments).
												Est. A-6a
	10		2/4/7	2.0-2.5								Medium-stiff to stiff brown mottled with gray silty clay, some fine to coarse sand, trace fine to coarse gravel.
25												A-6a(8)
												Very-stiff brown mottled with gray silty clay, little fine to medium sand.
												Est. A-6b
30	11		12 50-5"R									Very-soft gray shale, similar to hard silty clay, nearly horizontally bedded, highly fractured.
												Visual
	12		NQ REC 33% RQD 6%									Soft to medium-hard gray siltstone, nearly horizontally bedded, many diagonal and vertical fractures, few seams of very-soft shale.
35												Visual
												- Topsoil stripped for levelling pad.
												- Encountered water at 9.0'.
40												- Auger refusal at 29.5'.

WATER LEVEL: ▽ 2.7
WATER NOTE: Before Coring
DATE: 12/16/99

JOB: 01106405.002

PLATE 8

BRIDGE-LAW-7-07.13: STA. 379+81.1, 35.0' Lt. of PROPOSED SR 7 CENTERLINE

LAW-7-07.13

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6EBF-211
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 379+81.1, 35' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 38.1' ELEVATION: 541.6 DATE: 12/14/99 - 12/15/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												Soft to medium-stiff brown silty clay, some fine to coarse sand, slightly organic, few roots, few silt seams.
	1		2/2/2	0.25-0.75	30	37	23	1	7	24	43	25
5												A-6a(8)
	2		1/2/3	0.75-1.25	34	44	25	4	8	23	37	28
												Medium-stiff to stiff brown silty clay, some to "and" fine to coarse sand, trace fine gravel, slightly organic, few roots, few silt seams.
	3		2/3/4	0.75-1.5	30	42	23	3	11	24	32	30
												A-7-6 (10)
	4		3/3/4	1.5-2.5	25	36	22	0	11	25	64	
10												Stiff to very-stiff brown silty clay, some to "and" fine to medium sand, desiccated.
	5		2/3/5	1.0-2.25								A-6a(7)
												Very-stiff to hard brown mottled with gray silty clay, little fine to coarse sand, trace silt.
	6		3/5/9	3.5-4.5+								Est. A-6a
15												Very-stiff reddish-brown mottled with brown silty clay, trace to little fine sand, few seams of fine to coarse sand, desiccated.
	7		3/5/8	2.5-3.5	24	42	21	0	0	9	46	45
	8		3/5/8	2.5-3.5								
20												A-7-6(13)
	9		3/7/7	2.25-3.5								Very-stiff brown mottled with gray silty clay, trace to little fine sand, desiccated.
	10		3/3/7	2.0-3.0	25	38	23		0	10	42	48
25												A-6a(10)
	11		7/9/9	2.0-4.0								
30												

WATER LEVEL: ▽ 2.2
WATER NOTE: Before Coring
DATE: 12/15/99

JOB: 01106405.002

-CONTINUED-

PLATE 9

LAW-7-07.13

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6EBF-211
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 379+81.1, 35' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 38.1' ELEVATION: 541.6 DATE: 12/14/99 - 12/15/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
35	12		50-1"R									Medium-hard gray siltstone, interbedded with sandstone, nearly horizontally bedded, micaceous, many horizontal fractures, two vertical fractures near top of stratum.
												Visual
	13		NQ REC 80% RQD 27%									Soft to medium-hard gray shale, nearly horizontally bedded, few horizontal fractures, few very-soft layers, few seams of siltstone.
40												Visual
												- Encountered water at 4.5'.
												-Auger refusal at 33.0'.
45												
50												
55												
60												

WATER LEVEL: ▽ 2.2
WATER NOTE: Before Coring
DATE: 12/15/99

JOB: 01106405.002

PLATE 10

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-07.13

LAW-7-2.17

LAW-775-1.05

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6SF-103
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" and 2-1/2" O.D. Split-barrel Samplers; NX Rock Core Barrel
LOCATION: Sta. 380+44.96, 120.88' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 68.3' ELEVATION: 558.6 DATE: 6/29/99 - 6/30/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0													TOPSOIL - 3 INCHES
													Very-stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel, many fine sand and silt seams.
	1		3/3/4	2.5-3.0									
5													
	2		5/5/7	3.0-3.5									
													Est. A-6b
	3		1/1/2	1.0-1.5	28	33	23		0	5	71	24	Stiff to very-stiff brown mottled with gray clayey silt, trace to some fine to medium sand, few silt and fine sand seams.
10													
	4		1/2/1	1.75-2.5									
15													
	5A		1/2/3						0	1	27	47	25
	5B		3/2/2						0	0	18	72	10
20	6		3/2/2							0	24	68	8
	7								0	0	24	67	9
	8		2/2/2								12	82	6
25													A-4b (8)
	9		2/3/2										Very-loose brown and gray silt, little to some fine sand, trace clay, trace medium to coarse sand, trace fine gravel, few fine to coarse sand seams.
	10		1/1/2										
30													
	11		3/5/5						8	3	4	85	
	12		2/3/4										
35													Est. A-4b (8)

WATER LEVEL: ▽ 15.0
WATER NOTE: After Core
DATE: 6/30/99

JOB: 01106405.002

-CONTINUED-

PLATE 9

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6SF-103
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" and 2-1/2" O.D. Split-barrel Samplers; NX Rock Core Barrel
LOCATION: Sta. 380+44.96, 120.88' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 68.3' ELEVATION: 558.6 DATE: 6/29/99 - 6/30/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION - CONTINUED
35													
	13		1/2/4										Very-loose brown and gray silt, little to some fine sand, trace clay, trace medium to coarse sand, trace fine gravel, few fine to coarse sand seams.
	14		3/3/2										
40													
	15		2/2/4										
													Est. A-4b (8)
45													Soft to stiff gray silty clay interbedded with silt, trace fine sand, few fine sand seams.
	16		2/3/3	0.25-2.0									
50													
	17		2/3/5	1.0-2.0					0	0	2	98	
55													
	18A		S/H	1.0-1.5									
	18B		4/6	1.0-2.0									
60													Est. A-6b
													Stiff gray clayey silt, some fine to coarse sand, little fine to coarse gravel.
													Est. A-4a/
65	19		50-1"R										Very-soft gray shale, nearly horizontally bedded, few vertical fractures, few slickensides.
	20		NX REC 17% RQD 0%										
													Visual
70													- Encountered water at 23.0'.

WATER LEVEL: ▽ 15.0
WATER NOTE: After Core
DATE: 6/30/99

JOB: 01106405.002

PLATE 10

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-775-1.05

LAW-7-2.17

186/206

1227/1247

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6SM-102
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 380+07.46, 0.11' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 61.0' ELEVATION: 549.7 DATE: 6/23/99 - 6/24/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION
0													TOPSOIL - 2 INCHES
	1		3/3/3	3.5-4.5+									Hard becoming stiff brown silty clay, little fine to medium sand, few roots near top of stratum, few silt and fine sand seams.
5													A-6a (9)
	2		2/2/3	2.0-3.0									
	3		1/2/2	1.5-2.0	26	33	20	0	1	10	62	27	
10	4		4/5/6					19	52	24	3	2	Loose to medium-dense brown fine to coarse sand, trace to little fine gravel, trace to little clayey silt.
	5		2/4/6					4	70	21	2	3	A-1-b (0)
	6A		2/1/1	1.5-2.0	25			21	46	19	6	8	
	6B							0	1	12	73	14	Stiff brown silty clay, little fine to coarse sand, trace fine to coarse gravel.
15	6C												Est. A-6a
	7		1/0/0										Very-loose brown silt, little fine to medium sand, little clay.
													Est. A-4b
	8		4/3/2										Loose brown fine to coarse sand, trace fine to coarse gravel, trace silt, few cobbles.
20													Est. A-3a
	9		1/1/1										Stiff reddish-brown silty clay, little fine to coarse sand, trace fine gravel.
													Est. A-6a
	10		S/H 2/5					0	1	5	84	10	Very-loose to loose brown and gray silt, trace fine to medium sand, trace fine gravel, few fine sand seams.
25													A-4b(8)
	11		1/2/3										Loose brown fine to medium sand, trace coarse sand, trace silt.
													Est. A-3
	12		3/4/3					8	7	21	64		Loose brown and gray silt, some fine to coarse sand, trace clay, trace fine to coarse gravel.
30													Est. A-4b
	13		1/3/4	1.75-3.5				0	0	7	72	21	Stiff to very-stiff gray mottled with brown clayey silt, trace fine sand.
35													Est. A-4b

WATER LEVEL:
WATER NOTE:
DATE:

ODOTLJ 1640502.GPJ BBCM.GDT 4/10/02

JOB: 01106405.002

-CONTINUED-

PLATE 7

LAW-775-1.05

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6SM-102
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NXM Rock Core Barrel
LOCATION: Sta. 380+07.46, 0.11' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 61.0' ELEVATION: 549.7 DATE: 6/23/99 - 6/24/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT	CLAY	DESCRIPTION - CONTINUED
40	14		5/5/5										Loose gray and brown fine to coarse sand, little fine to coarse gravel, trace silt.
													Est. A-1-b
45	15		1/2/4	2.0-2.5									Stiff to very-stiff gray mottled with brown clayey silt, some fine sand, trace medium to coarse sand, few fragments of sandstone at 55.0'.
	16		1/2/3	1.5-2.25									
50													
	17		1/2/5	1.25-2.0	9	25	19	0	1	29	47	23	
55													A-4a (7)
	18		NXM REC 62% RQD 24%										Very-soft to soft brown and gray shale, nearly horizontally bedded, many horizontal fractures, few diagonal fractures, few slickensides.
60													Visual
65													- Encountered slight seepage from 12.0' to 13.6'. - Encountered water at 25.5'. - Encountered heaving sand at 28.5'.
70													

WATER LEVEL:
WATER NOTE:
DATE:

ODOTLJ 1640502.GPJ BBCM.GDT 4/10/02

JOB: 01106405.002

PLATE 8

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-775-1.05

LAW-7-2.17

1228
1247

LAW-775-1.05

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6SR-101
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/2" O.D. Continuous-flight Auger; 3-1/4" I.D. Hollow-stem Auger; 2" and 2-1/2" O.D. Split-barrel Samplers
LOCATION: Sta. 379+70.10, 118.87' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 73.8' ELEVATION: 539.5 DATE: 6/24/99 - 6/28/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												TOPSOIL - 5 INCHES
	1	SS	1/1/1	2.5-2.75								Stiff to very-stiff brown silty clay, trace fine sand, contains few silt seams, few roots.
	2	SS	S/H-12"/1	1.75-2.5				0	0	5	63 32	
	3	SS	S/H /1/2	1.75-2.5				0	0	9	60 31	Est. A-6a
5	4	SS	2/3/2	0.75-1.0	37	39	24	0	0	21	47 32	Medium-stiff gray mottled with brown silty clay, some fine sand, few roots.
	5	SS	1/2/2	1.5-2.25				0	0	10	48 42	A-6a (10)
10	6	SS	2/3/4	1.75-2.5								Stiff to very-stiff brown mottled with gray silty clay, trace to little fine to coarse sand, trace fine gravel.
	7	SS	1/2/2									Est. A-6a
15	8	SS	2/2/2									Very-loose to loose brown and gray fine sand, trace medium to coarse sand, trace fine gravel, little to some silty clay, contains few silt seams.
	9	SS	S/H /1/1					0	1	66	33	
20	10	SS	1/2/4									A-3a(0)
	11	SS	1/3/7									Loose brown and gray fine to medium sand, trace silt, trace medium sand, few zones of fine to coarse sand.
25												
	12	SS	3/3/5									
30												
	13A 13B	SS	2/4/6					1	65	29	5	A-1-b(0)
35												Loose brown and gray fine to coarse sand, some fine to coarse gravel, little silty clay. Est. A-1-b
	14A 14B 14C	SS	2/11/13					0	1	16	71 12	Medium-dense brown and gray silt, little fine to medium sand, little clay. A-4b(8)
40												Medium-dense greenish-gray fine to coarse gravel, some fine to coarse sand, little silty clay. Est. A-1-b
												Medium-dense gray and brown silt, trace fine to medium sand. Est. A-4b

WATER LEVEL: ▽ 6.8
WATER NOTE:
DATE: 6/28/99

JOB: 01106405.002

-CONTINUED-

PLATE 5

ODOTLJ 1640560.CPJ BBCM.GDT 4/19/02

LAW-775-1.05

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B6SR-101
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/2" O.D. Continuous-flight Auger; 3-1/4" I.D. Hollow-stem Auger; 2" and 2-1/2" O.D. Split-barrel Samplers
LOCATION: Sta. 379+70.10, 118.87' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 73.8' ELEVATION: 539.5 DATE: 6/24/99 - 6/28/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
45	15	SS	26/41/50-5"R	4.5+								Very-soft to soft gray shale, nearly horizontally bedded, highly fissile, similar to hard silty clay, few seams of hard reddish-brown clay.
50	16	SS	20/45/50-2"R	4.5+								
	17	SS	26/50-2"R	4.5+								
55	18	SS	50-3"R	4.5+								
60	19	SS	50-5"R	4.5+								
65	20	SS	50-2"R	4.5+								
70	21	SS	50-3"R	4.5+								
75												Visual
												- Encountered water at 7.0'.
80												- Encountered heaving sand at 28.5' and 33.5'.
85												

WATER LEVEL: ▽ 6.8
WATER NOTE:
DATE: 6/28/99

JOB: 01106405.002

PLATE 6

ODOTLJ 1640560.CPJ BBCM.GDT 4/19/02

DRAWN MSJ
CHECKED EMK

STRUCTURE FOUNDATION EXPLORATION
LAW-775-1.05

LAW-7-2.17

BRIDGE-LAW-7-07.11: PROPOSED RAMP I
PROPOSED SR 7 CENTERLINE

LAW-7-0711

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B13-1
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; NQ Rock Core Barrel; 2" O.D. Split-barrel Sampler
LOCATION: Sta. 374+81.3, 132.2' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 26.5' ELEVATION: 547.8 DATE: 11/9/00

DEPTH, FEET	SAMPLE NO.	SAMPLES: SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 3 INCHES
	1	3/5/6	2.0-3.7								Very-stiff brown silty clay, some fine to medium sand, contains roots.
5											Est. A-6b
	2	6/6/5									Medium-dense brown fine to coarse gravel, some fine to coarse sand, some silty clay.
											Est. A-2-6
10	3	3/4/6	1.3-3.2	21	37	21	6	5	17	40 / 32	Stiff to very-stiff reddish-brown silty clay, some fine to coarse sand, trace fine gravel.
		5/5/10									A-6b (10)
	4	8/10		17			32	13	16	21 / 18	Medium-dense reddish-brown fine to coarse sand, little fine to coarse gravel, "and" silty clay.
	5	4/5/8									Est. A-6a
15	6	50-5"R									Medium-hard yellowish-brown sandstone fragments.
	7	NQ REC 100% RQD 77%									Medium-hard blue-green and gray fine to medium-grained sandstone, well cemented, nearly horizontally bedded, becoming soft to medium-hard shale, few horizontal fractures, occasional diagonal fractures.
20		REC 90% RQD 70%									Q_u = 188.9 psi between 23.3' and 23.9'.
	8										Very-soft to soft reddish-brown shale, nearly horizontally bedded, few horizontal and diagonal fractures.
25											
30											- No seepage encountered prior to coring.
35											
40											
45											

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 11/09/00

JOB: 01106405.002

LAW-7-0711

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B13-2
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; NQ Rock Core Barrel; 2" O.D. Split-barrel Sampler
LOCATION: Sta. 375+93.5, 137.4' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 37.5' ELEVATION: 544.6 DATE: 11/8/00

DEPTH, FEET	SAMPLE NO.	SAMPLES: SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 3 INCHES
	1	3/3/2	1.2-2.5								Stiff to very-stiff brown silty clay, little fine to coarse sand, trace fine gravel, contains roots.
5											Est. A-6a
	2	3/5/4		14	34	21	42	12	16	17 / 13	Loose to medium-dense reddish-brown fine to coarse sand, some fine to coarse gravel, some silty clay.
		7/7/7									
10	3	5/8/9									A-2-6 (0)
		3/4/5									
	4	1/2/3		27	27	25		0	1	79 / 20	Loose gray silt, some clay, trace fine to medium sand, few clay seams.
15											A-4b (8)
	5	1/2/3	0.5-1.5	29	33	22	0	0	8	62 / 30	Medium-stiff to stiff dark-gray silty clay, trace fine sand, contains decayed vegetation.
											A-6a (8)
20	6	2/3/5	0.6-1.4	35	37	28	1	2	17	52 / 28	Medium-stiff to stiff gray clayey silt, little fine to coarse sand, trace fine gravel, contains decayed wood fragments, many silt lenses.
											A-4b (8)
	7	4/6/7	1.1-2.1								Stiff to very-stiff gray clayey silt, some fine to coarse sand, little fine to coarse gravel.
	8	6/6/12	1.7-2.9								Est. A-4a
25	9	9/15/34	4.5+								Very-soft to soft gray, yellowish-brown and reddish-brown shale, nearly horizontally bedded, few horizontal fractures, occasional vertical fractures.
		50-1"R									
30	10	NQ REC 80% RQD 70%									- Encountered seepage at 8.0' and 21.0'.
		REC 100% RQD 92%									
35	11										
40											
45											

WATER LEVEL: ▽
WATER NOTE:
DATE:

JOB: 01106405.002

LAW-7-0711

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B13-3
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; NQ Rock Core Barrel; 2" O.D. Split-barrel Sampler
LOCATION: Sta. 376+97.6, 196.3' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 35.5' ELEVATION: 541.8 DATE: 11/8/00

DEPTH, FEET	SAMPLE NO.	SAMPLES: SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 3 INCHES
	1	3/3/3	0.5-1.0	40	53	36	12	2	16	46 / 24	Medium-stiff to stiff brown silty clay, trace fine to coarse sand, many roots, partly organic.
5											A-7-5 (12)
	2	2/4/4	0.7-1.4	25	38	24	1	1	15	48 / 35	Medium-stiff to stiff brown silty clay, little fine to coarse sand, contains many silt lenses.
	3	3/6/5	1.4-2.4	21	34	22	5	6	16	43 / 30	A-6a (10)
	4	3/3/4	0.7-1.1								Stiff to very-stiff brown silty clay, some fine to coarse sand, trace fine gravel.
10											A-6a (8)
	5	3/5/7	1.5-2.8								Medium-stiff to stiff brown silty clay, some fine to coarse sand, trace fine gravel.
											Est. A-6a
12	6	2/4/5	0.5-1.3	25	37	22	0	3	15	45 / 37	Stiff to very-stiff brown mottled with gray silty clay, little fine to coarse sand, trace fine gravel.
											Est. A-6a
15	7	4/4/6	2.0-3.0								Medium-stiff to stiff brown silty clay, little fine to medium sand, few pockets of fine sand.
	8A		1.4-2.9								A-6a (10)
	8B	7/8/11	3.4-4.5+								Stiff to very-stiff brown silty clay, little to some fine to coarse sand, trace fine to coarse gravel.
20											Est. A-6a
	9	9/14/50	3.0-4.5+								Very-stiff to hard yellowish-brown silty clay, some fine to coarse sand, little fine to coarse gravel.
	10	30/50	3.5-4.5+								Est. A-6a
		30-1"R									Very-stiff to hard reddish-brown mottled with gray silty clay, partly similar to very-soft shale.
	11	NQ REC 85% RQD 60%									Est. A-7-6
25											Very-soft to soft gray shale, nearly horizontally bedded, few horizontal fractures, partly similar to silty clay.
30		REC 96% RQD 92%									Q_u = 171.5 psi between 30.0' and 30.5'.
	12										Very-soft to soft yellowish-brown shale, nearly horizontally bedded, occasional horizontal fractures, interbedded with very-soft to soft gray shale.
35											
40											
45											

WATER LEVEL: ▽ 13.5
WATER NOTE:
DATE: 11/08/00

JOB: 01106405.002

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-07.11

LAW-7-2.17

BRIDGE-LAW-7-07.11: PROPOSED RAMP I
PROPOSED SR 7 CENTERLINE

LAW-7-0711

BBC&M ENGINEERING, INC.

LOG OF BORING NO. B13-4
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-2.17
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; NQ Rock Core Barrel; 2" O.D. Split-barrel Sampler

LOCATION: Sta. 378+6.7, 209.9' Rt. of Proposed SR 7 Centerline

COMPLETION DEPTH: 23.0' ELEVATION: 541.4 DATE: 11/7/00 - 11/8/00

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 3 INCHES
	1	S/H 1/1/1	0.25-0.3	29	32	21	0	1	26	51 : 22	Very-soft to soft brown silty clay, some fine sand, trace medium sand, few roots.
5	2	1/1/1	2.3-2.5								A-6a (8)
	3	1/2/2	1.0-2.5								Stiff to very-stiff brown silty clay, little fine sand, few roots.
	4	5 50/4" R									Est. A-6b
10	5	NQ REC 75% RQD 46%									Soft yellowish-brown siltstone, nearly horizontally bedded, many horizontal fractures.
		REC 100%									Very-soft to soft yellowish-brown arenaceous shale, nearly horizontally bedded, few horizontal and vertical fractures.
15	6	RQD 47%									
		REC 98%									Very-soft to soft reddish-brown shale, nearly horizontally bedded, many horizontal and vertical fractures.
20	7	RQD 96%									Soft reddish-brown shale, nearly horizontally bedded, occasional horizontal and vertical fractures.
25											
30											- Encountered seepage at 4.5'.
											- Encountered water at 6.0'.
35											
40											
45											

WATER LEVEL: ▽ 6.0 ▽ ▽ ▽ ▽ ▽
WATER NOTE:
DATE: 11/08/00

JOB: 01106405.002

DRAWN M.S.J. CHECKED E.M.K.

STRUCTURE FOUNDATION EXPLORATION
LAW-7-07.11

LAW-7-2.17

190/206

1231/1247

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 386+46, 23' RT.	EXPLORATION ID B-097-1-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP K	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 645.2 (MSL) EOB: 42.0 ft.	PAGE 1 OF 1
START: 6/29/21 END: 6/29/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449922, -82.376317	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM STIFF TO STIFF, RED WITH TAN, **CLAY**, TRACE GRAVEL, TRACE SAND, "AND" SILT, DAMP	645.2		3 3 3	8	33	SS-1	4.50	1	1	4	42	52	50	25	25	20	A-7-6 (16)	
	642.7	TR																
SANDSTONE, BLUISH GRAY, HIGHLY WEATHERED, MODERATELY STRONG, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS.			50/5"	-	100	SS-2	2.50	-	-	-	-	-	-	-	-	-	Rock (V)	
	639.7		50/5"	-	80	SS-3	-	-	-	-	-	-	-	-	-	7	Rock (V)	
CLAYSTONE, REDDISH BROWN, HIGHLY WEATHERED, WEAK, VERY FINE GRAINED, VERY THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 15%, REC 87%.	635.2		15		87	NQ2-1											CORE	
SANDSTONE, LIGHT BROWN TO GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, FRACTURED TO HIGHLY FRACTURED; RQD 0%, REC 88%.	630.2		0		88	NQ2-2											CORE	
RED, **FINE SAND**, LENSE	629.5		43		87	NQ2-3											CORE	
CLAYSTONE, LIGHT BROWN TO RED, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARENACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 43%, REC 87%.	624.7																	
SANDSTONE, LIGHT BROWN TO GRAY, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE TO FINE GRAINED, LAMINATED TO THIN BEDDED, MODERATELY FRACTURED; RQD 15%, REC 78%.	620.2		13		80	NQ2-4											CORE	
SANDSTONE, LIGHT BROWN TO GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, FRACTURED; RQD 13%, REC 73%.	615.2		13		73	NQ2-5											CORE	
CLAYSTONE, BLUISH GRAY TO PURPLE AND RED, MODERATELY TO HIGHLY WEATHERED, VERY WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED; RQD 41%, REC 94%.			33		95	NQ2-6											CORE	
			38		90	NQ2-7											CORE	
	603.2	EOB	67		100	NQ2-8											CORE	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: 50 LB. BENTONITE CHIPS; 150 LB. QUICKCRETE

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 388+62, 15' RT.	EXPLORATION ID B-098-1-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP K	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 681.7 (MSL) EOB: 85.0 ft.	PAGE 1 OF 2
START: 6/16/21 END: 6/18/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449686, -82.375614	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
HARD, LIGHT BROWN TO RED, **SANDY SILT**, TRACE GRAVEL, LITTLE CLAY, DRY	681.7	1	13 25 50	102	61	SS-1	-	-	-	-	-	-	-	-	-	7	A-4a (V)	
		3	5 21 50	97	67	SS-2	-	-	-	-	-	-	-	-	-	6	A-4a (V)	
		6	8 23 50	100	67	SS-3	-	8	10	20	47	15	32	22	10	5	A-4a (5)	
	673.7	TR 8	8 50/4"	-	100	SS-4	-	-	-	-	-	-	-	-	-	-	Rock (V)	
CLAYSTONE, RED, SEVERELY WEATHERED.	670.2	11	3 50/4"	-	70	SS-5	-	-	-	-	-	-	-	-	-	5	Rock (V)	
CLAYSTONE, LIGHT BROWN TO RED, MODERATELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, SLIGHTLY TO MODERATELY FRACTURED; RQD 37%, REC 91%.		13	40		79	NQ2-1											CORE	
		18	20		100	NQ2-2											CORE	
		23	0		80	NQ2-3											CORE	
		28	72		100	NQ2-4											CORE	
		33	58		100	NQ2-5											CORE	
		38	33		83	NQ2-6											CORE	
		43	33		90	NQ2-7											CORE	
	636.7	45																
BROWNISH RED, **FINE SAND**, LENSE	FS 635.2	46																
CLAYSTONE, BLUISH RED, HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, THIN BEDDED, ARGILLACEOUS, SLIGHTLY FRACTURED; RQD 75%, REC 92%.	632.9	48	43		100	NQ2-8											CORE	
SANDSTONE, GRAY/TAN/GREEN, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, SLIGHTLY FRACTURED; RQD 80%, REC 100%.	631.5	50																

BORING CONTINUES

(CONTINUED BORING)

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 388+62, 15' RT.	EXPLORATION ID B-098-1-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: RAMP K	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 681.7 (MSL) EOB: 85.0 ft.	PAGE 2 OF 2
START: 6/16/21 END: 6/18/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449686, -82.375614	

MATERIAL DESCRIPTION AND NOTES	ELEV. 631.5	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
(CONTINUED BORING) **CLAYSTONE**, RED WITH BLUE, HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 19%, REC 86%.	626.7	51–55	27		48	NQ2-9											CORE	
SANDSTONE, GRAY/TAN/GREEN, MODERATELY WEATHERED, WEAK, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 35%, REC 94%.	620.0	55–60	37		100	NQ2-10											CORE	
CLAYSTONE, RED, HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, VERY FRACTURED; RQD 18%, REC 90%.	612.7	60–65	30		80	NQ2-11											CORE	
		65–70	13		92	NQ2-12											CORE	
SANDSTONE, GRAY/TAN/GREEN, MODERATELY WEATHERED, WEAK, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED; RQD 61%, REC 73%.	610.7	70–75	57		100	NQ2-13											CORE	
CLAYSTONE, RED BROWN TO GRAY, MODERATELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 36%, REC 92%.	601.7	75–80	40		97	NQ2-14											CORE	
SANDSTONE, BLUISH GRAY, MODERATELY WEATHERED, WEAK, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED; RQD 43%, REC 90%.	596.7 EOB	80–85	43		90	NQ2-15											CORE	

NOTES: HOLE TERMINATED 5 FT SHORT DUE TO MECHANICAL ISSUES WITH THE RIG. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: 100 LB. BENTONITE CHIPS; 100 LB. QUICKCRETE

PROJECT: LAW - 7 - 2.17
TYPE: STRUCTURE
PID: 75923 BR ID:
START: 5/7/13 END: 5/7/13

DRILLING FIRM / OPERATOR: HORN / T.L.
SAMPLING FIRM / LOGGER: HORN / T.L.
DRILLING METHOD: 3.25" HSA / NQ
SAMPLING METHOD: SPT/ST/NQ

DRILL RIG: CME 55 TRACK
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 4/30/13
ENERGY RATIO (%): 85.9

STATION / OFFSET: 229+50, 170 RT
ALIGNMENT: MAINLINE
ELEVATION: 598.8 (MSL) EOB: 28.7 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-019-1-12
PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, DAMP TO MOIST	598.8	W	2 4 2	9	100	SS-1	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		2.5	2 4 11	21	100	SS-2	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		5.0	4 5 11	23	100	SS-3	-	-	-	-	-	-	-	-	-	37	A-6b (V)	
	589.8	7.5			46	ST-4	-	0	3	13	33	51	40	17	23	20	A-6b (13)	
VERY STIFF, BROWN, **CLAY**, SOME SILT, LITTLE SAND, DAMP TO MOIST		10.0	3 6 9	21	100	SS-5	-	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
		12.5			79	ST-6	-	0	7	4	26	63	50	23	27	23	A-7-6 (17)	
	584.3	TR																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).		15.0	10 24 30	77	100	SS-7	-	-	-	-	-	-	-	-	-	14	Rock (V)	
		17.5	11 50/2"	-	100	SS-8	-	-	-	-	-	-	-	-	-	15	Rock (V)	
	580.1																	
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, LAMINATED; RQD 0%, REC 33%.	578.3	20.0		63		77	NQ-1										CORE	
SANDSTONE, GRAY, UNWEATHERED, VERY STRONG, FINE GRAINED, THICK TO VERY THICK BEDDED; RQD 95%, REC 100%.		22.5																
		25.0		87		100	NQ-2										CORE	
	570.1	27.5 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 75 GAL. BENTONITE GROUT

PROJECT: LAW - 7 - 2.17
TYPE: STRUCTURE
PID: 75923 BR ID:
START: 5/8/13 END: 5/8/13

DRILLING FIRM / OPERATOR: HORN / T.L.
SAMPLING FIRM / LOGGER: HORN / T.L.
DRILLING METHOD: 3.25" HSA / NQ
SAMPLING METHOD: SPT/ST/NQ

DRILL RIG: CME 55 TRACK
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 4/30/13
ENERGY RATIO (%): 85.9

STATION / OFFSET: 229+70, 300 LT
ALIGNMENT: MAINLINE
ELEVATION: 618.6 (MSL) EOB: 24.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-019-2-12
PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **CLAY**, SOME SILT, TRACE SAND, DAMP TO MOIST	618.6		1 1 1	3	100	SS-1	-	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
		2.5	2 3 3	9	100	SS-2	-	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
		W 5.0			63	ST-3	-	0	2	4	30	64	41	20	21	17	A-7-6 (13)	
	611.1	7.5																
VERY STIFF TO HARD, DARK BROWN, **SILTY CLAY**, SOME STONE FRAGMENTS AND SAND, DAMP TO MOIST			3 5 6	16	100	SS-4	-	-	-	-	-	-	-	-	-	20	A-6b (V)	
		10.0	4 12 16	40	100	SS-5	-	25	10	11	24	30	37	19	18	18	A-6b (7)	
	606.1	TR 12.5																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	604.6		20 50/2"	-	100	SS-6	-	-	-	-	-	-	-	-	-	10	Rock (V)	
SHALE, GRAY TO RED, SLIGHTLY WEATHERED, WEAK TO MODERATELY STRONG, LAMINATED TO THIN BEDDED; RQD 75%, REC 96%.		15.0		72		92	NQ-1										CORE	
		17.5																
		20.0		78		100	NQ-2										CORE	
	594.6	22.5 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 50 GAL. BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 184+20, 260 LT	EXPLORATION ID B-008-1-12
TYPE: STRUCTURE	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 650.5 (MSL) EOB: 28.7 ft.	PAGE 1 OF 1
START: 5/8/13 END: 5/9/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF, BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP	650.5		2 3 3	9	100	SS-1	-	15	9	22	28	26	32	21	11	18	A-6a (4)	
		2.5	50/5"	-	100	SS-2	-	-	-	-	-	-	-	-	-	16	A-6a (V)	
	645.5	W																
VERY STIFF TO HARD, RED AND BROWN, **CLAY**, AND SILT, TRACE GRAVEL AND SAND, DAMP		5.0	3 6 6	17	100	SS-3	-	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
		7.5	6 13 13	37	100	SS-4	-	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
		10.0	6 13 15	40	100	SS-5	-	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
		12.5	11 16 17	47	100	SS-6	-	9	2	6	42	41	41	19	22	14	A-7-6 (13)	
	633.5	15.0 TR	16 27 29	80	100	SS-7	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	631.8	17.5	25 50	-	100	SS-8	-	-	-	-	-	-	-	-	-	10	Rock (V)	
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, ARENACEOUS; RQD 89%, REC 99%.		20.0	80		100	NQ-1											CORE	
		22.5																
		25.0	98		98	NQ-2											CORE	
	621.8	27.5 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 50 GAL. BENTONITE GROUT

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

LOG OF BORING NO. S-102
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; 5-7/8" Diamter Tricone Bit; 4" Diameter Casing; NX Rock Core Barrel
LOCATION: Sta. 394+81.03, 209.7' L of proposed SR 7 centerline
COMPLETION DEPTH: 36.0' ELEVATION: 650.1 DATE: 7/9/99 - 7/13/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												Hard brown silty clay, trace fine to coarse sand, trace fine gravel, similar to very-soft shale.
	1		7 /9/40									Est. A-7-6
5												BOULDER: Medium-hard brown fine-grained sandstone, well cemented, micaceous, pyritic, nearly vertically bedded.
	2		50-0"R NX REC 60% RQD 0%									Visual/ Very-stiff to hard reddish-brown silty clay, trace fine to coarse sand, trace fine to coarse gravel, similar to very-soft shale, contains few sandstone fragments.
10												
	3		6 /10/15	4.5+	12	37	19					
15												Est. A-6b
	4		50-4"R NX REC 55% RQD 55%									Soft to medium-hard brown, red and green shale, nearly horizontally bedded, interbedded with siltstone, few vertical fractures, few sand-filled desiccation cracks.
20	5											
	6		REC 90% RQD 73%									Visual
25			REC 73% RQD 22%									Soft gray shale, nearly horizontally bedded, highly fractured, partly similar to hard silty clay.
30	7											Visual
35												- Topsoil stripped for rig access.
40												

WATER LEVEL: ▽ ▽ ▽ ▽ ▽ ▽
WATER NOTE:
DATE:

ODOT LI 44052 | BBC&M GDT 1/29/99
JOB: 6405.2

PLATE 3

LOG OF BORING NO. S-103
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 1 of 1

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler
LOCATION: Sta. 403+44.51, 185.05' L of proposed SR 7 centerline
COMPLETION DEPTH: 30.0' ELEVATION: 645.9 DATE: 8/3/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												Hard reddish-brown silty clay, little fine to coarse sand, trace fine gravel, contains few sandstone and shale fragments.
	1		7 /9/9	4.5+								
5	2		7 /12/20	4.5+								
	3		5 /11/10	4.5+	14	43	25	3	3	3	32 59	
10	4		7 /18/24	4.5+								A-7-6(12)
15												Soft to medium-hard brown and green shale, nearly horizontally bedded, fractured.
	5		50-5"R									Visual
20												Medium-hard gray fine-grained sandstone, well cemented, micaceous.
	6		180-4"R									Visual
25												Soft to medium-hard brown, red and green shale, nearly horizontally bedded, highly fractured.
30	7		100-5"R									Visual
35												- No seepage encountered.

WATER LEVEL: ▽ "Dry" ▽ ▽ ▽ ▽ ▽
WATER NOTE:
DATE: 8/3/99

ODOT LI 44052 | BBC&M GDT 1/29/99
JOB: 6405.2

PLATE 4

LOG OF BORING NO. S-104
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 417+86.56, 226.07' L of proposed SR 7 centerline
COMPLETION DEPTH: 45.0' ELEVATION: 676.8 DATE: 8/4/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0												Hard brown and reddish-brown mottled with gray silty clay, little to some fine to medium sand, trace coarse sand, trace fine gravel, few shale fragments, few roots near top of stratum.
	1		5 /20/22	4.5+								
5	2		10/28/20	4.5+	14	41	23	0	16	10	30 44	
	3		3 /10/16	4.5+								A-7-6(11)
10												Very-soft reddish-brown shale, nearly horizontally bedded, highly fractured.
	4		50-5"R NQ REC 87% RQD 77%									Visual
15												Medium-hard brown and gray fine-grained sandstone, well cemented, nearly horizontally bedded, partly micaceous, contains iron oxide staining.
20	5											Visual
												Very-soft to soft gray interbedded with reddish-brown shale, nearly horizontally bedded, few horizontal and vertical fractures, few layers of soft to medium-hard shale, similar to soil at 30.5'.
25			REC 89% RQD 73%									
	6											Visual
30			REC 58% RQD 43%									Soft to medium-hard brown and gray siltstone, nearly horizontally bedded, interbedded with fine-grained sandstone, micaceous, iron oxide staining.
35	7											
40												Visual

WATER LEVEL: ▽ "Dry" ▽ ▽ ▽ ▽ ▽
WATER NOTE:
DATE: 8/4/99

ODOT LI 44052.GPJ BBC&M GDT 1/29/99
JOB: 6405.2

-CONTINUED-

PLATE 5

DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE LAW-7

LAW-7-2.17

193/206

1234/1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

LOG OF BORING NO. S-104
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO
Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 417+86.56, 226.07' L of proposed SR 7 centerline
COMPLETION DEPTH: 45.0' ELEVATION: 676.8 DATE: 8/4/99

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
40											Soft to medium-hard brown and gray siltstone, nearly horizontally bedded, interbedded with fine-grained sandstone, micaceous, iron oxide staining.
	8	REC 98% RQD 98%									Visual
45											Soft to medium-hard gray siltstone, nearly horizontally bedded, slightly micaceous.
											Visual
50											- No seepage encountered.
55											
60											
65											
70											
75											
80											

WATER LEVEL: "Dry"
WATER NOTE:
DATE: 8/4/99

ODOTLJ 64352.GPJ BBCM.GDT 12/7/99
JOB: 6405.2
PLATE 6

LOG OF BORING NO. S-105
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO
Page 1 of 4

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 434+93.55, 421.63' L of proposed SR 7 centerline
COMPLETION DEPTH: 111.2' ELEVATION: 796.2 DATE: 7/16/99 - 7/22/99

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0											TOPSOIL - 6 INCHES
	1	4 9/10	4.0-4.5								Hard brown and reddish-brown silty clay, little fine to medium sand, trace coarse sand, trace fine gravel, few cobbles, few roots, desiccated.
5											Est. A-7-6
	2	15/24/39	4.0-4.5								Hard brown silty clay, trace fine to medium sand, similar to very-soft shale, contains few sandstone fragments, desiccated.
10	3	14/20/20	4.0-4.5								Est. A-7-6
											Hard reddish-brown silty clay, trace fine to coarse sand, similar to very-soft shale, desiccated.
15	4	25/ 50-4"R	4.0-4.5								Est. A-7-6
											Very-soft brown shale, nearly horizontally bedded, highly fissile, many horizontal and vertical fractures, micaceous.
20	5	44/ 50-4"R									Visual
											Very-soft brown and gray shale, nearly horizontally bedded, highly fissile, many horizontal fractures, slightly micaceous, few slickensides.
25	6	22/35/ 50-1"R	4.0-4.5								Visual
											Soft to medium-hard black coal, highly fractured.
30	7A 7B	30/35/ 50-4"R	4.0-4.5								#9? Meigs Creek
											Visual
35	8	50-2"R									Very-soft to soft gray shale, nearly horizontally bedded, fissile, few slickensides, slightly micaceous, few thin seams of soft sandstone and siltstone.
											Visual

WATER LEVEL:
WATER NOTE:
DATE:

ODOTLJ 64352.GPJ BBCM.GDT 12/7/99
JOB: 6405.2
-CONTINUED-
PLATE 7

LOG OF BORING NO. S-105
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO
Page 2 of 4

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 434+93.55, 421.63' L of proposed SR 7 centerline
COMPLETION DEPTH: 111.2' ELEVATION: 796.2 DATE: 7/16/99 - 7/22/99

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
35											Very-soft to soft gray shale, nearly horizontally bedded, fissile, few slickensides, slightly micaceous, few thin seams of soft sandstone and siltstone.
	9	50-2"R									Visual
40											Very-soft to soft gray and red shale, nearly horizontally bedded, similar to hard silty clay, many horizontal fractures.
	10	50-5"R									Visual
45											Very-soft to soft brown and gray shale, interbedded with medium-hard siltstone, nearly horizontally bedded, fragmental structure from 61.2' to 66.2', few diagonal fractures, slightly micaceous.
	11	50-4"R									Visual
50											Medium-hard gray siltstone, interbedded with fine-grained sandstone, nearly horizontally bedded, well cemented.
	12	43/ 50-3"R									Visual
55		NQ REC 85% RQD 25%									
60	13										
		REC 70% RQD 0%									
65	14										
		REC 50% RQD 28%									
70	15										

WATER LEVEL:
WATER NOTE:
DATE:

ODOTLJ 64352.GPJ BBCM.GDT 12/7/99
JOB: 6405.2
-CONTINUED-
PLATE 8

DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE
LAW-7

LAW-7-2.17

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

LOG OF BORING NO. S-105
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 3 of 4

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 434+93.55, 421.63' L of proposed SR 7 centerline
COMPLETION DEPTH: 111.2' ELEVATION: 796.2 DATE: 7/16/99 - 7/22/99

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
70											Medium-hard gray siltstone, interbedded with fine-grained sandstone, nearly horizontally bedded, well cemented. Visual
75											Medium-hard gray fine-grained sandstone, nearly horizontally bedded, well cemented, micaceous. Visual
80	16	REC 0% RQD 0%									Soft to medium-hard brown and gray shale, nearly horizontally bedded, highly fractured, micaceous, thinly bedded. Visual
85	17	REC 83% RQD 57%									Soft to medium-hard gray shale, interbedded with siltstone, nearly horizontally bedded, micaceous, few horizontal fractures. Visual
90											Medium-hard brown and gray argillaceous limestone, massive, partly crystalline structure, few horizontal and vertical fractures. Visual
95	18	REC 94% RQD 59%									Soft to medium-hard brown and gray shale, interbedded with siltstone, few horizontal fractures, few vertical and diagonal fractures from 96.4' to 99.2', iron oxide stained fractures, slightly micaceous. Visual
100											Medium-hard gray siltstone, nearly horizontally bedded, few horizontal fractures, partly micaceous. Visual
105	19	REC 57% RQD 26%									SEE DESCRIPTION ON NEXT PAGE

WATER LEVEL:
WATER NOTE:
DATE:

ODOTLJ 6405S.GPJ BBCM.GDT 12/7/99

JOB: 6405.2

-CONTINUED-

PLATE 9

LOG OF BORING NO. S-105
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 4 of 4

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NQ Rock Core Barrel
LOCATION: Sta. 434+93.55, 421.63' L of proposed SR 7 centerline
COMPLETION DEPTH: 111.2' ELEVATION: 796.2 DATE: 7/16/99 - 7/22/99

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
105											Soft red interbedded with gray shale, nearly horizontally bedded, few horizontal fractures, few slickensides. Visual
110	2										- Encountered water at 60.0'. - Boring abandoned at 111.2' when air return was lost because of swelling shales below 60.0'.
115											
120											
125											
130											
135											
140											

WATER LEVEL:
WATER NOTE:
DATE:

ODOTLJ 6405S.GPJ BBCM.GDT 12/7/99

JOB: 6405.2

PLATE 10

LOG OF BORING NO. S-105A
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 1 of 3

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; 5-7/8" Tricone Bit; 4" Diameter Casing; NQ Rock Core Barrel
LOCATION: Sta. 434+54.72, 9.64' L of proposed SR 7 centerline
COMPLETION DEPTH: 98.0' ELEVATION: 693.7 DATE: 7/26/99 - 8/2/99

DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
0	1	18/13/26	4.5+								Hard brown and reddish-brown mottled with gray silty clay, little to some fine to medium sand, trace coarse sand, trace fine gravel, few sandstone and shale fragments.
5	2										A-6b(10)
10	3	9/9/7	4.5+	13	39	22	0	17	11	24	48 Very-soft to soft brown and reddish-brown shale, nearly horizontally bedded, fissile. Visual
15	4	50-5"R									Medium-hard brown and gray fine-grained sandstone, interbedded with siltstone, nearly horizontally bedded, well cemented, highly fractured from 18.3' to 18.5', micaceous, partly massive, iron oxide staining.
20	5	NQ REC 51% RQD 47%									Visual
25	6	REC 72% RQD 25%									Very-soft to soft red shale, interbedded with medium-hard siltstone, nearly horizontally bedded, partly similar to hard silty clay, few horizontal fractures, contains slickensides. Visual
30	3	REC 78% RQD 69%									Medium-hard brown and gray siltstone, nearly horizontally bedded, micaceous. Visual
35	7										Soft blue-gray shale, nearly horizontally bedded, few horizontal fractures, contains slickensides, iron oxide staining.

WATER LEVEL: 6.8
WATER NOTE: Caved at 23.3'
DATE: 6/30/99

ODOTLJ 1405S05.GPJ BBCM.GDT 2/13/00

JOB: 01106405.002

-CONTINUED-

PLATE 11

DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE
LAW-7

LAW-7-2.17

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

LOG OF BORING NO. S-105A
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 2 of 3

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; 5-7/8" Tricone Bit; 4" Diameter Casing; NQ Rock Core Barrel
LOCATION: Sta. 434+54.72, 9.64' L of proposed SR 7 centerline
COMPLETION DEPTH: 98.0' ELEVATION: 693.7 DATE: 7/26/99 - 8/2/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION - CONTINUED
35												Soft blue-gray shale, nearly horizontally bedded, few horizontal fractures, contains slickensides, iron oxide staining. Visual
40	8		REC 83% RQD 78%									Medium-hard brown and gray siltstone, nearly horizontally bedded, few horizontal fractures, iron oxide staining, vertical fracture from 36.4' to 36.9'. Visual
												Medium-hard brown and gray fine-grained sandstone, interbedded with siltstone, well cemented, few horizontal fractures, iron oxide staining, highly fractured from 42.7' to 43.1', partly micaceous. Visual
45												Soft to medium-hard gray and brown shale, nearly horizontally bedded, few horizontal and vertical fractures. Visual
50	9		REC 90% RQD 53%									Medium-hard gray fine to medium-grained sandstone, nearly horizontally bedded, well cemented, partly micaceous. Visual
55												Soft to medium hard gray and red shale, interbedded with siltstone, nearly horizontally bedded, few horizontal and vertical fractures, highly fractured from 52.0' to 52.5', 53.8' to 54.0', and 55.4' to 56.3'. Visual
60	10		REC 61% RQD 0%									Very-soft to soft red interbedded with gray shale, nearly horizontally bedded, partly similar to hard silty clay, few slickensides, highly fractured, few thin layers of siltstone and argillaceous limestone.
			REC 13% RQD 0%									
65	11											Visual
70												

WATER LEVEL: ▽ 6.8
WATER NOTE: Caved at 23.3'
DATE: 6/30/99

ODOTLJ 1440593.GPJ BBCM.GDT 3/13/09
JOB: 01106405.002

-CONTINUED-

PLATE 12

LOG OF BORING NO. S-105A
PHASE 2 SUBSURFACE INVESTIGATION, LAW-7-3.669
LAWRENCE COUNTY, OHIO

Page 3 of 3

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; 5-7/8" Tricone Bit; 4" Diameter Casing; NQ Rock Core Barrel
LOCATION: Sta. 434+54.72, 9.64' L of proposed SR 7 centerline
COMPLETION DEPTH: 98.0' ELEVATION: 693.7 DATE: 7/26/99 - 8/2/99

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION - CONTINUED
70	12		REC 40% RQD 13%									Very-soft to soft red interbedded with gray shale, nearly horizontally bedded, partly similar to hard silty clay, few slickensides, highly fractured, few thin layers of siltstone and argillaceous limestone.
75												
80	13		REC 40% RQD 15%									
85	14		REC 23% RQD 5%									Visual
90												Encountered water at 24'
95												Encountered water at 53'.
100												
105												

WATER LEVEL: ▽ 6.8
WATER NOTE: Caved at 23.3'
DATE: 6/30/99

ODOTLJ 1445593.GPJ BBCM.GDT 3/13/09
JOB: 01106405.002

PLATE 13

LOG OF BORING NO. SL-1
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 421+67.9, 55.5' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 58.0' ELEVATION: 615.7 DATE: 1/7/04 - 1/8/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
615.7	0												Hard gray mottled with reddish-brown silty clay, some fine to coarse sand, little fine to coarse gravel (shale and siltstone fragments).
612.7	3.0	1		6 / 8 / 9	4.5+								Est. A-6b
	5	2		2 / 4 / 6	3.5-4.5+	17							Very-stiff to hard reddish-brown mottled with brown silty clay, some fine to coarse sand, some fine to coarse gravel (shale and siltstone fragments), few cobbles.
609.2	6.5												Est. A-6a
		3		2 / 5 / 5	1.2-2.3	18	41	23	9	16	9	66	Stiff to very-stiff reddish-brown silty clay, some fine to coarse sand, trace fine to coarse gravel (shale and siltstone fragments).
605.7	10.0												A-7-6 (10)
	10	4A		2 / 3 / 3	1.7-3.5	18							Stiff to very-stiff reddish-brown mottled with brown silty clay, little to some fine to coarse sand, little to some fine to coarse gravel (shale fragments).
		4B			1.8-2.0								
		5		2 / 4 / 5	1.9-3.5								
601.7	14.0												Est. A-6b
600.6	15.1	6		40 / 50-2"R									Very-dense brown fine to coarse gravel, some fine to coarse sand, trace silt, trace clay, similar to highly fractured shale bedrock.
				NX REC 94% RQD 70%									Est. A-1-b
	20	7		REC 100% RQD 81%									Very-soft to soft light-brown and gray shale interbedded with medium-hard siltstone, nearly horizontally bedded, many diagonal fractures, nearly vertical clay filled fracture from 15.1' to 15.2'. - Qu = 125.9 psi from 20.0' to 20.6'.
	25	8											
585.7	30.0			REC 99% RQD 76%									Visual
													Very-soft to soft reddish-brown shale, fragmental structure, similar to hard silty clay, many diagonal fractures. - Qu = 63.0 psi from 31.4' to 32.0'.
580.7	35.0												Visual

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/08/04

ODOTLJ 1057909.GPJ BBCM.GDT 3/13/09
JOB: 011-09375-000

-CONTINUED-

PLATE 4

DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE
LAW-7

LAW-7-2.17

196/206

1237
1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

BBCM

LOG OF BORING NO. SL-1
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 421+67.9, 55.5' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 58.0' ELEVATION: 615.7 DATE: 1/7/04 - 1/8/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
	35	9											Soft to medium-hard light-brown shale interbedded with siltstone, contains thin seams of argillaceous limestone at 38.4' and 40.3', nearly horizontally bedded, many diagonal fractures, shale has partly fragmental structure.
	40			REC 98% RQD 81%									
	45	10											
565.7	50	11		REC 88% RQD 79%									50.0 Visual Very-soft to soft gray and reddish-gray shale, fragmental structure, many diagonal fractures.
	55	12		REC 71% RQD 50%									
557.7	60												58.0 Visual
	65												- Encountered cobble from 3.5' to 4.0'. - Installed 60' of inclinometer casing with 3.2' of stickup. - No seepage encountered prior to coring rock.
	70												

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/08/04

JOB: 011-09575-000

PLATE 5

BBCM

LOG OF BORING NO. SL-2
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 424+50.4, 45.6' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 55.0' ELEVATION: 592.8 DATE: 1/8/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION
	0												Loose gray and reddish-brown fine to coarse gravel (shale fragments), some fine to coarse sand, some silty clay.
589.8		1		1/1/3		8							3.0 Est. A-2-4
	5	2A		4/8/9	4.5+	13	38	26	12	28	12	48	Medium-dense brown and gray fine to coarse sand, "and" silty clay, little fine gravel (shale fragments), contains few roots. A-6a (3)
587.8		2B				14							5.0 Hard reddish-brown mottled with brown silty clay, some fine to coarse sand, some fine to coarse gravel (shale fragments).
586.3		3		2/4/6	2.0-3.8	21	56	25	0	12	8	80	6.5 Est. A-6a Very-stiff reddish-brown silty clay, little fine to medium sand, trace coarse sand, trace fine gravel (shale fragments).
	10	4		2/3/5	2.2-3.6	19							
580.3		5A		2/10/17	3.3-3.5								12.5 A-7-6 (19)
		5B			4.5+								Hard brown silty clay interbedded with silt, trace fine to medium sand, similar to very-soft shale.
578.3	15	6		50-2"R									14.5 Est. A-7-6
				NX REC 90% RQD 42%									Very-soft to medium-hard yellow-brown shale interbedded with siltstone, nearly horizontally bedded, shale has fragmental structure, contains few thin seams of well cemented fine-grained sandstone and limestone, many diagonal fractures, micaceous.
	20	7		REC 97% RQD 87%									
		8		REC 98% RQD 77%									
567.9	25												24.9 Visual Very-soft to medium-hard reddish-brown and gray shale interbedded with siltstone, fragmental structure, many diagonal fractures, contains many limestone nodules throughout.
537.8	30	9											Visual

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/08/04

JOB: 011-09575-000

-CONTINUED-

PLATE 6

BBCM

LOG OF BORING NO. SL-2
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 424+50.4, 45.6' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 55.0' ELEVATION: 592.8 DATE: 1/8/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY	DESCRIPTION - CONTINUED
	30												Very-soft to medium-hard reddish-brown and gray shale interbedded with siltstone, fragmental structure, many diagonal fractures, contains many limestone nodules throughout.
		10		REC 100% RQD 100%									
	35												
	40			REC 97% RQD 75%									
	45	11											
	50			REC 90% RQD 80%									
537.8	55	12											55.0 Visual - No seepage encountered prior to coring rock.
	60												

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/08/04

JOB: 011-09575-000

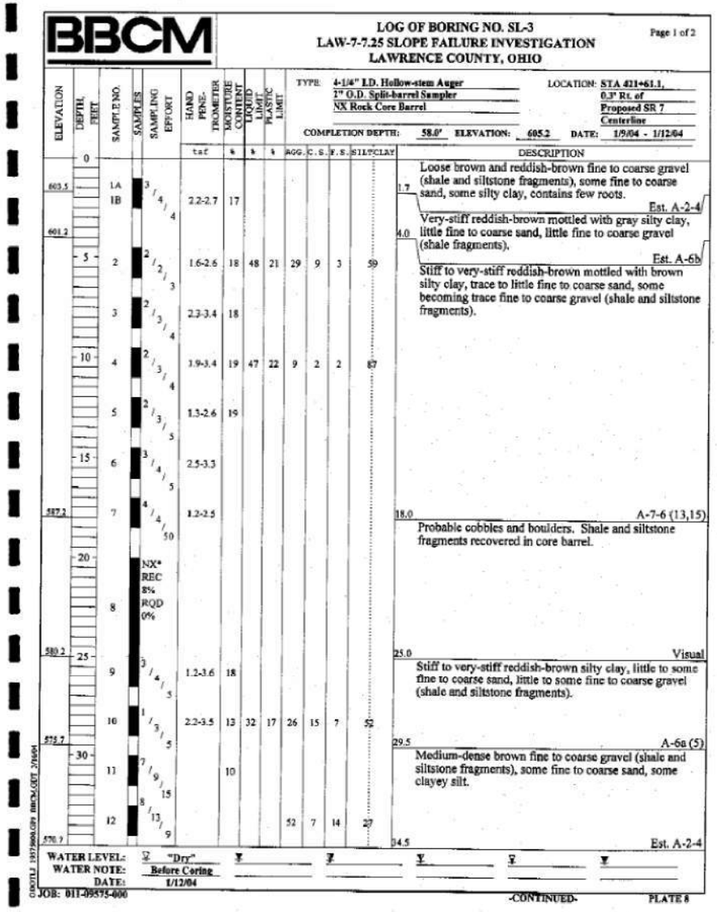
PLATE 7

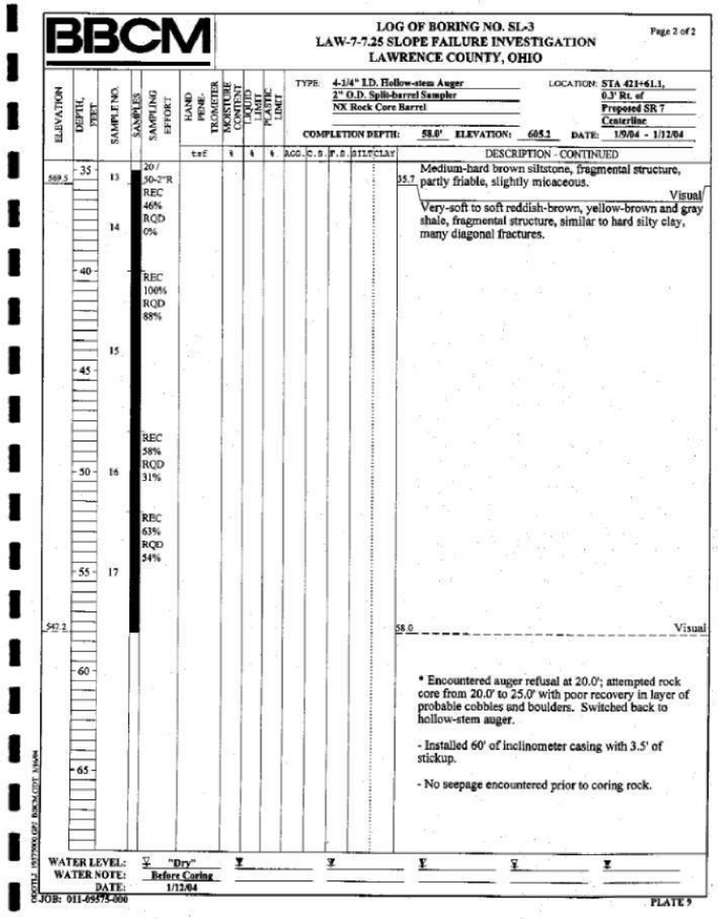
DRAWN MSJ
CHECKED EMK

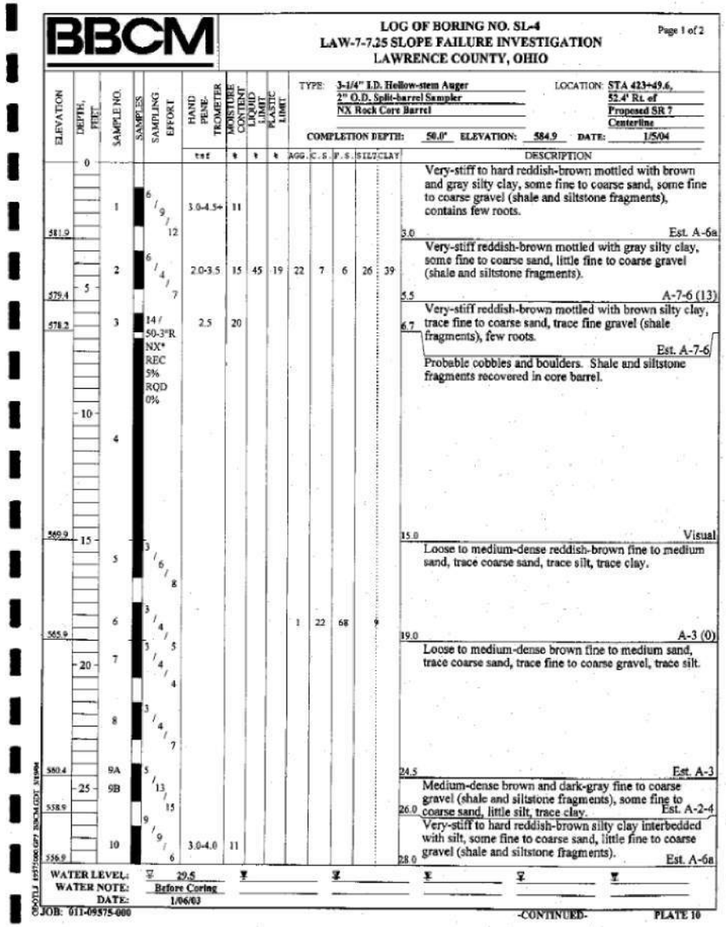
GEOTECHNICAL EXPLORATION - LANDSLIDE
LAW-7

LAW-7-2.17

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS







DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE LAW-7

LAW-7-2.17

198/206

1239
1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

BBCM

LOG OF BORING NO. SL-4
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 3-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 423+49.6, 52.4' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 50.0' ELEVATION: 584.9 DATE: 1/5/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION - CONTINUED
	30	11		2/6/14	4.5+	15	39	22	0	0	3	41	56 Hard reddish-brown mottled with brown and gray silty clay, trace fine to coarse sand, trace fine gravel (shale and siltstone fragments), desiccated.
552.4		12		14/26/40	4.5+	11							32.5 A-6b (11) Very-soft to soft reddish-brown shale, fragmental structure, similar to hard silty clay, many diagonal fractures, contains few limestone nodules, soft to medium-hard shale from 35.9' to 44.0'.
	35	13		REC 100% RQD 60%									
	40	14		REC 100% RQD 61%									
	45	15		REC 100% RQD 13%									
534.9	50												50.0 Visual
	55												

* Encountered auger refusal at 7.0'; attempted rock core from 7.0' to 15.0' with poor recovery in probable layer of cobbles and boulders. Switched back to hollow-stem auger.

- Encountered water at 26.8'.

WATER LEVEL: ▽ 29.5
WATER NOTE: Before Coring
DATE: 1/06/03

JOB: 011-09575-000

PLATE 11

BBCM

LOG OF BORING NO. SL-5
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; Shelby Tube Sampler; NX Rock Core Barrel
LOCATION: STA 422+45.8, 115.9' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 70.0' ELEVATION: 571.3 DATE: 1/6/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
	0												FILL: Loose to medium-dense gray and brown fine to coarse gravel (shale and siltstone fragments), some fine to coarse sand, little to some silty clay.
	5	1		6/5/9									
		2		P* 50-3"R									
		3		3/3/4									
562.8													8.5 Est. A-2-4
560.8	10	4		3/4/5	1.7-3.0	11	34	20	30	13	6	43	8 FILL: Stiff to very-stiff reddish-brown mixed with gray and brown silty clay, some fine to coarse sand, little fine to coarse gravel (shale fragments).
		5		1/3/4	1.5-2.0	22							10.5 A-6a (5) FILL: Stiff dark-brown mottled with light-brown and reddish-brown silty clay, little to some fine to coarse sand, trace to little fine to coarse gravel (shale fragments).
	15	6		P	1.0-2.0	30	51	26	16	10	6	26	42
555.3													16.0 A-7-6 (14) Stiff reddish-brown and brown silty clay, little to some fine to coarse sand, little fine gravel.
		7		1/2/4	1.5+2.0	21							
	20	8		2/3/4									21.0 Est. A-7-6 Very-loose to loose reddish-brown fine to coarse sand, trace fine gravel, trace silt, contains few thin seams of soft to medium-stiff silty clay.
550.3													
		9		1/1/3									
	25	10		2/3/5					4	34	58	4	26.0 A-3a (0) Medium-dense brown and dark-brown fine to medium sand, trace coarse sand, "and" fine to coarse gravel, trace silt.
545.3													
		11		2/6/5									
		12		1/2/14									
540.8	30												30.5 Est. A-1-b Stiff to very-stiff reddish-brown mottled with brown and gray silty clay, little to some fine to coarse sand, some fine to coarse gravel (shale and siltstone fragments).
		13		2/4/5	2.0-3.5	16							
		14		3/4/6	1.9-2.5	15	37	21	29	8	6	27	30
535.3	35												36.0 A-6b (7) Hard reddish-brown and gray silty clay, little fine to coarse sand, similar to very-soft shale.
		15		8/12/19	4.5+	14							
532.3													39.0 Est. A-7-6
530.8	40	17		44/40									40.5 Very-soft reddish-brown and brown shale, fragmental structure, similar to hard silty clay. Visual

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/07/04

JOB: 011-09575-000

-CONTINUED-

PLATE 12

BBCM

LOG OF BORING NO. SL-5
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; Shelby Tube Sampler; NX Rock Core Barrel
LOCATION: STA 422+45.8, 115.9' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 70.0' ELEVATION: 571.3 DATE: 1/6/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION - CONTINUED
	45	18		NX REC 100% RQD 87%		0							Very-soft to soft gray shale, fragmental structure, similar to hard silty clay, many diagonal fractures. - Qu = 99.9 psi from 42.5' to 43.0'.
526.5													44.8 Visual Hard gray fine to medium-grained sandstone, nearly horizontally bedded, well cemented, micaceous.
	50	19		REC 100% RQD 100%									
	55	20		REC 100% RQD 100%									
	60			REC 100% RQD 100%									
	65	21											
501.3	70												70.0 Visual
	75												
	80												

* Attempt to push a shelby tube at 4.0' resulted in no recovery.

- Encountered slight seepage at 26.5'.

- Installed 70' of inclinometer casing with 1.1' of stickup.

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/07/04

JOB: 011-09575-000

PLATE 13

DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE LAW-7

LAW-7-2.17

199/206

1240/1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

LOG OF BORING NO. SL-6
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO
Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; Shelby Tube Sampler; NX Rock Core Barrel
LOCATION: STA 422+48.0, 164.3' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 53.2' ELEVATION: 555.2 DATE: 1/12/04 - 1/13/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
	0												Medium-stiff to stiff reddish-brown silty clay, little fine to coarse sand, some fine to coarse gravel (shale and siltstone fragments), contains few roots.
552.2		1		1/3/4	0.9-1.4	23							3.0 Est. A-6b
	5	2		P 50-400 PSI	1.2-1.5	21 20 24	46	21	1	5	7	29 58	Stiff reddish-brown silty clay, trace to little fine to coarse sand, trace fine gravel (shale fragments).
548.7		3		2/4/3	1.3-1.5	20							6.5 A-7-6 (15)
	10	4		1/3/4	1.2-1.8								Stiff reddish-brown mottled with brown silty clay, some fine to coarse sand, little fine to coarse gravel (shale and siltstone fragments).
544.2		5		1/4/4									11.0 Est. A-6a
	15	6		1/1/4						1	9	84 6	Very-loose to loose reddish-brown and brown fine to medium sand, trace coarse sand, trace fine gravel, trace silt.
		7		2/4/4									
	20	8		2/3/3									
		9		1/1/3									
530.1	25	10A		5/5/4									25.1 A-3 (0)
528.2		10B											Loose brown fine to coarse gravel, some fine to coarse sand, trace silt, contains few decayed roots.
		11		8/18/15		12				51	8	22 13 6	27.0 Est. A-1-b
526.2		12		3/5/9	2.4-3.3	14							Dense brown and dark-brown fine to coarse sand, "and" fine to coarse gravel (shale and siltstone fragments), little silt, trace clay. 29.0 A-1-b (0)
	30	13		4/7/8	3.0-3.9	14 33 21			19	6	6	41 28	Very-stiff reddish-brown mottled with gray silty clay, little fine to coarse sand, little fine to coarse gravel (shale fragments).
520.7													34.5 A-6a (8)

WATER LEVEL: ▽ 28.5
WATER NOTE: Before Coring
DATE: 1/13/04

JOB: 011-09575-000 -CONTINUED- PLATE 14

LOG OF BORING NO. SL-6
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO
Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; Shelby Tube Sampler; NX Rock Core Barrel
LOCATION: STA 422+48.0, 164.3' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 53.2' ELEVATION: 555.2 DATE: 1/12/04 - 1/13/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION - CONTINUED
	35	14		3/6/9		10							Medium-dense brown fine to coarse gravel (siltstone fragments), little fine to coarse sand, trace silty clay.
		15		50-5"R									39.2 Est. A-1-b
516.0	40	16		NX REC 100% RQD 100% REC 98% RQD 98%									Hard gray arenaceous siltstone interbedded with hard gray fine to medium-grained sandstone, nearly horizontally bedded, sandstone is well cemented, few diagonal fractures, micaceous.
	45	17											
	50												
502.0													53.2 Visual
	55												- Encountered slight seepage at 20.8'.
													- Encountered water at 22.5'.
	60												- Installed 55' of inclinometer casing with 3.2' of stickup.
	65												

WATER LEVEL: ▽ 28.5
WATER NOTE: Before Coring
DATE: 1/13/04

JOB: 011-09575-000 PLATE 15

LOG OF BORING NO. SL-7
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO
Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 423+70.2, 195.1' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 44.5' ELEVATION: 545.4 DATE: 1/13/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENETROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
544.9	0												0.5 TOPSOIL - 6 INCHES
543.7		1A		1/3/7	1.9-2.4								Stiff to very-stiff reddish-brown and dark-gray silty 1.7 clay, little fine to coarse sand, little fine to coarse gravel (shale and siltstone fragments). Est. A-6b
	5	1B											Loose to medium-dense reddish-brown and brown fine to medium sand, trace coarse sand, trace fine gravel, trace silt, contains few decayed roots from 9.5' to 9.9'.
		2		5/5/6						3	19	71 7	
		3		2/4/7									
	10	4		2/5/3									
533.4		5		1/2/2									12.0 A-3 (0)
	15	6		5/W/1						0	7	84 9	Very-loose brown fine to medium sand, trace coarse sand, trace fine gravel, trace silt.
528.0		7A		1/3/3									17.4 A-3 (0)
	20	7B											Loose to medium-dense brown fine to coarse gravel, some fine to coarse sand, little silt, trace clay.
523.9		8		2/5/10									21.5 Est. A-1-b
		9		6/8/9									Medium-dense gray and brown fine to coarse gravel (shale and siltstone fragments), little to some fine to coarse sand, some silty clay.
520.3	25	10A		5/7/9	3.2-4.3	15							25.1 Est. A-2-4
518.4		10B				18	40	23	6	3	7	40 44	Very-stiff to hard reddish-brown mottled with brown silty clay, little fine to coarse sand, trace fine gravel (shale fragments). 27.0 A-6b (11)
		11		7/7/8		13							Medium-dense reddish-brown and brown fine to coarse gravel (shale and siltstone fragments), some fine to coarse sand, little to some silty clay.
	30	12		4/6/7									
512.4													32.0 Est. A-2-4

WATER LEVEL: ▽ 18.0
WATER NOTE: Before Coring
DATE: 1/13/04

JOB: 011-09575-000 -CONTINUED- PLATE 16

DRAWN MSJ
CHECKED EMK

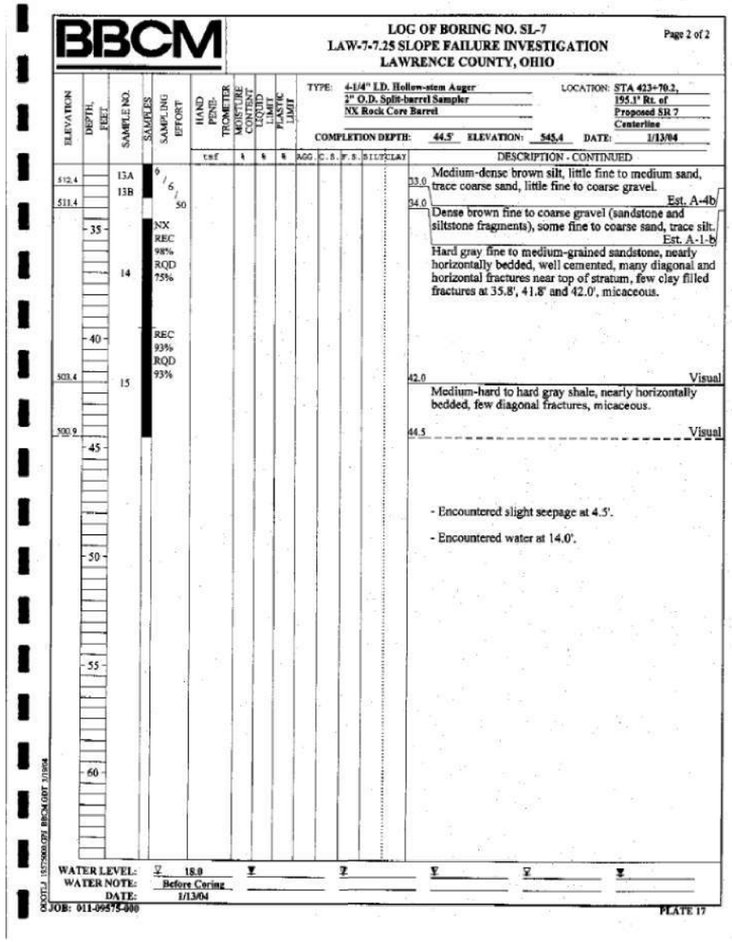
GEOTECHNICAL EXPLORATION - LANDSLIDE LAW-7

LAW-7-2.17

200/206

1241/1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS



BBCM

LOG OF BORING NO. SL-7
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 423+70.2, 195.3' Rt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 44.5' ELEVATION: 545.4 DATE: 1/13/04

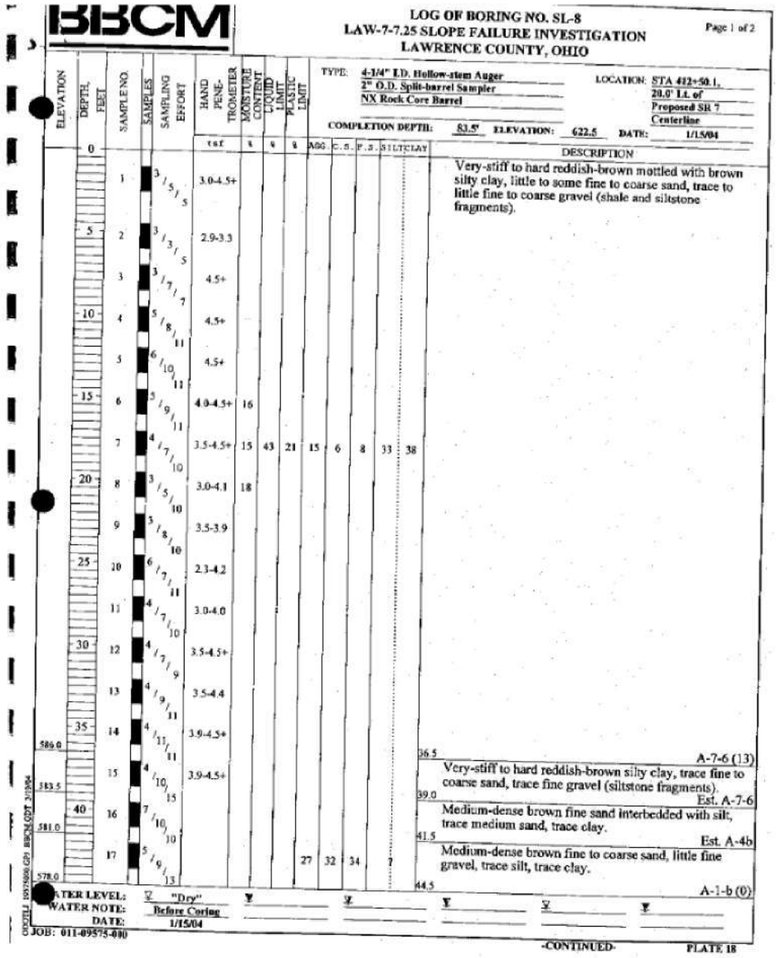
DESCRIPTION - CONTINUED

33.0 — Medium-dense brown silt, little fine to medium sand, trace coarse sand, little fine to coarse gravel. Est. A-4b
34.0 — Dense brown fine to coarse gravel (sandstone and siltstone fragments), some fine to coarse sand, trace silt. Est. A-1-b
Hard gray fine to medium-grained sandstone, nearly horizontally bedded, well cemented, many diagonal and horizontal fractures near top of stratum, few clay filled fractures at 35.8', 41.8' and 42.0', micaceous.
NX REC 98% RQD 75%
REC 93% RQD 93%
42.0 — Visual
Medium-hard to hard gray shale, nearly horizontally bedded, few diagonal fractures, micaceous.
44.5 — Visual

- Encountered slight seepage at 4.5'.
- Encountered water at 14.0'.

WATER LEVEL: 18.0
WATER NOTE: Before Coring
DATE: 1/13/04
JOB: 011-09575-000

PLATE 17



BBCM

LOG OF BORING NO. SL-8
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 412+50.1, 20.0' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 83.5' ELEVATION: 622.5 DATE: 1/15/04

SAMPLE NO.	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY
1	3.0-4.5+							
2	2.9-3.3							
3	4.5+							
4	4.5+							
5	4.0-4.5+	16						
6	3.5-4.5+	15	43	21	15	6	8	33 38
7	3.0-4.1	18						
8	3.5-3.9							
9	2.3-4.2							
10	3.0-4.0							
11	3.5-4.5+							
12	3.5-4.4							
13	3.9-4.5+							
14	3.9-4.5+							
15								
16								
17								

DESCRIPTION

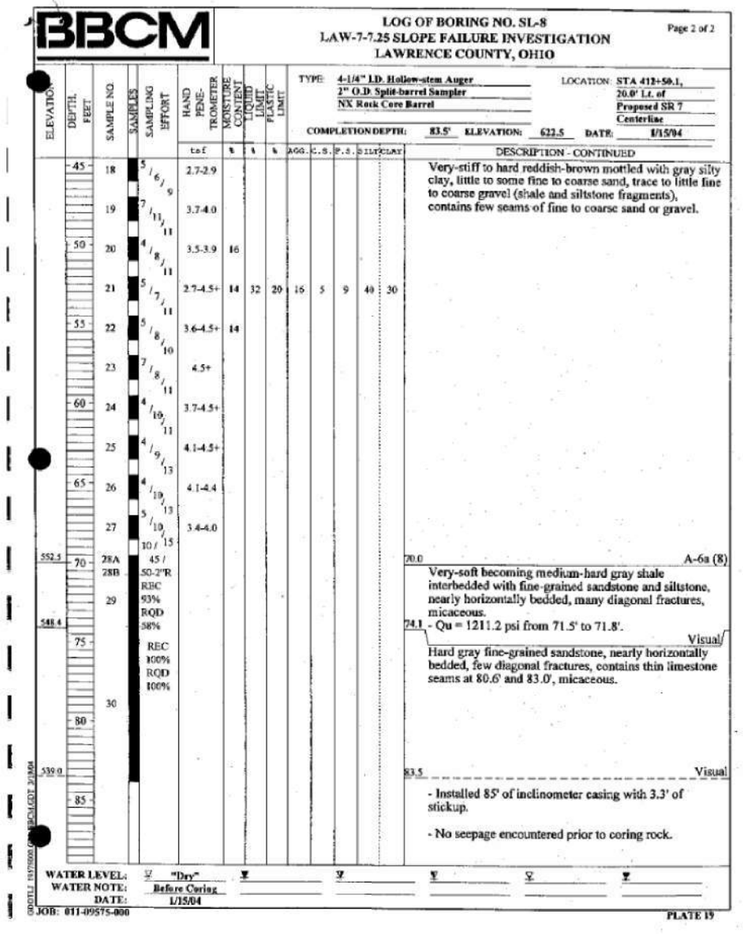
Very-stiff to hard reddish-brown mottled with brown silty clay, little to some fine to coarse sand, trace to little fine to coarse gravel (shale and siltstone fragments).

36.5 — A-7-6 (13)
Very-stiff to hard reddish-brown silty clay, trace fine to coarse sand, trace fine gravel (siltstone fragments).
39.0 — Est. A-7-6
Medium-dense brown fine sand interbedded with silt, trace medium sand, trace clay.
41.5 — Est. A-4b
Medium-dense brown fine to coarse sand, little fine gravel, trace silt, trace clay.
44.5 — A-1-b (0)

WATER LEVEL: "Dry"
WATER NOTE: Before Coring
DATE: 1/15/04
JOB: 011-09575-000

-CONTINUED-

PLATE 18



BBCM

LOG OF BORING NO. SL-8
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 412+50.1, 20.0' Lt. of Proposed SR 7 Centerline
COMPLETION DEPTH: 83.5' ELEVATION: 622.5 DATE: 1/15/04

SAMPLE NO.	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.S.	F.S.	SILT/CLAY
18	2.7-2.9							
19	3.7-4.0							
20	3.5-3.9	16						
21	2.7-4.5+	14	32	20	16	5	9	40 30
22	3.6-4.5+	14						
23	4.5+							
24	3.7-4.5+							
25	4.1-4.5+							
26	4.1-4.4							
27	3.4-4.0							
28A	45 / 5							
28B	0-2"R							
29	REC 100% RQD 100%							
30								

DESCRIPTION - CONTINUED

Very-stiff to hard reddish-brown mottled with gray silty clay, little to some fine to coarse sand, trace to little fine to coarse gravel (shale and siltstone fragments), contains few seams of fine to coarse sand or gravel.

70.0 — A-6a (8)
Very-soft becoming medium-hard gray shale interbedded with fine-grained sandstone and siltstone, nearly horizontally bedded, many diagonal fractures, micaceous.
74.1 - Qu = 1211.2 psi from 71.5' to 71.8'.
Visual
Hard gray fine-grained sandstone, nearly horizontally bedded, few diagonal fractures, contains thin limestone seams at 80.6' and 83.0', micaceous.
83.5 — Visual

- Installed 85' of inclinometer casing with 3.3' of stickup.
- No seepage encountered prior to coring rock.

WATER LEVEL: "Dry"
WATER NOTE: Before Coring
DATE: 1/15/04
JOB: 011-09575-000

PLATE 19

DRAWN MSJ
CHECKED EMK

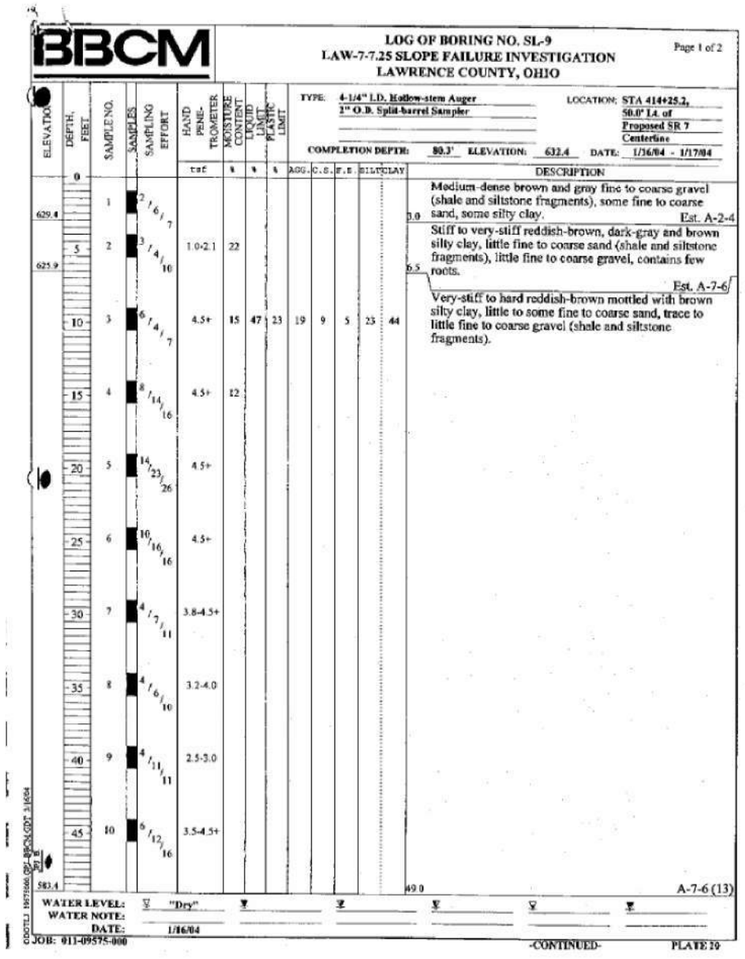
GEOTECHNICAL EXPLORATION - LANDSLIDE
LAW-7

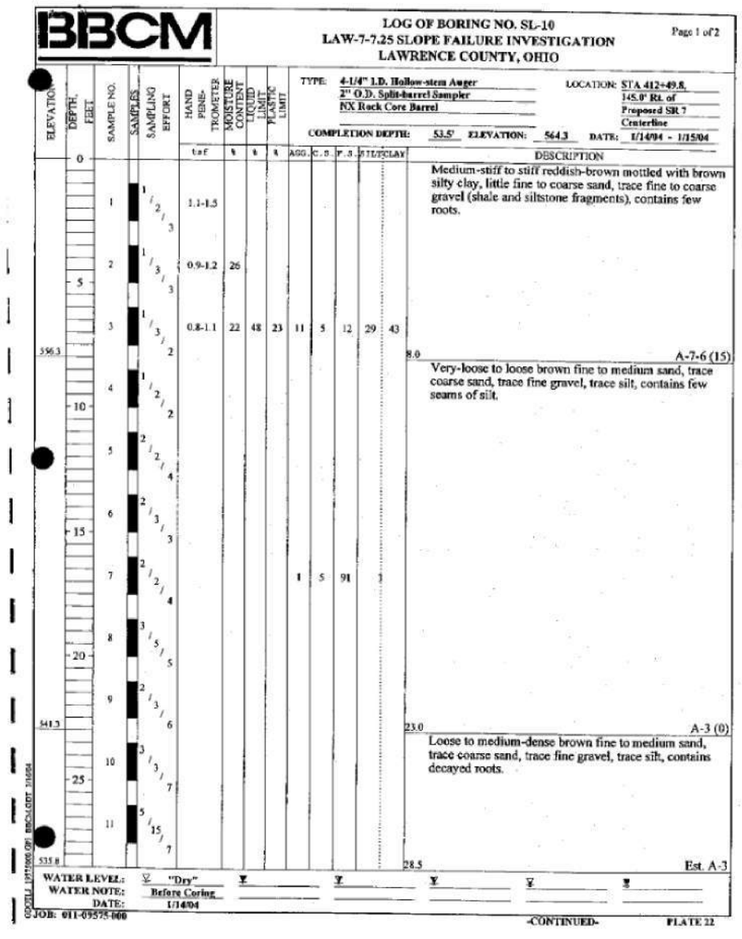
LAW-7-2.17

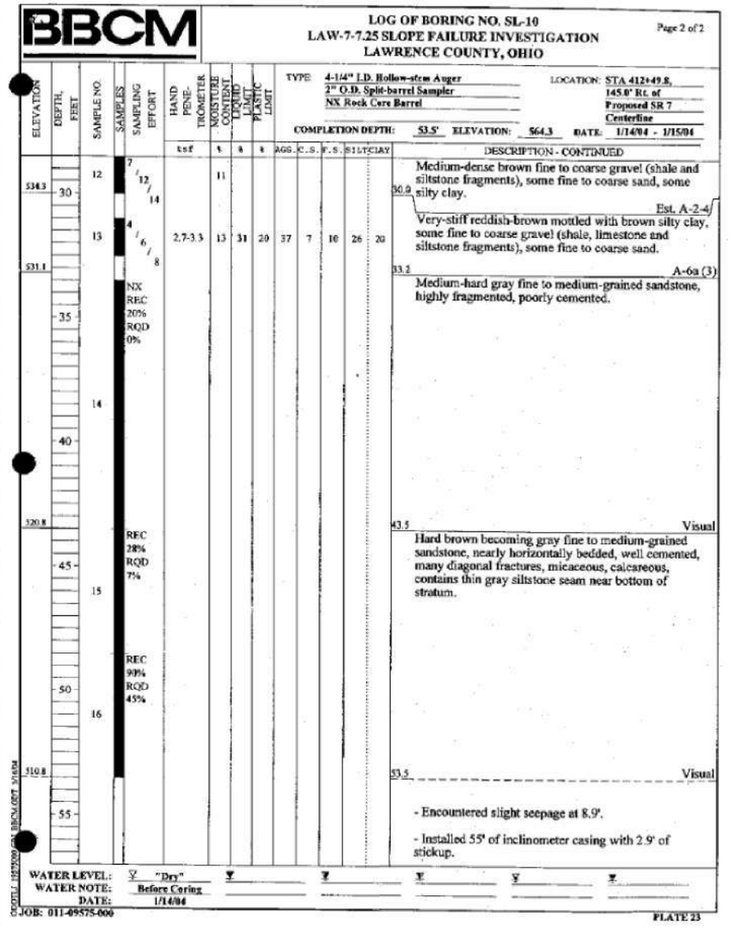
201/206

1242/1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS







LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

BBCM

LOG OF BORING NO. SL-11
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler
LOCATION: STA 414+25.3, 100.0' Rt. of Centerline
COMPLETION DEPTH: 50.8' ELEVATION: 589.2 DATE: 1/14/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
	0												Very-stiff to hard reddish-brown mottled with brown silty clay, little fine to coarse sand, trace to little fine to coarse gravel (shale and siltstone fragments), contains few roots near top of stratum.
		1	4/8/9		2.5-3.3	17							
584.2	5	2A	5/7/9		4.5+	13	42	21	10	9	6	34	41
		2B			4.5+	19							5.0 A-7-6 (13)
													Hard dark-brown silty clay, little fine to coarse sand, trace fine to coarse gravel (shale and siltstone fragments).
580.2		3	6/12/15		4.5+								9.0 Est. A-6b
	10	4	6/16/20										Medium-dense to dense brown fine to coarse sand, some fine to coarse gravel, trace to little silt, trace clay.
		5	4/6/9										14.0 Est. A-1-b
575.2		6	3/5/5										Loose brown fine to coarse sand, trace fine to coarse gravel, trace silt.
	15	7	2/3/3								14	68	15
570.2													19.0 A-1-b (0)
	20	8	2/3/5										Loose to medium-dense brown fine to medium sand, trace coarse sand, trace fine gravel, trace silt, trace clay, contains few decayed roots from 42.0' to 43.1'.
		9	2/3/2										
542.7	25	10	1/3/5										Est. A-3

WATER LEVEL: ▽ "Dry"
WATER NOTE:
DATE: 1/14/04

JOB: 011-09575-000 -CONTINUED- PLATE 24

BBCM

LOG OF BORING NO. SL-11
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler
LOCATION: STA 414+25.3, 100.0' Rt. of Centerline
COMPLETION DEPTH: 50.8' ELEVATION: 589.2 DATE: 1/14/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION - CONTINUED
		11	2/3/4										Loose to medium-dense brown fine to medium sand, trace coarse sand, trace fine gravel, trace silt, trace clay, contains few decayed roots from 42.0' to 43.1'.
	30	12	2/4/5										
		13	2/3/4										
	35	14	2/6/10										
		15	4/8/11										
	40	16	4/7/9										
		17	3/4/5										
542.7	45	18	2/6/10										46.5 Est. A-3
		19A	16/28/37										Very dense brown fine to coarse gravel (shale and siltstone fragments), some fine to coarse sand, trace silt, contains few silty clay seams.
538.4	50	19B											50.8 Est. A-1-b
		20	11/18/50-4"R										- Encountered slight seepage at 25.5'.

WATER LEVEL: ▽ "Dry"
WATER NOTE:
DATE: 1/14/04

JOB: 011-09575-000 PLATE 25

BBCM

LOG OF BORING NO. SL-12
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: NX Rock Core Barrel
LOCATION: STA 421+47.7, 103.5' Lt. of Centerline
COMPLETION DEPTH: 63.5' ELEVATION: 626.8 DATE: 1/17/04

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C. S.	F. S.	SILT/CLAY	DESCRIPTION
	0												Very-soft yellow-brown and reddish-brown shale, fragmental structure, similar to hard silty clay, many diagonal fractures.
	5												
617.6													9.2 Visual
	10		NX REC 96% RQD 91%										Very-soft reddish-brown shale, fragmental structure, partly similar to hard silty clay, many diagonal fractures.
612.5		1											14.3 Visual
	15												Soft to medium-hard yellow-brown shale, interbedded with siltstone and fine-grained sandstone, nearly horizontally bedded, many diagonal fractures, contains few limestone nodules and seams.
	20		RBC 96% RQD 71%										
	25	2											
	30		REC 100% RQD 73%										
588.1	35	3											Visual

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/17/04

JOB: 011-09575-000 -CONTINUED- PLATE 26

DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE
LAW-7

LAW-7-2.17

203/206

1244
1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

BBCM

LOG OF BORING NO. SL-12
LAW-7-7.25 SLOPE FAILURE INVESTIGATION
LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: NX Rock Core Barrel
LOCATION: STA 421+47.7, 103.5' Lt. of Centerline
COMPLETION DEPTH: 63.5' ELEVATION: 626.8 DATE: 1/17/04

DESCRIPTION - CONTINUED

Soft to medium-hard yellow-brown shale, interbedded with siltstone and fine-grained sandstone, nearly horizontally bedded, many diagonal fractures, contains few limestone nodules and seams.

38.7 Visual

Very-soft to soft reddish-brown and gray shale, fragmental structure, many diagonal fractures, many limestone nodules from 44.8' to 46.5'.

REC 85% RQD 52%

46.5 Visual

Soft to medium-hard yellow-brown siltstone interbedded with shale, nearly horizontally bedded, many diagonal fractures, contains a clay filled fracture at 59.5'.

REC 93% RQD 86%

59.7 Visual

Soft to medium-hard gray and reddish-brown shale, fragmental structure, many diagonal fractures.

63.5 Visual

- Pad cleared of soil overburden at boring location by bulldozer to facilitate drill rig access.

- No seepage noted prior to coring rock.

- Installed 65.0' of inclinometer casing with 3' of stickup.

WATER LEVEL: ▽ "Dry"
WATER NOTE: Before Coring
DATE: 1/17/04

JOB: 011-09575-000

PLATE 27

BBCM

LOG OF BORING NO. SLI-981
DRILLING & INSTRUMENT MONITORING FOR SLIDE 5
LAW-7-7.25, LAWRENCE COUNTY, OHIO

Page 1 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 393+10.4, 54.0' Lt. of Mainline Centerline
COMPLETION DEPTH: 53.8' ELEVATION: 587.5 DATE: 4/6/05 - 4/7/05

DESCRIPTION

Stiff (est.) reddish-brown mixed with gray silty clay, little fine to coarse sand, trace fine gravel.

1.0 Est. A-6a

Medium-dense brown fine sand, trace medium to coarse sand, some fine to coarse gravel (sandstone and shale fragments), some clayey silt.

8.0 Est. A-2-4

Very-stiff to hard reddish-brown mottled with greenish-gray clayey silt, some fine to coarse sand, trace to little fine gravel (shale and sandstone fragments).

20.5 A-4a (8)

Medium-dense brown and gray fine to coarse gravel (shale and sandstone fragments), some fine to coarse sand, "and" silty clay.

25.5 Est. A-6a

Very-stiff to hard reddish-brown mottled with gray silty clay, some fine to coarse sand, trace to little fine gravel (shale and siltstone fragments).

31.0 A-6a (8)

WATER LEVEL: ▽ 6.0
WATER NOTE: End of Day
DATE: 4/06/05

JOB: 011-09575-006

-CONTINUED-

PLATE 1

BBCM

LOG OF BORING NO. SLI-981
DRILLING & INSTRUMENT MONITORING FOR SLIDE 5
LAW-7-7.25, LAWRENCE COUNTY, OHIO

Page 2 of 2

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel
LOCATION: STA 393+10.4, 54.0' Lt. of Mainline Centerline
COMPLETION DEPTH: 53.8' ELEVATION: 587.5 DATE: 4/6/05 - 4/7/05

DESCRIPTION - CONTINUED

Very-soft to soft gray shale interbedded with fine-grained sandstone and siltstone, nearly horizontally bedded, many diagonal fractures.

REC 54% RQD 50%

REC 92% RQD 47%

REC 93% RQD 78%

REC 98% RQD 92%

REC 98% RQD 80%

39.2 Visual

Hard gray fine-grained sandstone, well cemented, few diagonal fractures.

51.3 Visual

Very-soft to medium-hard gray shale, nearly horizontally bedded, many diagonal fractures.

53.8 Visual

- Installed inclinometer casing to bottom of boring.

- Unconfined Compression (Q_u) Test:
Sample S-14: q_{max} = 80.7 psi at 3.0% strain.
Sample S-15: q_{max} = 346.0 psi at 4.2% strain.

WATER LEVEL: ▽ 6.0
WATER NOTE: End of Day
DATE: 4/06/05

JOB: 011-09575-006

PLATE 2

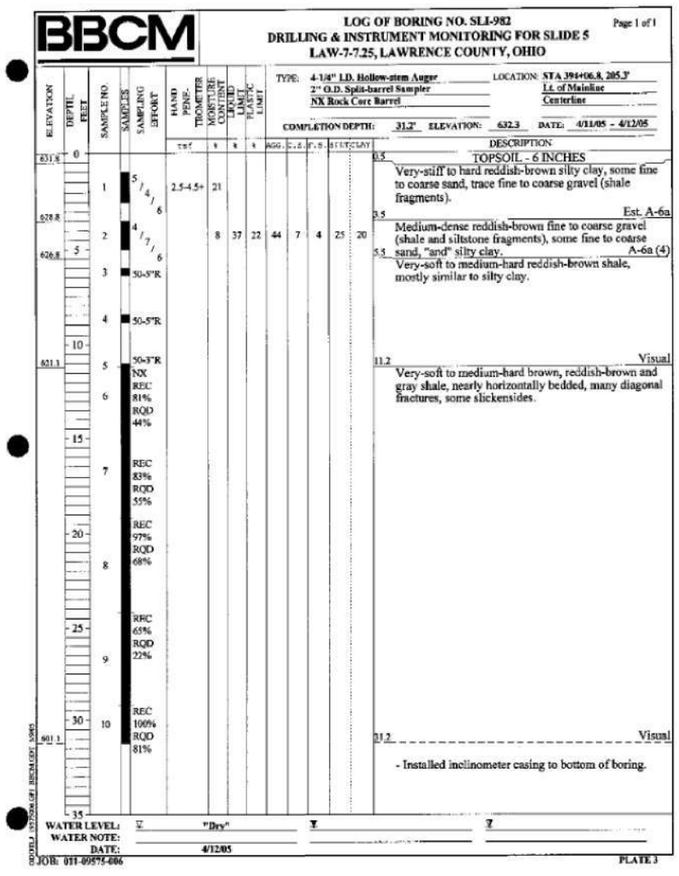
DRAWN MSJ | CHECKED EMK

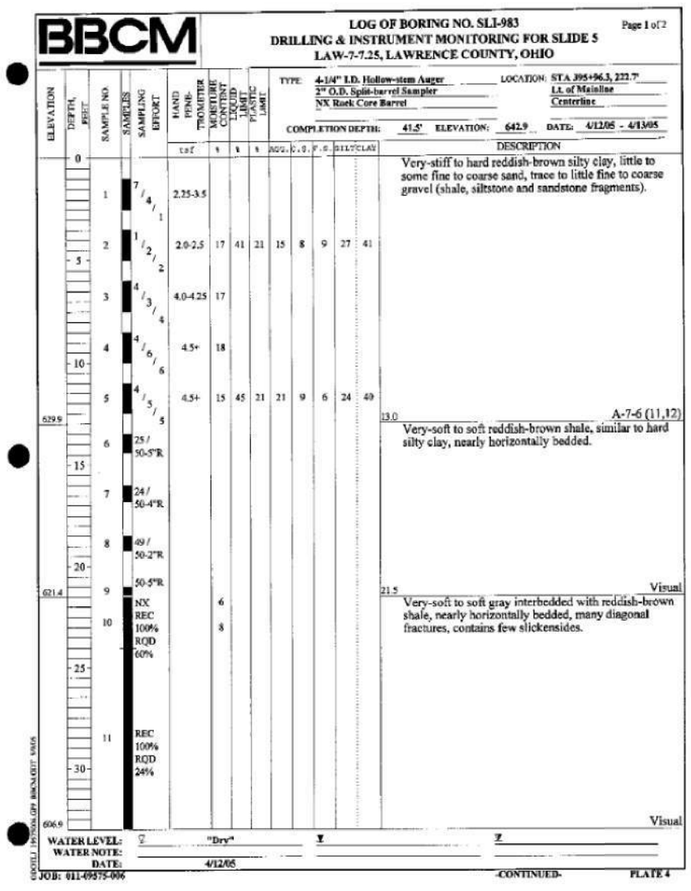
GEOTECHNICAL EXPLORATION - LANDSLIDE LAW-7

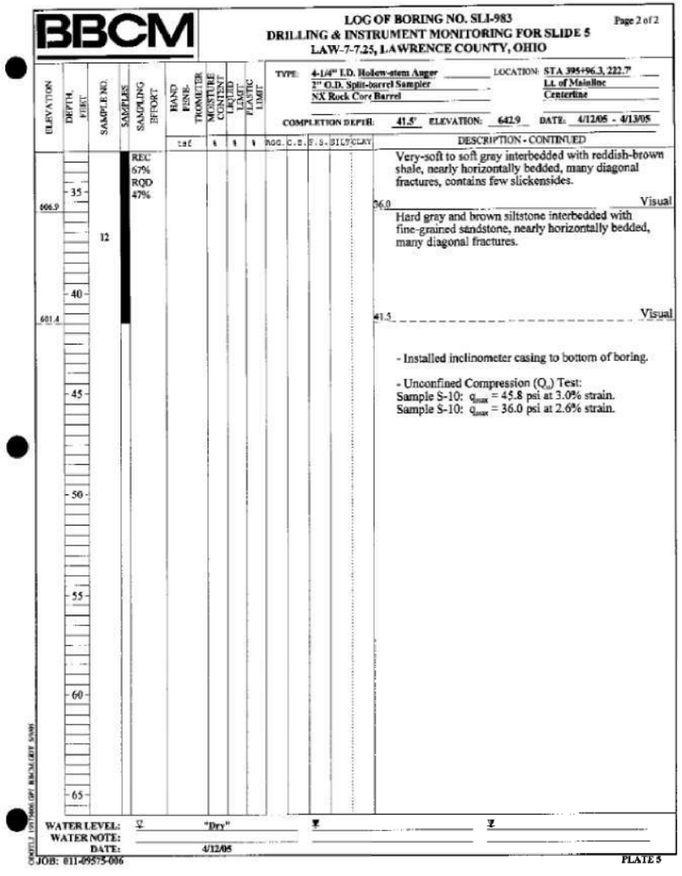
LAW-7-2.17

1245
1247

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS







DRAWN MSJ
CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE LAW-7

LAW-7-2.17

LANDSLIDE BORINGS FROM PREVIOUS SUBSURFACE INVESTIGATIONS

BBCM

LOG OF BORING NO. SLI-984 — Page 1 of 2
DRILLING & INSTRUMENT MONITORING FOR SLIDE 5
LAW-7-7.25, LAWRENCE COUNTY, OHIO

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel — LOCATION: STA 397+13.2, 90.9' Lt. of Mainline Centerline
COMPLETION DEPTH: 59.0' ELEVATION: 602.8 DATE: 4/7/05 - 4/8/05

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.	F.	SILT/CLAY	DESCRIPTION
	0											Very-stiff to hard brown silty clay, little fine to coarse sand, "and" fine to coarse gravel (sandstone and shale fragments).
600.3		1	4/20/5									Est. A-6a
	5	2	4/3/5	2.6-3.3	15							2.5 Stiff to hard reddish-brown mottled with brown silty clay, little to some fine to coarse sand, trace to little fine to coarse gravel (shale, siltstone and fine-grained sandstone fragments).
		3	4/3/4	1.5-1.8	17	39	22	15	8	9	29 / 39	
592.3	10	4	3/4/10	4.5+	17							10.5 A-6b (9) Medium-dense to dense brown mottled with gray silt, interbedded with silty clay, some fine sand.
589.8		5	7/8/10									13.0 Est. A-3a
		6	5/6/8	3.5-4.5+								Very-stiff to hard reddish-brown and brown silty clay, little fine to coarse sand, trace fine gravel (shale and siltstone fragments).
584.8	15	7	6/8/10	4.0								18.0 Est. A-6a
		8	5/6/7	3.5-4.5+	16	29	20	0	2	11	60 / 27	Very-stiff to hard brown mottled with reddish-brown and gray clayey silt, little fine to coarse sand, trace fine gravel (sandstone, siltstone and shale fragments), few silt lenses.
579.8	20	9	5/7/9	2.5-4.5+	20							23.0 A-4b (8) Medium-dense brown and gray fine to coarse gravel (sandstone fragments), some fine to coarse sand, little silty clay.
577.6	25	10	15/14/6									25.0 Est. A-1-b Hard reddish-brown, light-brown and gray silty clay, trace to little fine to coarse sand, similar to very-soft shale.
		11	5/10/12	4.5+	19	44	25	2	1	1	34 / 62	
570.3	30	12	6/10/18	4.5+	19							32.5 A-7-6 (12)

WATER LEVEL: ▽ 16.0 ▼ ▼
WATER NOTE: End of Day
DATE: 4/07/05

JOB: 011-09575-006 -CONTINUED- PLATE 6

BBCM

LOG OF BORING NO. SLI-984 — Page 2 of 2
DRILLING & INSTRUMENT MONITORING FOR SLIDE 5
LAW-7-7.25, LAWRENCE COUNTY, OHIO

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler; NX Rock Core Barrel — LOCATION: STA 397+13.2, 90.9' Lt. of Mainline Centerline
COMPLETION DEPTH: 59.0' ELEVATION: 602.8 DATE: 4/7/05 - 4/8/05

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.	F.	SILT/CLAY	DESCRIPTION - CONTINUED
	35	13	30/50-5"R									Very-soft to medium-hard reddish-brown shale, nearly horizontally bedded, many diagonal fractures, similar to hard silty clay.
		14	50-5"R NX REC 69% RQD 58%									
	40	15	REC 60% RQD 47%									
	45	16	REC 95% RQD 65%									
553.0	50	17	REC 98% RQD 100%									49.8 Visual Hard gray fine-grained sandstone, well cemented, many diagonal fractures.
543.8	55	18	REC 100% RQD 100%									59.0 Visual - Installed inclinometer casing to bottom of boring.
	60	19										
	65											

WATER LEVEL: ▽ 16.0 ▼ ▼
WATER NOTE: End of Day
DATE: 4/07/05

JOB: 011-09575-006 PLATE 7

BBCM

LOG OF BORING NO. SLI-985 — Page 1 of 1
DRILLING & INSTRUMENT MONITORING FOR SLIDE 5
LAW-7-7.25, LAWRENCE COUNTY, OHIO

TYPE: 4-1/4" I.D. Hollow-stem Auger; 2" O.D. Split-barrel Sampler — LOCATION: STA 395+25.7, 61.7' Lt. of Mainline Centerline
COMPLETION DEPTH: 29.4' ELEVATION: 598.1 DATE: 4/13/05

ELEVATION	DEPTH, FEET	SAMPLE NO.	SAMPLES SAMPLING EFFORT	HAND PENE-TROMETER tsf	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	AGG.	C.	F.	SILT/CLAY	DESCRIPTION
	0											Very-stiff to hard reddish-brown silty clay, little to some fine to coarse sand, trace to little fine to coarse gravel (sandstone and shale fragments).
		1	2/2/4	2.0								
	5	2	5/5/6	2.2-3.5	18	38	20	9	6	11	35 / 39	
590.1		3	7/9/16	4.5+	15							8.0 A-6b (11) Medium-dense brown silt, little clay, little to some fine to coarse sand, trace fine gravel.
	10	4	5/8/9									
		5	5/7/6		19			0	3	13	67 / 17	
582.6	15	6	2/5/10									15.5 A-4b (8) Hard brown mottled with gray silty clay, little to some fine to coarse sand, trace to little fine to coarse gravel (sandstone and shale fragments).
		7	7/10/12	4.5+								
	20	8	5/12/12	4.5+	14	31	19	8	4	13	44 / 31	
		9	8/18/20	4.5+	14							
575.1	25	10A	10/13/17	4.5+	5					14	3 / 64 / 19	23.0 A-6a (9) Medium-dense brown fine sand, trace medium to coarse sand, trace fine gravel, little silt. 24.1 Est. A-3a Very-soft to soft reddish-brown shale, similar to hard silty clay.
574.0		10B										
		11	16/39/50-5"R									
568.1	30	12	22/50-5"R									30.0 Visual - Encountered cobble at 15.0'. - Installed piezometer at 25.5'.
	35											

WATER LEVEL: ▽ "Dry" ▼ ▼
WATER NOTE:
DATE: 4/13/05

JOB: 011-09575-006 PLATE 8

DRAWN MSJ CHECKED EMK

GEOTECHNICAL EXPLORATION - LANDSLIDE LAW-7

LAW-7-2.17

206/206

1247/1247

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 127+82, 82' RT.	EXPLORATION ID B-001-1-23
TYPE: CULVERT	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 537.3 (MSL) EOB: 41.5 ft.	PAGE 1 OF 1
START: 4/29/24 END: 4/29/24	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 80	LAT / LONG: 38.437629, -82.455831	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST	537.3																	
			4 7 7	19	100	SS-1	4.00	6	7	9	41	37	42	23	19	22	A-7-6 (12)	
			3 3 3	8	44	SS-2	4.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
ST ATTEMPT FROM 7.5'-9.5', NO RECOVERY			1 2 3	7	39	SS-3	2.25	-	-	-	-	-	-	-	-	32	A-7-6 (V)	
			2 2 4	8	100	SS-4	2.00	0	0	1	44	55	50	28	22	31	A-7-6 (15)	
					100	ST-5	2.60	0	0	1	53	46	46	27	19	28	A-7-6 (13)	
	522.8																	
SOFT TO STIFF, BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET			3 2 3	7	100	SS-6	1.50	0	0	48	34	18	23	17	6	24	A-4a (3)	
SS-7 CONTAINS NO INTACT SOIL FOR HP READINGS			0 0 3	4	100	SS-7	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
SS-8 CONTAINS NO INTACT SOIL FOR HP READINGS			1 1 2	4	100	SS-8	-	-	-	-	-	-	-	-	-	27	A-4a (V)	
	515.8																	
LOOSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE CLAY, TRACE GRAVEL, WET		W 512.3																
			1 2 4	8	100	SS-9	-	-	-	-	-	-	-	-	-	28	A-3a (V)	
			3 3 4	9	100	SS-10	-	0	27	46	15	12	NP	NP	NP	22	A-3a (0)	
	504.0																	
STIFF, GRAY AND BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, SLIGHTLY ORGANIC, WET			2 3 2	7	100	SS-11	1.50	-	-	-	-	-	-	-	-	26	A-4a (V)	
	499.0																	
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, WET			5 4 10	19	100	SS-12	-	-	-	-	-	-	-	-	-	26	A-3a (V)	
	495.8	EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 25.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 2 BAGS HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 164+02, 176' RT.	EXPLORATION ID B-007-1-23
TYPE: CULVERT	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 576.5 (MSL) EOB: 41.5 ft.	PAGE 1 OF 1
START: 4/24/24 END: 4/24/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.442765, -82.445738	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY STIFF, BROWN, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST	576.5																	
	572.0		2 4 5	12	89	SS-1	3.00	-	-	-	-	-	-	-	-	27	A-6a (V)	
HARD, BROWN, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP			3 4 6	13	100	SS-2	4.50	-	-	-	-	-	-	-	-	24	A-4b (V)	
			2 3 5	11	100	SS-3	4.50	0	0	1	57	42	33	23	10	26	A-4b (8)	
			3 6 6	16	100	SS-4	4.50	-	-	-	-	-	-	-	-	22	A-4b (V)	
			3 5 6	15	100	SS-5	4.50	-	-	-	-	-	-	-	-	23	A-4b (V)	
	559.5		3 6 8	19	100	SS-6	4.50	-	-	-	-	-	-	-	-	23	A-4b (V)	
VERY STIFF TO HARD, BROWN BECOMING GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP			4 5 6	15	100	SS-7	3.75	-	-	-	-	-	-	-	-	27	A-6a (V)	
			3 3 8	15	100	SS-8	3.50	1	0	1	47	51	35	20	15	23	A-6a (10)	
			3 5 7	16	100	SS-9	4.25	-	-	-	-	-	-	-	-	25	A-6a (V)	
			4 5 6	15	100	SS-10	3.75	-	-	-	-	-	-	-	-	27	A-6a (V)	
		W 543.5																
			3 4 6	13	100	SS-11	3.25	0	1	2	38	59	38	23	15	25	A-6a (10)	
			3 7 10	23	100	SS-12	4.00	-	-	-	-	-	-	-	-	21	A-6a (V)	
	535.0	EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 33.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 2 BAGS HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 174+98, 83' RT.	EXPLORATION ID B-007-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/8/24	ELEVATION: 631.5 (MSL) EOB: 17.5 ft.	PAGE 1 OF 1
START: 4/24/24 END: 5/1/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80	LAT / LONG: 38.443989, -82.442227	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
2.0" ASPHALT (DRILLERS DESCRIPTION)	631.5																	
VERY STIFF, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, MOIST	631.3		4 2 5	9	39	SS-1	3.00	3	4	12	26	55	50	22	28	23	A-7-6 (17)	
SHALE, MAROONISH BROWN AND BROWN, SEVERELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY THIN BEDDED, BEDDING DISCONTINUITIES: LOW ANGLE, JOINT DISCONTINUITY: 12.5'-13.5', FRACTURED TO HIGHLY FRACTURED, OPEN, SLIGHTLY ROUGH, DISINTIGRATED, POOR SURFACE CONDITION; RQD 7%, REC 57%.	626.0	TR	5 50	-	83	SS-2	-	-	-	-	-	-	-	-	-	10	Rock (V)	
			50	-	67	SS-3	-	-	-	-	-	-	-	-	-	9	Rock (V)	
			16 50/3"	-	78	SS-4	-	-	-	-	-	-	-	-	-	5	Rock (V)	
			50	-	67	SS-5	-	-	-	-	-	-	-	-	-	6	Rock (V)	
			7		57	NQ2-1											CORE	
	614.0	EOB																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE. OFFSET 2.0' SOUTH.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 1 BAG HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 177+50, 50' RT.	EXPLORATION ID B-007-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/8/24	ELEVATION: 659.2 (MSL) EOB: 12.5 ft.	PAGE 1 OF 1
START: 5/1/24 END: 5/1/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80	LAT / LONG: 38.444310, -82.441429	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY STIFF, MAROONISH BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, DAMP	659.2																	
	654.7		2 3 8	15	50	SS-1	3.50	2	1	4	39	54	42	21	21	17	A-7-6 (13)	
HARD, MAROONISH BROWN AND BROWN, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, RESIDUAL ROCK, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	653.2	TR	4 13 50/5"	-	100	SS-2	-	12	11	11	39	27	35	21	14	11	A-6a (8)	
SHALE, BROWN AND MAROONISH BROWN, SEVERELY TO HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY THIN TO THIN BEDDED, CONTAINS SIDERITE NODULES, BEDDING DISCONTINUITIES: LOW ANGLE, JOINT DISCONTINUITIES: 8.7'-9.3', 10.0'-10.6', 11.5'-12.5', HIGHLY FRACTURED TO MODERATELY FRACTURED, OPEN TO NARROW, SLIGHTLY ROUGH, DISINTIGRATED TO BLOCKY/DISTURBED/SEAMY, POOR SURFACE CONDITION; RQD 26%, REC 95%.			50/4"	-	100	SS-3	-	-	-	-	-	-	-	-	-	1	Rock (V)	
			26		95	NQ2-1											CORE	
	646.7	EOB																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 1 BAG HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 179+91, 55' RT.	EXPLORATION ID B-007-4-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/8/24	ELEVATION: 669.0 (MSL) EOB: 24.0 ft.	PAGE 1 OF 1
START: 5/2/24 END: 5/2/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80	LAT / LONG: 38.444573, -82.440641	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF, ORANGISH BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP	669.0																	
	664.5	1–4	2 3 4	9	61	SS-1	3.50	-	-	-	-	-	-	-	-	13	A-4a (V)	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP		5–6	3 5 10	20	100	SS-2	4.50	1	1	5	33	60	44	22	22	19	A-7-6 (14)	
	659.5	8–9	7 10 13	31	100	SS-3	4.50	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
HARD, MAROONISH BROWN AND GRAY, **SILTY CLAY**, TRACE STONE FRAGMENTS, TRACE SAND, RESIDUAL ROCK, DAMP		10–11	10 18 13	41	100	SS-4	4.50	9	1	2	38	50	39	21	18	11	A-6b (11)	
	655.5	TR 13	10 25 50/3"	-	93	SS-5	4.50	-	-	-	-	-	-	-	-	7	A-6b (V)	
SHALE, GRAY BECOMING BROWN AND GRAY, SEVERELY WEATHERED, VERY WEAK, BEDDING DISCONTINUITIES: LOW ANGLE, FRACTURED, OPEN, SLIGHTLY ROUGH, DISINTIGRATED, POOR SURFACE CONDITION; RQD 0%, REC 24%.		15	50/4"	-	100	SS-6	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		18	50	-	100	SS-7	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		18	50/2"	-	50	SS-8	-	-	-	-	-	-	-	-	-	4	Rock (V)	
MATERIAL DEGRADED DURING CORING CONTAINS A 2.5" SILTSTONE LAYER AT UNKNOWN DEPTH WITHIN CORE RUN		19–22	0		24	NQ2-1											CORE	
		23	50	-	83	SS-9	-	-	-	-	-	-	-	-	-	12	Rock (V)	
	645.0	EOB 24	50	-	67	SS-10	-	-	-	-	-	-	-	-	-	8	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 50 GAL. BENTONITE GROUT; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 181+87, 103' RT.	EXPLORATION ID B-007-5-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 645.2 (MSL) EOB: 24.0 ft.	PAGE 1 OF 1
START: 5/4/24 END: 5/4/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.444725, -82.439943	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF TO VERY STIFF, MAROONISH BROWN, **CLAY**, SOME SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, MOIST TO DAMP	645.2		1 2 1	4	44	SS-1	1.50	6	4	9	25	56	65	26	39	27	A-7-6 (20)	
			4 6 8	19	50	SS-2	3.75	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
	637.2		7 10 9	25	100	SS-3	3.25	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
VERY STIFF, YELLOWISH BROWN AND BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, DAMP			6 10 7	23	100	SS-4	3.50	1	1	4	48	46	48	28	20	20	A-7-6 (14)	
	634.7																	
VERY DENSE, BROWN, **STONE FRAGMENTS WITH SAND**, TRACE SILT, TRACE CLAY, RESIDUAL ROCK, DAMP	632.7	TR	8 15 24	52	28	SS-5	-	55	17	8	10	10	NP	NP	NP	5	A-1-b (0)	
SHALE, GRAY AND YELLOWISH BROWN, HIGHLY WEATHERED, VERY WEAK TO WEAK.			9 19 26	60	33	SS-6	-	-	-	-	-	-	-	-	-	8	Rock (V)	
			6 23 32	73	28	SS-7	-	-	-	-	-	-	-	-	-	8	Rock (V)	
	627.2																	
SILTSTONE, GRAY AND YELLOWISH BROWN, MODERATELY WEATHERED, SLIGHTLY STRONG.			17 50	-	33	SS-8	-	-	-	-	-	-	-	-	-	5	Rock (V)	
			38 50/4"	-	30	SS-9	-	-	-	-	-	-	-	-	-	6	Rock (V)	
	621.2	EOB	50	-	50	SS-10	-	-	-	-	-	-	-	-	-	7	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 185+93, 85' RT.	EXPLORATION ID B-009-1-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 623.7 (MSL) EOB: 24.5 ft.	PAGE 1 OF 1
START: 5/3/24 END: 5/3/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.445433, -82.438781	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
HARD, YELLOWISH BROWN, **CLAY**, SOME GRAVEL, SOME SILT, LITTLE SAND, DAMP	623.7		5 9 12	28	100	SS-1	4.50	32	11	6	30	21	42	24	18	11	A-7-6 (6)	
HARD, MAROONISH BROWN AND YELLOWISH BROWN, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	620.7		7 16 12	37	100	SS-2	-	20	14	18	30	18	34	20	14	15	A-6a (4)	
VERY DENSE, YELLOWISH BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, RESIDUAL ROCK, DAMP	618.2		6 16 38	72	89	SS-3	-	45	17	9	22	7	30	21	9	6	A-2-4 (0)	
			21 22 36	77	100	SS-4	-	-	-	-	-	-	-	-	-	7	A-2-4 (V)	
SHALE, GRAY AND YELLOWISH BROWN BECOMING MAROONISH BROWN, HIGHLY WEATHERED, VERY WEAK TO WEAK.	613.2	TR	50	-	100	SS-5	-	-	-	-	-	-	-	-	-	6	Rock (V)	
			10 50	-	75	SS-6	-	-	-	-	-	-	-	-	-	6	Rock (V)	
			25 50/5"	-	45	SS-7	-	-	-	-	-	-	-	-	-	6	Rock (V)	
			22 50/5"	-	36	SS-8	-	-	-	-	-	-	-	-	-	6	Rock (V)	
			50	-	83	SS-9	-	-	-	-	-	-	-	-	-	6	Rock (V)	
			50/5"	-	80	SS-10	-	-	-	-	-	-	-	-	-	6	Rock (V)	
	599.2	EOB	21 50	-	67	SS-11	-	-	-	-	-	-	-	-	-	8	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 193+42, 98' RT.	EXPLORATION ID B-009-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 583.9 (MSL) EOB: 24.5 ft.	PAGE 1 OF 1
START: 5/3/24 END: 5/3/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.446815, -82.436821	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY STIFF, BROWN AND ORANGISH BROWN, **CLAY**, SOME TO "AND" SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, IRON STAINING, MOIST TO DAMP	583.9		2 2 3	7	100	SS-1	3.50	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
			2 6 7	17	100	SS-2	3.00	1	4	9	35	51	51	24	27	21	A-7-6 (17)	
			4 5 8	17	100	SS-3	3.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
			4 6 9	20	100	SS-4	3.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
			5 8 14	29	78	SS-5	3.75	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
			6 9 9	24	33	SS-6	3.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
	568.4																	
VERY STIFF TO HARD, MAROONISH BROWN AND YELLOWISH BROWN, **CLAY**, "AND" SILT, LITTLE SAND, LITTLE GRAVEL AND STONE FRAGMENTS, DAMP TO MOIST			5 9 11	27	100	SS-7	4.50	13	8	5	38	36	42	24	18	15	A-7-6 (11)	
			6 9 12	28	72	SS-8	3.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
			5 10 13	31	100	SS-9	3.00	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
	560.4	TR																
SILTSTONE, GRAY, HIGHLY WEATHERED, SLIGHTLY STRONG.	559.4	EOB	27 50	-	33	SS-10	-	-	-	-	-	-	-	-	-	4	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 212+17, 118' RT.	EXPLORATION ID B-014-1-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 581.4 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/6/24 END: 5/6/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449475, -82.431502	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
HARD, MAROONISH BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, CONTAINS IRON STAINING AND ROOTS, DAMP	581.4																	
	578.4		4 5 5	13	100	SS-1	4.50	1	5	6	40	48	46	24	22	22	A-7-6 (14)	
HARD, YELLOWISH BROWN AND BROWN, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP			4 5 9	19	100	SS-2	4.50	0	0	1	24	75	59	27	32	22	A-7-6 (20)	
			4 7 11	24	100	SS-3	4.50	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
			5 8 12	27	100	SS-4	4.50	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
			5 7 11	24	100	SS-5	4.50	0	0	1	30	69	45	26	19	24	A-7-6 (13)	
			5 7 9	21	100	SS-6	4.50	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
			6 7 11	24	78	SS-7	4.50	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
			4 6 7	17	89	SS-8	4.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
			3 5 8	17	100	SS-9	4.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
	556.4	EOB	8 11 16	36	100	SS-10	4.25	-	-	-	-	-	-	-	-	24	A-7-6 (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17
TYPE: NOISE WALL
PID: 75923 SFN: N/A
START: 5/6/24 END: 5/6/24

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: CME 55X
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 3/8/24
ENERGY RATIO (%): 80

STATION / OFFSET: 213+75, 95' RT.
ALIGNMENT: LAW-7
ELEVATION: 609.0 (MSL) EOB: 24.0 ft.
LAT / LONG: 38.449658, -82.431007

EXPLORATION ID B-014-2-23
PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 609.0	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF, BROWN AND MAROONISH BROWN, **SILTY CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	606.0		8 6 4	13	83	SS-1	-	16	11	23	24	26	36	20	16	14	A-6b (5)	
HARD, BROWN AND MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP	603.5		3 3 7	13	100	SS-2	4.50	7	11	6	29	47	50	26	24	18	A-7-6 (16)	
HARD, BROWN AND GRAY, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP			9 16 21	49	100	SS-3	4.50	-	-	-	-	-	-	-	-	9	A-6a (V)	
SS-4 CONTAINS GYPSUM			9 25 31	75	100	SS-4	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
SS-5 CONTAINS GYPSUM			13 19 22	55	100	SS-5	4.50	2	12	19	36	31	40	25	15	15	A-6a (8)	
			11 28 39	89	89	SS-6	4.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
	590.5	TR	9 31 40	95	100	SS-7	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
SILTSTONE, GRAY AND BROWN, MODERATELY WEATHERED, SLIGHTLY STRONG.			12 29 42	95	33	SS-8	-	-	-	-	-	-	-	-	-	8	Rock (V)	
			10 35 44	105	39	SS-9	-	-	-	-	-	-	-	-	-	5	Rock (V)	
	585.0	EOB	50	-	83	SS-10	-	-	-	-	-	-	-	-	-	7	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17
TYPE: NOISE WALL
PID: 75923 SFN: N/A
START: 5/4/24 END: 5/4/24

DRILLING FIRM / OPERATOR: NEAS / J. HODGES
SAMPLING FIRM / LOGGER: NEAS / J. HODGES
DRILLING METHOD: 3.25" HSA / NQ2
SAMPLING METHOD: SPT / NQ2

DRILL RIG: CME 55X
HAMMER: CME AUTOMATIC
CALIBRATION DATE: 3/8/24
ENERGY RATIO (%): 80

STATION / OFFSET: 216+38, 86' RT.
ALIGNMENT: LAW-7
ELEVATION: 628.0 (MSL) EOB: 15.5 ft.
LAT / LONG: 38.449877, -82.430131

EXPLORATION ID B-014-3-23
PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 628.0	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
HARD, MAROONISH BROWN AND YELLOWISH BROWN, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, IRON STAINING, DAMP	625.0		3 3 5	11	100	SS-1	4.25	1	0	1	23	75	53	24	29	18	A-7-6 (18)	
HARD, REDDISH BROWN AND YELLOWISH BROWN BECOMING ORANGISH BROWN, **CLAY**, SOME TO "AND" SILT, LITTLE TO SOME SAND, TRACE GRAVEL AND STONE FRAGMENTS, IRON STAINING, RESIDUAL ROCK, DAMP			8 13 20	44	100	SS-2	4.50	2	7	8	38	45	41	20	21	9	A-7-6 (13)	
			6 11 13	32	33	SS-3	4.50	-	-	-	-	-	-	-	-	11	A-7-6 (V)	
	618.0	TR	8 12 16	37	28	SS-4	4.50	-	-	-	-	-	-	-	-	11	A-7-6 (V)	
SILTSTONE, GRAY AND BROWN, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY STRONG TO MODERATELY STRONG, VERY THIN TO MEDIUM BEDDED, BEDDING DISCONTINUITIES: LOW ANGLE, PARTIALLY CLAY FILLED HIGH ANGLE JOINT DISCONTINUITIES FROM 12.3'-12.9' AND 14.7'-15.2', HIGHLY FRACTURED TO SLIGHTLY FRACTURED, OPEN TO NARROW, SLIGHTLY ROUGH, BLOCKY, GOOD TO FAIR SURFACE CONDITION; RQD 80%, REC 100%.			50	-	83	SS-5	-	-	-	-	-	-	-	-	-	5	Rock (V)	
			80		100	NQ2-1											CORE	
	612.5	EOB																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 50 GAL. BENTONITE GROUT; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 396+04, 102' RT.	EXPLORATION ID B-076-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 587.7 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/29/24 END: 5/29/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.448656, -82.373197	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
13.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	587.7																	
	586.1																	
HARD, BROWN, **SANDY SILT**, SOME STONE FRAGMENTS, LITTLE CLAY, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	584.7	1	7 18 11	39	100	SS-1	-	26	19	13	28	14	30	20	10	7	A-4a (1)	
HARD, MAROONISH BROWN BECOMING DARK BROWN, **CLAY**, SOME SILT, LITTLE TO SOME SAND, TRACE TO LITTLE GRAVEL, DAMP		2																
		3																
		4	5 5 6	15	89	SS-2	4.50	15	7	12	30	36	44	24	20	20	A-7-6 (11)	
		5																
		6																
		7	7 7 8	20	100	SS-3	4.50	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
		8																
		9	6 5 6	15	72	SS-4	4.50	7	9	15	31	38	42	23	19	19	A-7-6 (11)	
		10																
		11																
		12	3 5 5	13	100	SS-5	4.50	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
	574.7	13																
MEDIUM DENSE, ORANGISH BROWN BECOMING MAROONISH BROWN, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, DAMP		14																
		15	4 5 6	15	28	SS-6	-	32	32	26	5	5	NP	NP	NP	6	A-1-b (0)	
		16																
		17	3 7 8	20	33	SS-7	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
		18																
		19	5 5 7	16	44	SS-8	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	
		20																
		21																
		22	4 6 9	20	100	SS-9	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	
		23																
		24	4 7 9	21	83	SS-10	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
	562.7	EOB 25																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 398+01, 110' RT.	EXPLORATION ID B-076-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 589.9 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/29/24 END: 5/29/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.448837, -82.372539	

MATERIAL DESCRIPTION AND NOTES	ELEV. 589.9	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
12.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	588.4	1																
HARD, MAROONISH BROWN AND GRAY, **SILTY CLAY**, LITTLE TO SOME SAND, LITTLE STONE FRAGMENTS, DAMP	584.4	2	4 3 7	13	67	SS-1	4.25	12	15	11	31	31	36	20	16	12	A-6b (8)	
		3																
		4	7 7 10	23	100	SS-2	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
HARD, BROWN, **SILT AND CLAY**, LITTLE TO SOME SAND, TRACE TO LITTLE STONE FRAGMENTS, DAMP	577.4	5																
		6	6 8 9	23	100	SS-3	4.50	16	12	13	31	28	34	20	14	13	A-6a (6)	
		7																
		8	5 6 8	19	100	SS-4	4.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
		9																
		10	6 5 6	15	78	SS-5	4.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
MEDIUM DENSE, ORANGISH BROWN, **GRAVEL WITH SAND**, TRACE CLAY, TRACE SILT, IRON STAINING, DAMP	574.4	11																
		12	5 6 8	19	100	SS-6	-	22	29	30	9	10	NP	NP	NP	8	A-1-b (0)	
		13																
MEDIUM DENSE, ORANGISH BROWN, **COARSE AND FINE SAND**, TRACE CLAY, TRACE SILT, TRACE GRAVEL, IRON STAINING, DAMP	571.9	14	4 8 8	21	39	SS-7	-	4	23	59	5	9	NP	NP	NP	7	A-3a (0)	
		15																
		16																
MEDIUM DENSE, ORANGISH BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, IRON STAINING, DAMP		17	4 5 6	15	50	SS-8	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
		18																
		19	2 6 6	16	44	SS-9	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
		20																
		21																
		22	4 7 9	21	100	SS-10	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	
	564.9	23																
	EOB	24																
		25																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 399+99, 108' RT.	EXPLORATION ID B-077-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 592.6 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449043, -82.371899	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
12.0" ASPHALT AND 5.5" BASE (DRILLERS DESCRIPTION)	592.6																	
	591.1																	
HARD, MAROONISH BROWN AND BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP		1	4 5 5	13	72	SS-1	4.50	7	9	8	34	42	44	21	23	15	A-7-6 (14)	
	589.6	2																
VERY STIFF, BROWN AND GRAY, **SANDY SILT**, "AND" GRAVEL, LITTLE CLAY, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP		3	5 12 6	24	94	SS-2	-	35	9	8	33	15	30	20	10	8	A-4a (3)	
	587.1	4																
HARD, MAROONISH BROWN AND BROWN, **SILTY CLAY**, SOME SAND, TRACE TO LITTLE GRAVEL, DAMP		5	4 8 9	23	100	SS-3	4.50	18	13	10	31	28	38	21	17	13	A-6b (8)	
	582.1	6																
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP		7	5 5 7	16	89	SS-4	4.25	-	-	-	-	-	-	-	-	13	A-6b (V)	
	577.1	8																
HARD, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP		9	4 5 9	19	39	SS-5	4.50	-	-	-	-	-	-	-	-	16	A-7-6 (V)	
	574.6	10																
MEDIUM DENSE, ORANGISH BROWN, **FINE SAND**, SOME COARSE SAND, LITTLE GRAVEL, TRACE SILT, TRACE CLAY, IRON STAINING, DAMP		11	5 6 7	17	72	SS-6	4.25	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
		12																
		13																
		14	5 5 8	17	100	SS-7	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
		15																
		16																
		17	5 5 7	16	78	SS-8	-	14	27	53	5	1	NP	NP	NP	3	A-3 (0)	
		18																
F S		19																
		20	6 6 5	15	33	SS-9	-	-	-	-	-	-	-	-	-	3	A-3 (V)	
		21																
		22																
		23	2 5 11	21	89	SS-10	-	-	-	-	-	-	-	-	-	4	A-3 (V)	
	567.6	24																
		EOB 25																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 402+00, 112' RT.	EXPLORATION ID B-077-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 588.8 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449237, -82.371242	

MATERIAL DESCRIPTION AND NOTES	ELEV. 588.8	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
13.0" ASPHALT AND 5.0" BASE (DRILLERS DESCRIPTION)	587.3	1	6 4 12	21	22	SS-1	-	47	7	9	21	16	NP	NP	NP	10	A-4a (0)	
MEDIUM DENSE, MAROONISH BROWN AND BROWN, **SANDY SILT**, "AND" STONE FRAGMENTS, LITTLE CLAY, DAMP	585.8	2																
HARD, MAROONISH BROWN BECOMING BROWN, **SILTY CLAY**, SOME SAND, LITTLE TO SOME GRAVEL, DAMP		3																
		4	6 5 10	20	100	SS-2	4.50	21	12	10	32	25	38	22	16	13	A-6b (7)	
		5																
		6																
		7	6 8 11	25	17	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-6b (V)	
		8																
		9	5 6 6	16	100	SS-4	4.50	17	12	12	34	25	36	20	16	12	A-6b (7)	
		10																
		11																
		12	6 5 7	16	33	SS-5	4.50	-	-	-	-	-	-	-	-	12	A-6b (V)	
		13																
	573.3	14	5 4 8	16	44	SS-6	4.25	-	-	-	-	-	-	-	-	16	A-6b (V)	
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP		15																
	570.8	16	6 7 8	20	44	SS-7	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
HARD, DARK BROWN, **SILTY CLAY**, "AND" SAND, TRACE GRAVEL, DAMP		17																
		18																
		19	5 6 7	17	100	SS-8	4.50	4	13	28	28	27	34	18	16	15	A-6b (6)	
		20																
		21	4 5 8	17	100	SS-9	4.50	-	-	-	-	-	-	-	-	10	A-6b (V)	
	565.8	22																
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP		23																
	563.8	24	5 7 7	19	100	SS-10	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
	EOB	25																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 404+03, 102' RT.	EXPLORATION ID B-078-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 595.3 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449462, -82.370599	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
12.5" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	595.3																	
	593.8																	
HARD, MAROONISH BROWN, **SILTY CLAY**, LITTLE TO SOME SAND, TRACE TO LITTLE GRAVEL, DAMP		1	3 5 6	15	100	SS-1	4.25	19	9	9	35	28	38	21	17	13	A-6b (8)	
		2																
		3																
		4	6 7 6	17	100	SS-2	4.50	-	-	-	-	-	-	-	-	13	A-6b (V)	
		5																
		6																
		7	4 5 7	16	100	SS-3	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
		8																
		9	5 9 12	28	50	SS-4	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
	584.8	10																
HARD, BROWN AND GRAY, **SILT AND CLAY**, SOME GRAVEL AND STONE FRAGMENTS, LITTLE SAND, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP		11	7 16 12	37	100	SS-5	-	31	10	9	30	20	34	20	14	10	A-6a (4)	
	582.3	12																
HARD, MAROONISH BROWN AND BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP		13																
		14	6 7 10	23	28	SS-6	4.50	-	-	-	-	-	-	-	-	17	A-6b (V)	
		15																
		16																
		17	6 6 7	17	44	SS-7	4.50	-	-	-	-	-	-	-	-	17	A-6b (V)	
		18																
		19	6 8 5	17	22	SS-8	4.50	-	-	-	-	-	-	-	-	14	A-6b (V)	
	574.8	20																
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP		21																
	572.3	22	4 4 5	12	28	SS-9	-	-	-	-	-	-	-	-	-	12	A-2-4 (V)	
		23																
HARD, MAROONISH BROWN AND BROWN, **SILT AND CLAY**, "AND" SAND, LITTLE GRAVEL, DAMP		24	4 6 6	16	100	SS-10	4.50	13	15	25	26	21	30	17	13	13	A-6a (3)	
	570.3	25																
		EOB																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 406+02, 93' RT.	EXPLORATION ID B-078-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 602.4 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449677, -82.369965	

MATERIAL DESCRIPTION AND NOTES	ELEV. 602.4	DEPTHS	SPT/ RQD	N60	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
13.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	600.8																	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, LITTLE GRAVEL, DAMP	599.4		5 2 4	8	33	SS-1	4.50	13	8	10	32	37	41	20	21	16	A-7-6 (11)	
HARD, MAROONISH BROWN AND BROWN, **SILT AND CLAY**, LITTLE TO SOME GRAVEL, SOME SAND, DAMP	594.4		3 4 4	11	89	SS-2	4.50	33	15	10	27	15	34	21	13	10	A-6a (2)	
			5 5 12	23	100	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP	591.9		6 7 9	21	28	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME STONE FRAGMENTS, SOME SAND, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	586.9		5 12 8	27	94	SS-5	-	33	16	10	23	18	36	22	14	10	A-6a (2)	
			6 7 8	20	22	SS-6	-	-	-	-	-	-	-	-	-	9	A-6a (V)	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE TO LITTLE GRAVEL, DAMP	577.4	EOB	4 4 7	15	17	SS-7	4.50	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
			5 8 8	21	100	SS-8	4.50	11	12	7	33	37	41	21	20	13	A-7-6 (11)	
			6 9 14	31	100	SS-9	4.50	-	-	-	-	-	-	-	-	12	A-7-6 (V)	
			6 10 16	35	100	SS-10	4.50	-	-	-	-	-	-	-	-	17	A-7-6 (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

Appendix B

Roadway Boring Logs

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 114+91, 25 LT	EXPLORATION ID B-001-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 555.4 (MSL) EOB: 11.1 ft.	PAGE 1 OF 1
START: 6/3/11 END: 6/3/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 555.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
ASPHALT PAVEMENT	554.3																	
VERY STIFF, RED-BROWN, **CLAY**, AND SILT, TRACE SAND, DAMP		2.5	6 6 10	20	87	SS-1	-	0	0	2	48	50	43	21	22	15	A-7-6 (13)	
		5.0	8 11 12	29	73	SS-2	-	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
	547.9	7.5	7 11 23	42	100	SS-3	-	3	4	6	41	46	38	16	22	10	A-6b (13)	
HARD, RED-BROWN, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP	544.3	10.0 ETR3	10 20 50/1"	-	100	SS-4	-	-	-	-	-	-	-	-	-	9	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 11:42 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 127+82, 82' RT.	EXPLORATION ID B-001-1-23
TYPE: CULVERT	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 537.3 (MSL) EOB: 41.5 ft.	PAGE 1 OF 2
START: 4/29/24 END: 4/29/24	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 80	LAT / LONG: 38.437629, -82.455831	

MATERIAL DESCRIPTION AND NOTES	ELEV. 537.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST			4 7 7	19	100	SS-1	4.00	6	7	9	41	37	42	23	19	22	A-7-6 (12)	
			3 3 3	8	44	SS-2	4.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
ST ATTEMPT FROM 7.5'-9.5', NO RECOVERY			1 2 3	7	39	SS-3	2.25	-	-	-	-	-	-	-	-	32	A-7-6 (V)	
			2 2 4	8	100	SS-4	2.00	0	0	1	44	55	50	28	22	31	A-7-6 (15)	
					100	ST-5	2.60	0	0	1	53	46	46	27	19	28	A-7-6 (13)	
	522.8																	
SOFT TO STIFF, BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET			3 2 3	7	100	SS-6	1.50	0	0	48	34	18	23	17	6	24	A-4a (3)	
SS-7 CONTAINS NO INTACT SOIL FOR HP READINGS			0 0 3	4	100	SS-7	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
SS-8 CONTAINS NO INTACT SOIL FOR HP READINGS			1 1 2	4	100	SS-8	-	-	-	-	-	-	-	-	-	27	A-4a (V)	
	515.8																	
LOOSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE CLAY, TRACE GRAVEL, WET		W 512.3	1 2 4	8	100	SS-9	-	-	-	-	-	-	-	-	-	28	A-3a (V)	

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 127+82, 82' RT.	START: 4/29/24	END: 4/29/24	PG 2 OF 2	B-001-1-23

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
LOOSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE CLAY, TRACE GRAVEL, WET *(continued)*	507.3	31	3 3 4	9	100	SS-10	-	0	27	46	15	12	NP	NP	NP	22	A-3a (0)	
	504.0	32																
STIFF, GRAY AND BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, SLIGHTLY ORGANIC, WET		33																
		34																
		35	2 3 2	7	100	SS-11	1.50	-	-	-	-	-	-	-	-	26	A-4a (V)	
	499.0	36																
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, WET		37																
		38																
		39																
		40	5 4 10	19	100	SS-12	-	-	-	-	-	-	-	-	-	26	A-3a (V)	
	495.8	41																
		EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 25.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 2 BAGS HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 135+97, 122 LT	EXPLORATION ID B-002-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 525.9 (MSL) EOB: 33.6 ft.	PAGE 1 OF 1
START: 6/21/11 END: 6/21/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 525.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **SILT AND CLAY**, LITTLE SAND, MOIST			1 1 3	5	100	SS-1	-	-	-	-	-	-	-	-	-	26	A-6a (V)	
		2.5	2 2 2	5	100	SS-2	-	0	0	16	51	33	36	22	14	32	A-6a (10)	
	520.9																	
STIFF, LIGHT BROWN, **SILTY CLAY**, SOME SAND, WET		5.0			75	ST-3	-	0	1	20	39	40	38	22	16	43	A-6b (10)	
wood fragments in sample		7.5	13 3 4	10	67	SS-4	-	-	-	-	-	-	-	-	-	-	A-6b (V)	
	516.4																	
LOOSE, BROWN AND GRAY, **GRAVEL WITH SAND**, TRACE SILT AND CLAY, WET		10.0	2 2 4	8	20	SS-5	-	-	-	-	-	-	-	-	-	33	A-1-b (V)	
		12.5	2 3 2	7	87	SS-6	-	-	-	-	-	-	-	-	-	39	A-1-b (V)	
		W																
		15.0	2 2 3	7	100	SS-7	-	1	65	27	4	3	NP	NP	NP	25	A-1-b (0)	
		17.5	5 4 4	11	100	SS-8	-	-	-	-	-	-	-	-	-	24	A-1-b (V)	
	505.9																	
LOOSE TO MEDIUM DENSE, BROWN AND GRAY, **COARSE AND FINE SAND**, LITTLE SILT, TRACE GRAVEL AND CLAY, WET		20.0	1 2 1	4	33	SS-9	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
		22.5																
		25.0	2 3 3	8	100	SS-10	-	3	41	37	12	7	NP	NP	NP	21	A-3a (0)	
		27.5																
		30.0	8 7 7	19	100	SS-11	-	-	-	-	-	-	-	-	-	18	A-3a (V)	
	492.3	32.5																

ETR3

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:23 - \\US1268-F01\SHARED_PROJECTS\11736\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 135+96, 118 RT	EXPLORATION ID B-003-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 528.1 (MSL) EOB: 36.5 ft.	PAGE 1 OF 1	
START: 6/20/11 END: 6/21/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 528.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **SILT AND CLAY**, TRACE SAND, MOIST			2 3 5	11	100	SS-1	-	-	-	-	-	-	-	-	-	23	A-6a (V)	
		2.5	1 2 3	7	100	SS-2	-	0	0	6	63	31	39	24	15	30	A-6a (10)	
	523.1																	
MEDIUM STIFF, BROWN, **SILT**, SOME CLAY, LITTLE SAND, MOIST		5.0			100	ST-3	-	0	0	10	63	27	33	23	10	30	A-4b (8)	
	521.1																	
VERY SOFT TO SOFT, BROWN, **SANDY SILT**, LITTLE CLAY, WET		7.5	1 2 2	5	87	SS-4	-	-	-	-	-	-	-	-	-	12	A-4a (V)	
		10.0	WOH WOH 1	1	100	SS-5	-	0	5	48	32	15	23	17	6	25	A-4a (2)	
							W											
consistency increases to stiff at 12.5'		12.5	WOH 2 6	11	100	SS-6	-	-	-	-	-	-	-	-	-	25	A-4a (V)	
	513.6																	
LOOSE TO MEDIUM DENSE, GRAY, **GRAVEL WITH SAND**, TRACE SILT AND CLAY, WET		15.0	1 3 5	11	100	SS-7	-	-	-	-	-	-	-	-	-	26	A-1-b (V)	
		17.5	WOH 2 3	7	100	SS-8	-	0	60	28	9	3	NP	NP	NP	22	A-1-b (0)	
		20.0	3 4 3	10	100	SS-9	-	-	-	-	-	-	-	-	-	25	A-1-b (V)	
		22.5																
	503.1	25.0																
STIFF TO HARD, GRAY, **SANDY SILT**, SOME CLAY, MOIST			7 10 15	34	100	SS-10	-	-	-	-	-	-	-	-	-	26	A-4a (V)	
		27.5																
		30.0	3 4 5	12	67	SS-11	-	0	4	29	45	22	25	15	10	20	A-4a (6)	
		32.5																
		35.0	18 50	-	7	SS-12	-	-	-	-	-	-	-	-	-	14	A-4a (V)	
	491.6																	
							ETR3											

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 150+00, 74 LT	EXPLORATION ID B-004-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 567.6 (MSL) EOB: 21.5 ft.	PAGE 1 OF 1
START: 6/22/11 END: 6/23/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 567.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	567.0		WOH 2 3	7	80	SS-1	-	10	12	15	29	34	43	23	20	21	A-7-6 (10)	
VERY STIFF, BROWN, **CLAY**, SOME SILT AND SAND, TRACE GRAVEL, DAMP		2.5	3 7 12	26	53	SS-2	-	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
		5.0	4 6 6	16	13	SS-3	-	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
	560.1	7.5	2 7 4	15	67	SS-4	-	17	15	12	24	32	36	18	18	17	A-6b (7)	
MEDIUM STIFF TO STIFF, BROWN, **SILTY CLAY**, SOME SAND, LITTLE GRAVEL, DAMP TO MOIST		10.0			0	ST-5	-	-	-	-	-	-	-	-	-	-	A-6b (V)	
		12.5	2 3 3	8	100	SS-6	-	0	8	13	32	47	40	18	22	19	A-6b (13)	
		15.0	2 4 6	14	93	SS-7	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
	550.1	17.5	2 6 6	16	93	SS-8	-	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
VERY STIFF, BROWN, **CLAY**, SOME SILT AND SAND, TRACE GRAVEL, DAMP		20.0	4 9 12	29	100	SS-9	-	5	11	9	29	46	41	21	20	15	A-7-6 (12)	
	546.1	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 153+86, 82 LT	EXPLORATION ID B-005-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 577.0 (MSL) EOB: 21.5 ft.	PAGE 1 OF 1
START: 6/21/11 END: 6/22/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 577.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILT AND CLAY**, AND SAND, DAMP TO MOIST		2.5	2 2 5	10	87	SS-1	-	-	-	-	-	-	-	-	-	20	A-6a (V)	
		5.0	5 8 11	26	100	SS-2	-	0	14	23	37	26	28	17	11	14	A-6a (6)	
		7.5	7 10 12	30	100	SS-3	-	-	-	-	-	-	-	-	-	12	A-6a (V)	
	569.5																	
MEDIUM DENSE TO DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND CLAY, DAMP		10.0	6 6 9	20	100	SS-4	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
		12.5	3 5 9	19	100	SS-5	-	0	11	57	18	14	NP	NP	NP	11	A-3a (0)	
		15.0	5 12 11	31	87	SS-6	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
	562.0																	
VERY STIFF TO HARD, BROWN, **SILT AND CLAY**, AND SAND, TRACE GRAVEL, DAMP		17.5	5 8 13	29	33	SS-7	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
		20.0	6 9 14	31	100	SS-8	-	6	14	25	27	28	29	14	15	12	A-6a (6)	
	555.5	EOB	4 5 8	18	100	SS-9	-	-	-	-	-	-	-	-	-	21	A-6a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:23 - \\US1268-F01\SHARED_PROJECTS\17736\173608714 LAW-7-2.14\GINT LOGS-IN PROGRESS\173608714 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 160+00, 19 LT	EXPLORATION ID B-006-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 572.0 (MSL) EOB: 31.5 ft.	PAGE 1 OF 1	
START: 6/22/11 END: 6/22/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded		

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)	ABAN-DONED
VERY STIFF, MOTTLED BROWN AND GRAY, **SILT AND CLAY**, TRACE TO LITTLE SAND, DAMP TO MOIST	572.0	2.5	2 4 8	16	100	SS-1	-	-	-	-	-	-	-	-	-	25	A-6a (V)	
		5.0			100	ST-2	-	0	1	3	48	48	34	22	12	-	A-6a (9)	
		7.5	3 6 7	18	100	SS-3	-	-	-	-	-	-	-	-	-	20	A-6a (V)	
		10.0	3 5 7	16	100	SS-4	-	0	4	13	49	34	31	16	15	19	A-6a (10)	
		12.5	6 8 13	29	100	SS-5	-	-	-	-	-	-	-	-	-	15	A-6a (V)	
	557.0																	
VERY STIFF, MOTTLED BROWN AND GRAY, **SILTY CLAY**, SOME SAND, DAMP TO MOIST		15.0	5 8 9	23	100	SS-6	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		17.5	5 7 9	22	100	SS-7	-	0	2	22	30	46	35	18	17	18	A-6b (11)	
		20.0	7 8 8	22	80	SS-8	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
	547.0	22.5	W															
MEDIUM DENSE TO DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND CLAY, WET		25.0	6 7 11	25	67	SS-9	-	0	12	57	19	12	NP	NP	NP	18	A-3a (0)	
		27.5																
		30.0	29 13 17	41	67	SS-10	-	0	12	57	19	12	NP	NP	NP	15	A-3a (0)	
	540.5		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 160+03, 175 RT	EXPLORATION ID B-007-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 543.7 (MSL) EOB: 31.5 ft.	PAGE 1 OF 1
START: 6/22/11 END: 6/22/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
TOPSOIL	543.7																	
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP TO MOIST	543.2		2 4 5	12	100	SS-1	-	-	-	-	-	-	-	-	-	20	A-2-4 (V)	
		2.5	5 7 7	19	100	SS-2	-	19	23	24	19	15	27	18	9	12	A-2-4 (0)	
		5.0	6 7 8	20	7	SS-3	-	-	-	-	-	-	-	-	-	25	A-2-4 (V)	
	536.2	7.5	3 5 8	18	100	SS-4	-	-	-	-	-	-	-	-	-	24	A-6b (V)	
STIFF TO VERY STIFF, MOTTLED BROWN AND GRAY, **SILTY CLAY**, TRACE SAND, MOIST		10.0			100	ST-5	-	0	0	1	34	65	39	23	16	-	A-6b (10)	
		12.5	4 5 6	15	100	SS-6	-	-	-	-	-	-	-	-	-	27	A-6b (V)	
	528.7	15.0	6 7 8	20	100	SS-7	-	5	25	29	26	15	27	18	9	16	A-4a (1)	
VERY STIFF, MOTTLED BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP	526.2	W																
STIFF TO VERY STIFF, GRAY, **CLAY**, SOME SILT, LITTLE SAND, MOIST		17.5	4 6 19	34	100	SS-8	-	-	-	-	-	-	-	-	-	16	A-7-6 (V)	
		20.0	2 5 9	19	100	SS-9	-	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
		22.5																
		25.0	3 5 6	15	100	SS-10	-	0	3	15	29	53	50	23	27	29	A-7-6 (17)	
		27.5																
	512.2	30.0 EOB	3 6 6	16	87	SS-11	-	-	-	-	-	-	-	-	-	24	A-7-6 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 11:43 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 164+02, 176' RT.	EXPLORATION ID B-007-1-23
TYPE: CULVERT	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 576.5 (MSL) EOB: 41.5 ft.	PAGE 1 OF 2
START: 4/24/24 END: 4/24/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.442765, -82.445738	

MATERIAL DESCRIPTION AND NOTES	ELEV. 576.5	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
VERY STIFF, BROWN, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		1																
		2																
		3	2 4 5	12	89	SS-1	3.00	-	-	-	-	-	-	-	-	27	A-6a (V)	
	572.0	4																
HARD, BROWN, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		5																
		6	3 4 6	13	100	SS-2	4.50	-	-	-	-	-	-	-	-	24	A-4b (V)	
		7																
		8	2 3 5	11	100	SS-3	4.50	0	0	1	57	42	33	23	10	26	A-4b (8)	
		9																
		10																
		11	3 6 6	16	100	SS-4	4.50	-	-	-	-	-	-	-	-	22	A-4b (V)	
		12																
		13	3 5 6	15	100	SS-5	4.50	-	-	-	-	-	-	-	-	23	A-4b (V)	
		14																
		15																
		16	3 6 8	19	100	SS-6	4.50	-	-	-	-	-	-	-	-	23	A-4b (V)	
	559.5	17																
VERY STIFF TO HARD, BROWN BECOMING GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		18	4 5 6	15	100	SS-7	3.75	-	-	-	-	-	-	-	-	27	A-6a (V)	
		19																
		20																
		21	3 3 8	15	100	SS-8	3.50	1	0	1	47	51	35	20	15	23	A-6a (10)	
		22																
		23																
		24																
		25																
		26	3 5 7	16	100	SS-9	4.25	-	-	-	-	-	-	-	-	25	A-6a (V)	
		27																
		28																
		29																

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 164+02, 176' RT.	START: 4/24/24	END: 4/24/24	PG 2 OF 2	B-007-1-23

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
VERY STIFF TO HARD, BROWN BECOMING GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP *(continued)*	546.5	31	4 5 6	15	100	SS-10	3.75	-	-	-	-	-	-	-	-	27	A-6a (V)	
		W 543.5 32 33 34																
		35	3 4 6	13	100	SS-11	3.25	0	1	2	38	59	38	23	15	25	A-6a (10)	
		36 37 38 39																
		40	3 7 10	23	100	SS-12	4.00	-	-	-	-	-	-	-	-	21	A-6a (V)	
	535.0	41 EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 33.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 2 BAGS HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 174+98, 83' RT.	EXPLORATION ID B-007-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/8/24	ELEVATION: 631.5 (MSL) EOB: 17.5 ft.	PAGE 1 OF 1
START: 4/24/24 END: 5/1/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80	LAT / LONG: 38.443989, -82.442227	

MATERIAL DESCRIPTION AND NOTES	ELEV. 631.5	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
2.0" ASPHALT (DRILLERS DESCRIPTION)	631.3																	
VERY STIFF, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, MOIST		1 2 3 4 5	4 2 5	9	39	SS-1	3.00	3	4	12	26	55	50	22	28	23	A-7-6 (17)	
	626.0	TR 5 6 7	5 50	-	83	SS-2	-	-	-	-	-	-	-	-	-	10	Rock (V)	
SHALE, MAROONISH BROWN AND BROWN, SEVERELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY THIN BEDDED, BEDDING DISCONTINUITIES: LOW ANGLE, JOINT DISCONTINUITY: 12.5'-13.5', FRACTURED TO HIGHLY FRACTURED, OPEN, SLIGHTLY ROUGH, DISINTIGRATED, POOR SURFACE CONDITION; RQD 7%, REC 57%.		8	50	-	67	SS-3	-	-	-	-	-	-	-	-	-	9	Rock (V)	
		9 10	16 50/3"	-	78	SS-4	-	-	-	-	-	-	-	-	-	5	Rock (V)	
		11 12	50	-	67	SS-5	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		13 14 15	7		57	NQ2-1											CORE	
	614.0	EOB 16 17																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE. OFFSET 2.0' SOUTH.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 1 BAG HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 177+50, 50' RT.	EXPLORATION ID B-007-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/8/24	ELEVATION: 659.2 (MSL) EOB: 12.5 ft.	PAGE 1 OF 1
START: 5/1/24 END: 5/1/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80	LAT / LONG: 38.444310, -82.441429	

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
VERY STIFF, MAROONISH BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, DAMP	659.2																	
	654.7	3	2 3 8	15	50	SS-1	3.50	2	1	4	39	54	42	21	21	17	A-7-6 (13)	
HARD, MAROONISH BROWN AND BROWN, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, RESIDUAL ROCK, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	653.2	6 TR	4 13 50/5"	-	100	SS-2	-	12	11	11	39	27	35	21	14	11	A-6a (8)	
SHALE, BROWN AND MAROONISH BROWN, SEVERELY TO HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY THIN TO THIN BEDDED, CONTAINS SIDERITE NODULES, BEDDING DISCONTINUITIES: LOW ANGLE, JOINT DISCONTINUITIES: 8.7'-9.3', 10.0'-10.6', 11.5'-12.5', HIGHLY FRACTURED TO MODERATELY FRACTURED, OPEN TO NARROW, SLIGHTLY ROUGH, DISINTIGRATED TO BLOCKY/DISTURBED/SEAMY, POOR SURFACE CONDITION; RQD 26%, REC 95%.		7	50/4"	-	100	SS-3	-	-	-	-	-	-	-	-	-	1	Rock (V)	
	646.7 EOB	10	26		95	NQ2-1											CORE	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 1 BAG HOLE PLUG; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:24 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 179+91, 55' RT.	EXPLORATION ID B-007-4-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/8/24	ELEVATION: 669.0 (MSL) EOB: 24.0 ft.	PAGE 1 OF 1
START: 5/2/24 END: 5/2/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80	LAT / LONG: 38.444573, -82.440641	

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, ORANGISH BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP	669.0																	
	664.5	1	2 3 4	9	61	SS-1	3.50	-	-	-	-	-	-	-	-	13	A-4a (V)	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP		5	3 5 10	20	100	SS-2	4.50	1	1	5	33	60	44	22	22	19	A-7-6 (14)	
	659.5	9	7 10 13	31	100	SS-3	4.50	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
HARD, MAROONISH BROWN AND GRAY, **SILTY CLAY**, TRACE STONE FRAGMENTS, TRACE SAND, RESIDUAL ROCK, DAMP		11	10 18 13	41	100	SS-4	4.50	9	1	2	38	50	39	21	18	11	A-6b (11)	
	655.5	13	10 25 50/3"	-	93	SS-5	4.50	-	-	-	-	-	-	-	-	7	A-6b (V)	
SHALE, GRAY BECOMING BROWN AND GRAY, SEVERELY WEATHERED, VERY WEAK, BEDDING DISCONTINUITIES: LOW ANGLE, FRACTURED, OPEN, SLIGHTLY ROUGH, DISINTIGRATED, POOR SURFACE CONDITION; RQD 0%, REC 24%.		TR 14	50/4"	-	100	SS-6	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		17	50	-	100	SS-7	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		18	50/2"	-	50	SS-8	-	-	-	-	-	-	-	-	-	4	Rock (V)	
MATERIAL DEGRADED DURING CORING CONTAINS A 2.5" SILTSTONE LAYER AT UNKNOWN DEPTH WITHIN CORE RUN		21	0		24	NQ2-1											CORE	
	645.0	EOB 24	50	-	83	SS-9	-	-	-	-	-	-	-	-	-	12	Rock (V)	
			50	-	67	SS-10	-	-	-	-	-	-	-	-	-	8	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 50 GAL. BENTONITE GROUT; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:24 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 181+87, 103' RT.	EXPLORATION ID B-007-5-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 645.2 (MSL) EOB: 24.0 ft.	PAGE 1 OF 1
START: 5/4/24 END: 5/4/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.444725, -82.439943	

MATERIAL DESCRIPTION AND NOTES	ELEV. 645.2	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
STIFF TO VERY STIFF, MAROONISH BROWN, **CLAY**, SOME SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, MOIST TO DAMP		1	1 2 1	4	44	SS-1	1.50	6	4	9	25	56	65	26	39	27	A-7-6 (20)	
		2																
		3																
		4	4 6 8	19	50	SS-2	3.75	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
		5																
		6																
		7	7 10 9	25	100	SS-3	3.25	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
	637.2	8																
VERY STIFF, YELLOWISH BROWN AND BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, DAMP		9	6 10 7	23	100	SS-4	3.50	1	1	4	48	46	48	28	20	20	A-7-6 (14)	
	634.7	10																
VERY DENSE, BROWN, **STONE FRAGMENTS WITH SAND**, TRACE SILT, TRACE CLAY, RESIDUAL ROCK, DAMP	632.7	11	8 15 24	52	28	SS-5	-	55	17	8	10	10	NP	NP	NP	5	A-1-b (0)	
SHALE, GRAY AND YELLOWISH BROWN, HIGHLY WEATHERED, VERY WEAK TO WEAK.		12 TR																
		13																
		14	9 19 26	60	33	SS-6	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		15																
		16																
		17	6 23 32	73	28	SS-7	-	-	-	-	-	-	-	-	-	8	Rock (V)	
	627.2	18																
SILTSTONE, GRAY AND YELLOWISH BROWN, MODERATELY WEATHERED, SLIGHTLY STRONG.		19	17 50	-	33	SS-8	-	-	-	-	-	-	-	-	-	5	Rock (V)	
		20																
		21	38 50/4"	-	30	SS-9	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		22																
		23																
	621.2	24 EOB	50	-	50	SS-10	-	-	-	-	-	-	-	-	-	7	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 183+86, 111 RT	EXPLORATION ID B-008-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 599.0 (MSL) EOB: 16.3 ft.	PAGE 1 OF 1
START: 6/23/11 END: 6/23/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	599.0																	
MEDIUM STIFF, BROWN, **CLAY**, AND SILT, SOME SAND, DAMP TO MOIST			1 2 2	5	100	SS-1	-	0	17	13	38	32	44	23	21	21	A-7-6 (12)	
		2.5	2 2 4	8	73	SS-2	-	-	-	-	-	-	-	-	-	34	A-7-6 (V)	
	594.0																	
VERY STIFF TO HARD, RED-BROWN, **CLAY**, SOME TO "AND" SILT, TRACE SAND, DRY		5.0			80	ST-3	-	0	1	2	31	66	49	22	27	-	A-7-6 (17)	
		7.5	4 8 14	30	93	SS-4	-	0	1	5	50	44	41	22	19	14	A-7-6 (12)	
	588.0	10.0	35 50/2"	-	86	SS-5	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
SHALE, TAN, SEVERELY WEATHERED, (AUGERED).		TR																
		12.5	30 50/4"	-	63	SS-6	-	-	-	-	-	-	-	-	-	-	Rock (V)	
		15.0	36 50/4"	-	75	SS-7	-	-	-	-	-	-	-	-	-	-	Rock (V)	
	582.7	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 183+93, 233 RT	EXPLORATION ID B-009-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 590.0 (MSL) EOB: 21.5 ft.	PAGE 1 OF 1
START: 6/3/11 END: 6/3/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 590.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO HARD, LIGHT BROWN TO BROWN, **SILT AND CLAY**, AND SAND, TRACE GRAVEL, DAMP TO MOIST			21 7 5	15	67	SS-1	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
		2.5	4 4 5	11	100	SS-2	-	7	21	24	25	23	32	17	15	19	A-6a (4)	
		5.0	4 6 8	17	100	SS-3	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
		7.5	5 10 15	31	100	SS-4	-	-	-	-	-	-	-	-	-	16	A-6a (V)	
		10.0	7 11 12	29	100	SS-5	-	0	4	26	40	30	30	18	12	17	A-6a (8)	
decreased sand content in sample from 10' to 15'		12.5	3 3 5	10	100	SS-6	-	2	2	15	43	38	32	17	15	22	A-6a (10)	
		15.0	5 15 11	32	87	SS-7	-	2	7	35	35	21	30	19	11	17	A-6a (5)	
	572.5	TR																
SANDSTONE, BROWN, SEVERELY WEATHERED, (AUGERED).		17.5	6 14 17	38	93	SS-8	-	-	-	-	-	-	-	-	-	13	Rock (V)	
		20.0	3 9 9	22	100	SS-9	-	-	-	-	-	-	-	-	-	19	Rock (V)	
	568.5	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:25 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 185+93, 85' RT.	EXPLORATION ID B-009-1-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 623.7 (MSL) EOB: 24.5 ft.	PAGE 1 OF 1
START: 5/3/24 END: 5/3/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.445433, -82.438781	

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
HARD, YELLOWISH BROWN, **CLAY**, SOME GRAVEL, SOME SILT, LITTLE SAND, DAMP	623.7	1	5															
		2	9 12	28	100	SS-1	4.50	32	11	6	30	21	42	24	18	11	A-7-6 (6)	
	620.7	3																
HARD, MAROONISH BROWN AND YELLOWISH BROWN, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP		4	7															
		5	16 12	37	100	SS-2	-	20	14	18	30	18	34	20	14	15	A-6a (4)	
	618.2	6																
VERY DENSE, YELLOWISH BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, RESIDUAL ROCK, DAMP		7	6 16 38	72	89	SS-3	-	45	17	9	22	7	30	21	9	6	A-2-4 (0)	
		8																
		9	21 22 36	77	100	SS-4	-	-	-	-	-	-	-	-	-	7	A-2-4 (V)	
	613.2	10																
SHALE, GRAY AND YELLOWISH BROWN BECOMING MAROONISH BROWN, HIGHLY WEATHERED, VERY WEAK TO WEAK.		TR 11	50	-	100	SS-5	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		12	10 50	-	75	SS-6	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		13																
		14	25 50/5"	-	45	SS-7	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		15																
		16	22 50/5"	-	36	SS-8	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		17																
		18																
		19	50	-	83	SS-9	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		20																
		21	50/5"	-	80	SS-10	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		22																
		23																
	599.2	EOB 24	21 50	-	67	SS-11	-	-	-	-	-	-	-	-	-	8	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:25 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 193+42, 98' RT.	EXPLORATION ID B-009-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 583.9 (MSL) EOB: 24.5 ft.	PAGE 1 OF 1
START: 5/3/24 END: 5/3/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.446815, -82.436821	

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
VERY STIFF, BROWN AND ORANGISH BROWN, **CLAY**, SOME TO "AND" SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, IRON STAINING, MOIST TO DAMP	583.9																	
		1	2															
		2	2 3	7	100	SS-1	3.50	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
		3																
		4	2															
		5	6 7	17	100	SS-2	3.00	1	4	9	35	51	51	24	27	21	A-7-6 (17)	
		6	4															
		7	5 8	17	100	SS-3	3.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
		8																
		9	4															
		10	6 9	20	100	SS-4	3.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
		11	5															
		12	8 14	29	78	SS-5	3.75	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
		13																
		14	6															
		15	9 9	24	33	SS-6	3.75	-	-	-	-	-	-	-	-	18	A-7-6 (V)	
	568.4																	
VERY STIFF TO HARD, MAROONISH BROWN AND YELLOWISH BROWN, **CLAY**, "AND" SILT, LITTLE SAND, LITTLE GRAVEL AND STONE FRAGMENTS, DAMP TO MOIST		16																
		17	5 9 11	27	100	SS-7	4.50	13	8	5	38	36	42	24	18	15	A-7-6 (11)	
		18																
		19	6															
		20	9 12	28	72	SS-8	3.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
		21																
		22	5 10 13	31	100	SS-9	3.00	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
		23																
	560.4																	
SILTSTONE, GRAY, HIGHLY WEATHERED, SLIGHTLY STRONG.	559.4	TR 24 EOB	27 50	-	33	SS-10	-	-	-	-	-	-	-	-	-	4	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 197+89, 183 LT	EXPLORATION ID B-010-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 537.9 (MSL) EOB: 24.5 ft.	PAGE 1 OF 1
START: 6/23/11 END: 6/24/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST	537.9		WOH 1 2	4	100	SS-1	-	-	-	-	-	-	-	-	-	25	A-6a (V)	
		2.5	2 3 3	8	100	SS-2	-	0	6	14	45	35	39	24	15	29	A-6a (10)	
		5.0			100	ST-3	-	1	4	14	40	41	36	21	15	-	A-6a (10)	
STIFF, MOTTLED BROWN AND GRAY, **CLAY**, AND SILT, TRACE SAND, MOIST	530.4	7.5	2 4 5	12	100	SS-4	-	0	0	2	40	58	51	27	24	29	A-7-6 (16)	
		10.0	2 3 4	10	100	SS-5	-	-	-	-	-	-	-	-	-	30	A-7-6 (V)	
MEDIUM STIFF, GRAY, **SILTY CLAY**, TRACE SAND, MOIST	525.4	12.5			50	ST-6	-	0	1	9	46	44	40	22	18	34	A-6b (11)	
LOOSE TO MEDIUM DENSE, GRAY, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, WET	522.9 W	15.0	1 3 3	8	100	SS-7	-	-	-	-	-	-	-	-	-	39	A-1-b (V)	
		17.5	4 5 3	11	100	SS-8	-	-	-	-	-	-	-	-	-	18	A-1-b (V)	
		20.0	8 10 10	27	100	SS-9	-	18	32	32	12	6	NP	NP	NP	20	A-1-b (0)	
	513.4	22.5																

ETR3

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:24 - \\US1268-F01\SHARED_PROJECTS\11736\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 202+02, 232 LT	EXPLORATION ID B-011-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 534.5 (MSL) EOB: 34.3 ft.	PAGE 1 OF 1
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
VERY LOOSE TO LOOSE, BROWN, **SANDY SILT**, LITTLE CLAY, MOIST	534.5		2 2 3	6	67	SS-1	-	-	-	-	-	-	-	-	-	23	A-4a (V)	
		2.5	1 1 1	2	100	SS-2	-	0	0	39	43	18	NP	NP	NP	23	A-4a (5)	
		5.0			100	ST-3	-	0	0	63	21	16	NP	NP	NP	17	A-4a (0)	
LOOSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT AND CLAY, MOIST	527.5	7.5	3 3 2	6	100	SS-4	-	0	0	73	17	10	NP	NP	NP	21	A-3a (0)	
		10.0	3 2 2	5	100	SS-5	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
VERY LOOSE, GRAY, **FINE SAND**, TRACE SILT AND CLAY, WET	522.0	12.5	2 1 1	2	100	SS-6	-	0	0	90	7	3	NP	NP	NP	27	A-3 (0)	
		W 15.0	1 2 1	4	100	SS-7	-	-	-	-	-	-	-	-	-	26	A-3 (V)	
LOOSE TO MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, LITTLE GRAVEL AND SILT, TRACE CLAY, WET	517.0	17.5	5 11 4	19	100	SS-8	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
		20.0	3 4 4	10	100	SS-9	-	12	15	55	11	7	NP	NP	NP	24	A-3a (0)	
		22.5																
		25.0	3 6 4	12	100	SS-10	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
		27.5																
		30.0	4 5 7	15	100	SS-11	-	-	-	-	-	-	-	-	-	16	A-3a (V)	
	500.2	32.5																
		ETR3																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 201+90, 197 RT	EXPLORATION ID B-012-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 530.9 (MSL) EOB: 33.0 ft.	PAGE 1 OF 1
START: 6/28/11 END: 6/28/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **SANDY SILT**, SOME CLAY, MOIST TO WET	530.9		1 2 3	7	100	SS-1	-	-	-	-	-	-	-	-	-	27	A-4a (V)	
		2.5	1 1 2	4	100	SS-2	-	0	0	31	48	21	28	20	8	23	A-4a (7)	
		5.0			100	ST-3	-	0	0	52	34	14	NP	NP	NP	24	A-4a (3)	
VERY LOOSE TO LOOSE, BROWN TO GRAY, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY AND GRAVEL, MOIST TO WET	523.9	W 7.5	WOH WOH 1	1	100	SS-4	-	-	-	-	-	-	-	-	-	30	A-3a (V)	
		10.0	1 1 3	5	100	SS-5	-	0	11	73	11	5	NP	NP	NP	28	A-3a (0)	
		12.5	3 3 2	7	100	SS-6	-	-	-	-	-	-	-	-	-	-	A-3a (V)	
		15.0	2 3 2	7	100	SS-7	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
		17.5	1 2 3	7	100	SS-8	-	1	36	43	12	8	NP	NP	NP	23	A-3a (0)	
medium dense to dense from 20' to 33'.		20.0	6 7 10	23	100	SS-9	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
		22.5																
		25.0	1 3 5	11	100	SS-10	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		27.5																
		30.0	17 21 20	56	100	SS-11	-	10	27	44	14	5	NP	NP	NP	13	A-3a (0)	
	497.9	32.5 ETR3																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 205+00, 260 LT	EXPLORATION ID B-013-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 555.9 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1	
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

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)	ABAN-DONED
STIFF TO VERY STIFF, LIGHT BROWN, **SILTY CLAY**, TRACE GRAVEL AND SAND, MOIST	555.9		1 2 3	6	93	SS-1	-	-	-	-	-	-	-	-	-	23	A-6b (V)	
		2.5	3 3 6	11	100	SS-2	-	0	0	1	35	64	39	21	18	23	A-6b (11)	
		5.0	3 3 6	11	100	SS-3	-	-	-	-	-	-	-	-	-	26	A-6b (V)	
		7.5	3 4 6	12	100	SS-4	-	1	1	4	35	59	38	21	17	21	A-6b (11)	
		10.0	4 6 8	17	100	SS-5	-	-	-	-	-	-	-	-	-	24	A-6b (V)	
	544.4	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 207+93, 271 LT	EXPLORATION ID B-014-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 570.0 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1	
START: 6/2/11 END: 6/2/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 570.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
ASPHALT	569.7																	
AGGREGATE BASE	569.2																	
STIFF, LIGHT BROWN, **CLAY**, AND SILT, MOIST		2.5	4 5 7	15	100	SS-1	-	0	0	0	36	64	41	20	21	22	A-7-6 (13)	
		5.0	4 4 6	12	100	SS-2	-	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
	562.5																	
STIFF, LIGHT BROWN, **SILT AND CLAY**, TRACE SAND, MOIST		7.5	3 5 4	11	100	SS-3	-	0	1	1	49	49	34	20	14	26	A-6a (10)	
		10.0	2 5 6	14	87	SS-4	-	-	-	-	-	-	-	-	-	22	A-6a (V)	
	558.5	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 212+17, 118' RT.	EXPLORATION ID B-014-1-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 581.4 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/6/24 END: 5/6/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449475, -82.431502	

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
HARD, MAROONISH BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, CONTAINS IRON STAINING AND ROOTS, DAMP	581.4																	
	578.4		4 5 5	13	100	SS-1	4.50	1	5	6	40	48	46	24	22	22	A-7-6 (14)	
HARD, YELLOWISH BROWN AND BROWN, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP			4 5 9	19	100	SS-2	4.50	0	0	1	24	75	59	27	32	22	A-7-6 (20)	
			4 7 11	24	100	SS-3	4.50	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
			5 8 12	27	100	SS-4	4.50	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
			5 7 11	24	100	SS-5	4.50	0	0	1	30	69	45	26	19	24	A-7-6 (13)	
			5 7 9	21	100	SS-6	4.50	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
			6 7 11	24	78	SS-7	4.50	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
			4 6 7	17	89	SS-8	4.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
			3 5 8	17	100	SS-9	4.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
	556.4	EOB	8 11 16	36	100	SS-10	4.25	-	-	-	-	-	-	-	-	24	A-7-6 (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:25 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\7923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 213+75, 95' RT.	EXPLORATION ID B-014-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 609.0 (MSL) EOB: 24.0 ft.	PAGE 1 OF 1
START: 5/6/24 END: 5/6/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449658, -82.431007	

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
STIFF, BROWN AND MAROONISH BROWN, **SILTY CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	609.0																	
	606.0	1	8 6 4	13	83	SS-1	-	16	11	23	24	26	36	20	16	14	A-6b (5)	
HARD, BROWN AND MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP		2																
	603.5	3	3 3 7	13	100	SS-2	4.50	7	11	6	29	47	50	26	24	18	A-7-6 (16)	
HARD, BROWN AND GRAY, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP		4																
		5																
		6	9 16 21	49	100	SS-3	4.50	-	-	-	-	-	-	-	-	9	A-6a (V)	
		7																
SS-4 CONTAINS GYPSUM		8	9 25 31	75	100	SS-4	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
		9																
SS-5 CONTAINS GYPSUM		10	13 19 22	55	100	SS-5	4.50	2	12	19	36	31	40	25	15	15	A-6a (8)	
		11																
		12	11 28 39	89	89	SS-6	4.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
		13																
		14	9 31 40	95	100	SS-7	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
	590.5	15																
SILTSTONE, GRAY AND BROWN, MODERATELY WEATHERED, SLIGHTLY STRONG.		TR 16																
		17	12 29 42	95	33	SS-8	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		18																
		19	10 35 44	105	39	SS-9	-	-	-	-	-	-	-	-	-	5	Rock (V)	
		20																
	585.0	EOB 21	50	-	83	SS-10	-	-	-	-	-	-	-	-	-	7	Rock (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:25 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 216+38, 86' RT.	EXPLORATION ID B-014-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 3/8/24	ELEVATION: 628.0 (MSL) EOB: 15.5 ft.	PAGE 1 OF 1
START: 5/4/24 END: 5/4/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80	LAT / LONG: 38.449877, -82.430131	

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
HARD, MAROONISH BROWN AND YELLOWISH BROWN, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, IRON STAINING, DAMP	628.0																	
		1	3	11	100	SS-1	4.25	1	0	1	23	75	53	24	29	18	A-7-6 (18)	
		2	3 5															
	625.0	3																
HARD, REDDISH BROWN AND YELLOWISH BROWN BECOMING ORANGISH BROWN, **CLAY**, SOME TO "AND" SILT, LITTLE TO SOME SAND, TRACE GRAVEL AND STONE FRAGMENTS, IRON STAINING, RESIDUAL ROCK, DAMP		4	8	44	100	SS-2	4.50	2	7	8	38	45	41	20	21	9	A-7-6 (13)	
		5	13 20															
		6																
		7	6 11 13	32	33	SS-3	4.50	-	-	-	-	-	-	-	-	11	A-7-6 (V)	
		8																
	618.0	9	8 12 16	37	28	SS-4	4.50	-	-	-	-	-	-	-	-	11	A-7-6 (V)	
	TR	10	50	-	83	SS-5	-	-	-	-	-	-	-	-	-	5	Rock (V)	
SILTSTONE, GRAY AND BROWN, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY STRONG TO MODERATELY STRONG, VERY THIN TO MEDIUM BEDDED, BEDDING DISCONTINUITIES: LOW ANGLE, PARTIALLY CLAY FILLED HIGH ANGLE JOINT DISCONTINUITIES FROM 12.3'-12.9' AND 14.7'-15.2', HIGHLY FRACTURED TO SLIGHTLY FRACTURED, OPEN TO NARROW, SLIGHTLY ROUGH, BLOCKY, GOOD TO FAIR SURFACE CONDITION; RQD 80%, REC 100%.		11																
		12																
		13	80		100	NQ2-1											CORE	
		14																
	612.5	15																
	EOB																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 50 GAL. BENTONITE GROUT; SHOVELED SOIL CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 218+91, 79 LT	EXPLORATION ID B-015-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 660.3 (MSL) EOB: 16.8 ft.	PAGE 1 OF 1
START: 6/29/11 END: 6/29/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 660.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP TO MOIST			1 3 5	11	47	SS-1	-	-	-	-	-	-	-	-	-	22	A-6a (V)	
		2.5	3 3 3	8	80	SS-2	-	7	13	22	26	32	33	18	15	19	A-6a (7)	
		5.0	3 3 7	14	73	SS-3	-	-	-	-	-	-	-	-	-	14	A-6a (V)	
	652.8																	
STIFF, BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP		7.5	2 4 6	14	100	SS-4	-	9	7	12	30	42	41	19	22	16	A-7-6 (12)	
		10.0	4 4 7	15	100	SS-5	-	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
	647.8																	
VERY STIFF, RED, **SILT AND CLAY**, AND SAND, TRACE GRAVEL, DAMP		12.5	4 7 8	20	67	SS-6	-	2	8	28	29	33	30	17	13	12	A-6a (7)	
	645.3																	
SHALE, SEVERELY WEATHERED, (AUGERED).		TR 15.0	29 50/2"	-	71	SS-7	-	-	-	-	-	-	-	-	-	7	Rock (V)	
	643.5	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 218+94, 12 RT	EXPLORATION ID B-016-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 605.4 (MSL) EOB: 15.0 ft.	PAGE 1 OF 1	
START: 6/29/11 END: 6/29/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded		

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP TO MOIST	605.4		2 5 5	14	100	SS-1	-	6	6	21	31	36	37	21	16	15	A-6b (9)	
		2.5	3 4 6	14	80	SS-2	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
	600.4																	
HARD, MOTTLED BROWN AND GRAY, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP		5.0			95	ST-3	-	8	8	7	35	42	42	25	17	14	A-7-6 (11)	
		7.5	3 3 9	16	100	SS-4	-	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
		10.0	7 10 21	42	100	SS-5	-	1	7	7	29	56	42	23	19	16	A-7-6 (12)	
		12.5	10 15 50/5"	-	100	SS-6	-	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
	590.4	ETR3 15.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 218+77, 270 RT	EXPLORATION ID B-017-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 572.7 (MSL) EOB: 31.5 ft.	PAGE 1 OF 1
START: 6/29/11 END: 6/29/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 572.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF, BROWN, **SILT AND CLAY**, AND SAND, LITTLE GRAVEL, DAMP TO MOIST			2 3 4	10	33	SS-1	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
		2.5	2 3 4	10	73	SS-2	-	-	-	-	-	-	-	-	-	15	A-6a (V)	
		5.0	2 4 5	12	100	SS-3	-	15	12	24	26	23	35	21	14	22	A-6a (4)	
	565.2	7.5																
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP			6 7 7	19	73	SS-4	-	-	-	-	-	-	-	-	-	6	A-2-4 (V)	
		10.0	5 7 7	19	100	SS-5	-	44	14	19	12	11	26	19	7	14	A-2-4 (0)	
		12.5	4 4 5	12	93	SS-6	-	-	-	-	-	-	-	-	-	15	A-2-4 (V)	
	557.7 W	15.0																
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, CLAY AND GRAVEL, WET			4 4 6	14	100	SS-7	-	12	24	34	20	10	NP	NP	NP	16	A-3a (0)	
		17.5	5 14 7	29	100	SS-8	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
	552.7	20.0																
STIFF TO VERY STIFF, GRAY, **SANDY SILT**, SOME CLAY, DAMP TO MOIST			4 3 5	11	80	SS-9	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
		22.5																
		25.0	3 6 8	19	100	SS-10	-	0	3	27	37	33	29	19	10	19	A-4a (7)	
		27.5																
	541.2	30.0 EOB	8 5 7	16	100	SS-11	-	-	-	-	-	-	-	-	-	20	A-4a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 225+07, 3 RT	EXPLORATION ID B-018-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 653.1 (MSL) EOB: 17.4 ft.	PAGE 1 OF 1
START: 6/15/11 END: 6/15/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	653.1																	
SOFT TO MEDIUM STIFF, GRAY TO MOTTLED BROWN AND GRAY, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP TO MOIST			1 1 1	2	13	SS-1	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
		2.5	WOH 2 2	5	40	SS-2	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
		5.0			100	ST-3	-	10	7	13	37	33	37	19	18	18	A-6b (10)	
		7.5	2 2 2	5	87	SS-4	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
	643.1																	
STIFF, LIGHT BROWN, **SILT AND CLAY**, AND SAND, LITTLE GRAVEL, DAMP TO MOIST		10.0	3 3 5	10	73	SS-5	-	15	12	29	25	19	25	14	11	11	A-6a (2)	
		12.5	2 4 5	11	60	SS-6	-	-	-	-	-	-	-	-	-	17	A-6a (V)	
	638.1																	
STIFF, BROWN, **CLAY**, SOME SILT, LITTLE GRAVEL, TRACE SAND, DAMP	637.4	15.0			100	ST-7	-	14	1	2	35	48	41	20	21	18	A-7-6 (13)	
			50/5"	-	100	SS-8	-	-	-	-	-	-	-	-	-	5	Rock (V)	
SHALE, SEVERELY WEATHERED, (AUGERED).	635.7	EOB																

NOTES: SLIGHT METHANE ODOR IN SAMPLE ST-3

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 228+76, 0 LT	EXPLORATION ID B-019-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 621.8 (MSL) EOB: 11.1 ft.	PAGE 1 OF 1
START: 6/29/11 END: 6/29/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 621.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	621.3		1 1 2	4	67	SS-1	-	-	-	-	-	-	-	-	-	32	A-7-6 (V)	
STIFF, BROWN GRASING TO RED-BROWN, **CLAY**, AND SILT, TRACE SAND AND GRAVEL, DAMP TO MOIST		2.5	2 3 5	11	67	SS-2	-	0	0	2	35	63	49	24	25	19	A-7-6 (16)	
		5.0			100	ST-3	-	10	0	5	40	45	42	22	20	15	A-7-6 (12)	
	613.8	7.5	6 8 20	38	100	SS-4	-	0	3	4	50	43	40	23	17	16	A-6b (11)	
HARD, TAN, **SILTY CLAY**, TRACE SAND, DAMP	611.8	TR																
SHALE, SEVERELY WEATHERED, (AUGERED).	610.7	10.0 EOB	8 23 50/1"	-	100	SS-5	-	-	-	-	-	-	-	-	-	10	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 231+17, 233 LT	EXPLORATION ID B-020-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 637.0 (MSL) EOB: 21.5 ft.	PAGE 1 OF 1
START: 6/30/11 END: 6/30/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	637.0																	
STIFF, LIGHT BROWN, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, DAMP	634.5		3 3 5	11	67	SS-1	-	18	10	19	28	25	30	20	10	18	A-4a (4)	
DENSE TO VERY DENSE, TAN, **STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP	627.0	2.5	7 22 17	53	100	SS-2	-	-	-	-	-	-	-	-	-	9	A-2-4 (V)	
		5.0	13 26 40	90	100	SS-3	-	43	16	9	20	12	32	22	10	6	A-2-4 (0)	
		7.5	22 11 13	33	100	SS-4	-	-	-	-	-	-	-	-	-	14	A-2-4 (V)	
HARD, RED, **CLAY**, SOME SILT, TRACE SAND AND GRAVEL, DAMP	622.0	10.0	8 12 14	35	100	SS-5	-	5	2	3	30	60	44	24	20	12	A-7-6 (13)	
		12.5	9 13 22	48	100	SS-6	-	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
HARD, TAN, **SILTY CLAY**, TRACE SAND, DAMP	615.5	15.0	10 14 22	49	100	SS-7	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		17.5	8 18 36	74	100	SS-8	-	0	1	5	45	49	39	22	17	9	A-6b (11)	
		20.0 EOB	13 20 50	96	100	SS-9	-	-	-	-	-	-	-	-	-	10	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 230+85, 275 RT	EXPLORATION ID B-021-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 637.7 (MSL) EOB: 9.9 ft.	PAGE 1 OF 1
START: 6/30/11 END: 6/30/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF, RED-BROWN, **CLAY**, SOME SILT, LITTLE SAND AND GRAVEL, MOIST	637.7		1 3 3	8	100	SS-1	-	14	5	10	23	48	44	22	22	22	A-7-6 (13)	
	634.7	2.5	7 9 14	31	100	SS-2	-	3	9	18	49	21	31	21	10	8	A-4a (7)	
HARD, TAN, **SANDY SILT**, SOME SAND AND CLAY, TRACE GRAVEL, DAMP	632.7	5.0	25 17 45	85	100	SS-3	-	17	11	12	32	28	35	22	13	8	A-6a (6)	
HARD, TAN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DRY	627.8	7.5	19 18 50	93	100	SS-4	-	-	-	-	-	-	-	-	-	8	A-6a (V)	
		ETR3																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 235+95, 44 RT	EXPLORATION ID B-022-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 674.3 (MSL) EOB: 21.5 ft.	PAGE 1 OF 1
START: 6/30/11 END: 6/30/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 674.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	673.8		2 2 3	7	100	SS-1	-	-	-	-	-	-	-	-	-	23	A-4a (V)	
MEDIUM STIFF TO STIFF, BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, DAMP TO MOIST		2.5	3 3 4	10	73	SS-2	-	6	9	15	44	26	34	24	10	17	A-4a (7)	
		5.0	2 2 5	10	87	SS-3	-	-	-	-	-	-	-	-	-	25	A-4a (V)	
	666.8	7.5	5 9 12	29	100	SS-4	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
VERY STIFF TO HARD, RED-BROWN, **SILT AND CLAY**, TRACE SAND, DAMP		10.0	9 13 15	38	100	SS-5	-	0	0	3	48	49	37	22	15	12	A-6a (10)	
		12.5	9 10 12	30	80	SS-6	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
	659.3	15.0	4 8 11	26	100	SS-7	-	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
VERY STIFF TO HARD, RED-BROWN, **CLAY**, AND SILT, TRACE SAND AND GRAVEL, DAMP		17.5	5 8 13	29	100	SS-8	-	2	1	3	42	52	43	22	21	14	A-7-6 (13)	
		20.0	9 13 20	45	100	SS-9	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
	652.8	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 247+64, 12 LT	EXPLORATION ID B-023-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 608.5 (MSL) EOB: 15.5 ft.	PAGE 1 OF 1	
START: 6/30/11 END: 6/30/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 608.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
LOOSE, BROWN, **GRAVEL WITH SAND, SILT, AND CLAY**, DAMP	606.0		4 2 2	5	67	SS-1	-	52	8	14	14	12	35	20	15	8	A-2-6 (1)	
LOOSE, BROWN, **GRAVEL WITH SAND AND SILT**, LITTLE CLAY, MOIST	602.0	2.5	3 2 4	8	87	SS-2	-	48	11	17	13	11	29	19	10	20	A-2-4 (0)	
		5.0	31 50/2"	-	100	SS-3	-	-	-	-	-	-	-	-	-	10	A-2-4 (V)	
SHALE, SEVERELY WEATHERED, (AUGERED).		TR 7.5	50	-	100	SS-4	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		10.0	25 50/4"	-	100	SS-5	-	-	-	-	-	-	-	-	-	5	Rock (V)	
	593.0	12.5 15.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 253+41, 305 LT	EXPLORATION ID B-024-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 625.6 (MSL) EOB: 51.5 ft.	PAGE 1 OF 2
START: 7/5/11 END: 7/5/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 625.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
VERY STIFF TO HARD, RED, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP			4 4 10	19	67	SS-1	-	6	11	15	33	35	38	20	18	12	A-6b (10)	
	622.1	2.5	8 13 13	35	100	SS-2	-	-	-	-	-	-	-	-	-	12	A-6b (V)	
HARD, BROWN, **SILTY CLAY**, LITTLE SAND, DRY		5.0	7 18 20	52	100	SS-3	-	-	-	-	-	-	-	-	-	7	A-6b (V)	
		7.5	26 50	-	100	SS-4	-	-	-	-	-	-	-	-	-	6	A-6b (V)	
		10.0	11 28 40	93	100	SS-5	-	0	5	11	48	36	40	21	19	11	A-6b (12)	
	613.1	TR 12.5	16 25 41	90	100	SS-6	-	-	-	-	-	-	-	-	-	8	Rock (V)	
SHALE, SEVERELY WEATHERED, (AUGERED).	610.2	15.0																
SHALE, BROWN GRADING TO GRAY, MODERATELY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, HIGHLY FRACTURED; RQD 26%, REC 79%.		17.5	20		75	NQ-1											CORE	
		20.0 22.5	0		61	NQ-2											CORE	
		25.0 27.5	56		100	NQ-3											CORE	
	594.6	30.0																
MUDSTONE, MOTTLED RED AND GRAY, MODERATELY WEATHERED, WEAK, THIN BEDDED; RQD 0%, REC 65%.		32.5 35.0	0		66	NQ-4											CORE	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 253+41, 305 LT	START: 7/5/11	END: 7/5/11	PG 2 OF 2	B-024-0-11

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)	ABAN-DONED
	588.9																	
	587.7	37.5																
SILTSTONE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, THIN BEDDED, PLANAR; RQD 81%, REC 99%.		40.0	81		97	NQ-5											CORE	
		42.5																
		45.0	81		100	NQ-6											CORE	
		47.5																
		50.0																
	574.1	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 253+92, 704 LT	EXPLORATION ID B-025-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 604.7 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1
START: 7/6/11 END: 7/6/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 604.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
ASPHALT	604.3																	
MEDIUM DENSE TO DENSE, BROWN, **GRAVEL WITH SAND, SILT, AND CLAY**, DAMP		2.5	9 11 7	25	100	SS-1	-	28	21	24	13	14	27	16	11	13	A-2-6 (0)	
		5.0	26 50	-	50	SS-2	-	-	-	-	-	-	-	-	-	12	A-2-6 (V)	
		7.5	18 16 10	35	100	SS-3	-	-	-	-	-	-	-	-	-	10	A-2-6 (V)	
	594.7																	
VERY STIFF, BROWN, **CLAY**, AND SILT, TRACE SAND, MOIST	593.2	10.0 EOB	6 8 12	27	100	SS-4	-	0	1	3	38	58	48	22	26	24	A-7-6 (16)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:24 - \\US1268-F01\SHARED_PROJECTS\1736\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 255+99, 82 RT	EXPLORATION ID B-026-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 612.0 (MSL) EOB: 31.4 ft.	PAGE 1 OF 1
START: 6/30/11 END: 6/30/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP TO MOIST	612.0		2 2 2	5	100	SS-1	-	-	-	-	-	-	-	-	-	21	A-6a (V)	
		2.5	2 2 3	7	100	SS-2	-	15	14	17	31	23	33	21	12	22	A-6a (5)	
		5.0	2 3 4	10	100	SS-3	-	-	-	-	-	-	-	-	-	21	A-6a (V)	
		7.5	2 3 3	8	100	SS-4	-	-	-	-	-	-	-	-	-	21	A-6a (V)	
	602.0	10.0	5 10 18	38	100	SS-5	-	1	3	5	43	48	46	21	25	13	A-7-6 (15)	
VERY STIFF TO HARD, BROWN, **CLAY**, AND SILT, TRACE SAND AND GRAVEL, DAMP		12.5	10 10 9	26	93	SS-6	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
		15.0	16 19 26	61	100	SS-7	-	-	-	-	-	-	-	-	-	9	A-7-6 (V)	
	592.9	17.5	18 50/4"	-	100	SS-8	-	-	-	-	-	-	-	-	-	8	A-7-6 (V)	
		TR																
SILTSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, THIN BEDDED, ARENACEOUS, IRON STAINING; RQD 76%, REC 94%.		20.0	71		95	NQ-1											CORE	
		22.5																
		25.0																
		27.5	84		92	NQ-2											CORE	
	580.6	30.0																
		EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 255+86, 231 LT	EXPLORATION ID B-027-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 584.5 (MSL) EOB: 10.8 ft.	PAGE 1 OF 1	
START: 6/2/11 END: 6/2/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

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)	ABAN-DONED
MEDIUM STIFF TO STIFF, LIGHT BROWN, **SILTY CLAY**, AND SAND, TRACE GRAVEL, DAMP	584.5		4 3 3	7	80	SS-1	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		2.5	4 4 5	11	87	SS-2	-	10	18	22	23	27	36	18	18	14	A-6b (6)	
HARD, RED-BROWN, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP	580.0	5.0	5 14 23	46	100	SS-3	-	1	2	4	42	51	35	17	18	11	A-6b (11)	
		7.5	10 14 24	47	93	SS-4	-	-	-	-	-	-	-	-	-	11	A-6b (V)	
SANDSTONE, TAN, SEVERELY WEATHERED, (AUGERED).	574.5 573.7	TR 10.0 EOB	16 50/4"	-	100	SS-5	-	-	-	-	-	-	-	-	-	11	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 260+01, 137 LT	EXPLORATION ID B-028-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 565.2 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1
START: 6/30/11 END: 6/30/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
SOFT TO MEDIUM STIFF, TAN, **SILTY CLAY**, SOME SAND, LITTLE GRAVEL, ORGANICS PRESENT, DAMP	565.2		3 3 3	8	67	SS-1	-	14	12	9	31	34	39	20	19	11	A-6b (10)	
		2.5	2 1 1	3	73	SS-2	-	14	12	9	31	34	39	20	19	14	A-6b (10)	
	560.2																	
STIFF TO HARD, RED-BROWN, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST		5.0	2 5 5	14	33	SS-3	-	-	-	-	-	-	-	-	-	21	A-6a (V)	
		7.5	4 3 4	10	67	SS-4	-	-	-	-	-	-	-	-	-	18	A-6a (V)	
		10.0	9 10 13	31	100	SS-5	-	8	2	18	44	28	29	18	11	11	A-6a (8)	
	553.7	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 261+96, 14 RT	EXPLORATION ID B-029-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 565.2 (MSL) EOB: 21.5 ft.	PAGE 1 OF 1	
START: 6/2/11 END: 6/2/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 565.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
ASPHALT	564.4																	
AGGREGATE BASE	563.6																	
VERY STIFF, LIGHT BROWN, **SILT AND CLAY**, SOME SAND, DAMP		2.5	6 8 9	21	100	SS-1	-	0	11	24	36	29	29	17	12	13	A-6a (7)	
		5.0	4 7 8	19	100	SS-2	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
	557.7	7.5	4 7 7	17	100	SS-3	-	8	16	23	33	20	26	16	10	13	A-4a (3)	
VERY STIFF, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP		10.0	3 7 7	17	100	SS-4	-	-	-	-	-	-	-	-	-	13	A-4a (V)	
	553.7	12.5	4 8 15	29	87	SS-5	-	7	14	22	32	25	27	14	13	15	A-6a (6)	
VERY STIFF, LIGHT BROWN, **SILT AND CLAY**, AND SAND, TRACE GRAVEL, DAMP TO MOIST	551.2	15.0	5 8 7	19	87	SS-6	-	9	20	16	33	22	27	17	10	13	A-4a (4)	
MEDIUM DENSE, BROWN, **SANDY SILT**, LITTLE TO SOME CLAY, TRACE GRAVEL, DAMP TO MOIST		17.5	5 5 5	12	100	SS-7	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
	543.7	20.0 EOB	4 6 4	12	100	SS-8	-	6	13	41	24	16	NP	NP	NP	14	A-4a (1)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 264+03, 123 LT	EXPLORATION ID B-030-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 564.9 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1	
START: 7/7/11 END: 7/7/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded		

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)	ABAN-DONED
STIFF, BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP	564.9		3 4 5	12	80	SS-1	-	13	19	9	29	30	35	22	13	12	A-6a (6)	
	562.9	2.5																
VERY STIFF, RED-BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP			6 10 11	29	100	SS-2	-	5	6	12	38	39	38	20	18	11	A-6b (11)	
	559.9	5.0																
HARD, RED, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP			7 9 13	30	100	SS-3	-	8	3	9	44	36	33	18	15	11	A-6a (10)	
		7.5																
			9 14 17	42	100	SS-4	-	-	-	-	-	-	-	-	-	10	A-6a (V)	
	554.9	TR 10.0																
SHALE, SEVERELY WEATHERED, (AUGERED).	553.4	EOB	13 20 18	52	100	SS-5	-	-	-	-	-	-	-	-	-	4	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 268+17, 550 LT	EXPLORATION ID B-031-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 542.6 (MSL) EOB: 20.0 ft.	PAGE 1 OF 1
START: 6/1/11 END: 6/1/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **SILT AND CLAY**, AND SAND, LITTLE GRAVEL, MOIST	542.6		5 4 3	9	40	SS-1	-	-	-	-	-	-	-	-	-	20	A-6a (V)	
		2.5	2 1 2	4	100	SS-2	-	11	9	27	31	22	29	17	12	26	A-6a (4)	
VERY DENSE, BROWN, **STONE FRAGMENTS**, SOME SAND, TRACE SILT AND CLAY, MOIST	537.1	5.0	2 30 11	51	73	SS-3	-	58	13	17	8	4	NP	NP	NP	10	A-1-a (0)	
STIFF, BROWN, **SILTY CLAY**, AND GRAVEL, LITTLE SAND, DAMP	535.1	7.5	5 4 4	10	80	SS-4	-	45	9	7	19	20	37	19	18	16	A-6b (3)	
MUDSTONE, RED, SEVERELY WEATHERED, (AUGERED).	532.6	TR 10.0	8 14 21	43	73	SS-5	-	-	-	-	-	-	-	-	-	11	Rock (V)	
MUDSTONE, RED GRADING TO GRAY, MODERATELY TO SLIGHTLY WEATHERED, WEAK, THICK BEDDED, CLAY FILLED JOINTS; RQD 0%, REC 100%.	531.1	12.5	14		100	NQ-1											CORE	
SANDSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, FINE TO MEDIUM GRAINED, THIN BEDDED, IRON STAINING; RQD 67%, REC 89%.	526.2	15.0 17.5	57		86	NQ-2											CORE	
	522.6	EOB 20.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 272+41, 161 LT	EXPLORATION ID B-036-1-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 569.4 (MSL) EOB: 9.5 ft.	PAGE 1 OF 1
START: 7/7/11 END: 7/7/11	SAMPLING METHOD: ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 569.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF, LIGHT BROWN, **CLAY**, AND SILT, LITTLE SAND, TRACE GRAVEL, DAMP	562.9	2.5																
		5.0			100	ST-1	-	8	5	6	36	45	42	22	20	19	A-7-6 (12)	
VERY STIFF TO HARD, MOTTLED RED NAD BROWN, **SILT AND CLAY**, TRACE TO LITTLE SAND AND GRAVEL, DAMP	559.9	7.5			100	ST-2	-	2	3	8	44	43	36	21	15	13	A-6a (10)	
		EOB			100	ST-3	-	18	5	10	38	29	31	17	14	12	A-6a (8)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 271+55, 221 RT	EXPLORATION ID B-037-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 562.6 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1
START: 6/2/11 END: 6/2/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 562.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
ASPHALT	561.4																	
MEDIUM STIFF, BROWN, **SILTY CLAY**, SOME SAND, MOIST		2.5	1 2 3	6	100	SS-1	-	0	8	19	32	41	37	19	18	22	A-6b (11)	
		5.0	2 2 2	5	67	SS-2	-	-	-	-	-	-	-	-	-	26	A-6b (V)	
	555.1																	
VERY STIFF, BROWN, **SILT AND CLAY**, AND SAND, TRACE STONE FRAGMENTS, DAMP TO MOIST		7.5	4 6 8	17	93	SS-3	-	8	21	30	22	19	27	14	13	11	A-6a (2)	
		10.0	5 5 8	16	73	SS-4	-	-	-	-	-	-	-	-	-	20	A-6a (V)	
	551.1	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 274+16, 567 LT	EXPLORATION ID B-039-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 666.9 (MSL) EOB: 21.0 ft.	PAGE 1 OF 1
START: 6/2/11 END: 6/2/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP	666.9		6 4 6	12	73	SS-1	-	-	-	-	-	-	-	-	-	9	A-6b (V)	
		2.5	6 10 12	27	80	SS-2	-	6	4	7	46	37	34	17	17	12	A-6b (11)	
	661.3	5.0 TR	16 50/1"	-	100	SS-3	-	-	-	-	-	-	-	-	-	8	A-6b (V)	
SANDSTONE, TAN, SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, FINE GRAINED, VERY THIN TO THIN BEDDED, IRON STAINING THROUGHOUT, VERTICAL FRACTURE FROM 15.8' TO 16.7'; RQD 60%, REC 100%.		7.5	60		100	NQ-1											CORE	
		10.0																
		12.5	65		100	NQ-2											CORE	
	648.1	15.0																
MUDSTONE, RED-BROWN, SLIGHTLY WEATHERED, WEAK, THIN BEDDED; RQD 0%, REC 77%.	645.9	17.5																
		20.0 EOB	0		77	NQ-3											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 277+41, 383 LT	EXPLORATION ID B-040-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 641.5 (MSL) EOB: 21.3 ft.	PAGE 1 OF 1
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, MOTTLED BROWN AND GRAY, **CLAY**, AND SILT, LITTLE SAND, TRACE GRAVEL, DAMP	641.5		2 4 5	11	93	SS-1	-	5	8	9	36	42	53	27	26	23	A-7-6 (17)	
		2.5	5 8 12	25	40	SS-2	-	-	-	-	-	-	-	-	-	6	A-7-6 (V)	
SHALE, BROWN GRADING TO GRAY, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, IRON STAINING THROUGHOUT, SEVERELY WEATHERES AND WEAK ZONE FROM 10.5' TO 11.3'; RQD 51%, REC 87%.	636.5	TR 5.0	42		100	NQ-1											CORE	
		7.5	48		90	NQ-2											CORE	
SANDSTONE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, STRONG, FINE GRAINED, THIN BEDDED, FEW SHALE LAMINAE (<1%); RQD 67%, REC 100%.	628.8	10.0 12.5 15.0	66		95	NQ-3											CORE	
	620.2	17.5 20.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 277+97, 3 LT	EXPLORATION ID B-041-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 570.3 (MSL) EOB: 4.7 ft.	PAGE 1 OF 1
START: 5/24/11 END: 5/24/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 570.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF, BROWN, **SILTY CLAY**, SOME SAND, LITTLE GRAVEL, MOIST		2.5	2 3 2	7	53	SS-1	-	12	6	17	33	32	35	18	17	19	A-6b (9)	
	567.0	TR	2 10 40	68	67	SS-2	-	-	-	-	-	-	-	-	-	11	Rock (V)	
SANDSTONE, BROWN, SEVERELY WEATHERED, (AUGERED).	565.6	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 280+11, 181 LT	EXPLORATION ID B-042-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 632.5 (MSL) EOB: 3.6 ft.	PAGE 1 OF 1	
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 632.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	632.2																	
STIFF, RED-BROWN, **CLAY**, SOME SILT, TRACE SAND, DAMP			3 3 6	11	80	SS-1	-	0	1	3	35	61	52	26	26	19	A-7-6 (17)	
	629.6																	
SHALE, TAN, SEVERELY WEATHERED, (AUGERED).	628.9	2.5 TR EOB	17 31 50/1"	-	91	SS-2	-	-	-	-	-	-	-	-	-	11	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 282+04, 10 RT	EXPLORATION ID B-043-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 578.4 (MSL) EOB: 8.7 ft.	PAGE 1 OF 1
START: 7/7/11 END: 7/7/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 578.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **CLAY**, AND SILT, LITTLE SAND, TRACE GRAVEL, DAMP			1 3 6	12	80	SS-1	-	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
		2.5	5 6 8	19	100	SS-2	-	7	8	7	38	40	44	22	22	17	A-7-6 (14)	
	573.4																	
VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND AND GRAVEL, DAMP		5.0	8 9 11	27	100	SS-3	-	11	12	6	30	41	38	21	17	17	A-6b (10)	
		7.5	13 50	-	100	SS-4	-	-	-	-	-	-	-	-	-	7	A-6b (V)	
	569.7	ETR3																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 286+94, 0 RT	EXPLORATION ID B-044-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 605.7 (MSL) EOB: 7.3 ft.	PAGE 1 OF 1
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 605.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF, RED-BROWN, **SILTY CLAY**, SOME GRAVEL, LITTLE SAND, DAMP	603.2	2.5	3 4 5	11	100	SS-1	-	28	7	6	29	30	40	20	20	14	A-6b (9)	
VERY STIFF TO HARD, RED-BROWN, **CLAY**, SOME SILT, TRACE SAND AND GRAVEL, DAMP	598.4	5.0	5 6 11	21	67	SS-2	-	2	2	3	35	58	49	25	24	22	A-7-6 (15)	
		ETR	12 15 15	37	100	SS-3	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 287+77, 163 LT	EXPLORATION ID B-045-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 650.3 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO HARD, RED-BROWN, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP TO MOIST	650.3		2 3 4	9	53	SS-1	-	-	-	-	-	-	-	-	-	27	A-6b (V)	
		2.5	4 11 13	30	100	SS-2	-	8	4	5	38	45	38	18	20	12	A-6b (12)	
		5.0	9 22 31	66	73	SS-3	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
		7.5	18 30 50	99	100	SS-4	-	2	1	3	46	48	39	20	19	8	A-6b (12)	
	639.3	10.0	12 31 50	100	67	SS-5	-	-	-	-	-	-	-	-	-	8	A-6b (V)	
SHALE, SEVERELY WEATHERED, (AUGERED).	638.8	TR EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 292+10, 145 LT	EXPLORATION ID B-046-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 556.8 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1	
START: 6/1/11 END: 6/1/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

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)	ABAN-DONED
AGGREGATE BASE	556.8																	
	556.0																	
MEDIUM STIFF TO STIFF, BROWN, **SILTY CLAY**, TRACE TO LITTLE GRAVEL AND SAND, MOIST			13 6 3	11	80	SS-1	-	-	-	-	-	-	-	-	-	8	A-1-b (V)	
		2.5	3 3 2	6	80	SS-2	-	18	8	8	32	34	39	23	16	25	A-6b (9)	
		5.0	3 5 5	12	100	SS-3	-	-	-	-	-	-	-	-	-	25	A-6b (V)	
		7.5	3 3 4	9	100	SS-4	-	3	1	1	33	62	38	21	17	28	A-6b (11)	
		10.0	4 6 7	16	100	SS-5	-	-	-	-	-	-	-	-	-	27	A-6b (V)	
	545.3	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:25 - \\US1268-F01\SHARED_PROJECTS\17736\173608714 LAW-7-2.14\GINT LOGS-IN PROGRESS\173608714 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 293+00, 12 RT	EXPLORATION ID B-047-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 532.4 (MSL) EOB: 39.2 ft.	PAGE 1 OF 2
START: 5/24/11 END: 5/24/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF, LIGHT BROWN, **CLAY**, AND SILT, TRACE SAND, MOIST	532.4		1 3 3	7	80	SS-1	-	-	-	-	-	-	-	-	-	36	A-7-6 (V)	
		2.5	1 3 3	7	100	SS-2	-	0	2	4	38	56	51	27	24	32	A-7-6 (16)	
MEDIUM STIFF, LIGHT BROWN, **ELASTIC CLAY**, SOME SILT, TRACE GRAVEL AND SAND, MOIST	527.9	5.0	1 1 3	5	100	SS-3	-	10	1	3	24	62	66	32	34	50	A-7-5 (20)	
SOFT, LIGHT BROWN, **CLAY**, AND SILT, LITTLE SAND, TRACE GRAVEL, MOIST	525.3	7.5 W	1 1 2	4	80	SS-4	-	-	-	-	-	-	-	-	-	44	A-7-6 (V)	
	520.4	10.0	WOH 1 1	2	100	SS-5	-	1	4	7	36	52	49	23	26	39	A-7-6 (16)	
SOFT TO MEDIUM STIFF, LIGHT GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET		12.5	1 1 1	2	33	SS-6	-	-	-	-	-	-	-	-	-	26	A-4a (V)	
		15.0	2 2 2	5	80	SS-7	-	-	-	-	-	-	-	-	-	26	A-4a (V)	
		17.5	1 2 2	5	100	SS-8	-	6	17	35	26	16	19	12	7	27	A-4a (1)	
		20.0	1 3 4	9	73	SS-9	-	-	-	-	-	-	-	-	-	28	A-4a (V)	
		22.5																
	506.4	25.0	3 6 9	19	100	SS-10	-	-	-	-	-	-	-	-	-	20	A-4a (V)	
MEDIUM DENSE TO DENSE, GRAY, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, WET		27.5																
		30.0	4 8 18	32	100	SS-11	-	23	27	27	16	7	NP	NP	NP	13	A-1-b (0)	
		32.5																
		35.0	3 4	11	100	SS-12	-	-	-	-	-	-	-	-	-	21	A-1-b (V)	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 293+00, 12 RT	START: 5/24/11	END: 5/24/11	PG 2 OF 2	B-047-0-11

MATERIAL DESCRIPTION AND NOTES	ELEV. 495.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM DENSE TO DENSE, GRAY, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, WET *(continued)*	493.7	37.5	5															
SHALE, SEVERELY WEATHERED, (AUGERED).	493.2	TR EOB	50	-	100	SS-13	-	-	-	-	-	-	-	-	-	-	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 293+00, 12 RT	EXPLORATION ID B-047-1-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 532.4 (MSL) EOB: 6.5 ft.	PAGE 1 OF 1
START: 7/7/11 END: 7/7/11	SAMPLING METHOD: ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF, LIGHT BROWN, **CLAY**, LITTLE SILT, TRACE SAND AND GRAVEL, MOIST	532.4	2.5																
	525.9	5.0 EOB			100	ST-1	-	7	2	3	20	68	66	29	37	40	A-7-6 (20)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 293+00, 12 RT	EXPLORATION ID B-047-2-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 532.4 (MSL) EOB: 8.5 ft.	PAGE 1 OF 1
START: 7/7/11 END: 7/7/11	SAMPLING METHOD:	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 532.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF, LIGHT BROWN, **CLAY**, AND SILT, TRACE SAND, MOIST (VISUAL)	527.9	2.5																
MEDIUM STIFF, LIGHT BROWN, **ELASTIC CLAY**, LITTLE SILT, TRACE SAND, MOIST	525.9	5.0			100	ST-1	-	0	1	1	19	79	66	30	36	46	A-7-5 (20)	
SOFT, LIGHT BROWN, **CLAY**, SOME SILT AND SAND, MOIST	523.9	7.5			100	ST-2	-	0	8	14	24	54	44	21	23	30	A-7-6 (14)	
		EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 292+96, 195 RT	EXPLORATION ID B-048-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 535.9 (MSL) EOB: 40.7 ft.	PAGE 1 OF 2
START: 5/25/11 END: 5/25/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	535.9																	
MEDIUM STIFF, LIGHT BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, MOIST			2 2 3	6	87	SS-1	-	-	-	-	-	-	-	-	-	31	A-6b (V)	
	531.4	2.5	2 3 3	7	100	SS-2	-	3	1	20	38	38	39	19	20	24	A-6b (12)	
MEDIUM STIFF, LIGHT BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, MOIST		5.0	2 2 2	5	100	SS-3	-	1	0	34	39	26	29	18	11	25	A-6a (6)	
	528.4	7.5			100	ST-4	-	0	6	63	18	13	NP	NP	NP	26	A-3a (0)	
LOOSE, BROWN, **COARSE AND FINE SAND**, LITTLE GRAVEL AND SILT, TRACE TO LITTLE CLAY, MOIST TO WET		10.0	2 2 2	5	100	SS-5	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
		W 12.5	1 1 3	5	100	SS-6	-	15	19	47	11	8	NP	NP	NP	29	A-3a (0)	
	520.9	15.0	2 3 2	6	100	SS-7	-	10	16	29	21	24	22	14	8	31	A-4a (2)	
MEDIUM STIFF TO STIFF, BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, WET		17.5	2 4 5	11	67	SS-8	-	-	-	-	-	-	-	-	-	26	A-4a (V)	
	515.9	20.0			35	ST-9	-	0	0	4	48	48	31	19	12	27	A-6a (9)	
STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, MOIST		22.5																
		25.0	3 4 4	10	100	SS-10	-	-	-	-	-	-	-	-	-	27	A-6a (V)	
		27.5																
		30.0			35	ST-11	-	0	2	7	45	46	33	20	13	25	A-6a (9)	
		32.5																
		35.0	4 4	10	88	SS-12	-	-	-	-	-	-	-	-	-	23	A-6a (V)	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 292+96, 195 RT	START: 5/25/11	END: 5/25/11	PG 2 OF 2	B-048-0-11

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)	ABAN-DONED
	499.2																	
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	498.8	TR 37.5	4															
	495.2	EOB 40.0	7 50/2"	-	100	SS-13	-	-	-	-	-	-	-	-	-	14	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 295+78, 146 LT	EXPLORATION ID B-049-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 563.5 (MSL) EOB: 11.5 ft.	PAGE 1 OF 1	
START: 5/25/11 END: 5/25/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

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)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **CLAY**, AND SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, MOIST	563.5		2 2 4	7	100	SS-1	-	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
		2.5	3 4 5	11	100	SS-2	-	4	11	8	38	39	43	18	25	19	A-7-6 (15)	
		5.0	3 3 5	10	100	SS-3	-	-	-	-	-	-	-	-	-	22	A-7-6 (V)	
		7.5	3 5 5	12	100	SS-4	-	0	4	5	40	51	42	23	19	26	A-7-6 (12)	
	552.0	10.0 EOB	2 4 6	12	100	SS-5	-	-	-	-	-	-	-	-	-	27	A-7-6 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 305+98, 7 RT	EXPLORATION ID B-052-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 598.2 (MSL) EOB: 29.7 ft.	PAGE 1 OF 1
START: 5/26/11 END: 5/26/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 598.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF, BROWN, **SILT AND CLAY**, AND STONE FRAGMENTS, SOME SAND, DAMP	595.7	TR 2.5	2 3 5	10	87	SS-1	-	36	5	22	19	18	29	18	11	13	A-6a (1)	
SHALE, BROWN, SEVERELY WEATHERED, (AUGERED).	593.9		12 24 37	76	67	SS-2	-	-	-	-	-	-	-	-	-	5	Rock (V)	
SILTSTONE, LIGHT BROWN, MODERATELY TO HIGHLY WEATHERED, MODERATELY STRONG, THIN BEDDED, ARENACEOUS, HIGHLY FRACTURED; RQD 0%, REC 32%.	590.5	5.0	0		32	NQ-1											CORE	
MUDSTONE, RED, MODERATELY WEATHERED, WEAK, THIN TO MEDIUM BEDDED; RQD 0%, REC 67%.	581.3	7.5	0		30	NQ-2											CORE	
		10.0	0		36	NQ-3											CORE	
		12.5	0		100	NQ-4											CORE	
		15.0																
SILTSTONE, LIGHT BROWN, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG TO STRONG, THIN BEDDED, ARENACEOUS, FRACTURED; RQD 40%, REC 100%.	578.8	17.5	20		100	NQ-5											CORE	
SHALE, LIGHT BROWN GRADING TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, LAMINATED, IRON STAINING; RQD 58%, REC 100%.	568.5	20.0																
		22.5																
		25.0	60		100	NQ-6											CORE	
		27.5																
		EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 313+13, 262 LT	EXPLORATION ID B-053-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 701.2 (MSL) EOB: 80.0 ft.	PAGE 1 OF 3	
START: 5/31/11 END: 6/1/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 701.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	700.6		1 2 3	6	73	SS-1	-	1	4	6	30	59	52	24	28	24	A-7-6 (18)	
MEDIUM STIFF, BROWN, **CLAY**, SOME SILT, TRACE SAND AND GRAVEL, MOIST		2.5	2 2 4	7	27	SS-2	-	1	4	6	30	59	52	24	28	26	A-7-6 (18)	
	696.2	TR																
MUDSTONE, RED AND GRAY, SEVERELY WEATHERED, (AUGERED).		5.0	8 17 21	47	67	SS-3	-	-	-	-	-	-	-	-	-	15	Rock (V)	
		7.5	16 39 50/2"	-	100	SS-4	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		10.0	50/5"	-	100	SS-5	-	-	-	-	-	-	-	-	-	8	Rock (V)	
	688.7	12.5	50	-	100	SS-6	-	-	-	-	-	-	-	-	-	4	Rock (V)	
INTERBEDDED SANDSTONE (70%) AND SHALE (30%); **SANDSTONE**, TAN TO GRAY, UNWEATHERED, STRONG, FINE GRAINED, LAMINATED TO THIN BEDDED, IRON STAINING, 45 DEG FRACTURES AT 20.7' AND 21.2'; **SHALE**, TAN TO GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED.		15.0	61		100	NQ-1											CORE	
		17.5																
		20.0																
		22.5	75		100	NQ-2											CORE	
	675.8	25.0																
SANDSTONE, BROWN AND WHITE GRADING TO GRAY, UNWEATHERED, STRONG, MEDIUM GRAINED, THIN BEDDED; RQD 100%, REC 100%.		27.5																
		30.0																
		32.5	97		98	NQ-3											CORE	
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 313+13, 262 LT	START: 5/31/11	END: 6/1/11	PG 2 OF 3	B-053-0-11

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)	ABAN-DONED
	664.5																	
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED; RQD 80%, REC 86%.	664.0																	
MUDSTONE, DARK RED GRADING TO GRAY, SLIGHTLY WEATHERED, WEAK, THIN BEDDED; RQD 0%, REC 100%.	662.5	37.5																
SHALE, TAN AND GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED, IRON STAINING; RQD 64%, REC 98%.	660.3	40.0	58		98	NQ-4											CORE	
		42.5																
		45.0																
		47.5																
	651.2	50.0	56		100	NQ-5											CORE	
SANDSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, FINE GRAINED, THICK BEDDED; RQD 68%, REC 100%.	649.0	52.5																
SHALE, TAN AND GRAY, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, HIGHLY FRACTURED AND WEATHERED ZONE FROM 53.7' TO 56.2'; RQD 68%, REC 100%.		55.0																
		57.5																
	640.2	60.0	19		100	NQ-6											CORE	
MUDSTONE, RED AND GRAY, SLIGHTLY WEATHERED, WEAK, THICK BEDDED, JOINTED WITH SLICKENSIDES; RQD 0%, REC 88%.		62.5																
		65.0																
		67.5																
		70.0	0		61	NQ-7											CORE	
		72.5																
		75.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 313+13, 262 LT	START: 5/31/11	END: 6/1/11	PG 3 OF 3	B-053-0-11

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)	ABAN-DONED
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, LAMINATED, FISSILE, IRON STAINED; RQD 100%, REC 100%.	625.1 624.9 621.2	77.5 EOB 80.0	45		100	NQ-8											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 321+91, 200 LT	EXPLORATION ID B-054-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 581.5 (MSL) EOB: 14.2 ft.	PAGE 1 OF 1	
START: 6/13/11 END: 6/13/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

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)	ABAN-DONED
STIFF TO VERY STIFF, LIGHT BROWN TO GRAY, **CLAY**, AND SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, DAMP	581.5		3 4 4	10	73	SS-1	-	-	-	-	-	-	-	-	-	9	A-7-6 (V)	
		2.5	3 6 6	15	100	SS-2	-	2	8	6	38	46	46	25	21	20	A-7-6 (14)	
		5.0	6 7 6	16	33	SS-3	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
		7.5	9 9 10	24	67	SS-4	-	-	-	-	-	-	-	-	-	11	A-7-6 (V)	
		10.0	6 7 11	22	67	SS-5	-	1	1	2	39	57	43	21	22	14	A-7-6 (13)	
	567.3	12.5 ETR3	8 13 12	31	87	SS-6	-	-	-	-	-	-	-	-	-	15	A-7-6 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 321+94, 283 RT	EXPLORATION ID B-055-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 537.0 (MSL) EOB: 16.5 ft.	PAGE 1 OF 1
START: 5/27/11 END: 5/27/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF TO STIFF, DARK BROWN, **CLAY**, SOME SILT, TRACE SAND AND GRAVEL, MOIST	537.0		1 3 3	7	67	SS-1	-	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
		2.5	2 3 4	9	100	SS-2	-	7	2	7	26	58	54	26	28	29	A-7-6 (18)	
STIFF, MOTTLED TAN AND LIGHT BROWN, **SILTY CLAY**, SOME GRAVEL AND SAND, DAMP	532.0	5.0	2 5 7	15	87	SS-3	-	27	10	16	19	28	36	17	19	15	A-6b (5)	
STIFF, BROWN, **CLAY**, SOME SILT AND SAND, TRACE GRAVEL, MOIST	529.5 528.8	7.5	7 23 30	66	100	SS-4	- -	8 -	12 -	10 -	25 -	45 -	53 -	20 -	33 -	45 7	A-7-6 (17) Rock (V)	
SHALE, SEVERELY WEATHERED, (AUGERED).	TR	10.0	11 50/1"	-	50	SS-5	-	-	-	-	-	-	-	-	-	5	Rock (V)	
		12.5	50	-	100	SS-6	-	-	-	-	-	-	-	-	-	6	Rock (V)	
		15.0	30 50/1"	-	100	SS-7	-	-	-	-	-	-	-	-	-	5	Rock (V)	
	520.5	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 321+94, 283 RT	EXPLORATION ID B-055-1-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 537.0 (MSL) EOB: 6.0 ft.	PAGE 1 OF 1
START: 5/27/11 END: 5/27/11	SAMPLING METHOD: ST	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 537.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF, DARK BROWN, **CLAY**, SOME SILT, LITTLE GRAVEL, TRACE SAND, DAMP		2.5																
	531.0	5.0 EOB			100	ST-1	-	13	1	6	21	59	51	27	24	24	A-7-6 (16)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 321+94, 283 RT	EXPLORATION ID B-055-2-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 537.0 (MSL) EOB: 7.0 ft.	PAGE 1 OF 1
START: 7/7/11 END: 7/7/11	SAMPLING METHOD: ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF, DARK BROWN, **ELASTIC CLAY**, SOME SILT, TRACE SAND, DAMP	537.0	2.5																
	532.0	5.0			100	ST-1	-	0	0	6	21	73	58	30	28	29	A-7-5 (19)	
STIFF, MOTTLED TAN AND LIGHT BROWN, **SILTY CLAY**, SOME GRAVEL AND SAND, DAMP	530.0	EOB			100	ST-2	-	29	12	15	18	26	38	21	17	16	A-6b (4)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 321+94, 283 RT	EXPLORATION ID B-055-3-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 537.0 (MSL) EOB: 6.0 ft.	PAGE 1 OF 1
START: 7/7/11 END: 7/7/11	SAMPLING METHOD: ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF, DARK BROWN, **CLAY**, SOME SILT, TRACE GRAVEL AND SAND, DAMP	537.0	2.5																
	531.0	5.0 EOB			100	ST-1	-	8	1	4	23	64	51	27	24	23	A-7-6 (16)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 328+92, 152 RT	EXPLORATION ID B-056-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 582.0 (MSL) EOB: 14.6 ft.	PAGE 1 OF 1
START: 6/13/11 END: 6/13/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, SOME SAND, LITTLE GRAVEL, DAMP TO MOIST	582.0		2 3 4	9	87	SS-1	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
		2.5	3 4 14	22	100	SS-2	-	16	15	10	27	32	40	19	21	16	A-6b (9)	
		5.0	4 4 7	14	20	SS-3	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
		7.5	5 5 8	16	33	SS-4	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
	572.5	TR																
SHALE, SEVERELY WEATHERED, (AUGERED).		10.0	7 9 21	37	87	SS-5	-	0	3	15	37	45	36	18	18	12	A-6b (11)	
		12.5	10 13 15	35	73	SS-6	-	-	-	-	-	-	-	-	-	7	Rock (V)	
	567.4	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:25 - \\US1268-F01\SHARED_PROJECTS\11736\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 329+15, 321 RT	EXPLORATION ID B-057-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 550.5 (MSL) EOB: 29.3 ft.	PAGE 1 OF 1	
START: 5/31/11 END: 5/31/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

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)	ABAN-DONED
STIFF, BROWN, **SILTY CLAY**, TRACE TO SOME SAND, LITTLE TO NO STONE FRAGMENTS, DAMP TO MOIST	550.5		3 3 5	10	80	SS-1	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
		2.5	5 5 7	15	100	SS-2	-	-	-	-	-	-	-	-	-	20	A-6b (V)	
		5.0			70	ST-3	-	11	14	10	27	38	39	20	19	20	A-6b (10)	
		7.5	4 5 7	15	100	SS-4	-	-	-	-	-	-	-	-	-	21	A-6b (V)	
		10.0			50	ST-5	-	0	0	11	40	49	39	20	19	21	A-6b (12)	
		12.5	3 4 5	11	100	SS-6	-	-	-	-	-	-	-	-	-	24	A-6b (V)	
		15.0	2 3 7	12	100	SS-7	-	-	-	-	-	-	-	-	-	24	A-6b (V)	
		17.5	2 4 6	12	100	SS-8	-	0	0	6	54	40	39	22	17	24	A-6b (11)	
	529.5	20.0 TR	8 15 12	33	100	SS-9	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
SHALE, SEVERELY WEATHERED, (AUGERED).		22.5																
		25.0	8 17 40	71	67	SS-10	-	-	-	-	-	-	-	-	-	10	Rock (V)	
	521.2	27.5 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 329+15, 321 RT	EXPLORATION ID B-057-1-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 550.5 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 7/7/11 END: 7/7/11	SAMPLING METHOD: ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF, BROWN, **SILTY CLAY**, SOME GRAVEL, LITTLE SAND, DAMP	550.5	2.5																
		5.0			100	ST-1	-	22	7	11	26	34	37	18	19	17	A-6b (9)	
	542.5	7.5			100	ST-2	-	33	4	8	24	31	39	20	19	18	A-6b (8)	
STIFF, BROWN, **CLAY**, AND SILT, TRACE SAND, DAMP	540.5	EOB 10.0			100	ST-3	-	0	2	4	38	56	47	24	23	22	A-7-6 (15)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 334+27, 285 LT	EXPLORATION ID B-058-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 737.2 (MSL) EOB: 80.0 ft.	PAGE 1 OF 3
START: 6/14/11 END: 6/14/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 737.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF, BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP			3 2 3	6	80	SS-1	-	7	13	14	30	36	37	21	16	17	A-6b (9)	
		2.5	3 2 2	5	53	SS-2	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
	732.2																	
MEDIUM DENSE TO DENSE, LIGHT BROWN, **STONE FRAGMENTS WITH SAND, SILT, AND CLAY**, DAMP		5.0	7 8 10	22	100	SS-3	-	54	18	7	14	7	30	17	13	7	A-2-6 (0)	
		7.5	6 5 5	12	47	SS-4	-	-	-	-	-	-	-	-	-	10	A-2-6 (V)	
		10.0	15 50/4"	-	100	SS-5	-	-	-	-	-	-	-	-	-	8	A-2-6 (V)	
		12.5	11 15 15	37	40	SS-6	-	-	-	-	-	-	-	-	-	6	A-2-6 (V)	
		15.0	2 10 15	31	33	SS-7	-	-	-	-	-	-	-	-	-	6	A-2-6 (V)	
		17.5	6 12 6	22	73	SS-8	-	62	11	7	13	7	31	16	15	11	A-2-6 (0)	
		20.0	15 15 11	32	93	SS-9	-	-	-	-	-	-	-	-	-	6	A-2-6 (V)	
		22.5																
	711.7	25.0	30 50/4"	-	100	SS-10	-	-	-	-	-	-	-	-	-	5	Rock (V)	
MUDSTONE, SEVERELY WEATHERED, WEAK, (AUGERED).		TR																
		27.5																
		30.0	25 30 35	81	100	SS-11	-	-	-	-	-	-	-	-	-	5	Rock (V)	
		32.5																
		35.0	30 50/5"	-	100	SS-12	-	-	-	-	-	-	-	-	-	8	Rock (V)	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 334+27, 285 LT	START: 6/14/11	END: 6/14/11	PG 2 OF 3	B-058-0-11

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)	ABAN-DONED
MUDSTONE, SEVERELY WEATHERED, WEAK, (AUGERED). *(continued)*	700.5	37.5																
		40.0	32 50/5"	-	89	SS-13	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		42.5																
		45.0	50/5"	-	100	SS-14	-	-	-	-	-	-	-	-	-	7	Rock (V)	
		47.5																
	687.6	50.0																
SANDSTONE, LIGHT BROWN, UNWEATHERED, STRONG, MEDIUM GRAINED, THIN BEDDED; RQD 100%, REC 100%.	684.7	52.5																
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED, FRIABLE, ARENACEOUS; RQD 61%, REC 97%.	680.9	55.0	55		100	NQ-1											CORE	
MUDSTONE, BROWN TO RED-BROWN, SLIGHTLY WEATHERED, WEAK, THICK BEDDED, SLICKENSIDES; RQD 0%, REC 97%.		57.5																
		60.0																
		62.5	0		99	NQ-2											CORE	
		65.0																
		67.5																
		70.0	0		96	NQ-3											CORE	
		72.5																
	661.6	75.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 334+27, 285 LT	START: 6/14/11	END: 6/14/11	PG 3 OF 3	B-058-0-11

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)	ABAN-DONED
SILTSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, THIN BEDDED, IRON STAINING, TRACE SHALE LAMINAE; RQD 86%, REC 100%. *(continued)*	661.1	77.5	67		100	NQ-4											CORE	
SANDSTONE, LIGHT BROWN, SLIGHTLY WEATHERED, STRONG, THIN BEDDED, IRON STAINING; RQD 67%, REC 100%.	658.7 657.2	EOB 80.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 334+12, 698 LT	EXPLORATION ID B-059-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 819.4 (MSL) EOB: 80.0 ft.	PAGE 1 OF 3
START: 6/14/11 END: 6/15/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
LOOSE TO MEDIUM DENSE, LIGHT BROWN, **STONE FRAGMENTS WITH SAND, SILT, AND CLAY**, DAMP TO MOIST	819.4	2.5	2 3 5	10	67	SS-1	-	-	-	-	-	-	-	-	-	31	A-2-6 (V)	
		5.0	5 6 6	15	93	SS-2	-	60	11	5	12	12	34	19	15	7	A-2-6 (0)	
		7.5	4 3 6	11	67	SS-3	-	-	-	-	-	-	-	-	-	16	A-2-6 (V)	
STIFF, GRAY, **CLAY**, SOME SILT AND SAND, DAMP	811.9		4 5 5	12	87	SS-4	-	0	10	14	26	50	54	29	25	20	A-7-6 (17)	
SANDSTONE, BROWN, SLIGHTLY WEATHERED, STRONG, MEDIUM GRAINED, THIN BEDDED, IRON STAINING FROM 9.8' TO 11.5'; RQD 67%, REC 100%.	809.6 TR	10.0	79		100	NQ-1											CORE	
SILTSTONE, GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, LAMINATED, MICACEOUS, IRON STAINING FROM 14.3' TO 16.3'; RQD 50%, REC 100%.	805.1	12.5																
		15.0																
	801.2	17.5	47		95	NQ-2											CORE	
SHALE, GRAY, MODERATELY WEATHERED, WEAK, LAMINATED, TURBID BEDDING; RQD 50%, REC 90%.	796.6	20.0																
		22.5																
		25.0																
MUDSTONE, GRAY TO RED-BROWN, MODERATELY WEATHERED, WEAK, THICK BEDDED; RQD 0%, REC 100%.		27.5	0		100	NQ-3											CORE	
		30.0																
		32.5																
	784.3	35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 334+12, 698 LT	START: 6/14/11	END: 6/15/11	PG 2 OF 3	B-059-0-11

MATERIAL DESCRIPTION AND NOTES	ELEV. 782.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SILTSTONE, GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, THIN BEDDED, SLICKENSIDES; RQD 83%, REC 99%. *(continued)*		37.5	70		99	NQ-4											CORE	
	779.5	40.0																
SHALE, TAN TO GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, LAMINATED, SANDSTONE SEAMS, 60 DEG FRACTURE AT 41.6'; RQD 94%, REC 100%.		42.5																
	776.3																	
SANDSTONE, TAN TO GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, STRONG, MEDIUM GRAINED, THIN BEDDED, VERTICAL FRACTURE FROM 43.6' TO 46.4'; RQD 68%, REC 100%.		45.0	55		100	NQ-5											CORE	
		47.5																
		50.0																
		52.5																
		55.0	79		99	NQ-6											CORE	
		57.5																
	758.4	60.0																
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED; RQD 67%, REC 100%.	756.6	62.5																
MUDSTONE, GRAY, SLIGHTLY WEATHERED, WEAK, THICK BEDDED; RQD 0%, REC 99%.	753.3	65.0	20		100	NQ-7											CORE	
INTERBEDDED SHALE (70%) AND SILTSTONE (30%); **SHALE**, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, LAMINATED TO VERY THIN BEDDED;	751.1	67.5																
SILTSTONE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED TO VERY THIN BEDDED.		70.0																
MUDSTONE, GRAY, SLIGHTLY WEATHERED, WEAK, THICK BEDDED; RQD 0%, REC 100%.	747.0	72.5																
INTERBEDDED SHALE (70%) AND SILTSTONE (30%); **SHALE**, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, LAMINATED TO VERY THIN BEDDED; **SILTSTONE**, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED TO VERY THIN BEDDED.		75.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 334+12, 698 LT	START: 6/14/11	END: 6/15/11	PG 3 OF 3	B-059-0-11

MATERIAL DESCRIPTION AND NOTES	ELEV. 743.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
INTERBEDDED SHALE (70%) AND SILTSTONE (30%); **SHALE**, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, LAMINATED TO VERY THIN BEDDED; **SILTSTONE**, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED TO VERY THIN BEDDED. *(continued)*		77.5	44		100	NQ-8											CORE	
	739.4	EOB 80.0	29		100	NQ-9											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 335+71, 175 RT	EXPLORATION ID B-060-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 602.1 (MSL) EOB: 29.5 ft.	PAGE 1 OF 1
START: 6/10/11 END: 6/10/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 602.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, LITTLE TO SOME SAND, TRACE GRAVEL, DAMP			2 4 4	11	73	SS-1	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
		2.5	4 4 5	12	100	SS-2	-	4	10	15	35	36	40	21	19	19	A-6b (11)	
		5.0			100	ST-3	-	7	4	11	32	46	36	16	20	16	A-6b (12)	
		7.5	3 5 8	18	100	SS-4	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		10.0	6 9 11	27	100	SS-5	-	6	9	7	42	36	36	17	19	13	A-6b (12)	
		12.5	5 7 10	23	100	SS-6	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
	587.1	TR																
MUDSTONE, SEVERELY WEATHERED, (AUGERED).		15.0	13 34 50	115	100	SS-7	-	-	-	-	-	-	-	-	-	9	Rock (V)	
		17.5	15 25 47	98	100	SS-8	-	-	-	-	-	-	-	-	-	10	Rock (V)	
		20.0	11 37 50	119	100	SS-9	-	-	-	-	-	-	-	-	-	12	Rock (V)	
		22.5																
		25.0	20 42 50	126	100	SS-10	-	-	-	-	-	-	-	-	-	11	Rock (V)	
		27.5																
	572.6	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 336+17, 517 RT	EXPLORATION ID B-061-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 528.8 (MSL) EOB: 14.4 ft.	PAGE 1 OF 1
START: 5/31/11 END: 5/31/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **CLAY**, AND SILT, TRACE SAND AND GRAVEL, DAMP TO MOIST	528.8		2 3 3	7	100	SS-1	-	1	1	3	39	56	54	28	26	27	A-7-6 (17)	
		2.5	3 3 4	9	100	SS-2	-	-	-	-	-	-	-	-	-	31	A-7-6 (V)	
		5.0	2 2 3	6	73	SS-3	-	-	-	-	-	-	-	-	-	31	A-7-6 (V)	
		7.5			95	ST-4	-	0	0	7	46	47	44	24	20	25	A-7-6 (13)	
		10.0	3 3 4	9	100	SS-5	-	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
		12.5	1 13 39	64	100	SS-6	-	-	-	-	-	-	-	-	-	16	A-7-6 (V)	
	515.1																	
SHALE, SEVERELY WEATHERED, (AUGERED0.	514.4	TR EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 340+07, 326 LT	EXPLORATION ID B-062-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 604.7 (MSL) EOB: 14.5 ft.	PAGE 1 OF 1
START: 6/8/11 END: 6/8/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 604.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF, LIGHT BROWN, **SILT AND CLAY**, LITTLE TO SOME SAND, TRACE GRAVEL, MOIST			2 2 2	5	67	SS-1	-	5	12	24	33	26	28	16	12	17	A-6a (6)	
		2.5	2 2 2	5	67	SS-2	-	-	-	-	-	-	-	-	-	14	A-6a (V)	
		5.0			75	ST-3	-	7	2	10	37	44	33	19	14	19	A-6a (10)	
	597.2																	
MEDIUM STIFF, MOTTLED RED-BROWN AND TAN, **SILTY CLAY**, LITTLE SAND, DAMP		7.5	2 3 3	8	100	SS-4	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
	593.4	10.0	3 9 15	33	87	SS-5	-	0	1	10	39	50	38	17	21	13	A-6b (12)	
SANDSTONE, SEVERELY WEATHERED, (AUGERED).		TR																
		12.5	39 50/4"	-	63	SS-6	-	-	-	-	-	-	-	-	-	3	Rock (V)	
	590.2	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 340+04, 171 LT	EXPLORATION ID B-063-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / J.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 592.9 (MSL) EOB: 23.0 ft.	PAGE 1 OF 1	
START: 6/8/11 END: 6/9/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded		

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)	ABAN-DONED
	592.9																	
STIFF TO HARD, RED-BROWN, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP TO MOIST			WOH WOH 2	3	33	SS-1	-	-	-	-	-	-	-	-	-	23	A-6b (V)	
		2.5	2 2 5	10	87	SS-2	-	-	-	-	-	-	-	-	-	17	A-6b (V)	
		5.0			100	ST-3	-	20	2	5	36	37	36	15	21	24	A-6b (12)	
		7.5	5 8 9	23	100	SS-4	-	-	-	-	-	-	-	-	-	7	A-6b (V)	
		10.0	10 7 8	20	67	SS-5	-	-	-	-	-	-	-	-	-	8	A-6b (V)	
		12.5	7 12 17	40	73	SS-6	-	1	1	2	45	51	37	18	19	12	A-6b (12)	
		15.0	16 18 39	78	100	SS-7	-	-	-	-	-	-	-	-	-	12	A-6b (V)	
	575.2																	
SHALE, SEVERELY WEATHERED, (AUGERED).		TR 17.5	36 50	-	100	SS-8	-	-	-	-	-	-	-	-	-	9	Rock (V)	
		20.0	17 50	-	100	SS-9	-	-	-	-	-	-	-	-	-	11	Rock (V)	
	569.9	EOB 22.5																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:26 - \\US1268-F01\SHARED_PROJECTS\1736\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 340+06, 175 RT	EXPLORATION ID B-064-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 602.8 (MSL) EOB: 29.7 ft.	PAGE 1 OF 1
START: 6/9/11 END: 6/9/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF TO STIFF, RED-BROWN, **SILTY CLAY**, LITTLE SAND, DAMP TO MOIST	602.8		1 2 3	7	73	SS-1	-	0	5	12	46	37	39	19	20	21	A-6b (12)	
		2.5	2 2 4	8	27	SS-2	-	-	-	-	-	-	-	-	-	18	A-6b (V)	
		5.0	2 4 3	10	20	SS-3	-	-	-	-	-	-	-	-	-	11	A-6b (V)	
		7.5	2 2 5	10	33	SS-4	-	-	-	-	-	-	-	-	-	17	A-6b (V)	
HARD, RED, **CLAY**, SOME TO "AND" SILT, TRACE SAND AND GRAVEL, DAMP	592.8	10.0	5 10 13	31	80	SS-5	-	0	0	3	27	70	47	16	31	13	A-7-6 (17)	
		12.5	15 35 44	108	100	SS-6	-	-	-	-	-	-	-	-	-	7	A-7-6 (V)	
		15.0	13 24 30	74	100	SS-7	-	-	-	-	-	-	-	-	-	8	A-7-6 (V)	
		17.5	8 25 40	89	100	SS-8	-	2	2	2	41	53	41	20	21	9	A-7-6 (13)	
SANDSTONE, SEVERELY WEATHERED, (AUGERED).	582.4 TR	20.0	18 35 50	116	100	SS-9	-	-	-	-	-	-	-	-	-	7	Rock (V)	
		22.5																
		25.0	12 26 36	85	100	SS-10	-	-	-	-	-	-	-	-	-	11	Rock (V)	
	573.1 EOB	27.5																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 340+19, 382 RT	EXPLORATION ID B-065-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 605.3 (MSL) EOB: 24.0 ft.	PAGE 1 OF 1
START: 6/9/11 END: 6/9/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	605.3																	
MEDIUM STIFF TO STIFF, BROWN, **SILTY CLAY**, LITTLE SAND AND GRAVEL, DAMP			1 2 4	8	87	SS-1	-	-	-	-	-	-	-	-	-	17	A-6b (V)	
		2.5	2 4 4	11	80	SS-2	-	11	9	10	37	33	39	19	20	17	A-6b (11)	
		5.0	2 4 6	14	87	SS-3	-	-	-	-	-	-	-	-	-	17	A-6b (V)	
	597.8	7.5	5 5 9	19	73	SS-4	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
VERY STIFF TO HARD, BROWN, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP		10.0	10 15 19	46	100	SS-5	-	4	3	4	38	51	39	18	21	10	A-6b (12)	
	592.8	12.5	7 14 21	48	87	SS-6	-	-	-	-	-	-	-	-	-	12	A-7-6 (V)	
HARD, BROWN, **CLAY**, AND SILT, TRACE SAND, DAMP		15.0	8 13 22	48	93	SS-7	-	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
		17.5	11 18 32	68	100	SS-8	-	0	0	3	38	59	43	19	24	12	A-7-6 (14)	
		20.0	8 13 25	52	100	SS-9	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
	581.3	22.5																
		ETR3																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:26 - \\US1268-F01\SHARED_PROJECTS\17336\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 349+26, 626 LT	EXPLORATION ID B-066-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 816.6 (MSL) EOB: 40.9 ft.	PAGE 1 OF 2
START: 6/14/11 END: 6/14/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 816.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, RED-BROWN, **CLAY**, SOME SILT AND SAND, DAMP			1 3 4	10	67	SS-1	-	-	-	-	-	-	-	-	-	16	A-7-6 (V)	
		2.5	4 5 7	16	73	SS-2	-	0	8	16	32	44	45	21	24	20	A-7-6 (15)	
		5.0	6 5 5	14	87	SS-3	-	-	-	-	-	-	-	-	-	12	A-7-6 (V)	
	809.6																	
VERY STIFF, BROWN, **SANDY SILT**, LITTLE CLAY, DAMP		7.5	10 11 9	27	87	SS-4	-	0	20	18	45	17	29	20	9	9	A-4a (5)	
		10.0	8 7 9	22	73	SS-5	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
	803.6																	
SHALE, SEVERELY WEATHERED, (AUGERED).		12.5 TR	10 16 31	64	87	SS-6	-	-	-	-	-	-	-	-	-	13	Rock (V)	
	801.0	15.0	17 50/1"	-	100	SS-7	-	-	-	-	-	-	-	-	-	23	Rock (V)	
SANDSTONE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, STRONG, FINE GRAINED, THIN TO MEDIUM BEDDED, IRON STAINING; RQD 86%, REC 94%.		17.5 20.0 22.5 25.0	83		93	NQ-1											CORE	
	789.2																	
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, LAMINATED; RQD 69%, REC 89%.		27.5 30.0	31		95	NQ-2											CORE	
	784.7																	
MUDSTONE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, WEAK, THICK BEDDED, SLICKENSIDES; RQD 0%, REC 100%.		32.5 35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 349+26, 626 LT	START: 6/14/11	END: 6/14/11	PG 2 OF 2	B-066-0-11

MATERIAL DESCRIPTION AND NOTES	ELEV. 779.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MUDSTONE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, WEAK, THICK BEDDED, SLICKENSIDES; RQD 0%, REC 100%. *(continued)*		37.5	0		100	NQ-3											CORE	
	775.7	40.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 348+94, 243 RT	EXPLORATION ID B-067-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 765.6 (MSL) EOB: 3.6 ft.	PAGE 1 OF 1
START: 6/14/11 END: 6/14/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 765.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
VERY STIFF, BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP	763.6	TR	4 7 6	18	67	SS-1	-	6	14	14	35	31	38	22	16	15	A-6b (9)	
SANDSTONE, SEVERELY WEATHERED, (AUGERED).	762.0	EOB 2.5	7 20 50/1"	-	91	SS-2	-	-	-	-	-	-	-	-	-	12	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 359+03, 461 RT	EXPLORATION ID B-068-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 869.8 (MSL) EOB: 6.1 ft.	PAGE 1 OF 1
START: 6/9/11 END: 6/9/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 869.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF, LIGHT BROWN, **SILT**, SOME CLAY, LITTLE SAND, MOIST	867.3	2.5	2 2 5	9	100	SS-1	-	0	7	12	53	28	27	17	10	18	A-4b (8)	
HARD, LIGHT, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP	864.3	5.0	6 12 14	32	100	SS-2	-	11	16	13	41	19	33	20	13	13	A-6a (6)	
SANDSTONE, SEVERELY WEATHERED, (AUGERED).	863.7	TR EOB	7 12 50/1"	-	91	SS-3	-	-	-	-	-	-	-	-	-	13	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:26 - \\US1268-F01\SHARED_PROJECTS\11736\173608714 LAW-7-2.14\GINT LOGS-IN PROGRESS\173608714 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 359+62, 105 RT	EXPLORATION ID B-069-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 2/24/10	ELEVATION: 797.7 (MSL) EOB: 145.0 ft.	PAGE 1 OF 4
START: 6/7/11 END: 6/8/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	797.7																	
MEDIUM STIFF TO STIFF, BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP TO MOIST			2 3 3	7	80	SS-1	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		2.5	3 3 5	10	100	SS-2	-	1	12	20	34	33	35	19	16	21	A-6b (9)	
		5.0	3 2 3	6	53	SS-3	-	-	-	-	-	-	-	-	-	22	A-6b (V)	
	790.2																	
SHALE, SEVERELY WEATHERED, (AUGERED).		TR 7.5	10 50/2"	-	100	SS-4	-	-	-	-	-	-	-	-	-	13	Rock (V)	
		10.0	50/4"	-	100	SS-5	-	-	-	-	-	-	-	-	-	6	Rock (V)	
	785.4																	
SANDSTONE, GRAY, UNWEATHERED, STRONG, FINE GRAINED, THIN BEDDED; RQD 80%, REC 100%.	784.4	12.5																
INTERBEDDED SILTSTONE (60%) AND SHALE (40%); **SILTSTONE**, LIGHT AND DARK GRAY, SLIGHTLY WEATHERED, STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS; **SHALE**, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, LAMINATED.		15.0	73		100	NQ-1											CORE	
		17.5																
	775.7	20.0																
MUDSTONE, GRAY TO RED BROWN, SLIGHTLY WEATHERED, WEAK, THICK TO VERY THICK BEDDED, SLICKENSIDES; RQD 0%, REC 99%.		22.5	30		100	NQ-2											CORE	
		25.0																
		27.5																
		30.0																
		32.5	10		99	NQ-3											CORE	
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 359+62, 105 RT	START: 6/7/11	END: 6/8/11	PG 2 OF 4	B-069-0-11

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)	ABAN-DONED
	761.0																	
	759.4	37.5																
INTERBEDDED SILTSTONE (80%) AND SHALE (20%); **SILTSTONE**, GRAY, UNWEATHERED, STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS; **SHALE**, GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED.		40.0																
		42.5	70		99	NQ-4											CORE	
		45.0																
		47.5																
		50.0																
		52.5	80		100	NQ-5											CORE	
		55.0																
		57.5																
	738.7	60.0																
SHALE, GRAY WITH LITTLE RED, SLIGHTLY WEATHERED, WEAK, LAMINATED, SLICKENSIDES AND CLAY FILLED FRACTURES; RQD 64%, REC 100%.		62.5	76		100	NQ-6											CORE	
		65.0																
		67.5																
		70.0																
	725.3	72.5																
SILTSTONE, GRAY WITH LITTLE RED, SLIGHTLY WEATHERED, STRONG, LAMINATED TO THIN BEDDED, FEW LAMINATED SHALE LAYERS; RQD 83%, REC 87%.		75.0	81		100	NQ-7											CORE	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 359+62, 105 RT	START: 6/7/11	END: 6/8/11	PG 3 OF 4	B-069-0-11

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)	ABAN-DONED
SILTSTONE, GRAY WITH LITTLE RED, SLIGHTLY WEATHERED, STRONG, LAMINATED TO THIN BEDDED, FEW LAMINATED SHALE LAYERS; RQD 83%, REC 87%. *(continued)*	721.6	77.5																
		80.0	32		46	NQ-8											CORE	
	713.8	82.5																
MUDSTONE, GRAY GRADING TO DARK RED, SLIGHTLY WEATHERED, SLIGHTLY STRONG, THIN TO MEDIUM BEDDED, SLICKENSIDES; RQD 0%, REC 100%.		85.0	22		100	NQ-9											CORE	
		87.5																
	706.2	90.0																
INTERBEDDED SILTSTONE (60%) AND SHALE (40%); **SILTSTONE**, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, STRONG, LAMINATED TO THIN BEDDED; **SHALE**, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED.		92.5	67		100	NQ-10											CORE	
		95.0																
	697.7	97.5																
MUDSTONE, DARK RED, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY STRONG, THIN BEDDED; RQD 0%, REC 10%.		100.0																
		102.5	0		19	NQ-11											CORE	
		105.0																
	688.7	107.5																
SANDSTONE, GRAY, UNWEATHERED, VERY STRONG, FINE TO MEDIUM GRAINED, THICK BEDDED; RQD 100%, REC 100%.		110.0	100		100	NQ-12											CORE	
		112.5																
	682.7	115.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 359+62, 105 RT	START: 6/7/11	END: 6/8/11	PG 4 OF 4	B-069-0-11

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)	ABAN-DONED
INTERBEDDED SILTSTONE (70%) AND SHALE (30%); **SILTSTONE**, GRAY, UNWEATHERED, STRONG, LAMINATED TO THIN BEDDED; **SHALE**, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED. *(continued)*	682.2	117.5	90		100	NQ-13											CORE	
		120.0																
		122.5	96		100	NQ-14											CORE	
		125.0																
		127.5																
MUDSTONE, DARK RED, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, THIN BEDDED; RQD 0%, REC 99%.	668.6	130.0																
		132.5	47		99	NQ-15											CORE	
	661.3	135.0																
INTERBEDDED SILTSTONE (70%) AND SHALE (30%); **SILTSTONE**, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, STRONG, LAMINATED TO THIN BEDDED, IRON STAINING FROM 141.5' TO 145'; **SHALE**, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, SLIGHTLY STRONG, LAMINATED.		137.5																
		140.0	45		97	NQ-16											CORE	
	652.7	142.5																
		EOB 145.0																

NOTES: LOST CORE SAMPLE IN CORE RUN AT 99', UNABLE TO RECOVER

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / M.M.	DRILL RIG: CME 55 #1 TRUCK	STATION / OFFSET: 358+89, 287 LT	EXPLORATION ID B-070-0-11	
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / M.M.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE		
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 803.5 (MSL) EOB: 10.8 ft.	PAGE 1 OF 1	
START: 6/7/11 END: 6/7/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.4	LAT / LONG: Not Recorded		

MATERIAL DESCRIPTION AND NOTES	ELEV. 803.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP			2 3 3	7	67	SS-1	-	0	13	14	36	37	38	20	18	17	A-6b (11)	
		2.5	3 3 3	7	87	SS-2	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		5.0	3 4 5	11	80	SS-3	-	5	14	11	33	37	40	22	18	17	A-6b (10)	
		7.5	5 8 10	22	93	SS-4	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
SHALE, SEVERELY WEATHERED, (AUGERED).	795.0 TR																	
	792.7 EOB	10.0	5 50/4"	-	100	SS-5	-	-	-	-	-	-	-	-	-	24	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 371+07, 264 LT	EXPLORATION ID B-071-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 585.3 (MSL) EOB: 22.7 ft.	PAGE 1 OF 1
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO HARD, RED-BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP TO MOIST	585.3		5 3 5	11	33	SS-1	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		2.5	3 4 4	11	73	SS-2	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
		5.0	4 3 6	12	87	SS-3	-	2	8	23	38	29	37	20	17	18	A-6b (9)	
		7.5	4 5 7	16	100	SS-4	-	-	-	-	-	-	-	-	-	21	A-6b (V)	
		10.0	7 12 13	34	100	SS-5	-	-	-	-	-	-	-	-	-	18	A-6b (V)	
		12.5	5 9 9	25	100	SS-6	-	0	4	23	33	40	36	17	19	14	A-6b (11)	
		15.0	10 10 13	31	100	SS-7	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
		17.5	5 9 9	25	100	SS-8	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		20.0	4 8 15	31	100	SS-9	-	-	-	-	-	-	-	-	-	20	A-6b (V)	
	562.6	22.5 ETR3																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: STANTEC / S.B.	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 371+03, 131 LT	EXPLORATION ID B-072-0-11
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: STANTEC / S.B.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 2/24/10	ELEVATION: 589.3 (MSL) EOB: 21.7 ft.	PAGE 1 OF 1
START: 6/16/11 END: 6/16/11	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 81.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP	589.3		1 2 4	8	100	SS-1	-	9	22	18	32	19	32	22	10	21	A-4a (3)	
		2.5	2 2 2	5	73	SS-2	-	-	-	-	-	-	-	-	-	13	A-4a (V)	
		5.0	2 2 3	7	67	SS-3	-	-	-	-	-	-	-	-	-	21	A-4a (V)	
	582.3																	
MEDIUM STIFF TO STIFF, BROWN, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP TO MOIST		7.5	2 2 3	7	87	SS-4	-	0	1	2	65	32	35	19	16	25	A-6b (10)	
		10.0	2 3 5	11	80	SS-5	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
		12.5	3 5 6	15	100	SS-6	-	0	1	9	51	39	35	19	16	19	A-6b (10)	
		15.0	3 5 7	16	100	SS-7	-	-	-	-	-	-	-	-	-	17	A-6b (V)	
		17.5			-	ST-8	-	3	3	11	42	41	35	19	16	19	A-6b (10)	
		20.0	4 9 50	81	100	SS-9	-	-	-	-	-	-	-	-	-	18	A-6b (V)	
	567.6																	
			TR															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 374+00, 260 LT	EXPLORATION ID B-073-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 577.7 (MSL) EOB: 40.2 ft.	PAGE 1 OF 2
START: 5/2/12 END: 5/2/12	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SANDY SILT**, SOME CLAY, MOIST TO WET	577.7		2 4 6	15	100	SS-1	-	-	-	-	-	-	-	-	-	21	A-4a (V)	
		2.5																
		5.0	2 2 3	7	100	SS-2	-	0	2	36	36	26	23	13	10	24	A-4a (5)	
		7.5	3 5 6	16	100	SS-3	-	-	-	-	-	-	-	-	-	25	A-4a (V)	
		10.0	4 5 8	19	100	SS-4	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
	566.7	TR																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).		12.5	8 50/4"	-	100	SS-5	-	-	-	-	-	-	-	-	-	10	Rock (V)	
	563.5		10 50/2"	-	100	SS-6	-	-	-	-	-	-	-	-	-	10	Rock (V)	
SHALE, BROWN TO GRAY, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO MODERATELY STRONG, LAMINATED, ARENACEOUS, FEW THIN, STRONG SANDSTONE LAYERS; RQD 54%, REC 100%.		15.0	48		100	NQ-1											CORE	
		17.5																
		20.0	56		100	NQ-2											CORE	
		22.5																
		25.0																
		27.5	55		100	NQ-3											CORE	
		30.0																
	543.5	32.5																
MUDSTONE, BROWN TO RED, SLIGHTLY WEATHERED, VERY WEAK, MEDIUM TO THICK BEDDED, FRIABLE; RQD 0%, REC 100%.		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 374+00, 260 LT	START: 5/2/12	END: 5/2/12	PG 2 OF 2	B-073-0-12

MATERIAL DESCRIPTION AND NOTES	ELEV. 541.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MUDSTONE, BROWN TO RED, SLIGHTLY WEATHERED, VERY WEAK, MEDIUM TO THICK BEDDED, FRIABLE; RQD 0%, REC 100%. *(continued)*	537.5	37.5 EOB 40.0	37		100	NQ-4											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 5/22/24 01:33 - U:\1736090006\LAW\75923\DESIGN\GEOTECHNICAL\EXPLORATIONS\2020 BORINGS\LAW-7-2.17_WORKING.GPJ

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 376+06, 133' RT.	EXPLORATION ID B-073-1-20
TYPE: EMBANKMENT	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 566.9 (MSL) EOB: 10.5 ft.	PAGE 1 OF 1
START: 4/6/21 END: 4/6/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.448656, -82.380233	

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)	SO4 ppm	BACK FILL
VERY STIFF, MAROONISH BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, SS-1 AND SS-2 WERE COMBINED FOR FULL CLASSIFICATION TESTING, DAMP	566.9		1 2 3	7	93	SS-1	3.00	3	5	10	42	40	44	24	20	24	A-7-6 (13)	-	
		1																	
		2																	
		3	1 3 20	31	87	SS-2	3.50	-	-	-	-	-	-	-	-	24	A-7-6 (V)	-	
	562.4	4																	
SANDSTONE, YELLOWISH BROWN, MODERATELY TO HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG.		TR 5	50	-	100	SS-3	-	-	-	-	-	-	-	-	-	4	Rock (V)	-	
		6																	
		7																	
		8	15 50/1"	-	100	SS-4	-	-	-	-	-	-	-	-	-	5	Rock (V)	-	
		9																	
SS-5 BECOMES GRAY	556.4	EOB 10	50	-	100	SS-5	-	-	-	-	-	-	-	-	-	4	Rock (V)	-	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 379+17, 144' RT.
TYPE: EMBANKMENT	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 7
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 539.9 (MSL) EOB: 37.0 ft.
START: 4/6/21 END: 4/6/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.448106, -82.379453

EXPLORATION ID B-073-2-20

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)	SO4 ppm	HOLE SEALED
MEDIUM DENSE TO DENSE, GRAY, **STONE FRAGMENTS**, LITTLE SAND, TRACE SILT, TRACE CLAY, SS-1 THROUGH SS-3 WERE COMBINED FOR FULL CLASSIFICATION TESTING, DRY	539.9		5 12 12	33	47	SS-1	-	75	9	7	6	3	NP	NP	NP	1	A-1-a (0)	-	
			20 18 24	57	72	SS-2	-	-	-	-	-	-	-	-	-	1	A-1-a (V)	-	
		W 531.9	8 9 10	26	53	SS-3	-	-	-	-	-	-	-	-	-	1	A-1-a (V)	-	
	530.4																		
VERY STIFF, BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, MOIST			3 3 5	11	67	SS-4	3.00	1	3	11	48	37	42	24	18	26	A-7-6 (12)	-	
	527.9																		
MEDIUM STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, LITTLE TO SOME SAND, TRACE GRAVEL, MOIST FROM 13.0 FT. TO 13.5 FT.; UCS = 1191 PSF					100	ST-1	2.00	2	4	22	43	29	36	20	16	24	A-6b (10)	-	
					100	ST-2	1.70	1	4	14	49	32	38	21	17	22	A-6b (11)	-	
			7 8 9	23	53	SS-5	3.75	-	-	-	-	-	-	-	-	22	A-6b (V)	-	
		▽ 521.6																	
	520.9																		
STIFF, BROWN WITH DARK BROWN MOTTLES, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP FROM 20.5 FT. TO 21.0 FT.; UCS = 2032 PSF					100	ST-3	1.25	12	4	17	41	26	34	20	14	19	A-6a (8)	-	
	517.9																		
MEDIUM DENSE, ORANGISH BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND, SILT, AND CLAY**, CONTAINS IRON STAINING, WET			3 5 6	15	100	SS-6	-	17	35	23	14	11	31	17	14	21	A-2-6 (0)	-	
	515.4																		

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 379+17, 144' RT.	START: 4/6/21	END: 4/6/21	PG 2 OF 2	B-073-2-20

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)	SO4 ppm	HOLE SEALED
LOOSE, ORANGISH BROWN, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE GRAVEL, TRACE CLAY, CONTAINS IRON STAINING, WET *(continued)*	514.9	26	3 3 3	8	100	SS-7	-	12	23	37	19	9	21	15	6	21	A-3a (0)	-	
MEDIUM DENSE, ORANGISH BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS IRON STAINING, WET	512.9	27 28	2 3 7	14	72	SS-8	-	27	20	22	24	7	24	19	5	18	A-2-4 (0)	-	
STIFF TO VERY STIFF, GRAY, **SANDY SILT**, LITTLE CLAY, LITTLE GRAVEL, DAMP	510.4	29 30	3 4 5	12	87	SS-9	2.00	11	16	21	41	11	25	19	6	17	A-4a (3)	-	
LOOSE, GRAY, **SILT**, SOME SAND, LITTLE CLAY, TRACE GRAVEL, WET	507.9	31 32 33	WOH 2 2	5	87	SS-10	-	2	3	18	62	15	NP	NP	NP	19	A-4b (8)	-	
MEDIUM STIFF, GRAY, **SILT**, LITTLE CLAY, TRACE SAND, TRACE GRAVEL, MOIST @35.0 FT.; POSSIBLE 6.0" SAND HEAVE NOTED ON FIELD LOG FROM 36.5 FT. TO 37.0 FT.; UCS = 1533 PSF	505.4	34 35 36			100	ST-4	1.00	0	0	9	74	17	25	21	4	23	A-4b (8)	-	
	502.9	37																	

NOTES: GROUNDWATER ENCOUNTERED AT 8.0' DURING DRILLING, 18.3' AT COMPLETION.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED BENTONITE GROUT

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 118+00, CL	EXPLORATION ID B-074-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 556.2 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/23/13 END: 4/23/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND AND GRAVEL, DAMP	556.2	2.5	3 4 5	9	100	SS-1	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		5.0	4 6 7	13	100	SS-2	-	-	-	-	-	-	-	-	-	13	A-6b (V)	
		7.5	2 8 4	12	100	SS-3	-	11	8	7	36	38	38	18	20	13	A-6b (12)	
	546.2	EOB 10.0	8 10 12	23	100	SS-4	-	-	-	-	-	-	-	-	-	13	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 387+00, CL	EXPLORATION ID B-074-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 582.2 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/26/13 END: 4/26/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, SOME STONE FRAGMENTS AND SAND, DAMP	582.2		3 7 6	13	100	SS-1	-	-	-	-	-	-	-	-	-	11	A-6b (V)	
		2.5																
			9 10 9	20	100	SS-2	-	-	-	-	-	-	-	-	-	11	A-6b (V)	
		5.0																
			4 7 6	13	100	SS-3	-	23	10	14	36	17	30	16	14	16	A-6a (5)	
		7.5																
	572.2		4 5 13	19	100	SS-4	-	-	-	-	-	-	-	-	-	21	A-6b (V)	
		EOB 10.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 120+00, CL	EXPLORATION ID B-075-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 555.3 (MSL) EOB: 9.5 ft.	PAGE 1 OF 1
START: 4/23/13 END: 4/23/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP	555.3		3 5 4	9	100	SS-1	-	-	-	-	-	-	-	-	-	17	A-6b (V)	
		2.5																
			5 3 3	6	100	SS-2	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
		5.0																
			5 9 9	19	100	SS-3	-	5	8	10	38	39	35	18	17	16	A-6b (11)	
		7.5																
	545.8	EOB	5 6 10	17	100	SS-4	-	-	-	-	-	-	-	-	-	12	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 391+00, CL	EXPLORATION ID B-075-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 584.7 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 584.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF, RED, **SILTY CLAY**, LITTLE STONE FRAGMENTS, (VISUAL), DAMP	583.7		3 9 9	19	100	SS-1	-	-	-	-	-	-	-	-	-	13	A-6b (V)	
	582.7						-	-	-	-	-	-	-	-	-	5	A-2-6 (V)	
DENSE, BROWN, **GRAVEL WITH SAND, SILT, AND CLAY**, (VISUAL), DRY		2.5																
VERY STIFF, RED TO BROWN, **SILTY CLAY**, LITTLE STONE FRAGMENTS, SOME SAND, DAMP TO MOIST			5 10 11	22	100	SS-2	-	19	10	12	28	31	36	15	21	14	A-6b (9)	
		5.0																
		7.5	3 9 8	18	100	SS-3	-	-	-	-	-	-	-	-	-	18	A-6b (V)	
	574.7	EOB 10.0	5 6 10	17	100	SS-4	-	-	-	-	-	-	-	-	-	14	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / B.B.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 123+50, CL	EXPLORATION ID B-076-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / B.B.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 528.9 (MSL) EOB: 30.5 ft.	PAGE 1 OF 1
START: 4/23/13 END: 4/23/13	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF, BROWN TO GRAY, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST	528.9		2 2 3	7	100	SS-1	-	-	-	-	-	-	-	-	-	26	A-6b (V)	
		2.5																
		5.0	2 2 2	6	100	SS-2	-	5	5	12	44	34	36	20	16	20	A-6b (10)	
		7.5	2 2 2	6	100	SS-3	-	-	-	-	-	-	-	-	-	28	A-6b (V)	
	519.9																	
SOFT, GRAY, **SILT AND CLAY**, LITTLE SAND, MOIST		10.0			79	ST-4	-	0	0	11	48	41	34	19	15	-	A-6a (10)	
		12.5	WOH WOH WOH	0	100	SS-5	-	-	-	-	-	-	-	-	-	27	A-6a (V)	
	514.4						-	-	-	-	-	-	-	-	-	39	A-6a (V)	
VERY LOOSE, BROWN, **COARSE AND FINE SAND**, (VISUAL), WET	513.4	15.0	1 1 3	6	100	SS-6	-	-	-	-	-	-	-	-	-	31	A-3a (V)	
STIFF TO VERY STIFF, GRAY, **SANDY SILT**, LITTLE GRAVEL AND CLAY, MOIST TO WET		17.5	WOH 2 2	6	100	SS-7	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
		20.0	2 2 3	7	100	SS-8	-	13	23	28	22	14	22	15	7	18	A-4a (0)	
		22.5	2 5 3	12	100	SS-9	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
		25.0	5 6 7	19	100	SS-10	-	-	-	-	-	-	-	-	-	16	A-4a (V)	
		27.5	4 5 5	15	100	SS-11	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
	498.4	EOB 30.0	5 6 11	25	100	SS-12	-	-	-	-	-	-	-	-	-	21	A-4a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 395+00, CL	EXPLORATION ID B-076-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 590.9 (MSL) EOB: 9.5 ft.	PAGE 1 OF 1
START: 4/24/13 END: 4/24/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, RED AND GRAY, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, DAMP	590.9		3 3 4	7	100	SS-1	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		2.5																
		5.0	5 8 10	19	100	SS-2	-	4	12	9	33	42	38	19	19	17	A-6b (12)	
	583.4		6 13 13	27	100	SS-3	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		7.5																
VERY STIFF, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, MOIST	581.4		11 11 11	23	100	SS-4	-	7	24	24	33	12	19	14	5	6	A-4a (2)	
		EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:25 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 396+04, 102' RT.	EXPLORATION ID B-076-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 587.7 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/29/24 END: 5/29/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.448656, -82.373197	

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
13.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	587.7																	
HARD, BROWN, **SANDY SILT**, SOME STONE FRAGMENTS, LITTLE CLAY, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	586.1	1	7 18 11	39	100	SS-1	-	26	19	13	28	14	30	20	10	7	A-4a (1)	
HARD, MAROONISH BROWN BECOMING DARK BROWN, **CLAY**, SOME SILT, LITTLE TO SOME SAND, TRACE TO LITTLE GRAVEL, DAMP	584.7	2 3 4 5	5 5 6	15	89	SS-2	4.50	15	7	12	30	36	44	24	20	20	A-7-6 (11)	
		6 7 8	7 7 8	20	100	SS-3	4.50	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
		9 10	6 5 6	15	72	SS-4	4.50	7	9	15	31	38	42	23	19	19	A-7-6 (11)	
		11 12 13	3 5 5	13	100	SS-5	4.50	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
MEDIUM DENSE, ORANGISH BROWN BECOMING MAROONISH BROWN, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, DAMP	574.7	14 15	4 5 6	15	28	SS-6	-	32	32	26	5	5	NP	NP	NP	6	A-1-b (0)	
		16 17 18	3 7 8	20	33	SS-7	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
		19 20	5 5 7	16	44	SS-8	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	
		21 22 23	4 6 9	20	100	SS-9	-	-	-	-	-	-	-	-	-	7	A-1-b (V)	
	562.7	EOB 24 25	4 7 9	21	83	SS-10	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:25 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 398+01, 110' RT.	EXPLORATION ID B-076-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 589.9 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/29/24 END: 5/29/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.448837, -82.372539	

MATERIAL DESCRIPTION AND NOTES	ELEV. 589.9	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
12.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	588.4	1																
HARD, MAROONISH BROWN AND GRAY, **SILTY CLAY**, LITTLE TO SOME SAND, LITTLE STONE FRAGMENTS, DAMP	584.4	2	4 3 7	13	67	SS-1	4.25	12	15	11	31	31	36	20	16	12	A-6b (8)	
		3																
		4	7 7 10	23	100	SS-2	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
		5																
HARD, BROWN, **SILT AND CLAY**, LITTLE TO SOME SAND, TRACE TO LITTLE STONE FRAGMENTS, DAMP	577.4	6	6 8 9	23	100	SS-3	4.50	16	12	13	31	28	34	20	14	13	A-6a (6)	
		7																
		8																
		9	5 6 8	19	100	SS-4	4.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
		10																
		11	6 5 6	15	78	SS-5	4.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
MEDIUM DENSE, ORANGISH BROWN, **GRAVEL WITH SAND**, TRACE CLAY, TRACE SILT, IRON STAINING, DAMP	574.4	12																
		13																
		14	5 6 8	19	100	SS-6	-	22	29	30	9	10	NP	NP	NP	8	A-1-b (0)	
		15																
MEDIUM DENSE, ORANGISH BROWN, **COARSE AND FINE SAND**, TRACE CLAY, TRACE SILT, TRACE GRAVEL, IRON STAINING, DAMP	571.9	16																
		17	4 8 8	21	39	SS-7	-	4	23	59	5	9	NP	NP	NP	7	A-3a (0)	
		18																
MEDIUM DENSE, ORANGISH BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, IRON STAINING, DAMP	564.9	19	4 5 6	15	50	SS-8	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
		20																
		21																
		22	2 6 6	16	44	SS-9	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
		23																
	EOB	24	4 7 9	21	100	SS-10	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	
		25																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / B.B.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 123+50, 80 LT	EXPLORATION ID B-077-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / B.B.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 525.6 (MSL) EOB: 33.0 ft.	PAGE 1 OF 1
START: 4/24/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 525.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SOFT TO MEDIUM STIFF, BROWN, **SILTY CLAY**, WITH SAND, (VISUAL), MOIST			WOH WOH WOH	0	100	SS-1	-	-	-	-	-	-	-	-	-	24	A-6b (V)	
	520.1	2.5																
STIFF TO VERY STIFF, RED TO GRAY, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP		5.0	2 3 3	9	100	SS-2	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
		7.5	14 11 5	24	100	SS-3	-	4	9	12	52	23	32	19	13	10	A-6a (9)	
		10.0	4 6 7	19	100	SS-4	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
		12.5	2 5 6	16	100	SS-5	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
	510.1	15.0	3 3 3	9	100	SS-6	-	-	-	-	-	-	-	-	-	15	A-6a (V)	
LOOSE, BROWN, **GRAVEL WITH SAND AND SILT**, LITTLE CLAY, DAMP	507.6	17.5	3 3 4	10	100	SS-7	-	28	20	18	21	13	25	16	9	14	A-2-4 (0)	
LOOSE TO MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, TRACE SILT AND CLAY, MOIST TO WET		20.0	2 3 5	12	100	SS-8	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
		22.5	1 2 3	7	100	SS-9	-	0	36	48	10	6	NP	NP	NP	22	A-3a (0)	
		25.0	1 2 3	7	100	SS-10	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		27.5	3 7 9	24	100	SS-11	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
	494.6	30.0	4 7 9	24	100	SS-12	-	-	-	-	-	-	-	-	-	14	A-3a (V)	
DENSE, GRAY, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, MOIST	492.6	32.5	4 10 17	40	100	SS-13	-	38	21	23	13	5	NP	NP	NP	14	A-1-b (0)	
		EOB																
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	490.1		10 20 50/1"	-	100	SS-14	-	-	-	-	-	-	-	-	-	13	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 339+00, CL	EXPLORATION ID B-077-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 597.8 (MSL) EOB: 9.5 ft.	PAGE 1 OF 1
START: 4/24/13 END: 4/24/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 597.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, BROWN AND GRAY, **SILTY CLAY**, SOME SAND, LITTLE GRAVEL, DAMP			2 3 5	8	100	SS-1	-	-	-	-	-	-	-	-	-	14	A-6b (V)	
		2.5																
		5.0	4 9 7	17	100	SS-2	-	14	17	10	27	32	36	20	16	14	A-6b (7)	
			5 5 7	12	100	SS-3	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		7.5																
	588.3	EOB	5 7 10	18	100	SS-4	-	-	-	-	-	-	-	-	-	16	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 13:25 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 399+99, 108' RT.	EXPLORATION ID B-077-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 592.6 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449043, -82.371899	

MATERIAL DESCRIPTION AND NOTES	ELEV. 592.6	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
12.0" ASPHALT AND 5.5" BASE (DRILLERS DESCRIPTION)	591.1	1																
HARD, MAROONISH BROWN AND BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP	589.6	2	4 5 5	13	72	SS-1	4.50	7	9	8	34	42	44	21	23	15	A-7-6 (14)	
VERY STIFF, BROWN AND GRAY, **SANDY SILT**, "AND" GRAVEL, LITTLE CLAY, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	587.1	3 4 5	5 12 6	24	94	SS-2	-	35	9	8	33	15	30	20	10	8	A-4a (3)	
HARD, MAROONISH BROWN AND BROWN, **SILTY CLAY**, SOME SAND, TRACE TO LITTLE GRAVEL, DAMP	582.1	6 7 8	4 8 9	23	100	SS-3	4.50	18	13	10	31	28	38	21	17	13	A-6b (8)	
		9	5 5 7	16	89	SS-4	4.25	-	-	-	-	-	-	-	-	13	A-6b (V)	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP	577.1	10 11 12	4 5 9	19	39	SS-5	4.50	-	-	-	-	-	-	-	-	16	A-7-6 (V)	
		13 14	5 6 7	17	72	SS-6	4.25	-	-	-	-	-	-	-	-	17	A-7-6 (V)	
HARD, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP	574.6	15 16 17	5 5 8	17	100	SS-7	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
MEDIUM DENSE, ORANGISH BROWN, **FINE SAND**, SOME COARSE SAND, LITTLE GRAVEL, TRACE SILT, TRACE CLAY, IRON STAINING, DAMP		18 19 20	5 5 7	16	78	SS-8	-	14	27	53	5	1	NP	NP	NP	3	A-3 (0)	
		21 22 23	6 6 5	15	33	SS-9	-	-	-	-	-	-	-	-	-	3	A-3 (V)	
	567.6	EOB 24 25	2 5 11	21	89	SS-10	-	-	-	-	-	-	-	-	-	4	A-3 (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 402+00, 112' RT.	EXPLORATION ID B-077-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 588.8 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449237, -82.371242	

MATERIAL DESCRIPTION AND NOTES	ELEV. 588.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
13.0" ASPHALT AND 5.0" BASE (DRILLERS DESCRIPTION)	587.3																	
MEDIUM DENSE, MAROONISH BROWN AND BROWN, **SANDY SILT**, "AND" STONE FRAGMENTS, LITTLE CLAY, DAMP	585.8	1	6 4 12	21	22	SS-1	-	47	7	9	21	16	NP	NP	NP	10	A-4a (0)	
HARD, MAROONISH BROWN BECOMING BROWN, **SILTY CLAY**, SOME SAND, LITTLE TO SOME GRAVEL, DAMP		2																
		3																
		4	6 5 10	20	100	SS-2	4.50	21	12	10	32	25	38	22	16	13	A-6b (7)	
		5																
		6	6 8 11	25	17	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-6b (V)	
		7																
		8																
		9	5 6 6	16	100	SS-4	4.50	17	12	12	34	25	36	20	16	12	A-6b (7)	
		10																
		11																
		12	6 5 7	16	33	SS-5	4.50	-	-	-	-	-	-	-	-	12	A-6b (V)	
		13																
	573.3	14	5 4 8	16	44	SS-6	4.25	-	-	-	-	-	-	-	-	16	A-6b (V)	
MEDIUM DENSE, BROWN, **STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP		15																
	570.8	16																
		17	6 7 8	20	44	SS-7	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
HARD, DARK BROWN, **SILTY CLAY**, "AND" SAND, TRACE GRAVEL, DAMP		18																
		19																
		20	5 6 7	17	100	SS-8	4.50	4	13	28	28	27	34	18	16	15	A-6b (6)	
		21																
	565.8	22	4 5 8	17	100	SS-9	4.50	-	-	-	-	-	-	-	-	10	A-6b (V)	
MEDIUM DENSE, BROWN, **GRAVEL WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP		23																
	563.8	24	5 7 7	19	100	SS-10	-	-	-	-	-	-	-	-	-	6	A-1-b (V)	
	EOB	25																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 111+00, CL	EXPLORATION ID B-078-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 567.4 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/23/13 END: 4/23/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILT**, SOME CLAY, TRACE GRAVEL AND SAND, MOIST TO WET	567.4		4 5 7	12	100	SS-1	-	1	1	5	70	23	26	22	4	20	A-4b (8)	
		2.5																
		5.0	2 5 6	11	100	SS-2	-	-	-	-	-	-	-	-	-	29	A-4b (V)	
		7.5	4 6 8	14	100	SS-3	-	-	-	-	-	-	-	-	-	26	A-4b (V)	
	557.4	EOB 10.0	5 7 10	18	100	SS-4	-	-	-	-	-	-	-	-	-	25	A-4b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 403+00, CL	EXPLORATION ID B-078-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 603.7 (MSL) EOB: 9.5 ft.	PAGE 1 OF 1
START: 4/24/13 END: 4/24/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 603.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, RED TO GRAY, **SILT AND CLAY**, LITTLE GRAVEL AND SAND, DAMP TO MOIST		2.5	2 3 4	7	100	SS-1	-	-	-	-	-	-	-	-	-	12	A-6a (V)	
		5.0	5 10 17	28	100	SS-2	-	18	9	14	32	27	34	20	14	15	A-6a (6)	
		7.5	8 7 8	16	100	SS-3	-	-	-	-	-	-	-	-	-	19	A-6a (V)	
	594.2	EOB	10 17 10	28	100	SS-4	-	-	-	-	-	-	-	-	-	13	A-6a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 404+03, 102' RT.	EXPLORATION ID B-078-2-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 595.3 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449462, -82.370599	

MATERIAL DESCRIPTION AND NOTES	ELEV. 595.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
12.5" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	593.8																	
HARD, MAROONISH BROWN, **SILTY CLAY**, LITTLE TO SOME SAND, TRACE TO LITTLE GRAVEL, DAMP		1	3 5 6	15	100	SS-1	4.25	19	9	9	35	28	38	21	17	13	A-6b (8)	
		2																
		3																
		4	6 7 6	17	100	SS-2	4.50	-	-	-	-	-	-	-	-	13	A-6b (V)	
		5																
		6																
		7	4 5 7	16	100	SS-3	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
		8																
	584.8	9	5 9 12	28	50	SS-4	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
		10																
HARD, BROWN AND GRAY, **SILT AND CLAY**, SOME GRAVEL AND STONE FRAGMENTS, LITTLE SAND, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	582.3	11	7 16 12	37	100	SS-5	-	31	10	9	30	20	34	20	14	10	A-6a (4)	
		12																
HARD, MAROONISH BROWN AND BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP		13																
		14	6 7 10	23	28	SS-6	4.50	-	-	-	-	-	-	-	-	17	A-6b (V)	
		15																
		16																
		17	6 6 7	17	44	SS-7	4.50	-	-	-	-	-	-	-	-	17	A-6b (V)	
		18																
		19	6 8 5	17	22	SS-8	4.50	-	-	-	-	-	-	-	-	14	A-6b (V)	
	574.8	20																
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, DAMP	572.3	21																
		22	4 4 5	12	28	SS-9	-	-	-	-	-	-	-	-	-	12	A-2-4 (V)	
		23																
HARD, MAROONISH BROWN AND BROWN, **SILT AND CLAY**, "AND" SAND, LITTLE GRAVEL, DAMP	570.3	24	4 6 6	16	100	SS-10	4.50	13	15	25	26	21	30	17	13	13	A-6a (3)	
		EOB 25																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 406+02, 93' RT.	EXPLORATION ID B-078-3-23
TYPE: NOISE WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 602.4 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 5/30/24 END: 5/30/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.449677, -82.369965	

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
13.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	602.4																	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, LITTLE GRAVEL, DAMP	600.8		5 2 4	8	33	SS-1	4.50	13	8	10	32	37	41	20	21	16	A-7-6 (11)	
HARD, MAROONISH BROWN AND BROWN, **SILT AND CLAY**, LITTLE TO SOME GRAVEL, SOME SAND, DAMP	599.4		3 4 4	11	89	SS-2	4.50	33	15	10	27	15	34	21	13	10	A-6a (2)	
	594.4		5 5 12	23	100	SS-3	4.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE GRAVEL, DAMP	591.9		6 7 9	21	28	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME STONE FRAGMENTS, SOME SAND, CONTAINS NO INTACT SOIL FOR HP READINGS, DAMP	586.9		5 12 8	27	94	SS-5	-	33	16	10	23	18	36	22	14	10	A-6a (2)	
			6 7 8	20	22	SS-6	-	-	-	-	-	-	-	-	-	9	A-6a (V)	
HARD, MAROONISH BROWN, **CLAY**, SOME SILT, LITTLE SAND, TRACE TO LITTLE GRAVEL, DAMP			4 4 7	15	17	SS-7	4.50	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
			5 8 8	21	100	SS-8	4.50	11	12	7	33	37	41	21	20	13	A-7-6 (11)	
			6 9 14	31	100	SS-9	4.50	-	-	-	-	-	-	-	-	12	A-7-6 (V)	
	577.4	EOB	6 10 16	35	100	SS-10	4.50	-	-	-	-	-	-	-	-	17	A-7-6 (V)	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / B.B.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 113+50, CL	EXPLORATION ID B-079-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / B.B.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 577.1 (MSL) EOB: 24.5 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 577.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	576.4		2 2 3	7	100	SS-1	-	-	-	-	-	-	-	-	-	28	A-4b (V)	
STIFF, BROWN, **SILT**, SOME CLAY, TRACE SAND, MOIST TO WET		2.5	2 2 3	7	100	SS-2	-	-	-	-	-	-	-	-	-	29	A-4b (V)	
		5.0	2 3 5	12	100	SS-3	-	0	0	8	62	30	27	18	9	21	A-4b (8)	
		7.5	2 4 6	15	100	SS-4	-	-	-	-	-	-	-	-	-	27	A-4b (V)	
		10.0	2 4 6	15	100	SS-5	-	-	-	-	-	-	-	-	-	27	A-4b (V)	
		12.5	2 3 6	13	100	SS-6	-	-	-	-	-	-	-	-	-	28	A-4b (V)	
	562.6	15.0																
VERY STIFF, BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, MOIST			3 6 10	24	100	SS-7	-	4	7	15	43	31	29	16	13	16	A-6a (9)	
		17.5	4 6 8	21	100	SS-8	-	-	-	-	-	-	-	-	-	18	A-6a (V)	
		20.0	4 6 7	19	100	SS-9	-	-	-	-	-	-	-	-	-	17	A-6a (V)	
		22.5	2 6 7	19	100	SS-10	-	-	-	-	-	-	-	-	-	18	A-6a (V)	
	552.6	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 407+00, CL	EXPLORATION ID B-079-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 607.9 (MSL) EOB: 9.5 ft.	PAGE 1 OF 1
START: 4/24/13 END: 4/24/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 607.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, SOME SAND, LITTLE GRAVEL, DAMP			3 7 5	12	100	SS-1	-	-	-	-	-	-	-	-	-	15	A-6b (V)	
		2.5																
Encountered cobble or boulder at 4.0'			50/3"	-	100	SS-2	-	-	-	-	-	-	-	-	-	8	A-6b (V)	
		5.0																
			3 6 8	14	100	SS-3	-	12	14	9	26	39	40	18	22	14	A-6b (11)	
		7.5																
	598.4	EOB	10 7 10	18	100	SS-4	-	-	-	-	-	-	-	-	-	12	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 117+00, CL	EXPLORATION ID B-080-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 553.8 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/23/13 END: 4/23/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
VERY STIFF, BROWN AND GRAY, **SILTY CLAY**, TRACE GRAVEL AND SAND, DAMP	553.8		5 7 14	22	100	SS-1	-	3	3	8	45	41	40	21	19	15	A-6b (12)	
	549.8	2.5																
HARD, RED AND GRAY, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP			29 50/5"	-	100	SS-2	-	-	-	-	-	-	-	-	-	9	A-6a (V)	
		5.0																
			22 40 44	87	100	SS-3	-	5	7	13	41	34	34	20	14	9	A-6a (10)	
		7.5																
			50	-	100	SS-4	-	-	-	-	-	-	-	-	-	7	A-6a (V)	
	543.8	EOB 10.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 13+00, 300 LT	EXPLORATION ID B-083-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 744.9 (MSL) EOB: 81.0 ft.	PAGE 1 OF 3
START: 5/9/13 END: 5/9/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 744.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
VERY DENSE, BROWN, **GRAVEL WITH SAND AND SILT**, LITTLE CLAY, DRY			6 17 50/1"	-	100	SS-1	-	35	15	18	19	13	25	18	7	6	A-2-4 (0)	
		2.5	50/3"	-	100	SS-2	-	35	15	18	19	13	25	18	7	6	A-2-4 (0)	
	739.4	5.0 TR	50	-	100	SS-3	-	35	15	18	19	13	25	18	7	7	A-2-4 (0)	
SHALE, BROWN, SEVERELY WEATHERED, (AUGERED).	737.4	7.5																
SHALE, BROWN, MODERATELY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED; RQD 40%, REC 98%.	734.5	10.0	54		97	NX-1											CORE	
SANDSTONE, BROWN, SLIGHTLY WEATHERED, STRONG, MEDIUM GRAINED, THIN BEDDED, SHALE PARTINGS FROM 10.4' TO 16.5'; RQD 72%, REC 91%.		12.5																
		15.0	88		98	NX-2											CORE	
		17.5																
		20.0																
		22.5	87		100	NX-3											CORE	
		25.0																
		27.5																
		30.0																
		32.5	58		91	NX-4											CORE	
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 13+00, 300 LT	START: 5/9/13	END: 5/9/13	PG 2 OF 3	B-083-1-12

MATERIAL DESCRIPTION AND NOTES	ELEV. 708.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
	707.5	37.5																
SHALE, BROWN TO GRAY, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, HIGHLY WEATHERED CLAY ZONES; RQD 19%, REC 87%.		40.0	24		100	NX-5											CORE	
		42.5																
		45.0	14		73	NX-6											CORE	
	697.4	47.5																
MUDSTONE, RED TO BROWN, SLIGHTLY TO MODERATELY WEATHERED, WEAK, MEDIUM BEDDED, FRIABLE; RQD 0%, REC 100%.		50.0	56		100	NX-7											CORE	
	690.9	52.5																
SHALE, BROWN, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY STRONG, LAMINATED, WATER STAINING; RQD 64%, REC 98%.		55.0	60		100	NX-8											CORE	
		57.5																
		60.0	52		97	NX-9											CORE	
	681.6	62.5																
SANDSTONE, GRAY, SLIGHTLY WEATHERED, STRONG, THIN TO MEDIUM BEDDED; RQD 55%, REC 100%.		65.0	31		82	NX-10											CORE	
	676.9	67.5																
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED; RQD 20%, REC 98%.		70.0																
		72.5	32		98	NX-11											CORE	
		75.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 13+00, 300 LT	START: 5/9/13	END: 5/9/13	PG 3 OF 3	B-083-1-12

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)	ABAN-DONED
	668.8																	
	667.8																	
MUDSTONE, RED TO BROWN, SLIGHTLY WEATHERED, WEAK, MEDIUM BEDDED, FRIABLE, SLICKENSIDES; RQD 0%, REC 96%.		77.5	38		87	NX-12											CORE	
	663.9	80.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 18+00, CL	EXPLORATION ID B-084-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 611.1 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
ASPHALT	610.1																	
AGGREGATE BASE	609.6																	
STIFF TO VERY STIFF, BROWN, **SANDY SILT**, SOME CLAY, DAMP TO MOIST		2.5	18 6 6	12	100	SS-1	-	-	-	-	-	-	-	-	-	16	A-4a (V)	
		5.0	6 7 8	16	100	SS-2	-	0	11	47	19	23	25	17	8	16	A-4a (1)	
		7.5	4 6 7	13	100	SS-3	-	0	10	42	22	26	23	14	9	17	A-4a (3)	
	601.1	EOB 10.0	3 5 7	12	100	SS-4	-	-	-	-	-	-	-	-	-	17	A-4a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 10+00, CL	EXPLORATION ID B-085-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 631.0 (MSL) EOB: 25.7 ft.	PAGE 1 OF 1
START: 5/9/13 END: 5/9/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	631.0																	
VERY STIFF TO HARD, BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, DAMP TO MOIST			3 5 5	14	100	SS-1	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
		2.5	14 24 26	72	100	SS-2	-	1	10	45	22	22	21	16	5	14	A-4a (2)	
	624.5	5.0	24 26 20	66	100	SS-3	-	-	-	-	-	-	-	-	-	19	A-4a (V)	
VERY STIFF, BROWN, **SILT AND CLAY**, AND SAND, TRACE GRAVEL, MOIST		7.5	10 11 7	26	100	SS-4	-	6	21	25	19	29	31	20	11	24	A-6a (3)	
	621.0																	
SHALE, GRAY, SEVERELY WEATHERED, (AUGERED).	620.3	TR 10.0	26 50/2"	-	100	SS-5	-	-	-	-	-	-	-	-	-	11	Rock (V)	
INTERBEDDED SHALE (80%) AND MUDSTONE (20%), RQD 10%, REC. 73%; **SHALE**, BROWN TO GRAY, MODERATELY WEATHERED, VERY WEAK TO WEAK, LAMINATED, HIGHLY FRACTURED; **MUDSTONE**, BROWN TO GRAY, MODERATELY WEATHERED, VERY WEAK TO WEAK, THIN BEDDED, FRIABLE.		12.5	19		100	NX-1											CORE	
		15.0	8		32	NX-2											CORE	
		17.5 20.0	24		86	NX-3											CORE	
		22.5	0		100	NX-4											CORE	
	605.3	25.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 15+00, 30 LT	EXPLORATION ID B-086-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 602.4 (MSL) EOB: 40.2 ft.	PAGE 1 OF 2
START: 4/30/13 END: 4/30/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 602.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
VERY STIFF TO HARD, BROWN, **SILT AND CLAY**, LITTLE TO SOME SAND, TRACE TO LITTLE GRAVEL, DAMP			6 9 7	23	100	SS-1	-	-	-	-	-	-	-	-	-	14	A-6a (V)	
		2.5	8 6 6	17	100	SS-2	-	18	25	10	30	17	33	22	11	12	A-6a (3)	
		5.0	7 16 23	56	100	SS-3	-	-	-	-	-	-	-	-	-	12	A-6a (V)	
		7.5	19 27 50/4"	-	100	SS-4	-	5	3	7	47	38	33	20	13	12	A-6a (9)	
	593.4	TR																
SANDSTONE, BROWN, SLIGHTLY WEATHERED, STRONG, FINE GRAINED, THIN BEDDED, SHALE SEAMS; RQD 56%, REC 90%.		10.0	42		83	NX-1											CORE	
	587.3	12.5																
SHALE, GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS; RQD 38%, REC 100%.		15.0	24		100	NX-2											CORE	
		17.5																
		20.0	58		100	NX-3											CORE	
	579.1	22.5																
MUDSTONE, GRAY TO RED, SLIGHTLY WEATHERED, WEAK, THIN BEDDED, FRIABLE; RQD 0%, REC 100%.		25.0	78		97	NX-4											CORE	
	571.7	27.5																
SHALE, GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS; RQD 50%, REC 98%.		30.0	74		100	NX-5											CORE	
		32.5																
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 15+00, 30 LT	START: 4/30/13	END: 4/30/13	PG 2 OF 2	B-086-0-12

MATERIAL DESCRIPTION AND NOTES	ELEV. 565.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
	563.7	37.5	33		94	NX-6											CORE	
MUDSTONE, GRAY TO RED, SLIGHTLY WEATHERED, WEAK, THIN BEDDED, FRIABLE; RQD 0%, REC 95%.	562.2	EOB 40.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 15+00, 260 LT	EXPLORATION ID B-086-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 659.6 (MSL) EOB: 40.0 ft.	PAGE 1 OF 2
START: 4/29/13 END: 4/30/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
VERY STIFF TO HARD, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE STONE FRAGMENTS, DAMP TO MOIST	659.6		2 2 2	6	100	SS-1	-	-	-	-	-	-	-	-	-	24	A-6b (V)	
		2.5	4 7 11	26	100	SS-2	-	6	10	10	37	37	38	19	19	18	A-6b (11)	
	653.6	5.0	20 21 21	60	100	SS-3	-	6	10	10	37	37	38	19	19	12	A-6b (11)	
HARD, RED TO BROWN, **CLAY**, SOME SILT, TRACE GRAVEL AND SAND, DAMP		7.5	15 17 18	50	100	SS-4	-	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
		10.0	16 19 24	62	100	SS-5	-	8	2	3	34	53	42	19	23	13	A-7-6 (14)	
	646.6	12.5	22 50/5"	-	100	SS-6	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
SHALE, BROWN, SEVERELY WEATHERED, (AUGERED).	644.6	TR																
INTERBEDDED SHALE (80%) AND MUDSTONE (20%), RQD 36%, REC. 78%; **SHALE**, BROWN, MODERATELY WEATHERED, WEAK TO MODERATELY STRONG, LAMINATED TO VERY THIN BEDDED, ARENACEOUS; **MUDSTONE**, BROWN, MODERATELY WEATHERED, WEAK, THIN BEDDED.		15.0	62		78	NX-1											CORE	
		17.5																
		20.0	24		57	NX-2											CORE	
		22.5																
		25.0	24		100	NX-3											CORE	
	629.6	27.5																
MUDSTONE, BROWN TO RED, SLIGHTLY WEATHERED, WEAK, THIN BEDDED; RQD 0%, REC 96%.		30.0	80		100	NX-4											CORE	
		32.5																
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 15+00, 260 LT	START: 4/29/13	END: 4/30/13	PG 2 OF 2	B-086-1-12

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)	ABAN-DONED
MUDSTONE, BROWN TO RED, SLIGHTLY WEATHERED, WEAK, THIN BEDDED; RQD 0%, REC 96%. *(continued)*	622.9	37.5	44		92	NX-5											CORE	
	619.6	EOB 40.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / R.C.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 24+00, 120 LT	EXPLORATION ID B-087-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / R.C.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 615.4 (MSL) EOB: 50.0 ft.	PAGE 1 OF 2
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 615.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
HARD, BROWN, **GRAVEL WITH SAND, SILT, AND CLAY**, (POSSIBLE SEVERELY WEATHERED ROCK), DRY		2.5	8 11 20	44	100	SS-1	-	38	21	10	19	12	33	21	12	10	A-2-6 (0)	
	609.9	5.0 TR	38 50/2"	-	100	SS-2	-	-	-	-	-	-	-	-	-	7	A-2-6 (V)	
SHALE, BROWN TO GRAY, MODERATELY TO SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED, ARENACEOUS; RQD 35%, REC 87%.		7.5	11		82	NX-1											CORE	
		10.0 12.5	28		100	NX-2											CORE	
		15.0	80		93	NX-3											CORE	
		17.5 20.0 22.5	26		77	NX-4											CORE	
	584.7	25.0 27.5 30.0	46		100	NX-5											CORE	
SANDSTONE, BROWN TO GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, STRONG, THIN BEDDED; RQD 78%, REC 100%.		32.5 35.0	100		100	NX-6											CORE	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 24+00, 120 LT	START: 4/25/13	END: 4/25/13	PG 2 OF 2	B-087-0-12

MATERIAL DESCRIPTION AND NOTES	ELEV. 578.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SANDSTONE, BROWN TO GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, STRONG, THIN BEDDED; RQD 78%, REC 100%. *(continued)*		37.5																
	574.6	40.0																
SHALE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED, ARENACEOUS; RQD 75%, REC 100%.		42.5	68		96	NX-7											CORE	
	570.4	45.0																
MUDSTONE, RED AND GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, WEAK, THIN BEDDED; RQD 0%, REC 88%.		47.5																
	565.4	EOB 50.0	60		92	NX-8											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:27 - \\US1268-F01\SHARED_PROJECTS\17336\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / R.C.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 24+00, 350 LT	EXPLORATION ID B-087-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / R.C.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 654.5 (MSL) EOB: 50.0 ft.	PAGE 1 OF 2
START: 4/24/13 END: 4/24/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
SOFT, BROWN, **SILTY CLAY**, TRACE GRAVEL AND SAND, WET (VISUAL)	654.5		WOH 1 2	4	100	SS-1	-	-	-	-	-	-	-	-	-	35	A-6b (V)	
HARD, BROWN, **SILTY CLAY**, TRACE TO LITTLE GRAVEL, TRACE SAND, DAMP	652.5	2.5																
		5.0	10 11 12	33	100	SS-2	-	19	4	3	32	42	39	21	18	14	A-6b (11)	
		7.5	10 11 19	43	100	SS-3	-	-	-	-	-	-	-	-	-	13	A-6b (V)	
		10.0	17 19 22	59	100	SS-4	-	0	0	3	45	52	40	22	18	12	A-6b (11)	
	641.5	12.5	17 39 50/4"	-	100	SS-5	-	-	-	-	-	-	-	-	-	10	A-6b (V)	
MUDSTONE, RED AND GRAY, MODERATELY WEATHERED, VERY WEAK TO WEAK, VERY FINE TO FINE GRAINED, VERY THICK BEDDED, FRIABLE, (AUGERED).		TR 15.0	13 21 50/2"	-	100	SS-6	-	-	-	-	-	-	-	-	-	9	Rock (V)	
		17.5	21 32 50/5"	-	100	SS-7	-	-	-	-	-	-	-	-	-	9	Rock (V)	
		20.0	28 50/4"	-	100	SS-8	-	-	-	-	-	-	-	-	-	10	Rock (V)	
		22.5	26 50/2"	-	100	SS-9	-	-	-	-	-	-	-	-	-	9	Rock (V)	
	630.5																	
MUDSTONE, RED AND GRAY, SLIGHTLY TO MODERATELY WEATHERED, VERY WEAK TO WEAK, VERY FINE TO FINE GRAINED, VERY THICK BEDDED, FRIABLE, SLICKENSIDES PRESENT; RQD 0%, REC 83%.		25.0	16		80	NX-1											CORE	
		30.0	0		70	NX-2											CORE	
		35.0	23		95	NX-3											CORE	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 24+00, 350 LT	START: 4/24/13	END: 4/24/13	PG 2 OF 2	B-087-1-12

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)	ABAN-DONED
MUDSTONE, RED AND GRAY, SLIGHTLY TO MODERATELY WEATHERED, VERY WEAK TO WEAK, VERY FINE TO FINE GRAINED, VERY THICK BEDDED, FRIABLE, SLICKENSIDES PRESENT; RQD 0%, REC 83%. *(continued)*	617.8	37.5																
	613.2	40.0																
SHALE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, VERY FINE TO FINE GRAINED, LAMINATED, WATER STAINING PRESENT; RQD 62%, REC 99%.		42.5	13		100	NX-4											CORE	
		45.0																
		47.5																
	604.5	EOB 50.0	90		100	NX-5											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:27 - \\US1268-F01\SHARED_PROJECTS\11736\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / R.C.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 33+50, 120 LT	EXPLORATION ID B-088-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / R.C.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 645.6 (MSL) EOB: 60.1 ft.	PAGE 1 OF 2
START: 4/26/13 END: 4/26/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 645.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	644.6		2 2 2	6	100	SS-1	-	-	-	-	-	-	-	-	-	17	A-6b (V)	
HARD, BROWN AND RED, **SILTY CLAY**, TRACE GRAVEL AND SAND, DAMP		2.5																
		5.0	6 12 16	40	100	SS-2	-	6	3	5	46	40	39	19	20	16	A-6b (12)	
		7.5	10 12 25	53	100	SS-3	-	-	-	-	-	-	-	-	-	12	A-6b (V)	
		10.0	16 25 40	93	100	SS-4	-	-	-	-	-	-	-	-	-	10	A-6b (V)	
		12.5	31 30 33	90	100	SS-5	-	0	3	8	44	45	38	20	18	8	A-6b (11)	
	630.5	TR 15.0																
SANDSTONE, BROWN, SLIGHTLY WEATHERED, STRONG, FINE TO MEDIUM GRAINED, THIN BEDDED, SHALE SEAMS AND STRINGERS; RQD 57%, REC 83%.		17.5	57		83	NX-1											CORE	
	627.0																	
SHALE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, (HIGHLY WEATHERED FROM 18.6' TO 38'); RQD 54%, REC 77%.		20.0																
		22.5	38		86	NX-2											CORE	
		25.0																
		27.5																
		30.0																
		32.5	0		20	NX-3											CORE	
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 33+50, 120 LT	START: 4/26/13	END: 4/26/13	PG 2 OF 2	B-088-0-12

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)	ABAN-DONED
SHALE, GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, (HIGHLY WEATHERED FROM 18.6' TO 38'); RQD 54%, REC 77%. *(continued)*	608.9	37.5																
36.8' - 38.0' mudstone zone		40.0	92		97	NX-4											CORE	
43.2' - 43.4' clay seam		42.5																
		45.0	73		100	NX-5											CORE	
		47.5																
		50.0	92		100	NX-6											CORE	
		52.5																
		55.0	88		100	NX-7											CORE	
	585.5	57.5																
		EOB 60.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 3/4/14 09:27 - \\US1268-F01\SHARED_PROJECTS\17736\1736087\14 LAW-7-2.14\GINT LOGS-IN PROGRESS\1736087\14 ROADWAY L

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 46+50, 110 LT	EXPLORATION ID B-089-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 666.0 (MSL) EOB: 50.0 ft.	PAGE 1 OF 2
START: 5/8/13 END: 5/8/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

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)	ABAN-DONED
VERY STIFF TO HARD, BROWN AND RED, **CLAY**, AND SILT, TRACE GRAVEL AND SAND, DAMP	666.0		1 1 2	4	100	SS-1	-	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
		2.5	3 6 5	16	100	SS-2	-	1	2	6	50	41	41	19	22	17	A-7-6 (13)	
		5.0	6 7 9	23	100	SS-3	-	-	-	-	-	-	-	-	-	13	A-7-6 (V)	
		7.5	17 20 24	63	100	SS-4	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
	655.0	10.0	16 24 30	77	100	SS-5	-	6	1	3	43	47	42	19	23	11	A-7-6 (14)	
SHALE, RED, SEVERELY WEATHERED, (AUGERED).	652.0	TR 12.5	17 30 50/5"	-	100	SS-6	-	-	-	-	-	-	-	-	-	12	Rock (V)	
MUDSTONE, RED, SLIGHTLY WEATHERED, VERY WEAK TO WEAK, THICK BEDDED, FRIABLE, SLICKENSIDES PRESENT; RQD 0%, REC 90%.		15.0	60		80	NX-1											CORE	
		17.5																
		20.0	64		100	NX-2											CORE	
	642.0	22.5																
SHALE, BROWN, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO MODERATELY STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, SANDSTONE PARTINGS; RQD 55%, REC 100%.		25.0	72		100	NX-3											CORE	
		27.5																
		30.0	38		100	NX-4											CORE	
	632.0	32.5																
MUDSTONE, RE, SLIGHTLY WEATHERED, VERY WEAK TO WEAK, THICK BEDDED, FRIABLE; RQD 0%, REC 27%.		35.0	22		47	NX-5											CORE	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 46+50, 110 LT	START: 5/8/13	END: 5/8/13	PG 2 OF 2	B-089-0-12

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)	ABAN-DONED
MUDSTONE, RE, SLIGHTLY WEATHERED, VERY WEAK TO WEAK, THICK BEDDED, FRIABLE; RQD 0%, REC 27%. *(continued)*	629.3	37.5																
		40.0	0		10	NX-6											CORE	
	621.5	42.5																
SHALE, BROWN, SLIGHTLY WEATHERED, WEAK TO MODERATELY STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS; RQD 24%, REC 64%.		45.0	22		58	NX-7											CORE	
	616.0	EOB 50.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / R.C.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 11+00, CL	EXPLORATION ID B-090-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / R.C.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 551.8 (MSL) EOB: 3.3 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 551.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM STIFF, BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, MOIST	548.5	2.5 ETR3	1 2 3	7	100	SS-1	-	4	14	16	40	26	34	21	13	26	A-6a (7)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / T.L.	DRILL RIG: CME 55 TRACK	STATION / OFFSET: 15+00, 40 RT	EXPLORATION ID B-091-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / T.L.	HAMMER: CME AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 667.1 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 4/29/13 END: 4/29/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 85.9	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 667.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
VERY STIFF, BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP			6 7 8	21	100	SS-1	-	1	10	20	31	38	36	21	15	15	A-6a (9)	
		2.5																
		5.0	7 8 9	24	100	SS-2	-	-	-	-	-	-	-	-	-	16	A-6a (V)	
	661.1																	
HARD, BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, DRY		7.5	6 12 13	36	100	SS-3	-	1	13	28	30	28	32	22	10	16	A-4a (5)	
	657.3		15 50/5"	-	100	SS-4	-	-	-	-	-	-	-	-	-	15	A-4a (V)	
SANDSTONE, BROWN, SEVERELY WEATHERED, (AUGERED).	656.6	TR 10.0																
SANDSTONE, BROWN, MODERATELY TO SLIGHTLY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN BEDDED, FRIABLE; RQD 0%, REC 91%.	653.3	12.5	0		49	NX-1											CORE	
MUDSTONE, RED AND BROWN, SLIGHTLY WEATHERED, VERY WEAK TO WEAK, THIN TO MEDIUM BEDDED, FRIABLE; RQD 0%, REC 66%.		15.0																
		17.5	0		90	NX-2											CORE	
		20.0																
		22.5	0		100	NX-3											CORE	
	642.1	EOB 25.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 46+00, CL	EXPLORATION ID B-092-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 590.1 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
ASPHALT	590.1																	
	589.1																	
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, SOME GRAVEL AND SAND, DAMP		2.5	4 6 5	11	100	SS-1	-	35	13	9	20	23	34	18	16	18	A-6b (3)	
		5.0	5 8 8	17	100	SS-2	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		7.5	8 8 8	17	100	SS-3	-	-	-	-	-	-	-	-	-	18	A-6b (V)	
	580.1	EOB 10.0	10 15 15	31	100	SS-4	-	-	-	-	-	-	-	-	-	10	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 50+00, CL	EXPLORATION ID B-093-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 602.7 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 602.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
ASPHALT	601.7																	
STIFF TO VERY STIFF, BROWN, **SILTY CLAY**, SOME GRAVEL AND SAND, DAMP		2.5	20 18 7	26	100	SS-1	-	-	-	-	-	-	-	-	-	12	A-6b (V)	
		5.0	3 6 7	13	100	SS-2	-	23	11	9	27	30	37	21	16	11	A-6b (7)	
		7.5	4 7 12	20	100	SS-3	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
	592.7	EOB 10.0	5 10 13	24	100	SS-4	-	-	-	-	-	-	-	-	-	14	A-6b (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 53+91, 19 RT	EXPLORATION ID B-094-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 603.9 (MSL) EOB: 32.5 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 603.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
ASPHALT	602.4																	
VERY STIFF TO HARD, BROWN, **SILT AND CLAY**, SOME STONE FRAGMENTS AND SAND, DAMP		2.5	10 7 10	18	100	SS-1	-	-	-	-	-	-	-	-	-	10	A-6a (V)	
			4 9 10	20	100	SS-2	-	20	23	11	25	21	34	20	14	10	A-6a (3)	
		5.0																
			5 9 12	22	100	SS-3	-	20	23	11	25	21	34	20	14	8	A-6a (3)	
		7.5																
			8 13 13	27	100	SS-4	-	-	-	-	-	-	-	-	-	12	A-6a (V)	
		10.0																
			8 12 14	27	100	SS-5	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
		12.5																
	588.9		15 17 15	33	100	SS-6	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, SOME SAND, LITTLE STONE FRAGMENTS, DAMP		15.0																
			12 12 14	27	100	SS-7	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
		17.5																
			10 17 23	41	100	SS-8	-	-	-	-	-	-	-	-	-	14	A-6a (V)	
		20.0																
sandstone cobble			50/4"	-	100	SS-9	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
		22.5																
			10 11 20	32	100	SS-10	-	10	8	13	36	33	33	19	14	12	A-6a (8)	
		25.0																
			10 13 12	26	100	SS-11	-	10	8	13	36	33	33	19	14	8	A-6a (8)	
		27.5																
			11 31 16	49	100	SS-12	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
		30.0																
	571.4	EOB	14 24 18	43	100	SS-13	-	-	-	-	-	-	-	-	-	10	A-6a (V)	
		32.5																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 67+00, 110 RT	EXPLORATION ID B-095-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 655.4 (MSL) EOB: 40.0 ft.	PAGE 1 OF 2
START: 5/1/13 END: 5/1/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

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)	ABAN-DONED
	655.4																	
VERY STIFF TO HARD, RED AND BROWN, **SILTY CLAY**, TRACE GRAVEL AND SAND, SOFT AND MOIST FROM 0.0' TO 2.5', DAMP			1 1 1	3	100	SS-1	-	-	-	-	-	-	-	-	-	28	A-6b (V)	
		2.5																
			6 9 9	27	100	SS-2	-	-	-	-	-	-	-	-	-	13	A-6b (V)	
		5.0																
			14 21 25	68	100	SS-3	-	6	4	3	39	48	39	22	17	13	A-6b (11)	
		7.5																
			14 20 30	74	100	SS-4	-	-	-	-	-	-	-	-	-	11	A-6b (V)	
	644.4	10.0																
SHALE, SEVERELY WEATHERED, (AUGERED).		TR	30 50/5"	-	100	SS-5	-	-	-	-	-	-	-	-	-	6	Rock (V)	
	641.4	12.5																
INTERBEDDED SHALE (50%) AND MUDSTONE (50%), RQD 38%, REC. 100%; **SHALE**, BROWN, SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, VERY THIN BEDDED, ARENACEOUS; **MUDSTONE**, RED TO BROWN, SLIGHTLY WEATHERED, WEAK, THIN TO MEDIUM BEDDED, FRIABLE.		15.0																
		17.5	42		100	NX-1											CORE	
		20.0																
		22.5	82		100	NX-2											CORE	
		25.0																
		27.5																
		30.0	61		100	NX-3											CORE	
		32.5																
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 67+00, 110 RT	START: 5/1/13	END: 5/1/13	PG 2 OF 2	B-095-0-12

MATERIAL DESCRIPTION AND NOTES	ELEV. 618.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
	615.4	37.5 EOB 40.0	38		100	NX-4											CORE	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 68+50, CL	EXPLORATION ID B-096-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 618.4 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
ASPHALT	618.4																	
	617.4																	
AGGREGATE BASE	616.9																	
STIFF TO VERY STIFF, BROWN, **SANDY SILT**, SOME CLAY, DAMP TO MOIST		2.5	7 7 7	14	100	SS-1	-	0	3	25	49	23	25	21	4	18	A-4a (7)	
		5.0	3 6 8	14	100	SS-2	-	-	-	-	-	-	-	-	-	22	A-4a (V)	
		7.5	3 6 7	13	100	SS-3	-	-	-	-	-	-	-	-	-	19	A-4a (V)	
	608.4	EOB 10.0	5 6 10	17	100	SS-4	-	-	-	-	-	-	-	-	-	15	A-4a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 385+00, CL
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 618.5 (MSL) EOB: 10.0 ft.
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded

EXPLORATION ID B-097-0-12

MATERIAL DESCRIPTION AND NOTES	ELEV. 618.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
HARD, GRAY, **SILT AND CLAY**, WITH ROCK FRAGMENTS, (VISUAL), DAMP	615.5	2.5	9 17 18	36	100	SS-1	-	-	-	-	-	-	-	-	-	13	A-6a (V)	
VERY LOOSE TO LOOSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE GRAVEL AND CLAY, MOIST		5.0	1 1 1	2	100	SS-2	-	4	1	60	25	10	NP	NP	NP	18	A-3a (0)	
	610.0	7.5	2 2 5	7	100	SS-3	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP	608.5	EOB 10.0	4 7 8	16	100	SS-4	-	4	11	13	42	30	31	18	13	16	A-6a (9)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 386+46, 23' RT.
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 7
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 645.2 (MSL) EOB: 42.0 ft.
START: 6/29/21 END: 6/29/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449922, -82.376317

EXPLORATION ID B-097-1-20

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)	SO4 ppm	HOLE SEALED
MEDIUM STIFF TO STIFF, RED WITH TAN, **CLAY**, TRACE GRAVEL, TRACE SAND, "AND" SILT, DAMP	645.2		3 3 3	8	33	SS-1	4.50	1	1	4	42	52	50	25	25	20	A-7-6 (16)	-	
	642.7	TR																	
SANDSTONE, BLUISH GRAY, HIGHLY WEATHERED, MODERATELY STRONG, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS.			50/5"	-	100	SS-2	2.50	-	-	-	-	-	-	-	-	-	Rock (V)	-	
	639.7		50/5"	-	80	SS-3	-	-	-	-	-	-	-	-	-	7	Rock (V)	-	
CLAYSTONE, REDDISH BROWN, HIGHLY WEATHERED, WEAK, VERY FINE GRAINED, VERY THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 15%, REC 87%.	635.2		15		87	NQ2-1											CORE		
SANDSTONE, LIGHT BROWN TO GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, FRACTURED TO HIGHLY FRACTURED; RQD 0%, REC 88%.	630.2		0		88	NQ2-2											CORE		
RED, **FINE SAND**, LENSE	629.5																		
CLAYSTONE, LIGHT BROWN TO RED, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARENACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 43%, REC 87%.	624.7		43		87	NQ2-3											CORE		
SANDSTONE, LIGHT BROWN TO GRAY, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE TO FINE GRAINED, LAMINATED TO THIN BEDDED, MODERATELY FRACTURED; RQD 15%, REC 78%.	620.2		13		80	NQ2-4											CORE		

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 386+46, 23' RT.	START: 6/29/21	END: 6/29/21	PG 2 OF 2	B-097-1-20

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)	SO4 ppm	HOLE SEALED
SANDSTONE, LIGHT BROWN TO GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, FRACTURED; RQD 13%, REC 73%.	620.2	26–30	13		73	NQ2-5											CORE		
CLAYSTONE, BLUISH GRAY TO PURPLE AND RED, MODERATELY TO HIGHLY WEATHERED, VERY WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED; RQD 41%, REC 94%.	615.2	30–35	33		95	NQ2-6											CORE		
		35–40	38		90	NQ2-7											CORE		
	603.2	40–41	67		100	NQ2-8											CORE		
		EOB 42																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: 50 LB. BENTONITE CHIPS; 150 LB. QUICKCRETE

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 388+00, 40 LT	EXPLORATION ID B-098-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 696.9 (MSL) EOB: 101.4 ft.	PAGE 1 OF 3
START: 4/29/13 END: 4/29/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, RED AND BROWN, **SILTY CLAY**, LITTLE SAND, DAMP TO MOIST	696.9		1 4 4	12	100	SS-1	-	-	-	-	-	-	-	-	-	22	A-6b (V)	
		2.5																
			2 4 6	15	100	SS-2	-	-	-	-	-	-	-	-	-	-	A-6b (V)	
		5.0																
			4 6 8	21	100	SS-3	-	-	-	-	-	-	-	-	-	16	A-6b (V)	
		7.5																
			12 50/5"	-	100	SS-4	-	0	5	6	49	40	35	19	16	8	A-6b (10)	
	685.9	10.0																
SANDSTONE, GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, THIN BEDDED, (AUGERED FROM 11.0' - 11.4'); RQD 0%, REC 80%.	684.9	TR	50/5"	-	100	SS-5	-	-	-	-	-	-	-	-	-	5	Rock (V)	
		12.5																
SHALE, RED AND LIGHT BROWN, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, BROWN LAYERS ARENACEOUS AND HIGHER STRENGTH; RQD 58%, REC 80%.			70		82	NX-1											CORE	
		15.0																
		17.5	62		97	NX-2											CORE	
		20.0																
		22.5	44		88	NX-3											CORE	
		25.0																
		27.5	50		57	NX-4											CORE	
		30.0																
	665.3	32.5																
MUDSTONE, GRAY AND BROWN, SLIGHTLY WEATHERED, WEAK, THICK BEDDED, FISSILE; RQD 0%, REC 30%.			0		32	NX-5											CORE	
		35.0																
	660.5																	

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 388+00, 40 LT	START: 4/29/13	END: 4/29/13	PG 2 OF 3	B-098-0-12

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)	ABAN-DONED
SHALE, RED AND LIGHT BROWN, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, BROWN LAYERS ARENACEOUS AND HIGHER STRENGTH; RQD 31%, REC 72%. *(continued)*	660.2	37.5	0		20	NX-6											CORE	
		40.0																
		42.5	27		93	NX-7											CORE	
		45.0																
		47.5	70		100	NX-8											CORE	
		50.0																
	644.9	52.5	12		90	NX-9											CORE	
MUDSTONE, RED AND GRAY, SLIGHTLY WEATHERED, WEAK, THICK BEDDED, FISSILE; RQD 0%, REC 100%.		55.0																
		57.5	78		100	NX-10											CORE	
	637.5	60.0																
SHALE, RED AND LIGHT BROWN, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, BROWN LAYERS ARENACEOUS AND HIGHER STRENGTH; RQD 62%, REC 85%.		62.5	32		50	NX-11											CORE	
		65.0																
		67.5	20		100	NX-12											CORE	
		70.0																
		72.5	70		100	NX-13											CORE	
		75.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 388+00, 40 LT	START: 4/29/13	END: 4/29/13	PG 3 OF 3	B-098-0-12

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)	ABAN-DONED
SHALE, RED AND LIGHT BROWN, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED, BROWN LAYERS ARENACEOUS AND HIGHER STRENGTH; RQD 62%, REC 85%. *(continued)*	620.8	77.5																
		80.0	64		80	NX-14											CORE	
	610.9	82.5																
MUDSTONE, RED AND GRAY, SLIGHTLY WEATHERED, WEAK, THICK BEDDED, FISSILE, SHALE PARTINGS; RQD 0%, REC 98%.		85.0																
		87.5																
		90.0	20		98	NX-15											CORE	
	600.5	92.5																
SHALE, BROWN, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED; RQD 40%, REC 60%.		95.0																
		97.5	40		60	NX-16											CORE	
	595.5	100.0																
		EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / B.B.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 388+00, 300 LT	EXPLORATION ID B-098-1-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / B.B.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 735.3 (MSL) EOB: 80.0 ft.	PAGE 1 OF 3
START: 4/29/13 END: 4/29/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 735.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	734.9		3															
HARD, GRAY, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, DRY			15 22	55	100	SS-1	-	2	5	7	53	33	33	20	13	12	A-6a (9)	
	730.7	TR 2.5	31 50/1"	-	100	SS-2	-	-	-	-	-	-	-	-	-	8	A-6a (V)	
SHALE, GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, LAMINATED TO THIN BEDDED, FRACTURED, WATER STAINING; RQD 0%, REC 100%.	729.3	5.0	0		100	NX-1											CORE	
MUDSTONE, GRAY, SLIGHTLY WEATHERED, WEAK, THICK BEDDED; RQD 0%, REC 100%.	726.3	7.5	0		100	NX-2											CORE	
SHALE, LIGHT BROWN, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, THIN SANDSTONE ZONES; RQD 21%, REC 72%.		10.0 12.5	20		46	NX-3											CORE	
		15.0 17.5	24		84	NX-4											CORE	
	714.0	20.0																
MUDSTONE, RED TO BROWN, UNWEATHERED, WEAK, THIN TO MEDIUM BEDDED; RQD 0%, REC 100%.		22.5	44		100	NX-5											CORE	
		25.0 27.5 30.0	60		90	NX-6											CORE	
	702.7	32.5																
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 388+00, 300 LT	START: 4/29/13	END: 4/29/13	PG 2 OF 3	B-098-1-12

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)	ABAN-DONED
INTERBEDDED SHALE (60%) AND SANDSTONE (40%), RQD 50%, REC. 98%; **SHALE**, LIGHT BROWN, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS; **SANDSTONE**, BROWN, UNWEATHERED, STRONG, FINE GRAINED, THIN BEDDED. *(continued)*	698.6	37.5																
	696.6	40.0	46		91	NX-7											CORE	
MUDSTONE, RED TO BROWN, UNWEATHERED, WEAK, THIN TO MEDIUM BEDDED; RQD 0%, REC 90%.		42.5																
		45.0																
	688.1	47.5	90		100	NX-8											CORE	
SHALE, LIGHT BROWN, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, THIN SANDSTONE SEAMS, FRACTURED ZONES WITH WATER STAINING; RQD 51%, REC 93%.		50.0																
		52.5	40		90	NX-9											CORE	
		55.0																
		57.5																
		60.0	50		92	NX-10											CORE	
	670.3	62.5																
MUDSTONE, RED TO BROWN, UNWEATHERED, WEAK, THIN TO MEDIUM BEDDED, RED SHALE SEAMS; RQD 0%, REC 92%.		65.0																
		67.5																
		70.0	42		92	NX-11											CORE	
	660.3	72.5																
		75.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 388+00, 300 LT	START: 4/29/13	END: 4/29/13	PG 3 OF 3	B-098-1-12

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)	ABAN-DONED
SHALE, LIGHT BROWN, UNWEATHERED TO SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, THIN FRACTURED SANDSTONE SEAMS; RQD 56%, REC 100%. *(continued)*	659.2	77.5	56		100	NX-12											CORE	
	655.3	EOB 80.0																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 388+62, 15' RT.	EXPLORATION ID B-098-1-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 681.7 (MSL) EOB: 85.0 ft.	PAGE 1 OF 4
START: 6/16/21 END: 6/18/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449686, -82.375614	

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)	SO4 ppm	HOLE SEALED
HARD, LIGHT BROWN TO RED, **SANDY SILT**, TRACE GRAVEL, LITTLE CLAY, DRY	681.7	1	13 25 50	102	61	SS-1	-	-	-	-	-	-	-	-	-	7	A-4a (V)	-	
		2																	
		3	5 21 50	97	67	SS-2	-	-	-	-	-	-	-	-	-	6	A-4a (V)	-	
		4																	
		5																	
		6	8 23 50	100	67	SS-3	-	8	10	20	47	15	32	22	10	5	A-4a (5)	-	
		7																	
	673.7	TR 8	8 50/4"	-	100	SS-4	-	-	-	-	-	-	-	-	-	-	Rock (V)	-	
CLAYSTONE, RED, SEVERELY WEATHERED.		9																	
		10	3 50/4"	-	70	SS-5	-	-	-	-	-	-	-	-	-	5	Rock (V)	-	
	670.2	11																	
CLAYSTONE, LIGHT BROWN TO RED, MODERATELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, SLIGHTLY TO MODERATELY FRACTURED; RQD 37%, REC 91%.		12	40		79	NQ2-1											CORE		
		13																	
		14																	
		15																	
		16																	
		17	20		100	NQ2-2											CORE		
		18																	
		19																	
		20																	
		21																	
		22	0		80	NQ2-3											CORE		
		23																	
		24																	

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 388+62, 15' RT.	START: 6/16/21	END: 6/18/21	PG 2 OF 4	B-098-1-20

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)	SO4 ppm	HOLE SEALED
CLAYSTONE, LIGHT BROWN TO RED, MODERATELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, SLIGHTLY TO MODERATELY FRACTURED; RQD 37%, REC 91%. *(continued)*	656.7	26	72		100	NQ2-4											CORE		
		30	58		100	NQ2-5											CORE		
		35	33		83	NQ2-6											CORE		
		40	33		90	NQ2-7											CORE		
BROWNISH RED, **FINE SAND**, LENSE (FS)	636.7	45																	
CLAYSTONE, BLUISH RED, HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, THIN BEDDED, ARGILLACEOUS, SLIGHTLY FRACTURED; RQD 75%, REC 92%.	635.2	46	43		100	NQ2-8											CORE		
SANDSTONE, GRAY/TAN/GREEN, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, SLIGHTLY FRACTURED; RQD 80%, REC 100%.	632.9 631.5	50																	
		51																	

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 388+62, 15' RT.	START: 6/16/21	END: 6/18/21	PG 3 OF 4	B-098-1-20

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)	SO4 ppm	HOLE SEALED
CLAYSTONE, RED WITH BLUE, HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 19%, REC 86%. *(continued)*	629.9	52	27		48	NQ2-9											CORE		
	626.7	53																	
SANDSTONE, GRAY/TAN/GREEN, MODERATELY WEATHERED, WEAK, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 35%, REC 94%.		54																	
		55																	
		56																	
		57	37		100	NQ2-10											CORE		
		58																	
		59																	
		60																	
	620.0	61																	
CLAYSTONE, RED, HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, VERY FRACTURED; RQD 18%, REC 90%.		62																	
		63																	
		64																	
		65	30		80	NQ2-11											CORE		
		66																	
		67																	
		68																	
		69																	
	612.7	70	13		92	NQ2-12											CORE		
SANDSTONE, GRAY/TAN/GREEN, MODERATELY WEATHERED, WEAK, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED; RQD 61%, REC 73%.		71																	
	610.7	72																	
CLAYSTONE, RED BROWN TO GRAY, MODERATELY TO HIGHLY WEATHERED, VERY WEAK TO WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 36%, REC 92%.		73																	
		74																	
		75	57		100	NQ2-13											CORE		
		76																	
		77																	
		78	40		97	NQ2-14											CORE		

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 388+62, 15' RT.	START: 6/16/21	END: 6/18/21	PG 4 OF 4	B-098-1-20

MATERIAL DESCRIPTION AND NOTES	ELEV. 603.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
	601.7	79																	
SANDSTONE, BLUISH GRAY, MODERATELY WEATHERED, WEAK, FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED; RQD 43%, REC 90%.		80	43		90	NQ2-15											CORE		
		81																	
		82																	
		83																	
		84																	
	596.7	EOB 85																	

NOTES: HOLE TERMINATED 5 FT SHORT DUE TO MECHANICAL ISSUES WITH THE RIG. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: 100 LB. BENTONITE CHIPS; 100 LB. QUICKCRETE

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / B.B.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 392+25, CL	EXPLORATION ID B-099-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / B.B.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 583.5 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/26/13 END: 4/26/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

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)	ABAN-DONED
STIFF TO VERY STIFF, BROWN, **CLAY**, SOME SILT, TRACE SAND, DAMP	583.5		2 3 3	9	100	SS-1	-	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
		2.5																
			3 6 7	19	100	SS-2	-	0	3	5	34	58	44	22	22	17	A-7-6 (14)	
		5.0																
			2 5 7	18	100	SS-3	-	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
		7.5																
	573.5	EOB 10.0	2 5 7	18	100	SS-4	-	-	-	-	-	-	-	-	-	21	A-7-6 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 384+50, CL	EXPLORATION ID B-100-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 566.2 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 5/2/13 END: 5/2/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

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)	ABAN-DONED
MEDIUM STIFF TO STIFF, BROWN, **SILT**, SOME CLAY, TRACE SAND, COBBLES AND BOULDERS PRESENT, MOIST	566.2	2.5																
		5.0	2 4 6	15	100	SS-1	-	0	1	2	66	31	29	22	7	25	A-4b (8)	
		7.5	1 2 3	7	100	SS-2	-	-	-	-	-	-	-	-	-	22	A-4b (V)	
	556.2	EOB 10.0	50/3"	-	100	SS-3	-	-	-	-	-	-	-	-	-	26	A-4b (V)	

NOTES: COBBLES OR BOULDERS ENCOUNTERED DURING DRILLING AND SAMPLING

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 386+50, CL	EXPLORATION ID B-101-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 586.0 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/26/13 END: 4/26/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
LOOSE TO MEDIUM DENSE, BROWN AND RED, **GRAVEL WITH SAND AND SILT**, LITTLE CLAY, DAMP TO MOIST	586.0	2.5	2 4 6	10	100	SS-1	-	43	12	10	20	15	32	22	10	10	A-2-4 (0)	
		5.0	6 3 2	5	100	SS-2	-	43	12	10	20	15	32	22	10	23	A-2-4 (0)	
		7.5	4 7 10	18	100	SS-3	-	-	-	-	-	-	-	-	-	23	A-2-4 (V)	
	576.0	EOB 10.0	5 7 10	18	100	SS-4	-	-	-	-	-	-	-	-	-	19	A-2-4 (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 389+50, 20 LT	EXPLORATION ID B-102-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA / NQ	CALIBRATION DATE: 4/30/13	ELEVATION: 631.2 (MSL) EOB: 56.5 ft.	PAGE 1 OF 2
START: 5/1/13 END: 5/1/13	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 631.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
HARD, BROWN AND RED, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DRY	629.7	TR	15 50/5"	-	100	SS-1	-	8	21	6	40	25	37	23	14	6	A-6a (8)	
INTERBEDDED SHALE (50%) AND MUDSTONE (50%), RQD 30%, REC. 100%; **SHALE**, BROWN TO GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, FEW THIN SANDSTONE SEAMS; **MUDSTONE**, RED TO GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, WEAK, THICK BEDDED, SLICKENSIDES.		2.5	50/5"	-	100	SS-2	-	8	21	6	40	25	37	23	14	6	A-6a (8)	
		5.0																
		7.5	55		100	NX-1											CORE	
		10.0																
		12.5	67		100	NX-2											CORE	
		15.0																
		17.5	59		100	NX-3											CORE	
		20.0																
		22.5																
		25.0																
		27.5	78		100	NX-4											CORE	
		30.0																
		32.5	20		100	NX-5											CORE	
		35.0																

PID: 75923	BR ID:	PROJECT: LAW - 7 - 2.17	STATION / OFFSET: 389+50, 20 LT	START: 5/1/13	END: 5/1/13	PG 2 OF 2	B-102-0-12

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)	ABAN-DONED
INTERBEDDED SHALE (50%) AND MUDSTONE (50%), RQD 30%, REC. 100%; **SHALE**, BROWN TO GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, LAMINATED TO THIN BEDDED, ARENACEOUS, FEW THIN SANDSTONE SEAMS; **MUDSTONE**, RED TO GRAY, UNWEATHERED TO SLIGHTLY WEATHERED, WEAK, THICK BEDDED, SLICKENSIDES. *(continued)*	594.5	37.5 40.0 42.5 45.0	53		100	NX-6											CORE	
		47.5 50.0 52.5 55.0	97		100	NX-7											CORE	
	574.7	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / A.C.	DRILL RIG: DIEDRICH D-120	STATION / OFFSET: 380+65, CL	EXPLORATION ID B-103-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / A.C.	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 599.6 (MSL) EOB: 20.0 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 62	LAT / LONG: Not Recorded	

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)	ABAN-DONED
ASPHALT	599.6																	
	598.6																	
AGGREGATE BASE	598.1																	
STIFF TO HARD, BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL AND STONE FRAGMENTS, DAMP		2.5	3 5 6	11	100	SS-1	-	15	12	9	32	32	36	21	15	17	A-6a (8)	
			3 7 8	16	100	SS-2	-	15	12	9	32	32	36	21	15	17	A-6a (8)	
		5.0																
		7.5	6 5 8	13	100	SS-3	-	-	-	-	-	-	-	-	-	16	A-6a (V)	
		10.0	5 5 7	12	100	SS-4	-	-	-	-	-	-	-	-	-	12	A-6a (V)	
		12.5	6 8 7	16	100	SS-5	-	-	-	-	-	-	-	-	-	17	A-6a (V)	
		15.0	6 12 16	29	100	SS-6	-	-	-	-	-	-	-	-	-	16	A-6a (V)	
		17.5	8 13 14	28	100	SS-7	-	-	-	-	-	-	-	-	-	12	A-6a (V)	
	579.6	EOB 20.0	9 16 26	43	100	SS-8	-	26	17	10	25	22	34	21	13	14	A-6a (3)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: LAW - 7 - 2.17	DRILLING FIRM / OPERATOR: HORN / B.B.	DRILL RIG: DIEDRICH D-50	STATION / OFFSET: 389+12, 11 RT	EXPLORATION ID B-104-0-12
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: HORN / B.B.	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MAINLINE	
PID: 75923 BR ID:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 4/30/13	ELEVATION: 572.2 (MSL) EOB: 10.5 ft.	PAGE 1 OF 1
START: 4/25/13 END: 4/25/13	SAMPLING METHOD: SPT	ENERGY RATIO (%): 88.7	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 572.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
TOPSOIL	571.9																	
VERY STIFF, BROWN, **SILTY CLAY**, AND GRAVEL, LITTLE SAND, DAMP TO MOIST		2.5	4 12 6	27	100	SS-1	-	36	9	10	19	26	36	18	18	22	A-6b (4)	
		5.0	4 6 5	16	100	SS-2	-	-	-	-	-	-	-	-	-	19	A-6b (V)	
	565.7																	
STIFF TO VERY STIFF, BROWN, **CLAY**, AND SILT, TRACE SAND, DAMP		7.5	8 7 6	19	100	SS-3	-	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
	561.7	EOB 10.0	3 4 6	15	100	SS-4	-	0	3	4	40	53	48	26	22	25	A-7-6 (14)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 5/22/24 01:33 - U:\1736090006\LAW\75923\DESIGN\GEOTECHNICAL\EXPLORATIONS\2020 BORINGS\LAW-7-2.17_WORKING.GPJ

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 392+31, 21' RT.
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 7
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 622.8 (MSL) EOB: 45.0 ft.
START: 6/23/21 END: 6/28/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449222, -82.374464

EXPLORATION ID B-106-1-20

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)	SO4 ppm	HOLE SEALED
VERY STIFF, REDDISH BROWN, **SILTY CLAY**, LITTLE GRAVEL, SOME SAND, DAMP	622.8	1			60	ST-1	3.00	14	12	13	28	33	40	20	20	12	A-6b (9)	-	
	619.6	3	5 11 14	34	94	SS-1	-	33	13	14	24	16	34	21	13	8	A-6a (2)	-	
HARD, TAN, **SILT AND CLAY**, SOME GRAVEL, SOME SAND, DRY		5	4 4 7	15	44	SS-2	-	-	-	-	-	-	-	-	-	12	A-6a (V)	-	
	615.3	7																	
STIFF TO VERY STIFF, RED WITH GRAY, **CLAY**, TRACE GRAVEL, LITTLE SAND, SOME SILT, DAMP		8	3 5 6	15	100	SS-3	-	9	9	8	32	42	45	21	24	16	A-7-6 (14)	-	
	610.3	10	5 6 12	25	78	SS-4	-	-	-	-	-	-	-	-	-	13	A-7-6 (V)	-	
SANDSTONE, TAN, SEVERELY WEATHERED, LAMINATED TO THIN BEDDED, SANDSTONE/CLAYSTONE MATRIX.		13	20 50/3"	-	100	SS-5	-	-	-	-	-	-	-	-	-	13	Rock (V)	-	
		15	50/4"	-	100	SS-6	-	-	-	-	-	-	-	-	-	10	Rock (V)	-	
		18	50/5"	-	100	SS-7	-	-	-	-	-	-	-	-	-	5	Rock (V)	-	
		20	50/5"	-	100	SS-8	-	-	-	-	-	-	-	-	-	5	Rock (V)	-	
		23	50/5"	-	80	SS-9	-	-	-	-	-	-	-	-	-	-	Rock (V)	-	
	598.8	TR 24	67		100	NQ2-1											CORE		

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 392+31, 21' RT.	START: 6/23/21	END: 6/28/21	PG 2 OF 2	B-106-1-20

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)	SO4 ppm	HOLE SEALED
SANDSTONE, LIGHT BROWN TO BLUISH GRAY, SLIGHTLY WEATHERED, SLIGHTLY TO MODERATELY STRONG, FINE TO MEDIUM GRAINED, LAMINATED TO THIN BEDDED, SLIGHTLY ARENACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 44%, REC 100%. *(continued)*	597.8																		
CLAYSTONE, LIGHT BROWN TO GRAY TO BLUISH RED WITH DEPTH, MODERATELY WEATHERED, VERY WEAK TO WEAK, VERY FINE TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED TO FRACTURED; RQD 35%, REC 78%.	597.3	26	13		100	NQ2-2											CORE		
		30	38		80	NQ2-3											CORE		
		35	30		47	NQ2-4											CORE		
		40	53		87	NQ2-5											CORE		
	577.8	EOB 45																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: 150 LB. QUICKCRETE

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 392+10, 170' LT.	EXPLORATION ID B-106-2-20
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 12/5/19	ELEVATION: 662.9 (MSL) EOB: 40.0 ft.	PAGE 1 OF 2
START: 6/23/21 END: 6/23/21	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449744, -82.374381	

MATERIAL DESCRIPTION AND NOTES	ELEV. 662.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
MEDIUM STIFF, BROWN WITH SOME BLUE, **SILTY CLAY**, LITTLE GRAVEL, SOME SAND, DAMP		1	2 4 4	11	78	SS-1	-	-	-	-	-	-	-	-	-	13	A-6b (V)	-	
	657.9	2																	
		3																	
		4																	
SANDSTONE, TAN TO GRAY, SEVERELY WEATHERED.	657.4	TR 5	50/5"	-	100	SS-2	-	-	-	-	-	-	-	-	-	5	Rock (V)	-	
SANDSTONE, GRAY/TAN WITH ORANGE, MODERATELY WEATHERED, WEAK, FINE GRAINED, LAMINATED TO THIN BEDDED, FRIABLE, MODERATELY FRACTURED; RQD 21%, REC 100%.		6																	
		7																	
		8	19		100	NQ2-1											CORE		
		9																	
	653.4	10																	
CLAYSTONE, REDDISH BROWN TO TAN, MODERATELY WEATHERED, VERY WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, SLIGHTLY FRACTURED; RQD 32%, REC 70%.		11																	
		12	87		100	NQ2-2											CORE		
		13																	
		14																	
		15																	
		16																	
		17	0		33	NQ2-3											CORE		
		18																	
		19																	
		20																	
		21																	
		22	40		77	NQ2-4											CORE		
		23																	
		24																	

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 392+10, 170' LT.	START: 6/23/21	END: 6/23/21	PG 2 OF 2	B-106-2-20

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)	SO4 ppm	HOLE SEALED
CLAYSTONE, REDDISH BROWN TO TAN, MODERATELY WEATHERED, VERY WEAK, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, SLIGHTLY FRACTURED; RQD 32%, REC 70%. *(continued)*	637.9	26 27 28 29 30	8		63	NQ2-5											CORE		
SANDSTONE, BLUISH GRAY, SLIGHTLY TO MODERATELY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE GRAINED TO FINE GRAINED, LAMINATED TO THIN BEDDED, ARENACEOUS, MODERATELY FRACTURED; RQD 76%, REC 100%.	632.2	31 32 33 34 35	62		100	NQ2-6											CORE		
CLAYSTONE, REDDISH BROWN TO GRAY, MODERATELY WEATHERED, WEAK, VERY FINE GRAINED, LAMINATED TO THIN BEDDED, ARGILLACEOUS, MODERATELY FRACTURED; RQD 63%, REC 100%.	624.6	36 37 38 39	83		100	NQ2-7											CORE		
	622.9	EOB 40																	

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: 100 LB. BENTONITE CHIPS; 50 LB. BENTONITE GROUT

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 392+10, 170' LT.	EXPLORATION ID B-106-3-20
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: NEAS / M. FORRAI	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 662.9 (MSL) EOB: 4.5 ft.	PAGE 1 OF 1
START: 6/23/21 END: 6/23/21	SAMPLING METHOD: ST	ENERGY RATIO (%): 81.9	LAT / LONG: 38.449744, -82.374381	

MATERIAL DESCRIPTION AND NOTES	ELEV. 662.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
		1			100	ST-1	-	1	4	8	60	27	35	18	17	14	A-6b (11)	-	
		2																	
		3			46	ST-2	-	-	-	-	-	-	-	-	-	-	A-6b (V)	-	
		4 EOB																	

NOTES: HOLE OFFSET 1 FT FROM B-106-2-20 TO OBTAIN SHELBY TUBE SAMPLES. GROUNDWATER NOT ENCOUNTERED DURING DRILLING.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

Appendix C

Bedrock Core Photos

Figure 1 – Boring B-009-1-12, Box 1 of 1. Depth 48.7' to 58.7'.

Figure 2 – Boring B-010-1-12, Box 1 of 2. Depth 29.0' to 48.2'.

Figure 3 – Boring B-010-1-12, Box 2 of 2. Depth 48.2' to 54.0'.

Figure 4 – Boring B-010-2-12, Box 1 of 2. Depth 32.0' to 48.4'.

Figure 5 – Boring B-010-2-12, Box 2 of 2. Depth 48.4' to 57.0'.

Figure 6 – Boring B-024-0-11, Box 1 of 3. Depth 15.4' to 33.6'.

Figure 7 – Boring B-024-0-11, Box 2 of 3. Depth 33.6' to 50.3'.

Figure 8 – Boring B-024-0-11, Box 3 of 3. Depth 50.3' to 51.5'.

Figure 9 – Boring B-026-0-11, Box 1 of 1. Depth 19.1' to 31.4'.

Figure 10 – Boring B-031-0-11, Box 1 of 1. Depth 11.5' to 20.0'.

Figure 11 – Boring B-032-0-11, Box 1 of 1. Depth 19.0' to 30.9'.

Figure 12 – Boring B-033-0-11, Box 1 of 1. Depth 25.4' to 35.4'.

Figure 13 – Boring B-033-1-12, Box 1 of 1. Depth 26.0' to 36.0'.

Figure 14 – Boring B-034-0-11, Box 1 of 1. Depth 25.2' to 36.2'.

Figure 15 – Boring B-035-0-11, Box 1 of 1. Depth 24.5' to 35.9'.

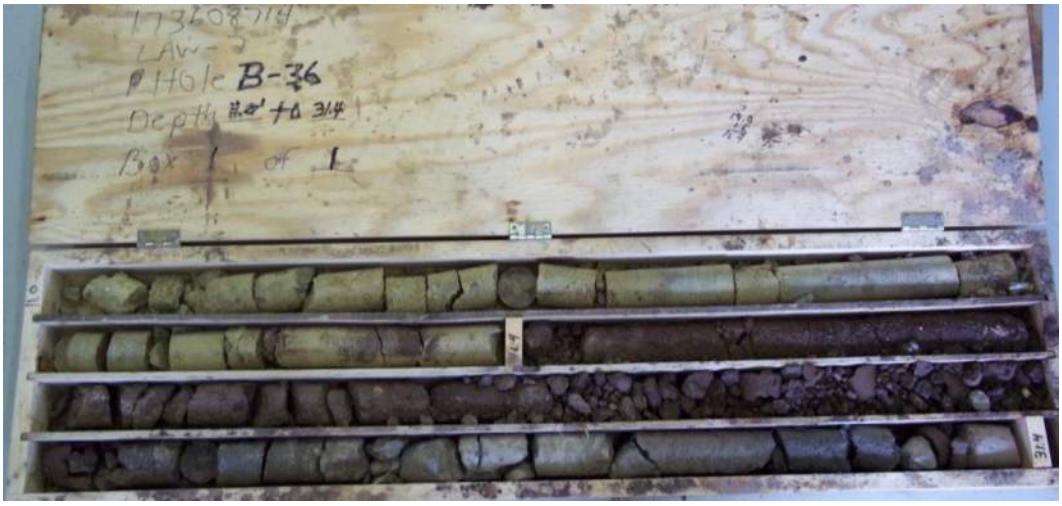


Figure 16 – Boring B-036-0-11, Box 1 of 1. Depth 11.0' to 31.4'.

Figure 17 – Boring B-037-1-12, Box 1 of 1. Depth 24.5' to 34.5'.

Figure 18 – Boring B-038-0-11, Box 1 of 1. Depth 36.9' to 50.6'.

Figure 19 – Boring B-039-0-11, Box 1 of 2. Depth 5.6' to 18.8'.

Figure 20 – Boring B-039-0-11, Box 2 of 2. Depth 18.8' to 21.0'.

Figure 21 – Boring B-040-0-11, Box 1 of 2. Depth 5.0' to 20.5'.

Figure 22 – Boring B-040-0-11, Box 2 of 2. Depth 20.5' to 21.3'.

Figure 23 – Boring B-050-0-11, Box 1 of 1. Depth 36.5' to 51.0'.

Figure 24 – Boring B-051-0-11, Box 1 of 2. Depth 3.1' to 19.4'.

Figure 25 – Boring B-051-0-11, Box 2 of 2. Depth 19.4' to 28.0'.

Figure 26 – Boring B-052-0-11, Box 1 of 2. Depth 4.3' to 19.7'.

Figure 27 – Boring B-052-0-11, Box 2 of 2. Depth 19.7' to 29.7'.

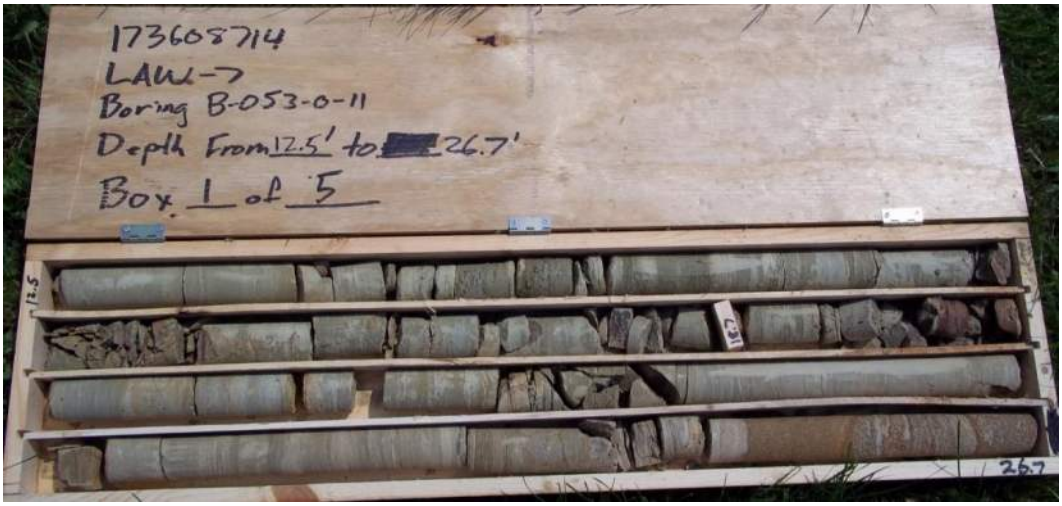


Figure 28 – Boring B-053-0-11, Box 1 of 5. Depth 12.5' to 26.7'.

Figure 29 – Boring B-053-0-11, Box 2 of 5. Depth 26.7' to 38.7'.

Figure 30 – Boring B-053-0-11, Box 3 of 5. Depth 38.7' to 53.7'.

Figure 31 – Boring B-053-0-11, Box 4 of 5. Depth 53.7' to 68.0'.

Figure 32 – Boring B-053-0-11, Box 5 of 5. Depth 68.0' to 80.0'.

Figure 33 – Boring B-058-0-11, Box 1 of 3. Depth 49.6' to 64.5'.

Figure 34 – Boring B-058-0-11, Box 2 of 3. Depth 64.5' to 79.0'.

Figure 35 – Boring B-058-0-11, Box 3 of 3. Depth 79.0' to 80.0'.

Figure 36 – Boring B-059-0-11, Box 1 of 5. Depth 9.8' to 24.6'.

Figure 37 – Boring B-059-0-11, box 2 of 5. Depth 24.6' to 38.6'.

Figure 38 – Boring B-059-0-11, Box 3 of 5. Depth 38.6' to 53.2'.

Figure 39 – Boring B-059-0-11, Box 4 of 5. Depth 53.2' to 67.8'.

Figure 40 – Boring B-059-0-11, Box 5 of 5. Depth 67.8' to 80.0'.

Figure 41 – Boring B-066-0-11, Box 1 of 2. Depth 15.6' to 31.6'.

Figure 42 – Boring B-066-0-11, Box 2 of 2. Depth 31.6' to 40.9'.

Figure 43 – Boring B-069-0-11, Box 1 of 9. Depth 12.3' to 26.0'.

Figure 44 – Boring B-069-0-11, Box 2 of 9. Depth 26.0' to 39.0'.

Figure 45 – Boring B-069-0-11, Box 3 of 9. Depth 39.0' to 53.5'.

Figure 46 – Boring B-069-0-11, Box 4 of 9. Depth 53.5' to 68.0'.

Figure 47 – Boring B-069-0-11, Box 5 of 9. Depth 68.0' to 83.9'.

Figure 48 – Boring B-069-0-11, Box 6 of 9. Depth 83.9' to 98.0'.

Figure 49 – Boring B-069-0-11, Box 7 of 9. Depth 98.0' to 120.7'.

Figure 50 – Boring B-069-0-11, Box 8 of 9. Depth 120.7' to 135.8'.

Figure 51 – Boring B-069-0-11, Box 9 of 9. Depth 135.8' to 145.0'.

Figure 52 – Boring B-073-0-12, Box 1 of 2. Depth 14.2’ to 32.2’.

Figure 53 – Boring B-073-0-12, Box 2 of 2. Depth 32.2’ to 40.2’.

Figure 54 – Boring B-086-0-12, Box 1 of 2. Depth 9.2’ to 24.7’.

Figure 55 – Boring B-086-0-12, Box 2 of 2. Depth 24.7’ to 40.2’.

Figure 56 – Boring B-086-1-12, Box 1 of 2. Depth 15.0’ to 32.8’.

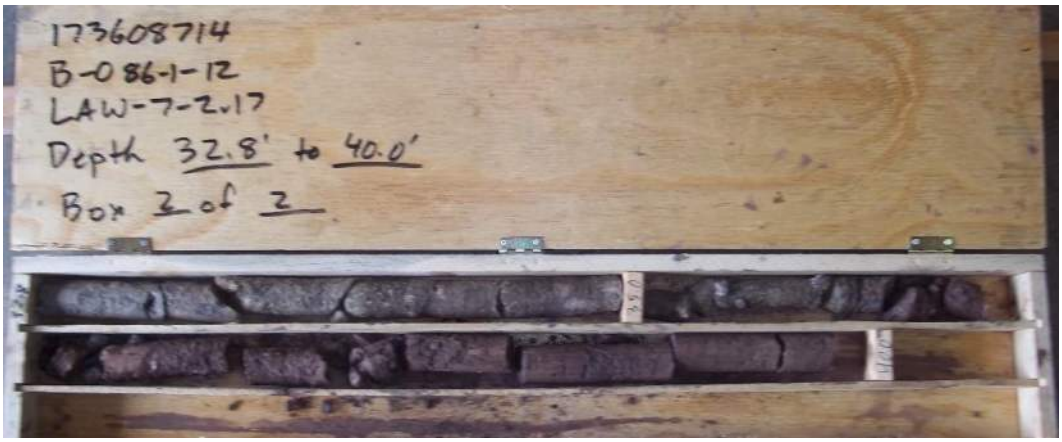


Figure 57 – Boring B-086-1-12, Box 2 of 2. Depth 32.8’ to 40.0’.

Figure 58 – Boring B-087-0-12, Box 1 of 3. Depth 5.5' to 21.5'.

Figure 59 – Boring B-087-0-12, Box 2 of 3. Depth 21.5' to 38.0'.

Figure 60 – Boring B-087-0-12, Box 3 of 3. Depth 38.0' to 50.0'.

Figure 61 – Boring B-087-1-12, Box 1 of 2. Depth 24.0' to 41.0'.

Figure 62 – Boring B-087-1-12, Box 2 of 2. Depth 41.0' to 50.0'.

Figure 63 – Boring B-088-0-12, Box 1 of 3. Depth 15.1' to 38.6'.

Figure 64 – Boring B-088-0-12, Box 2 of 3. Depth 38.6’ to 53.6’.

Figure 65 – Boring B-088-0-12, Box 3 of 3. Depth 53.6’ to 60.1’.

Figure 66 – Boring B-091-0-12, Box 1 of 1. Depth 10.5’ to 25.0’.

Figure 67 – Boring B-095-0-12, Box 1 of 2. Depth 14.0' to 32.6'.

Figure 68 – Boring B-095-0-12, Box 2 of 2. Depth 32.6' to 40.0'.

Figure 69 – Boring B-098-0-12, Box 1 of 5. Depth 11.4' to 27.1'.

Figure 70 – Boring B-098-0-12, Box 2 of 5. Depth 27.1' to 52.7'.

Figure 71 – Boring B-098-0-12, Box 3 of 5. Depth 52.7' to 70.9'.

Figure 72 – Boring B-098-0-12, Box 4 of 5. Depth 70.9' to 86.4'.

Figure 73 – Boring B-098-0-12, Box 5 of 5. Depth 86.4' to 101.4'.

Figure 74 – Boring B-098-1-12, Box 1 of 5. Depth 4.6' to 22.8'.

Figure 75 – Boring B-098-1-12, Box 2 of 5. Depth 22.8' to 38.7'.

Figure 76 – Boring B-098-1-12, Box 3 of 5. Depth 38.7' to 55.0'.

Figure 77 – Boring B-098-1-12, Box 4 of 5. Depth 55.0' to 72.5'.

Figure 78 – Boring B-098-1-12, Box 5 of 5. Depth 72.5' to 80.0'.

Figure 79 – Boring B-102-0-12, Box 1 of 3. Depth 4.5' to 25.3'.

Figure 80 – Boring B-102-0-12, Box 2 of 3. Depth 25.3' to 40.3'.

Figure 81 – Boring B-102-0-12, Box 3 of 3. Depth 40.3' to 56.0'.

OHIO DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING

Office of Geotechnical Engineering

B-007-2-23

Run #:	Depth		Recovery		RQD	
NQ2-1	12.5'	17.5'	34/60"	57%	4.25/60"	7%

LAW-7-2.17

OHIO DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING

Office of Geotechnical Engineering

B-007-3-23

Run #:	Depth		Recovery		RQD	
NQ2-1	7.5'	12.5'	57/60"	95%	15.5/60"	26%

LAW-7-2.17

OHIO DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING

Office of Geotechnical Engineering

B-007-4-23

Run #:	Depth		Recovery		RQD	
NQ2-1	19.0'	22.7'	10.5/44.4"	24%	0/44.4"	0%

LAW-7-2.17

OHIO DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING

Office of Geotechnical Engineering

B-014-3-23

Run #:	Depth		Recovery		RQD	
NQ2-1	10.5'	15.5'	60/60"	100%	48/60"	80%

LAW-7-2.17

Appendix D

Bedrock Test Results

Stantec

Unconfined Compressive Strength Of Intact Rock Core

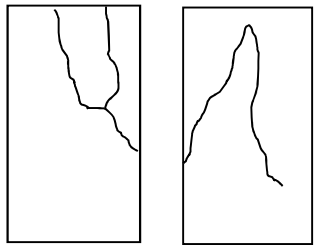
ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, tan, moderately hard, fine grained	Lab ID	UCR-351
Hole Number	B-053-0-11	Depth (ft) 24.0'-24.4'	Date Received 06-22-2011
Temperature (^{o}C)	21.5	Moisture Condition	As received, moist
Date Tested	06-29-2011		

Side Planeness	Pass	Height (in)	4.371	Wet Unit Weight (pcf)	157.2
Perpendicularity	Pass	Diameter (in)	1.961	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.020	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec)	100
Peak Load (lbf)	16306
Failure Type	Shear
Compressive Strength (psi)	5400
Compressive Strength (tsf)	389

Failure Sketches



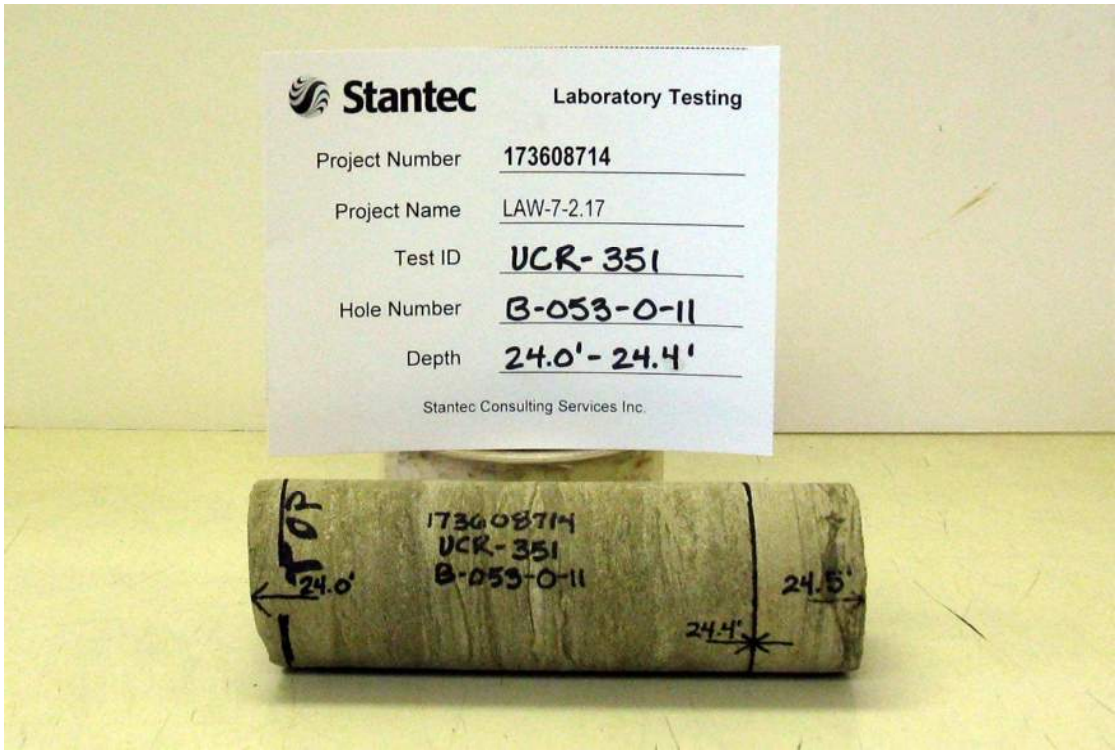
Comments

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, fine grained | Lab ID UCR-351
Hole Number B-053-0-11 | Depth (ft) 24.0'-24.4'
Test Type Unconfined compressive strength

As Received



Core Preparation

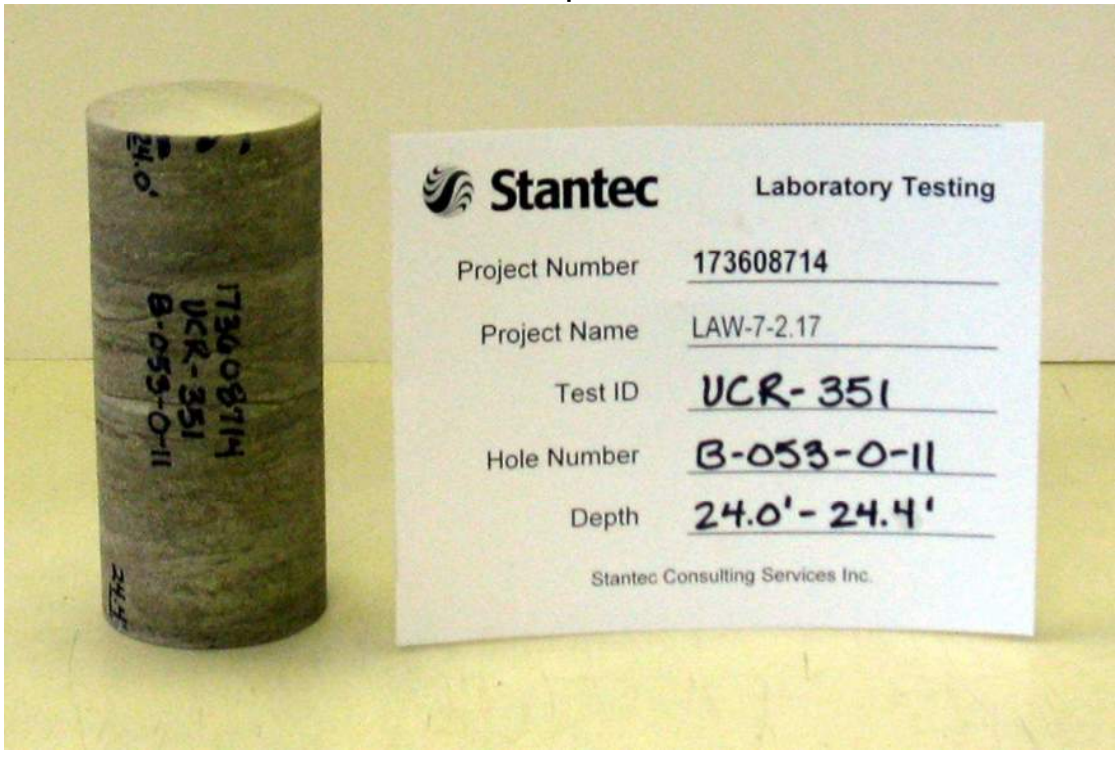
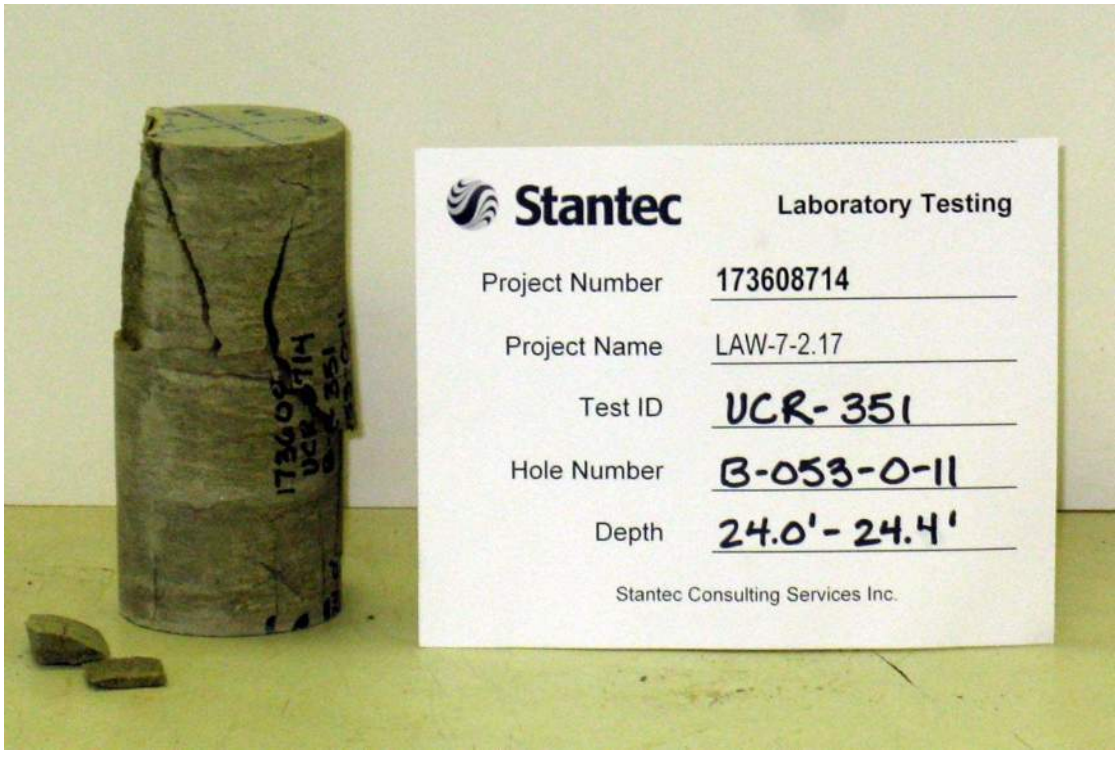


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, fine grained | Lab ID UCR-351
Hole Number B-053-0-11 | Depth (ft) 24.0'-24.4'
Test Type Unconfined compressive strength

Core Preparation

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

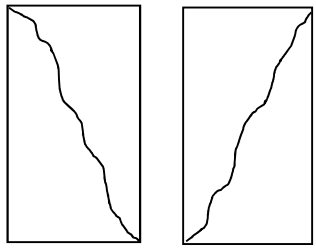
ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, tan, moderately hard, coarse grained	Lab ID	UCR-352
Hole Number	B-053-0-11	Depth (ft)	26.8'-27.2'
		Date Received	06-22-2011
Temperature (^{o}C)	21.5	Moisture Condition	As received, moist
		Date Tested	06-29-2011

Side Planeness	Pass	Height (in)	4.402	Wet Unit Weight (pcf)	128.3
Perpendicularity	Pass	Diameter (in)	1.970	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.049	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec)	73
Peak Load (lbf)	4990
Failure Type	Shear
Compressive Strength (psi)	1637
Compressive Strength (tsf)	118

Failure Sketches

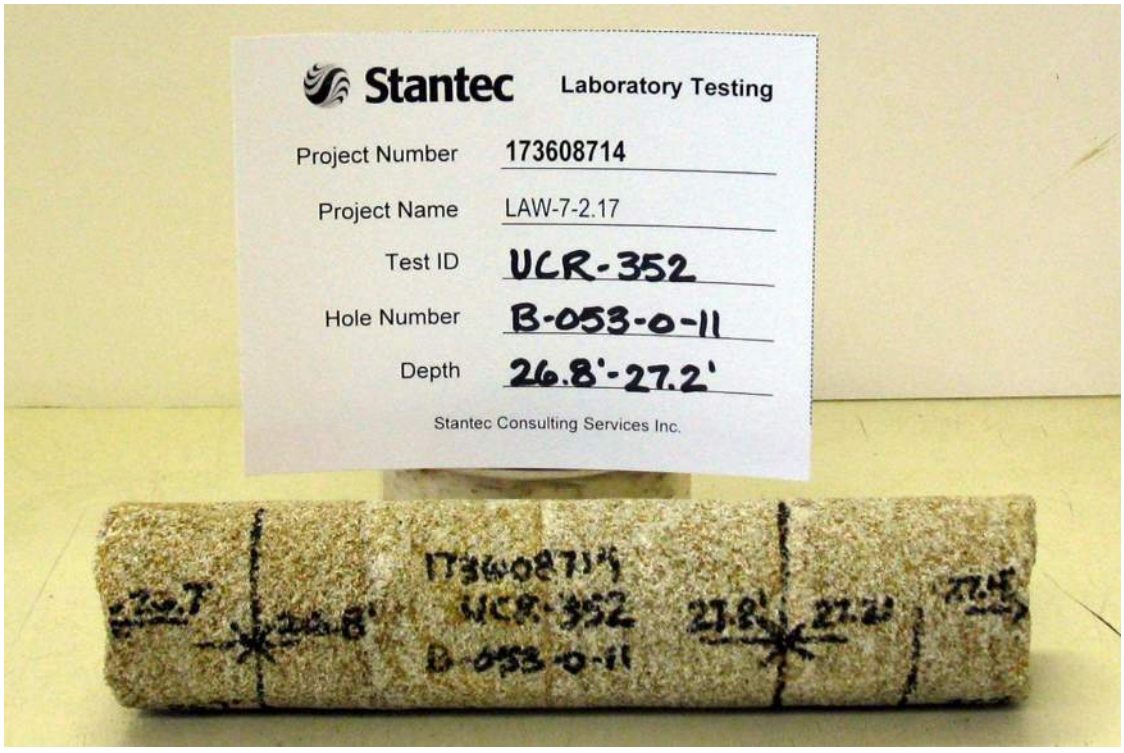


Comments

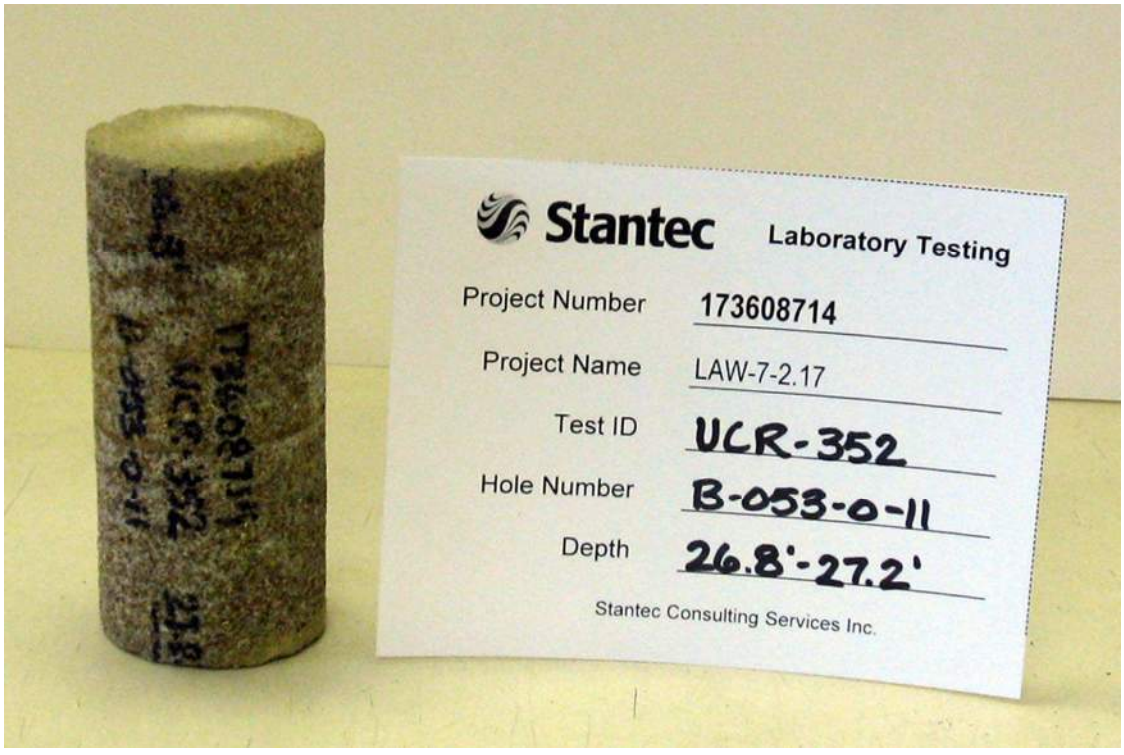
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grained | Lab ID UCR-352
Hole Number B-053-0-11 | Depth (ft) 26.8'-27.2'
Test Type Unconfined compressive strength

As Received



Core Preparation



Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grained | Lab ID UCR-352
Hole Number B-053-0-11 | Depth (ft) 26.8'-27.2'
Test Type Unconfined compressive strength

Core Preparation

Post Test

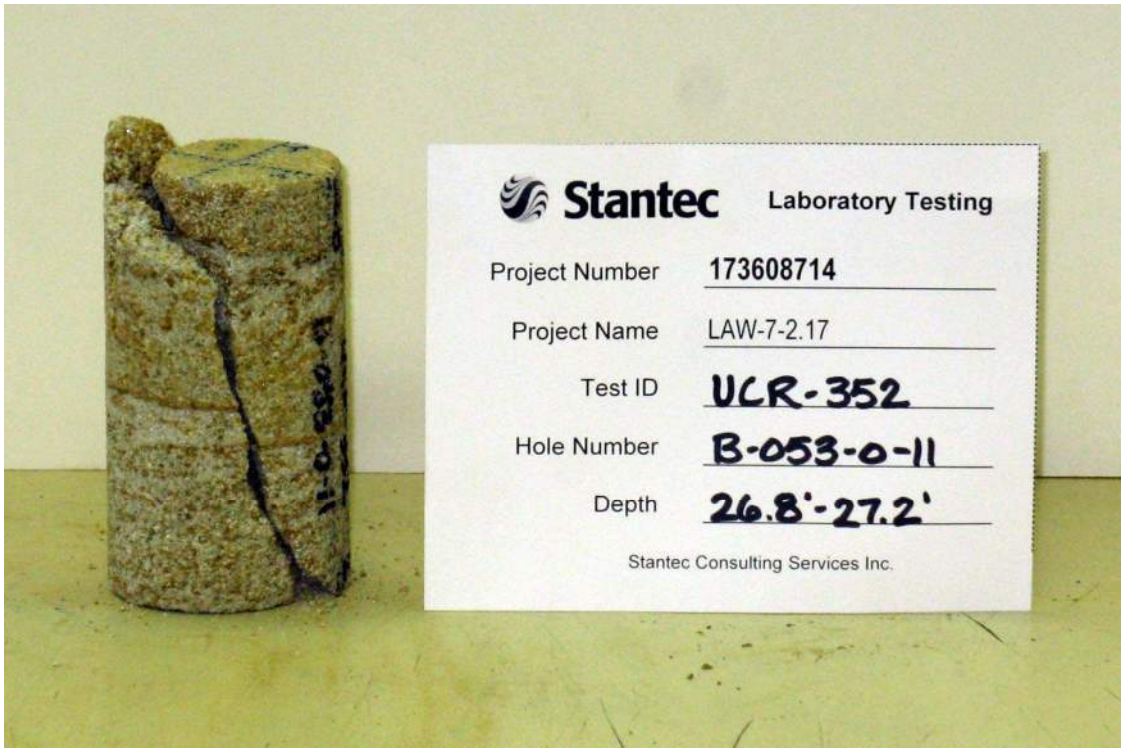


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grained | Lab ID UCR-352
Hole Number B-053-0-11 | Depth (ft) 26.8'-27.2'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Shale, brownish gray, soft, weathered	Lab ID	UCR-355
Hole Number	B-053-0-11	Depth (ft) 41.6'-42.2'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	N/A	Height (in)	4.525	Wet Unit Weight (pcf)	154.6
Perpendicularity	N/A	Diameter (in)	1.956	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	3.004	Moisture Content (%)	N/A
Parallelism	N/A				

Dimensions were not confirmed.

Loading Rate (lbf/sec) 65

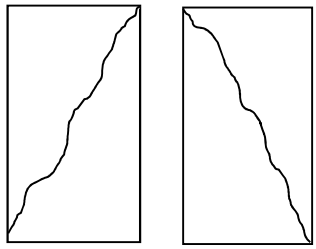
Peak Load (lbf) 4645

Failure Type Shear

Compressive Strength (psi) 1546

Compressive Strength (tsf) 111

Failure Sketches

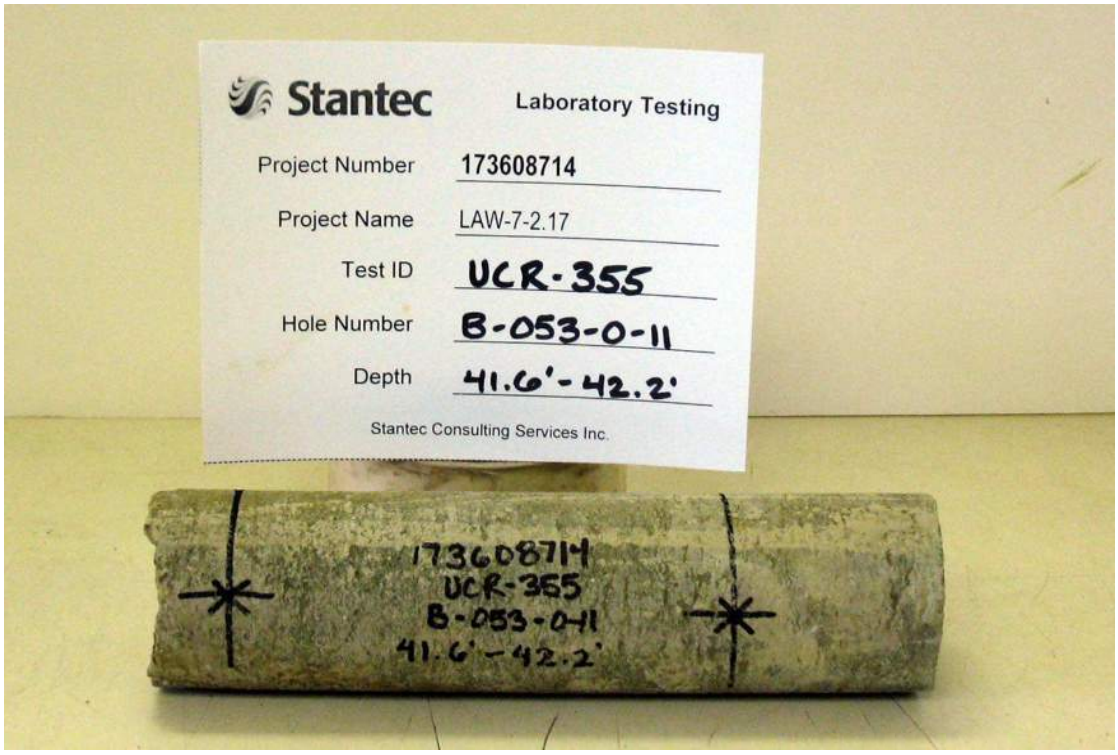


Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

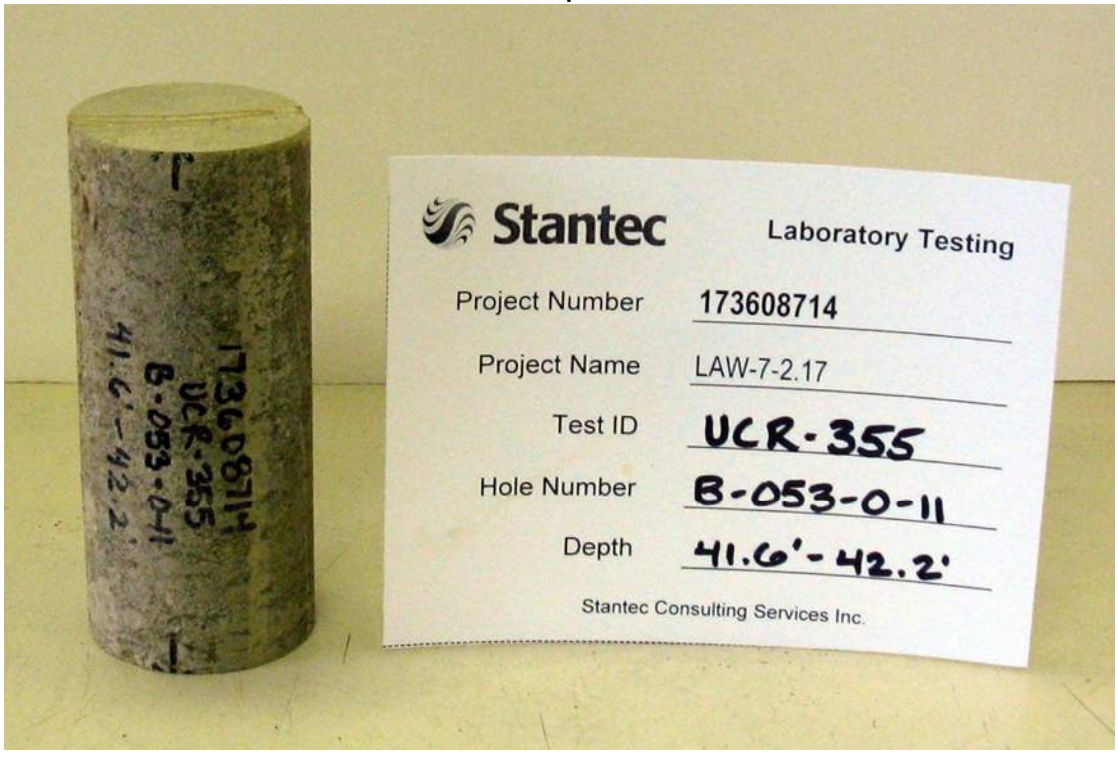
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brownish gray, soft, weathered | Lab ID UCR-355
Hole Number B-053-0-11 | Depth (ft) 41.6'-42.2'
Test Type Unconfined compressive strength

As Received



Core Preparation

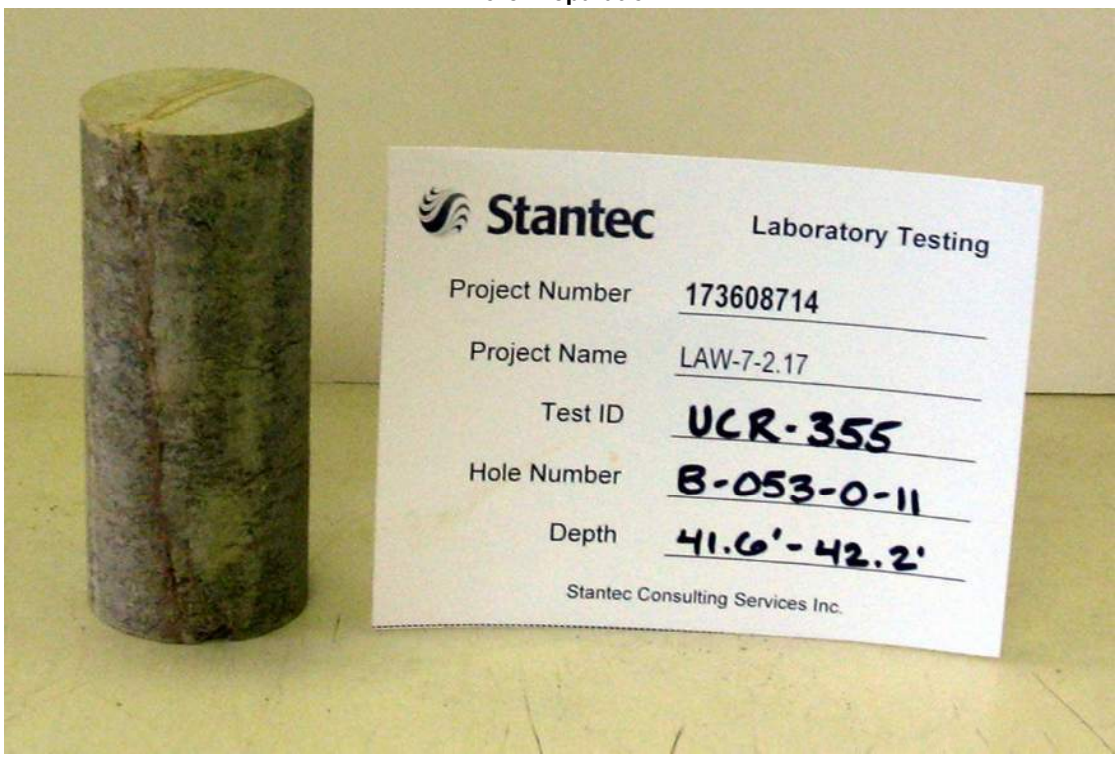


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brownish gray, soft, weathered | Lab ID UCR-355
Hole Number B-053-0-11 | Depth (ft) 41.6'-42.2'
Test Type Unconfined compressive strength

Core Preparation



Post Test

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brownish gray, soft, weathered | Lab ID UCR-355
Hole Number B-053-0-11 | Depth (ft) 41.6'-42.2'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Limestone, gray, moderately hard	Lab ID	UCR-358
Hole Number	B-053-0-11	Depth (ft) 50.4'-50.8'	Date Received 06-22-2011
Temperature (°C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	3.988	Wet Unit Weight (pcf)	163.9
Perpendicularity	Pass	Diameter (in)	1.970	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.049	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 95

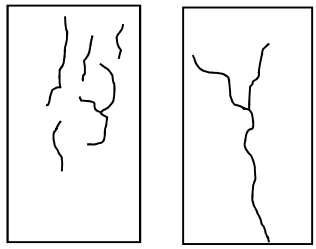
Peak Load (lbf) 26960

Failure Type Undetermined

Compressive Strength (psi) 8840

Compressive Strength (tsf) 637

Failure Sketches



Comments

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Limestone, gray, moderately hard | Lab ID UCR-358
Hole Number B-053-0-11 | Depth (ft) 50.4'-50.8'
Test Type Unconfined compressive strength

As Received

Core Preparation

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Limestone, gray, moderately hard | Lab ID UCR-358
Hole Number B-053-0-11 | Depth (ft) 50.4'-50.8'
Test Type Unconfined compressive strength

Core Preparation

Post Test

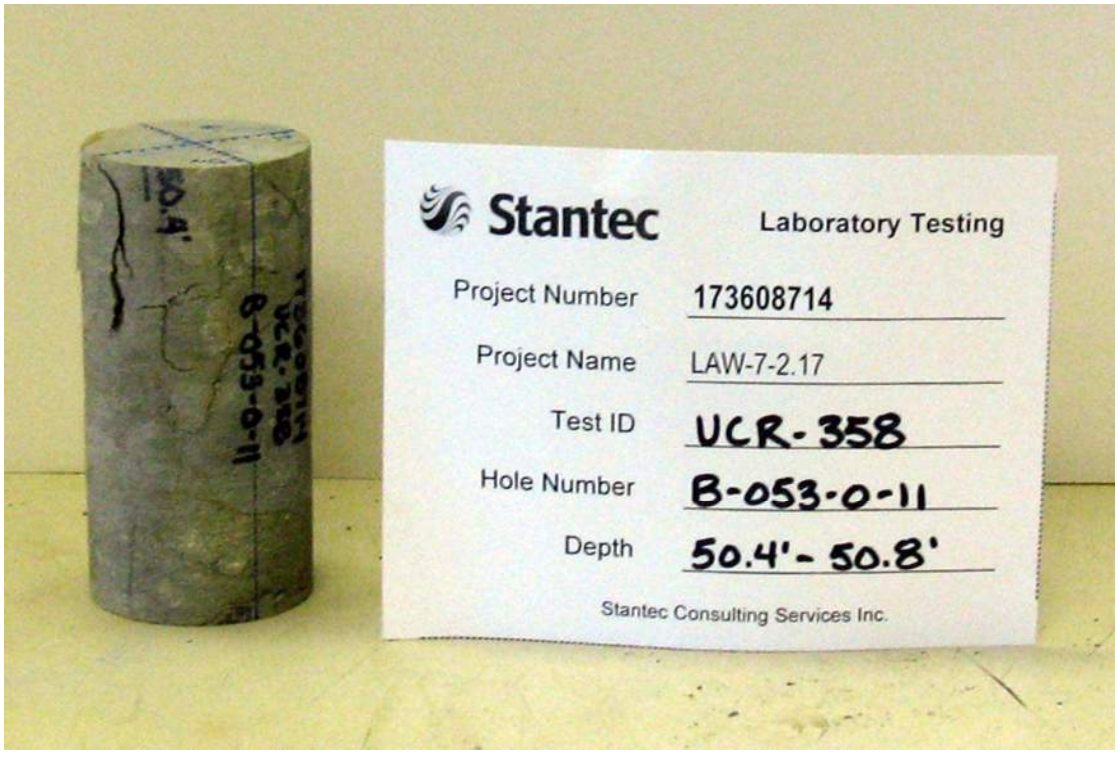
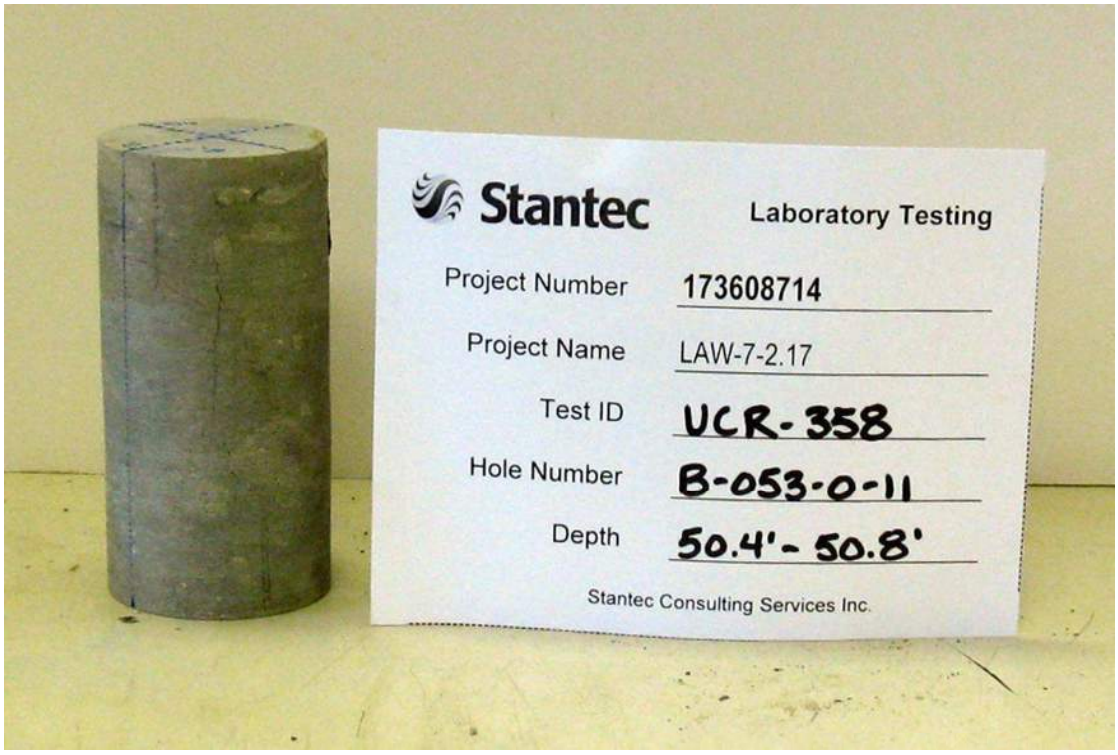


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Limestone, gray, moderately hard | Lab ID UCR-358
Hole Number B-053-0-11 | Depth (ft) 50.4'-50.8'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

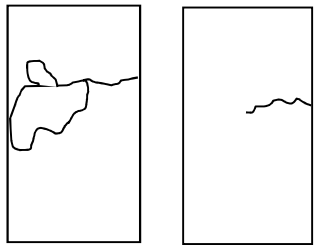
ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, gray, moderately hard, fine grained	Lab ID	UCR-364
Hole Number	B-069-0-11	Depth (ft) 16.2'-16.6'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
Date Tested	06-29-2011		

Side Planeness	Pass	Height (in)	4.409	Wet Unit Weight (pcf)	158.5
Perpendicularity	Pass	Diameter (in)	1.968	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.041	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec)	89
Peak Load (lbf)	23890
Failure Type	Undetermined
Compressive Strength (psi)	7860
Compressive Strength (tsf)	566

Failure Sketches

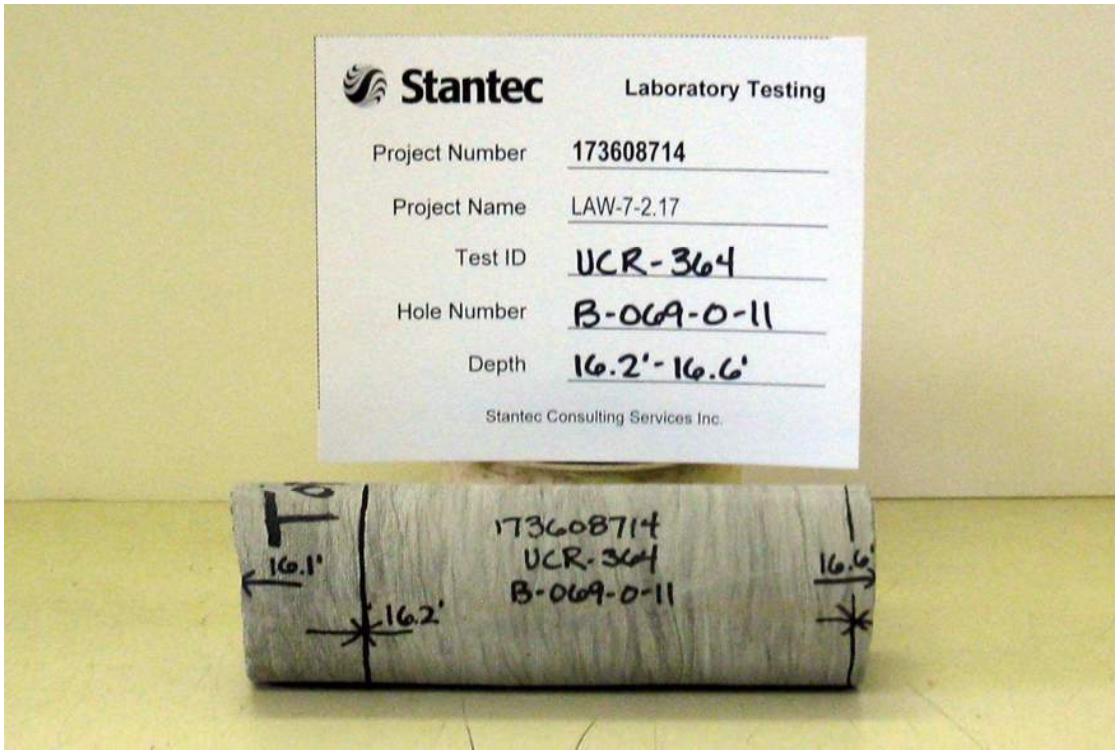


Comments

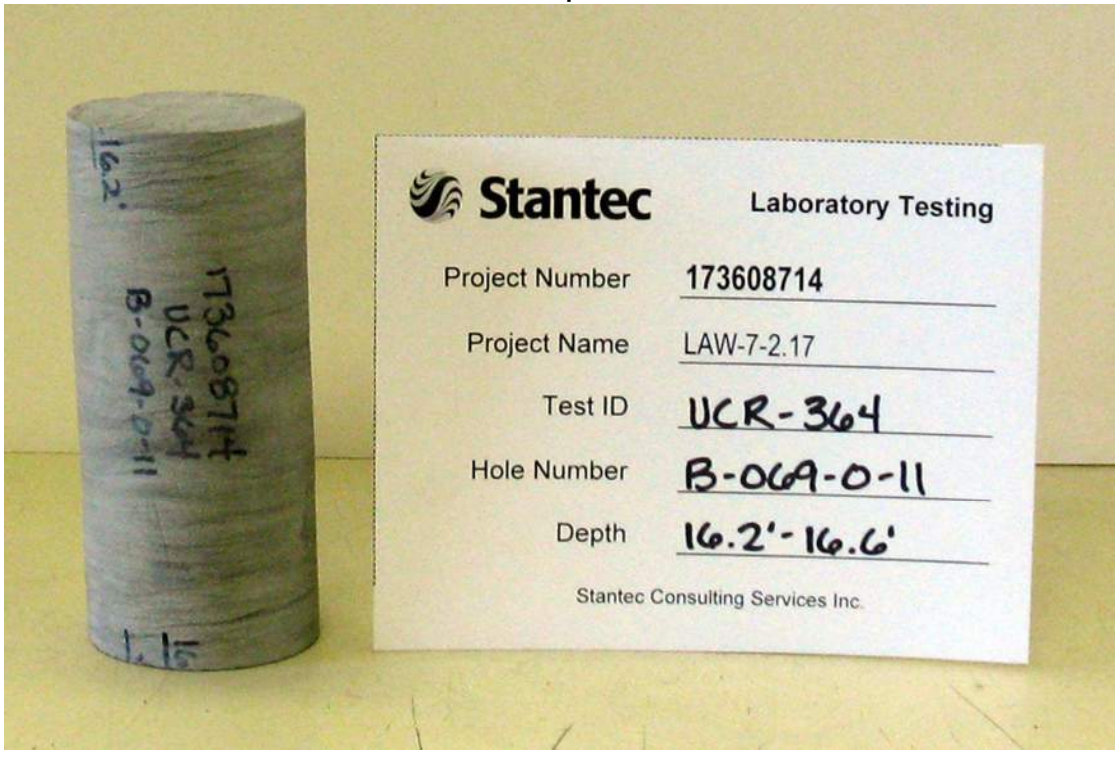
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-364
Hole Number B-069-0-11 | Depth (ft) 16.2'-16.6'
Test Type Unconfined compressive strength

As Received



Core Preparation



Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-364
Hole Number B-069-0-11 | Depth (ft) 16.2'-16.6'
Test Type Unconfined compressive strength

Core Preparation

Post Test

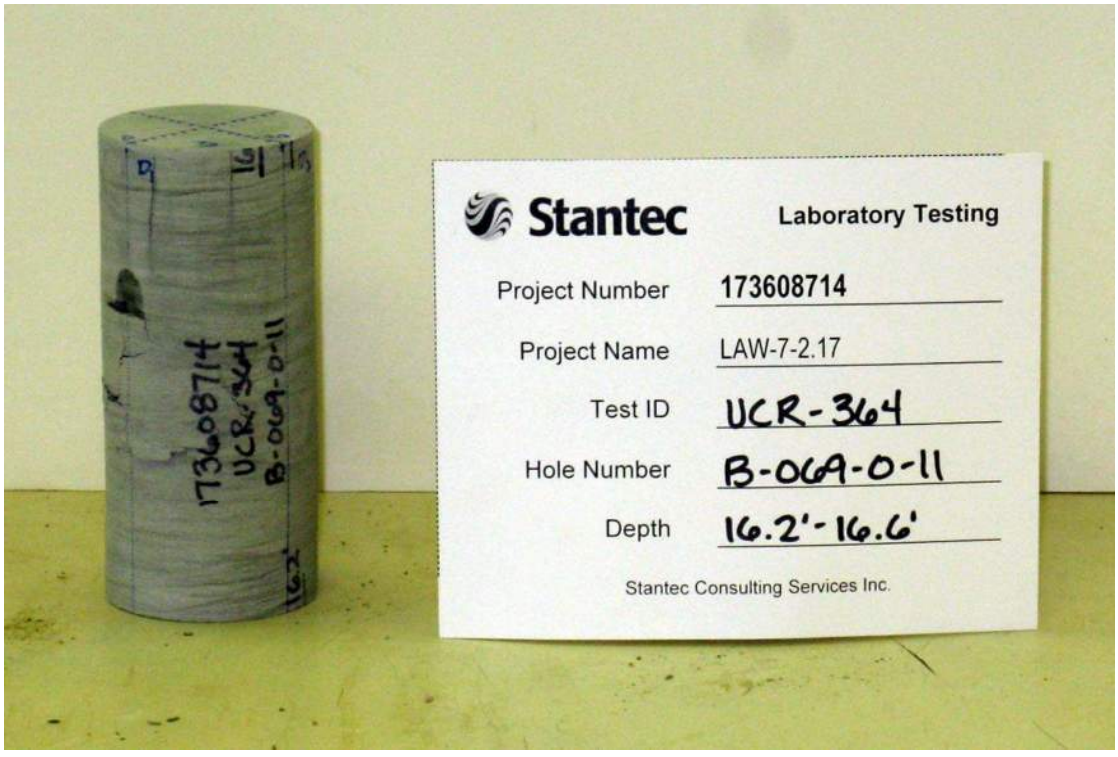
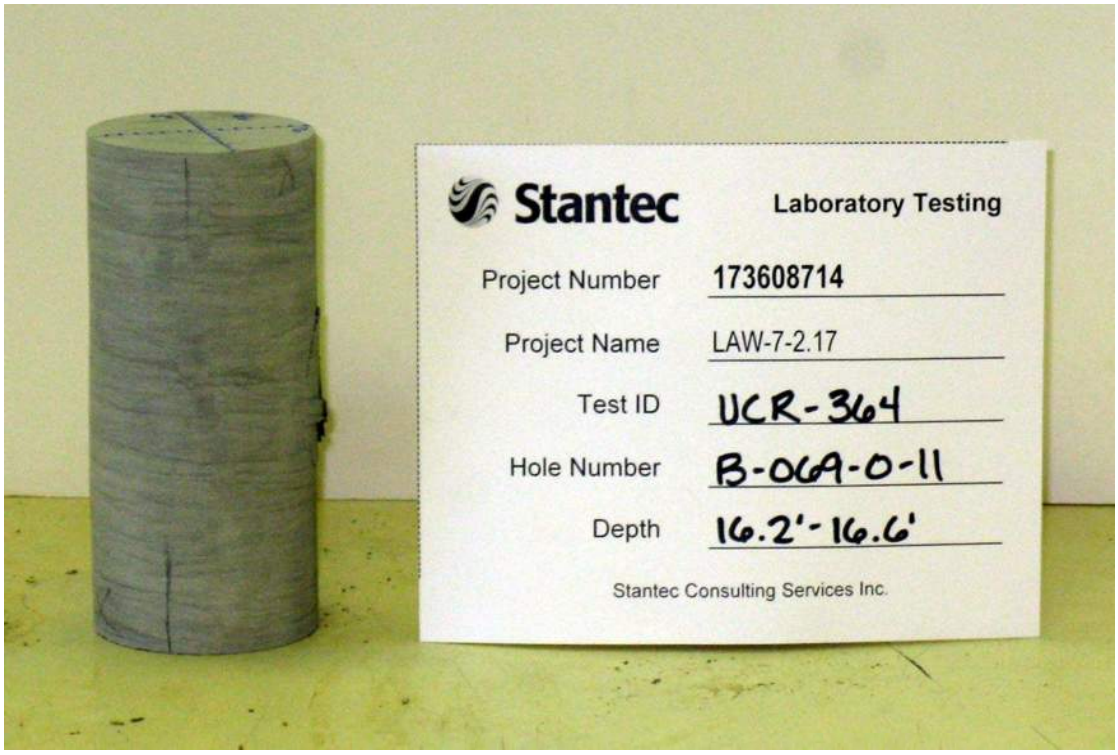


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-364
Hole Number B-069-0-11 | Depth (ft) 16.2'-16.6'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Claystone, gray and reddish brown, soft, weathered	Lab ID	UCR-367
Hole Number	B-069-0-11	Depth (ft) 32.5'-33.0'	Date Received 06-22-2011
Temperature (^{o}C)	21.3	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	N/A	Height (in)	4.715	Wet Unit Weight (pcf)	145.9
Perpendicularity	N/A	Diameter (in)	1.933	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	2.935	Moisture Content (%)	N/A
Parallelism	N/A				

Dimensions were not confirmed.

Loading Rate (lbf/sec) 12

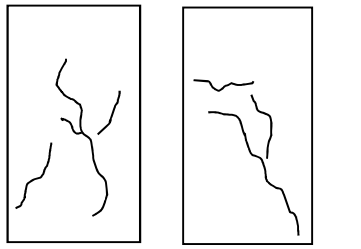
Peak Load (lbf) 1212

Failure Type Undetermined

Compressive Strength (psi) 413

Compressive Strength (tsf) 30

Failure Sketches



Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, gray and reddish brown, soft, weathered | Lab ID UCR-367
Hole Number B-069-0-11 | Depth (ft) 32.5'-33.0'
Test Type Unconfined compressive strength

As Received

Core Preparation

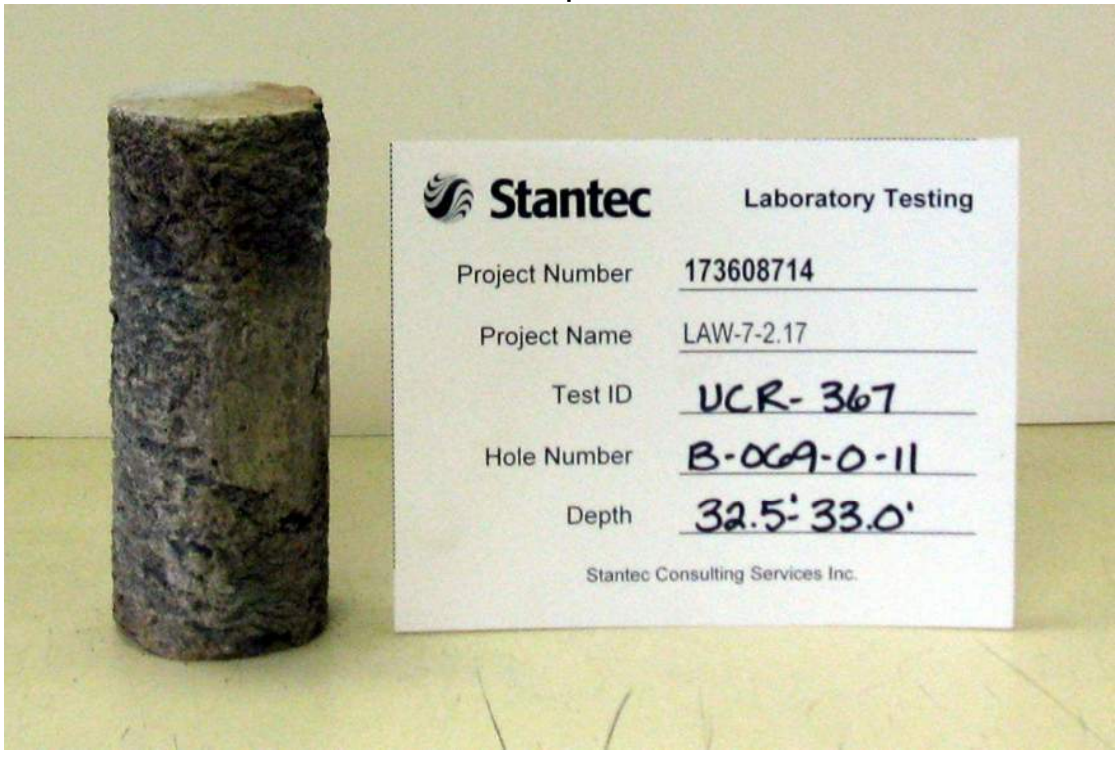


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, gray and reddish brown, soft, weathered | Lab ID UCR-367
Hole Number B-069-0-11 | Depth (ft) 32.5'-33.0'
Test Type Unconfined compressive strength

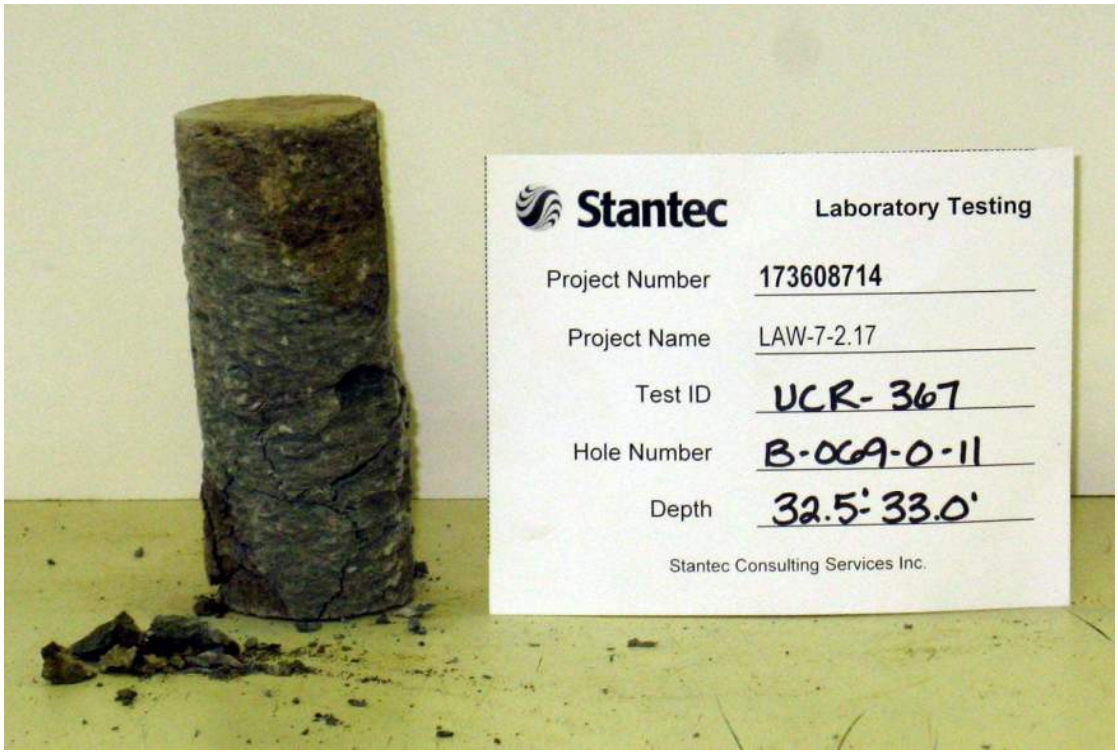
Core Preparation

Post Test

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, gray and reddish brown, soft, weathered | Lab ID UCR-367
Hole Number B-069-0-11 | Depth (ft) 32.5'-33.0'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Limestone, gray, moderately hard	Lab ID	UCR-369
Hole Number	B-069-0-11	Depth (ft) 45.8'-46.2'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.714	Wet Unit Weight (pcf)	161.7
Perpendicularity	Pass	Diameter (in)	1.971	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.052	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 95

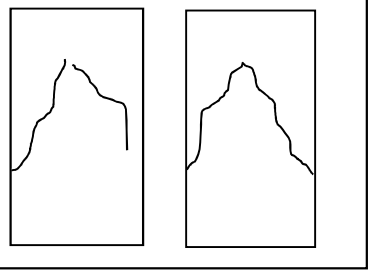
Peak Load (lbf) 32094

Failure Type Cone

Compressive Strength (psi) 10520

Compressive Strength (tsf) 757

Failure Sketches

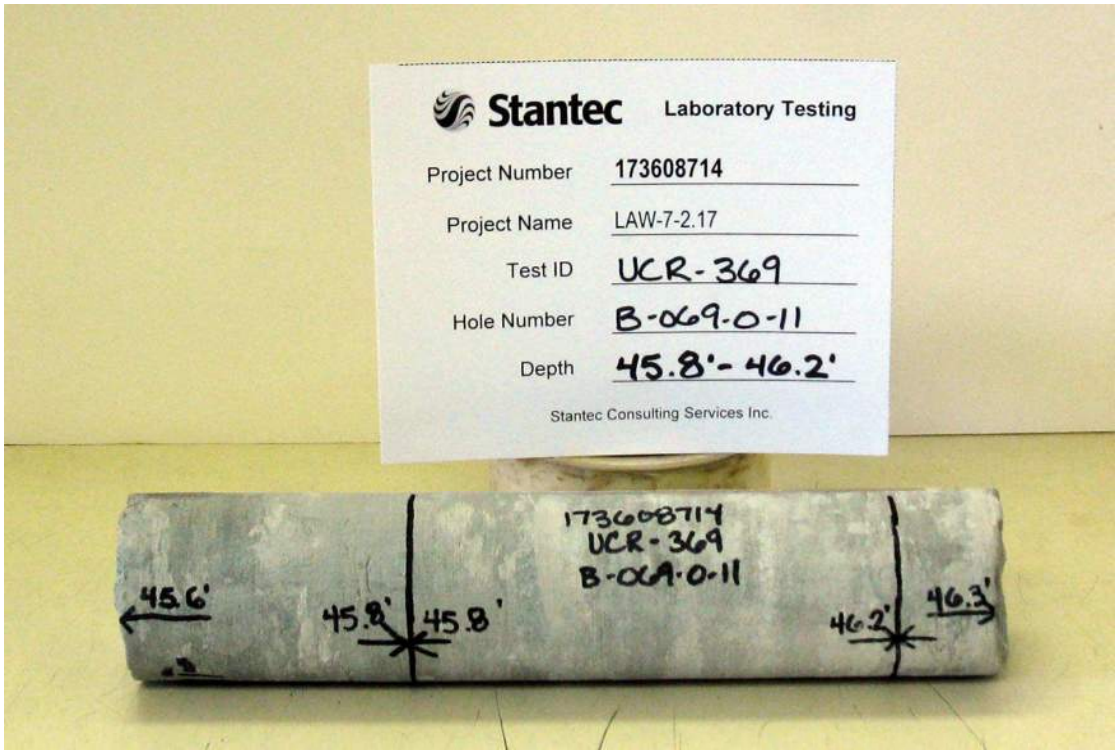


Comments

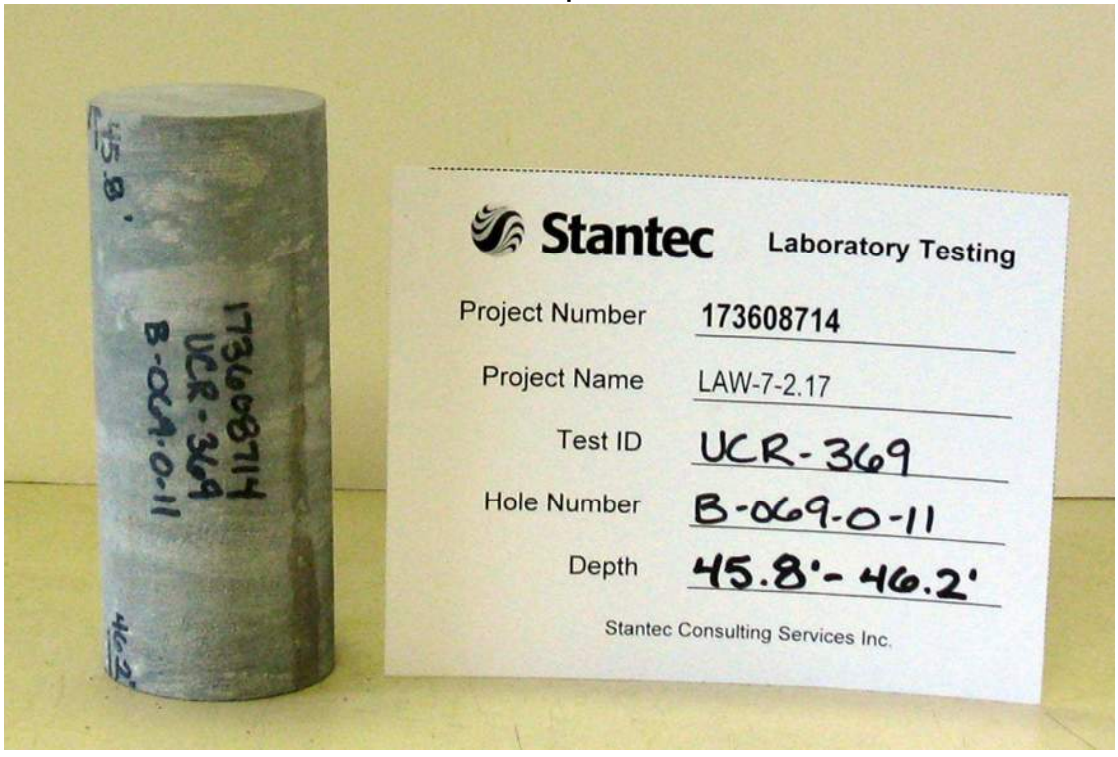
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Limestone, gray, moderately hard | Lab ID UCR-369
Hole Number B-069-0-11 | Depth (ft) 45.8'-46.2'
Test Type Unconfined compressive strength

As Received



Core Preparation

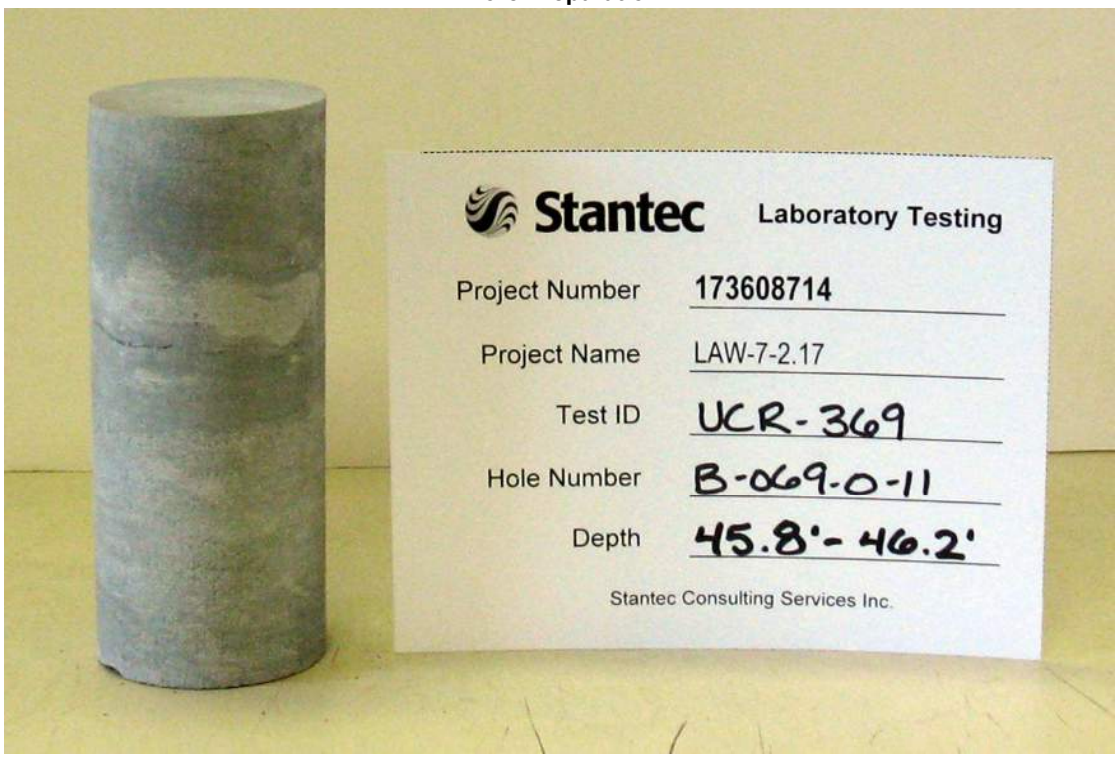


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Limestone, gray, moderately hard | Lab ID UCR-369
Hole Number B-069-0-11 | Depth (ft) 45.8'-46.2'
Test Type Unconfined compressive strength

Core Preparation



Post Test

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Limestone, gray, moderately hard | Lab ID UCR-369
Hole Number B-069-0-11 | Depth (ft) 45.8'-46.2'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Claystone, dark gray, soft	Lab ID	UCR-371
Hole Number	B-069-0-11	Depth (ft) 62.3'-62.7'	Date Received 06-22-2011
Temperature (^{o}C)	21.4	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	N/A	Height (in)	4.698	Wet Unit Weight (pcf)	158.1
Perpendicularity	N/A	Diameter (in)	1.943	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	2.966	Moisture Content (%)	N/A
Parallelism	N/A				

Dimensions were not confirmed.

Loading Rate (lbf/sec) 16

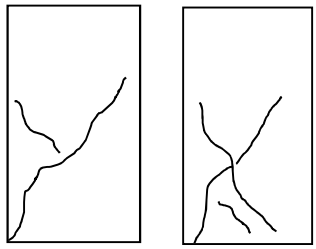
Peak Load (lbf) 3374

Failure Type Shear

Compressive Strength (psi) 1138

Compressive Strength (tsf) 82

Failure Sketches



Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, soft | Lab ID UCR-371
Hole Number B-069-0-11 | Depth (ft) 62.3'-62.7'
Test Type Unconfined compressive strength

As Received

Core Preparation

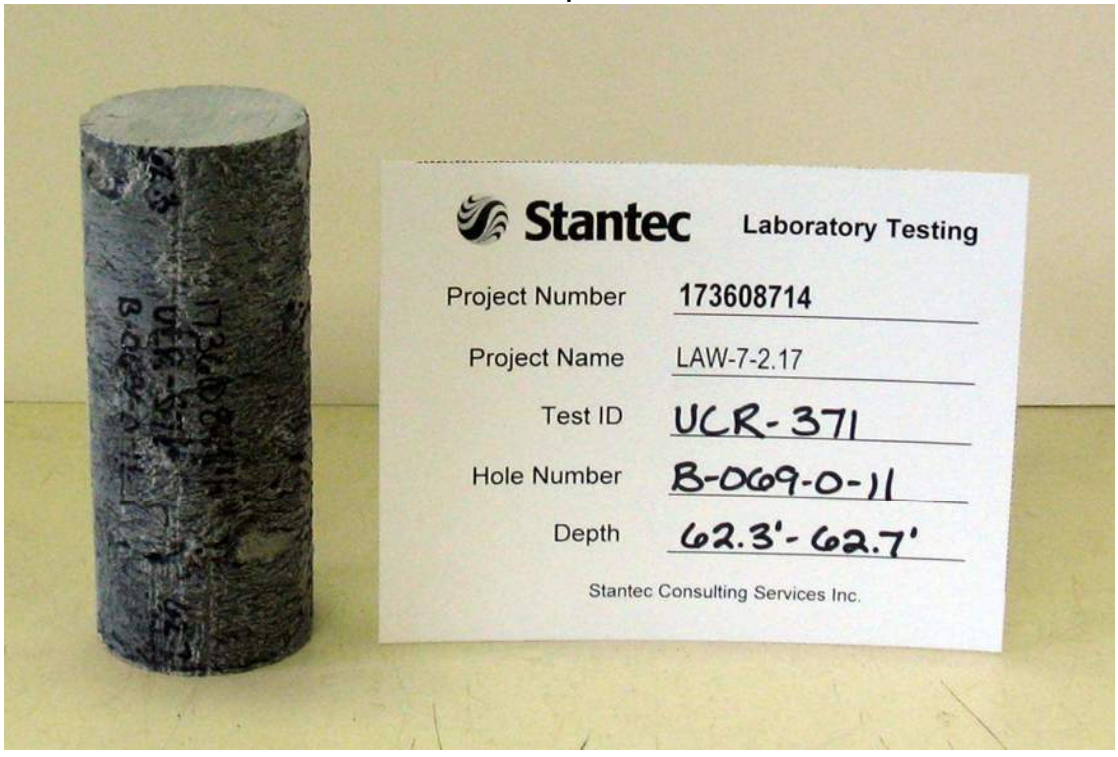
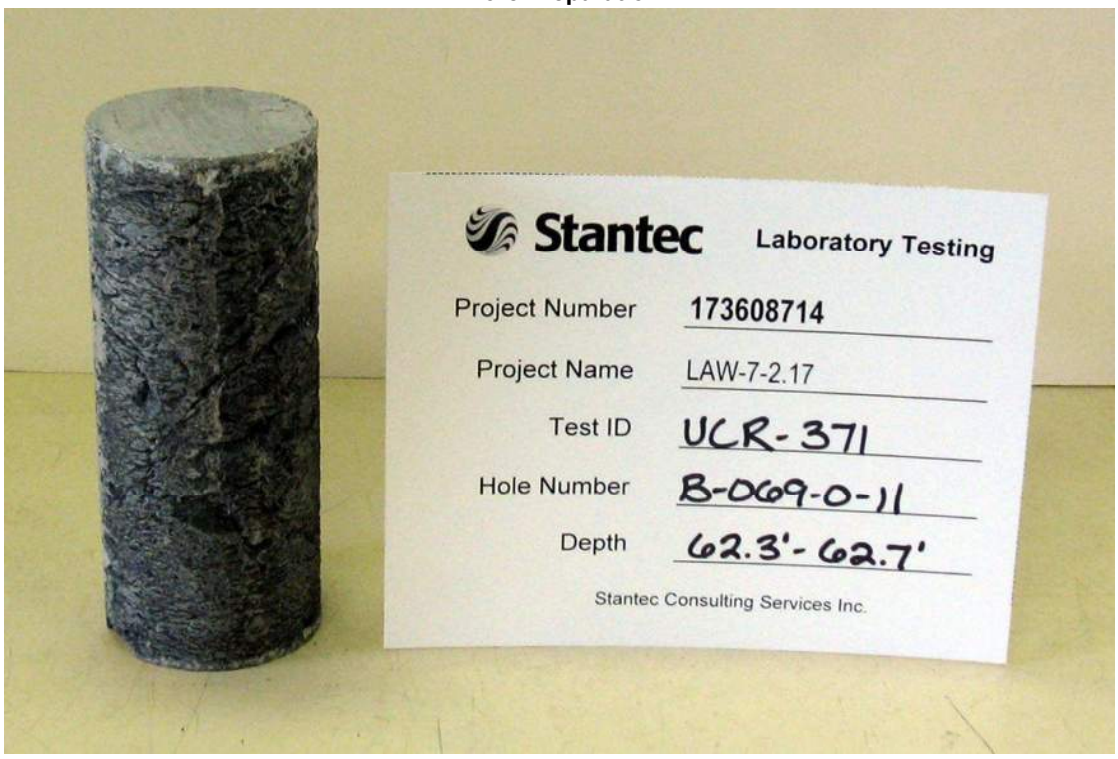


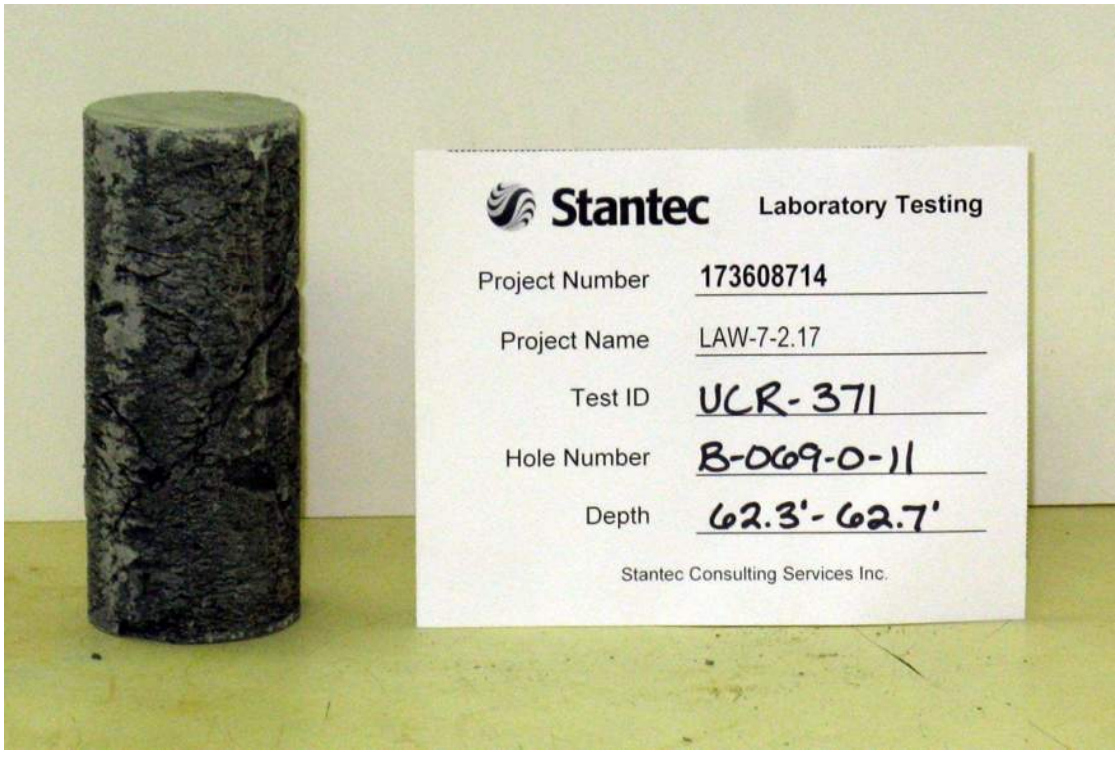
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, soft | Lab ID UCR-371
Hole Number B-069-0-11 | Depth (ft) 62.3'-62.7'
Test Type Unconfined compressive strength

Core Preparation



Post Test



Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, soft | Lab ID UCR-371
Hole Number B-069-0-11 | Depth (ft) 62.3'-62.7'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Shale, gray, moderately hard	Lab ID	UCR-372
Hole Number	B-069-0-11	Depth (ft) 77.7'-78.1'	Date Received 06-22-2011
Temperature (°C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.081	Wet Unit Weight (pcf)	164.8
Perpendicularity	Pass	Diameter (in)	1.962	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.022	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 88

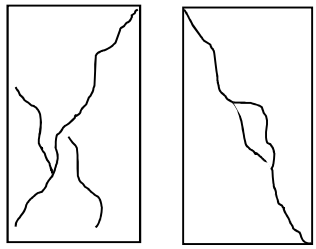
Peak Load (lbf) 10414

Failure Type Shear

Compressive Strength (psi) 3450

Compressive Strength (tsf) 248

Failure Sketches

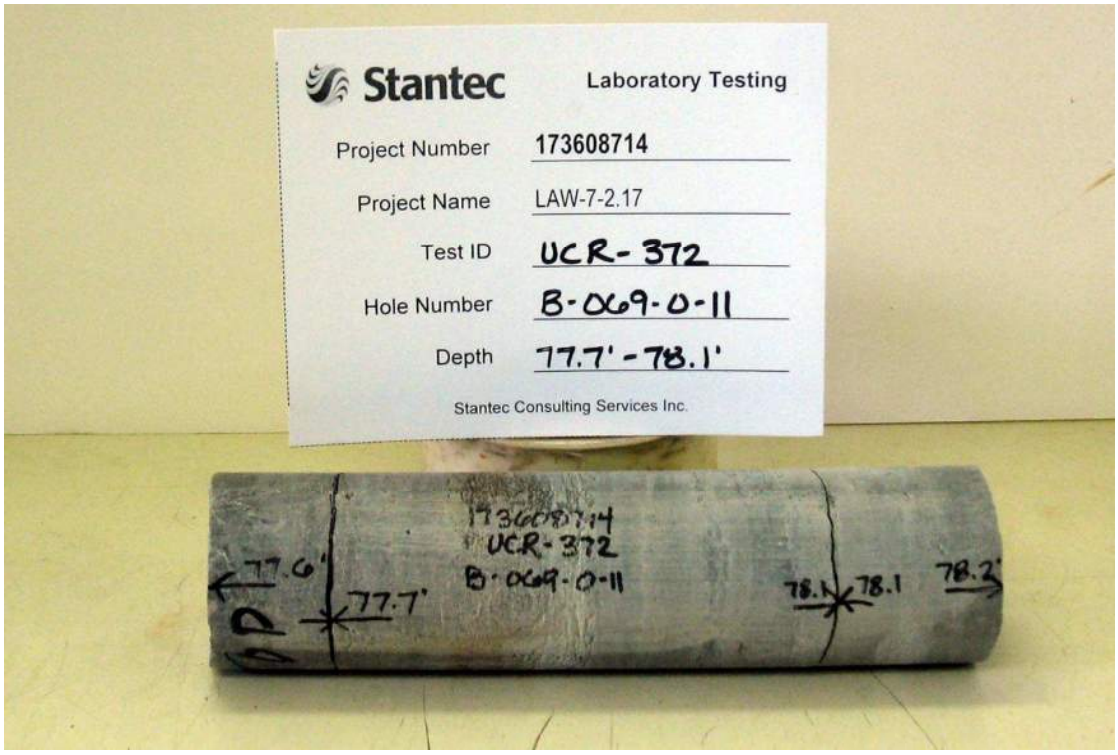


Comments

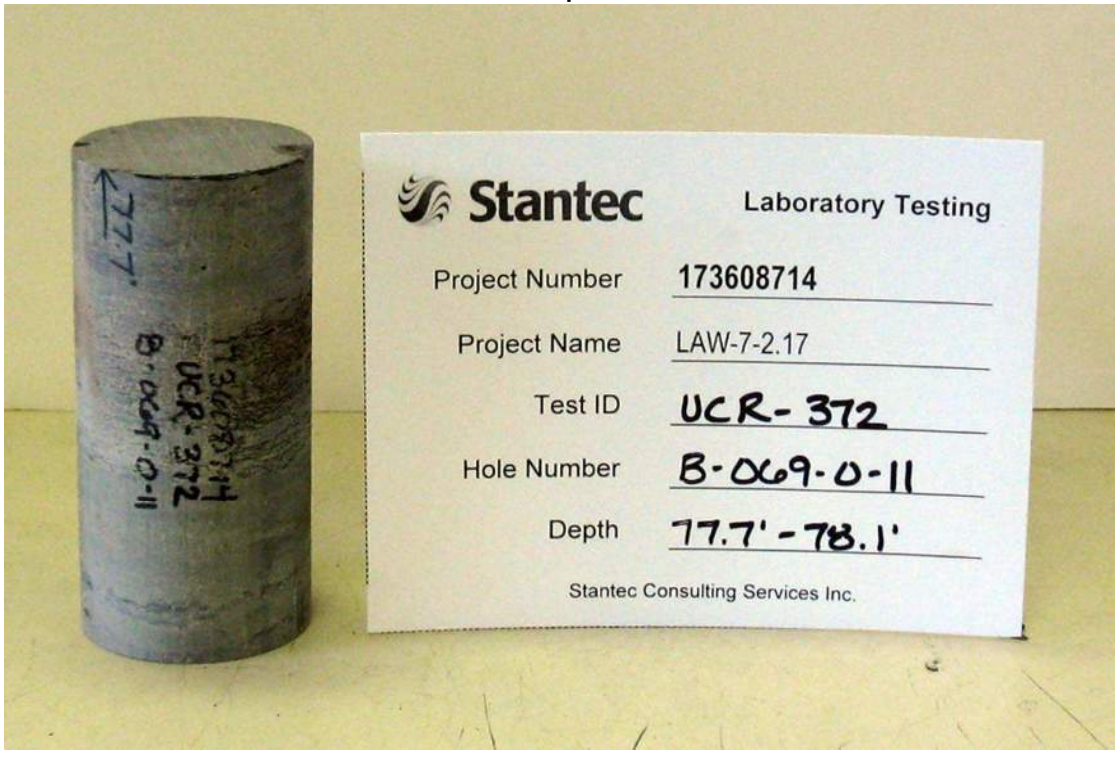
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-372
Hole Number B-069-0-11 | Depth (ft) 77.7'-78.1'
Test Type Unconfined compressive strength

As Received



Core Preparation

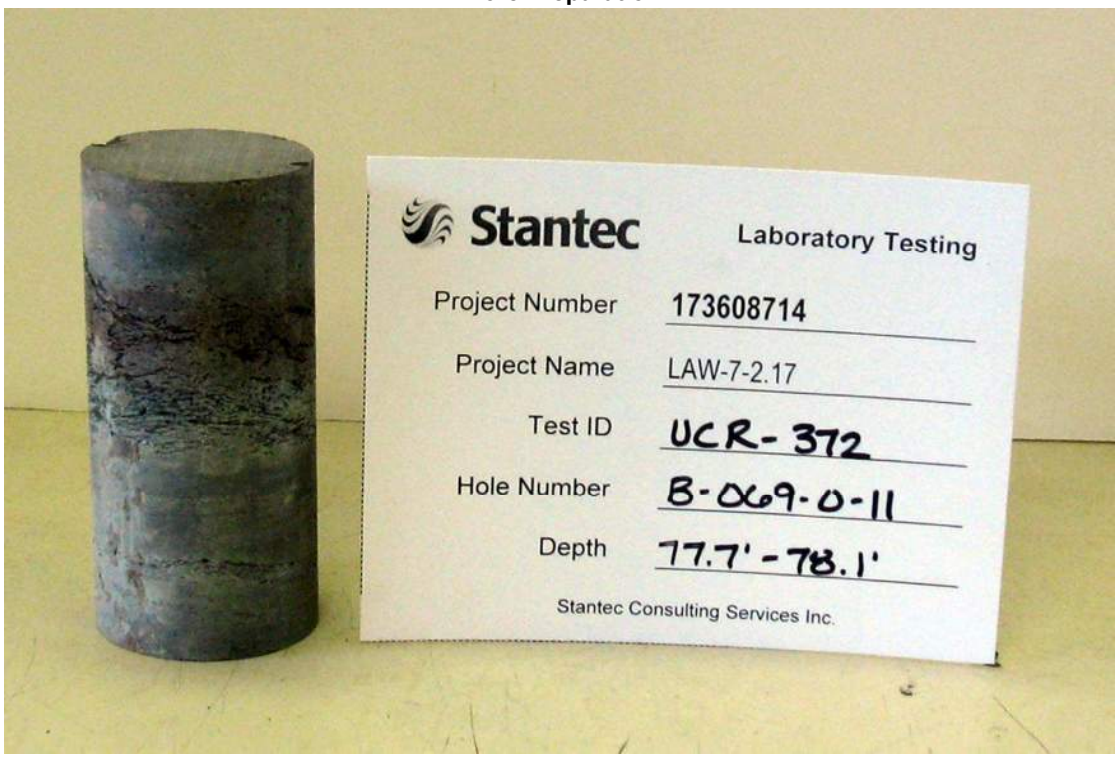


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-372
Hole Number B-069-0-11 | Depth (ft) 77.7'-78.1'
Test Type Unconfined compressive strength

Core Preparation

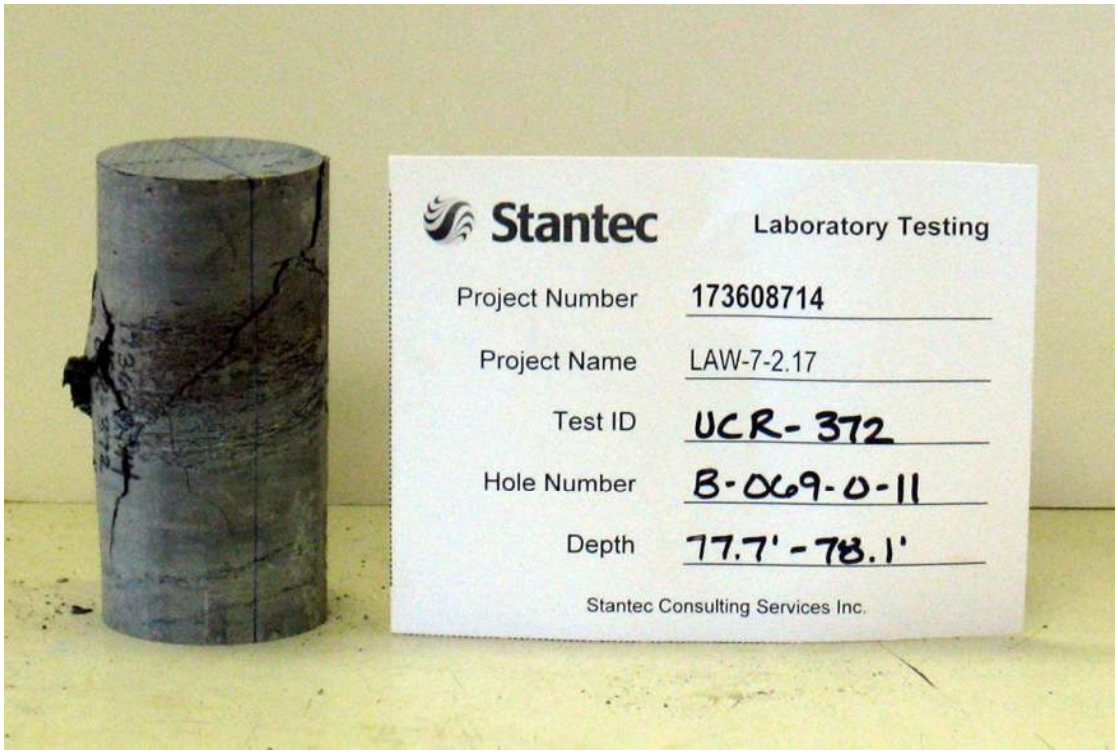


Post Test

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-372
Hole Number B-069-0-11 | Depth (ft) 77.7'-78.1'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Shale, gray, moderately hard	Lab ID	UCR-375
Hole Number	B-069-0-11	Depth (ft) 93.8'-94.2'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	3.920	Wet Unit Weight (pcf)	164.7
Perpendicularity	Pass	Diameter (in)	1.957	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.009	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 83

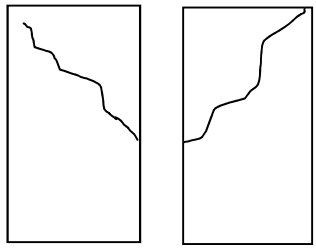
Peak Load (lbf) 15714

Failure Type Shear

Compressive Strength (psi) 5220

Compressive Strength (tsf) 376

Failure Sketches



Comments

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-375
Hole Number B-069-0-11 | Depth (ft) 93.8'-94.2'
Test Type Unconfined compressive strength

As Received

Core Preparation

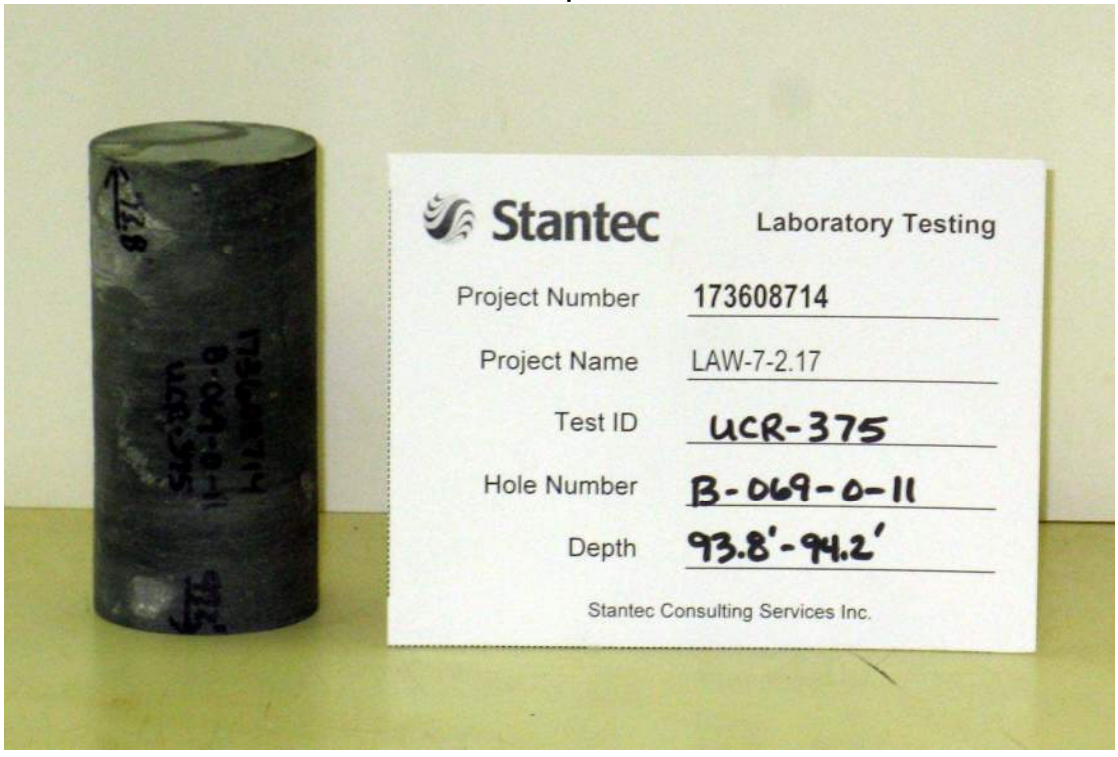
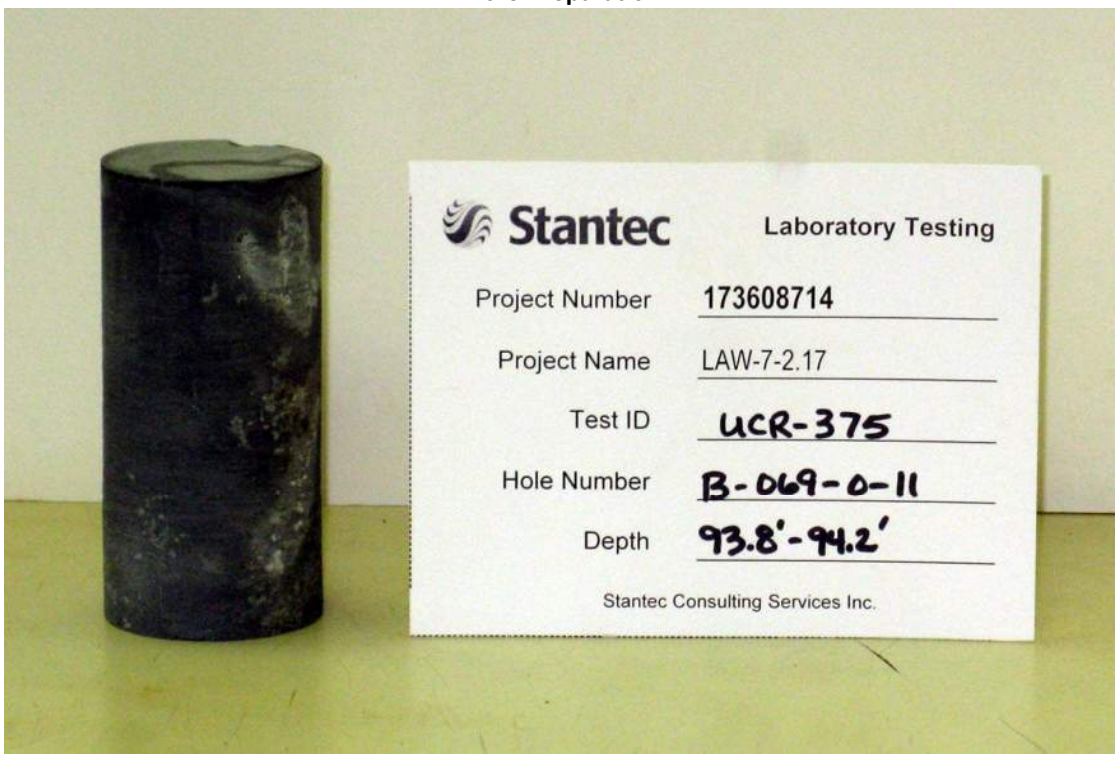


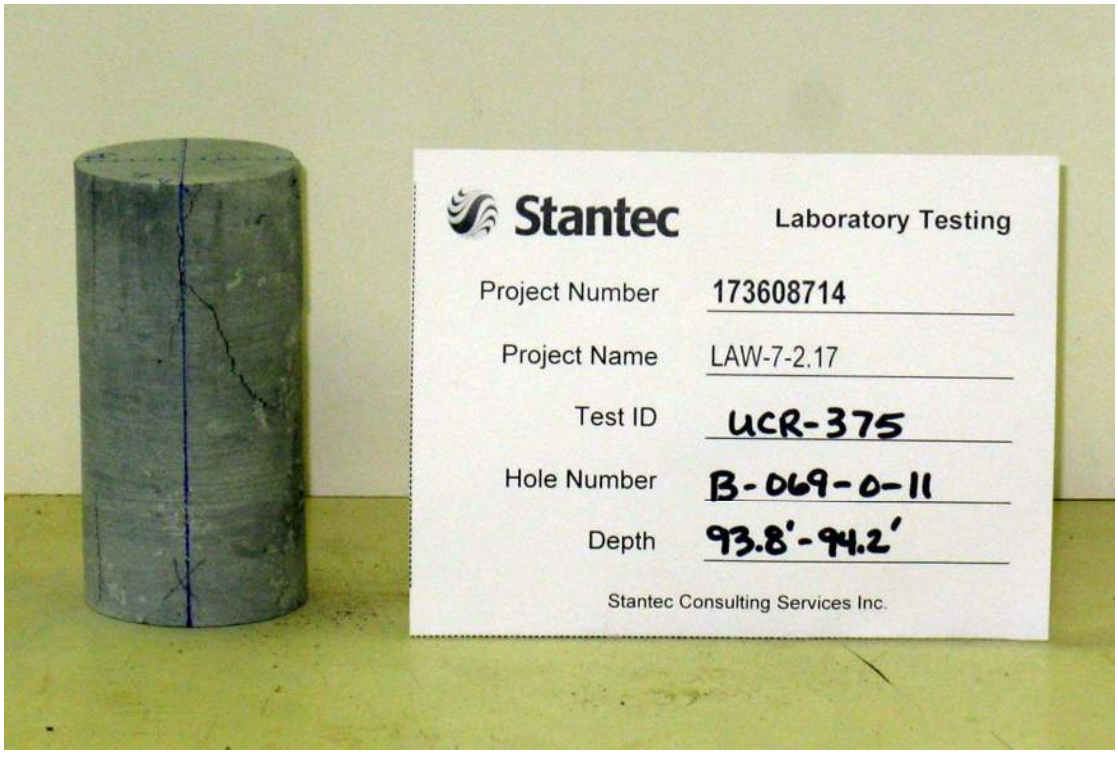
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-375
Hole Number B-069-0-11 | Depth (ft) 93.8'-94.2'
Test Type Unconfined compressive strength

Core Preparation



Post Test



Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-375
Hole Number B-069-0-11 | Depth (ft) 93.8'-94.2'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, gray, moderately hard, fine grained	Lab ID	UCR-377
Hole Number	B-069-0-11	Depth (ft)	112.5'-113.0'
		Date Received	06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
		Date Tested	06-29-2011

Side Planeness	Pass	Height (in)	4.922	Wet Unit Weight (pcf)	156.3
Perpendicularity	Pass	Diameter (in)	1.972	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.054	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 87

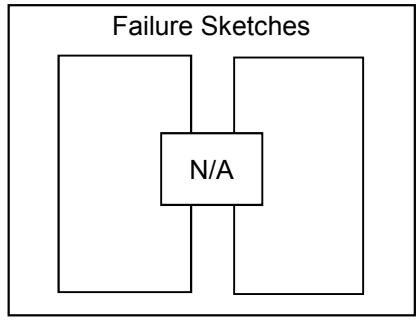
Peak Load (lbf) 27964

Failure Type Undetermined

Compressive Strength (psi) 9160

Compressive Strength (tsf) 659

Failure Sketches

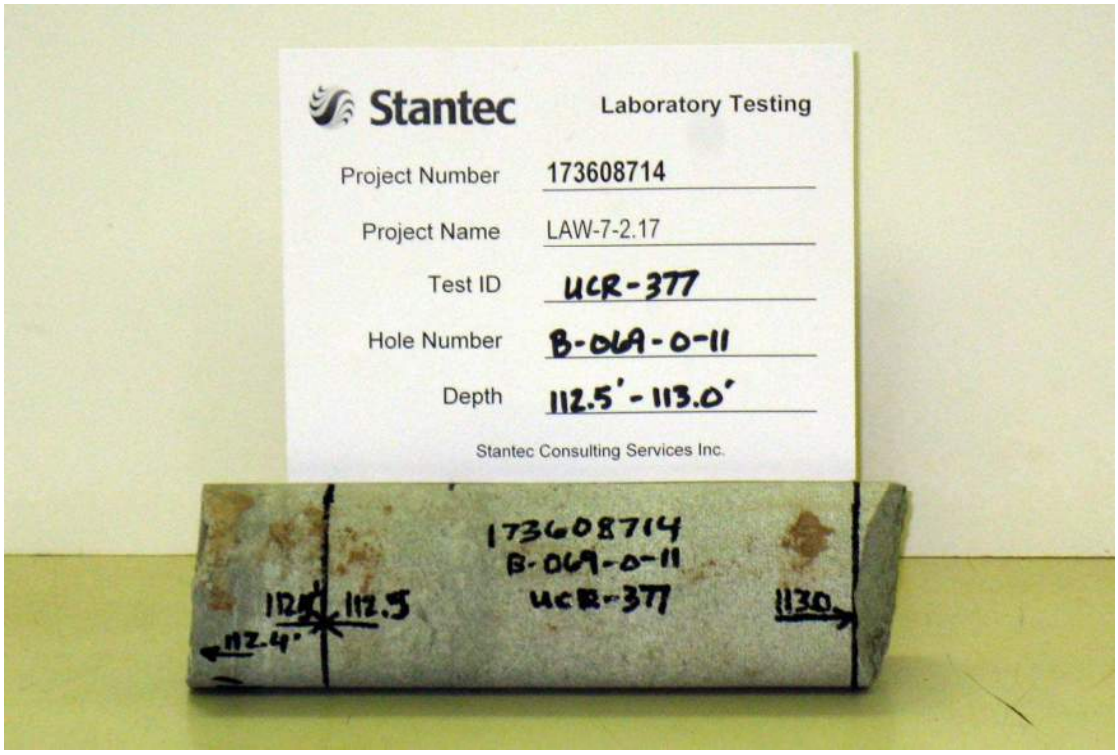


Comments No external faults observed after test.

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-377
Hole Number B-069-0-11 | Depth (ft) 112.5'-113.0'
Test Type Unconfined compressive strength

As Received



Core Preparation

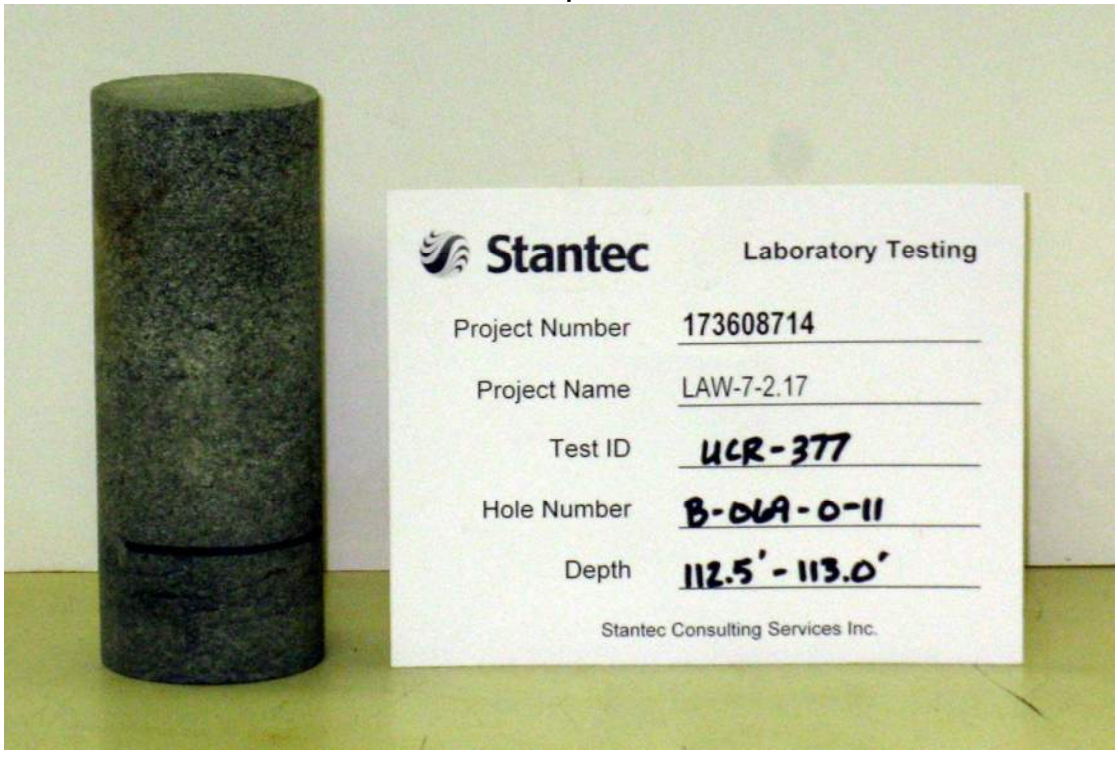
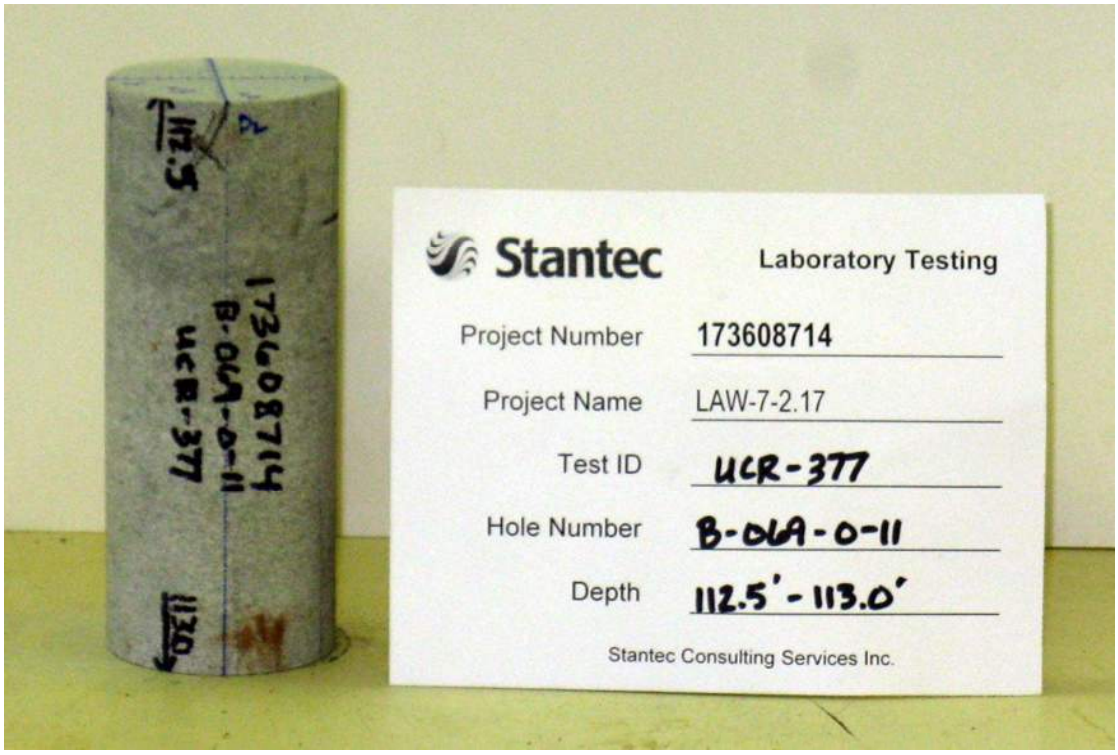


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-377
Hole Number B-069-0-11 | Depth (ft) 112.5'-113.0'
Test Type Unconfined compressive strength

Post Test



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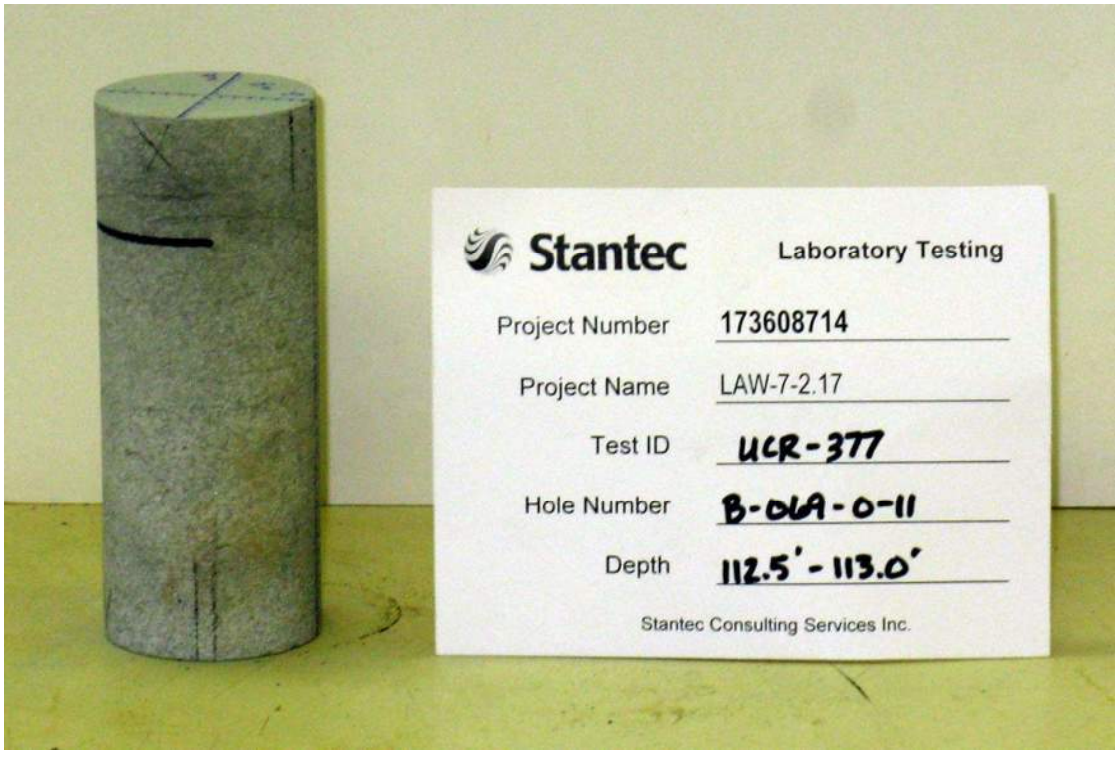


Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

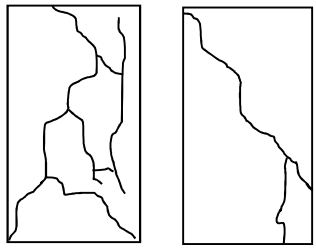
Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, gray, moderately hard, fine grained	Lab ID	UCR-379
Hole Number	B-069-0-11	Depth (ft) 124.5'-124.9'	Date Received 06-22-2011

Temperature (^{o}C)	21.6	Moisture Condition	As received, moist	Date Tested	06-29-2011

Side Planeness	Pass	Height (in)	4.158	Wet Unit Weight (pcf)	164.8
Perpendicularity	Pass	Diameter (in)	1.965	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.033	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec)	88
Peak Load (lbf)	25703
Failure Type	Shear
Compressive Strength (psi)	8480
Compressive Strength (tsf)	610

Failure Sketches



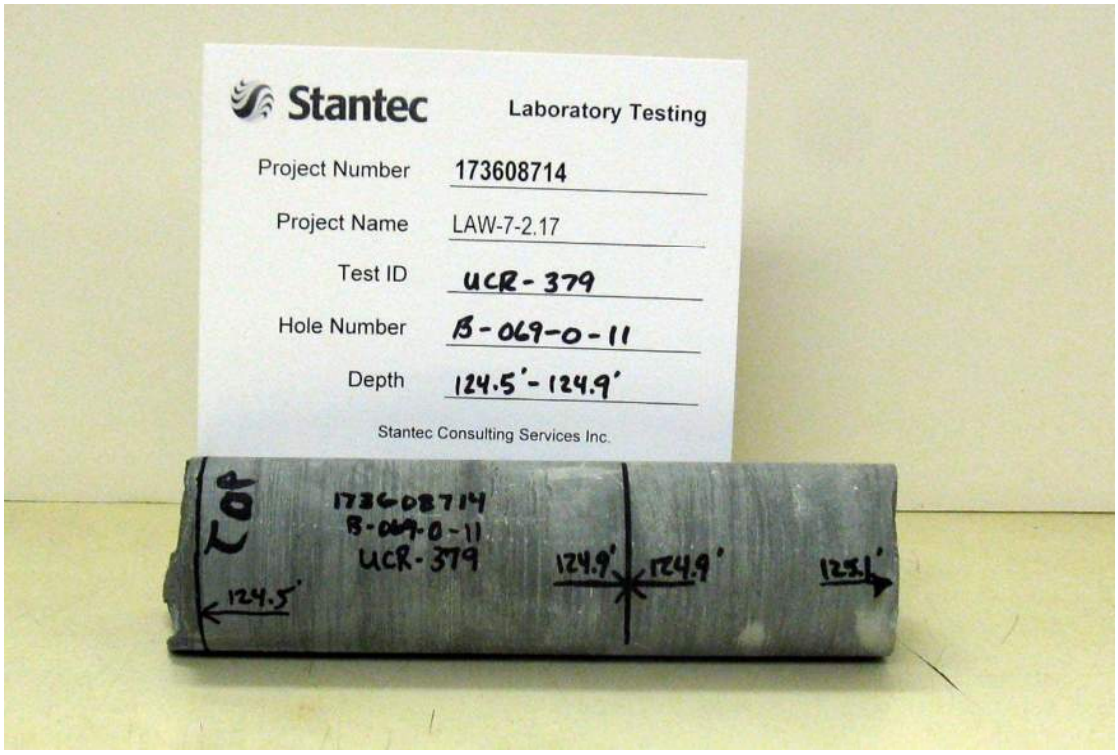
Comments

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-379
Hole Number B-069-0-11 | Depth (ft) 124.5'-124.9'
Test Type Unconfined compressive strength

As Received



Core Preparation

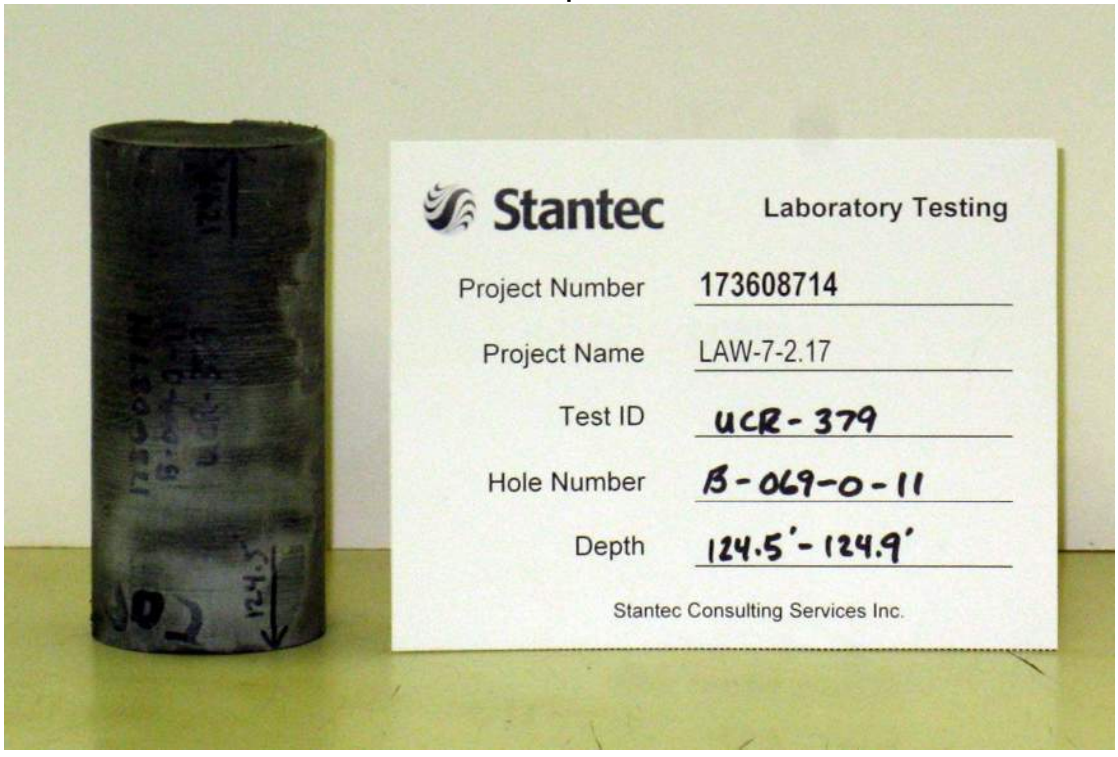
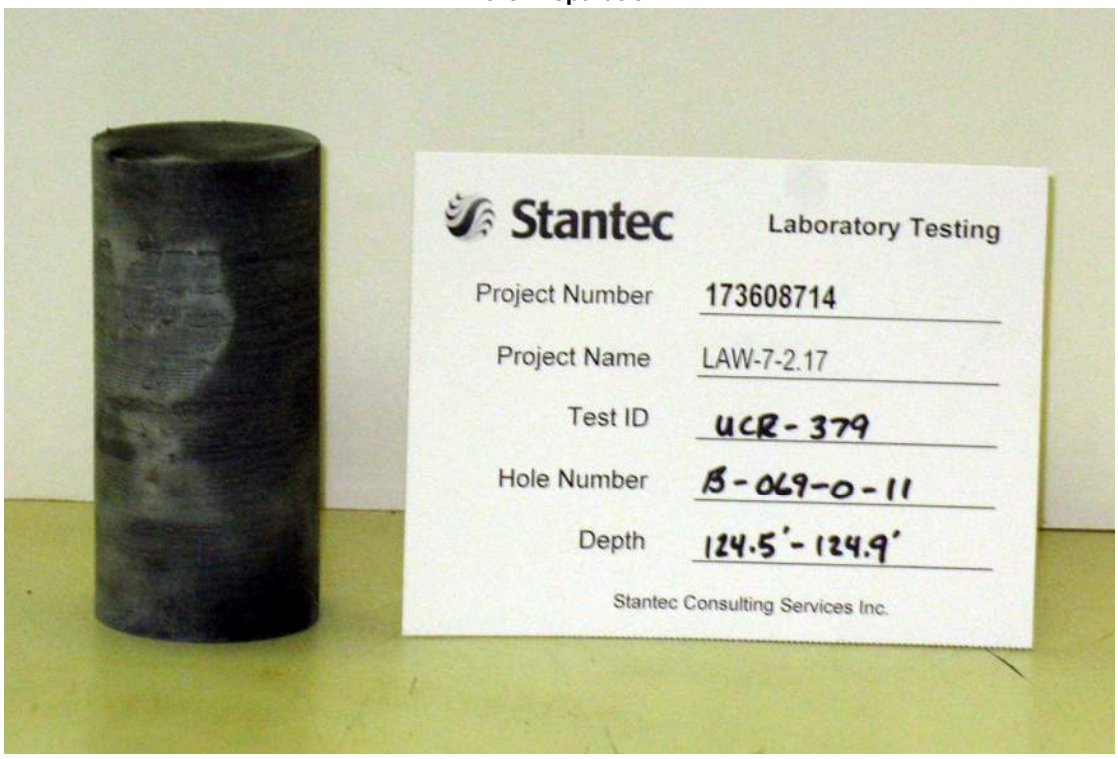


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-379
Hole Number B-069-0-11 | Depth (ft) 124.5'-124.9'
Test Type Unconfined compressive strength

Core Preparation



Post Test

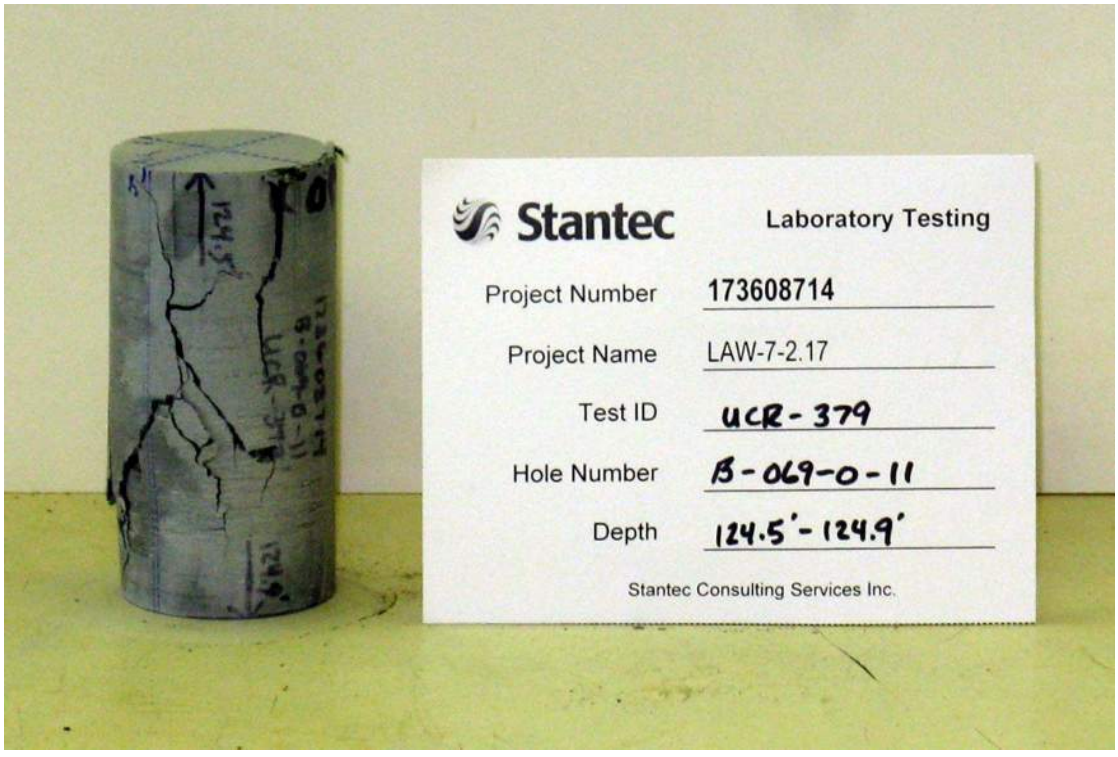
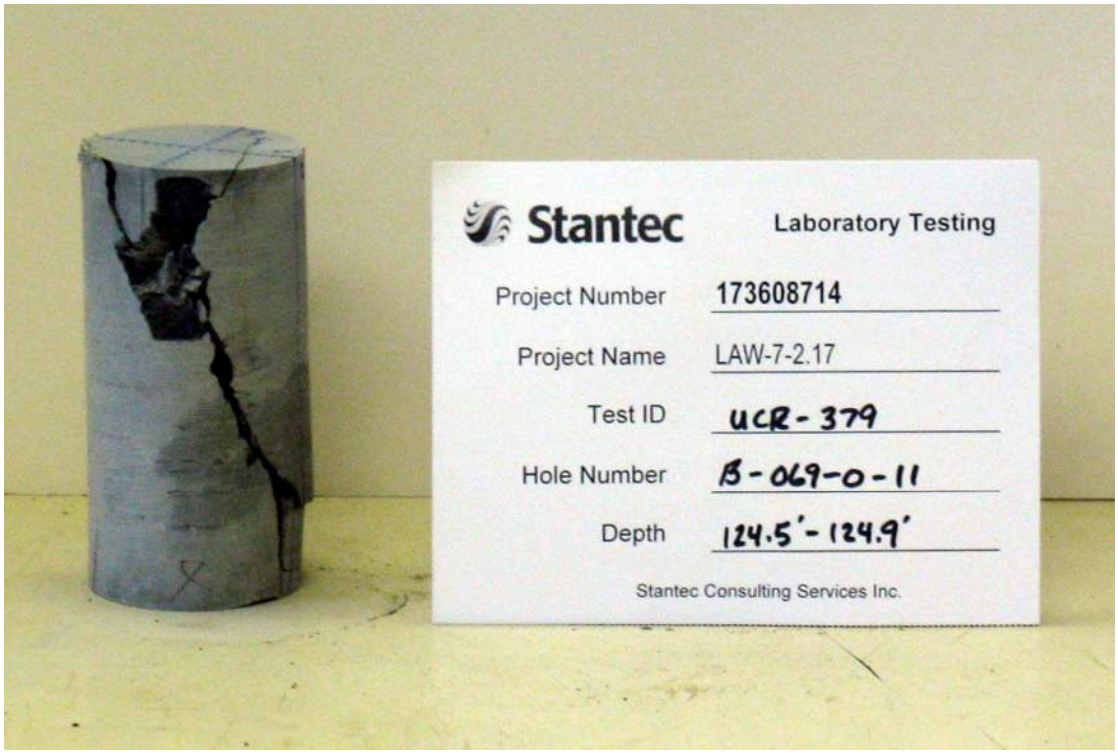


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-379
Hole Number B-069-0-11 | Depth (ft) 124.5'-124.9'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Shale, brown, soft	Lab ID	UCR-383
Hole Number	B-069-0-11	Depth (ft) 142.7'-143.0	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.242	Wet Unit Weight (pcf)	167.2
Perpendicularity	Pass	Diameter (in)	1.962	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.024	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 97

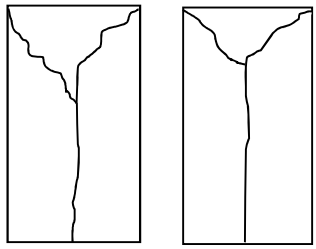
Peak Load (lbf) 15806

Failure Type Cone and Split

Compressive Strength (psi) 5230

Compressive Strength (tsf) 376

Failure Sketches

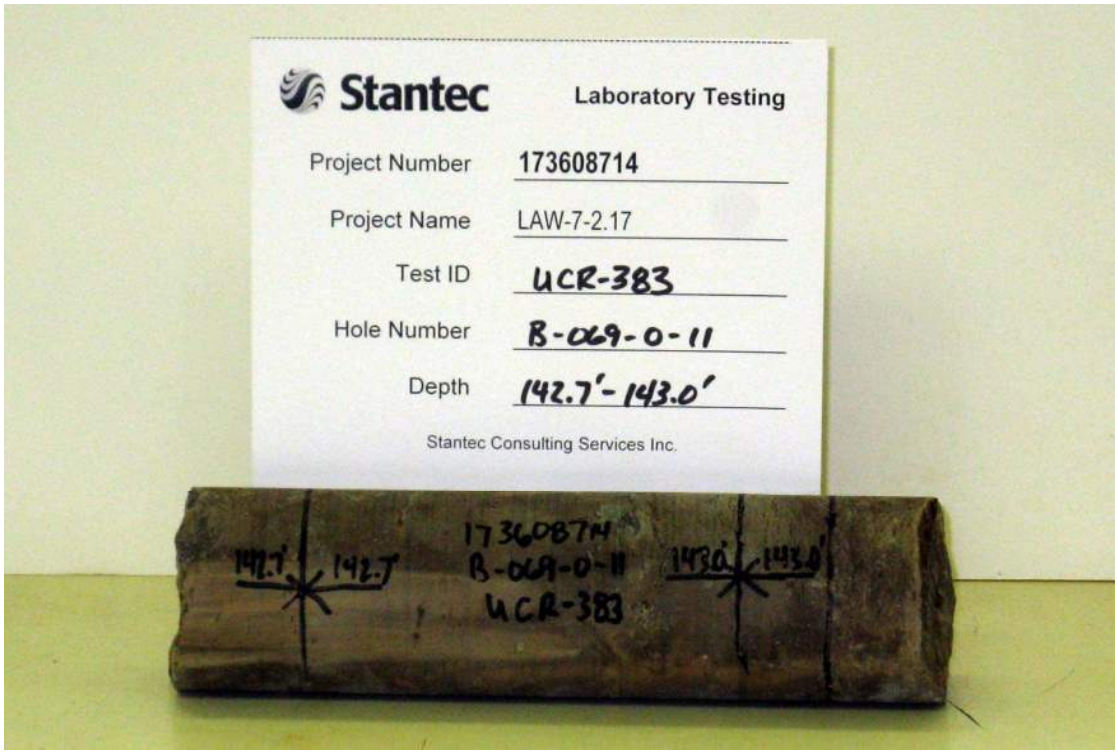


Comments

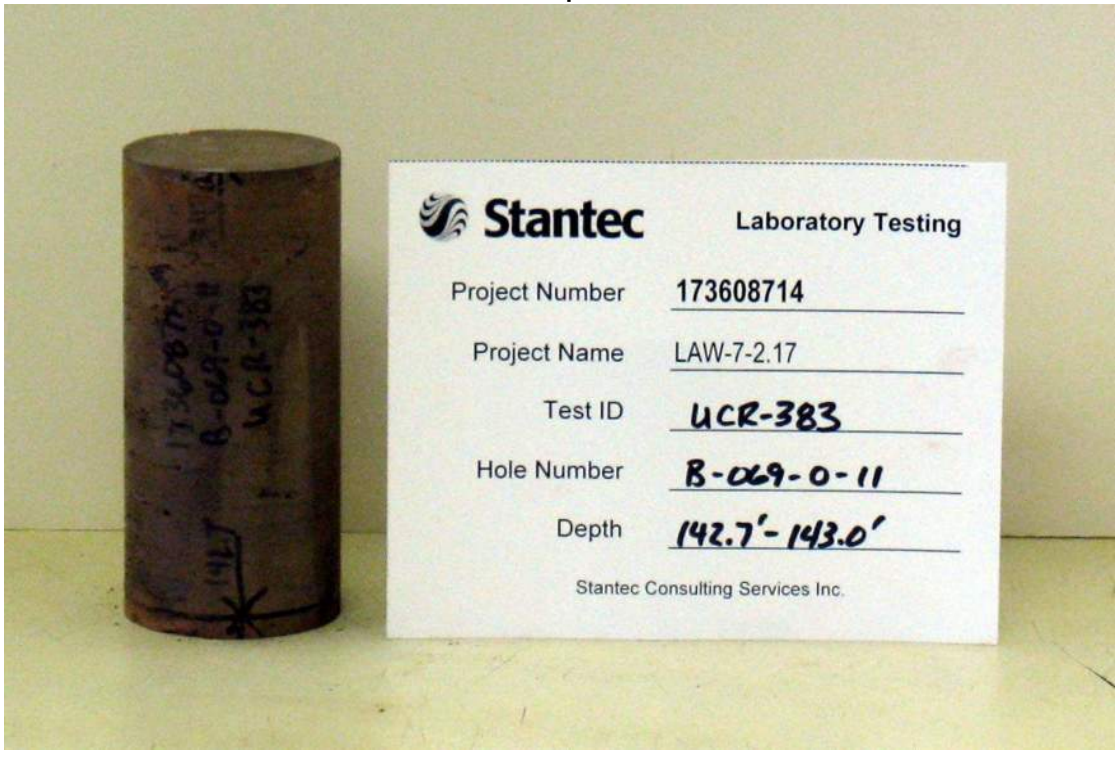
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brown, soft | Lab ID UCR-383
Hole Number B-069-0-11 | Depth (ft) 142.7'-143.0
Test Type Unconfined compressive strength

As Received



Core Preparation

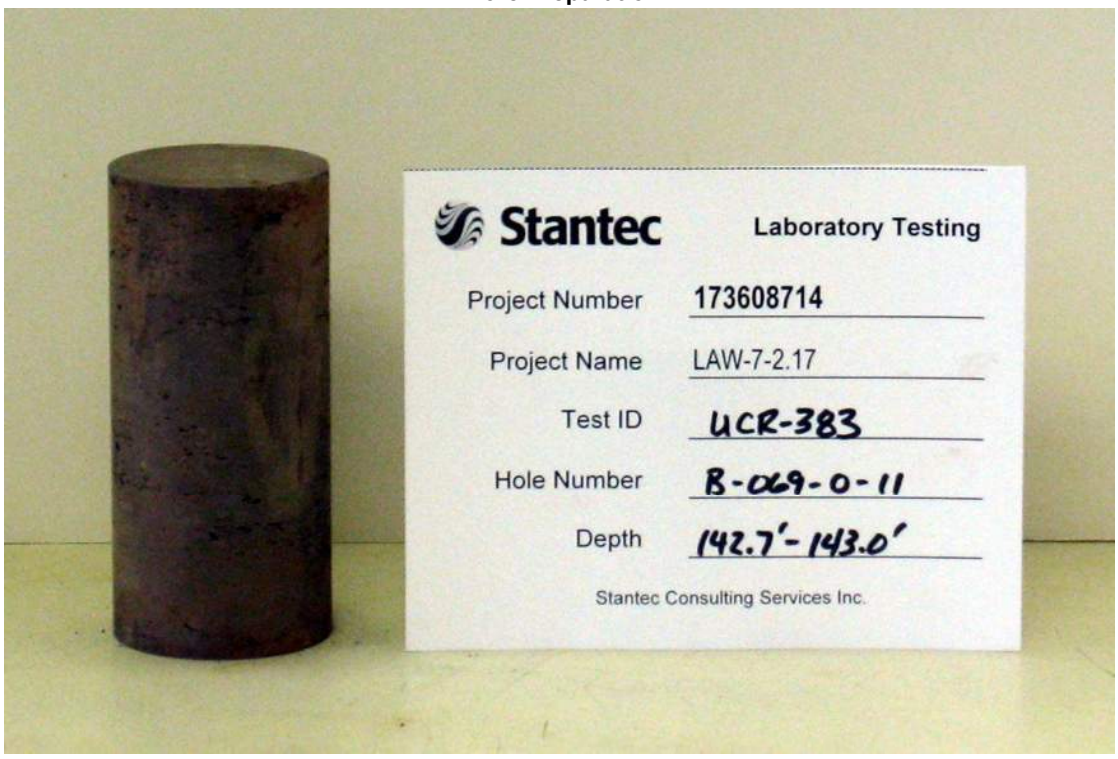


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brown, soft | Lab ID UCR-383
Hole Number B-069-0-11 | Depth (ft) 142.7'-143.0
Test Type Unconfined compressive strength

Core Preparation



Post Test

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brown, soft | Lab ID UCR-383
Hole Number B-069-0-11 | Depth (ft) 142.7'-143.0
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, brown, moderately hard, medium to fine grained	Lab ID	UCR-384
Hole Number	B-059-0-11	Depth (ft) 13.0'-13.4'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Fail	Height (in)	4.034	Wet Unit Weight (pcf)	158.0
Perpendicularity	Fail	Diameter (in)	1.966	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.036	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 90

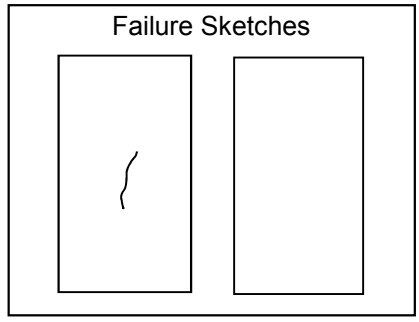
Peak Load (lbf) 12212

Failure Type Undetermined

Compressive Strength (psi) 4020

Compressive Strength (tsf) 290

Failure Sketches

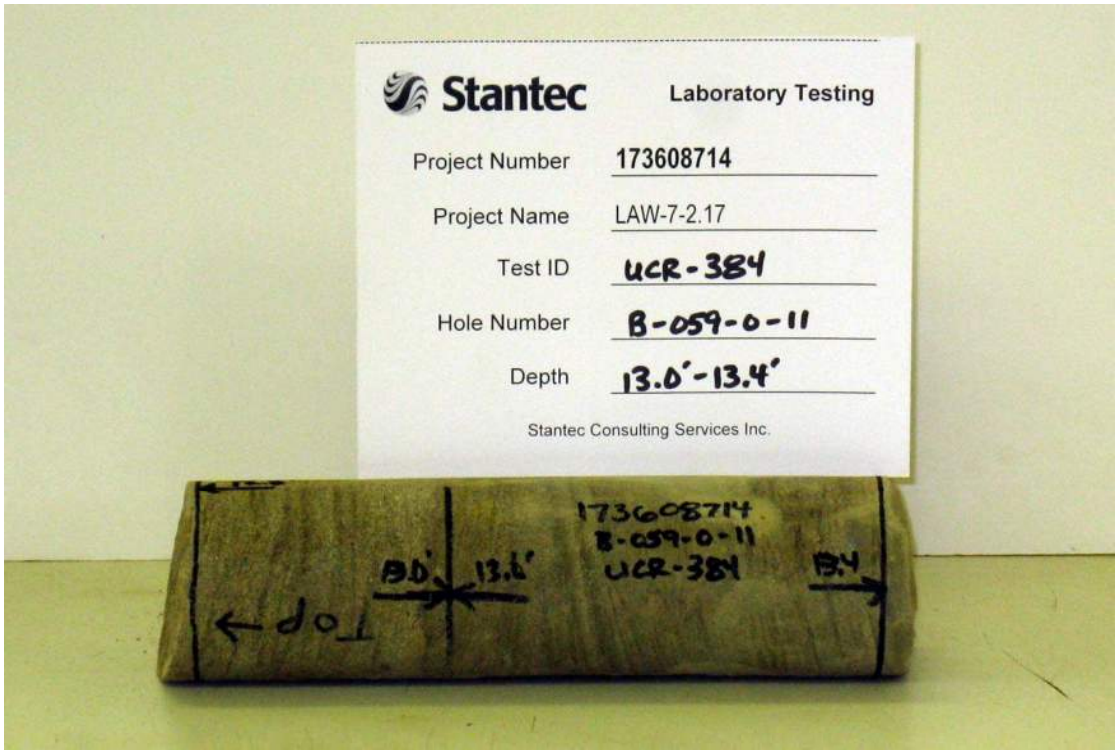


Comments

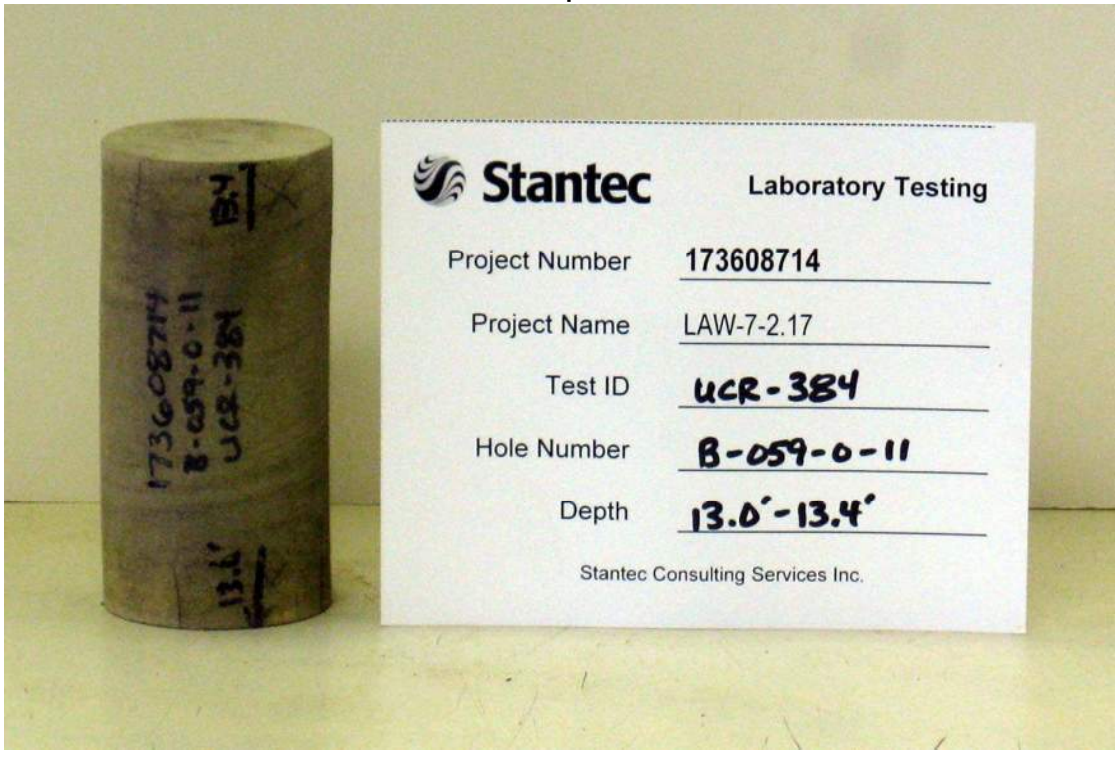
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, brown, moderately hard, medium to fine grained | Lab ID UCR-384
Hole Number B-059-0-11 | Depth (ft) 13.0'-13.4'
Test Type Unconfined compressive strength

As Received



Core Preparation

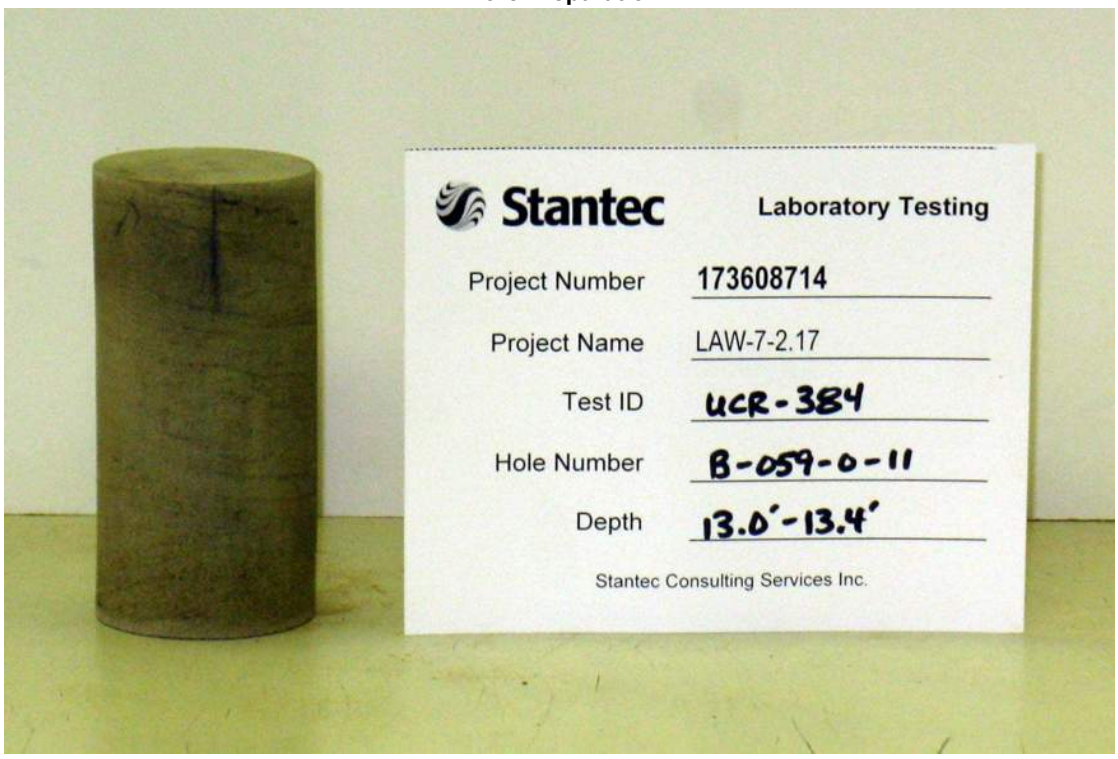


Stantec

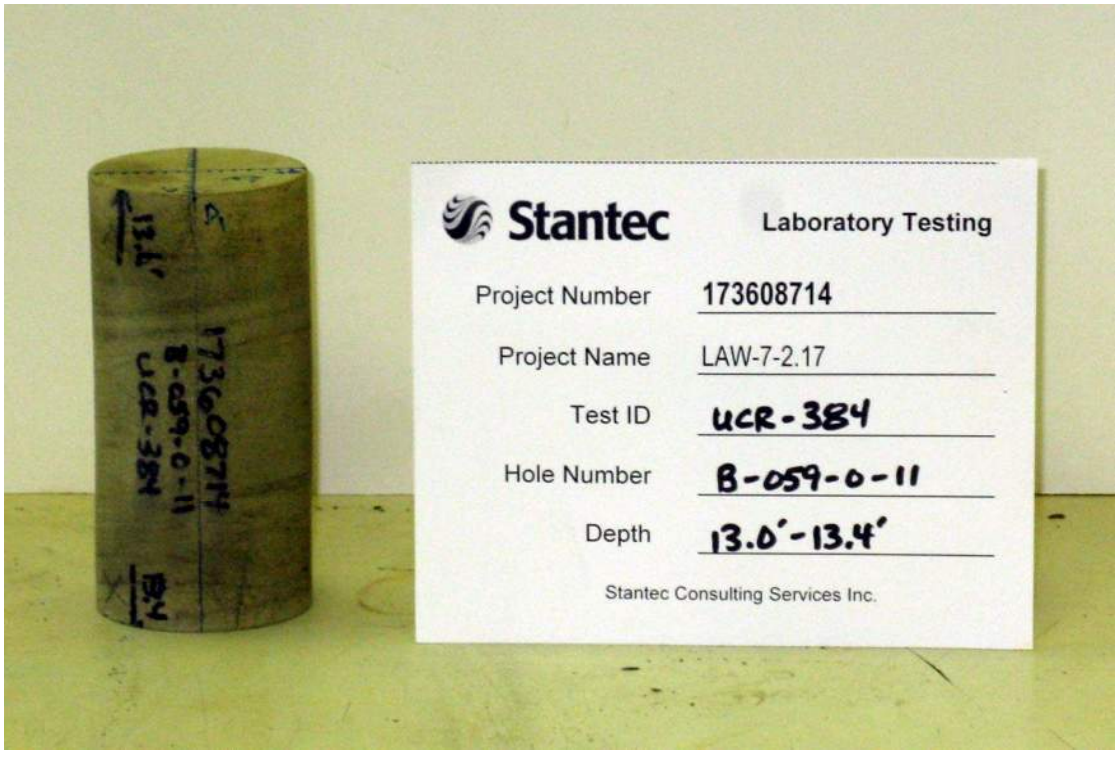
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, brown, moderately hard, medium to fine grained | Lab ID UCR-384
Hole Number B-059-0-11 | Depth (ft) 13.0'-13.4'
Test Type Unconfined compressive strength

Core Preparation



Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Claystone, dark gray, very soft	Lab ID	UCR-388
Hole Number	B-059-0-11	Depth (ft) 26.8'-27.2'	Date Received 06-22-2011
Temperature (°C)	21.7	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	N/A	Height (in)	4.199	Wet Unit Weight (pcf)	137.8
Perpendicularity	N/A	Diameter (in)	2.012	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	3.180	Moisture Content (%)	N/A
Parallelism	N/A				

Dimensions were not confirmed.

Loading Rate (lbf/sec) 0.24

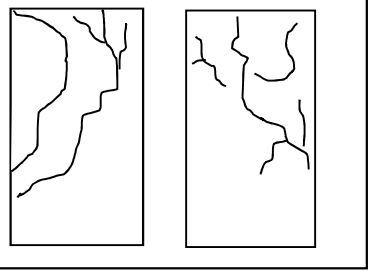
Peak Load (lbf) 49.9

Failure Type Shear

Compressive Strength (psi) 16

Compressive Strength (tsf) 1

Failure Sketches



Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

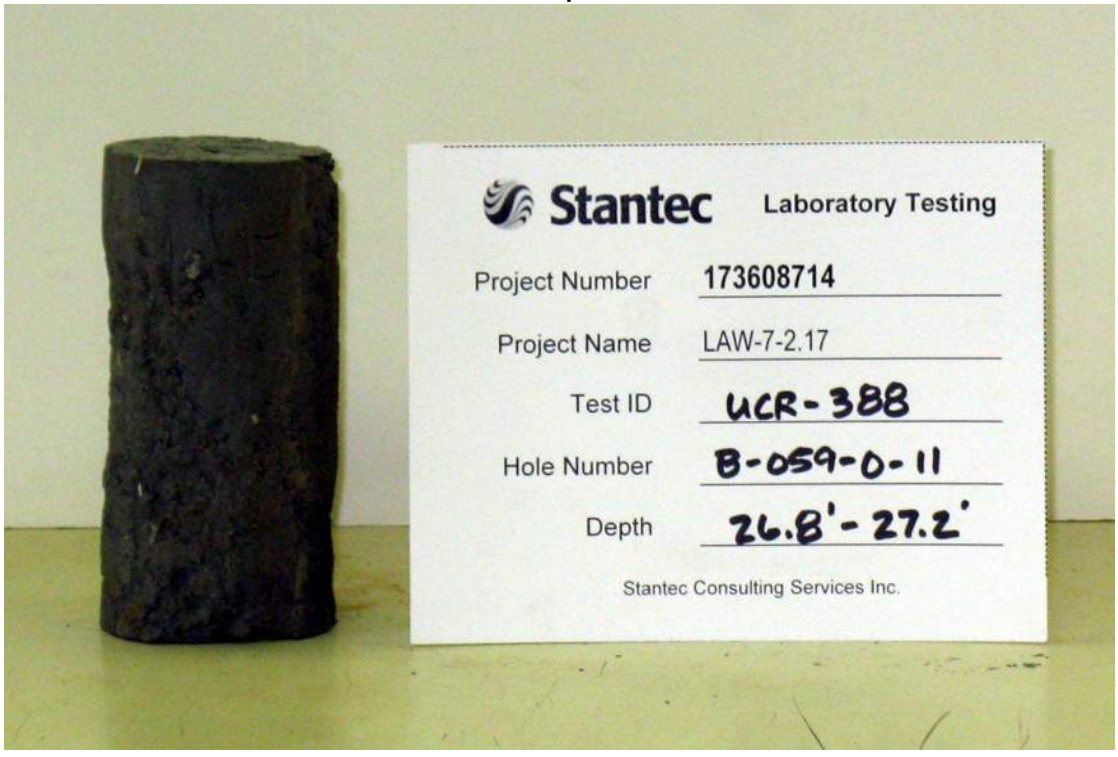
Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, very soft | Lab ID UCR-388
Hole Number B-059-0-11 | Depth (ft) 26.8'-27.2'
Test Type Unconfined compressive strength

As Received

Core Preparation

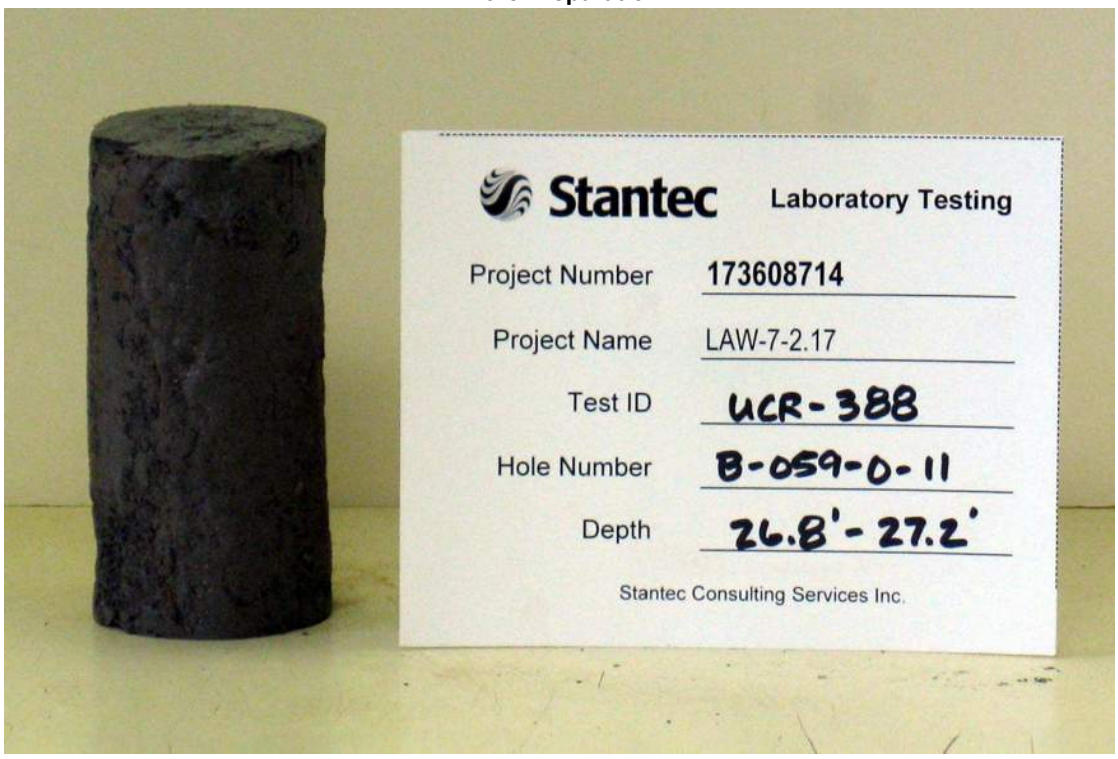


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, very soft | Lab ID UCR-388
Hole Number B-059-0-11 | Depth (ft) 26.8'-27.2'
Test Type Unconfined compressive strength

Core Preparation



Post Test

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, very soft | Lab ID UCR-388
Hole Number B-059-0-11 | Depth (ft) 26.8'-27.2'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Claystone, dark gray, moderately hard	Lab ID	UCR-391
Hole Number	B-059-0-11	Depth (ft) 36.2'-36.6'	Date Received 06-22-2011
Temperature (°C)	21.3	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Fail	Height (in)	3.938	Wet Unit Weight (pcf)	150.2
Perpendicularity	1 of 2 Pass	Diameter (in)	1.961	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.019	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 13

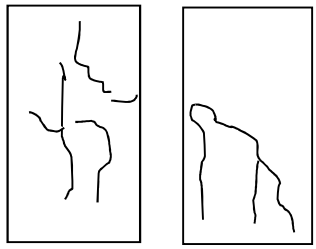
Peak Load (lbf) 2194

Failure Type Undetermined

Compressive Strength (psi) 727

Compressive Strength (tsf) 52

Failure Sketches



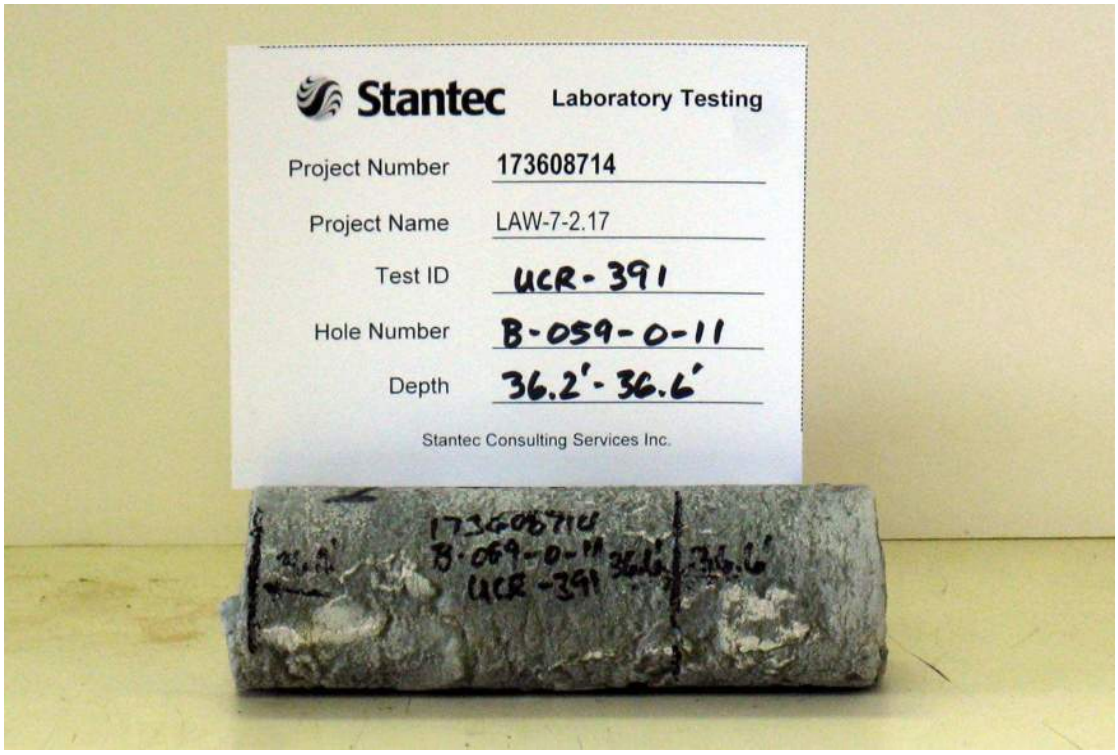
Comments

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, moderately hard | Lab ID UCR-391
Hole Number B-059-0-11 | Depth (ft) 36.2'-36.6'
Test Type Unconfined compressive strength

As Received



Core Preparation

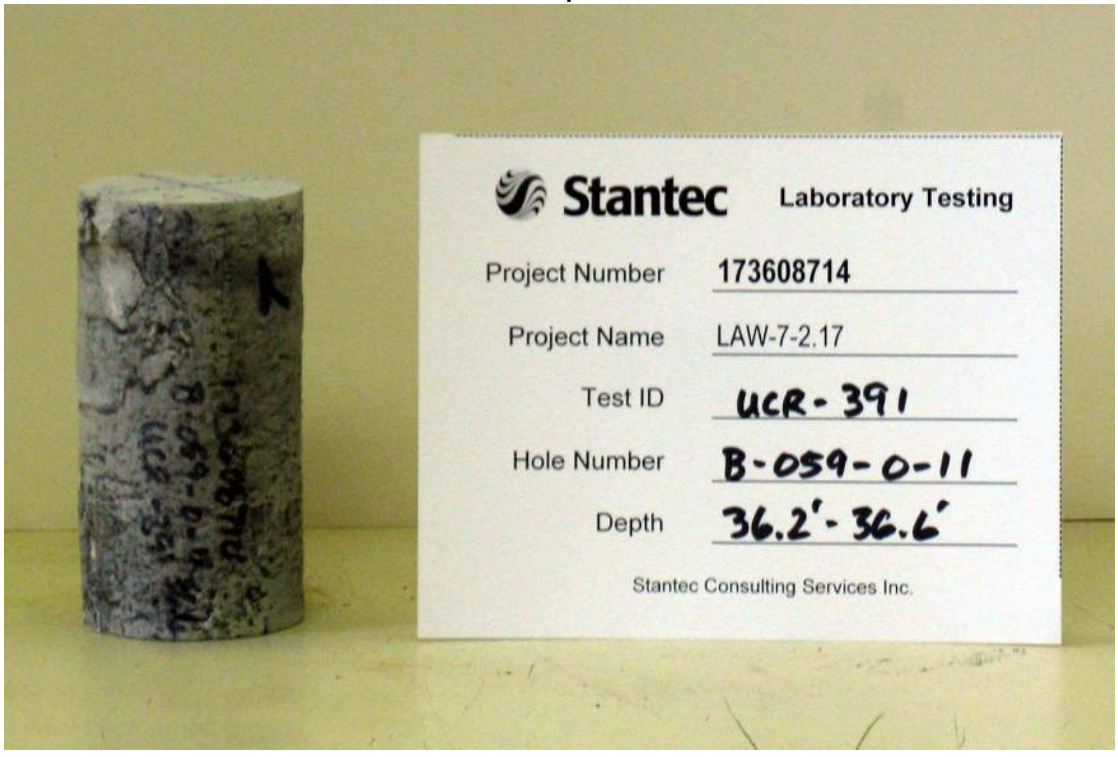
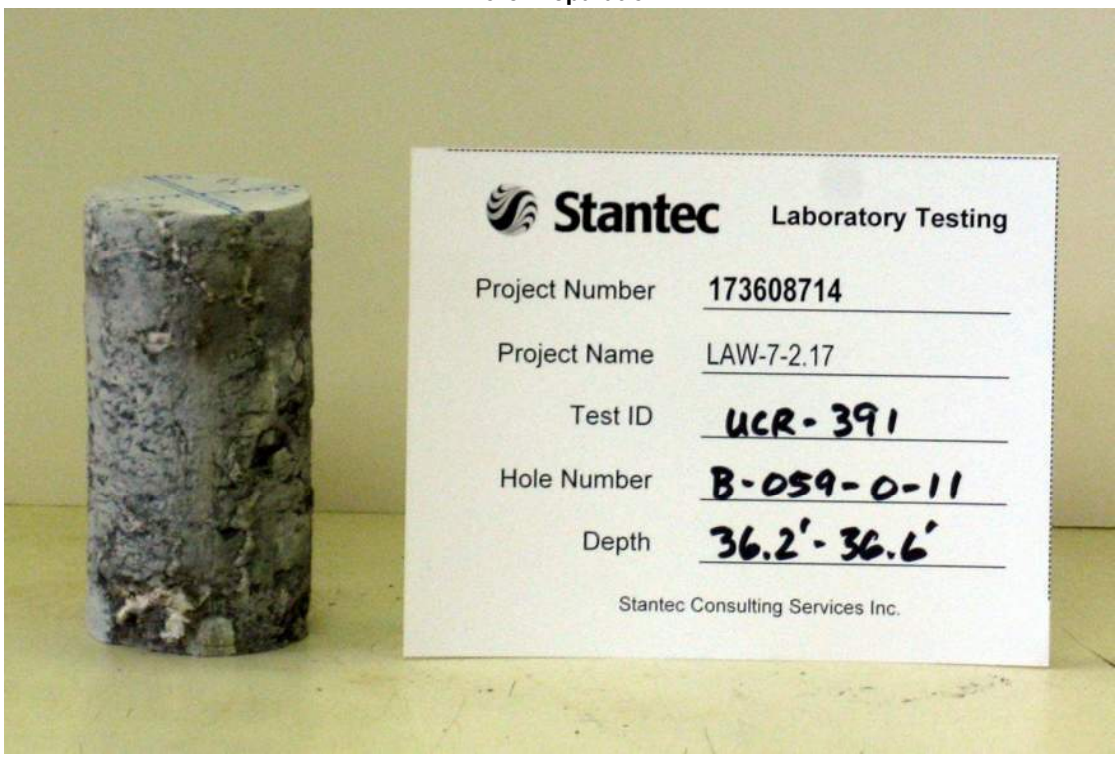


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, moderately hard | Lab ID UCR-391
Hole Number B-059-0-11 | Depth (ft) 36.2'-36.6'
Test Type Unconfined compressive strength

Core Preparation



Post Test

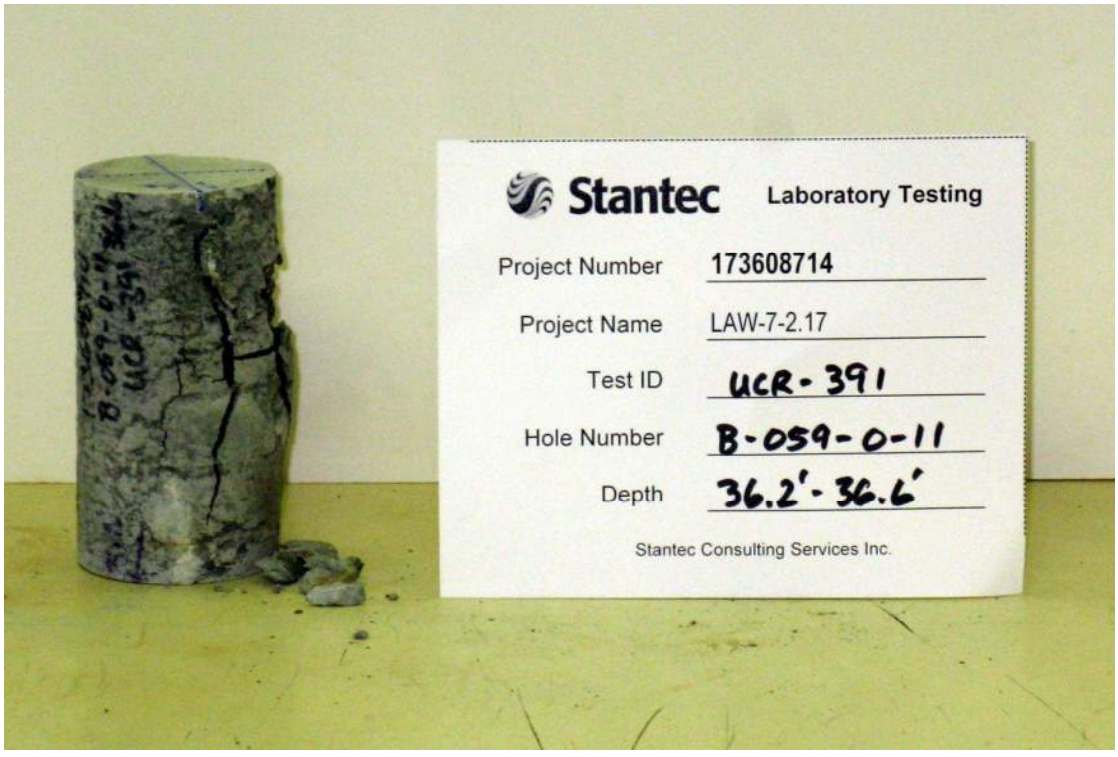


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, moderately hard | Lab ID UCR-391
Hole Number B-059-0-11 | Depth (ft) 36.2'-36.6'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Claystone, tan, moderately hard	Lab ID	UCR-392
Hole Number	B-059-0-11	Depth (ft) 38.2'-38.6'	Date Received 06-22-2011
Temperature (^{o}C)	21.4	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	3.961	Wet Unit Weight (pcf)	155.2
Perpendicularity	Pass	Diameter (in)	1.951	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	2.990	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 13

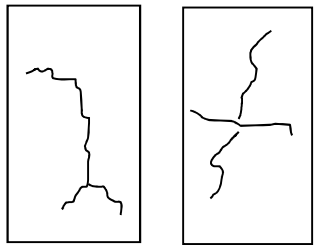
Peak Load (lbf) 3063

Failure Type Undetermined

Compressive Strength (psi) 1025

Compressive Strength (tsf) 74

Failure Sketches

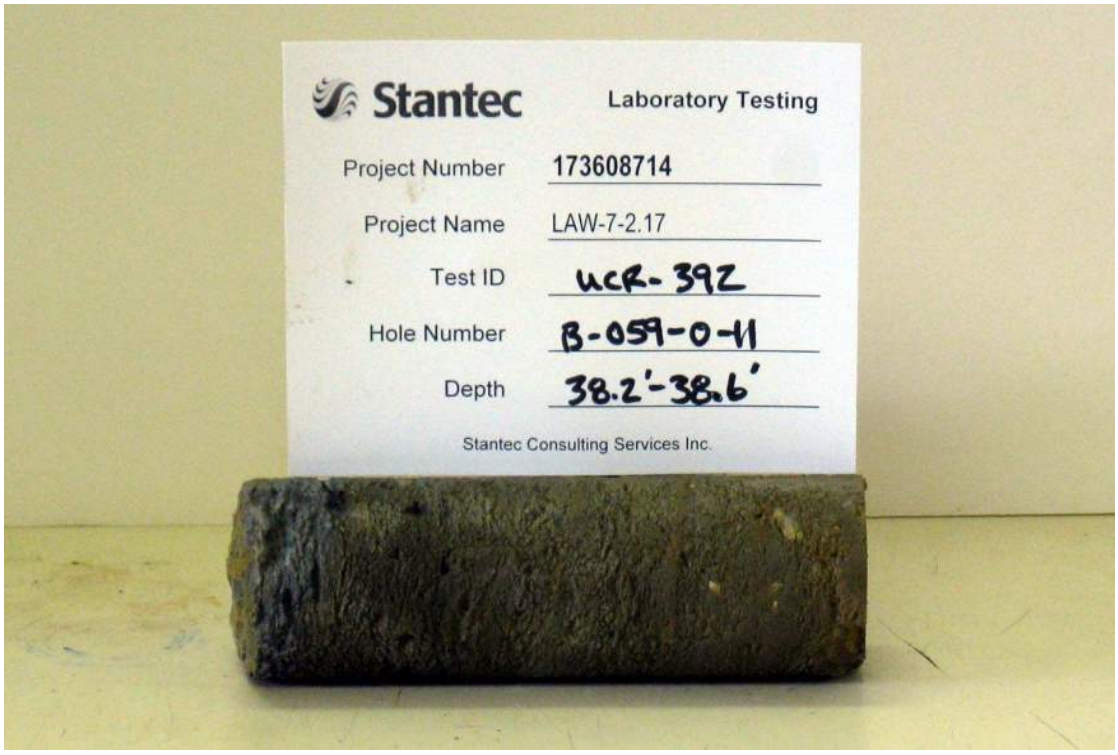


Comments

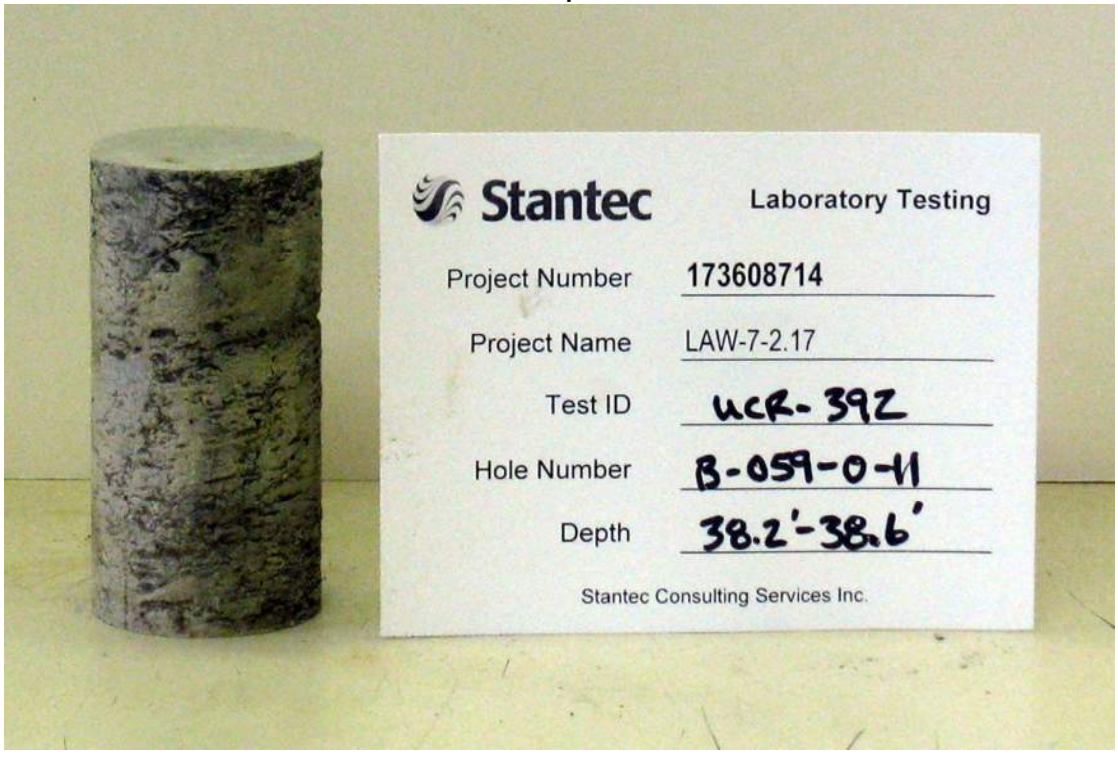
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, tan, moderately hard | Lab ID UCR-392
Hole Number B-059-0-11 | Depth (ft) 38.2'-38.6'
Test Type Unconfined compressive strength

As Received



Core Preparation

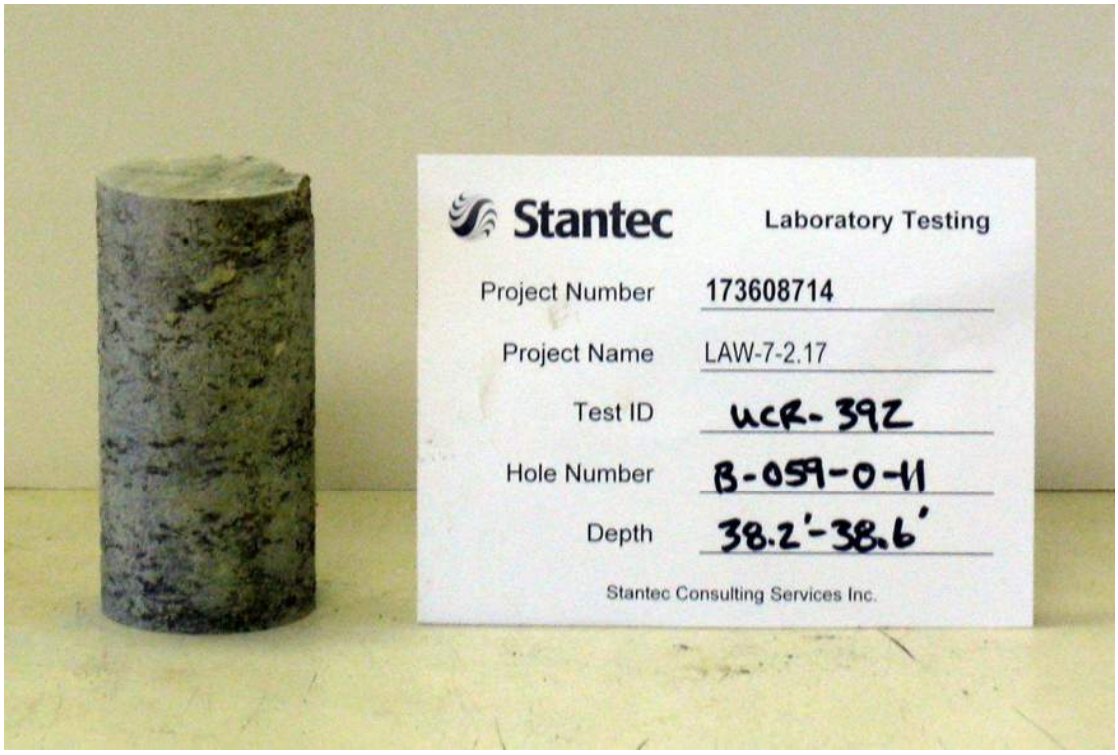


Stantec

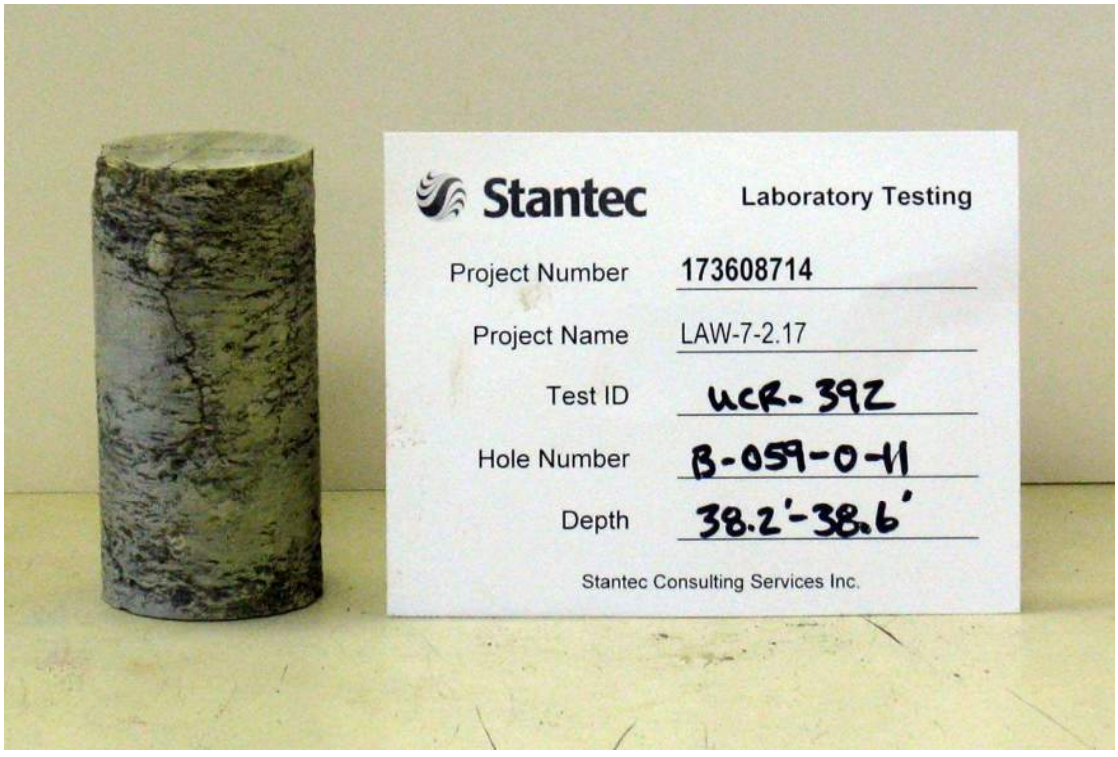
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, tan, moderately hard | Lab ID UCR-392
Hole Number B-059-0-11 | Depth (ft) 38.2'-38.6'
Test Type Unconfined compressive strength

Post Test



Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Shale, brown, moderately hard	Lab ID	UCR-394
Hole Number	B-059-0-11	Depth (ft) 41.1'-41.5'	Date Received 06-22-2011
Temperature (^{o}C)	21.7	Moisture Condition As received, moist	Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.183	Wet Unit Weight (pcf)	162.7
Perpendicularity	Pass	Diameter (in)	1.960	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.016	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 81

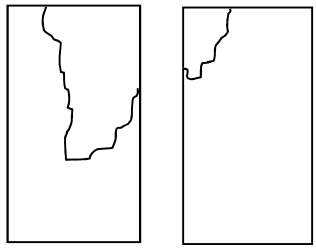
Peak Load (lbf) 12240

Failure Type Undetermined

Compressive Strength (psi) 4060

Compressive Strength (tsf) 292

Failure Sketches



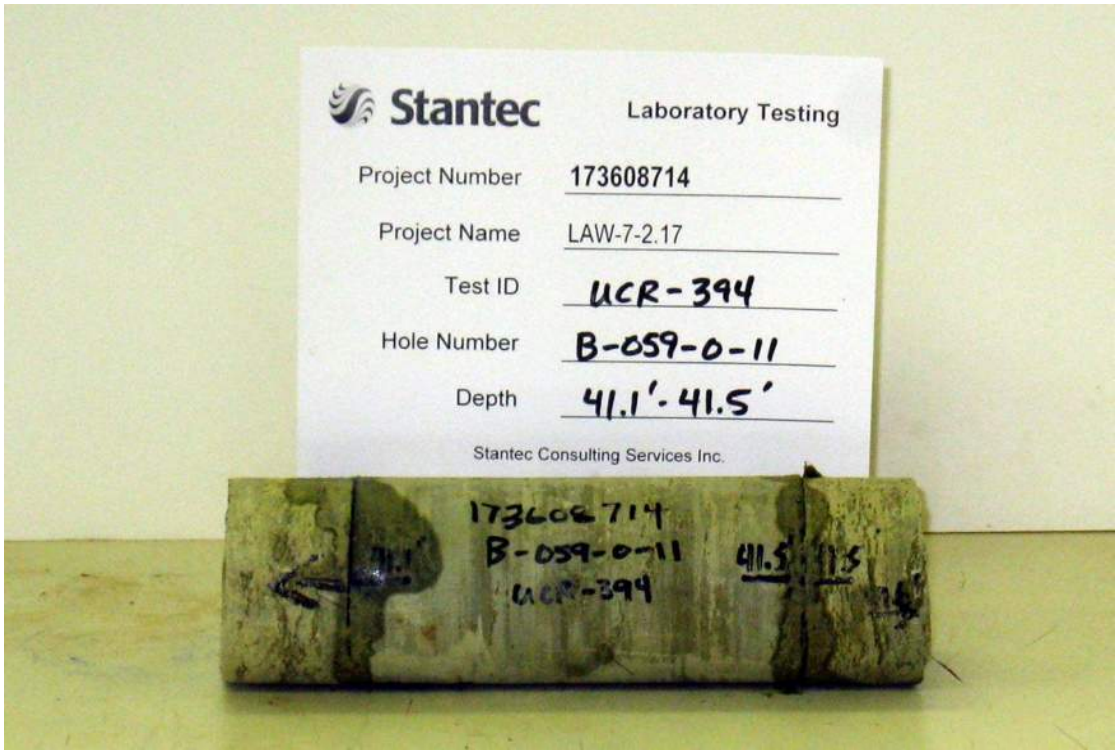
Comments

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brown, moderately hard | Lab ID UCR-394
Hole Number B-059-0-11 | Depth (ft) 41.1'-41.5'
Test Type Unconfined compressive strength

As Received



Core Preparation

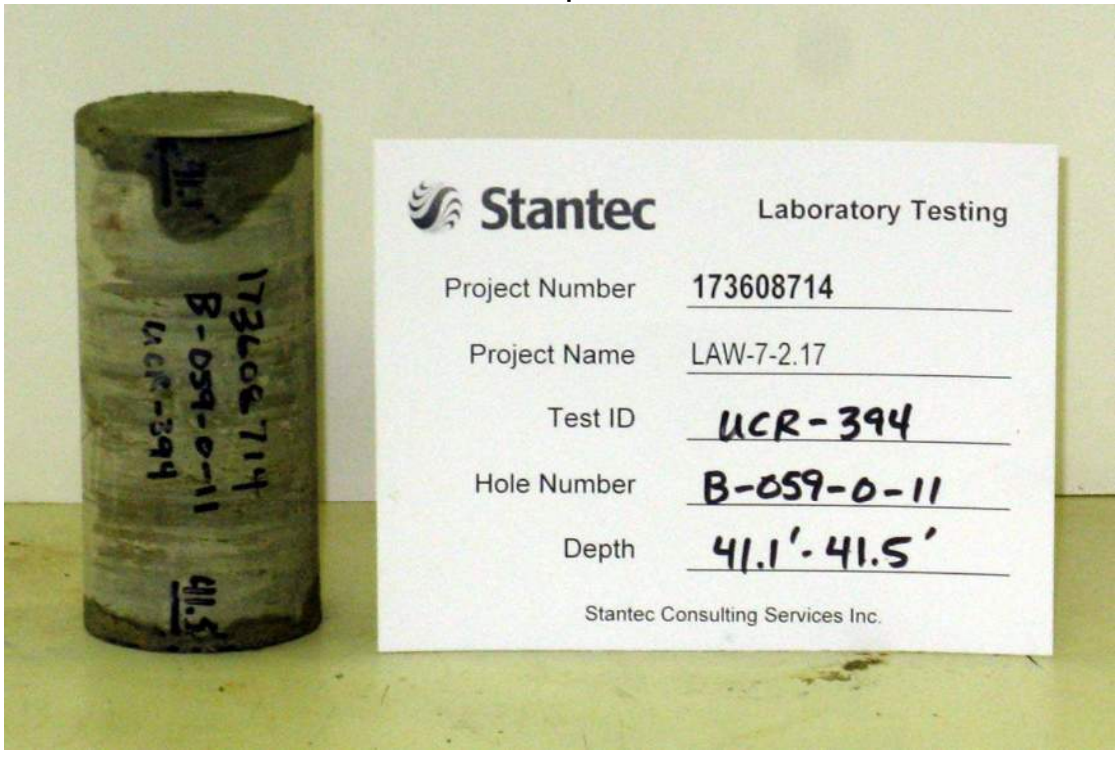
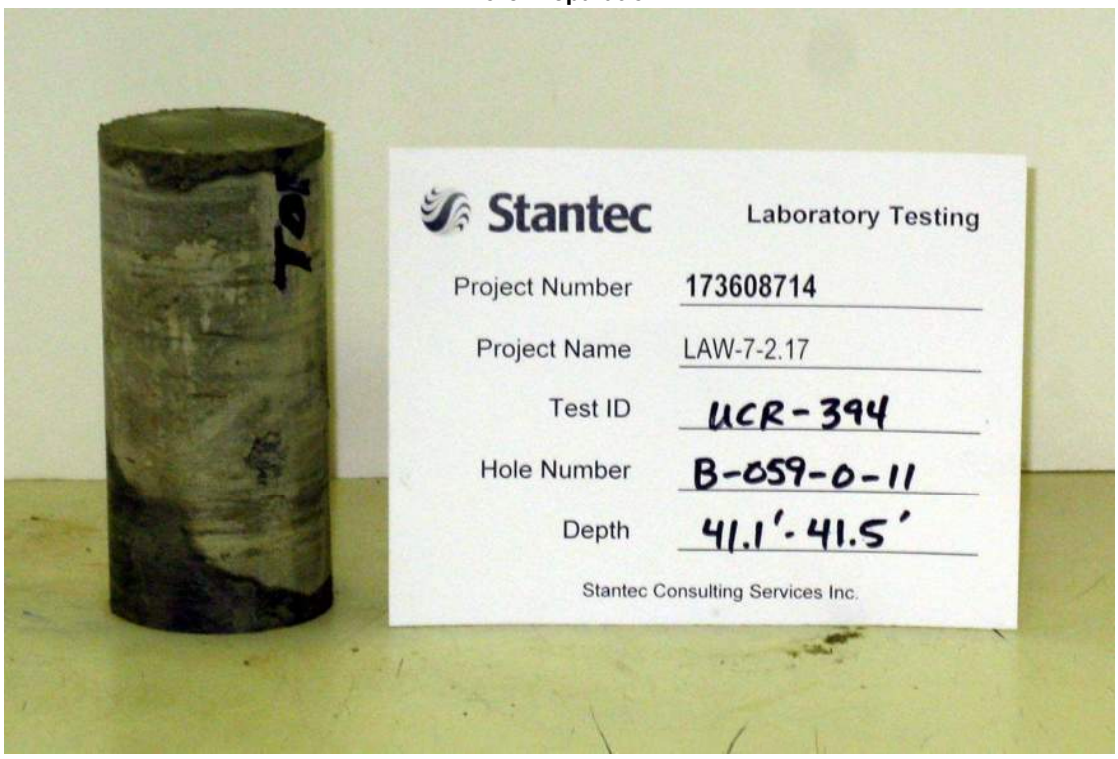


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brown, moderately hard | Lab ID UCR-394
Hole Number B-059-0-11 | Depth (ft) 41.1'-41.5'
Test Type Unconfined compressive strength

Core Preparation



Post Test

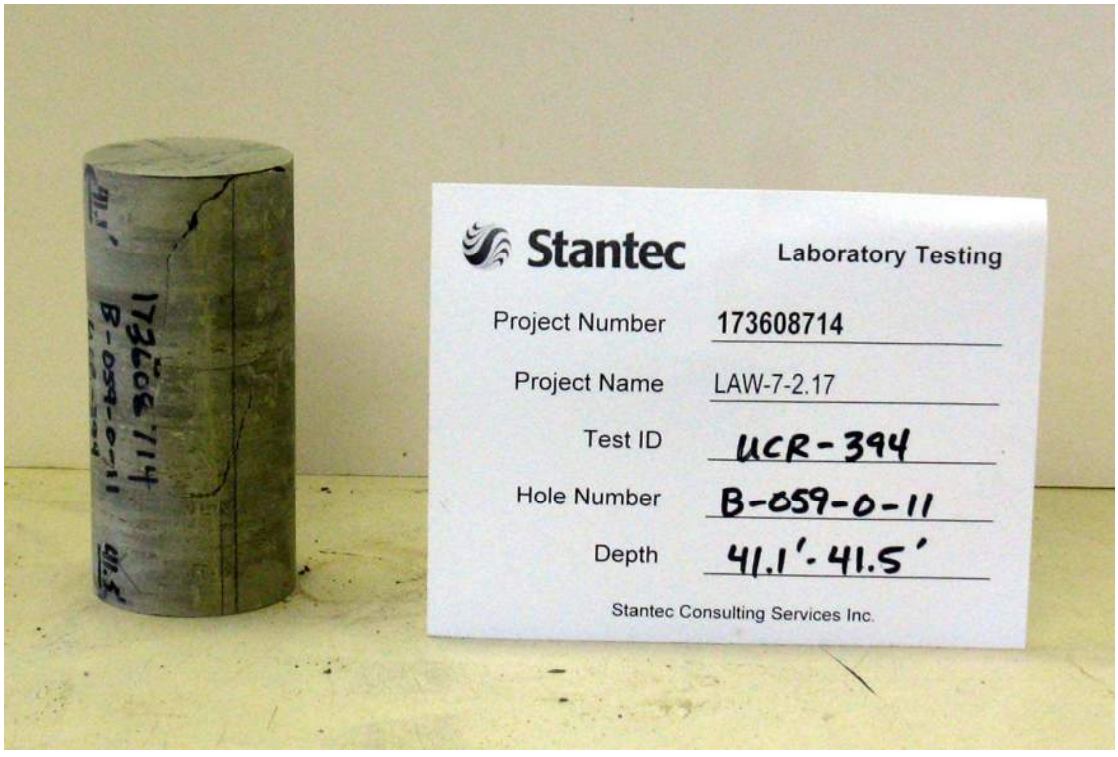
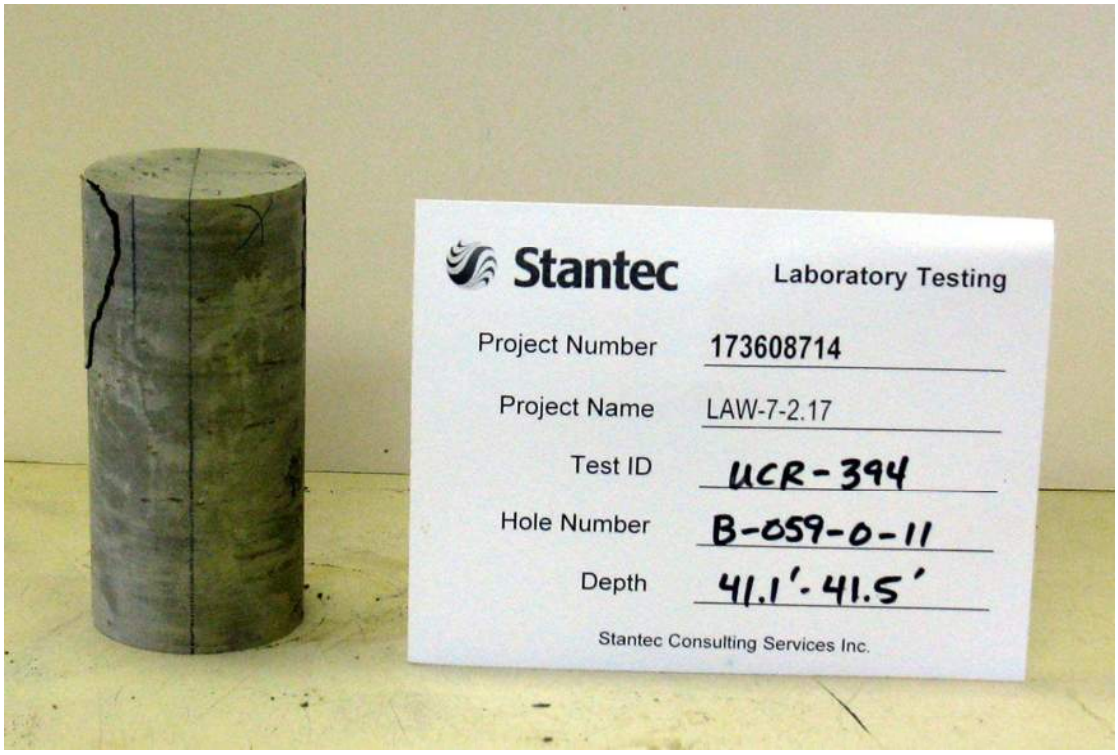


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, brown, moderately hard | Lab ID UCR-394
Hole Number B-059-0-11 | Depth (ft) 41.1'-41.5'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, tan, moderately hard, coarse grain, with mica	Lab ID	UCR-396
Hole Number	B-059-0-11	Depth (ft) 50.6'-51.2'	Date Received 06-22-2011
Temperature (^{o}C)	21.7	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.272	Wet Unit Weight (pcf)	146.8
Perpendicularity	Pass	Diameter (in)	1.972	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.053	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 82

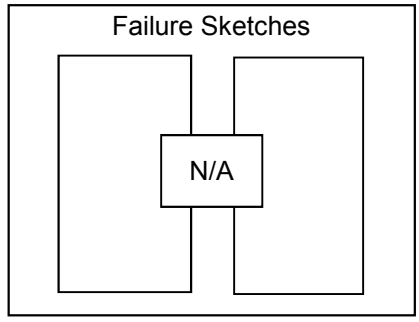
Peak Load (lbf) 15800

Failure Type Undetermined

Compressive Strength (psi) 5170

Compressive Strength (tsf) 373

Failure Sketches



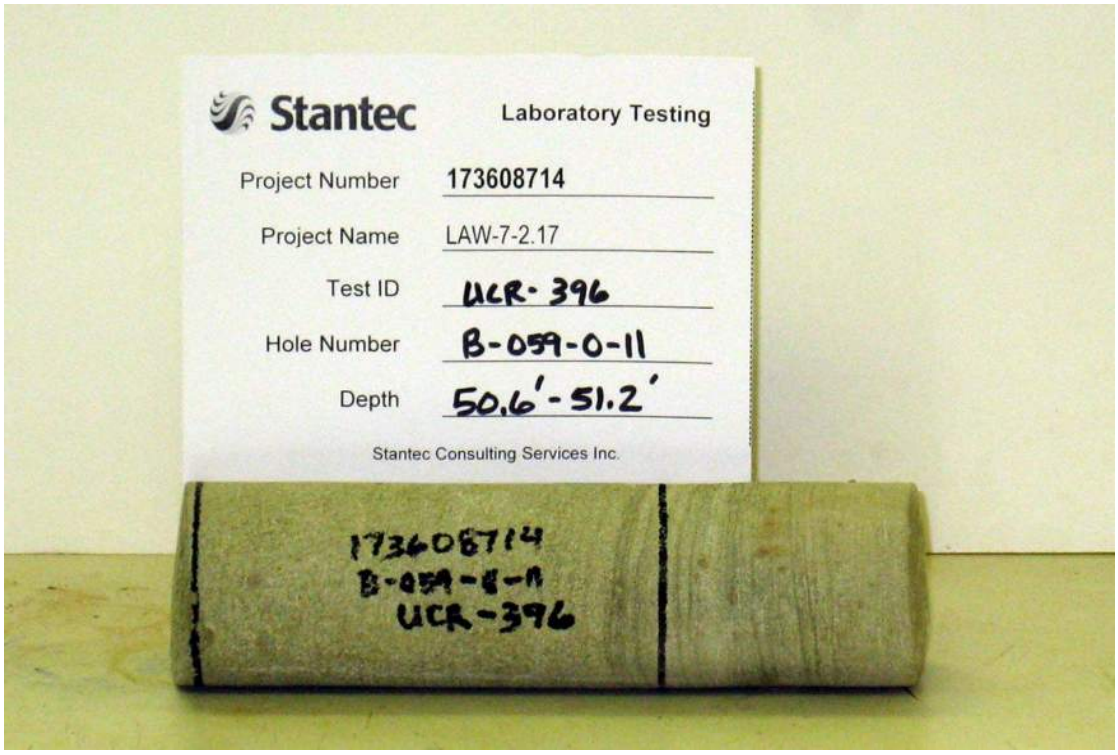
Comments No external faults observed after test.

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grain, with mica | Lab ID UCR-396
Hole Number B-059-0-11 | Depth (ft) 50.6'-51.2'
Test Type Unconfined compressive strength

As Received



Core Preparation

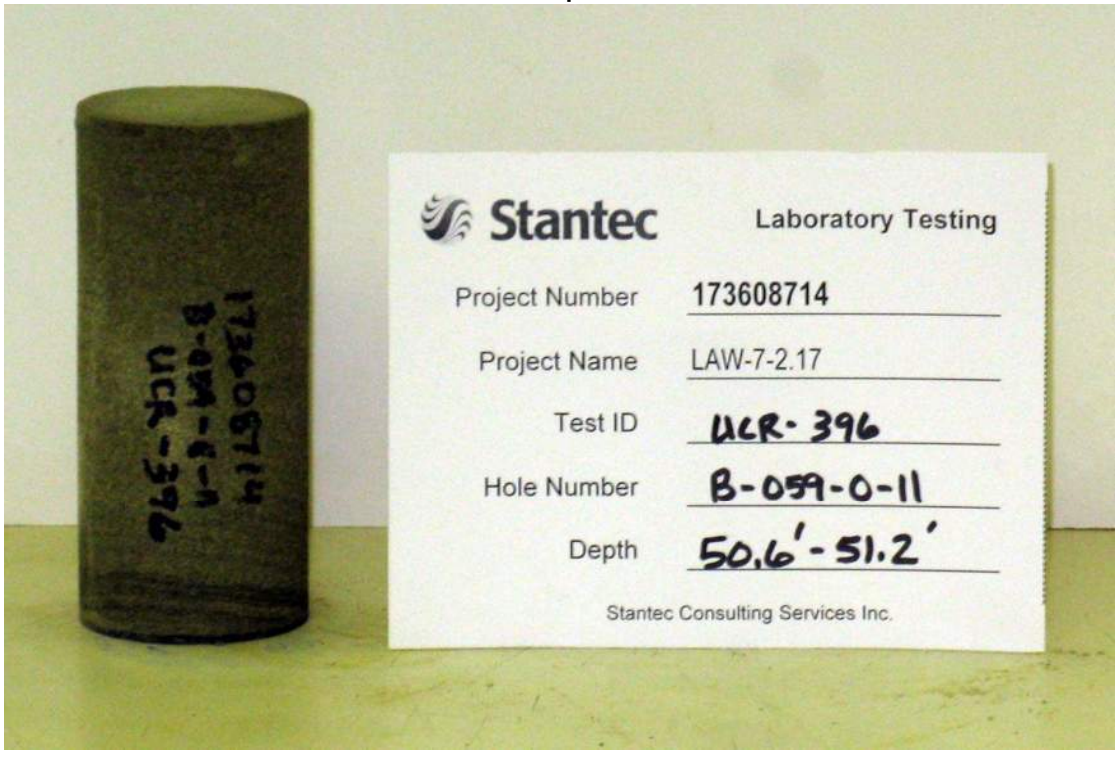
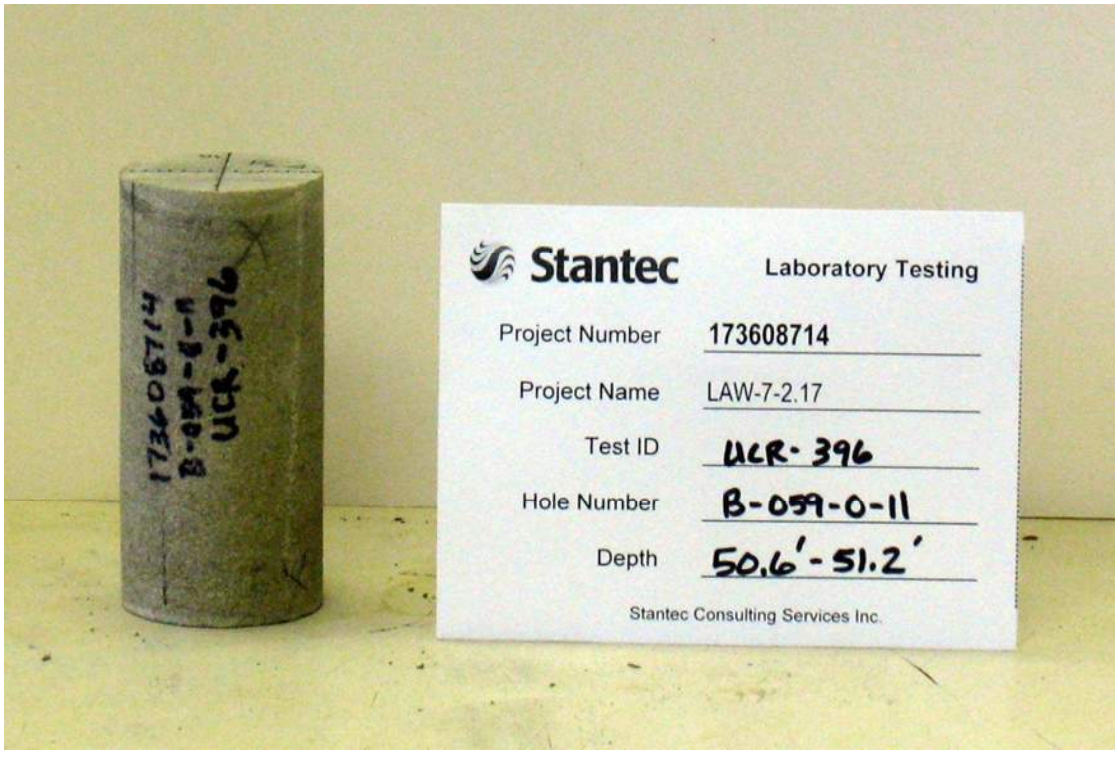


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grain, with mica | Lab ID UCR-396
Hole Number B-059-0-11 | Depth (ft) 50.6'-51.2'
Test Type Unconfined compressive strength

Core Preparation

Post Test



Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grain, with mica | Lab ID UCR-396
Hole Number B-059-0-11 | Depth (ft) 50.6'-51.2'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Shale, gray, moderately hard	Lab ID	UCR-400
Hole Number	B-059-0-11	Depth (ft) 76.1'-76.5'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.173	Wet Unit Weight (pcf)	164.6
Perpendicularity	N/A	Diameter (in)	1.959	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	3.015	Moisture Content (%)	N/A
Parallelism	N/A				

Loading Rate (lbf/sec) 76

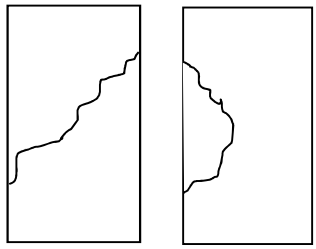
Peak Load (lbf) 7963

Failure Type Shear

Compressive Strength (psi) 2641

Compressive Strength (tsf) 190

Failure Sketches



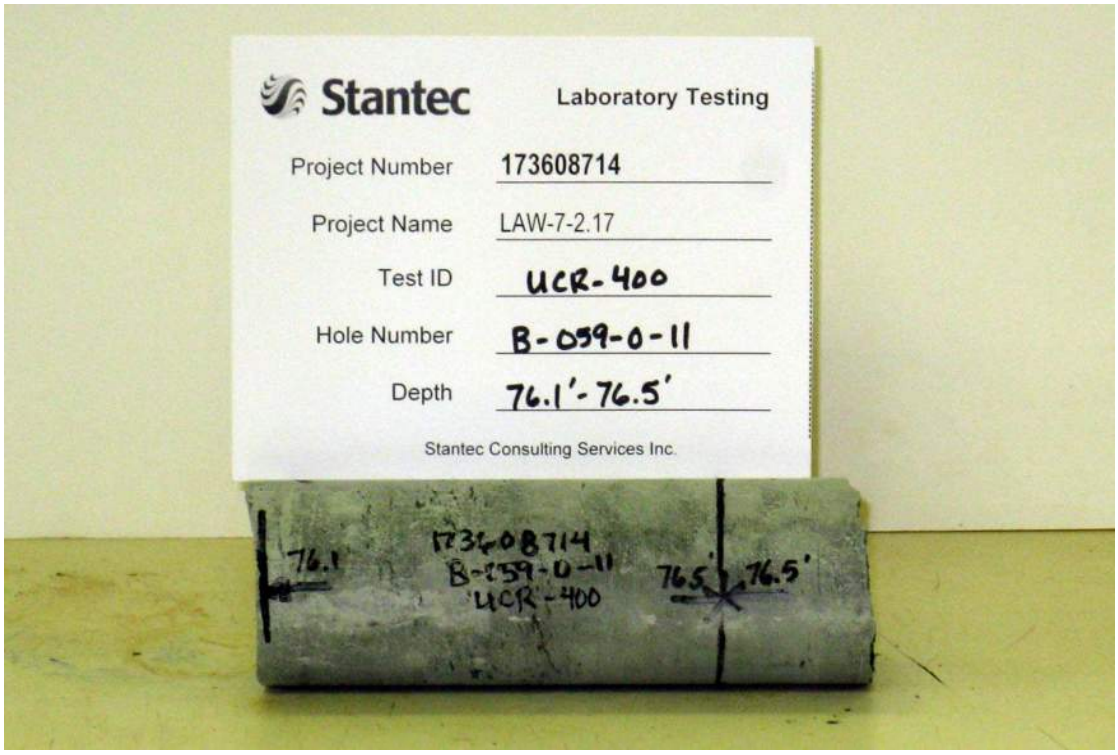
Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

Stantec

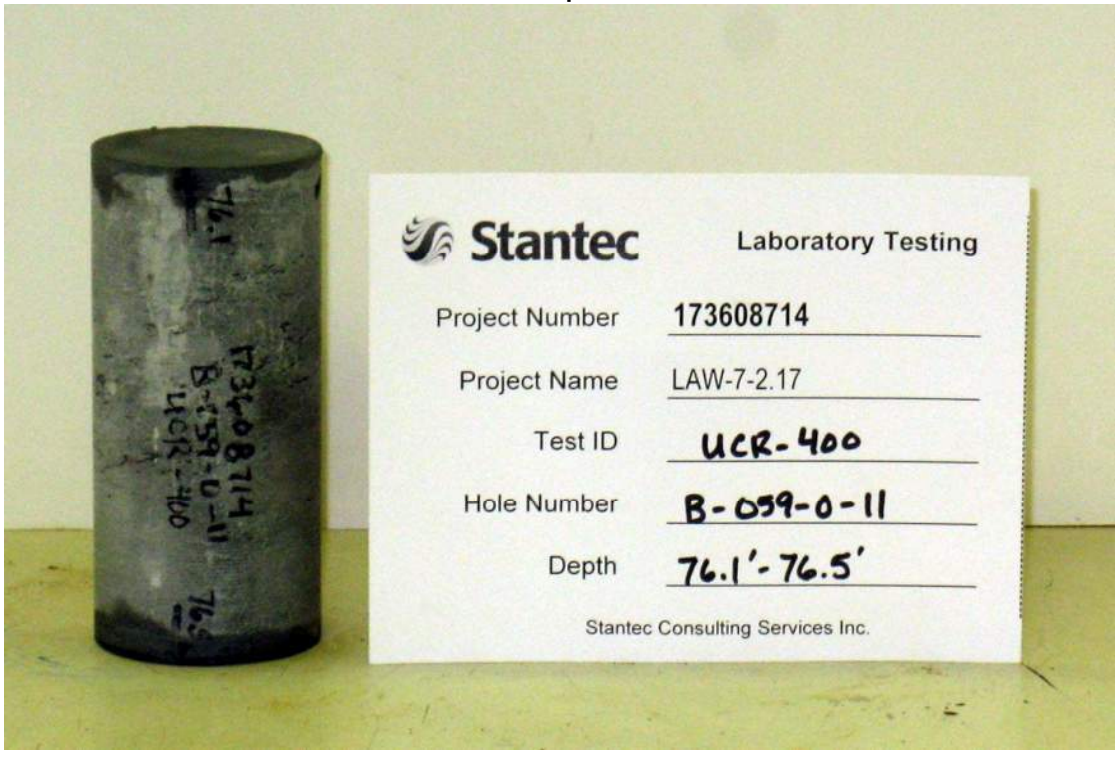
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-400
Hole Number B-059-0-11 | Depth (ft) 76.1'-76.5'
Test Type Unconfined compressive strength

As Received



Core Preparation

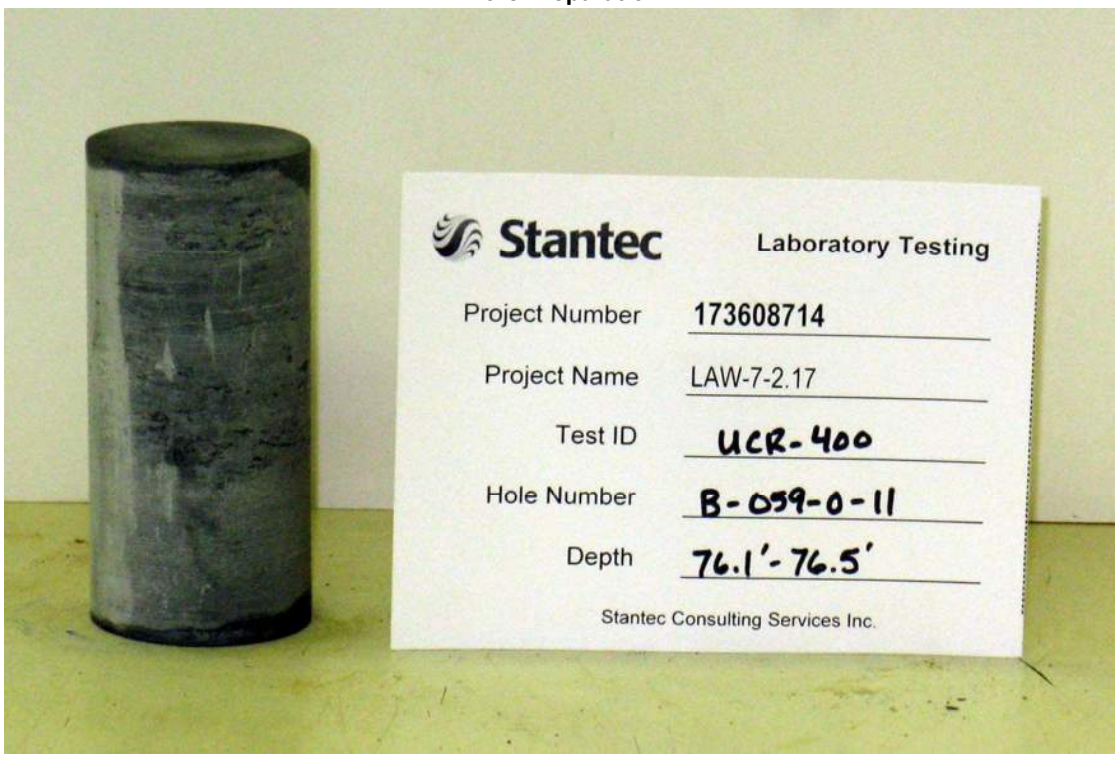


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-400
Hole Number B-059-0-11 | Depth (ft) 76.1'-76.5'
Test Type Unconfined compressive strength

Core Preparation



Post Test

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-400
Hole Number B-059-0-11 | Depth (ft) 76.1'-76.5'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, tan, moderately hard, coarse grained	Lab ID	UCR-403
Hole Number	B-058-0-11	Depth (ft) 50.6'-51.2'	Date Received 06-22-2011
Temperature (^{o}C)	21.7	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.250	Wet Unit Weight (pcf)	154.3
Perpendicularity	Pass	Diameter (in)	1.971	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.052	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec) 94

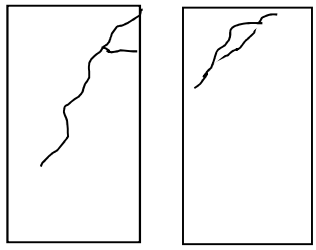
Peak Load (lbf) 14508

Failure Type Shear

Compressive Strength (psi) 4750

Compressive Strength (tsf) 342

Failure Sketches

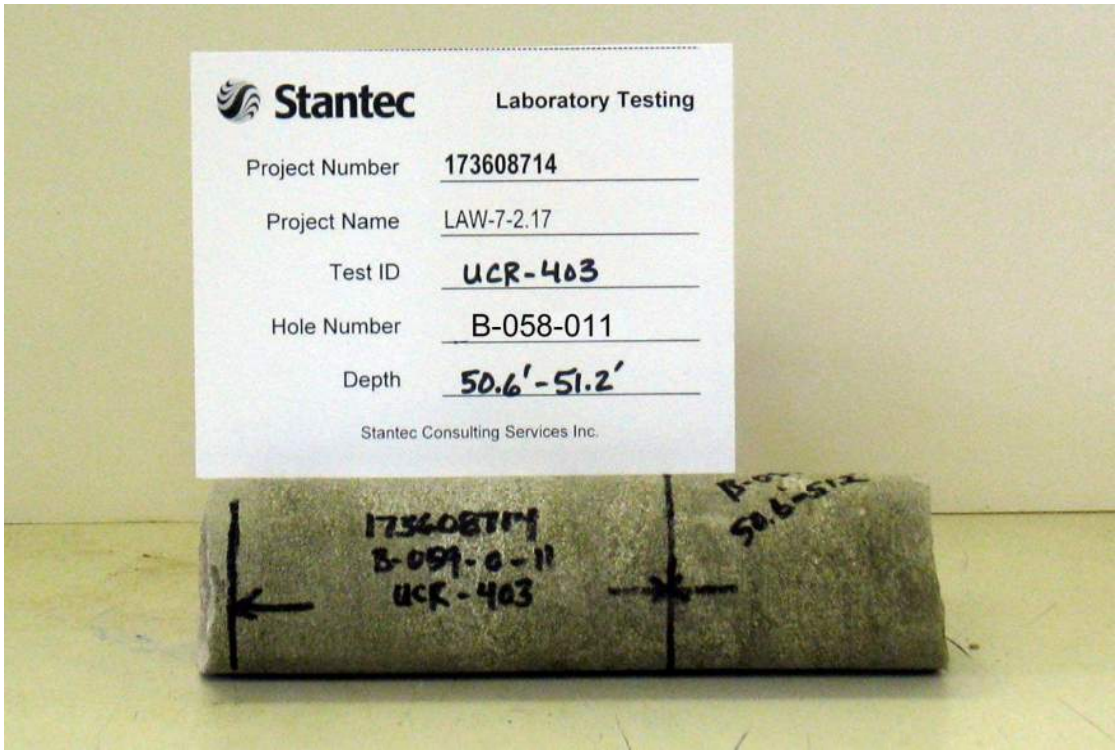


Comments

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grained | Lab ID UCR-403
Hole Number B-058-0-11 | Depth (ft) 50.6'-51.2'
Test Type Unconfined compressive strength

As Received



Core Preparation

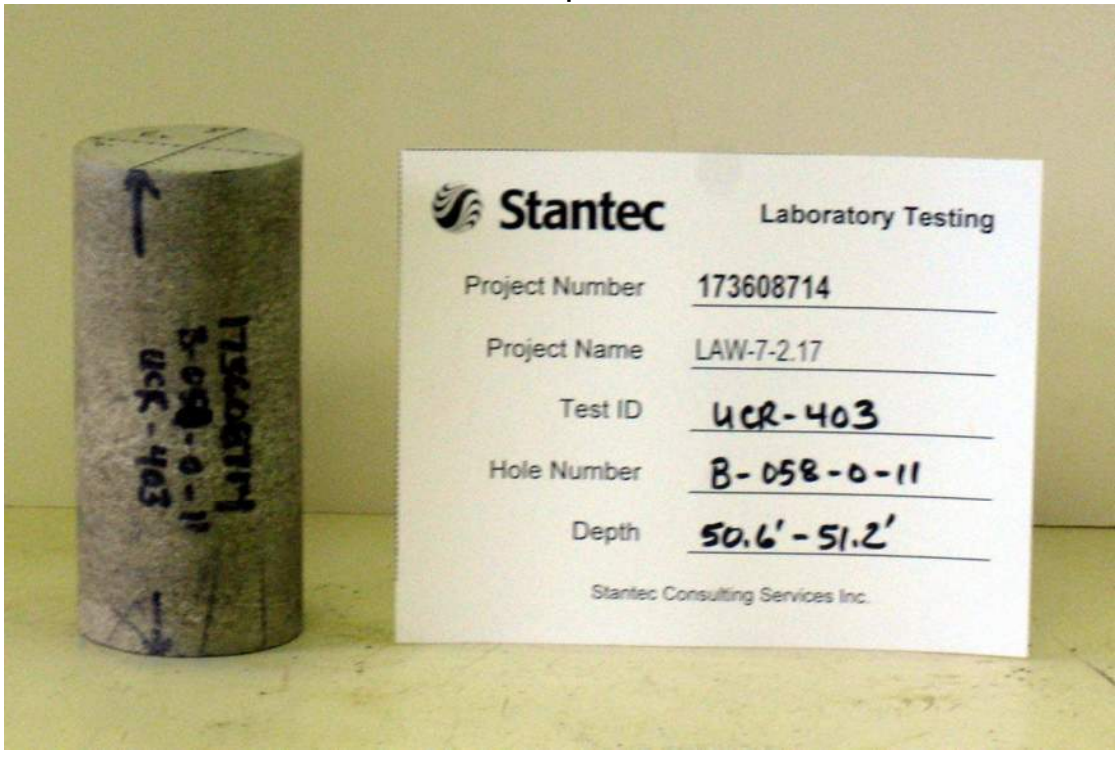
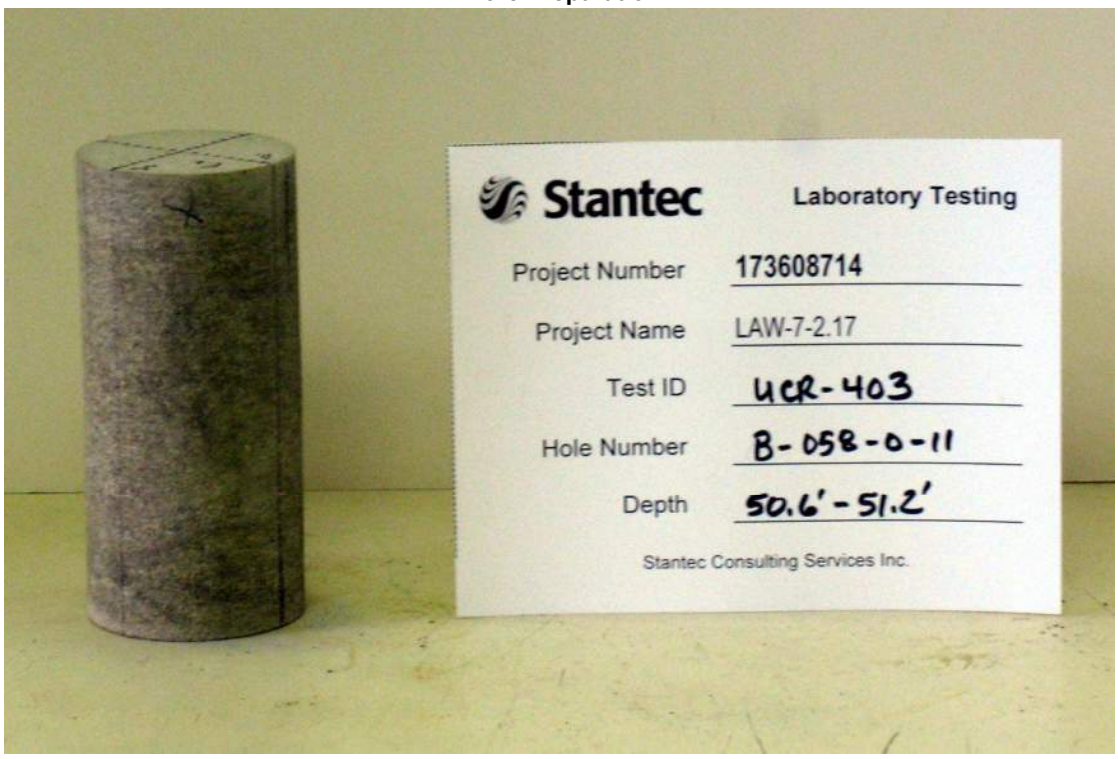


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grained | Lab ID UCR-403
Hole Number B-058-0-11 | Depth (ft) 50.6'-51.2'
Test Type Unconfined compressive strength

Core Preparation



Post Test

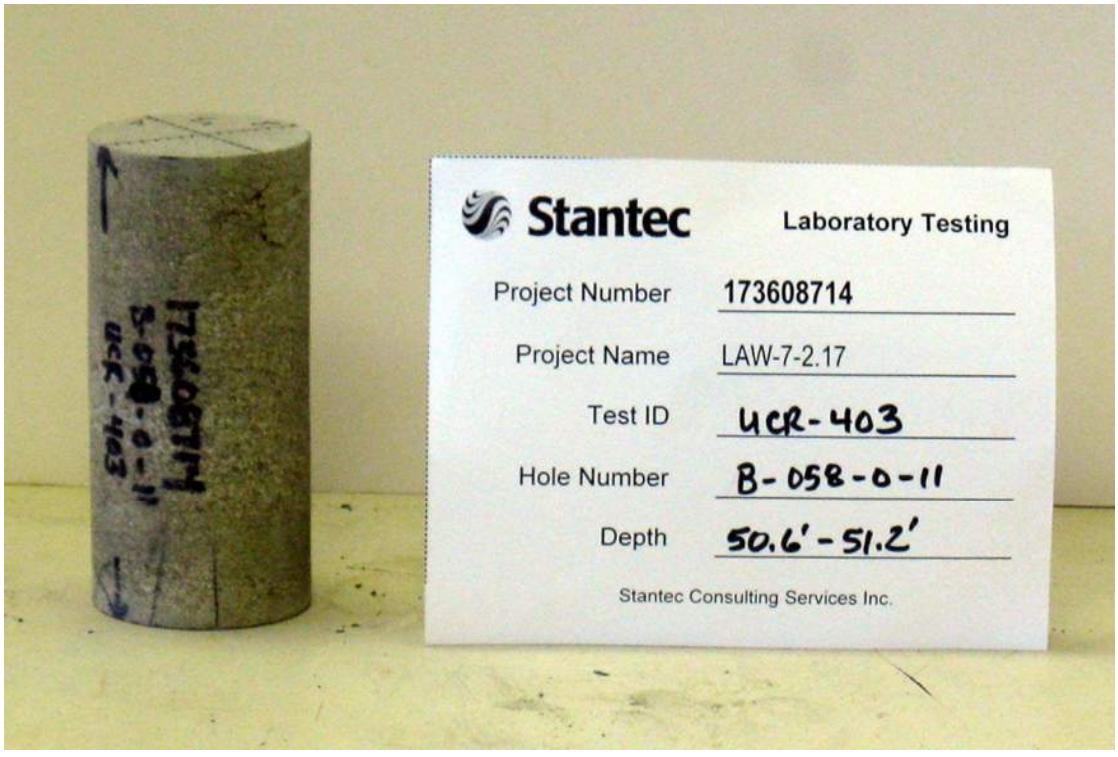
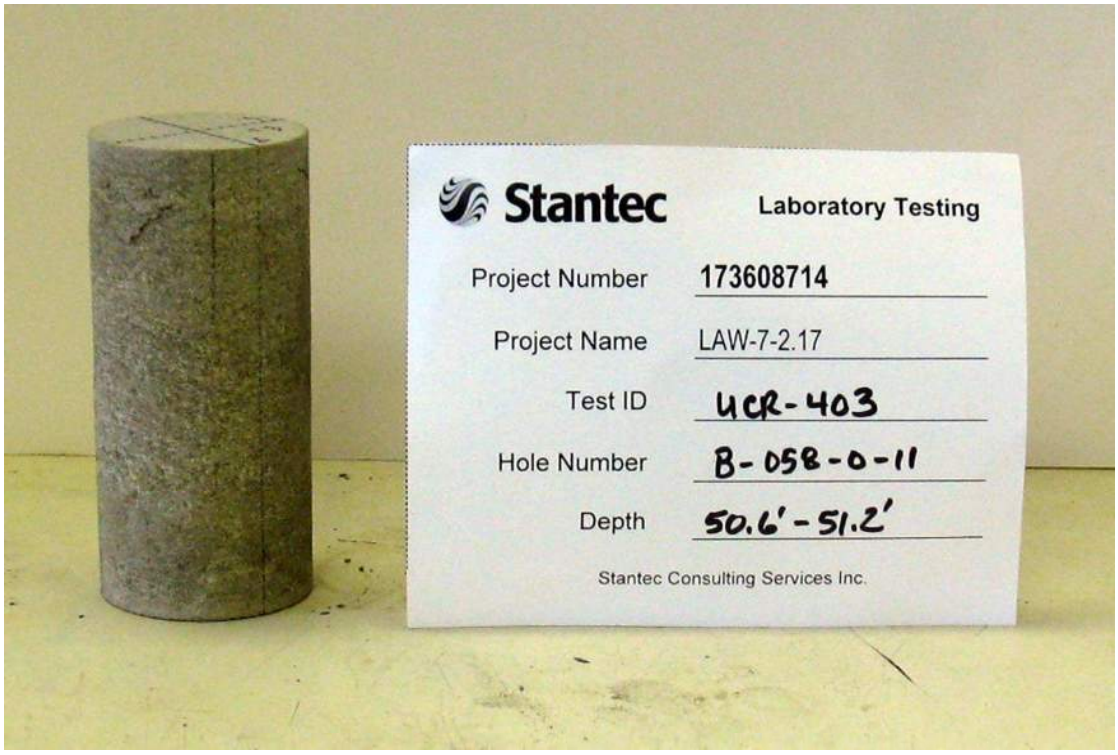


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, tan, moderately hard, coarse grained | Lab ID UCR-403
Hole Number B-058-0-11 | Depth (ft) 50.6'-51.2'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Claystone, red brown, moderately hard, conglomerate	Lab ID	UCR-405
Hole Number	B-058-0-11	Depth (ft) 63.7'-64.4'	Date Received 06-22-2011
Temperature (^{o}C)	21.4	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	N/A	Height (in)	4.272	Wet Unit Weight (pcf)	159.0
Perpendicularity	N/A	Diameter (in)	1.962	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	3.024	Moisture Content (%)	N/A
Parallelism	N/A				

Dimensions were not confirmed.

Loading Rate (lbf/sec) 12

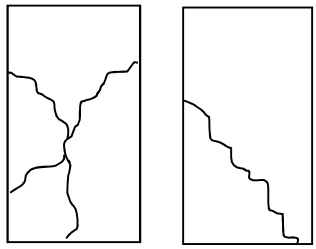
Peak Load (lbf) 1945

Failure Type Shear

Compressive Strength (psi) 643

Compressive Strength (tsf) 46

Failure Sketches

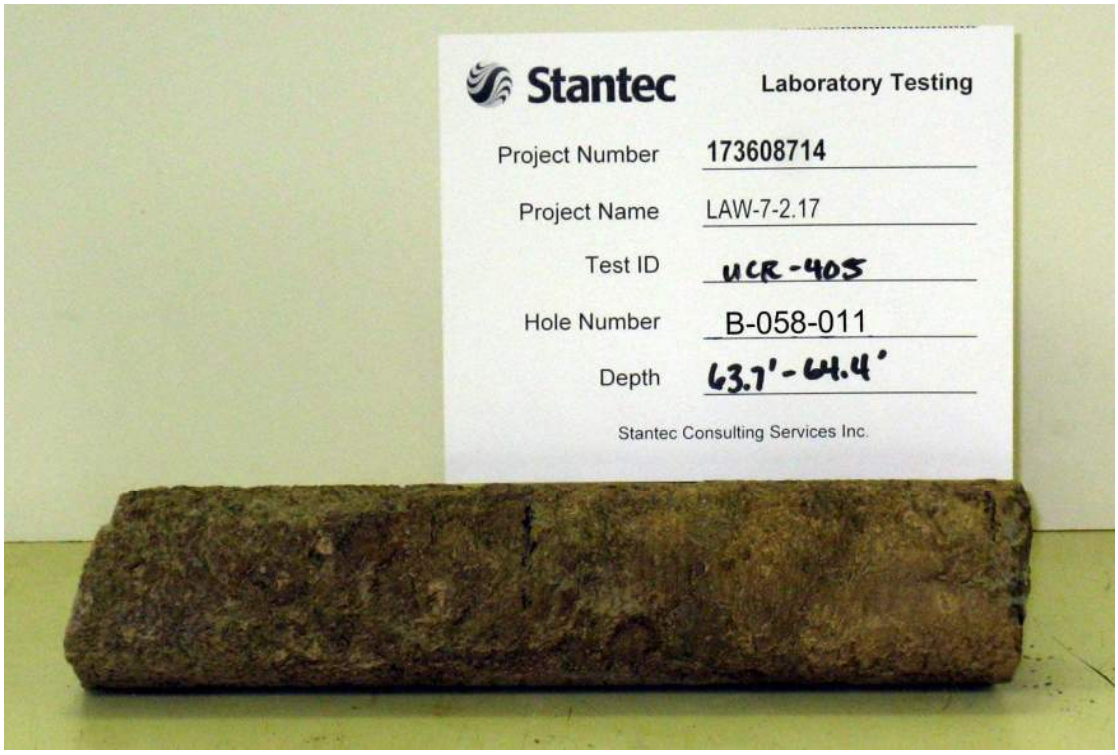


Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

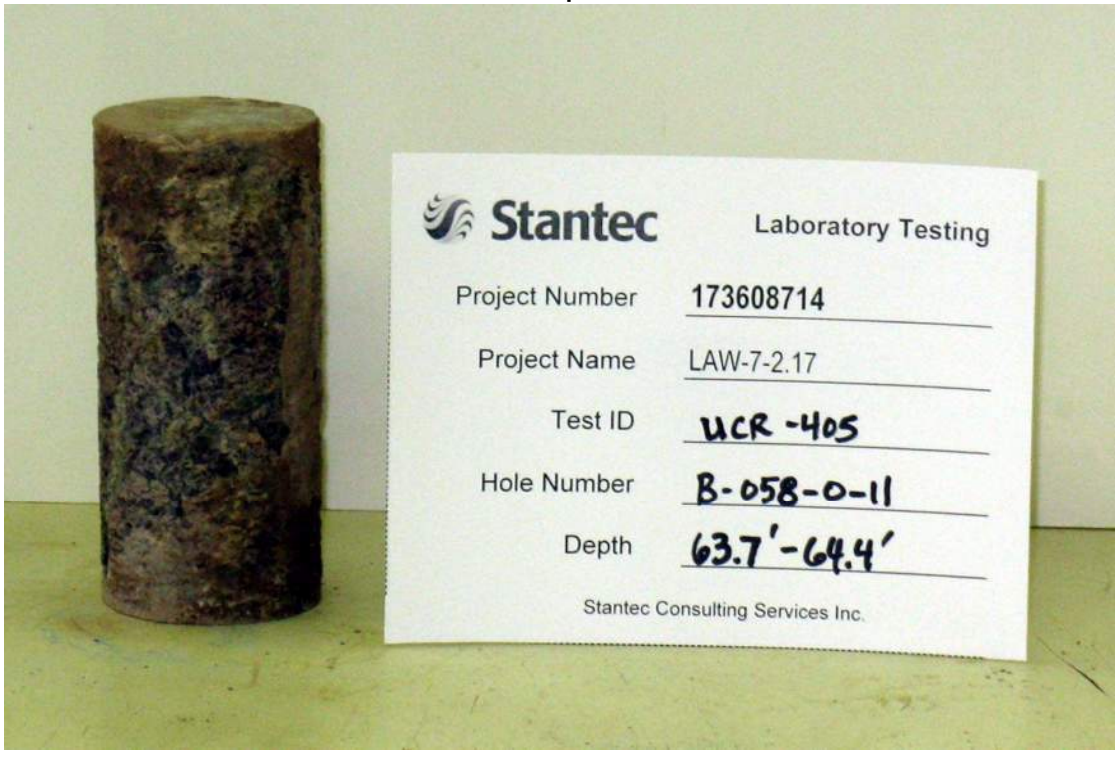
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, red brown, moderately hard, conglomerate | Lab ID UCR-405
Hole Number B-058-0-11 | Depth (ft) 63.7'-64.4'
Test Type Unconfined compressive strength

As Received



Core Preparation



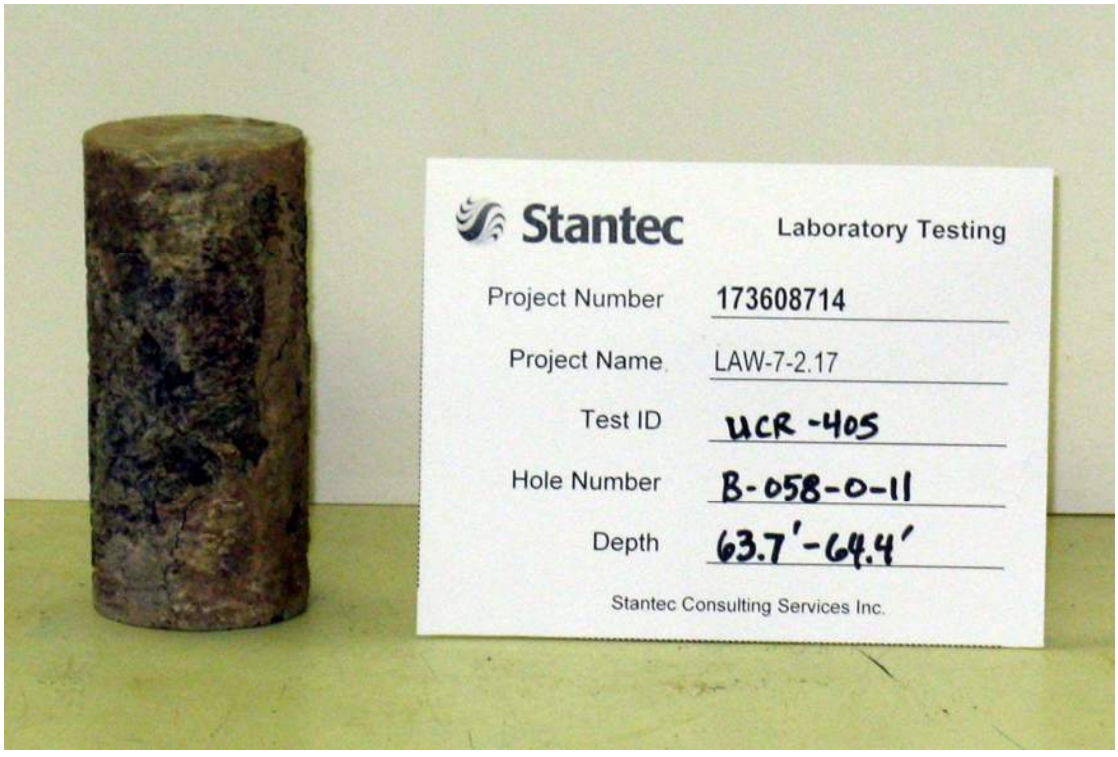
Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, red brown, moderately hard, conglomerate | Lab ID UCR-405
Hole Number B-058-0-11 | Depth (ft) 63.7'-64.4'
Test Type Unconfined compressive strength

Core Preparation

Post Test



Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, red brown, moderately hard, conglomerate | Lab ID UCR-405
Hole Number B-058-0-11 | Depth (ft) 63.7'-64.4'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Shale, gray, moderately hard	Lab ID	UCR-407
Hole Number	B-058-0-11	Depth (ft) 76.1'-76.8'	Date Received 06-22-2011

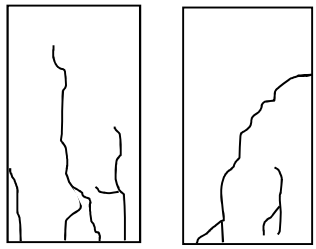
Temperature (^{o}C)	21.5	Moisture Condition	As received, moist	Date Tested	06-29-2011

Side Planeness	N/A	Height (in)	4.192	Wet Unit Weight (pcf)	161.4
Perpendicularity	N/A	Diameter (in)	1.961	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	3.020	Moisture Content (%)	N/A
Parallelism	N/A				

Dimensions were not confirmed.

Loading Rate (lbf/sec)	19
Peak Load (lbf)	5333
Failure Type	Cone and Shear
Compressive Strength (psi)	1766
Compressive Strength (tsf)	127

Failure Sketches



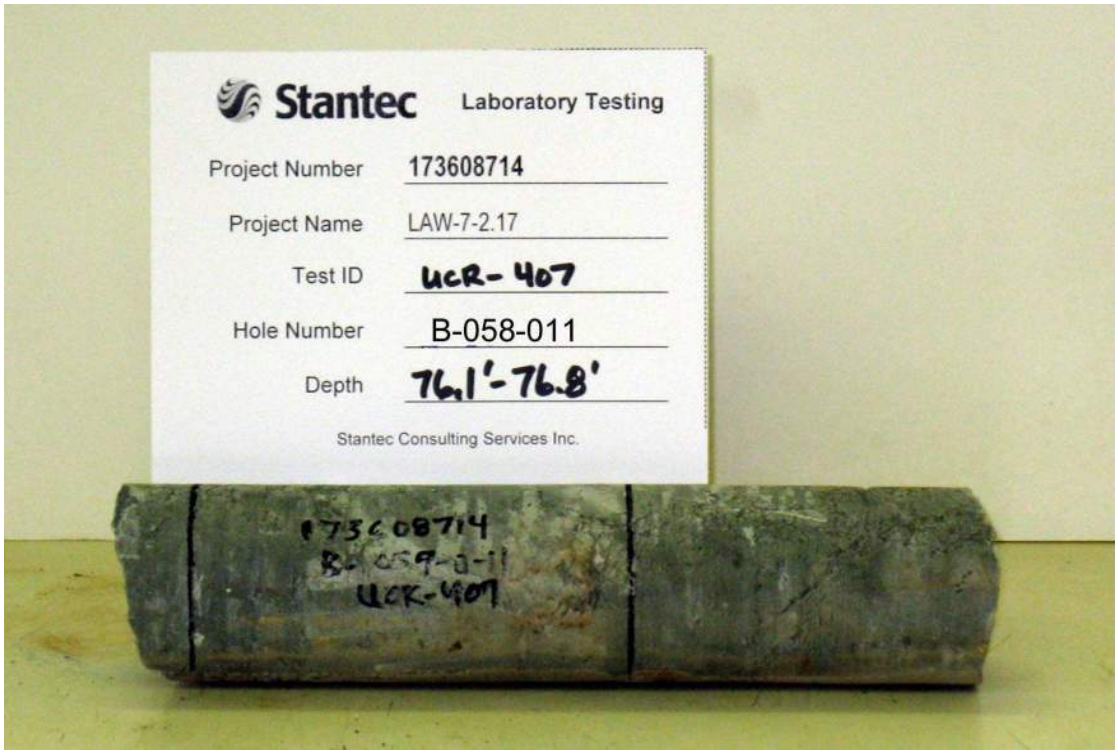
Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

Stantec

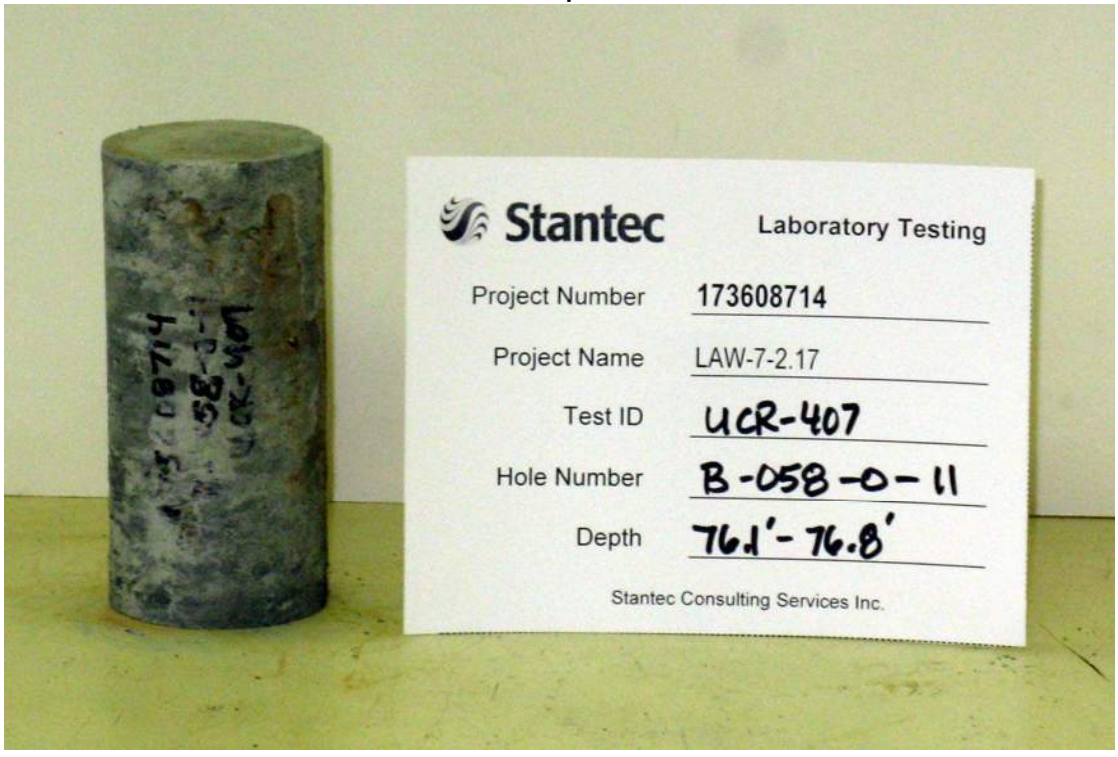
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-407
Hole Number B-058-0-11 | Depth (ft) 76.1'-76.8'
Test Type Unconfined compressive strength

As Received



Core Preparation

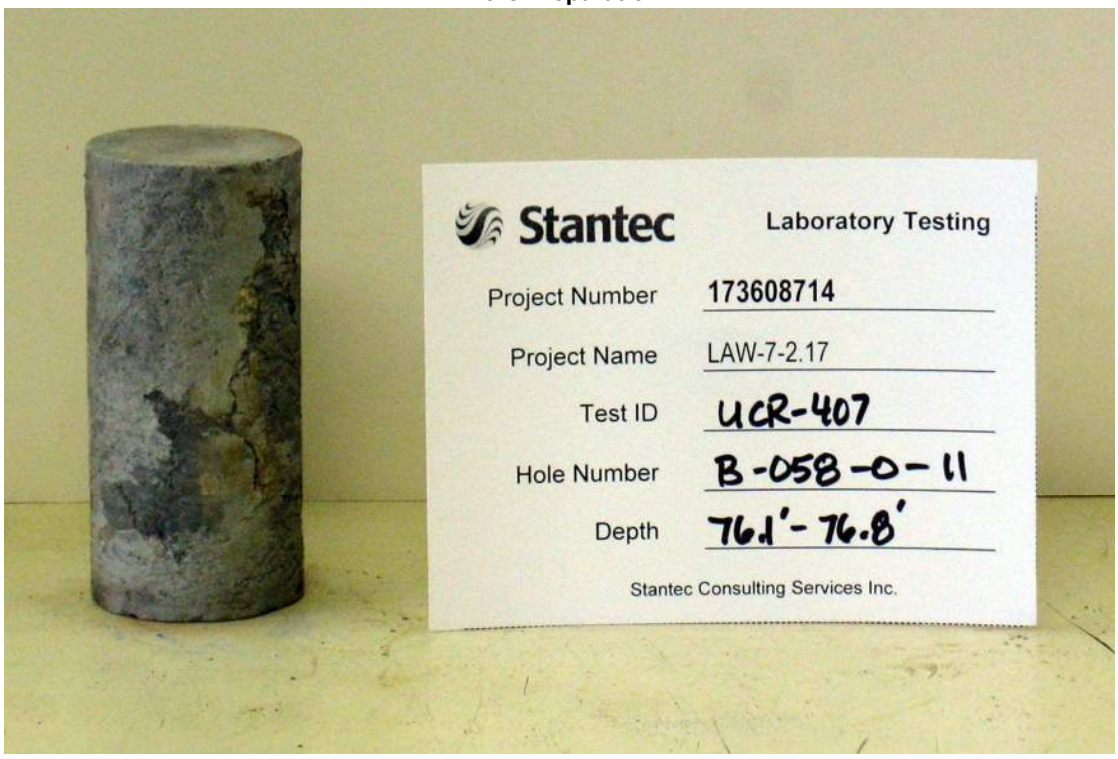


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-407
Hole Number B-058-0-11 | Depth (ft) 76.1'-76.8'
Test Type Unconfined compressive strength

Core Preparation



Post Test

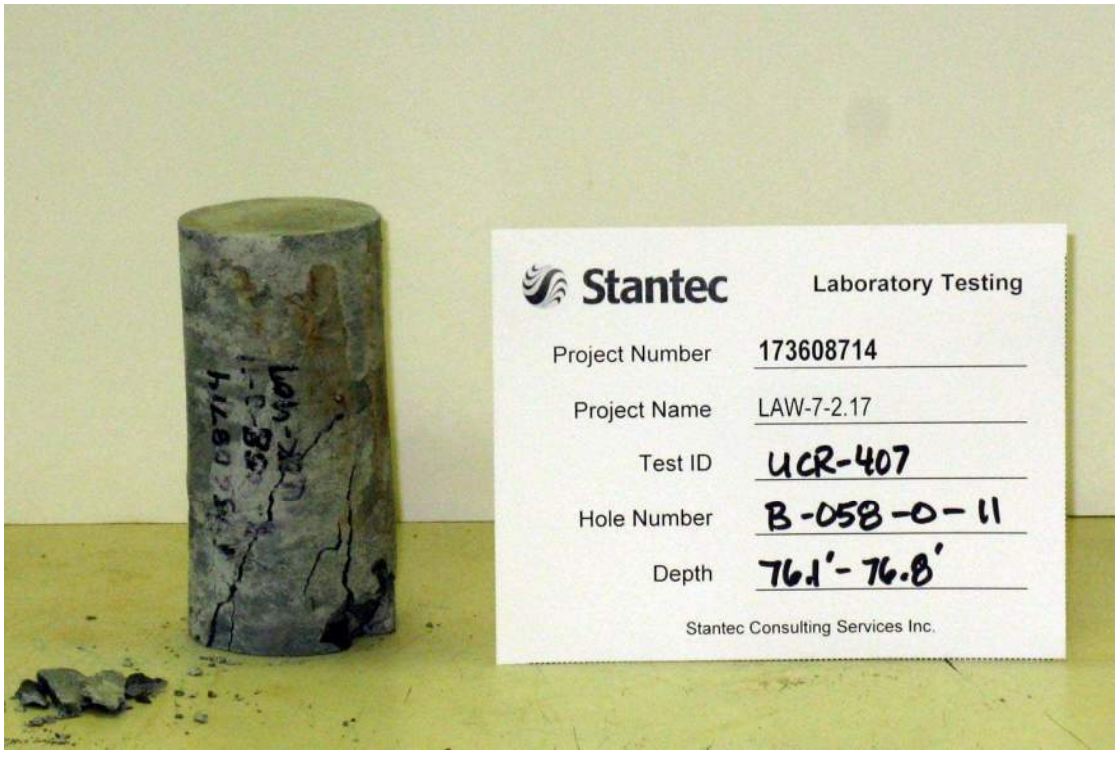


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Shale, gray, moderately hard | Lab ID UCR-407
Hole Number B-058-0-11 | Depth (ft) 76.1'-76.8'
Test Type Unconfined compressive strength

Post Test

Stantec

Unconfined Compressive Strength Of Intact Rock Core

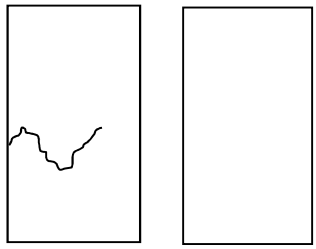
ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, gray, moderately hard, medium grained	Lab ID	UCR-409
Hole Number	B-066-0-11	Depth (ft) 19.7'-20.0'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
Date Tested	06-29-2011		

Side Planeness	Pass	Height (in)	4.370	Wet Unit Weight (pcf)	146.2
Perpendicularity	Pass	Diameter (in)	1.985	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.095	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec)	90
Peak Load (lbf)	13928
Failure Type	Undetermined
Compressive Strength (psi)	4500
Compressive Strength (tsf)	324

Failure Sketches

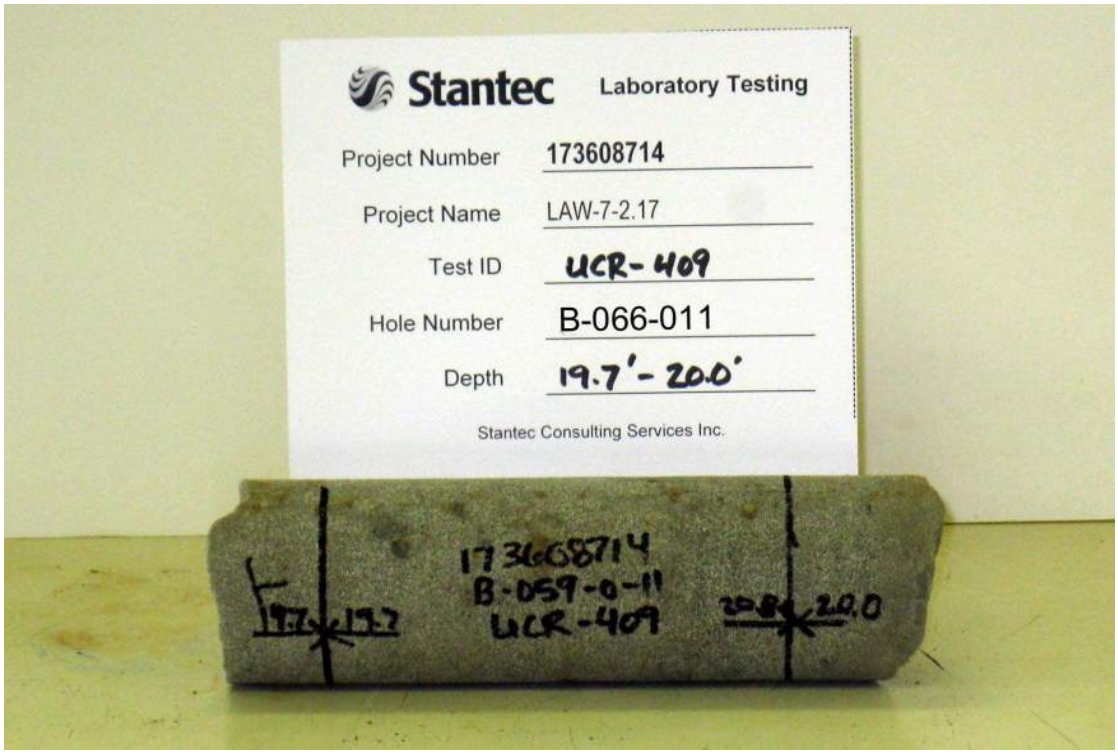


Comments

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, medium grained | Lab ID UCR-409
Hole Number B-066-0-11 | Depth (ft) 19.7'-20.0'
Test Type Unconfined compressive strength

As Received



Core Preparation

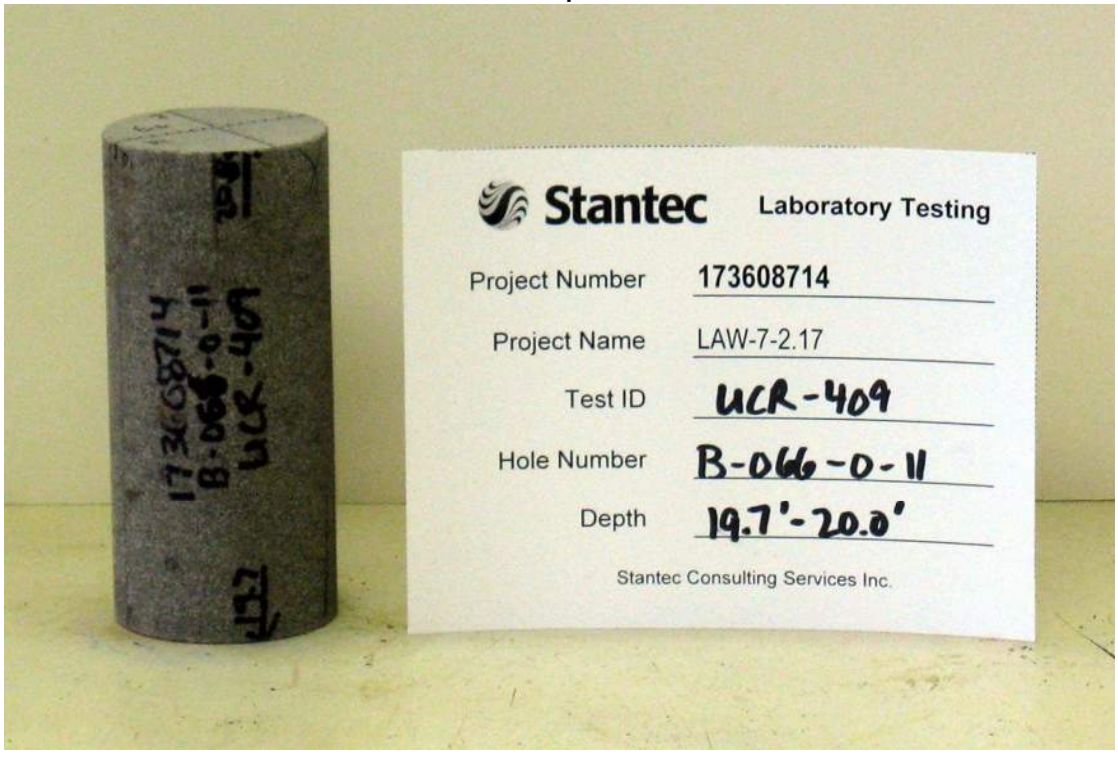
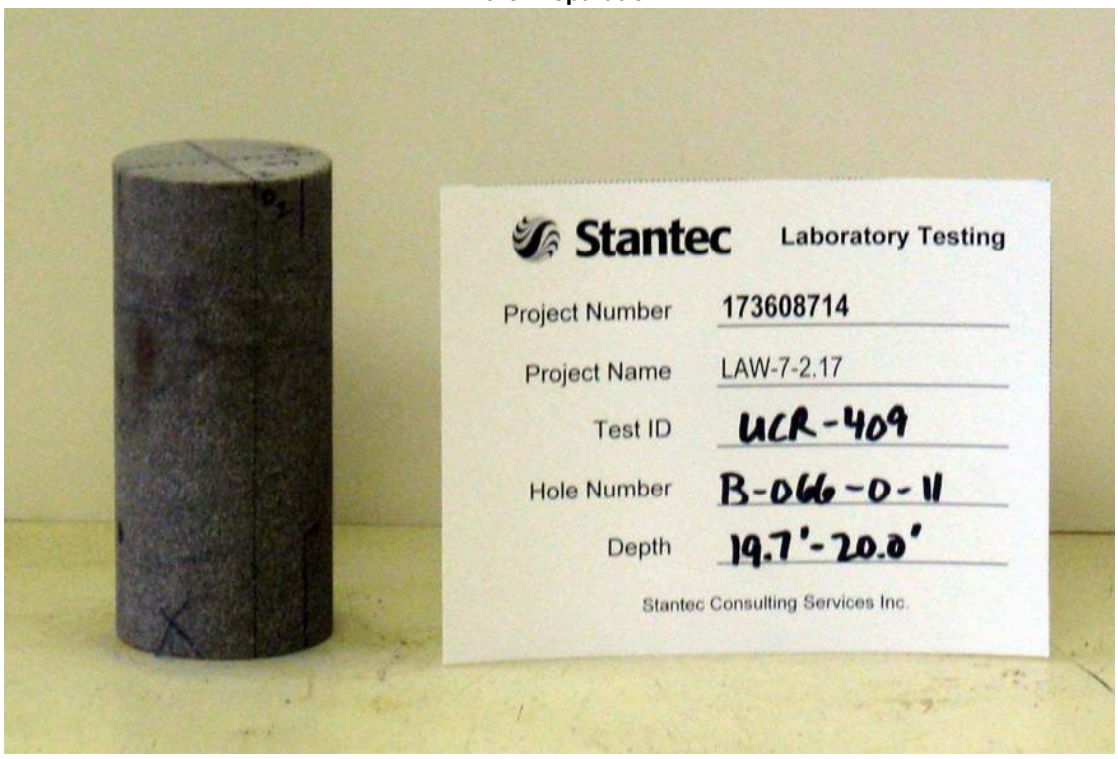


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, medium grained | Lab ID UCR-409
Hole Number B-066-0-11 | Depth (ft) 19.7'-20.0'
Test Type Unconfined compressive strength

Core Preparation



Post Test

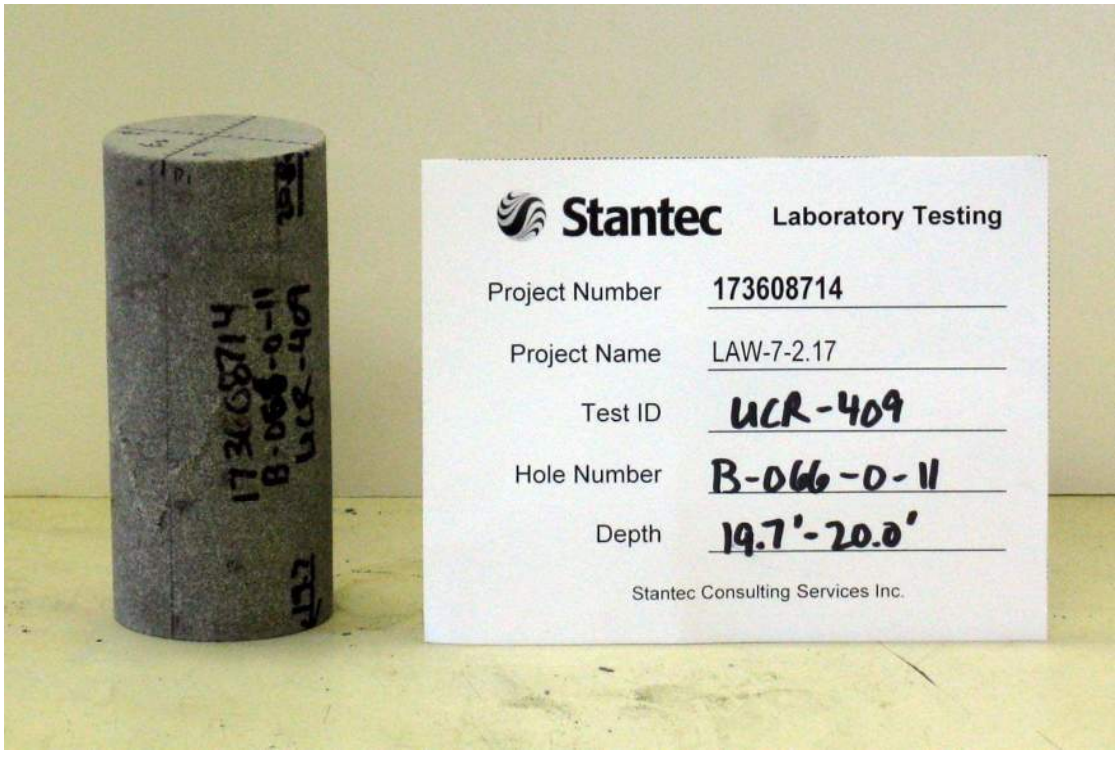
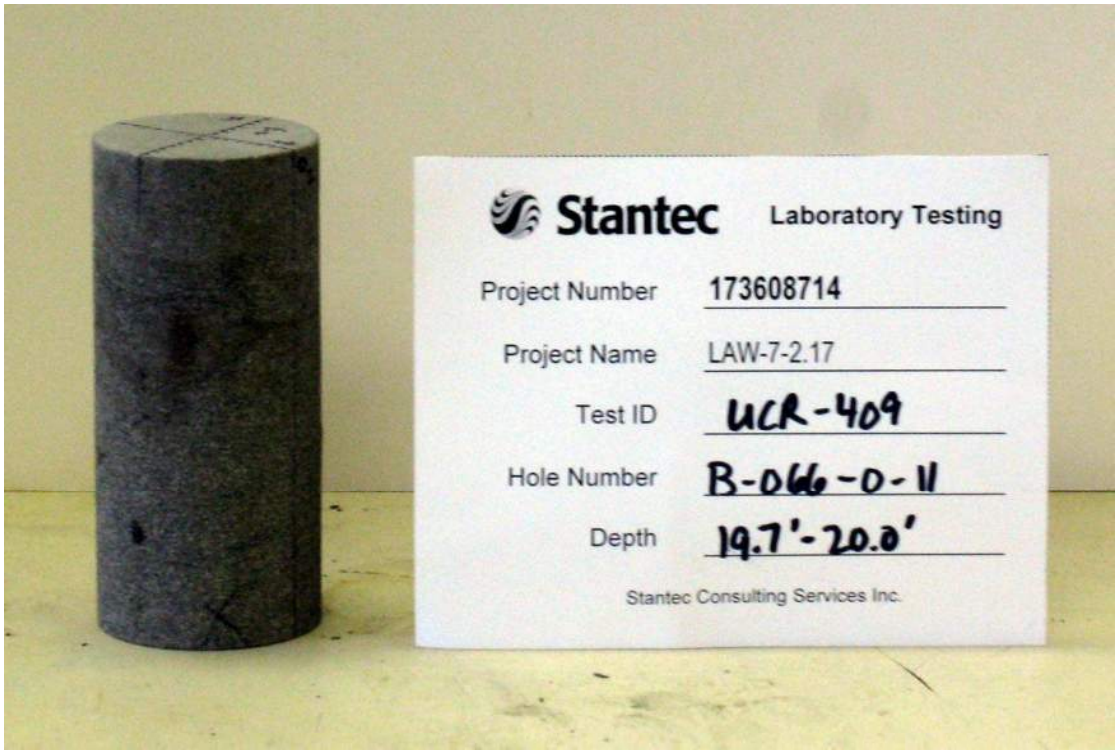


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, medium grained | Lab ID UCR-409
Hole Number B-066-0-11 | Depth (ft) 19.7'-20.0'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

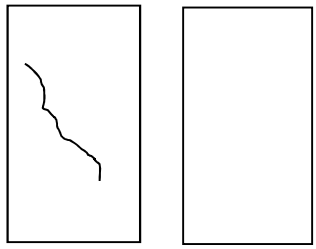
ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, gray, moderately hard, fine grained	Lab ID	UCR-411
Hole Number	B-066-0-11	Depth (ft) 29.2'-29.6'	Date Received 06-22-2011
Temperature (^{o}C)	21.6	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	Pass	Height (in)	4.222	Wet Unit Weight (pcf)	164.9
Perpendicularity	Pass	Diameter (in)	1.980	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.080	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec)	89
Peak Load (lbf)	18419
Failure Type	Undetermined
Compressive Strength (psi)	5980
Compressive Strength (tsf)	431

Failure Sketches

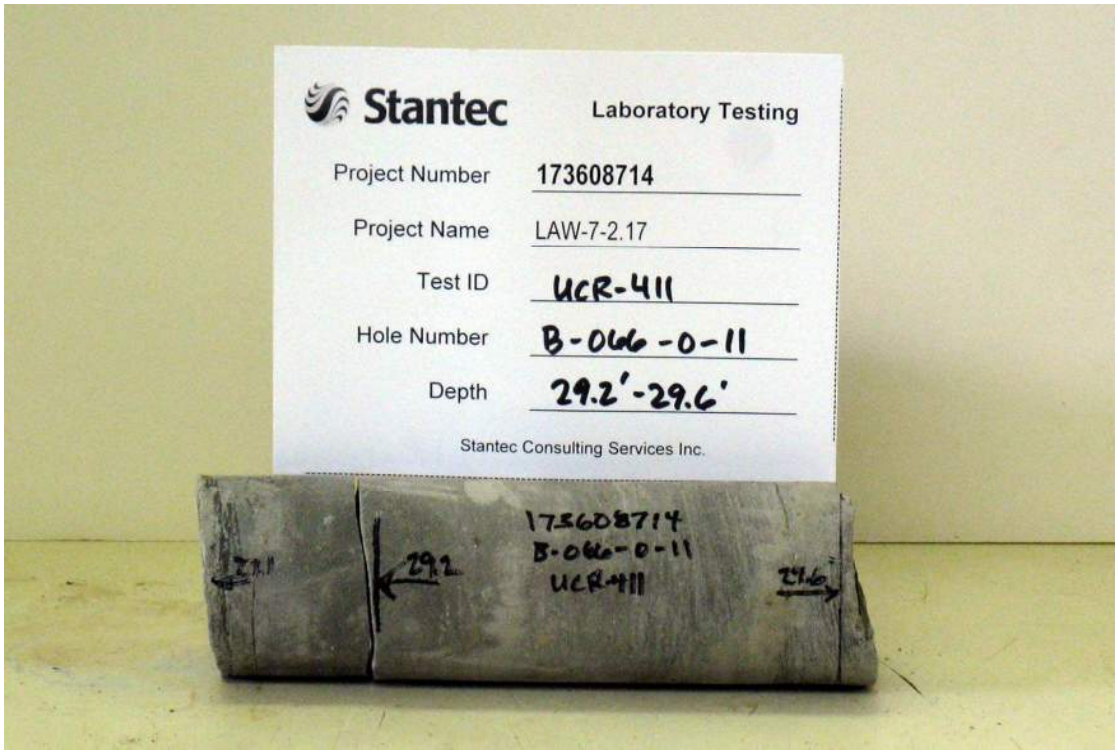


Comments

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-411
Hole Number B-066-0-11 | Depth (ft) 29.2'-29.6'
Test Type Unconfined compressive strength

As Received



Core Preparation

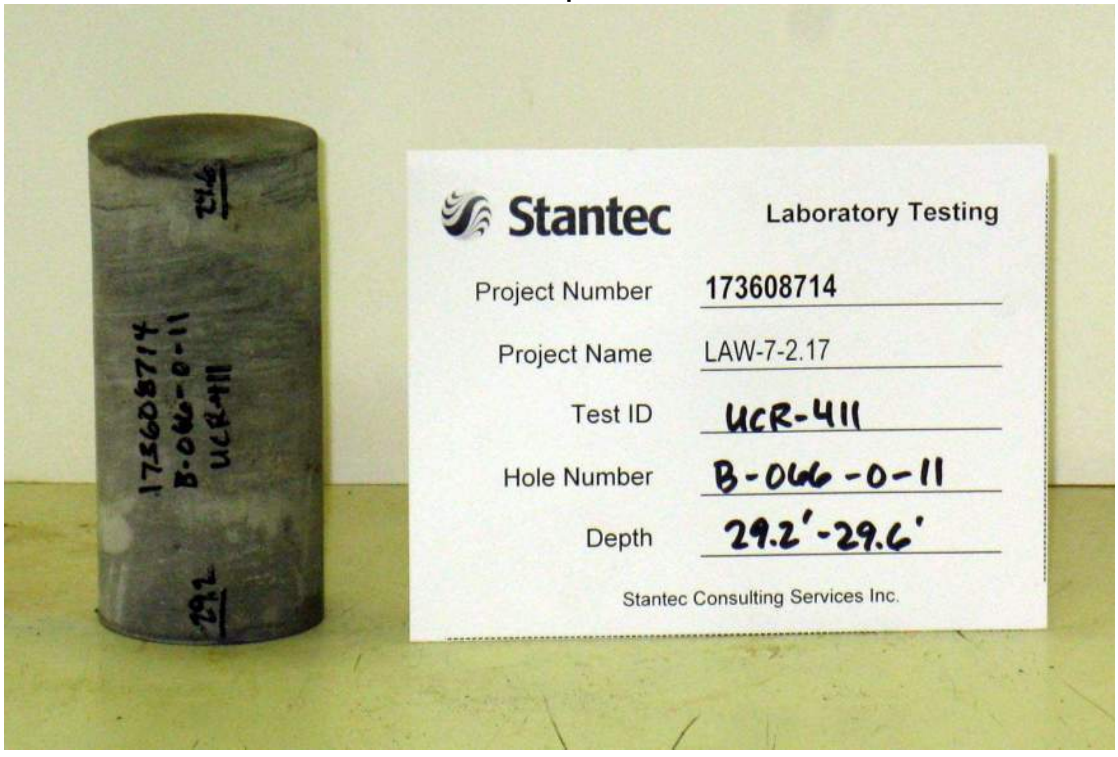
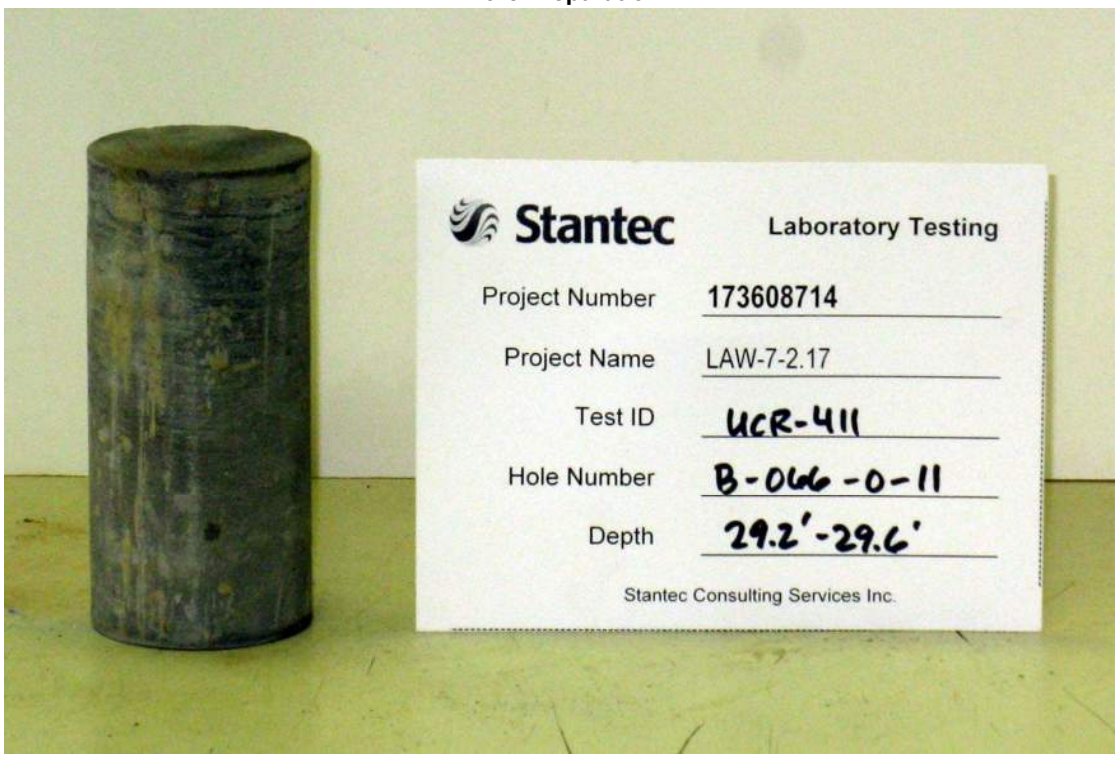


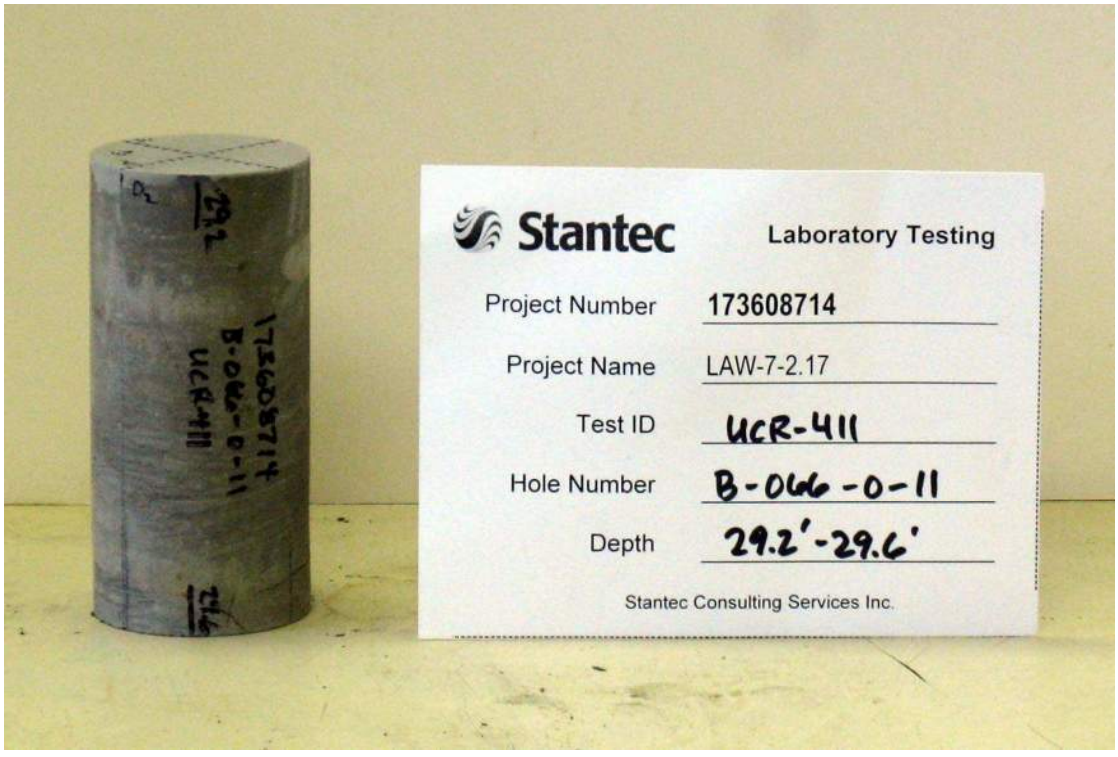
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-411
Hole Number B-066-0-11 | Depth (ft) 29.2'-29.6'
Test Type Unconfined compressive strength

Core Preparation



Post Test

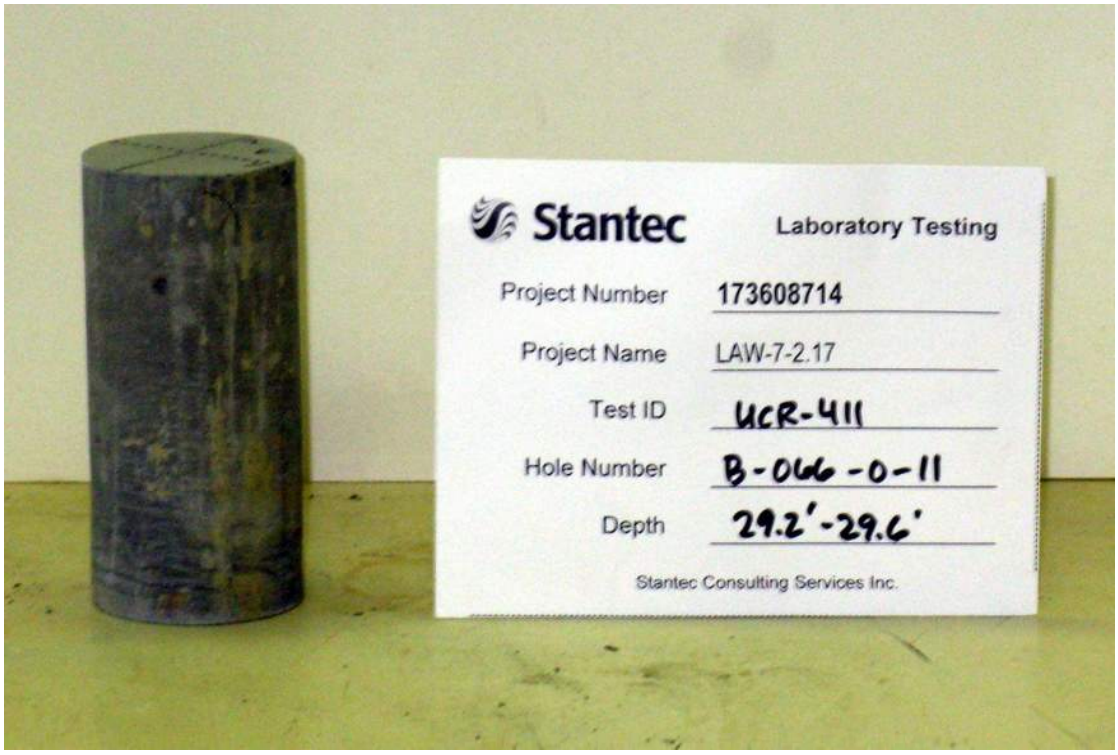


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-411
Hole Number B-066-0-11 | Depth (ft) 29.2'-29.6'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Claystone, dark gray, moderately hard	Lab ID	UCR-413
Hole Number	B-066-0-11	Depth (ft) 35.3'-35.9'	Date Received 06-22-2011
Temperature (°C)	21.5	Moisture Condition	As received, moist
			Date Tested 06-29-2011

Side Planeness	N/A	Height (in)	4.001	Wet Unit Weight (pcf)	147.2
Perpendicularity	N/A	Diameter (in)	1.978	Dry Unit Weight (pcf)	N/A
End Planeness	N/A	Area (in^2)	3.072	Moisture Content (%)	N/A
Parallelism	N/A				

Dimensions were not confirmed.

Loading Rate (lbf/sec) 11

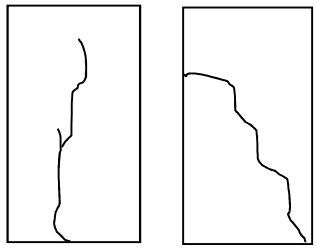
Peak Load (lbf) 1007

Failure Type Shear

Compressive Strength (psi) 328

Compressive Strength (tsf) 24

Failure Sketches



Comments Fragile nature of specimen inhibited preparation. Dimensional tolerances were not confirmed.

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, moderately hard | Lab ID UCR-413
Hole Number B-066-0-11 | Depth (ft) 35.3'-35.9'
Test Type Unconfined compressive strength

As Received

Core Preparation

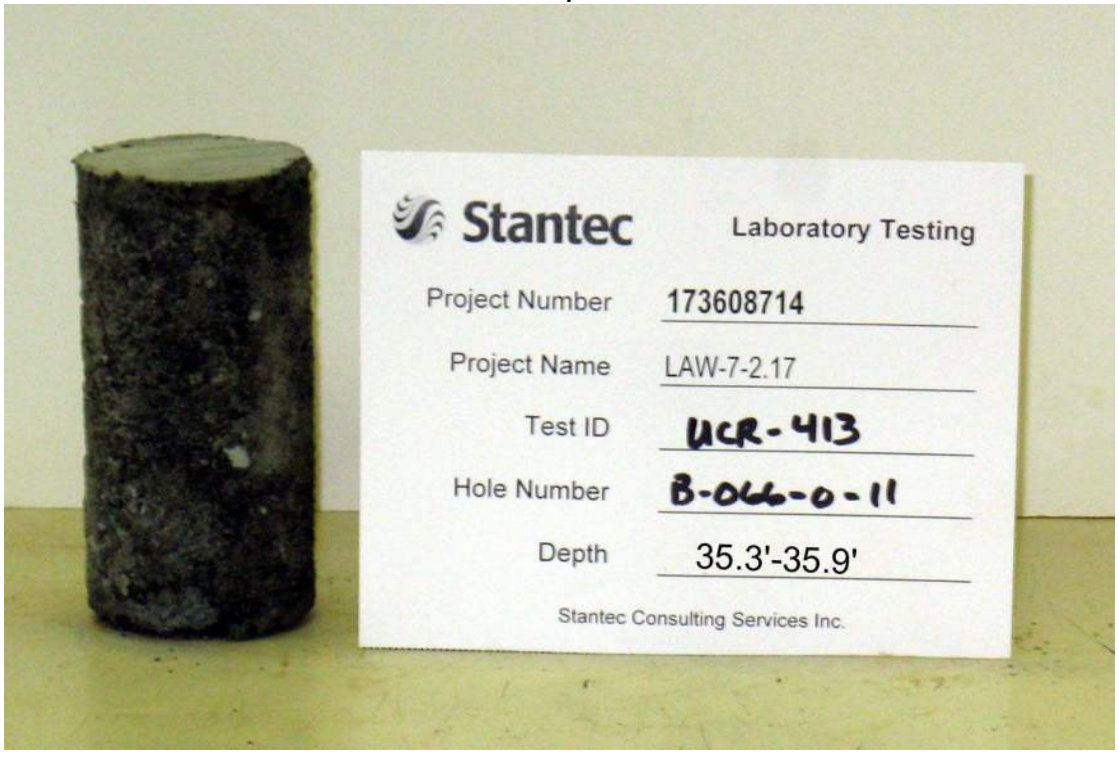
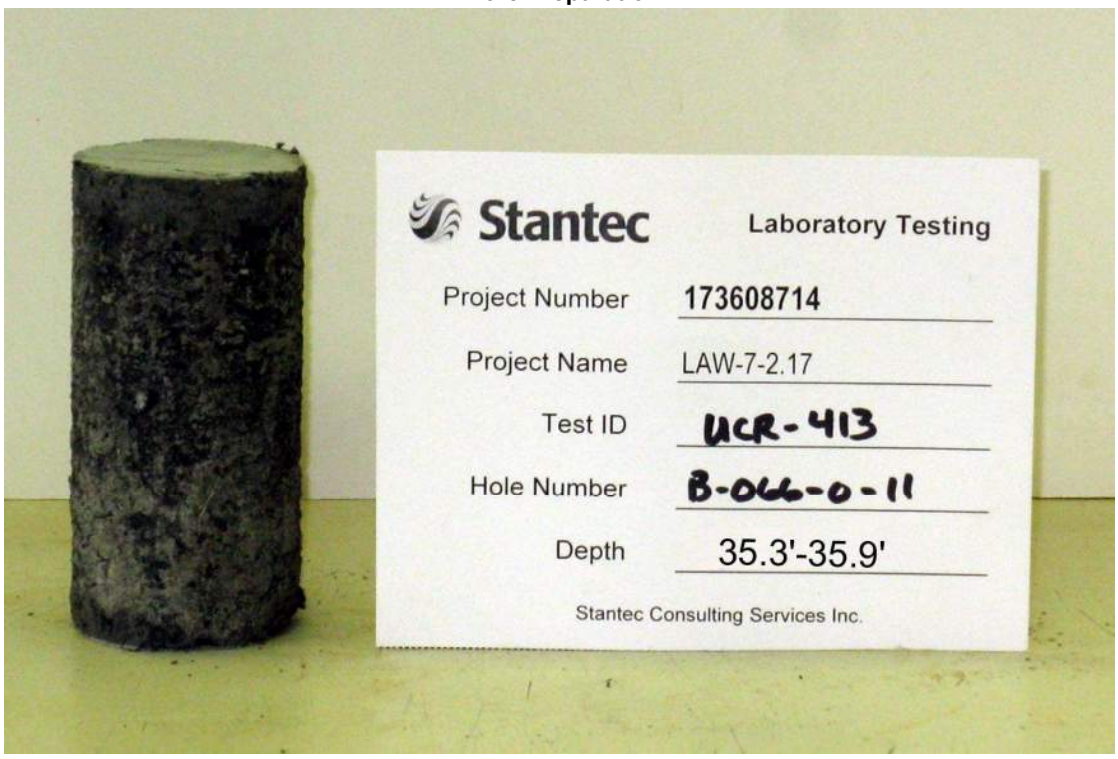


Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, moderately hard | Lab ID UCR-413
Hole Number B-066-0-11 | Depth (ft) 35.3'-35.9'
Test Type Unconfined compressive strength

Core Preparation



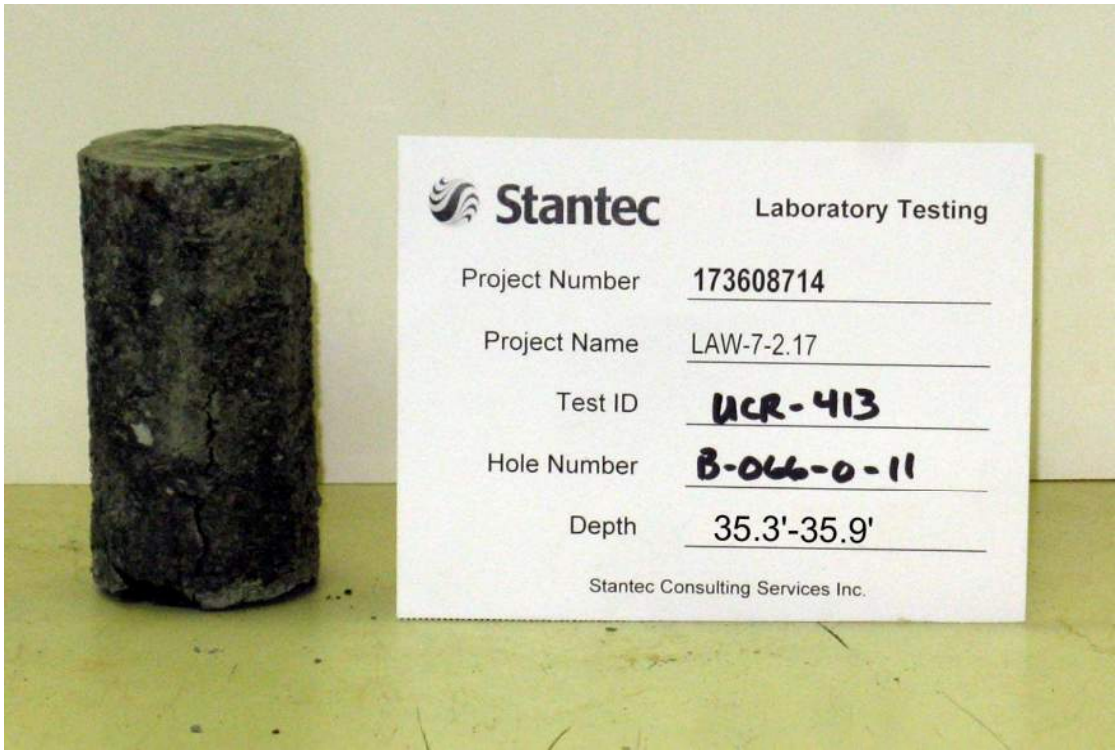
Post Test

Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Claystone, dark gray, moderately hard | Lab ID UCR-413
Hole Number B-066-0-11 | Depth (ft) 35.3'-35.9'
Test Type Unconfined compressive strength

Post Test



Stantec

Unconfined Compressive Strength Of Intact Rock Core

ASTM D 7012

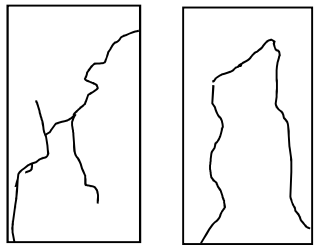
Project Name	LAW-7-2.17	Project Number	173608714
Lithology	Sandstone, gray, moderately hard, fine grained	Lab ID	UCR-568
Hole Number	B-026-0-11	Depth (ft) 19.3'-19.7'	Date Received 07-18-2011

Temperature (^{o}C)	22.3	Moisture Condition	As received, moist	Date Tested	07-20-2011

Side Planeness	Fail	Height (in)	4.584	Wet Unit Weight (pcf)	163.1
Perpendicularity	Fail	Diameter (in)	1.981	Dry Unit Weight (pcf)	N/A
End Planeness	Pass	Area (in^2)	3.083	Moisture Content (%)	N/A
Parallelism	Pass				

Loading Rate (lbf/sec)	94
Peak Load (lbf)	26460
Failure Type	Shear
Compressive Strength (psi)	8580
Compressive Strength (psf)	1235520
Compressive Strength (tsf)	618

Failure Sketches

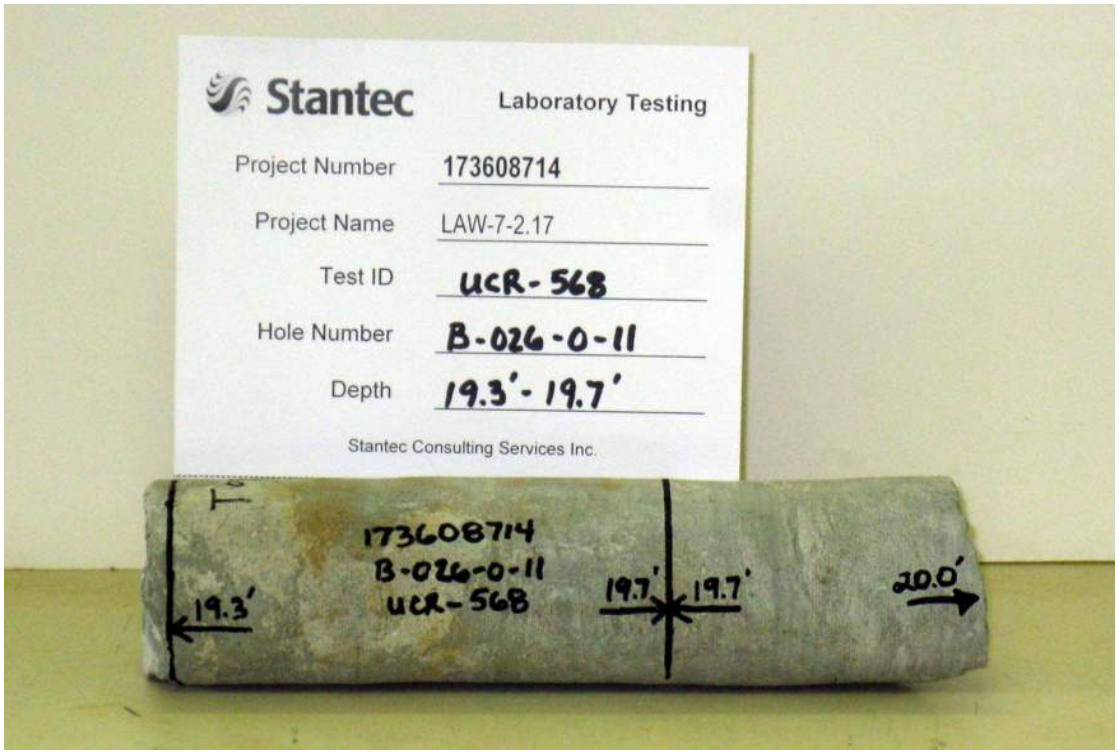


Comments

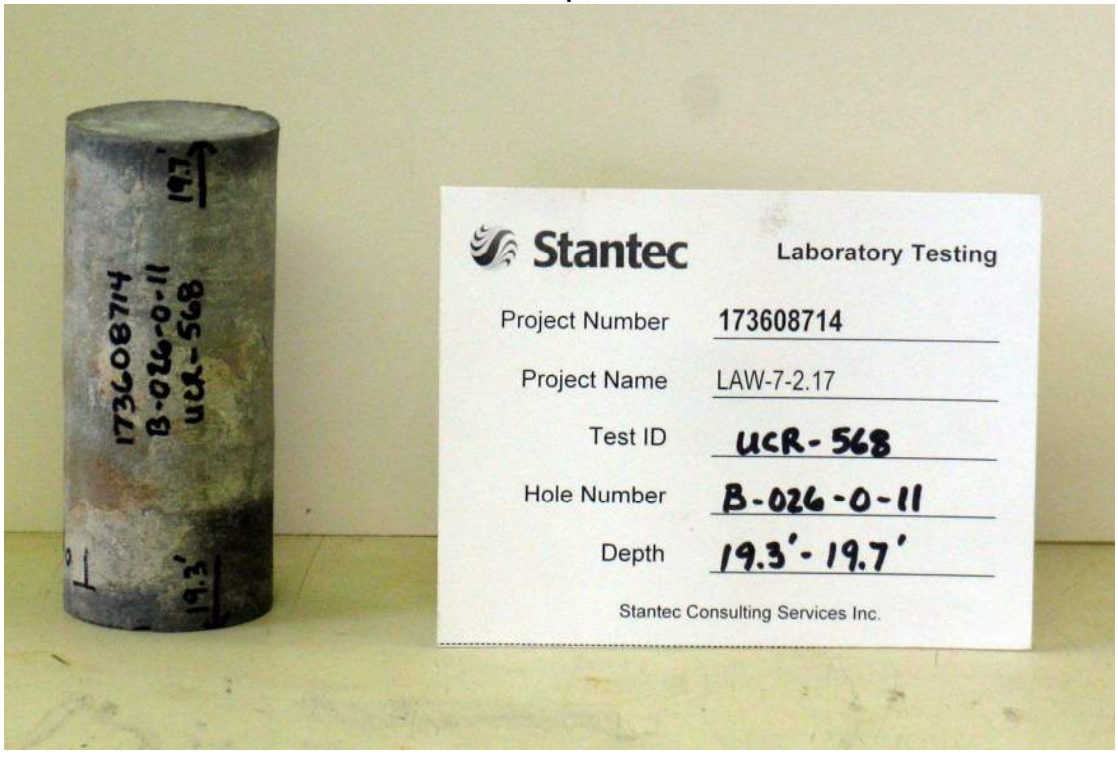
Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-568
Hole Number B-026-0-11 | Depth (ft) 19.3'-19.7'
Test Type Unconfined compressive strength

As Received



Core Preparation



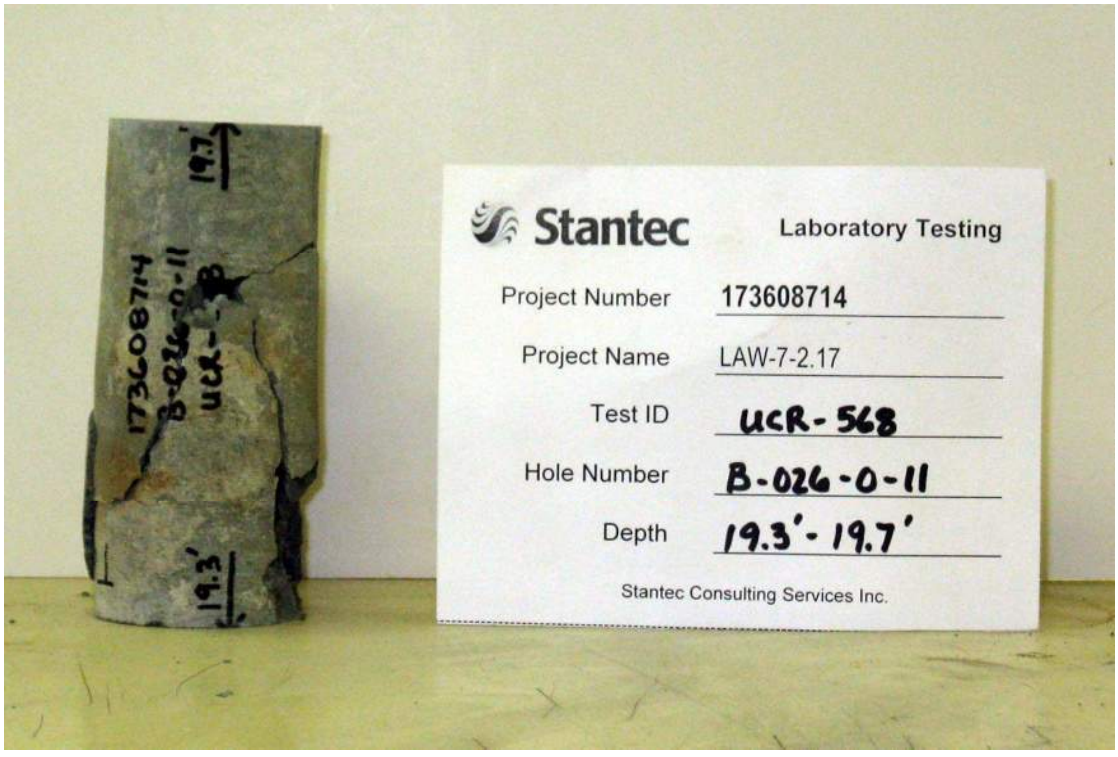
Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-568
Hole Number B-026-0-11 | Depth (ft) 19.3'-19.7'
Test Type Unconfined compressive strength

Core Preparation

Post Test

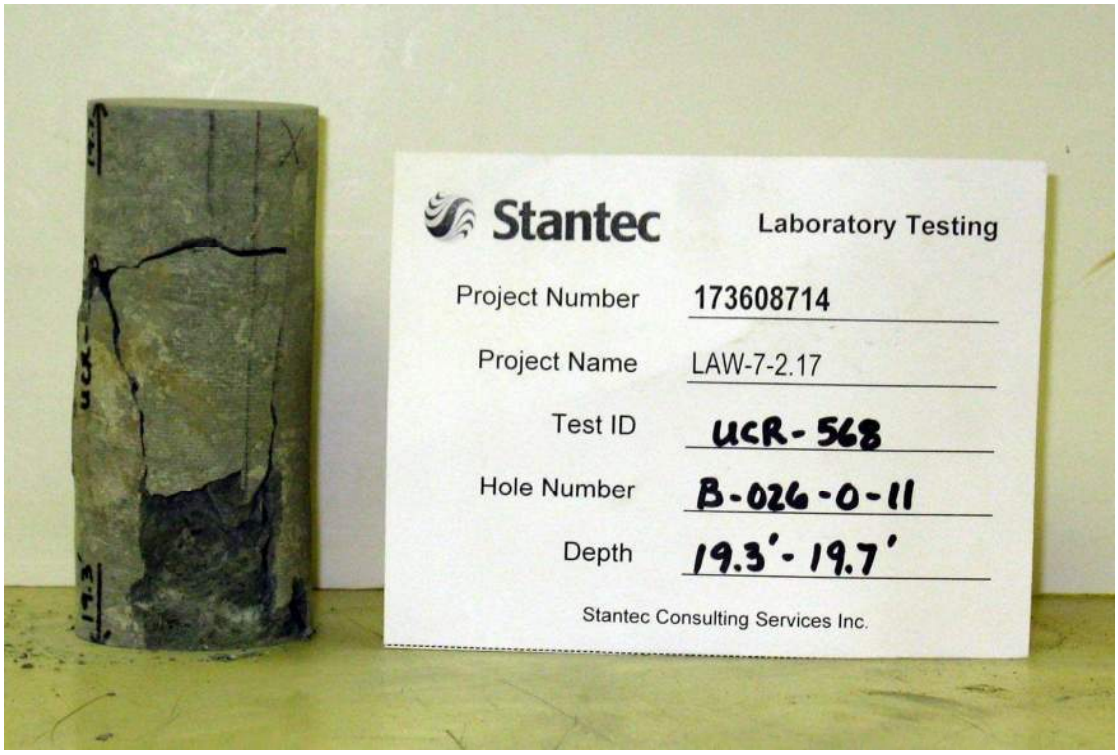


Stantec

Photo Report

Project Name LAW-7-2.17 | Project Number 173608714
Lithology Sandstone, gray, moderately hard, fine grained | Lab ID UCR-568
Hole Number B-026-0-11 | Depth (ft) 19.3'-19.7'
Test Type Unconfined compressive strength

Post Test



NEAS
National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: LAW-7-2.17, Boring Location: B-098-1-20, NQ2-13, Depth: 73.2 - 73.6ft)

Tested Date: 7/26/21

Specimen Properties

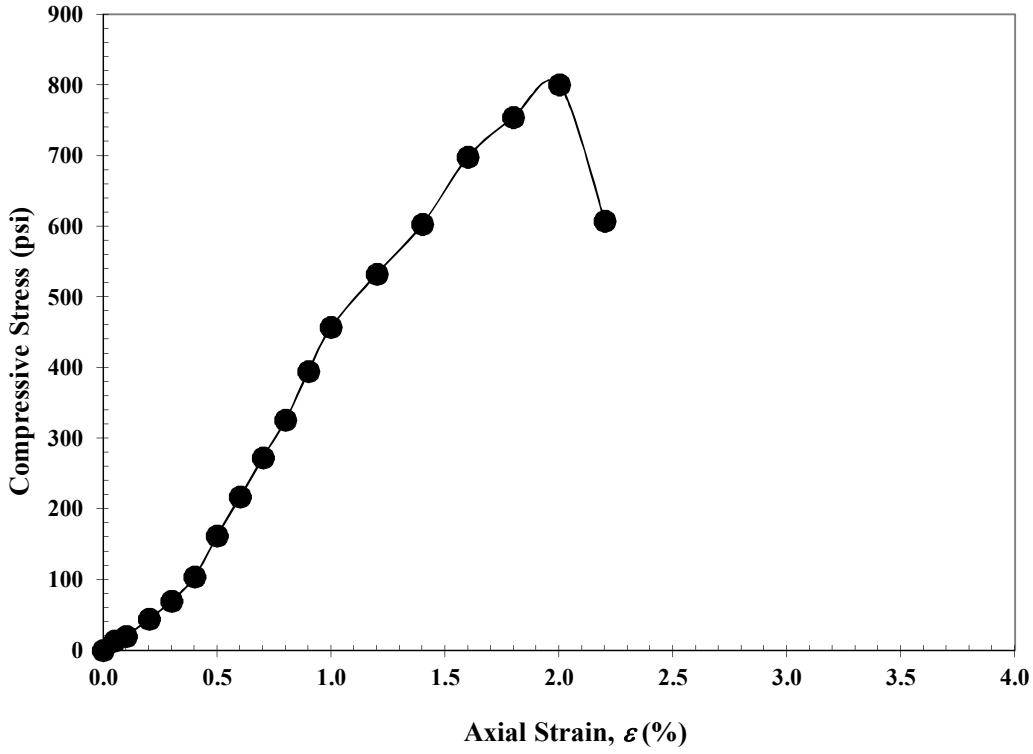
Average Dia., D_{avg} (in):	1.97
Average Height, H_{avg} (in):	4.31
Length to Diameter Ratio:	2.19
Area, A (in^2):	3.06
Volume, V (in^3):	13.18
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	3.6
Dry Mass of Specimen (lb):	1.2
Wet Unit Weight, γ (lb/ft^3):	160.5
Dry Unit Weight, γ_d (lb/ft^3):	154.9

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **801** **6** (MPa)

Strain (%): **2.0**



Notes: Siltstone, gray, slightly weathered, weak.

Sample trimming procedure does not conform to ASTM D4543 and the results reported may differ from the results obtained from a test specimen that meets the requirements of Practice D4543.

NEAS
National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: LAW-7-2.17, Boring Location: B-106-1-20, NQ2-3, Depth: 33.3 - 33.6ft)

Tested Date: 7/26/21

Specimen Properties

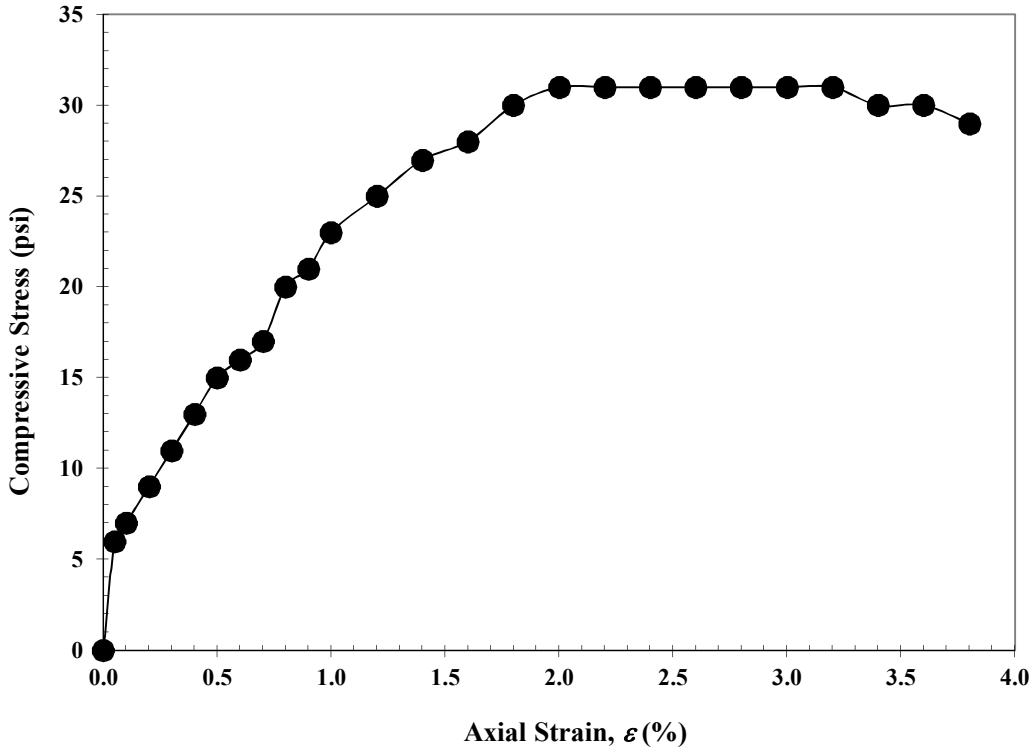
Average Dia., D_{avg} (in):	1.95
Average Height, H_{avg} (in):	3.93
Length to Diameter Ratio:	2.02
Area, A (in^2):	2.97
Volume, V (in^3):	11.67
Wet Mass of Specimen (lb):	1.0
Moisture Content (%):	9.6
Dry Mass of Specimen (lb):	0.9
Wet Unit Weight, γ (lb/ft^3):	145.9
Dry Unit Weight, γ_d (lb/ft^3):	133.1

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **31** **0.2** (MPa)

Strain (%): **2.0**



Notes: Claystone, maroonish brown with brown mottles, severely weathered, extremely weak, slickensided (after testing).

Sample trimming procedure does not conform to ASTM D4543 and the results reported may differ from the results obtained from a test specimen that meets the requirements of Practice D4543.

National Engineering & Architectural Services Inc.
5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: LAW-7-2.17, Boring Location: B-106-2-20, NQ2-2, Depth: 14.3 - 14.6ft)

Tested Date: 7/26/21

Specimen Properties

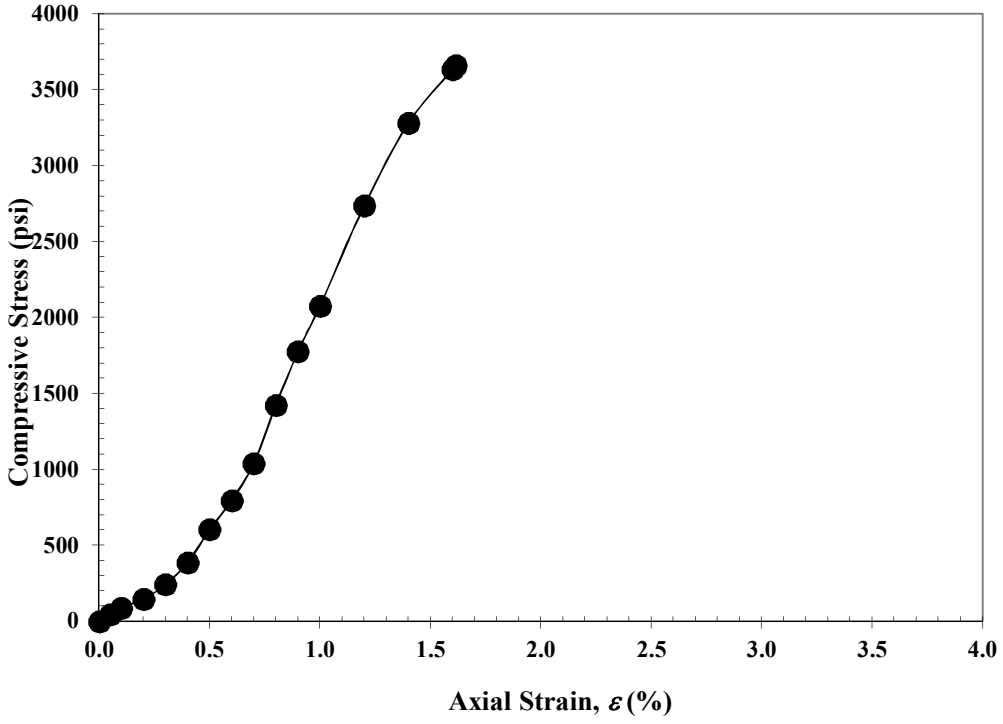
Average Dia., D_{avg} (in):	1.97
Average Height, H_{avg} (in):	3.90
Length to Diameter Ratio:	1.98
Area, A (in^2):	3.06
Volume, V (in^3):	11.94
Wet Mass of Specimen (lb):	1.1
Moisture Content (%):	2.5
Dry Mass of Specimen (lb):	1.1
Wet Unit Weight, γ (lb/ft^3):	161.0
Dry Unit Weight, γ_d (lb/ft^3):	157.1

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **3661** **25** (MPa)

Strain (%): **1.6**



Notes: Sandstone, brown, slightly to moderately weathered, moderately strong, very fine grained. Please note that the length to diameter ratio of this specimen does not meet the requirements of D7012 and the results reported may differ from a specimen that does meet these requirements.

Sample trimming procedure does not conform to ASTM D4543 and the results reported may differ from the results obtained from a test specimen that meets the requirements of Practice D4543.

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: LAW-7-2.17, Boring Location: B-106-2-20, NQ2-7, Depth: 37.2 - 37.6ft)

Tested Date: 7/26/21

Specimen Properties

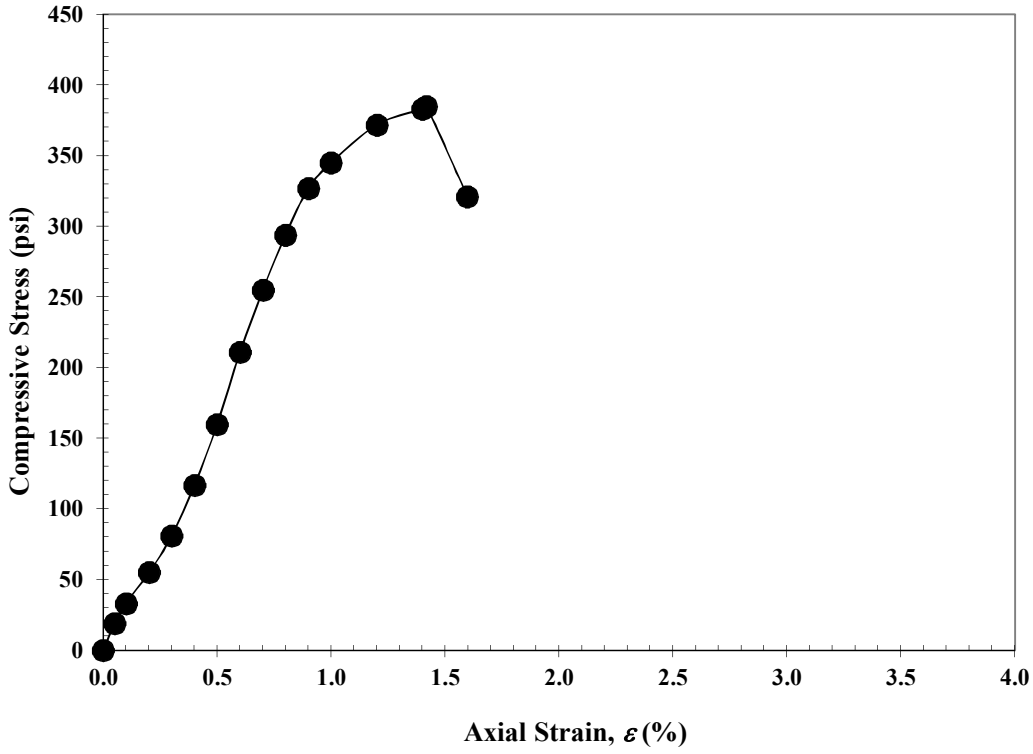
Average Dia., D_{avg} (in):	1.98
Average Height, H_{avg} (in):	4.44
Length to Diameter Ratio:	2.25
Area, A (in^2):	3.07
Volume, V (in^3):	13.62
Wet Mass of Specimen (lb):	1.3
Moisture Content (%):	4.9
Dry Mass of Specimen (lb):	1.2
Wet Unit Weight, γ (lb/ft^3):	159.4
Dry Unit Weight, γ_d (lb/ft^3):	152.0

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **385** **3** (MPa)

Strain (%): **1.4**



Notes: Siltstone, dark gray, slightly to moderately weathered, very weak, slickensided (after testing).

Sample trimming procedure does not conform to ASTM D4543 and the results reported may differ from the results obtained from a test specimen that meets the requirements of Practice D4543.

Stantec

Slake Durability Index

ASTM D 4644

Project Name LAW-7-2.17

Project Number 173608714
Preparation Date 6/23/2011
Final Test Cycle Date 6/25/2011
Number of Test Cycles performed 2

Lab ID	Source	Material Description	Fragment Description	Tare Weight (g)	Initial Wt. + Tare (g)	Final Wt. + Tare (g)	Initial Weight (g)	Final Weight (g)	SDI (%)
349	B-053-0-11, 14.1'-14.6'	Sandstone, tan	50% intact with chips	294.82	675.8	553.28	380.98	258.46	67.8
350	B-053-0-11, 23.4'-24.0'	Sandstone, tan	90% Intact	293.64	716.54	689.77	422.90	396.13	93.7
353	B-053-0-11, 27.4'-28.0'	Sandstone, tan	85% intact	294.77	735.82	639.86	441.05	345.09	78.2
354	B-053-0-11, 38.7'-39.3'	Shale, red	No sample remaining	296.66	625.84	296.67	329.18	0.01	0
356	B-053-0-11, 42.7'-43.3'	Shale, red	80% intact	299.97	798.09	742.2	498.12	442.23	88.8
357	B-053-0-11, 45.2'-45.7'	Shale, red	80% intact	296.08	716.39	652.11	420.31	356.03	84.7
359	B-053-0-11, 50.8'-51.7'	Sandstone, tan	90% Intact	309.6	753.35	736.04	443.75	426.44	96.1
360	B-053-0-11, 59.7'-60.2'	Shale, red	10% intact with chips and flakes	283.41	758.99	553.13	475.58	269.72	56.7
361	B-053-0-11, 67.4'-68.0'	Shale, red	7 very small chips	288.62	696.8	288.74	408.18	0.12	0
362	B-053-0-11, 79.4'-80.0'	Shale, red	25% intact, pile of chips	285.94	767.95	504.55	482.01	218.61	45.4
363	B-069-0-11, 15.1'-15.7'	Sandstone, gray	95% intact	285.2	732.47	712.7	447.27	427.50	95.6
365	B-069-0-11, 19.5'-20.1'	Shale	80% intact	309.61	754.66	706.2	445.05	396.59	89.1
366	B-069-0-11, 27.9'-28.5'	Shale	Small pile of chips	292.93	718.18	301.06	425.25	8.13	1.9
368	B-069-0-11, 40.8'-41.4'	Shale	85% intact, pile of chips	282.63	797.18	759.15	514.55	476.52	92.6
370	B-069-0-11, 59.6'-60.2'	Shale	60% intact, pile of flakes and chips	289.22	763.65	677.02	474.43	387.80	81.7
373	B-069-0-11, 78.3'-78.9'	Shale	90% intact with chips	297.1	815.8	798.1	518.70	501.00	96.6

Stantec

Slake Durability Index

ASTM D 4644

Project Name LAW-7-2.17

Project Number 173608714
Preparation Date 6/23/2011
Final Test Cycle Date 6/28/2011
Number of Test Cycles performed 2

Lab ID	Source	Material Description	Fragment Description	Tare Weight (g)	Initial Wt. + Tare (g)	Final Wt. + Tare (g)	Initial Weight (g)	Final Weight (g)	SDI (%)
374	B-069-0-11, 87.0'-87.8'	Shale, red	Very small pile of chips	279.14	684.99	281.23	405.85	2.09	0.5
376	B-069-0-11, 95.3'-95.9'	Shale, red	95% intact	295.53	820.25	803.5	524.72	507.97	96.8
378	B-069-0-11, 113.5'-114.0'	Sandstone, coarse grained, gray	98% intact	299.92	814.11	802.94	514.19	503.02	97.8
380	B-069-0-11, 125.1'-125.6'	Sandstone, fine grained, gray	95% intact	282.35	771.75	759.85	489.40	477.50	97.6
381	B-069-0-11, 135.2'-135.8'	Shale, red	Very small pile of chips	286	638.15	289.12	352.15	3.12	0.9
382	B-069-0-11, 142.0'-142.6'	Shale, red	30% intact with flakes and chips	283.53	828.04	706.89	544.51	423.36	77.8
385	B-059-0-11, 13.6'-14.3'	Shale	95% intact	279.87	717.14	695.01	437.27	415.14	94.9
386	B-059-0-11, 16.6'-17.1'	Shale, gray	95% intact with chips	289.58	773.57	736.54	483.99	446.96	92.3
387	B-059-0-11, 19.5'-20.0'	Shale, gray	20% intact with pile of flakes	291.06	703.42	451.25	412.36	160.19	38.8
389	B-059-0-11, 27.4'-28.0'	Shale, gray	Very small pile of chips	306.44	724.68	307.23	418.24	0.79	0.2
390	B-059-0-11, 35.7'-36.2'	Shale, gray	Pile of chips	290.27	770.47	331.52	480.20	41.25	8.6
393	B-059-0-11, 39.9'-40.5'	Shale, gray	95% intact	283.3	787.25	769.98	503.95	486.68	96.6

Stantec

Slake Durability Index

ASTM D 4644

Project Name LAW-7-2.17

Project Number 173608714
Preparation Date 6/27/2011
Final Test Cycle Date 6/29/2011
Number of Test Cycles performed 2

Lab ID	Source	Material Description	Fragment Description	Tare Weight (g)	Initial Wt. + Tare (g)	Final Wt. + Tare (g)	Initial Weight (g)	Final Weight (g)	SDI (%)
395	B-059-0-11, 50.0'-50.6'	Sandstone	70% intact with flakes	289.74	788.26	715.19	498.52	425.45	85.3
397	B-059-0-11, 62.8'-63.3'	Shale	Small pile of flakes and chips	281.74	749.4	311.91	467.66	30.17	6.5
398	B-059-0-11, 65.2'-65.8'	Shale	5% intact with chips	280.38	788.1	370.41	507.72	90.03	17.7
399	B-059-0-11, 70.1'-70.7'	Shale	Very small pile of chips	283.83	695.14	284.06	411.31	0.23	0.1
401	B-059-0-11, 76.6'-77.1'	Shale	95% intact	288.4	772.48	765.25	484.08	476.85	98.5
402	B-058-0-11, 50.1'-50.6'	Sandstone	95% intact	282.11	725.69	703.94	443.58	421.83	95.1
404	B-058-0-11, 53.5'-54.1'	Shale	60% intact with chips and flakes	300.13	726.85	663.95	426.72	363.82	85.3
406	B-058-0-11, 66.5'-67.0'	Shale	Very small pile of chips	300.23	775.55	300.4	475.32	0.17	0
408	B-058-0-11, 76.8'-77.3'	Shale	85% intact with chips	295.07	743.09	690.53	448.02	395.46	88.3
410	B-066-0-11, 25.3'-25.9'	Shale	95% intact	296.94	758.81	737.53	461.87	440.59	95.4
412	B-066-0-11, 29.6'-30.2'	Shale	70% intact with flakes	293.29	757.73	630.98	464.44	337.69	72.7
414	B-066-0-11, 36.2'-36.8'	Shale	10% intact with chips	294.97	766.56	325.02	471.59	30.05	6.4

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	LR	Checked	LR	Report Date:	7/29/2021
County	LAW	Route	7	Section	2.17
Boring Number	B-098-1-20	District	9	PID	75923
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-2	Top Depth	16.8'	Bottom Depth	17.5'

Description	CLAYSTONE, maroonish brown, highly weathered, very weak to weak.

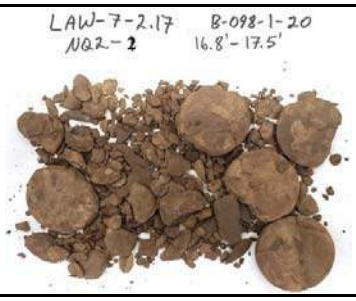
NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 7/27/21	OUT: 7/28/21	Moisture Content (%)
A	511.34	792.55	Time	1:13P	8:00A	
			Mass	1303.89	1273.33	6.36%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
10:10A	10:20A		Drum ID	Tare Weight (g)		IN: 7/28/21	OUT: 7/28/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	792.55	Time	10:25A	1:18P	
21.9	22.1	22.0			Mass	1155.32	1130.76	338.21

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
3:37P	3:47P		Drum ID	Tare Weight (g)		IN: 7/28/21	OUT: 7/29/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	792.55	Time	3:52P	8:20A	
22.2	22.0	22.1			Mass	1065.05	1039.50	246.95

Before First Cycle



After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **51.4%**

Retained Material Type: **T2** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces

T 3 — Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	LR	Checked	LR	Report Date:	7/29/2021
County	LAW	Route	7	Section	2.17
Boring Number	B-098-1-20	District	9	PID	75923
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-4	Top Depth	29.0'	Bottom Depth	30.0'

Description	SANDSTONE, brown, slightly weathered, slightly to moderately strong, very fine to medium grained, contains slickensides, micaceous, silty.

NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 7/27/21	OUT: 7/28/21	Moisture Content (%)
B	508.87	797.57	Time	1:57P	8:00A	
			Mass	1306.44	1292.04	2.91%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
10:10A	10:20A		Drum ID	Tare Weight (g)		IN: 7/28/21	OUT: 7/28/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	797.57	Time	10:25A	1:18P	
21.9	22.1	22.0			Mass	1289.56	1273.71	476.14

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
3:37P	3:47P		Drum ID	Tare Weight (g)		IN: 7/28/21	OUT: 7/29/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	797.57	Time	3:52P	8:20A	
22.2	22.0	22.1			Mass	1272.26	1254.56	456.99

Before First Cycle

After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **92.4%**

Retained Material Type: **T1** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

	T 1	Retained pieces remain virtually unchanged		T 2	Retained material consists of large and small pieces
	T 3	Retained material is exclusively small pieces			

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	LR	Checked	LR	Report Date:	7/30/2021
County	LAW	Route	7	Section	2.17
Boring Number	B-098-1-20	District	9	PID	75923
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-7	Top Depth	40.3'	Bottom Depth	41.5'

Description	SANDSTONE, brown and grayish brown, slightly to moderately weathered, moderately strong, very fine to medium grained, micaceous, contains healed vertical joints.

NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 7/28/21	OUT: 7/29/21	Moisture Content (%)
Beth	550.00	161.23	Time	3:55P	8:22A	
			Mass	708.01	701.61	1.18%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
11:03A	11:13A		Drum ID	Tare Weight (g)		IN: 7/29/21	OUT: 7/29/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	792.64	Time	11:15A	1:33P	
23.0	22.9	22.95			Mass	1339.79	1325.44	532.8

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
1:45P	1:55P		Drum ID	Tare Weight (g)		IN: 7/29/21	OUT: 7/30/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	792.64	Time	1:58P	8:30A	
22.3	22.6	22.45			Mass	1334.27	1319.62	526.98

Before First Cycle

After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **97.5%**

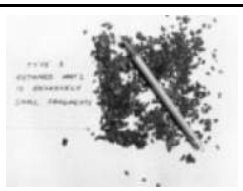
Retained Material Type: **T1** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



T 3 — Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	LR	Checked	LR	Report Date:	7/30/2021
County	LAW	Route	7	Section	2.17
Boring Number	B-106-2-20	District	9	PID	75923
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-6	Top Depth	34.3'	Bottom Depth	35.0'

Description	SILTSTONE, gray, slightly weathered, moderately strong.

NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 7/28/21	OUT: 7/29/21	Moisture Content (%)
Sun	531.44	260.18	Time	3:55P	8:22A	
			Mass	788.49	781.48	1.34%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
11:03A	11:13A		Drum ID	Tare Weight (g)		IN: 7/29/21	OUT: 7/29/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	797.47	Time	11:15A	1:33P	
23.0	22.9	22.95			Mass	1312.35	1296.64	499.17

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
1:45P	1:55P		Drum ID	Tare Weight (g)		IN: 7/29/21	OUT: 7/30/21	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	797.47	Time	1:58P	8:30A	
22.3	22.6	22.45			Mass	1285.91	1272.01	474.54

Before First Cycle

After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **91.0%**

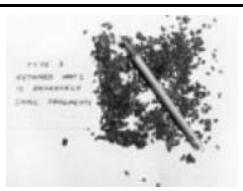
Retained Material Type: **T1** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



T 3 — Retained material is exclusively small pieces

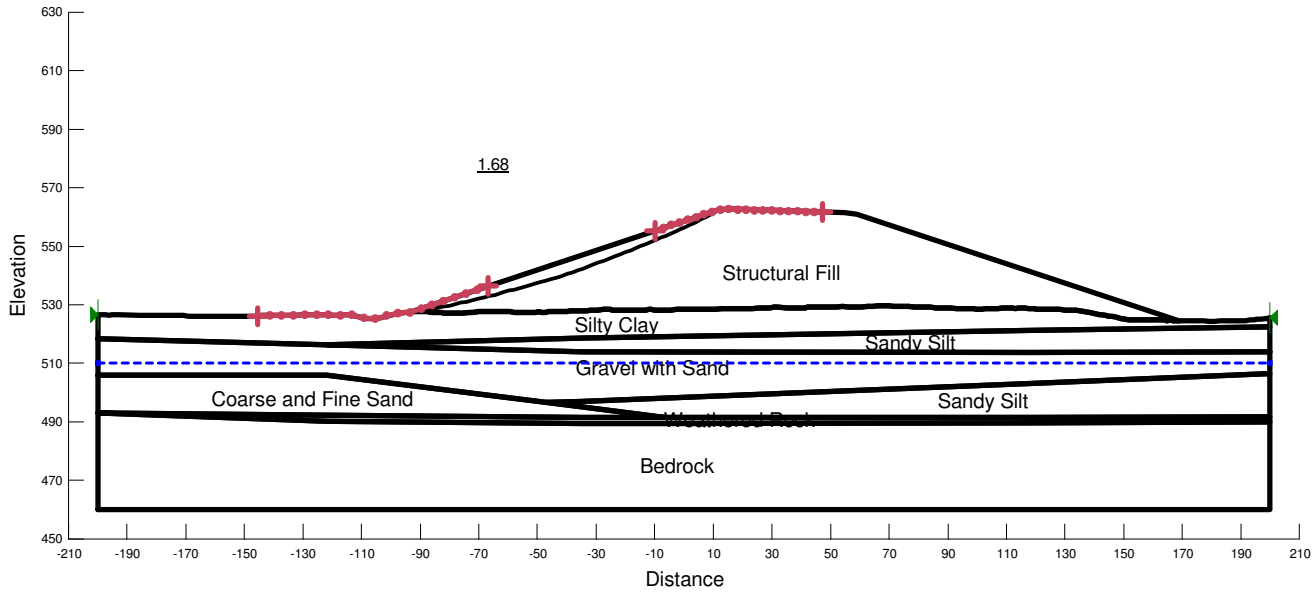
Appendix E

Slope Stability Analyses

173608714 LAW-7-2.17
Sta. 136+00 Left Embankment
Embankment Stability

Long Term

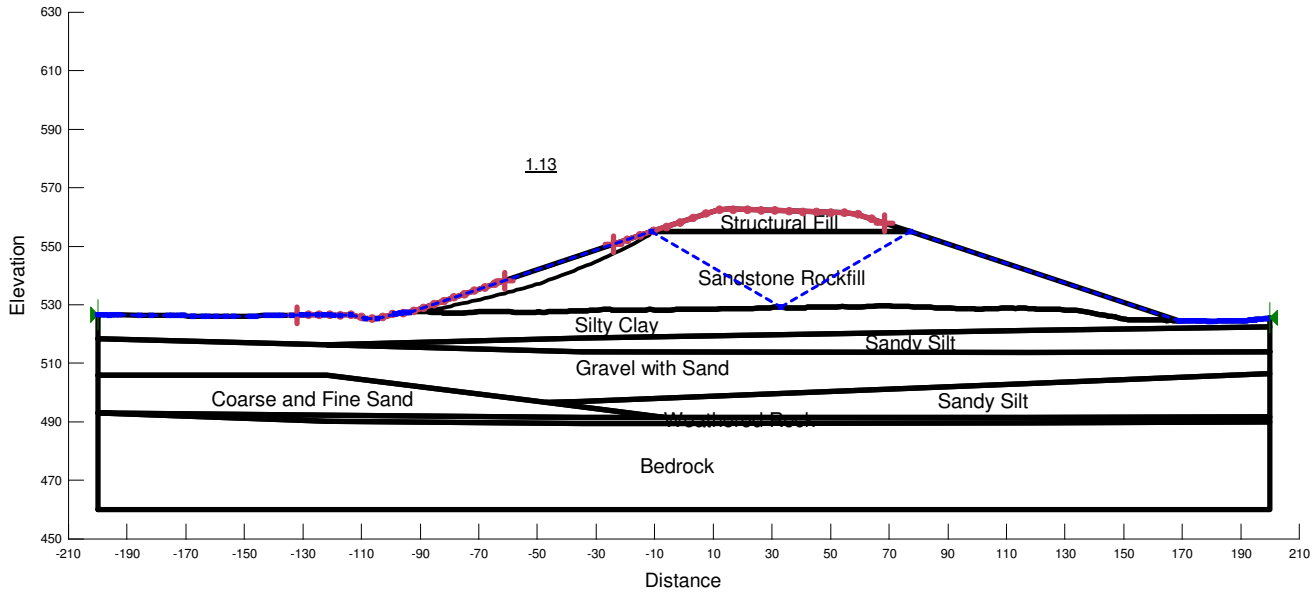
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	0 psf	29 °
Silty Clay	126 pcf	300 psf	28 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	150 psf	24 °
Weathered Rock	130 pcf	0 psf	35 °
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 136+00 Left Embankment
Embankment Stability

Rapid Drawdown

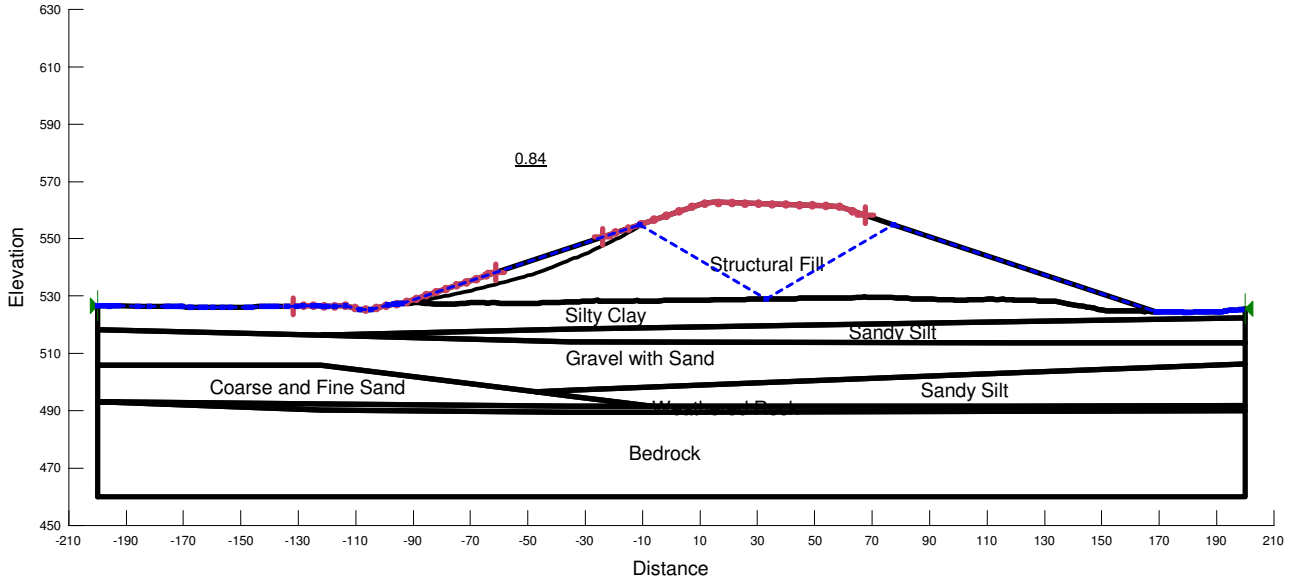
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	0 psf	29 °
Silty Clay	126 pcf	300 psf	28 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	150 psf	24 °
Weathered Rock	130 pcf	0 psf	35 °
Sandstone Rockfill	140 pcf	0 psf	36 °
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 136+00 Left Embankment
Embankment Stability

Rapid Drawdown

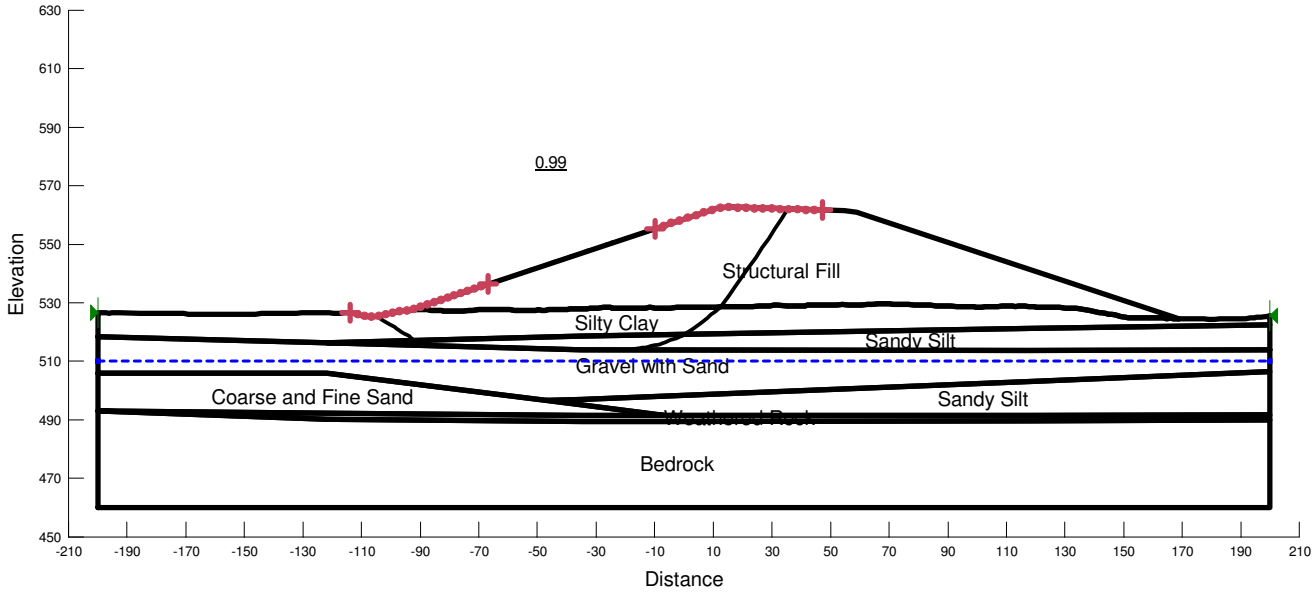
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	0 psf	29 °
Silty Clay	126 pcf	300 psf	28 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	150 psf	24 °
Weathered Rock	130 pcf	0 psf	35 °
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 136+00 Left Embankment
Embankment Stability

Short Term

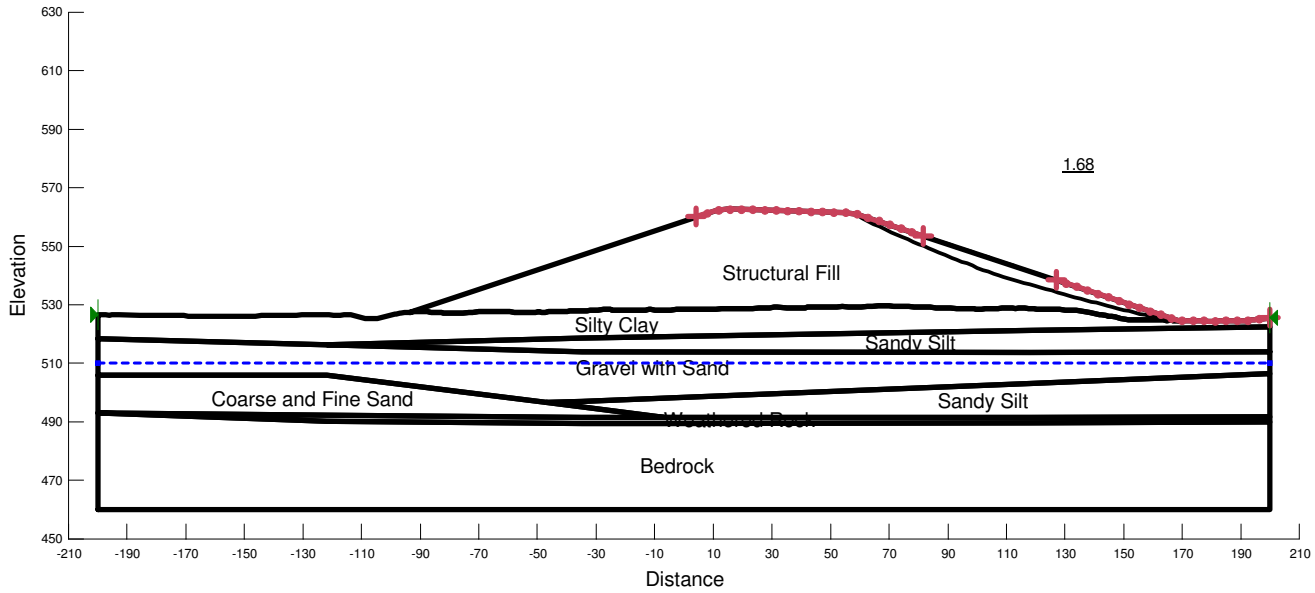
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	320 psf	21 °
Silty Clay	126 pcf	750 psf	0 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	500 psf	0 °
Weathered Rock	130 pcf	0 psf	35 °
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 136+00 Right Embankment
Embankment Stability

Long Term

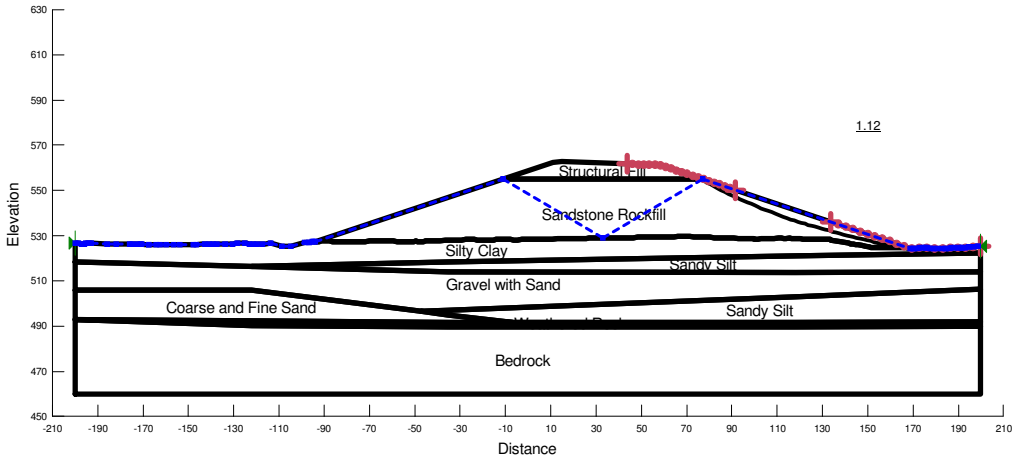
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	0 psf	29 °
Silty Clay	126 pcf	300 psf	28 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	150 psf	24 °
Weathered Rock	130 pcf	0 psf	35 °
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 136+00 Right Embankment
Embankment Stability

Rapid Drawdown

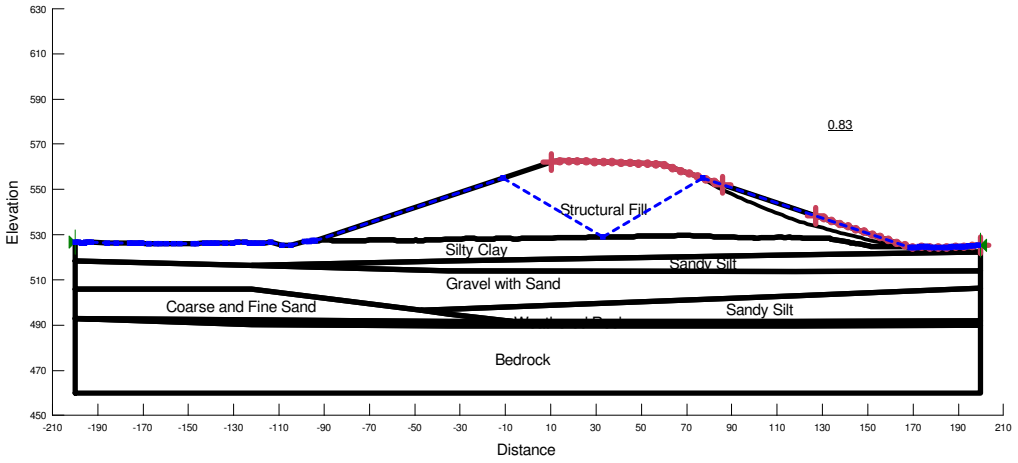
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	0 psf	29 °
Silty Clay	126 pcf	300 psf	28 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	150 psf	24 °
Weathered Rock	130 pcf	0 psf	35 °
Sandstone Rockfill	140 pcf	0 psf	36 °
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 136+00 Right Embankment
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	0 psf	29 °
Silty Clay	126 pcf	300 psf	28 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	150 psf	24 °
Weathered Rock	130 pcf	0 psf	35 °
Bedrock		Impenetrable	

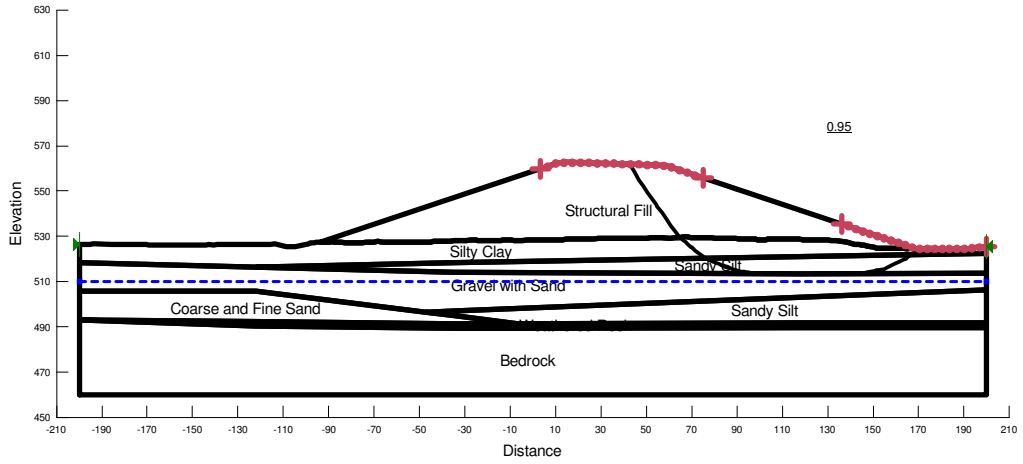


173608714 Sta 136+00 right RD.gsz 11/25/2013

173608714 LAW-7-2.17
Sta. 136+00 Right Embankment
Embankment Stability

Short Term

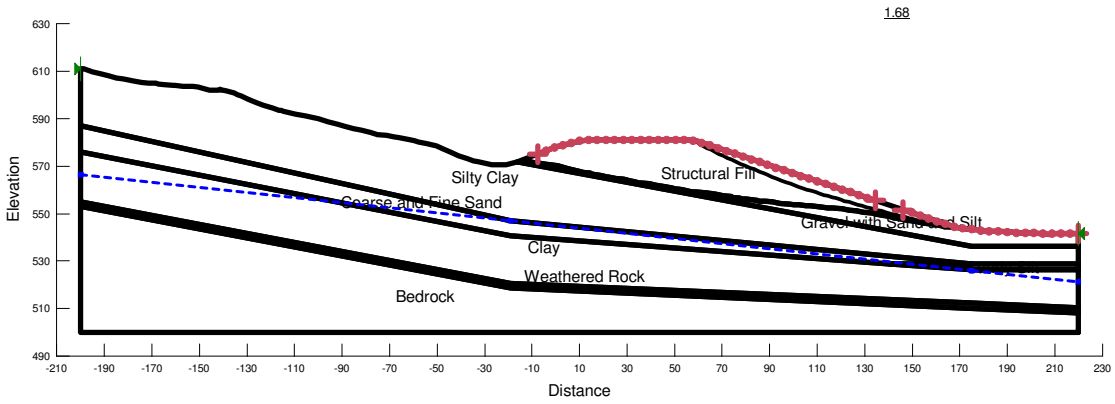
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136 pcf	320 psf	21 °
Silty Clay	126 pcf	750 psf	0 °
Gravel with Sand	125 pcf	0 psf	30 °
Coarse and Fine Sand	130 pcf	0 psf	30 °
Sandy Silt	130 pcf	500 psf	0 °
Weathered Rock	130 pcf	0 psf	35 °
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 160+00 Upper Embankment
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	550	28
Clay	125	300	26
Gravel with Sand and Silt	125	0	32
Coarse and Fine Sand	130	0	30
Sandy Silt	130	150	24
Weathered Rock	130	0	35
Bedrock	Impenatrable		

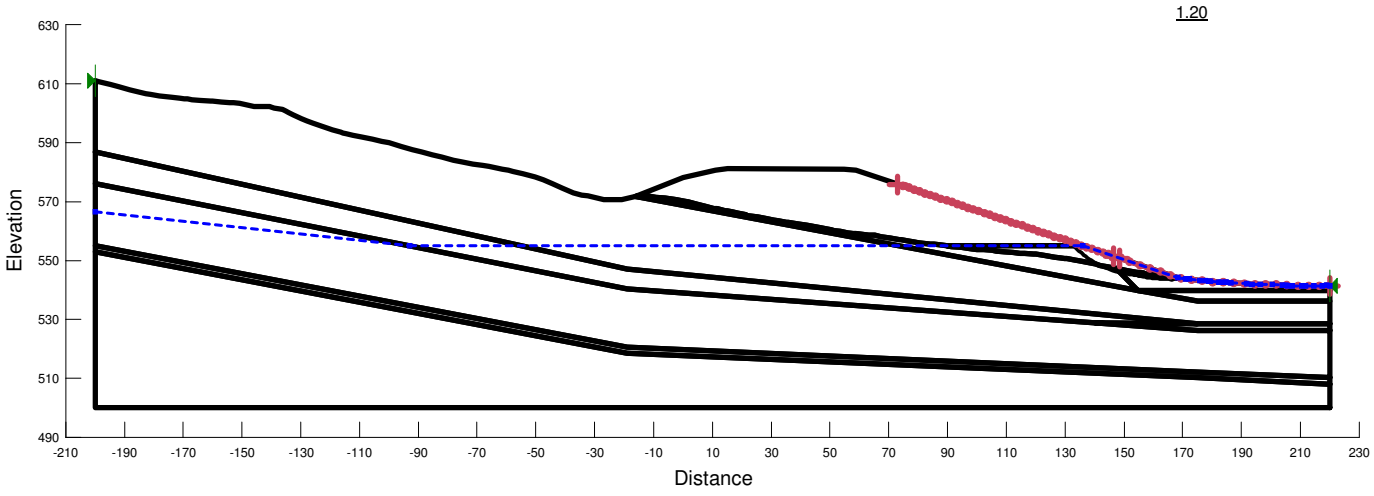


173608714 Sta 160+00 LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 160+00 Upper Embankment
Embankment Stability

Rapid Drawdown

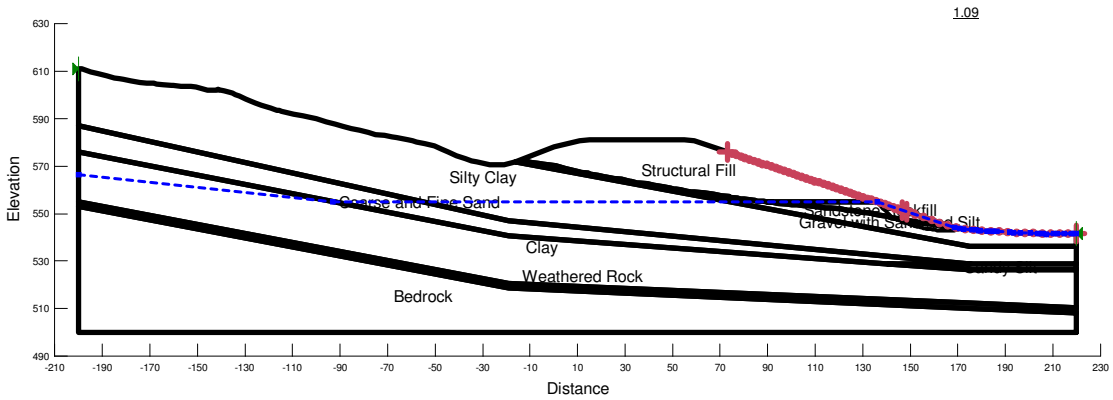
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	550	28
Clay	125	300	26
Gravel with Sand and Silt	125	0	32
Coarse and Fine Sand	130	0	30
Sandy Silt	130	150	24
Weathered Rock	130	0	35
Sandstone Rockfill	140	0	36
Bedrock	Impenatrable		



173608714 LAW-7-2.17
Sta. 160+00 Upper Embankment
Embankment Stability

Rapid Drawdown

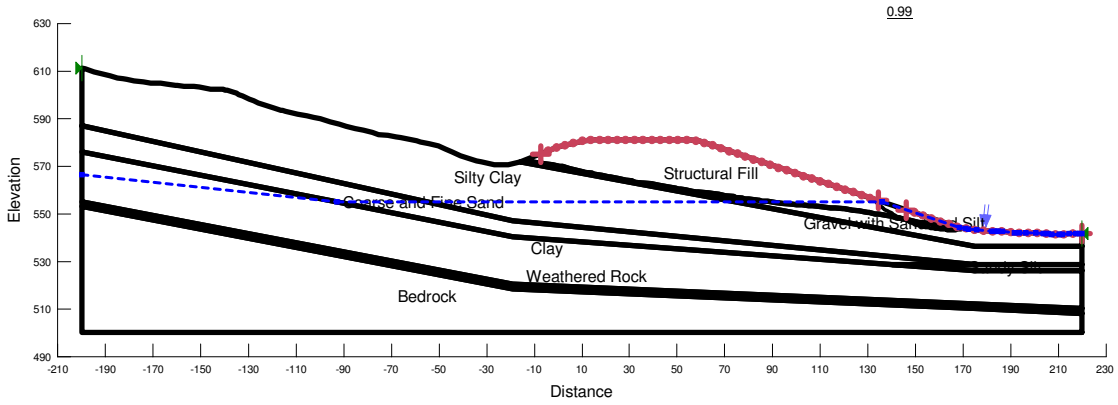
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	550	28
Clay	125	300	26
Gravel with Sand and Silt	125	0	32
Coarse and Fine Sand	130	0	30
Sandy Silt	130	150	24
Weathered Rock	130	0	35
Sandstone Rockfill	140	0	45
Bedrock	Impenatrable		



173608714 LAW-7-2.17
Sta. 160+00 Upper Embankment
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	550	28
Clay	125	300	26
Gravel with Sand and Silt	125	0	32
Coarse and Fine Sand	130	0	30
Sandy Silt	130	150	24
Weathered Rock	130	0	35
Bedrock	Impenatrable		

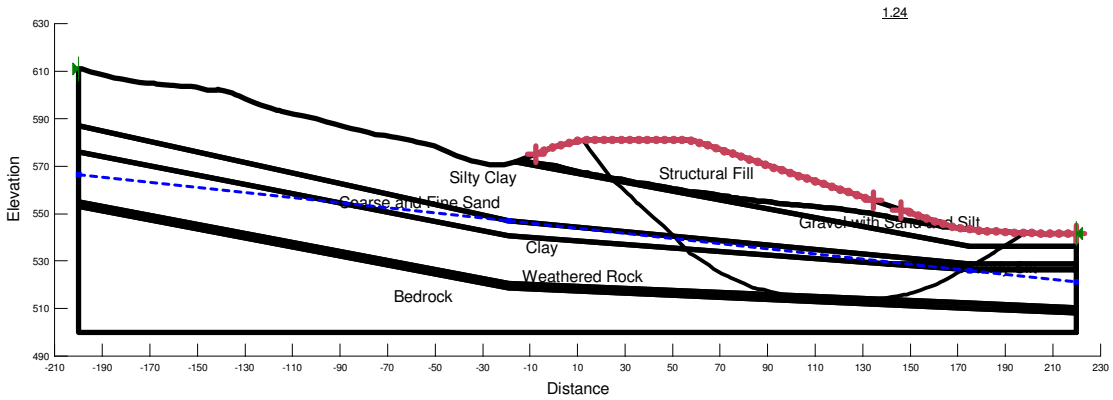


173608714 Sta 160+00 RD.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 160+00 Upper Embankment
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Silty Clay	126	1,000	0
Clay	125	1,000	0
Gravel with Sand and Silt	125	0	32
Coarse and Fine Sand	130	0	30
Sandy Silt	130	500	0
Weathered Rock	130	0	35
Bedrock	Impenatrable		



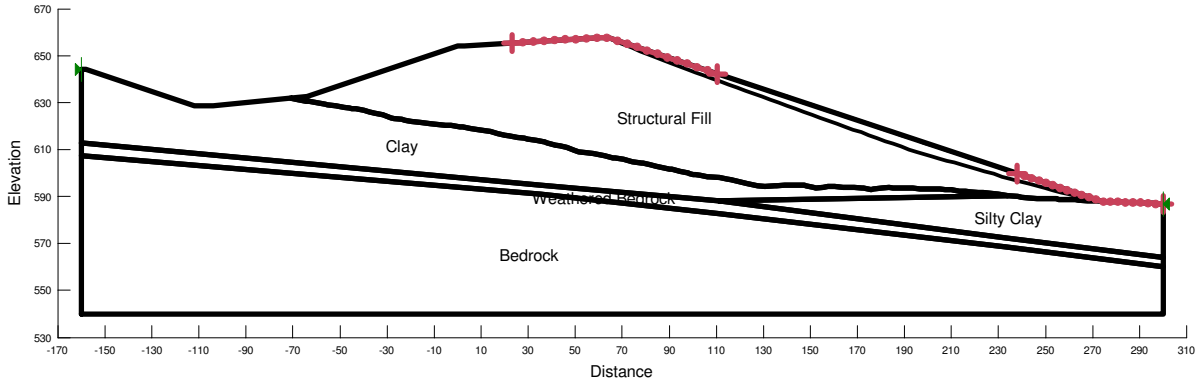
173608714 Sta 160+00 ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 184+00
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	125	300	28
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

1.67



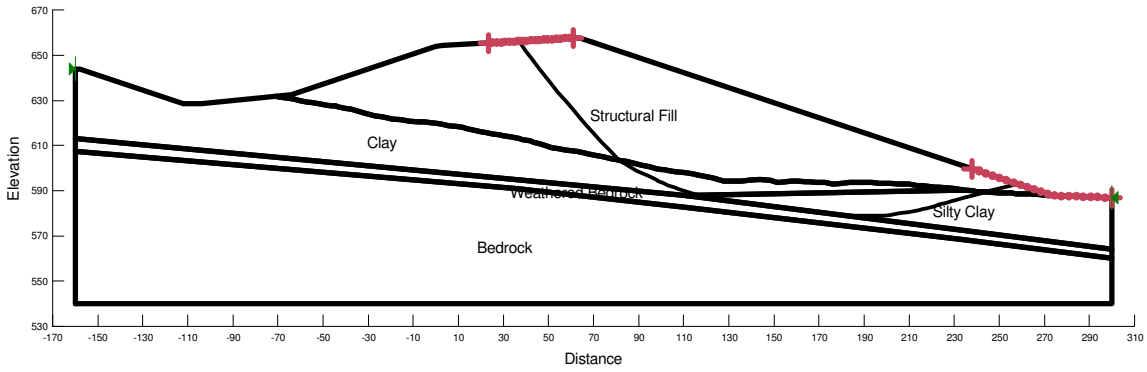
173608714 Sta 184+00 LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 184+00
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Silty Clay	126	1,500	0
Clay	125	1,500	0
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

1.34



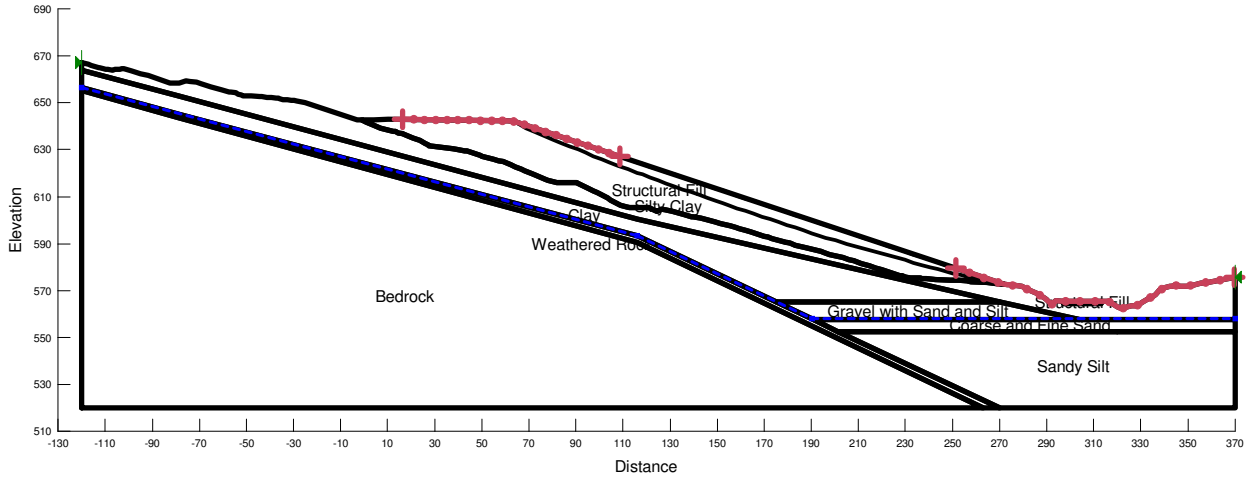
173608714 Sta 184+00 ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 219+00
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	125	200	26
Gravel with Sand and Silt	125	0	32
Coarse and Fine Sand	130	0	32
Sandy Silt	130	150	24
Weathered Rock	130	0	35
Bedrock	Impenatrable		

1.67

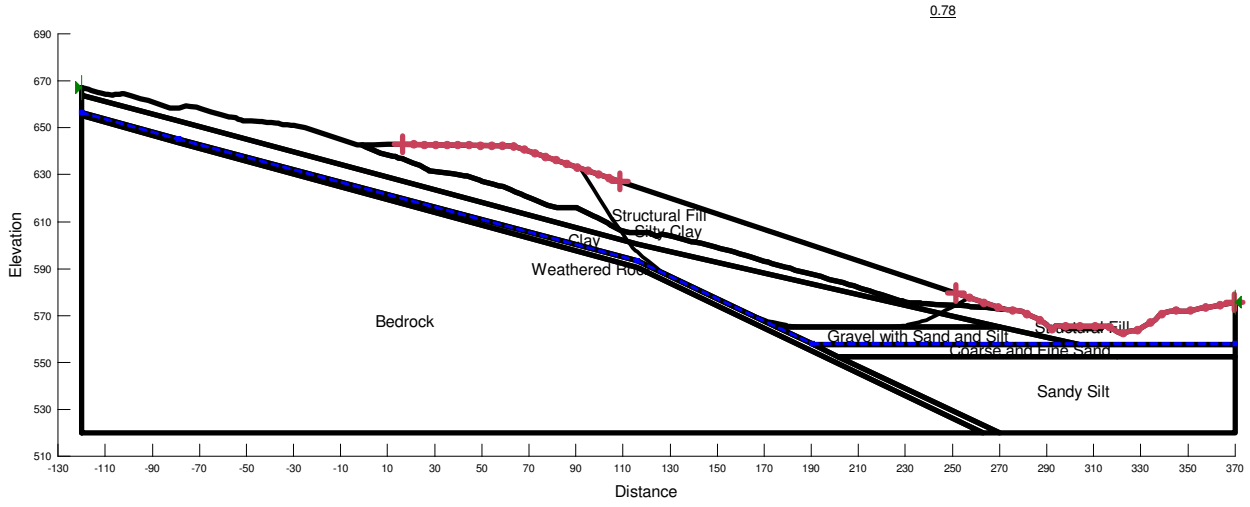


173608714 Sta 219+00(2) LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 219+00
Embankment Stability

Short Term

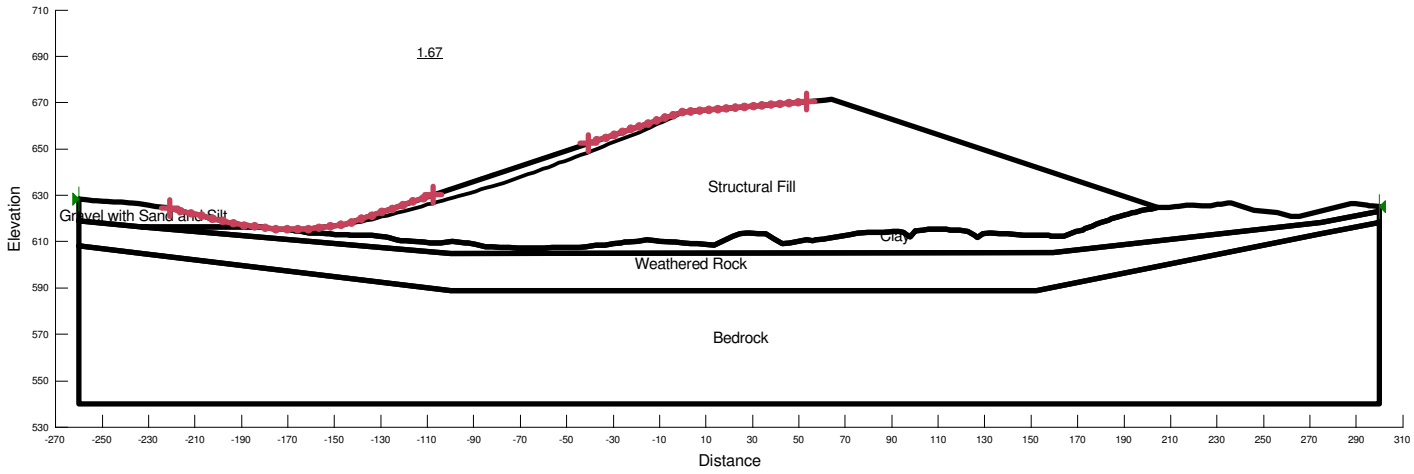
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	
Silty Clay	126	1,700	
Clay	125	500	21
Gravel with Sand and Silt	125	0	32
Coarse and Fine Sand	130	0	32
Sandy Silt	130	150	24
Weathered Rock	130	0	35
Bedrock	Impenatrable		



173608714 Sta 219+00(2) ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 230+50 Left Embankment
Embankment Stability
Long Term

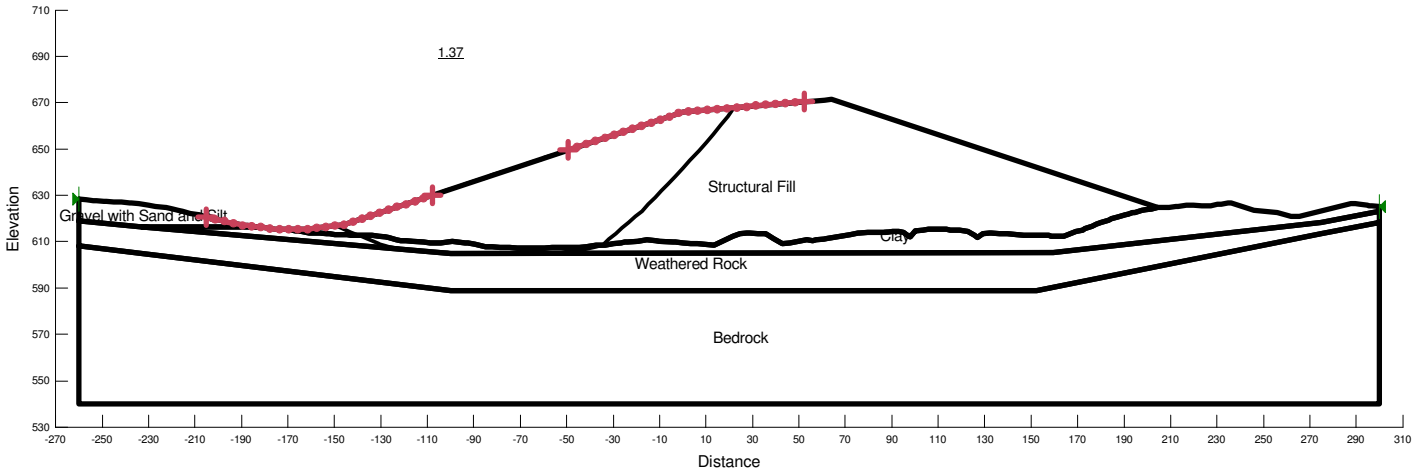
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Clay	125	150	25
Gravel with Sand and Silt	125	0	32
Weathered Rock	130	200	24
Bedrock		Impenatrable	



173608714 Sta 230+50 left LT.gsz 11/27/2013

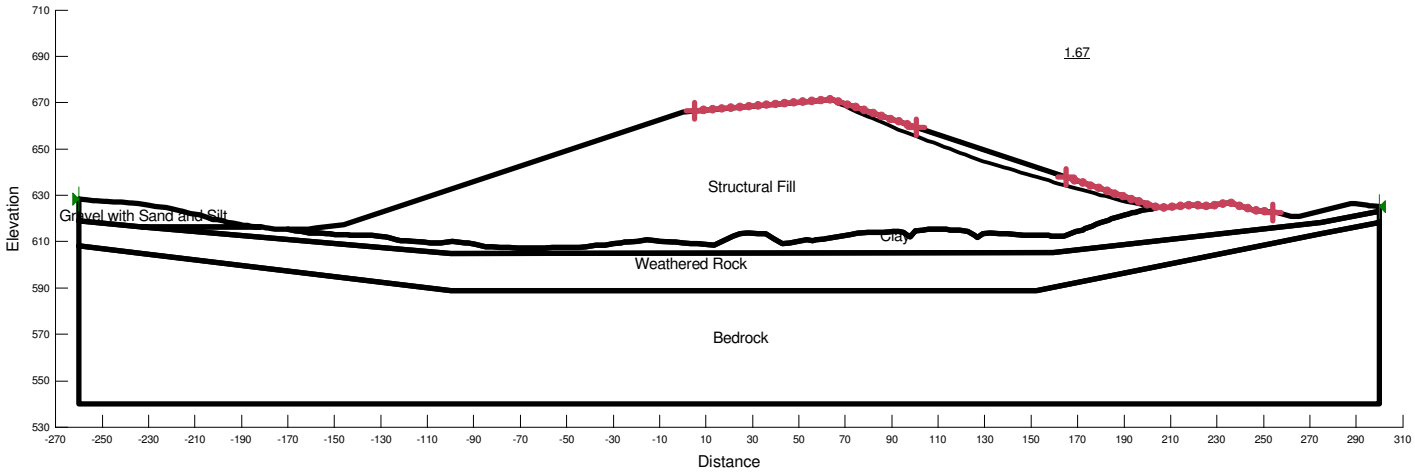
173608714 LAW-7-2.17
Sta. 230+50 Left Embankment
Embankment Stability
Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Clay	125	1,000	0
Gravel with Sand and Silt	125	0	32
Weathered Rock	130	200	24
Bedrock		Impenetrable	



173608714 LAW-7-2.17
Sta. 230+50 Right Embankment
Embankment Stability
Long Term

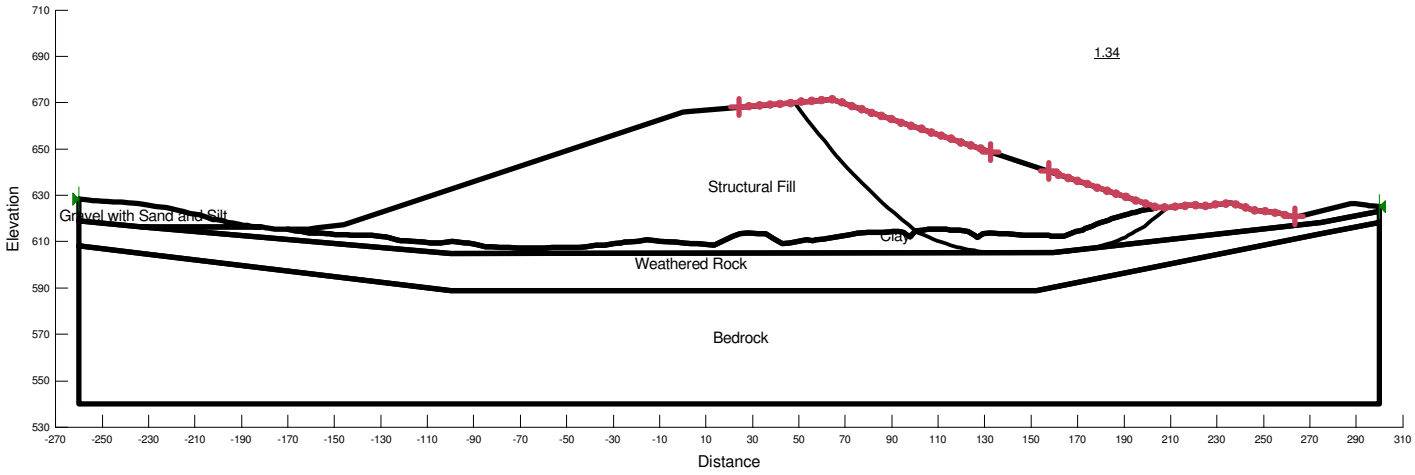
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Clay	125	150	25
Gravel with Sand and Silt	125	0	32
Weathered Rock	130	200	24
Bedrock		Impenatrable	



173608714 Sta 230+50 right LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 230+50 Right Embankment
Embankment Stability
Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Clay	125	1,000	0
Gravel with Sand and Silt	125	0	32
Weathered Rock	130	200	24
Bedrock		Impenetrable	

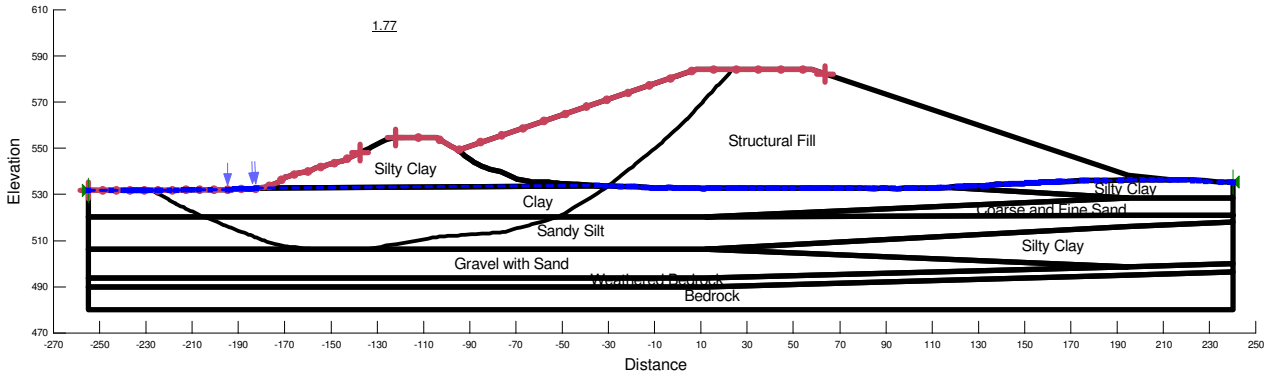


173608714 Sta 230+50 right ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 293+00 Left Embankment
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Coarse and Fine Sand	120	0	28
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Weathered Bedrock	130	0	35
Bedrock	Impenatrable		



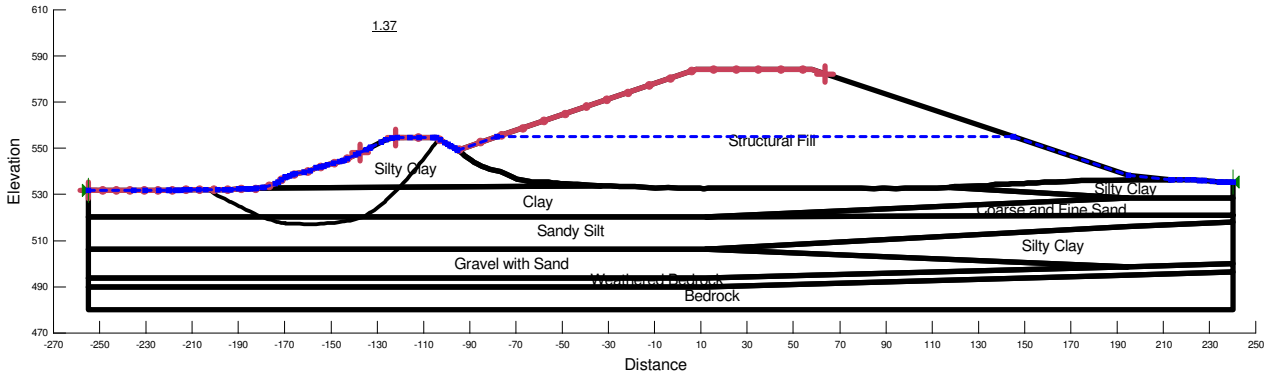
173608714 Sta 293+00 left(2) LT.gsz

11/21/2013

173608714 LAW-7-2.17
Sta. 293+00 Left Embankment
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Coarse and Fine Sand	120	0	28
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Weathered Bedrock	130	0	35
Bedrock	Impenatrable		



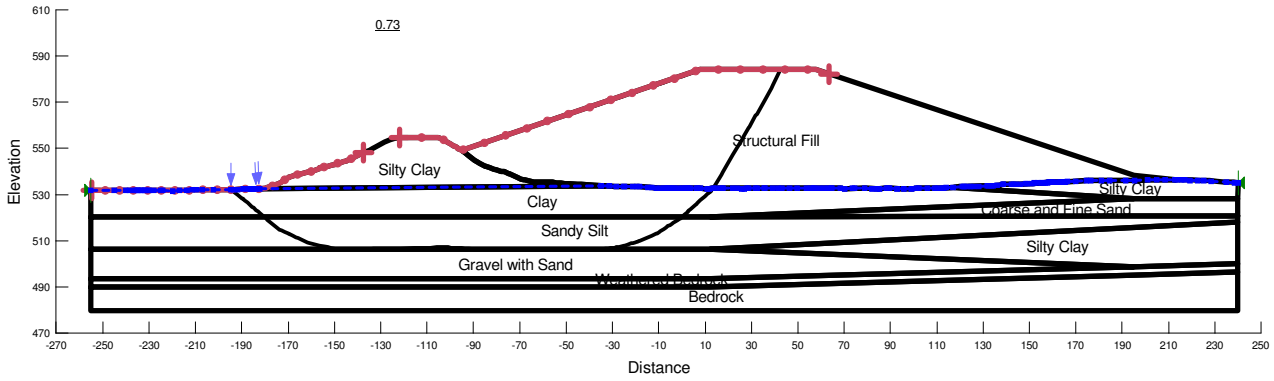
173608714 Sta 293+00 left RD.gsz

11/21/2013

173608714 LAW-7-2.17
Sta. 293+00 Left Embankment
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Silty Clay	126	750	0
Clay	115	750	0
Coarse and Fine Sand	120	0	28
Sandy Silt	120	500	0
Gravel with Sand	135	0	34
Weathered Bedrock	130	0	35
Bedrock	Impenatrable		



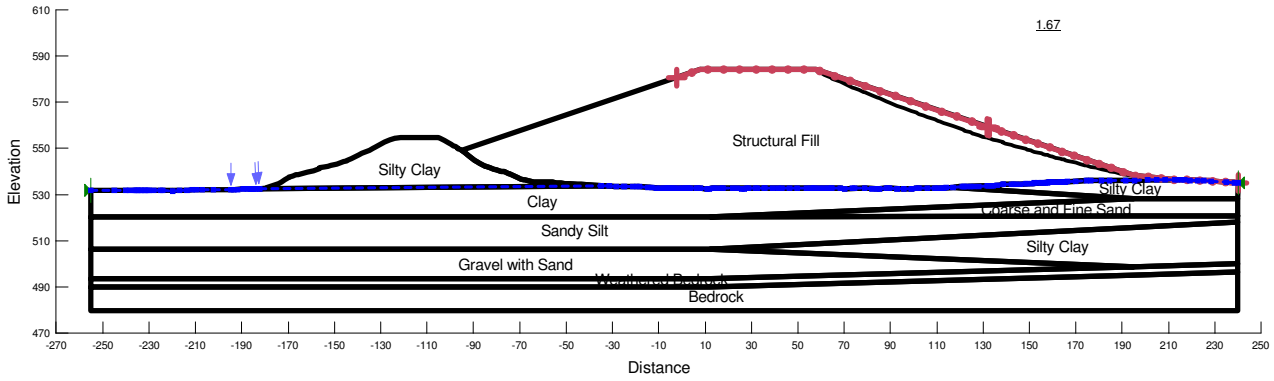
173608714 Sta 293+00 left(2) ST.gsz

11/21/2013

173608714 LAW-7-2.17
Sta. 293+00 Right Embankment
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Coarse and Fine Sand	120	0	28
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Weathered Bedrock	130	0	35
Bedrock	Impenatrable		



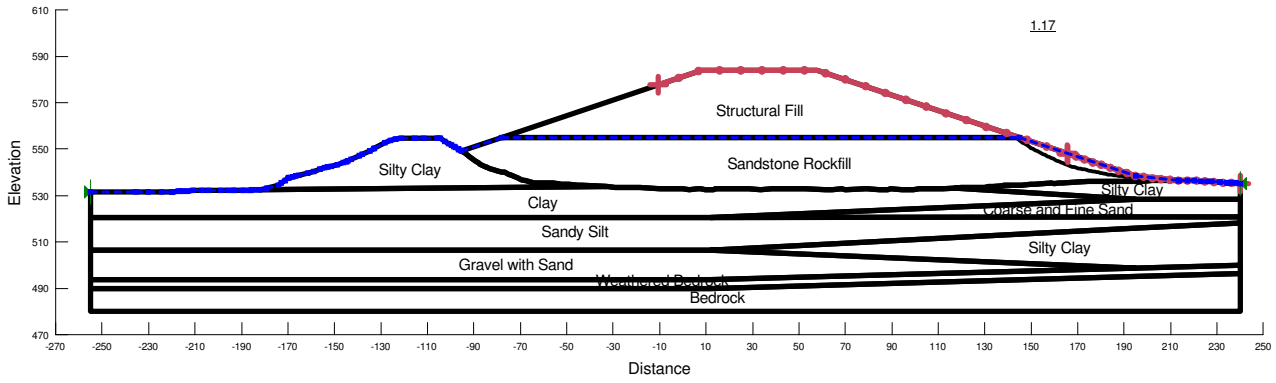
173608714 Sta 293+00 right(2) LT.gsz

11/21/2013

173608714 LAW-7-2.17
Sta. 293+00 Right Embankment
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Coarse and Fine Sand	120	0	28
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Weathered Bedrock	130	0	35
Sandstone Rockfill	140	0	36
Bedrock	Impenatrable		

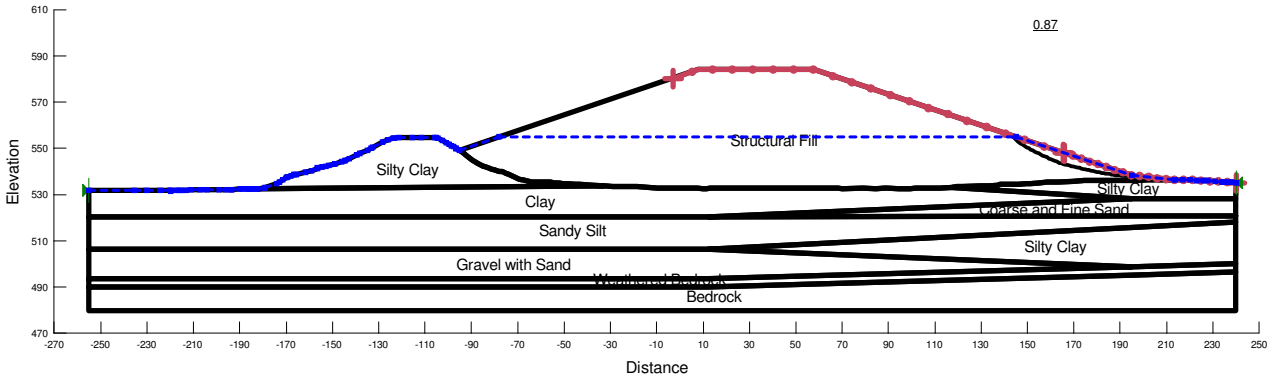


173608714 Sta 293+00 right RD Rockfill.gsz 11/25/2013

173608714 LAW-7-2.17
Sta. 293+00 Right Embankment
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Coarse and Fine Sand	120	0	28
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Weathered Bedrock	130	0	35
Bedrock	Impenatrable		



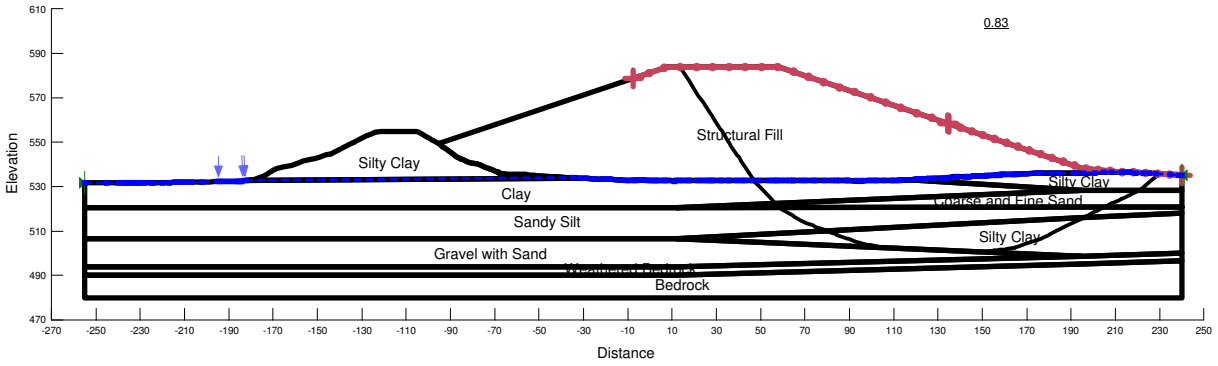
173608714 Sta 293+00 right RD.gsz

11/21/2013

173608714 LAW-7-2.17
Sta. 293+00 Right Embankment
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Silty Clay	126	750	0
Clay	115	750	0
Coarse and Fine Sand	120	0	28
Sandy Silt	120	500	0
Gravel with Sand	135	0	34
Weathered Bedrock	130	0	35
Bedrock	Impenatrable		



173608714 Sta 293+00 right(2) ST.gsz

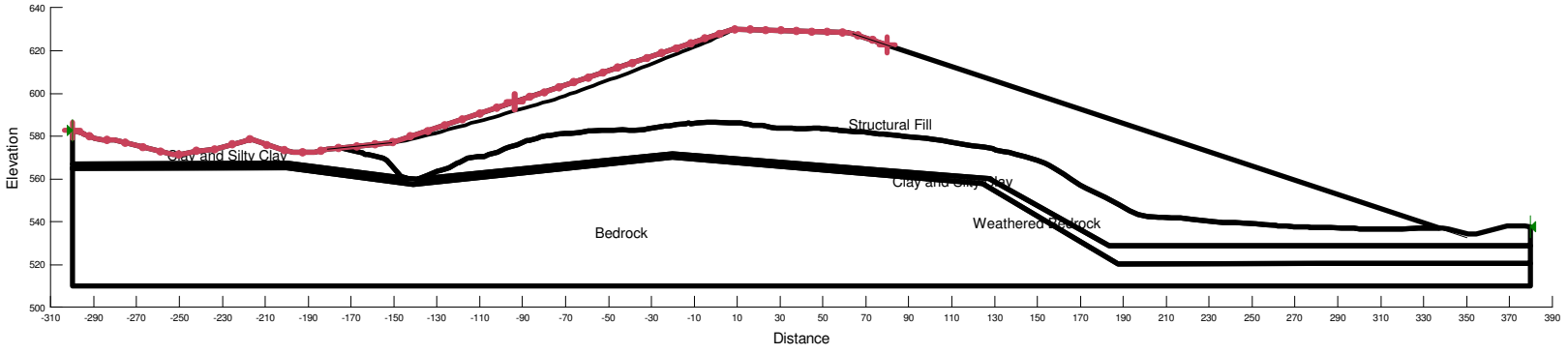
11/21/2013

173608714 LAW-7-2.17
Sta. 322+00 Left Embankment
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Clay and Silty Clay	123	200	28
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

1.67

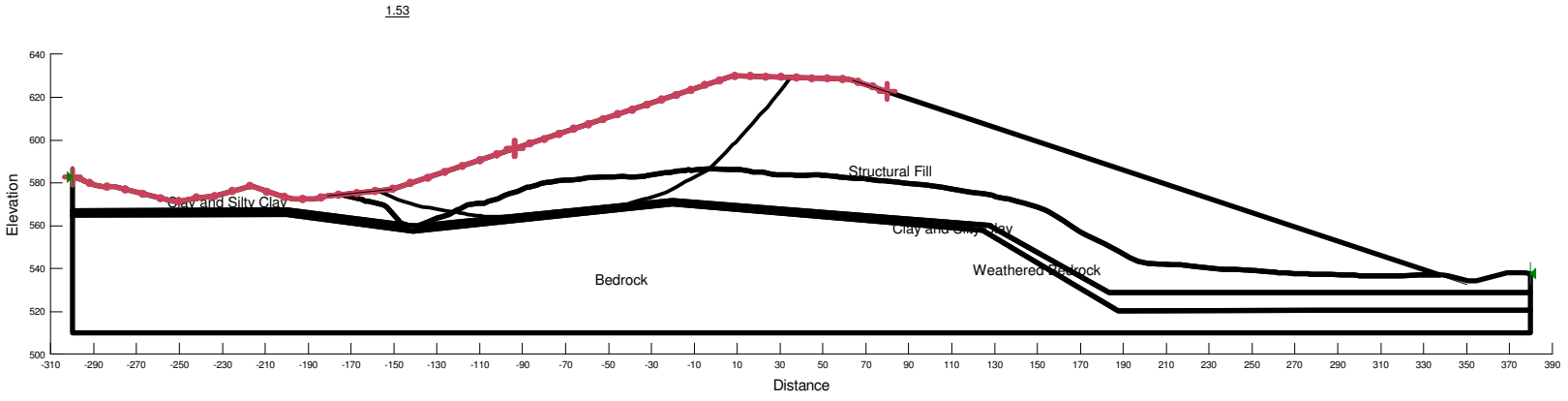


173608714 Sta 322+00 left LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 322+00 Left Embankment
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Clay and Silty Clay	123	1,500	
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	



173608714 Sta 322+00 left ST.gsz 11/27/2013

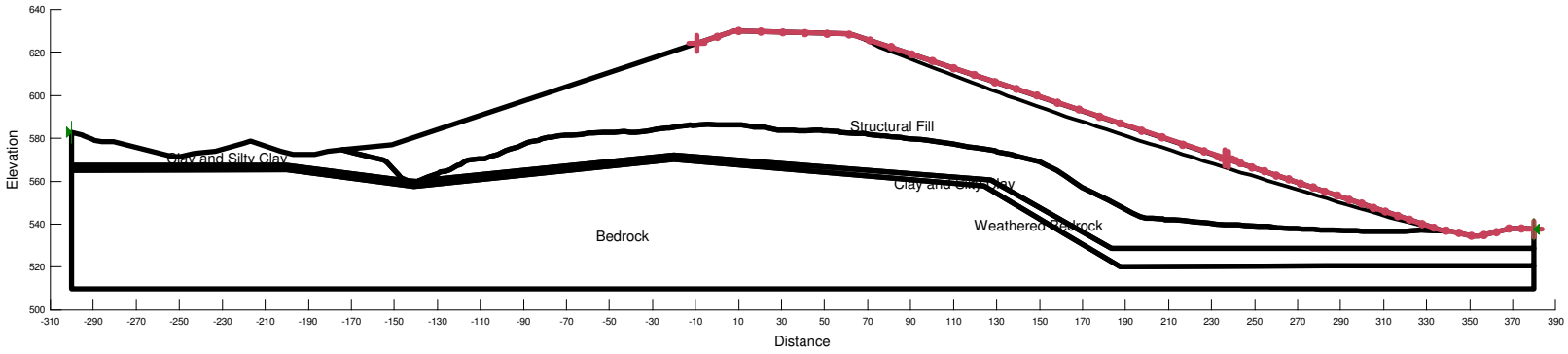
173608714 LAW-7-2.17
Sta. 322+00 Right Embankment
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Clay and Silty Clay	123	200	28
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

Stantec

1.67



173608714 Sta 322+00 right LT.gsz 11/27/2013

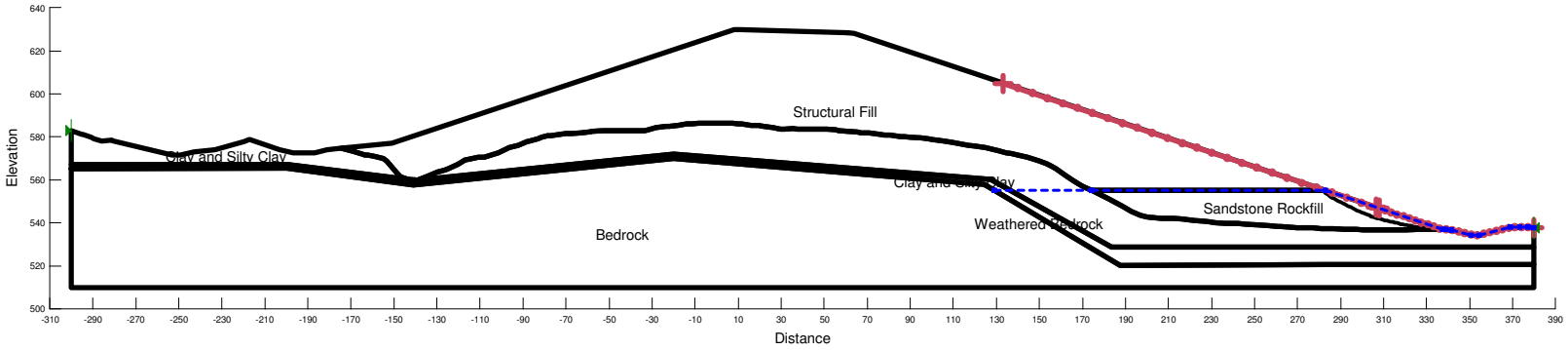
173608714 LAW-7-2.17
Sta. 322+00 Right Embankment
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	
Clay and Silty Clay	123	200	29
Weathered Bedrock	130	0	28
Sandstone Rockfill	140	0	35
Bedrock		Impenatrable	

Stantec

1.16



173608714 Sta 322+00 right RD Rockfill.gsz 11/27/2013

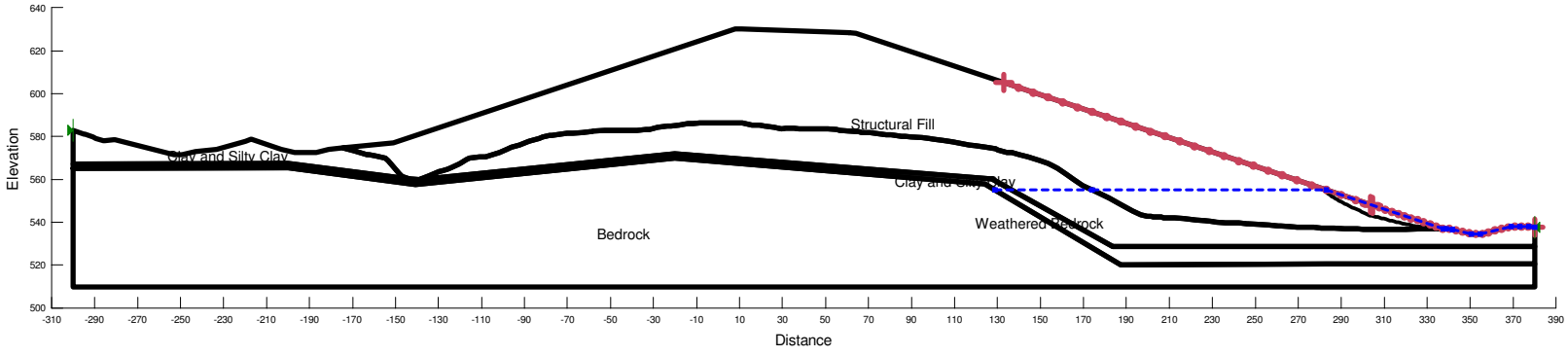
173608714 LAW-7-2.17
Sta. 322+00 Right Embankment
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Clay and Silty Clay	123	200	28
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

Stantec

0.86



173608714 Sta 322+00 right RD.gsz 11/27/2013

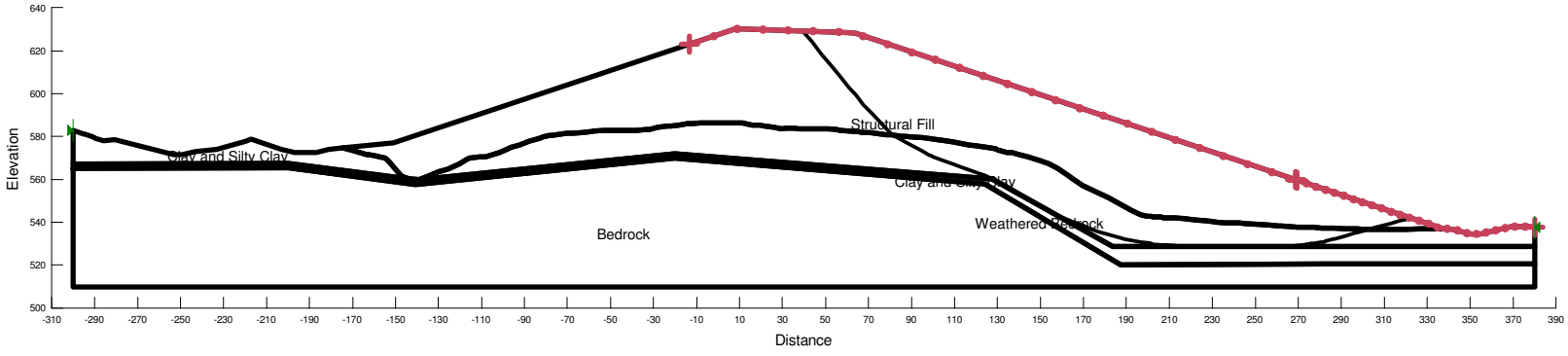
173608714 LAW-7-2.17
Sta. 322+00 Right Embankment
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Clay and Silty Clay	123	1,500	
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

Stantec

1.14



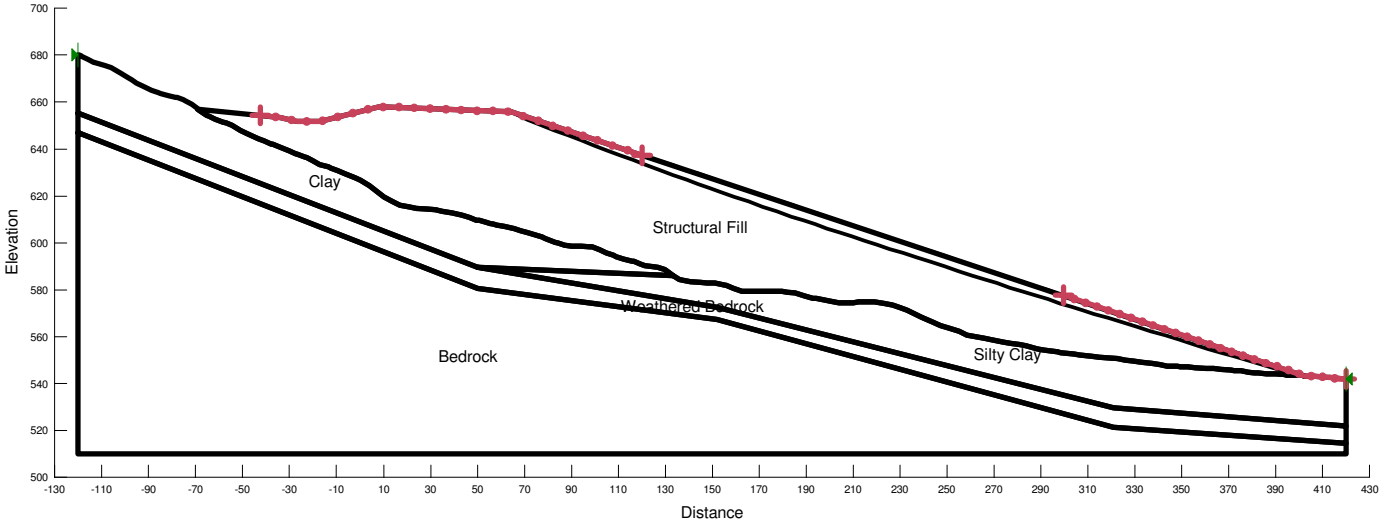
173608714 Sta 322+00 right ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 329+00
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Clay	123	200
Silty Clay	130	350
Weathered Bedrock	130	0
Bedrock		Impenatrable

1.67



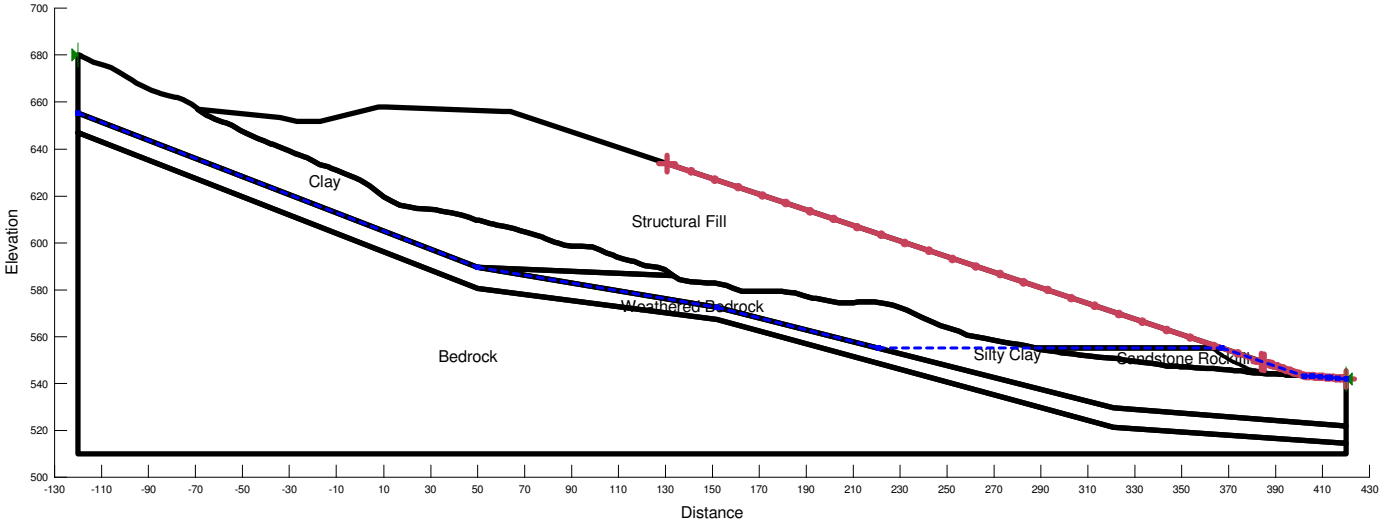
173608714 Sta 329+00 LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 329+00
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Clay	123	200
Silty Clay	130	350
Weathered Bedrock	130	0
Sandstone Rockfill	140	0
Bedrock	Impenatrable	

1.25



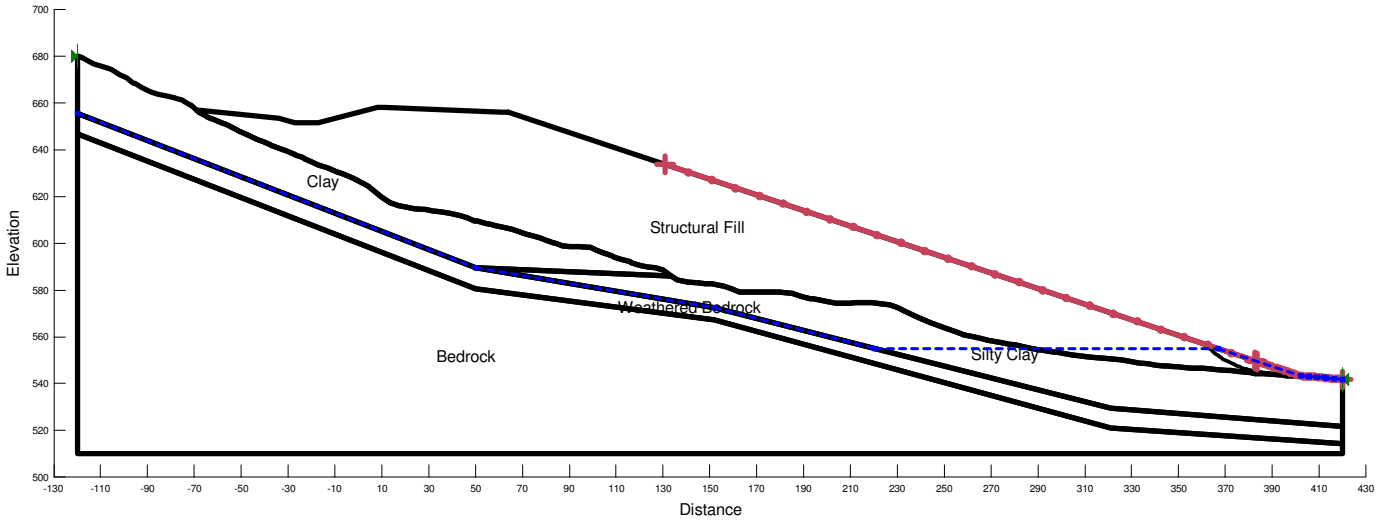
173608714 Sta 329+00 RD Rockfill.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 329+00
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Clay	123	200
Silty Clay	130	350
Weathered Bedrock	130	0
Bedrock	Impenatrable	

0.93



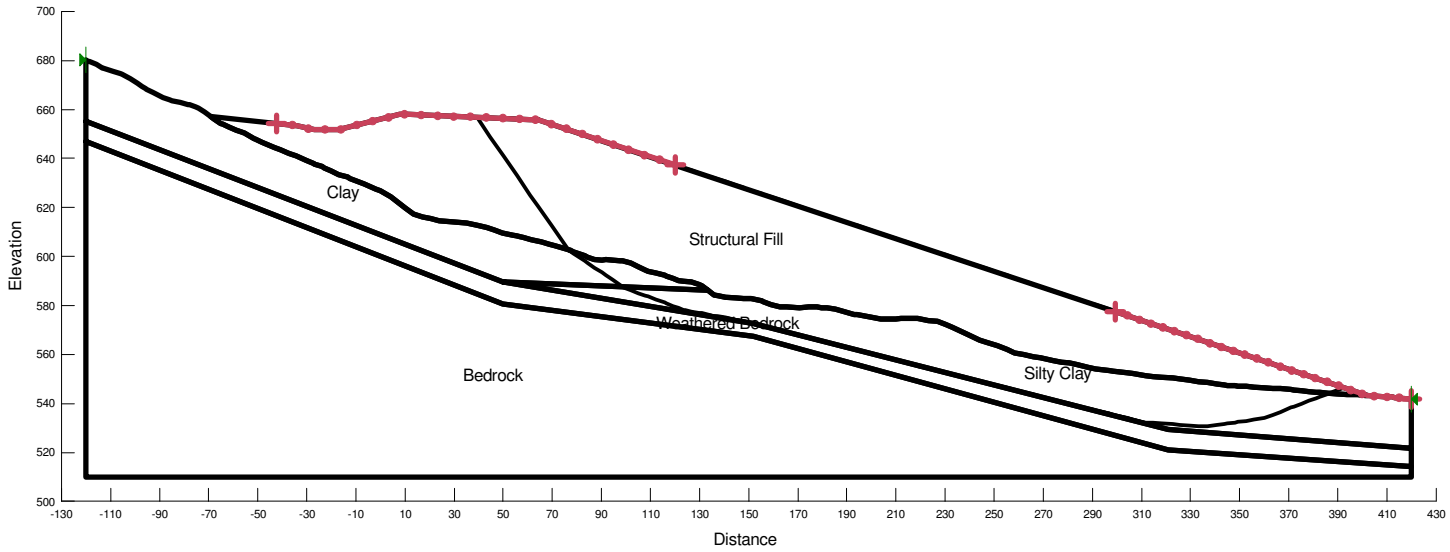
173608714 Sta 329+00 RD.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 329+00
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	320
Clay	123	1,500
Silty Clay	130	1,100
Weathered Bedrock	130	0
Bedrock		Impenatrable

0.81

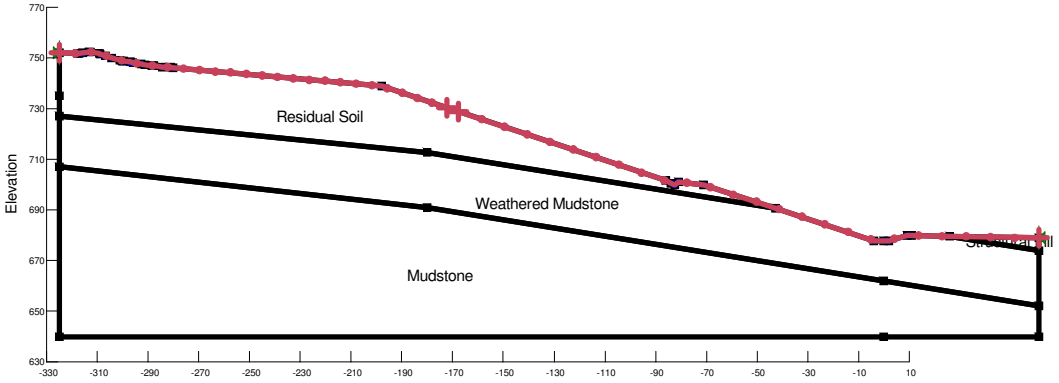


173608714 Sta 329+00 ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 334+00
Cut Slope Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Residual Soil	130	170	23.5
Weathered Mudstone	130	170	23.5
Mudstone	130	170	23.5
Structural Fill	136	0	29

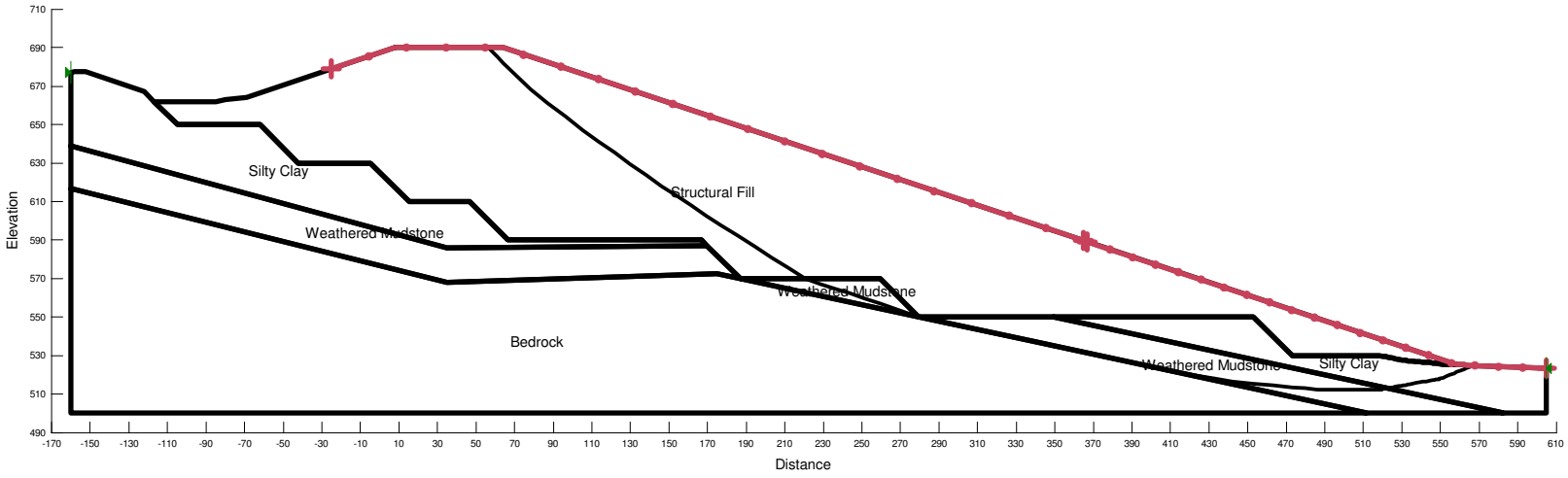


173608714 LAW-7-2.17
Sta. 336+00
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Silty Clay	126	300
Weathered Mudstone	130	460
Bedrock		Impenatrable

1.55

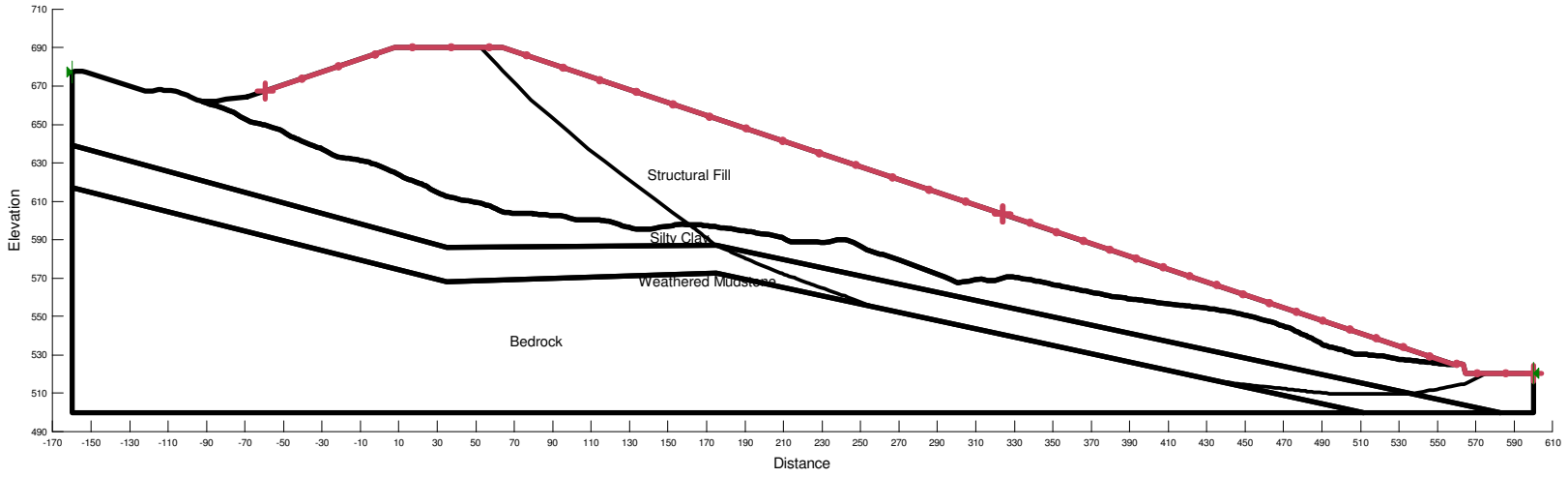


173608714 Sta 336+00(2) LT-benched.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 336+00
Embankment Stability
Long Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Silty Clay	126	300
Weathered Mudstone	130	460
Bedrock		Impenatrable

1.51



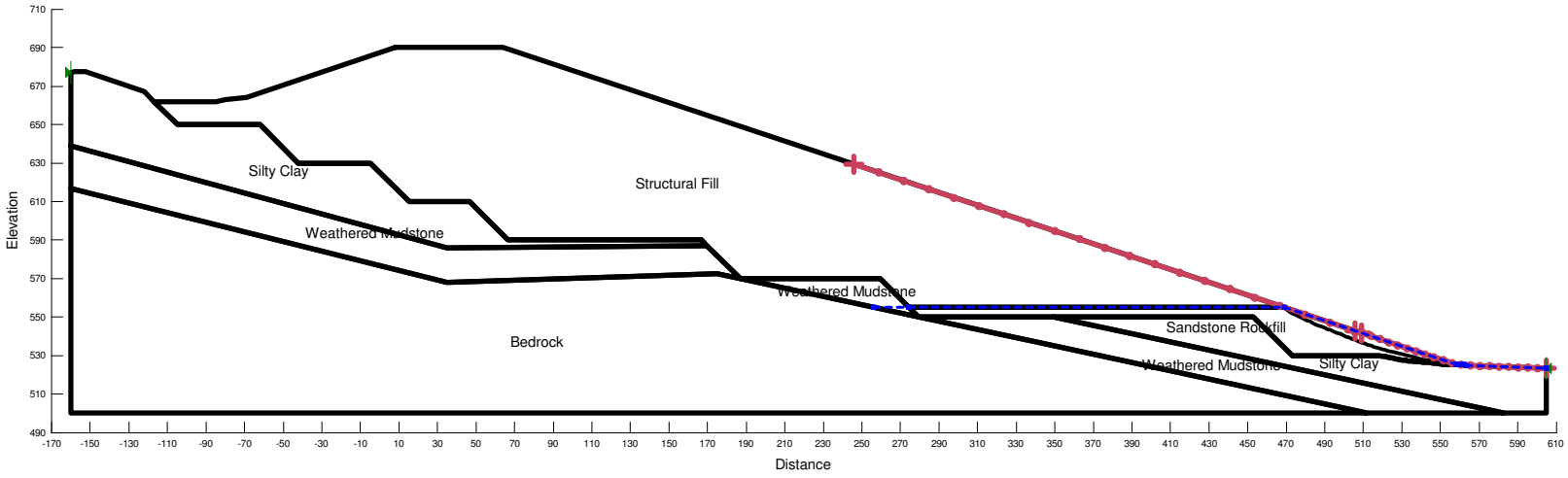
173608714 Sta 336+00(2) LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 336+00
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Silty Clay	126	300
Weathered Mudstone	130	460
Sandstone Rockfill	140	0
Bedrock		Impenatrable

1.12



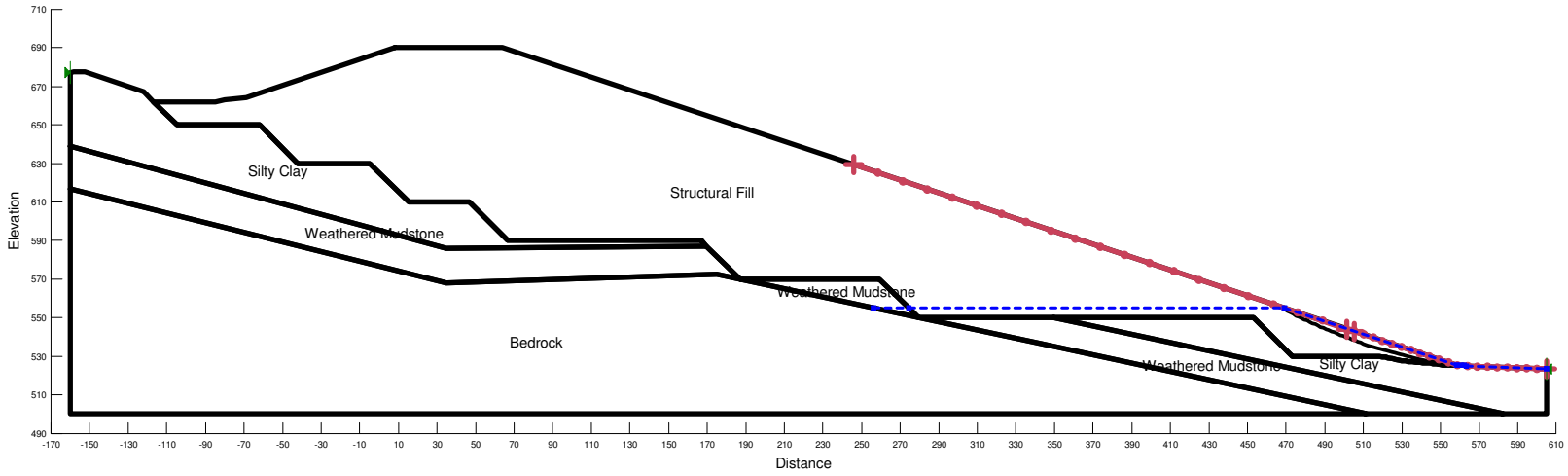
173608714 Sta 336+00 RD-benched Rockfill.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 336+00
Embankment Stability

Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Silty Clay	126	300
Weathered Mudstone	130	460
Bedrock		Impenatrable

0.83

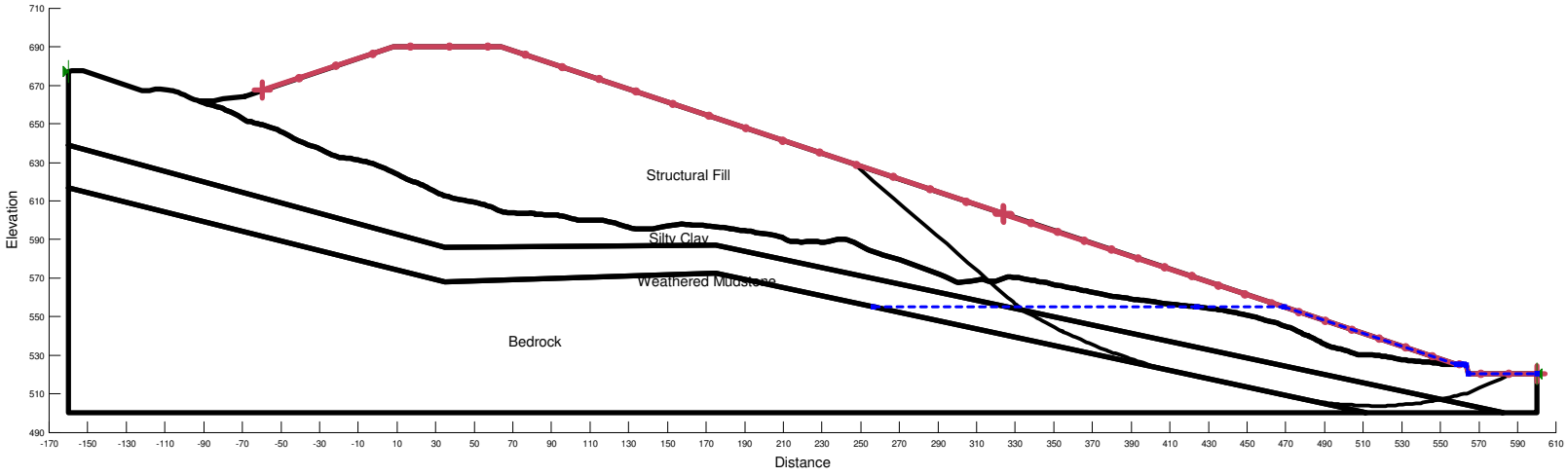


173608714 Sta 336+00 RD-benched.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 336+00
Embankment Stability
Rapid Drawdown

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Silty Clay	126	300
Weathered Mudstone	130	460
Bedrock		Impenatrable

1.27



173608714 Sta 336+00 RD.gsz

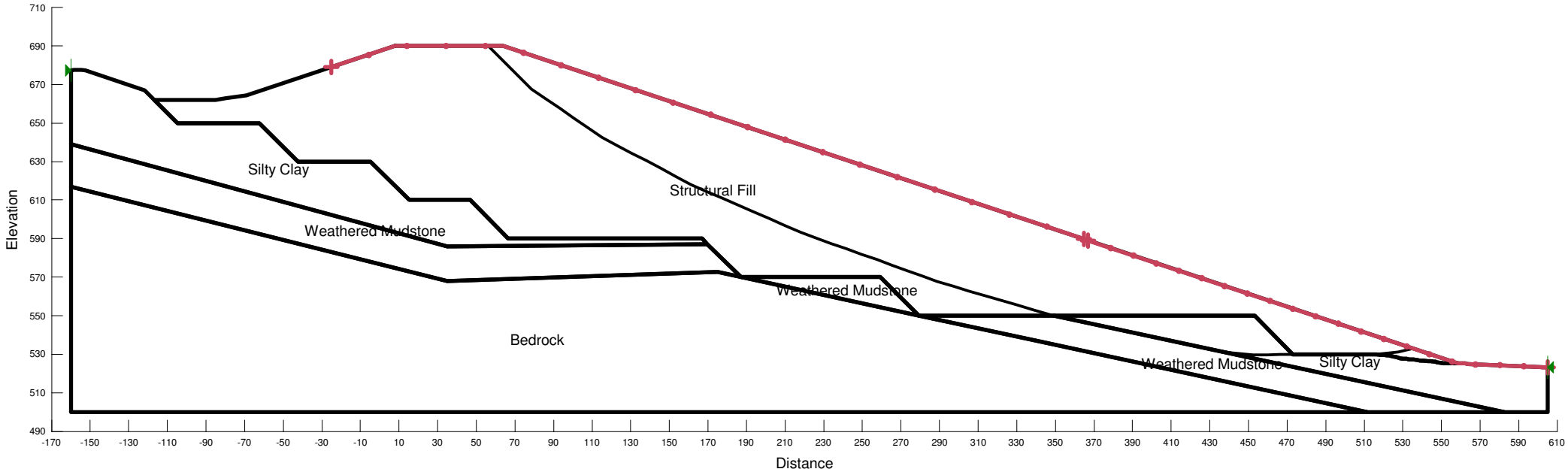
11/27/2013

173608714 LAW-7-2.17
Sta. 336+00
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	320
Silty Clay	126	1,700
Weathered Mudstone	130	460
Bedrock		Impenatrable

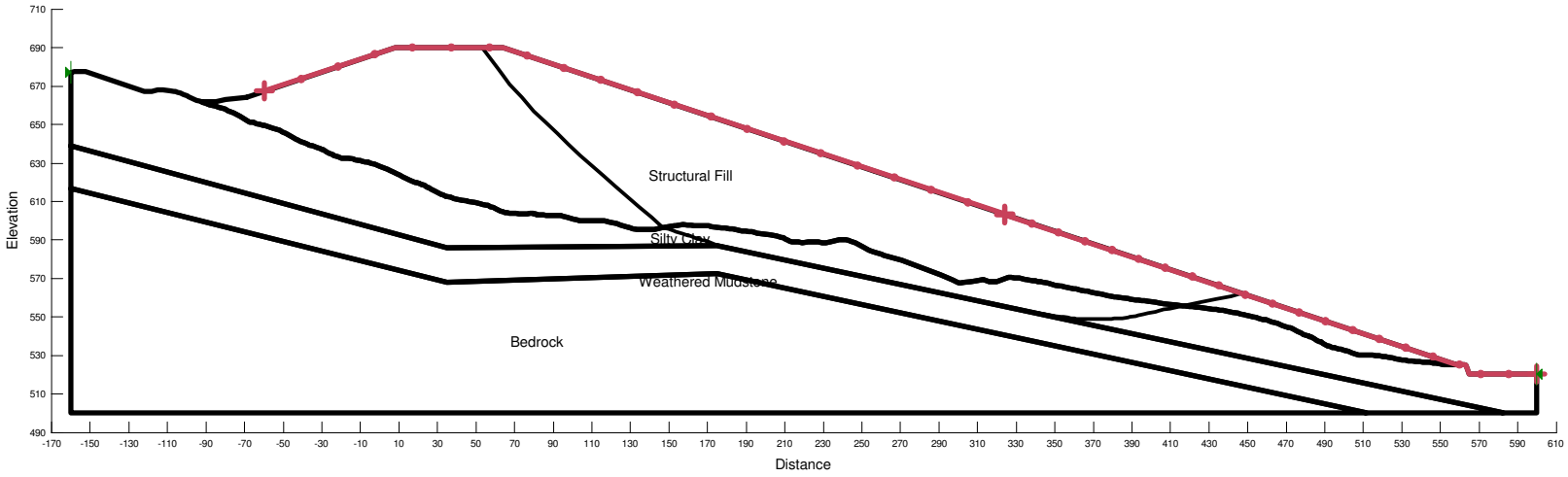
1.37



173608714 LAW-7-2.17
Sta. 336+00
Embankment Stability
Short Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	320
Silty Clay	126	1,700
Weathered Mudstone	130	460
Bedrock		Impenatrable

1.07



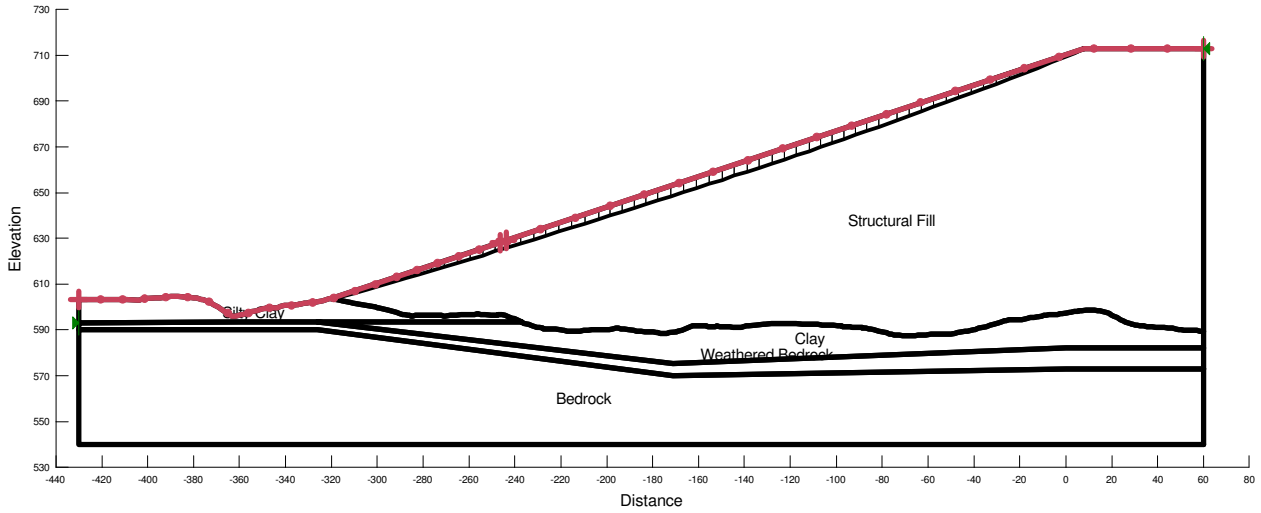
173608714 Sta 336+00(2) ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 340+00 Left Embankment
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Silty Clay	130	190
Clay	130	350
Weathered Bedrock	130	0
Bedrock		Impenatrable

1.67



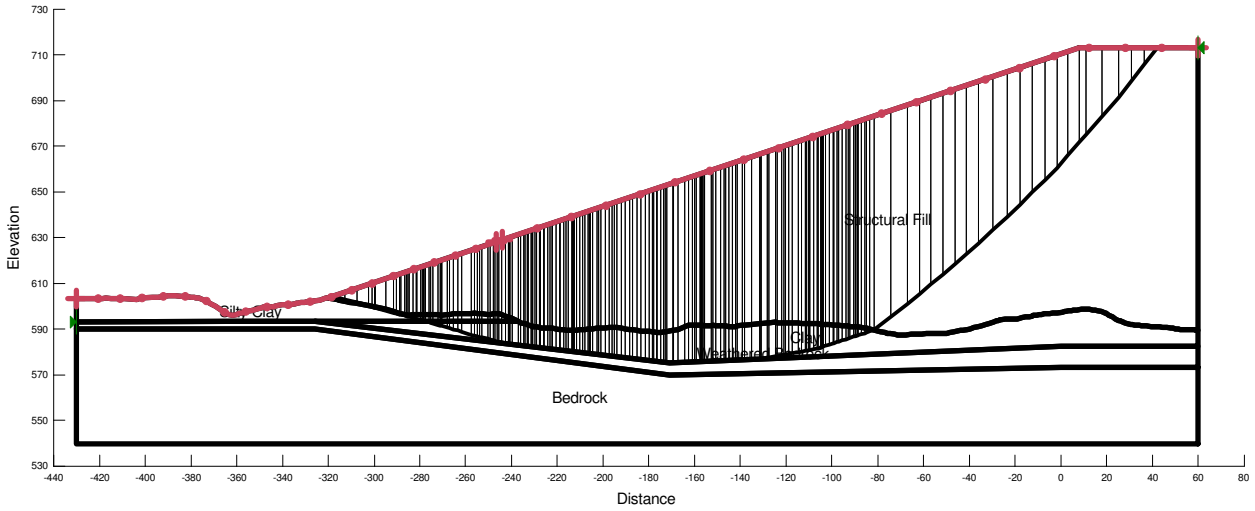
173608714 Sta 340+00 left(2) LT.gsz

11/27/2013

173608714 LAW-7-2.17
Sta. 340+00 Left Embankment
Embankment Stability
Short Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	320
Silty Clay	130	1,000
Clay	130	2,000
Weathered Bedrock	130	0
Bedrock		Impenatrable

1.19

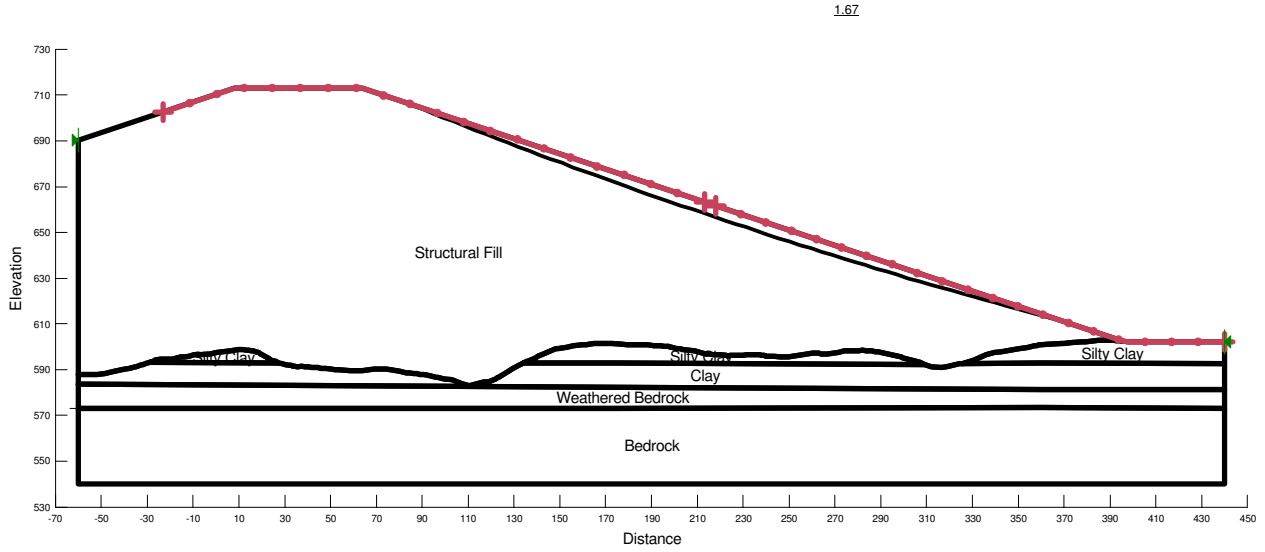


173608714 Sta 340+00 left(2) ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 340+00 Right Embankment
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	0
Silty Clay	130	190
Clay	130	300
Weathered Bedrock	130	0
Bedrock		Impenatrable

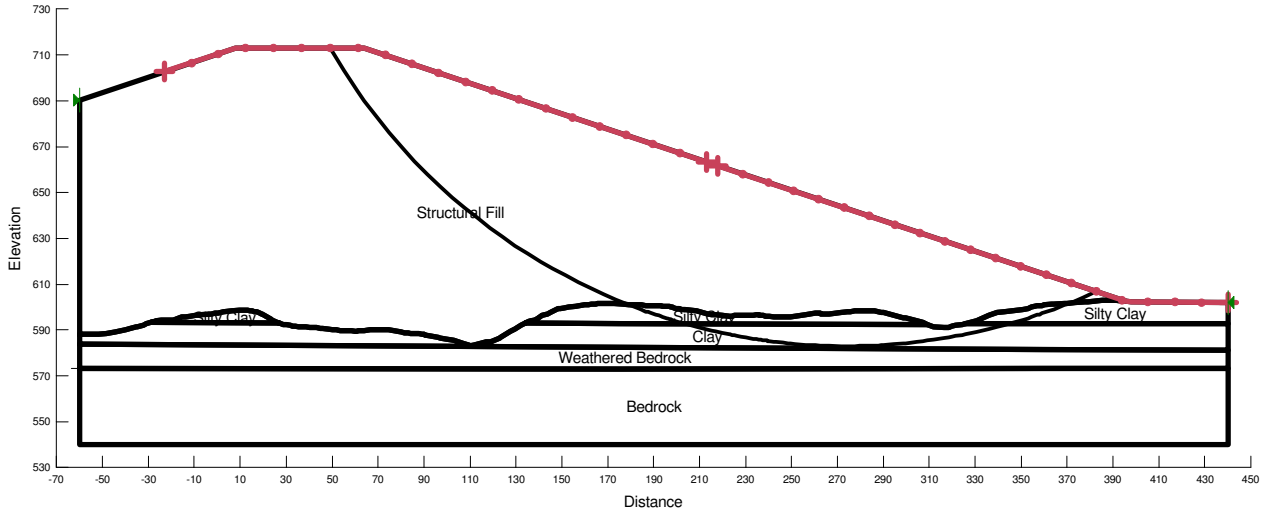


173608714 Sta 340+00 right(2) LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 340+00 Right Embankment
Embankment Stability
Short Term

Material	Unit Weight (pcf)	Cohesion (psf)
Structural Fill	136	320
Silty Clay	130	1,000
Clay	130	2,000
Weathered Bedrock	130	0
Bedrock		Impenatrable

1.19



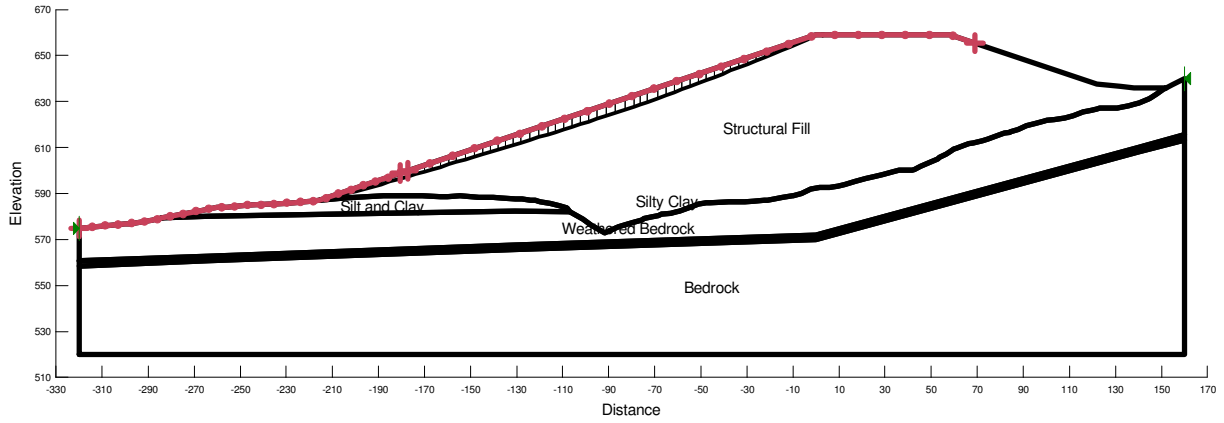
173608714 Sta 340+00 right(2) ST.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 371+00
Embankment Stability

Long Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silt and Clay	125	160	28
Silty Clay	130	350	28
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

1.67

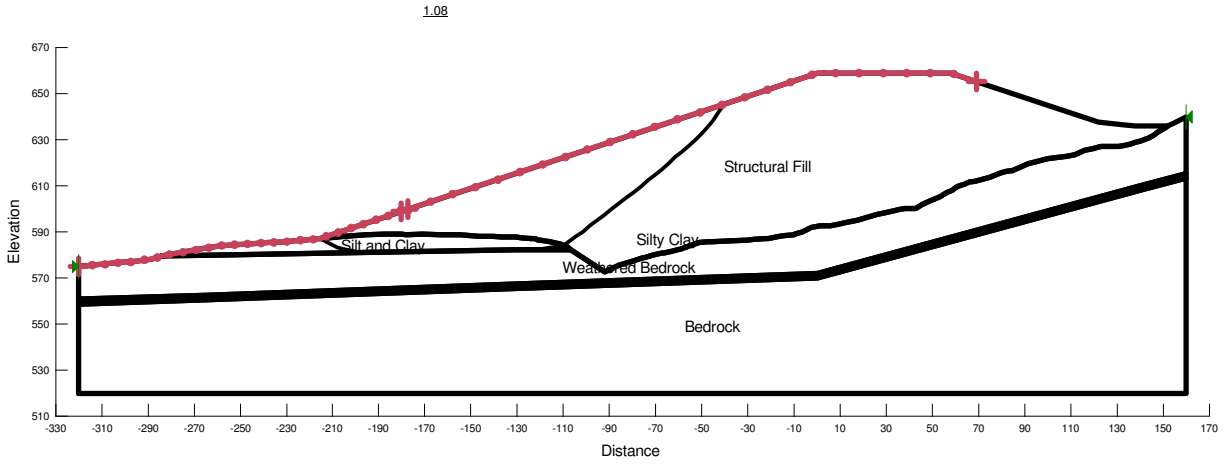


173608714 Sta 371+00(2) LT.gsz 11/27/2013

173608714 LAW-7-2.17
Sta. 371+00
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	
Silt and Clay	125	500	
Silty Clay	130	1,500	21
Weathered Bedrock	130	0	35
Bedrock		Impenatrable	

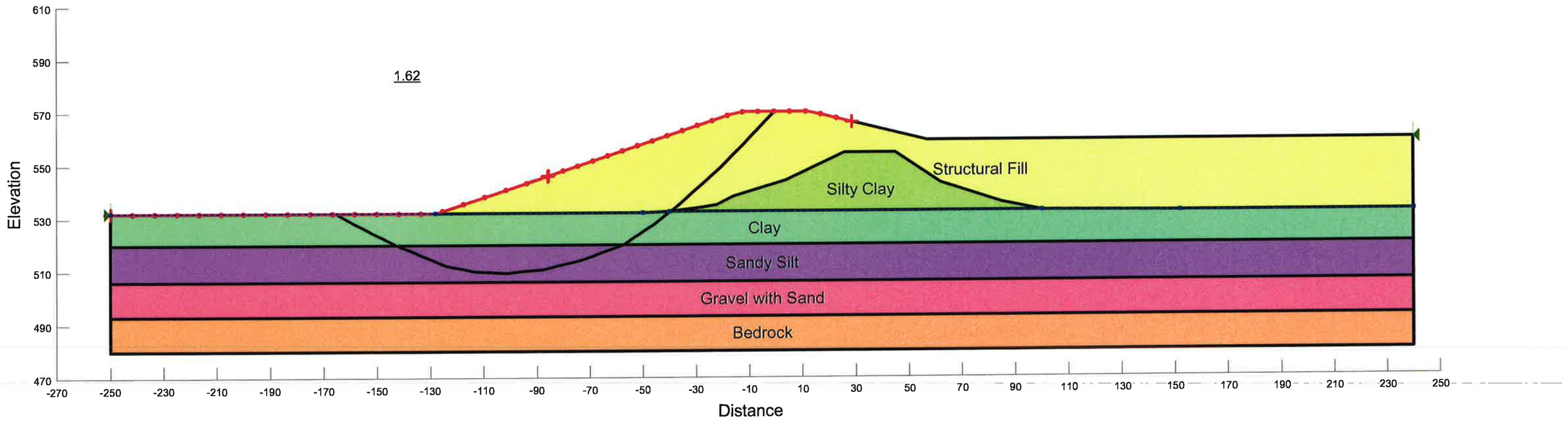


173608714 Sta 371+00(2) ST.gsz 11/27/2013

173608714 LAW-7-2.17
C.R. 69 Sta. 52+00 Left Embankment
Embankment Stability

Long Term

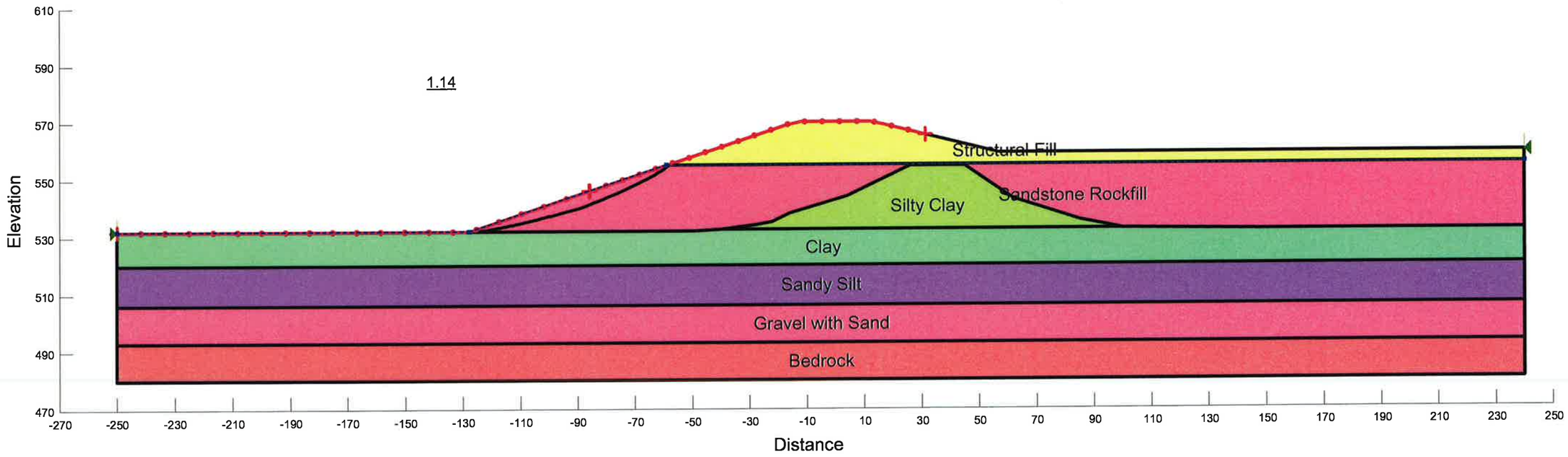
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Bedrock	Impenatrable		



173608714 LAW-7-2.17
C.R. 69 Sta. 52+00 Left Embankment
Embankment Stability

Rapid Drawdown

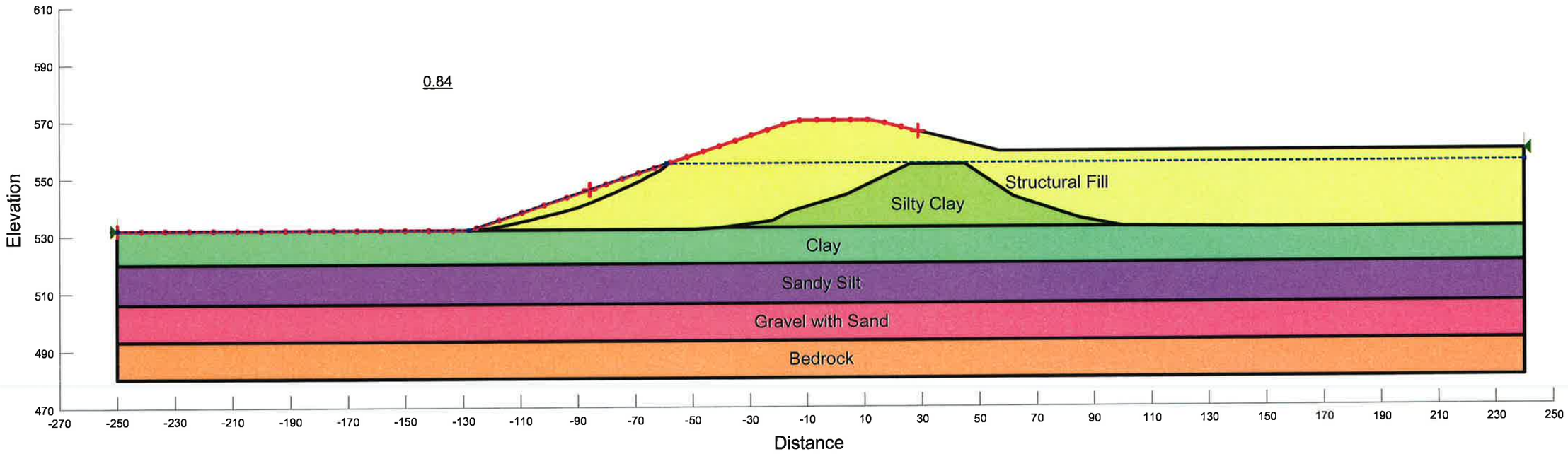
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Sandstone Rockfill	140	0	36
Bedrock	Impenatrable		



173608714 LAW-7-2.17
C.R. 69 Sta. 52+00 Left Embankment
Embankment Stability

Rapid Drawdown

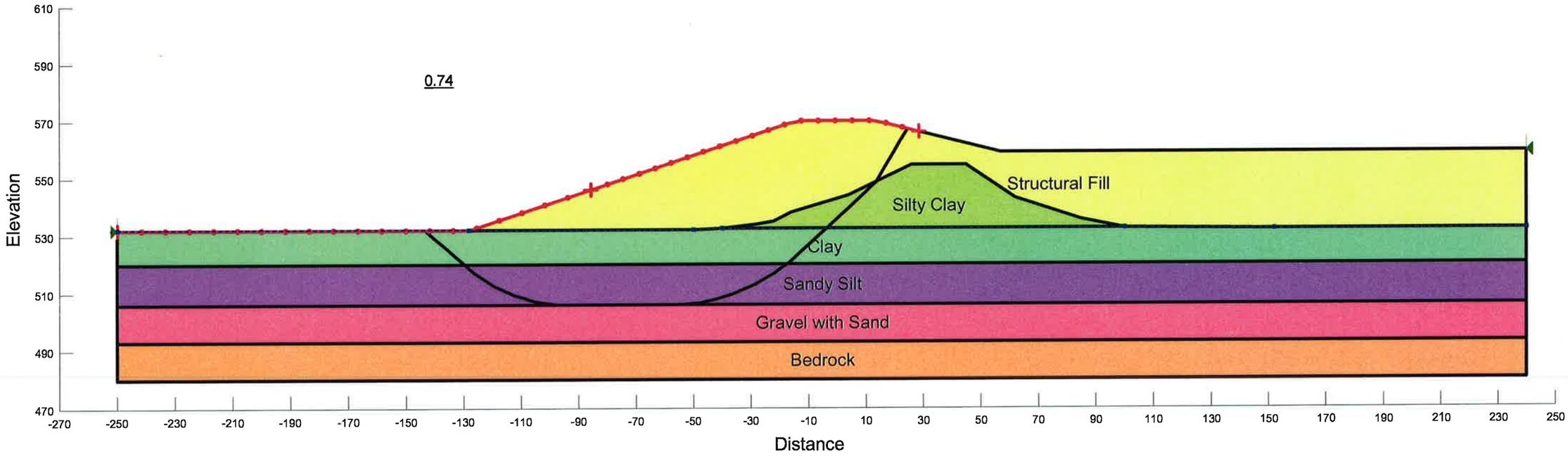
Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	0	29
Silty Clay	126	300	28
Clay	115	200	26
Sandy Silt	120	100	22
Gravel with Sand	135	0	34
Bedrock	Impenatrable		



173608714 LAW-7-2.17
C.R. 69 Sta. 52+00 Left Embankment
Embankment Stability

Short Term

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (deg)
Structural Fill	136	320	21
Silty Clay	126	750	0
Clay	115	750	0
Sandy Silt	120	500	0
Gravel with Sand	135	0	34
Bedrock	Impenatrable		



Appendix F

Reinforced Soil Slope Analyses

LAW-7-2.17_135+70.46

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _135+70.46
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... alyses\135+70.46\ReSSA 135+70.46 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 08:16:18 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	126.0	0.0	1300.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

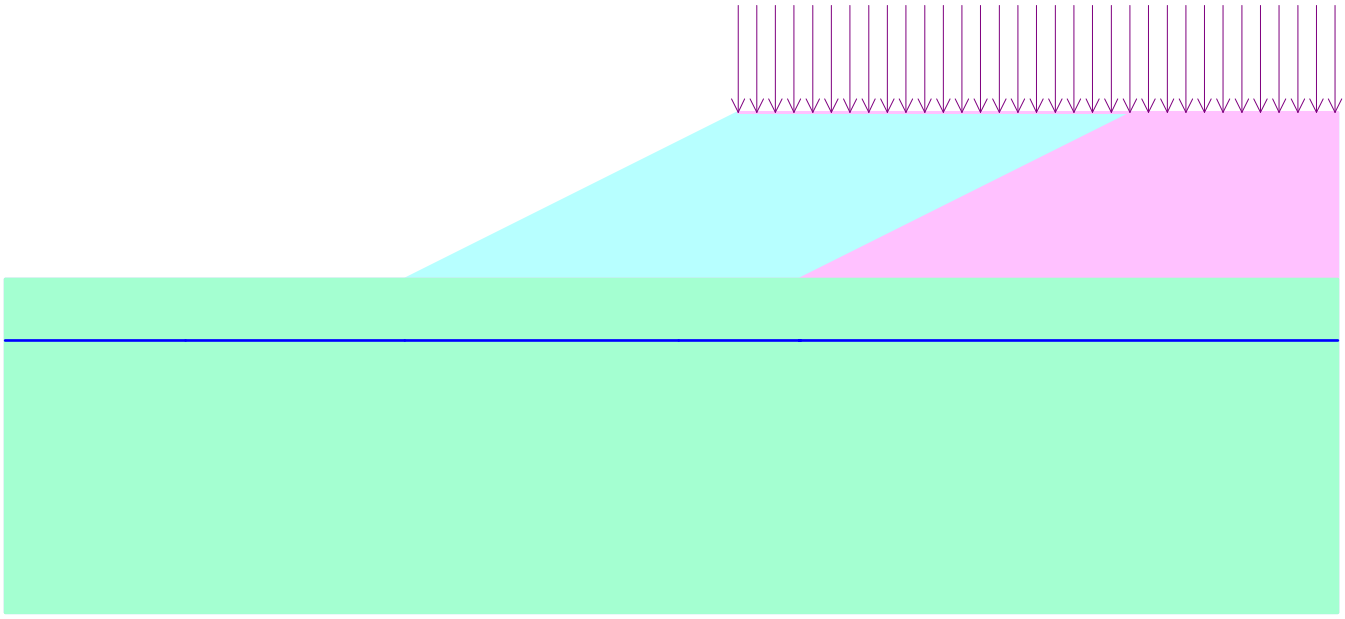
Height of slope, H	38.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

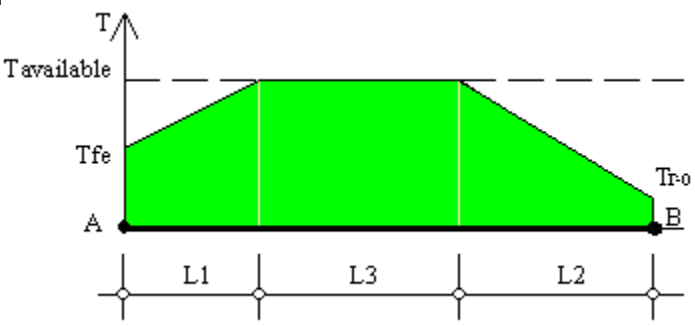
# 1	Xw =	-50.00	Yw =	-14.00
# 2	Xw =	0.00	Yw =	-14.00
# 3	Xw =	62.50	Yw =	-14.00
# 4	Xw =	90.00	Yw =	-14.00



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	90.00	8.79	0.52	80.68	0.00	0.00	1300.00
2	P1	2.00	90.00	8.79	0.56	80.65	0.00	0.00	1300.00
3	P1	3.00	90.00	8.79	0.56	80.65	0.00	0.00	1300.00
4	P1	4.00	85.00	8.79	0.59	75.62	0.00	0.00	1300.00
5	P1	5.00	85.00	8.79	0.59	75.62	0.00	0.00	1300.00
6	P1	8.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
7	P1	11.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
8	P1	14.00	50.00	8.79	0.82	40.39	0.00	0.00	1300.00
9	P1	17.00	50.00	8.79	0.95	40.26	0.00	0.00	1300.00
10	P1	23.00	40.00	8.79	1.31	29.90	0.00	0.00	1300.00
11	P1	29.00	40.00	8.79	2.17	29.04	0.00	0.00	1300.00
12	P1	35.00	40.00	9.45	6.46	24.09	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	75.00	37.49	-20.25	0.26	19.75	38.39	55.26	2.00	
2	87.50	38.00	-20.64	0.77	26.63	39.13	60.88	1.65	
3	100.00	38.00	-20.07	0.09	32.16	43.77	68.09	1.49	
4	112.50	38.00	-30.28	0.33	32.36	52.33	81.41	1.39	
5	125.00	38.00	-30.84	1.01	38.14	57.18	88.95	1.36	
6	137.50	38.00	-40.32	0.39	38.68	66.02	102.71	1.34	
7	150.00	38.00	-50.74	0.89	39.36	74.99	116.66	1.33	
. 8	162.50	38.00	-61.22	1.47	40.14	84.03	130.73	1.33 .	OK
9	175.00	38.00	-71.39	1.69	41.00	93.14	144.90	1.33	
10	187.50	38.00	-80.70	0.84	41.92	102.30	159.15	1.33	
11	200.00	38.00	-91.52	1.83	42.88	111.50	173.46	1.34	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-100.19	0.23	200.00	38.00	37.76	115.60	179.84	1.34	
2	-91.52	1.83	200.00	38.00	42.88	111.50	173.46	1.34	
3	-80.70	0.84	187.50	38.00	41.92	102.30	159.15	1.33	
4	-71.39	1.69	175.00	38.00	41.00	93.14	144.90	1.33	
. 5	-61.22	1.47	162.50	38.00	40.14	84.03	130.73	1.33 .	OK
6	-50.74	0.89	150.00	38.00	39.36	74.99	116.66	1.33	
7	-41.04	1.26	150.00	38.00	44.60	70.99	110.44	1.34	
8	-30.17	0.20	137.50	38.00	43.98	62.08	96.57	1.35	
9	-20.11	0.13	125.00	38.00	43.51	53.29	82.91	1.37	
10	-11.11	1.26	125.00	38.00	48.12	52.33	78.21	1.41	
11	-0.00	0.00	112.50	38.00	46.85	46.85	66.25	1.48	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.33
Critical Circle: Xc = 40.14[ft], Yc = 84.03[ft], R = 130.73[ft]. (Number of slices used = 64)

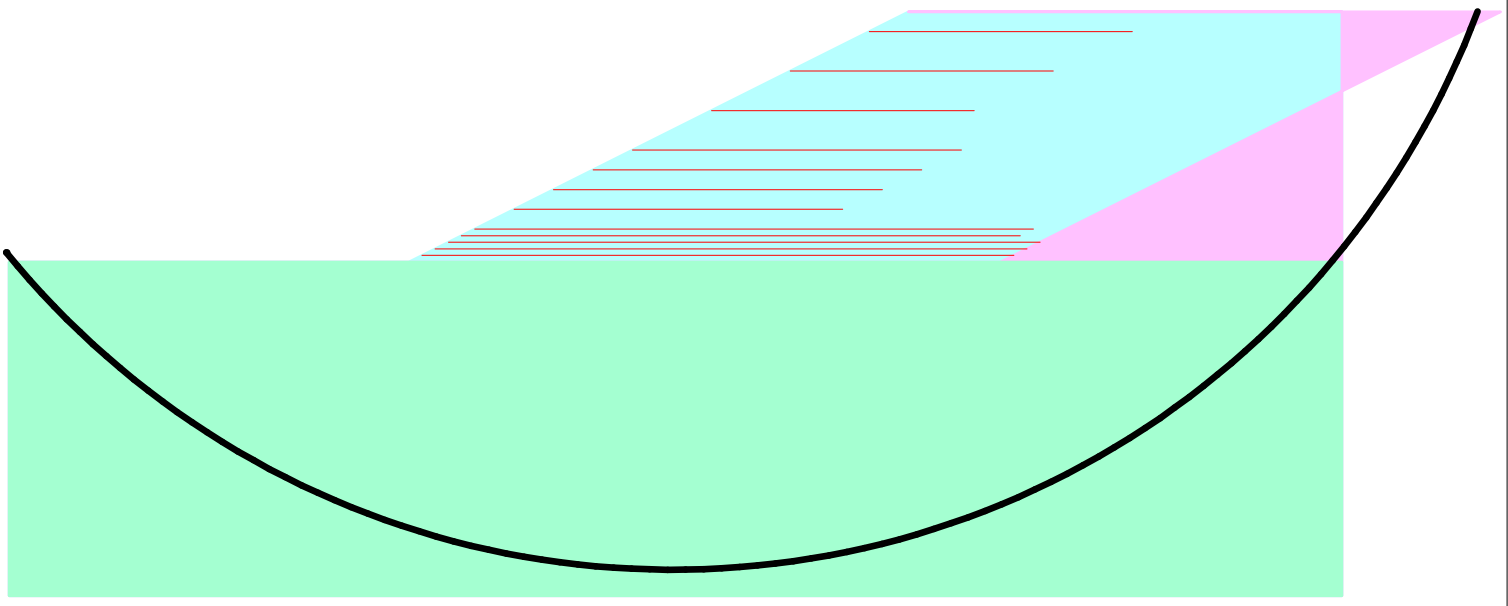
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

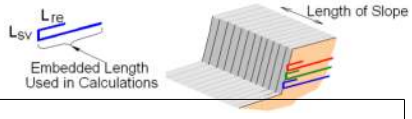
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	1	P1	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	1	P1	3.00	90.00	1.00	6.00	3.00	96.00	3.00	0.00	0.00
4	1	P1	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	1	P1	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	1	P1	11.00	50.00	1.00	22.00	11.00	72.00	11.00	0.00	0.00
8	1	P1	14.00	50.00	1.00	28.01	14.00	78.01	14.00	0.00	0.00
9	1	P1	17.00	50.00	1.00	34.01	17.00	84.01	17.00	0.00	0.00
10	1	P1	23.00	40.00	1.00	46.01	23.00	86.01	23.00	0.00	0.00
11	1	P1	29.00	40.00	1.00	58.01	29.00	98.01	29.00	0.00	0.00
12	1	P1	35.00	40.00	1.00	70.02	35.00	110.02	35.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	760.00

LAW-7-2.17_135+70.46

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _135+70.46
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd Suite 300
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... alyses\135+70.46\ReSSA1 135+70.46 (Long Term).MSEp
Original date and time of creating this file: Tue Apr 16 09:37:44 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	126.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00
2	P2	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

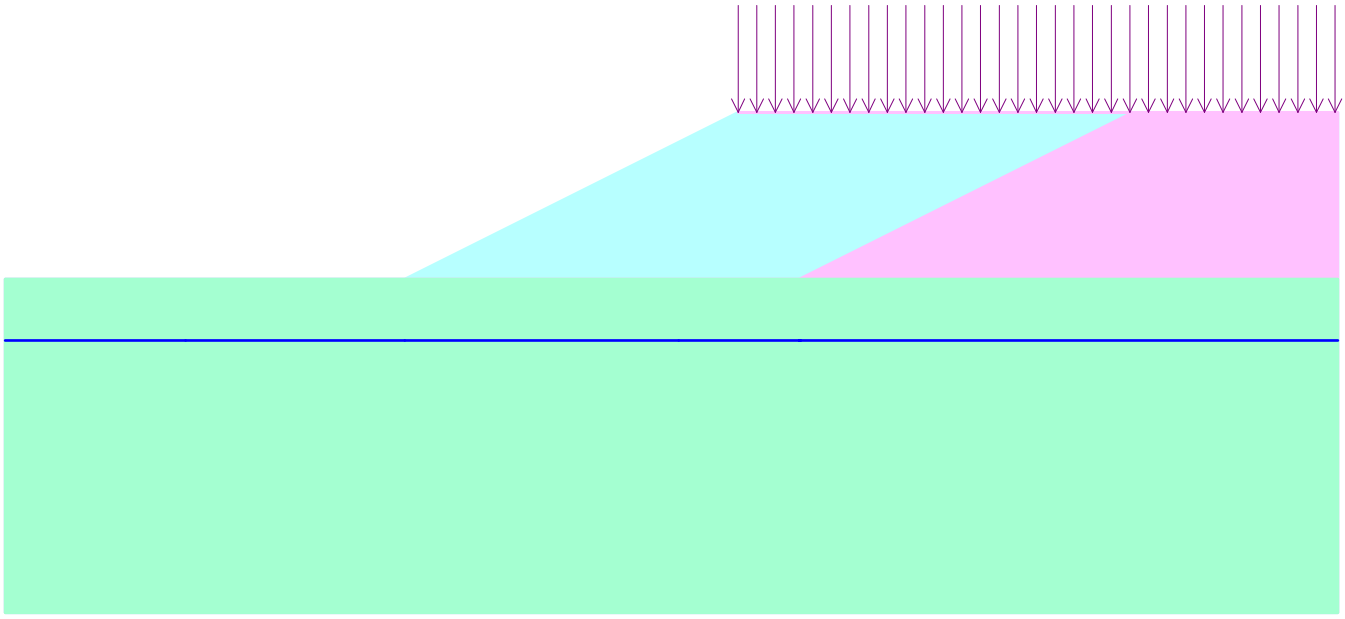
Height of slope, H	38.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

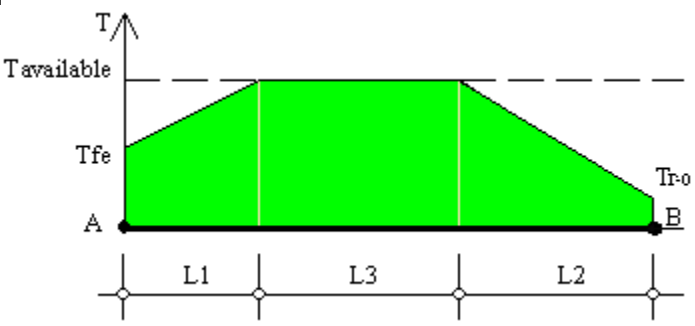
# 1	Xw =	-50.00	Yw =	-14.00
# 2	Xw =	0.00	Yw =	-14.00
# 3	Xw =	62.50	Yw =	-14.00
# 4	Xw =	90.00	Yw =	-14.00



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P2	1.00	90.00	10.89	0.82	78.29	0.00	0.00	2000.00
2	P2	2.00	90.00	10.89	0.85	78.25	0.00	0.00	2000.00
3	P2	3.00	90.00	10.89	0.85	78.25	0.00	0.00	2000.00
4	P2	4.00	85.00	10.89	0.89	73.22	0.00	0.00	2000.00
5	P2	5.00	85.00	10.89	0.92	73.19	0.00	0.00	2000.00
6	P1	8.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
7	P1	11.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
8	P1	14.00	50.00	8.79	0.82	40.39	0.00	0.00	1300.00
9	P1	17.00	50.00	8.79	0.95	40.26	0.00	0.00	1300.00
10	P1	23.00	40.00	8.79	1.31	29.90	0.00	0.00	1300.00
11	P1	29.00	40.00	8.79	2.17	29.04	0.00	0.00	1300.00
12	P1	35.00	40.00	9.45	6.46	24.09	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	70.00	34.99	-16.02	0.39	12.83	52.90	59.91	2.13	
2	74.00	36.99	-15.71	0.20	12.99	58.00	64.53	2.05	
3	78.00	38.00	-15.45	0.06	13.10	63.80	69.84	1.98	
4	82.00	38.00	-16.29	0.43	13.90	68.80	74.74	1.93	
5	86.00	38.00	-16.10	0.31	13.92	76.13	81.54	1.89	
6	90.00	38.00	-15.90	0.30	18.90	70.12	78.02	1.88	
7	94.00	38.00	-15.70	0.19	19.79	75.26	83.04	1.86	
8	98.00	38.00	-15.49	0.08	19.91	82.94	90.10	1.82	
9	102.00	38.00	-16.53	0.51	20.67	89.02	96.01	1.82	
10	106.00	38.00	-21.01	0.20	15.39	110.16	115.83	1.81	OK
11	110.00	38.00	-20.78	0.10	12.22	130.82	134.82	1.83	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

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Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-51.50	0.17	110.00	38.00	-0.58	146.44	154.87	1.94	
2	-47.21	0.43	110.00	38.00	1.28	145.22	152.69	1.91	
3	-41.87	0.33	110.00	38.00	3.16	143.78	150.35	1.88	
4	-36.73	0.40	106.00	38.00	9.01	116.47	124.76	1.86	
5	-31.16	0.20	106.00	38.00	11.11	114.59	121.95	1.83	
6	-26.86	0.48	106.00	38.00	13.23	112.49	118.97	1.82	
7	-21.01	0.20	106.00	38.00	15.39	110.16	115.83	1.81	OK
8	-16.36	0.33	106.00	38.00	17.60	107.60	112.51	1.81	
9	-10.25	0.01	106.00	38.00	19.85	104.79	109.01	1.82	
10	-5.23	0.03	106.00	38.00	21.06	104.93	108.14	1.83	
11	-0.00	0.00	106.00	38.00	23.43	101.49	104.16	1.86	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.81
Critical Circle: Xc = 15.39[ft], Yc = 110.16[ft], R = 115.83[ft]. (Number of slices used = 64)

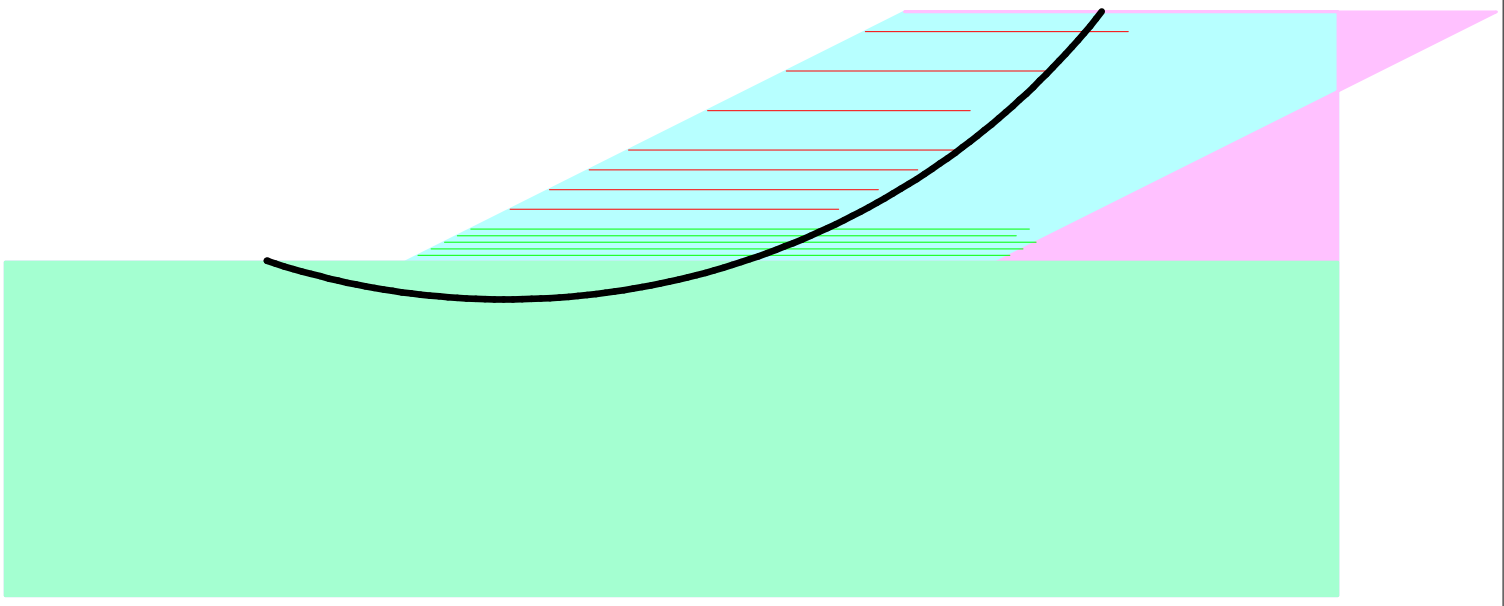
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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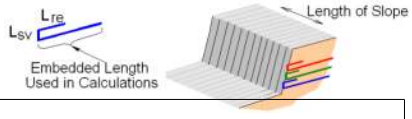


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	2	P2	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	2	P2	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	2	P2	3.00	90.00	1.00	6.00	3.00	96.00	3.00	0.00	0.00
4	2	P2	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	2	P2	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	1	P1	11.00	50.00	1.00	22.00	11.00	72.00	11.00	0.00	0.00
8	1	P1	14.00	50.00	1.00	28.01	14.00	78.01	14.00	0.00	0.00
9	1	P1	17.00	50.00	1.00	34.01	17.00	84.01	17.00	0.00	0.00
10	1	P1	23.00	40.00	1.00	46.01	23.00	86.01	23.00	0.00	0.00
11	1	P1	29.00	40.00	1.00	58.01	29.00	98.01	29.00	0.00	0.00
12	1	P1	35.00	40.00	1.00	70.02	35.00	110.02	35.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	320.00
2	P2	1.00	440.00

LAW-7-2.17_135+70.46 (Rapid DD)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _135+70.46 (Rapid DD)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... nalyses\135+70.46\ReSSA1 135+70.46 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 07:54:42 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	126.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00
2	P2	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

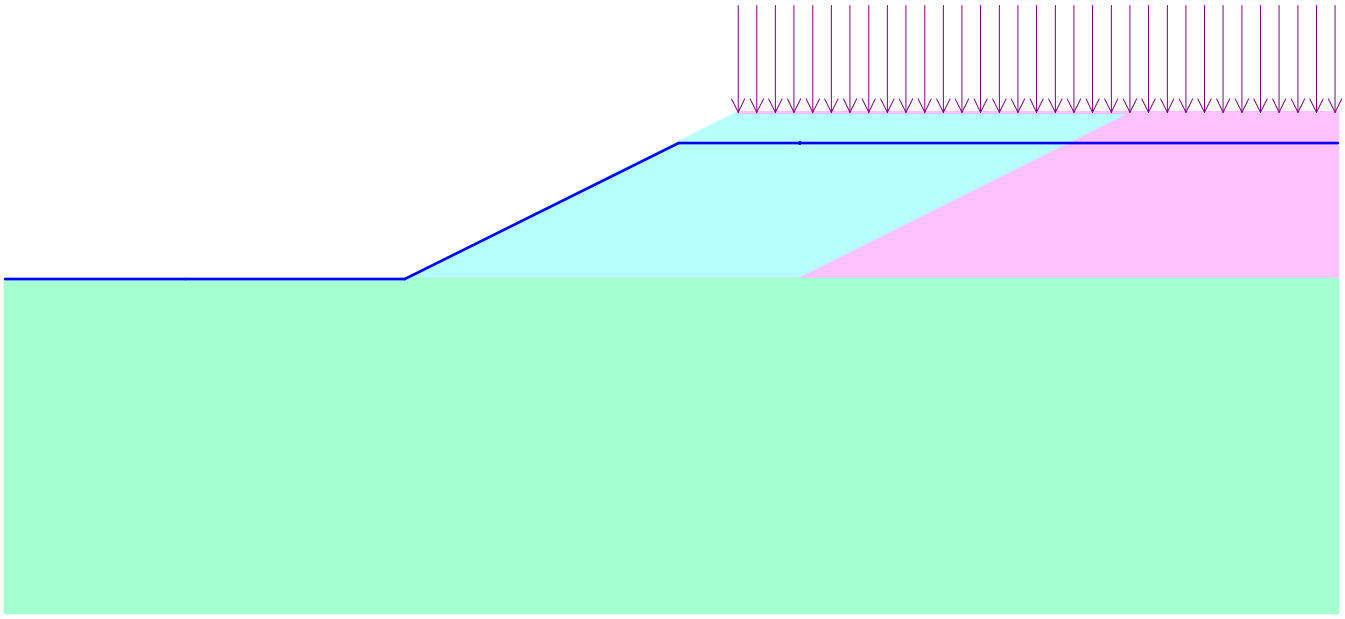
Height of slope, H	38.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

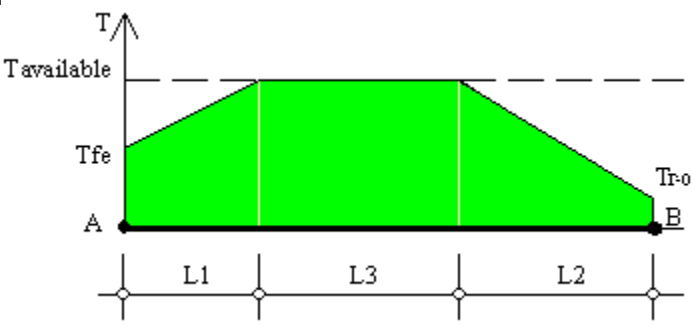
# 1	Xw =	-50.00	Yw =	0.00
# 2	Xw =	0.00	Yw =	0.00
# 3	Xw =	62.50	Yw =	31.00
# 4	Xw =	90.00	Yw =	31.00



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P2	1.00	90.00	14.76	1.28	73.96	0.00	0.00	2000.00
2	P2	2.00	90.00	14.73	1.31	73.96	0.00	0.00	2000.00
3	P2	3.00	90.00	14.73	1.35	73.92	0.00	0.00	2000.00
4	P2	4.00	85.00	14.73	1.38	68.89	0.00	0.00	2000.00
5	P2	5.00	85.00	14.70	1.41	68.89	0.00	0.00	2000.00
6	P1	8.00	50.00	11.81	1.38	36.81	0.00	0.00	1300.00
7	P1	11.00	50.00	11.78	1.25	36.98	0.00	0.00	1300.00
8	P1	14.00	50.00	11.75	1.21	37.04	0.00	0.00	1300.00
9	P1	17.00	50.00	11.68	1.35	36.98	0.00	0.00	1300.00
10	P1	23.00	40.00	11.61	1.71	26.68	0.00	0.00	1300.00
11	P1	29.00	40.00	10.30	2.40	27.30	0.00	0.00	1300.00
12	P1	35.00	40.00	9.45	6.46	24.09	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs		STATUS
1	75.00	37.49	-15.21	0.11	14.06	57.03	64.00	1.19		
2	79.50	38.00	-15.98	0.47	14.47	63.21	69.74	1.16		
3	84.00	38.00	-15.76	0.35	15.50	68.50	74.99	1.14		
4	88.50	38.00	-15.55	0.28	19.13	66.99	75.18	1.13		
5	93.00	38.00	-20.02	0.01	17.89	74.36	83.45	1.12		
. 6	97.50	38.00	-20.96	0.45	18.32	82.18	90.67	1.10	.	OK
7	102.00	38.00	-20.69	0.30	18.60	90.93	98.78	1.11		
8	106.50	38.00	-26.12	0.39	13.73	112.49	118.97	1.11		
9	111.00	38.00	-25.80	0.28	15.47	117.53	124.30	1.14		
10	115.50	38.00	-31.00	0.35	14.19	128.35	135.74	1.17		
11	120.00	38.00	-30.64	0.22	15.98	133.54	141.24	1.21		

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs		STATUS
1	-51.47	0.60	106.50	38.00	1.76	128.11	138.17	1.17		
2	-46.31	0.54	106.50	38.00	4.68	122.95	132.61	1.15		
3	-41.08	0.42	106.50	38.00	6.65	121.54	130.18	1.14		
4	-35.73	0.27	106.50	38.00	8.65	119.92	127.62	1.13		
5	-31.01	0.52	97.50	38.00	13.80	85.95	96.47	1.11		
6	-25.42	0.21	97.50	38.00	16.04	84.15	93.62	1.10		
. 7	-20.96	0.45	97.50	38.00	18.32	82.18	90.67	1.10	.	OK
8	-15.10	0.04	97.50	38.00	20.63	80.04	87.61	1.10		
9	-10.27	0.11	97.50	38.00	22.25	79.82	86.09	1.11		
10	-5.24	0.09	97.50	38.00	24.65	77.25	82.75	1.13		
11	-0.00	0.00	97.50	38.00	26.34	76.50	80.91	1.15		

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.10
Critical Circle: Xc = 18.32[ft], Yc = 82.18[ft], R = 90.67[ft]. (Number of slices used = 64)

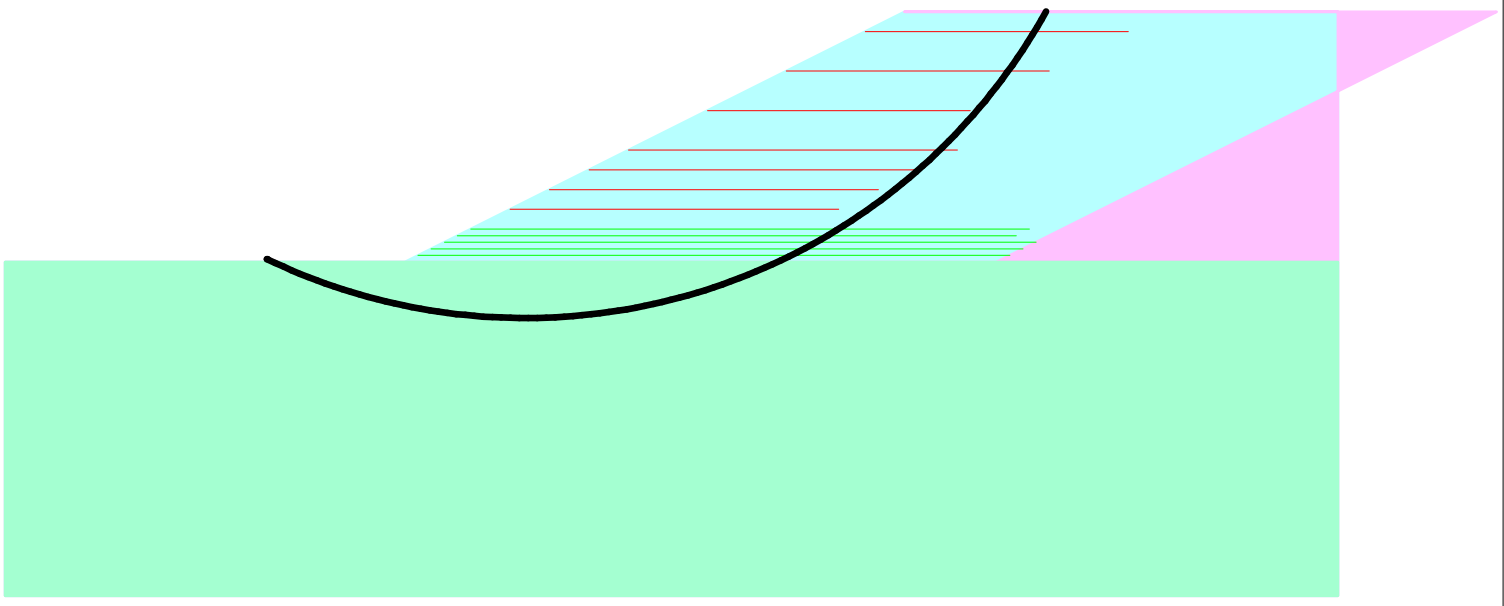
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

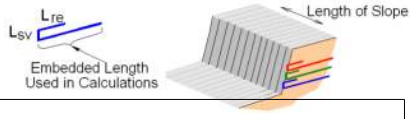
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	2	P2	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	2	P2	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	2	P2	3.00	90.00	1.00	6.00	3.00	96.00	3.00	0.00	0.00
4	2	P2	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	2	P2	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	1	P1	11.00	50.00	1.00	22.00	11.00	72.00	11.00	0.00	0.00
8	1	P1	14.00	50.00	1.00	28.01	14.00	78.01	14.00	0.00	0.00
9	1	P1	17.00	50.00	1.00	34.01	17.00	84.01	17.00	0.00	0.00
10	1	P1	23.00	40.00	1.00	46.01	23.00	86.01	23.00	0.00	0.00
11	1	P1	29.00	40.00	1.00	58.01	29.00	98.01	29.00	0.00	0.00
12	1	P1	35.00	40.00	1.00	70.02	35.00	110.02	35.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	320.00
2	P2	1.00	440.00

LAW-7-2.17_198+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _198+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... -7 Analyses\198+00\ReSSA1 198+00 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 08:40:06 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	125.0	0.0	1000.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

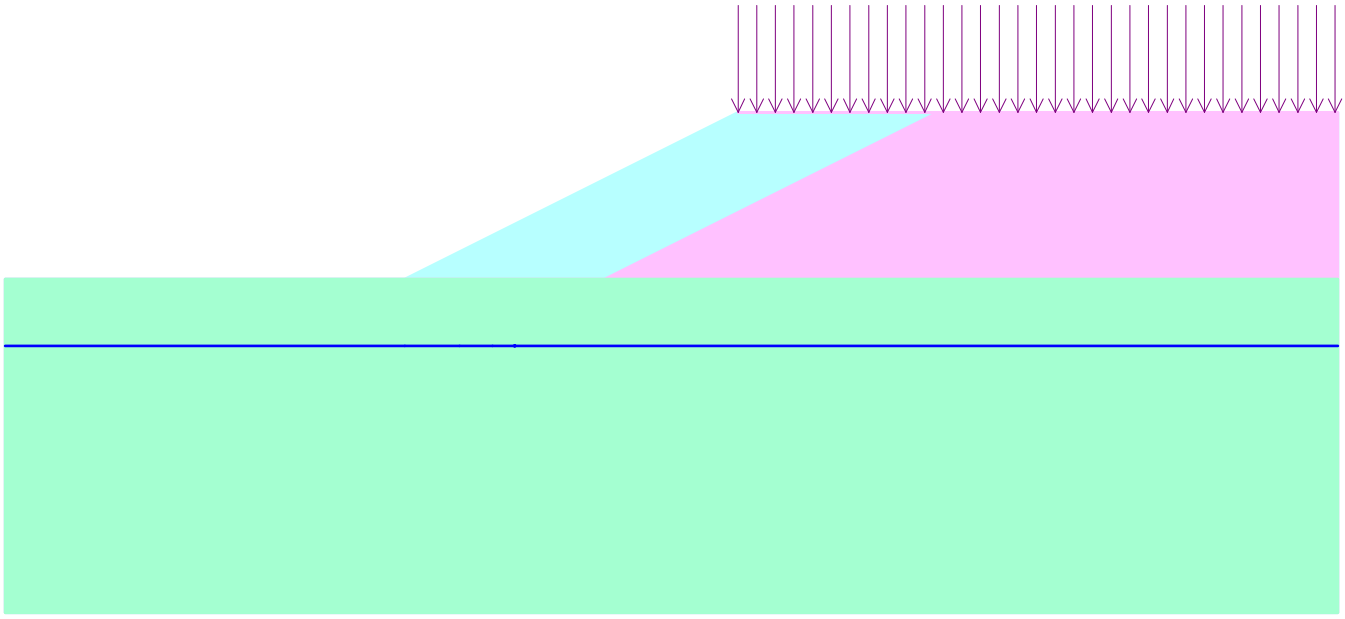
Height of slope, H	50.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

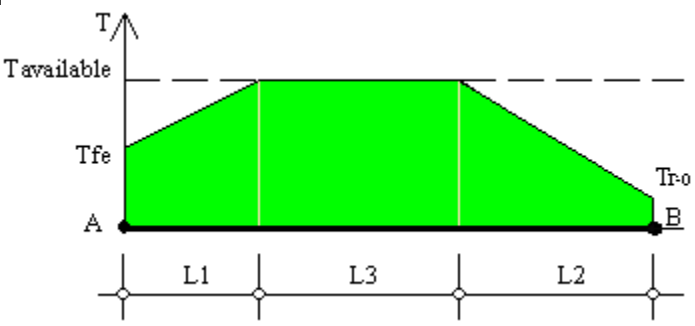
# 1	Xw =	0.00	Yw =	-20.00
# 2	Xw =	16.40	Yw =	-20.00
# 3	Xw =	26.25	Yw =	-20.00
# 4	Xw =	32.81	Yw =	-20.00



SCALE:

0 5 10 15 20 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name		Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1		P1	1.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
2		P1	2.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
3		P1	3.00	55.00	3.94	0.85	50.21	0.00	0.00	1300.00
4		P1	4.00	55.00	3.94	0.85	50.21	0.00	0.00	1300.00
5		P1	5.00	55.00	3.94	0.85	50.21	0.00	0.00	1300.00
6		P1	8.00	45.00	3.94	0.98	40.08	0.00	0.00	1300.00
7		P1	11.00	45.00	3.94	0.98	40.08	0.00	0.00	1300.00
8		P1	14.00	45.00	3.94	0.98	40.08	0.00	0.00	1300.00
9		P1	17.00	45.00	3.94	0.98	40.08	0.00	0.00	1300.00
10		P1	23.00	45.00	3.94	0.98	40.08	0.00	0.00	1300.00
11		P1	29.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
12		P1	35.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
13		P1	41.00	30.00	3.94	1.87	24.19	0.00	0.00	1300.00
14		P1	47.00	30.00	3.94	3.08	22.98	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	100.00	49.99	-38.71	1.47	22.14	50.05	77.86	1.15	
2	105.00	50.00	-31.20	1.41	28.07	50.48	76.94	1.08	
3	110.00	50.00	-30.96	1.17	30.73	50.96	79.28	1.03	
4	115.00	50.00	-23.35	1.03	37.14	50.05	77.86	0.99	
5	120.00	50.00	-23.16	0.79	39.32	51.88	80.70	0.96	
6	125.00	50.00	-22.96	0.55	41.52	53.72	83.57	0.93	
7	130.00	50.00	-22.76	0.31	43.73	55.57	86.45	0.91	
8	135.00	50.00	-31.14	1.38	41.81	60.26	93.75	0.90	
9	140.00	50.00	-30.91	1.09	44.07	62.16	96.70	0.88	
10	145.00	50.00	-39.02	1.86	42.26	66.93	104.12	0.87	
11	150.00	50.00	-38.76	1.52	44.56	68.85	107.12	0.86	On extreme X-entry

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-76.19	1.44	150.00	50.00	24.50	83.49	129.89	0.90	
2	-68.65	1.39	150.00	50.00	28.48	80.54	125.30	0.89	
3	-60.98	1.19	150.00	50.00	32.48	77.60	120.72	0.88	
4	-53.18	0.82	150.00	50.00	36.49	74.67	116.16	0.87	
5	-45.25	0.30	150.00	50.00	40.51	71.75	111.63	0.87	
6	-38.76	1.52	150.00	50.00	44.56	68.85	107.12	0.86	OK
7	-30.44	0.53	150.00	50.00	48.62	65.97	102.63	0.87	
8	-23.43	1.12	150.00	50.00	52.70	63.11	98.17	0.87	
9	-16.08	1.30	150.00	50.00	56.81	60.26	93.75	0.89	
10	-8.31	0.98	150.00	50.00	60.95	57.44	89.36	0.91	
11	-0.00	0.00	150.00	50.00	65.12	54.64	85.01	0.94	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 0.86
Critical Circle: Xc = 44.56[ft], Yc = 68.85[ft], R = 107.12[ft]. (Number of slices used = 65)

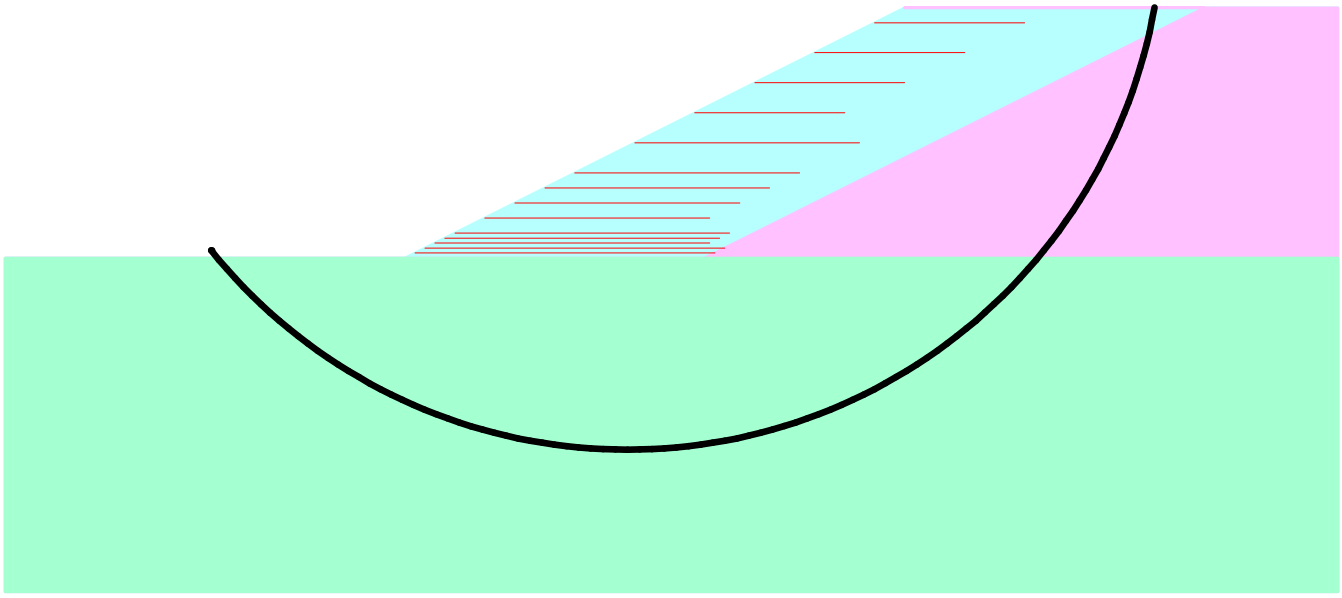
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

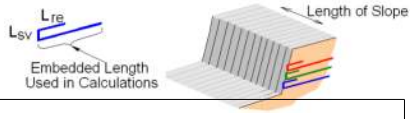
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	60.00	1.00	2.00	1.00	62.00	1.00	0.00	0.00
2	1	P1	2.00	60.00	1.00	4.00	2.00	64.00	2.00	0.00	0.00
3	1	P1	3.00	55.00	1.00	6.00	3.00	61.00	3.00	0.00	0.00
4	1	P1	4.00	55.00	1.00	8.00	4.00	63.00	4.00	0.00	0.00
5	1	P1	5.00	55.00	1.00	10.00	5.00	65.00	5.00	0.00	0.00
6	1	P1	8.00	45.00	1.00	16.00	8.00	61.00	8.00	0.00	0.00
7	1	P1	11.00	45.00	1.00	22.00	11.00	67.00	11.00	0.00	0.00
8	1	P1	14.00	45.00	1.00	28.01	14.00	73.01	14.00	0.00	0.00
9	1	P1	17.00	45.00	1.00	34.01	17.00	79.01	17.00	0.00	0.00
10	1	P1	23.00	45.00	1.00	46.01	23.00	91.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	630.00

LAW-7-2.17 _198+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _198+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... W-7 Analyses\198+00\ReSSA1 198+00 (Long Term).MSEp
Original date and time of creating this file: Tue Apr 16 13:20:10 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	125.0	30.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

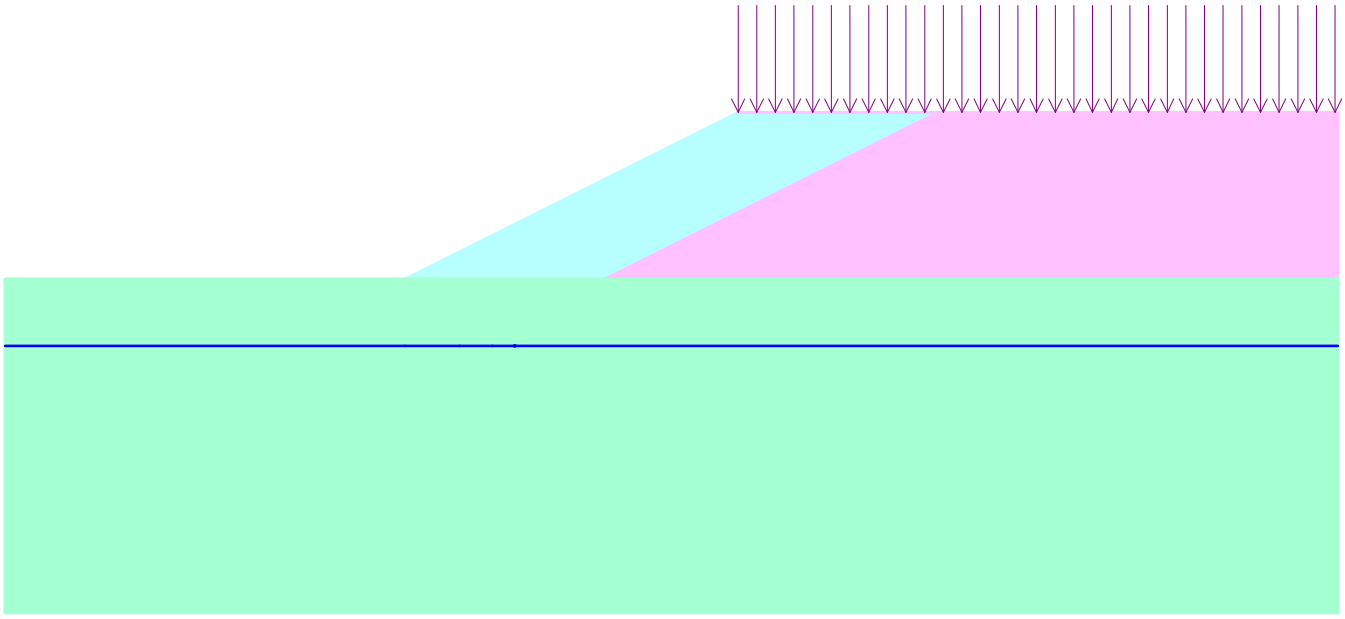
Height of slope, H	50.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

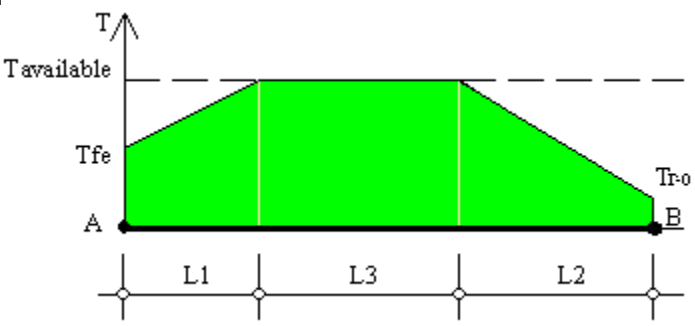
# 1	Xw =	0.00	Yw =	-20.00
# 2	Xw =	16.40	Yw =	-20.00
# 3	Xw =	26.25	Yw =	-20.00
# 4	Xw =	32.81	Yw =	-20.00



SCALE:

0 5 10 15 20 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
2	P1	2.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
3	P1	3.00	55.00	8.79	0.72	45.49	0.00	0.00	1300.00
4	P1	4.00	55.00	8.79	0.72	45.49	0.00	0.00	1300.00
5	P1	5.00	55.00	8.79	0.72	45.49	0.00	0.00	1300.00
6	P1	8.00	45.00	8.79	0.89	35.32	0.00	0.00	1300.00
7	P1	11.00	45.00	8.79	0.89	35.32	0.00	0.00	1300.00
8	P1	14.00	45.00	8.79	0.89	35.32	0.00	0.00	1300.00
9	P1	17.00	45.00	8.79	0.89	35.32	0.00	0.00	1300.00
10	P1	23.00	45.00	8.79	0.89	35.32	0.00	0.00	1300.00
11	P1	29.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
12	P1	35.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
13	P1	41.00	30.00	8.79	2.17	19.04	0.00	0.00	1300.00
14	P1	47.00	30.00	9.45	6.46	14.09	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	100.00	49.99	-8.22	0.09	23.37	73.90	80.28	1.65	
2	110.00	50.00	-9.30	0.46	23.20	90.61	95.83	1.54	
3	120.00	50.00	-9.14	0.19	13.28	134.37	136.04	1.51	OK
4	130.00	50.00	-8.98	0.09	7.18	173.54	174.21	1.54	
5	140.00	50.00	-17.23	0.24	16.47	167.05	170.18	1.62	
6	150.00	50.00	-24.83	0.15	11.82	203.13	206.26	1.71	
7	160.00	50.00	-24.26	0.05	17.20	211.95	215.92	1.80	
8	170.00	50.00	-33.10	0.20	12.59	252.89	256.79	1.90	
9	180.00	50.00	-32.45	0.07	12.95	283.83	287.37	2.01	
10	190.00	50.00	-40.83	0.13	10.76	320.50	324.49	2.13	
11	200.00	50.00	-48.87	0.12	5.00	377.14	380.85	2.25	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-80.45	0.12	130.00	50.00	-21.25	219.26	226.99	1.81	
2	-73.14	0.29	130.00	50.00	-18.21	215.74	222.34	1.74	
3	-64.61	0.15	130.00	50.00	-13.13	204.01	210.26	1.70	
4	-57.15	0.27	130.00	50.00	-9.93	199.57	204.82	1.65	
5	-49.57	0.34	130.00	50.00	-6.64	194.60	198.94	1.61	
6	-40.07	0.01	130.00	50.00	-3.25	189.06	192.60	1.58	
7	-32.97	0.24	120.00	50.00	4.31	145.65	150.11	1.55	
8	-24.88	0.19	120.00	50.00	6.64	144.13	147.35	1.53	
9	-16.45	0.09	120.00	50.00	10.70	137.35	139.92	1.51	
10	-9.14	0.19	120.00	50.00	13.28	134.37	136.04	1.51	OK
11	-0.00	0.00	120.00	50.00	14.18	134.96	135.71	1.51	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.51
Critical Circle: Xc = 13.28[ft], Yc = 134.37[ft], R = 136.04[ft]. (Number of slices used = 64)

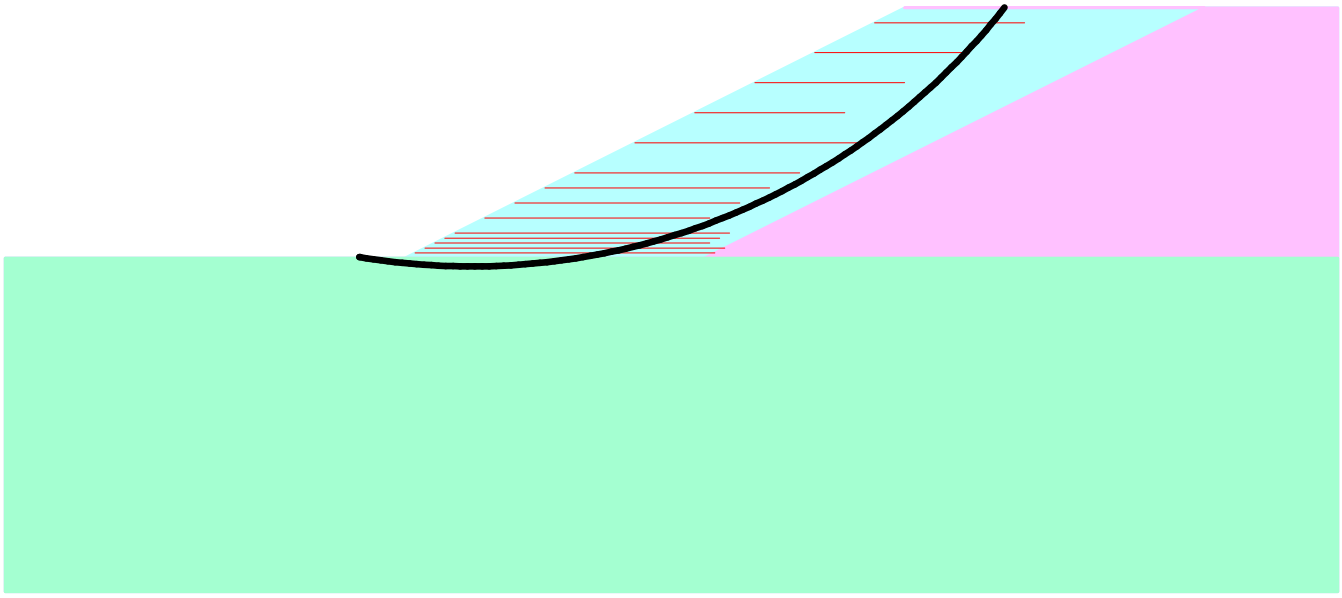
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

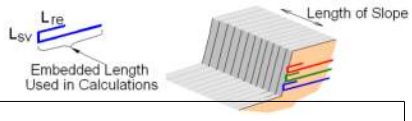
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	60.00	1.00	2.00	1.00	62.00	1.00	0.00	0.00
2	1	P1	2.00	60.00	1.00	4.00	2.00	64.00	2.00	0.00	0.00
3	1	P1	3.00	55.00	1.00	6.00	3.00	61.00	3.00	0.00	0.00
4	1	P1	4.00	55.00	1.00	8.00	4.00	63.00	4.00	0.00	0.00
5	1	P1	5.00	55.00	1.00	10.00	5.00	65.00	5.00	0.00	0.00
6	1	P1	8.00	45.00	1.00	16.00	8.00	61.00	8.00	0.00	0.00
7	1	P1	11.00	45.00	1.00	22.00	11.00	67.00	11.00	0.00	0.00
8	1	P1	14.00	45.00	1.00	28.01	14.00	73.01	14.00	0.00	0.00
9	1	P1	17.00	45.00	1.00	34.01	17.00	79.01	17.00	0.00	0.00
10	1	P1	23.00	45.00	1.00	46.01	23.00	91.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	630.00

LAW-7-2.17_198+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _198+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... AW-7 Analyses\198+00\ReSSA1 _198+00 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 08:11:17 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	125.0	30.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

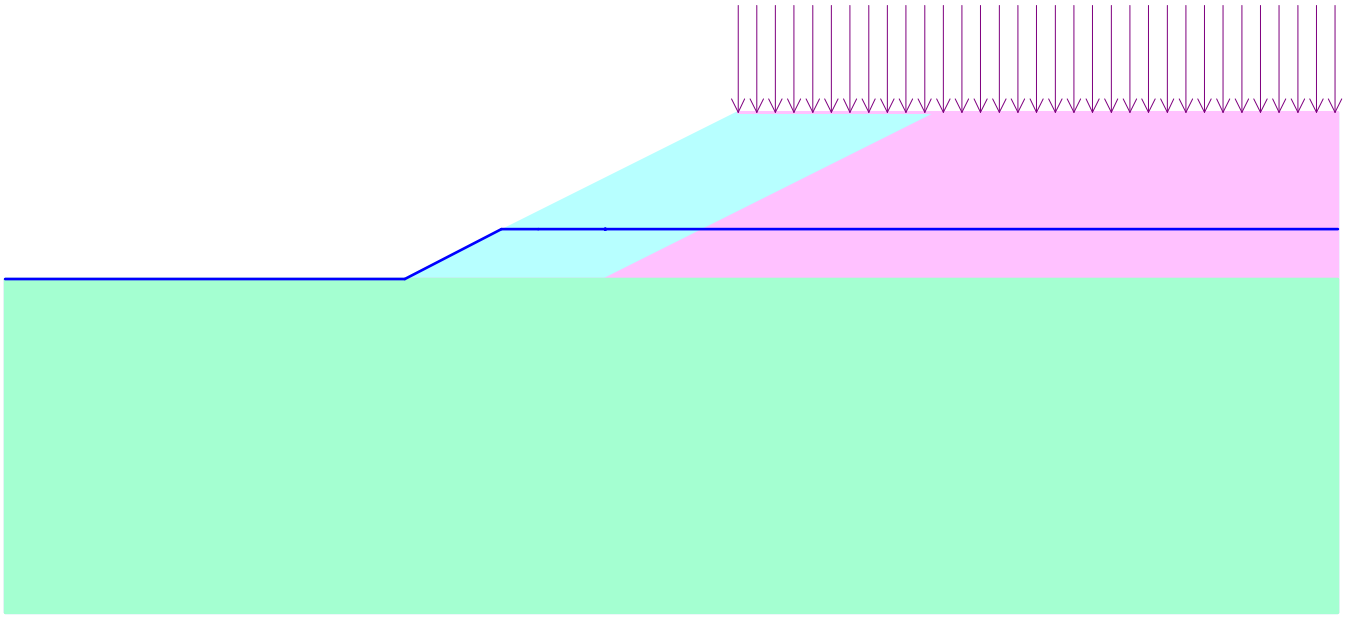
Height of slope, H	50.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

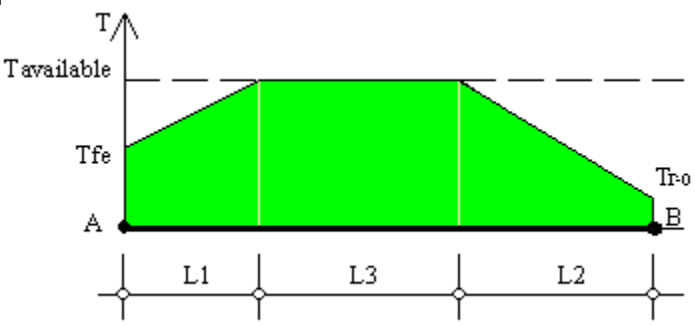
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	29.00	Yw =	15.00
# 3	Xw =	40.00	Yw =	15.00
# 4	Xw =	60.00	Yw =	15.00



SCALE:

0 5 10 15 20 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	60.00	11.94	0.85	47.20	0.00	0.00	1300.00
2	P1	2.00	60.00	11.94	0.82	47.24	0.00	0.00	1300.00
3	P1	3.00	55.00	11.94	0.92	42.14	0.00	0.00	1300.00
4	P1	4.00	55.00	11.94	0.89	42.17	0.00	0.00	1300.00
5	P1	5.00	55.00	11.94	0.85	42.20	0.00	0.00	1300.00
6	P1	8.00	45.00	11.94	1.02	32.04	0.00	0.00	1300.00
7	P1	11.00	45.00	11.52	0.95	32.53	0.00	0.00	1300.00
8	P1	14.00	45.00	9.65	0.89	34.47	0.00	0.00	1300.00
9	P1	17.00	45.00	8.79	0.89	35.32	0.00	0.00	1300.00
10	P1	23.00	45.00	8.79	0.89	35.32	0.00	0.00	1300.00
11	P1	29.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
12	P1	35.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
13	P1	41.00	30.00	8.79	2.17	19.04	0.00	0.00	1300.00
14	P1	47.00	30.00	9.45	6.46	14.09	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	100.00	49.99	-20.28	0.16	20.20	72.53	82.92	1.18	
2	105.00	50.00	-25.62	0.32	17.52	83.45	93.66	1.17	
. 3	110.00	50.00	-21.14	0.52	20.03	89.92	98.43	1.15 .	OK
4	115.00	50.00	-20.90	0.37	20.05	99.12	106.91	1.16	
5	120.00	50.00	-26.21	0.47	17.73	111.33	119.25	1.17	
6	125.00	50.00	-25.92	0.32	17.34	122.97	130.06	1.19	
7	130.00	50.00	-31.01	0.33	14.76	137.76	144.85	1.22	
8	135.00	50.00	-35.92	0.28	12.07	153.96	161.00	1.26	
9	140.00	50.00	-35.52	0.15	12.41	165.33	171.99	1.30	
10	145.00	50.00	-40.18	0.05	11.10	178.19	185.38	1.35	
11	150.00	50.00	-46.64	0.57	14.56	172.97	182.94	1.39	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.70	0.32	120.00	50.00	5.62	124.91	136.73	1.21	
2	-46.16	0.55	115.00	50.00	7.58	112.75	124.41	1.19	
3	-41.43	0.74	110.00	50.00	10.38	98.87	110.97	1.18	
4	-36.16	0.57	110.00	50.00	12.52	97.44	108.41	1.16	
5	-30.78	0.38	110.00	50.00	15.56	93.42	103.94	1.16	
6	-25.31	0.14	110.00	50.00	17.78	91.75	101.23	1.15	
. 7	-21.14	0.52	110.00	50.00	20.03	89.92	98.43	1.15 .	OK
8	-15.40	0.17	110.00	50.00	22.33	87.94	95.53	1.15	
9	-10.89	0.37	110.00	50.00	24.67	85.80	92.54	1.17	
10	-6.18	0.39	110.00	50.00	24.24	90.00	94.63	1.18	
11	-0.00	0.00	110.00	50.00	26.69	87.29	91.28	1.21	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.15
Critical Circle: Xc = 20.03[ft], Yc = 89.92[ft], R = 98.43[ft]. (Number of slices used = 64)

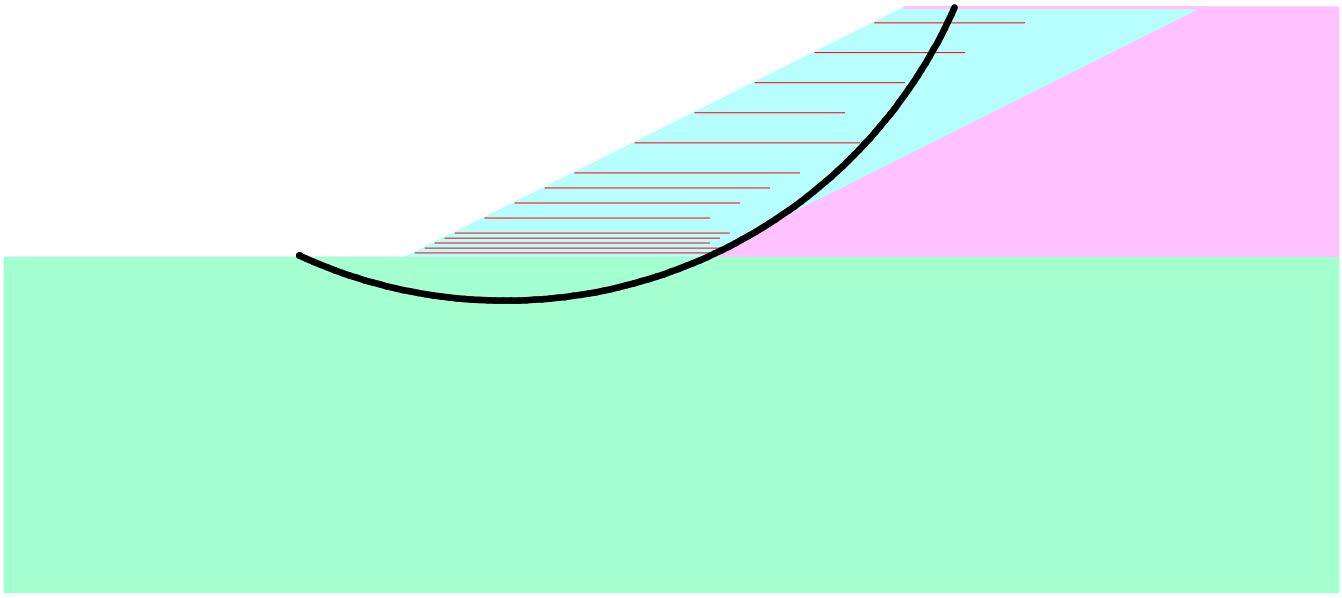
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

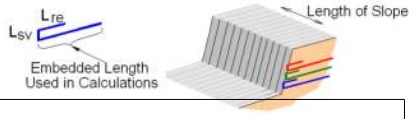
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	60.00	1.00	2.00	1.00	62.00	1.00	0.00	0.00
2	1	P1	2.00	60.00	1.00	4.00	2.00	64.00	2.00	0.00	0.00
3	1	P1	3.00	55.00	1.00	6.00	3.00	61.00	3.00	0.00	0.00
4	1	P1	4.00	55.00	1.00	8.00	4.00	63.00	4.00	0.00	0.00
5	1	P1	5.00	55.00	1.00	10.00	5.00	65.00	5.00	0.00	0.00
6	1	P1	8.00	45.00	1.00	16.00	8.00	61.00	8.00	0.00	0.00
7	1	P1	11.00	45.00	1.00	22.00	11.00	67.00	11.00	0.00	0.00
8	1	P1	14.00	45.00	1.00	28.01	14.00	73.01	14.00	0.00	0.00
9	1	P1	17.00	45.00	1.00	34.01	17.00	79.01	17.00	0.00	0.00
10	1	P1	23.00	45.00	1.00	46.01	23.00	91.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	630.00

LAW-7-2.17_203+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _203+00
Project Number: 173609006 -
Client:
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... -7 Analyses\203+00\ReSSA1 203+00 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 10:26:48 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	130.0	24.0	150.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

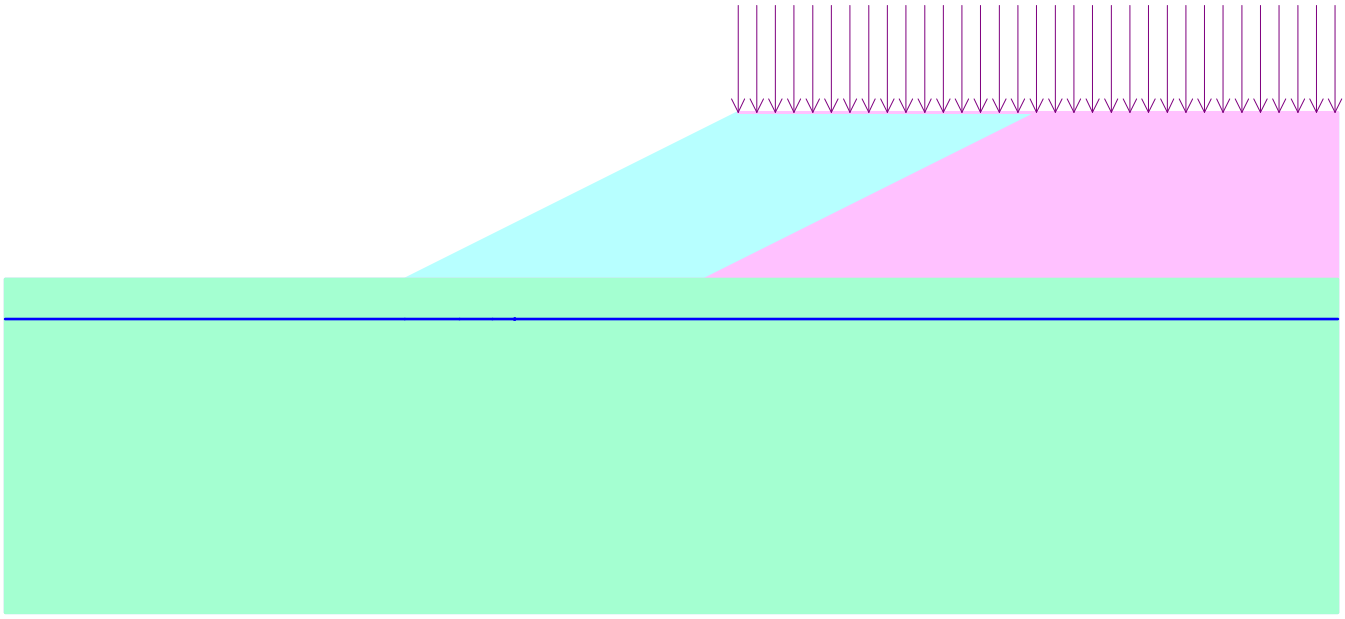
Height of slope, H	50.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

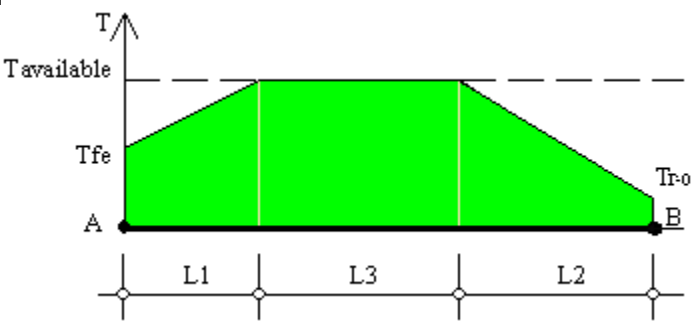
# 1	Xw =	0.00	Yw =	-12.00
# 2	Xw =	16.40	Yw =	-12.00
# 3	Xw =	26.25	Yw =	-12.00
# 4	Xw =	32.81	Yw =	-12.00



SCALE:

0 5 10 15 20 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	90.00	3.94	0.56	85.51	0.00	0.00	1300.00
2	P1	2.00	90.00	3.94	0.56	85.51	0.00	0.00	1300.00
3	P1	3.00	85.00	3.94	0.59	80.47	0.00	0.00	1300.00
4	P1	4.00	85.00	3.94	0.59	80.47	0.00	0.00	1300.00
5	P1	5.00	85.00	3.94	0.59	80.47	0.00	0.00	1300.00
6	P1	8.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
7	P1	11.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
8	P1	14.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
9	P1	17.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
10	P1	23.00	60.00	3.94	0.85	55.21	0.00	0.00	1300.00
11	P1	29.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
12	P1	35.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
13	P1	41.00	30.00	3.94	1.87	24.19	0.00	0.00	1300.00
14	P1	47.00	30.00	3.94	3.08	22.98	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	100.00	49.99	-11.14	0.45	20.39	79.16	84.79	1.68	
2	110.00	50.00	-10.89	0.28	19.80	97.48	101.93	1.56	
3	120.00	50.00	-6.10	0.36	27.50	100.01	105.16	1.50	
. 4	130.00	50.00	-10.37	0.09	22.45	130.15	134.13	1.49 .	OK
5	140.00	50.00	-10.11	0.02	18.83	163.51	166.03	1.52	
6	150.00	50.00	-11.55	0.25	19.54	186.49	188.81	1.59	
7	160.00	50.00	-25.68	0.22	29.19	166.77	175.35	1.66	
8	170.00	50.00	-30.22	0.07	30.05	184.81	194.32	1.72	
9	180.00	50.00	-41.51	0.44	24.53	225.05	234.12	1.80	
10	190.00	50.00	-26.24	0.29	31.45	244.51	250.95	1.88	
11	200.00	50.00	-35.38	0.08	26.38	288.77	295.22	1.97	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-51.55	0.57	130.00	50.00	4.98	151.07	160.76	1.60	
2	-46.55	0.57	130.00	50.00	8.02	145.68	155.03	1.58	
3	-41.48	0.52	130.00	50.00	9.81	144.66	152.99	1.55	
4	-36.30	0.43	130.00	50.00	11.61	143.45	150.83	1.53	
5	-31.01	0.33	130.00	50.00	14.76	137.77	144.85	1.52	
6	-25.63	0.19	130.00	50.00	16.64	136.18	142.41	1.50	
7	-20.14	0.04	130.00	50.00	18.54	134.39	139.81	1.49	
8	-16.12	0.30	130.00	50.00	20.47	132.38	137.05	1.49	
. 9	-10.37	0.09	130.00	50.00	22.45	130.15	134.13	1.49 .	OK
10	-6.01	0.24	130.00	50.00	24.48	127.67	131.03	1.49	
11	-0.92	0.18	130.00	50.00	25.05	128.87	131.29	1.49	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.49
Critical Circle: Xc = 22.45[ft], Yc = 130.15[ft], R = 134.13[ft]. (Number of slices used = 65)

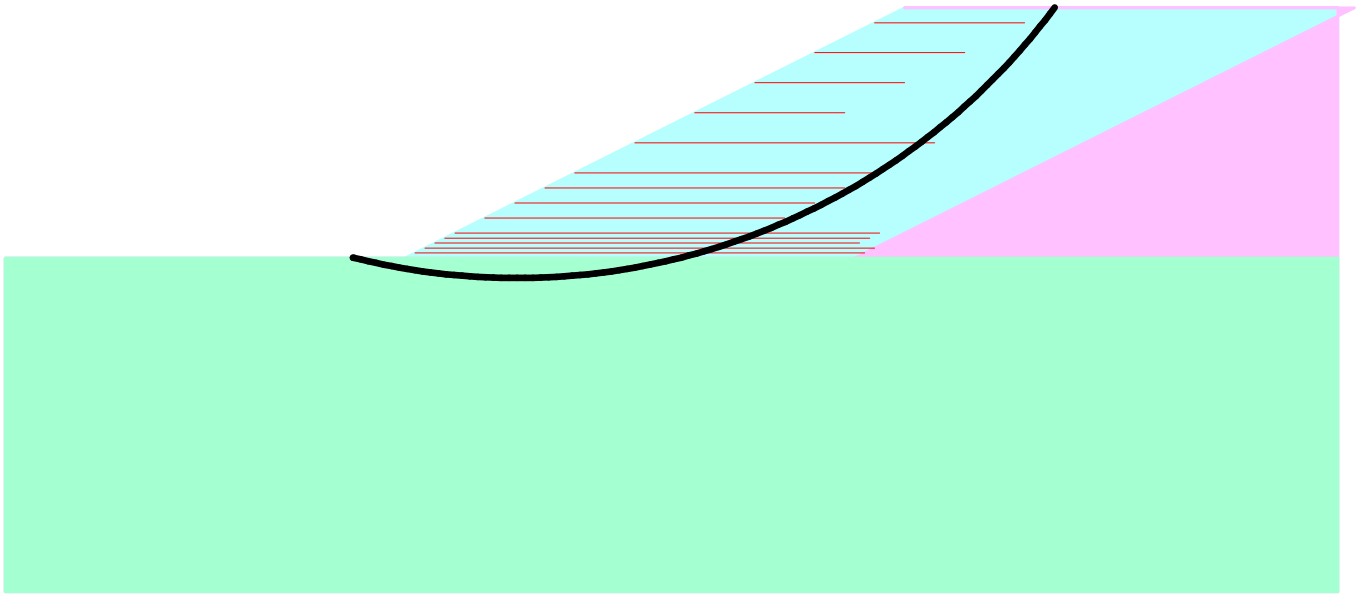
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

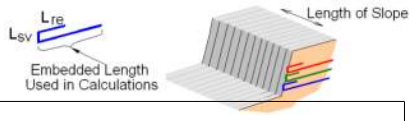
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	1	P1	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	1	P1	3.00	85.00	1.00	6.00	3.00	91.00	3.00	0.00	0.00
4	1	P1	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	1	P1	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	60.00	1.00	16.00	8.00	76.00	8.00	0.00	0.00
7	1	P1	11.00	60.00	1.00	22.00	11.00	82.00	11.00	0.00	0.00
8	1	P1	14.00	60.00	1.00	28.01	14.00	88.01	14.00	0.00	0.00
9	1	P1	17.00	60.00	1.00	34.01	17.00	94.01	17.00	0.00	0.00
10	1	P1	23.00	60.00	1.00	46.01	23.00	106.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	855.00

LAW-7-2.17_203+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _203+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... W-7 Analyses\203+00\ReSSA1 203+00 (Long Term).MSEp
Original date and time of creating this file: Tue Apr 16 14:40:19 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	130.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.10	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

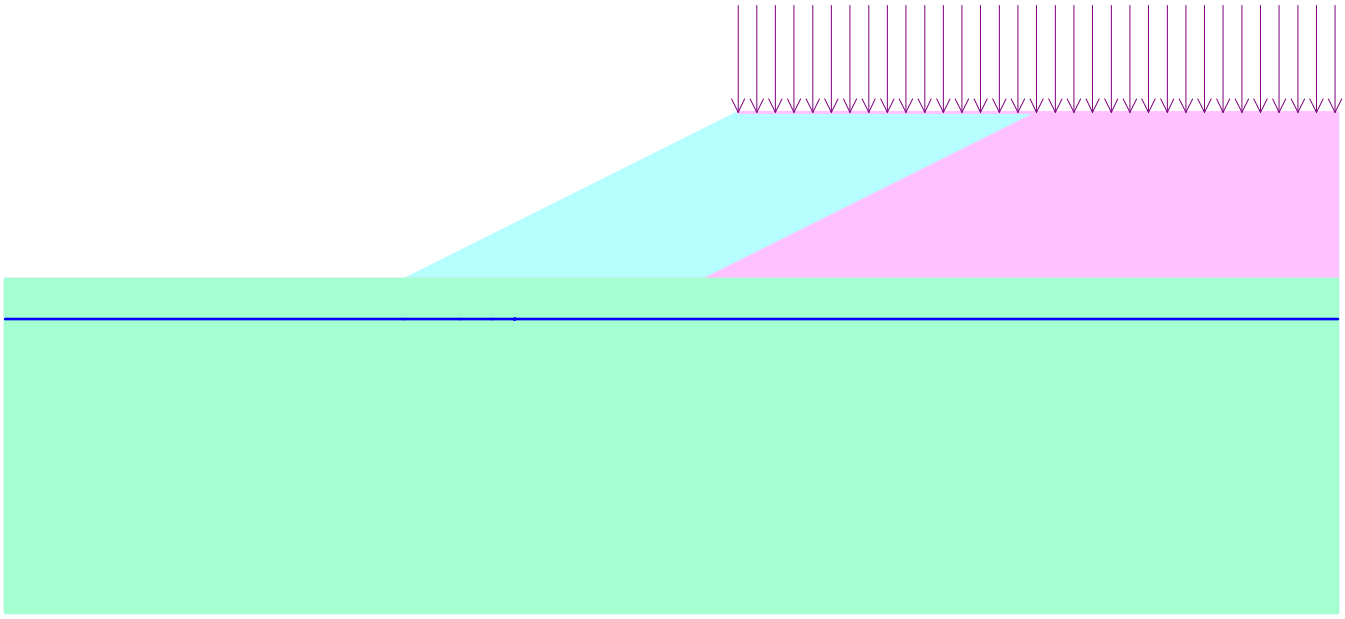
Height of slope, H	50.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

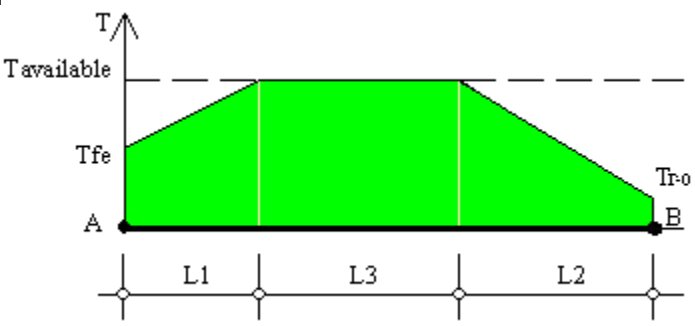
# 1	Xw =	0.00	Yw =	-12.00
# 2	Xw =	16.40	Yw =	-12.00
# 3	Xw =	26.25	Yw =	-12.00
# 4	Xw =	32.81	Yw =	-12.00



SCALE:

0 5 10 15 20 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	90.00	8.37	0.39	81.24	0.00	0.00	1181.82
2	P1	2.00	90.00	8.37	0.39	81.24	0.00	0.00	1181.82
3	P1	3.00	85.00	8.37	0.43	76.21	0.00	0.00	1181.82
4	P1	4.00	85.00	8.37	0.43	76.21	0.00	0.00	1181.82
5	P1	5.00	85.00	8.37	0.43	76.21	0.00	0.00	1181.82
6	P1	8.00	60.00	8.37	0.59	51.04	0.00	0.00	1181.82
7	P1	11.00	60.00	8.37	0.59	51.04	0.00	0.00	1181.82
8	P1	14.00	60.00	8.37	0.59	51.04	0.00	0.00	1181.82
9	P1	17.00	60.00	8.37	0.59	51.04	0.00	0.00	1181.82
10	P1	23.00	60.00	8.37	0.66	50.98	0.00	0.00	1181.82
11	P1	29.00	30.00	8.37	1.21	20.42	0.00	0.00	1181.82
12	P1	35.00	30.00	8.37	1.21	20.42	0.00	0.00	1181.82
13	P1	41.00	30.00	8.37	1.97	19.67	0.00	0.00	1181.82
14	P1	47.00	30.00	8.86	5.87	15.27	0.00	0.00	1181.82

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	100.00	49.99	-11.16	0.27	12.35	96.83	99.38	1.64	
2	108.00	50.00	-10.97	0.16	8.94	119.56	121.05	1.58	
. 3	116.00	50.00	-15.21	0.03	5.20	143.70	145.12	1.56 .	OK
4	124.00	50.00	-16.39	0.18	4.97	162.69	163.91	1.57	
5	132.00	50.00	-16.05	0.27	19.69	139.12	143.38	1.59	
6	140.00	50.00	-25.04	0.01	12.13	174.71	178.61	1.63	
7	148.00	50.00	-20.99	0.16	11.76	200.53	203.03	1.70	
8	156.00	50.00	-25.96	0.14	7.85	233.71	236.01	1.78	
9	164.00	50.00	-30.60	0.18	26.13	183.59	191.97	1.87	
10	172.00	50.00	-35.05	0.01	27.83	193.37	203.32	1.94	
11	180.00	50.00	-41.51	0.44	24.53	225.05	234.12	2.01	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-51.49	0.16	124.00	50.00	-24.78	239.99	241.31	1.64	
2	-46.50	0.24	124.00	50.00	-12.96	202.31	204.83	1.63	
3	-41.17	0.19	124.00	50.00	-9.36	193.46	195.87	1.61	
4	-35.62	0.12	116.00	50.00	-4.01	159.43	162.41	1.60	
5	-31.03	0.19	116.00	50.00	-2.28	157.22	159.64	1.58	
6	-25.05	0.01	116.00	50.00	1.36	149.49	151.79	1.57	
7	-20.96	0.15	116.00	50.00	3.24	146.75	148.58	1.56	
. 8	-15.21	0.03	116.00	50.00	5.20	143.70	145.12	1.56 .	OK
9	-10.77	0.10	116.00	50.00	7.23	140.34	141.40	1.56	
10	-6.14	0.10	116.00	50.00	7.38	141.47	142.01	1.56	
11	-0.00	0.00	116.00	50.00	5.15	147.61	147.70	1.57	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.56
Critical Circle: Xc = 5.20[ft], Yc = 143.70[ft], R = 145.12[ft]. (Number of slices used = 64)

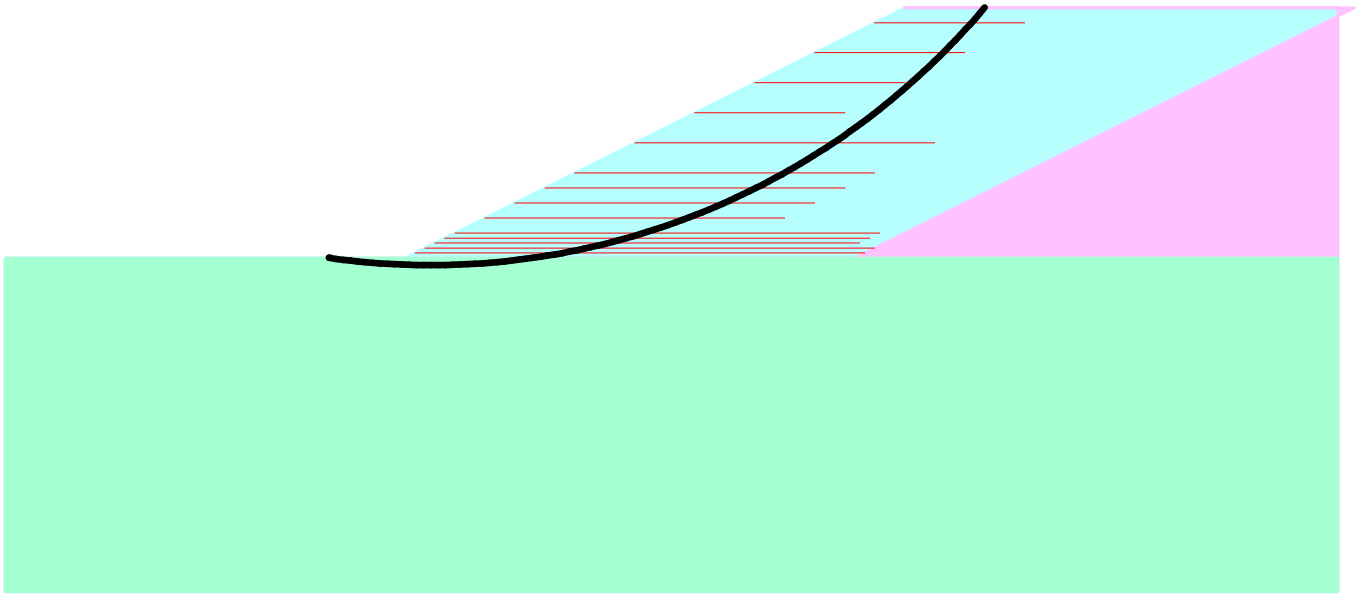
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

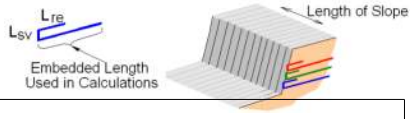
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	1	P1	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	1	P1	3.00	85.00	1.00	6.00	3.00	91.00	3.00	0.00	0.00
4	1	P1	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	1	P1	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	60.00	1.00	16.00	8.00	76.00	8.00	0.00	0.00
7	1	P1	11.00	60.00	1.00	22.00	11.00	82.00	11.00	0.00	0.00
8	1	P1	14.00	60.00	1.00	28.01	14.00	88.01	14.00	0.00	0.00
9	1	P1	17.00	60.00	1.00	34.01	17.00	94.01	17.00	0.00	0.00
10	1	P1	23.00	60.00	1.00	46.01	23.00	106.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	855.00

LAW-7-2.17_203+00 (Rapid DD)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _203+00 (Rapid DD)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... AW-7 Analyses\203+00\ReSSA1 203+00 (Rapid DD).MSEp
Original date and time of creating this file: Mon Apr 29 12:44:03 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	130.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

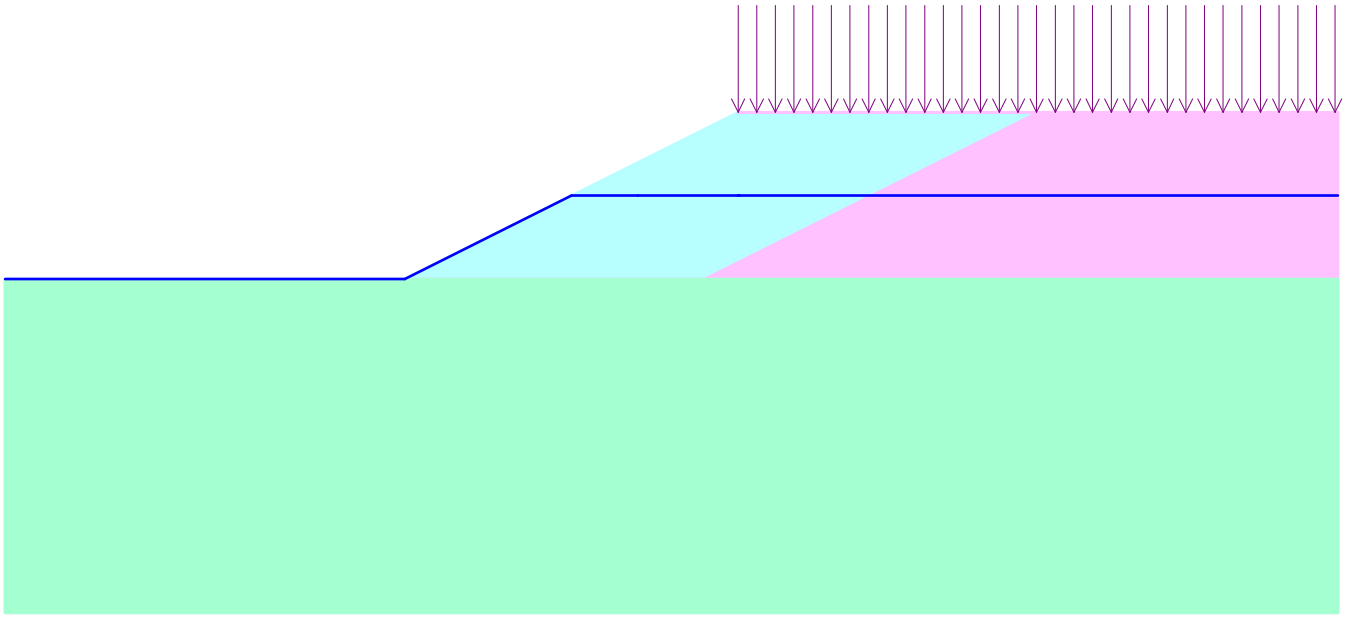
Height of slope, H	50.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

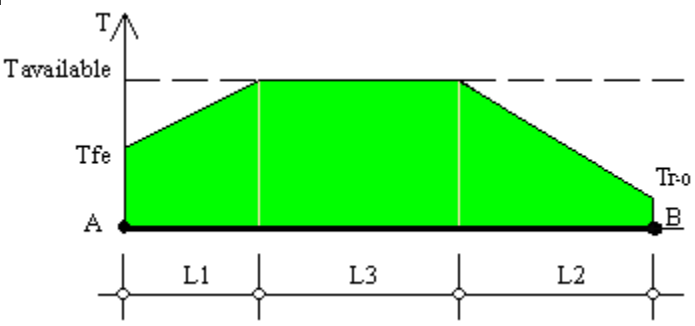
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	50.00	Yw =	25.00
# 3	Xw =	70.00	Yw =	25.00
# 4	Xw =	100.00	Yw =	25.00



SCALE:

0 5 10 15 20 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	90.00	11.94	0.59	77.47	0.00	0.00	1300.00
2	P1	2.00	90.00	11.94	0.59	77.47	0.00	0.00	1300.00
3	P1	3.00	85.00	11.94	0.62	72.43	0.00	0.00	1300.00
4	P1	4.00	85.00	11.94	0.59	72.47	0.00	0.00	1300.00
5	P1	5.00	85.00	11.94	0.59	72.47	0.00	0.00	1300.00
6	P1	8.00	60.00	11.94	0.89	47.17	0.00	0.00	1300.00
7	P1	11.00	60.00	11.94	0.85	47.20	0.00	0.00	1300.00
8	P1	14.00	60.00	11.94	0.79	47.27	0.00	0.00	1300.00
9	P1	17.00	60.00	11.94	0.75	47.30	0.00	0.00	1300.00
10	P1	23.00	60.00	10.40	0.75	48.85	0.00	0.00	1300.00
11	P1	29.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
12	P1	35.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
13	P1	41.00	30.00	8.79	2.17	19.04	0.00	0.00	1300.00
14	P1	47.00	30.00	9.45	6.46	14.09	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	100.00	49.99	-15.81	0.32	17.06	83.52	89.46	1.10	
2	105.00	50.00	-20.02	0.01	13.54	97.41	103.02	1.10	
. 3	110.00	50.00	-21.16	0.41	15.25	102.36	108.26	1.10 .	OK
4	115.00	50.00	-20.90	0.39	20.99	96.57	104.91	1.10	
5	120.00	50.00	-20.65	0.26	21.90	103.70	111.84	1.10	
6	125.00	50.00	-25.92	0.34	18.50	119.51	127.18	1.11	
7	130.00	50.00	-25.61	0.24	21.49	121.12	129.74	1.13	
8	135.00	50.00	-30.66	0.20	15.24	147.97	154.73	1.16	
9	140.00	50.00	-30.31	0.09	17.07	153.96	161.00	1.20	
10	145.00	50.00	-35.12	0.06	27.74	123.14	138.20	1.22	
11	150.00	50.00	-36.62	0.77	27.84	134.75	148.68	1.25	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.15	0.07	125.00	50.00	7.65	129.48	141.74	1.15	
2	-45.18	0.08	125.00	50.00	10.61	124.91	136.73	1.14	
3	-40.55	0.26	120.00	50.00	12.58	112.75	124.41	1.12	
4	-35.36	0.16	120.00	50.00	14.62	111.44	121.99	1.11	
5	-30.06	0.02	120.00	50.00	16.68	109.97	119.47	1.11	
6	-25.33	0.12	110.00	50.00	13.05	104.53	111.24	1.10	
. 7	-21.16	0.41	110.00	50.00	15.25	102.36	108.26	1.10 .	OK
8	-15.40	0.13	110.00	50.00	17.50	100.01	105.16	1.10	
9	-10.89	0.26	110.00	50.00	18.71	100.11	104.15	1.11	
10	-6.18	0.32	110.00	50.00	21.07	97.30	100.73	1.12	
11	-0.00	0.00	110.00	50.00	22.35	96.83	99.37	1.13	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.10
Critical Circle: Xc = 15.25[ft], Yc = 102.36[ft], R = 108.26[ft]. (Number of slices used = 64)

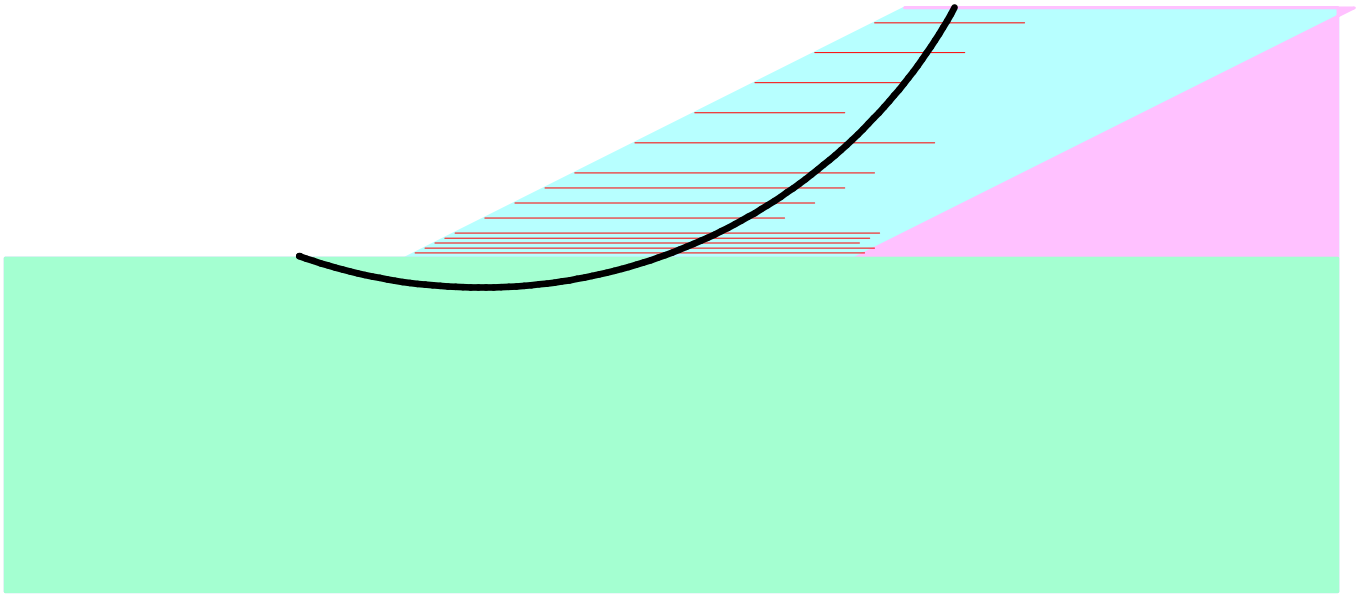
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

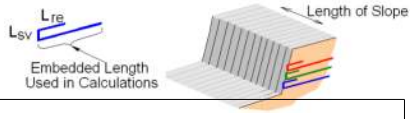
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	1	P1	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	1	P1	3.00	85.00	1.00	6.00	3.00	91.00	3.00	0.00	0.00
4	1	P1	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	1	P1	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	60.00	1.00	16.00	8.00	76.00	8.00	0.00	0.00
7	1	P1	11.00	60.00	1.00	22.00	11.00	82.00	11.00	0.00	0.00
8	1	P1	14.00	60.00	1.00	28.01	14.00	88.01	14.00	0.00	0.00
9	1	P1	17.00	60.00	1.00	34.01	17.00	94.01	17.00	0.00	0.00
10	1	P1	23.00	60.00	1.00	46.01	23.00	106.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	855.00

LAW-7-2.17_208+00 (Short Term)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _208+00 (Short Term)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name:
Original date and time of creating this file: Wed May 01 08:11:32 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	130.0	24.0	150.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

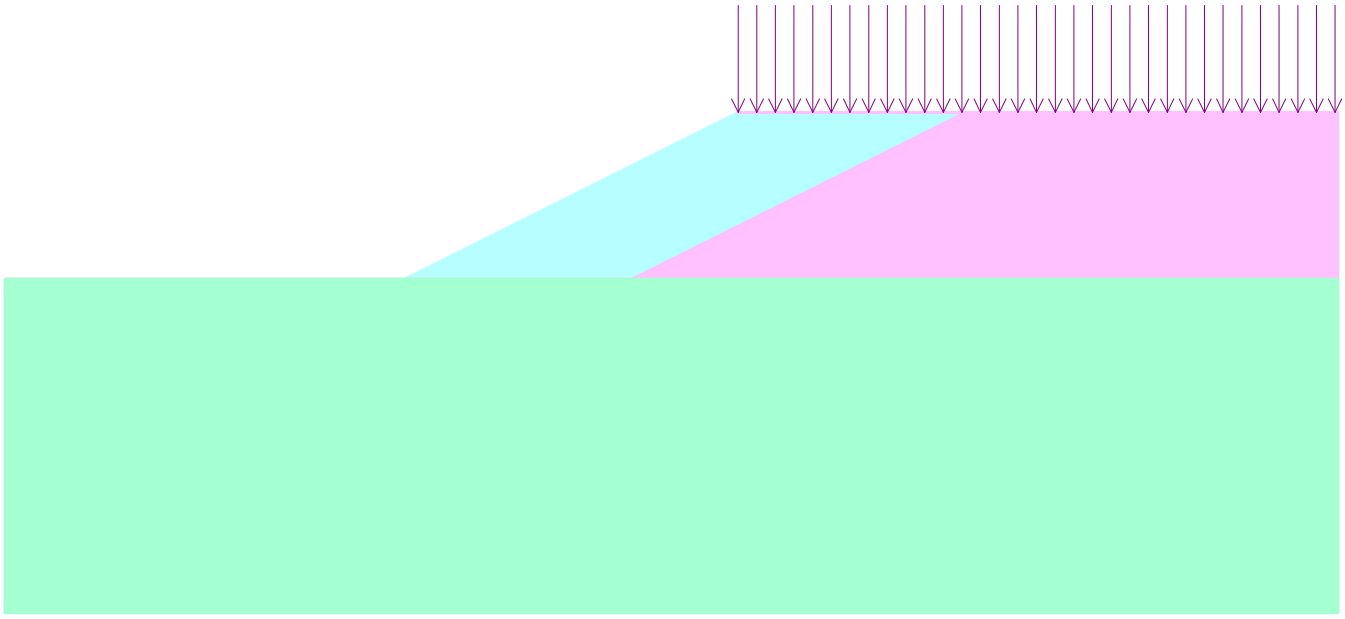
DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

Height of slope, H	22.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

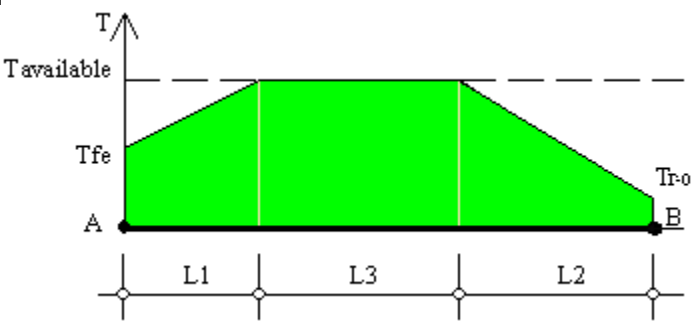
Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
2	P1	2.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
3	P1	3.00	25.00	3.94	1.54	19.52	0.00	0.00	1300.00
4	P1	4.00	25.00	3.94	1.54	19.52	0.00	0.00	1300.00
5	P1	5.00	25.00	3.94	1.54	19.52	0.00	0.00	1300.00
6	P1	8.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
7	P1	11.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
8	P1	14.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
9	P1	17.00	15.00	3.94	2.53	8.54	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	43.00	21.50	-5.31	0.24	13.32	23.44	29.75	2.07	
2	48.70	22.00	-5.08	0.05	13.03	32.53	37.19	1.81	
3	54.40	22.00	-5.52	0.21	12.62	43.62	47.04	1.70	OK
4	60.10	22.00	-5.37	0.11	12.23	56.35	58.92	1.72	
5	65.80	22.00	-5.21	0.06	13.63	64.97	67.59	1.80	
6	71.50	22.00	-10.66	0.21	13.22	75.95	79.42	1.89	
7	77.20	22.00	-10.40	0.12	15.41	83.11	86.91	2.00	
8	82.90	22.00	-15.33	0.11	15.40	93.56	98.37	2.12	
9	88.60	22.00	-16.03	0.32	16.95	104.49	109.27	2.24	
10	94.30	22.00	-20.54	0.19	18.02	110.41	116.77	2.36	
11	100.00	22.00	-25.90	0.31	17.64	123.84	130.97	2.48	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.04	0.02	65.80	22.00	-8.56	97.63	106.06	2.29	
2	-45.88	0.38	65.80	22.00	-5.77	92.43	100.41	2.19	
3	-40.58	0.25	65.80	22.00	-2.96	87.27	94.80	2.11	
4	-35.93	0.40	60.10	22.00	-2.58	76.39	82.99	2.02	
5	-30.46	0.20	60.10	22.00	0.30	71.39	77.56	1.94	
6	-25.57	0.23	60.10	22.00	2.68	68.52	73.90	1.87	
7	-20.46	0.19	60.10	22.00	5.64	63.47	68.45	1.81	
8	-15.60	0.28	54.40	22.00	7.73	48.75	53.79	1.76	
9	-10.02	0.01	54.40	22.00	9.92	46.94	50.99	1.71	
10	-5.52	0.21	54.40	22.00	12.62	43.62	47.04	1.70	OK
11	-0.00	0.00	54.40	22.00	14.99	41.19	43.84	1.71	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.70
Critical Circle: Xc = 12.62[ft], Yc = 43.62[ft], R = 47.04[ft]. (Number of slices used = 56)

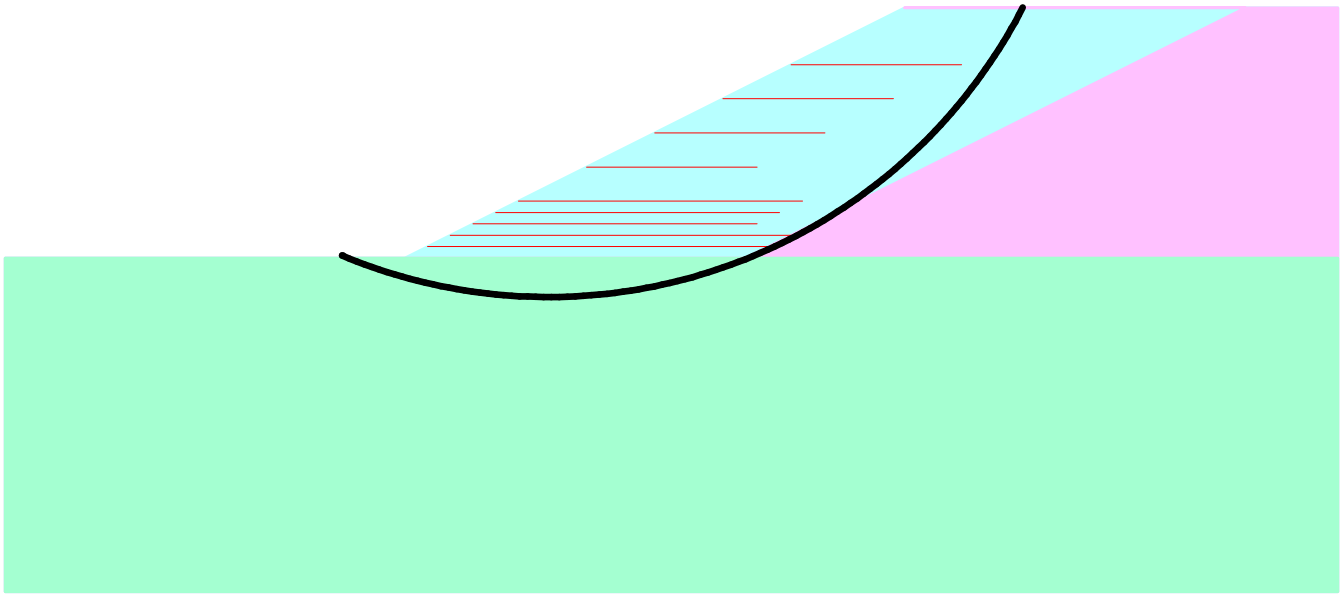
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

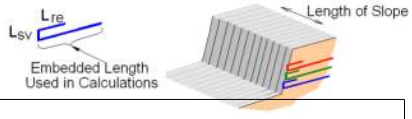
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	30.00	1.00	2.00	1.00	32.00	1.00	0.00	0.00
2	1	P1	2.00	30.00	1.00	4.00	2.00	34.00	2.00	0.00	0.00
3	1	P1	3.00	25.00	1.00	6.00	3.00	31.00	3.00	0.00	0.00
4	1	P1	4.00	25.00	1.00	8.00	4.00	33.00	4.00	0.00	0.00
5	1	P1	5.00	25.00	1.00	10.00	5.00	35.00	5.00	0.00	0.00
6	1	P1	8.00	15.00	1.00	16.00	8.00	31.00	8.00	0.00	0.00
7	1	P1	11.00	15.00	1.00	22.00	11.00	37.00	11.00	0.00	0.00
8	1	P1	14.00	15.00	1.00	28.01	14.00	43.01	14.00	0.00	0.00
9	1	P1	17.00	15.00	1.00	34.01	17.00	49.01	17.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	195.00

LAW-7-2.17_208+00 (Long Term)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _208+00 (Long Term)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name:
Original date and time of creating this file: Wed May 01 07:38:32 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	130.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

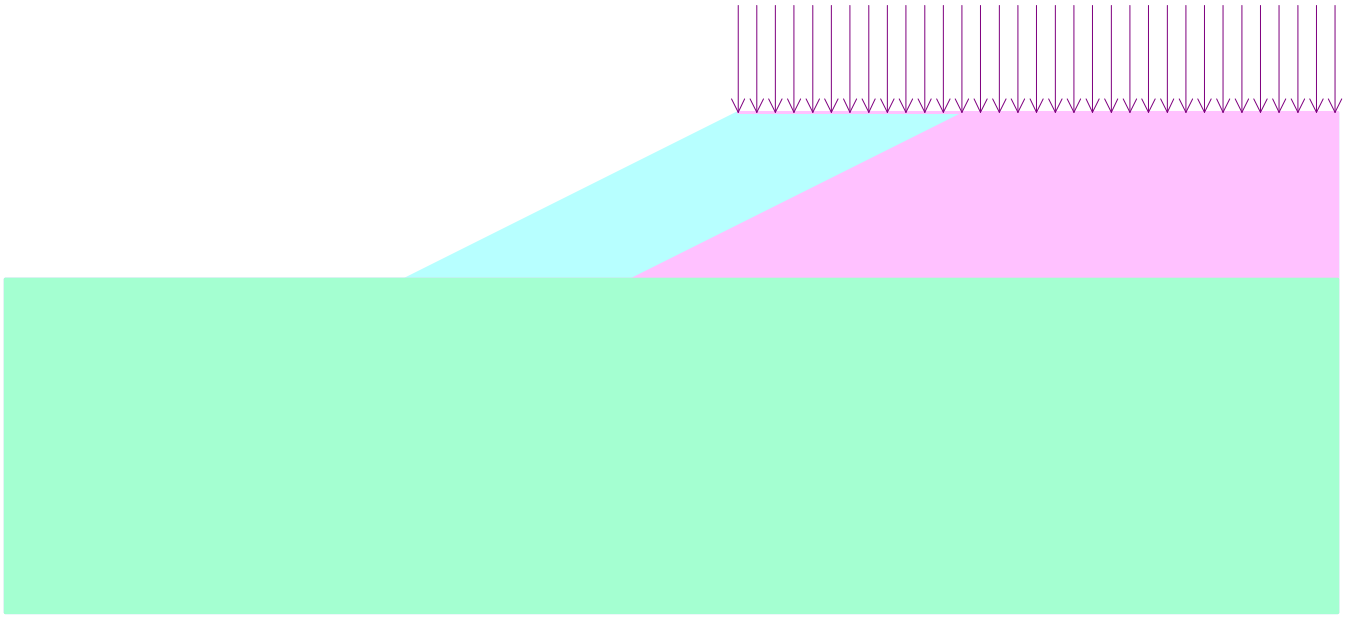
DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

Height of slope, H	22.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

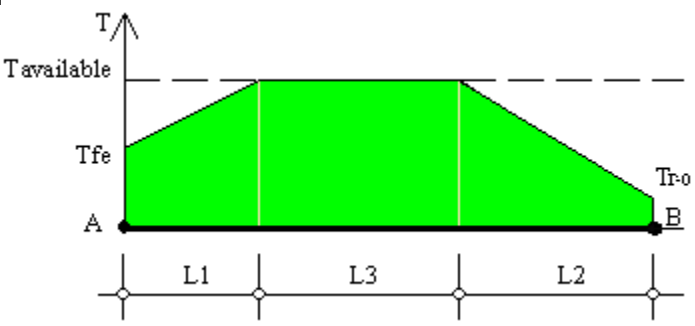
Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
2	P1	2.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
3	P1	3.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
4	P1	4.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
5	P1	5.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
6	P1	8.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
7	P1	11.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
8	P1	14.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
9	P1	17.00	15.00	8.79	3.87	2.34	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	44.00	22.00	-5.25	0.18	13.20	25.05	30.96	1.82	
2	49.60	22.00	-5.05	0.02	12.72	34.78	39.03	1.57	
3	55.20	22.00	-5.50	0.19	12.48	45.54	48.78	1.51	OK
4	60.80	22.00	-5.35	0.10	11.89	58.90	61.27	1.56	
5	66.40	22.00	-10.09	0.02	9.20	77.00	79.35	1.64	
6	72.00	22.00	-10.64	0.14	9.43	91.41	93.45	1.76	
7	77.60	22.00	-15.69	0.14	7.01	113.24	115.36	1.89	
8	83.20	22.00	-15.33	0.05	6.36	134.84	136.52	2.03	
9	88.80	22.00	-20.96	0.19	7.75	142.78	145.45	2.17	
10	94.40	22.00	-25.16	0.03	8.06	155.56	159.03	2.31	
11	100.00	22.00	-25.90	0.19	10.25	165.84	169.54	2.46	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.33	0.12	66.40	22.00	-10.32	109.01	116.01	2.05	
2	-45.05	0.02	66.40	22.00	-7.48	103.08	109.69	1.97	
3	-40.52	0.18	66.40	22.00	-5.34	100.66	106.47	1.88	
4	-35.00	0.00	60.80	22.00	-2.28	77.09	83.75	1.81	
5	-30.39	0.16	60.80	22.00	0.05	74.37	80.21	1.73	
6	-25.50	0.19	60.80	22.00	2.41	71.41	76.49	1.66	
7	-20.12	0.06	55.20	22.00	5.08	53.79	59.35	1.60	
8	-15.54	0.25	55.20	22.00	7.62	50.82	55.62	1.55	
9	-10.67	0.28	55.20	22.00	9.79	48.98	52.82	1.52	
10	-5.50	0.19	55.20	22.00	12.48	45.54	48.78	1.51	OK
11	-0.00	0.00	55.20	22.00	14.82	43.06	45.54	1.54	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.51
Critical Circle: Xc = 12.48[ft], Yc = 45.54[ft], R = 48.78[ft]. (Number of slices used = 57)

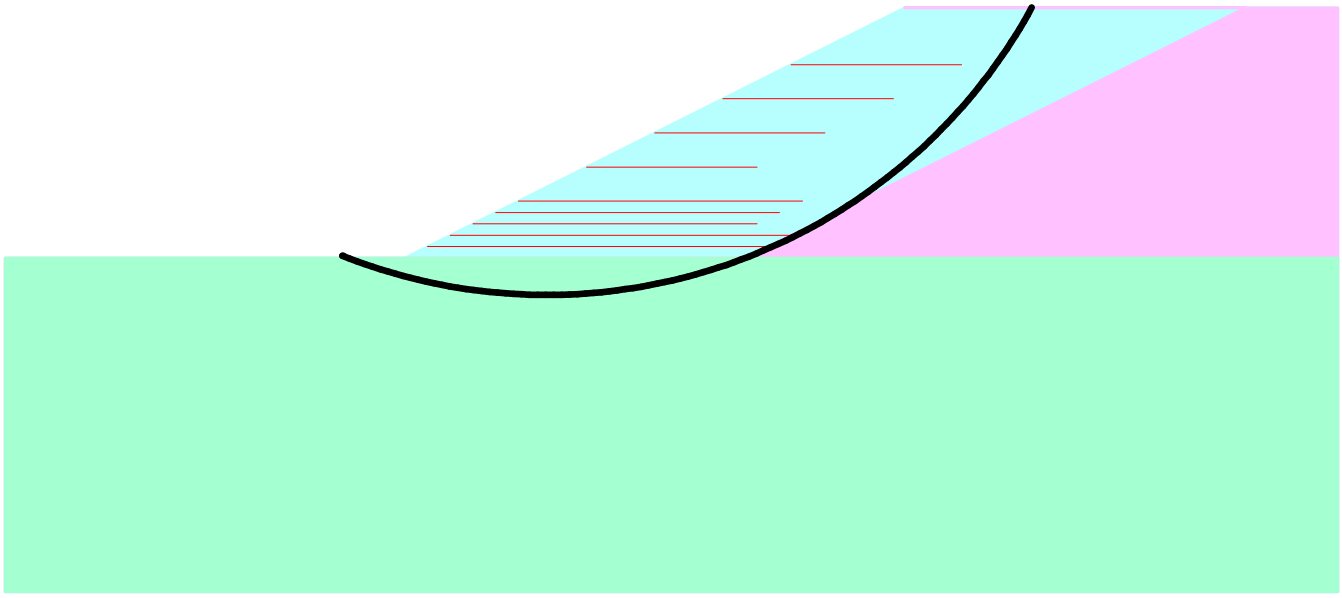
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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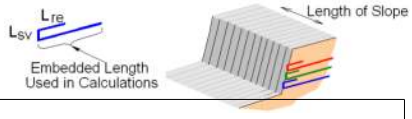


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	30.00	1.00	2.00	1.00	32.00	1.00	0.00	0.00
2	1	P1	2.00	30.00	1.00	4.00	2.00	34.00	2.00	0.00	0.00
3	1	P1	3.00	25.00	1.00	6.00	3.00	31.00	3.00	0.00	0.00
4	1	P1	4.00	25.00	1.00	8.00	4.00	33.00	4.00	0.00	0.00
5	1	P1	5.00	25.00	1.00	10.00	5.00	35.00	5.00	0.00	0.00
6	1	P1	8.00	15.00	1.00	16.00	8.00	31.00	8.00	0.00	0.00
7	1	P1	11.00	15.00	1.00	22.00	11.00	37.00	11.00	0.00	0.00
8	1	P1	14.00	15.00	1.00	28.01	14.00	43.01	14.00	0.00	0.00
9	1	P1	17.00	15.00	1.00	34.01	17.00	49.01	17.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	195.00

LAW-7-2.17_208+00 (Rapid DD)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _208+00 (Rapid DD)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name:
Original date and time of creating this file: Wed May 01 08:20:23 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	130.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

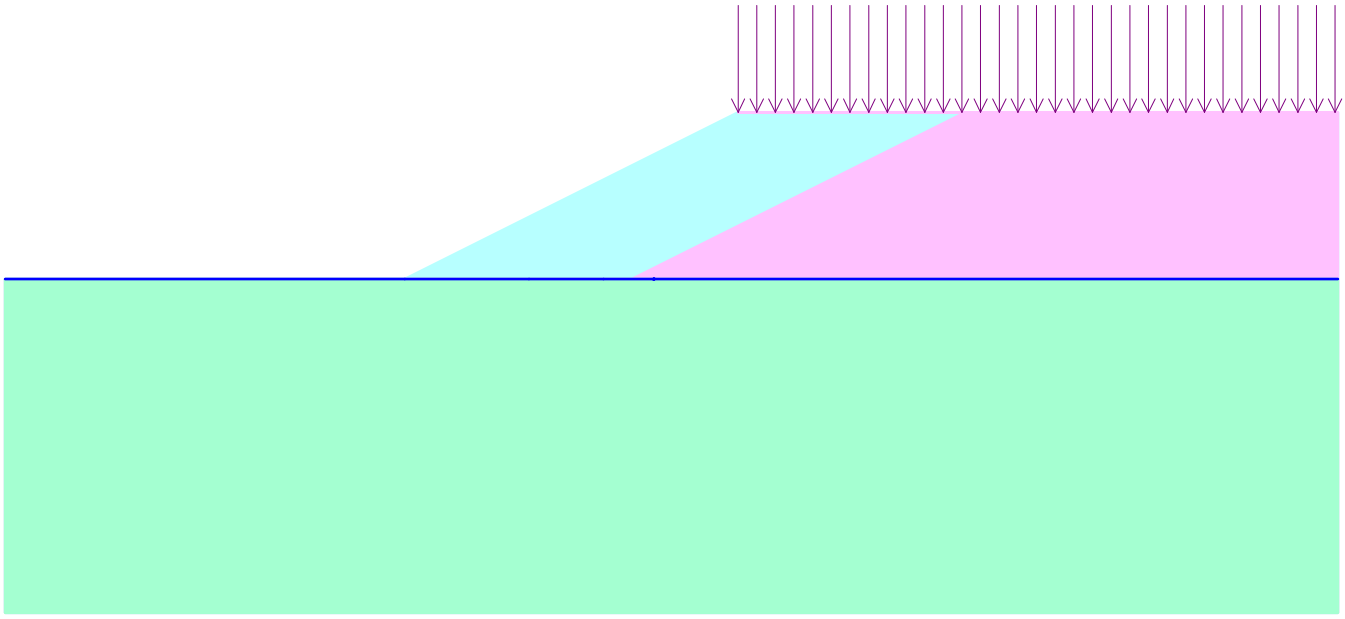
Height of slope, H	22.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

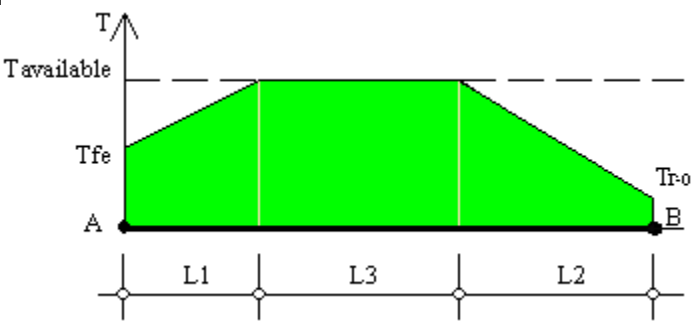
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	16.40	Yw =	0.00
# 3	Xw =	26.25	Yw =	0.00
# 4	Xw =	32.81	Yw =	0.00



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
2	P1	2.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
3	P1	3.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
4	P1	4.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
5	P1	5.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
6	P1	8.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
7	P1	11.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
8	P1	14.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
9	P1	17.00	15.00	8.79	3.87	2.34	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	44.00	22.00	-10.05	0.04	10.95	25.87	33.28	1.53	
2	49.60	22.00	-15.25	0.15	8.01	38.29	44.67	1.38	
. 3	55.20	22.00	-15.54	0.25	7.62	50.82	55.62	1.37 .	OK
4	60.80	22.00	-20.41	0.15	4.83	68.21	72.59	1.44	
5	66.40	22.00	-20.75	0.29	7.66	72.05	77.17	1.54	
6	72.00	22.00	-25.18	0.08	8.24	78.30	85.06	1.64	
7	77.60	22.00	-30.30	0.14	8.96	83.56	92.20	1.74	
8	83.20	22.00	-30.79	0.39	12.00	86.12	95.81	1.84	
9	88.80	22.00	-35.75	0.37	11.80	95.96	106.77	1.94	
10	94.40	22.00	-40.51	0.26	12.22	102.49	115.03	2.04	
11	100.00	22.00	-41.20	0.62	14.82	107.59	120.75	2.14	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.28	0.13	60.80	22.00	-9.61	86.61	95.57	1.64	
2	-45.83	0.37	60.80	22.00	-7.38	84.49	92.49	1.58	
3	-40.24	0.13	55.20	22.00	-4.61	63.84	73.00	1.53	
4	-35.71	0.38	55.20	22.00	-2.24	61.61	69.78	1.47	
5	-30.16	0.08	55.20	22.00	0.16	59.19	66.43	1.43	
6	-25.24	0.12	55.20	22.00	2.60	56.58	62.96	1.40	
7	-20.12	0.06	55.20	22.00	5.08	53.79	59.35	1.37	
. 8	-15.54	0.25	55.20	22.00	7.62	50.82	55.62	1.37 .	OK
9	-10.67	0.29	55.20	22.00	10.23	47.66	51.78	1.38	
10	-5.50	0.19	55.20	22.00	12.48	45.54	48.78	1.41	
11	-0.00	0.00	55.20	22.00	14.82	43.06	45.54	1.47	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.37
Critical Circle: Xc = 7.62[ft], Yc = 50.82[ft], R = 55.62[ft]. (Number of slices used = 63)

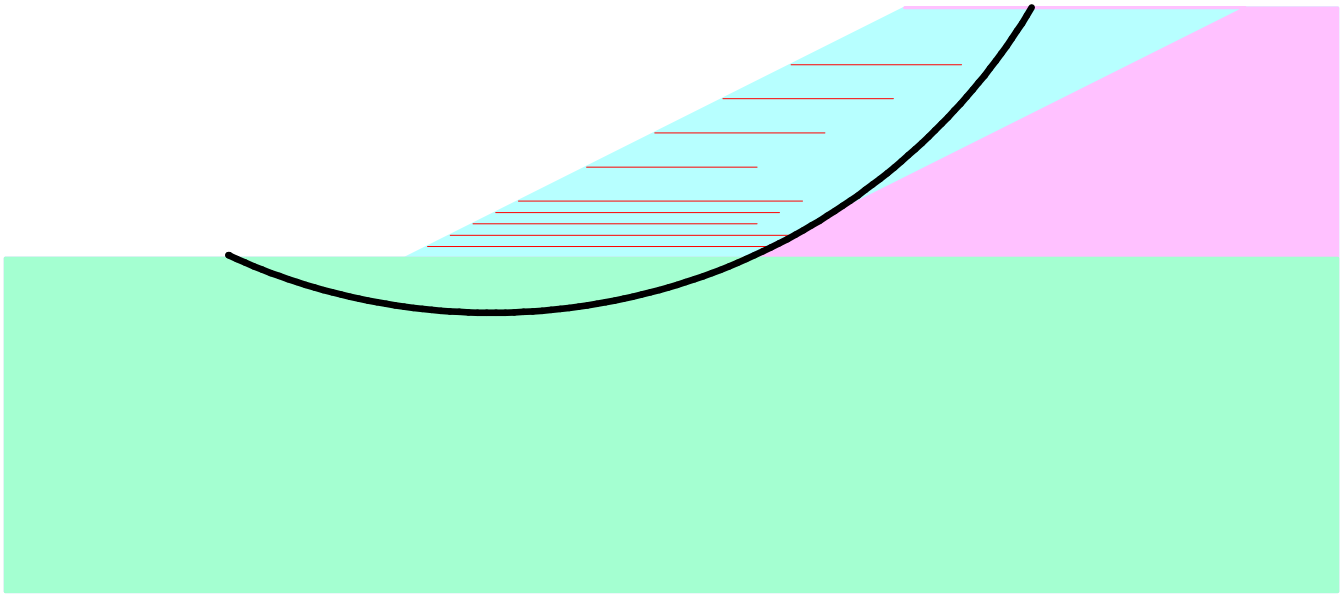
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

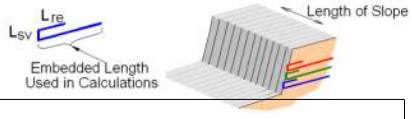
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	30.00	1.00	2.00	1.00	32.00	1.00	0.00	0.00
2	1	P1	2.00	30.00	1.00	4.00	2.00	34.00	2.00	0.00	0.00
3	1	P1	3.00	25.00	1.00	6.00	3.00	31.00	3.00	0.00	0.00
4	1	P1	4.00	25.00	1.00	8.00	4.00	33.00	4.00	0.00	0.00
5	1	P1	5.00	25.00	1.00	10.00	5.00	35.00	5.00	0.00	0.00
6	1	P1	8.00	15.00	1.00	16.00	8.00	31.00	8.00	0.00	0.00
7	1	P1	11.00	15.00	1.00	22.00	11.00	37.00	11.00	0.00	0.00
8	1	P1	14.00	15.00	1.00	28.01	14.00	43.01	14.00	0.00	0.00
9	1	P1	17.00	15.00	1.00	34.01	17.00	49.01	17.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	195.00

LAW-7-2.17_297+64.48

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _297+64.48
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... lyses\297+68.48\ReSSA1 297+68.48 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 11:31:16 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	122.0	0.0	750.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

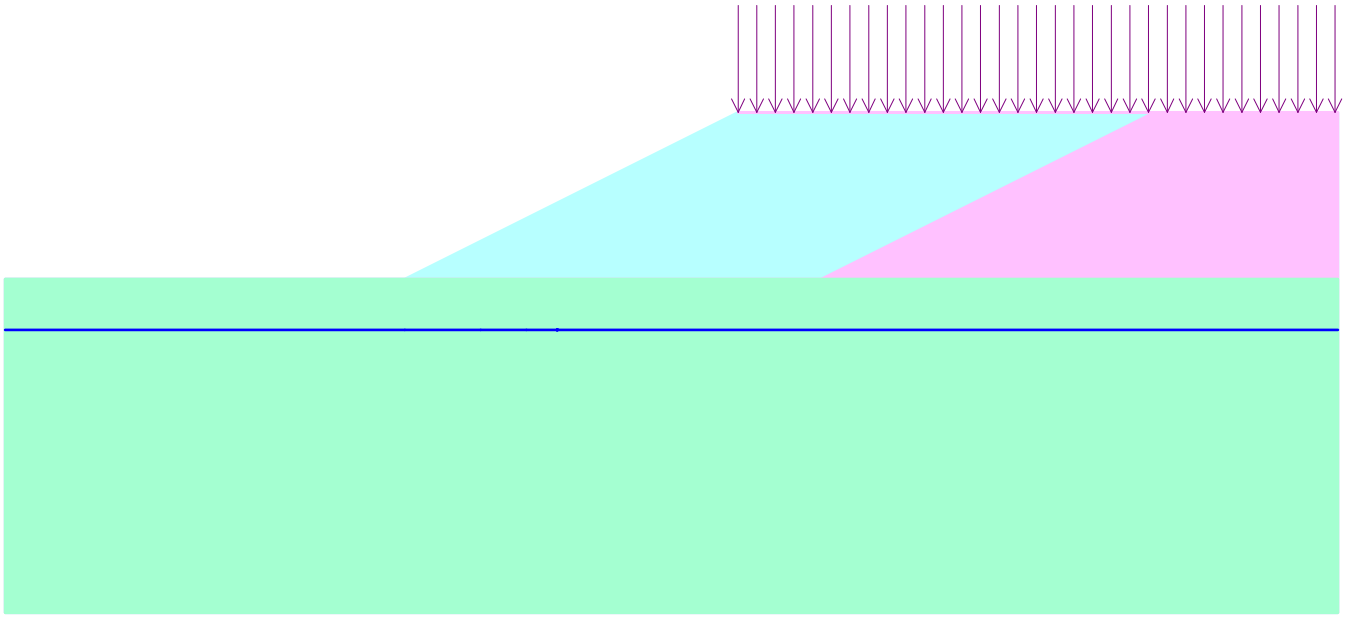
Height of slope, H	36.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

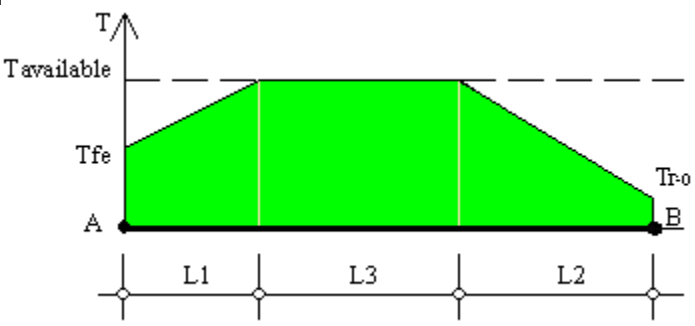
# 1	Xw =	0.00	Yw =	-11.00
# 2	Xw =	16.40	Yw =	-11.00
# 3	Xw =	26.25	Yw =	-11.00
# 4	Xw =	32.81	Yw =	-11.00



SCALE:

0 5 1015202530 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	90.00	6.86	1.31	81.83	0.00	0.00	2500.00
2	P3	2.00	90.00	6.86	1.35	81.80	0.00	0.00	2500.00
3	P3	3.00	85.00	6.86	1.38	76.77	0.00	0.00	2500.00
4	P3	4.00	85.00	6.86	1.41	76.73	0.00	0.00	2500.00
5	P3	5.00	85.00	6.86	1.48	76.67	0.00	0.00	2500.00
6	P3	8.00	50.00	6.86	1.77	41.37	0.00	0.00	2500.00
7	P3	11.00	50.00	6.86	1.77	41.37	0.00	0.00	2500.00
8	P3	14.00	40.00	6.86	2.10	31.04	0.00	0.00	2500.00
9	P3	17.00	40.00	6.86	2.17	30.98	0.00	0.00	2500.00
10	P3	23.00	40.00	6.86	2.82	30.32	0.00	0.00	2500.00
11	P3	29.00	40.00	6.86	4.10	29.04	0.00	0.00	2500.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	60.00	30.00	-20.74	0.84	14.11	30.71	45.90	1.88	
2	69.00	34.49	-30.21	0.25	12.95	36.04	56.07	1.56	
3	78.00	36.00	-20.24	0.27	22.15	36.64	55.85	1.23	
4	87.00	36.00	-20.76	0.93	26.45	38.97	60.63	1.09	
5	96.00	36.00	-20.35	0.42	30.45	42.33	65.86	1.02	
6	105.00	36.00	-21.02	1.24	34.51	45.74	71.16	0.95	
7	114.00	36.00	-30.30	0.36	33.24	53.06	82.55	0.89	
8	123.00	36.00	-40.04	0.05	32.11	60.51	94.14	0.87	
9	132.00	36.00	-40.80	0.96	36.36	64.07	99.68	0.86	
10	141.00	36.00	-51.52	1.85	35.39	71.65	111.47	0.86	
11	150.00	36.00	-60.22	0.26	34.49	79.29	123.35	0.85	On extreme X-entry

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-100.36	0.43	150.00	36.00	13.84	95.52	148.60	0.88	
2	-90.15	0.18	150.00	36.00	18.98	91.45	142.27	0.87	
3	-81.62	1.97	150.00	36.00	24.14	87.38	135.95	0.86	
4	-71.00	1.21	150.00	36.00	29.31	83.33	129.64	0.86	
5	-60.22	0.26	150.00	36.00	34.49	79.29	123.35	0.85	OK
6	-50.86	1.03	150.00	36.00	39.69	75.26	117.09	0.86	
7	-40.20	0.24	141.00	36.00	40.62	67.65	105.25	0.86	
8	-30.56	0.67	132.00	36.00	41.64	60.11	93.52	0.87	
9	-20.27	0.32	123.00	36.00	42.77	52.67	81.94	0.89	
10	-10.31	0.37	114.00	36.00	44.06	45.36	70.57	0.92	
11	-0.09	0.11	114.00	36.00	49.55	41.58	64.69	0.98	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 0.85

Critical Circle: Xc = 34.49[ft], Yc = 79.29[ft], R = 123.35[ft]. (Number of slices used = 64)

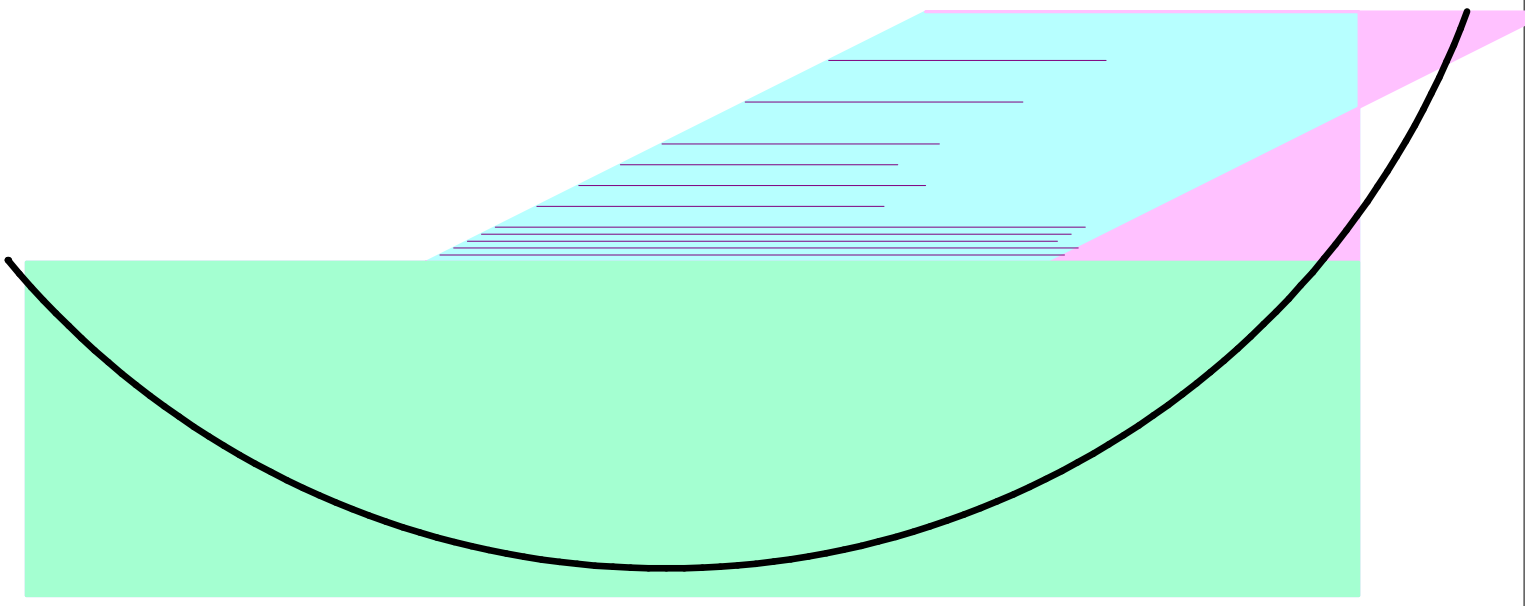
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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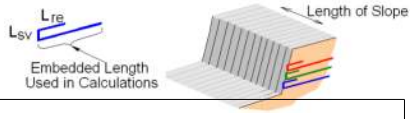


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	3	P3	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	3	P3	3.00	85.00	1.00	6.00	3.00	91.00	3.00	0.00	0.00
4	3	P3	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	3	P3	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	3	P3	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	3	P3	11.00	50.00	1.00	22.00	11.00	72.00	11.00	0.00	0.00
8	3	P3	14.00	40.00	1.00	28.01	14.00	68.01	14.00	0.00	0.00
9	3	P3	17.00	40.00	1.00	34.01	17.00	74.01	17.00	0.00	0.00
10	3	P3	23.00	40.00	1.00	46.01	23.00	86.01	23.00	0.00	0.00
11	3	P3	29.00	40.00	1.00	58.01	29.00	98.01	29.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
3	P3	1.00	695.00

LAW-7-2.17_297+68.48

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _297+68.48
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... alyses\297+68.48\ReSSA1 297+68.48 (Long Term).MSEp
Original date and time of creating this file: Wed Apr 17 09:46:50 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	122.0	24.0	100.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

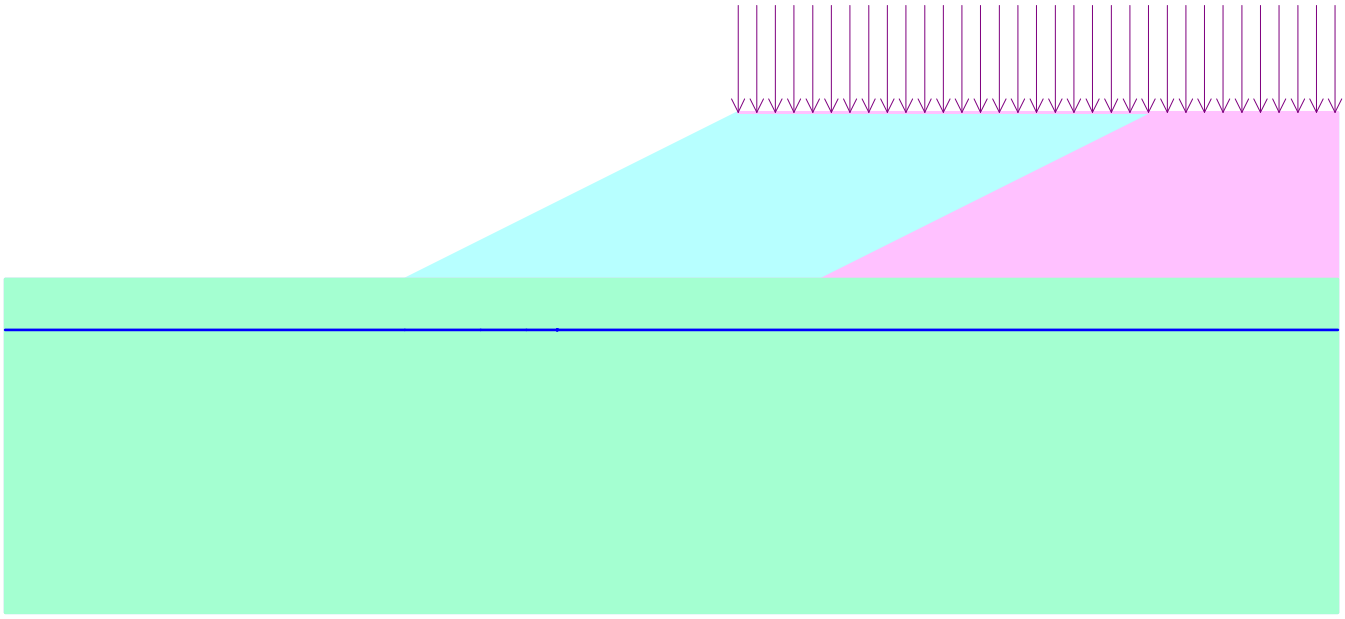
Height of slope, H	36.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

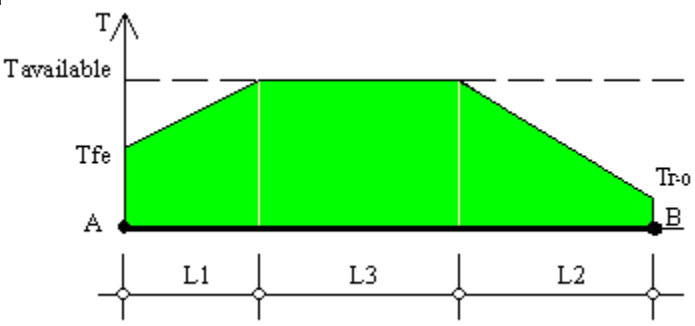
# 1	Xw =	0.00	Yw =	-11.00
# 2	Xw =	16.40	Yw =	-11.00
# 3	Xw =	26.25	Yw =	-11.00
# 4	Xw =	32.81	Yw =	-11.00



SCALE:

0 5 1015202530 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	90.00	8.79	0.56	80.65	0.00	0.00	1300.00
2	P1	2.00	90.00	8.79	0.59	80.62	0.00	0.00	1300.00
3	P1	3.00	85.00	8.79	0.59	75.62	0.00	0.00	1300.00
4	P1	4.00	85.00	8.79	0.62	75.58	0.00	0.00	1300.00
5	P1	5.00	85.00	8.79	0.62	75.58	0.00	0.00	1300.00
6	P1	8.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
7	P1	11.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
8	P1	14.00	40.00	8.79	0.98	30.22	0.00	0.00	1300.00
9	P1	17.00	40.00	8.79	1.02	30.19	0.00	0.00	1300.00
10	P1	23.00	40.00	8.79	1.51	29.70	0.00	0.00	1300.00
11	P1	29.00	40.00	8.79	2.79	28.42	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	71.00	35.49	-10.30	0.15	15.96	50.94	57.17	1.89	
2	78.90	36.00	-15.06	0.03	14.55	63.38	69.93	1.78	
3	86.80	36.00	-10.70	0.36	21.85	62.51	70.15	1.70	
. 4	94.70	36.00	-15.30	0.13	19.27	80.73	87.70	1.68 .	OK
5	102.60	36.00	-20.73	0.28	17.73	98.28	105.28	1.72	
6	110.50	36.00	-20.24	0.09	19.94	109.74	116.79	1.79	
7	118.40	36.00	-36.36	1.16	28.24	75.36	98.38	1.87	
8	126.30	36.00	-35.64	0.42	28.01	97.03	115.70	1.88	
9	134.20	36.00	-45.09	0.05	24.15	119.78	138.31	1.95	
10	142.10	36.00	-51.03	0.63	25.79	126.13	147.15	2.02	
11	150.00	36.00	-50.27	0.17	30.15	128.27	151.25	2.10	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.35	0.22	102.60	36.00	8.47	93.58	110.34	1.83	
2	-46.13	0.72	94.70	36.00	7.74	84.40	99.52	1.80	
3	-40.89	0.54	94.70	36.00	9.95	83.12	96.98	1.77	
4	-35.53	0.31	94.70	36.00	12.17	81.70	94.34	1.75	
5	-30.07	0.04	94.70	36.00	12.43	87.00	96.80	1.72	
6	-25.73	0.34	94.70	36.00	14.68	85.09	93.88	1.70	
7	-21.20	0.54	94.70	36.00	16.95	83.00	90.85	1.68	
. 8	-15.30	0.13	94.70	36.00	19.27	80.73	87.70	1.68 .	OK
9	-10.41	0.17	94.70	36.00	21.63	78.28	84.43	1.68	
10	-5.31	0.11	94.70	36.00	23.29	77.72	82.71	1.70	
11	-0.00	0.00	94.70	36.00	25.76	74.81	79.12	1.72	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.68
Critical Circle: Xc = 19.27[ft], Yc = 80.73[ft], R = 87.70[ft]. (Number of slices used = 64)

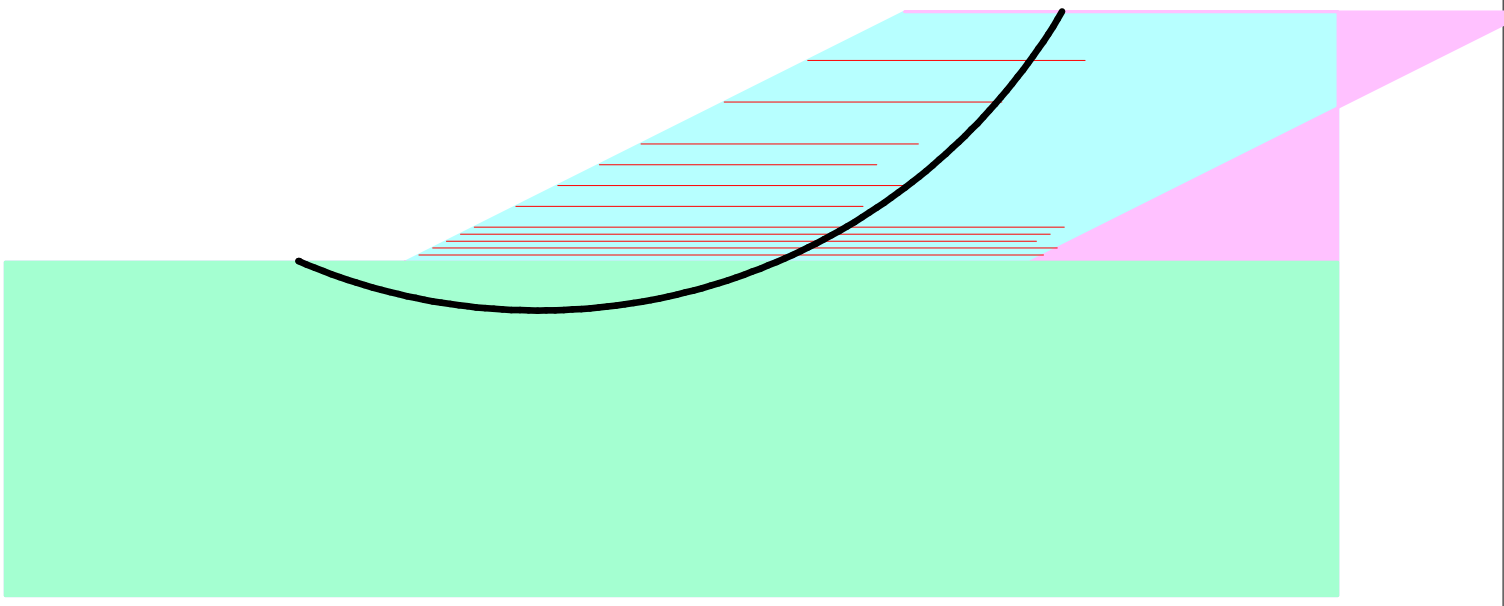
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

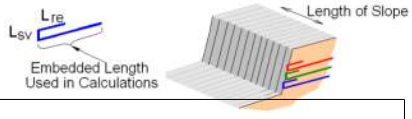
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	1	P1	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	1	P1	3.00	85.00	1.00	6.00	3.00	91.00	3.00	0.00	0.00
4	1	P1	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	1	P1	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	1	P1	11.00	50.00	1.00	22.00	11.00	72.00	11.00	0.00	0.00
8	1	P1	14.00	40.00	1.00	28.01	14.00	68.01	14.00	0.00	0.00
9	1	P1	17.00	40.00	1.00	34.01	17.00	74.01	17.00	0.00	0.00
10	1	P1	23.00	40.00	1.00	46.01	23.00	86.01	23.00	0.00	0.00
11	1	P1	29.00	40.00	1.00	58.01	29.00	98.01	29.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	695.00

LAW-7-2.17_297+68.48 (Rapid DD)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _297+68.48 (Rapid DD)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... nalyses\297+68.48\ReSSA1 297+68.48 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 08:24:51 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	122.0	24.0	100.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

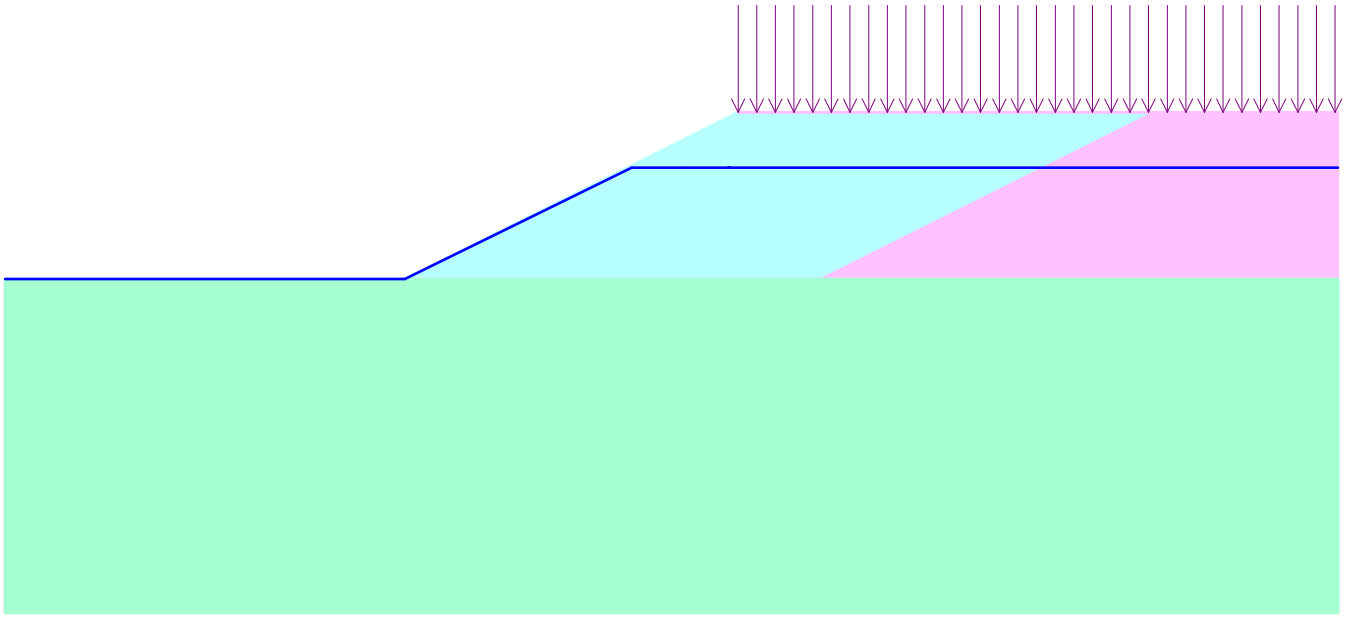
Height of slope, H	36.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

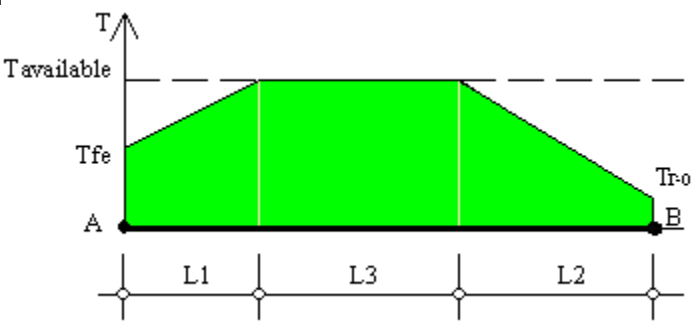
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	49.00	Yw =	24.00
# 3	Xw =	60.00	Yw =	24.00
# 4	Xw =	70.00	Yw =	24.00



SCALE:

0 5 1015202530 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	90.00	11.81	0.82	77.37	0.00	0.00	1300.00
2	P1	2.00	90.00	11.78	0.82	77.40	0.00	0.00	1300.00
3	P1	3.00	85.00	11.75	0.85	72.40	0.00	0.00	1300.00
4	P1	4.00	85.00	11.71	0.85	72.43	0.00	0.00	1300.00
5	P1	5.00	85.00	11.68	0.89	72.43	0.00	0.00	1300.00
6	P1	8.00	50.00	11.58	1.12	37.30	0.00	0.00	1300.00
7	P1	11.00	50.00	11.48	1.05	37.47	0.00	0.00	1300.00
8	P1	14.00	40.00	11.38	1.31	27.30	0.00	0.00	1300.00
9	P1	17.00	40.00	11.32	1.25	27.43	0.00	0.00	1300.00
10	P1	23.00	40.00	9.55	1.54	28.91	0.00	0.00	1300.00
11	P1	29.00	40.00	8.79	2.79	28.42	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	70.00	34.99	-15.60	0.38	14.96	47.95	56.54	1.20	
2	78.00	36.00	-15.16	0.11	18.97	50.37	60.75	1.15	
. 3	86.00	36.00	-15.76	0.42	19.64	62.50	71.46	1.11 .	OK
4	94.00	36.00	-20.06	0.03	19.33	73.97	83.77	1.11	
5	102.00	36.00	-25.19	0.10	19.08	86.51	97.10	1.15	
6	110.00	36.00	-30.08	0.04	19.60	97.34	109.25	1.20	
7	118.00	36.00	-30.90	0.49	23.78	101.14	114.55	1.26	
8	126.00	36.00	-35.67	0.44	27.88	96.82	115.45	1.27	
9	134.00	36.00	-40.06	0.03	25.31	122.83	139.12	1.31	
10	142.00	36.00	-46.09	0.56	25.38	138.12	155.02	1.38	
11	150.00	36.00	-50.20	0.11	27.13	145.06	164.29	1.44	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-51.39	0.88	94.00	36.00	4.64	87.44	103.11	1.20	
2	-46.23	0.75	94.00	36.00	6.82	86.25	100.62	1.18	
3	-40.96	0.58	94.00	36.00	9.64	82.62	96.38	1.15	
4	-35.60	0.35	94.00	36.00	11.87	81.18	93.74	1.14	
5	-30.13	0.08	94.00	36.00	14.73	77.48	89.47	1.12	
6	-25.78	0.44	94.00	36.00	17.02	75.80	86.67	1.11	
7	-20.58	0.35	86.00	36.00	17.77	62.86	73.33	1.11	
. 8	-15.76	0.42	86.00	36.00	19.64	62.50	71.46	1.11 .	OK
9	-10.73	0.39	86.00	36.00	22.11	60.39	68.39	1.11	
10	-5.48	0.25	86.00	36.00	24.62	58.14	65.25	1.13	
11	-0.00	0.00	86.00	36.00	26.63	57.11	63.01	1.16	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.11
Critical Circle: Xc = 19.64[ft], Yc = 62.50[ft], R = 71.46[ft]. (Number of slices used = 63)

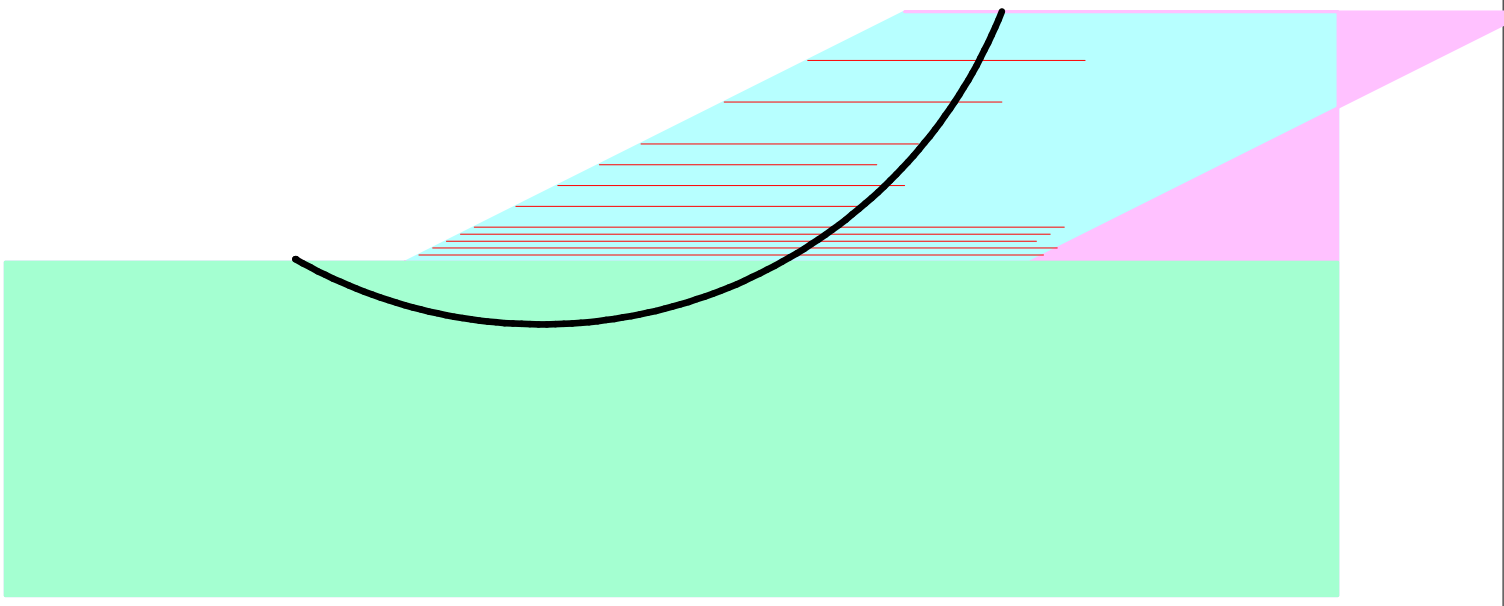
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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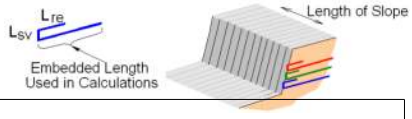


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	90.00	1.00	2.00	1.00	92.00	1.00	0.00	0.00
2	1	P1	2.00	90.00	1.00	4.00	2.00	94.00	2.00	0.00	0.00
3	1	P1	3.00	85.00	1.00	6.00	3.00	91.00	3.00	0.00	0.00
4	1	P1	4.00	85.00	1.00	8.00	4.00	93.00	4.00	0.00	0.00
5	1	P1	5.00	85.00	1.00	10.00	5.00	95.00	5.00	0.00	0.00
6	1	P1	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	1	P1	11.00	50.00	1.00	22.00	11.00	72.00	11.00	0.00	0.00
8	1	P1	14.00	40.00	1.00	28.01	14.00	68.01	14.00	0.00	0.00
9	1	P1	17.00	40.00	1.00	34.01	17.00	74.01	17.00	0.00	0.00
10	1	P1	23.00	40.00	1.00	46.01	23.00	86.01	23.00	0.00	0.00
11	1	P1	29.00	40.00	1.00	58.01	29.00	98.01	29.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	695.00

LAW-7-2.17_300+81.52

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _300+81.52
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... lyses\300+81.52\ReSSA1 300+81.52 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 11:47:49 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	122.0	0.0	750.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

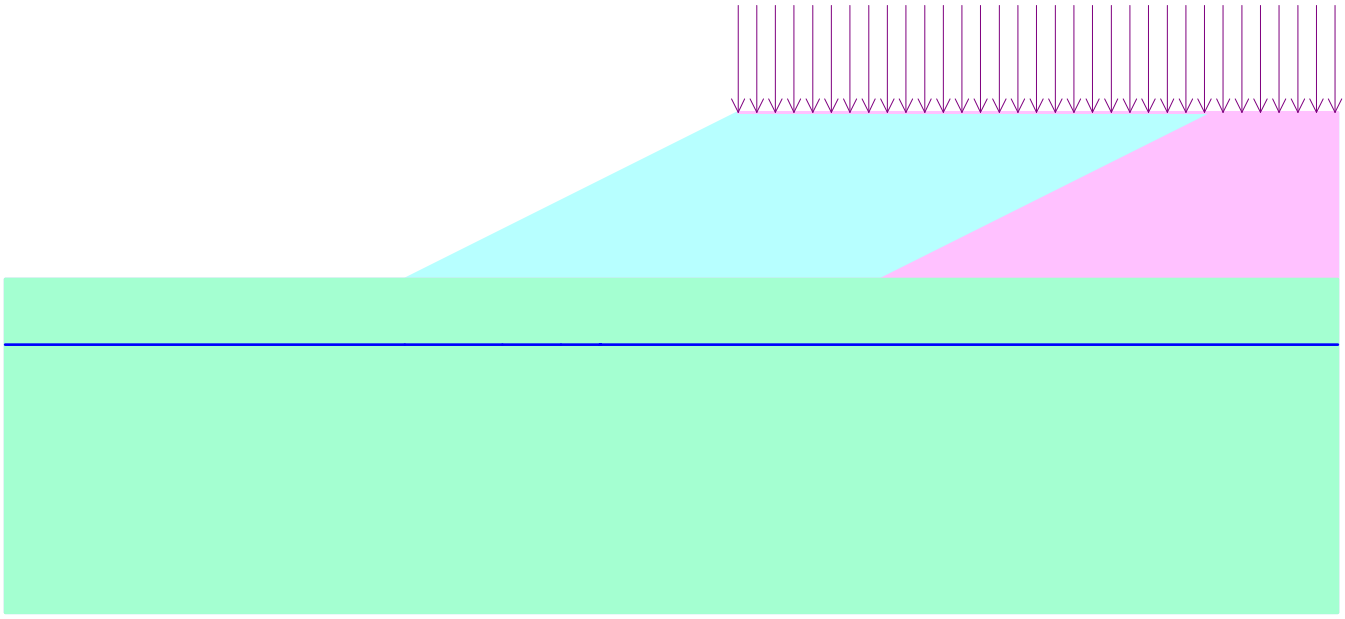
Height of slope, H	28.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

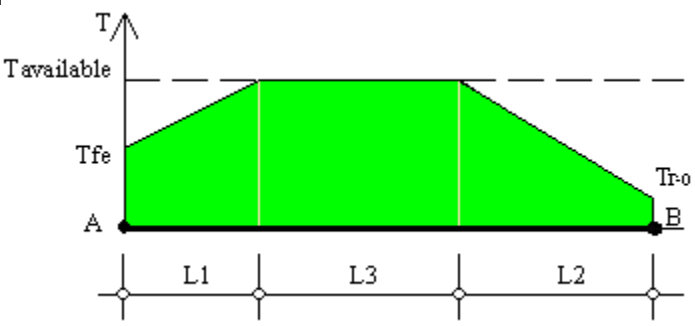
# 1	Xw =	0.00	Yw =	-11.00
# 2	Xw =	16.40	Yw =	-11.00
# 3	Xw =	26.25	Yw =	-11.00
# 4	Xw =	32.81	Yw =	-11.00



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	80.00	3.94	0.85	75.21	0.00	0.00	1300.00
2	P1	2.00	80.00	3.94	0.89	75.18	0.00	0.00	1300.00
3	P1	3.00	75.00	3.94	0.92	70.14	0.00	0.00	1300.00
4	P1	4.00	75.00	3.94	0.95	70.11	0.00	0.00	1300.00
5	P1	5.00	75.00	3.94	0.98	70.08	0.00	0.00	1300.00
6	P1	8.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
7	P1	11.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
8	P1	14.00	30.00	3.94	1.41	24.65	0.00	0.00	1300.00
9	P1	17.00	30.00	3.94	1.64	24.42	0.00	0.00	1300.00
10	P1	23.00	30.00	3.94	2.53	23.54	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	55.00	27.50	-20.48	0.56	12.26	28.04	42.75	1.75	
2	59.50	28.00	-20.18	0.21	14.49	28.94	45.02	1.55	
3	64.00	28.00	-15.58	0.70	19.27	28.76	44.74	1.41	
4	68.50	28.00	-10.13	0.16	24.05	28.57	44.45	1.32	
5	73.00	28.00	-15.17	0.20	23.24	32.09	49.93	1.26	
6	77.50	28.00	-20.73	0.89	22.52	35.68	55.51	1.22	
7	82.00	28.00	-20.49	0.60	24.58	37.40	58.19	1.19	
8	86.50	28.00	-25.86	1.05	23.95	41.08	63.90	1.16	
9	91.00	28.00	-25.59	0.72	26.04	42.83	66.63	1.15	
10	95.50	28.00	-25.33	0.39	28.14	44.59	69.37	1.10	
11	100.00	28.00	-30.48	0.57	27.60	48.34	75.20	1.08	On extreme X-entry

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-51.21	1.47	100.00	28.00	17.10	56.31	87.60	1.10	
2	-46.16	1.41	100.00	28.00	19.72	54.30	84.48	1.09	
3	-41.02	1.24	100.00	28.00	22.34	52.31	81.38	1.09	
4	-35.79	0.96	100.00	28.00	24.97	50.32	78.28	1.08	
5	-30.48	0.57	100.00	28.00	27.60	48.34	75.20	1.08	OK
6	-25.06	0.07	100.00	28.00	30.25	46.36	72.13	1.08	
7	-20.53	0.64	100.00	28.00	32.91	44.40	69.07	1.09	
8	-15.80	0.97	100.00	28.00	35.58	42.44	66.02	1.11	
9	-10.05	0.06	95.50	28.00	36.18	38.75	60.29	1.13	
10	-5.66	0.80	95.50	28.00	38.89	36.83	57.29	1.16	
11	-0.00	0.00	95.50	28.00	41.32	35.92	54.75	1.22	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.08
Critical Circle: Xc = 27.60[ft], Yc = 48.34[ft], R = 75.20[ft]. (Number of slices used = 65)

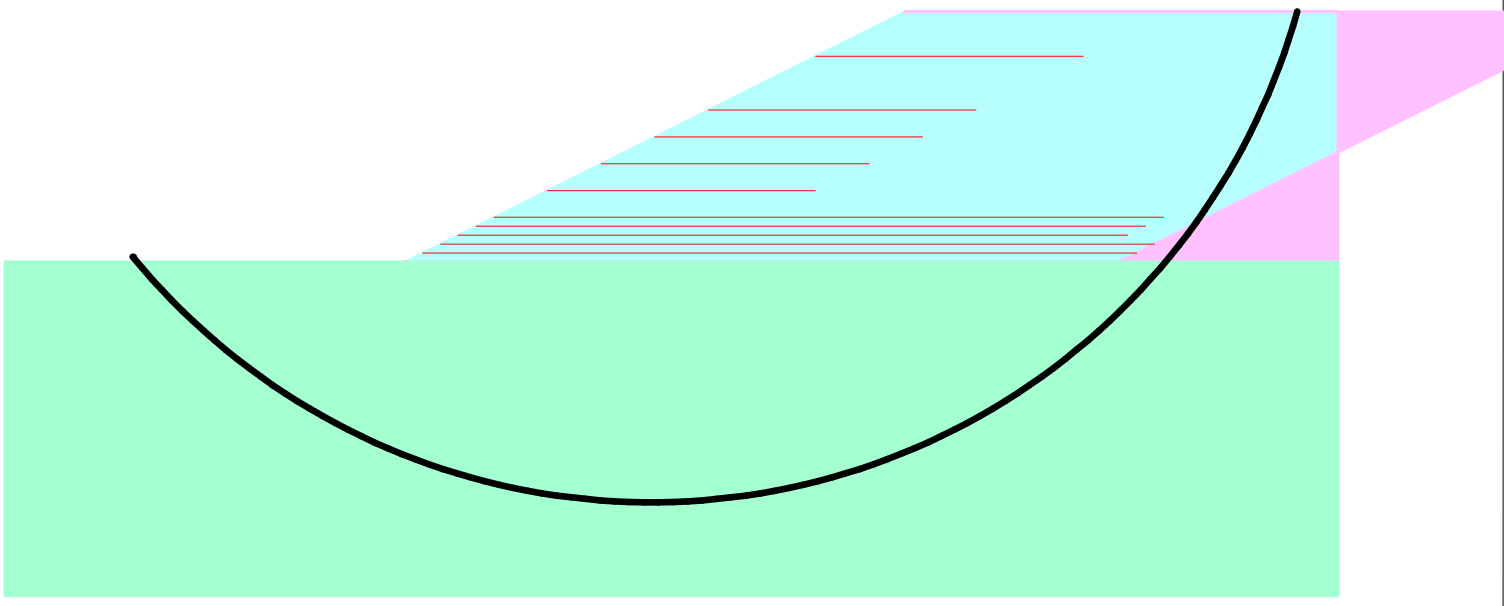
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

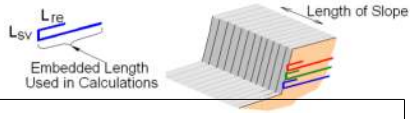
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	80.00	1.00	2.00	1.00	82.00	1.00	0.00	0.00
2	1	P1	2.00	80.00	1.00	4.00	2.00	84.00	2.00	0.00	0.00
3	1	P1	3.00	75.00	1.00	6.00	3.00	81.00	3.00	0.00	0.00
4	1	P1	4.00	75.00	1.00	8.00	4.00	83.00	4.00	0.00	0.00
5	1	P1	5.00	75.00	1.00	10.00	5.00	85.00	5.00	0.00	0.00
6	1	P1	8.00	30.00	1.00	16.00	8.00	46.00	8.00	0.00	0.00
7	1	P1	11.00	30.00	1.00	22.00	11.00	52.00	11.00	0.00	0.00
8	1	P1	14.00	30.00	1.00	28.01	14.00	58.01	14.00	0.00	0.00
9	1	P1	17.00	30.00	1.00	34.01	17.00	64.01	17.00	0.00	0.00
10	1	P1	23.00	30.00	1.00	46.01	23.00	76.01	23.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	535.00

LAW-7-2.17_30+81.52

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _30+81.52
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... alyses\300+81.52\ReSSA1 300+81.52 (Long Term).MSEp
Original date and time of creating this file: Wed Apr 17 10:24:25 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	122.0	24.0	100.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

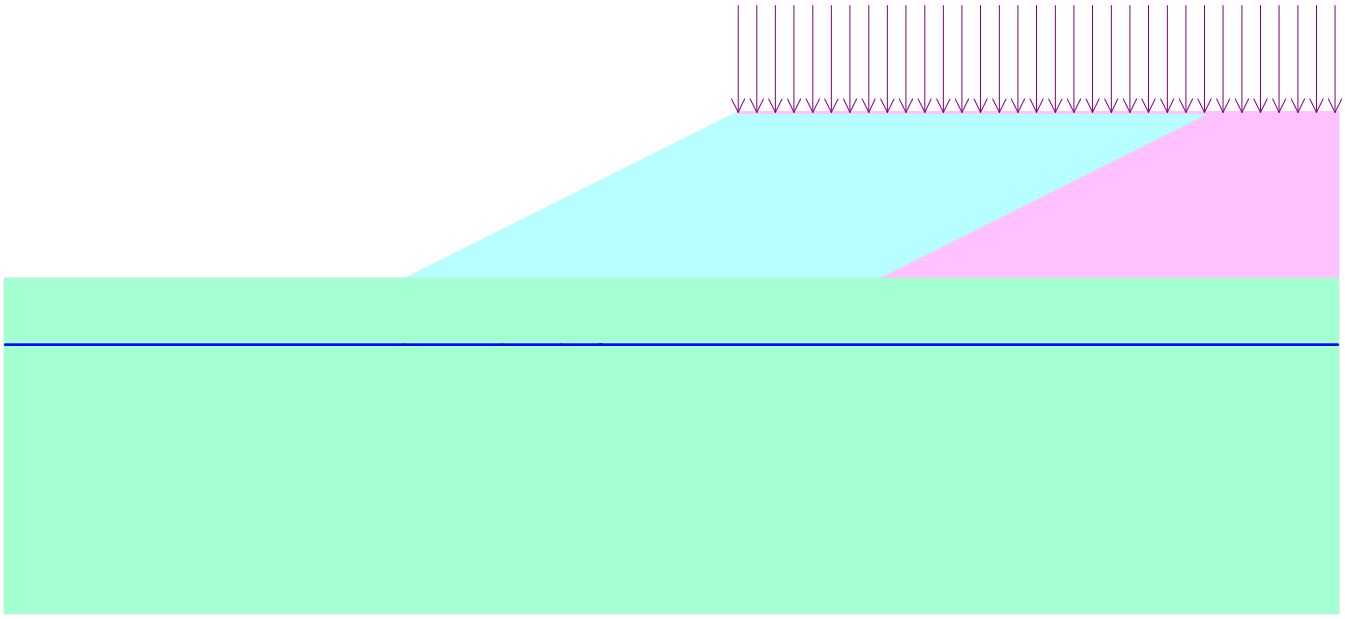
Height of slope, H	28.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

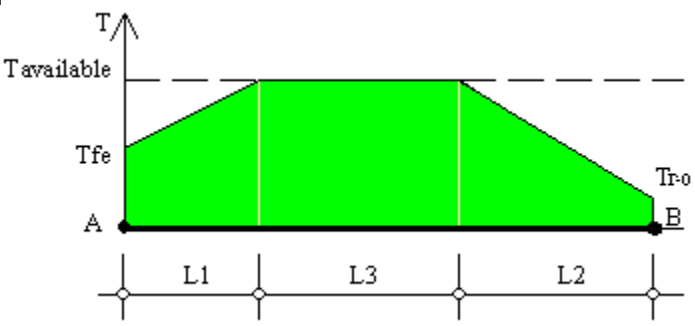
# 1	Xw =	0.00	Yw =	-11.00
# 2	Xw =	16.40	Yw =	-11.00
# 3	Xw =	26.25	Yw =	-11.00
# 4	Xw =	32.81	Yw =	-11.00



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	80.00	8.79	0.72	70.49	0.00	0.00	1300.00
2	P1	2.00	80.00	8.79	0.75	70.45	0.00	0.00	1300.00
3	P1	3.00	75.00	8.79	0.79	65.42	0.00	0.00	1300.00
4	P1	4.00	75.00	8.79	0.82	65.39	0.00	0.00	1300.00
5	P1	5.00	75.00	8.79	0.85	65.35	0.00	0.00	1300.00
6	P1	8.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
7	P1	11.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
8	P1	14.00	30.00	8.79	1.41	19.80	0.00	0.00	1300.00
9	P1	17.00	30.00	8.79	1.77	19.44	0.00	0.00	1300.00
10	P1	23.00	30.00	8.79	3.87	17.34	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	55.00	27.50	-10.48	0.33	13.55	34.91	42.11	2.08	
2	60.50	28.00	-10.21	0.13	14.95	39.93	47.09	1.91	
3	66.00	28.00	-10.75	0.41	15.49	47.95	54.31	1.81	
4	71.50	28.00	-10.51	0.23	15.72	57.76	63.23	1.77	OK
5	77.00	28.00	-15.51	0.22	14.27	68.96	74.92	1.80	
6	82.50	28.00	-15.17	0.07	15.19	78.64	84.24	1.84	
7	88.00	28.00	-20.79	0.34	15.78	84.29	91.57	1.91	
8	93.50	28.00	-20.41	0.17	18.08	89.70	97.45	1.98	
9	99.00	28.00	-25.77	0.34	18.23	97.11	106.30	2.06	
10	104.50	28.00	-31.08	0.89	25.82	68.93	88.69	2.06	
11	110.00	28.00	-35.95	0.62	22.97	89.26	106.43	2.09	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.75	0.53	82.50	28.00	3.16	75.93	92.69	2.05	
2	-45.57	0.39	82.50	28.00	5.41	74.74	90.15	2.01	
3	-40.38	0.17	82.50	28.00	2.59	95.65	104.71	1.96	
4	-35.57	0.28	77.00	28.00	4.34	80.65	89.74	1.92	
5	-31.09	0.52	77.00	28.00	6.62	78.52	86.64	1.87	
6	-25.85	0.46	71.50	28.00	8.84	63.65	72.09	1.83	
7	-20.94	0.49	71.50	28.00	11.26	61.35	68.86	1.80	
8	-15.83	0.39	71.50	28.00	13.20	60.49	66.74	1.78	
9	-10.51	0.23	71.50	28.00	15.72	57.76	63.23	1.77	OK
10	-5.81	0.33	71.50	28.00	17.76	56.33	60.75	1.79	
11	-0.00	0.00	71.50	28.00	19.29	56.03	59.26	1.83	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.77
Critical Circle: Xc = 15.72[ft], Yc = 57.76[ft], R = 63.23[ft]. (Number of slices used = 63)

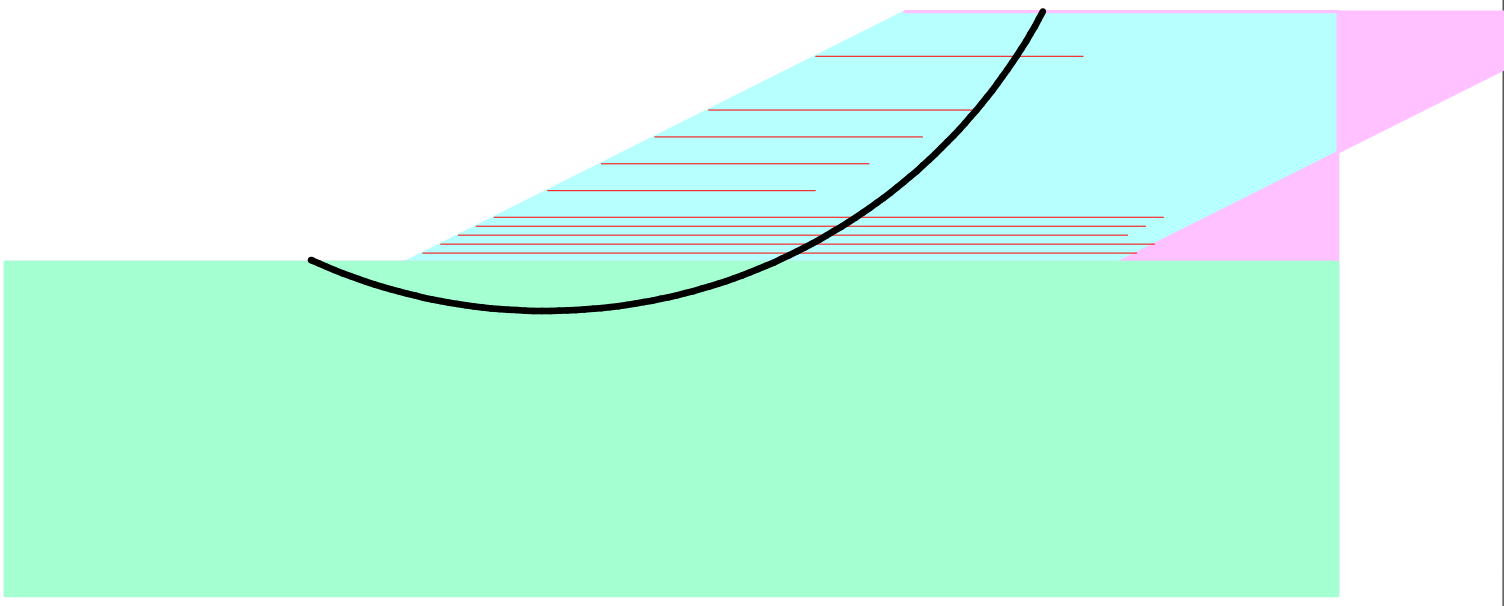
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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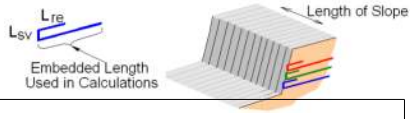


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	80.00	1.00	2.00	1.00	82.00	1.00	0.00	0.00
2	1	P1	2.00	80.00	1.00	4.00	2.00	84.00	2.00	0.00	0.00
3	1	P1	3.00	75.00	1.00	6.00	3.00	81.00	3.00	0.00	0.00
4	1	P1	4.00	75.00	1.00	8.00	4.00	83.00	4.00	0.00	0.00
5	1	P1	5.00	75.00	1.00	10.00	5.00	85.00	5.00	0.00	0.00
6	1	P1	8.00	30.00	1.00	16.00	8.00	46.00	8.00	0.00	0.00
7	1	P1	11.00	30.00	1.00	22.00	11.00	52.00	11.00	0.00	0.00
8	1	P1	14.00	30.00	1.00	28.01	14.00	58.01	14.00	0.00	0.00
9	1	P1	17.00	30.00	1.00	34.01	17.00	64.01	17.00	0.00	0.00
10	1	P1	23.00	30.00	1.00	46.01	23.00	76.01	23.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	535.00

LAW-7-2.17_300+81.52

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _300+81.52
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... nalyses\300+81.52\ReSSA1 300+81.52 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 09:07:30 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	122.0	24.0	100.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

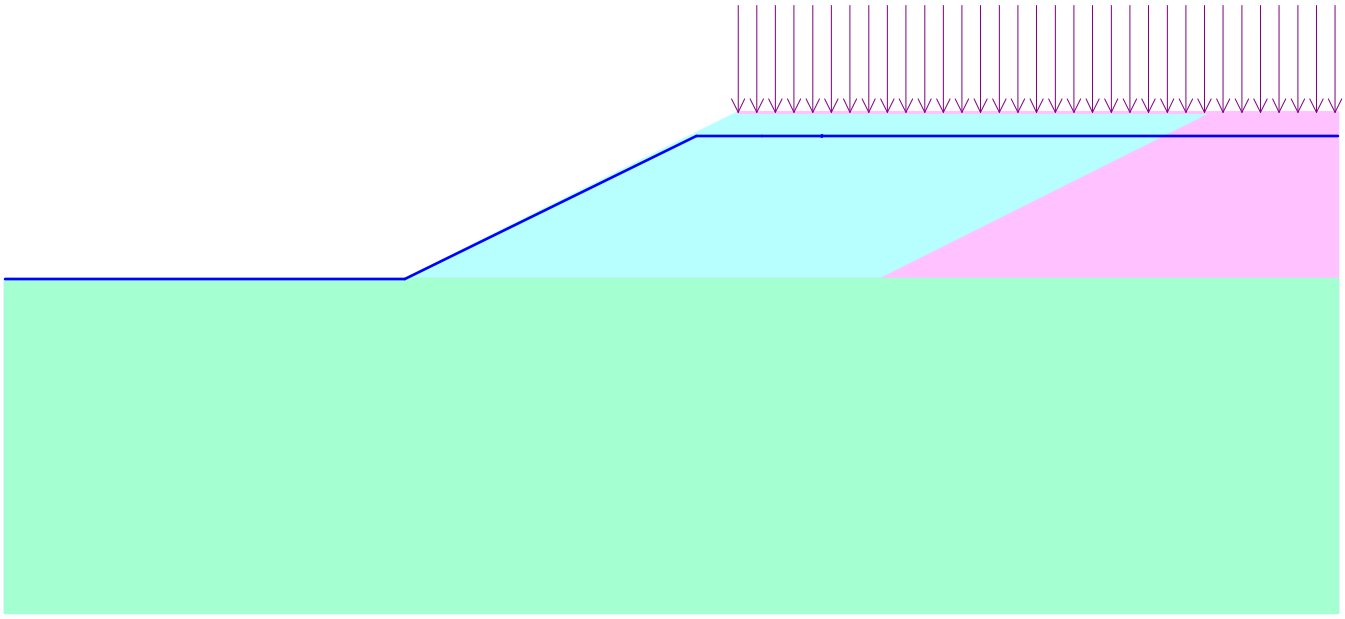
Height of slope, H	28.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

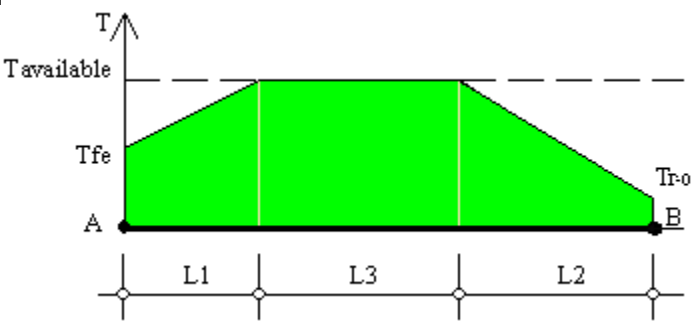
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	49.00	Yw =	24.00
# 3	Xw =	60.00	Yw =	24.00
# 4	Xw =	70.00	Yw =	24.00



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	80.00	11.81	1.18	67.01	0.00	0.00	1300.00
2	P1	2.00	80.00	11.78	1.25	66.98	0.00	0.00	1300.00
3	P1	3.00	75.00	11.75	1.28	61.98	0.00	0.00	1300.00
4	P1	4.00	75.00	11.71	1.31	61.98	0.00	0.00	1300.00
5	P1	5.00	75.00	11.68	1.38	61.94	0.00	0.00	1300.00
6	P1	8.00	30.00	11.58	2.43	15.99	0.00	0.00	1300.00
7	P1	11.00	30.00	11.48	2.30	16.22	0.00	0.00	1300.00
8	P1	14.00	30.00	11.38	2.07	16.55	0.00	0.00	1300.00
9	P1	17.00	30.00	11.32	2.49	16.19	0.00	0.00	1300.00
10	P1	23.00	30.00	9.55	4.27	16.19	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	55.00	27.50	-10.49	0.35	13.89	34.11	41.65	1.29	
2	59.50	28.00	-10.27	0.18	15.29	37.49	45.22	1.20	
3	64.00	28.00	-10.06	0.03	16.35	42.16	49.72	1.15	
4	68.50	28.00	-10.65	0.35	16.48	49.80	56.41	1.13	
. 5	73.00	28.00	-15.75	0.37	14.32	60.13	66.90	1.12 .	OK
6	77.50	28.00	-15.49	0.24	16.15	63.88	71.07	1.14	
7	82.00	28.00	-20.16	0.08	15.09	71.95	80.05	1.16	
8	86.50	28.00	-20.90	0.44	16.99	75.84	84.38	1.19	
9	91.00	28.00	-25.23	0.12	17.22	79.40	89.92	1.23	
10	95.50	28.00	-26.06	0.57	19.19	83.11	94.13	1.27	
11	100.00	28.00	-30.04	0.02	18.41	91.04	103.11	1.31	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.90	0.50	82.00	28.00	-0.12	89.99	102.89	1.28	
2	-45.73	0.39	82.00	28.00	2.07	88.53	100.26	1.25	
3	-40.93	0.54	77.50	28.00	3.95	76.12	87.90	1.22	
4	-35.48	0.27	77.50	28.00	6.22	74.37	85.03	1.19	
5	-30.40	0.22	73.00	28.00	7.11	66.95	76.54	1.17	
6	-25.71	0.38	73.00	28.00	9.48	64.84	73.44	1.14	
7	-20.83	0.43	73.00	28.00	11.88	62.57	70.22	1.13	
. 8	-15.75	0.37	73.00	28.00	14.32	60.13	66.90	1.12 .	OK
9	-10.45	0.20	73.00	28.00	16.30	59.07	64.66	1.13	
10	-5.78	0.31	73.00	28.00	17.75	59.27	63.49	1.14	
11	-0.00	0.00	73.00	28.00	18.57	60.75	63.52	1.16	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.12
Critical Circle: Xc = 14.32[ft], Yc = 60.13[ft], R = 66.90[ft]. (Number of slices used = 62)

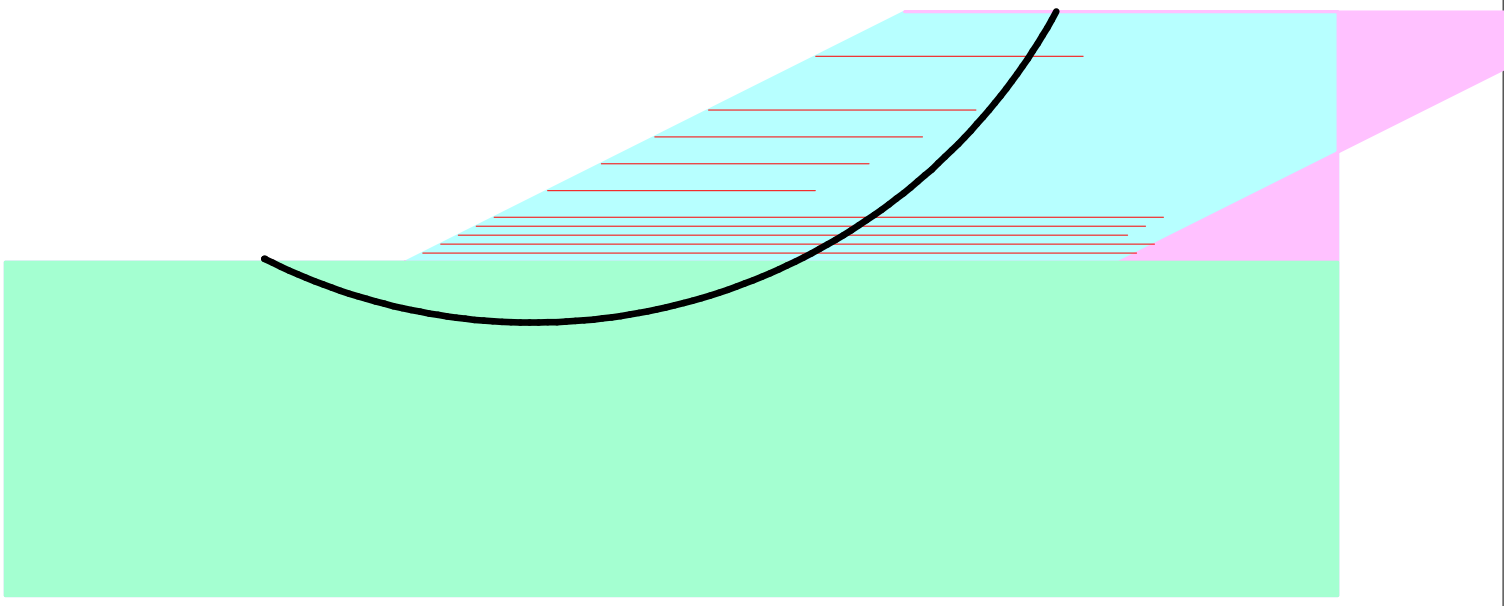
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

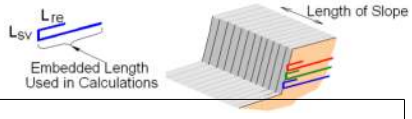
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	80.00	1.00	2.00	1.00	82.00	1.00	0.00	0.00
2	1	P1	2.00	80.00	1.00	4.00	2.00	84.00	2.00	0.00	0.00
3	1	P1	3.00	75.00	1.00	6.00	3.00	81.00	3.00	0.00	0.00
4	1	P1	4.00	75.00	1.00	8.00	4.00	83.00	4.00	0.00	0.00
5	1	P1	5.00	75.00	1.00	10.00	5.00	85.00	5.00	0.00	0.00
6	1	P1	8.00	30.00	1.00	16.00	8.00	46.00	8.00	0.00	0.00
7	1	P1	11.00	30.00	1.00	22.00	11.00	52.00	11.00	0.00	0.00
8	1	P1	14.00	30.00	1.00	28.01	14.00	58.01	14.00	0.00	0.00
9	1	P1	17.00	30.00	1.00	34.01	17.00	64.01	17.00	0.00	0.00
10	1	P1	23.00	30.00	1.00	46.01	23.00	76.01	23.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	535.00

LAW-7-2.17 _377+50 (Short Term)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _377+50 (Short Term)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... ses\377+50\revised\ReSSA1 377+50 (Short Term).MSEp
Original date and time of creating this file: Thu Apr 25 09:49:33 2024

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
1	136.0	21.0	320.0
2	127.0	0.0	2000.0
3	127.0	0.0	2000.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - GENERAL

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.
-- Xw,Yw represents the coordinates of phreatic surface.

GEOMETRY

Soil profile contains 3 layers

WATER GEOMETRY

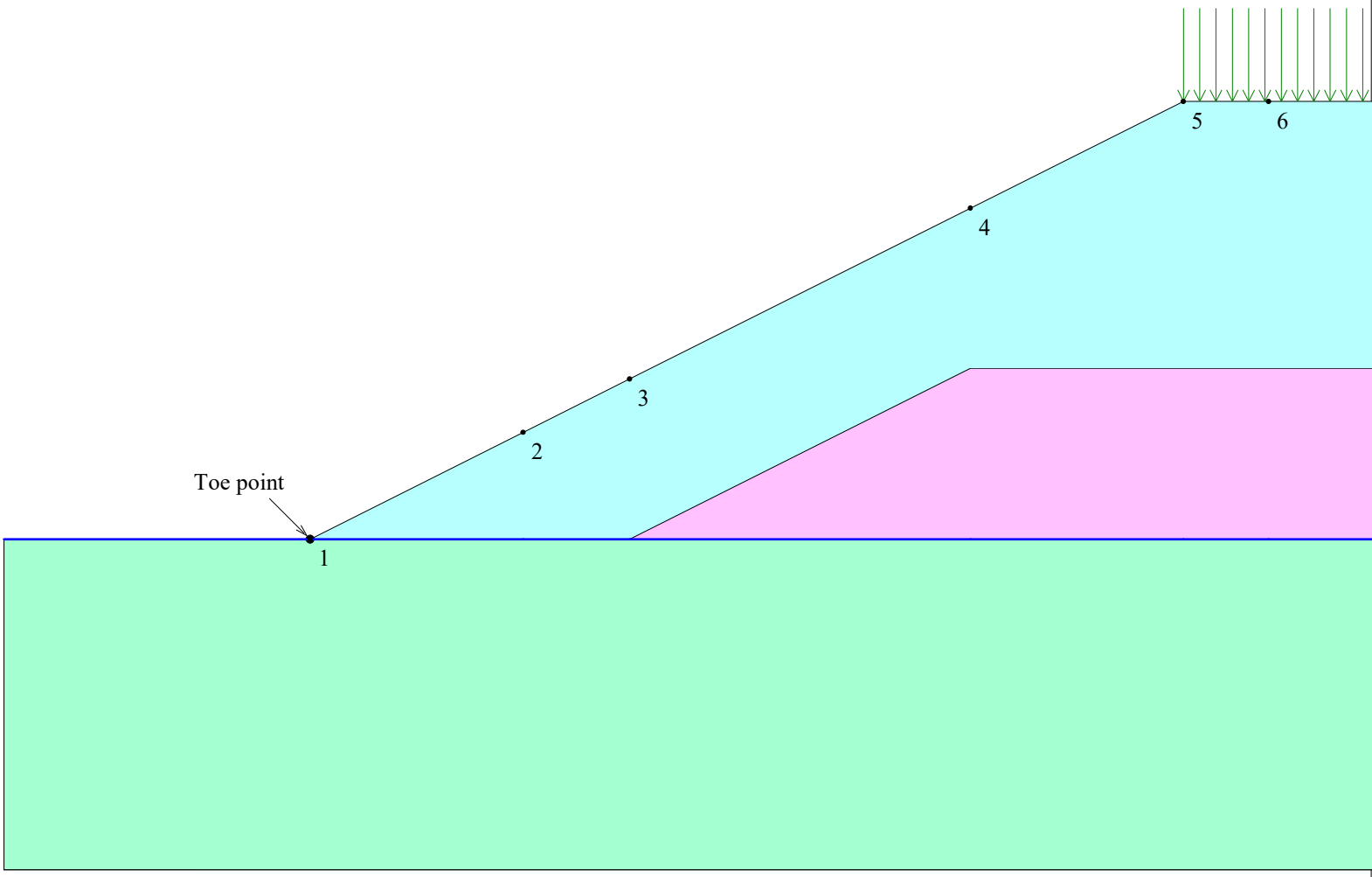
Phreatic line was specified.

UNIFORM SURCHARGE

Load Q1 = 250.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 484.00 and ends at X1e = 600.00 [ft].
Surcharge load, Q2.....None
Surcharge load, Q3.....None

STRIP LOAD

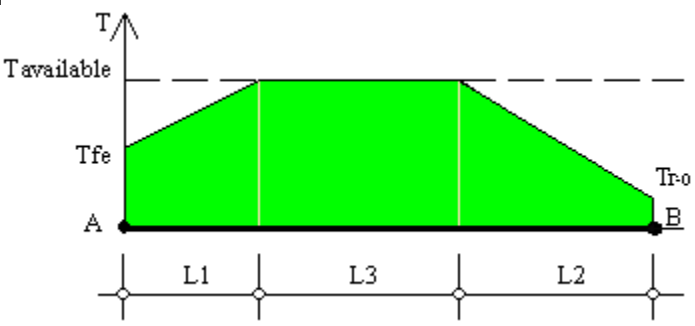
.....None.....



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
2	P3	2.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
3	P3	3.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
4	P3	4.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
5	P3	5.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
6	P3	8.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
7	P3	11.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
8	P3	14.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
9	P3	17.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
10	P3	20.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
11	P3	25.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
12	P3	30.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
13	P3	35.00	70.00	6.86	1.35	61.80	0.00	0.00	2500.00
14	P3	40.00	70.00	6.86	1.35	61.80	0.00	0.00	2500.00
15	P3	45.00	70.00	6.86	1.35	61.80	0.00	0.00	2500.00
16	P3	50.00	70.00	6.86	1.41	61.73	0.00	0.00	2500.00
17	P3	55.00	70.00	6.86	1.64	61.50	0.00	0.00	2500.00
18	P3	60.00	70.00	6.86	1.94	61.21	0.00	0.00	2500.00
19	P3	65.00	70.00	6.86	2.33	60.81	0.00	0.00	2500.00
20	P2	70.00	70.00	5.68	2.40	61.93	0.00	0.00	2000.00
21	P2	75.00	70.00	5.68	3.28	61.04	0.00	0.00	2000.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	484.00	472.00	307.89	390.09	376.87	472.07	107.14	1.32	
2	487.60	472.00	298.45	391.42	375.21	473.53	112.40	1.28	
3	491.20	472.00	294.87	391.11	376.02	472.86	115.19	1.25	
4	494.80	472.00	294.94	391.07	378.35	472.35	116.46	1.22	
5	498.40	472.00	298.64	391.38	382.18	472.18	116.22	1.20	
6	502.00	472.00	291.59	390.44	380.71	472.72	121.30	1.17	
7	505.60	472.00	295.19	390.88	384.54	472.57	121.06	1.15	
8	509.20	472.00	291.79	390.23	384.60	473.38	124.61	1.14	
9	512.80	472.00	291.86	390.16	386.97	472.55	125.83	1.12	
10	516.40	472.00	286.50	391.82	387.07	473.13	129.33	1.11	
11	520.00	472.00	286.63	391.67	388.64	474.45	131.38	1.10	On extreme X-entry

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	279.99	390.02	516.40	472.00	382.57	476.07	133.89	1.11	
2	283.35	390.77	520.00	472.00	386.39	475.92	133.66	1.10	
3	286.63	391.67	520.00	472.00	388.64	474.45	131.38	1.10	OK
4	291.98	390.02	516.40	472.00	388.52	473.91	127.89	1.11	
5	295.57	390.48	520.00	472.00	391.52	476.01	128.54	1.10	
6	299.10	390.98	520.00	472.00	392.97	476.70	127.12	1.10	
7	302.70	391.37	520.00	472.00	394.42	477.32	125.70	1.10	
8	306.40	391.57	520.00	472.00	395.01	480.10	125.25	1.11	
9	311.98	390.01	502.00	472.00	389.04	472.62	112.96	1.18	
10	316.00	390.00	520.00	472.00	401.35	472.42	118.65	1.12	
11	320.00	390.00	520.00	472.00	397.55	485.76	123.23	1.12	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.10
Critical Circle: Xc = 388.64[ft], Yc = 474.45[ft], R = 131.38[ft]. (Number of slices used = 55)

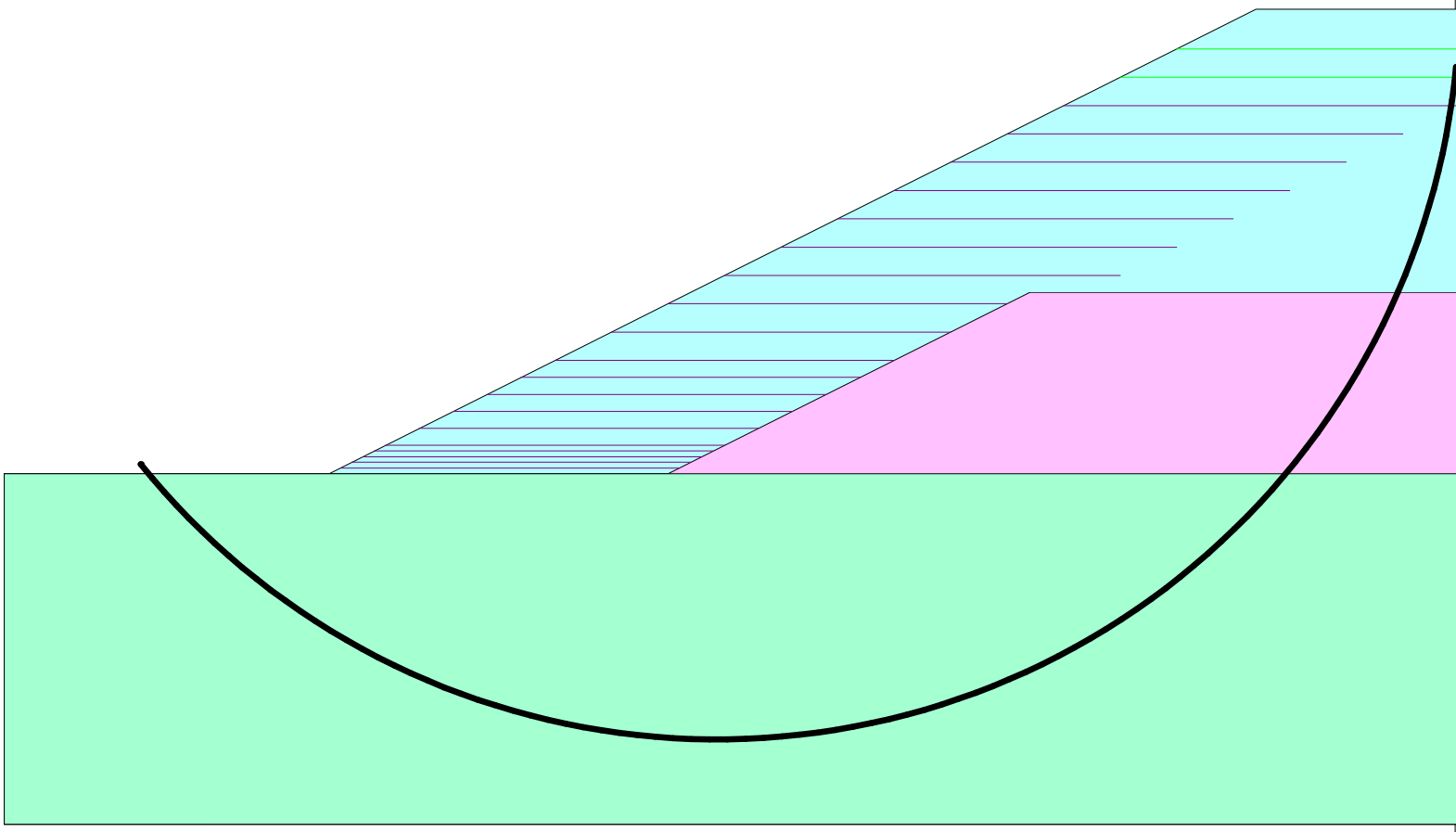
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

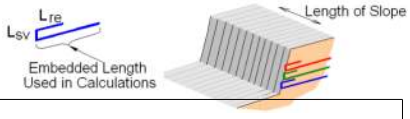
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	60.00	1.00	322.00	391.00	382.00	391.00	0.00	0.00
2	3	P3	2.00	60.00	1.00	324.00	392.00	384.00	392.00	0.00	0.00
3	3	P3	3.00	60.00	1.00	326.00	393.00	386.00	393.00	0.00	0.00
4	3	P3	4.00	60.00	1.00	328.00	394.00	388.00	394.00	0.00	0.00
5	3	P3	5.00	60.00	1.00	330.00	395.00	390.00	395.00	0.00	0.00
6	3	P3	8.00	60.00	1.00	336.00	398.00	396.00	398.00	0.00	0.00
7	3	P3	11.00	60.00	1.00	342.00	401.00	402.00	401.00	0.00	0.00
8	3	P3	14.00	60.00	1.00	348.00	404.00	408.00	404.00	0.00	0.00
9	3	P3	17.00	60.00	1.00	354.00	407.00	414.00	407.00	0.00	0.00
10	3	P3	20.00	60.00	1.00	360.00	410.00	420.00	410.00	0.00	0.00
11	3	P3	25.00	60.00	1.00	370.00	415.00	430.00	415.00	0.00	0.00
12	3	P3	30.00	60.00	1.00	380.00	420.00	440.00	420.00	0.00	0.00
13	3	P3	35.00	70.00	1.00	390.00	425.00	460.00	425.00	0.00	0.00
14	3	P3	40.00	70.00	1.00	400.00	430.00	470.00	430.00	0.00	0.00
15	3	P3	45.00	70.00	1.00	410.00	435.00	480.00	435.00	0.00	0.00
16	3	P3	50.00	70.00	1.00	420.00	440.00	490.00	440.00	0.00	0.00
17	3	P3	55.00	70.00	1.00	430.00	445.00	500.00	445.00	0.00	0.00
18	3	P3	60.00	70.00	1.00	440.00	450.00	510.00	450.00	0.00	0.00
19	3	P3	65.00	70.00	1.00	450.00	455.00	520.00	455.00	0.00	0.00
20	2	P2	70.00	70.00	1.00	460.00	460.00	530.00	460.00	0.00	0.00
21	2	P2	75.00	70.00	1.00	470.00	465.00	540.00	465.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
2	P2	1.00	140.00
3	P3	1.00	1210.00

LAW-7-2.17_377+50

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _377+50
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... lyses\377+50\revised\ReSSA 377+50 (Long Term).MSEp
Original date and time of creating this file: Wed Apr 24 10:49:35 2024

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
1	136.0	29.0	0.0
2	127.0	28.0	250.0
3	127.0	28.0	250.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - GENERAL

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.
-- Xw,Yw represents the coordinates of phreatic surface.

GEOMETRY

Soil profile contains 3 layers

WATER GEOMETRY

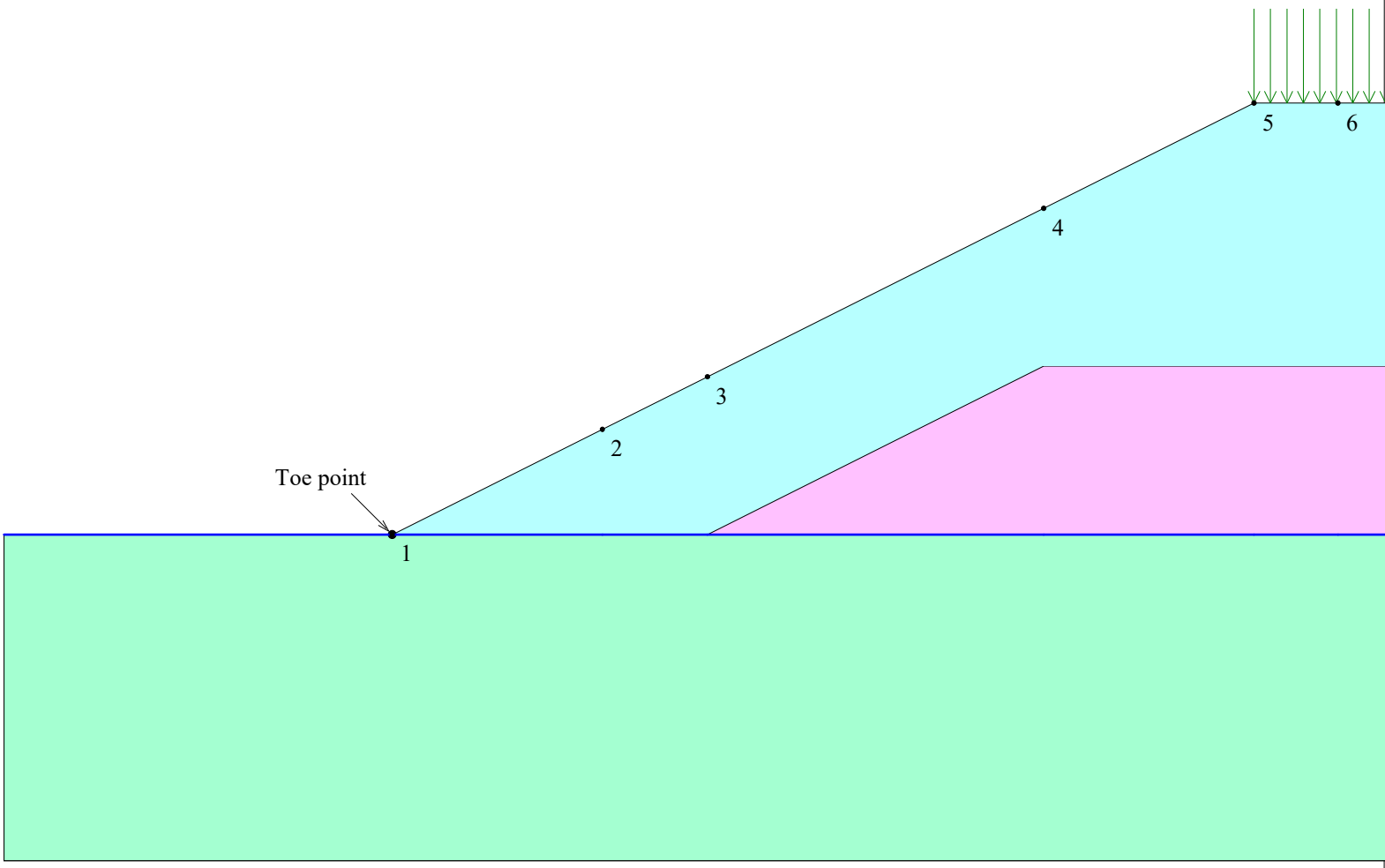
Phreatic line was specified.

UNIFORM SURCHARGE

Load Q1 = 250.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 484.00 and ends at X1e = 600.00 [ft].
Surcharge load, Q2.....None
Surcharge load, Q3.....None

STRIP LOAD

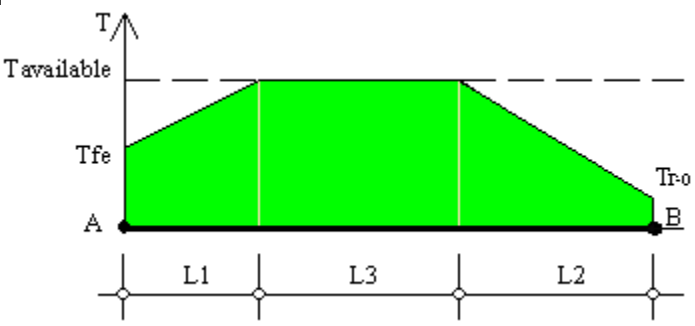
.....None.....



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
2	P3	2.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
3	P3	3.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
4	P3	4.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
5	P3	5.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
6	P3	8.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
7	P3	11.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
8	P3	14.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
9	P3	17.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
10	P3	20.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
11	P3	25.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
12	P3	30.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
13	P3	35.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
14	P3	40.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
15	P3	45.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
16	P3	50.00	70.00	12.17	1.18	56.65	0.00	0.00	2500.00
17	P3	55.00	70.00	12.17	1.38	56.45	0.00	0.00	2500.00
18	P3	60.00	70.00	12.01	1.71	56.29	75.00	0.00	2500.00
19	P3	65.00	70.00	12.01	2.20	55.79	75.00	0.00	2500.00
20	P2	70.00	70.00	10.79	2.49	56.71	40.00	0.00	2000.00
21	P2	75.00	70.00	10.79	4.27	54.94	40.00	0.00	2000.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	400.00	430.00	298.84	390.17	341.26	430.81	58.75	2.14	
2	420.00	440.00	291.30	390.55	341.18	452.95	79.88	1.84	
3	440.00	450.00	291.67	390.18	341.77	479.78	102.65	1.69	
4	460.00	460.00	291.60	390.18	342.92	504.38	125.21	1.61	
5	480.00	470.00	291.06	390.33	341.65	534.21	152.52	1.57	
. 6	500.00	472.00	284.53	390.19	348.34	546.78	169.09	1.52 .	OK
7	520.00	472.00	290.63	390.32	342.33	608.03	223.76	1.54	
8	540.00	472.00	262.98	390.35	344.62	624.14	247.63	1.59	
9	560.00	472.00	304.48	390.16	340.44	717.71	329.51	1.71	
10	580.00	472.00	256.40	390.24	362.57	651.30	281.82	1.78	
11	600.00	472.00	270.77	390.09	376.94	665.97	295.61	1.91	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	248.63	390.68	500.00	472.00	332.78	559.72	188.83	1.56	
2	255.52	390.70	500.00	472.00	335.52	558.38	185.79	1.54	
3	262.57	390.67	500.00	472.00	339.78	552.51	179.31	1.54	
4	269.74	390.57	500.00	472.00	342.60	550.81	176.03	1.53	
5	277.06	390.40	500.00	472.00	345.45	548.91	172.63	1.53	
. 6	284.53	390.19	500.00	472.00	348.34	546.78	169.09	1.52 .	OK
7	290.63	390.32	520.00	472.00	342.33	608.03	223.76	1.54	
8	297.66	390.47	500.00	472.00	352.65	545.83	164.81	1.53	
9	305.64	390.09	500.00	472.00	348.42	560.14	175.34	1.54	
10	311.64	390.32	500.00	472.00	351.45	556.55	170.93	1.55	
11	320.00	390.00	500.00	472.00	352.50	557.22	170.35	1.56	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.52
Critical Circle: Xc = 348.34[ft], Yc = 546.78[ft], R = 169.09[ft]. (Number of slices used = 56)

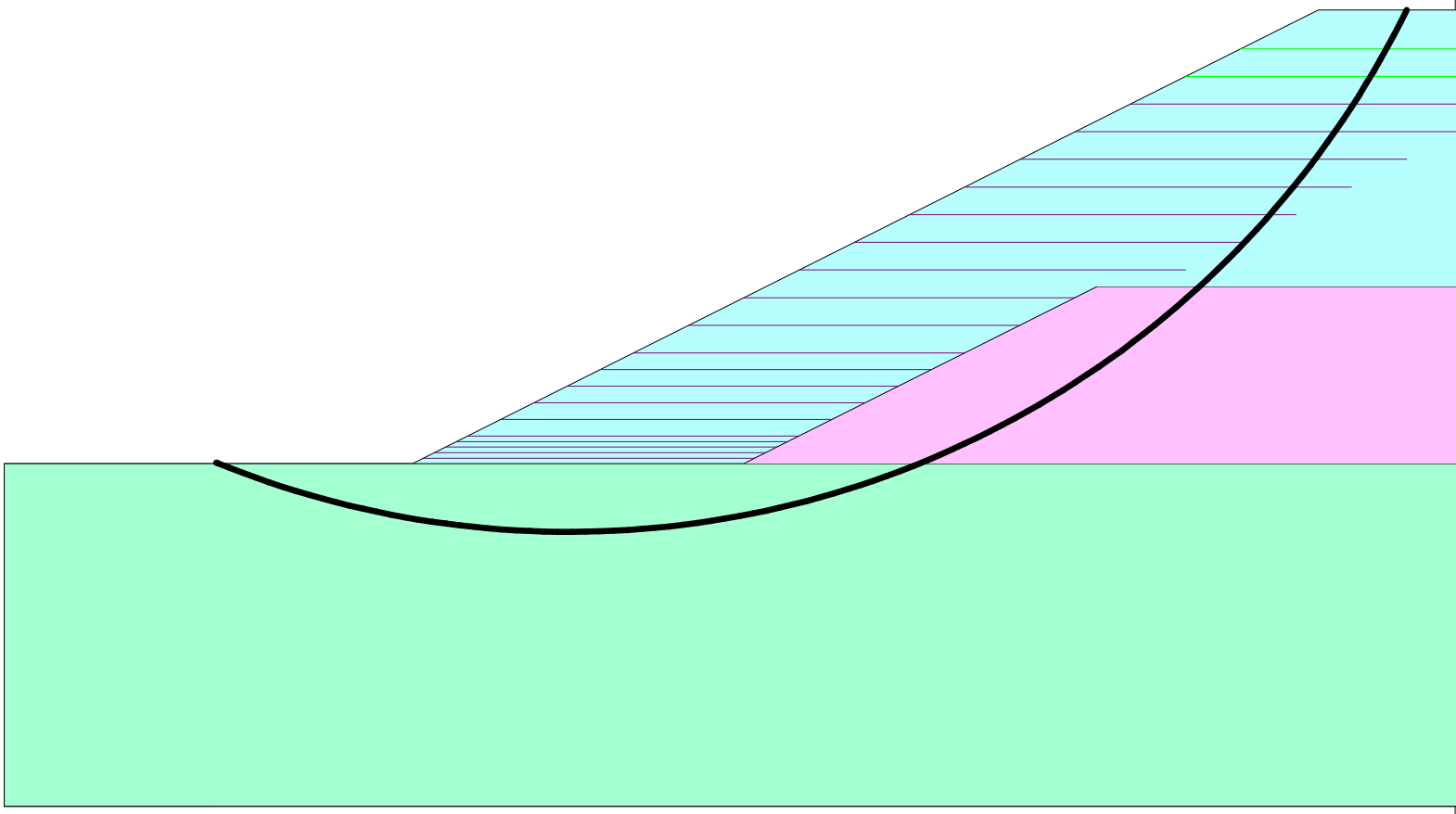
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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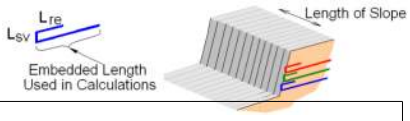


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	60.00	1.00	322.00	391.00	382.00	391.00	0.00	0.00
2	3	P3	2.00	60.00	1.00	324.00	392.00	384.00	392.00	0.00	0.00
3	3	P3	3.00	60.00	1.00	326.00	393.00	386.00	393.00	0.00	0.00
4	3	P3	4.00	60.00	1.00	328.00	394.00	388.00	394.00	0.00	0.00
5	3	P3	5.00	60.00	1.00	330.00	395.00	390.00	395.00	0.00	0.00
6	3	P3	8.00	60.00	1.00	336.00	398.00	396.00	398.00	0.00	0.00
7	3	P3	11.00	60.00	1.00	342.00	401.00	402.00	401.00	0.00	0.00
8	3	P3	14.00	60.00	1.00	348.00	404.00	408.00	404.00	0.00	0.00
9	3	P3	17.00	60.00	1.00	354.00	407.00	414.00	407.00	0.00	0.00
10	3	P3	20.00	60.00	1.00	360.00	410.00	420.00	410.00	0.00	0.00
11	3	P3	25.00	60.00	1.00	370.00	415.00	430.00	415.00	0.00	0.00
12	3	P3	30.00	60.00	1.00	380.00	420.00	440.00	420.00	0.00	0.00
13	3	P3	35.00	70.00	1.00	390.00	425.00	460.00	425.00	0.00	0.00
14	3	P3	40.00	70.00	1.00	400.00	430.00	470.00	430.00	0.00	0.00
15	3	P3	45.00	70.00	1.00	410.00	435.00	480.00	435.00	0.00	0.00
16	3	P3	50.00	70.00	1.00	420.00	440.00	490.00	440.00	0.00	0.00
17	3	P3	55.00	70.00	1.00	430.00	445.00	500.00	445.00	0.00	0.00
18	3	P3	60.00	70.00	1.00	440.00	450.00	510.00	450.00	0.00	0.00
19	3	P3	65.00	70.00	1.00	450.00	455.00	520.00	455.00	0.00	0.00
20	2	P2	70.00	70.00	1.00	460.00	460.00	530.00	460.00	0.00	0.00
21	2	P2	75.00	70.00	1.00	470.00	465.00	540.00	465.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
2	P2	1.00	140.00
3	P3	1.00	1210.00

LAW-7-2.17_

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... lyses\377+50\revised\ReSSA1 377+50 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 12:27:55 2024

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
1	136.0	29.0	0.0
2	127.0	28.0	250.0
3	127.0	28.0	250.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - GENERAL

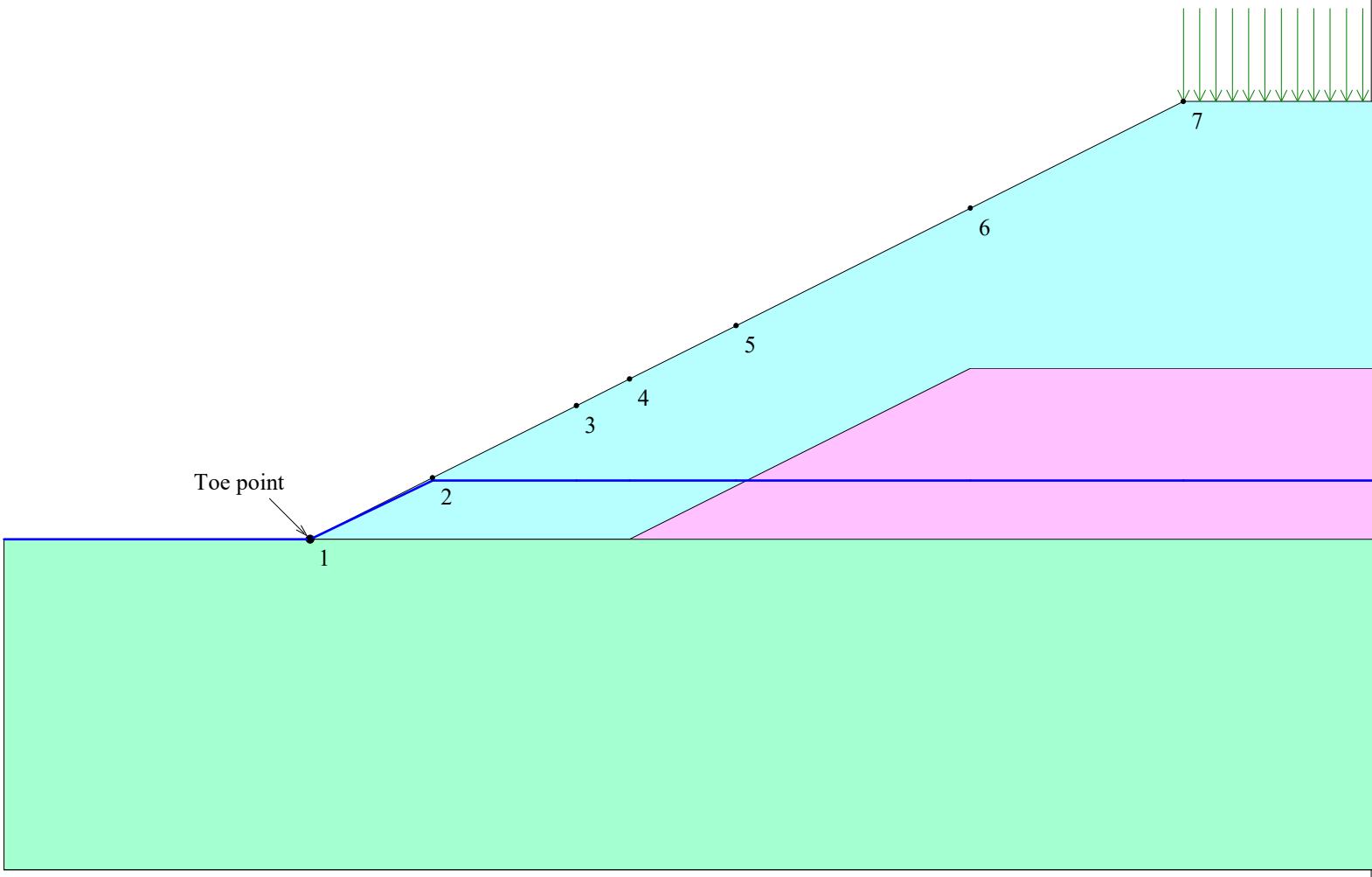
-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.
-- Xw,Yw represents the coordinates of phreatic surface.

GEOMETRY
Soil profile contains 3 layers

WATER GEOMETRY
Phreatic line was specified.

UNIFORM SURCHARGE
Load Q1 = 250.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 484.00 and ends at X1e = 600.00 [ft].
Surcharge load, Q2.....None
Surcharge load, Q3.....None

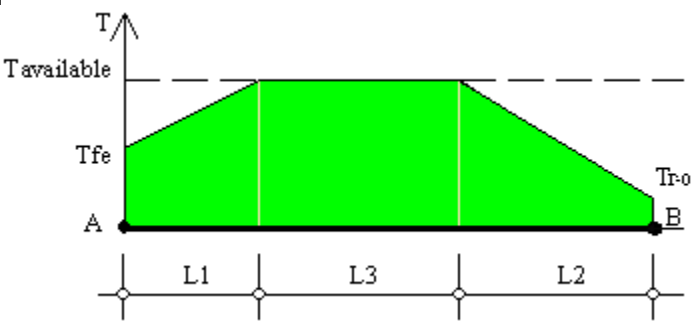
STRIP LOAD
.....None.....



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	60.00	16.21	1.51	42.28	0.00	0.00	2500.00
2	P3	2.00	60.00	16.14	1.48	42.38	0.00	0.00	2500.00
3	P3	3.00	60.00	16.08	1.44	42.48	0.00	0.00	2500.00
4	P3	4.00	60.00	15.98	1.41	42.61	0.00	0.00	2500.00
5	P3	5.00	60.00	15.75	1.41	42.84	0.00	0.00	2500.00
6	P3	8.00	60.00	14.37	1.35	44.28	0.00	0.00	2500.00
7	P3	11.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
8	P3	14.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
9	P3	17.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
10	P3	20.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
11	P3	25.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
12	P3	30.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
13	P3	35.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
14	P3	40.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
15	P3	45.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
16	P3	50.00	70.00	12.17	1.18	56.65	0.00	0.00	2500.00
17	P3	55.00	70.00	12.17	1.38	56.45	0.00	0.00	2500.00
18	P3	60.00	70.00	12.17	1.71	56.12	0.00	0.00	2500.00
19	P3	65.00	70.00	12.17	2.20	55.63	0.00	0.00	2500.00
20	P2	70.00	70.00	10.89	2.49	56.61	0.00	0.00	2000.00
21	P2	75.00	70.00	10.89	4.27	54.84	0.00	0.00	2000.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	460.00	460.00	303.86	390.21	347.47	502.20	120.19	1.46	
2	484.00	472.00	292.49	390.11	344.76	532.76	151.92	1.44	
. 3	508.00	472.00	291.32	390.52	351.29	559.88	179.67	1.41 .	OK
4	532.00	472.00	281.04	390.06	352.40	596.78	218.69	1.46	
5	556.00	472.00	269.08	390.19	356.32	628.27	253.56	1.56	
6	580.00	472.00	245.07	390.57	358.41	653.89	286.68	1.67	
7	604.00	472.00	222.86	390.16	359.49	682.28	322.49	1.79	
8	628.00	472.00	233.25	390.73	376.55	693.99	335.42	1.93	
9	652.00	472.00	223.20	390.00	396.35	646.71	309.64	2.09	
10	676.00	472.00	198.92	390.55	383.14	749.44	403.41	2.17	
11	700.00	472.00	223.14	390.04	415.68	698.03	363.22	2.35	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	199.74	390.12	532.00	472.00	315.14	636.92	272.45	1.57	
2	210.31	390.55	532.00	472.00	318.09	640.87	272.54	1.54	
3	222.00	390.61	508.00	472.00	321.73	583.38	217.03	1.51	
4	234.50	390.15	508.00	472.00	326.98	579.00	210.28	1.48	
5	245.41	390.30	508.00	472.00	317.33	622.00	242.60	1.50	
6	257.59	390.18	508.00	472.00	337.72	569.05	196.00	1.43	
7	268.36	390.50	508.00	472.00	341.60	568.22	192.21	1.42	
8	279.61	390.62	508.00	472.00	347.23	562.02	184.26	1.41	
. 9	291.32	390.52	508.00	472.00	351.29	559.88	179.67	1.41 .	OK
10	303.51	390.28	508.00	472.00	355.46	557.00	174.63	1.42	
11	315.98	390.01	484.00	472.00	347.55	538.45	151.77	1.45	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.41
Critical Circle: Xc = 351.29[ft], Yc = 559.88[ft], R = 179.67[ft]. (Number of slices used = 56)

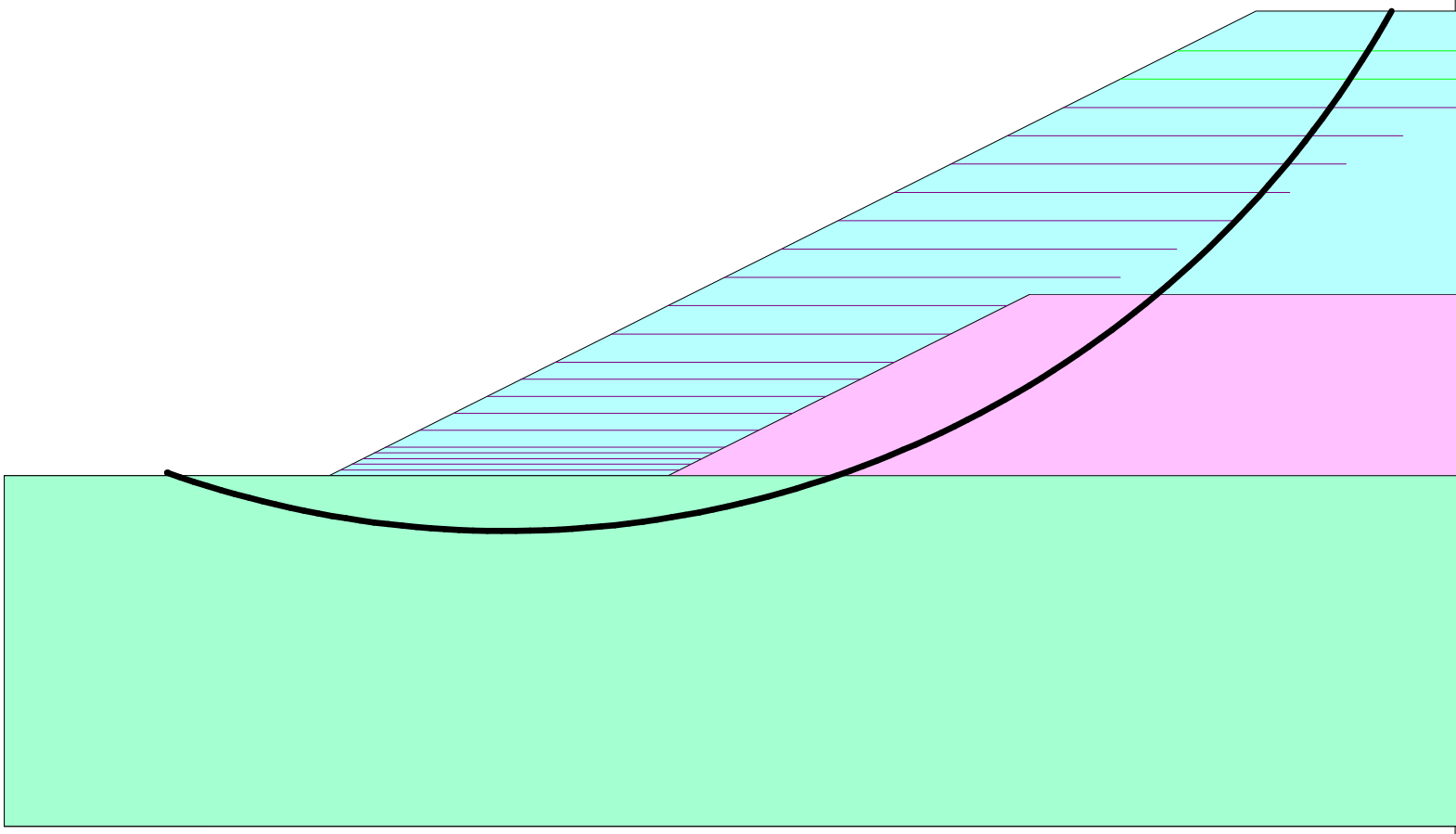
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

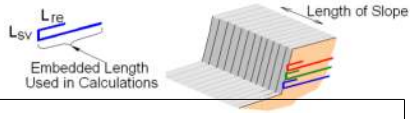
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	60.00	1.00	322.00	391.00	382.00	391.00	0.00	0.00
2	3	P3	2.00	60.00	1.00	324.00	392.00	384.00	392.00	0.00	0.00
3	3	P3	3.00	60.00	1.00	326.00	393.00	386.00	393.00	0.00	0.00
4	3	P3	4.00	60.00	1.00	328.00	394.00	388.00	394.00	0.00	0.00
5	3	P3	5.00	60.00	1.00	330.00	395.00	390.00	395.00	0.00	0.00
6	3	P3	8.00	60.00	1.00	336.00	398.00	396.00	398.00	0.00	0.00
7	3	P3	11.00	60.00	1.00	342.00	401.00	402.00	401.00	0.00	0.00
8	3	P3	14.00	60.00	1.00	348.00	404.00	408.00	404.00	0.00	0.00
9	3	P3	17.00	60.00	1.00	354.00	407.00	414.00	407.00	0.00	0.00
10	3	P3	20.00	60.00	1.00	360.00	410.00	420.00	410.00	0.00	0.00
11	3	P3	25.00	60.00	1.00	370.00	415.00	430.00	415.00	0.00	0.00
12	3	P3	30.00	60.00	1.00	380.00	420.00	440.00	420.00	0.00	0.00
13	3	P3	35.00	70.00	1.00	390.00	425.00	460.00	425.00	0.00	0.00
14	3	P3	40.00	70.00	1.00	400.00	430.00	470.00	430.00	0.00	0.00
15	3	P3	45.00	70.00	1.00	410.00	435.00	480.00	435.00	0.00	0.00
16	3	P3	50.00	70.00	1.00	420.00	440.00	490.00	440.00	0.00	0.00
17	3	P3	55.00	70.00	1.00	430.00	445.00	500.00	445.00	0.00	0.00
18	3	P3	60.00	70.00	1.00	440.00	450.00	510.00	450.00	0.00	0.00
19	3	P3	65.00	70.00	1.00	450.00	455.00	520.00	455.00	0.00	0.00
20	2	P2	70.00	70.00	1.00	460.00	460.00	530.00	460.00	0.00	0.00
21	2	P2	75.00	70.00	1.00	470.00	465.00	540.00	465.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
2	P2	1.00	140.00
3	P3	1.00	1210.00

LAW-7-2.17_379+50

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _379+50
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... -7_analyses\378+50\ReSSA1 378+50 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 12:49:35 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	127.0	0.0	2000.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

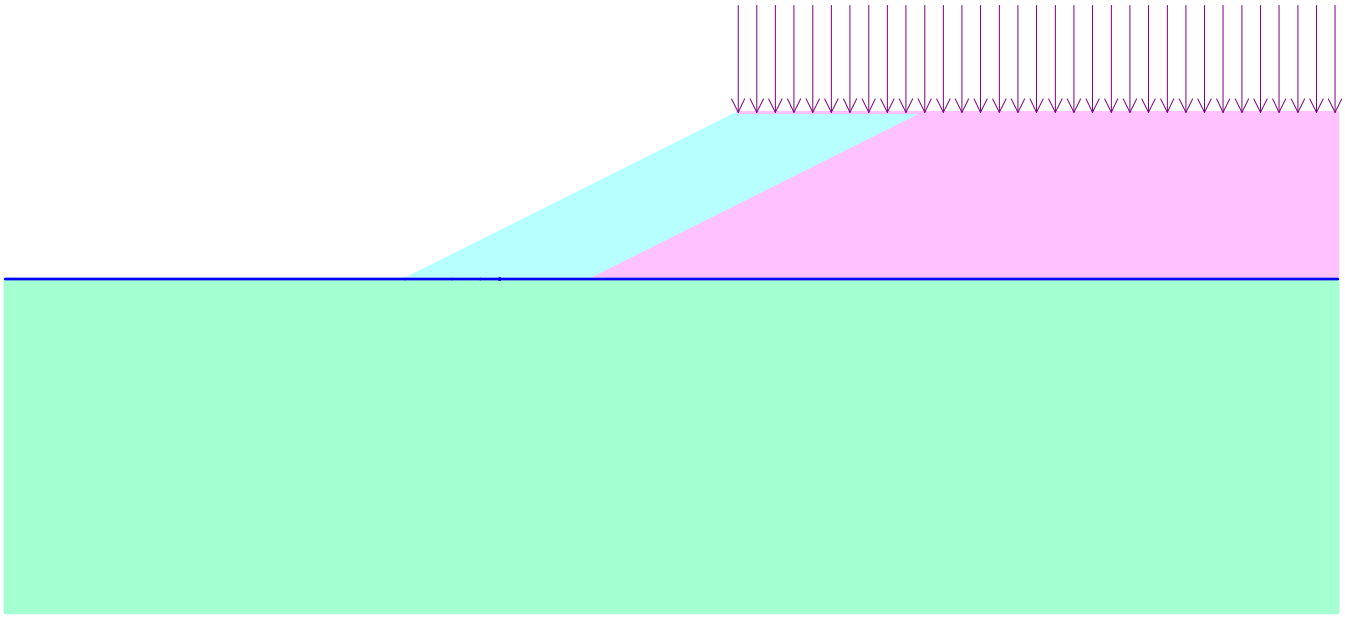
Height of slope, H	58.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

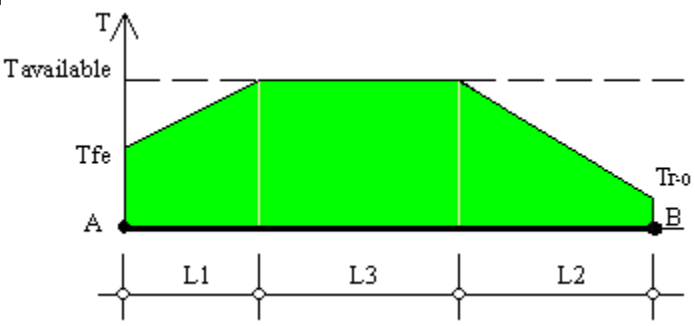
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	16.40	Yw =	0.00
# 3	Xw =	26.25	Yw =	0.00
# 4	Xw =	32.81	Yw =	0.00



SCALE:

0 5 10 12 20 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	65.00	3.94	0.75	60.31	0.00	0.00	1300.00
2	P1	2.00	65.00	3.94	0.75	60.31	0.00	0.00	1300.00
3	P1	3.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
4	P1	4.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
5	P1	5.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
6	P1	8.00	50.00	3.94	0.92	45.14	0.00	0.00	1300.00
7	P1	10.00	50.00	3.94	0.92	45.14	0.00	0.00	1300.00
8	P1	14.00	50.00	3.94	0.92	45.14	0.00	0.00	1300.00
9	P1	17.00	50.00	3.94	0.92	45.14	0.00	0.00	1300.00
10	P1	23.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
11	P1	29.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
12	P1	35.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
13	P1	41.00	30.00	3.94	1.35	24.72	0.00	0.00	1300.00
14	P1	47.00	30.00	3.94	1.64	24.42	0.00	0.00	1300.00
15	P1	53.00	30.00	3.94	2.53	23.54	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	115.00	57.49	-10.76	0.65	38.91	58.29	76.10	1.77	
2	133.50	58.00	-20.23	0.26	45.44	58.93	88.06	1.56	
3	152.00	58.00	-31.58	1.93	49.09	66.37	103.25	1.45	
4	170.50	58.00	-40.55	0.65	51.98	77.18	120.07	1.40	
5	189.00	58.00	-50.67	0.80	55.13	88.22	137.24	1.37	
6	207.50	58.00	-60.35	0.42	58.48	99.42	154.67	1.36	
7	226.00	58.00	-61.45	1.76	67.23	106.76	166.09	1.36	
. 8	244.50	58.00	-91.08	1.29	60.40	126.20	196.33	1.35 .	OK
9	263.00	58.00	-61.64	1.84	83.51	129.21	193.11	1.39	
10	281.50	58.00	-100.81	0.97	73.08	145.23	225.94	1.36	
11	300.00	58.00	-101.62	1.27	72.24	220.46	279.76	1.49	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-100.96	1.15	244.50	58.00	55.21	130.23	202.61	1.35	
. 2	-91.08	1.29	244.50	58.00	60.40	126.20	196.33	1.35 .	OK
3	-81.02	1.22	244.50	58.00	65.60	122.17	190.06	1.35	
4	-70.77	0.93	244.50	58.00	70.81	118.15	183.81	1.36	
5	-60.35	0.42	207.50	58.00	58.48	99.42	154.67	1.36	
6	-51.59	1.80	207.50	58.00	62.47	101.27	151.35	1.37	
7	-40.61	0.73	207.50	58.00	69.09	91.54	142.41	1.37	
8	-30.06	0.07	189.00	58.00	65.87	80.45	125.16	1.38	
9	-20.05	0.05	189.00	58.00	70.67	78.82	120.15	1.41	
10	-11.44	1.47	170.50	58.00	65.36	75.36	106.57	1.43	
11	-0.00	0.00	170.50	58.00	68.36	78.64	104.20	1.47	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.35
Critical Circle: Xc = 60.40[ft], Yc = 126.20[ft], R = 196.33[ft]. (Number of slices used = 66)

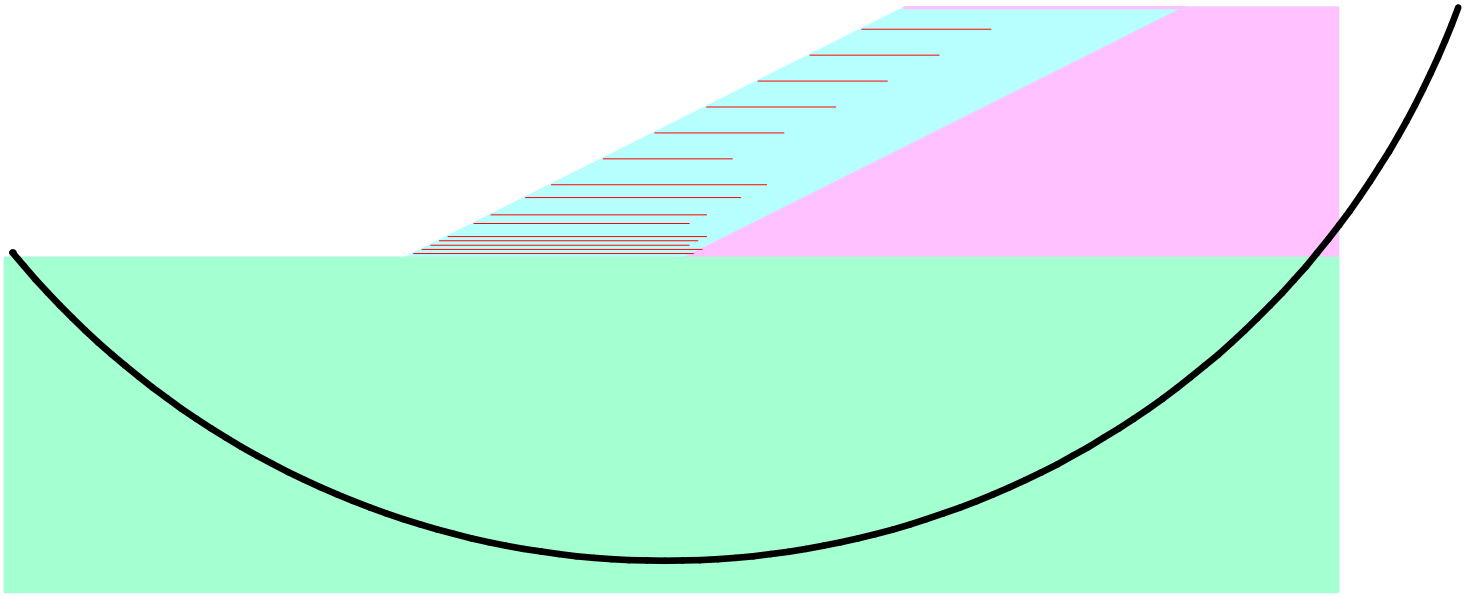
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

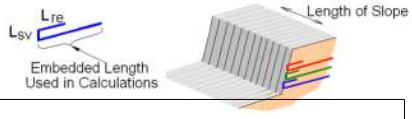
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	65.00	1.00	2.00	1.00	67.00	1.00	0.00	0.00
2	1	P1	2.00	65.00	1.00	4.00	2.00	69.00	2.00	0.00	0.00
3	1	P1	3.00	60.00	1.00	6.00	3.00	66.00	3.00	0.00	0.00
4	1	P1	4.00	60.00	1.00	8.00	4.00	68.00	4.00	0.00	0.00
5	1	P1	5.00	60.00	1.00	10.00	5.00	70.00	5.00	0.00	0.00
6	1	P1	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	1	P1	10.00	50.00	1.00	20.00	10.00	70.00	10.00	0.00	0.00
8	1	P1	14.00	50.00	1.00	28.01	14.00	78.01	14.00	0.00	0.00
9	1	P1	17.00	50.00	1.00	34.01	17.00	84.01	17.00	0.00	0.00
10	1	P1	23.00	30.00	1.00	46.01	23.00	76.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00
15	1	P1	53.00	30.00	1.00	106.02	53.00	136.02	53.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	690.00

LAW-7-2.17_379+50 (Rapid DD)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _379+50 (Rapid DD)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... AW-7 Analyses\379+50\ReSSA1 _379+50 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 13:04:51 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	127.0	28.0	250.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

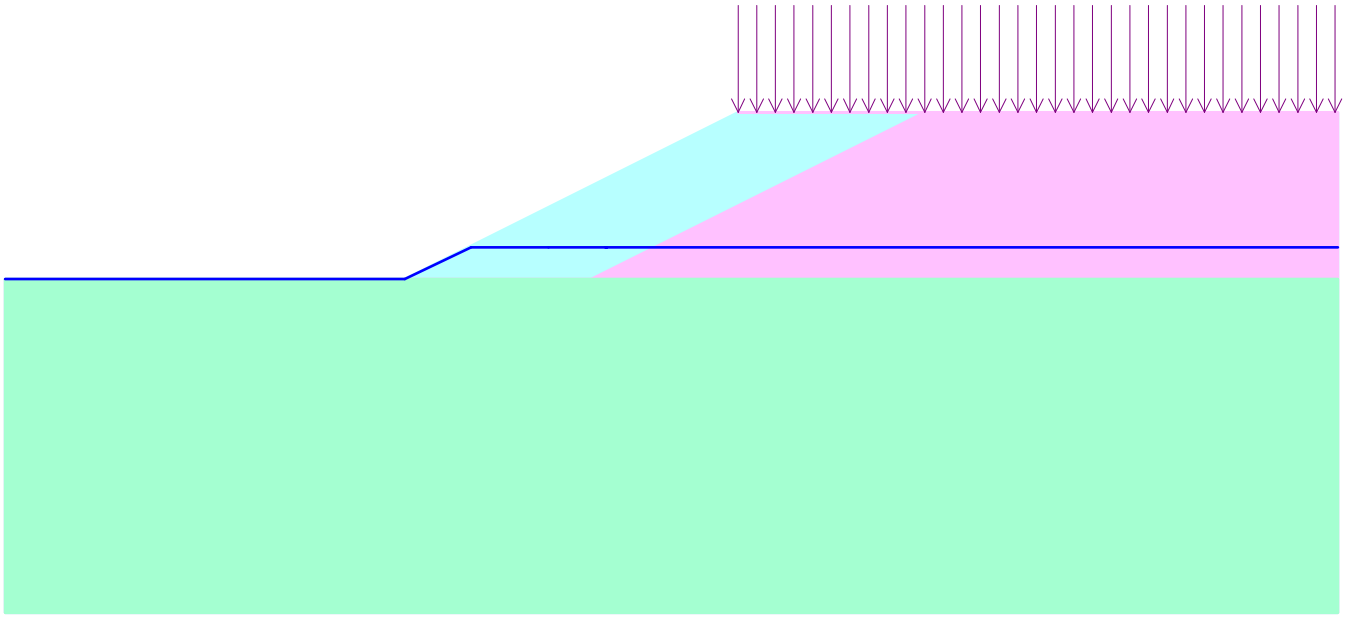
Height of slope, H	58.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

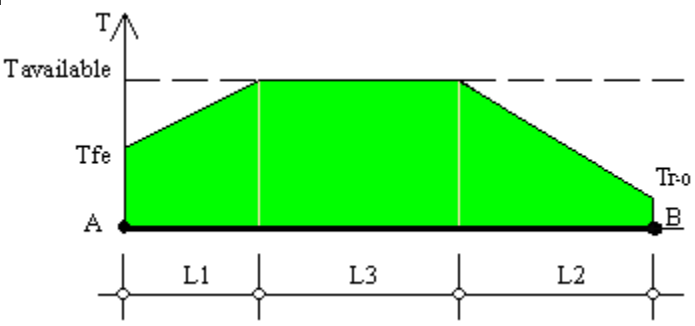
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	23.00	Yw =	11.00
# 3	Xw =	50.00	Yw =	11.00
# 4	Xw =	70.00	Yw =	11.00



SCALE:

0 5 1 1 2 2 3 0 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	65.00	11.68	0.72	52.60	0.00	0.00	1300.00
2	P1	2.00	65.00	11.58	0.69	52.73	0.00	0.00	1300.00
3	P1	3.00	60.00	11.52	0.75	47.73	0.00	0.00	1300.00
4	P1	4.00	60.00	11.45	0.75	47.80	0.00	0.00	1300.00
5	P1	5.00	60.00	11.38	0.72	47.89	0.00	0.00	1300.00
6	P1	8.00	50.00	10.73	0.85	38.42	0.00	0.00	1300.00
7	P1	11.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
8	P1	14.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
9	P1	17.00	50.00	8.79	0.79	40.42	0.00	0.00	1300.00
10	P1	23.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
11	P1	29.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
12	P1	35.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
13	P1	41.00	30.00	8.79	1.35	19.86	0.00	0.00	1300.00
14	P1	47.00	30.00	8.79	1.77	19.44	0.00	0.00	1300.00
15	P1	53.00	30.00	8.79	3.87	17.34	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	116.00	57.99	-16.38	0.66	25.19	86.18	95.09	1.38	
2	119.40	58.00	-16.27	0.58	25.48	90.92	99.53	1.36	
3	122.80	58.00	-20.21	0.09	22.51	100.14	108.79	1.35	
4	126.20	58.00	-16.05	0.41	24.86	103.84	111.23	1.35	
. 5	129.60	58.00	-15.94	0.34	24.93	109.71	116.75	1.34 .	OK
6	133.00	58.00	-15.82	0.29	24.92	115.95	122.63	1.35	
7	136.40	58.00	-15.71	0.23	24.84	122.61	128.92	1.36	
8	139.80	58.00	-15.59	0.18	24.66	129.73	135.65	1.36	
9	143.20	58.00	-15.47	0.14	24.38	137.34	142.87	1.38	
10	146.60	58.00	-20.81	0.23	22.18	147.11	153.04	1.40	
11	150.00	58.00	-20.66	0.18	21.74	155.79	161.28	1.41	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.65	0.28	133.00	58.00	7.65	135.81	147.54	1.40	
2	-45.73	0.31	133.00	58.00	10.70	131.21	142.54	1.39	
3	-40.73	0.30	133.00	58.00	12.59	130.16	140.38	1.37	
4	-35.86	0.37	129.60	58.00	15.55	119.10	129.38	1.36	
5	-30.64	0.26	129.60	58.00	17.56	117.72	126.96	1.35	
6	-25.11	0.04	133.00	58.00	19.63	122.63	130.50	1.35	
7	-21.52	0.60	129.60	58.00	22.81	111.52	119.45	1.35	
. 8	-15.94	0.34	129.60	58.00	24.93	109.71	116.75	1.34 .	OK
9	-10.24	0.08	129.60	58.00	27.09	107.73	113.93	1.35	
10	-5.96	0.34	129.60	58.00	30.44	102.93	108.87	1.36	
11	-0.00	0.00	126.20	58.00	17.90	127.36	128.61	1.36	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.34
Critical Circle: Xc = 24.93[ft], Yc = 109.71[ft], R = 116.75[ft]. (Number of slices used = 66)

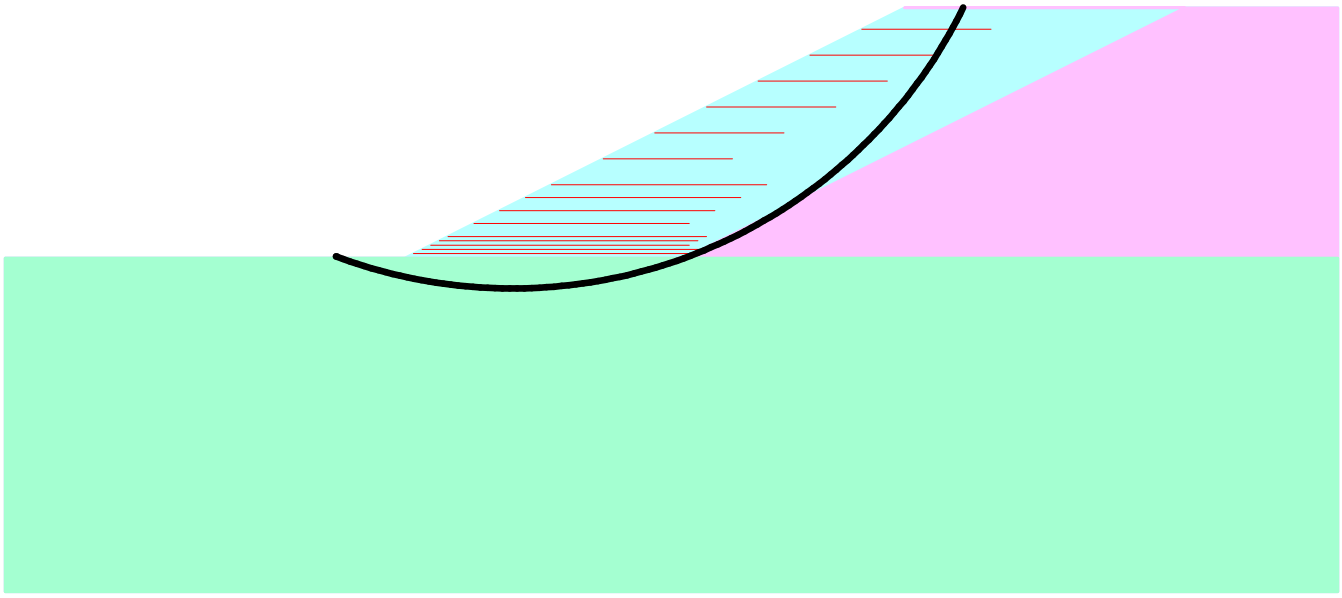
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

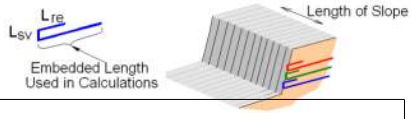
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	65.00	1.00	2.00	1.00	67.00	1.00	0.00	0.00
2	1	P1	2.00	65.00	1.00	4.00	2.00	69.00	2.00	0.00	0.00
3	1	P1	3.00	60.00	1.00	6.00	3.00	66.00	3.00	0.00	0.00
4	1	P1	4.00	60.00	1.00	8.00	4.00	68.00	4.00	0.00	0.00
5	1	P1	5.00	60.00	1.00	10.00	5.00	70.00	5.00	0.00	0.00
6	1	P1	8.00	50.00	1.00	16.00	8.00	66.00	8.00	0.00	0.00
7	1	P1	11.00	50.00	1.00	22.00	11.00	72.00	11.00	0.00	0.00
8	1	P1	14.00	50.00	1.00	28.01	14.00	78.01	14.00	0.00	0.00
9	1	P1	17.00	50.00	1.00	34.01	17.00	84.01	17.00	0.00	0.00
10	1	P1	23.00	30.00	1.00	46.01	23.00	76.01	23.00	0.00	0.00
11	1	P1	29.00	30.00	1.00	58.01	29.00	88.01	29.00	0.00	0.00
12	1	P1	35.00	30.00	1.00	70.02	35.00	100.02	35.00	0.00	0.00
13	1	P1	41.00	30.00	1.00	82.02	41.00	112.02	41.00	0.00	0.00
14	1	P1	47.00	30.00	1.00	94.02	47.00	124.02	47.00	0.00	0.00
15	1	P1	53.00	30.00	1.00	106.02	53.00	136.02	53.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	690.00

LAW-7-2.17_Ramp I 377+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _Ramp I 377+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... p I 377+00\revised\ReSSA1 377+00 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 13:15:04 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	127.0	0.0	2000.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

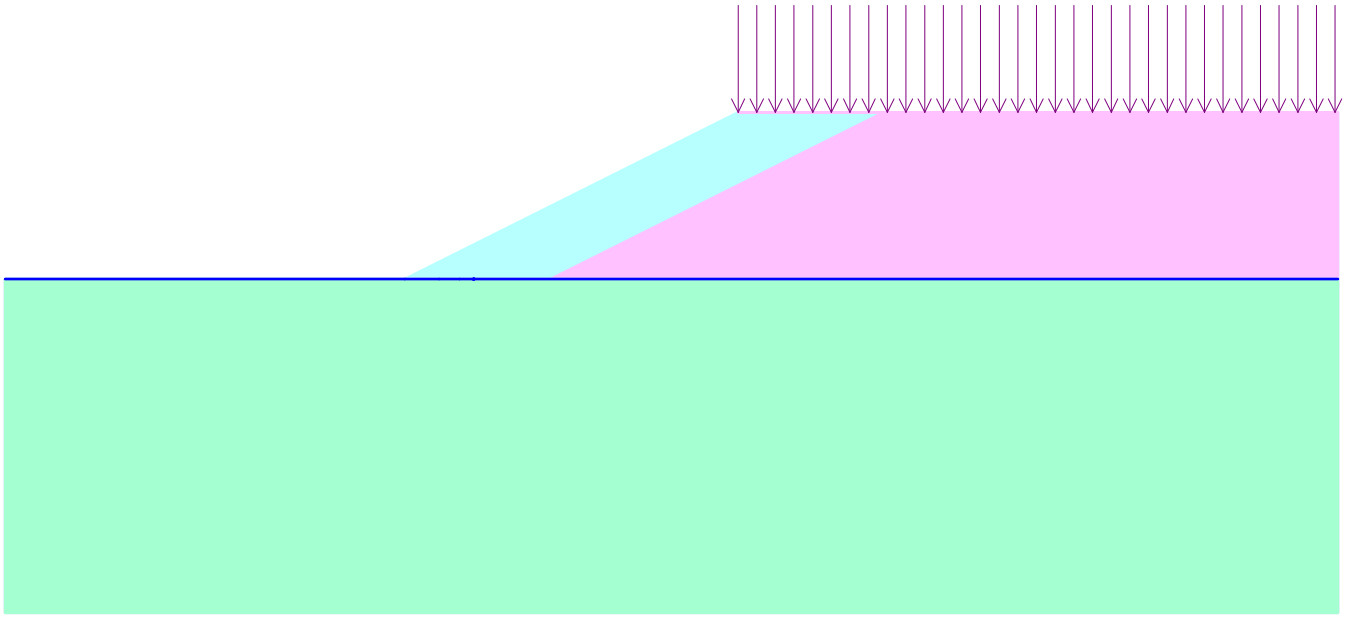
Height of slope, H	80.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

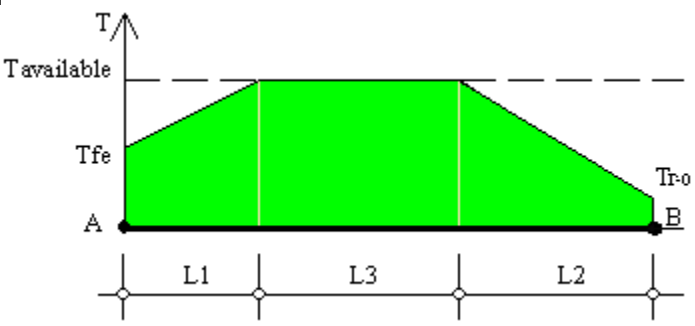
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	16.40	Yw =	0.00
# 3	Xw =	26.25	Yw =	0.00
# 4	Xw =	32.81	Yw =	0.00



SCALE:

0 5 11 22 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
2	P3	2.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
3	P3	3.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
4	P3	4.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
5	P3	5.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
6	P3	8.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
7	P3	11.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
8	P3	14.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
9	P3	17.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
10	P3	20.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
11	P3	25.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
12	P3	30.00	60.00	6.86	1.51	51.63	0.00	0.00	2500.00
13	P3	35.00	70.00	6.86	1.35	61.80	0.00	0.00	2500.00
14	P3	40.00	70.00	6.79	1.35	61.86	25.00	0.00	2500.00
15	P3	45.00	70.00	6.79	1.35	61.86	25.00	0.00	2500.00
16	P3	50.00	70.00	6.79	1.51	61.70	25.00	0.00	2500.00
17	P3	55.00	70.00	6.79	1.74	61.47	25.00	0.00	2500.00
18	P3	60.00	70.00	6.69	2.07	61.24	75.00	0.00	2500.00
19	P3	65.00	70.00	6.69	2.56	60.75	75.00	0.00	2500.00
20	P2	70.00	70.00	5.61	2.69	61.70	40.00	0.00	2000.00
21	P2	75.00	70.00	5.61	3.87	60.52	40.00	0.00	2000.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	159.00	79.48	-30.07	0.07	47.48	80.23	111.53	1.36	
2	163.10	80.00	-26.31	0.30	51.52	80.27	111.59	1.32	
3	167.20	80.01	-26.20	0.20	54.03	80.03	113.18	1.29	
4	171.30	80.00	-22.46	0.46	58.07	80.07	113.23	1.26	
5	175.40	80.00	-31.46	1.59	56.77	80.91	118.64	1.23	
6	179.50	80.00	-31.35	1.53	59.32	80.42	120.19	1.20	
7	183.60	80.00	-31.21	1.36	61.07	82.00	122.55	1.18	
8	187.70	80.00	-31.11	1.29	63.64	81.40	124.07	1.16	
9	191.80	80.00	-31.02	1.23	66.21	80.73	125.59	1.14	
10	195.90	80.00	-30.88	1.06	68.00	82.23	127.92	1.13	
11	200.00	80.00	-30.74	0.89	69.79	83.73	130.26	1.12	On extreme X-entry

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-30.74	0.89	200.00	80.00	69.79	83.73	130.26	1.12	On extreme X-exit
2	-27.35	1.64	200.00	80.00	72.04	82.26	127.98	1.12	
3	-23.61	1.53	200.00	80.00	68.46	97.00	132.64	1.15	
4	-18.26	0.29	200.00	80.00	75.77	81.51	124.24	1.13	
5	-14.62	0.71	200.00	80.01	78.04	80.01	121.96	1.13	
6	-10.84	0.94	200.00	80.00	79.53	80.61	120.47	1.14	
7	-6.97	1.05	200.00	80.00	81.02	81.15	118.99	1.15	
8	-3.00	1.05	200.00	80.00	82.52	81.62	117.49	1.16	
9	1.04	1.97	200.00	80.00	84.03	83.03	116.01	1.17	
10	4.50	4.59	200.00	80.00	87.17	81.38	112.84	1.20	
11	9.31	5.72	200.00	80.00	89.50	81.77	110.52	1.23	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.12
Critical Circle: Xc = 69.79[ft], Yc = 83.73[ft], R = 130.26[ft]. (Number of slices used = 64)

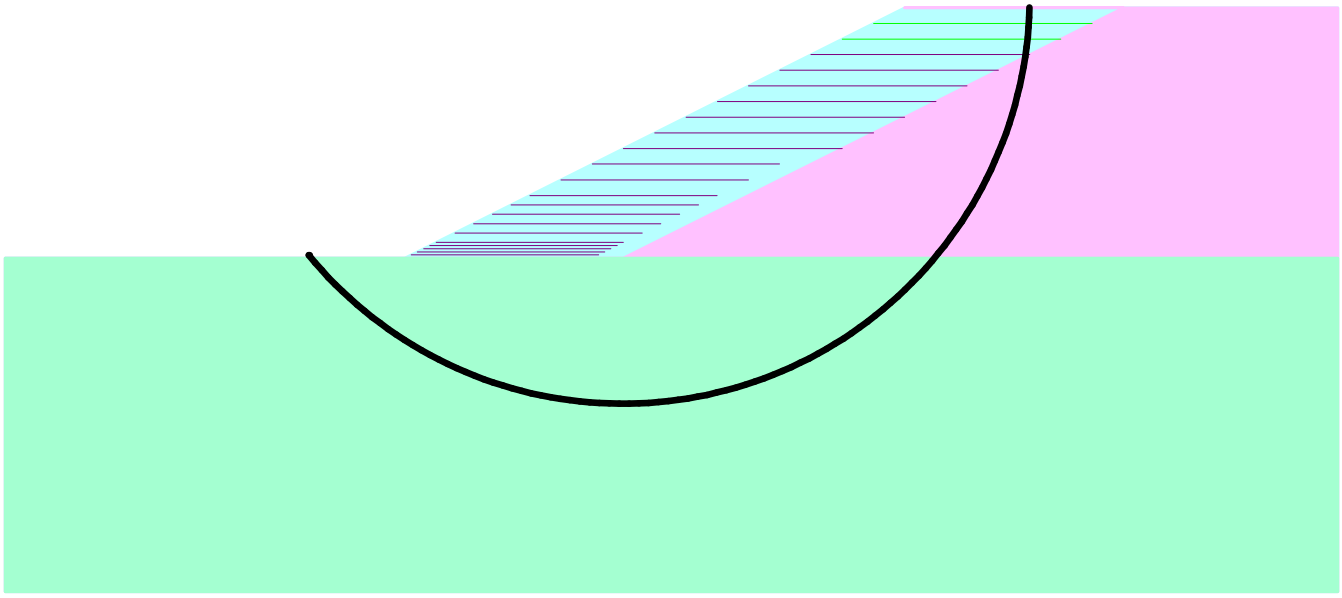
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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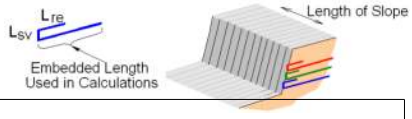


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	60.00	1.00	2.00	1.00	62.00	1.00	0.00	0.00
2	3	P3	2.00	60.00	1.00	4.00	2.00	64.00	2.00	0.00	0.00
3	3	P3	3.00	60.00	1.00	6.00	3.00	66.00	3.00	0.00	0.00
4	3	P3	4.00	60.00	1.00	8.00	4.00	68.00	4.00	0.00	0.00
5	3	P3	5.00	60.00	1.00	10.00	5.00	70.00	5.00	0.00	0.00
6	3	P3	8.00	60.00	1.00	16.00	8.00	76.00	8.00	0.00	0.00
7	3	P3	11.00	60.00	1.00	22.00	11.00	82.00	11.00	0.00	0.00
8	3	P3	14.00	60.00	1.00	28.01	14.00	88.01	14.00	0.00	0.00
9	3	P3	17.00	60.00	1.00	34.01	17.00	94.01	17.00	0.00	0.00
10	3	P3	20.00	60.00	1.00	40.01	20.00	100.01	20.00	0.00	0.00
11	3	P3	25.00	60.00	1.00	50.01	25.00	110.01	25.00	0.00	0.00
12	3	P3	30.00	60.00	1.00	60.01	30.00	120.01	30.00	0.00	0.00
13	3	P3	35.00	70.00	1.00	70.02	35.00	140.02	35.00	0.00	0.00
14	3	P3	40.00	70.00	1.00	80.02	40.00	150.02	40.00	0.00	0.00
15	3	P3	45.00	70.00	1.00	90.02	45.00	160.02	45.00	0.00	0.00
16	3	P3	50.00	70.00	1.00	100.02	50.00	170.02	50.00	0.00	0.00
17	3	P3	55.00	70.00	1.00	110.02	55.00	180.02	55.00	0.00	0.00
18	3	P3	60.00	70.00	1.00	120.03	60.00	190.03	60.00	0.00	0.00
19	3	P3	65.00	70.00	1.00	130.03	65.00	200.03	65.00	0.00	0.00
20	2	P2	70.00	70.00	1.00	140.03	70.00	210.03	70.00	0.00	0.00
21	2	P2	75.00	70.00	1.00	150.03	75.00	220.03	75.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
2	P2	1.00	140.00
3	P3	1.00	1210.00

LAW-7-2.17_Ramp I 377+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _Ramp I 377+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... mp I 377+00\revised\ReSSA1 377+00 (Long Term).MSEp
Original date and time of creating this file: Wed Apr 17 15:16:26 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	127.0	28.0	250.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

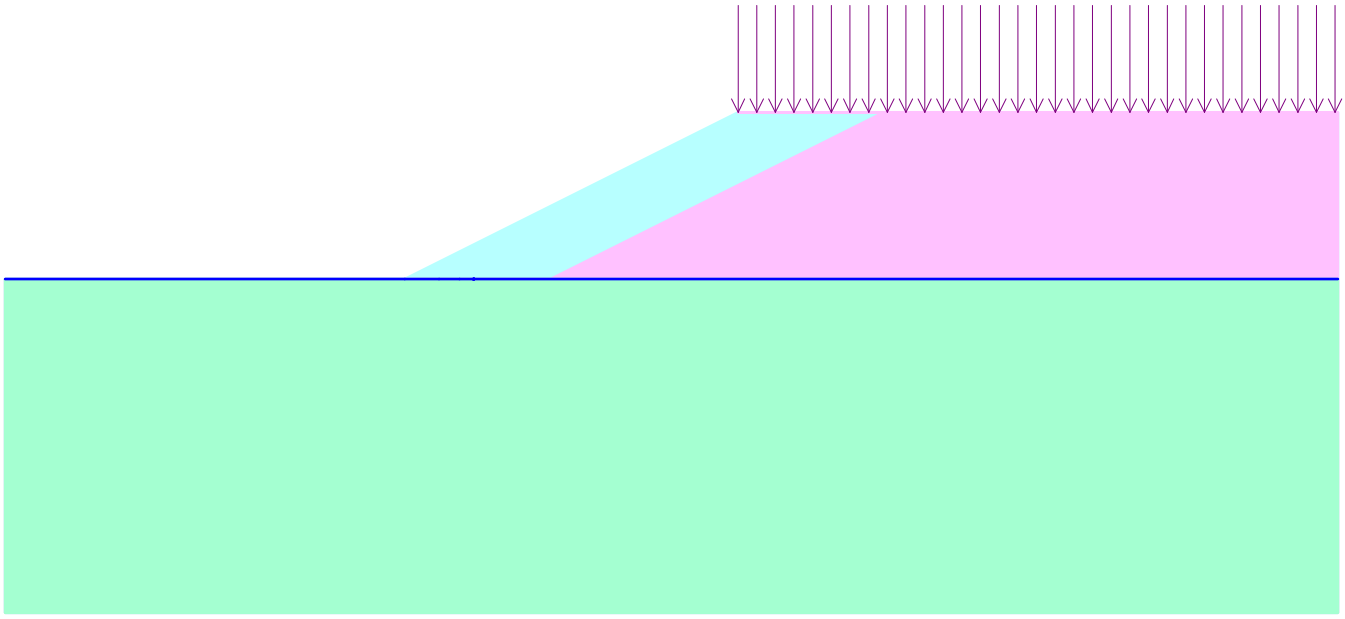
Height of slope, H	80.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

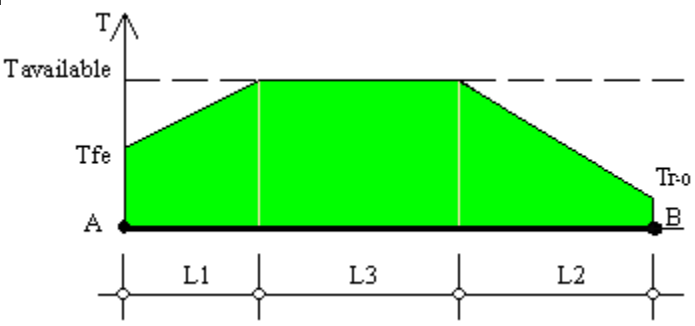
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	16.40	Yw =	0.00
# 3	Xw =	26.25	Yw =	0.00
# 4	Xw =	32.81	Yw =	0.00



SCALE:

0 5 11 22 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
2	P3	2.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
3	P3	3.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
4	P3	4.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
5	P3	5.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
6	P3	8.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
7	P3	11.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
8	P3	14.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
9	P3	17.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
10	P3	20.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
11	P3	25.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
12	P3	30.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
13	P3	35.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
14	P3	40.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
15	P3	45.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
16	P3	50.00	70.00	12.17	1.25	56.58	0.00	0.00	2500.00
17	P3	55.00	70.00	12.17	1.51	56.32	0.00	0.00	2500.00
18	P3	60.00	70.00	12.17	1.87	55.96	0.00	0.00	2500.00
19	P3	65.00	70.00	12.17	2.49	55.33	0.00	0.00	2500.00
20	P2	70.00	70.00	10.89	2.99	56.12	0.00	0.00	2000.00
21	P2	75.00	70.00	10.93	5.97	53.10	0.00	0.00	2000.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	158.00	78.98	-16.44	0.39	23.66	144.28	149.37	1.52	
2	167.20	80.00	-26.50	0.38	17.24	169.41	174.60	1.50	
. 3	176.40	80.00	-35.79	0.28	22.57	167.19	176.83	1.50 .	OK
4	185.60	80.00	-30.53	0.15	23.46	186.45	193.96	1.50	
5	194.80	80.00	-10.43	0.07	24.05	214.98	217.66	1.51	
6	204.00	80.00	-41.29	0.33	18.37	234.09	241.26	1.54	
7	213.20	80.00	-45.04	0.01	23.01	237.18	246.73	1.57	
8	222.40	80.00	-31.37	0.20	12.66	303.56	306.55	1.59	
9	231.60	80.00	-26.46	0.18	14.78	323.95	326.38	1.65	
10	240.80	80.00	-50.10	0.03	34.69	260.66	274.08	1.70	
11	250.00	80.00	-45.48	0.16	41.31	265.64	279.31	1.76	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-51.35	0.58	185.60	80.00	22.99	171.96	186.81	1.51	
2	-45.11	0.04	176.40	80.00	19.47	167.95	179.90	1.51	
3	-40.50	0.18	176.40	80.00	21.02	167.64	178.40	1.50	
. 4	-35.79	0.28	176.40	80.00	22.57	167.19	176.83	1.50 .	OK
5	-30.99	0.32	176.40	80.00	24.13	166.60	175.17	1.50	
6	-26.50	0.38	167.20	80.00	17.24	169.41	174.60	1.50	
7	-21.10	0.24	176.40	80.00	19.26	184.70	188.83	1.50	
8	-16.20	0.28	167.20	80.00	22.45	162.20	166.47	1.50	
9	-10.90	0.19	167.20	80.00	24.14	160.63	164.22	1.50	
10	-5.42	0.08	176.40	80.00	25.94	175.50	178.21	1.51	
11	-0.00	0.00	185.60	80.00	31.95	181.18	183.98	1.52	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.50
Critical Circle: Xc = 22.57[ft], Yc = 167.19[ft], R = 176.83[ft]. (Number of slices used = 64)

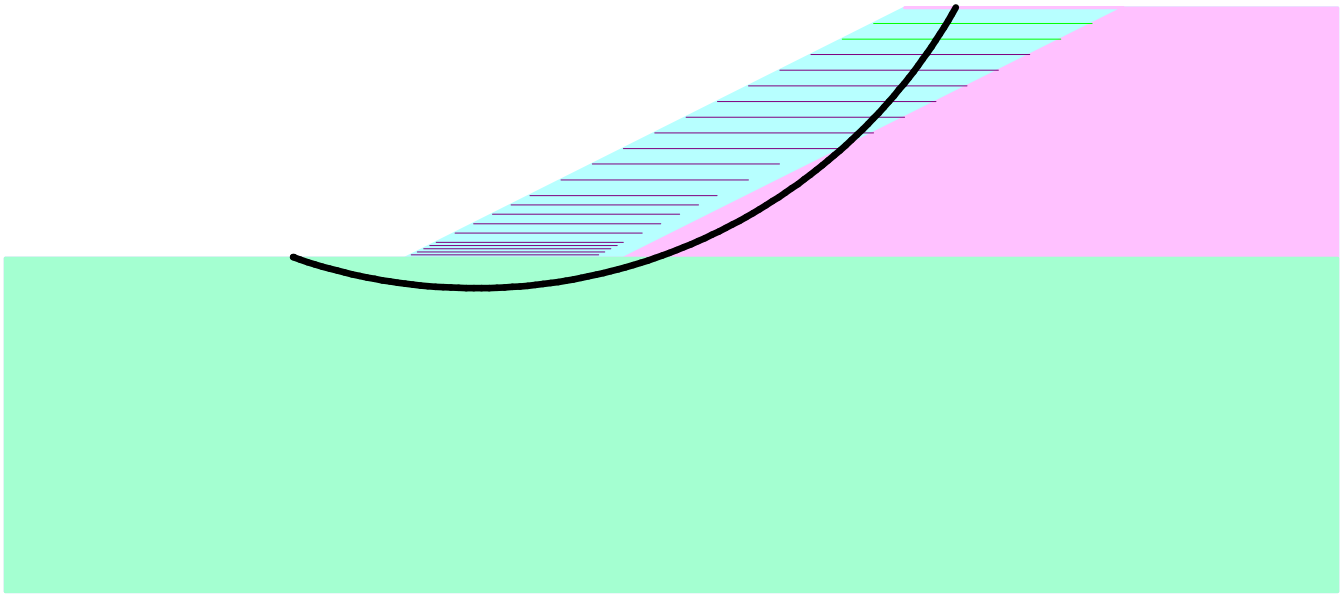
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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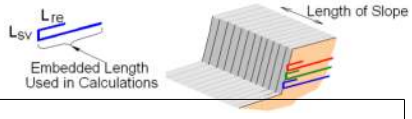


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	60.00	1.00	2.00	1.00	62.00	1.00	0.00	0.00
2	3	P3	2.00	60.00	1.00	4.00	2.00	64.00	2.00	0.00	0.00
3	3	P3	3.00	60.00	1.00	6.00	3.00	66.00	3.00	0.00	0.00
4	3	P3	4.00	60.00	1.00	8.00	4.00	68.00	4.00	0.00	0.00
5	3	P3	5.00	60.00	1.00	10.00	5.00	70.00	5.00	0.00	0.00
6	3	P3	8.00	60.00	1.00	16.00	8.00	76.00	8.00	0.00	0.00
7	3	P3	11.00	60.00	1.00	22.00	11.00	82.00	11.00	0.00	0.00
8	3	P3	14.00	60.00	1.00	28.01	14.00	88.01	14.00	0.00	0.00
9	3	P3	17.00	60.00	1.00	34.01	17.00	94.01	17.00	0.00	0.00
10	3	P3	20.00	60.00	1.00	40.01	20.00	100.01	20.00	0.00	0.00
11	3	P3	25.00	60.00	1.00	50.01	25.00	110.01	25.00	0.00	0.00
12	3	P3	30.00	60.00	1.00	60.01	30.00	120.01	30.00	0.00	0.00
13	3	P3	35.00	70.00	1.00	70.02	35.00	140.02	35.00	0.00	0.00
14	3	P3	40.00	70.00	1.00	80.02	40.00	150.02	40.00	0.00	0.00
15	3	P3	45.00	70.00	1.00	90.02	45.00	160.02	45.00	0.00	0.00
16	3	P3	50.00	70.00	1.00	100.02	50.00	170.02	50.00	0.00	0.00
17	3	P3	55.00	70.00	1.00	110.02	55.00	180.02	55.00	0.00	0.00
18	3	P3	60.00	70.00	1.00	120.03	60.00	190.03	60.00	0.00	0.00
19	3	P3	65.00	70.00	1.00	130.03	65.00	200.03	65.00	0.00	0.00
20	2	P2	70.00	70.00	1.00	140.03	70.00	210.03	70.00	0.00	0.00
21	2	P2	75.00	70.00	1.00	150.03	75.00	220.03	75.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
2	P2	1.00	140.00
3	P3	1.00	1210.00

LAW-7-2.17_Ramp I _377+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _Ramp I _377+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... amp I 377+00\revised\ReSSA1 377+00 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 13:14:30 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	127.0	28.0	250.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

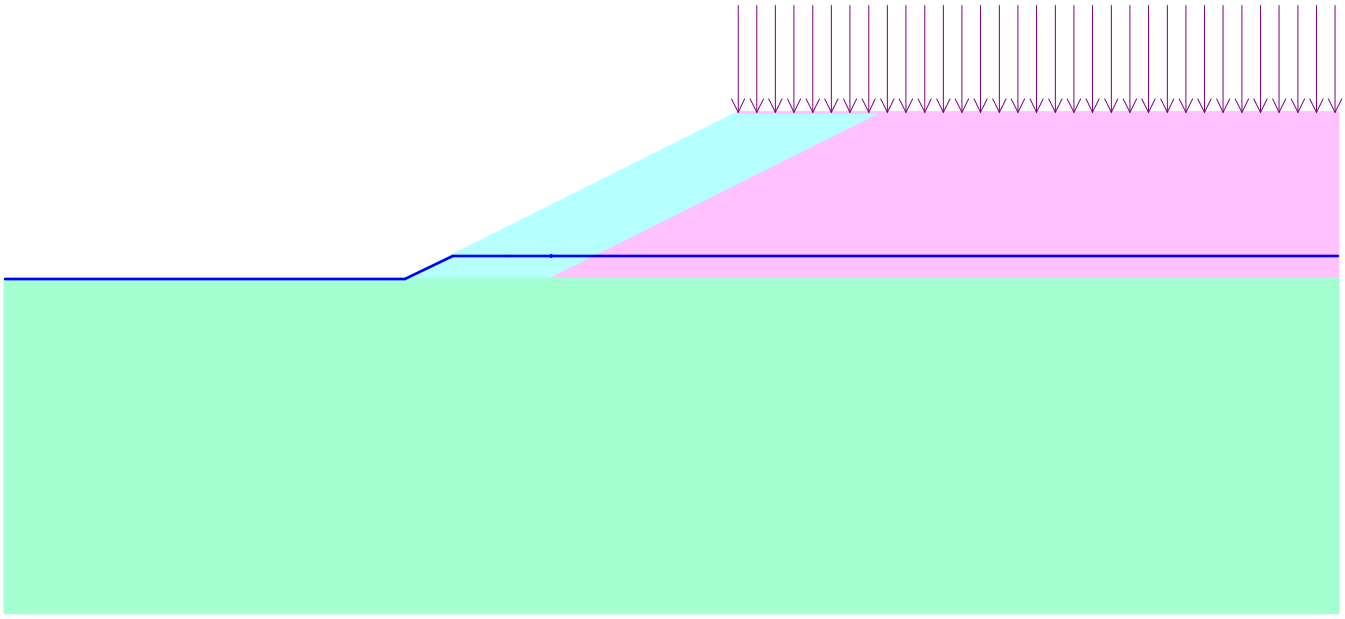
Height of slope, H	80.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	23.00	Yw =	11.00
# 3	Xw =	50.00	Yw =	11.00
# 4	Xw =	70.00	Yw =	11.00



SCALE:

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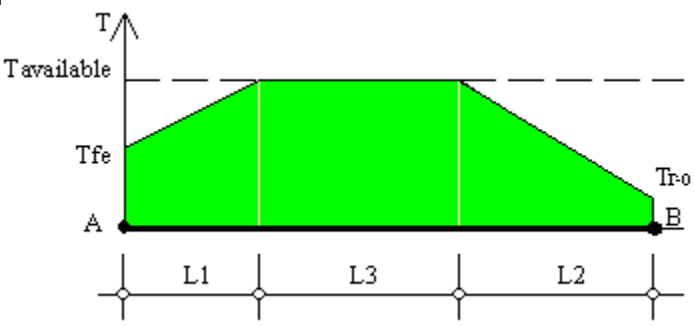
DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	60.00	16.21	1.51	42.28	0.00	0.00	2500.00
2	P3	2.00	60.00	16.14	1.48	42.38	0.00	0.00	2500.00
3	P3	3.00	60.00	16.08	1.44	42.48	0.00	0.00	2500.00
4	P3	4.00	60.00	15.98	1.41	42.61	0.00	0.00	2500.00
5	P3	5.00	60.00	15.75	1.41	42.84	0.00	0.00	2500.00
6	P3	8.00	60.00	14.37	1.35	44.28	0.00	0.00	2500.00
7	P3	11.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
8	P3	14.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
9	P3	17.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
10	P3	20.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
11	P3	25.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
12	P3	30.00	60.00	12.17	1.28	46.55	0.00	0.00	2500.00
13	P3	35.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
14	P3	40.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
15	P3	45.00	70.00	12.17	1.08	56.75	0.00	0.00	2500.00
16	P3	50.00	70.00	12.17	1.25	56.58	0.00	0.00	2500.00
17	P3	55.00	70.00	12.17	1.51	56.32	0.00	0.00	2500.00
18	P3	60.00	70.00	12.17	1.87	55.96	0.00	0.00	2500.00
19	P3	65.00	70.00	12.17	2.49	55.33	0.00	0.00	2500.00
20	P2	70.00	70.00	10.89	2.99	56.12	0.00	0.00	2000.00
21	P2	75.00	70.00	10.93	5.97	53.10	0.00	0.00	2000.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	160.00	79.98	-11.02	0.24	24.17	148.03	151.92	1.38	
2	164.00	80.00	-16.28	0.30	21.57	158.43	162.59	1.38	
. 3	168.00	80.00	-21.38	0.32	19.05	169.14	173.59	1.38 .	OK
4	172.00	80.00	-16.08	0.23	21.72	172.74	176.60	1.38	
5	176.00	80.00	-26.09	0.36	27.33	161.04	169.33	1.38	
6	180.00	80.00	-25.92	0.32	30.36	160.79	170.05	1.38	
7	184.00	80.00	-25.76	0.22	26.31	178.95	186.16	1.39	
8	188.00	80.00	-30.39	0.13	28.08	178.76	187.96	1.39	
9	192.00	80.00	-25.42	0.11	24.72	199.43	205.54	1.40	
10	196.00	80.00	-25.24	0.06	28.16	198.40	205.40	1.41	
11	200.00	80.00	-41.47	0.51	27.75	196.76	208.09	1.42	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-51.53	0.56	184.00	80.00	17.38	185.13	197.01	1.40	
2	-45.14	0.05	176.00	80.00	19.32	167.57	179.49	1.39	
3	-40.53	0.19	176.00	80.00	20.87	167.25	177.98	1.39	
4	-35.81	0.30	176.00	80.00	24.10	162.38	172.80	1.39	
5	-31.00	0.35	176.00	80.00	25.71	161.78	171.11	1.38	
6	-26.47	0.37	168.00	80.00	17.47	170.35	175.56	1.38	
. 7	-21.38	0.32	168.00	80.00	19.05	169.14	173.59	1.38 .	OK
8	-16.18	0.28	168.00	80.00	22.67	163.15	167.44	1.38	
9	-10.89	0.19	168.00	80.00	24.35	161.60	165.21	1.38	
10	-5.50	0.10	168.00	80.00	26.07	159.86	162.86	1.38	
11	-0.00	0.00	172.00	80.00	28.75	163.08	165.60	1.39	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.38
Critical Circle: Xc = 19.05[ft], Yc = 169.14[ft], R = 173.59[ft]. (Number of slices used = 63)

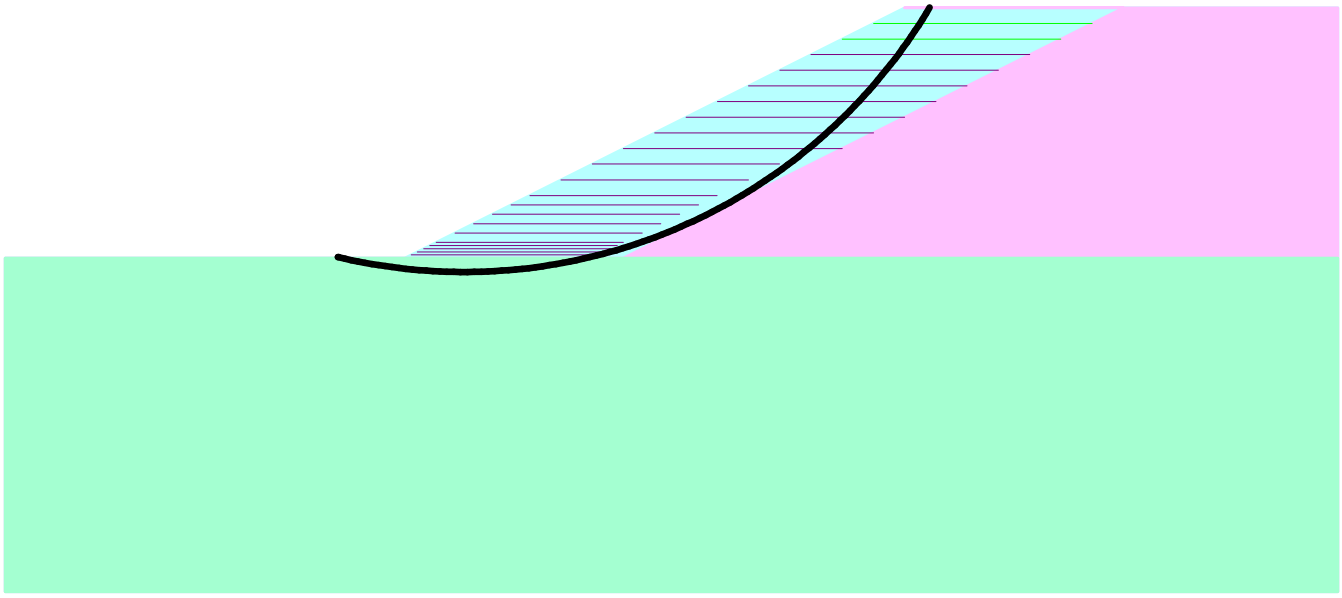
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

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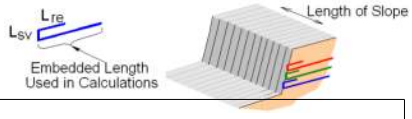


REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	60.00	1.00	2.00	1.00	62.00	1.00	0.00	0.00
2	3	P3	2.00	60.00	1.00	4.00	2.00	64.00	2.00	0.00	0.00
3	3	P3	3.00	60.00	1.00	6.00	3.00	66.00	3.00	0.00	0.00
4	3	P3	4.00	60.00	1.00	8.00	4.00	68.00	4.00	0.00	0.00
5	3	P3	5.00	60.00	1.00	10.00	5.00	70.00	5.00	0.00	0.00
6	3	P3	8.00	60.00	1.00	16.00	8.00	76.00	8.00	0.00	0.00
7	3	P3	11.00	60.00	1.00	22.00	11.00	82.00	11.00	0.00	0.00
8	3	P3	14.00	60.00	1.00	28.01	14.00	88.01	14.00	0.00	0.00
9	3	P3	17.00	60.00	1.00	34.01	17.00	94.01	17.00	0.00	0.00
10	3	P3	20.00	60.00	1.00	40.01	20.00	100.01	20.00	0.00	0.00
11	3	P3	25.00	60.00	1.00	50.01	25.00	110.01	25.00	0.00	0.00
12	3	P3	30.00	60.00	1.00	60.01	30.00	120.01	30.00	0.00	0.00
13	3	P3	35.00	70.00	1.00	70.02	35.00	140.02	35.00	0.00	0.00
14	3	P3	40.00	70.00	1.00	80.02	40.00	150.02	40.00	0.00	0.00
15	3	P3	45.00	70.00	1.00	90.02	45.00	160.02	45.00	0.00	0.00
16	3	P3	50.00	70.00	1.00	100.02	50.00	170.02	50.00	0.00	0.00
17	3	P3	55.00	70.00	1.00	110.02	55.00	180.02	55.00	0.00	0.00
18	3	P3	60.00	70.00	1.00	120.03	60.00	190.03	60.00	0.00	0.00
19	3	P3	65.00	70.00	1.00	130.03	65.00	200.03	65.00	0.00	0.00
20	2	P2	70.00	70.00	1.00	140.03	70.00	210.03	70.00	0.00	0.00
21	2	P2	75.00	70.00	1.00	150.03	75.00	220.03	75.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
2	P2	1.00	140.00
3	P3	1.00	1210.00

LAW-7-2.17_184+00_Ramp L (Short Term)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _184+00_Ramp L (Short Term)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... ses\Ramp L\ReSSA1 384+00 Ramp L (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 14:32:29 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	136.0	21.0	320.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

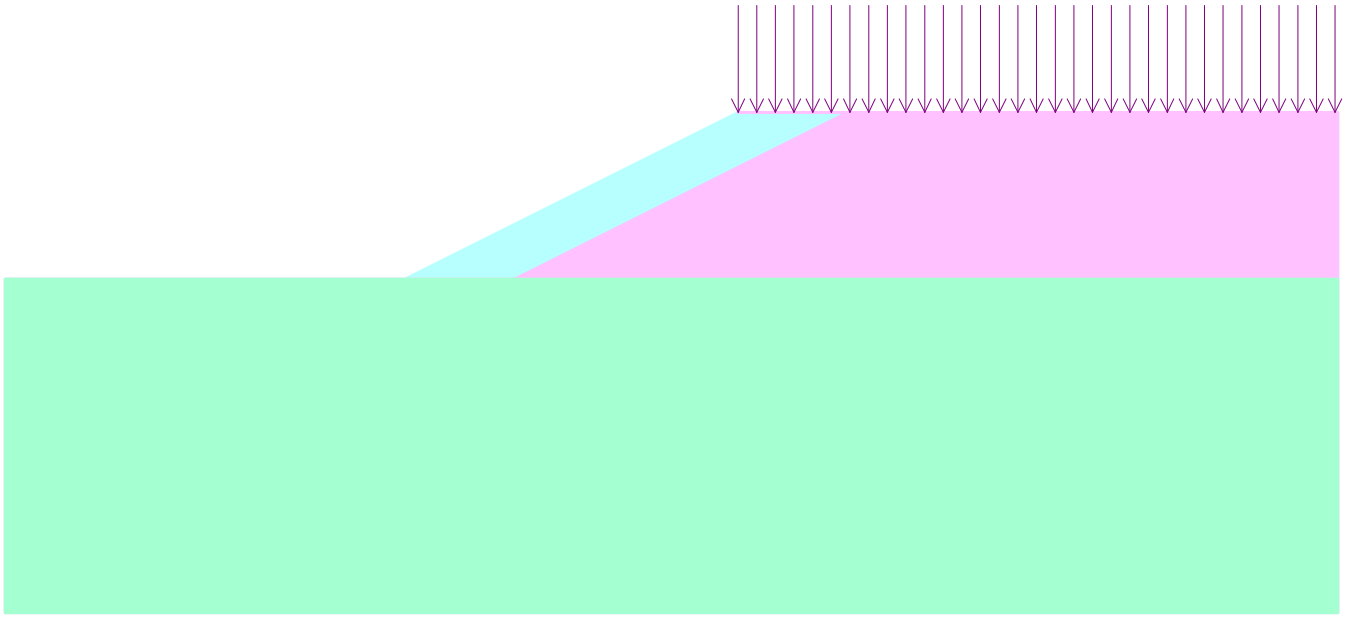
DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

Height of slope, H	38.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

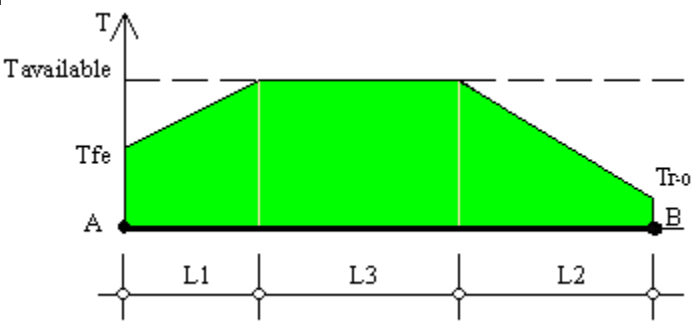
Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name		Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1		P1	1.00	25.00	3.94	1.54	19.52	0.00	0.00	1300.00
2		P1	2.00	25.00	3.94	1.54	19.52	0.00	0.00	1300.00
3		P1	3.00	20.00	3.94	1.80	14.26	0.00	0.00	1300.00
4		P1	4.00	20.00	3.94	1.80	14.26	0.00	0.00	1300.00
5		P1	5.00	20.00	3.94	1.80	14.26	0.00	0.00	1300.00
6		P1	8.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
7		P1	11.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
8		P1	14.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
9		P1	17.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
10		P1	23.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00
11		P1	29.00	15.00	3.94	2.13	8.93	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	75.00	37.49	-1.50	0.16	17.08	59.13	61.83	1.63	
2	79.50	38.00	-1.50	0.11	14.28	71.90	73.50	1.54	
3	84.00	38.00	-0.25	0.39	14.61	80.27	81.25	1.50	
. 4	88.50	38.00	-1.50	0.09	14.50	87.90	89.25	1.49 .	OK
5	93.00	38.00	-1.50	0.09	15.61	94.19	95.64	1.50	
6	97.50	38.00	-1.50	0.08	15.47	103.98	105.27	1.52	
7	102.00	38.00	-1.50	0.08	16.57	110.96	112.34	1.54	
8	106.50	38.00	-1.50	0.08	17.71	118.13	119.60	1.58	
9	111.00	38.00	-1.50	0.08	18.87	125.48	127.04	1.62	
10	115.50	38.00	-1.50	0.08	20.07	133.00	134.66	1.66	
11	120.00	38.00	-1.50	0.08	21.28	140.69	142.44	1.71	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-10.57	0.16	88.50	38.00	13.19	86.55	89.60	1.52	
2	-9.47	0.27	88.50	38.00	14.22	84.80	87.80	1.52	
3	-7.27	0.07	88.50	38.00	14.31	85.46	88.08	1.51	
4	-6.13	0.15	88.50	38.00	14.38	86.10	88.36	1.51	
5	-4.95	0.21	88.50	38.00	14.43	86.72	88.66	1.50	
6	-2.72	0.04	88.50	38.00	14.47	87.32	88.95	1.50	
. 7	-1.50	0.09	88.50	38.00	14.50	87.90	89.25	1.49 .	OK
8	-0.48	0.41	88.50	38.00	14.55	88.95	89.81	1.49	
9	1.13	1.16	88.50	38.00	16.93	85.70	86.01	1.50	
10	2.97	1.85	88.50	38.00	18.19	85.08	84.62	1.51	
11	4.46	2.60	88.50	38.00	19.45	84.46	83.23	1.52	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.49
Critical Circle: Xc = 14.50[ft], Yc = 87.90[ft], R = 89.25[ft]. (Number of slices used = 57)

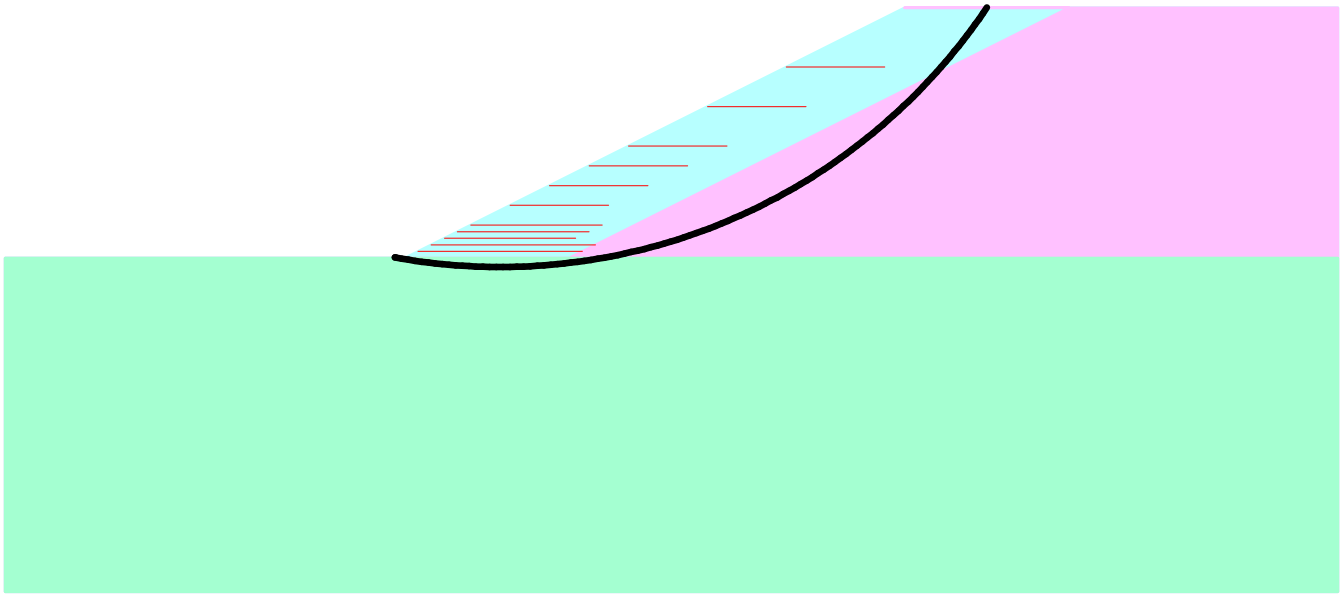
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

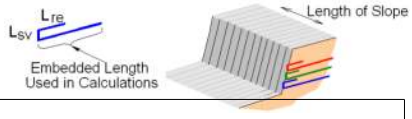
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	25.00	1.00	2.00	1.00	27.00	1.00	0.00	0.00
2	1	P1	2.00	25.00	1.00	4.00	2.00	29.00	2.00	0.00	0.00
3	1	P1	3.00	20.00	1.00	6.00	3.00	26.00	3.00	0.00	0.00
4	1	P1	4.00	20.00	1.00	8.00	4.00	28.00	4.00	0.00	0.00
5	1	P1	5.00	20.00	1.00	10.00	5.00	30.00	5.00	0.00	0.00
6	1	P1	8.00	15.00	1.00	16.00	8.00	31.00	8.00	0.00	0.00
7	1	P1	11.00	15.00	1.00	22.00	11.00	37.00	11.00	0.00	0.00
8	1	P1	14.00	15.00	1.00	28.01	14.00	43.01	14.00	0.00	0.00
9	1	P1	17.00	15.00	1.00	34.01	17.00	49.01	17.00	0.00	0.00
10	1	P1	23.00	15.00	1.00	46.01	23.00	61.01	23.00	0.00	0.00
11	1	P1	29.00	15.00	1.00	58.01	29.00	73.01	29.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	200.00

LAW-7-2.17_384+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _384+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... lyses\Ramp L\ReSSA1 384+00 Ramp L (Long Term).MSEp
Original date and time of creating this file: Thu Apr 18 10:27:16 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	136.0	29.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

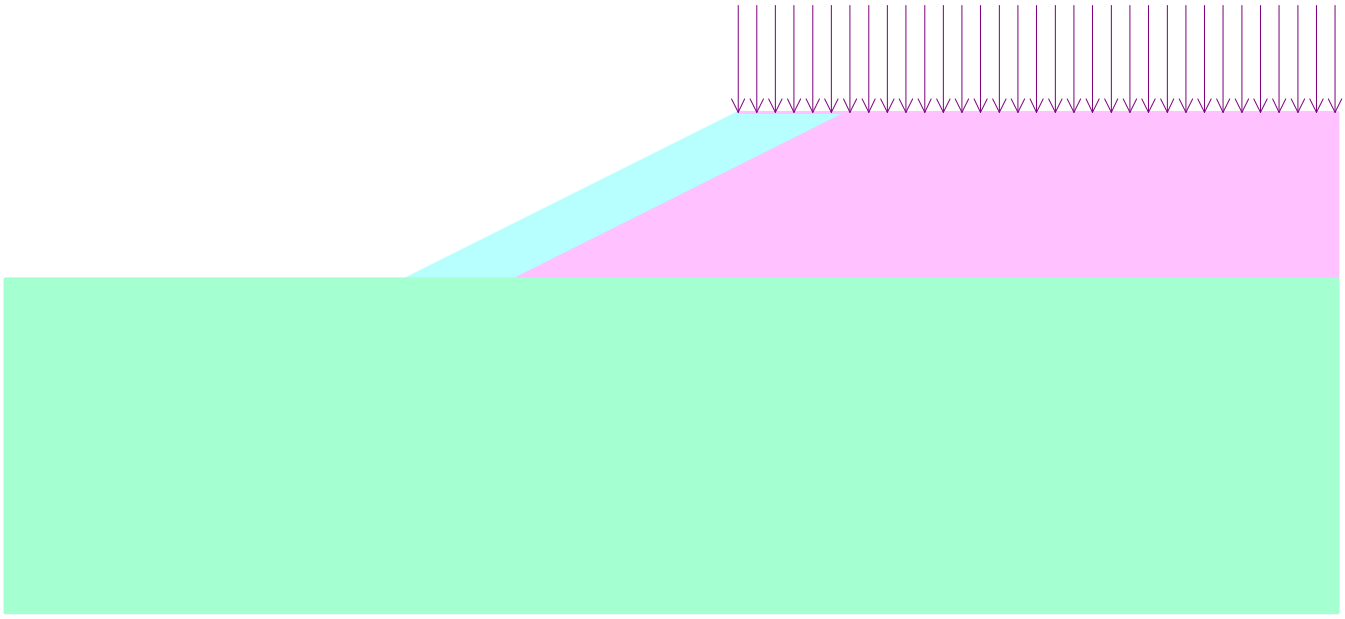
DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

Height of slope, H	38.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

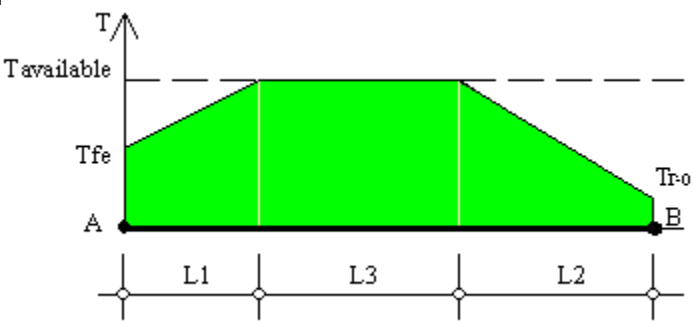
Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
2	P1	2.00	25.00	8.79	1.61	14.60	0.00	0.00	1300.00
3	P1	3.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
4	P1	4.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
5	P1	5.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
6	P1	8.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
7	P1	11.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
8	P1	14.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
9	P1	17.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
10	P1	23.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00
11	P1	29.00	15.00	8.79	2.85	3.35	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	75.00	37.49	-10.10	0.02	6.51	77.68	79.41	1.36	
2	79.50	38.00	-5.56	0.09	8.23	83.54	84.58	1.31	OK
3	84.00	38.00	-5.48	0.07	8.03	92.72	93.63	1.31	
4	88.50	38.00	-5.41	0.05	7.64	102.94	103.71	1.34	
5	93.00	38.00	-10.45	0.06	6.14	114.85	115.98	1.37	
6	97.50	38.00	-10.29	0.04	5.59	126.96	127.92	1.42	
7	102.00	38.00	-10.13	0.01	4.77	140.53	141.30	1.47	
8	106.50	38.00	-20.51	0.06	0.01	162.96	164.18	1.52	
9	111.00	38.00	-15.76	0.08	2.76	169.00	169.93	1.58	
10	115.50	38.00	-21.33	0.14	-0.08	189.55	190.59	1.65	
11	120.00	38.00	-15.35	0.03	2.27	197.44	198.20	1.71	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.52	0.14	88.50	38.00	-13.21	137.31	142.15	1.56	
2	-45.65	0.15	93.00	38.00	-11.15	146.64	150.50	1.51	
3	-40.66	0.17	88.50	38.00	-8.04	128.19	132.12	1.47	
4	-36.05	0.25	88.50	38.00	-6.02	125.52	128.82	1.42	
5	-30.98	0.25	84.00	38.00	-2.90	108.70	112.03	1.39	
6	-25.10	0.02	84.00	38.00	-0.65	105.48	108.26	1.36	
7	-20.73	0.16	84.00	38.00	1.68	101.99	104.27	1.33	
8	-15.84	0.17	84.00	38.00	4.09	98.23	100.07	1.32	
9	-10.91	0.18	79.50	38.00	6.59	85.34	86.94	1.31	
10	-5.56	0.09	79.50	38.00	8.23	83.54	84.58	1.31	OK
11	-0.00	0.00	79.50	38.00	11.09	78.96	79.73	1.32	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.31
Critical Circle: Xc = 8.23[ft], Yc = 83.54[ft], R = 84.58[ft]. (Number of slices used = 56)

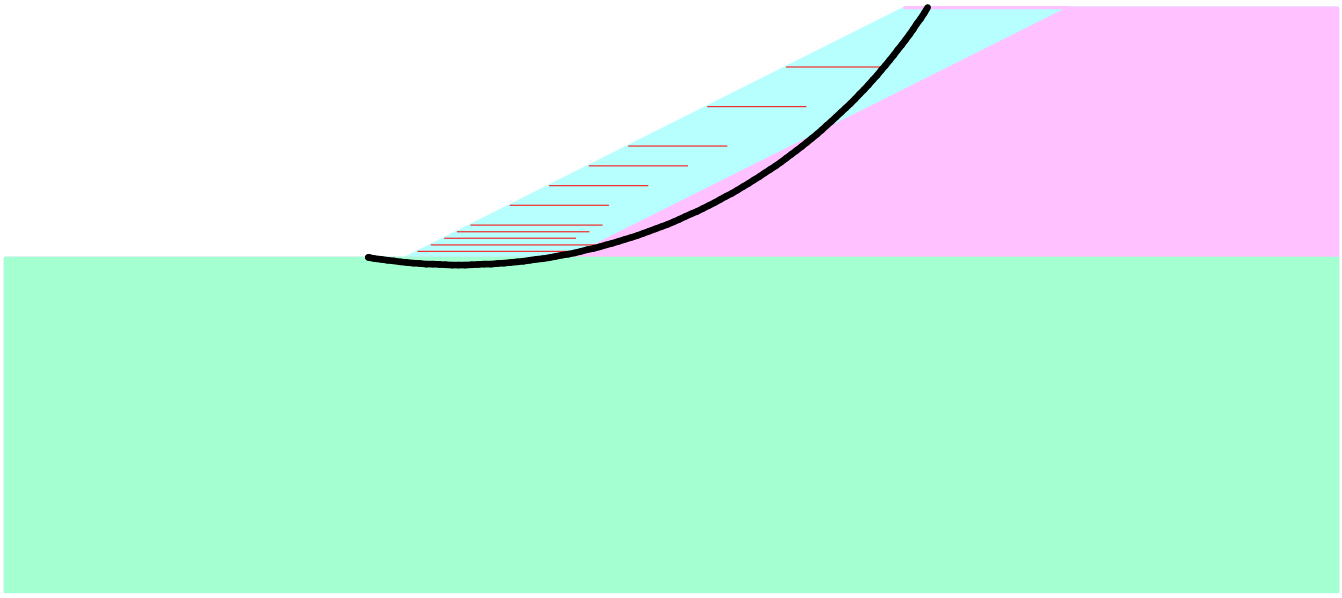
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

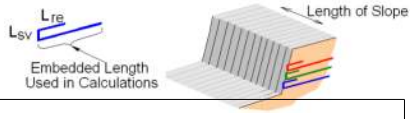
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	25.00	1.00	2.00	1.00	27.00	1.00	0.00	0.00
2	1	P1	2.00	25.00	1.00	4.00	2.00	29.00	2.00	0.00	0.00
3	1	P1	3.00	20.00	1.00	6.00	3.00	26.00	3.00	0.00	0.00
4	1	P1	4.00	20.00	1.00	8.00	4.00	28.00	4.00	0.00	0.00
5	1	P1	5.00	20.00	1.00	10.00	5.00	30.00	5.00	0.00	0.00
6	1	P1	8.00	15.00	1.00	16.00	8.00	31.00	8.00	0.00	0.00
7	1	P1	11.00	15.00	1.00	22.00	11.00	37.00	11.00	0.00	0.00
8	1	P1	14.00	15.00	1.00	28.01	14.00	43.01	14.00	0.00	0.00
9	1	P1	17.00	15.00	1.00	34.01	17.00	49.01	17.00	0.00	0.00
10	1	P1	23.00	15.00	1.00	46.01	23.00	61.01	23.00	0.00	0.00
11	1	P1	29.00	15.00	1.00	58.01	29.00	73.01	29.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	200.00

LAW-7-2.17_SR 775_55+00 (Short Term)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _SR 775_55+00 (Short Term)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... eSSA_54+61.56\ReSSA1 SR775 55+00 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 15:08:52 2024

PROGRAM MODE: Analysis of a Tiered Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
1	136.0	21.0	320.0
2	136.0	21.0	320.0
3	136.0	21.0	320.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - TIERED

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

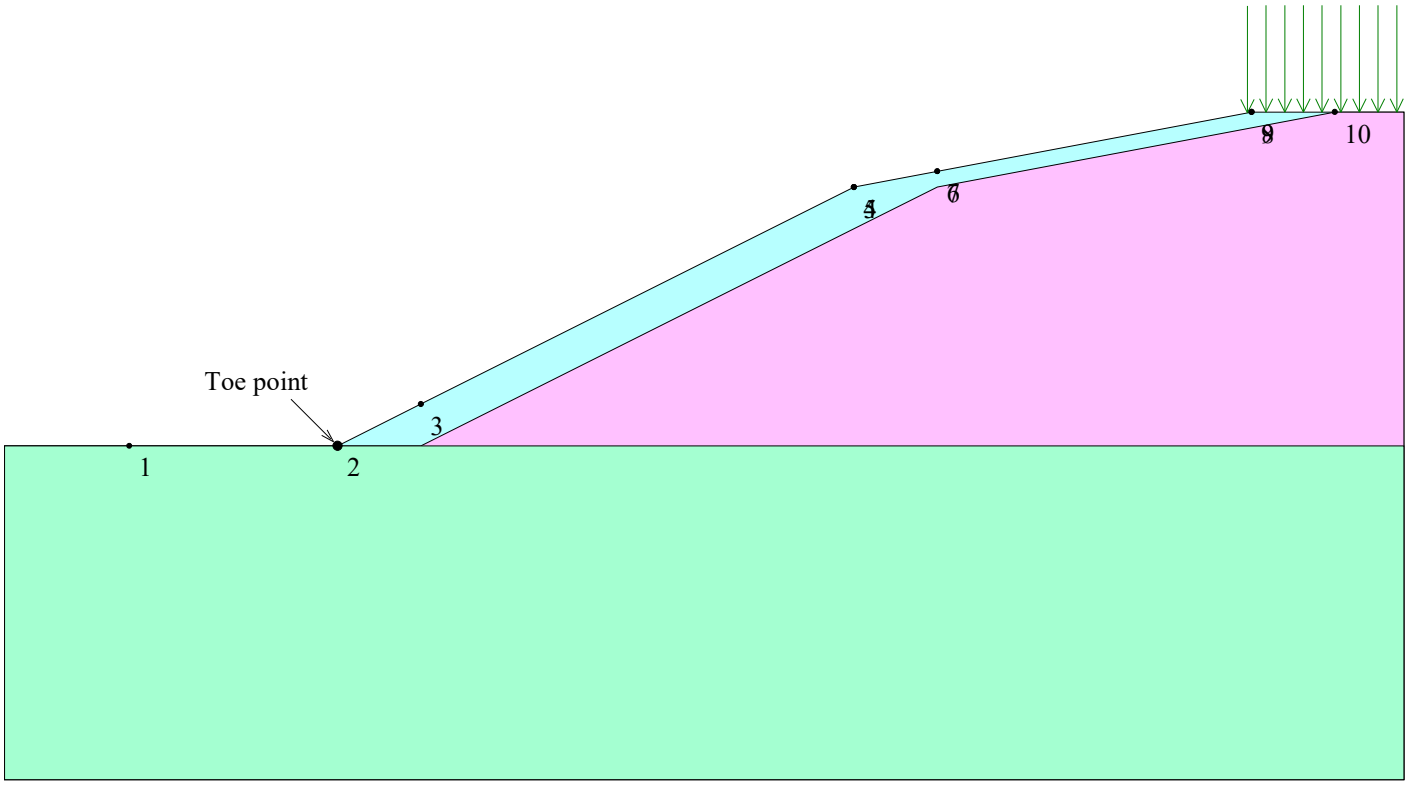
Soil profile contains 3 layers

UNIFORM SURCHARGE

Load Q1 = 250.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 645.00 and ends at X1e = 800.00 [ft].
Surcharge load, Q2.....None
Surcharge load, Q3.....None

STRIP LOAD

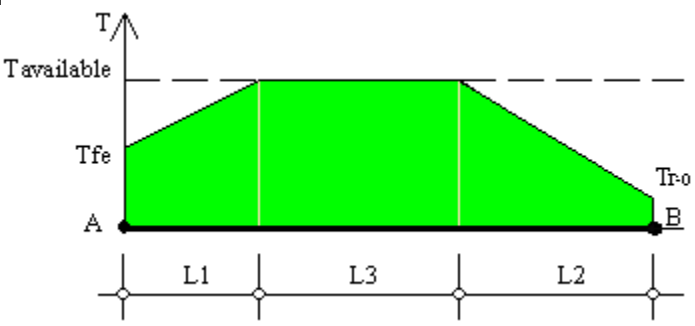
.....None.....



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	65.00	3.94	0.75	60.31	0.00	0.00	1300.00
2	P1	2.00	65.00	3.94	0.75	60.31	0.00	0.00	1300.00
3	P1	3.00	65.00	3.94	0.75	60.31	0.00	0.00	1300.00
4	P1	4.00	65.00	3.94	0.75	60.31	0.00	0.00	1300.00
5	P1	5.00	65.00	3.94	0.75	60.31	0.00	0.00	1300.00
6	P1	8.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
7	P1	11.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
8	P1	14.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
9	P1	17.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
10	P1	23.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
11	P1	29.00	60.00	3.94	0.79	55.28	0.00	0.00	1300.00
12	P1	35.00	60.00	3.94	0.82	55.24	0.00	0.00	1300.00
13	P1	41.00	60.00	3.94	0.92	55.14	0.00	0.00	1300.00
14	P1	47.00	50.00	3.94	1.15	44.91	0.00	0.00	1300.00
15	P1	53.00	50.00	3.94	1.35	44.72	0.00	0.00	1300.00
16	P1	59.00	50.00	3.94	1.64	44.42	0.00	0.00	1300.00
17	P1	65.00	50.00	4.30	1.84	43.86	0.00	0.00	1300.00
18	P1	71.00	30.00	4.30	2.43	23.27	0.00	0.00	1300.00
19	P1	77.00	30.00	4.30	3.08	22.62	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	560.00	457.49	420.16	394.04	456.02	500.85	112.67	1.40	
2	574.00	460.13	420.29	393.95	455.84	522.98	133.84	1.36	
. 3	588.00	462.77	418.17	393.75	454.17	548.64	159.01	1.35 .	OK
4	602.00	465.41	418.48	393.96	454.58	572.65	182.30	1.36	
5	616.00	468.05	422.75	393.90	456.05	596.04	204.86	1.38	
6	630.00	470.69	422.75	393.88	456.08	621.96	230.51	1.41	
7	644.00	473.33	422.75	393.86	455.51	650.36	258.59	1.44	
8	658.00	473.70	422.75	393.84	454.73	686.05	293.96	1.47	
9	672.00	473.70	419.16	393.77	454.34	722.34	330.45	1.52	
10	686.00	473.70	422.75	393.81	455.90	758.27	365.96	1.57	
11	700.00	473.70	422.75	393.79	453.07	809.49	416.81	1.64	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	409.73	393.77	588.00	462.77	450.06	554.37	165.59	1.36	
2	409.80	394.11	588.00	462.77	451.04	552.67	163.84	1.36	
3	411.86	393.94	588.00	462.77	452.01	550.98	162.09	1.36	
4	413.91	393.77	588.00	462.77	452.99	549.29	160.36	1.36	
5	414.03	394.10	588.00	462.77	453.98	547.62	158.63	1.36	
6	416.10	393.91	588.00	462.77	453.17	550.37	160.79	1.36	
. 7	418.17	393.75	588.00	462.77	454.17	548.64	159.01	1.35 .	OK
8	418.35	394.04	588.00	462.77	455.17	546.91	157.24	1.35	
9	420.43	393.88	588.00	462.77	456.17	545.19	155.48	1.35	
10	422.52	393.72	588.00	462.77	457.18	543.48	153.72	1.36	
11	422.75	393.97	588.00	462.77	456.38	546.05	155.76	1.36	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.35
Critical Circle: Xc = 454.17[ft], Yc = 548.64[ft], R = 159.01[ft]. (Number of slices used = 56)

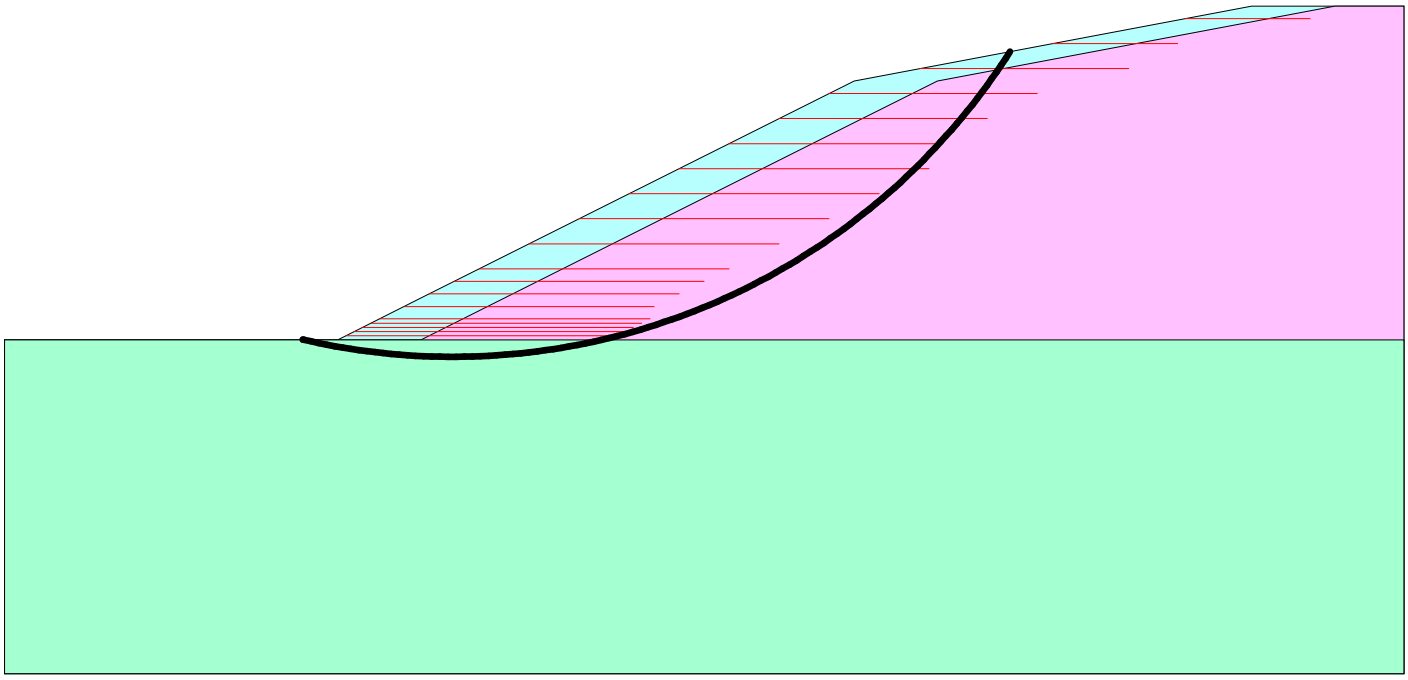
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

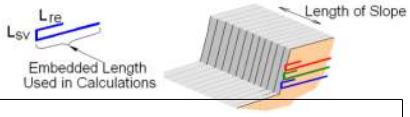
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	65.00	1.00	428.51	394.70	493.51	394.70	0.00	0.00
2	1	P1	2.00	65.00	1.00	430.51	395.70	495.51	395.70	0.00	0.00
3	1	P1	3.00	65.00	1.00	432.51	396.70	497.51	396.70	0.00	0.00
4	1	P1	4.00	65.00	1.00	434.51	397.70	499.51	397.70	0.00	0.00
5	1	P1	5.00	65.00	1.00	436.51	398.70	501.51	398.70	0.00	0.00
6	1	P1	8.00	60.00	1.00	442.51	401.70	502.51	401.70	0.00	0.00
7	1	P1	11.00	60.00	1.00	448.51	404.70	508.51	404.70	0.00	0.00
8	1	P1	14.00	60.00	1.00	454.52	407.70	514.52	407.70	0.00	0.00
9	1	P1	17.00	60.00	1.00	460.52	410.70	520.52	410.70	0.00	0.00
10	1	P1	23.00	60.00	1.00	472.52	416.70	532.52	416.70	0.00	0.00
11	1	P1	29.00	60.00	1.00	484.52	422.70	544.52	422.70	0.00	0.00
12	1	P1	35.00	60.00	1.00	496.52	428.70	556.52	428.70	0.00	0.00
13	1	P1	41.00	60.00	1.00	508.53	434.70	568.53	434.70	0.00	0.00
14	1	P1	47.00	50.00	1.00	520.53	440.70	570.53	440.70	0.00	0.00
15	1	P1	53.00	50.00	1.00	532.53	446.70	582.53	446.70	0.00	0.00
16	1	P1	59.00	50.00	1.00	544.54	452.70	594.54	452.70	0.00	0.00
17	1	P1	65.00	50.00	1.00	566.44	458.70	616.44	458.70	0.00	0.00
18	1	P1	71.00	30.00	1.00	598.26	464.70	628.26	464.70	0.00	0.00
19	1	P1	77.00	30.00	1.00	630.07	470.70	660.07	470.70	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	1065.00

LAW-7-2.17_SR 775_55+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _SR 775_55+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... SR 775\ReSSA 54+61.56\ReSSA_55+00 (Long Term).MSEp
Original date and time of creating this file: Fri Apr 19 09:29:55 2024

PROGRAM MODE: Analysis of a Tiered Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
1	136.0	29.0	0.0
2	136.0	29.0	0.0
3	136.0	29.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Water is not present

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - TIERED

-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.

GEOMETRY

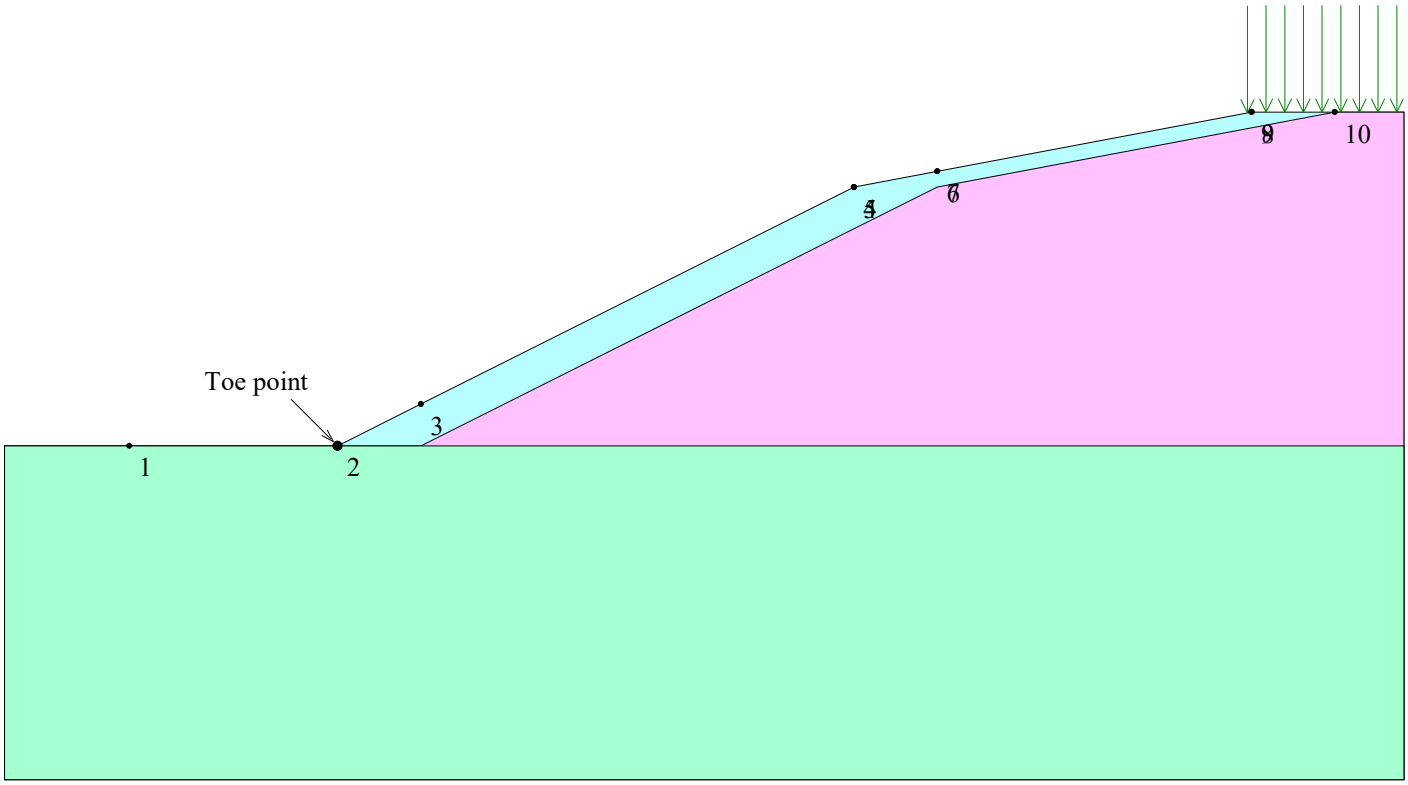
Soil profile contains 3 layers

UNIFORM SURCHARGE

Load Q1 = 250.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 645.00 and ends at X1e = 800.00 [ft].
Surcharge load, Q2.....None
Surcharge load, Q3.....None

STRIP LOAD

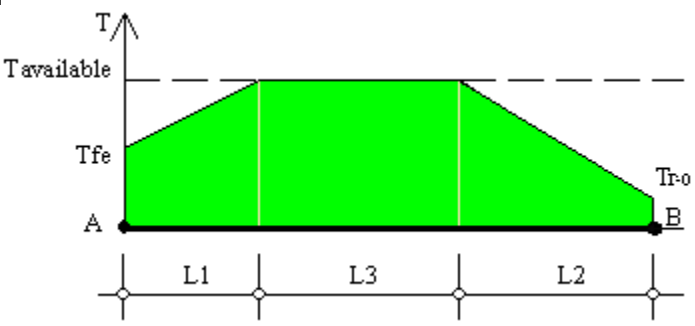
.....None.....



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	65.00	8.79	0.62	55.58	0.00	0.00	1300.00
2	P1	2.00	65.00	8.79	0.62	55.58	0.00	0.00	1300.00
3	P1	3.00	65.00	8.79	0.62	55.58	0.00	0.00	1300.00
4	P1	4.00	65.00	8.79	0.62	55.58	0.00	0.00	1300.00
5	P1	5.00	65.00	8.79	0.62	55.58	0.00	0.00	1300.00
6	P1	8.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
7	P1	11.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
8	P1	14.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
9	P1	17.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
10	P1	23.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
11	P1	29.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
12	P1	35.00	60.00	8.79	0.69	50.52	0.00	0.00	1300.00
13	P1	41.00	60.00	8.79	0.82	50.39	0.00	0.00	1300.00
14	P1	47.00	50.00	8.79	1.05	40.16	0.00	0.00	1300.00
15	P1	53.00	50.00	8.79	1.31	39.90	0.00	0.00	1300.00
16	P1	59.00	50.00	9.12	1.74	39.14	0.00	0.00	1300.00
17	P1	65.00	50.00	14.30	2.10	33.60	0.00	0.00	1300.00
18	P1	71.00	30.00	14.30	3.64	12.05	0.00	0.00	1300.00
19	P1	77.00	30.00	14.30	6.46	9.23	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	560.00	457.49	410.41	393.99	451.65	504.81	118.24	1.53	
2	574.00	460.13	410.95	393.78	451.88	526.73	139.11	1.50	
. 3	588.00	462.77	402.40	394.02	447.42	557.39	169.47	1.50 .	OK
4	602.00	465.41	409.92	393.98	450.54	578.74	189.17	1.52	
5	616.00	468.05	395.08	393.88	443.26	616.48	227.76	1.56	
6	630.00	470.69	401.98	393.98	446.69	638.35	248.42	1.60	
7	644.00	473.33	402.52	393.85	443.30	676.52	285.60	1.64	
8	658.00	473.70	403.04	393.76	442.82	713.47	322.17	1.70	
9	672.00	473.70	379.32	393.88	433.65	771.17	381.18	1.76	
10	686.00	473.70	388.03	393.73	438.32	801.45	410.81	1.84	
11	700.00	473.70	409.66	393.84	448.52	820.25	428.18	1.95	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	348.66	394.01	630.00	470.69	418.73	691.41	305.54	1.67	
2	356.07	394.16	602.00	465.41	423.23	622.41	237.93	1.62	
3	364.76	393.86	602.00	465.41	428.13	612.82	227.95	1.59	
4	372.95	393.71	560.00	457.49	450.80	471.55	110.10	2.25	
5	379.51	394.00	602.00	465.41	435.98	600.37	213.96	1.54	
6	387.93	393.78	602.00	465.41	438.95	597.02	209.55	1.52	
7	395.58	393.80	588.00	462.77	444.03	561.53	174.59	1.51	
. 8	402.40	394.02	588.00	462.77	447.42	557.39	169.47	1.50 .	OK
9	410.95	393.78	574.00	460.13	451.88	526.73	139.11	1.50	
10	418.84	393.70	588.00	462.77	454.50	548.08	158.44	1.50	
11	426.50	393.70	574.00	460.13	458.12	520.48	130.66	1.51	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.50
Critical Circle: Xc = 447.42[ft], Yc = 557.39[ft], R = 169.47[ft]. (Number of slices used = 56)

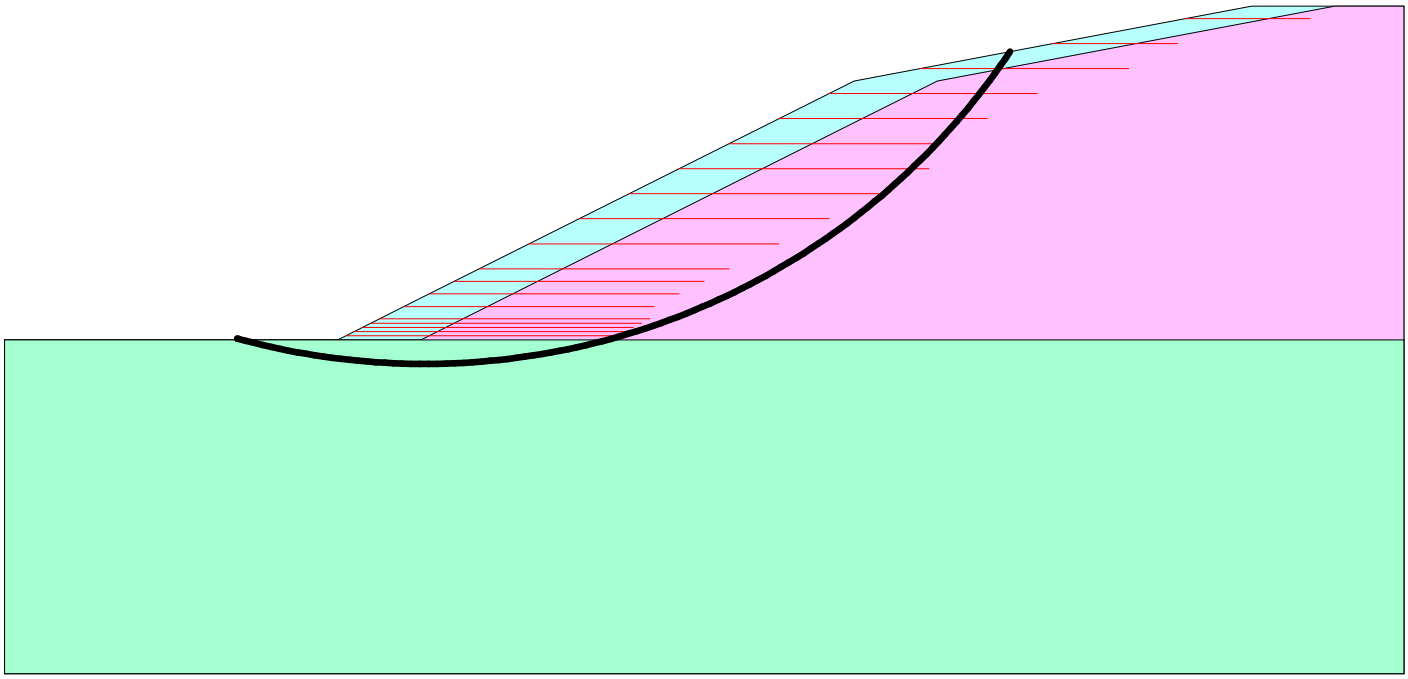
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

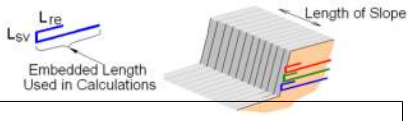
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	65.00	1.00	428.51	394.70	493.51	394.70	0.00	0.00
2	1	P1	2.00	65.00	1.00	430.51	395.70	495.51	395.70	0.00	0.00
3	1	P1	3.00	65.00	1.00	432.51	396.70	497.51	396.70	0.00	0.00
4	1	P1	4.00	65.00	1.00	434.51	397.70	499.51	397.70	0.00	0.00
5	1	P1	5.00	65.00	1.00	436.51	398.70	501.51	398.70	0.00	0.00
6	1	P1	8.00	60.00	1.00	442.51	401.70	502.51	401.70	0.00	0.00
7	1	P1	11.00	60.00	1.00	448.51	404.70	508.51	404.70	0.00	0.00
8	1	P1	14.00	60.00	1.00	454.52	407.70	514.52	407.70	0.00	0.00
9	1	P1	17.00	60.00	1.00	460.52	410.70	520.52	410.70	0.00	0.00
10	1	P1	23.00	60.00	1.00	472.52	416.70	532.52	416.70	0.00	0.00
11	1	P1	29.00	60.00	1.00	484.52	422.70	544.52	422.70	0.00	0.00
12	1	P1	35.00	60.00	1.00	496.52	428.70	556.52	428.70	0.00	0.00
13	1	P1	41.00	60.00	1.00	508.53	434.70	568.53	434.70	0.00	0.00
14	1	P1	47.00	50.00	1.00	520.53	440.70	570.53	440.70	0.00	0.00
15	1	P1	53.00	50.00	1.00	532.53	446.70	582.53	446.70	0.00	0.00
16	1	P1	59.00	50.00	1.00	544.54	452.70	594.54	452.70	0.00	0.00
17	1	P1	65.00	50.00	1.00	566.44	458.70	616.44	458.70	0.00	0.00
18	1	P1	71.00	30.00	1.00	598.26	464.70	628.26	464.70	0.00	0.00
19	1	P1	77.00	30.00	1.00	630.07	470.70	660.07	470.70	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	1065.00

LAW-7-2.17_55+00 (Rapid DD)

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _55+00 (Rapid DD)
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... SR 775\ReSSA 54+61.56\ReSSA1_55+00 (Rapid DD).MSEp
Original date and time of creating this file: Tue Apr 30 08:21:52 2024

PROGRAM MODE: Analysis of a Tiered Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
1	136.0	29.0	0.0
2	136.0	29.0	0.0
3	136.0	29.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - TIERED

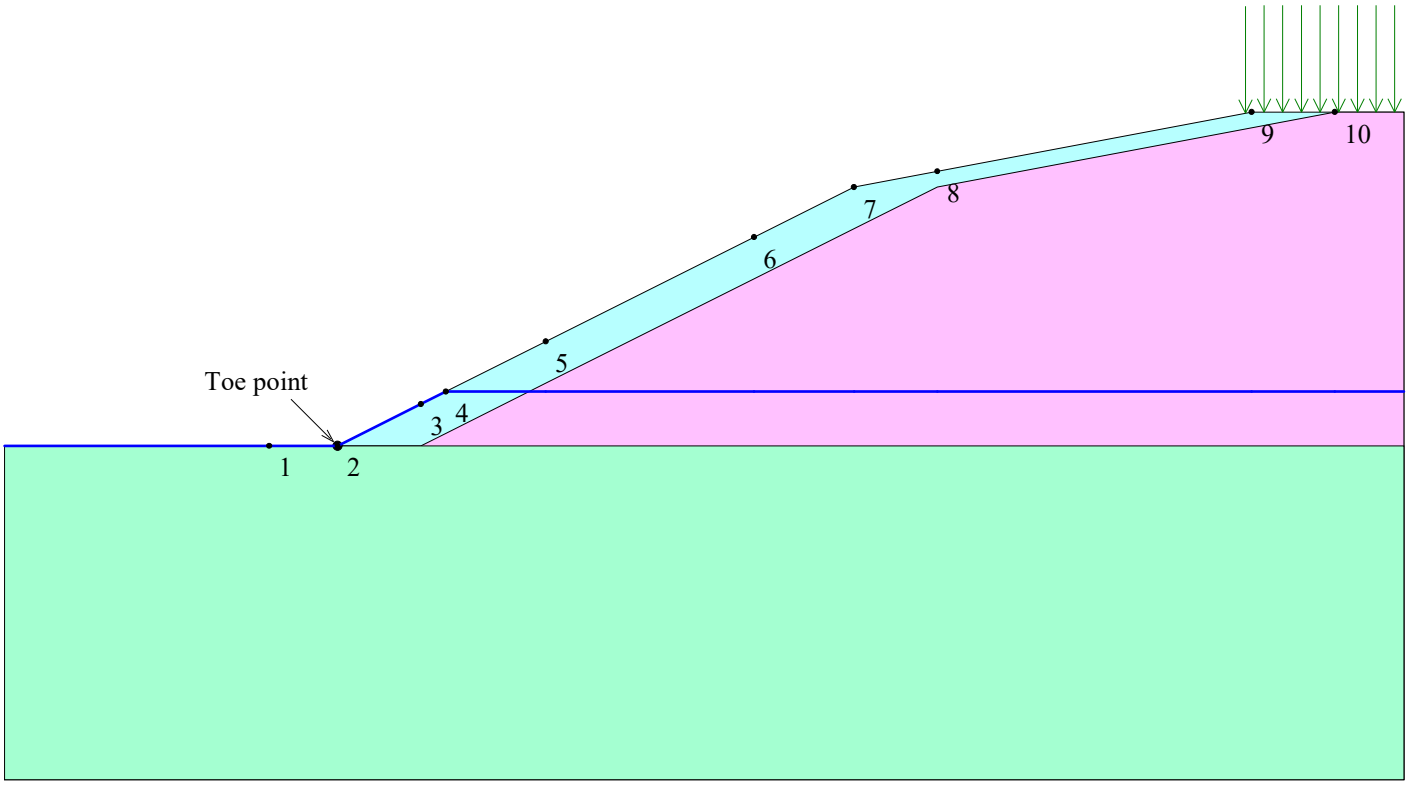
-- Problem geometry is defined along sections selected by user at x,y coordinates.
-- X1,Y1 represents the coordinates of soil surface. X2,Y2 represent the coordinates of the end of soil layer 1 and start of soil layer 2, and so on.
-- Xw,Yw represents the coordinates of phreatic surface.

GEOMETRY
Soil profile contains 3 layers

WATER GEOMETRY
Phreatic line was specified.

UNIFORM SURCHARGE
Load Q1 = 250.00 [lb/ft²] inclined from verical at 0.00 degrees, starts at X1s = 218.00 and ends at X1e = 350.00 [ft].
Surcharge load, Q2.....None
Surcharge load, Q3.....None

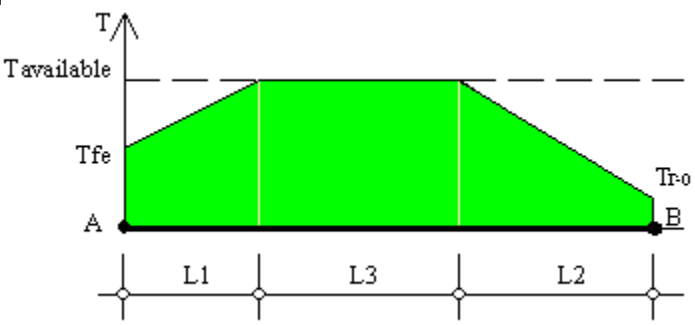
STRIP LOAD
.....None.....



SCALE:

0 5 10 15 20 25 30 [ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	65.00	11.94	0.72	52.34	0.00	0.00	1300.00
2	P1	2.00	65.00	11.94	0.72	52.34	0.00	0.00	1300.00
3	P1	3.00	65.00	11.94	0.72	52.34	0.00	0.00	1300.00
4	P1	4.00	65.00	11.94	0.69	52.37	0.00	0.00	1300.00
5	P1	5.00	65.00	11.94	0.69	52.37	0.00	0.00	1300.00
6	P1	8.00	60.00	11.84	0.72	47.43	0.00	0.00	1300.00
7	P1	11.00	60.00	10.40	0.69	48.91	0.00	0.00	1300.00
8	P1	14.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
9	P1	17.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
10	P1	23.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
11	P1	29.00	60.00	8.79	0.66	50.55	0.00	0.00	1300.00
12	P1	35.00	60.00	8.79	0.69	50.52	0.00	0.00	1300.00
13	P1	41.00	60.00	8.79	0.82	50.39	0.00	0.00	1300.00
14	P1	47.00	50.00	8.79	1.05	40.16	0.00	0.00	1300.00
15	P1	53.00	50.00	8.79	1.31	39.90	0.00	0.00	1300.00
16	P1	59.00	50.00	9.12	1.74	39.14	0.00	0.00	1300.00
17	P1	65.00	50.00	14.30	2.10	33.60	0.00	0.00	1300.00
18	P1	71.00	30.00	14.30	3.64	12.05	0.00	0.00	1300.00
19	P1	77.00	30.00	14.30	6.46	9.23	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	125.00	62.18	-20.17	0.07	23.72	98.20	107.50	1.23	
. 2	142.50	65.48	-25.56	0.19	20.21	131.31	138.88	1.23 .	OK
3	160.00	68.78	-35.69	0.21	15.90	166.50	174.10	1.27	
4	177.50	72.08	-35.00	0.00	15.19	201.31	207.47	1.31	
5	195.00	75.39	-46.29	0.30	10.85	241.92	248.29	1.38	
6	212.50	78.69	-45.42	0.09	12.75	271.69	277.76	1.44	
7	230.00	80.00	-40.22	0.05	21.34	288.60	295.04	1.52	
8	247.50	80.00	-51.00	0.27	29.61	297.11	307.59	1.60	
9	265.00	80.00	-50.20	0.06	38.91	310.07	322.57	1.70	
10	282.50	80.00	-45.59	0.18	51.45	315.49	329.91	1.81	
11	300.00	80.00	-45.00	0.00	66.04	305.07	324.65	1.92	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.66	0.23	160.00	68.78	9.59	173.05	183.02	1.28	
2	-45.92	0.47	125.00	62.18	11.10	110.10	123.57	1.27	
3	-41.63	0.64	142.50	65.48	13.24	138.69	148.55	1.23	
4	-36.38	0.51	142.50	65.48	15.07	137.58	146.41	1.23	
5	-31.02	0.36	142.50	65.48	16.94	136.31	144.17	1.23	
. 6	-25.56	0.19	142.50	65.48	20.21	131.31	138.88	1.23 .	OK
7	-20.17	0.07	125.00	62.18	23.72	98.20	107.50	1.23	
8	-15.97	0.42	125.00	62.18	25.96	96.49	104.82	1.23	
9	-10.28	0.11	125.00	62.18	28.23	94.63	102.07	1.24	
10	-5.98	0.38	125.00	62.18	30.56	92.64	99.23	1.25	
11	-0.00	0.00	142.50	65.48	31.78	118.63	122.81	1.27	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.23
Critical Circle: Xc = 20.21[ft], Yc = 131.31[ft], R = 138.88[ft]. (Number of slices used = 57)

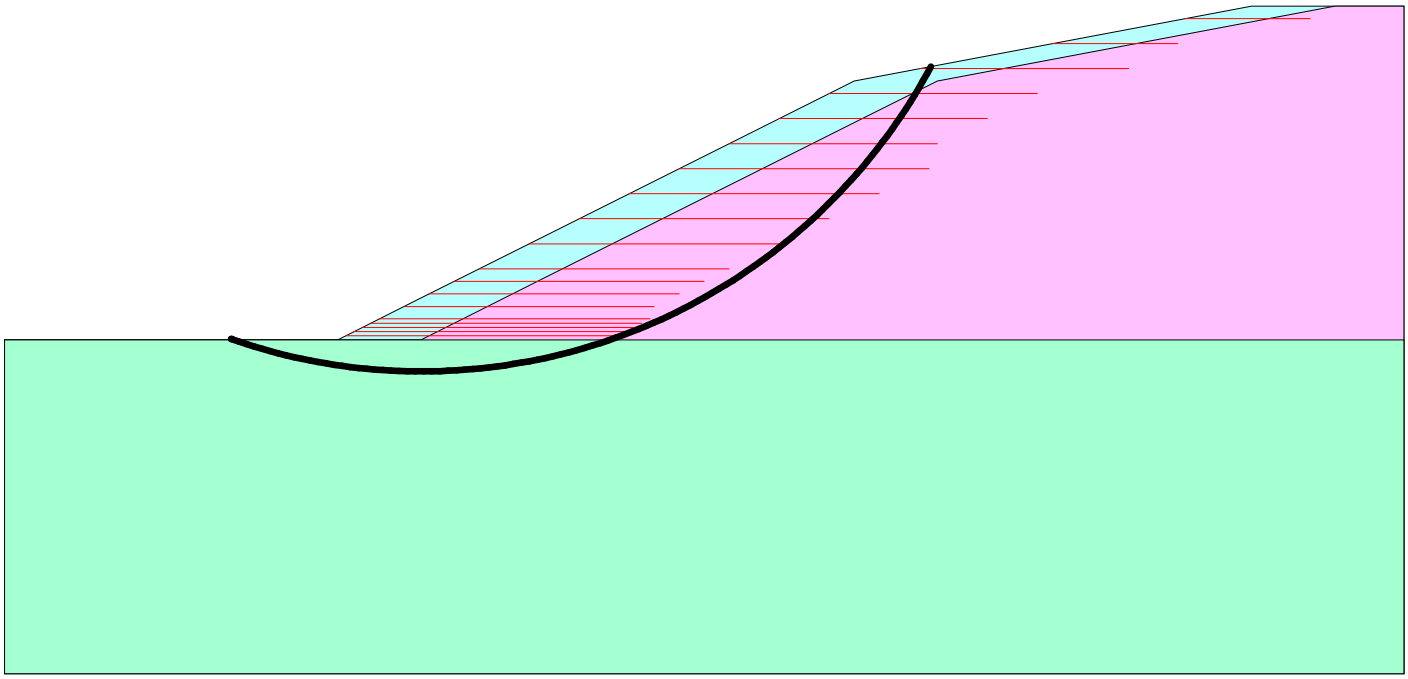
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

N O T C O N D U C T E D

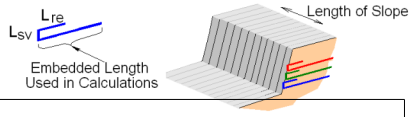
REINFORCEMENT LAYOUT: DRAWING



SCALE:

0 5 10 15 20 25 30 [ft]

REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES



Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	65.00	1.00	2.00	1.00	67.00	1.00	0.00	0.00
2	1	P1	2.00	65.00	1.00	4.00	2.00	69.00	2.00	0.00	0.00
3	1	P1	3.00	65.00	1.00	6.00	3.00	71.00	3.00	0.00	0.00
4	1	P1	4.00	65.00	1.00	8.00	4.00	73.00	4.00	0.00	0.00
5	1	P1	5.00	65.00	1.00	10.00	5.00	75.00	5.00	0.00	0.00
6	1	P1	8.00	60.00	1.00	16.00	8.00	76.00	8.00	0.00	0.00
7	1	P1	11.00	60.00	1.00	22.00	11.00	82.00	11.00	0.00	0.00
8	1	P1	14.00	60.00	1.00	28.01	14.00	88.01	14.00	0.00	0.00
9	1	P1	17.00	60.00	1.00	34.01	17.00	94.01	17.00	0.00	0.00
10	1	P1	23.00	60.00	1.00	46.01	23.00	106.01	23.00	0.00	0.00
11	1	P1	29.00	60.00	1.00	58.01	29.00	118.01	29.00	0.00	0.00
12	1	P1	35.00	60.00	1.00	70.02	35.00	130.02	35.00	0.00	0.00
13	1	P1	41.00	60.00	1.00	82.02	41.00	142.02	41.00	0.00	0.00
14	1	P1	47.00	50.00	1.00	94.02	47.00	144.02	47.00	0.00	0.00
15	1	P1	53.00	50.00	1.00	106.02	53.00	156.02	53.00	0.00	0.00
16	1	P1	59.00	50.00	1.00	118.03	59.00	168.03	59.00	0.00	0.00
17	1	P1	65.00	50.00	1.00	139.93	65.00	189.93	65.00	0.00	0.00
18	1	P1	71.00	30.00	1.00	171.75	71.00	201.75	71.00	0.00	0.00
19	1	P1	77.00	30.00	1.00	203.56	77.00	233.56	77.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	1065.00

LAW-7-2.17_SR775_59+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _SR775_59+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... 5\ReSSA 59+00\ReSSA1 SR775 59+00 (Short Term).MSEp
Original date and time of creating this file: Mon Apr 22 15:29:56 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	21.0	320.0
RETAINED SOIL.....	136.0	21.0	320.0
FOUNDATION SOIL.....	125.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water ponding is defined by 'phreatic surface' in Total Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

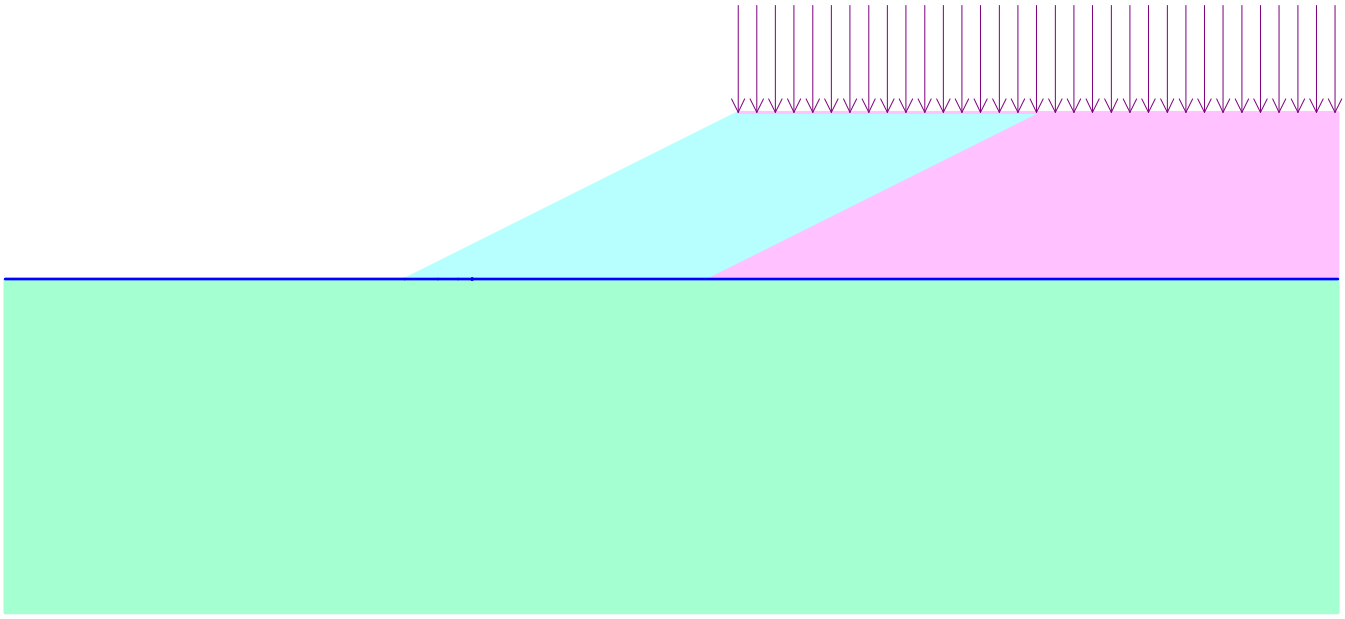
Height of slope, H	82.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	16.40	Yw =	0.00
# 3	Xw =	26.25	Yw =	0.00
# 4	Xw =	32.81	Yw =	0.00



SCALE:

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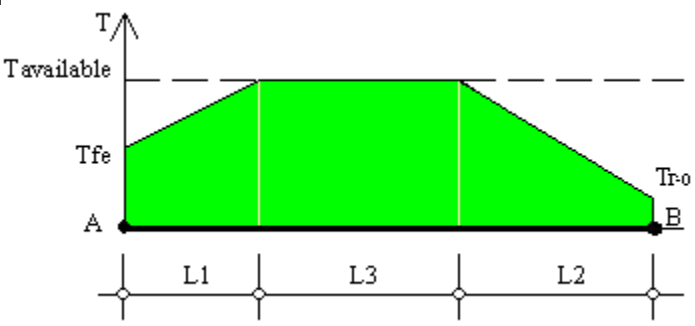
DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P1	1.00	150.00	3.94	0.36	145.70	0.00	0.00	1300.00
2	P1	2.00	150.00	3.94	0.36	145.70	0.00	0.00	1300.00
3	P1	3.00	150.00	3.94	0.36	145.70	0.00	0.00	1300.00
4	P1	4.00	150.00	3.94	0.36	145.70	0.00	0.00	1300.00
5	P1	5.00	150.00	3.94	0.36	145.70	0.00	0.00	1300.00
6	P1	6.00	150.00	3.94	0.36	145.70	0.00	0.00	1300.00
7	P1	8.00	120.00	3.94	0.43	115.64	0.00	0.00	1300.00
8	P1	10.00	120.00	3.94	0.43	115.64	0.00	0.00	1300.00
9	P1	12.00	120.00	3.94	0.43	115.64	0.00	0.00	1300.00
10	P1	14.00	120.00	3.94	0.43	115.64	0.00	0.00	1300.00
11	P1	16.00	120.00	3.94	0.43	115.64	0.00	0.00	1300.00
12	P1	18.00	120.00	3.94	0.43	115.64	0.00	0.00	1300.00
13	P1	20.00	120.00	3.94	0.43	115.64	0.00	0.00	1300.00
14	P1	25.00	120.00	3.94	0.46	115.60	0.00	0.00	1300.00
15	P1	30.00	100.00	3.94	0.52	95.54	0.00	0.00	1300.00
16	P1	35.00	100.00	3.94	0.52	95.54	0.00	0.00	1300.00
17	P1	40.00	100.00	3.94	0.59	95.47	0.00	0.00	1300.00
18	P1	45.00	100.00	3.94	0.66	95.41	0.00	0.00	1300.00
19	P1	50.00	100.00	3.94	0.75	95.31	0.00	0.00	1300.00
20	P1	55.00	100.00	3.94	0.85	95.21	0.00	0.00	1300.00
21	P1	60.00	20.00	3.94	1.80	14.26	0.00	0.00	1300.00
22	P1	65.00	20.00	3.94	1.80	14.26	0.00	0.00	1300.00
23	P1	70.00	20.00	3.94	1.80	14.26	0.00	0.00	1300.00
24	P1	75.00	20.00	3.94	2.13	13.93	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	162.00	80.98	-10.99	0.18	18.63	162.35	164.86	1.41	
2	165.80	82.00	-10.91	0.16	19.36	166.51	169.08	1.39	
3	169.60	82.00	-10.85	0.14	17.95	176.47	178.67	1.36	
4	173.40	82.00	-10.79	0.11	16.31	187.24	189.08	1.35	
5	177.20	82.00	-10.72	0.10	17.10	192.82	194.72	1.33	
6	181.00	82.00	-10.66	0.08	15.15	204.86	206.40	1.32	
7	184.80	82.00	-10.60	0.07	15.89	210.88	212.46	1.32	
. 8	188.60	82.00	-15.65	0.08	12.64	225.13	226.82	1.32 .	OK
9	192.40	82.00	-15.55	0.07	13.41	231.42	233.16	1.32	
10	196.20	82.00	-15.45	0.06	14.20	237.79	239.57	1.33	
11	200.00	82.00	-10.33	0.04	15.66	244.18	245.52	1.33	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-50.69	0.14	192.40	82.00	-0.71	253.57	258.32	1.35	
2	-46.56	0.28	192.40	82.00	-0.10	254.65	258.58	1.35	
3	-40.06	0.01	184.80	82.00	1.50	235.37	239.00	1.34	
4	-35.16	0.03	188.60	82.00	3.26	241.54	244.55	1.33	
5	-30.42	0.07	188.60	82.00	7.01	233.70	236.62	1.33	
6	-25.60	0.09	188.60	82.00	7.84	233.66	235.96	1.32	
7	-20.67	0.10	188.60	82.00	11.71	225.66	227.87	1.32	
. 8	-15.65	0.08	188.60	82.00	12.64	225.13	226.82	1.32 .	OK
9	-10.60	0.07	184.80	82.00	15.89	210.88	212.46	1.32	
10	-5.32	0.03	188.60	82.00	17.70	215.96	217.15	1.32	
11	-0.00	0.00	188.60	82.00	18.78	214.69	215.51	1.32	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.32
Critical Circle: Xc = 12.64[ft], Yc = 225.13[ft], R = 226.82[ft]. (Number of slices used = 63)

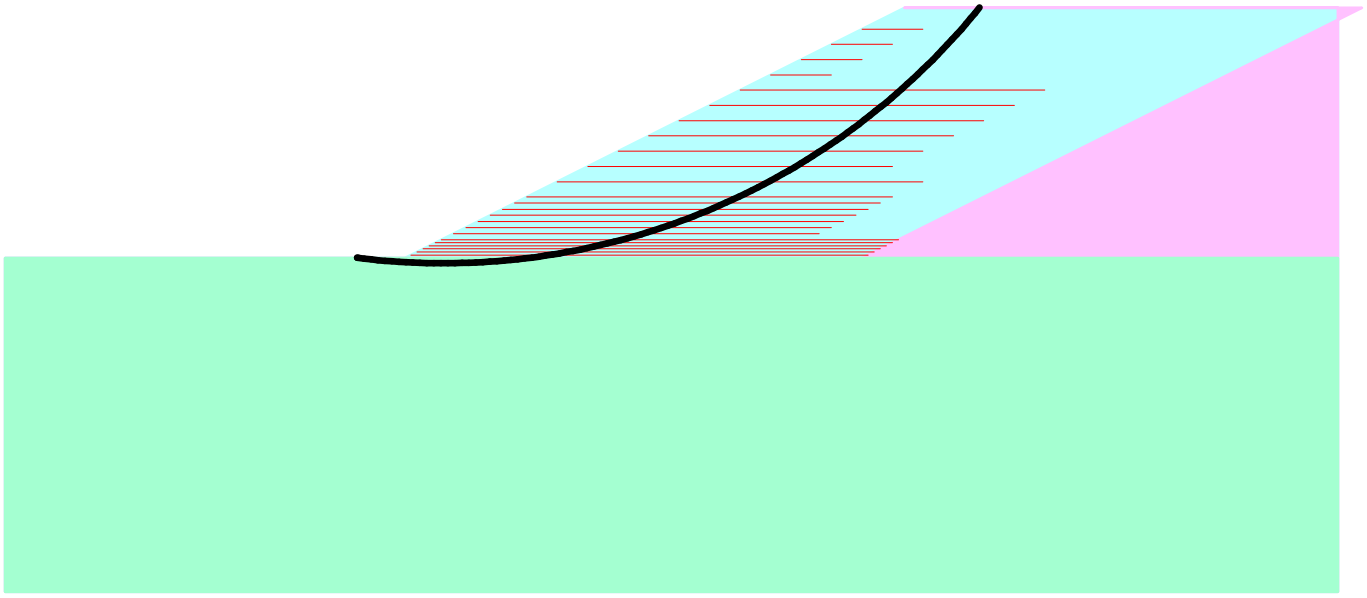
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

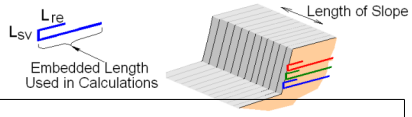
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

05112230[ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	1	P1	1.00	150.00	1.00	2.00	1.00	152.00	1.00	0.00	0.00
2	1	P1	2.00	150.00	1.00	4.00	2.00	154.00	2.00	0.00	0.00
3	1	P1	3.00	150.00	1.00	6.00	3.00	156.00	3.00	0.00	0.00
4	1	P1	4.00	150.00	1.00	8.00	4.00	158.00	4.00	0.00	0.00
5	1	P1	5.00	150.00	1.00	10.00	5.00	160.00	5.00	0.00	0.00
6	1	P1	6.00	150.00	1.00	12.00	6.00	162.00	6.00	0.00	0.00
7	1	P1	8.00	120.00	1.00	16.00	8.00	136.00	8.00	0.00	0.00
8	1	P1	10.00	120.00	1.00	20.00	10.00	140.00	10.00	0.00	0.00
9	1	P1	12.00	120.00	1.00	24.01	12.00	144.01	12.00	0.00	0.00
10	1	P1	14.00	120.00	1.00	28.01	14.00	148.01	14.00	0.00	0.00
11	1	P1	16.00	120.00	1.00	32.01	16.00	152.01	16.00	0.00	0.00
12	1	P1	18.00	120.00	1.00	36.01	18.00	156.01	18.00	0.00	0.00
13	1	P1	20.00	120.00	1.00	40.01	20.00	160.01	20.00	0.00	0.00
14	1	P1	25.00	120.00	1.00	50.01	25.00	170.01	25.00	0.00	0.00
15	1	P1	30.00	100.00	1.00	60.01	30.00	160.01	30.00	0.00	0.00
16	1	P1	35.00	100.00	1.00	70.02	35.00	170.02	35.00	0.00	0.00
17	1	P1	40.00	100.00	1.00	80.02	40.00	180.02	40.00	0.00	0.00
18	1	P1	45.00	100.00	1.00	90.02	45.00	190.02	45.00	0.00	0.00
19	1	P1	50.00	100.00	1.00	100.02	50.00	200.02	50.00	0.00	0.00
20	1	P1	55.00	100.00	1.00	110.02	55.00	210.02	55.00	0.00	0.00
21	1	P1	60.00	20.00	1.00	120.03	60.00	140.03	60.00	0.00	0.00
22	1	P1	65.00	20.00	1.00	130.03	65.00	150.03	65.00	0.00	0.00
23	1	P1	70.00	20.00	1.00	140.03	70.00	160.03	70.00	0.00	0.00
24	1	P1	75.00	20.00	1.00	150.03	75.00	170.03	75.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	2540.00

LA-7-2.17_SR775_59+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LA-7-2.17 SR775_59+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... SSA_59+00\ReSSA-59+00 SR775_59+00 (Long Term).MSEp
Original date and time of creating this file: Fri Apr 19 11:30:50 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	125.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

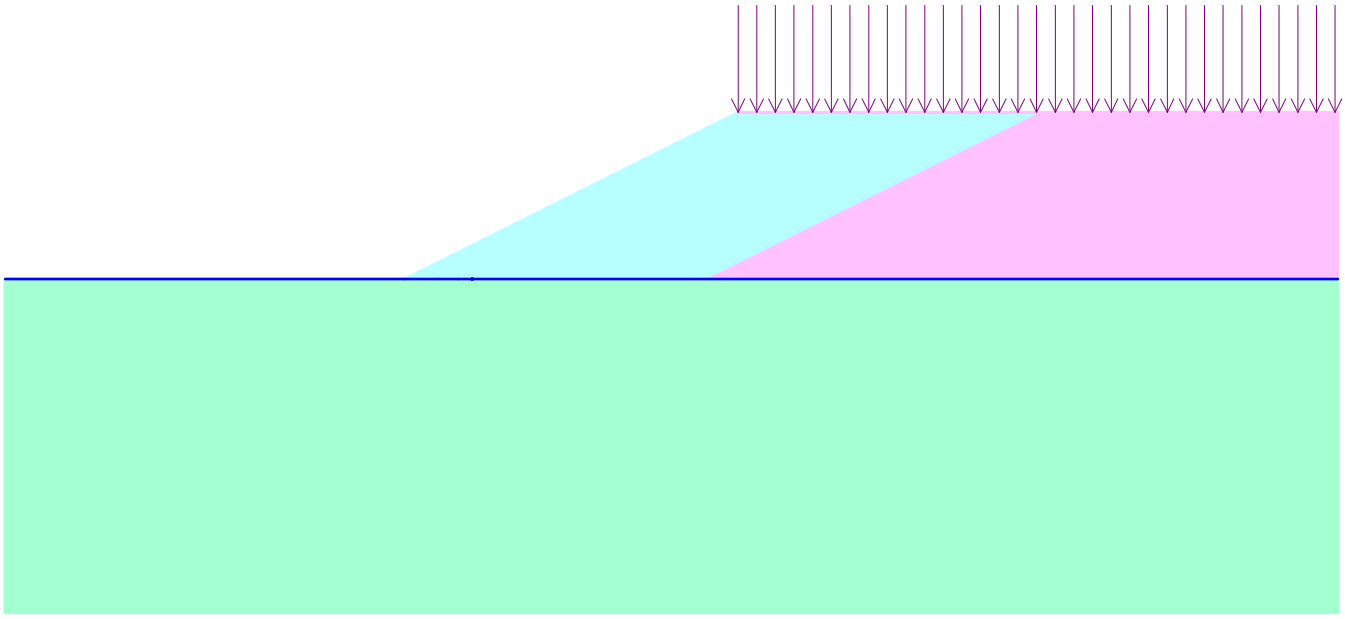
Height of slope, H	82.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

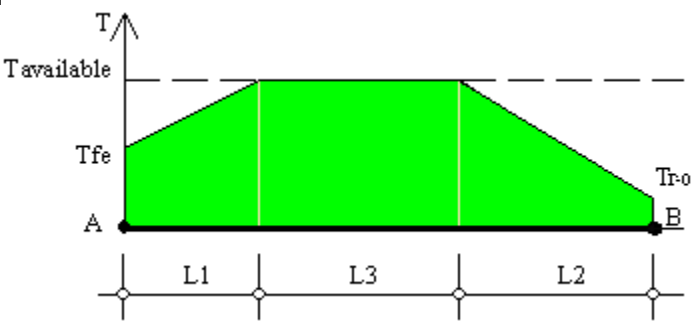
# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	16.40	Yw =	0.00
# 3	Xw =	26.25	Yw =	0.00
# 4	Xw =	32.81	Yw =	0.00



SCALE:

0511223C[ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	150.00	12.17	0.52	137.30	0.00	0.00	2500.00
2	P3	2.00	150.00	12.17	0.52	137.30	0.00	0.00	2500.00
3	P3	3.00	150.00	12.17	0.52	137.30	0.00	0.00	2500.00
4	P3	4.00	150.00	12.17	0.52	137.30	0.00	0.00	2500.00
5	P3	5.00	150.00	12.17	0.52	137.30	0.00	0.00	2500.00
6	P3	6.00	150.00	12.17	0.52	137.30	0.00	0.00	2500.00
7	P3	8.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
8	P3	10.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
9	P3	12.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
10	P3	14.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
11	P3	16.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
12	P3	18.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
13	P3	20.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
14	P3	25.00	120.00	12.17	0.66	107.17	0.00	0.00	2500.00
15	P2	30.00	100.00	10.89	0.62	88.48	0.00	0.00	2000.00
16	P2	35.00	100.00	10.89	0.66	88.45	0.00	0.00	2000.00
17	P2	40.00	100.00	10.89	0.72	88.39	0.00	0.00	2000.00
18	P2	45.00	100.00	10.89	0.82	88.29	0.00	0.00	2000.00
19	P2	50.00	100.00	10.89	0.95	88.16	0.00	0.00	2000.00
20	P2	55.00	100.00	10.89	1.12	87.99	0.00	0.00	2000.00
21	P1	60.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
22	P1	65.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
23	P1	70.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
24	P1	75.00	20.00	8.79	2.79	8.42	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	162.00	80.98	-50.62	0.34	21.91	129.73	148.33	1.56	
2	167.80	82.00	-50.11	0.06	22.79	136.91	155.06	1.53	
3	173.60	82.00	-60.91	0.46	17.68	152.45	171.10	1.52	
4	179.40	82.00	-60.40	0.20	19.98	156.97	176.17	1.51	
5	185.20	82.00	-70.83	0.43	16.33	169.44	190.16	1.52	
6	191.00	82.00	-70.27	0.14	18.69	174.07	195.36	1.52	
7	196.80	82.00	-61.51	1.03	36.03	142.37	171.73	1.51	
8	202.60	82.00	-61.06	0.67	36.09	153.77	181.32	1.50	
. 9	208.40	82.00	-60.59	0.34	35.95	166.19	191.90	1.50 .	OK
10	214.20	82.00	-70.89	0.48	29.78	187.67	212.54	1.50	
11	220.00	82.00	-70.37	0.19	30.71	197.65	221.83	1.51	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-101.39	0.77	220.00	82.00	16.60	210.36	240.51	1.53	
2	-91.24	0.69	220.00	82.00	22.27	202.54	231.58	1.52	
3	-81.46	0.82	214.20	82.00	25.49	190.30	217.58	1.51	
4	-71.39	0.84	208.40	82.00	31.51	168.95	197.10	1.50	
. 5	-60.59	0.34	208.40	82.00	35.95	166.19	191.90	1.50 .	OK
6	-50.02	0.01	202.60	82.00	40.64	150.85	175.99	1.51	
7	-40.92	0.49	208.40	82.00	44.98	159.82	181.01	1.52	
8	-30.74	0.32	179.40	82.00	32.81	147.97	160.75	1.54	
9	-20.91	0.35	179.40	82.00	36.27	146.60	157.03	1.57	
10	-10.66	0.20	179.40	82.00	36.54	152.24	159.19	1.61	
11	-0.00	0.00	185.20	82.00	33.79	173.83	177.08	1.65	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.50
Critical Circle: Xc = 35.95[ft], Yc = 166.19[ft], R = 191.90[ft]. (Number of slices used = 63)

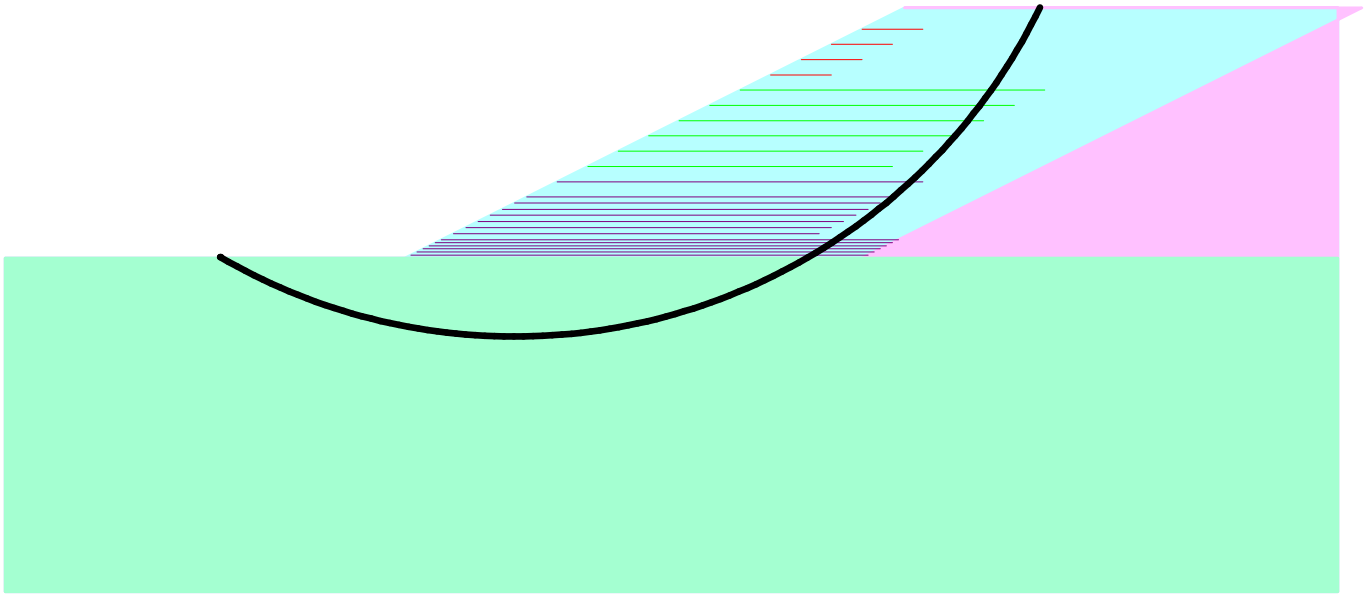
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

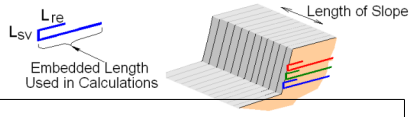
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

05112230[ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	150.00	1.00	2.00	1.00	152.00	1.00	0.00	0.00
2	3	P3	2.00	150.00	1.00	4.00	2.00	154.00	2.00	0.00	0.00
3	3	P3	3.00	150.00	1.00	6.00	3.00	156.00	3.00	0.00	0.00
4	3	P3	4.00	150.00	1.00	8.00	4.00	158.00	4.00	0.00	0.00
5	3	P3	5.00	150.00	1.00	10.00	5.00	160.00	5.00	0.00	0.00
6	3	P3	6.00	150.00	1.00	12.00	6.00	162.00	6.00	0.00	0.00
7	3	P3	8.00	120.00	1.00	16.00	8.00	136.00	8.00	0.00	0.00
8	3	P3	10.00	120.00	1.00	20.00	10.00	140.00	10.00	0.00	0.00
9	3	P3	12.00	120.00	1.00	24.01	12.00	144.01	12.00	0.00	0.00
10	3	P3	14.00	120.00	1.00	28.01	14.00	148.01	14.00	0.00	0.00
11	3	P3	16.00	120.00	1.00	32.01	16.00	152.01	16.00	0.00	0.00
12	3	P3	18.00	120.00	1.00	36.01	18.00	156.01	18.00	0.00	0.00
13	3	P3	20.00	120.00	1.00	40.01	20.00	160.01	20.00	0.00	0.00
14	3	P3	25.00	120.00	1.00	50.01	25.00	170.01	25.00	0.00	0.00
15	2	P2	30.00	100.00	1.00	60.01	30.00	160.01	30.00	0.00	0.00
16	2	P2	35.00	100.00	1.00	70.02	35.00	170.02	35.00	0.00	0.00
17	2	P2	40.00	100.00	1.00	80.02	40.00	180.02	40.00	0.00	0.00
18	2	P2	45.00	100.00	1.00	90.02	45.00	190.02	45.00	0.00	0.00
19	2	P2	50.00	100.00	1.00	100.02	50.00	200.02	50.00	0.00	0.00
20	2	P2	55.00	100.00	1.00	110.02	55.00	210.02	55.00	0.00	0.00
21	1	P1	60.00	20.00	1.00	120.03	60.00	140.03	60.00	0.00	0.00
22	1	P1	65.00	20.00	1.00	130.03	65.00	150.03	65.00	0.00	0.00
23	1	P1	70.00	20.00	1.00	140.03	70.00	160.03	70.00	0.00	0.00
24	1	P1	75.00	20.00	1.00	150.03	75.00	170.03	75.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	80.00
2	P2	1.00	600.00
3	P3	1.00	1860.00

LAW-7-2.17_SR 775_59+00

ReSSA+: Update #0.180

PROJECT IDENTIFICATION

Title: LAW-7-2.17 _SR 775_59+00
Project Number: 173609006 -
Client: ODOT
Designer: GK

Description:

Company's information:

Name: Stantec Consulting Services Inc
Street: 10200 Alliance Rd
Suite 300
Blue Ash, OH
Telephone #:
Fax #:
E-Mail:

File path and name: U:\1736090 ..... 75\ReSSA 59+00\ReSSA1 SR 775_59+00 (Rapid DD).MSEp
Original date and time of creating this file: Fri Apr 26 14:19:37 2024

PROGRAM MODE: Analysis of a Simplified Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

========== Soil Layer #: ==========	Unit weight, γ [lb/ft ^{3}]	Internal angle of friction, ϕ [deg.]	Cohesion, c [lb/ft ^{2}]
REINFORCED SOIL.....	136.0	29.0	0.0
RETAINED SOIL.....	136.0	29.0	0.0
FOUNDATION SOIL.....	125.0	28.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [lb/ft]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFc	Additional Reduction Factor, RFa	Coverage Ratio, Rc
1	P1	1300.00	1.00	1.00	1.00	1.00	1.00
2	P2	2000.00	1.00	1.00	1.00	1.00	1.00
3	P3	2500.00	1.00	1.00	1.00	1.00	1.00

Interaction Parameters Type #	Geosynthetic Designated Name	== Direct Sliding == Cds-phi	Cds-c	==== Pullout ==== Ci	Alpha
1	P1	0.67	0.67	0.67	1.00
2	P2	0.67	0.67	0.67	1.00
3	P3	0.67	0.67	0.67	1.00

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.50
Design method for Global Stability: Comprehensive Bishop.

WATER

Unit weight of water = 62.45 [lb/ft ^{3}]
Water pressure is defined by phreatic surface in Effective Stress Analysis.

SEISMICITY

Not Applicable

DRAWING OF SPECIFIED GEOMETRY - SIMPLE

GEOMETRY

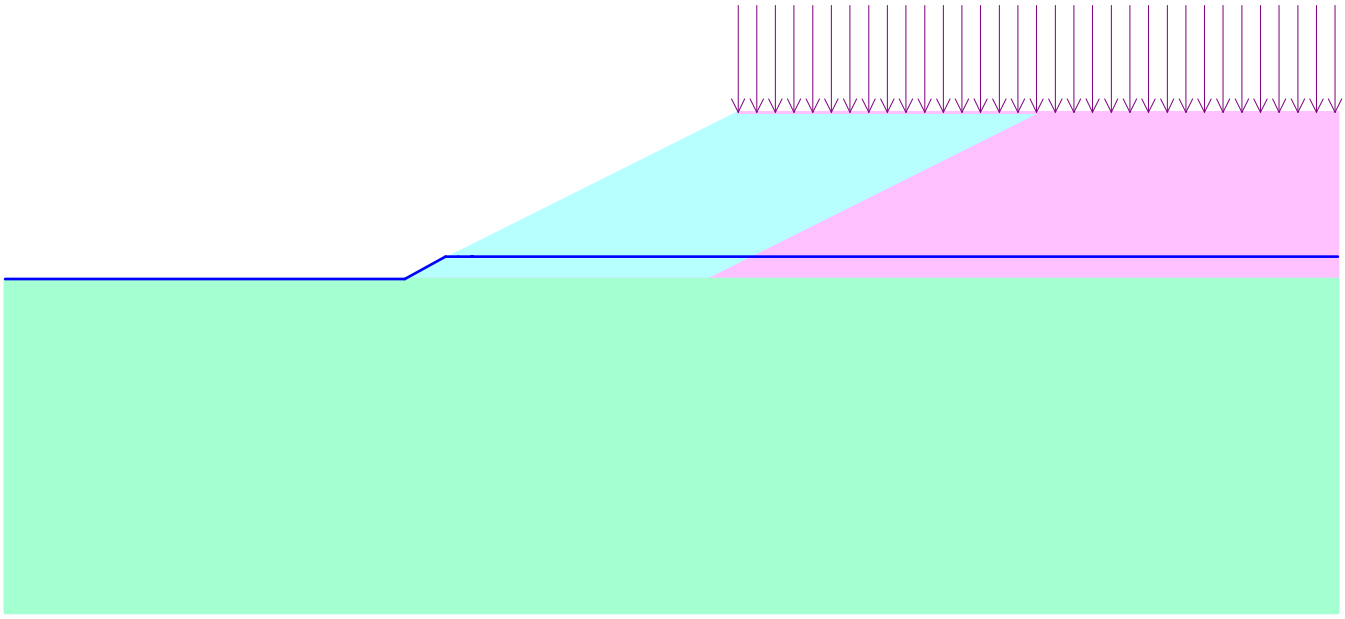
Height of slope, H	82.00	[ft]
Slope angle, i	26.56	[deg.]
Horizontal crest length, A	0.00	[ft]
Horizontal crest length, B	0.00	[ft]
Backslope angle, β	0.00	[deg.]
Sloping angle, α	0.00	[deg.]

UNIFORM SURCHARGE

Surcharge load over A, Q1	0.00	[lb/ft²]
Surcharge load over backslope B, Q2	0.00	[lb/ft²]
Surcharge load away from backslope, Q3	250.00	[lb/ft²]

WATER GEOMETRY Coordinates of water line in [ft]

# 1	Xw =	0.00	Yw =	0.00
# 2	Xw =	20.00	Yw =	11.00
# 3	Xw =	26.25	Yw =	11.00
# 4	Xw =	32.81	Yw =	11.00



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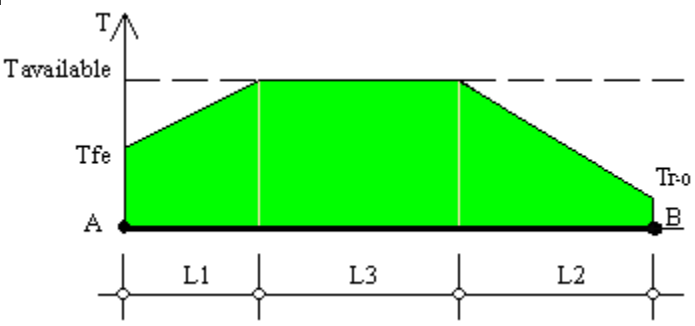
0511223([ft]

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
B = Rear-end of reinforcement
AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
Tfe = Available front-end strength (e.g., connection to facing)
Tr-o = Pullout resistance at rear-end

L1 = Front-end 'pullout' length
L2 = Rear-end pullout length
Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, Fs-po = 1.50

Reinforcement Layer #	Designated Name	Height Relative to Toe [ft]	L [ft]	L1 [ft]	L2 [ft]	L3 [ft]	Tfe [lb/ft]	Tr-o [lb/ft]	Tavailable [lb/ft]
1	P3	1.00	150.00	16.57	0.56	132.87	0.00	0.00	2500.00
2	P3	2.00	150.00	16.57	0.56	132.87	0.00	0.00	2500.00
3	P3	3.00	150.00	16.57	0.52	132.91	0.00	0.00	2500.00
4	P3	4.00	150.00	16.44	0.52	133.04	0.00	0.00	2500.00
5	P3	5.00	150.00	16.14	0.52	133.33	0.00	0.00	2500.00
6	P3	6.00	150.00	15.72	0.52	133.76	0.00	0.00	2500.00
7	P3	8.00	120.00	14.57	0.66	104.78	0.00	0.00	2500.00
8	P3	10.00	120.00	13.06	0.66	106.29	0.00	0.00	2500.00
9	P3	12.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
10	P3	14.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
11	P3	16.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
12	P3	18.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
13	P3	20.00	120.00	12.17	0.62	107.20	0.00	0.00	2500.00
14	P3	25.00	120.00	12.17	0.66	107.17	0.00	0.00	2500.00
15	P2	30.00	100.00	10.89	0.62	88.48	0.00	0.00	2000.00
16	P2	35.00	100.00	10.89	0.66	88.45	0.00	0.00	2000.00
17	P2	40.00	100.00	10.89	0.72	88.39	0.00	0.00	2000.00
18	P2	45.00	100.00	10.89	0.82	88.29	0.00	0.00	2000.00
19	P2	50.00	100.00	10.89	0.95	88.16	0.00	0.00	2000.00
20	P2	55.00	100.00	10.89	1.12	87.99	0.00	0.00	2000.00
21	P1	60.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
22	P1	65.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
23	P1	70.00	20.00	8.79	2.07	9.14	0.00	0.00	1300.00
24	P1	75.00	20.00	8.79	2.79	8.42	0.00	0.00	1300.00

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)

Entry Point #	Entry Point (X, Y) [ft]		Exit Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	162.00	80.98	-50.63	0.34	20.69	132.94	150.57	1.42	
2	170.80	82.00	-40.71	0.35	27.51	138.41	154.00	1.40	
. 3	179.60	82.00	-51.63	0.84	26.10	149.36	167.63	1.39 .	OK
4	188.40	82.00	-51.01	0.48	26.72	164.52	181.53	1.40	
5	197.20	82.00	-50.42	0.27	40.81	139.84	166.74	1.40	
6	206.00	82.00	-60.79	0.48	36.26	160.20	186.89	1.40	
7	214.80	82.00	-60.07	0.04	37.27	175.48	200.64	1.40	
8	223.60	82.00	-70.05	0.02	30.63	206.32	229.55	1.42	
9	232.40	82.00	-61.62	0.95	46.14	183.84	212.28	1.43	
10	241.20	82.00	-71.59	0.85	41.26	209.26	237.00	1.46	
11	250.00	82.00	-91.43	0.70	30.37	246.79	274.58	1.49	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

****

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.) The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).

Exit Point #	Exit Point (X, Y) [ft]		Entry Point (X, Y) [ft]		Critical Circle (Xc, Yc, R) [ft]			Fs	STATUS
1	-101.00	0.54	223.60	82.00	16.61	219.32	248.40	1.44	
2	-90.89	0.46	223.60	82.00	20.71	217.28	243.86	1.43	
3	-81.41	0.79	214.80	82.00	25.74	190.77	218.11	1.41	
4	-71.59	1.01	206.00	82.00	31.79	162.89	192.08	1.40	
5	-60.40	0.19	179.60	82.00	18.65	161.25	179.41	1.39	
. 6	-51.63	0.84	179.60	82.00	26.10	149.36	167.63	1.39 .	OK
7	-40.16	0.07	179.60	82.00	28.04	152.83	167.29	1.40	
8	-30.73	0.31	179.60	82.00	32.88	148.15	160.94	1.41	
9	-20.90	0.35	179.60	82.00	36.34	146.78	157.23	1.43	
10	-10.66	0.23	179.60	82.00	39.88	144.87	153.21	1.47	
11	-0.00	0.00	179.60	82.00	40.13	149.79	155.07	1.51	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.39
Critical Circle: Xc = 26.10[ft], Yc = 149.36[ft], R = 167.63[ft]. (Number of slices used = 65)

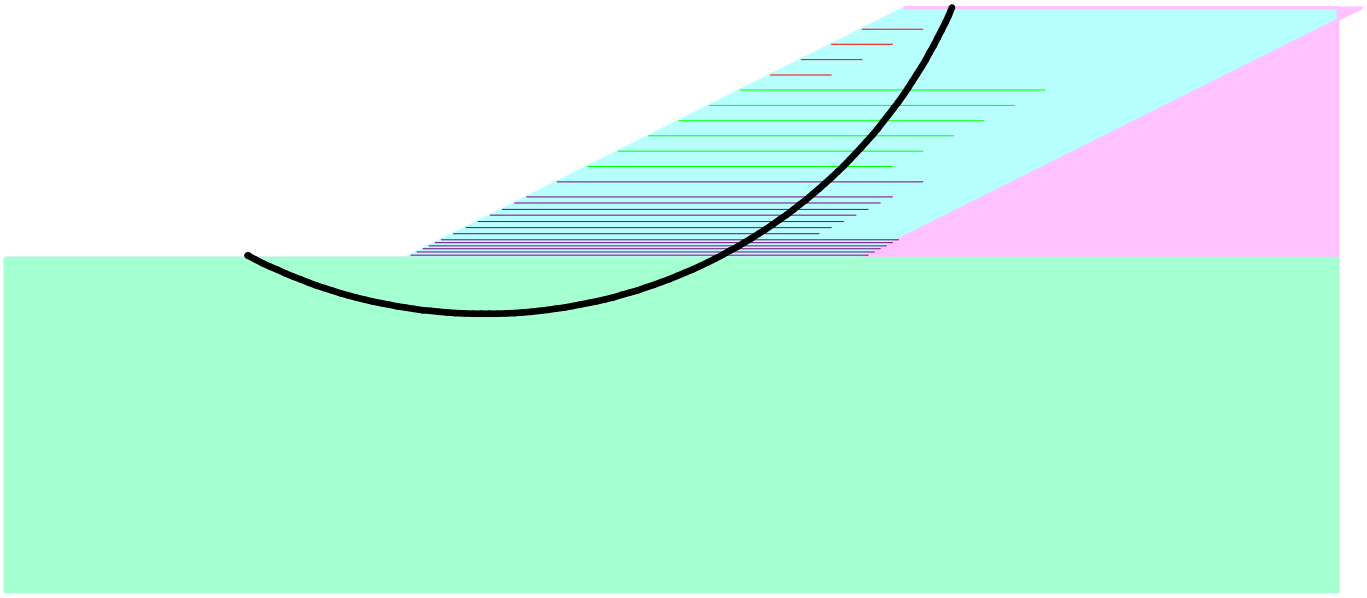
Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

N O T C O N D U C T E D

Three-Part Wedge Stability Analysis

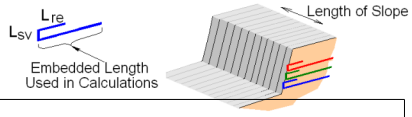
N O T C O N D U C T E D

REINFORCEMENT LAYOUT: DRAWING



SCALE:

05112230[ft]



REINFORCEMENT LAYOUT: TABULATED DATA & QUANTITIES

Layer #	Reinf. Type #	Geosynthetic Designated Name	Height Relative to Toe [ft]	Embedded Length [ft]	Covergae Ratio, Rc	(X, Y) front [ft]		(X, Y) rear [ft]		Lsv * [ft]	Lre [ft]
1	3	P3	1.00	150.00	1.00	2.00	1.00	152.00	1.00	0.00	0.00
2	3	P3	2.00	150.00	1.00	4.00	2.00	154.00	2.00	0.00	0.00
3	3	P3	3.00	150.00	1.00	6.00	3.00	156.00	3.00	0.00	0.00
4	3	P3	4.00	150.00	1.00	8.00	4.00	158.00	4.00	0.00	0.00
5	3	P3	5.00	150.00	1.00	10.00	5.00	160.00	5.00	0.00	0.00
6	3	P3	6.00	150.00	1.00	12.00	6.00	162.00	6.00	0.00	0.00
7	3	P3	8.00	120.00	1.00	16.00	8.00	136.00	8.00	0.00	0.00
8	3	P3	10.00	120.00	1.00	20.00	10.00	140.00	10.00	0.00	0.00
9	3	P3	12.00	120.00	1.00	24.01	12.00	144.01	12.00	0.00	0.00
10	3	P3	14.00	120.00	1.00	28.01	14.00	148.01	14.00	0.00	0.00
11	3	P3	16.00	120.00	1.00	32.01	16.00	152.01	16.00	0.00	0.00
12	3	P3	18.00	120.00	1.00	36.01	18.00	156.01	18.00	0.00	0.00
13	3	P3	20.00	120.00	1.00	40.01	20.00	160.01	20.00	0.00	0.00
14	3	P3	25.00	120.00	1.00	50.01	25.00	170.01	25.00	0.00	0.00
15	2	P2	30.00	100.00	1.00	60.01	30.00	160.01	30.00	0.00	0.00
16	2	P2	35.00	100.00	1.00	70.02	35.00	170.02	35.00	0.00	0.00
17	2	P2	40.00	100.00	1.00	80.02	40.00	180.02	40.00	0.00	0.00
18	2	P2	45.00	100.00	1.00	90.02	45.00	190.02	45.00	0.00	0.00
19	2	P2	50.00	100.00	1.00	100.02	50.00	200.02	50.00	0.00	0.00
20	2	P2	55.00	100.00	1.00	110.02	55.00	210.02	55.00	0.00	0.00
21	1	P1	60.00	20.00	1.00	120.03	60.00	140.03	60.00	0.00	0.00
22	1	P1	65.00	20.00	1.00	130.03	65.00	150.03	65.00	0.00	0.00
23	1	P1	70.00	20.00	1.00	140.03	70.00	160.03	70.00	0.00	0.00
24	1	P1	75.00	20.00	1.00	150.03	75.00	170.03	75.00	0.00	0.00

* Vertical distance between layers.

QUANTITIES

Reinf. Type #	Designated Name	Coverage Ratio	Area of reinforcemnt [ft²] / length of slope [ft]
1	P1	1.00	80.00
2	P2	1.00	600.00
3	P3	1.00	1860.00

Appendix G

Construction Rate Calculations

Project	LAW-7-2.17				
Sheet No.	1	of	1	Scale	NTS
Calculated By	EMK			Date	12/2/2013
Checked By				Date	

Construction Rate Analysis - Station 136+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 1.0
$FS_{long\ term}$ = calculated short term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 42.9 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.147
D_p = drainage path (feet) = 7.25 assuming 2-way drainage
C_v = coefficient of consolidation (ft^2/day) = 0.4 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 19.3 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 36 feet

Permissible Construction Rate = 13.0 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17				
Sheet No.	1	of	1	Scale	NTS
Calculated By	EMK			Date	12/2/2013
Checked By				Date	

Construction Rate Analysis - Station 160+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 1.2
$FS_{long\ term}$ = calculated short term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 20 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.031
D_p = drainage path (feet) = 12.5 assuming single drainage
C_v = coefficient of consolidation (ft^2/day) = 0.37 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 13.1 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 20 feet

Permissible Construction Rate = 10.7 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17		
Sheet No.	1 of 1	Scale	NTS
Calculated By	JMM	Date	5/2/2024
Checked By		Date	

Construction Rate Analysis - Station 198+00 (Reinforced Slope at Bridge Approach)

Because the short-term factor of safety was less than the ODOT required minimum of 1.5, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 0.9
$FS_{long\ term}$ = calculated long term factor of safety = 1.5

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 68.8 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.380
D_p = drainage path (feet) = 15 assuming 1-way drainage
C_v = coefficient of consolidation (ft^2/day) = 1.5 based on consolidation test

$t_v = T_v(D_p)^2/C_v$ = 57 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 50 feet

Permissible Construction Rate = 6.1 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17		
Sheet No.	1 of 1	Scale	NTS
Calculated By	EMK	Date	12/2/2013
Checked By		Date	

Construction Rate Analysis - Station 219+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 0.8
$FS_{long\ term}$ = calculated short term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 55.6 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.247
D_p = drainage path (feet) = 15 assuming 2-way drainage
C_v = coefficient of consolidation (ft^2/day) = 0.37 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 150 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 69 feet

Permissible Construction Rate = 3.2 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17		
Sheet No.	1 of 1	Scale	NTS
Calculated By	EMK	Date	12/2/2013
Checked By		Date	

Construction Rate Analysis - Station 293+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 0.7
$FS_{long\ term}$ = calculated short term factor of safety = 1.8

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$ = 54.5 percent

Estimate the time required for the required percent consolidation to occur.

$$t_v = T_v(D_p)^2/C_v$$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.238
D_p = drainage path (feet) = 6 assuming single drainage
C_v = coefficient of consolidation (ft^2/day) = 0.13 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 65.9 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 47 feet

Permissible Construction Rate = 5.0 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17		
Sheet No.	1 of 1	Scale	NTS
Calculated By	EMK	Date	12/18/2013
Checked By		Date	

Construction Rate Analysis - Station 297+68 (Reinforced Slope at Bridge Approach)

Because the short-term factor of safety was less than the ODOT required minimum of 1.5, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 0.9
$FS_{long\ term}$ = calculated long term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 50 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.197
D_p = drainage path (feet) = 11 assuming 1-way drainage
C_v = coefficient of consolidation (ft^2/day) = 1.5 based on consolidation test

$t_v = T_v(D_p)^2/C_v$ = 15.4 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 36 feet

Permissible Construction Rate = 16.4 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17		
Sheet No.	1 of 1	Scale	NTS
Calculated By	JMM	Date	5/2/2024
Checked By		Date	

Construction Rate Analysis - Station 300+81 (Reinforced Slope at Bridge Approach)

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 1.1
$FS_{long\ term}$ = calculated long term factor of safety = 1.8

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 31.9 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.080
D_p = drainage path (feet) = 15 assuming 1-way drainage
C_v = coefficient of consolidation (ft^2/day) = 1.5 based on consolidation test

$t_v = T_v(D_p)^2/C_v$ = 12 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 28 feet

Permissible Construction Rate = 16.3 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17					
Sheet No.	1	of	1	Scale	NTS	
Calculated By	EMK			Date	12/2/2013	
Checked By				Date		

Construction Rate Analysis - Station 322+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 1.1
$FS_{long\ term}$ = calculated short term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 33.3 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.074
D_p = drainage path (feet) = 15 assuming single drainage
C_v = coefficient of consolidation (ft^2/day) = 0.19 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 87.6 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 45 feet

Permissible Construction Rate = 3.6 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17				
Sheet No.	1	of	1	Scale	NTS
Calculated By	EMK			Date	12/2/2013
Checked By				Date	

Construction Rate Analysis - Station 329+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 0.8
$FS_{long\ term}$ = calculated short term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 55.6 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.247
D_p = drainage path (feet) = 20 assuming single drainage
C_v = coefficient of consolidation (ft^2/day) = 0.3 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 329 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 63 feet

Permissible Construction Rate = 1.3 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17				
Sheet No.	1	of	1	Scale	NTS
Calculated By	EMK			Date	12/2/2013
Checked By				Date	

Construction Rate Analysis - Station 340+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 1.2
$FS_{long\ term}$ = calculated short term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 20 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.031
D_p = drainage path (feet) = 27 assuming single drainage
C_v = coefficient of consolidation (ft^2/day) = 0.3 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 75.3 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 120 feet

Permissible Construction Rate = 11.2 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17				
Sheet No.	1	of	1	Scale	NTS
Calculated By	EMK			Date	12/2/2013
Checked By				Date	

Construction Rate Analysis - Station 371+00

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 1.1
$FS_{long\ term}$ = calculated short term factor of safety = 1.7

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 33.3 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.089
D_p = drainage path (feet) = 20 assuming single drainage
C_v = coefficient of consolidation (ft^2/day) = 0.36 based on average LL

$t_v = T_v(D_p)^2/C_v$ = 98.9 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 65 feet

Permissible Construction Rate = 4.6 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Project	LAW-7-2.17		
Sheet No.	1 of 1	Scale	NTS
Calculated By	JMM	Date	5/2/2024
Checked By		Date	

Construction Rate Analysis - SR 7 STA 377+50, Ramp I STA 377+00 (Reinforced Slope at Bridge Approach)

Because the short-term factor of safety was less than the ODOT required minimum of 1.3, a controlled rate of fill should be used. Assume that the percent consolidation (U) is directly proportional to the ratio of short term and long term factors of safety.

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\%$

where: U_{req} = required percent consolidation
$FS_{required}$ = required short term factor of safety = 1.3
$FS_{short\ term}$ = calculated short term factor of safety = 1.1
$FS_{long\ term}$ = calculated long term factor of safety = 1.5

$U_{req} = [(FS_{req} - FS_{ST}) / (FS_{LT} - FS_{ST})] \times 100\% =$ 47.6 percent

Estimate the time required for the required percent consolidation to occur.

$t_v = T_v(D_p)^2/C_v$

where: t_v = time for required consolidation to occur
Tv = time factor for required % consolidation = 0.170
D_p = drainage path (feet) = 9 assuming 2-way drainage
C_v = coefficient of consolidation (ft^2/day) = 0.2 based on consolidation test

$t_v = T_v(D_p)^2/C_v$ = 68.6 days

Estimate the permissible construction rate.

$$\text{Permissible Construction Rate} = \frac{\text{Fill Height} \times 7 \text{ days per week}}{t_v}$$

where: Fill Height = 80 feet

Permissible Construction Rate = 8.2 feet per week

Reference: Das, Principles of Geotechnical Engineering, 3rd Edition, 1994.

Appendix H

Subgrade Stabilization Spreadsheet

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Design Manual Section 600

Instructions: Enter data in the shaded cells only.
(Enter state route number, project description,county, consultant's name, prepared by name, and date prepared. This information will be transferred to all other sheets. The date prepared must be entered in the appropriate cell on this sheet to remove these instructions prior to printing.)

LAW-7-2.17
75923

Analysis of entire project to determine global CBR value.

Stantec

Prepared By: James Samples
Date prepared: Tuesday, February 27, 2024

Stantec
10200 Alliance Road
Suite 300
Cincinnati, OH 45242
(513) 842-8204
james.samples@stantec.com

NO. OF BORINGS: 53

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-001-0-11	SR-7	114+91	25	LT	Unknown	82	555.5	555.5	0.0
2	R-202-0-99	SR-7	120+00	40	LT	Unknown	60	555.7	556.5	0.8 F
3	R-203-0-99	SR-7	124+00	40	LT	Unknown	60	555.5	558.2	2.7 F
4	R-2P1-0-99	SR-7	179+30	2	RT	Unknown	82	670.7	659.8	10.9 C
5	***B-022-0-11***	SR-7	235+95	44	RT	Unknown	82	674.6	665.2	9.4 C
6	***B-026-0-11***	SR-7	255+99	82	RT	Unknown	82	612.1	606.6	5.5 C
7	***B-026-0-11***	SR-7	255+99	82	RT	Unknown	82	612.1	606.6	5.5 C
8	B-036-1-11	SR-7	272+41	161	LT	Unknown	82	570.0	574.0	4.0 F
9	B-044-0-11	SR-7	286+94	0	CL	Unknown	82	606.1	602.0	4.1 C
10	B-052-0-11	SR-7	305+98	7	RT	Unknown	82	598.3	568.7	29.6 C
11	B-053-0-11	SR-7	313+13	262	LT	Unknown	82	701.7	674.7	27.0 C
12	B-058-0-11	SR-7	334+27	285	LT	Unknown	82	737.7	732.7	5.0 C
13	***B-060-0-11***	SR-7	335+71	175	RT	Unknown	82	602.6	587.6	15.0 C
14	***B-060-0-11***	SR-7	335+71	175	RT	Unknown	82	602.6	587.6	15.0 C
15	B-068-0-11	SR-7	359+03	461	RT	Unknown	82	736.7	731.7	5.0 C
16	B-069-0-11	SR-7	359+62	105	RT	Unknown	82	797.6	728.0	69.6 C
17	***B-022-0-11***	SR-7	235+95	44	RT	Unknown	82	674.6	665.2	9.4 C
18	***B-022-0-11***	SR-7	235+95	44	RT	Unknown	82	674.6	665.2	9.4 C
19	B-073-0-12	SR-7	374+00	260	LT	Unknown	82	576.8	575.1	1.7 C
20	B-074-1-12	SR-7	387+00	0	CL	Unknown	62	583.1	583.1	0.0
21	B-075-1-12	SR-7	391+00	0	CL	Unknown	62	585.1	586.5	1.4 F
22	B-076-1-12	SR-7	395+00	0	CL	Unknown	62	591.3	593.6	2.3 F
23	B-077-1-12	SR-7	399+00	0	CL	Unknown	62	598.1	599.6	1.5 F
24	B-078-1-12	SR-7	403+00	0	CL	Unknown	62	604.1	606.1	2.0 F
25	B-079-1-12	SR-7	407+00	0	CL	Unknown	62	608.1	610.0	1.9 F
26	B-075-0-12	Ramp C	120+00	0	CL	Unknown	62	556.0	556.6	0.6 F
27	B-080-0-12	Ramp D Access	115+59	8	LT	Unknown	62	557.1	555.6	1.5 C
28	R-201-0-99	Ramp D Access	117+12	4	RT	Unknown	60	571.3	562.6	8.7 C
29	B-079-0-12	Ramp D Access	117+72	41	LT	Unknown	89	577.2	565.8	11.4 C
30	B-078-0-12	Ramp D Access	120+17	0	CL	Unknown	62	567.5	569.2	1.7 F
31	B-013-0-11	Lynn Lane	10+90	41	LT	Unknown	82	557.0	554.6	2.4 C
32	B-014-0-11	Lynn Lane	13+93	3	RT	Unknown	82	570.2	570.2	0.0
33	B-040-0-11	CR-2	13+03	10	RT	Unknown	82	641.6	640.6	1.0 C
34	B-091-0-12	CR-2	15+00	40	RT	Unknown	62	667.6	656.6	11.0 C
35	B-039-0-11	CR-2	17+09	7	RT	Unknown	82	667.4	668.0	0.6 F
36	***B-024-0-11***	CR-69	10+95	7	LT	Unknown	82	626.0	610.3	15.7 C
37	***B-024-0-11***	CR-69	10+95	7	LT	Unknown	82	626.0	610.3	15.7 C
38	B-025-0-11	CR-69	17+03	46	RT	Unknown	82	605.3	609.7	4.4 F
39	B-087-1-12	CR-69	24+00	120	Lt	Unknown	62	654.7	656.5	1.8 F
40	B-042-0-11	CR-69	39+30	5	LT	Unknown	82	632.7	628.0	4.7 C
41	***B-045-0-11***	CR-69	46+85	8	LT	Unknown	82	650.9	616.7	34.2 C
42	***B-045-0-11***	CR-69	46+85	8	LT	Unknown	82	650.9	616.7	34.2 C
43	***B-049-0-11***	CR-69	54+86	4	RT	Unknown	82	663.9	648.6	15.3 C
44	***B-049-0-11***	CR-69	54+86	4	RT	Unknown	82	663.9	648.6	15.3 C
45	B-031-0-11	CR-118	14+42	9	RT	Unknown	82	543.0	543.6	0.6 F

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
46	B-083-1-12	SR-243	13+00	300	LT	Unknown	62	744.1	695.9	48.2 C
47	B-092-0-12	SR-775	46+00	0	CL	Unknown	62	591.1	590.4	0.7 C
48	B-093-0-12	SR-775	50+00	0	CL	Unknown	62	602.9	609.7	6.8 F
49	R-116-0-99	SR-775	64+58	1	LT	Unknown	82	622.8	624.8	2.0 F
50	B-095-0-12	SR-775	67+00	110	RT	Unknown	62	655.7	638.5	17.2 C
51	B-096-0-12	SR-775	68+50	0	CL	Unknown	82	618.6	619.0	0.4 F
52	B-097-0-12	SR-775 Conn	385+00	0	CL	Unknown	82	622.6	623.8	1.2 F
53	B-098-0-12	SR-775 Conn	388+00	40	LT	Unknown	82	701.0	614.8	86.2 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	2.5	4.0	2.5	4.0	22			43	21	22	48	50	98	15	18	A-7-6	13						
	001-0	SS-2	5.0	6.5	5.0	6.5	31			43	21	22	48	50	98	14	18	A-7-6	13						
	11	SS-3	7.5	9.0	7.5	9.0	46			38	16	22	41	46	87	10	16	A-6b							
		SS-4	10.0	11.5	10.0	11.5	137	22		38	16	22	41	46	87	9	16	A-6b							
2	R	SS-2	4.0	5.5	4.8	6.3	17			34	23	11					18	A-6a	8						
	202-0	SS-3	6.0	7.5	6.8	8.3	32			34	23	11				12	18	A-6a							
	99	SS-4	8.0	9.5	8.8	10.3	25			34	23	11													
								17																	
3	R	SS-2	4.5	6.0	7.2	8.7	18			41	25	16	41	39	80		22	A-7-6							
	203-0	SS-3	6.5	8.0	9.2	10.7	20			41	25	16	41	39	80		22	A-7-6							
	99	SS-4	8.5	10.0	11.2	12.7	20			41	25	16	41	39	80	17	22	A-7-6							
4	R	SS-2	3.0	3.6	-7.9	-7.3							30	20	50		10	A-4a	8						
	2P1-0	SS-3	6.0	7.5	-4.9	-3.4	19			32	21	11	29	26	55	14	16	A-6a	4						
	99	SS-4	13.5	15.0	2.6	4.1	26			41	24	17	40	53	93	15	21	A-7-6	11						
								26																	
5	B	SS-1	0.0	1.5	-9.4	-7.9	7			34	24	10	44	26	70	23	19	A-4a	7						
	022-0	SS-2	2.5	4.0	-6.9	-5.4	10			34	24	10	44	26	70	17	19	A-4a	7						
	11	SS-3	5.0	6.5	-4.4	-2.9	10			34	24	10	44	26	70	25	19	A-4a	7						
		SS-4	7.5	9.0	-1.9	-0.4	29	7		37	22	15	48	49	97	11	17	A-6a	10						
6	B	SS-1	0.0	1.5	-5.5	-4.0	5			33	21	12	31	23	54	21	16	A-6a	5						
	026-0	SS-2	2.5	4.0	-3.0	-1.5	7			33	21	12	31	23	54	22	16	A-6a	5						
	11	SS-3	5.0	6.5	-0.5	1.0	10			33	21	12	31	23	54	21	16	A-6a	5			N_{60} & Mc		**12"**	
		SS-4	7.5	9.0	2.0	3.5	8	8		33	21	12	31	23	54	21	16	A-6a	5			N_{60} & Mc			
7	B	SS-5	10.0	11.5	4.5	6.0	38			46	21	25	43	48	91	13	18	A-7-6	15						
	026-0																								
	11																								
								30																	
8	B	SS-1	0.0	1.5	4.0	5.5	4			38	21	17	25	25	50	17	16	A-6b	5						
	036-1																								
	11																								
								4																	
9	B	SS-1	0.0	1.5	-4.1	-2.6	12			40	20	20	29	30	59	14	16	A-6b	9						
	044-0	SS-2	2.5	4.0	-1.6	-0.1	23			49	25	24	35	58	93	22	22	A-7-6	15						
	11	SS-3	5.0	6.5	0.9	2.4	41			49	25	24	35	58	93	10	22	A-7-6	15						
								30																	

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
10	B	SS-1	0.0	1.5	-29.6	-28.1	11			29	18	11	19	18	37	13	14	A-6a	1						
	052-0	SS-2	2.5	4.0	-27.1	-25.6																			
	11																								
								0																	
11	B	SS-1	0.0	1.5	-27.0	-25.5	7			52	24	28	30	59	89	24	21	A-7-6	18						
	053-0	SS-2	2.5	4.0	-24.5	-23.0	8			52	24	28	30	59	89	26	21	A-7-6	18						
	11																								
								8																	
12	B	SS-1	0.0	1.5	-5.0	-3.5	7			37	21	16	30	36	66	17	16	A-6b	9						
	058-0	SS-2	2.5	4.0	-2.5	-1.0	5			37	21	16	30	36	66	17	16	A-6b	9						
	11																								
								5																	
13	B	SS-1	0.0	1.5	-15.0	-13.5	11			40	21	19	35	36	71	15	16	A-6b	11						
	060-0	SS-2	2.5	4.0	-12.5	-11.0	12			40	21	19	35	36	71	19	16	A-6b	11						
	11	SS-3	5.0	7.0	-10.0	-8.0				36	16	20	32	46	78	19	16	A-6b	12						
		SS-4	7.5	9.0	-7.5	-6.0	18	11		36	17	19	42	36	78	14	16	A-6b	12						
14	B	SS-5	10.0	11.5	-5.0	-3.5	27			36	17	19	42	36	78	13	16	A-6b	12						
	060-0	SS-6	12.5	14.0	-2.5	-1.0	23			36	17	19	42	36	78	14	16	A-6b	12						
	11																								
								23																	
15	B	SS-1	0.0	1.5	-5.0	-3.5	10			27	17	10	53	28	81	18	12	A-4b	8						
	068-0	SS-2	2.5	4.0	-2.5	-1.0	35			33	20	13	41	19	60	13	15	A-6a	6						
	11																								
								30																	
16	B	SS-1	0.0	1.5	-69.6	-68.1	8			35	19	16	34	33	67	16	16	A-6b	9						
	069-0	SS-2	2.5	4.0	-67.1	-65.6	11			35	19	16	34	33	67	21	16	A-6b	9						
	11	SS-3	5.0	6.5	-64.6	-63.1	7			35	19	16	34	33	67	22	16	A-6b	9						
								7																	
17	B	SS-1	0.0	1.5	-9.4	-7.9	7			34	24	10	44	26	70	23	19	A-4a	7						
	022-0	SS-2	2.5	4.0	-6.9	-5.4	10			34	24	10	44	26	70	17	19	A-4a	7						
	11	SS-3	5.0	6.5	-4.4	-2.9	10			34	24	10	44	26	70	25	19	A-4a	7						
		SS-4	7.5	9.0	-1.9	-0.4	29	7		37	22	15	48	49	97	11	17	A-6a	10						
18	B	SS-5	10.0	11.5	0.6	2.1	38			37	22	15	48	49	97	12	17	A-6a	10						
	022-0	SS-6	12.5	14.0	3.1	4.6	30			37	22	15	48	49	97	13	17	A-6a	10						
	11	SS-7	15.0	16.5	5.6	7.1	26			43	22	21	42	52	94	13	19	A-7-6							
		SS-8	17.5	19.0	8.1	9.6	29	26		43	22	21	42	52	94	14	19	A-7-6							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
19	B	SS-2	3.5	5.0	1.8	3.3	7			23	13	10	36	26	62	24	10	A-4a	5			N_{60} & Mc			
	073-0																								
	12																								
								7																	
20	B	SS-1	0.0	1.5	0.0	1.5	13			30	16	14	36	17	53	11	14	A-6a	5						
	074-1	SS-2	3.5	5.0	3.5	5.0	20			30	16	14	36	17	53	11	14	A-6a	5						
	12	SS-3	6.0	7.5	6.0	7.5	13			30	16	14	36	17	53	16	14	A-6a							
		SS-4	8.5	10.0	8.5	10.0	19	13		30	16	14	36	17	53	21	14	A-6a							
21	B	SS-1	0.0	1.5	1.4	2.9	19			36	15	21	28	31	59	9	16	A-6b	9						
	075-1	SS-2	3.5	5.0	4.9	6.4	22			36	15	21	28	31	59	14	16	A-6b	9						
	12	SS-3	6.0	7.5	7.4	8.9	18			36	15	21	28	31	59	18	16	A-6b							
		SS-4	8.5	10.0	9.9	11.4	17	19		36	15	21	28	31	59	14	16	A-6b							
22	B	SS-1	0.0	1.5	2.3	3.8	7			38	19	19	33	42	75	14	16	A-6b	12						
	076-1	SS-2	3.5	5.0	5.8	7.3	19			38	19	19	33	42	75	17	16	A-6b							
	12	SS-3	6.0	7.5	8.3	9.8	27			38	19	19	33	42	75	14	16	A-6b							
		SS-4	8.5	10.0	10.8	12.3	23	7		19	14	5	33	12	45	6	10	A-4a							
23	B	SS-1	0.0	1.5	1.5	3.0	8			36	20	16	27	31	58	14	16	A-6b	7			N_{60}			
	077-1	SS-2	3.5	5.0	5.0	6.5	17			36	20	16	27	32	59	14	16	A-6b	7						
	12	SS-3	6.0	7.5	7.5	9.0	12			36	20	16	27	32	59	16	16	A-6b							
		SS-4	8.5	10.0	10.0	11.5	18	8		36	20	16	27	32	59	16	16	A-6b							
24	B	SS-1	0.0	1.5	2.0	3.5	7			34	20	14	32	27	59	12	15	A-6a	6			N_{60}			
	078-1	SS-2	3.5	5.0	5.5	7.0	28			34	20	14	32	27	59	15	15	A-6a							
	12	SS-3	6.0	7.5	8.0	9.5	16			34	20	14	32	27	59	19	15	A-6a							
		SS-4	8.5	10.0	10.5	12.0	28	7		34	20	14	32	27	59	13	15	A-6a							
25	B	SS-1	0.0	1.5	1.9	3.4	12			34	20	14	32	27	59	12	15	A-6a	6						
	079-1	SS-2	3.5	5.0	5.4	6.9	52			34	20	14	32	27	59	15	15	A-6a							
	12	SS-3	6.0	7.5	7.9	9.4	14			34	20	14	32	27	59	19	15	A-6a							
		SS-4	8.5	10.0	10.4	11.9	18	12		34	20	14	32	27	59	13	15	A-6a							
26	B	SS-1	0.0	1.5	0.6	2.1	9			35	18	17	38	39	77	17	16	A-6b	11			N_{60}			12"
	075-0	SS-2	4.0	5.5	4.6	6.1	6			35	18	17	38	39	77	15	16	A-6b	11						
	12	SS-3	6.0	7.5	6.6	8.1	19			35	18	17	38	39	77	16	16	A-6b							
		SS-4	8.0	9.5	8.6	10.1	17	6		35	18	17	38	39	77	12	16	A-6b							
27	B	SS-1	0.0	1.5	-1.5	0.0	22			40	21	19	45	41	86	15	16	A-6b	12						
	080-0	SS-2	4.0	5.5	2.5	4.0	52			34	20	14	41	34	75	9	15	A-6a	10						
	12	SS-3	6.0	7.5	4.5	6.0	87			34	20	14	41	34	75	9	15	A-6a	10						
		SS-4	8.0	9.5	6.5	8.0	52	30		34	20	14	41	34	75	7	15	A-6a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
28	R	SS-2	3.0	4.5	-5.7	-4.2	9			33	25	8	70	29	99	28	20	A-4b	8						
	201-0	SS-3	6.0	7.5	-2.7	-1.2	11																		
	99	SS-4	8.5	10.0	-0.2	1.3	13																		
								13																	
29	B	SS-5	10.5	12.0	-0.9	0.6	15			27	18	9	62	30	92	28	13	A-4b	8		A-4b	Mc	7"		
	079-0	SS-6	13.0	14.5	1.6	3.1	13			29	16	13	43	31	74	16	14	A-6a	9						
	12	SS-7	15.5	17.0	4.1	5.6	24			29	16	13	43	31	74	18	14	A-6a	9						
		SS-8	18.0	19.5	6.6	8.1	21	13		29	16	13	43	31	74	17	14	A-6a							
30	B	SS-1	0.0	1.5	1.7	3.2	12			26	22	4	70	23	93	20	17	A-4b	8		A-4b	N_{60} & Mc	38"		
	078-0	SS-2	2.5	4.0	4.2	5.7	11			26	22	4	70	23	93	29	17	A-4b	8						
	12	SS-3	5.0	6.5	6.7	8.2	14			26	22	4	70	23	93	26	17	A-4b							
		SS-4	7.5	9.0	9.2	10.7	18	11		26	22	4	70	23	93	25	17	A-4b							
31	B	SS-1	0.0	1.5	-2.4	-0.9	7			39	21	18	35	64	99	23	16	A-6b	11						
	013-0	SS-2	2.5	4.0	0.1	1.6	12			39	21	18	35	64	99	23	16	A-6b	11			N_{60} & Mc		12"	
	11	SS-3	5.0	6.5	2.6	4.1	12			39	21	18	35	64	99	26	16	A-6b	11						
		SS-4	7.5	9.0	5.1	6.6	14	12		38	21	17	35	59	94	21	16	A-6b							
32	B	SS-2	2.5	4.0	2.5	4.0	16			41	20	21	36	64	100	22	18	A-7-6	13						
	014-0	SS-3	5.0	6.5	5.0	6.5	14			41	20	21	36	64	100	24	18	A-7-6	13						
	11																								
								14																	
33	B	SS-1	0.0	1.5	-1.0	0.5	12			53	27	26	36	42	78	23	24	A-7-6	17						
	040-0	SS-2	2.5	4.0	1.5	3.0	27			53	27	26	36	42	78	6	24	A-7-6	17						
	11																								
								12																	
34	B	SS-1	0.0	1.5	-11.0	-9.5	16			36	21	15	31	38	69	15	16	A-6a	9						
	091-0	SS-2	4.0	5.5	-7.0	-5.5	26			32	22	10	30	28	58	16	17	A-4a	5						
	12																								
								26																	
35	B	SS-1	0.0	1.5	0.6	2.1	14			34	17	17	46	37	83	9	16	A-6b	11						
	039-0	SS-2	2.5	4.0	3.1	4.6	30			34	17	17	46	37	83	12	16	A-6b	11						
	11	SS-3	5.0	5.6	5.6	6.2	137			34	17	17	46	37	83	8	16	A-6b							
								14																	
36	B	SS-1	0.0	1.5	-15.7	-14.2	19			38	20	18	33	35	68	12	16	A-6b	10						
	024-0	SS-2	2.5	4.0	-13.2	-11.7	35			38	20	18	33	35	68	12	16	A-6b	10						
	11	SS-3	5.0	6.5	-10.7	-9.2	52			40	21	19	48	36	84	7	16	A-6b	12						
		SS-4	7.5	8.5	-8.2	-7.2	137	19		40	21	19	48	36	84	6	16	A-6b	12						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
37	B	SS-5	10.0	11.5	-5.7	-4.2	106			40	21	19	48	36	84	11	16	A-6b	12						
	024-0																								
	11																								
								30																	
38	B	SS-2	2.5	4.0	6.9	8.4	25			27	16	11	13	14	27	13	10	A-2-6							
	025-0	SS-3	5.0	6.0	9.4	10.4	137			27	16	11	13	14	27	12	10	A-2-6							
	11	SS-4	7.5	9.0	11.9	13.4	35			27	16	11	13	14	27	10	10	A-2-6							
		SS-5	10.0	11.5	14.4	15.9	27			48	22	26	38	58	96	24	19	A-7-6							
39	B	SS-1	0.0	1.5	1.8	3.3	32			33	21	12	19	12	31	10	10	A-2-4	0						
	087-1																								
	12																								
								30																	
40	B	SS-1	0.0	1.5	-4.7	-3.2	12			52	26	26	35	61	96	19	23	A-7-6	17						
	042-0	SS-2	2.5	4.0	-2.2	-0.7	111																		
	11																								
								30																	
41	B	SS-1	0.0	1.5	-34.2	-32.7	10			38	18	20	38	45	83	27	16	A-6b	12						
	045-0	SS-2	2.5	4.0	-31.7	-30.2	33			38	18	20	38	45	83	12	16	A-6b	12						
	11	SS-3	5.0	6.5	-29.2	-27.7	72			38	18	20	38	45	83	19	16	A-6b	12						
		SS-4	7.5	9.0	-26.7	-25.2	109	10		39	20	19	46	48	94	8	16	A-6b	12						
42	B	SS-5	10.0	11.5	-24.2	-22.7	111			39	20	19	46	48	94	8	16	A-6b	12						
	045-0																								
	11																								
								30																	
43	B	SS-1	0.0	1.5	-15.3	-13.8	8			43	18	25	38	39	77	26	18	A-7-6	15						
	049-0	SS-2	2.5	4.0	-12.8	-11.3	12			43	18	25	38	39	77	19	18	A-7-6	15						
	11	SS-3	5.0	6.5	-10.3	-8.8	11			43	18	25	38	39	77	22	18	A-7-6	15						
		SS-4	7.5	9.0	-7.8	-6.3	14	8		42	23	19	40	51	91	26	20	A-7-6	12						
44	B	SS-5	10.0	11.5	-5.3	-3.8	14			42	23	19	40	51	91	27	20	A-7-6	12						
	049-0																								
	11																								
								14																	
45	B	SS-1	0.0	1.5	0.6	2.1	10			29	17	12	31	22	53	20	14	A-6a	4			N_{60} & Mc		12"	
	031-0	SS-2	2.5	4.0	3.1	4.6	4			29	17	12	31	22	53	26	14	A-6a	4						
	11	SS-3	5.0	6.5	5.6	7.1	56			NP	NP	NP	8	4	12	10	6	A-1-a							
		SS-4	7.5	9.0	8.1	9.6	11	4		37	19	18	19	20	39	16	16	A-6b							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
46	B	SS-1	0.0	1.5	-48.2	-46.7	69			25	18	7	19	13	32	6	10	A-2-4	0						
	083-1	SS-2	2.5	4.0	-45.7	-44.2	52			25	18	7	19	13	32	6	10	A-2-4	0						
	12	SS-3	5.0	6.5	-43.2	-41.7	52			25	18	7	19	13	32	7	10	A-2-4	0						
								30																	
47	B	SS-1	0.0	1.5	-0.7	0.8	11			34	18	16	20	23	43	18	16	A-6b	3			N_{60}		12"	
	092-0	SS-2	3.5	5.0	2.8	4.3	17			34	18	16	20	23	43	16	16	A-6b	3						
	12	SS-3	6.0	7.5	5.3	6.8	17			34	18	16	20	23	43	18	16	A-6b							
		SS-4	8.5	10.0	7.8	9.3	31	11		34	18	16	20	23	43	10	16	A-6b							
48	B	SS-1	0.0	1.5	6.8	8.3	26									18									
	093-0	SS-2	3.5	5.0	10.3	11.8	13			37	21	16	27	30	57	16	16	A-6b							
	12	SS-3	6.0	7.5	12.8	14.3	20									18									
		SS-4	8.5	10.0	15.3	16.8	24									10									
49	R	SS-2	3.0	4.5	5.0	6.5				24	14	10	35	21	56	12	10	A-4a	4						
	116-0																								
	99																								
								0																	
50	B	SS-3	6.0	7.5	-11.2	-9.7	48			39	22	17	39	48	87	13	17	A-6b	11						
	095-0																								
	12																								
								30																	
51	B	SS-2	1.5	3.0	1.9	3.4	19			25	21	4	49	23	72	18	16	A-6b	7						
	096-0	SS-3	4.5	6.0	4.9	6.4	19									22									
	12	SS-4	6.5	8.0	6.9	8.4	18									19									
		SS-5	8.5	10.0	8.9	10.4	22	19								15									
52	B	SS-1	0.0	1.5	1.2	2.7	48			31	18	13	42	30	72	13	14	A-6a	9						
	097-0	SS-2	4.5	6.0	5.7	7.2	3			NP	NP	NP	25	10	35	18	8	A-3a							
	12	SS-3	6.5	8.0	7.7	9.2	10			NP	NP	NP	25	10	35	20	8	A-3a							
		SS-4	8.5	10.0	9.7	11.2	20	3		31	18	13	42	30	72	16	14	A-6a							
53	B	SS-4	8.5	10.0	-77.7	-76.2	68			35	19	16	49	40	89	8	16	A-6b	10						
	098-0																								
	12																								
								30																	

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

PID: 75923

County-Route-Section: LAW-7-2.17
No. of Borings: 53

Geotechnical Consultant: Stantec
Prepared By: James Samples
Date prepared: 2/27/2024

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	12"

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	12"
Average(HP):	0"
Global Geogrid Average(N60L):	0"
Average(HP):	0"

Design CBR	6

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	5%	HP ≤ 0.5	0%
$N_{60} < 12$	24%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	21%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	36%	HP > 2	0%
M+	12%		
Rock	0%		
Unsuitable	6%		

Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

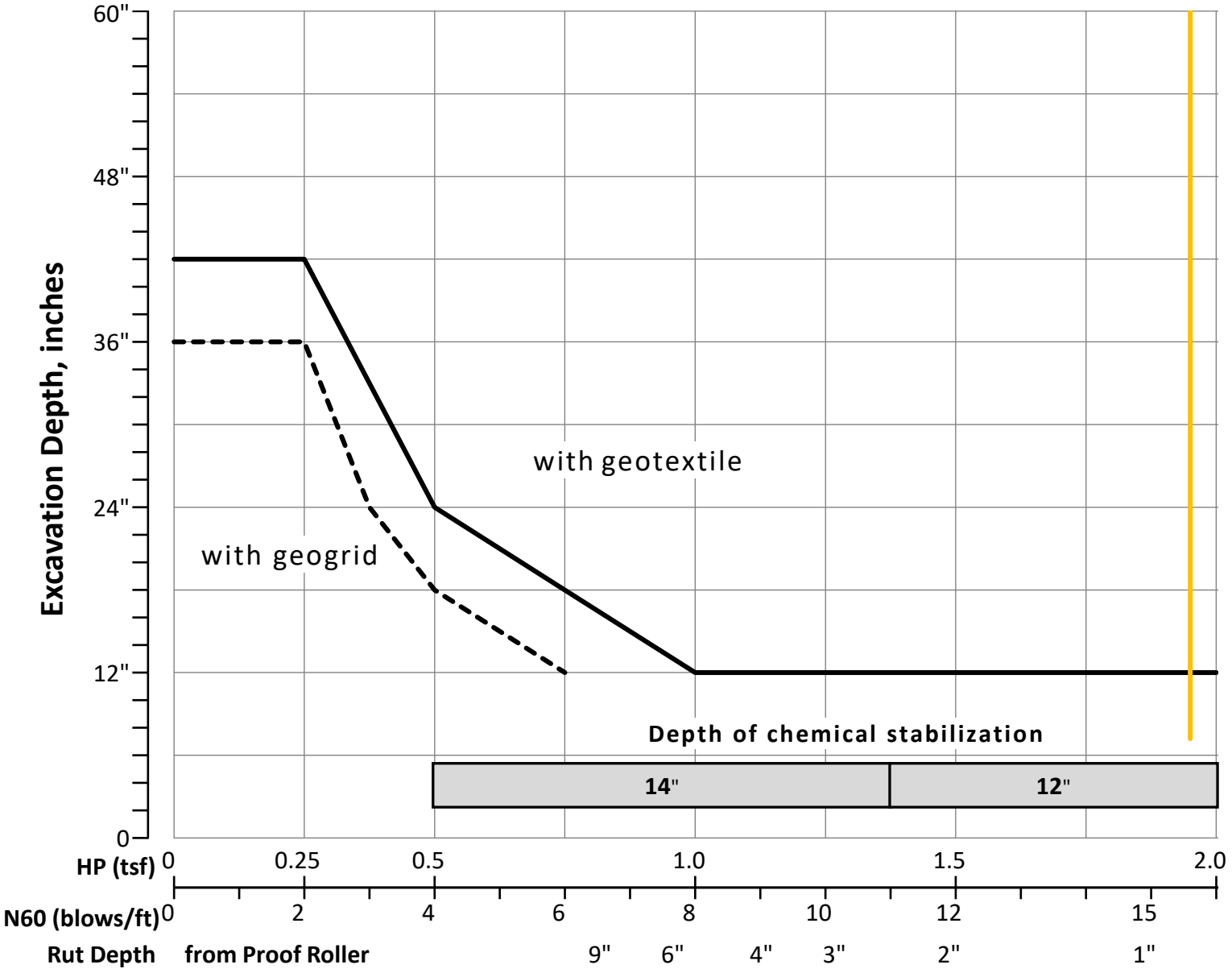
% Proposed Subgrade Surface	
Unstable & Unsuitable	15%
Unstable	13%
Unsuitable	2%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	25	16	NP	35	19	15	36	33	69	16	16	9
Maximum	137	30	NP	53	27	28	70	64	100	29	24	18
Minimum	3	0	NP	19	13	4	8	4	12	6	6	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	1	0	1	0	3	0	0	2	3	5	0	28	31	0	15	0	0	89
Percent	0%	1%	0%	1%	0%	3%	0%	0%	2%	3%	6%	0%	31%	35%	0%	17%	0%	0%	100%
% Rock|Granular|Cohesive	0%	11%									89%								100%
Surface Class Count	0	0	0	4	0	0	0	0	0	9	4	0	18	35	0	15	0	0	85
Surface Class Percent	0%	0%	0%	5%	0%	0%	0%	0%	0%	11%	5%	0%	21%	41%	0%	18%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
NP		☐ HP
15.66		☐ N60L

Average HP
Average N_{60L}

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Design Manual Section 600

Instructions: Enter data in the shaded cells only.
(Enter state route number, project description,county, consultant's name, prepared by name, and date prepared. This information will be transferred to all other sheets. The date prepared must be entered in the appropriate cell on this sheet to remove these instructions prior to printing.)

LAW-7-2.17
75923

SR 7 subgrade analysis from STA. 384+00 to end of alignment

Stantec

Prepared By: James Samples
Date prepared: Monday, March 4, 2024

Stantec
10200 Alliance Road
Suite 300
Cincinnati, OH 45242
(513) 842-8204
james.samples@stantec.com

NO. OF BORINGS: 6

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-074-1-12	SR-7	387+00	0	CL	Unknown	62	583.1	583.1	0.0
2	B-075-1-12	SR-7	391+00	0	CL	Unknown	62	585.1	586.5	1.4 F
3	B-076-1-12	SR-7	395+00	0	CL	Unknown	62	591.3	593.6	2.3 F
4	B-077-1-12	SR-7	399+00	0	CL	Unknown	62	598.1	599.6	1.5 F
5	B-078-1-12	SR-7	403+00	0	CL	Unknown	62	604.1	606.1	2.0 F
6	B-079-1-12	SR-7	407+00	0	CL	Unknown	62	608.1	610.0	1.9 F

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	0.0	1.5	0.0	1.5	13			30	16	14	36	17	53	11	14	A-6a	5						
	074-1	SS-2	3.5	5.0	3.5	5.0	20			30	16	14	36	17	53	11	14	A-6a	5						
	12	SS-3	6.0	7.5	6.0	7.5	13			30	16	14	36	17	53	16	14	A-6a							
		SS-4	8.5	10.0	8.5	10.0	19	13		30	16	14	36	17	53	21	14	A-6a							
2	B	SS-1	0.0	1.5	1.4	2.9	19			36	15	21	28	31	59	9	16	A-6b	9						
	075-1	SS-2	3.5	5.0	4.9	6.4	22			36	15	21	28	31	59	14	16	A-6b	9						
	12	SS-3	6.0	7.5	7.4	8.9	18			36	15	21	28	31	59	18	16	A-6b							
		SS-4	8.5	10.0	9.9	11.4	17	19		36	15	21	28	31	59	14	16	A-6b							
3	B	SS-1	0.0	1.5	2.3	3.8	7			38	19	19	33	42	75	14	16	A-6b	12						
	076-1	SS-2	3.5	5.0	5.8	7.3	19			38	19	19	33	42	75	17	16	A-6b							
	12	SS-3	6.0	7.5	8.3	9.8	27			38	19	19	33	42	75	14	16	A-6b							
		SS-4	8.5	10.0	10.8	12.3	23	7		19	14	5	33	12	45	6	10	A-4a							
4	B	SS-1	0.0	1.5	1.5	3.0	8			36	20	16	27	31	58	14	16	A-6b	7			N_{60}			
	077-1	SS-2	3.5	5.0	5.0	6.5	17			36	20	16	27	32	59	14	16	A-6b	7						
	12	SS-3	6.0	7.5	7.5	9.0	12			36	20	16	27	32	59	16	16	A-6b							
		SS-4	8.5	10.0	10.0	11.5	18	8		36	20	16	27	32	59	16	16	A-6b							
5	B	SS-1	0.0	1.5	2.0	3.5	7			34	20	14	32	27	59	12	15	A-6a	6			N_{60}			
	078-1	SS-2	3.5	5.0	5.5	7.0	28			34	20	14	32	27	59	15	15	A-6a							
	12	SS-3	6.0	7.5	8.0	9.5	16			34	20	14	32	27	59	19	15	A-6a							
		SS-4	8.5	10.0	10.5	12.0	28	7		34	20	14	32	27	59	13	15	A-6a							
6	B	SS-1	0.0	1.5	1.9	3.4	12			34	20	14	32	27	59	12	15	A-6a	6						
	079-1	SS-2	3.5	5.0	5.4	6.9	52			34	20	14	32	27	59	15	15	A-6a							
	12	SS-3	6.0	7.5	7.9	9.4	14			34	20	14	32	27	59	19	15	A-6a							
		SS-4	8.5	10.0	10.4	11.9	18	12		34	20	14	32	27	59	13	15	A-6a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

PID: 75923

County-Route-Section: LAW-7-2.17
No. of Borings: 6

Geotechnical Consultant: Stantec
Prepared By: James Samples
Date prepared: 3/4/2024

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	12''

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	12''
Average(HP):	0''
Global Geogrid Average(N60L):	0''
Average(HP):	0''

Design CBR	7

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	23%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	23%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	31%	HP > 2	0%
M+	0%		
Rock	0%		
Unsuitable	0%		

Excavate and Replace at Surface	
Average	0''
Maximum	0''
Minimum	0''

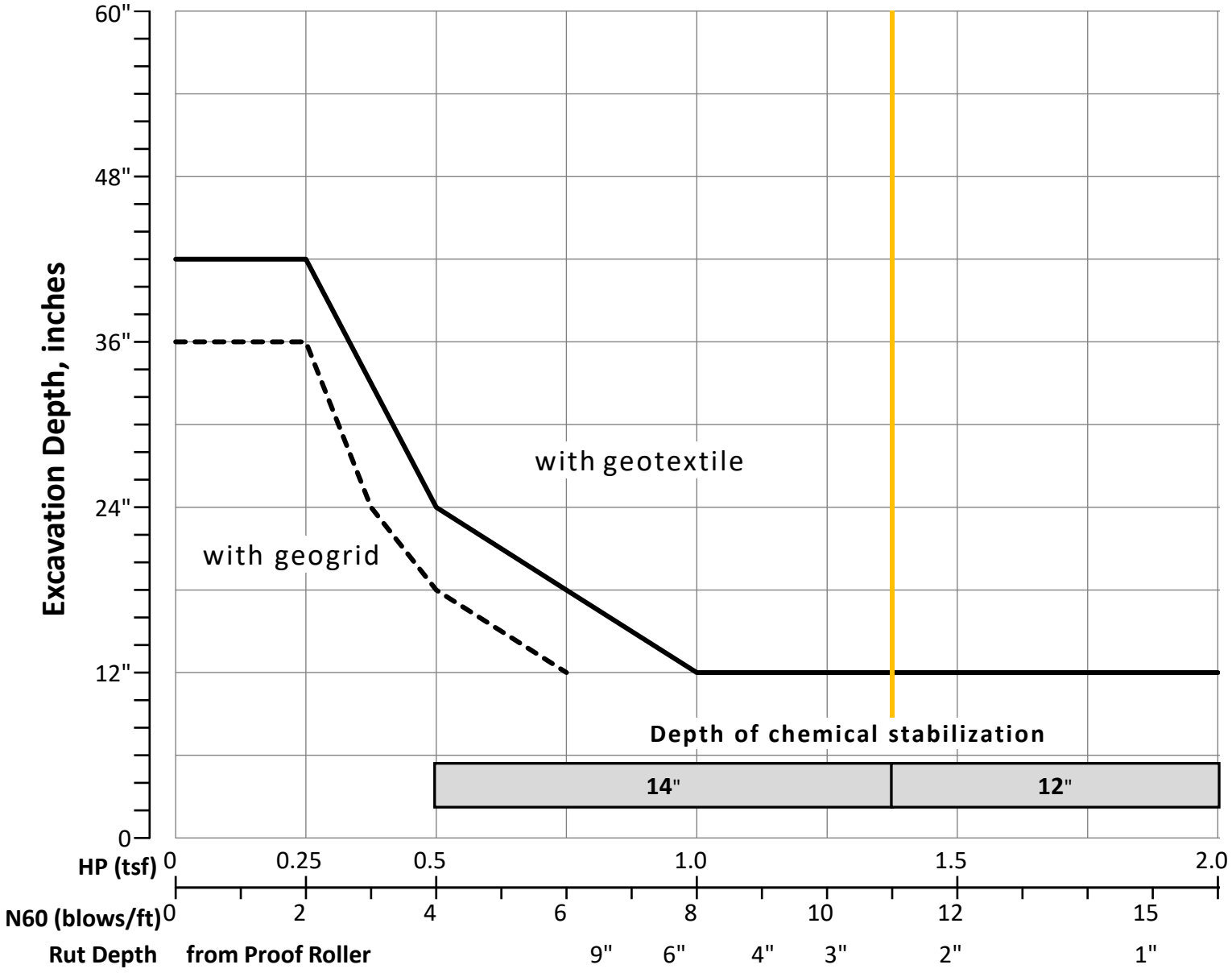
% Proposed Subgrade Surface	
Unstable & Unsuitable	33%
Unstable	33%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	19	11	NP	34	18	16	31	28	59	14	15	7
Maximum	52	19	NP	38	20	21	36	42	75	21	16	12
Minimum	7	7	NP	19	14	5	27	12	45	6	10	5

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	0	1	0	0	12	11	0	0	0	0	24
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	50%	46%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	4%									96%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	6
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
NP		☐ HP
11.00		☐ N60L

Average HP
Average N_{60L}

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Design Manual Section 600

Instructions: Enter data in the shaded cells only.
(Enter state route number, project description,county, consultant's name, prepared by name, and date prepared. This information will be transferred to all other sheets. The date prepared must be entered in the appropriate cell on this sheet to remove these instructions prior to printing.)

LAW-7-2.17
75923

Lynn Lane Subgrade Analysis

Stantec

Prepared By: James Samples
Date prepared: Monday, March 4, 2024

Stantec
10200 Alliance Road
Suite 300
Cincinnati, OH 45242
(513) 842-8204
james.samples@stantec.com

NO. OF BORINGS: 2

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-013-0-11	Lynn Lane	10+90	41	LT	Unknown	82	557.0	554.6	2.4 C
2	B-014-0-11	Lynn Lane	13+93	3	RT	Unknown	82	570.2	570.2	0.0

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	0.0	1.5	-2.4	-0.9	7			39	21	18	35	64	99	23	16	A-6b	11						
	013-0	SS-2	2.5	4.0	0.1	1.6	12			39	21	18	35	64	99	23	16	A-6b	11			N_{60} & Mc		**12''**	
	11	SS-3	5.0	6.5	2.6	4.1	12			39	21	18	35	64	99	26	16	A-6b	11						
		SS-4	7.5	9.0	5.1	6.6	14	12		38	21	17	35	59	94	21	16	A-6b							
2	B	SS-2	2.5	4.0	2.5	4.0	16			41	20	21	36	64	100	22	18	A-7-6	13						
	014-0	SS-3	5.0	6.5	5.0	6.5	14			41	20	21	36	64	100	24	18	A-7-6	13						
	11																								
								14																	

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

PID: 75923

County-Route-Section: LAW-7-2.17
No. of Borings: 2

Geotechnical Consultant: Stantec
Prepared By: James Samples
Date prepared: 3/4/2024

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	Option
206	Depth	12"

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	12"
Average(HP):	0"
Global Geogrid Average(N60L):	0"
Average(HP):	0"

Design CBR	5

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	80%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	0%	HP > 2	0%
M+	20%		
Rock	0%		
Unsuitable	0%		

Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

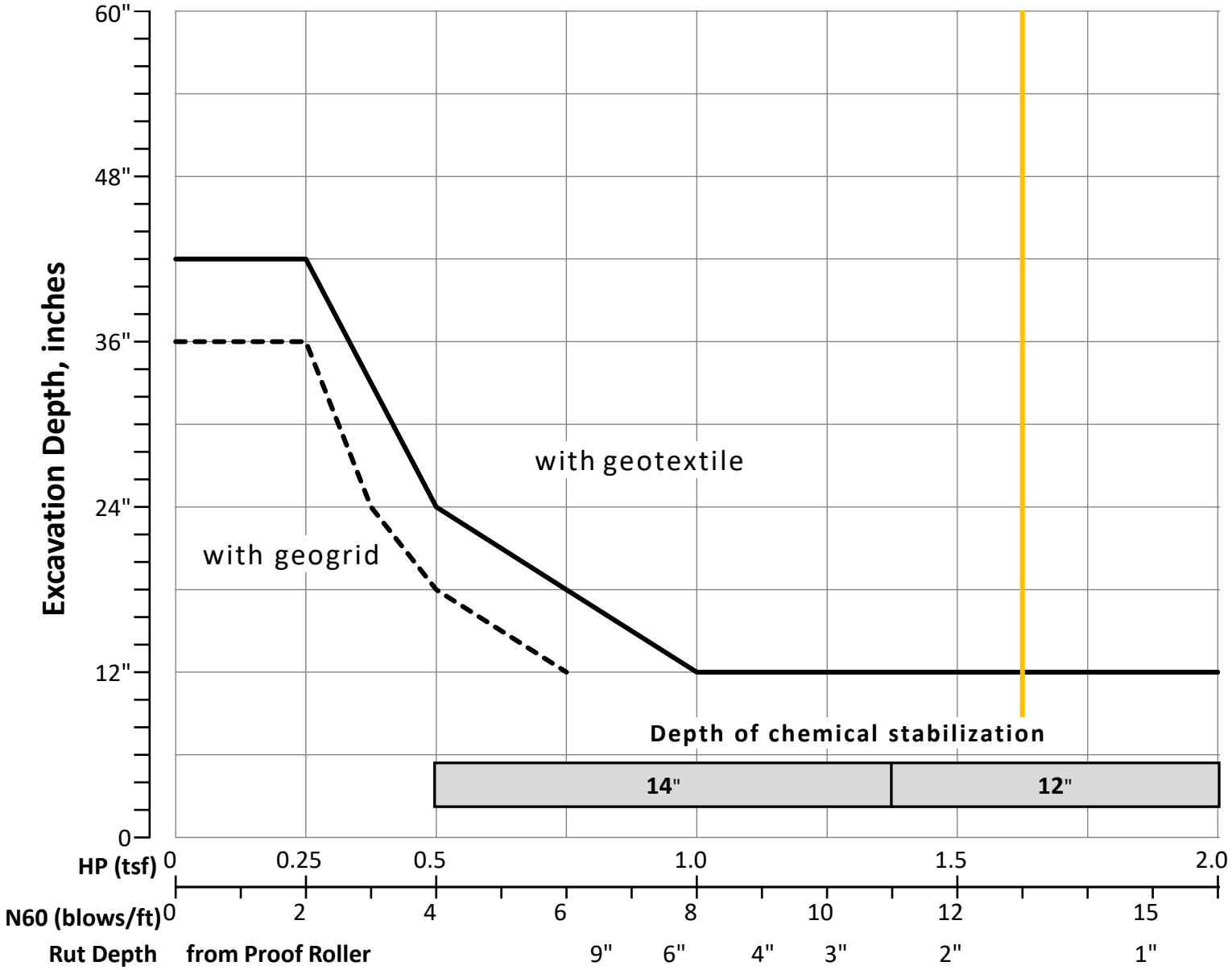
% Proposed Subgrade Surface	
Unstable & Unsuitable	25%
Unstable	25%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	14	13	NP	40	21	19	35	63	98	23	17	12
Maximum	16	14	NP	41	21	21	36	64	100	26	18	13
Minimum	7	12	NP	38	20	17	35	59	94	21	16	11

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0	0	5
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	60%	0%	40%	0%	0%	100%
% Rock|Granular|Cohesive	0%	0%				0%					100%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	4
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	75%	0%	25%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
NP		☐ HP
13.00	7.00	☐ N60L

Average HP
Average N_{60L}

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Design Manual Section 600

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LAW-7-2.17
75923

Ramp C subgrade analysis from STA. 119+55 to 121+50

Stantec

Prepared By: James Samples
Date prepared: Monday, March 4, 2024

Stantec
10200 Alliance Road
Suite 300
Cincinnati, OH 45242
(513) 842-8204
james.samples@stantec.com

NO. OF BORINGS: 1

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-075-0-12	Ramp C	120+00	0	CL	Unknown	62	556.0	556.6	0.6 F

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B 075-0 12	SS-1	0.0	1.5	0.6	2.1	9			35	18	17	38	39	77	17	16	A-6b	11			N_{60}		12''	
		SS-2	4.0	5.5	4.6	6.1	6			35	18	17	38	39	77	15	16	A-6b	11						
		SS-3	6.0	7.5	6.6	8.1	19			35	18	17	38	39	77	16	16	A-6b							
		SS-4	8.0	9.5	8.6	10.1	17	6		35	18	17	38	39	77	12	16	A-6b							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

PID: 75923

County-Route-Section: LAW-7-2.17
No. of Borings: 1

Geotechnical Consultant: Stantec
Prepared By: James Samples
Date prepared: 3/4/2024

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	Option
206	Depth	14"

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	18"
Average(HP):	0"
Global Geogrid Average(N60L):	12"
Average(HP):	0"

Design CBR	6

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	100%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	0%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	0%	HP > 2	0%
M+	0%		
Rock	0%		
Unsuitable	0%		

Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

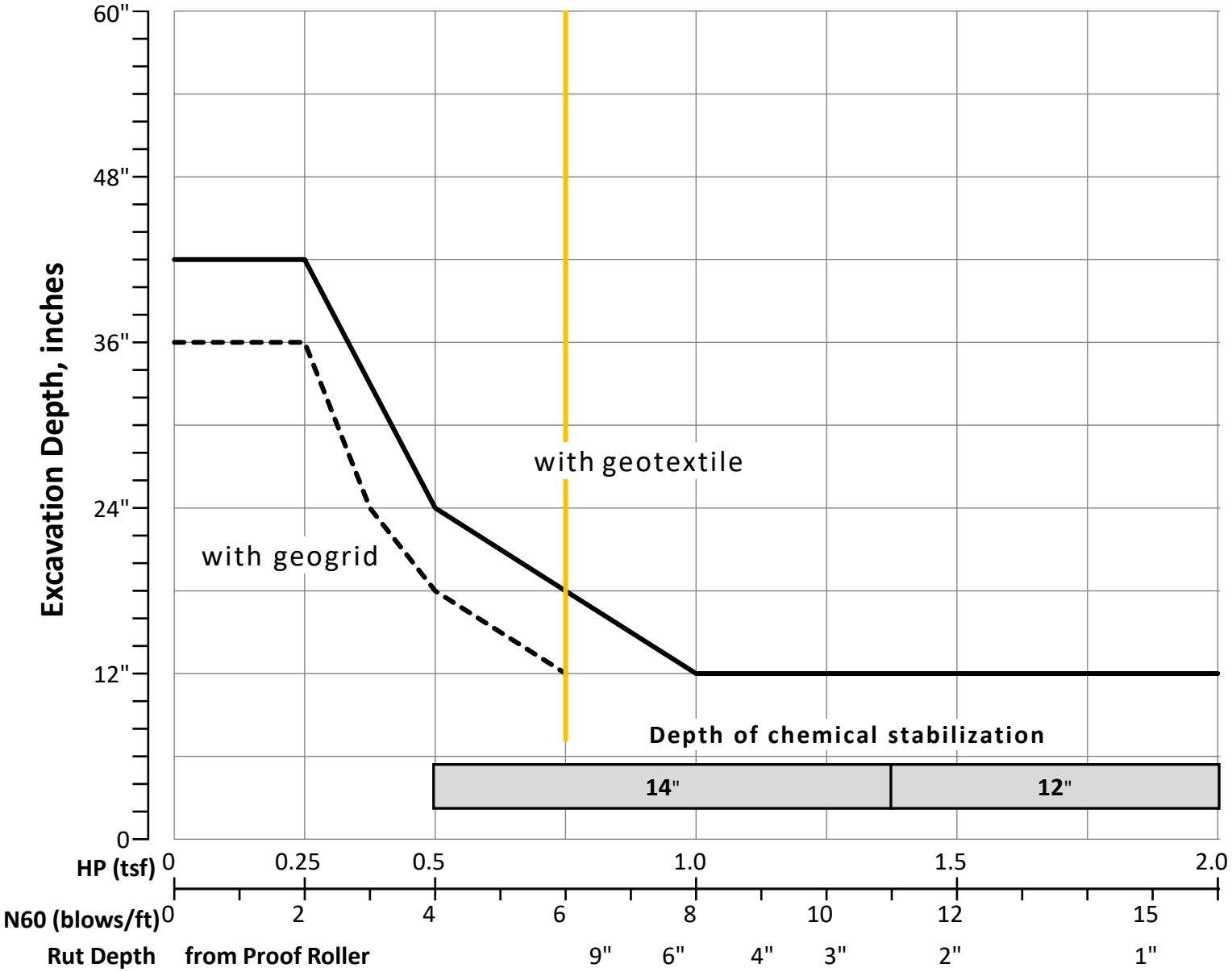
% Proposed Subgrade Surface	
Unstable & Unsuitable	100%
Unstable	100%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	13	6	NP	35	18	17	38	39	77	15	16	11
Maximum	19	6	NP	35	18	17	38	39	77	17	16	11
Minimum	6	6	NP	35	18	17	38	39	77	12	16	11

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	0%					0%				100%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
NP		☐ HP
6.00	7.00	☐ N60L

Average HP
Average N_{60L}

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OFFICE OF GEOTECHNICAL ENGINEERING

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Geotechnical Design Manual Section 600

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LAW-7-2.17
75923

CR 118 subgrade analysis from STA. 13+00 to 14+76

Stantec

Prepared By: James Samples
Date prepared: Monday, March 4, 2024

Stantec
10200 Alliance Road
Suite 300
Cincinnati, OH 45242
(513) 842-8204
james.samples@stantec.com

NO. OF BORINGS: 1

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-031-0-11	CR-118	14+42	9	RT	Unknown	82	543.0	543.6	0.6 F

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B 031-0 11	SS-1	0.0	1.5	0.6	2.1	10			29	17	12	31	22	53	20	14	A-6a	4			N_{60} & Mc		12''	
		SS-2	2.5	4.0	3.1	4.6	4			29	17	12	31	22	53	26	14	A-6a	4						
		SS-3	5.0	6.5	5.6	7.1	56			NP	NP	NP	8	4	12	10	6	A-1-a							
		SS-4	7.5	9.0	8.1	9.6	11	4		37	19	18	19	20	39	16	16	A-6b							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

PID: 75923

County-Route-Section: LAW-7-2.17
No. of Borings: 1

Geotechnical Consultant: Stantec
Prepared By: James Samples
Date prepared: 3/4/2024

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	14''

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	24''
Average(HP):	0''
Global Geogrid Average(N60L):	18''
Average(HP):	0''

Design CBR	8

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	33%	HP ≤ 0.5	0%
$N_{60} < 12$	67%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	0%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	33%	HP > 2	0%
M+	33%		
Rock	0%		
Unsuitable	0%		

Excavate and Replace at Surface	
Average	0''
Maximum	0''
Minimum	0''

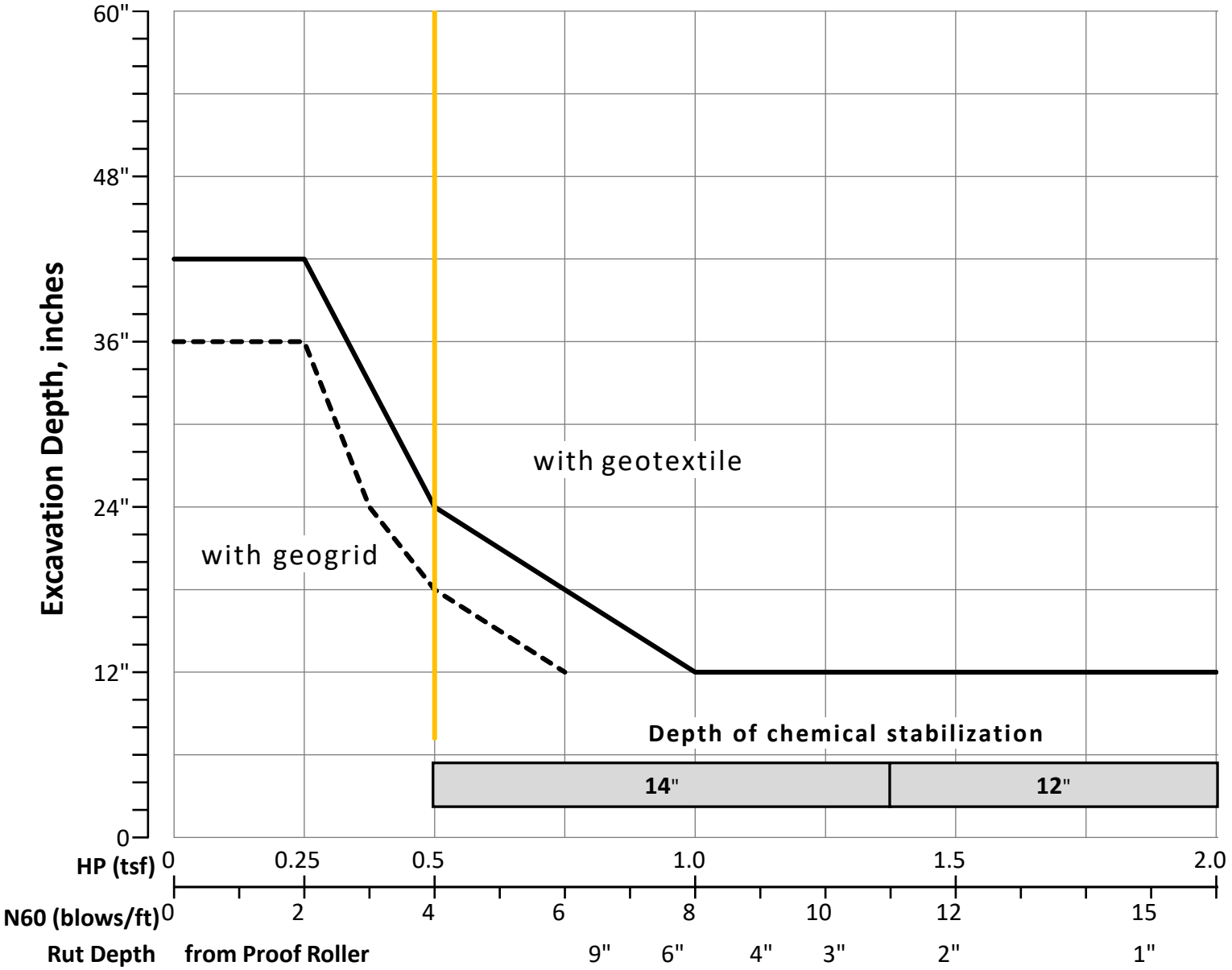
% Proposed Subgrade Surface	
Unstable & Unsuitable	100%
Unstable	100%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	20	4	NP	32	18	14	22	17	39	18	13	4
Maximum	56	4	NP	37	19	18	31	22	53	26	16	4
Minimum	4	4	NP	29	17	12	8	4	12	10	6	4

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	4
Percent	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	25%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	25%									75%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
NP		☐ HP
4.00		☐ N60L

Average HP
Average N_{60L}

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Geotechnical Design Manual Section 600

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LAW-7-2.17
75923

SR 775 subgrade analysis from STA. 45+43 to 48+50

Stantec

Prepared By: James Samples
Date prepared: Monday, March 4, 2024

Stantec
10200 Alliance Road
Suite 300
Cincinnati, OH 45242
(513) 842-8204
james.samples@stantec.com

NO. OF BORINGS: 1

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-092-0-12	SR-775	46+00	0	CL	Unknown	62	591.1	590.4	0.7 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B 092-0 12	SS-1	0.0	1.5	-0.7	0.8	11			34	18	16	20	23	43	18	16	A-6b	3			N_{60}		12"	
		SS-2	3.5	5.0	2.8	4.3	17			34	18	16	20	23	43	16	16	A-6b	3						
		SS-3	6.0	7.5	5.3	6.8	17			34	18	16	20	23	43	18	16	A-6b							
		SS-4	8.5	10.0	7.8	9.3	31	11		34	18	16	20	23	43	10	16	A-6b							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.6 2/11/2022

PID: 75923

County-Route-Section: LAW-7-2.17
No. of Borings: 1

Geotechnical Consultant: Stantec
Prepared By: James Samples
Date prepared: 3/4/2024

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	Option
206	Depth	12''

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	12''
Average(HP):	0''
Global Geogrid Average(N60L):	0''
Average(HP):	0''

Design CBR	9

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	33%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	0%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	0%	HP > 2	0%
M+	0%		
Rock	0%		
Unsuitable	0%		

Excavate and Replace at Surface	
Average	0''
Maximum	0''
Minimum	0''

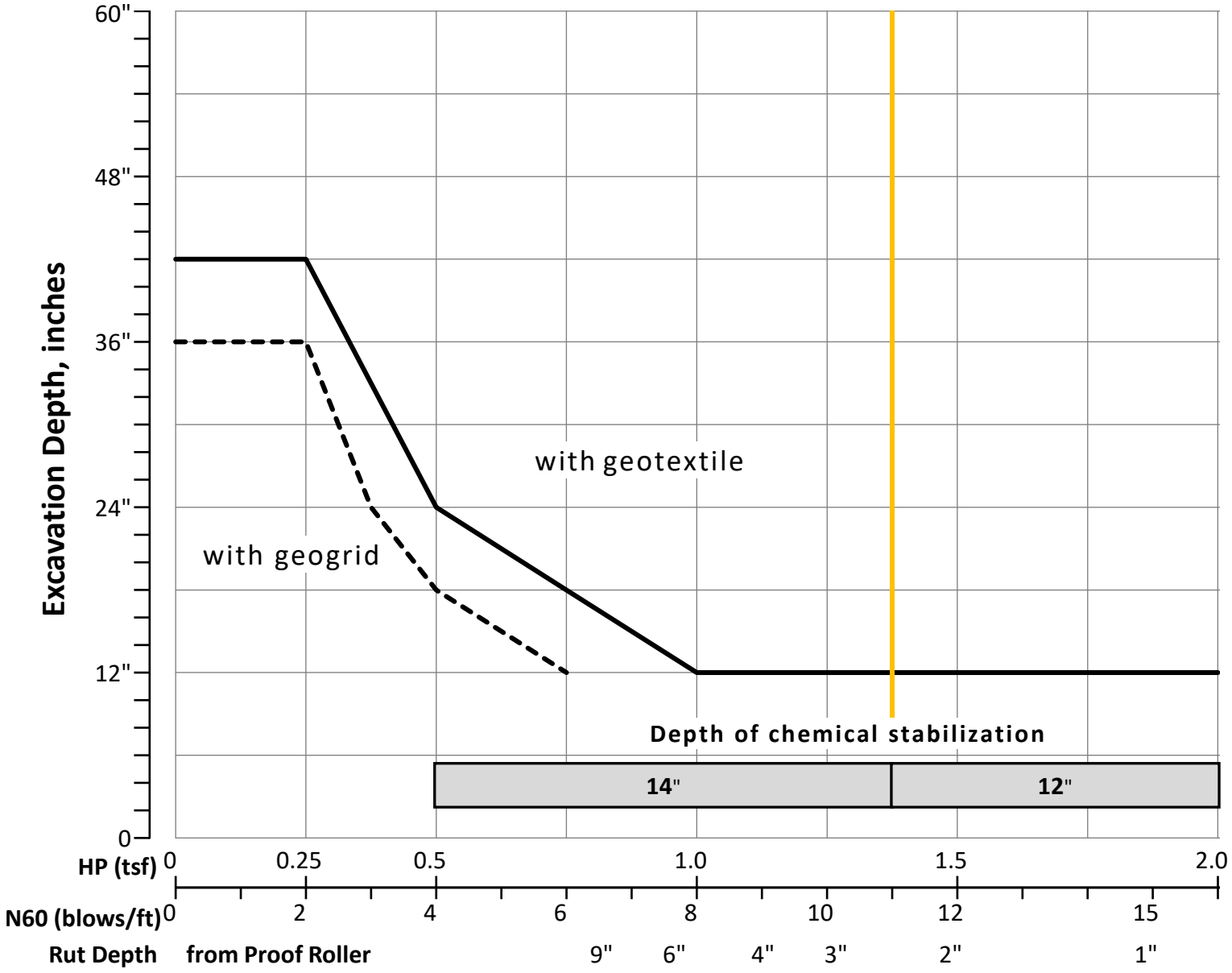
% Proposed Subgrade Surface	
Unstable & Unsuitable	100%
Unstable	100%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	19	11	NP	34	18	16	20	23	43	16	16	3
Maximum	31	11	NP	34	18	16	20	23	43	18	16	3
Minimum	11	11	NP	34	18	16	20	23	43	10	16	3

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	0%					0%				100%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
NP		☐ HP
11.00		☐ N60L

Average HP
Average N_{60L}

Appendix I

Retaining Wall Analysis

Client: *ODOT – District 9*
Project: *LAW-7-02.17*
Description: Retaining Wall between Ramp J and Ramp K

Date: *08/27/2024*
Job No: *173609006*
By: *BSM*

DESIGN CALCULATIONS FOR RETAINING WALL BETWEEN RAMP J AND RAMP K

Revisioning					
Rev.	**Date**	**Description**	**By**	**Checked**	**Date**
0	*08/06/21*	*Design Calculation for Retaining Wall*	*BSM*		
1	*08/27/24*	*Design Calculation for Retaining Wall*	*BSM*	MRS	09/30/24

Location and Format

Electronic copies of these calculations are located in the project files system at:

U:\173608714\LAW\75923\structures\LAW007_Retaining_Wall\analysis\eng_data\00_calc_package

The following calculations were generated using the following software:

Mathcad, Excel, STAAD Pro.

Table of Contents

Client:	*ODOT – District 9*	**Date:**	*08/27/2024*
Project:	*LAW-7-02.17*	**Job No:**	*173609006*
Description:	Retaining Wall between Ramp J and Ramp K	**By:**	*BSM*

Objective

Check retaining .stability and reinforcing design for wall.

Design Basis

Geotechnical Memo, AASHTO LRFD 9th Edition,ODOT Geotechnical Design Manual, and ODOT BDM 2020

Objective:

Reference:

Calculate stability of retaining wall based on soil parameters and grade separations from plans.

Assumptions:

Soil parameters provided by Geotechnical engineers for determining stability of wall.

- Backfill will have the following parameters based on use of granular backfill behind the wall.
  - Soil weight: 130 pcf
  - friction angle: 34 degrees
- Founding soils/claystone/mudstone shall have the following parameters: (assumed to be soil-like due to pressure-relief slickensides)
  - Maximum allowable bearing capacity: 11.3ksf
  - Cohesion Value: 4 ksf

Traffic Barrier will be placed on top of wall and will need to be capable withstanding a traffic crash. Barrier used will be SBR-1-20 Bridge Railing.

Material Properties:

$\gamma_{water} := 62.4\ pcf$ - Unit weight of water.

$\gamma_{conc} := 150\ pcf$ - Unit weight of concrete

$\gamma_{soil} := 130\ pcf$ - Unit weight of soil

$\phi_{soil} := 34\ deg$ - Internal friction angle of soil

$\theta := 90\ deg$ - Angle from vertical to backfill of soil

$\beta := 0\ deg$ - Angle of backfill

$C := 4\ ksf$ - Cohesion

$N_c := \pi + 2 = 5.142$ - phi taken as 0

$\varphi_b := 0.55$ - AASHTO Table 11.5.7-1, Bearing resistance gravity / semi-gravity walls

$qR := \varphi_b \cdot C \cdot N_c = 11.312\ ksf$ - Factored maximum bearing resistance

$\delta := \frac{2}{3} \cdot \phi_{soil} = 22.667\ deg$ - ODOT GDM 1501.1.2

$$k_a := \frac{\sin\left(\theta + \phi_{soil}\right)^2}{\left(1 + \sqrt{\frac{\sin\left(\phi_{soil} + \delta\right) \cdot \sin\left(\phi_{soil} - \beta\right)}{\sin\left(\theta - \delta\right) \cdot \sin\left(\theta + \beta\right)}}\right)^2 \cdot \left(\sin\left(\theta\right)^2 \cdot \sin\left(\theta - \delta\right)\right)} = 0.2543$$

$k_o := 1 - \sin\left(\phi_{soil}\right) = 0.441$

Wall Dimensions:

$H_{max} := 16.5\ ft$ - Maximum exposed height

$H_{soil} := 2\ ft$ - Height of soil above toe

$H_{wall} := H_{max} + H_{soil} = 18.5\ ft$ - Total Wall height

$Wall_{thk} := 28\ in$ - Wall thickness

$FTG_{thick} := 28\ in$ - Footing Thickness

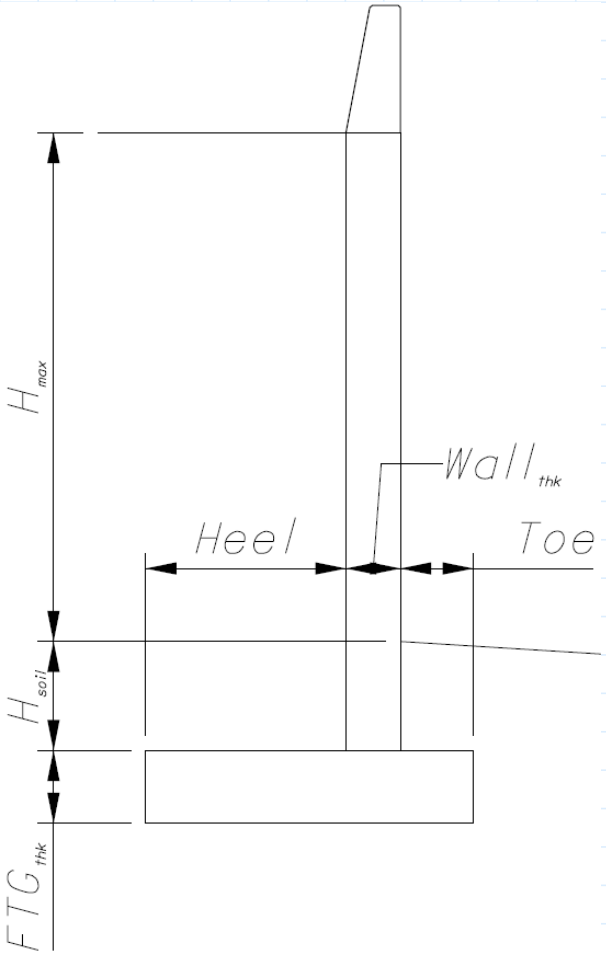
$Heel := 7\ ft$ - Heel Length

$Toe := 2\ ft$ - Toe Length

$H_{overall} := H_{max} + H_{soil} + FTG_{thick} = 20.833\ ft$

$FTG_{width} := Heel + Toe + Wall_{thk} = 11.333\ ft$

$B := FTG_{width}$



Calculate Bearing Resistance and Stability at the Strength Limit State:

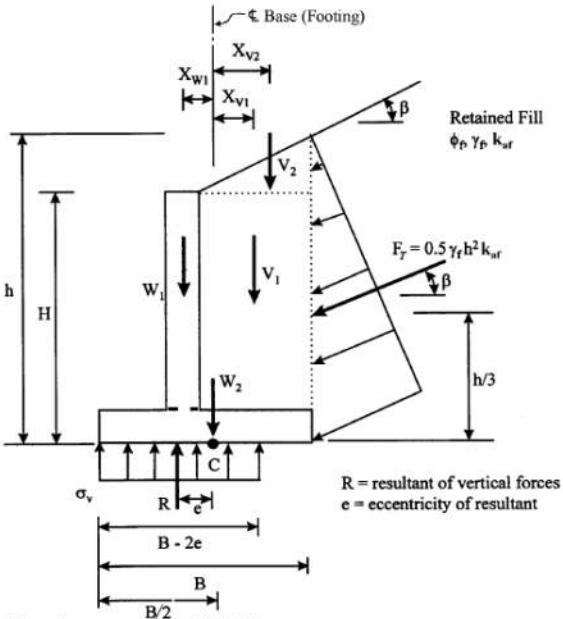


Figure 11.6.3.2-1—Bearing Stress Criteria for Conventional Wall Foundations on Soil

Dead Load:

$\gamma_{dl} := 1.25$ $\gamma_{dlmin} := 0.90$ - Load factor from Table 3.4.1-2

$w_1 := (H_{max} + H_{soil}) \cdot Wall_{thk} \cdot \gamma_{conc} = 6.475 \ \frac{kip}{ft}$ - Weight of wall portion of retaining wall

$X_{w1} := \frac{FTG_{width}}{2} - \left(Toe + \frac{Wall_{thk}}{2}\right) = 2.5 \ ft$ - Distance from c/l of base to c/l of wall

$w_2 := FTG_{thick} \cdot FTG_{width} \cdot \gamma_{conc} = 3.967 \ \frac{kip}{ft}$ - Weight of base slab

$w_3 := 1008 \ in^2 \cdot \gamma_{conc} = 1.05 \ \frac{kip}{ft}$ - Parapet weight per foot

$Y_{bar\_barrier} := \frac{20 \ in \cdot 42 \ in \cdot \frac{20 \ in}{2} + \frac{1}{2} \cdot 42 \ in \cdot 8 \ in \cdot \left(20 \ in + \frac{8 \ in}{3}\right)}{20 \ in \cdot 42 \ in + \frac{1}{2} \cdot 42 \ in \cdot 8 \ in} = 1.009 \ ft$ - Distance vertical face of barrier to centroid of barrier.

$X_{w3} := \frac{FTG_{width}}{2} - (Toe + Y_{bar\_barrier}) = 2.657 \ ft$ - Distance from c/l of base to centroid of barrier

Live Load:

$\gamma_{ls} := 1.75$ - Load factor from Table 3.4.1-1

$LS_v := 260\ psf \cdot Heel = 1.82\ \frac{kip}{ft}$ - Vertical Live load surcharge from vehicular traffic

$X_{LSv} := \frac{FTG_{width}}{2} - \left(Toe + Wall_{thk} + \frac{Heel}{2}\right) = -2.167\ ft$ - Distance to centroid of vertical live load on retained side.

$LS_L := 260\ psf \cdot \left(H_{max} + H_{soil} + FTG_{thick}\right) \cdot k_a = 1.377\ \frac{kip}{ft}$ - Lateral Live load surcharge from vehicular traffic

$LS_{Lh} := \cos\left(\delta\right) \cdot LS_L = 1.271\ \frac{kip}{ft}$ - Horizontal Component of Lateral live load.

$LS_{Lv} := \sin\left(\delta\right) \cdot LS_L = 0.531\ \frac{kip}{ft}$ - Vertical Component of Lateral live load.

$Y_{LSh} := \frac{\left(H_{max} + H_{soil} + FTG_{thick}\right)}{2} = 10.417\ ft$ - Distance to centroid of horizontal component of live load on wall.

$X_{LShv} := \frac{FTG_{width}}{2} - \left(Toe + Wall_{thk}\right) = 1.333\ ft$ - Distance to vertical component of live load due to lateral live load pressure, assumed to act on back of wall.

Vehicular Impact Load on Railing:

$CT_{full} := 124\ kip$ - Transverse impact loading from AASHTO Table A13.2-1

Height of impact will be assumed to be top of wall, 42" per AASHTO LRFD A13.3.1.

Note this load will only appear in the Extreme II Limit State, for eccentricity and bearing.

$Y_{CT} := H_{wall} + 3.5\ ft = 22\ ft$ - Moment arm for vehicular collision

Table A13.2-1—Design Forces for Traffic Railings

Design Forces and Designations	Railing Test Levels					
	TL-1	TL-2	TL-3	TL-4	TL-5	TL-6
F_t Transverse (kips)	13.5	27.0	54.0	54.0	124.0	175.0
F_L Longitudinal (kips)	4.5	9.0	18.0	18.0	41.0	58.0
F_v Vertical (kips) Down	4.5	4.5	4.5	18.0	80.0	80.0
L_t and L_L (ft)	4.0	4.0	4.0	3.5	8.0	8.0
L_v (ft)	18.0	18.0	18.0	18.0	40.0	40.0
H_e (min) (in.)	18.0	20.0	24.0	32.0	42.0	56.0
Minimum H Height of Rail (in.)	27.0	27.0	27.0	32.0	42.0	90.0

Vehicular collision distribution calculation.

$M_w := 781.354\ ft \cdot kip$ - Moment capacity of wall about vertical axis.

$M_c := 117.199\ ft \cdot kip$ - Moment capacity of wall longitudinal axis per foot.

$L_t := 8\ ft$ - From Table A13.2-1

$H := Y_{CT}$ - Height of wall

$$L_c := \min\left(\frac{L_t}{2} + \sqrt{\left(\frac{L_t}{2}\right)^2 + \frac{8 \cdot H \cdot M_w}{\frac{M_c}{ft}}}, 30\ ft\right) = 30\ ft$$

- Distribution width of vehicular impact to be spread to footing for evaluation or joint spacing of foundation. Note that Mb is taken as 0, therefore not included in equation.

$$CT := \frac{CT_{full}}{L_c} = 4.133\ \frac{kip}{ft}$$

- Load per foot of retaining wall based on distribution.

Load Combination Limit State	DC DD DW EH EV ES EL PS CR SH	LL IM CE BR PL LS	WA	WS	WL	FR	TU	TG	SE	Use One of These at a Time: EQ	BL	IC	CT	CV
Extreme Event II	1.00	0.50	1.00	—	—	1.00	—	—	—	—	1.00	1.00	1.00	1.00

Vertical Earth Load:

$\gamma_{ev\_max} := 1.35$ $\gamma_{ev\_min} := 1.00$ - Load factor from Table 3.4.1-2, for stability

$EV_1 := Heel \cdot \left(H_{max} + H_{soil}\right) \cdot \gamma_{soil} = 16.835 \ \frac{kip}{ft}$ - Weight soil on heel

$X_{EV1} := \frac{FTG_{width}}{2} - \left(Toe + Wall_{thk} + \frac{Heel}{2}\right) = -2.167 \ ft$ - Distance from c/l of base to centroid of soil mass

Lateral Earth Load:

$\gamma_{eh\_max} := 1.50$ $\gamma_{eh\_min} := 0.9$ - Load factor from Table 3.4.1-2

$EH_r := 0.5 \cdot \gamma_{soil} \cdot \left(H_{max} + H_{soil} + FTG_{thick}\right)^2 \cdot k_a = 7.173 \ \frac{kip}{ft}$ - Active lateral earth pressure

$EH_{rh} := \cos(\delta) \cdot EH_r = 6.619 \ \frac{kip}{ft}$ - Horizontal component of lateral earth load.

$EH_{rv} := \sin(\delta) \cdot EH_r = 2.764 \ \frac{kip}{ft}$ - Vertical component of lateral earth load.

$Y_{EHrh} := \frac{\left(H_{max} + H_{soil} + FTG_{thick}\right)}{3} = 6.944 \ ft$ - Distance from c/l of base to centroid of horizontal component of lateral earth pressure.

$X_{EHr1} := \frac{-FTG_{width}}{2} = -5.667 \ ft$ - Distance to centroid of vertical component of lateral earth pressure.

Load Combinations to be checked:

Strength Limit State:

Load Combinations to be checked:

Max DL

- Combo 1
  - Max EV
  - Max EH
  - LSv
  - LSlv
  - LSlh
- Combo 2
  - Max EV
  - Max EH
  - LSlv
  - LSlh
- Combo 3
  - Max EV
  - Max EH
- Combo 4
  - Min. EV
  - Min. EH
  - LSv
  - LSlv
  - LSlh
- Combo 5
  - Min. EV
  - Min. EH
  - LSlv
  - LSlh
- Combo 6
  - Min. EV
  - Min. EH
- Combo 7
  - Min. EV
  - Max. EH
  - LSv
  - LSlv
  - LSlh
- Combo 8
  - Min. EV
  - Max. EH
  - LSlv
  - LSlh
- Combo 9
  - Min. EV
  - Max. EH

Min. DL

- Combo 10
  - Max EV
  - Max EH
  - LSv
  - LSlv
  - LSlh
- Combo 11
  - Max EV
  - Max EH
  - LSlv
  - LSlh
- Combo 12
  - Max EV
  - Max EH
- Combo 13
  - Min. EV
  - Min. EH
  - LSv
  - LSlv
  - LSlh
- Combo 14
  - Min. EV
  - Min. EH
  - LSlv
  - LSlh
- Combo 15
  - Min. EV
  - Min. EH
- Combo 16
  - Min. EV
  - Max. EH
  - LSv
  - LSlv
  - LSlh
- Combo 17
  - Min. EV
  - Max. EH
  - LSlv
  - LSlh
- Combo 18
  - Min. EV
  - Max. EH

Extreme II Limit State:

DL
- Combo 19
  - EV
  - EH
  - 0.5 * LSv
  - 0.5 * LSlv
  - 0.5 * LSlh
  - CT
- Combo 20
  - EV
  - EH
  - 0.5 * LSlv
  - 0.5 * LSlh
  - CT

Service I Limit State:

DL
- Serv_01
  - EV
  - EH
  - LSv
  - LSlv
  - LSlh
- Serv_02
  - EV
  - EH
  - LSlv
  - LSlh

Strength Limit State:

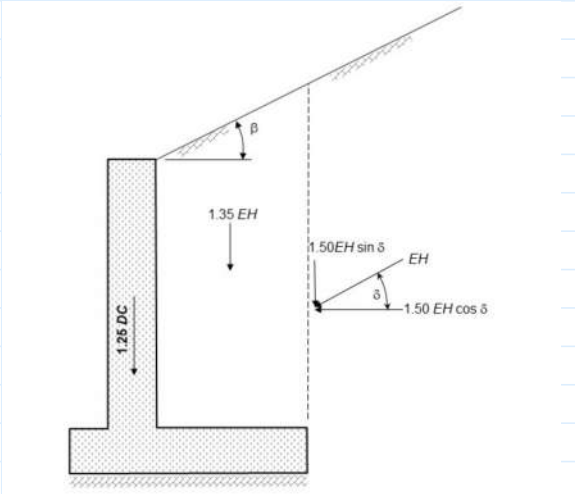


Figure C11.5.6-1—Typical Application of Load Factors for Bearing Resistance

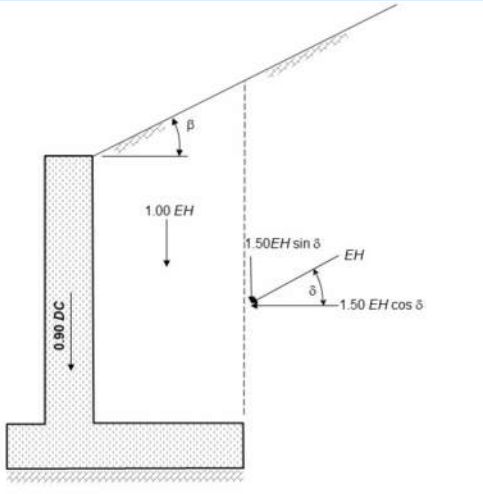


Figure C11.5.6-2—Typical Application of Load Factors for Sliding and Eccentricity

Combination No.: 1

Combination No.: 17

Total Factored Vertical Load:

$\gamma_{dl} = 1.25$ $\gamma_{ls} = 1.75$ $\gamma_{ev\_max} = 1.35$ $\gamma_{eh\_max} = 1.5$

$\gamma_{dlmin} = 0.9$ $\gamma_{ev\_min} = 1$ $\gamma_{eh\_min} = 0.9$

$$V_{comb\_01} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot (LS_v + LS_{Lv}) + \gamma_{ev\_max} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 45.352 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral live load and vertical live load. Figure C11.5.6-1

$$V_{comb\_02} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot LS_{Lv} + \gamma_{ev\_max} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 42.167 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral Live load.

$$V_{comb\_03} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ev\_max} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 41.238 \ \frac{kip}{ft}$$

- Maximum factored vertical load without Live Load Surcharge.

$$V_{comb\_04} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot (LS_v + LS_{Lv}) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_min} \cdot EH_{rv} = 37.801 \ \frac{kip}{ft}$$

- Minimum factored vertical load with Live Load Surcharge including vertical and vertical component of lateral Live load.

$$V_{comb\_05} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot LS_{Lv} + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_min} \cdot EH_{rv} = 34.616 \ \frac{kip}{ft}$$

- Minimum factored vertical load with Live Load Surcharge including vertical component of lateral Live load.

$$V_{comb\_06} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_min} \cdot EH_{rv} = 33.687 \ \frac{kip}{ft}$$

- Minimum factored vertical load including Earth Vertical and vertical component of Earth Horizontal without Live Load Surcharge.

$$V_{comb\_07} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot (LS_v + LS_{Lv}) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 39.46 \ \frac{kip}{ft}$$

- Maximum factored vertical load for Live Load Surcharge including vertical component of lateral live load and vertical live load and Earth Lateral Load. Minimum Earth Vertical Load.

$$V_{comb\_08} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot LS_{Lv} + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 36.275 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral Live load and Earth Horizontal Load. Minimum Earth Vertical Load.

$$V_{comb\_09} := \gamma_{dl} \cdot (w_1 + w_2 + w_3) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 35.346 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral Live load.

Total Factored Vertical Load (continued):

$$V_{comb\_10} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot (LS_v + LS_{Lv}) + \gamma_{ev\_max} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 41.33 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral live load and vertical live load. Figure C11.5.6-1

$$V_{comb\_11} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot LS_{Lv} + \gamma_{ev\_max} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 38.145 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral Live load.

$$V_{comb\_12} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ev\_max} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 37.216 \ \frac{kip}{ft}$$

- Maximum factored vertical load without Live Load Surcharge.

$$V_{comb\_13} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot (LS_v + LS_{Lv}) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_min} \cdot EH_{rv} = 33.779 \ \frac{kip}{ft}$$

- Minimum factored vertical load with Live Load Surcharge including vertical and vertical component of lateral Live load.

$$V_{comb\_14} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot LS_{Lv} + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_min} \cdot EH_{rv} = 30.594 \ \frac{kip}{ft}$$

- Minimum factored vertical load with Live Load Surcharge including vertical component of lateral Live load.

$$V_{comb\_15} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_min} \cdot EH_{rv} = 29.665 \ \frac{kip}{ft}$$

- Minimum factored vertical load including Earth Vertical and vertical component of Earth Horizontal without Live Load Surcharge.

$$V_{comb\_16} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot (LS_v + LS_{Lv}) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 35.438 \ \frac{kip}{ft}$$

- Maximum factored vertical load for Live Load Surcharge including vertical component of lateral live load and vertical live load and Earth Lateral Load. Minimum Earth Vertical Load.

$$V_{comb\_17} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ls} \cdot LS_{Lv} + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 32.253 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral Live load and Earth Horizontal Load. Minimum Earth Vertical Load. See C11.5.6.2.

$$V_{comb\_18} := \gamma_{dlmin} \cdot (w_1 + w_2 + w_3) + \gamma_{ev\_min} \cdot EV_1 + \gamma_{eh\_max} \cdot EH_{rv} = 31.324 \ \frac{kip}{ft}$$

- Maximum factored vertical load with Live Load Surcharge including vertical component of lateral Live load.

Total Factored Vertical Load (continued):

$$V_{comb\_19} := 1.0 \cdot \left(w_1 + w_2 + w_3\right) + 0.5 \cdot \left(LS_v + LS_{Lv}\right) + 1.0 \cdot EV_1 + 1.0 \cdot EH_{rv} = 32.266 \ \frac{kip}{ft}$$

- Extreme II max vertical load with Live Load Surcharge including vertical component of lateral live load and vertical live load with vehicular impact.

$$V_{comb\_20} := 1.0 \cdot \left(w_1 + w_2 + w_3\right) + 0.5 \cdot \left(LS_{Lv}\right) + 1.0 \cdot EV_1 + 1.0 \cdot EH_{rv} = 31.356 \ \frac{kip}{ft}$$

- Extreme II max vertical load with Live Load Surcharge including vertical component of lateral live load and vehicular impact.

$$V_{serv\_01} := \left(w_1 + w_2 + w_3\right) + \left(LS_v + LS_{Lv}\right) + EV_1 + EH_{rv} = 33.442 \ \frac{kip}{ft}$$

- Service loading condition.

$$V_{serv\_02} := \left(w_1 + w_2 + w_3\right) + LS_{Lv} + EV_1 + EH_{rv} = 31.622 \ \frac{kip}{ft}$$

- Service loading condition.

Eccentricity limits Check:

$$e_{comb\_01} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_v\cdot X_{LSv}+LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\dots}{+\gamma_{ev\_max}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 0.825\ ft$$

$$e_{comb\_02} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\dots}{+\gamma_{ev\_max}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 1.051\ ft$$

$$e_{comb\_03} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)\dots}{+\gamma_{ev\_max}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 0.483\ ft$$

$$e_{comb\_04} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_v\cdot X_{LSv}+LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\dots}{+\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_min}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 0.847\ ft$$

$$e_{comb\_05} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\dots}{+\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_min}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 1.124\ ft$$

$$e_{comb\_06} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)\dots}{+\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_min}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 0.431\ ft$$

$$e_{comb\_07} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_v\cdot X_{LSv}+LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\dots}{+\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 1.272\ ft$$

$$e_{comb\_08} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\dots}{+\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 1.574\ ft$$

$$e_{comb\_09} := \frac{\gamma_{dl}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)\dots}{+\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 0.925\ ft$$

$$e_{comb\_10} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_v\cdot X_{LSv}+LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\dots}{+\gamma_{ev\_max}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)} = 0.745\ ft$$

Eccentricity limits Check (continued):

$$e_{comb\_11} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\\ +\gamma_{ev\_max}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_11}} = 0.988\ ft$$

$$e_{comb\_12} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)\\ +\gamma_{ev\_max}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_12}} = 0.357\ ft$$

$$e_{comb\_13} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{v}\cdot X_{LSv}+LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\\ +\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_min}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_13}} = 0.751\ ft$$

$$e_{comb\_14} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\\ +\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_min}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_14}} = 1.055\ ft$$

$$e_{comb\_15} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)\\ +\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_min}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_15}} = 0.265\ ft$$

$$e_{comb\_16} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{v}\cdot X_{LSv}+LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\\ +\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_16}} = 1.229\ ft$$

$$e_{comb\_17} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+\gamma_{ls}\cdot\left(LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\\ +\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_17}} = 1.565\ ft$$

$$e_{comb\_18} := \frac{\gamma_{dlmin}\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)\\ +\gamma_{ev\_min}\cdot EV_1\cdot X_{EV1}+\gamma_{eh\_max}\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)}{V_{comb\_18}} = 0.832\ ft$$

$$e_{comb\_19} := \frac{1.0\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+0.5\cdot\left(LS_{v}\cdot X_{LSv}+LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\\ +1.0\cdot EV_1\cdot X_{EV1}+1.0\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)+1.0\cdot CT\cdot Y_{CT}}{V_{comb\_19}} = 3.37\ ft$$

$$e_{comb\_20} := \frac{1.0\cdot\left(w_1\cdot X_{w1}+w_3\cdot X_{w3}\right)+0.5\cdot\left(LS_{Lh}\cdot Y_{LSh}+LS_{Lv}\cdot X_{LShv}\right)\\ +1.0\cdot EV_1\cdot X_{EV1}+1.0\cdot\left(EH_{rh}\cdot Y_{EHrh}+EH_{rv}\cdot X_{EHr1}\right)+1.0\cdot CT\cdot Y_{CT}}{V_{comb\_20}} = 3.531\ ft$$

Eccentricity limits Check (continued):

$$e_{serv\_01} := \frac{\left(w_1 \cdot X_{w1} + w_3 \cdot X_{w3}\right) + \left(LS_v \cdot X_{LSv} + LS_{Lh} \cdot Y_{LSh} + LS_{Lv} \cdot X_{LShv}\right) \\ + EV_1 \cdot X_{EV1} + EH_{rh} \cdot Y_{EHrh} + EH_{rv} \cdot X_{EHr1}}{V_{serv\_01}} = 0.682\ ft$$

- Service loading

$$e_{serv\_02} := \frac{\left(w_1 \cdot X_{w1} + w_3 \cdot X_{w3}\right) + \left(LS_{Lh} \cdot Y_{LSh} + LS_{Lv} \cdot X_{LShv}\right) \\ + EV_1 \cdot X_{EV1} + EH_{rh} \cdot Y_{EHrh} + EH_{rv} \cdot X_{EHr1}}{V_{serv\_02}} = 0.846\ ft$$

- Service loading

$$d_2 := FTG_{width} \cdot \left(\frac{2}{3}\right) = 7.556\ ft$$

$$i := 0 \,..\, 19$$

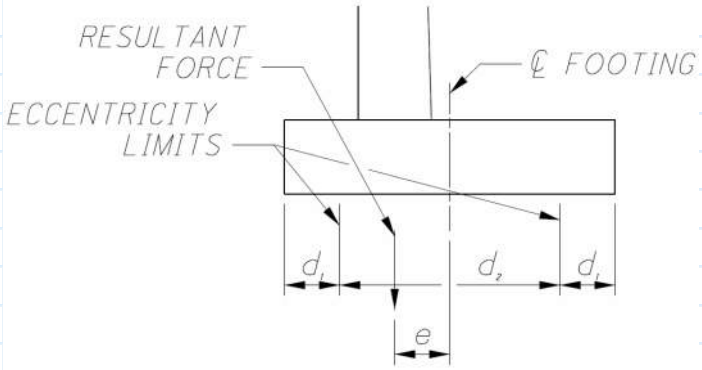
$$e_{chk} := \begin{bmatrix} e_{comb\_01} \\ e_{comb\_02} \\ e_{comb\_03} \\ e_{comb\_04} \\ e_{comb\_05} \\ e_{comb\_06} \\ e_{comb\_07} \\ e_{comb\_08} \\ e_{comb\_09} \\ e_{comb\_10} \\ e_{comb\_11} \\ e_{comb\_12} \\ e_{comb\_13} \\ e_{comb\_14} \\ e_{comb\_15} \\ e_{comb\_16} \\ e_{comb\_17} \\ e_{comb\_18} \\ e_{comb\_19} \\ e_{comb\_20} \end{bmatrix} = \begin{bmatrix} 0.825 \\ 1.051 \\ 0.483 \\ 0.847 \\ 1.124 \\ 0.431 \\ 1.272 \\ 1.574 \\ 0.925 \\ 0.745 \\ 0.988 \\ 0.357 \\ 0.751 \\ 1.055 \\ 0.265 \\ 1.229 \\ 1.565 \\ 0.832 \\ 3.37 \\ 3.531 \end{bmatrix} ft$$

$$V_{comb} := \begin{bmatrix} V_{comb\_01} \\ V_{comb\_02} \\ V_{comb\_03} \\ V_{comb\_04} \\ V_{comb\_05} \\ V_{comb\_06} \\ V_{comb\_07} \\ V_{comb\_08} \\ V_{comb\_09} \\ V_{comb\_10} \\ V_{comb\_11} \\ V_{comb\_12} \\ V_{comb\_13} \\ V_{comb\_14} \\ V_{comb\_15} \\ V_{comb\_16} \\ V_{comb\_17} \\ V_{comb\_18} \\ V_{comb\_19} \\ V_{comb\_20} \end{bmatrix} = \begin{bmatrix} 45.352 \\ 42.167 \\ 41.238 \\ 37.801 \\ 34.616 \\ 33.687 \\ 39.46 \\ 36.275 \\ 35.346 \\ 41.33 \\ 38.145 \\ 37.216 \\ 33.779 \\ 30.594 \\ 29.665 \\ 35.438 \\ 32.253 \\ 31.324 \\ 32.266 \\ 31.356 \end{bmatrix} \frac{kip}{ft}$$

$$e_{serv} := \begin{bmatrix} e_{serv\_01} \\ e_{serv\_02} \end{bmatrix} = \begin{bmatrix} 0.682 \\ 0.846 \end{bmatrix} ft$$

$$V_{serv} := \begin{bmatrix} V_{serv\_01} \\ V_{serv\_02} \end{bmatrix} = \begin{bmatrix} 33.442 \\ 31.622 \end{bmatrix} \frac{kip}{ft}$$

$$e_{check_i} := \text{if } e_{chk_i} \le \frac{d_2}{2} \text{ “O.K.” else “N.G.”} = \begin{bmatrix} \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \end{bmatrix}$$



- Check if eccentricity is within middle two-thirds of footing based on AASHTO LRFD 9th Edition, 11.6.3.3

Bearing Resistance Check:

$$\sigma_{comb\_01} := \frac{V_{comb\_01}}{B - 2 \cdot e_{comb\_01}} = 4.684 \ ksf$$

- Calculation of Max. factored bearing pressure

$$\sigma_{comb\_02} := \frac{V_{comb\_02}}{B - 2 \cdot e_{comb\_02}} = 4.568 \ ksf$$

$$\sigma_{comb\_03} := \frac{V_{comb\_03}}{B - 2 \cdot e_{comb\_03}} = 3.978 \ ksf$$

$$\sigma_{comb\_04} := \frac{V_{comb\_04}}{B - 2 \cdot e_{comb\_04}} = 3.922 \ ksf$$

$$\sigma_{comb\_05} := \frac{V_{comb\_05}}{B - 2 \cdot e_{comb\_05}} = 3.81 \ ksf$$

$$\sigma_{comb\_06} := \frac{V_{comb\_06}}{B - 2 \cdot e_{comb\_06}} = 3.217 \ ksf$$

$$\sigma_{comb\_07} := \frac{V_{comb\_07}}{B - 2 \cdot e_{comb\_07}} = 4.49 \ ksf$$

$$\sigma_{comb\_08} := \frac{V_{comb\_08}}{B - 2 \cdot e_{comb\_08}} = 4.432 \ ksf$$

$$\sigma_{comb\_09} := \frac{V_{comb\_09}}{B - 2 \cdot e_{comb\_09}} = 3.727 \ ksf$$

$$\sigma_{comb\_10} := \frac{V_{comb\_10}}{B - 2 \cdot e_{comb\_10}} = 4.199 \ ksf$$

$$\sigma_{comb\_11} := \frac{V_{comb\_11}}{B - 2 \cdot e_{comb\_11}} = 4.077 \ ksf$$

$$\sigma_{comb\_12} := \frac{V_{comb\_12}}{B - 2 \cdot e_{comb\_12}} = 3.505 \ ksf$$

$$\sigma_{comb\_13} := \frac{V_{comb\_13}}{B - 2 \cdot e_{comb\_13}} = 3.436 \ ksf$$

$$\sigma_{comb\_14} := \frac{V_{comb\_14}}{B - 2 \cdot e_{comb\_14}} = 3.317 \ ksf$$

Bearing Resistance Check (Continued):

$$\sigma_{comb\_15} := \frac{V_{comb\_15}}{B - 2 \cdot e_{comb\_15}} = 2.746 \ ksf$$

$$\sigma_{comb\_16} := \frac{V_{comb\_16}}{B - 2 \cdot e_{comb\_16}} = 3.993 \ ksf$$

$$\sigma_{comb\_17} := \frac{V_{comb\_17}}{B - 2 \cdot e_{comb\_17}} = 3.931 \ ksf$$

$$\sigma_{comb\_18} := \frac{V_{comb\_18}}{B - 2 \cdot e_{comb\_18}} = 3.239 \ ksf$$

$$\sigma_{comb\_19} := \frac{V_{comb\_19}}{B - 2 \cdot e_{comb\_19}} = 7.025 \ ksf$$

$$\sigma_{comb\_20} := \frac{V_{comb\_20}}{B - 2 \cdot e_{comb\_20}} = 7.34 \ ksf$$

$$\sigma_{serv\_01} := \frac{V_{serv\_01}}{B - 2 \cdot e_{serv\_01}} = 3.354 \ ksf$$

- Calculation of service bearing pressure including live load.

$$\sigma_{serv\_02} := \frac{V_{serv\_02}}{B - 2 \cdot e_{serv\_02}} = 3.28 \ ksf$$

$$\sigma_{chk} := \begin{bmatrix} \sigma_{comb\_01} \\ \sigma_{comb\_02} \\ \sigma_{comb\_03} \\ \sigma_{comb\_04} \\ \sigma_{comb\_05} \\ \sigma_{comb\_06} \\ \sigma_{comb\_07} \\ \sigma_{comb\_08} \\ \sigma_{comb\_09} \\ \sigma_{comb\_10} \\ \sigma_{comb\_11} \\ \sigma_{comb\_12} \\ \sigma_{comb\_13} \\ \sigma_{comb\_14} \\ \sigma_{comb\_15} \\ \sigma_{comb\_16} \\ \sigma_{comb\_17} \\ \sigma_{comb\_18} \\ \sigma_{comb\_19} \\ \sigma_{comb\_20} \end{bmatrix} = \begin{bmatrix} 4.684 \\ 4.568 \\ 3.978 \\ 3.922 \\ 3.81 \\ 3.217 \\ 4.49 \\ 4.432 \\ 3.727 \\ 4.199 \\ 4.077 \\ 3.505 \\ 3.436 \\ 3.317 \\ 2.746 \\ 3.993 \\ 3.931 \\ 3.239 \\ 7.025 \\ 7.34 \end{bmatrix} \ ksf$$

$$\sigma_{check_i} := \text{if } \sigma_{chk_i} \le qR \text{ "O.K." else "N.G."} = \begin{bmatrix} \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \\ \text{"O.K."} \end{bmatrix}$$

- Check bearing resistance versus allowable bearing resistance of soil.

Sliding Resistance Check:

$$H_{comb\_01} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_02} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_03} := \gamma_{eh\_max} \cdot EH_{rh} = 9.929 \ \frac{kip}{ft}$$

$$H_{comb\_04} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_min} \cdot EH_{rh} = 8.181 \ \frac{kip}{ft}$$

$$H_{comb\_05} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_min} \cdot EH_{rh} = 8.181 \ \frac{kip}{ft}$$

$$H_{comb\_06} := \gamma_{eh\_min} \cdot EH_{rh} = 5.957 \ \frac{kip}{ft}$$

$$H_{comb\_07} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_08} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_09} := \gamma_{eh\_max} \cdot EH_{rh} = 9.929 \ \frac{kip}{ft}$$

$$H_{comb\_10} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_11} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_12} := \gamma_{eh\_max} \cdot EH_{rh} = 9.929 \ \frac{kip}{ft}$$

$$H_{comb\_13} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_min} \cdot EH_{rh} = 8.181 \ \frac{kip}{ft}$$

$$H_{comb\_14} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_min} \cdot EH_{rh} = 8.181 \ \frac{kip}{ft}$$

Sliding Resistance Check (continued):

$$H_{comb\_15} := \gamma_{eh\_min} \cdot EH_{rh} = 5.957 \ \frac{kip}{ft}$$

$$H_{comb\_16} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_17} := \gamma_{ls} \cdot LS_{Lh} + \gamma_{eh\_max} \cdot EH_{rh} = 12.153 \ \frac{kip}{ft}$$

$$H_{comb\_18} := \gamma_{eh\_max} \cdot EH_{rh} = 9.929 \ \frac{kip}{ft}$$

$$H_{comb\_19} := 0.5 \cdot LS_{Lh} + 1.0 \cdot EH_{rh} + 1.0 \cdot CT = 11.388 \ \frac{kip}{ft}$$

$$H_{comb\_20} := 0.5 \cdot LS_{Lh} + 1.0 \cdot EH_{rh} + 1.0 \cdot CT = 11.388 \ \frac{kip}{ft}$$

$$H_{applied} := \begin{bmatrix} H_{comb\_01} \\ H_{comb\_02} \\ H_{comb\_03} \\ H_{comb\_04} \\ H_{comb\_05} \\ H_{comb\_06} \\ H_{comb\_07} \\ H_{comb\_08} \\ H_{comb\_09} \\ H_{comb\_10} \\ H_{comb\_11} \\ H_{comb\_12} \\ H_{comb\_13} \\ H_{comb\_14} \\ H_{comb\_15} \\ H_{comb\_16} \\ H_{comb\_17} \\ H_{comb\_18} \\ H_{comb\_19} \\ H_{comb\_20} \end{bmatrix} = \begin{bmatrix} 12.153 \\ 12.153 \\ 9.929 \\ 8.181 \\ 8.181 \\ 5.957 \\ 12.153 \\ 12.153 \\ 9.929 \\ 12.153 \\ 12.153 \\ 9.929 \\ 8.181 \\ 8.181 \\ 5.957 \\ 12.153 \\ 12.153 \\ 9.929 \\ 11.388 \\ 11.388 \end{bmatrix} \frac{kip}{ft}$$

$$e_{slide\_check_i} := \begin{array}{l} \text{if } e_{chk_i} \geq \frac{B}{6} \\ \quad \text{“Outside”} \\ \text{else} \\ \quad \text{“Middle 3rd”} \end{array} = \begin{bmatrix} \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Middle 3rd”} \\ \text{“Outside”} \\ \text{“Outside”} \end{bmatrix}$$

Sliding Resistance Check (continued):

$S_{uc} := C = 4$ *ksf* - Cohesion value of soil from Geotechs

$\varphi_t := 1$ - AASHTO LRFD 9th Edition, Table 11.5.7-1

$$\sigma_{sliding\_max_i} := \frac{V_{comb_i}}{B} \cdot \left(1 + \frac{6 \cdot e_{chk_i}}{B}\right) = \begin{bmatrix} 5.75 \\ 5.792 \\ 4.57 \\ 4.831 \\ 4.873 \\ 3.651 \\ 5.827 \\ 5.868 \\ 4.646 \\ 5.085 \\ 5.127 \\ 3.905 \\ 4.166 \\ 4.207 \\ 2.985 \\ 5.162 \\ 5.203 \\ 3.981 \\ 7.926 \\ 7.938 \end{bmatrix} \textit{ksf}$$

- AASHTO LRFD 9th Edition, Equation 11.6.3.2-2

$$\sigma_{sliding\_min_i} := \frac{V_{comb_i}}{B} \cdot \left(1 - \frac{6 \cdot e_{chk_i}}{B}\right) = \begin{bmatrix} 2.253 \\ 1.649 \\ 2.708 \\ 1.84 \\ 1.236 \\ 2.294 \\ 1.137 \\ 0.533 \\ 1.591 \\ 2.208 \\ 1.605 \\ 2.663 \\ 1.795 \\ 1.192 \\ 2.25 \\ 1.092 \\ 0.489 \\ 1.547 \\ -2.232 \\ -2.405 \end{bmatrix} \textit{ksf}$$

- AASHTO LRFD 9th Edition, Equation 11.6.3.2-3

Sliding Resistance Check (continued):

$$q_{sliding\_max_i} := 0.5 \cdot \sigma_{sliding\_max_i} = \begin{bmatrix} 2.875 \\ 2.896 \\ \vdots \end{bmatrix} ksf \qquad q_{sliding\_min_i} := 0.5 \cdot \sigma_{sliding\_min_i} = \begin{bmatrix} 1.126 \\ 0.825 \\ \vdots \end{bmatrix} ksf$$

$$Case_i := \text{if } e_{chk_i} \le \frac{B}{6} \wedge q_{sliding\_max_i} > S_{uc} \wedge q_{sliding\_min_i} \le S_{uc} \wedge q_{sliding\_min_i} \ge 0\ ksf$$
$$\quad \| \text{“Case 1”}$$
$$\text{else if } e_{chk_i} \le \frac{B}{6} \wedge S_{uc} \ge q_{sliding\_max_i} \wedge q_{sliding\_min_i} \le q_{sliding\_max_i} \wedge q_{sliding\_min_i} \ge 0\ ksf$$
$$\quad \| \text{“Case 2”}$$
$$\text{else if } e_{chk_i} \le \frac{B}{6} \wedge q_{sliding\_min_i} \ge 0\ ksf \wedge q_{sliding\_max_i} > S_{uc} \wedge q_{sliding\_min_i} > S_{uc}$$
$$\quad \| \text{“Case 3”}$$
$$\text{else if } e_{chk_i} > \frac{B}{6} \wedge q_{sliding\_min_i} < 0\ ksf \wedge S_{uc} < q_{sliding\_max_i}$$
$$\quad \| \text{“Case 4”}$$
$$\text{else if } e_{chk_i} > \frac{B}{6} \wedge q_{sliding\_min_i} < 0\ ksf \wedge S_{uc} \ge q_{sliding\_max_i}$$
$$\quad \| \text{“Case 5”}$$
$$\text{else}$$
$$\quad \| \text{“Error”}$$

- GDM 13.3.5 Failure by Sliding, Figures 1300-4 thru 1300-8

$$Case_i = \begin{bmatrix} \text{“Case 2”} \\ \text{“Case 5”} \\ \text{“Case 5”} \end{bmatrix}$$

Sliding Resistance Check (continued):

$$R_{r_i} := \varphi_t \cdot \begin{cases} 0.5 \cdot \left(S_{uc} - q_{sliding\_min_i}\right) \cdot \left(\dfrac{B \cdot \left(S_{uc} - q_{sliding\_min_i}\right)}{\left(q_{sliding\_max_i} - q_{sliding\_min_i}\right)}\right) \\ \quad + \left(S_{uc} - q_{sliding\_min_i}\right) \cdot \left(\dfrac{B \cdot \left(q_{sliding\_max_i} - S_{uc}\right)}{\left(q_{sliding\_max_i} - q_{sliding\_min_i}\right)}\right) + q_{sliding\_min_i} \cdot B & \text{if } Case_i = \text{“Case 1”} \\ 0.5 \cdot \left(q_{sliding\_max_i} - q_{sliding\_min_i}\right) \cdot B + q_{sliding\_min_i} \cdot B & \text{else if } Case_i = \text{“Case 2”} \\ S_{uc} \cdot B & \text{else if } Case_i = \text{“Case 3”} \\ 0.5 \cdot S_{uc} \cdot \left(\dfrac{S_{uc} \cdot \left(B - \dfrac{B \cdot -q_{sliding\_min_i}}{q_{sliding\_max_i} - q_{sliding\_min_i}}\right)}{q_{sliding\_max_i}}\right) \\ \quad + S_{uc} \cdot \left(B - \left(\left(\dfrac{S_{uc} \cdot \left(B - \dfrac{B \cdot -q_{sliding\_min_i}}{q_{sliding\_max_i} - q_{sliding\_min_i}}\right)}{q_{sliding\_max_i}}\right) - \left(\dfrac{B \cdot -q_{sliding\_min_i}}{q_{sliding\_max_i} - q_{sliding\_min_i}}\right)\right)\right) & \text{else if } Case_i = \text{“Case 4”} \\ 0.5 \cdot q_{sliding\_max_i} \cdot \left(\dfrac{B \cdot q_{sliding\_max_i}}{q_{sliding\_max_i} - q_{sliding\_min_i}}\right) & \text{else if } Case_i = \text{“Case 5”} \\ \text{“Error”} & \text{else} \end{cases}$$

- GDM 13.3.5 Failure by Sliding, Figures 1300-4 thru 1300-8

Sliding Resistance Check (continued):

$$R_{r_i} = \begin{bmatrix} 22.676 \\ 21.084 \\ 20.619 \\ 18.901 \\ 17.308 \\ 16.844 \\ 19.73 \\ 18.137 \\ 17.673 \\ 20.665 \\ 19.073 \\ 18.608 \\ 16.89 \\ 15.297 \\ 14.833 \\ 17.719 \\ 16.126 \\ 15.662 \\ 17.523 \\ 17.262 \end{bmatrix} \frac{kip}{ft}$$ - Resisting sliding force

$$H_{applied_i} = \begin{bmatrix} 12.153 \\ 12.153 \\ 9.929 \\ 8.181 \\ 8.181 \\ 5.957 \\ 12.153 \\ 12.153 \\ 9.929 \\ 12.153 \\ 12.153 \\ 9.929 \\ 8.181 \\ 8.181 \\ 5.957 \\ 12.153 \\ 12.153 \\ 9.929 \\ 11.388 \\ 11.388 \end{bmatrix} \frac{kip}{ft}$$ - Applied sliding force

$$Slide\_chk_i := \text{if } R_{r_i} \geq H_{applied_i} \text{ “Sliding OK” else “No Good”} = \begin{bmatrix} \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \end{bmatrix}$$

Stability Checks Summary:

$$e_{check} = \begin{bmatrix} \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \end{bmatrix}$$

- Eccentricity check

$$\sigma_{check} = \begin{bmatrix} \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \\ \text{“O.K.”} \end{bmatrix}$$

- Bearing check

$$Slide\_chk = \begin{bmatrix} \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \\ \text{“Sliding OK”} \end{bmatrix}$$

- Sliding Resisting Check

Objective:

Reference:

Calculate shears and moments on wall and footing based design loading.

Constants:

$\gamma_{conc} := 150\ pcf$ - Unit weight of concrete

$\gamma_{soil} := 130\ pcf$ - Unit weight backfill soil

$\phi_{soil} := 34\ deg$ - Internal friction angle of soil

$\delta := \frac{2}{3} \cdot \phi_{soil} = 22.667\ deg$ - ODOT GDM 1501.1.2

$LS_v := 2\ ft \cdot \gamma_{soil} = 0.26\ ksf$ - assumed live load surcharge

$\theta := 90\ deg$ - Angle from vertical to backfill of soil

$\beta := 0\ deg$ - Angle of backfill

$$k_a := \frac{\sin(\theta + \phi_{soil})^2}{\left(1 + \sqrt{\frac{\sin(\phi_{soil} + \delta) \cdot \sin(\phi_{soil} - \beta)}{\sin(\theta - \delta) \cdot \sin(\theta + \beta)}}\right)^2 \cdot \left(\sin(\theta)^2 \cdot \sin(\theta - \delta)\right)} = 0.2543$$

$k_o := 1 - \sin(\phi_{soil}) = 0.441$

Footing Toe Design:

$Toe := 2\ ft$ - Length of toe

$$\sigma_{max} := \max\left(\begin{bmatrix} 4.684 \\ 4.568 \\ 3.978 \\ 3.922 \\ 3.81 \\ 3.217 \\ 4.49 \\ 4.432 \\ 3.727 \\ 4.199 \\ 4.077 \\ 3.505 \\ 3.436 \\ 3.317 \\ 2.746 \\ 3.993 \\ 3.931 \\ 3.239 \\ 7.025 \\ 7.34 \end{bmatrix} ksf\right) = 7.34\ ksf$$

- Maximum bearing pressure from stability calculations.

$V_{u\_toe} := Toe \cdot \sigma_{max} = 14.68\ \frac{kip}{ft}$ - Maximum shear

$M_{u\_toe} := \frac{\sigma_{max} \cdot Toe^2}{2} = 14.68\ \frac{kip \cdot ft}{ft}$ - Maximum moment

Footing Heel Design:

> Where spread footings are used, the rear projection shall be designed as a cantilever supported at the abutment stem and loaded with the full weight of the superimposed material, unless a more exact method is used.

- AASHTO 11.6.1.2, provisions for rear projection of spread footing.

$Heel := 7\ ft$ - Heel Length to wall

$H_{fill} := 18.5\ ft$ - Maximum height of fill over heel of spread footing, from stability calculations.

$FTG_{thk} := 28\ in$ - Footing thickness, assumed.

Load Factors:

$\gamma_{dl} := 1.25$ - Maximum dead load factor

$\gamma_{ls} := 1.75$ - Live Load factor

$\gamma_{ev\_max} := 1.35$ - Maximum vertical earth load factor

Uniform Load on Heel:

$w_{serv} := H_{fill} \cdot \gamma_{soil} + LS_v + FTG_{thk} \cdot \gamma_{conc} = 3.015\ ksf$ - Service Load per foot

$w_{fact} := \gamma_{ev\_max} \cdot H_{fill} \cdot \gamma_{soil} + \gamma_{ls} \cdot LS_v + \gamma_{dl} \cdot FTG_{thk} \cdot \gamma_{conc} = 4.139\ ksf$ - Factored Load per foot

Moments and Shears on Heel:

$V_{u\_heel} := Heel \cdot w_{fact} = 28.975\ \frac{kip}{ft}$ - Maximum factored shear

$M_{s\_heel} := \frac{w_{serv} \cdot Heel^2}{2} = 73.868\ \frac{kip \cdot ft}{ft}$ - Maximum service moment

$M_{u\_heel} := \frac{w_{fact} \cdot Heel^2}{2} = 101.412\ \frac{kip \cdot ft}{ft}$ - Maximum factored moment

Wall Design (Strength Design):

$H_{fill} = 18.5\ ft$ - Maximum height of fill over heel of spread footing, from stability calculations.

Load Factors:

$\gamma_{dl} = 1.25$ - Maximum dead load factor

$\gamma_{ls} = 1.75$ - Live Load factor

$\gamma_{eh\_atrest} := 1.35$ - Maximum Horizontal earth load factor

Loads on Wall:

$EH := 0.5 \cdot \gamma_{soil} \cdot {H_{fill}}^2 \cdot k_o = 9.806\ \frac{kip}{ft}$ - Earth Horizontal pressure

$EH_h := \cos(\delta) \cdot EH = 9.049\ \frac{kip}{ft}$ - Horizontal component of earth horizontal pressure.

$Y_{EH} := H_{fill} \cdot \left(\frac{1}{3}\right) = 6.167\ ft$ - Moment arm for horizontal earth pressure.

$LS := LS_v \cdot H_{fill} \cdot k_o = 2.12\ \frac{kip}{ft}$ - Lateral Live load surcharge from vehicular traffic

$LS_h := \cos(\delta) \cdot LS = 1.957\ \frac{kip}{ft}$ - Horizontal Component of Lateral live load.

$Y_{LS} := H_{fill} \cdot \left(\frac{1}{2}\right) = 9.25\ ft$ - Moment arm for horizontal Live Load Surcharge.

Moments and Shears on Wall:

$V_{u\_wall} := \gamma_{eh\_atrest} \cdot EH_h + \gamma_{ls} \cdot LS_h = 15.64\ \frac{kip}{ft}$ - Max factored shear in retaining wall

$M_{s\_wall} := EH_h \cdot Y_{EH} + LS_h \cdot Y_{LS} = 73.899\ \frac{kip \cdot ft}{ft}$ - Max service moment in retaining wall.

$M_{u\_wall} := \gamma_{eh\_atrest} \cdot EH_h \cdot Y_{EH} + \gamma_{ls} \cdot LS_h \cdot Y_{LS} = 107.003\ \frac{kip \cdot ft}{ft}$ - Max factored moment in retaining wall.

Wall Design (Extreme II):

Load Factors:

$\gamma_{dl\_ex} := 1.0$ - Extreme II dead load factor

$\gamma_{ls\_ex} := 0.5$ - Extreme II Live Load Surcharge factor

$\gamma_{eh\_ex} := 1.0$ - Extreme II Horizontal earth load factor

$\gamma_{ct\_ex} := 1.0$ - Extreme II Collision force factor

Loads on Wall:

$EH_{ext} := 0.5 \cdot \gamma_{soil} \cdot H_{fill}^{\ 2} \cdot k_a = 5.656 \ \frac{kip}{ft}$ - Earth Horizontal pressure

$EH_{h\_ext} := \cos(\delta) \cdot EH_{ext} = 5.219 \ \frac{kip}{ft}$ - Horizontal component of earth horizontal pressure.

$Y_{EH} = 6.167 \ ft$ - Moment arm for horizontal earth pressure.

$LS_{ext} := LS_v \cdot H_{fill} \cdot k_a = 1.223 \ \frac{kip}{ft}$ - Lateral Live load surcharge from vehicular traffic

$LS_{h\_ext} := \cos(\delta) \cdot LS_{ext} = 1.129 \ \frac{kip}{ft}$ - Horizontal Component of Lateral live load.

$Y_{LS} = 9.25 \ ft$ - Moment arm for horizontal Live Load Surcharge.

$CT := 4.133 \ \frac{kip}{ft}$ - Vehicular Impact Loading

$Y_{CT} := H_{fill} + 3.5 \ ft = 22 \ ft$ - Height of wall plus height of barrier.

$V_{u\_wall\_ext} := \gamma_{eh\_ex} \cdot EH_h + \gamma_{ls\_ex} \cdot LS_h + \gamma_{ct\_ex} \cdot CT = 14.16 \ \frac{kip}{ft}$

$M_{s\_wall\_ext} := EH_{h\_ext} \cdot Y_{EH} + LS_{ext} \cdot Y_{LS} + CT \cdot Y_{CT} = 134.425 \ \frac{kip \cdot ft}{ft}$

$M_{u\_wall\_ext} := \gamma_{eh\_ex} \cdot EH_{h\_ext} \cdot Y_{EH} + \gamma_{ls\_ex} \cdot LS_{ext} \cdot Y_{LS} + \gamma_{ct\_ex} \cdot CT \cdot Y_{CT} = 128.769 \ \frac{kip \cdot ft}{ft}$

Concrete Footing Design Reinforcement (AASHTO LRFD 9th edition):

Reference:

1. Material Properties

$f'_c := 4000 \cdot psi$

$f_y := 60000 \cdot psi$

$E_s := 29000 \cdot ksi$

$$\beta_1 := \begin{cases} 0.85 & \text{if } f'_c < 4000 \cdot psi \\ 0.65 & \text{else if } f'_c \geq 8000 \cdot psi \\ 0.85 - 0.05 \cdot \dfrac{(f'_c - 4000 \cdot psi)}{1000 \cdot psi} & \text{else} \end{cases} = 0.85$$

Per AASHTO LRFD 5.6.2.2

$$E_c := 33000 \cdot 1 \cdot 0.145^{1.5} \cdot \sqrt{\frac{f'_c}{ksi}} \cdot psi = 3644.147\ psi$$

Per AASHTO LRFD C5.4.2.4-2

$$n := \frac{E_s}{E_c} = 7.958 \cdot 10^3$$

2. Calculated Design Shear and Moment

$M_u := 101.5\ kip \cdot ft$ Max Moment from STAAD

$V_u := 29\ kip$ Max Factored Out-of-plane Shear

$M_s := 74\ kip \cdot ft$ Max Service Moment

3. Select Reinforcement

$M := 8$ Longitudinal Bar

$N := 9 \cdot in$ spacing

$X := 0$ Longitudinal bar 2nd row

$Y := 11.5 \cdot in$ spacing

Area of steel and diameter of bar per ODOT BDM 2019, Figure 301-8

4. Thickness

$b := 1\ ft$ Design Width

$t := 28 \cdot in$ Wall Thickness

$Cover := 2\ in$

$$d' := Cover + \frac{d_b(M)}{2} = 2.5\ in$$

$$d := t - d' = 25.5\ in$$

5. Check Flexural Capacity

Reference:

AASHTO 8th edition LRFD equations 5.7.3.3-3 and 5.7.3.3-2

$\phi_f := 0.90$ Per AASHTO LRFD 9th Edition, 5.5.4.2

$A_{s\_prov} := \left(\frac{A_s(M)}{N}\right) \cdot b = 1.053\ in^2$ Total area of main longitudinal reinf.

$a := \frac{A_{s\_prov} \cdot f_y}{0.85 \cdot f'_c \cdot b} = 1.549\ in$

$d_s := d = 25.5\ in$

$c := \frac{a}{\beta_1} = 1.822\ in$

$d_s := d = 25.5\ in$ Distance from extreme compression fiber to centroid of longitudinal reinf.

$M_n := A_{s\_prov} \cdot f_y \cdot \left(d_s - \frac{a}{2}\right) = 130.221\ ft \cdot kip$ $M_u = 101.5\ ft \cdot kip$

$\phi M_n := \phi_f \cdot M_n = 117.199\ ft \cdot kip$

$$Check\_Moment := \begin{cases} \text{if } \phi M_n > M_u \\ \quad \text{“OK”} \\ \text{else} \\ \quad \text{“Increase Wall Capacity”} \end{cases} = \text{“OK”}$$

6. Check Shear Capacity

$\phi_v := 0.90$ Per AASHTO LRFD 9th Edition, 5.5.4.2

$\beta_v := 2$ Per AASHTO LRFD 9th Edition, 5.7.3.4.1

$d_v := \max\left(\frac{M_n}{A_{s\_prov} \cdot f_y}, 0.9 \cdot d_s, 0.72 \cdot t\right) = 24.725\ in$

$V_c := 0.0316 \cdot \beta_v \cdot \sqrt{\frac{f'_c}{ksi}} \cdot \frac{b}{in} \cdot \frac{d_v}{in} \cdot kip = 37.504\ kip$ Per AASHTO LRFD 9th Edition, 5.7.3.3-3

$V_{n1} := 0.25 \cdot f'_c \cdot b \cdot d = 306\ kip$ Per AASHTO LRFD 9th Edition, 5.7.3.3-2

$V_{n2} := V_c = 37.504\ kip$

$V_n := min\left(V_{n1}, V_{n2}\right) = 37.504\ kip$

6. Check Shear Capacity (continued):

$\phi V_n := \phi_v \cdot V_n = 33.753\ kip$ $V_u = 29\ kip$

$Check\_Shear := \text{if } \phi V_n > V_u \text{ "OK" else "No Good"} = \text{"OK"}$

7. Check Reinforcement Spacing

$S := N = 9\ in$ Reinforcing spacing

$\gamma_e := 1$ Per AASHTO LRFD 9th Edition, 5.6.7-2

AASHTO 9th edition LRFD 5.6.7

$d_c := t - d = 2.5\ in$

$\beta_s := 1 + \frac{d_c}{0.7 \cdot (t - d_c)} = 1.14$ Per AASHTO LRFD 9th Edition, 5.6.7-2

$\rho := \frac{A_{s\_prov}}{b \cdot d} = 0.003$ $k := \sqrt{2 \cdot \rho \cdot n + (\rho \cdot n)^2} - \rho \cdot n = 0.982$

$h' := k \cdot d = 25.051\ in$ Distance from extreme compression fiber to neutral axis.

$I_T := \frac{b \cdot h'^3}{12} + b \cdot h' \cdot \left(\frac{h'}{2}\right)^2 + \frac{A_{s\_prov}}{2} \cdot n \cdot (d - h')^2 = 63727.526\ in^4$ Transformed Moment of Inertia

$f_s := \frac{M_s \cdot (d - h')}{I_T} \cdot n = 49.81\ ksi$ Stress in reinf. closest to the tension face at service load.

$S_{max} := \left(\frac{700 \cdot \gamma_e}{\beta_s \cdot \frac{f_s}{ksi}} - 2 \cdot \frac{d_c}{in}\right) \cdot in = 7.327\ in$ Per AASHTO LRFD 9th Edition, 5.6.7-1

$Check\_Max\_Spa := \text{if } S \le S_{max} \text{ "OK" else "Reduce Rebar Spacing"} = \text{"Reduce Rebar Spacing"}$

8. Check Minimum Reinforcing

Reference:

AASHTO 8th edition LRFD 5.6.3.3

$\gamma_3 := 0.67$ Ratio of specified minimum yield strength to ultimate tensile strength. AASHTO LRFD 9th edition 5.6.3.3

$\gamma_1 := 1.6$ Flexural cracking variability factor. AASHTO LRFD 9th edition 5.6.3.3

$f_r := 0.24 \cdot 1 \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi = 0.48\ ksi$ Modulus of rupture. AASHTO LRFD 9th edition 5.4.2.6

$S_c := \frac{b \cdot t^2}{6} = (1.568 \cdot 10^3)\ in^3$ Section modulus for design section

$M_{cr} := \gamma_3 \cdot (\gamma_1 \cdot f_r \cdot S_c) = 67.236\ kip \cdot ft$ Mcr AASHTO LRFD 9th edition 5.6.3.3-1

$M_{min} := min(1.33 \cdot M_u, M_{cr}) = 67.236\ kip \cdot ft$

$\phi M_n = 117.199\ kip \cdot ft$

$Check\_M\_min := \text{if } \phi M_n \geq M_{min}$ "Reinforcing Adequate"
else "Increase reinforcing"
$= \text{"Reinforcing Adequate"}$

9. Determine Temperature and shrinkage reinforcing

$$A_{s\_temp\_calc} := \frac{1.3 \cdot b \cdot t \cdot \frac{1}{in^2}}{2 \cdot \frac{(b+t)}{in} \cdot \frac{f_y}{ksi}} \cdot \frac{in^2}{ft} = 0.091 \ \frac{in^2}{ft}$$

Minimum temperature and shrinking reinforcing per AASHT 9th edition , 5.10.6.

$$A_{s\_temp} := \begin{vmatrix} \text{if } A_{s\_temp\_calc} > 0.11 \cdot \frac{in^2}{ft} \wedge A_{s\_temp\_calc} < 0.60 \cdot \frac{in^2}{ft} \\ \quad \| A_{s\_temp\_calc} \\ \text{else if } A_{s\_temp\_calc} < 0.11 \ \frac{in^2}{ft} \\ \quad \| 0.11 \cdot \frac{in^2}{ft} \\ \text{else} \\ \quad \| 0.60 \cdot \frac{in^2}{ft} \end{vmatrix} = 0.11 \ \frac{in^2}{ft}$$

$U := 5$ Temperature Bar #

$V := 12 \cdot in$ spacing

$$A_{s\_temp\_prov} := \frac{A_s(U)}{V} = 0.31 \ \frac{in^2}{ft}$$

$$Check\_temp := \begin{vmatrix} \text{if } A_{s\_temp} \le A_{s\_temp\_prov} \\ \quad \| \text{“OK”} \\ \text{else} \\ \quad \| \text{“Increase Rebar”} \end{vmatrix} = \text{“OK”}$$

Concrete Footing Design Reinforcement (AASHTO LRFD 9th edition):

Reference:

1. Material Properties

$f'_c := 4000 \cdot psi$

$f_y := 60000 \cdot psi$

$E_s := 29000 \cdot ksi$

$$\beta_1 := \begin{cases} 0.85 & \text{if } f'_c < 4000 \cdot psi \\ 0.65 & \text{else if } f'_c \geq 8000 \cdot psi \\ 0.85 - 0.05 \cdot \dfrac{(f'_c - 4000 \cdot psi)}{1000 \cdot psi} & \text{else} \end{cases} = 0.85$$

Per AASHTO LRFD 5.6.2.2

$$E_c := 33000 \cdot 1 \cdot 0.145^{1.5} \cdot \sqrt{\frac{f'_c}{ksi}} \cdot psi = 3644.147\ psi$$

Per AASHTO LRFD C5.4.2.4-2

$$n := \frac{E_s}{E_c} = 7.958 \cdot 10^3$$

2. Calculated Design Shear and Moment

$M_u := 107\ kip \cdot ft$ Max Moment from STAAD

$V_u := 16\ kip$ Max Factored Out-of-plane Shear

$M_s := 74\ kip \cdot ft$ Max Service Moment

3. Select Reinforcement

$M := 9$ Longitudinal Bar

$N := 9 \cdot in$ spacing

$X := 0$ Longitudinal bar 2nd row

$Y := 11.5 \cdot in$ spacing

Area of steel and diameter of bar per ODOT BDM 2019, Figure 301-8

4. Thickness

$b := 1\ ft$ Design Width

$t := 28 \cdot in$ Wall Thickness

$Cover := 2\ in$

$$d' := Cover + \frac{d_b(M)}{2} = 2.564\ in$$

$$d := t - d' = 25.436\ in$$

5. Check Flexural Capacity

Reference:

AASHTO 8th edition LRFD equations 5.7.3.3-3 and 5.7.3.3-2

$\phi_f := 0.90$ Per AASHTO LRFD 9th Edition, 5.5.4.2

$A_{s\_prov} := \left(\frac{A_s(M)}{N}\right) \cdot b = 1.333\ in^2$ Total area of main longitudinal reinf.

$a := \frac{A_{s\_prov} \cdot f_y}{0.85 \cdot f'_c \cdot b} = 1.961\ in$

$d_s := d = 25.436\ in$

$c := \frac{a}{\beta_1} = 2.307\ in$

$d_s := d = 25.436\ in$ Distance from extreme compression fiber to centroid of longitudinal reinf.

$M_n := A_{s\_prov} \cdot f_y \cdot \left(d_s - \frac{a}{2}\right) = 163.037\ ft \cdot kip$ $M_u = 107\ ft \cdot kip$

$\phi M_n := \phi_f \cdot M_n = 146.734\ ft \cdot kip$

$$Check\_Moment := \begin{cases} \text{if } \phi M_n > M_u \\ \quad \text{“OK”} \\ \text{else} \\ \quad \text{“Increase Wall Capacity”} \end{cases} = \text{“OK”}$$

6. Check Shear Capacity

$\phi_v := 0.90$ Per AASHTO LRFD 9th Edition, 5.5.4.2

$\beta_v := 2$ Per AASHTO LRFD 9th Edition, 5.7.3.4.1

$d_v := \max\left(\frac{M_n}{A_{s\_prov} \cdot f_y}, 0.9 \cdot d_s, 0.72 \cdot t\right) = 24.456\ in$

$V_c := 0.0316 \cdot \beta_v \cdot \sqrt{\frac{f'_c}{ksi}} \cdot \frac{b}{in} \cdot \frac{d_v}{in} \cdot kip = 37.094\ kip$ Per AASHTO LRFD 9th Edition, 5.7.3.3-3

$V_{n1} := 0.25 \cdot f'_c \cdot b \cdot d = 305.232\ kip$ Per AASHTO LRFD 9th Edition, 5.7.3.3-2

$V_{n2} := V_c = 37.094\ kip$

$V_n := min\left(V_{n1}, V_{n2}\right) = 37.094\ kip$

6. Check Shear Capacity (continued):

$\phi V_n := \phi_v \cdot V_n = 33.385\ kip$ $V_u = 16\ kip$

$Check\_Shear := \text{if } \phi V_n > V_u \text{ "OK" else "No Good"} = \text{"OK"}$

7. Check Reinforcement Spacing

$S := N = 9\ in$ Reinforcing spacing

$\gamma_e := 1$ Per AASHTO LRFD 9th Edition, 5.6.7-2

AASHTO 9th edition LRFD 5.6.7

$d_c := t - d = 2.564\ in$

$\beta_s := 1 + \frac{d_c}{0.7 \cdot (t - d_c)} = 1.144$ Per AASHTO LRFD 9th Edition, 5.6.7-2

$\rho := \frac{A_{s\_prov}}{b \cdot d} = 0.004$ $k := \sqrt{2 \cdot \rho \cdot n + (\rho \cdot n)^2} - \rho \cdot n = 0.986$

$h' := k \cdot d = 25.08\ in$ Distance from extreme compression fiber to neutral axis.

$I_T := \frac{b \cdot h'^3}{12} + b \cdot h' \cdot \left(\frac{h'}{2}\right)^2 + \frac{A_{s\_prov}}{2} \cdot n \cdot (d - h')^2 = 63775.451\ in^4$ Transformed Moment of Inertia

$f_s := \frac{M_s \cdot (d - h')}{I_T} \cdot n = 39.413\ ksi$ Stress in reinf. closest to the tension face at service load.

$S_{max} := \left(\frac{700 \cdot \gamma_e}{\beta_s \cdot \frac{f_s}{ksi}} - 2 \cdot \frac{d_c}{in}\right) \cdot in = 10.397\ in$ Per AASHTO LRFD 9th Edition, 5.6.7-1

$Check\_Max\_Spa := \text{if } S \le S_{max} \text{ "OK" else "Reduce Rebar Spacing"} = \text{"OK"}$

8. Check Minimum Reinforcing

Reference:

AASHTO 8th edition LRFD 5.6.3.3

$\gamma_3 := 0.67$ Ratio of specified minimum yield strength to ultimate tensile strength. AASHTO LRFD 9th edition 5.6.3.3

$\gamma_1 := 1.6$ Flexural cracking variability factor. AASHTO LRFD 9th edition 5.6.3.3

$f_r := 0.24 \cdot 1 \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi = 0.48\ ksi$ Modulus of rupture. AASHTO LRFD 9th edition 5.4.2.6

$S_c := \frac{b \cdot t^2}{6} = \left(1.568 \cdot 10^3\right)\ in^3$ Section modulus for design section

$M_{cr} := \gamma_3 \cdot \left(\gamma_1 \cdot f_r \cdot S_c\right) = 67.236\ kip \cdot ft$ Mcr AASHTO LRFD 9th edition 5.6.3.3-1

$M_{min} := min\left(1.33 \cdot M_u, M_{cr}\right) = 67.236\ kip \cdot ft$

$\phi M_n = 146.734\ kip \cdot ft$

$Check\_M\_min := \text{if } \phi M_n \geq M_{min}$ "Reinforcing Adequate" else "Increase reinforcing" $=$ "Reinforcing Adequate"

9. Determine Temperature and shrinkage reinforcing

$$A_{s\_temp\_calc} := \frac{1.3 \cdot b \cdot t \cdot \frac{1}{in^2}}{2 \cdot \frac{(b+t)}{in} \cdot \frac{f_y}{ksi}} \cdot \frac{in^2}{ft} = 0.091 \ \frac{in^2}{ft}$$

Minimum temperature and shrinking reinforcing per AASHT 9th edition , 5.10.6.

$$A_{s\_temp} := \begin{vmatrix} \text{if } A_{s\_temp\_calc} > 0.11 \cdot \frac{in^2}{ft} \wedge A_{s\_temp\_calc} < 0.60 \cdot \frac{in^2}{ft} \\ \quad \| A_{s\_temp\_calc} \\ \text{else if } A_{s\_temp\_calc} < 0.11 \ \frac{in^2}{ft} \\ \quad \| 0.11 \cdot \frac{in^2}{ft} \\ \text{else} \\ \quad \| 0.60 \cdot \frac{in^2}{ft} \end{vmatrix} = 0.11 \ \frac{in^2}{ft}$$

$U := 5$ Temperature Bar #

$V := 12 \cdot in$ spacing

$$A_{s\_temp\_prov} := \frac{A_s(U)}{V} = 0.31 \ \frac{in^2}{ft}$$

$$Check\_temp := \begin{vmatrix} \text{if } A_{s\_temp} \le A_{s\_temp\_prov} \\ \quad \| \text{“OK”} \\ \text{else} \\ \quad \| \text{“Increase Rebar”} \end{vmatrix} = \text{“OK”}$$

Concrete Footing Design Reinforcement (AASHTO LRFD 9th edition):

Reference:

1. Material Properties

$f'_c := 4000 \cdot psi$

$f_y := 60000 \cdot psi$

$E_s := 29000 \cdot ksi$

$$\beta_1 := \begin{cases} 0.85 & \text{if } f'_c < 4000 \cdot psi \\ 0.65 & \text{else if } f'_c \geq 8000 \cdot psi \\ 0.85 - 0.05 \cdot \dfrac{(f'_c - 4000 \cdot psi)}{1000 \cdot psi} & \text{else} \end{cases} = 0.85$$

Per AASHTO LRFD 5.6.2.2

$$E_c := 33000 \cdot 1 \cdot 0.145^{1.5} \cdot \sqrt{\frac{f'_c}{ksi}} \cdot psi = 3644.147\ psi$$

Per AASHTO LRFD C5.4.2.4-2

$$n := \frac{E_s}{E_c} = 7.958 \cdot 10^3$$

2. Calculated Design Shear and Moment

$M_u := 129\ kip \cdot ft$ Max Moment from STAAD

$V_u := 16\ kip$ Max Factored Out-of-plane Shear

$M_s := 129\ kip \cdot ft$ Max Service Moment

3. Select Reinforcement

$M := 9$ Longitudinal Bar

$N := 9 \cdot in$ spacing

$X := 0$ Longitudinal bar 2nd row

$Y := 11.5 \cdot in$ spacing

Area of steel and diameter of bar per ODOT BDM 2019, Figure 301-8

4. Thickness

$b := 1\ ft$ Design Width

$t := 28 \cdot in$ Wall Thickness

$Cover := 2\ in$

$$d' := Cover + \frac{d_b(M)}{2} = 2.564\ in$$

$$d := t - d' = 25.436\ in$$

Note:
This is the for the Extreme II limit condition and serves to simply check the moment capacity of the wall is greater than applied moment.

5. Check Flexural Capacity

Reference:

AASHTO 8th edition LRFD equations 5.7.3.3-3 and 5.7.3.3-2

$\phi_f := 0.90$ Per AASHTO LRFD 9th Edition, 5.5.4.2

$A_{s\_prov} := \left(\frac{A_s(M)}{N}\right) \cdot b = 1.333\ in^2$ Total area of main longitudinal reinf.

$a := \frac{A_{s\_prov} \cdot f_y}{0.85 \cdot f'_c \cdot b} = 1.961\ in$

$d_s := d = 25.436\ in$

$c := \frac{a}{\beta_1} = 2.307\ in$

$d_s := d = 25.436\ in$ Distance from extreme compression fiber to centroid of longitudinal reinf.

$M_n := A_{s\_prov} \cdot f_y \cdot \left(d_s - \frac{a}{2}\right) = 163.037\ ft \cdot kip$ $M_u = 129\ ft \cdot kip$

$\phi M_n := \phi_f \cdot M_n = 146.734\ ft \cdot kip$

$$Check\_Moment := \begin{cases} \text{if } \phi M_n > M_u \\ \quad \text{“OK”} \\ \text{else} \\ \quad \text{“Increase Wall Capacity”} \end{cases} = \text{“OK”}$$

6. Check Shear Capacity

$\phi_v := 0.90$ Per AASHTO LRFD 9th Edition, 5.5.4.2

$\beta_v := 2$ Per AASHTO LRFD 9th Edition, 5.7.3.4.1

$d_v := \max\left(\frac{M_n}{A_{s\_prov} \cdot f_y}, 0.9 \cdot d_s, 0.72 \cdot t\right) = 24.456\ in$

$V_c := 0.0316 \cdot \beta_v \cdot \sqrt{\frac{f'_c}{ksi}} \cdot \frac{b}{in} \cdot \frac{d_v}{in} \cdot kip = 37.094\ kip$ Per AASHTO LRFD 9th Edition, 5.7.3.3-3

$V_{n1} := 0.25 \cdot f'_c \cdot b \cdot d = 305.232\ kip$ Per AASHTO LRFD 9th Edition, 5.7.3.3-2

$V_{n2} := V_c = 37.094\ kip$

$V_n := min\left(V_{n1}, V_{n2}\right) = 37.094\ kip$

6. Check Shear Capacity (continued):

$\phi V_n := \phi_v \cdot V_n = 33.385\ kip$ $V_u = 16\ kip$

$Check\_Shear := \text{if } \phi V_n > V_u \text{ "OK" else "No Good"} = \text{"OK"}$

7. Check Reinforcement Spacing

$S := N = 9\ in$ Reinforcing spacing

$\gamma_e := 1$ Per AASHTO LRFD 9th Edition, 5.6.7-2

AASHTO 9th edition LRFD 5.6.7

$d_c := t - d = 2.564\ in$

$\beta_s := 1 + \frac{d_c}{0.7 \cdot (t - d_c)} = 1.144$ Per AASHTO LRFD 9th Edition, 5.6.7-2

$\rho := \frac{A_{s\_prov}}{b \cdot d} = 0.004$ $k := \sqrt{2 \cdot \rho \cdot n + (\rho \cdot n)^2} - \rho \cdot n = 0.986$

$h' := k \cdot d = 25.08\ in$ Distance from extreme compression fiber to neutral axis.

$I_T := \frac{b \cdot h'^3}{12} + b \cdot h' \cdot \left(\frac{h'}{2}\right)^2 + \frac{A_{s\_prov}}{2} \cdot n \cdot (d - h')^2 = 63775.451\ in^4$ Transformed Moment of Inertia

$f_s := \frac{M_s \cdot (d - h')}{I_T} \cdot n = 68.706\ ksi$ Stress in reinf. closest to the tension face at service load.

$S_{max} := \left(\frac{700 \cdot \gamma_e}{\beta_s \cdot \frac{f_s}{ksi}} - 2 \cdot \frac{d_c}{in}\right) \cdot in = 3.778\ in$ Per AASHTO LRFD 9th Edition, 5.6.7-1

$Check\_Max\_Spa := \text{if } S \le S_{max} \text{ "OK" else "Reduce Rebar Spacing"} = \text{"Reduce Rebar Spacing"}$

Note:
This is the for the Extreme II limit condition and serves to simply check the moment capacity of the wall is greater than applied moment.

8. Check Minimum Reinforcing

Reference:

AASHTO 8th edition LRFD 5.6.3.3

$\gamma_3 := 0.67$ Ratio of specified minimum yield strength to ultimate tensile strength. AASHTO LRFD 9th edition 5.6.3.3

$\gamma_1 := 1.6$ Flexural cracking variability factor. AASHTO LRFD 9th edition 5.6.3.3

$f_r := 0.24 \cdot 1 \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi = 0.48\ ksi$ Modulus of rupture. AASHTO LRFD 9th edition 5.4.2.6

$S_c := \frac{b \cdot t^2}{6} = \left(1.568 \cdot 10^3\right)\ in^3$ Section modulus for design section

$M_{cr} := \gamma_3 \cdot \left(\gamma_1 \cdot f_r \cdot S_c\right) = 67.236\ kip \cdot ft$ Mcr AASHTO LRFD 9th edition 5.6.3.3-1

$M_{min} := min\left(1.33 \cdot M_u, M_{cr}\right) = 67.236\ kip \cdot ft$

$\phi M_n = 146.734\ kip \cdot ft$

$Check\_M\_min := \text{if } \phi M_n \geq M_{min}$ "Reinforcing Adequate" else "Increase reinforcing" $=$ "Reinforcing Adequate"

9. Determine Temperature and shrinkage reinforcing

$$A_{s\_temp\_calc} := \frac{1.3 \cdot b \cdot t \cdot \frac{1}{in^2}}{2 \cdot \frac{(b+t)}{in} \cdot \frac{f_y}{ksi}} \cdot \frac{in^2}{ft} = 0.091 \ \frac{in^2}{ft}$$

Minimum temperature and shrinking reinforcing per AASHT 9th edition , 5.10.6.

$$A_{s\_temp} := \begin{vmatrix} \text{if } A_{s\_temp\_calc} > 0.11 \cdot \frac{in^2}{ft} \wedge A_{s\_temp\_calc} < 0.60 \cdot \frac{in^2}{ft} \\ \quad \| A_{s\_temp\_calc} \\ \text{else if } A_{s\_temp\_calc} < 0.11 \ \frac{in^2}{ft} \\ \quad \| 0.11 \cdot \frac{in^2}{ft} \\ \text{else} \\ \quad \| 0.60 \cdot \frac{in^2}{ft} \end{vmatrix} = 0.11 \ \frac{in^2}{ft}$$

$U := 5$ Temperature Bar #

$V := 12 \cdot in$ spacing

$$A_{s\_temp\_prov} := \frac{A_s(U)}{V} = 0.31 \ \frac{in^2}{ft}$$

$$Check\_temp := \begin{vmatrix} \text{if } A_{s\_temp} \le A_{s\_temp\_prov} \\ \quad \| \text{“OK”} \\ \text{else} \\ \quad \| \text{“Increase Rebar”} \end{vmatrix} = \text{“OK”}$$

Appendix J

Culvert Camber Analysis

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 11:42 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 127+82, 82' RT.	EXPLORATION ID B-001-1-23
TYPE: CULVERT	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 537.3 (MSL) EOB: 41.5 ft.	PAGE 1 OF 2
START: 4/29/24 END: 4/29/24	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 80	LAT / LONG: 38.437629, -82.455831	

MATERIAL DESCRIPTION AND NOTES	ELEV. 537.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF TO HARD, BROWN AND GRAY, **CLAY**, "AND" SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST			4 7 7	19	100	SS-1	4.00	6	7	9	41	37	42	23	19	22	A-7-6 (12)	
			3 3 3	8	44	SS-2	4.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
ST ATTEMPT FROM 7.5'-9.5', NO RECOVERY			1 2 3	7	39	SS-3	2.25	-	-	-	-	-	-	-	-	32	A-7-6 (V)	
			2 2 4	8	100	SS-4	2.00	0	0	1	44	55	50	28	22	31	A-7-6 (15)	
					100	ST-5	2.60	0	0	1	53	46	46	27	19	28	A-7-6 (13)	
	522.8																	
SOFT TO STIFF, BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, WET			3 2 3	7	100	SS-6	1.50	0	0	48	34	18	23	17	6	24	A-4a (3)	
SS-7 CONTAINS NO INTACT SOIL FOR HP READINGS			0 0 3	4	100	SS-7	-	-	-	-	-	-	-	-	-	24	A-4a (V)	
SS-8 CONTAINS NO INTACT SOIL FOR HP READINGS			1 1 2	4	100	SS-8	-	-	-	-	-	-	-	-	-	27	A-4a (V)	
	515.8																	
LOOSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE CLAY, TRACE GRAVEL, WET		W 512.3	1 2 4	8	100	SS-9	-	-	-	-	-	-	-	-	-	28	A-3a (V)	

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 127+82, 82' RT.	START: 4/29/24	END: 4/29/24	PG 2 OF 2	B-001-1-23

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
LOOSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE CLAY, TRACE GRAVEL, WET *(continued)*	507.3	31	3 3 4	9	100	SS-10	-	0	27	46	15	12	NP	NP	NP	22	A-3a (0)	
	504.0	32																
STIFF, GRAY AND BROWN, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, SLIGHTLY ORGANIC, WET		33																
		34																
		35	2 3 2	7	100	SS-11	1.50	-	-	-	-	-	-	-	-	26	A-4a (V)	
	499.0	36																
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, WET		37																
		38																
		39																
		40	5 4 10	19	100	SS-12	-	-	-	-	-	-	-	-	-	26	A-3a (V)	
	495.8	41																
		EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 25.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 2 BAGS HOLE PLUG; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 7/15/24 11:43 - \\US0247-PPFSS01\SHARED_PROJECTS\173608714\LAW\75923\GEOTECHNICAL\REPORTS\ROADWAY\NOISE WA

PROJECT: LAW-7-2.17	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 164+02, 176' RT.	EXPLORATION ID B-007-1-23
TYPE: CULVERT	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: LAW-7	
PID: 75923 SFN: N/A	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/8/24	ELEVATION: 576.5 (MSL) EOB: 41.5 ft.	PAGE 1 OF 2
START: 4/24/24 END: 4/24/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 80	LAT / LONG: 38.442765, -82.445738	

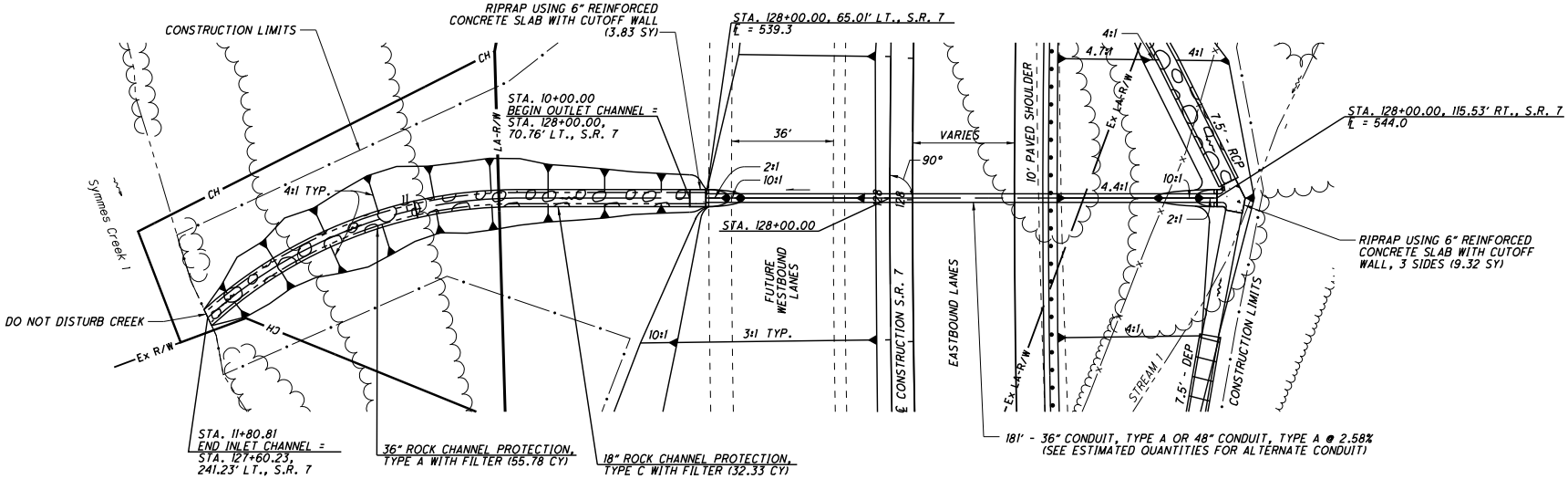
MATERIAL DESCRIPTION AND NOTES	ELEV. 576.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY STIFF, BROWN, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		1																
		2																
		3	2 4 5	12	89	SS-1	3.00	-	-	-	-	-	-	-	-	27	A-6a (V)	
	572.0	4																
HARD, BROWN, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		5																
		6	3 4 6	13	100	SS-2	4.50	-	-	-	-	-	-	-	-	24	A-4b (V)	
		7																
		8	2 3 5	11	100	SS-3	4.50	0	0	1	57	42	33	23	10	26	A-4b (8)	
		9																
		10																
		11	3 6 6	16	100	SS-4	4.50	-	-	-	-	-	-	-	-	22	A-4b (V)	
		12																
		13	3 5 6	15	100	SS-5	4.50	-	-	-	-	-	-	-	-	23	A-4b (V)	
		14																
		15																
		16	3 6 8	19	100	SS-6	4.50	-	-	-	-	-	-	-	-	23	A-4b (V)	
	559.5	17																
VERY STIFF TO HARD, BROWN BECOMING GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		18	4 5 6	15	100	SS-7	3.75	-	-	-	-	-	-	-	-	27	A-6a (V)	
		19																
		20																
		21	3 3 8	15	100	SS-8	3.50	1	0	1	47	51	35	20	15	23	A-6a (10)	
		22																
		23																
		24																
		25																
		26	3 5 7	16	100	SS-9	4.25	-	-	-	-	-	-	-	-	25	A-6a (V)	
		27																
		28																
		29																

PID: 75923	SFN: N/A	PROJECT: LAW-7-2.17	STATION / OFFSET: 164+02, 176' RT.	START: 4/24/24	END: 4/24/24	PG 2 OF 2	B-007-1-23

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
VERY STIFF TO HARD, BROWN BECOMING GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP *(continued)*	546.5	31	4 5 6	15	100	SS-10	3.75	-	-	-	-	-	-	-	-	27	A-6a (V)	
		W 543.5 32 33 34																
		35	3 4 6	13	100	SS-11	3.25	0	1	2	38	59	38	23	15	25	A-6a (10)	
		36 37 38 39																
		40	3 7 10	23	100	SS-12	4.00	-	-	-	-	-	-	-	-	21	A-6a (V)	
	535.0	41 EOB																

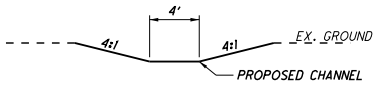
NOTES: GROUNDWATER ENCOUNTERED AT 33.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 2 BAGS HOLE PLUG; SHOVELED SOIL CUTTINGS



ESTIMATE QUANTITIES			
ITEM	TOTAL	UNIT	DESCRIPTION
203	182	CY	EXCAVATION
601	13.16	SY	RIPRAP, TYPE D
601	55.78	CY	ROCK CHANNEL PROTECTION, TYPE A WITH FILTER
601	32.33	CY	ROCK CHANNEL PROTECTION, TYPE C WITH FILTER
602	1.52	CY	CONCRETE MASONRY
611	181	FT	36" CONDUIT, TYPE A, 706.01 OR 706.02 OR 707.33 OR
			48" CONDUIT, TYPE A, 707.01 OR 707.02 (GALVANIZED OR ALUMINIZED)
659	572	SY	SEEDING AND MULCHING, CLASS 3C

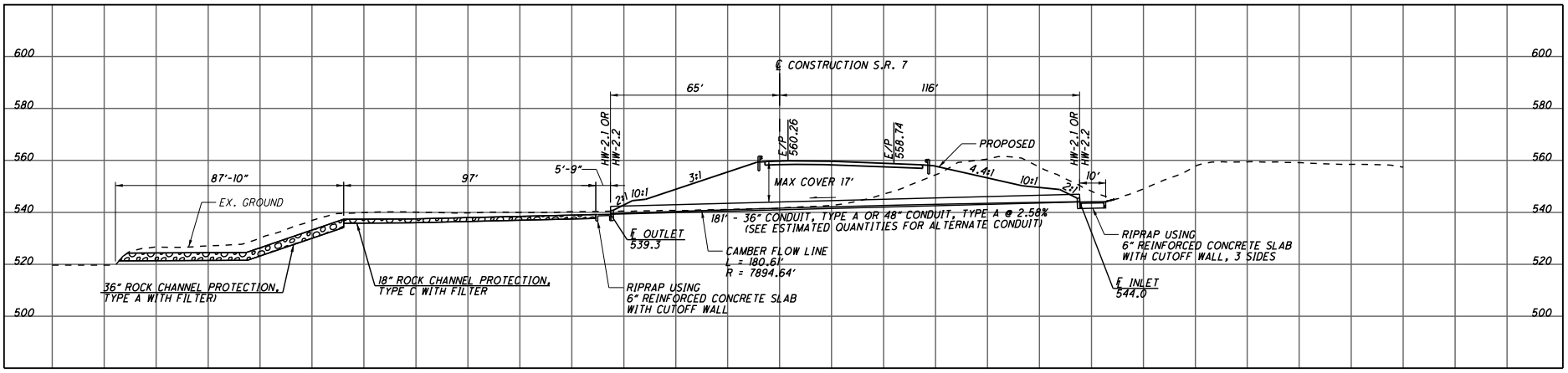
QUANTITIES CARRIED TO SUBSUMMARY SHEETS 79-80



CHANNEL TYPICAL SECTION

NOTE:
CULVERT SIZE SHOWN HAS BEEN INCREASED FOR FUTURE REHABILITATION

HYDRAULIC DATA	
DRAINAGE AREA	= 15 AC.
Q50	= 44 CFS
Q100	= 48 CFS
50V	= 6.22 FPS
100V	= 6.79 FPS
50 HW	= 547.8
100 HW	= 548.1
OHWMi	= 546.5
OHWMo	= 517.3
pH	= 7.2
DESIGN SERVICE LIFE	= 75 YEARS
ABRASION LEVEL	= 4
CFN	= 1995062



HORIZONTAL SCALE IN FEET
0 10 20 40
CALCULATED SLP
CHECKED ALB

CULVERT DETAIL
S.R. 7 STA. 128+00.00

LAW-7-2.17

649
1247

U:\1736087\4\LAW\75923\drainage\sheets\75923DC001-28.dgn 5/21/2024 4:59:36 PM SLParker

Table of Contents

Settle3 Analysis Information

LAW-7

Project Settings

Document Name	128+00_camber
Project Title	LAW-7
Analysis	Culvert 128+00 Camber
Author	J. Samples
Company	Stantec
Date Created	3/20/2024, 9:42:44 AM
Stress Computation Method	Boussinesq
Minimum settlement ratio for subgrade modulus	0.9
Use average properties to calculate layered stresses	
Improve consolidation accuracy	
Ignore negative effective stresses in settlement calculations	

Stage Settings

Stage #	Name
1	Stage 1

Results

Time taken to compute: 0.460881 seconds

Stage: Stage 1

Data Type	Minimum	Maximum
Total Settlement [in]	0	7.76646
Total Consolidation Settlement [in]	0	6.73631
Virgin Consolidation Settlement [in]	0	4.91528
Recompression Consolidation Settlement [in]	0	1.82399
Immediate Settlement [in]	0	1.04188
Loading Stress ZZ [ksf]	0.185207	2.50003
Loading Stress XX [ksf]	-0.41068	3.48796
Loading Stress YY [ksf]	-0.329244	2.091
Effective Stress ZZ [ksf]	0.185207	5.75375
Effective Stress XX [ksf]	0.0139389	7.06986
Effective Stress YY [ksf]	0.231218	5.6729
Total Stress ZZ [ksf]	0.185207	6.78335
Total Stress XX [ksf]	0.0139389	8.09946
Total Stress YY [ksf]	0.231218	6.7025
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0.000992332	0.244193
Pore Water Pressure [ksf]	0	1.0296
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.187579	9.20069
Over-consolidation Ratio	1	2.32794
Void Ratio	0	0.750262
Hydroconsolidation Settlement [in]	0	0
Undrained Shear Strength	0	0.144348

Embankments

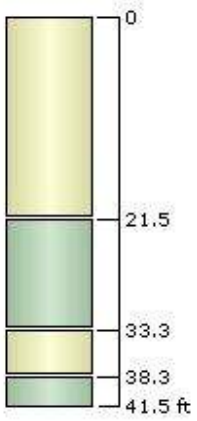
1. Embankment: "Embankment Load 1"

Label	Embankment Load 1
Center Line	(0, 0) to (0, 670)
Near End Angle	90 degrees
Far End Angle	90 degrees
Number of Zones	1
Number of Sections	1

Zone	Name	Unit Weight (kips/ft3)
1	New Zone	0.125

Soil Layers

Layer #	Type	Thickness [ft]	Depth [ft]
1	Cohesive Soil	21.5	0
2	Granular Soil	11.8	21.5
3	Cohesive Soil	5	33.3
4	Granular Soil	3.2	38.3



Soil Properties

Property	Cohesive Soil	Granular Soil
Color		
Unit Weight [kips/ft3]	0.108	0.112
Saturated Unit Weight [kips/ft3]	0.115	0.115
K0	1	1
Immediate Settlement	Disabled	Enabled
Es [ksf]	-	396.823
Esur [ksf]	-	208.9
Primary Consolidation	Enabled	Disabled
Material Type	Non-Linear	
Cc	0.16	-
Cr	0.027	-
e0	0.752	-
OCR	2.7	-
Undrained Su A [kips/ft2]	0	0
Undrained Su S	0.2	0.2
Undrained Su m	0.8	0.8
Piezo Line ID	1	1

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	0.0624 kips/ft3

Piezometric Line Entities

ID	Depth (ft)
1	25 ft

Query Points

Point #	Query Point Name	(X,Y) Location	Number of Divisions
1	Query Point 1	180.635, 335	Auto: 51
2	Query Point 2	151, 335	Auto: 51
3	Query Point 3	121, 335	Auto: 51
4	Query Point 4	91, 335	Auto: 51
5	Query Point 5	61, 335	Auto: 51
6	Query Point 6	31, 335	Auto: 51
7	Query Point 7	0, 335	Auto: 51

Query Lines

Line #	Query Line Name	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	Query Line 1	0, 335	180.635, 335	18	Auto: 51

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614.892.0162

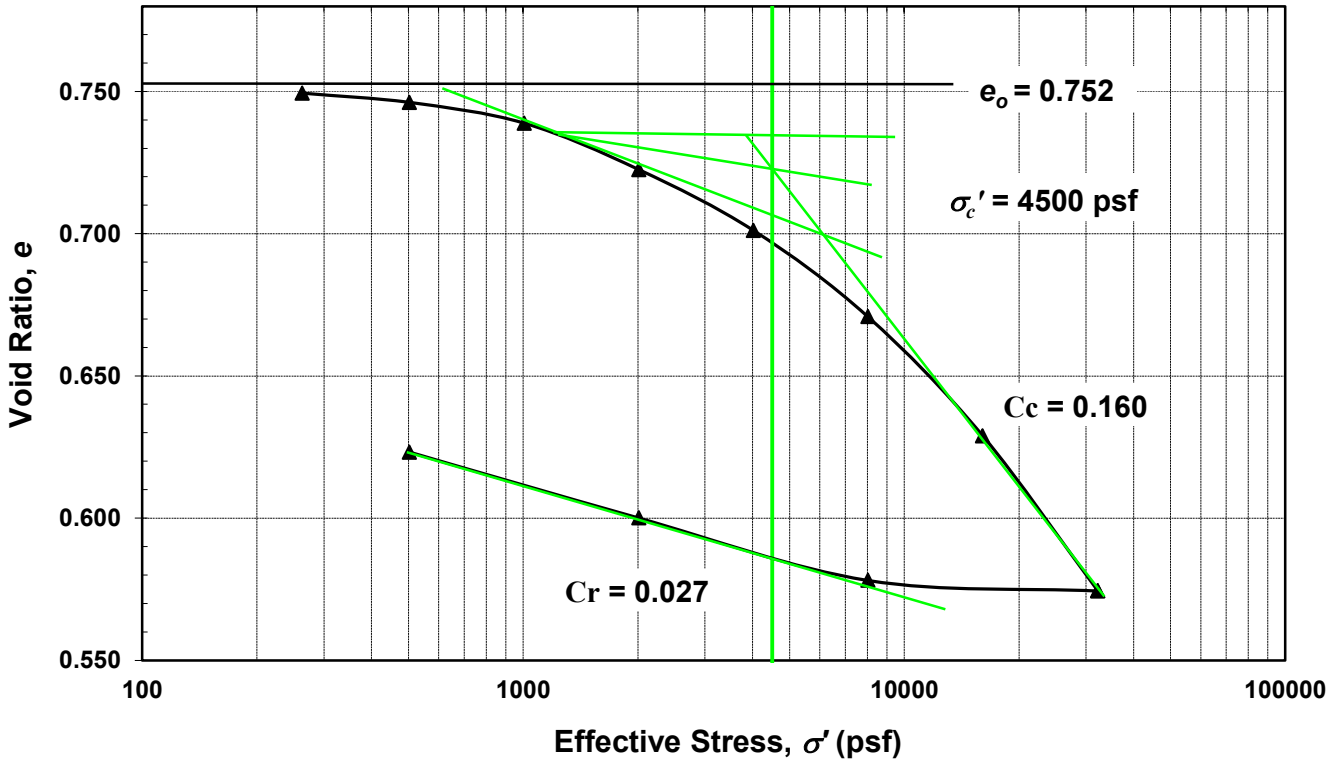
Consolidation Test

Project Name:	LAW-7-2.17	Prepared by:	LR
Source:	B-001-1-23 ST-5 12.5'-14.5' (13.8'-13.9' sampled)	Checked by:	ZM
Description:	Very stiff, brown and orangish brown, CLAY, "and" silt, trace sand trace gravel, moist.	Date:	7/9/2024
Test Specification:	ASTM D 2435		
Initial Void Ratio:	0.752	Initial Bulk Unit Weight (lb/ft^3):	123
In-situ Vertical Effective Stress (psf):	1650	Dry Unit Weight (lb/ft^3):	96

Compression and Swelling Index

Compression Index (Cc):	0.160	Preconsolidation Pressure (σ_c') (psf):	**4500**
Recompression Index (Cr):	0.027	Over-Consolidation Ratio (OCR):	**2.7**

Consolidation Curve



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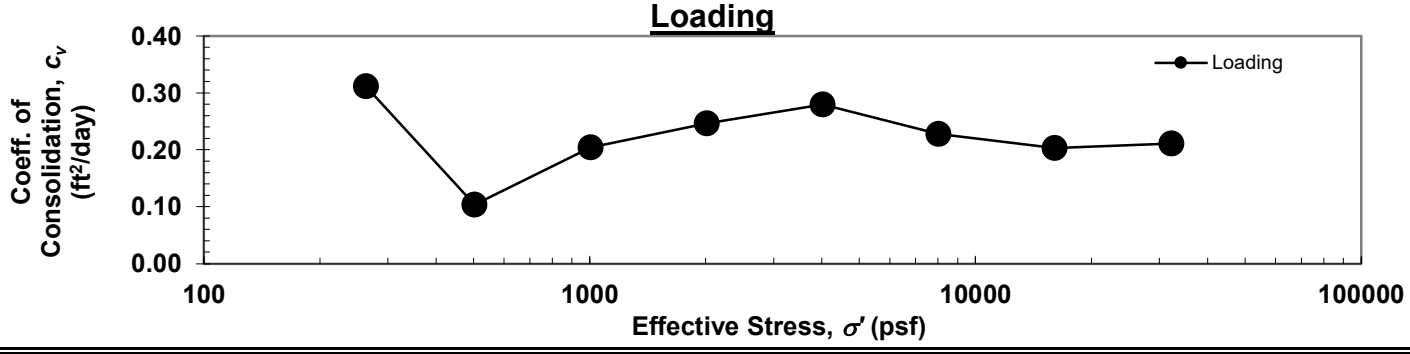
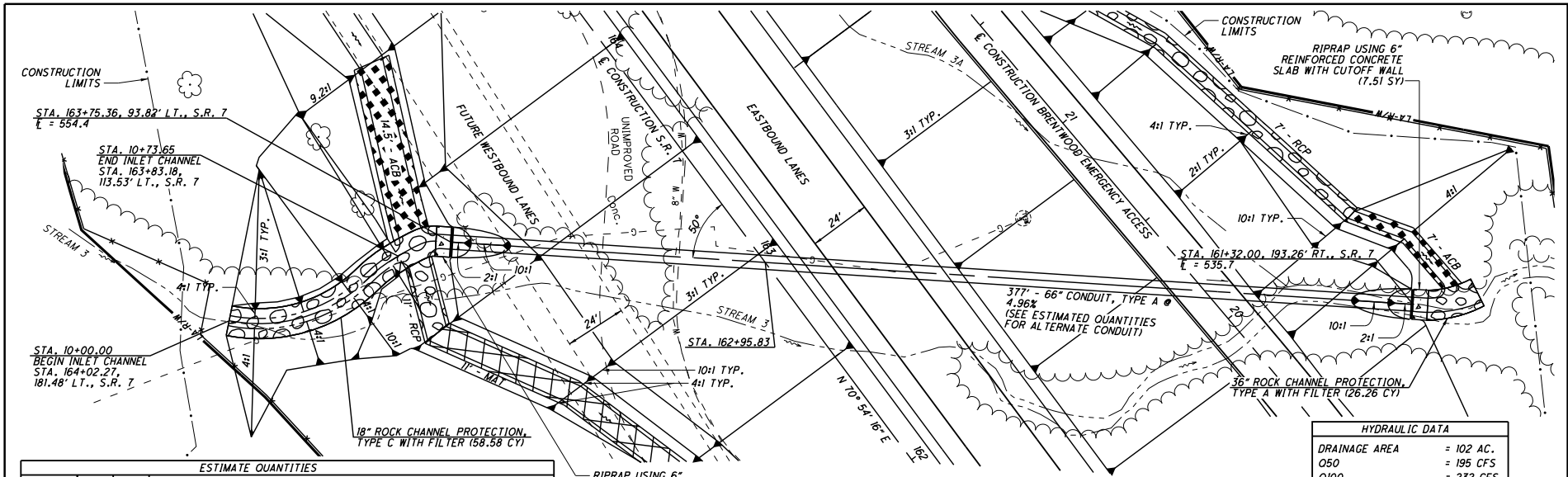


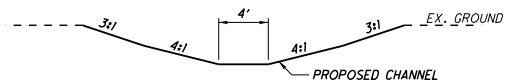


ESTIMATE QUANTITIES			
ITEM	TOTAL	UNIT	DESCRIPTION
203	674	CY	EXCAVATION
203	70	CY	EMBANKMENT
601	15.02	SY	RIPRAP, TYPE D
601	32.33	CY	ROCK CHANNEL PROTECTION, TYPE A WITH FILTER
601	55.78	CY	ROCK CHANNEL PROTECTION, TYPE C WITH FILTER
602	1.52	CY	CONCRETE MASONRY
611	377	FT	66" CONDUIT, TYPE A, 707.02 (0.218) GALVANIZED WITH CFP OR
			707.02 (0.064) ALUMINIZED WITH CFP OR 707.04 (0.064) WITH CFP
659	703	SY	SEEDING AND MULCHING, CLASS 3C

QUANTITIES CARRIED TO SUBSUMMARY SHEETS 79-80

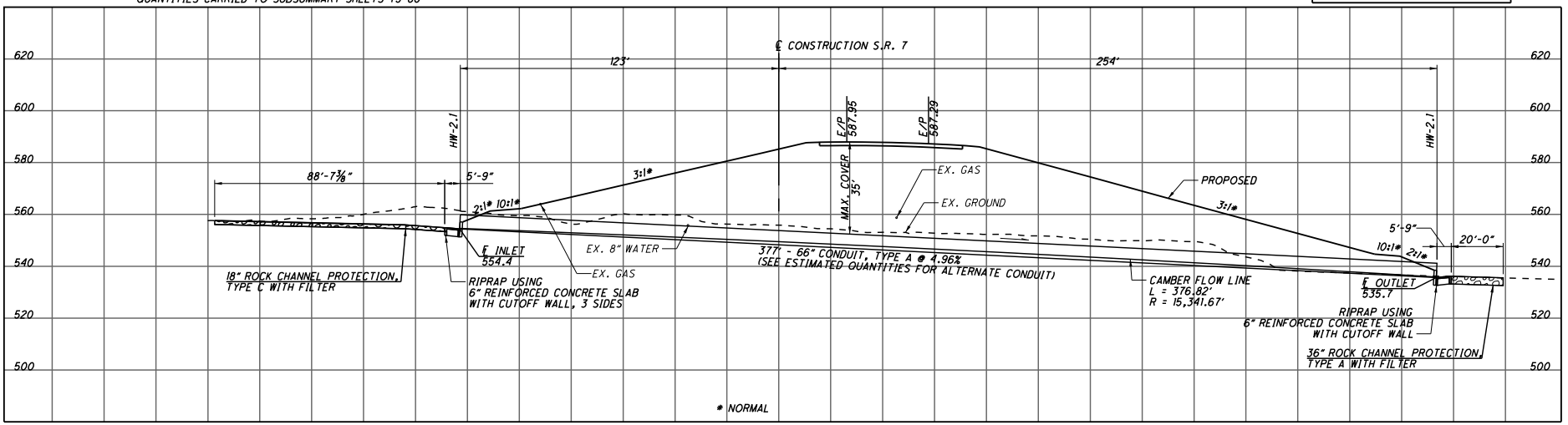
HYDRAULIC DATA	
DRAINAGE AREA	= 102 AC.
Q50	= 195 CFS
Q100	= 232 CFS
50V	= 15.3 FPS
100V	= 15.9 FPS
50 HW	= 562.4
100 HW	= 564.5
OHWMi	= 555.4
OHWMo	= 537.2
pH	= 6.9
DESIGN SERVICE LIFE	= 75 YEARS
ABRASION LEVEL	= 4
CFN	= 1995090

NOTE:
CULVERT SIZE SHOWN HAS BEEN INCREASED FOR FUTURE REHABILITATION.



CHANNEL TYPICAL SECTION

SOME SLOPES MAY VARY
SEE CROSS SECTIONS FOR DETAILS



CALCULATED SLP
CHECKED ALB

HORIZONTAL SCALE IN FEET
0 10 20 40

CULVERT DETAIL
S.R. 7 STA. 162+95.83

LAW-7-2.17

652
1247

U:\1736087\4\LAW\75923\drainage\sheets\75923DC002-2A.dgn 5/21/2024 4:59:40 PM SLParker

Table of Contents

Settle3 Analysis Information

LAW-7

Project Settings

Document Name	229+62_camber
Project Title	LAW-7
Analysis	Culvert 229+62 Camber
Author	J. Samples
Company	Stantec
Date Created	3/20/2024, 9:42:44 AM
Stress Computation Method	Boussinesq
Minimum settlement ratio for subgrade modulus	0.9
Use average properties to calculate layered stresses	
Improve consolidation accuracy	
Ignore negative effective stresses in settlement calculations	

Stage Settings

Stage #	Name
1	Stage 1

Results

Time taken to compute: 0.14322 seconds

Stage: Stage 1

Data Type	Minimum	Maximum
Total Settlement [in]	0	9.94023
Total Consolidation Settlement [in]	0	9.94023
Virgin Consolidation Settlement [in]	0	2.32122
Recompression Consolidation Settlement [in]	0	7.61902
Immediate Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.312503	8.09529
Loading Stress XX [ksf]	-1.63727	8.18949
Loading Stress YY [ksf]	0.309861	5.4259
Total Stress ZZ [ksf]	0.312503	9.78539
Total Stress XX [ksf]	-0.664647	10.0195
Total Stress YY [ksf]	1.07377	7.2559
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0.0037762	0.371535
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.313418	32.7406
Over-consolidation Ratio	1	14.5391
Void Ratio	-0.0981524	0.429581
Hydroconsolidation Settlement [in]	0	0
Undrained Shear Strength	0	0.731685

Embankments

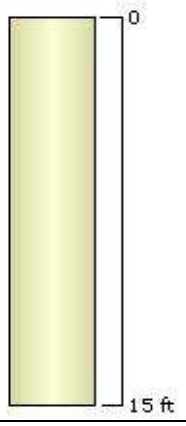
1. Embankment: "Embankment Load 1"

Label	Embankment Load 1
Center Line	(0, 0) to (0, 400)
Near End Angle	90 degrees
Far End Angle	90 degrees
Number of Zones	1
Number of Sections	1

Zone	Name	Unit Weight (kips/ft3)
1	New Zone	0.125

Soil Layers

Layer #	Type	Thickness [ft]	Depth [ft]
1	Soil Property 1	15	0



Soil Properties

Property	Soil Property 1
Color	
Unit Weight [kips/ft3]	0.122
K0	1
Primary Consolidation	Enabled
Material Type	Non-Linear
Cc	0.17
Cr	0.06
e0	0.435
OCR	17.9
Undrained Su A [kips/ft2]	0
Undrained Su S	0.2
Undrained Su m	0.8

Query Points

Point #	Query Point Name	(X,Y) Location	Number of Divisions
1	Query Point 1	71, 200	Auto: 31
2	Query Point 2	0, 200	Auto: 31
3	Query Point 3	142, 200	Auto: 31
4	Query Point 4	213, 200	Auto: 31
5	Query Point 5	284, 200	Auto: 31
6	Query Point 6	355, 200	Auto: 31
7	Query Point 7	425.881, 200	Auto: 31

Query Lines

Line #	Query Line Name	Start Location	End Location	Horizontal Divisions	Vertical Divisions
1	Query Line 1	0, 200	425.881, 200	42	Auto: 31

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614.892.0162

Consolidation Test

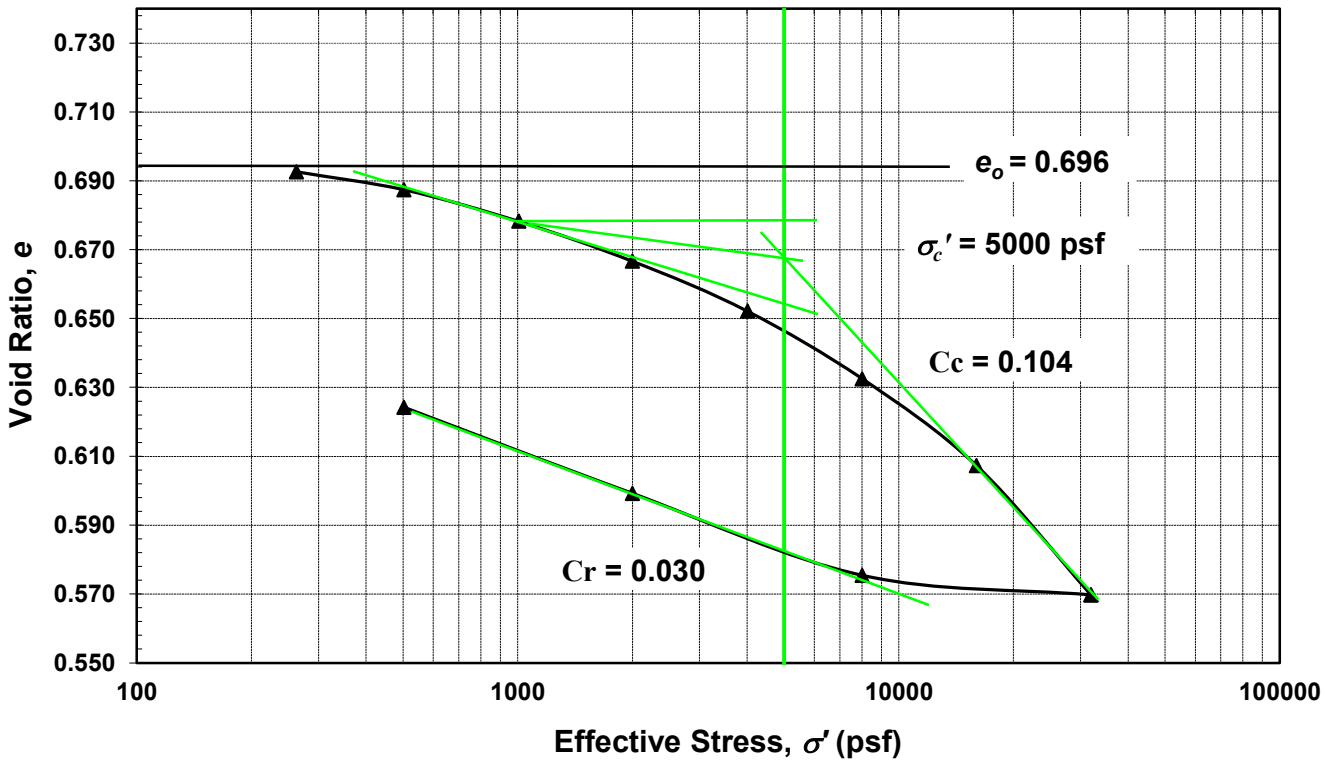
Project Name: LAW-7-2.17 | Prepared by: LR
Source: B-007-1B-23 ST-1 8.0'-10.0' (9.3'-9.4' sampled) | Checked by: ZM
Description: Hard, brown, SILT, "and" clay, trace sand, trace gravel, moist. | Date: 7/9/2024

Test Specification: ASTM D 2435
Initial Void Ratio: 0.696 | Initial Bulk Unit Weight (lb/ft^3): 125
In-situ Vertical Effective Stress (psf): 1110 | Dry Unit Weight (lb/ft^3): 99

Compression and Swelling Index

Compression Index (Cc): 0.104 | Preconsolidation Pressure (σ_c') (psf): **5000**
Recompression Index (Cr): 0.030 | Over-Consolidation Ratio (OCR): **4.5**

Consolidation Curve



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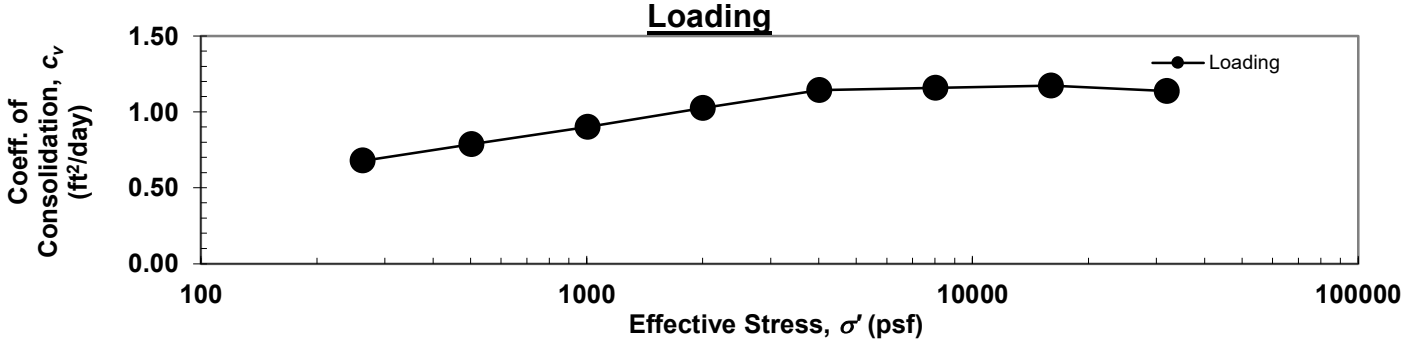
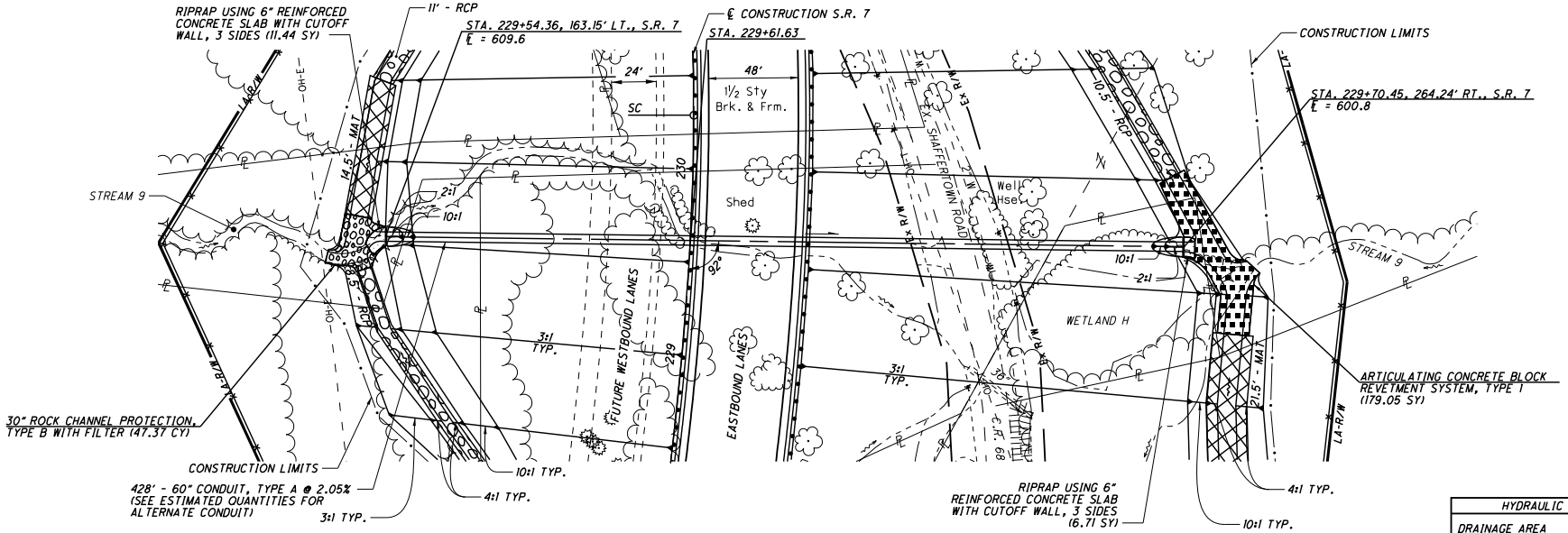


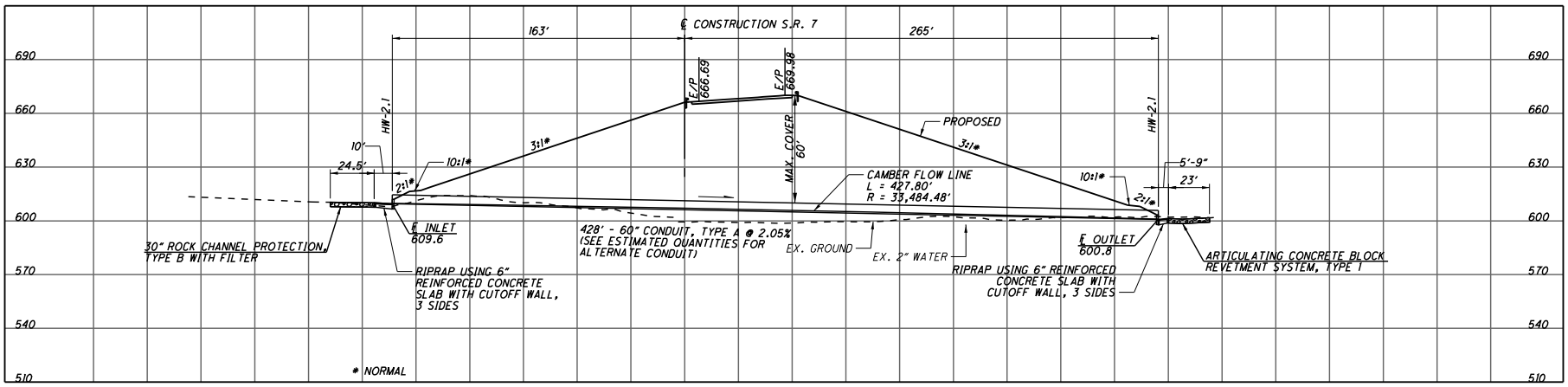


ESTIMATE QUANTITIES			
ITEM	TOTAL	UNIT	DESCRIPTION
601	18.15	SY	RIPRAP, TYPE D
601	179.05	SY	ARTICULATING CONCRETE BLOCK REVETMENT SYSTEM, TYPE 1
601	47.37	CY	ROCK CHANNEL PROTECTION, TYPE B WITH FILTER
602	3.56	CY	CONCRETE MASONRY
611	428	FT	60" CONDUIT, TYPE A, 707.02 (0.218) GALVANIZED WITH CFP OR
			707.02 (0.064) ALUMINIZED WITH CFP OR 707.04 (0.064) WITH CFP

QUANTITIES CARRIED TO SUBSUMMARY SHEETS 79-80

NOTE:
CULVERT SIZE SHOWN HAS BEEN INCREASED FOR FUTURE REHABILITATION.

HYDRAULIC DATA	
DRAINAGE AREA	= 80 AC.
Q50	= 147 CFS
Q100	= 175 CFS
50V	= 9.8 FPS
100V	= 11.7 FPS
50 HW	= 617.9
100 HW	= 623.4
OHWMi	= 610.5
OHWMo	= 601.1
pH	= 7.1
DESIGN SERVICE LIFE	= 75 YEARS
ABRASION LEVEL	= 4
CFN	= 1995072



CALCULATED SLP
CHECKED ALB

HORIZONTAL SCALE IN FEET
0 15 30 60

CULVERT DETAIL
S.R. 7 STA. 229+61.63

LAW-7-2.17

658
1247

U:\1736087\4\LAW\75923\drainage\sheets\75923DC004-2A.dgn 5/21/2024 4:59:48 PM SLParker

Table of Contents

Settle3 Analysis Information

LAW-7

Project Settings

Document Name	229+62_camber
Project Title	LAW-7
Analysis	Culvert 229+62 Camber
Author	J. Samples
Company	Stantec
Date Created	3/20/2024, 9:42:44 AM
Stress Computation Method	Boussinesq
Minimum settlement ratio for subgrade modulus	0.9
Use average properties to calculate layered stresses	
Improve consolidation accuracy	
Ignore negative effective stresses in settlement calculations	

Stage Settings

Stage #	Name
1	Stage 1

Results

Time taken to compute: 0.14322 seconds

Stage: Stage 1

Data Type	Minimum	Maximum
Total Settlement [in]	0	9.94023
Total Consolidation Settlement [in]	0	9.94023
Virgin Consolidation Settlement [in]	0	2.32122
Recompression Consolidation Settlement [in]	0	7.61902
Immediate Settlement [in]	0	0
Loading Stress ZZ [ksf]	0.312503	8.09529
Loading Stress XX [ksf]	-1.63727	8.18949
Loading Stress YY [ksf]	0.309861	5.4259
Total Stress ZZ [ksf]	0.312503	9.78539
Total Stress XX [ksf]	-0.664647	10.0195
Total Stress YY [ksf]	1.07377	7.2559
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	0
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0.0037762	0.371535
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	0.313418	32.7406
Over-consolidation Ratio	1	14.5391
Void Ratio	-0.0981524	0.429581
Hydroconsolidation Settlement [in]	0	0
Undrained Shear Strength	0	0.731685

Embankments

1. Embankment: "Embankment Load 1"

Label	Embankment Load 1
Center Line	(0, 0) to (0, 400)
Near End Angle	90 degrees
Far End Angle	90 degrees
Number of Zones	1
Number of Sections	1

Zone	Name	Unit Weight (kips/ft3)
1	New Zone	0.125

Soil Layers

Layer #	Type	Thickness [ft]	Depth [ft]
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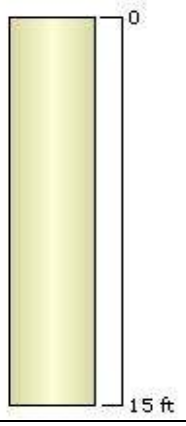

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