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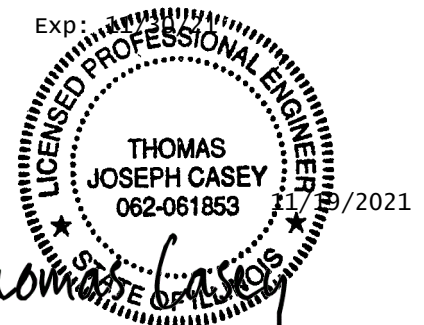
Roadway Geotechnical Report

ROADWAY IMPROVEMENTS
I270 BRIDGE OVER MISSISSIPPI RIVER
SECTION 60B-1
MADISON COUNTY, ILLINOIS

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July 16, 2021
Revised November 2021

Prepared for:
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SCI No. 2017-3167.10





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November 19, 2021

Brad E. Riechmann, P.E.
Horner & Shifrin, Inc.
604 Pierce Boulevard #300
O'Fallon, Illinois 62269

RE: Roadway Geotechnical Report
I270 Bridge over Mississippi River
Section 60B-1
Madison County, Illinois
SCI No. 2017-3167.10

Dear Brad Riechmann:

Enclosed is our *Roadway Geotechnical Report (RGR)* dated July 2021 and revised November 2021. It should be read in its entirety, and our recommendations considered in the design and construction of the proposed roadway widening. Please call if you have any questions.

Respectfully,

SCI ENGINEERING, INC.

A handwritten signature in black ink, appearing to read 'Prakash Paudel', with a horizontal line underneath.

Prakash Paudel
Staff Engineer

A handwritten signature in black ink, appearing to read 'Thomas J. Casey', with a horizontal line underneath.

Thomas J. Casey, P.E.
Chief Geotechnical Engineer

PP/TJC/tlw/snp

Enclosure

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Roadway Geotechnical Report
ROADWAY IMPROVEMENTS
I270 BRIDGE OVER MISSISSIPPI RIVER
SECTION 60B-1
MADISON COUNTY, ILLINOIS

1.0 PROJECT DESCRIPTION

The geotechnical study summarized in this report was performed for the realignment of I-270 along the east approach embankment of the Mississippi River Bridge and all the way up to the west approach abutment of Chain of Rocks Canal Bridge in Madison County, Illinois. The purpose of our study was to explore the subsurface conditions, develop design and construction recommendations for the areas of roadway widening, and provide recommendations for subgrade improvement for the roadway. There is a relatively flat surface on the top of embankment immediately south of the existing I-270 eastbound lane from approximate STA 1896+00 to STA 1904+00. This area used to be part of the embankment from the previous Chain of Rocks Canal Bridge alignment that was modified in approximately 2013. The scope of this report is also to discuss the suitability of this existing fill material from the old embankment to use as an embankment material for the new proposed sections. The location of the site is shown on the *Vicinity and Topographic Map*, Figure 1.

The I-270 improvements discussed in this report will comprise approximately 1.23 miles (6,500 feet) of roadway from west to east from Station (STA) 1840+00 to STA 1905+00. The improvements will include a combination of realignment, widening, refilling, and resurfacing. This project is part of a larger project that includes the construction of a multi-span bridge carrying I-270 over the Mississippi River and the geotechnical recommendations regarding the bridge are included in a separate Structural Geotechnical Report (SGR).

The existing pavement is on average 38 feet wide in each direction and consists of approximately 10 inches of asphalt pavement. The roadway is two lanes of traffic and a full-width paved shoulder in each direction with average lane widths of 12 feet. Based on the *Final Project Report, Volume 1* (FPR), dated July 9, 2018, the Condition Rating Survey (CRS) for the existing pavement is 8.0 on a 10 scale, indicating excellent condition. During a visual observation performed for inclusion in this report, the pavement did not show signs of significant failure. The FPR also stated that the pavement will be widened to accommodate six-lanes of traffic (three lanes in each direction), however the pavement will be striped for four lanes initially.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Geology

The project site begins approximately 2,400 feet east of the Mississippi River in the alluvial flood plain described as the American Bottoms. Soils in the project area consist of imported fill overlying fine grained alluvial sediments until encountering bedrock at an approximate depth of 120 feet. Generally, the alluvial deposit consists of silts, clays, sands, and gravels and the soil profile typically coarsens with depth.

More specifically, the near surface natural soils in the immediate area of the project are mostly comprised of the Nameoki Silty Clay Loam and Darwin Silty Clay (Soil Survey of Madison County, Illinois, USDA, Soil Conservation Service), with a small amount of Beaucoup silty clay loam. Except for the roadway embankment, the terrain in this area has gentle slopes ranging from 0 to 2 percent. The silty clay and silty clay loam soils are poorly drained to somewhat poorly drained.

Underlying the near surface fine-grained soils, the alluvium consists of deposits of sand and gravel with varying amounts of clay and silt, associated with the Mississippi flood plain. These deposits are typically on the order of 100 feet thick in this area. Fifty-six borings drilled for the proposed I-270 Bridge over the Mississippi River indicated apparent sandy limestone bedrock at approximate elevations of 331 in the vicinity of the embankment.

2.2 Subsurface Exploration

Both SPT borings and CPTu soundings were utilized to evaluate the subsurface conditions of the project site. The boring/sounding locations were staked/marked in the field by SCI personnel using a GPS unit with submeter accuracy and the elevation at each explored location were interpreted by SCI from the publicly available LiDAR data.

The northing, easting, station, and offset at each location were provided to us by Horner & Shifrin, Inc. on June 28, 2021. Additionally, both eastbound (EB) and westbound (WB) stations and offsets were provided for each location. However, for sake of consistency, we have used EB stations and offsets in this report. The table of both EB and WB stations and offsets for each explored location along with approximate northing and easting is shown on Appendix E. The latitude and longitude at each location were interpreted by SCI and should be considered approximate in nature. The field exploration was performed in general accordance with procedures outlined in the *2016 IDOT Geotechnical Manual* and *2020 IDOT Geotechnical Manual* for 2018 dated borings and 2021 dated borings/soundings, respectively.

The location of the site is shown on *Vicinity and Topographic Map*, Figure 1, and the explored locations are shown on the *Aerial Photograph*, Figure 2A and 2B, and *Site Plan*, Figure 3A through 3D. Representative subsurface profiles for the Eastbound and Westbound lanes can be found in Figures 4A through 4E and 5A through 5B, respectively.

2.2.1 Drilling Exploration Methods

Thirty-one (31) SPT borings were drilled for the proposed roadway improvements along I-270. Among them, twenty (20) borings were drilled on the shoulders of eastbound and westbound I-270 and the remaining eleven (11) borings were drilled in grassed areas at the toe of the northern and southern side slopes. The existing embankment was likely placed during the construction of the Chain of Rocks Canal Bridge around 1966. The roadway borings extended to nominal depths of 10 to 50 feet below the existing pavement surface while the grass borings at the bottom of the embankment were explored to the nominal depth of 30 feet, unless the boring refused at a shallower depth.

A Diedrich D-50 turbo drill rig with continuous flight augers was used to drill the borings. Mud rotary techniques were also utilized for the 50-foot and the 30-foot borings that penetrated into the deeper sands underlying the embankment. Samples were collected using a standard split-spoon sampler according to the methods outlined in ASTM D1586, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils. The split-spoon samples were obtained on 2½-foot intervals in the upper 30 feet and on 5-foot intervals thereafter. Unconfined compressive strengths of cohesive split-spoon samples were measured with a Rimac testing apparatus or a pocket penetrometer when the sample was not conducive to Rimac testing. Additionally, Shelby tubes were collected in the select location in place of SPT samples. Continuous Shelby tube samples had to be collected for the shallow 10- to 15-foot borings (B-119 through B-127) due to mechanical breakdown of the SPT hammer during night-time drilling. A geologist or geotechnical engineer from SCI was onsite to supervise drilling, log the borings, and perform field unconfined compressive strength tests using Rimac testing apparatus.

A summary of the borings is detailed below in Table 2.1. Detailed information regarding the nature and thickness of the soils encountered, and the results of the field sampling and laboratory testing are shown on the *Boring Logs, and Laboratory Test Results* in Appendix A and as laboratory testing results in Appendix C. The laboratory testing for the upper 5 feet is summarized on the *Illinois Department of Transportation (IDOT) BD-508A Form* included in Appendix C.

Table 2.1 – Summary of Borings

| Boring | Boring Depth (ft) | Station (EB) | Offset (feet) | Direction | Elevation (ft) |
|--------|-------------------|--------------|---------------|-----------|----------------|
| B-119 | 15 | 1841+58.73 | 3.66 | Right | 442.4 |
| B-120 | 15 | 1844+98.98 | 2.30 | Right | 443.4 |
| B-121 | 10 | 1848+02.12 | 8.08 | Right | 443.9 |
| B-122 | 10 | 1850+88.90 | 11.21 | Right | 444.1 |
| B-123 | 10 | 1854+11.03 | 14.87 | Right | 444.1 |
| B-124 | 10 | 1856+78.10 | 18.60 | Right | 443.1 |
| B-125 | 10 | 1860+12.82 | 20.89 | Right | 442.4 |
| B-126 | 10 | 1863+05.98 | 23.72 | Right | 442.1 |
| B-127 | 10 | 1866+21.89 | 25.51 | Right | 442.2 |
| B-128 | 50 | 1873+30.14 | 48.16 | Right | 441.5 |
| B-129 | 30 | 1873+43.58 | 180.25 | Right | 419.5 |
| B-132 | 50 | 1874+90.30 | 48.85 | Right | 441.5 |
| B-133 | 30 | 1879+04.87 | 159.65 | Right | 412.4 |
| B-136 | 50 | 1883+83.92 | 30.53 | Right | 442.2 |
| B-137 | 30 | 1883+89.17 | 139.72 | Right | 419.1 |
| B-138 | 39 | 1883+89.66 | 58.51 | Left | 446.3 |
| B-139 | 30 | 1884+00.88 | 147.81 | Left | 419.7 |
| B-144 | 50 | 1888+75.49 | 37.13 | Right | 441.9 |
| B-145 | 30 | 1888+68.39 | 125.91 | Right | 429.7 |
| B-146 | 50 | 1888+76.70 | 43.18 | Left | 447.8 |
| B-147 | 30 | 1888+81.31 | 139.47 | Left | 417.4 |
| B-152 | 50 | 1892+87.25 | 42.45 | Right | 442.1 |
| B-153 | 30 | 1892+80.16 | 137.81 | Right | 439.3 |
| B-154 | 50 | 1892+85.77 | 34.25 | Left | 449.0 |
| B-155 | 30 | 1892+83.21 | 142.50 | Left | 418.6 |
| B-160 | 50 | 1898+33.46 | 51.34 | Right | 448.8 |
| B-161 | 30 | 1898+09.30 | 217.14 | Right | 429.4 |
| B-162 | 50 | 1898+35.23 | 19.41 | Left | 456.7 |
| B-163 | 30 | 1898+33.45 | 148.84 | Left | 419.7 |
| B-169 | 30 | 1903+27.09 | 319.12 | Right | 427.5 |
| B-170 | 50 | 1903+80.15 | 19.01 | Left | 472.8 |

2.2.2 CPTu Exploration Methods

In addition to the soil test borings, twenty (20) CPTu soundings were advanced for the proposed roadway improvements along I-270. Among them, seven (7) soundings were performed on the shoulders of eastbound and westbound I-270 and remaining thirteen (13) soundings were performed on the grass at the top or bottom of the side slopes. The soundings extended to a range of depths of 30 to 50 feet below the existing ground surface, unless penetration refusal terminated them at shallower depth. The sounding locations are shown on *Aerial Photograph* and *Site Plan*.

The CPTu soundings were conducted in accordance with ASTM D5778 “Standard Test Method for Performing Electric Friction Cone and Piezocone Penetration Testing of Soils.” The equipment used is a Vertek Scorpion S4 mounted on a skid-steer. The skid-steer is equipped with two auger anchors which, when deployed, can provide up to 20 tons of down pressure reaction. Refusal is determined when the anchors fail or pull from the ground. Alternatively, refusal can be achieved when the pressure tolerances of the cone are exceeded. Refusal of penetration is indicative of very dense or hard material, typically bedrock, boulders, or debris.

The CPTu hydraulically pushes an instrumented cone through the soil while continuous readings are recorded on a portable computer. The cone is advanced through the ground at a constant rate of 1 inch per second. Load cells or strain gauges within the cone measure the in-situ parameters of the soil: tip resistance, friction, and pore water pressure. These in-situ measurements are recorded every approximately 1 inch.

The data obtained from the soundings were processed with our CPTu data presentation and interpretation software, CPeT-IT v.2.1.1.8 and the CPTu logs were generated. A summary of the CPTu soundings is detailed below in Table 2.2. Detailed information regarding the nature and thickness of the soils interpreted from the software generated Soil Behavior Type plot, correlated SPT N-values, and the interpreted GWT readings are shown on *CPTu Logs* (Appendix B)

Table 2.2 – Summary of Soundings

| Sounding | Depth (ft) | Station (EB) | Offset (ft) | Direction | Elevation (ft) |
|----------|------------|--------------|-------------|-----------|----------------|
| C-131 | 30 | 1875+46.97 | 175.83 | Right | 419.5 |
| C-135 | 30 | 1880+97.37 | 187.53 | Right | 410.1 |
| C-141 | 30 | 1886+26.43 | 130.49 | Right | 424.6 |
| C-142 | 50 | 1886+34.66 | 53.40 | Left | 447.2 |
| C-143 | 30 | 1886+45.43 | 146.21 | Left | 418.5 |
| C-148 | 4 | 1890+92.17 | 40.39 | Right | 441.7 |
| C-149 | 28 | 1890+90.75 | 134.51 | Right | 433.8 |
| C-150 | 42 | 1890+94.99 | 38.92 | Left | 448.4 |
| C-151 | 30 | 1890+97.70 | 124.19 | Left | 421.5 |
| C-156 | 48 | 1895+30.09 | 44.90 | Right | 443.2 |
| C-157 | 17 | 1895+33.70 | 148.59 | Right | 443.8 |
| C-158 | 50 | 1895+30.70 | 26.81 | Left | 450.5 |
| C-159 | 30 | 1895+29.67 | 131.76 | Left | 421.0 |
| C-160 | 10 | 1898+29.63 | 51.39 | Right | 448.9 |
| C-164 | 38 | 1901+22.56 | 157.72 | Right | 457.6 |
| C-165 | 30 | 1901+34.90 | 287.39 | Right | 424.3 |
| C-166 | 43 | 1901+50.15 | 19.88 | Left | 465.9 |
| C-167 | 20 | 1901+80.52 | 180.97 | Left | 419.3 |
| C-168 | 50 | 1904+11.77 | 156.82 | Right | 466.6 |
| C-171 | 30 | 1904+34.63 | 188.96 | Left | 420.7 |

2.3 Laboratory Testing

Advanced laboratory testing was conducted to classify the samples, determine index properties, and characterize the soil's behavior. These tests include:

- Sieve Analysis / Grain Size Analysis (ASTM D422);
- Sieve Analysis / Wash <#200 (ASTM D1140);
- Unconfined Compressive Strength testing (ASTM D2166);
- One Dimensional Consolidation (ASTM D2435);
- Unconsolidated Undrained Triaxial (ASTM D2850);
- Unit Weight Determination (ASTM D2937);
- Standard Proctor Compaction Test (ASTM D698);

- Illinois Bearing Value (per IDOT Subgrade Stabilization Manual);
- Atterberg Limits (ASTM D4318);
- Moisture Content (ASTM D4959); and
- Sieve Analysis / Hydrometer (ASTM D7928).

All tests were performed in general accordance with IDOT-recommended procedures. The soil test data for the upper 5 feet from all SPT borings are summarized in on the BD-508a forms (Appendix C). Detailed information regarding the nature and thickness of the soils and rocks encountered, and the results of the field sampling and laboratory testing are presented on the boring logs in Appendix A and as laboratory testing results in Appendix C.

2.4 Groundwater Conditions

During drilling, groundwater was observed in some borings and delayed groundwater readings were also taken where feasible. It is not anticipated that groundwater will affect the process of fill removal, fill replacement, and road construction activities. However, the groundwater level is subject to seasonal and climatic variations, the water level in the nearby river and channels, and other factors; and may be present at different depths in the future. In addition, without extended periods of observation, measurement of true groundwater levels may not be possible.

The measured and interpreted depths and elevations of groundwater respectively for SPT borings and CPTu soundings are shown together in Table 2.3. For the borings with groundwater depth measured during drilling and after a delayed interval, the readings corresponding to the delayed interval are presented in this table as they are considered more accurate.

Table 2.3 – Groundwater Summary

| Boring/Sounding | Approximate Ground/Pavement Surface Elevation (ft) | Groundwater Depth (ft) | Approximate Groundwater Elevation (ft) |
|------------------------|---|-------------------------------|---|
| B-119 | 442.4 | NE | NA |
| B-120 | 443.7 | NE | NA |
| B-121 | 444.7 | NE | NA |
| B-122 | 444.9 | NE | NA |
| B-123 | 444.1 | NE | NA |
| B-124 | 443.1 | NE | NA |
| B-125 | 442.5 | NE | NA |
| B-126 | 442.5 | NE | NA |
| B-127 | 442.5 | NE | NA |
| B-128 | 441.5 | NE | NA |
| B-129 | 419.5 | 22.0 | 397.5 |
| C-131 | 419.5 | 21.5* | 398.0* |
| B-132 | 441.5 | NE | NA |
| B-133 | 412.4 | 3.5 | 408.9 |
| C-135 | 410.1 | 1.5* | 408.6* |
| B-136 | 442.2 | 5.0 | 437.2 |
| B-137 | 419.1 | 18.5 | 400.6 |
| B-138 | 446.3 | NE | NA |
| B-139 | 419.7 | NE | NA |
| C-141 | 424.6 | 24.5* | 400.1* |
| C-142 | 447.2 | 28.0* | 419.2* |
| C-143 | 418.5 | 8.0* | 410.5* |
| B-144 | 441.9 | 6.0 | 435.9 |
| B-145 | 429.7 | 23.0 | 406.7 |
| B-146 | 447.8 | NE | NA |
| B-147 | 417.4 | 6.0 | 411.4 |
| C-148 | 441.7 | 8.5* | 433.2* |
| C-149 | 433.8 | 8.5* | 425.3* |
| C-150 | 448.4 | 28.0* | 420.4* |
| C-151 | 421.5 | 11.0* | 410.5* |
| B-152 | 442.1 | 11.0 | 431.1 |
| B-153 | 439.3 | 22.0 | 417.3 |
| B-154 | 449 | NE | NA |

Table 2.3 – Groundwater Summary (continued)

| Boring/Sounding | Approximate Ground/Pavement Surface Elevation (ft) | Groundwater Depth (ft) | Approximate Groundwater Elevation (ft) |
|------------------------|---|-------------------------------|---|
| B-155 | 418.6 | 21.0 | 397.6 |
| C-156 | 443.2 | 12.0* | 431.2* |
| C-157 | 443.8 | 27.0* | 416.8* |
| C-158 | 450.5 | 30.0* | 420.5* |
| C-159 | 421 | 23.0* | 398.0* |
| B-160 | 448.9 | NE | NA |
| C-160 | 448.9 | 40.0* | 408.9* |
| B-161 | 429.4 | 24 | 405.4 |
| B-162 | 456.7 | NE | NA |
| B-163 | 419.7 | 22.0 | 397.7 |
| C-164 | 457.6 | 51.0* | 406.6* |
| C-165 | 424.3 | 19.0* | 405.3* |
| C-166 | 465.9 | 67.0* | 398.9* |
| C-167 | 419.3 | 21.0* | 398.3* |
| C-168 | 466.6 | 49.5* | 417.1* |
| B-169 | 427.5 | 10.5 | 417.0 |
| B-170 | 472.8 | NE | NA |
| C-171 | 420.7 | 23* | 397.7* |

NE – Not Encountered
 NA – Not Applicable
 *Estimated GWT Depth

2.5 Climate Conditions

The borings and soundings were advanced on December 2018 and April 2021 through June 2021. Based on available climate data, the precipitation measured for downtown St. Louis during the exploration as well as the three months prior to each field exploration is shown in Table 2.4. The data used for compiling the climate information in this section was provided by the National Weather Service (NWS) Forecast Office, St. Louis, Missouri¹. The source data provided by the NWS is compiled from a weather gauge maintained by the National Oceanic and Atmospheric Administration (NOAA) located at the St. Louis Science Center (NOAA Network ID GHCND: USC00237452). The St. Louis Science center is located at 5050 Oakland Avenue in St. Louis, Missouri 63110, which is approximately 11 miles from the project site.

Table 2.4 – Precipitation Prior to Soil Exploration

| Month | Actual Precipitation (in) | Normal Precipitation (in) | Difference (in) |
|----------------|---------------------------|---------------------------|-----------------|
| September 2018 | 2.0 | 3.13 | -1.13 |
| October 2018 | 3.20 | 3.33 | -0.13 |
| November 2018 | 2.74 | 3.91 | -1.17 |
| January 2021 | 3.82 | 2.40 | 1.42 |
| February 2021 | 1.64 | 2.24 | -0.60 |
| March 2021 | 5.17 | 3.32 | 1.85 |
| April 2021 | 4.10 | 3.69 | 0.41 |
| May 2021 | 2.86 | 4.82 | -1.96 |

3.0 GEOTECHNICAL EVALUATIONS

3.1 Mining Activity

According to the *Illinois State Geological Survey -- ILMINES*, dated April 20, 2021, the subject site was not undermined. The listed disclaimer indicates locations of some features on the mine map may be offset by 500 or more feet due to errors in the original source maps, the compilation process, digitizing, or a combination of these factors. The subject site is more than 6.0 miles away from the closest mining area shown on the map.

3.2 Seismic Consideration

As no structure is planned for this roadway improvement, the seismic consideration is not deemed necessary at this time.

4.0 I-270 STA 1840+00 TO STA 1874+00

4.1 Site Description

The elevation of the existing pavement surface along the proposed alignment from STA 1840+00 to STA 1874+00 ranges between approximately 442 and 445 indicating a nearly level topography. The proposed grading varies with up to a maximum fill of approximately 21 feet with very minimal quantity of cut (on the order of 1 to 3 feet) in some sections. Roadway soil survey borings B-119 through B-129 and a sounding C-131 were advanced along this section. The explored locations extended to nominal depths of 10 to 50 feet from the pavement surface. Soil conditions encountered during our subsurface exploration are shown on the CPTu sounding logs and SPT boring logs appended in this report.

4.2 Subsurface Conditions

4.2.1 Existing Pavement

The pavement material consisted of asphalt pavement in all borings except B-128 which consisted of Portland cement concrete underlain by successive layers of asphalt and crushed rock. The summary of the pavement materials encountered in the SPT boreholes, and their corresponding thicknesses are shown in Table 4.1.

Table 4.1 – Pavement Summary (STA 1840+00 to 1874+00)

| Boring/Sounding | Concrete (in) | Asphalt (in) | Crushed Rock (in) |
|-----------------|---------------|--------------|-------------------|
| B-119 | - | 14.4 | - |
| B-120 | - | 14.4 | - |
| B-121 | - | 14.4 | - |
| B-122 | - | 14.4 | - |
| B-123 | - | 14.4 | - |
| B-124 | - | 14.4 | - |
| B-125 | - | 14.4 | - |
| B-126 | - | 14.4 | - |
| B-127 | - | 14.4 | - |
| B-128 | 12 | 6 | 12 |

4.2.2 Existing Fill

The pavement was underlain by cohesive fill materials in all borings that was likely placed during the construction of the existing I-270. Additionally, the fill layer extended to the termination depth on the shallow borings (B-117 through B-127). The fill materials in the shallow borings generally consisted of silty clay (A-6 or A-7) with clay (A-7), clay loam (A-6), sandy loam (A-4), sandy clay loam (A-4), and silty sand (A-2).

SPT N-values (sum of the second and the third blow count in each sampling interval), as observed from the boring logs for B-128 and B-129, ranged from 8 to 18 blows per foot (bpf) with an average of approximately 14 bpf, classifying the soil as medium stiff to very stiff in consistency. Additionally, unconfined compressive strength tests conducted on the cohesive samples using the rimac apparatus on the site and undisturbed Shelby tube samples using the compression testing machine in the lab resulted in values ranging from 0.7 to 3.7 tons per square foot (tsf) with an average of approximately 1.64 tsf, classifying the soils as medium stiff to stiff in consistency. Moisture content in the measured samples ranged from 12 to 34 percent, averaging approximately 23 percent.

Additional laboratory tests included unit weight determination, sieve analysis, washed sieve analysis with percent finer than #200, hydrometer analysis, Illinois Bearing Value (IBV), and triaxial testing on select sample/s and the results are appended in this report. The summary of the existing fill is shown in Table 4.2 below. It should be noted that the embankment in this section of roadway ranges from approximately 20 to 35 feet high in relation to the surrounding grades, so a majority of these borings terminated within the fill.

Table 4.2 – Existing Fill Summary (STA 1840+00 to 1874+00)

| Boring | Approximate Ground/Pavement Surface Elevation (ft) | Approximate Fill Depth (ft) | Approximate Bottom of the Fill Elevation (ft) |
|---------------|---|------------------------------------|--|
| B-119 | 442.4 | 15* | 427.4 |
| B-120 | 443.7 | 15* | 428.7 |
| B-121 | 444.7 | 10* | 434.7 |
| B-122 | 444.9 | 10* | 434.9 |
| B-123 | 444.1 | 10* | 434.1 |
| B-124 | 443.1 | 10* | 433.1 |
| B-125 | 442.5 | 10* | 432.5 |
| B-126 | 442.5 | 10* | 432.5 |
| B-127 | 442.5 | 10* | 432.5 |
| B-128 | 441.5 | 25.5 | 416.0 |
| B-129 | 419.5 | NE | NA |

NE – Not Encountered

NA – Not Applicable

* – Fill depth extended to the termination depth of boring

4.2.3 Natural Soil

Natural soil was encountered in borings B-128 and B-129 and sounding C-131. The natural soil in these locations consisted of interbedded layers of cohesive soil with various percentages of sand, silt, and clay down to the elevation ranging from approximately 398.5 to 407.0. The near surface interbedded layers are underlain by sand or sandy loam thereafter. Overall, the soils generally encountered were sandy to silty clay (A-6 or A-7), silty loam (A-4 or A-5), and relatively clean to silty sand (A-3 or A-2).

SPT N-values in the native soil, ranged from 1 to 40 bpf, with an average of approximately 14 bpf, classifying the soils as soft/loose to very stiff/very dense in consistency/relative density. Unconfined compressive strength (Qu) measured on cohesive samples ranged from 0.4 to 3.0 tsf, with an average of approximately 1.2 tsf, classifying the soils as soft to very stiff in consistency. In addition, moisture contents in the measured samples ranged from 24 to 42 percent, averaging approximately 33 percent. Additional laboratory tests included sieve analysis, washed sieve analysis with percent finer than #200, and Atterberg limits on select samples and the results are appended in this report.

4.3 Recommendations

4.3.1 Topsoil and Existing Pavement

Within the improvement area, surface vegetation/topsoil and existing pavements should be stripped. Although topsoil was not encountered during drilling, anticipate that up to 6 inches of topsoil will be encountered on the existing embankment side-slopes. The actual depth should be determined by field observations. Unsuitable soils should be identified by proofrolling where feasible. Proofrolling is accomplished by systematically passing over the subgrade to achieve complete coverage with proper compaction or loaded construction equipment, and observing the subgrade for pockets of excessively soft, wet, or disturbed soil, or otherwise unacceptable materials.

As per the plans provided, the grade in the existing pavement area will generally be raised up to 7 feet between STA 1840+00 to 1846+00 with the fill heights decreasing from west to east. From STA 1846+00 to 1874+00, the proposed grade will feature a minimal cut or be at existing grade. If the existing pavements and shoulders need to be milled off to construct the new ones, we recommend it be done in accordance with Section 1031 of the IDOT Standard Specifications for Road and Bridge Construction, 2016.

4.3.2 Embankment

As per the roadway cross sections provided to us in June 2021, redressing of the existing embankment slope/s by placing additional fill materials is planned in between these stations. The slopes should be benched prior to placement of the fill. Benching will provide level surfaces for compaction and reduce the potential for development of inclined planes of weakness between the existing soil and newly placed compacted fill. Benches should not exceed a maximum height of 5 feet. For additional construction considerations, we recommend you follow *the IDOT Standard Specifications for Road and Bridge Construction, 2016*.

4.3.3 Subgrade Recommendations

Silty clay soils with high moisture content and/or potential for volume change were generally encountered along the existing subgrade in this section. These soils may be unstable and/or unsuitable when they are exposed during construction and may require improvement. Lime treatment should only be used if the requirements of the standard specifications do not produce satisfactory results to the Engineer. The recommended depth of treatment is 12 inches in fill sections and 24 inches in cut or at-grade sections, if needed. The width of the treatment should extend at least 2 feet beyond the edge of the pavement, or to the toe of the embankment in fill areas. Per IDOT policy, the last 12 inches of any fill placed immediately beneath the pavement should be lime stabilized or consist of crushed rock. A summary of the recommended treatment methods and depths is detailed in Table 4.3 below.

Table 4.3 – Summary of Subgrade Treatment Recommendations (STA 1840+00 to 1874+00)

| Stations | Treatment Depth (inches) | Problem/Concern Soil | Treatment Type |
|------------------------|--------------------------|---|---|
| STA 1840+00 to 1846+50 | 12 | Silty Clay Loam (A-6) | Replace with crushed rock or Lime stabilization |
| STA 1846+50 to 1857+00 | 24 | Highly Plastic Clay to Silty Clay (A-7) | Lime Stabilization |
| STA 1857+00 to 1868+00 | 12 | Highly Plastic Clay to Silty Clay (A-7) | Lime Stabilization |
| STA 1868+00 to 1874+00 | 24 | Highly Plastic Clay to Silty Clay (A-7) | Lime Stabilization |

4.3.4 Roadway Drainage Conditions and Subgrade Support Rating

We do not anticipate that groundwater will be encountered during roadway grading activities. Drainage conditions in this section range from fair to poor, as summarized in Table 4.4.

Table 4.4 - Summary of Drainage Conditions (STA 1840+00 to 1874+00)

| Station | Drainage Conditions |
|--------------------|---------------------|
| 1840+00 to 1855+53 | Poor |
| 1855+53 to 1874+00 | Fair |

The existing subgrade soils are comprised of A-6 and A-7 soils with varying amounts of silt content. For mechanistic pavement design, the recommended SSR is poor. The results of Illinois Bearing Value (IBV) test and standard proctor test on combined bulk samples from B-119 (STA 1841+81) and B-120 (1845+17), and from B-126 (STA 1863+09) and B-127 (STA 1866+23) are summarized in Table 4.5 below. The detailed laboratory results are included in Appendix C.

Table 4.5 – IBV and Standard Proctor Compaction Test Results (STA 1840+00 to 1874+00)

| Bulk Sample | IBV | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|-----------------|----------------|---------------------------|------------------------------|
| B-119 and B-120 | 2.2 at 110% MC | 112.1 | 16.1 |
| B-126 and B-127 | 3.4 at 110% MC | 111.4 | 16.2 |

4.3.5 Settlement

The cross sections provided by Horner & Shifrin, Inc., indicated up to approximately 21 feet of fill could be placed on the side-slopes for the western extent of the project. Based on the soils encountered, the maximum settlement due to the additional fill was estimated to be less than 1 inch. While excessive settlement isn’t expected, to minimize the effects of settlement, we recommend the fill materials be placed at least 30 days prior to final paving. Additionally, secondary compression is not anticipated to be a major concern on this project. It should be noted that the discussion of settlement within this RGR is separate from the discussion of settlement and its effects on the proposed bridge structure included in the SGR previously referenced.

4.3.6 Slope Stability

Due to relatively minimal changes to the overall slope configurations in this section, we anticipate the final slopes will be stable based on the performance of the existing slopes. For this section, a rigorous slope stability analysis was not performed at this time considering that the recommendations provided in sections 4.3.1, 4.3.2, and 4.3.2 will also be followed.

5.0 I-270 STA 1874+00 TO STA 1905+00

5.1 Site Description

The elevation of the existing ground surface along the proposed alignment from STA 1874+00 to STA 1905+00 ranges between approximately 442 and 473 indicating a mild to moderately sloping topography. The new proposed embankment profile will require up to approximately 34 feet of cut along the southern side-slopes between approximate STA 1897+00 and STA 1905+00 and approximately up to 12 feet of fill on the northern side-slopes throughout this section.

Twenty (20) SPT borings and nineteen (19) CPTu soundings were advanced along this section. Among them, seven (7) soundings and ten (10) borings were performed on the existing shoulders, while the remaining borings and soundings were performed at the toe of the existing embankment. Soil conditions encountered during our subsurface exploration are shown on the CPTu sounding logs and SPT boring logs appended in this report.

5.2 Subsurface Conditions

5.2.1 Existing Pavement

The pavement material generally consisted of Portland cement concrete underlain by successive layers of asphalt and crushed rock. A total of 16 inches of pavement materials were encountered in all of the CPT holes while the summary of the pavement materials encountered in the SPT boreholes, and their corresponding thicknesses are shown in Table 5.1.

Table 5.1 – Pavement Summary (STA 1874+00 to STA 1905+00)

| Boring/Sounding | Concrete (in) | Asphalt (in) | Crushed Rock (in) |
|-----------------|---------------|--------------|-------------------|
| B-132 | 12 | - | 18 |
| B-136 | 12 | 3.6 | 44.4 |
| B-138 | 12 | - | 18 |
| B-144 | 12 | 3.6 | 8.4 |
| B-146 | 12 | - | 18 |
| B-152 | 12 | 7.2 | 8.4 |
| B-154 | 13.2 | - | 16.8 |
| B-160 | 12 | 3.6 | 8.4 |
| B-162 | 13.2 | - | 16.8 |
| B-170 | 14.4 | - | 15.6 |

5.2.2 Existing Fill

Existing fill was encountered in all borings performed within the limits of the existing embankment. The fill materials generally consisted of interbedded layers of cohesive soil with various percentages of sand, silt, and clay and was likely placed during the construction of the existing I-270. The fill layers extended to approximate elevations 404.6 and 431.7. The soils encountered were silty to sandy clay (A-6 or A-7), silty to clayey loam (A-4 or A-6), and relatively clean to silty sand (A-2 to A-3). It should be noted that the embankment in this section of roadway ranges from approximately 23 to 55 feet high in relation to the surrounding grades, so some of these borings (B-138 and B-170) terminated within the fill.

SPT N-values in the fill ranged from 3 to 53 blows per foot (bpf), with an average of approximately 16 bpf, classifying the soils as soft/loose to very stiff/very dense in consistency/relative density. Rimac Qu strengths ranged from 0.2 to 5.6 tsf, with an average of approximately 1.9 tsf, classifying the soils as soft to very stiff in consistency. Moisture contents in the measured samples ranged from 15 to 41 percent,

averaging approximately 22 percent. Additional laboratory tests included sieve analysis, washed sieve analysis with percent finer than #200, and Atterberg limits on select samples and the results are appended in this report. The summary of the existing fill is shown in Table 5.2 below.

Table 5.2 – Existing Fill Summary (STA 1874+00 to STA 1905+00)

| Boring | Approximate Ground/Pavement Surface Elevation (ft) | Approximate Fill Depth (ft) | Approximate Bottom of the Fill Elevation (ft) |
|---------------|---|------------------------------------|--|
| B-132 | 441.4 | 25.4 | 416 |
| B-133 | 412.4 | 5.0 | 407.4 |
| B-136 | 442.2 | 10.5 | 431.7 |
| B-137 | 419.1 | 7.5 | 411.6 |
| B-138 | 446.3 | 39 | 407.3 |
| B-139 | 419.7 | 5.0 | 414.7 |
| B-144 | 441.9 | 32.0 | 409.9 |
| B-145 | 429.7 | 7.0 | 422.7 |
| B-146 | 447.8 | 37.0 | 410.8 |
| B-147 | 417.4 | 4.0 | 413.4 |
| B-152 | 442.1 | 37.5 | 404.6 |
| B-153 | 439.3 | 10.5 | 428.8 |
| B-154 | 449 | 32.0 | 417 |
| B-155 | 418.6 | NE | NA |
| B-160 | 448.8 | 37.9 | 410.9 |
| B-161 | 429.4 | 4.0 | 425.4 |
| B-162 | 456.7 | 42.0 | 414.7 |
| B-163 | 419.7 | 5.0 | 414.7 |
| B-169 | 427.5 | NE | NA |
| B-170 | 472.8 | 50.0 | 422.8 |

NE – Not Encountered
 NA – Not Applicable

5.2.3 Natural Soil

Natural soil was encountered in all borings except B-138 and B-170 where the fill materials extended all the way down to the termination depth as discussed earlier. The natural soil consisted of interbedded layers of cohesive soil with various percentages of sand, silt, and clay down to the elevation ranging from

approximately 392.2 to 452.6. The near surface interbedded layers are underlain by sand or sandy loam thereafter. Overall, the soils encountered were generally sandy to silty clay (A-6 or A-7), silty loam (A-4 or A-5), and relatively clean to silty sand (A-3 or A-2).

SPT N-values from the borings logs in the native soil ranged from 2 to 40 bpf, with an average of approximately 12 bpf, and the correlated SPT N-values from CPTu sounding logs ranged from 1 to 100 bpf, averaging approximately 22 bpf, classifying the soils as soft/loose to very stiff/very dense in consistency/relative density. Rimac Qu strengths of the cohesive samples ranged from 0.2 to 4.5 tsf, with an average of approximately 1.2 tsf, classifying the soils as soft to very stiff in consistency. In addition, moisture contents in the measured samples ranged from 10 to 52 percent, averaging approximately 31 percent. Additional laboratory tests included sieve analyses, washed sieve analyses with percent finer than #200, and Atterberg limits on select samples and the results are appended in this report.

5.3 Recommendations

5.3.1 Topsoil and Existing Pavement

Within the improvement area, surface vegetation/topsoil and any pavements not being reused should be stripped. Although topsoil was not encountered during drilling, anticipate that up to 6 inches of topsoil will be encountered on the existing embankment side slopes. The actual depth should be determined by field observations. The existing pavements and shoulders shall be milled off to construct the new ones in accordance with Section 1031 of the IDOT Standard Specifications for Road and Bridge Construction, 2016.

5.3.2 Embankment

As per the June dated roadway cross sections provided, redressing of the existing embankment slopes by placing additional fill materials is planned along the northern side-slopes throughout this section, while the southern side-slopes will be cut to achieve the finished grades. For fill sections, the slopes should be benched prior to placement of the fill. Benching will provide level surfaces for compaction and reduce the potential for development of inclined planes of weakness between the existing soil and newly placed compacted fill. Benches should not exceed a maximum height of 5 feet. Additionally, cut sections are planned on the southern slope from approximate STA 1874+00 to 1882+50 and STA 1896+00 to 1905+00. For the section from approximate STA 1874+00 to 1882+50 and between approximate elevations 436 and 425, we anticipate that sandy soils may be encountered at the finished grade that will not be suitable for dressing the side slopes. Sandy soils are prone to erosion and raveling and may not promote vegetative cover. Within the cut areas of this section, we recommend that at least 18 inches of the sandy soils be

overexcavated followed by benching and replacement of suitable fill materials to achieve the finished grade. Benching shall be performed in accordance with the procedures described earlier within this section. We also recommend you follow *the IDOT Standard Specifications for Road and Bridge Construction, 2016* for additional construction consideration.

5.3.3 Subgrade Recommendations

Within the limits of the existing roadway, the subgrade appears to consist of crushed rock over silty clay. Based on the presence of the crushed rock, we are not anticipating any remediation within the current pavement limits. If unsuitable soils are encountered, they can be remediated using either lime stabilization for soils containing more than 15 percent clay or remove and replace with crushed rock for soils not conducive to lime stabilization. The benching and fill placement discussed previously for side slopes should be followed within this section.

5.3.4 Roadway Drainage Conditions and Subgrade Support Rating

We do not anticipate that the groundwater will be encountered during roadway grading activities. Based upon the hydrometer test of the soil samples at shallow depths, drainage conditions in this entire section are expected to be poor. As previously discussed, the existing subgrade soils are comprised of A-6 and A-7 soils. Therefore, the recommended SSR is poor for mechanistic pavement design.

5.3.5 Settlement

As the pavement construction will be almost at-grade with minimal quantity of new fill being planned to raise the pavement elevation, the settlement is not anticipated to be a major concern for this extent of the project. However, the new fills should be compacted to achieve the required dry density and moisture content as per *2016 IDOT Standard Specifications for Road and Bridge Construction Manual*.

5.3.6 Slope Stability

5.3.6.1 General Information

The global slope stability of the proposed embankment was analyzed for end-of-construction (short-term) and long-term loading conditions, at six stations for both the north and south slopes, totaling 12 cross sections. The results of the analyses are shown in *Slope Stability Analyses*, Appendix D. The analyses were conducted using limit equilibrium slope stability methods and the commercially available software program Slide 2018 (developed by RocScience). The analyses considered soil properties from the

subsurface exploration data, and the given slope geometries. To account for traffic loading, a surcharge load of 250 psf was applied to the analyses. Soil parameters used in the analyses and the results of the analyses are shown on the output plots in Appendix D.

A Morgenstern-Price analysis with a circular mode of failure was used to search for the critical factor of safety (FS). The required minimum factors of safety were obtained from Section 6.10.3 of the 2020 IDOT Geotechnical Manual for the global slope stability. Based on the level of investigation and that the embankment soils are all fill materials, a required factor of safety of 1.5 was utilized for the analysis.

5.3.6.2 Slope Stability for I-270 Embankments

Slope stability analyses were performed along the existing I-270 alignment for both the proposed north and south slopes at STAs 1889+50, 1892+00, 1894+50, 1898+70, 1901+50, and 1904+28. The north slopes of each analyzed stations are fill slopes while the south slopes at STAs 1898+70, 1901+50, and 1904+28 are cut slopes. Each section analyzed met the required factor of safety as detailed below in Table 5.3.

Table 5.3 – Summary of I-270 Slope Stability Factors of Safety (STA 1874+00 to STA 1905+00)

| Location | Direction of Slope | End-of-Construction (Short-Term) | | Long-Term | |
|-------------|--------------------|-----------------------------------|----------------------------|-----------------------------------|----------------------------|
| | | Required Minimum Factor of Safety | Estimated Factor of Safety | Required Minimum Factor of Safety | Estimated Factor of Safety |
| STA 1889+50 | North Slope | 1.5 | 1.95 | 1.5 | 1.58 |
| STA 1892+00 | | 1.5 | 1.79 | 1.5 | 1.52 |
| STA 1894+50 | | 1.5 | 2.55 | 1.5 | 1.73 |
| STA 1898+70 | | 1.5 | 2.24 | 1.5 | 2.00 |
| STA 1901+50 | | 1.5 | 1.91 | 1.5 | 1.70 |
| STA 1904+28 | | 1.5 | 2.21 | 1.5 | 1.89 |
| STA 1889+50 | South Slope | 1.5 | 2.28 | 1.5 | 1.76 |
| STA 1892+00 | | 1.5 | 1.97 | 1.5 | 1.60 |
| STA 1894+50 | | 1.5 | 2.72 | 1.5 | 2.03 |
| STA 1898+70 | | 1.5 | 2.37 | 1.5 | 2.09 |
| STA 1901+50 | | 1.5 | 1.98 | 1.5 | 1.75 |
| STA 1904+28 | | 1.5 | 2.39 | 1.5 | 2.24 |

5.3.7 Reuse of Existing Embankment Soils

A majority of the excavated soils along the southern side-slopes are anticipated to be clayey in nature with varying silt and sand contents as well as isolated lenses of silt and sand. In general, a majority of the soils can be reused to construct the new embankment sections. Silty and sandy soils should be blended with clayey soils before reuse. If blending them is not feasible, care should be taken to ensure that they are utilized within the core of the embankment and covered with a minimum of 36 inches of clayey materials to protect them from erosion. Silt and sand soils should not be used as the final surficial materials. The outside 3 feet of those portions of the embankment which will be permanently exposed in the completed roadway shall be constructed using native materials of a classification that will support vegetation and contain a minimum plasticity index of 12 to reduce frost susceptibility and potential for erosion. The outside cover of the embankment shall be placed perpendicular to the outside surface. Depending on the prevailing weather conditions during construction, the cut soils may be wet of optimum and need to be dried, either mechanically, by disking and air-drying, or chemically with lime as previously discussed in this report.

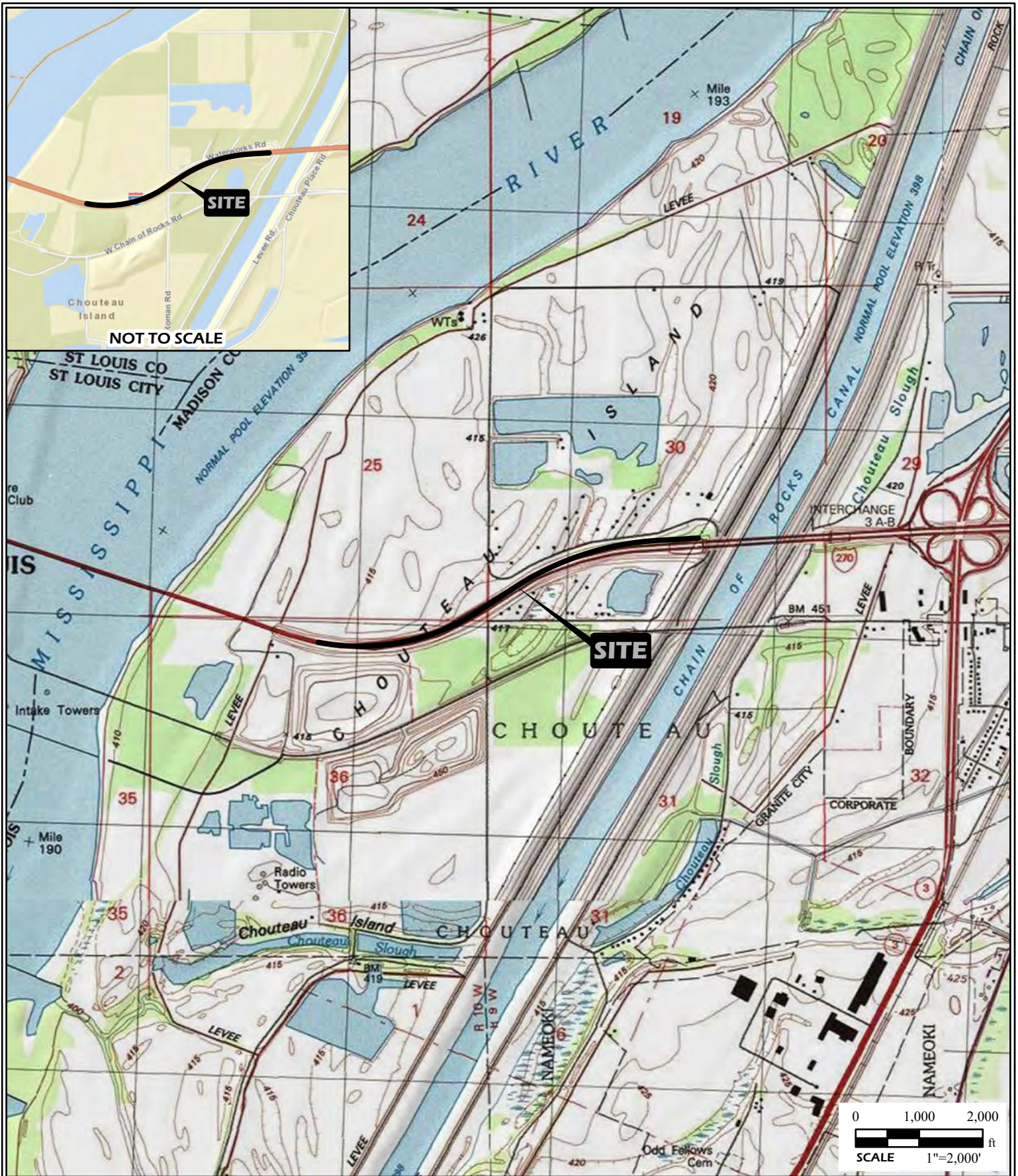
6.0 GENERAL RECOMMENDATIONS

In addition to the previously discussed recommendations, we suggest these general recommendations be followed in the design and construction of the roadways:

- Areas to receive fill should be stripped of topsoil. The amounts of topsoil to be stripped were discussed in previous sections. The topsoil can be stockpiled for future use in non-structural areas.
- Soils with a clay content less than 15 percent are typically unsuitable for lime treatment and will require modification by adding fly ash with the lime, or with cement stabilization, or removal and replacement with materials meeting the criteria set forth in the IDOT Geotechnical Manual (2020). A mixture of 5 percent lime and 5 percent fly ash by volume has shown to achieve satisfactory silt subgrade stabilization on previous projects. The amount of cement to be used can range from 4 to 5 percent by weight. If requested, additional testing could be performed to confirm the appropriate mix design for the soils and conditions at the time of construction. However, for estimating purposes, 5 percent (by dry weight) of cement generally works for silty (A-4) soils, if encountered in this area. For cement or lime treatment, water will need to be added to facilitate stabilization.
- Wet or soft soils could complicate construction. Soft and/or disturbed areas may require undercutting and replacement. If the materials are not reactive with lime or flyash, crushed rock, such as IDOT CA-7 or CA-11, can be used as the backfill. The A-4 silty soils will likely need to be modified with cement or be undercut and replaced with suitable fill soil meeting the IDOT Geotechnical Manual.

7.0 LIMITATIONS

The recommendations provided herein were based on undated plans provided by Horner & Shifrin, Inc., in June 2021. Any changes to the plans may alter the recommendations contained in this report. The recommendations are for the exclusive use of Horner & Shifrin and IDOT. They are specific only to the project described, and are based on subsurface information obtained at nine widely spaced boring locations within the proposed roadway improvements, our understanding of the project as described herein, and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. SCI should be contacted if conditions encountered during construction are not consistent with those described.





| | | | |
|--|-----|-------------------|--------------|
| <p>PROJECT NAME I-270 OVER MISSISSIPPI RIVER ST. LOUIS CITY, MISSOURI AND MADISON COUNTY, ILLINOIS</p> | | | |
| <p>VICINITY AND TOPOGRAPHIC MAP</p> | | | |
| DRAWN BY | RCV | DATE | 11/2021 |
| CHECKED BY | TJC | JOB NUMBER | 2017-3167.10 |

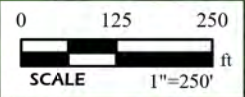
GENERAL NOTES/LEGEND
 USGS TOPOGRAPHIC MAP
 COLUMBIA BOTTOM, MISSOURI - ILLINOIS QUADRANGLE
 GRANITE CITY, ILLINOIS - MISSOURI QUADRANGLE
 DATED 1998
 10' CONTOURS


STREET MAP
[HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_STREET_MAP](http://goto.arcgisonline.com/maps/world_street_map)

FIGURE
 1



-  COMPLETED SPT BORING LOCATION
-  COMPLETED CPT SOUNDING LOCATION






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NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

GENERAL NOTES/LEGEND

PROJECT NAME
I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

AERIAL PHOTOGRAPH



JOB NUMBER

DATE
11/2021

DRAWN BY
RCV

CHECKED BY
TJC

FIGURE
2A

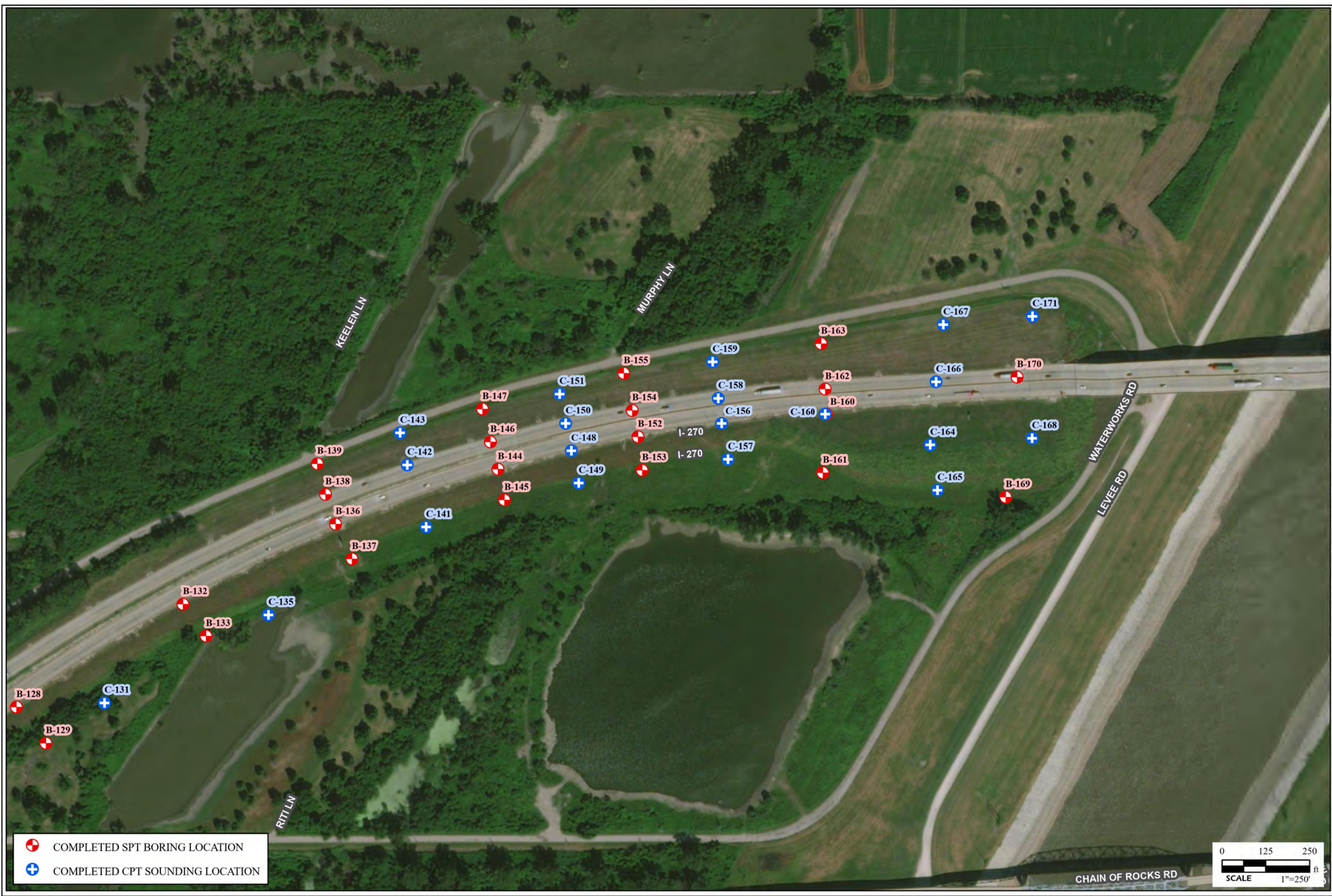


GENERAL NOTES/LEGEND
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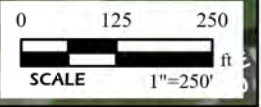
PROJECT NAME
I-270 OVER MISSISSIPPI RIVER
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MADISON COUNTY, ILLINOIS
AERIAL PHOTOGRAPH



JOB NUMBER
DATE 11/2021
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FIGURE 2B

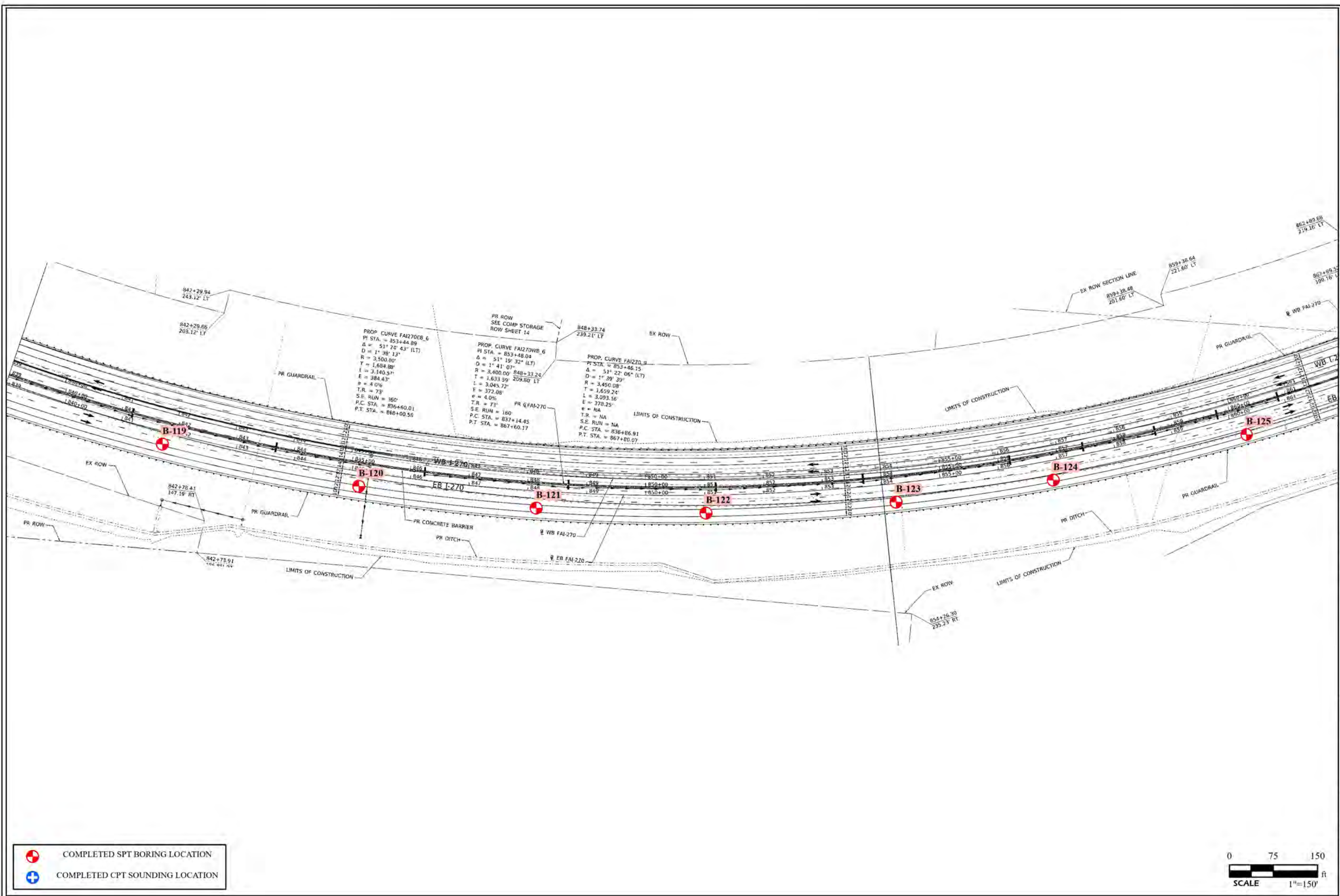


- COMPLETED SPT BORING LOCATION
- COMPLETED CPT SOUNDING LOCATION

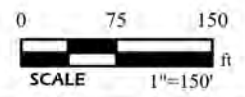




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- COMPLETED SPT BORING LOCATION
- COMPLETED CPT SOUNDING LOCATION



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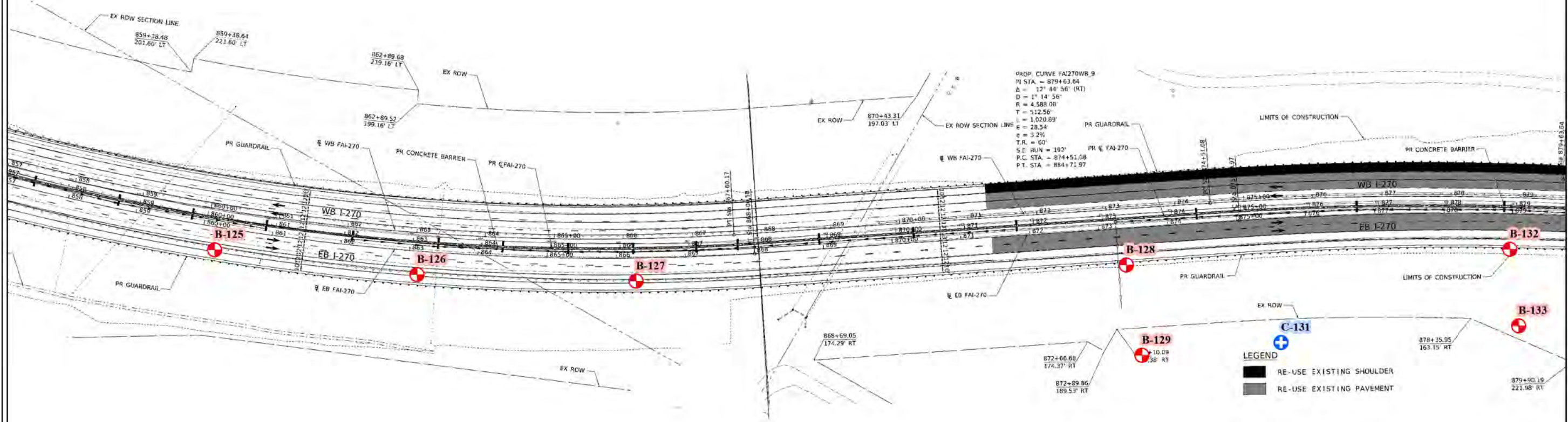
SITE PLAN



| |
|-------------------|
| JOB NUMBER |
| DATE 11/2021 |
| DRAWN BY RCV |
| CHECKED BY TJC |
| FIGURE 3A |



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GENERAL NOTES/LEGEND

PROJECT NAME
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 MADISON COUNTY, ILLINOIS

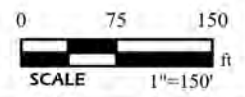
SITE PLAN

LEGEND
 [Black Box] RE-USE EXISTING SHOULDER
 [Grey Box] RE-USE EXISTING PAVEMENT

[Red Circle with Crosshair] COMPLETED SPT BORING LOCATION
 [Blue Circle with Plus] COMPLETED CPT SOUNDING LOCATION



JOB NUMBER
 DATE 11/2021
 DRAWN BY RCV
 CHECKED BY TJC
 FIGURE 3B



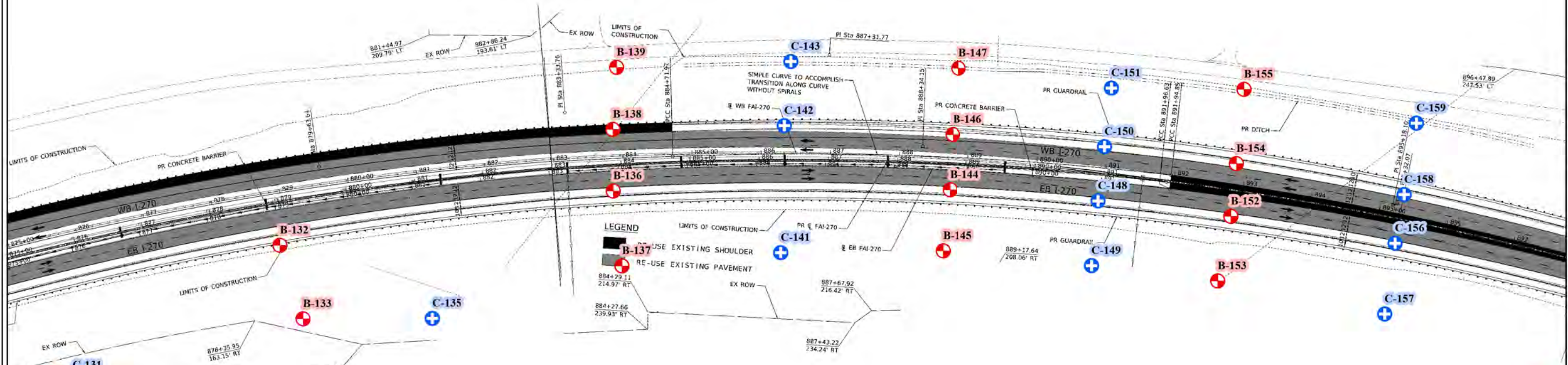


UNDATED PLAN PROVIDED BY HORNER & SHIFRIN.
 DIMENSIONS AND LOCATIONS ARE APPROXIMATE. ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

GENERAL NOTES/LEGEND

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

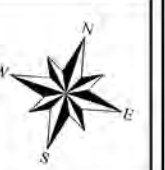
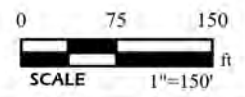
SITE PLAN



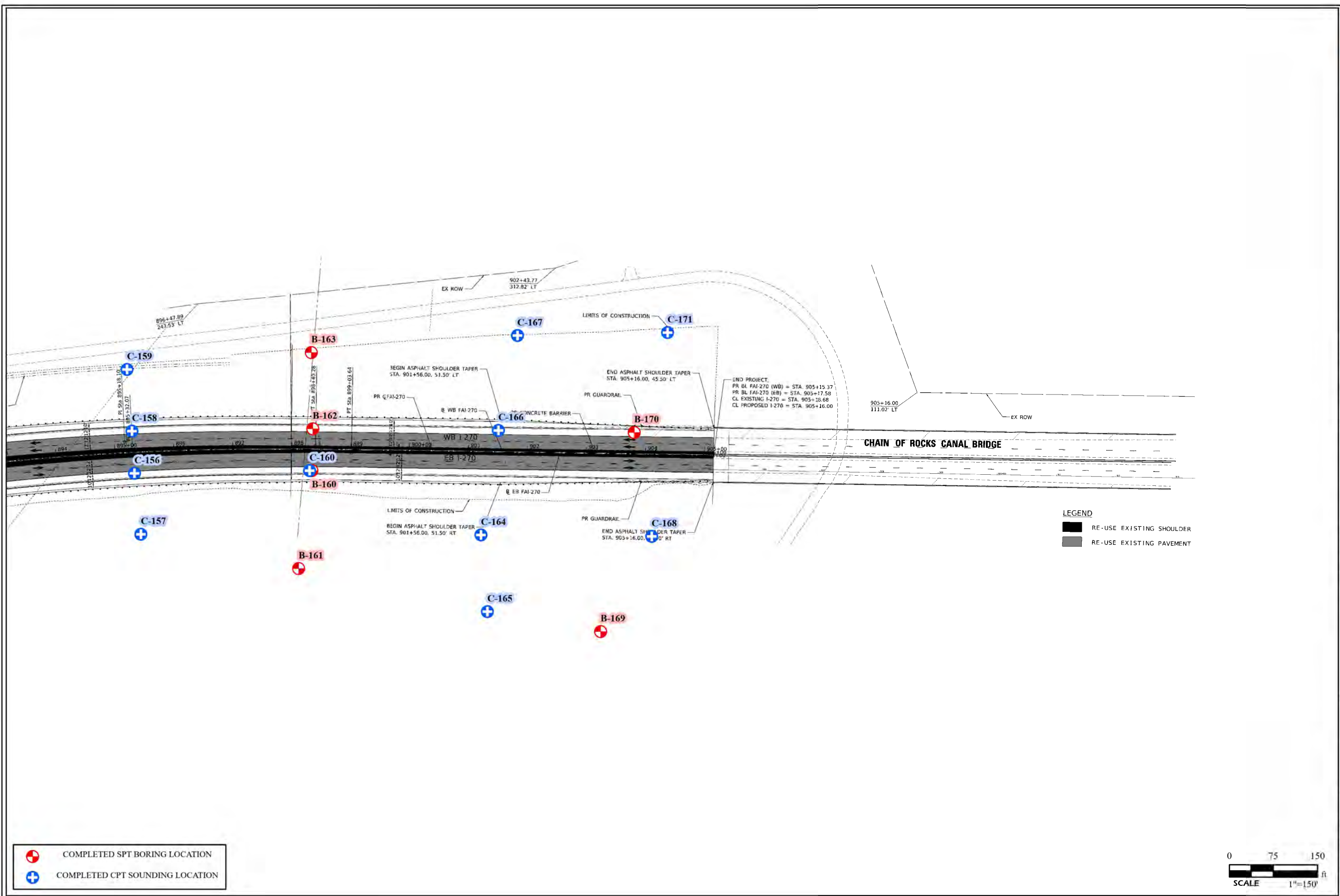
LEGEND
 [Red circle with crosshair] RE-USE EXISTING SHOULDER
 [Red circle with crosshair] RE-USE EXISTING PAVEMENT

LEGEND
 [Black rectangle] RE-USE EXISTING SHOULDER
 [Grey rectangle] RE-USE EXISTING PAVEMENT

[Red circle with crosshair] COMPLETED SPT BORING LOCATION
 [Blue circle with crosshair] COMPLETED CPT SOUNDING LOCATION

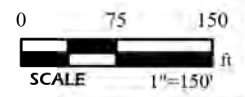


| |
|-------------------|
| JOB NUMBER |
| DATE 11/2021 |
| DRAWN BY RCV |
| CHECKED BY TJC |
| FIGURE 3C |



COMPLETED SPT BORING LOCATION
 COMPLETED CPT SOUNDING LOCATION

LEGEND
 RE-USE EXISTING SHOULDER
 RE-USE EXISTING PAVEMENT

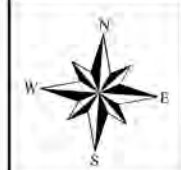


GENERAL NOTES/LEGEND

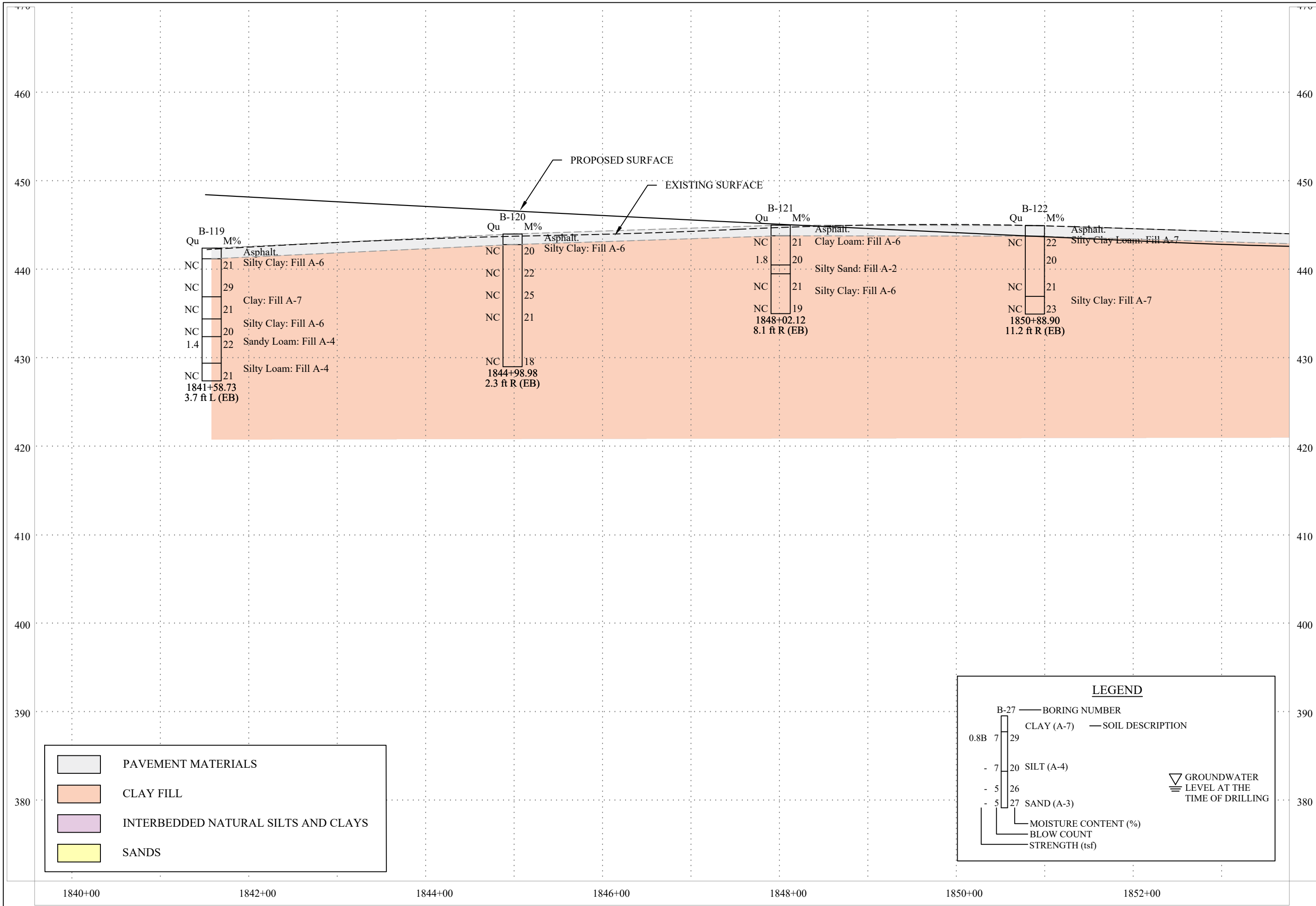
UNDATED PLAN PROVIDED BY HORNER & SHIFRIN.
 DIMENSIONS AND LOCATIONS ARE APPROXIMATE. ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

SITE PLAN



| | |
|------------|---------|
| JOB NUMBER | |
| DATE | 11/2021 |
| DRAWN BY | RCV |
| CHECKED BY | TJC |
| FIGURE | 3D |



| | |
|--|-------------------------------------|
| | PAVEMENT MATERIALS |
| | CLAY FILL |
| | INTERBEDDED NATURAL SILTS AND CLAYS |
| | SANDS |

LEGEND

B-27 — BORING NUMBER

CLAY (A-7) — SOIL DESCRIPTION

0.8B 7 29

- 7 20 SILT (A-4)

- 5 26

- 5 27 SAND (A-3)

MOISTURE CONTENT (%)

BLOW COUNT

STRENGTH (tsf)

GROUNDWATER LEVEL AT THE TIME OF DRILLING

General Notes/ Legend
 VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

EASTBOUND SUBSURFACE PROFILE

SCALE
 1" = 10' V
 1" = 100' H

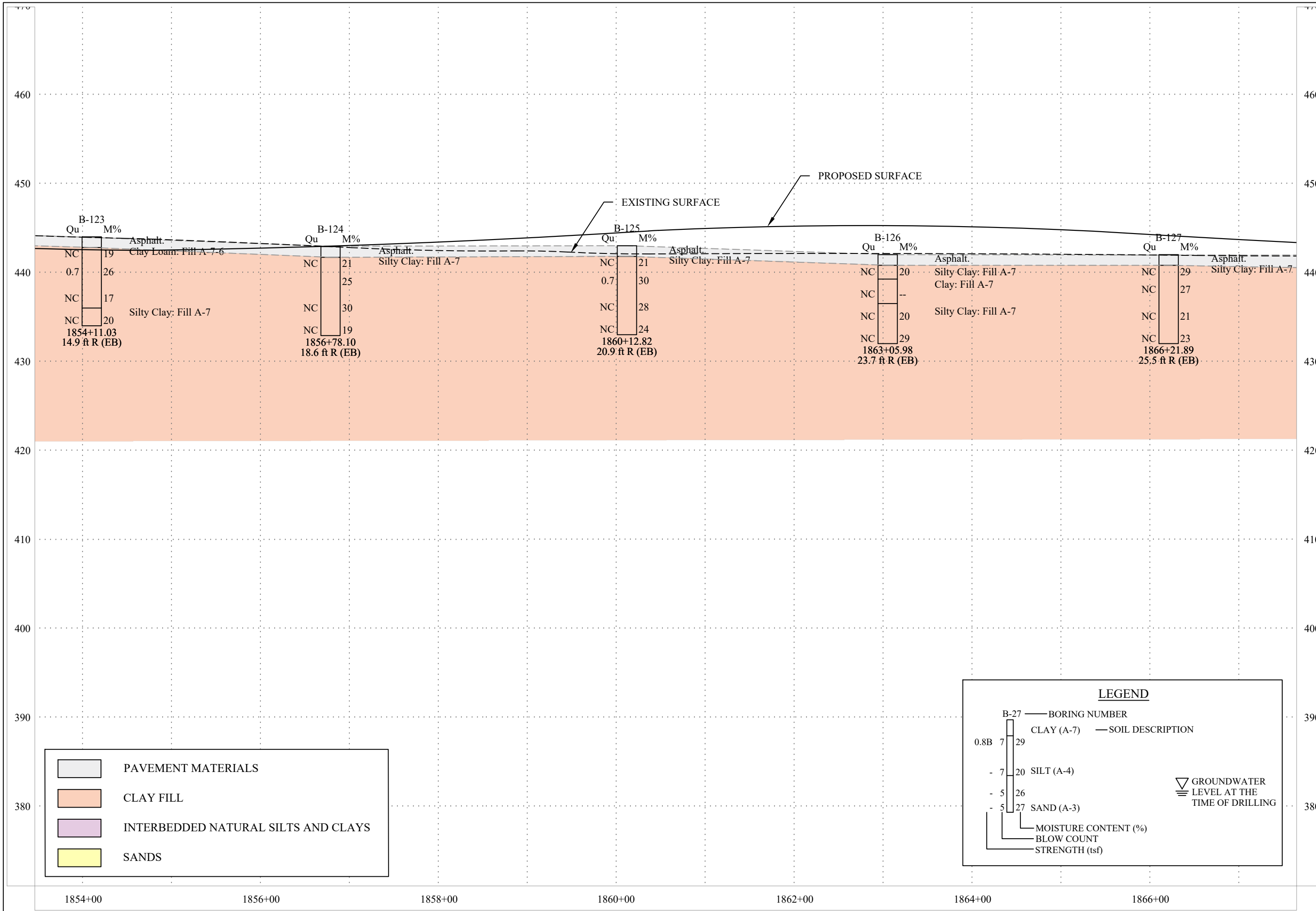
JOB NUMBER
 2017-3167.10

DATE
 11/2021

DRAWN BY RCV

CHECKED BY TJC

FIGURE
 4A



General Notes/Legend
 VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

EASTBOUND SUBSURFACE PROFILE

PAVEMENT MATERIALS

CLAY FILL

INTERBEDDED NATURAL SILTS AND CLAYS

SANDS

LEGEND

B-27 — BORING NUMBER

CLAY (A-7) — SOIL DESCRIPTION

0.8B 7 29

- 7 20 SILT (A-4)

- 5 26

- 5 27 SAND (A-3)

MOISTURE CONTENT (%)

BLOW COUNT

STRENGTH (tsf)

▽ GROUNDWATER LEVEL AT THE TIME OF DRILLING

SCALE
 1" = 10' V
 1" = 100' H

JOB NUMBER
 2017-3167.10

DATE
 11/2021

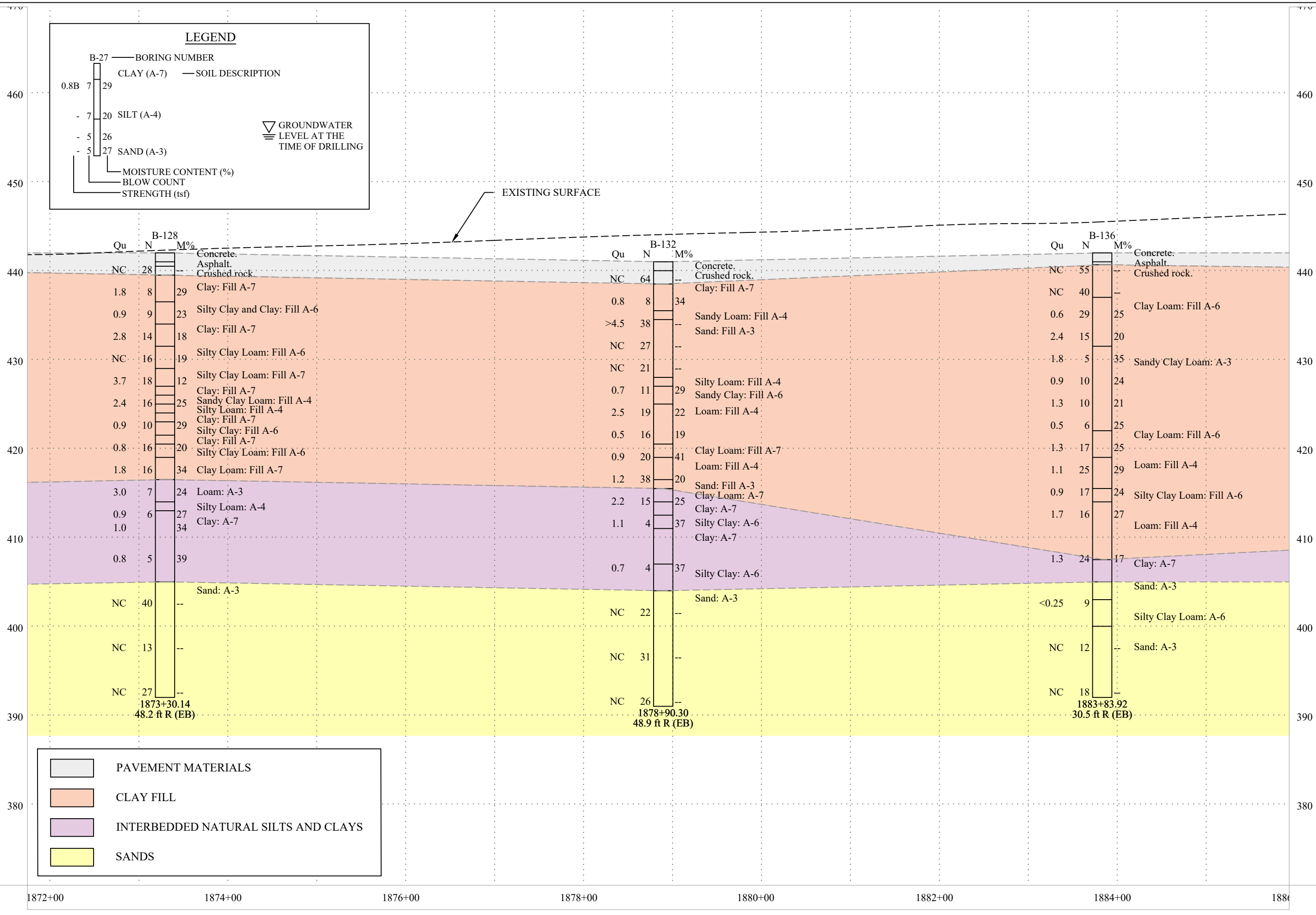
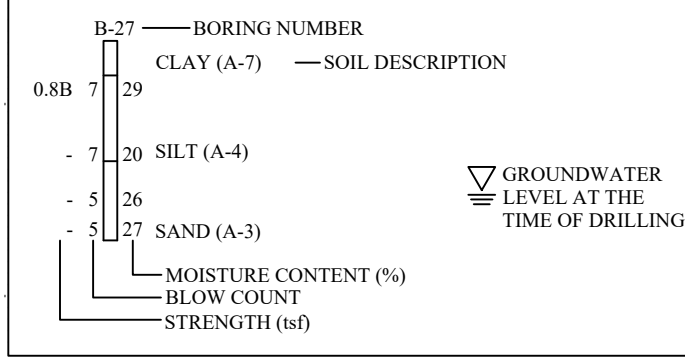
DRAWN BY RCV

CHECKED BY TJC

FIGURE
4B



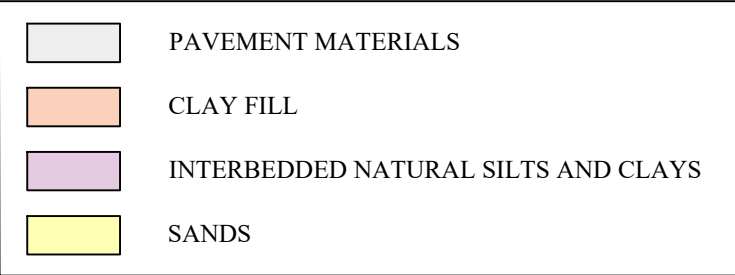
LEGEND



General Notes/Legend
 VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

EASTBOUND SUBSURFACE PROFILE

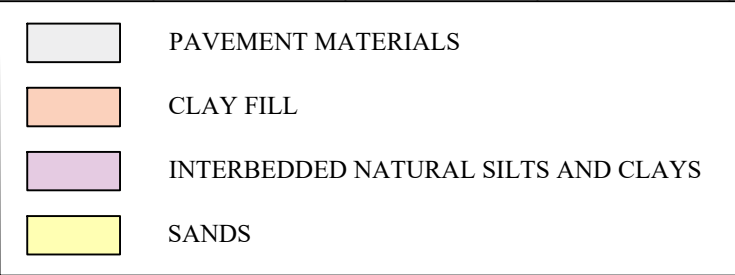
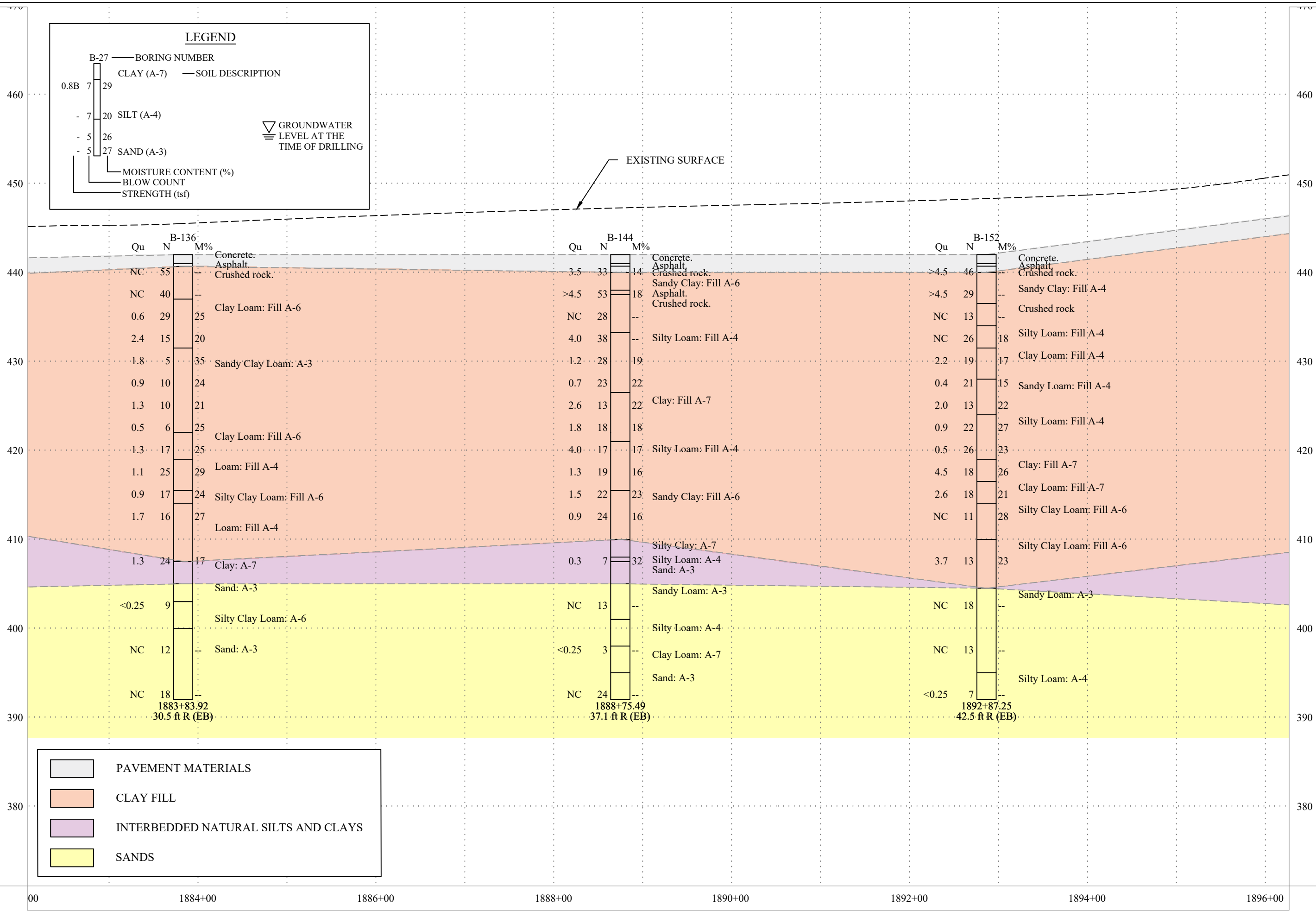
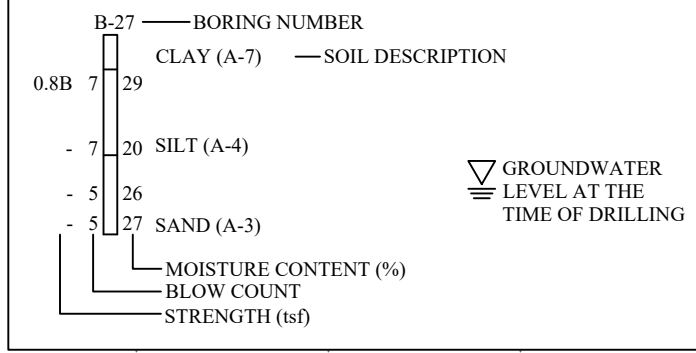


SCALE
 1" = 10' V
 1" = 100' H
JOB NUMBER
 2017-3167.10
DATE
 11/2021
DRAWN BY RCV
CHECKED BY TJC
FIGURE

4C



LEGEND



General Notes/Legend
 VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

EASTBOUND SUBSURFACE PROFILE

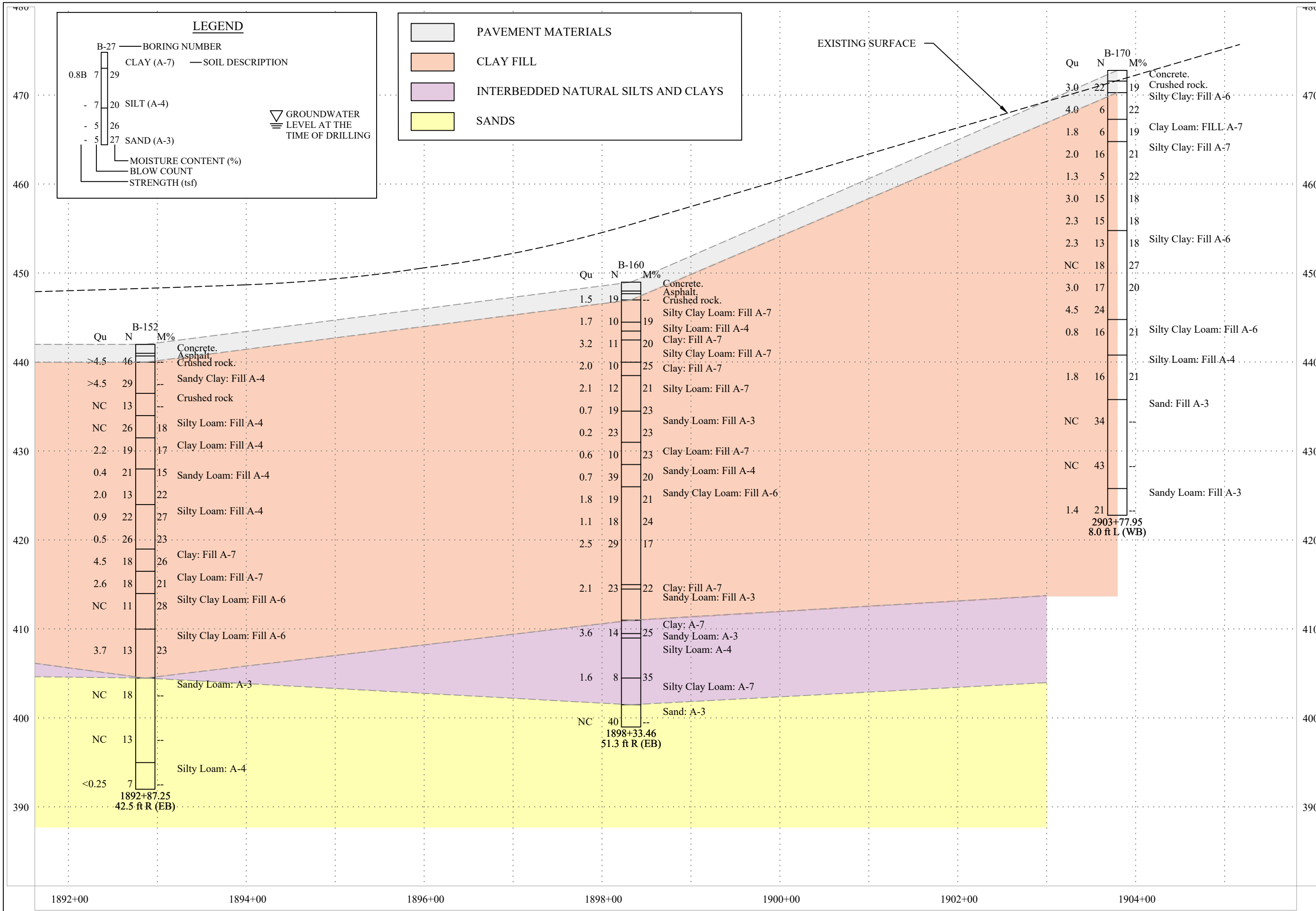
SCALE
 1" = 10' V
 1" = 100' H

JOB NUMBER
 2017-3167.10

DATE
 11/2021

DRAWN BY RCV
CHECKED BY TJC

FIGURE
4D



General Notes/Legend
 VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

EASTBOUND SUBSURFACE PROFILE

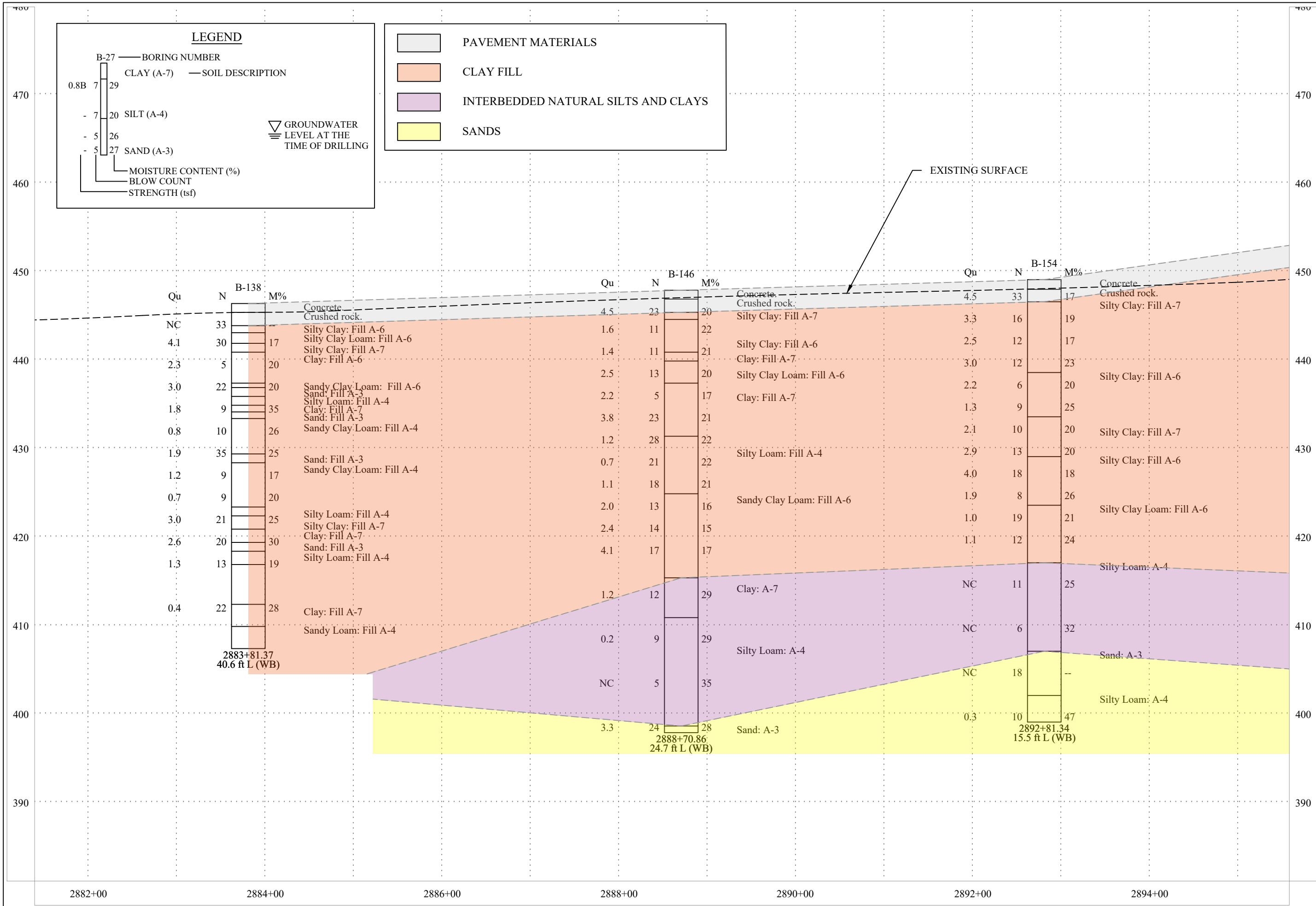
SCALE
 1" = 10' V
 1" = 100' H

JOB NUMBER
 2017-3167.10

DATE
 11/2021

DRAWN BY RCV
CHECKED BY TJC

FIGURE
 4E



General Notes/Legend
 VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
 I-270 OVER MISSISSIPPI RIVER
 ST. LOUIS CITY, MISSOURI AND
 MADISON COUNTY, ILLINOIS

WESTBOUND SUBSURFACE PROFILE

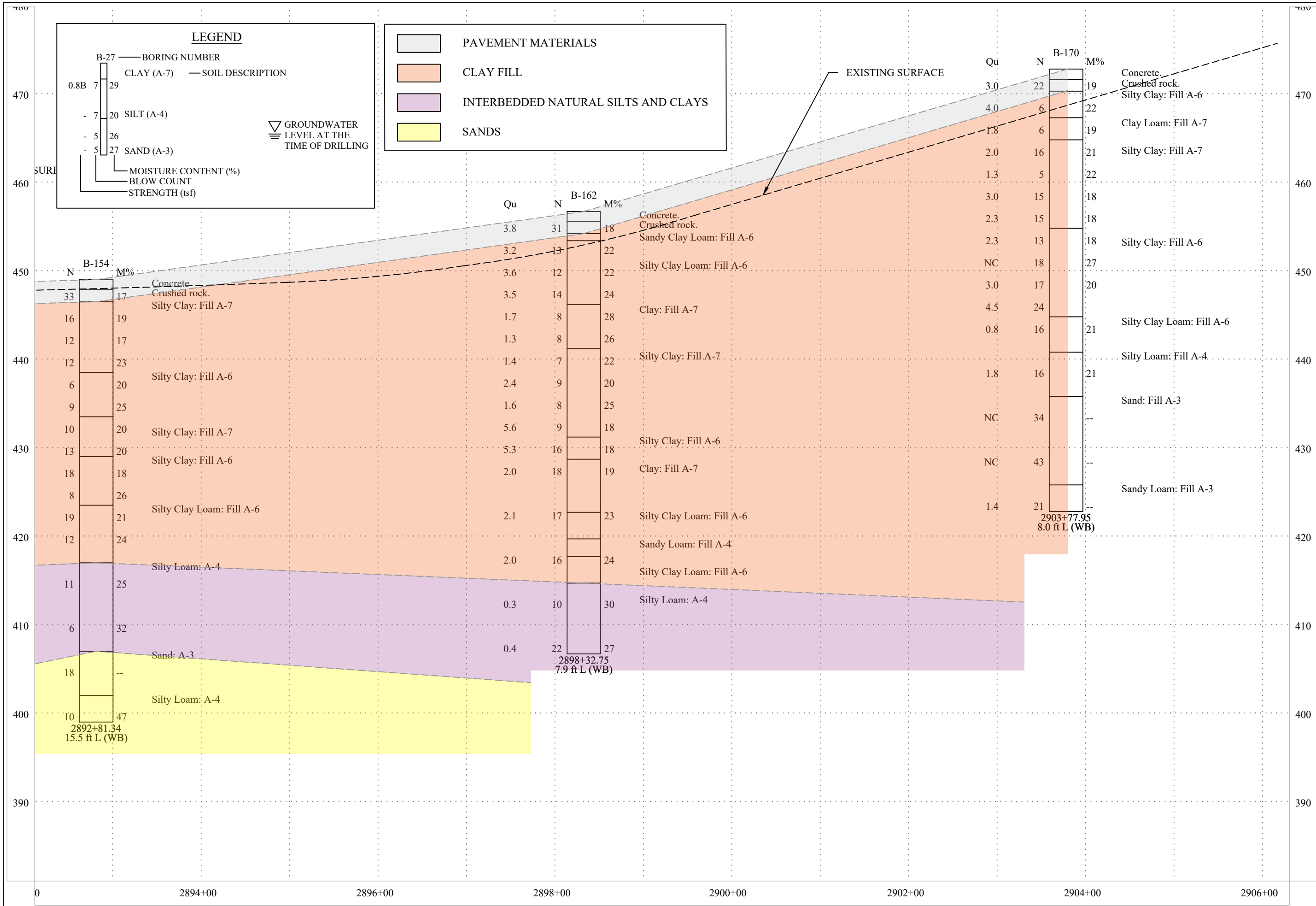
SCALE
 1" = 10' V
 1" = 100' H

JOB NUMBER
 2017-3167.10

DATE
 11/2021

DRAWN BY RCV
CHECKED BY TJC

FIGURE
 5A



Appendix A



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W
Lat 38.76090394 Long -90.15623182

COUNTY Madison DRILLING METHOD CFA HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-122
Station 1850+88.90
Offset 11.2 ft R (EB)
Ground Surface Elev. 444.1 ft

| D E P T H (ft) | B L O W S (/6") | U C S Qu (tsf) | M O I S T (%) |
|-------------------------------|--------------------------------|----------------------------|------------------------------|
|-------------------------------|--------------------------------|----------------------------|------------------------------|

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ Hrs. _____ ft

| | | | | |
|--|----|----|----|--|
| Asphalt. | | | | |
| ----- 442.9 | | | | |
| Silty Clay Loam: Gray, fill, A-7. | | NC | 22 | |
| A-7-6 (23). <i>Atterberg Limits and Particle Size Analysis Tests performed.</i> | ST | | 20 | |
| -5 | | | | |
| Dark gray. | | NC | 21 | |
| ----- 436.1 | | | | |
| Silty Clay: Gray, fill, A-7. | | NC | 23 | |
| ----- 434.1 -10 | | | | |
| Boring terminated at 10.0 feet. Boring back filled with bentonite chips and capped with asphalt cold patch. | | | | |
| -15 | | | | |
| -20 | | | | |



**Illinois Department
of Transportation**

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76502712 Long -90.1441888

COUNTY Madison & St. Louis DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-144
Station 1888+75.49
Offset 37.1 ft R (EB)
Ground Surface Elev. 441.9 ft

| D E P T H (ft) | B L O W S (/6") | U C S (tsf) | M O I S T (%) |
|-----------------------------------|------------------------------------|--------------------------|----------------------------------|
|-----------------------------------|------------------------------------|--------------------------|----------------------------------|

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter 435.9 ft ▼
Upon Completion _____ ft
After _____ Hrs. _____ ft

| | | | | | |
|--|--|----|-------|----|--|
| 400.9 | | | | | |
| Silty Loam: Brown, soft, very moist, A-4. | | | | | |
| 397.9 | | 3 | | | |
| Clay Loam: Brown, soft, very moist, A-7. | | | | | |
| -45 | | 1 | <0.25 | -- | |
| 394.9 | | 2 | P | | |
| Sand: Brown, fine grained, medium dense, very moist to wet, A-3. | | | | | |
| 391.9 | | 8 | | | |
| -50 | | 11 | NC | -- | |
| Boring terminated at 50.0 feet. | | | | | |
| -55 | | 13 | | | |
| -60 | | | | | |



SOIL BORING LOG

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76523964 Long -90.14426396

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-146
Station 1888+76.70
Offset 43.2 ft L (EB)
Ground Surface Elev. 447.8 ft

| DEPTH H S Qu T | B L O W S | U C S Qu | M O I S T T | Surface Water Elev. _____ ft | Stream Bed Elev. _____ ft | DEPTH H S Qu T | B L O W S | U C S Qu | M O I S T T |
|--|-----------------------|-------------------|----------------------------|------------------------------|---------------------------|----------------------------|-----------------------|-------------------|----------------------------|
| (ft) | (/6") | (tsf) | (%) | | | (ft) | (/6") | (tsf) | (%) |
| Concrete. | | | | | | | | | |
| ----- 446.8 | | | | | | | | | |
| Crushed rock. | | | | | | | 4 | | |
| ----- 445.3 | 16 | 4.5 | 20 | | | 9 | 1.1 | | 21 |
| | 18 | P | | | | 9 | S/5 | | |
| Silty Clay: Brown, medium stiff, moist, fill, A-7. | 5 | | | | | | | | |
| ----- 444.5 | | | | | | | | | |
| Silty Clay: Brown, stiff, moist, fill, A-6. | 2 | 1.6 | 22 | | | | 4 | 2.0 | 16 |
| ----- 440.8 | 3 | B | | | | 5 | B | | |
| Atterberg Limits test performed. | -5 | 8 | | | | -25 | 8 | | |
| | | | | | | | | | |
| | 3 | 1.4 | 21 | | | | 5 | 2.4 | 15 |
| ----- 440.8 | 5 | B | | | | 6 | S/10 | | |
| Clay: Brown, stiff, moist, fill, A-7. | 6 | | | | | 8 | | | |
| ----- 439.8 | | | | | | | | | |
| Particle Size Analysis performed. | | | | | | | | | |
| Silty Clay Loam: Brown, stiff, moist, fill, A-6. | 2 | 2.5 | 20 | | | | 5 | 4.1 | 17 |
| ----- 437.3 | 6 | S/10 | | | | 7 | S/15 | | |
| Grain Size Analysis performed. | -10 | 7 | | | | -30 | 10 | | |
| | | | | | | | | | |
| Clay: Brown, medium stiff to very stiff, moist, fill, A-7. | 2 | 2.2 | 17 | | | | | | |
| ----- 437.3 | 2 | S/10 | | | | | | | |
| | 3 | | | | | | | | |
| | | | | | | | | | |
| | 5 | 3.8 | 21 | | | | 6 | 1.2 | 29 |
| ----- 431.3 | 11 | P | | | | 4 | B | | |
| Trace coarse gravel. Sample damaged by gravel. | -15 | 12 | | | | -35 | 8 | | |
| ----- 431.3 | | | | | | | | | |
| Silty Loam: Brown, trace organics, very stiff, moist, fill, A-4. | 6 | 1.2 | 22 | | | | | | |
| ----- 431.3 | 11 | S/5 | | | | | | | |
| | 17 | | | | | | | | |
| | | | | | | | | | |
| | 8 | 0.7 | 22 | | | | 4 | 0.2 | 29 |
| ----- 410.8 | 9 | S/5 | | | | 4 | S/10 | | |
| Silty Loam: Brown, medium stiff to very stiff, very moist, A-4. | -20 | 12 | | | | -40 | 5 | | |
| | | | | | | | | | |



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 04/22/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76549703 Long -90.14434293

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-147
Station 1888+81.31
Offset 139.5 ft L (EB)
Ground Surface Elev. 417.4 ft

| DEPTH H S | B L O W S | U C S Qu | M O I S T | Surface Water Elev. _____ ft | D E P T H | B L O W S | U C S Qu | M O I S T |
|---|-----------------------|-------------------|-----------------------|--|-----------------------|-----------------------|-------------------|-----------------------|
| (ft) | (/6") | (tsf) | (%) | Stream Bed Elev. _____ ft | (ft) | (/6") | (tsf) | (%) |
| | | | | Groundwater Elev.: | | | | |
| | | | | First Encounter <u>408.9</u> ft ▼ | | | | |
| | | | | Upon Completion _____ ft | | | | |
| | | | | After <u>24</u> Hrs. <u>411.4</u> ft ▼ | | | | |
| Clay: Dark gray, very stiff, moist, fill, A-7. <i>Atterberg Limits test performed.</i> | | | | Sandy Loam: Gray, and brown, fine to coarse grained, medium dense, moist, A-1. | | | | |
| | 4 | 5.2 | 25 | | | 4 | NC | -- |
| | 6 | S/10 | | | | 8 | | |
| | 10 | | | | | 9 | | |
| | | | | | | | | |
| | | | | | | | | |
| Sand: Dark gray, fine grained, moist, fill, A-3 | 11 | 4.5 | 29 | | | 4 | NC | -- |
| | 5 | S/15 | | | | 5 | | |
| | 8 | | | | | 6 | | |
| Clay: Dark gray, stiff, moist, fill, A-7. | | | | | | | | |
| Silty Loam: Light gray, medium stiff, moist, A-4. | 4 | NC | 20 | | | 4 | NC | -- |
| | 3 | | | | | 7 | | |
| | 3 | | | | | 10 | | |
| Silt: Gray, soft, moist, A-4. <i>Grain Size Analysis performed.</i> | 2 | NC | 31 | | | 6 | NC | -- |
| | 1 | | | | | 4 | | |
| | 1 | | | | | 4 | | |
| | | | | | | | | |
| Silty Loam: Gray, medium stiff, moist, A-4. | 3 | NC | 28 | | | | | |
| | 4 | | | | | | | |
| | 2 | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Sandy Loam: Gray, fine grained, loose, moist, A-3. | 1 | NC | -- | | | | | |
| | 4 | | | | | | | |
| | 5 | | | | | | | |
| | | | | | | | | |
| | 4 | NC | -- | | | | | |
| | 5 | | | | | | | |
| | 6 | | | | | | | |
| Silt: Gray, soft, moist, A-4. | 1 | NC | 44 | | | | | |
| | 1 | | | | | | | |
| | 2 | | | | | | | |



**Illinois Department
of Transportation**

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76527985 Long -90.14279451

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-152
Station 1892+87.25
Offset 42.5 ft R (EB)
Ground Surface Elev. 442.1 ft

**D
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W
S**
**U
C
S
Qu**
**M
O
I
S
T**
(ft) **(/6")** **(tsf)** **(%)**

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter 431.1 ft ▼
Upon Completion _____ ft
After _____ Hrs. _____ ft

**D
E
P
T
H**
**B
L
O
W
S**
**U
C
S
Qu**
**M
O
I
S
T**
(ft) **(/6")** **(tsf)** **(%)**

| | | | | | | | | | |
|--|-------|-----|-------------|----|---|--|-----|-------------|----|
| Concrete. | | | | | Silty Loam: Brown, very stiff, moist, fill, A-4. (continued) | | | | |
| | 441.1 | | | | | | | | |
| Asphalt. | 440.8 | 23 | | | | | 7 | | |
| Crushed rock. | 440.1 | 27 | >4.5 P | -- | | | 13 | 0.5 S/10 | 23 |
| Sandy Clay: Dark brown, hard, moist, fill, A-4. | | 19 | | | | | 13 | | |
| | | | | | | | | | |
| | | 17 | | | Clay: Brown, stiff, moist, fill, A-7. Atterberg Limits test performed. | | 5 | | |
| | | 11 | >4.5 P | -- | | | 7 | 4.5 B/20 | 26 |
| | | -5 | | | | | -25 | 11 | |
| | 436.6 | | | | | | | | |
| Crushed rock: with crushed asphalt, concrete, and trash, fill. | | 4 | | | Clay Loam: Brown, stiff, moist, fill, A-7. | | 6 | | |
| | | 6 | NC | -- | | | 9 | 2.6 S/10 | 21 |
| | | 7 | | | | | 9 | | |
| | 434.1 | | | | | | | | |
| Silty Loam: Brown, very stiff, moist, fill, A-4. | | 7 | | | Silty Clay Loam: Brown, stiff, moist, fill, A-6. | | 4 | | |
| | | 13 | NC | 18 | | | 3 | NC | 28 |
| | | -10 | | | | | -30 | 8 | |
| | 431.6 | | | | | | | | |
| Clay Loam: Brown, very stiff, moist, fill, A-4. | | 3 | | | | | | | |
| | | 8 | 2.2 S/10 | 17 | | | | | |
| | | 11 | | | Silty Clay Loam: Brown, stiff, moist, fill, A-6. | | | | |
| | | | | | | | | | |
| | 428.1 | 3 | | | | | | | |
| Sandy Loam: Brown, fine grained, medium dense, moist, fill, A-4. | | 8 | 0.4 S/10 | 15 | | | 2 | | |
| | | 13 | | | | | 7 | 3.7 S/10 | 23 |
| | | -15 | | | | | -35 | 6 | |
| | | | | | | | | | |
| | | 12 | | | | | | | |
| | | 6 | 2.0 P | 22 | | | | | |
| | | 7 | | | | | | | |
| | 424.1 | | | | | | | | |
| Silty Loam: Brown, very stiff, moist, fill, A-4. | | 6 | | | Sandy Loam: Brown, fine grained, medium dense, very moist to wet, A-3. | | | | |
| | | 8 | 0.9 S/10 | 27 | | | | 4 | NC |
| | | 14 | | | | | | 8 | -- |
| | | -20 | | | | | -40 | 10 | |



**Illinois Department
of Transportation**

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 06/03/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76527985 Long -90.14279451

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-152
Station 1892+87.25
Offset 42.5 ft R (EB)
Ground Surface Elev. 442.1 ft

| D E P T H | B L O W S | U C S Qu | M O I S T |
|-----------------------|-----------------------|-------------------|-----------------------|
| (ft) | (/6") | (tsf) | (%) |

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter 431.1 ft ▼
Upon Completion _____ ft
After _____ Hrs. _____ ft

Sandy Loam: Brown, fine grained,
medium dense, very moist to wet,
A-3. (continued)

| | | |
|---|----|----|
| 5 | NC | -- |
| 6 | | |
| 7 | | |

395.1

Silty Loam: Brown, medium stiff,
moist,
A-4.

| | | |
|---|-------|----|
| 4 | <0.25 | -- |
| 2 | P | |
| 5 | | |

392.1 -50

Boring terminated at 50.0 feet.
Boring backfilled with 2 bags of
bentonite chips and capped with
concrete patch.

-55

-60



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 04/20/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76501932 Long -90.14275313

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-153
Station 1892+80.16
Offset 137.8 ft R (EB)
Ground Surface Elev. 439.3 ft

| DEPTH (ft) | BLOWS (B) | UCS (tsf) | MOIST (%) | Surface Water Elev. (ft) | Stream Bed Elev. (ft) | GROUNDWATER ELEV. (ft) | BLOWS (B) | UCS (tsf) | MOIST (%) |
|------------|-----------|-----------|-----------|--------------------------|-----------------------|------------------------|-----------|-----------|-----------|
| 437.8 | 1 | 0.9 B/20 | 35 | | | | 2 | NC | -- |
| 437.3 | 3 | | | | | | 7 | | |
| | 6 | | | | | | 9 | | |
| 435.3 | 4 | 2.4 B/20 | 37 | | | | 8 | NC | -- |
| 434.8 | 5 | | | | | | 12 | | |
| | 7 | | | | | | 14 | | |
| 432.8 | 3 | 2.5 P | 29 | | | | 11 | NC | -- |
| | 4 | | | | | | 9 | | |
| | 5 | | | | | | 6 | | |
| | 3 | 3.2 S/10 | 33 | | | | 9 | NC | -- |
| | 4 | | | | | | 6 | | |
| | 5 | | | | | | 8 | | |
| 428.8 | | | | | | | | | |
| | 2 | NC | 33 | | | | | | |
| | 4 | | | | | | | | |
| | 5 | | | | | | | | |
| | 3 | 0.5 P | 37 | | | | | | |
| | 4 | | | | | | | | |
| | 6 | | | | | | | | |
| 423.8 | | | | | | | | | |
| | 5 | NC | -- | | | | | | |
| | 8 | | | | | | | | |
| | 10 | | | | | | | | |
| 421.3 | | | | | | | | | |
| | 5 | NC | -- | | | | | | |
| | 6 | | | | | | | | |
| | 5 | | | | | | | | |
| | -20 | | | | | | | | |



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 04/22/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76577572 Long -90.14293502

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-155
Station 1892+83.21
Offset 142.5 ft L (EB)
Ground Surface Elev. 418.6 ft

| DEPTH H S | B L O W S | U C S Qu | M O I S T | Surface Water Elev. _____ ft | Stream Bed Elev. _____ ft | DEPTH H S | B L O W S | U C S Qu | M O I S T |
|-----------------|-----------------------|-------------------|-----------------------|------------------------------|---------------------------|-----------------|-----------------------|-------------------|-----------------------|
| (ft) | (/6") | (tsf) | (%) | | | (ft) | (/6") | (tsf) | (%) |
| | | | | | | | | | |
| | 4 | <0.25 P | 17 | | | | 5 | NC | -- |
| | 4 | | | | | | 9 | | |
| | 2 | | | | | | 12 | | |
| | | | | | | | | | |
| | 1 | <0.25 P | 24 | | | | 3 | NC | -- |
| | 2 | | | | | | 4 | | |
| | -5 | | | | | | 4 | | |
| | | | | | | | | | |
| | 1 | <0.25 P | 31 | | | | 5 | NC | -- |
| | 1 | | | | | | 7 | | |
| | 2 | | | | | | 11 | | |
| | | | | | | | | | |
| | 3 | NC | 30 | | | | 8 | NC | -- |
| | 3 | | | | | | 10 | | |
| | 3 | | | | | | 10 | | |
| | | | | | | | | | |
| | 3 | NC | 41 | | | | | | |
| | 2 | | | | | | | | |
| | 1 | NC | 37 | | | | | | |
| | 1 | | | | | | | | |
| | | | | | | | | | |
| | 1 | NC | 33 | | | | | | |
| | 2 | | | | | | | | |
| | 2 | | | | | | | | |
| | | | | | | | | | |
| | 2 | NC | -- | | | | | | |
| | 6 | | | | | | | | |
| | 7 | | | | | | | | |

Silt: Gray, medium stiff to soft, moist.
A-4.
Grain Size Analysis performed.

Silty Loam: Gray, medium stiff, moist, A-4.

Silt: Gray, medium stiff to soft, moist, A-4.

Grain Size Analysis performed.

Sandy Loam: Brown, fine grained, medium dense, moist, A-3. (continued)

Sand: Gray, fine to coarse grained, loose to medium dense, moist, A-1.

Boring terminated at 30.0 feet. Borehole caved in at 22 feet after 24 hours.



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 06/04/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76545643 Long -90.14092622

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-160
Station 1898+33.46
Offset 51.3 ft R (EB)
Ground Surface Elev. 448.8 ft

| DEPTH (ft) | BLOW COUNT (/6") | UCS (tsf) | MOISTURE (%) | Surface Water Elev. (ft) | Stream Bed Elev. (ft) | DEPTH (ft) | BLOW COUNT (/6") | UCS (tsf) | MOISTURE (%) |
|------------|------------------|-----------|--------------|--------------------------|-----------------------|------------|------------------|-----------|--------------|
|------------|------------------|-----------|--------------|--------------------------|-----------------------|------------|------------------|-----------|--------------|

| | | | | | | | | | |
|--|----|----------|----|--|--|-------|----|----------|----|
| Concrete. | | | | | | 428.3 | | | |
| Asphalt. | 16 | | | | | | 8 | | |
| Crushed rock. | 13 | 1.5 P | -- | | | | 18 | 0.7 S/10 | 20 |
| Silty Clay Loam: Brown, medium stiff, moist, fill, A-7. <i>Grain Size Analysis performed.</i> | 6 | | | | | | 21 | | |
| Silty Loam: Brown, moist, fill, A-4. | 2 | | | | | 425.8 | 6 | | |
| Silty Loam: Brown, moist, fill, A-4. | 4 | 1.7 S/10 | 19 | | | | 7 | 1.8 S/5 | 21 |
| Clay: Gray, moist, fill, A-7. | 6 | | | | | | 12 | | |
| Silty Clay Loam: Brown, stiff, moist, with silty clay, fill, A-7. | 4 | 3.2 S/15 | 20 | | | | 4 | 1.1 S/15 | 24 |
| Clay: Brown, stiff, moist, fill, A-7. | 5 | | | | | | 7 | | |
| Clay: Brown, stiff, moist, fill, A-7. | 6 | | | | | | 11 | | |
| Clay: Brown, stiff, moist, fill, A-7. | 3 | 2.0 B/20 | 25 | | | | 13 | 2.5 P | 17 |
| Clay: Brown, stiff, moist, fill, A-7. | 4 | | | | | | 12 | | |
| Silty Loam: Brown, stiff, moist, fill, A-7. | 6 | | | | | | 17 | | |
| Silty Loam: Brown, stiff, moist, fill, A-7. | 3 | 2.1 S/15 | 21 | | | | | | |
| Silty Loam: Brown, stiff, moist, fill, A-7. | 5 | | | | | | | | |
| Silty Loam: Brown, stiff, moist, fill, A-7. | 7 | | | | | | | | |
| <i>Grain Size Analysis performed.</i> | 6 | | | | | | | | |
| Sandy Loam: Brown, medium dense, moist, fill, A-3. | 6 | 0.7 S/10 | 23 | | | 414.8 | 6 | | |
| Sandy Loam: Brown, medium dense, moist, fill, A-3. | 13 | | | | | 414.3 | 7 | 2.1 S/10 | 22 |
| Sandy Loam: Brown, medium dense, moist, fill, A-3. | 7 | | | | | | 16 | | |
| Sandy Loam: Brown, medium dense, moist, fill, A-3. | 11 | 0.2 S/10 | 23 | | | | | | |
| Sandy Loam: Brown, medium dense, moist, fill, A-3. | 12 | | | | | | | | |
| Clay Loam: Brown, stiff, moist, with sandy loam, fill, A-7. | | | | | | 410.8 | | | |
| Clay Loam: Brown, stiff, moist, with sandy loam, fill, A-7. | 3 | | | | | | | | |
| Clay Loam: Brown, stiff, moist, with sandy loam, fill, A-7. | 3 | 0.6 S/15 | 23 | | | | 5 | 3.6 S/10 | 25 |
| Clay Loam: Brown, stiff, moist, with sandy loam, fill, A-7. | 7 | | | | | 409.3 | 7 | | |
| Clay Loam: Brown, stiff, moist, with sandy loam, fill, A-7. | 7 | | | | | 408.8 | 7 | | |



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 04/20/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76499848 Long -90.14094873

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-161
Station 1898+09.30
Offset 217.1 ft R (EB)
Ground Surface Elev. 429.4 ft

| D E P T H H | B L O W S | U C S Qu | M O I S T |
|--------------------------------|-----------------------|-----------------------|-----------------------|
| (ft) | (/6") | (tsf) | (%) |

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After 72 Hrs. 405.4 ft ∇

| D E P T H H | B L O W S | U C S Qu | M O I S T |
|--------------------------------|-----------------------|-----------------------|-----------------------|
| (ft) | (/6") | (tsf) | (%) |

| | | | | | | | | | |
|---|-------|-----|----------|--|-------|----------|-----|----|----|
| Silty Clay Loam: Brown, stiff, moist, fill, A-6. <i>Grain Size Analysis performed.</i> | | | | Sand: Brown, fine grained, medium dense, moist, A-3. | | | | | |
| | | 4 | | | | | 3 | | |
| | | 5 | 4.5 P | | 18 | | 4 | NC | -- |
| | 5 | | | | | 6 | | | |
| | | | | Trace fine gravel observed on top of sample. | | | | | |
| Silty Loam: Brown, medium stiff, dry to moist, A-4. | 425.4 | 3 | NC | | 20 | ∇ | 6 | NC | -- |
| | | 4 | | | | | 7 | | |
| | | -5 | 4 | | | | -25 | 11 | |
| | | | | | | | | | |
| | | 2 | | | | | 4 | | |
| | | 3 | NC | 10 | | 6 | NC | -- | |
| | | 3 | | | | 8 | | | |
| | | | | | | | | | |
| | | 2 | | | | 7 | | | |
| | | 3 | 1.5 S/10 | 24 | | 11 | NC | -- | |
| | | -10 | | | | 9 | | | |
| | | | | | 399.4 | -30 | | | |
| | | | | Boring terminated at 30.0 feet. Borehole caved in at 24.5 feet after 72 hours. | | | | | |
| Clay Loam: Brown, moist, A-7. | 418.9 | | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | 0.6 B/20 | | 37 | | | | |
| | 417.4 | | | | | | | | |
| Silty Loam: Brown, stiff, moist, A-4. <i>Grain Size Analysis performed.</i> | | 6 | | | | | | | |
| | 416.4 | | | | | | | | |
| Sand: Brown, fine grained, medium dense, moist, A-3. | | 6 | | | | | | | |
| | | 7 | NC | | -- | | | | |
| | -15 | 7 | | | | | -35 | | |
| | | | | | | | | | |
| | | 4 | | | | | | | |
| | | 6 | NC | -- | | | | | |
| | | 5 | | | | | | | |
| | | | | | | | | | |
| Very loose. <i>Grain Size Analysis performed.</i> With organics. | | 2 | | | | | | | |
| | | 1 | NC | -- | | | | | |
| | 409.4 | -20 | 1 | | | -40 | | | |



**Illinois Department
of Transportation**

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 05/11/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76565144 Long -90.14092586

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-162
Station 1898+35.23
Offset 19.4 ft L (EB)
Ground Surface Elev. 456.7 ft

| D E P T H (ft) | B L O W S (/6") | U C S Qu (tsf) | M O I S T (%) |
|-----------------------------------|------------------------------------|--------------------------------|----------------------------------|
|-----------------------------------|------------------------------------|--------------------------------|----------------------------------|

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ Hrs. _____ ft

Silty Clay Loam: Brown, very stiff,
moist, fill,
A-6. (continued)

414.7

Silty Loam: Brown, stiff to very stiff,
moist,
A-4.

| | | | |
|-----|--|----------|----|
| 5 | | | |
| 5 | | 0.3 P | 30 |
| -45 | | | |

406.7 -50

Boring terminated at 50.0 feet.

| | | | |
|----|--|------------|----|
| 11 | | | |
| 11 | | 0.4 S/5 | 27 |
| 11 | | | |

-55

-60



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 04/19/21

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76480848 Long -90.13913008

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

| | | | | | | | | | |
|--------------------------------------|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------------------|--------------------------------|-----------------------|-----------------------|-----------------------|
| STRUCT. NO. <u>060-0350 (EB)</u> | D E P T H H | B L O W S | U C S Qu | M O I S T | Surface Water Elev. _____ ft | D E P T H H | B L O W S | U C S Qu | M O I S T |
| Station <u>806+89.23</u> | | | | | Stream Bed Elev. _____ ft | | | | |
| BORING NO. <u>B-169</u> | (ft) | (/6") | (tsf) | (%) | Groundwater Elev.: | (ft) | (/6") | (tsf) | (%) |
| Station <u>1903+27.09</u> | | | | | First Encounter <u>417.0</u> ft ▼ | | | | |
| Offset <u>319.1 ft R (EB)</u> | | | | | Upon Completion _____ ft | | | | |
| Ground Surface Elev. <u>427.5</u> ft | | | | | After _____ Hrs. _____ ft | | | | |

| | | | | | | | | | |
|---|--|-----|------|----|---|--|-------|-----|----|
| Loam: Brown, very stiff, moist, A-4. <i>Grain Size Analysis performed.</i> | | | | | Sand: Brown, fine grained, loose to medium dense, very moist to wet, A-3. (continued) | | | | |
| | | 4 | 0.4 | 13 | | | 5 | NC | -- |
| | | 8 | S/15 | | | | 8 | | |
| | | 10 | | | | | 16 | | |
| ----- 424.5 | | | | | | | | | |
| Sand: Gray, fine grained, moist, A-3. | | 4 | | | | | 2 | | |
| ----- 423.5 | | 4 | 2.1 | 27 | | | 3 | NC | -- |
| Clay: Gray, medium stiff, moist, A-7. | | 4 | B/20 | | | | 4 | | |
| Gray. | | -5 | | | | | -25 | | |
| | | | | | | | | | |
| Brown. | | 2 | | | | | 4 | | |
| <i>Atterberg Limits test performed.</i> | | 2 | 0.7 | 32 | | | 7 | NC | -- |
| Silty Clay: Brown, medium stiff, moist, A-6. | | 6 | B/20 | | | | 8 | | |
| ----- 419.5 | | | | | | | | | |
| Sandy Loam: Brown, fine grained, medium dense, moist, A-3. | | 4 | 1.3 | 24 | | | 2 | | |
| | | 7 | P | | | | 6 | NC | -- |
| | | -10 | | | | | 6 | | |
| | | | | | | | | | |
| ----- 417.0 ▼ | | | | | | | 398.0 | | |
| Silty Loam: Brown, medium dense, very moist to wet, A-4. <i>Grain Size Analysis performed.</i> | | 4 | 1.5 | 27 | | | 397.5 | -30 | |
| | | 5 | P | | | | | | |
| | | 4 | | | | | | | |
| | | | | | | | | | |
| | | 2 | 2.0 | 31 | | | | | |
| ----- 413.0 | | 3 | P | | | | | | |
| Sand: Brown, fine grained, loose to medium dense, very moist to wet, A-3. | | -15 | | | | | -35 | | |
| | | | | | | | | | |
| | | 4 | | | | | | | |
| With silty loam deposit from approximately 16.5 to 17 feet. | | 7 | NC | -- | | | | | |
| | | 7 | | | | | | | |
| | | | | | | | | | |
| | | 2 | | | | | | | |
| | | 5 | NC | -- | | | | | |
| | | 7 | | | | | | | |
| | | -20 | | | | | -40 | | |



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 5/10-11/2021

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76574409 Long -90.1390175

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-170
Station 1903+80.15
Offset 19.0 ft L (EB)
Ground Surface Elev. 472.8 ft

| D E P T H (ft) | B L O W S (/6") | U C S Qu (tsf) | M O I S T (%) |
|-------------------------------|--------------------------------|----------------------------|------------------------------|
|-------------------------------|--------------------------------|----------------------------|------------------------------|

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ Hrs. _____ ft

| D E P T H (ft) | B L O W S (/6") | U C S Qu (tsf) | M O I S T (%) |
|-------------------------------|--------------------------------|----------------------------|------------------------------|
|-------------------------------|--------------------------------|----------------------------|------------------------------|

| | | | | | | | | |
|--|----|------|----|---|----|-----|------|-----|
| Concrete. | | | | Silty Clay: Brown, stiff to very stiff, moist, fill, A-6. (continued) | | | | |
| ----- 471.6 | | | | | | | | |
| Crushed rock. | 16 | | | <i>Poor recovery - sample in jar may not be indicative of materials (possible fall-in).</i> | | 6 | | |
| ----- | 17 | 3.0 | 19 | | 8 | NC | 27 | |
| ----- 470.3 | 5 | P | | | 10 | | | |
| Silty Clay Loam: Brown, medium stiff, moist, fill, A-6. <i>Particle Size Analysis performed.</i> | | | | | | | | |
| ----- | 3 | | | | | 7 | | |
| ----- | 2 | 4.0 | 22 | | | 8 | 3.0 | |
| ----- -5 | 4 | P | | | | 9 | S/5 | |
| ----- 467.3 | | | | | | -25 | | |
| Clay Loam: Brown, medium stiff, moist, fill, A-7. <i>Grain Size Analysis performed.</i> | | | | <i>Poor recovery - trace coarse gravel.</i> | | | | |
| ----- | 2 | | | | | | 7 | |
| ----- | 2 | 1.8 | 19 | | | | 12 | 4.5 |
| ----- 464.8 | 4 | B | | | | 12 | P | |
| Silty Clay: Brown, medium stiff to very stiff, moist, fill, A-7. With silty loam mixture. | | | | | | | | |
| ----- 444.8 | | | | Silty Clay Loam: Brown, very stiff, moist, fill, A-6. | | | | |
| ----- | 5 | | | | | 6 | | |
| ----- | 8 | 2.0 | 21 | | | 6 | 0.8 | |
| ----- -10 | 8 | S/15 | | | | 10 | S/15 | |
| ----- | | | | | | -30 | | |
| ----- | 4 | | | | | | | |
| ----- | 2 | 1.3 | 22 | | | | | |
| ----- 440.8 | 3 | S/10 | | Silty Loam: Brown, very stiff, moist, fill, A-4. | | | | |
| ----- | | | | | | | | |
| ----- | 4 | | | | | 7 | | |
| ----- | 6 | 3.0 | 18 | | | 7 | 1.8 | |
| ----- -15 | 9 | S/5 | | | | 9 | P | |
| ----- | | | | | | -35 | | |
| ----- | 4 | | | | | | | |
| ----- | 6 | 2.3 | 18 | | | | | |
| ----- 435.8 | 9 | S/15 | | Sand: Brown, fine grained, dense to very dense, very moist, fill, A-3. | | | | |
| ----- | | | | | | | | |
| ----- 454.8 | | | | | | | | |
| Silty Clay: Brown, stiff to very stiff, moist, fill, A-6. | | | | | | | | |
| ----- | 7 | | | | | 14 | | |
| ----- | 6 | 2.3 | 18 | | | 16 | NC | |
| ----- -20 | 7 | S/5 | | With clay lumps and silty loam mixture. | | 18 | -- | |



SOIL BORING LOG

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River LOGGED BY SCI

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W
Lat 38.76574409 Long -90.1390175

COUNTY Madison DRILLING METHOD CFA, Mud Rotary HAMMER TYPE Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-170
Station 1903+80.15
Offset 19.0 ft L (EB)
Ground Surface Elev. 472.8 ft

| D E P T H | B L O W S | U C S Qu | M O I S T |
|-----------------------|-----------------------|-------------------|-----------------------|
| (ft) | (/6") | (tsf) | (%) |

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ Hrs. _____ ft

Sand: Brown, fine grained, dense to very dense, very moist, fill, A-3. (continued)

| | | | |
|-----|----|--|----|
| 14 | | | |
| 21 | NC | | -- |
| 22 | | | |
| -45 | | | |

425.8

Sandy Loam: Brown, fine grained, dense, very moist, fill, A-3.

| | | | |
|-----|------|--|----|
| 8 | | | |
| 7 | 1.4 | | -- |
| 14 | S/10 | | |
| -50 | | | |

Boring terminated at 50.0 feet.

| | | | |
|-----|--|--|--|
| -55 | | | |
| -60 | | | |

Appendix B

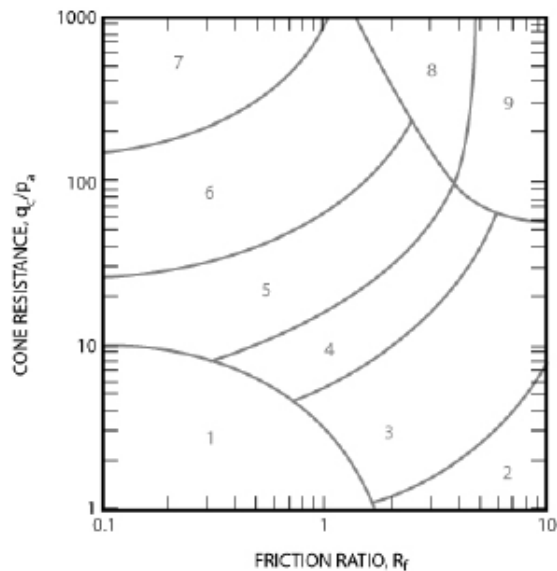


USE and UNDERSTANDING of CPTu Logs

The CPTu logs show the corrected Tip Resistance (q_t), Friction (f_s), Porewater Pressure (U_2), SPT N_{60} correlation (N_{60}), and the Soil Behavior interpretation results. The corrected cone tip resistance (q_t) is measured as the maximum force over the projected area of the cone tip. It is a point stress related to the bearing capacity of the soil. The measured uncorrected tip value (q_c) must be corrected for porewater pressure effects (Lunne et al, 1997), especially in clays and silts where porewater pressures typically vary greatly from hydrostatic. The sleeve friction (f_s) is used as a measure of soil type and can be expressed by friction ratio (R_F) which is used in the soil behavior classification. The u_2 position element is required for the measurement of penetration porewater pressures and the correction of tip resistance. Calculations of q_t , R_F , and the SPT N_{60} calculation are discussed below.

The estimated stratigraphic profiles included in the CPTu logs are based on relationships between q_t , f_s , and U_2 as shown graphically in the figure below.

Non-normalized CPT Soil Behavior Type (SBT) chart



| Z | Soil Behavior Type |
|---|---|
| 1 | Sensitive, fine grained |
| 2 | Organic soils - clay |
| 3 | Clay – silty clay to clay |
| 4 | Silt mixtures – clayey silt to silty clay |
| 5 | Sand mixtures – silty sand to sandy silt |
| 6 | Sands – clean sand to silty sand |
| 7 | Gravelly sand to dense sand |
| 8 | Very stiff sand to clayey sand* |
| 9 | Very stiff fine grained* |

* Heavily overconsolidated or cemented

$P_a = \text{atmospheric pressure} = 100 \text{ kPa} = 1 \text{ tsf}$

Derived Values from CPT

Corrected cone resistance: $q_t = q_c + u_2(1-a)$

Friction ratio: $R_f = (f_s/q_t) \times 100\%$

Equivalent SPT N_{60} , (blows/ft) Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5 \times \left(1 - \frac{I_c}{4.6} \right)$$

Where $I_c = ((3.47 - \log Q_{t1})^2 + (\log R_F + 1.22)^2)0.5$

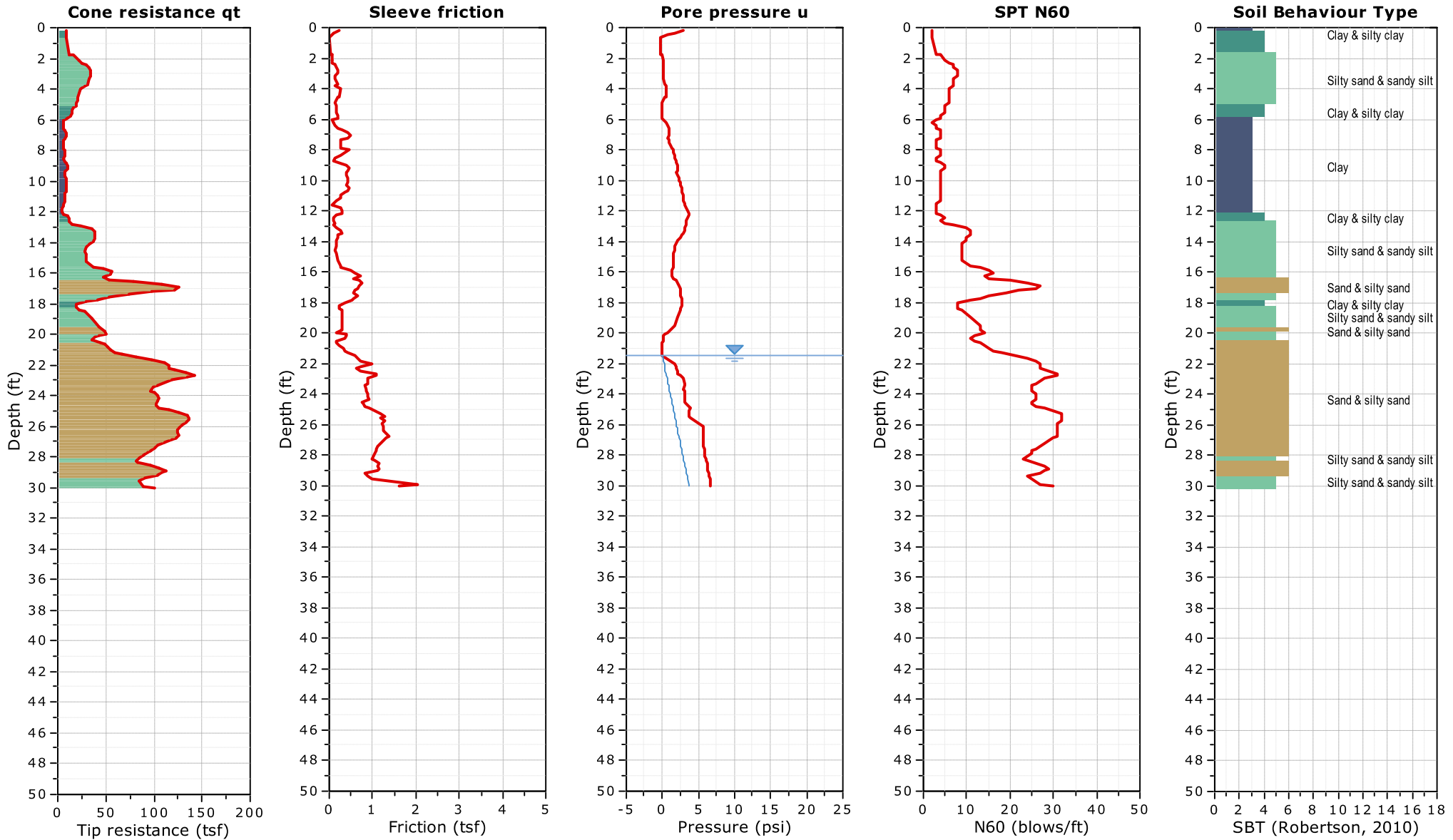
And $Q_{tn} = ((q_t - s'v_o)/p_a) \times (p_a/(s'v_o))^n$, and recalculate I_c , then iterate for n:

$$n = 0.381 \times I_c + 0.05 \times \left(\frac{s'v_o}{p_a} \right) - 0.15$$

Iterate until the change in n, $\Delta_n < 0.01$



Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL



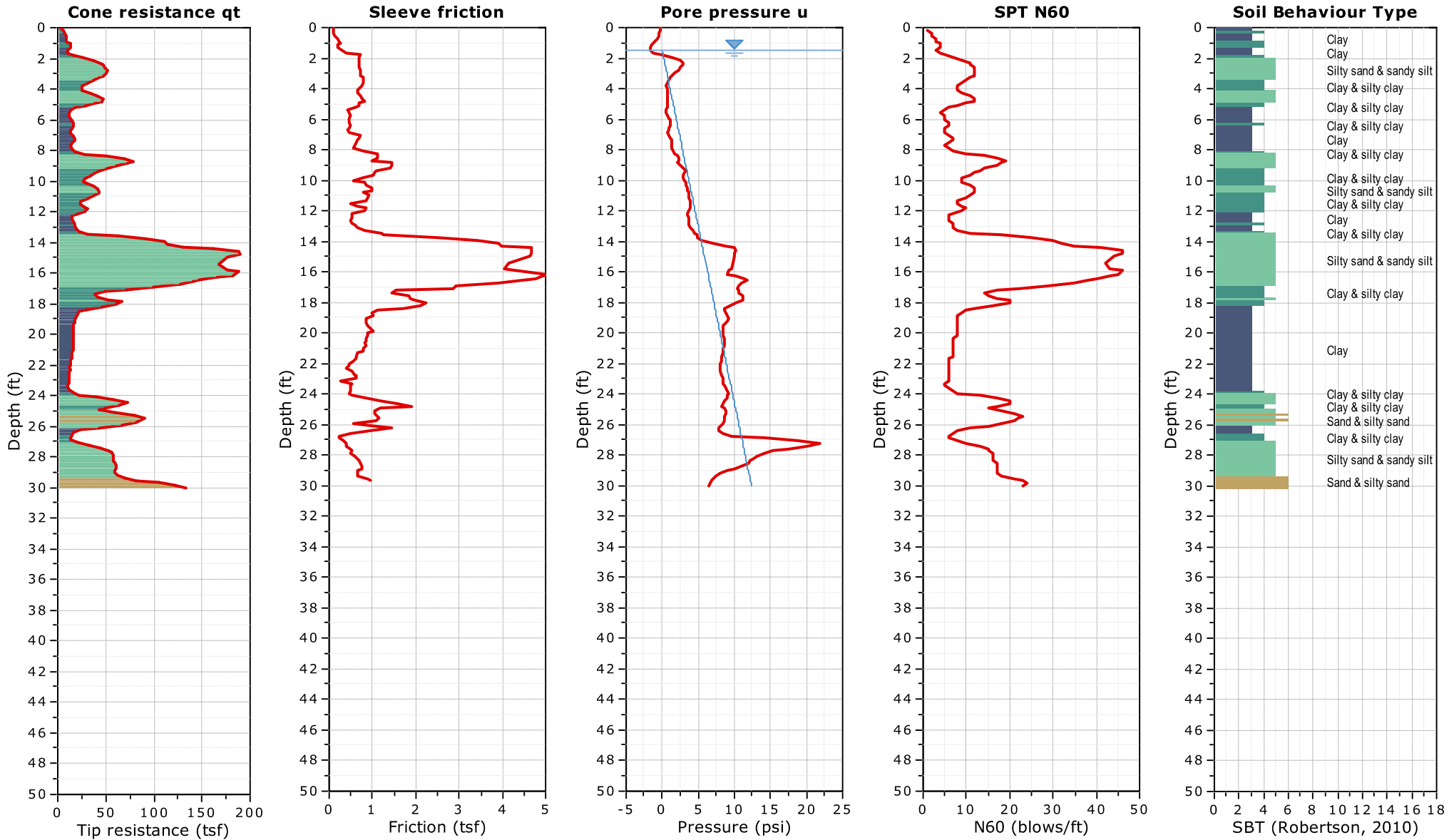


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CPT: C-135

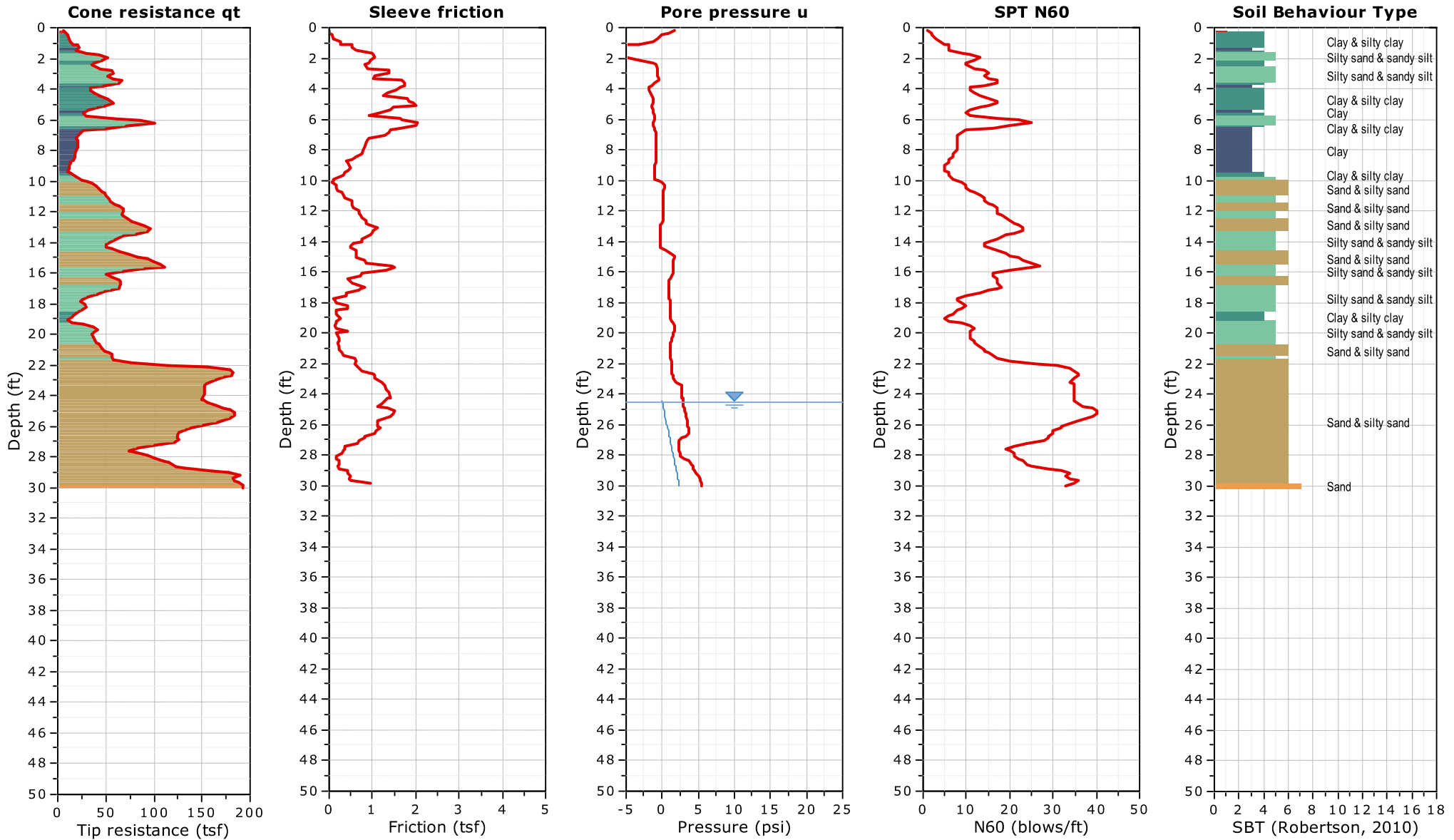
Total depth: 30.02 ft, Date: 5/6/2021
Surface Elevation: 410.1 ft
Coords: lat 38.76389° lon -90.146478°
Section: 30 Township: 4N Range: 9W
STA: 1880+97.37 (EB) Offest: 187.53 ft RT

Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL



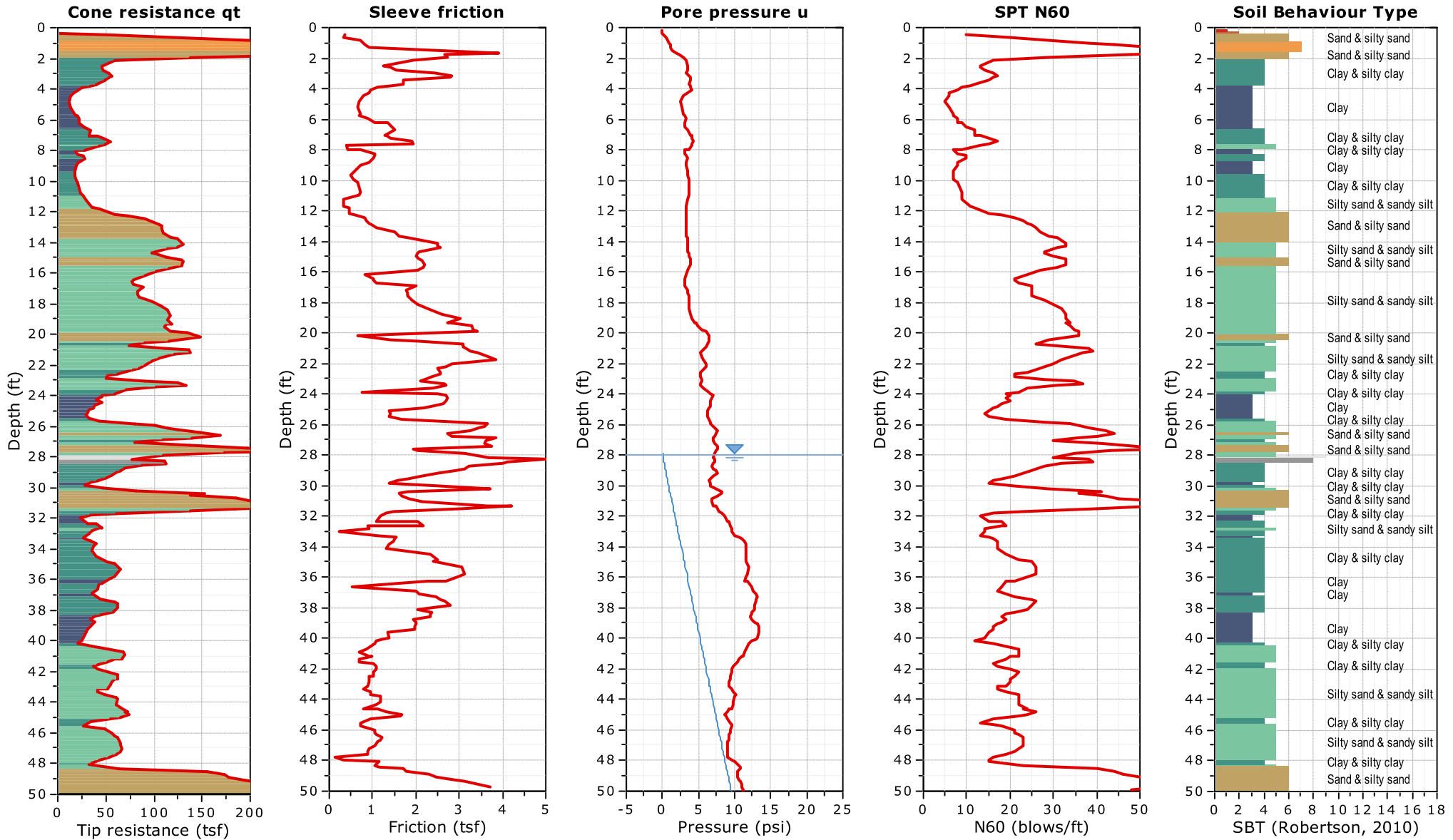


Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL





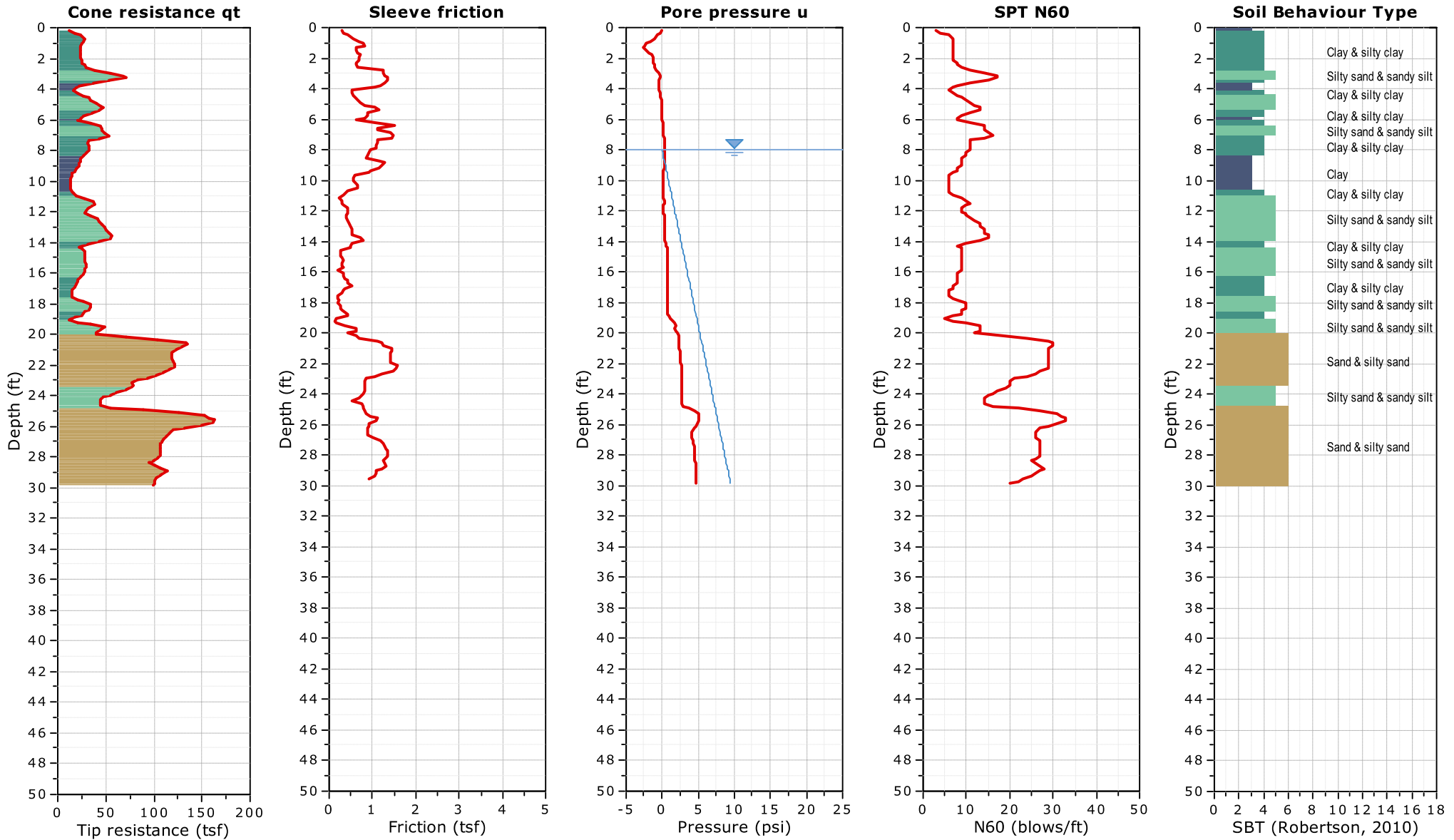
Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL





Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL





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CPT: C-148

Total depth: 4.43 ft, Date: 6/1/2021

Surface Elevation: 441.7 ft

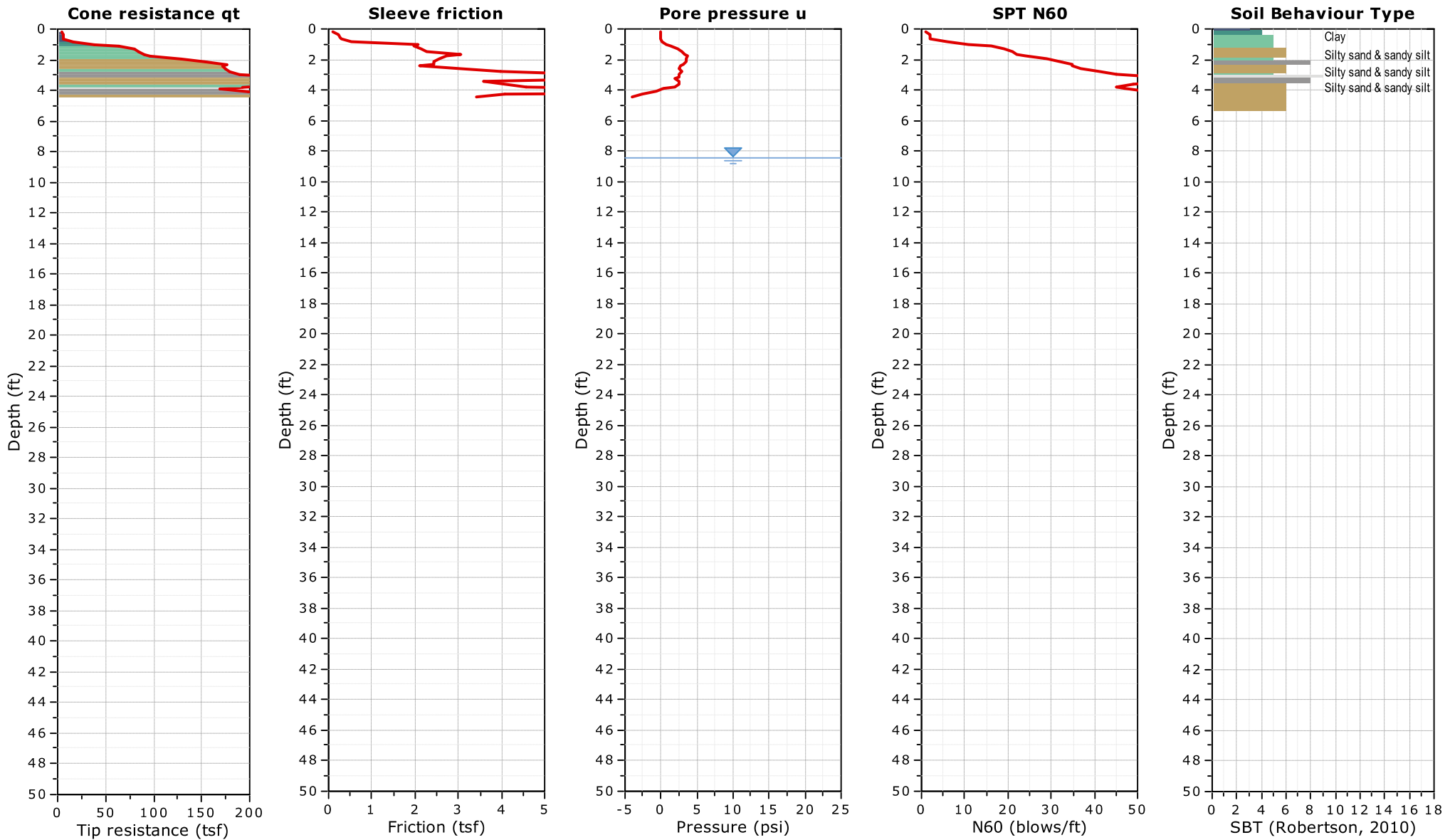
Coords: lat 38.765148° lon -90.143452°

Section: 30 Township: 4N Range: 9W

STA: 1890+92.17 (EB) Offest: 40.39 ft RT

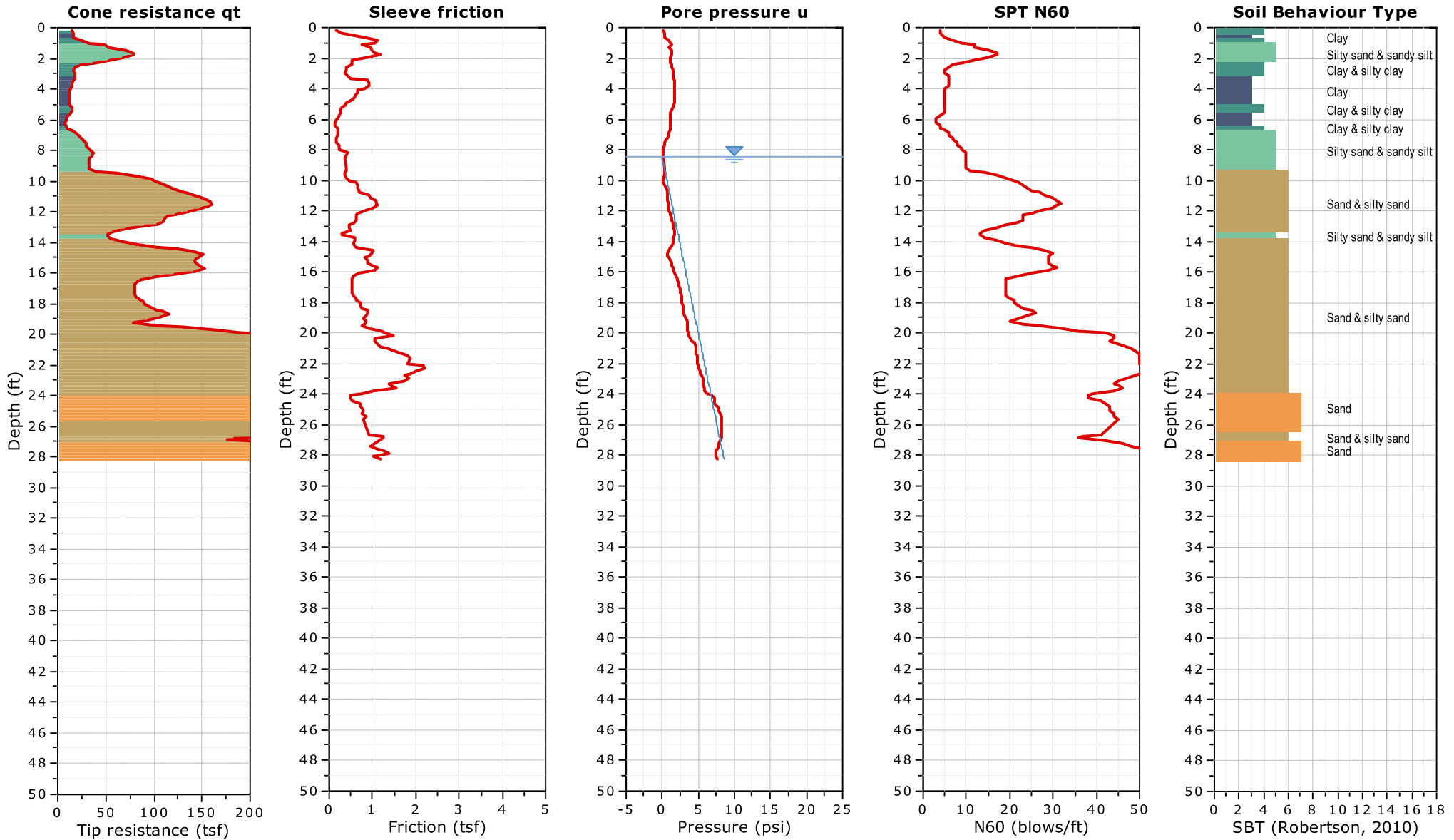
Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL





Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL





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CPT: C-150

Total depth: 41.83 ft, Date: 5/12/2021

Surface Elevation: 448.4 ft

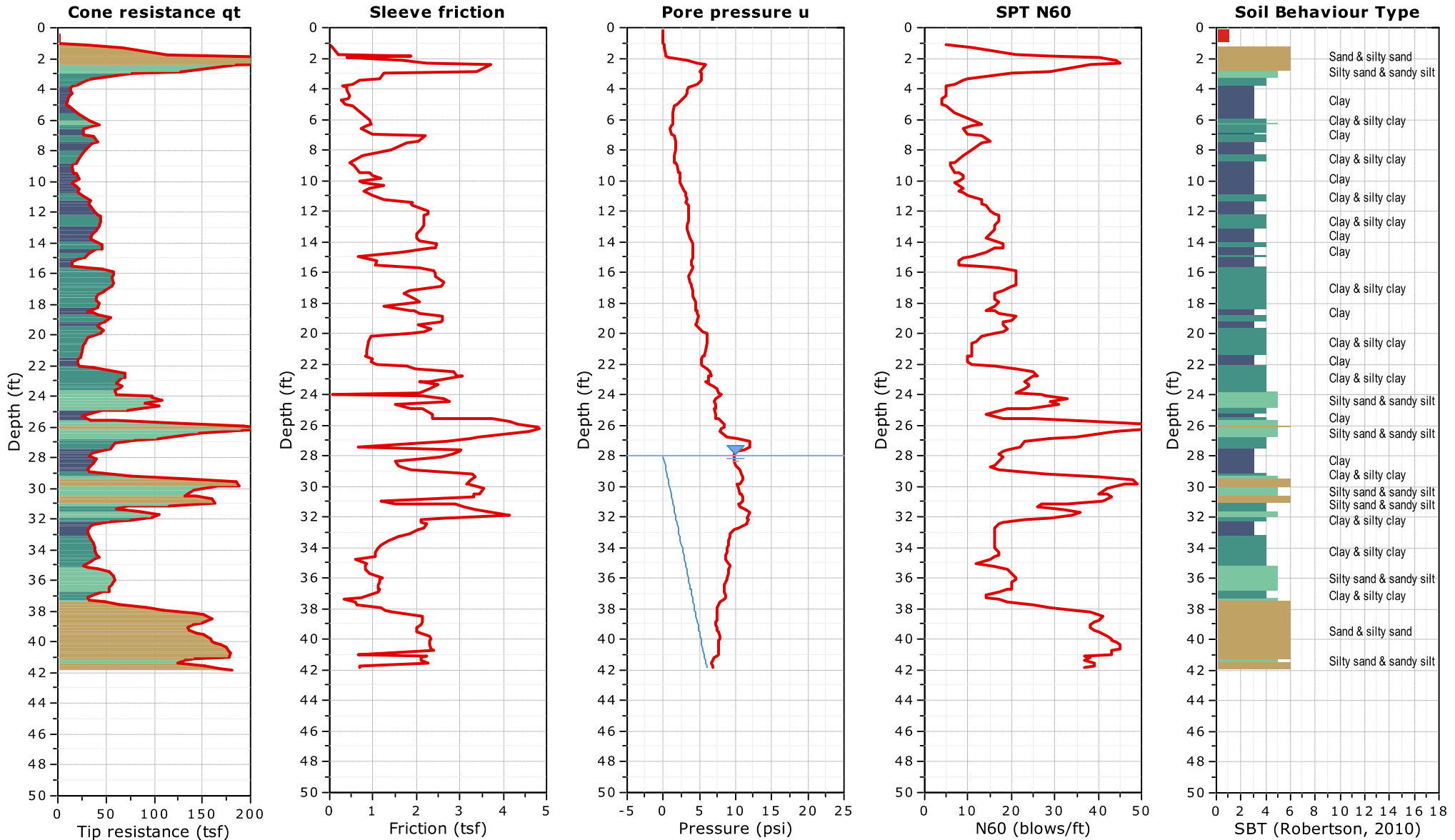
Coords: lat 38.765452° lon -90.143533°

Section: 30 Township: 4N Range: 9W

STA: 1890+94.99 (EB) Offest: 38.92 ft LT

Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL





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CPT: C-151

Total depth: 29.89 ft, Date: 5/6/2021

Surface Elevation: 421.5 ft

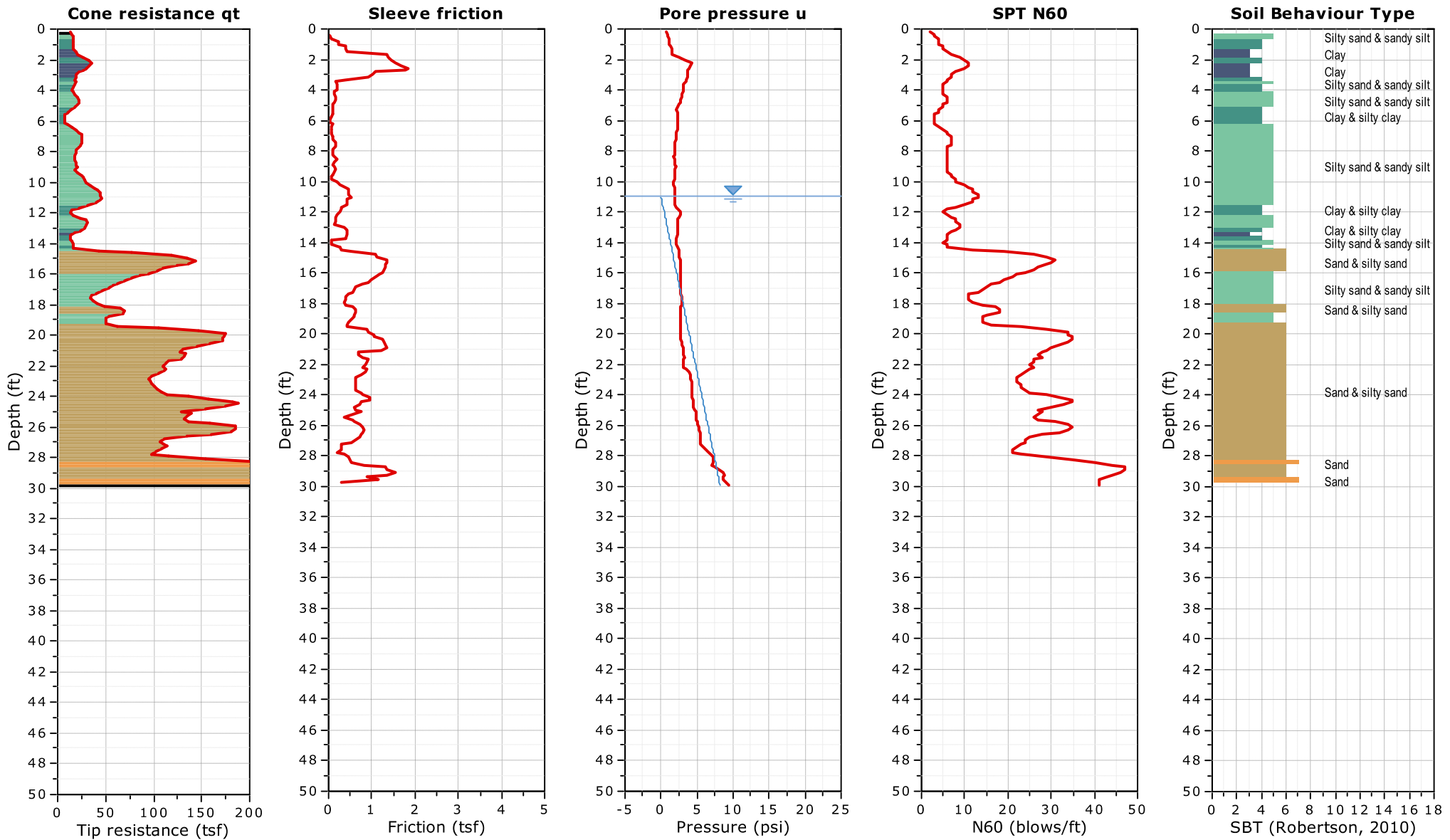
Coords: lat 38.765614° lon -90.143575°

Section: 30 Township: 4N Range: 9W

STA: 1890+97.70 (WB) Offest: 124.19 ft LT

Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL

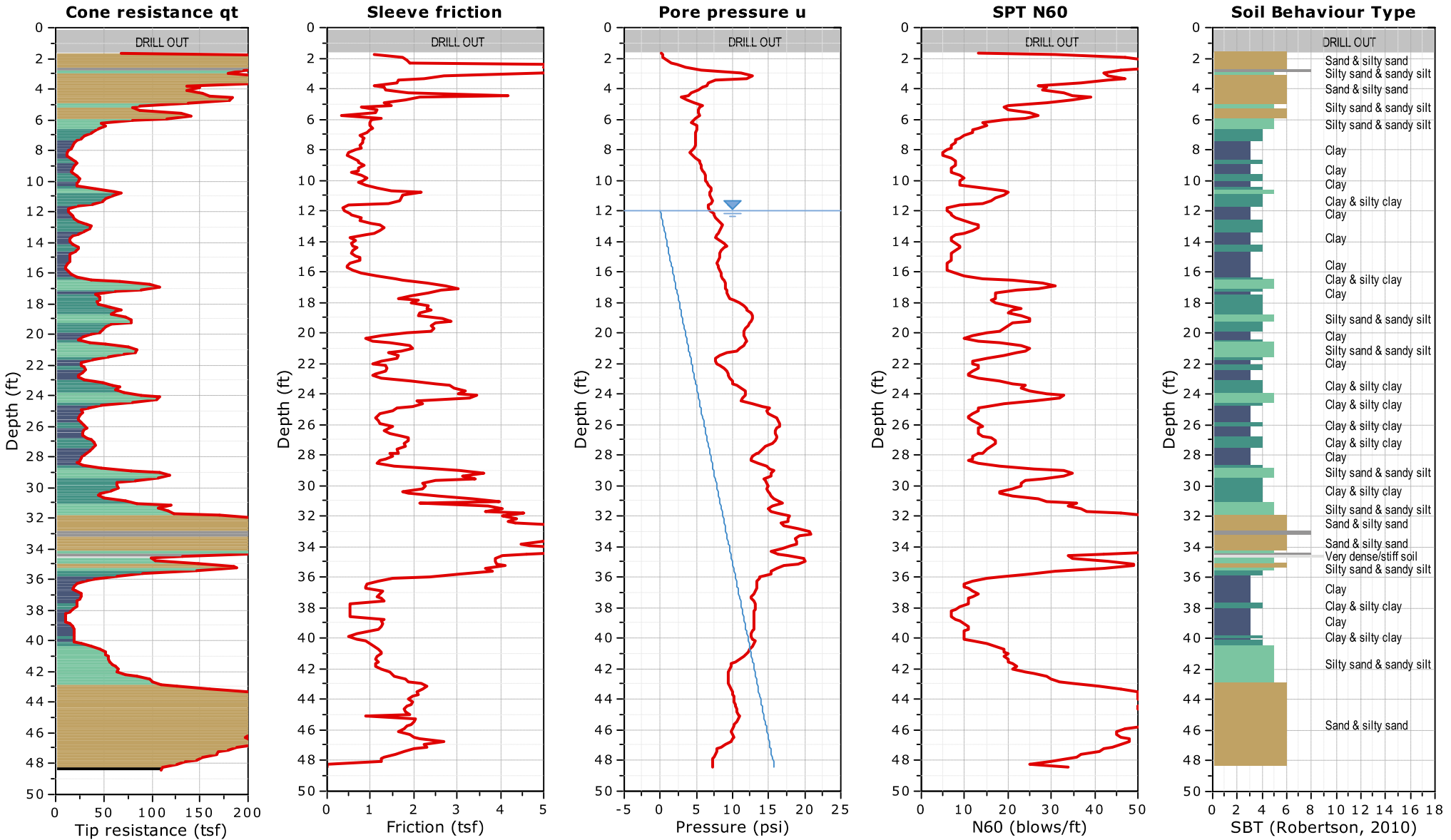




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Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL

CPT: C-156
Total depth: 48.39 ft, Date: 6/1/2021
Surface Elevation: 443.2 ft
Coords: lat 38.765375° lon -90.14196°
Section: 30 Township: 4N Range: 9W
STA: 1895+30.09 (EB) Offset: 44.90 ft RT





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CPT: C-157

Total depth: 17.55 ft, Date: 5/6/2021

Surface Elevation: 422.0 ft

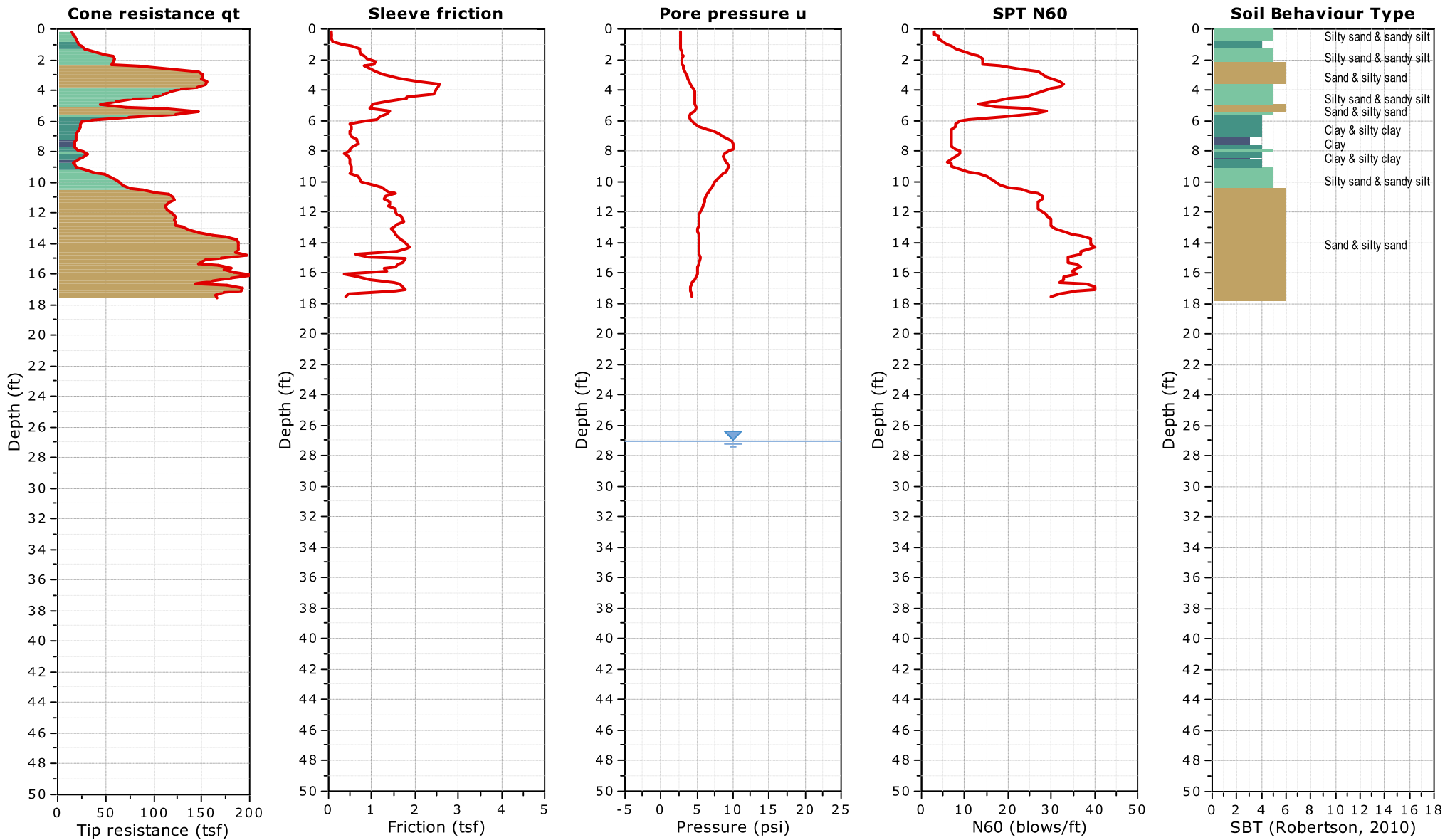
Coords: lat 38.765104° lon -90.141898°

Section: 30 Township: 4N Range: 9W

STA: 1895+33.70 (EB) Offest: 148.59 ft RT

Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL





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CPT: C-158

Total depth: 50.03 ft, Date: 5/12/2021

Surface Elevation: 450.5 ft

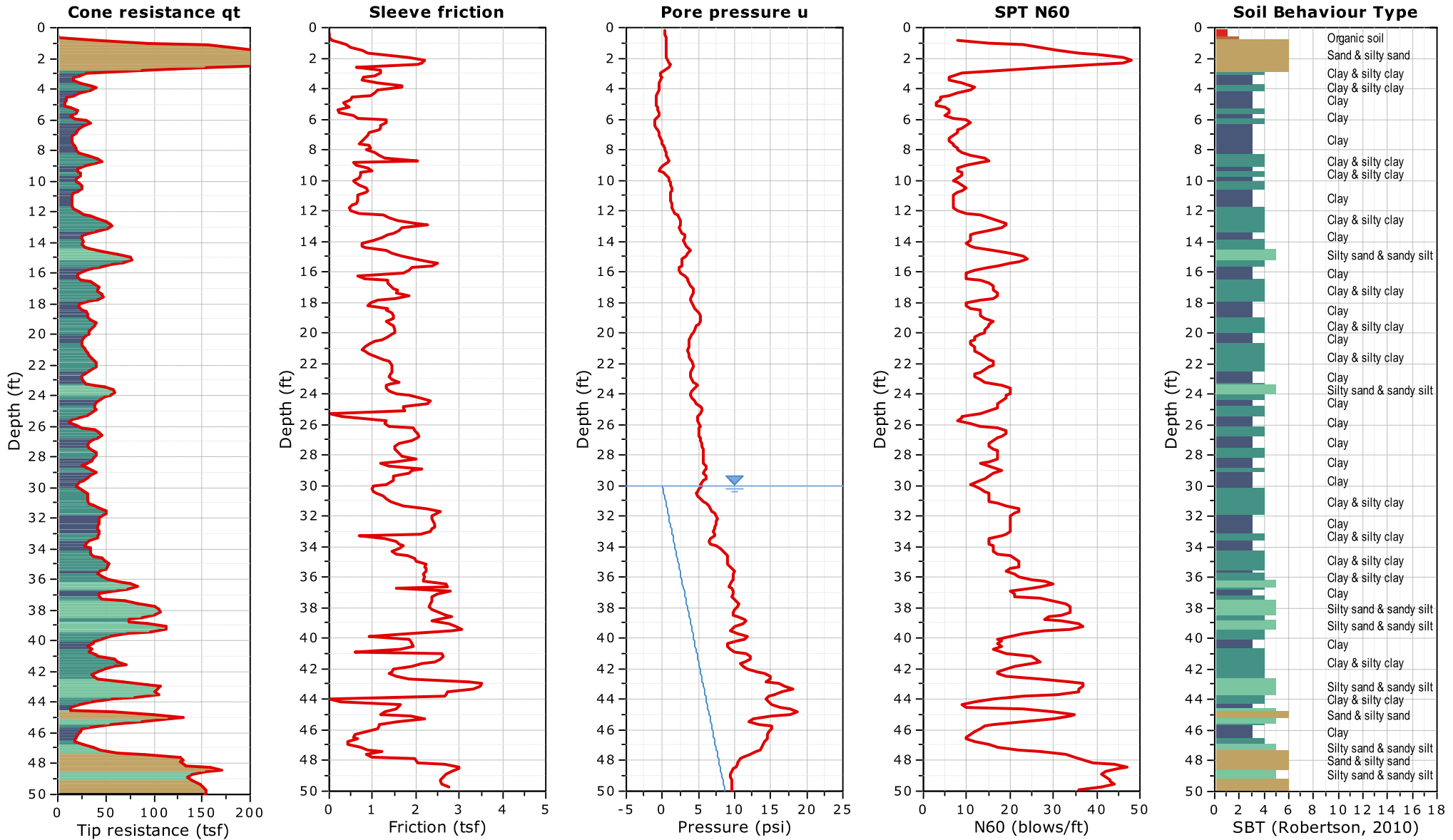
Coords: lat 38.76566° lon -90.142008°

Section: 30 Township: 4N Range: 9W

STA: 1895+30.70 (WB) Offest: 26.81 ft LT

Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL



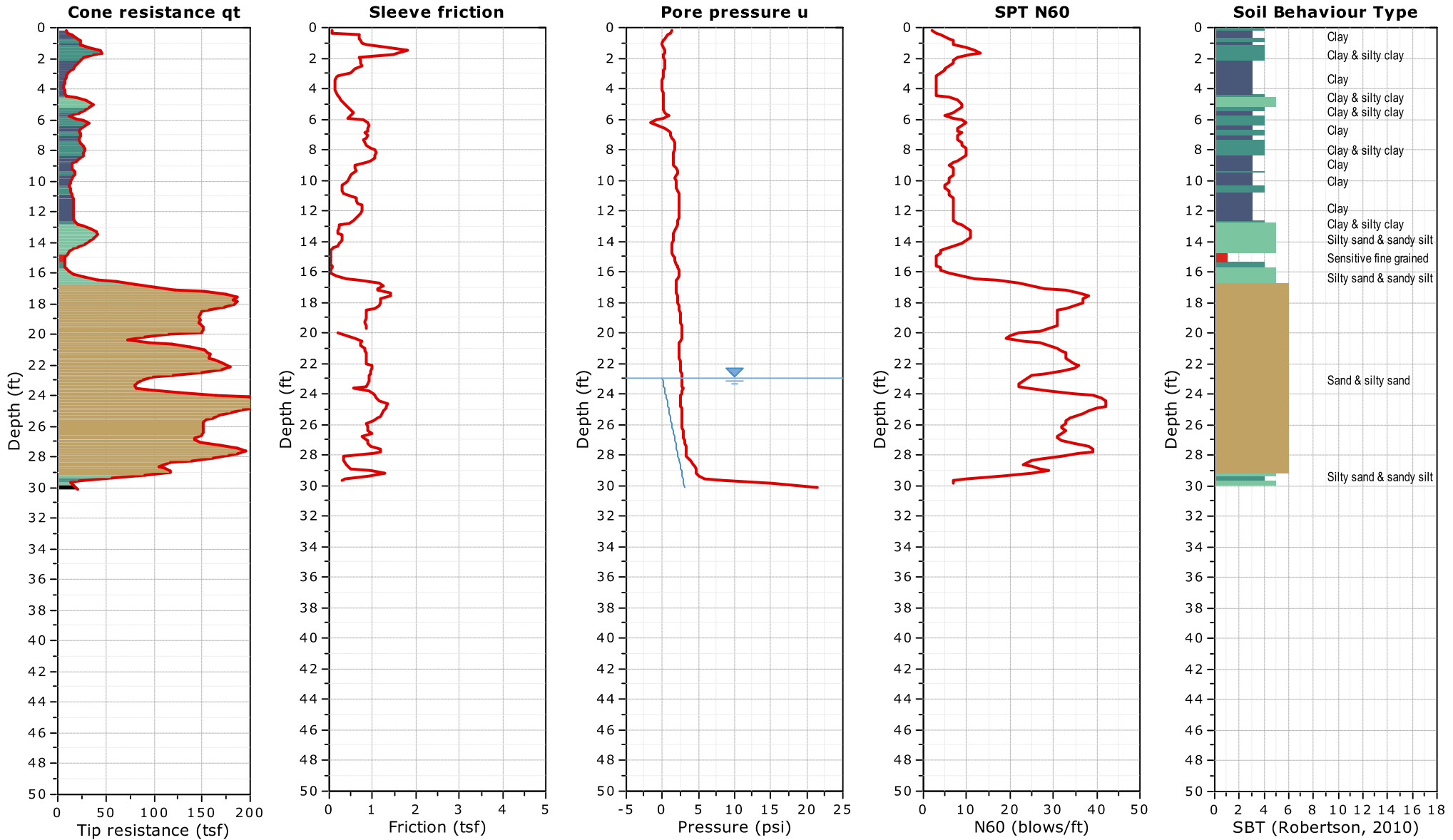


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CPT: C-159

Total depth: 30.12 ft, Date: 5/6/2021
Surface Elevation: 421.0 ft
Coords: lat 38.765864° lon -90.142051°
Section: 30 Township: 4N Range: 9W
STA: 1895+29.67 (EB) Offset: 131.76 ft LT

Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL





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CPT: C-160

Total depth: 10.66 ft, Date: 6/1/2021

Surface Elevation: 448.9 ft

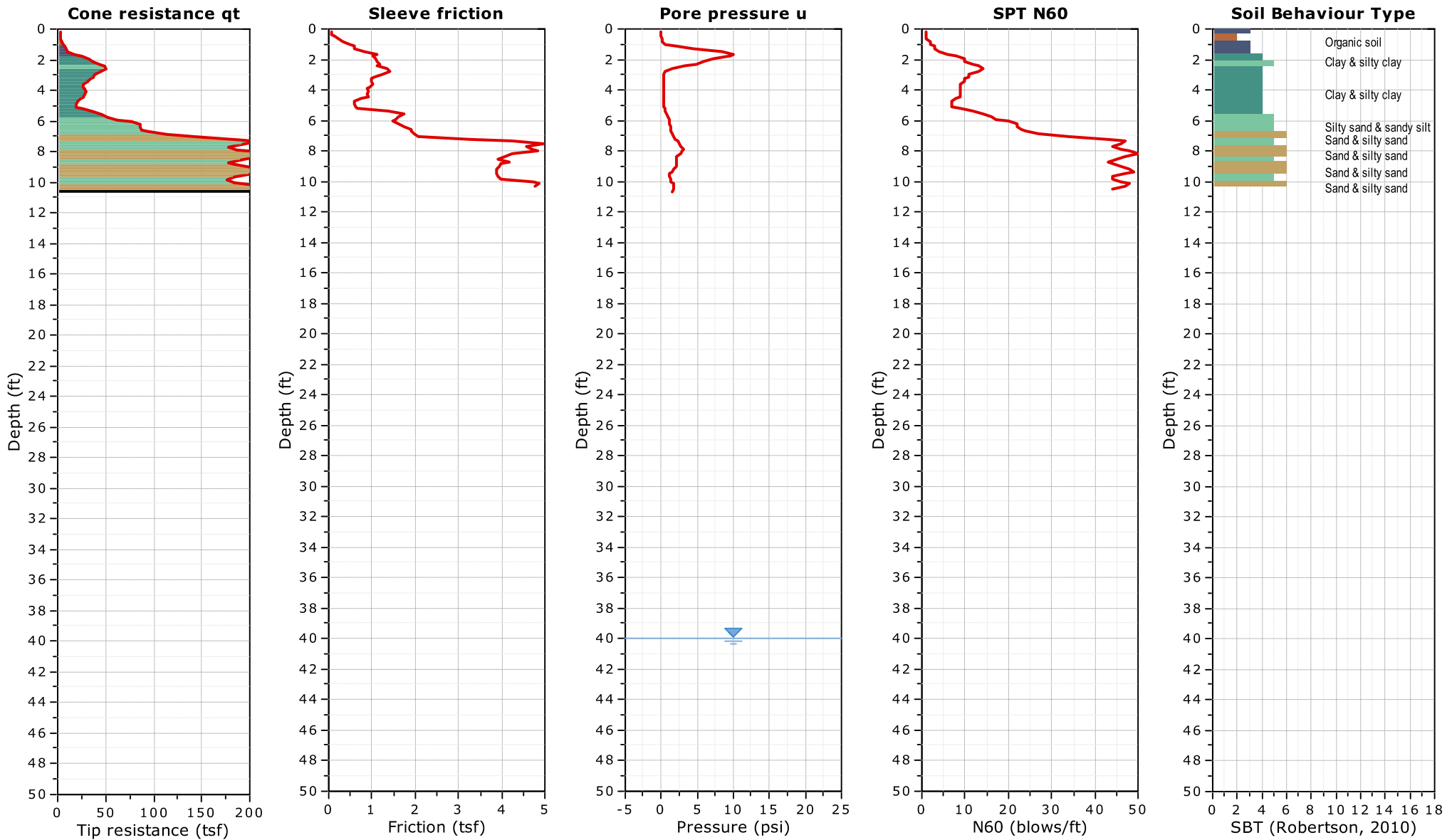
Coords: lat 38.765456° lon -90.140926°

Section: 30 Township: 4N Range: 9W

STA: 1898+29.63 (EB) Offest: 51.39 ft RT

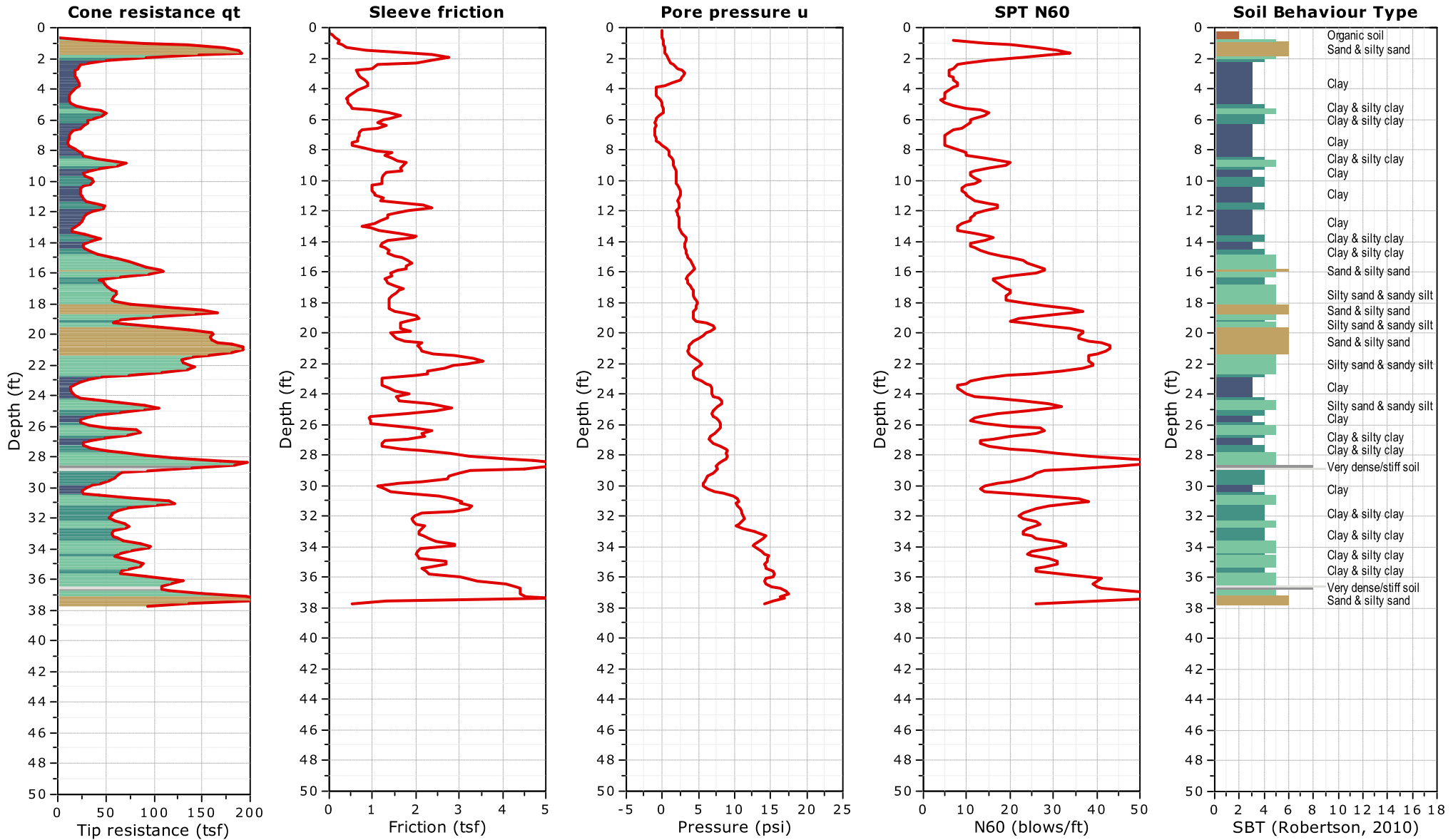
Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL





Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL





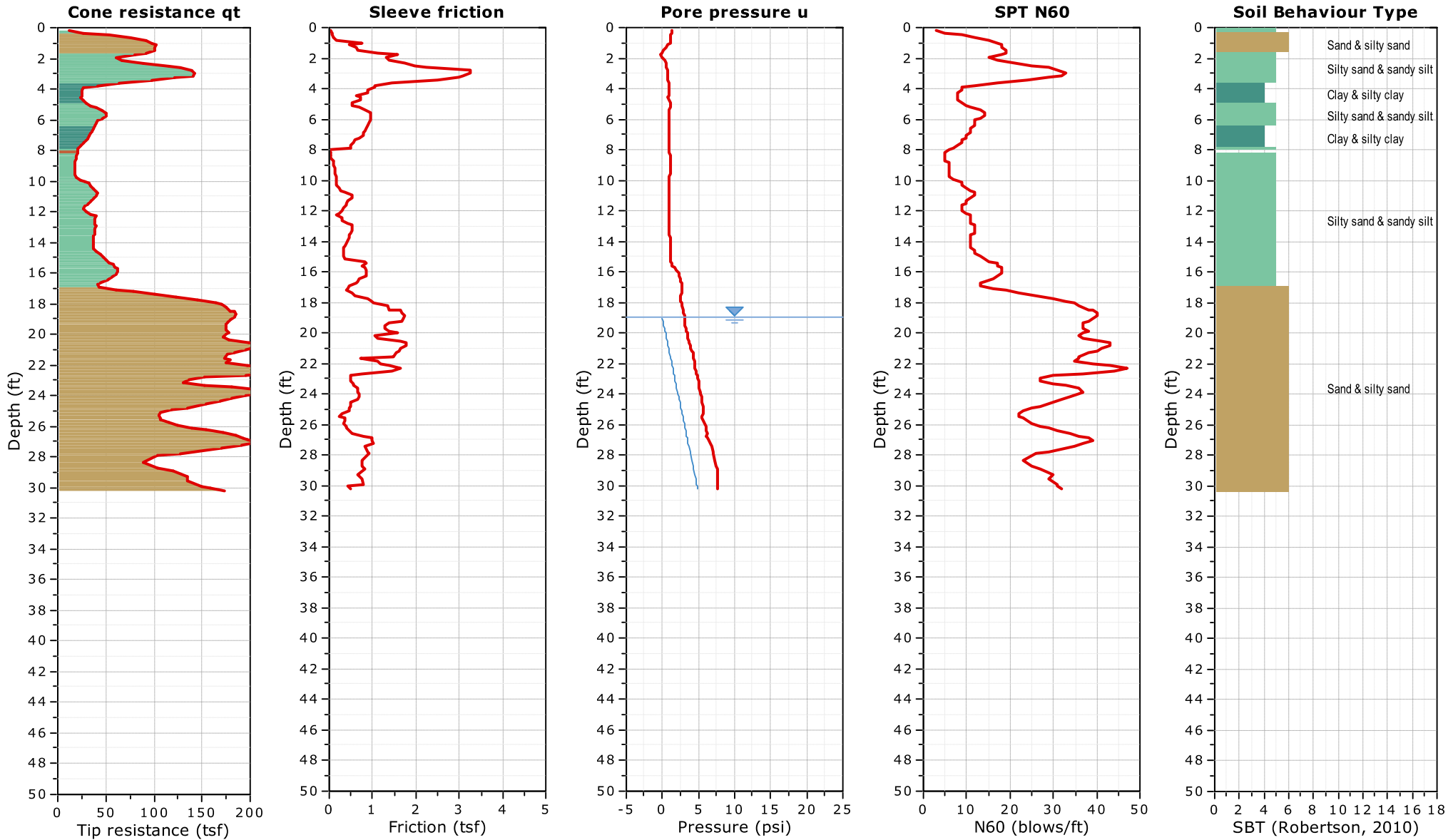
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CPT: C-165

Total depth: 30.22 ft, Date: 5/6/2021
Surface Elevation: 424.3 ft
Coords: lat 38.764863° lon -90.13981°
Section: 30 Township: 4N Range: 9W
STA: 1901+34.90 (EB) Offest: 287.39 ft RT

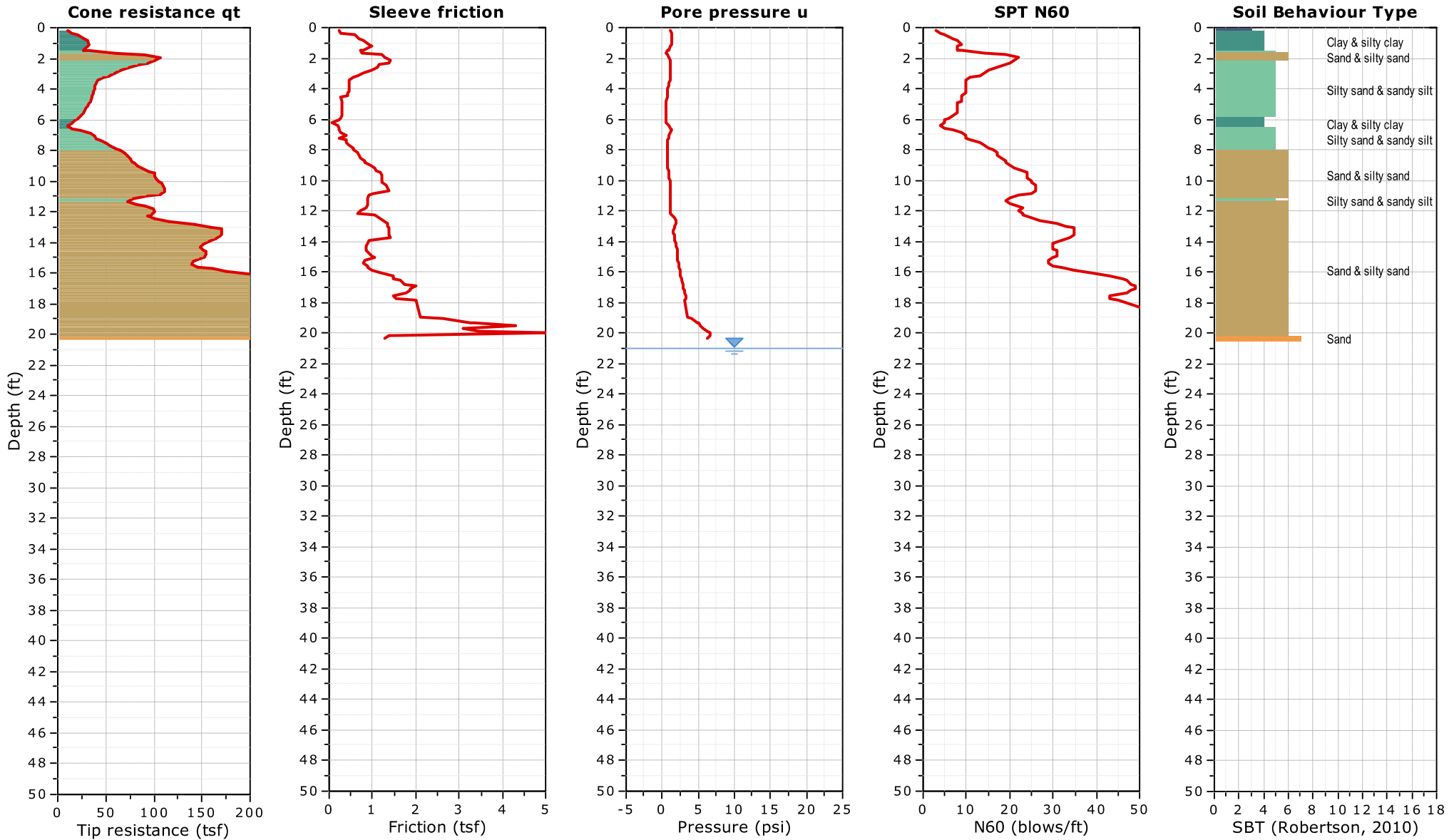
Project: I-270 over Mississippi River: 2017-3167.10 Task 300

Location: Madison County, IL



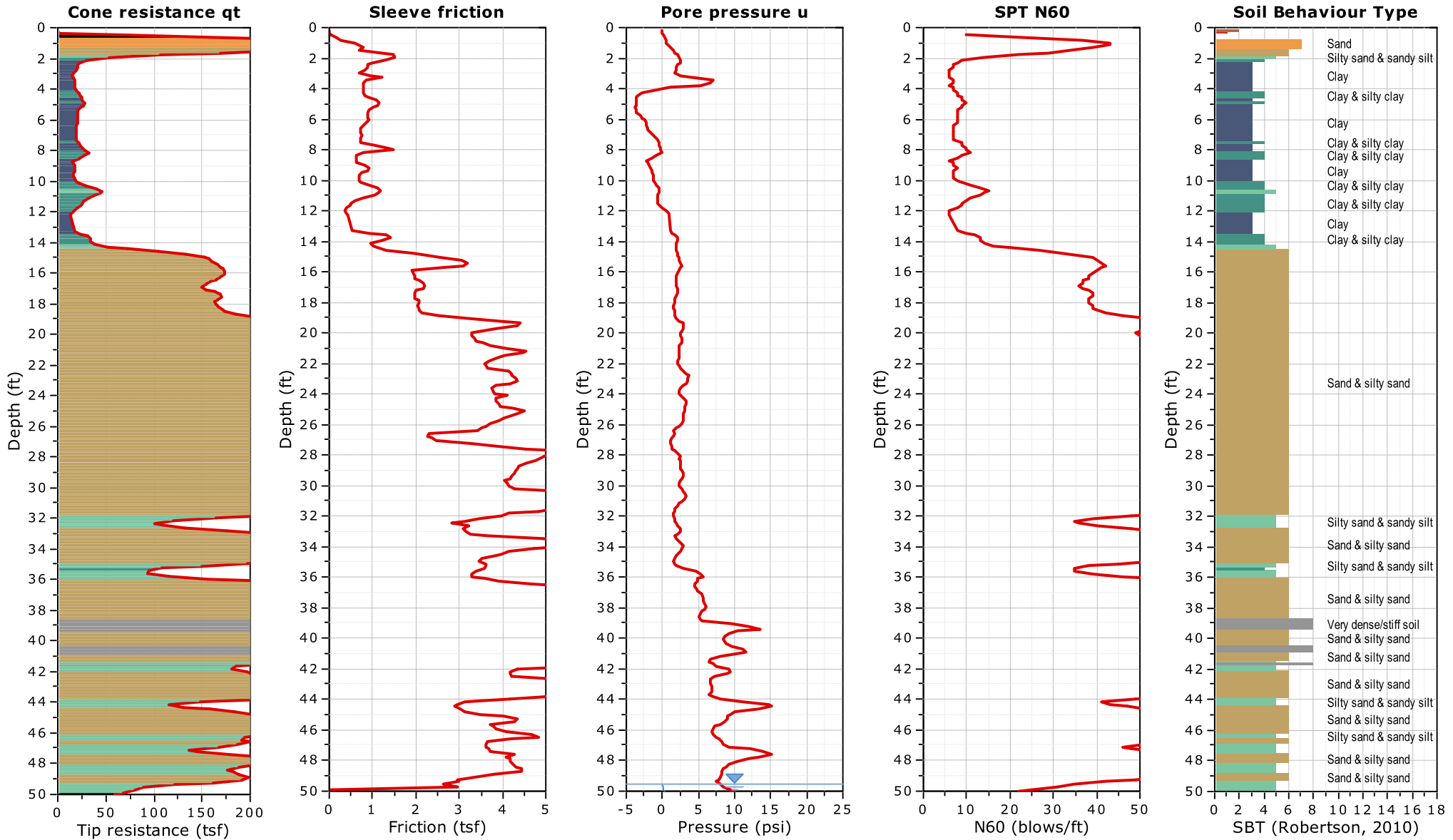


Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL





Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL

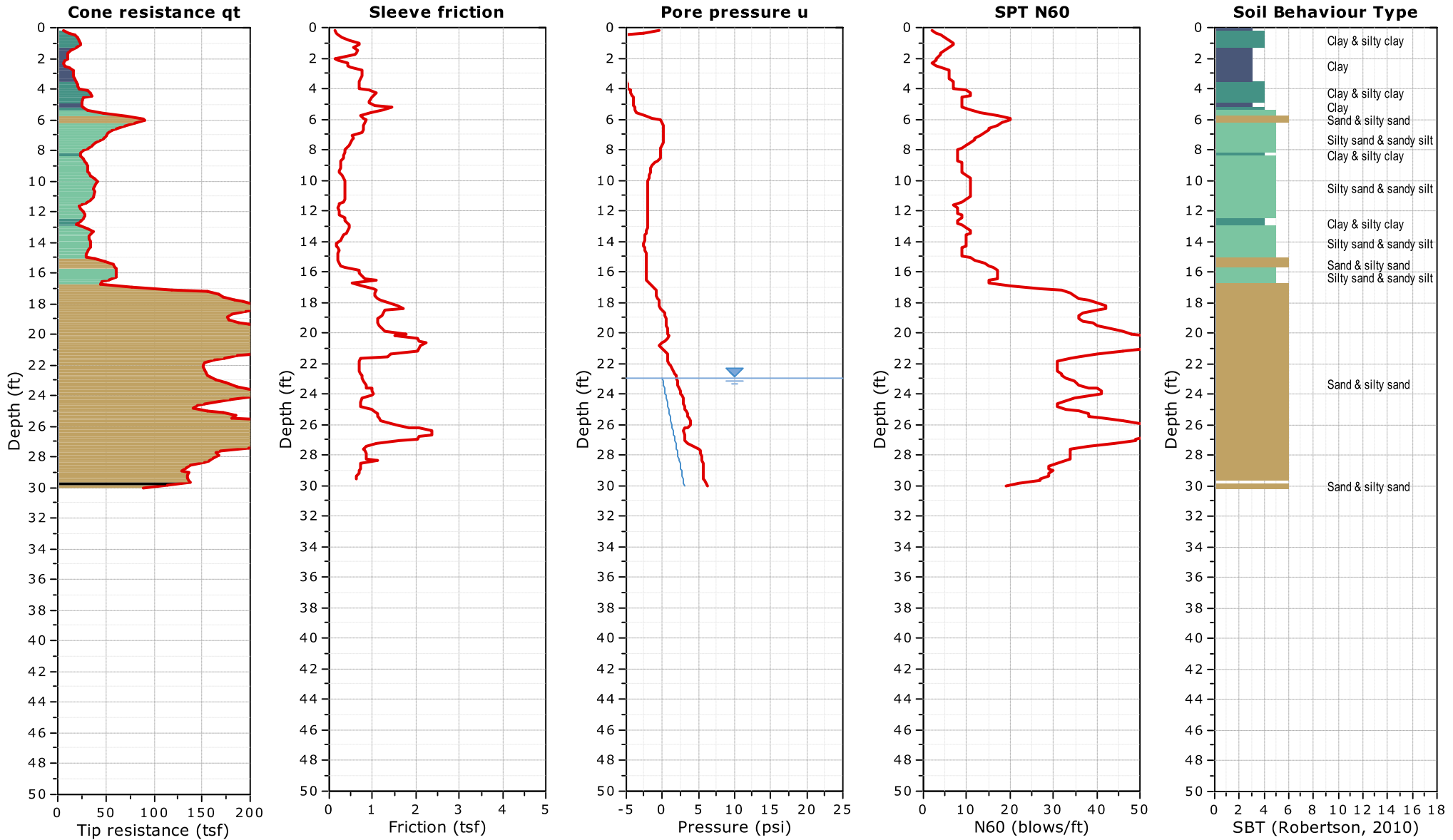




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Project: I-270 over Mississippi River: 2017-3167.10 Task 300
Location: Madison County, IL

CPT: C-171
Total depth: 30.02 ft, Date: 5/6/2021
Surface Elevation: 420.7 ft
Coords: lat 38.766219° lon -90.138864°
Section: 30 Township: 4N Range: 9W
STA: 1904+34.63 (EB) Offset: 188.96 ft LT



Appendix C



SHELBY TUBE TEST RESULTS

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W

COUNTY Madison STRUCT. NO. 060-0350 (EB)
 Station 806+89.23

BORING NO. B-121
 Station 1848+02.12 Ground Surface Elev. 443.9 ft Tube Length _____ in
 Offset 8.1 ft R (EB) Begin Sampling Depth -3 ft Tube Diameter _____ in

TRIAxIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| CLAY LOAM: Brown, fill, A-6. | | ST-1 | 67 | 129 | 1.8 | 20 | | | |
| | -5 | | | | | | | | |
| | -10 | | | | | | | | |
| | -15 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.

The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).

The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



Illinois Department of Transportation

Division of Highways
sci engineering inc

SHELBY TUBE TEST RESULTS

Date 12/01/18

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W

COUNTY Madison STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-122
Station 1850+88.90 Ground Surface Elev. 444.1 ft Tube Length _____ in
Offset 11.2 ft R (EB) Begin Sampling Depth -3 ft Tube Diameter _____ in

TRIAxIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| Silty Clay Loam: Gray, fill, A-7-6 (23). | ST-1 | 67 | | | | 20 | | | |
| | -5 | | | | | | | | |
| | -10 | | | | | | | | |
| | -15 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.

The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).

The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



SHELBY TUBE TEST RESULTS

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W

COUNTY Madison STRUCT. NO. 060-0350 (EB)
 Station 806+89.23

BORING NO. B-123
 Station 1854+11.03 Ground Surface Elev. 443.5 ft Tube Length _____ in
 Offset 14.9 ft R (EB) Begin Sampling Depth -3 ft Tube Diameter _____ in

TRIAxIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| CLAY LOAM: Brown, A-6. | | ST-1 | 42 | 123 | 0.7 | 26 | | | |
| | -5 | | | | | | | | |
| | -10 | | | | | | | | |
| | -15 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
 The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
 The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



SHELBY TUBE TEST RESULTS

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W

COUNTY Madison STRUCT. NO. 060-0350 (EB)
 Station 806+89.23

BORING NO. B-124
 Station 1856+78.10 Ground Surface Elev. 442.1 ft Tube Length _____ in
 Offset 18.6 ft R (EB) Begin Sampling Depth -3 ft Tube Diameter _____ in

TRIAXIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| Silty Clay: Brown, fill, A-7-6 (40). | 0 | ST-1 | 100 | | | 25 | | | |
| | -5 | | | | | | | | |
| | -10 | | | | | | | | |
| | -15 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
 The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
 The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



SHELBY TUBE TEST RESULTS

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W

COUNTY Madison STRUCT. NO. 060-0350 (EB)
 Station 806+89.23

BORING NO. B-125
 Station 1860+12.82 Ground Surface Elev. 442.4 ft Tube Length _____ in
 Offset 20.9 ft R (EB) Begin Sampling Depth -3 ft Tube Diameter _____ in

TRIAxIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| Silty Clay: Brown, fill, A-7. | | ST-1 | 79 | 119 | 0.7 | 30 | | | |
| | -5 | | | | | | | | |
| | -10 | | | | | | | | |
| | -15 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
 The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
 The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



SHELBY TUBE TEST RESULTS

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W

COUNTY Madison STRUCT. NO. 060-0350 (EB)
 Station 806+89.23

BORING NO. B-126
 Station 1863+05.98 Ground Surface Elev. 442.1 ft Tube Length _____ in
 Offset 23.7 ft R (EB) Begin Sampling Depth -3 ft Tube Diameter _____ in

TRIAxIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| Clay: Brown, fill, A-7. | ST-1 | | | | | | | | |
| | -5 | | | | | | | | |
| | -10 | | | | | | | | |
| | -15 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
 The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
 The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



SHELBY TUBE TEST RESULTS

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 36, TWP. 4N, RNG. 10W

COUNTY Madison STRUCT. NO. 060-0350 (EB)
 Station 806+89.23

BORING NO. B-127
 Station 1866+21.89 Ground Surface Elev. 442.2 ft Tube Length _____ in
 Offset 25.5 ft R (EB) Begin Sampling Depth -3 ft Tube Diameter _____ in

TRIAxIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| Silty Clay: Gray, fill, A-6. | 0 | ST-1 | 100 | | | 27 | | | |
| | -5 | | | | | | | | |
| | -10 | | | | | | | | |
| | -15 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
 The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
 The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



SHELBY TUBE TEST RESULTS

ROUTE FAI 270 DESCRIPTION I-270 over the Mississippi River DRILLED BY GeoServices, Inc.

SECTION 60B-1 LOCATION Roadway, SEC. 30, TWP. 4N, RNG. 9W

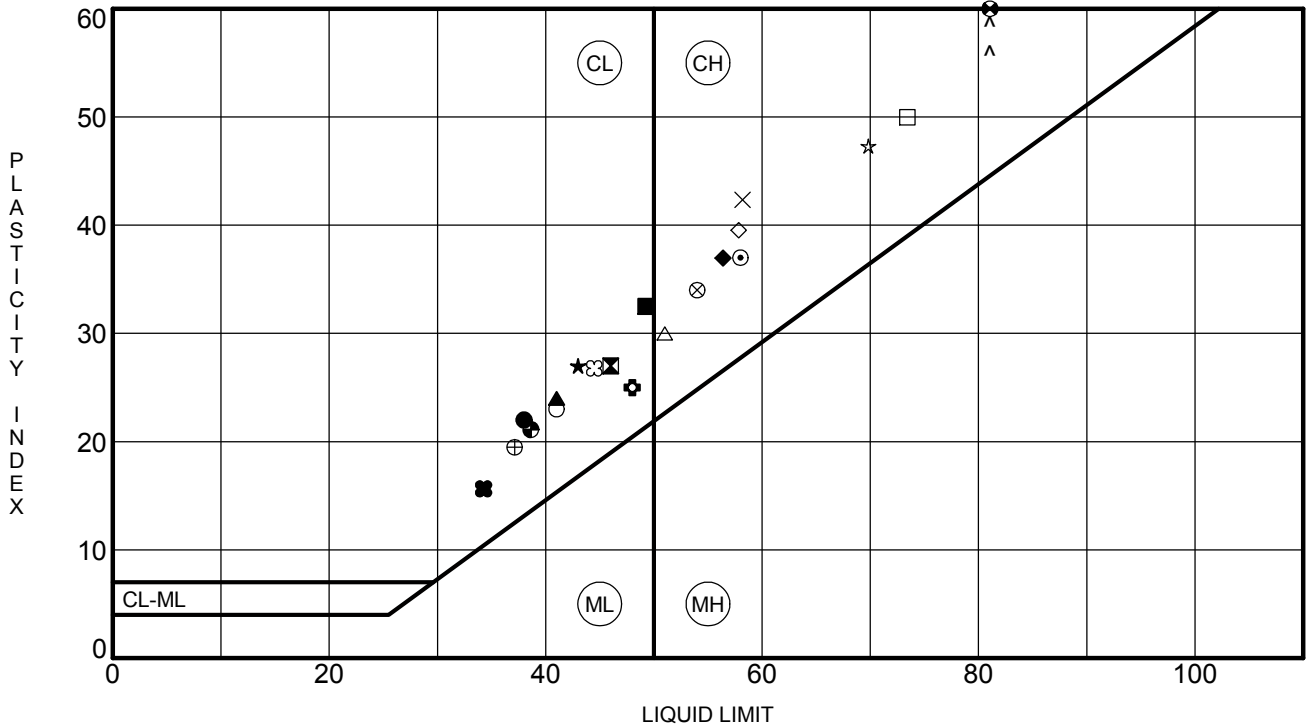
COUNTY Madison STRUCT. NO. 060-0350 (EB)
 Station 806+89.23

BORING NO. B-139
 Station 2883+91.61 Ground Surface Elev. 419.7 ft Tube Length _____ in
 Offset 130.0 ft L (WB) Begin Sampling Depth -21 ft Tube Diameter _____ in

TRIAxIAL DATA

| SOIL TYPE, DESCRIPTION, AND OBSERVATIONS | DEPTH (ft) | SPECIMEN (no) | RECOVERY (%) | UNIT WEIGHT (pcf) | STRENGTH (tsf) | MOISTURE (%) | COHESION (tsf) | PHI ANGLE (deg) | TEST TYPE |
|--|---------------|------------------|-----------------|----------------------|-------------------|-----------------|-------------------|--------------------|-----------|
| | | | | | | | | | |
| SILTY CLAY: Brown and gray, A-6. | | ST-1 | 100 | 106 | 0.6 | 52 | | | |
| | -25 | | | | | | | | |
| | -30 | | | | | | | | |

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
 The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
 The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



| Boring | Depth (ft) | LL | PL | PI | Fines | Classification |
|---------|------------|----|----|----|-------|----------------------------|
| ● B-120 | 1.0 | 38 | 16 | 22 | | |
| ⊠ B-122 | 3.0 | 46 | 19 | 27 | 84 | A-7-6 (23) SILTY CLAY LOAM |
| ▲ B-123 | 1.0 | 41 | 17 | 24 | 75 | A-7-6 (17) CLAY LOAM |
| ★ B-124 | 1.0 | 43 | 16 | 27 | | |
| ⊙ B-124 | 3.0 | 58 | 21 | 37 | 96 | A-7-6 (40) SILTY CLAY |
| ⊕ B-125 | 6.0 | 48 | 23 | 25 | 95 | A-7-6 (26) SILTY CLAY |
| ○ B-126 | 1.0 | 41 | 18 | 23 | | |
| △ B-126 | 8.5 | 51 | 21 | 30 | 96 | A-7-6 (32) SILTY CLAY |
| ⊗ B-127 | 3.0 | 54 | 20 | 34 | 93 | A-7-6 (34) SILTY CLAY |
| ⊕ B-128 | 6.0 | 37 | 18 | 19 | | |
| □ B-129 | 8.5 | 73 | 23 | 50 | | |
| ⊙ B-132 | 3.5 | 81 | 20 | 61 | | |
| ⊕ B-138 | 3.5 | 39 | 18 | 21 | | |
| ★ B-144 | 16.0 | 70 | 23 | 47 | | |
| ⊗ B-146 | 3.5 | 44 | 18 | 26 | | |
| ■ B-147 | 1.0 | 49 | 17 | 32 | | |
| ◆ B-152 | 23.5 | 56 | 19 | 37 | | |
| ◇ B-153 | 6.0 | 58 | 18 | 40 | | |
| × B-162 | 13.5 | 58 | 16 | 42 | | |
| ■ B-163 | 6.0 | 34 | 19 | 15 | | |

ATTERBERG LIMITS - IDH 2017-3167.10.1270 COR BRIDGE - NO PLOG.GPJ IL_DOT.GDT 6/17/21



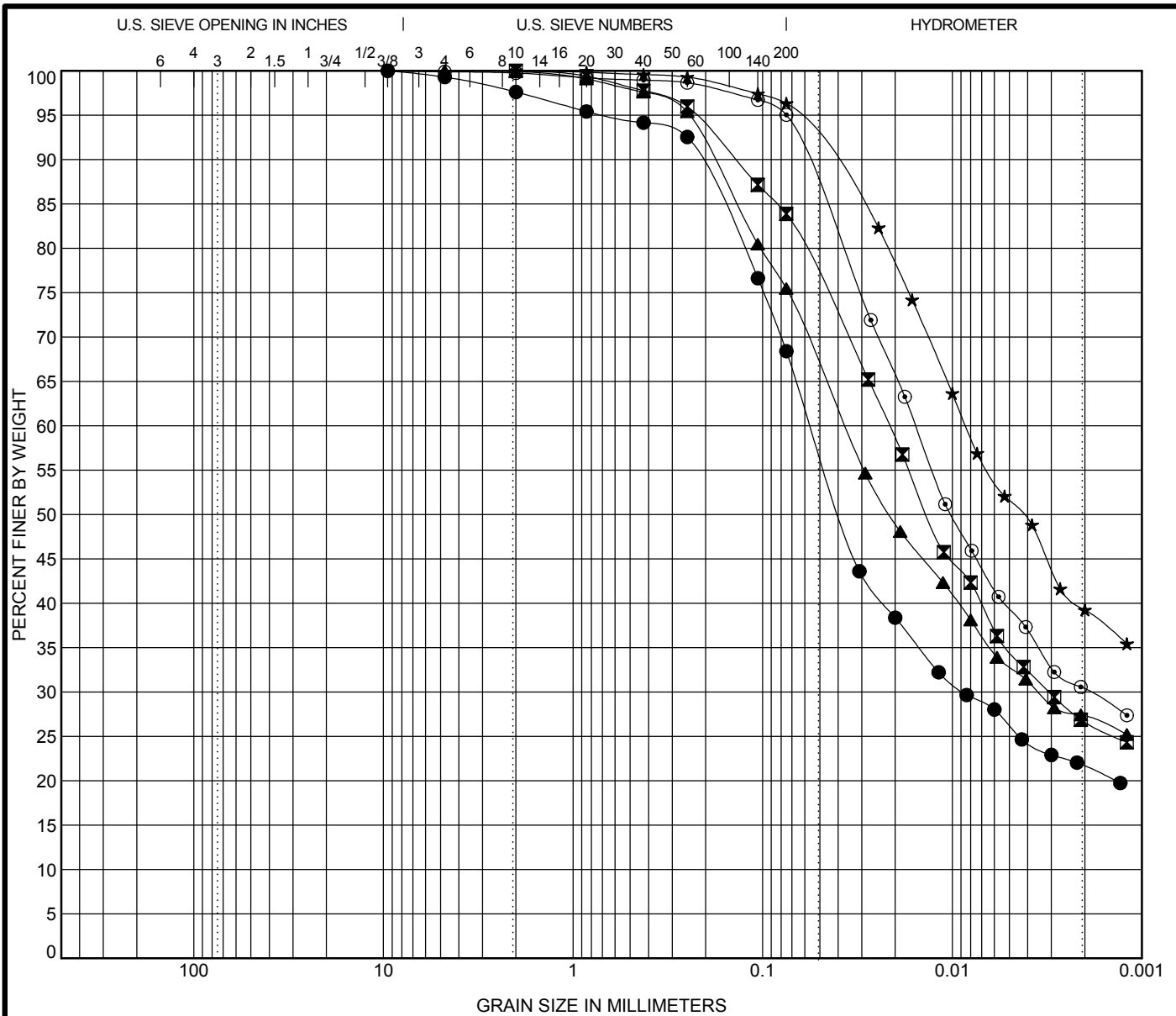
Illinois Department of Transportation
 Division of Highways
 sci engineering inc

ATTERBERG LIMITS' RESULTS

Route: FAI 270

Section: 60B-1

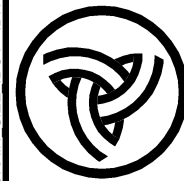
County: Madison & St. Louis



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

| Specimen Identification | Classification | LL | PL | PI | Cc | Cu |
|-------------------------|-----------------|----|----|----|----|----|
| ● B-121 2.0-3.5 ft | CLAY LOAM | | | | | |
| ☒ B-122 3.0-4.5 ft | SILTY CLAY LOAM | 46 | 19 | 27 | | |
| ▲ B-123 1.0-2.5 ft | CLAY LOAM | 41 | 17 | 24 | | |
| ★ B-124 3.0-4.5 ft | SILTY CLAY | 58 | 21 | 37 | | |
| ◎ B-125 6.0-7.5 ft | SILTY CLAY | 48 | 23 | 25 | | |

| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|-------------------------|------|-----|-----|-----|---------|-------|-------|-------|
| ● B-121 2.0-3.5 ft | 9.5 | 0.1 | 0.0 | | 2.4 | 29.2 | 46.8 | 21.6 |
| ☒ B-122 3.0-4.5 ft | 2.0 | 0.0 | 0.0 | | 0.0 | 16.1 | 57.2 | 26.7 |
| ▲ B-123 1.0-2.5 ft | 4.8 | 0.0 | 0.0 | | 0.1 | 24.4 | 48.2 | 27.2 |
| ★ B-124 3.0-4.5 ft | 2.0 | 0.0 | | | 0.0 | 3.7 | 57.1 | 39.2 |
| ◎ B-125 6.0-7.5 ft | 9.5 | 0.0 | 0.0 | | 0.3 | 4.7 | 64.7 | 30.3 |

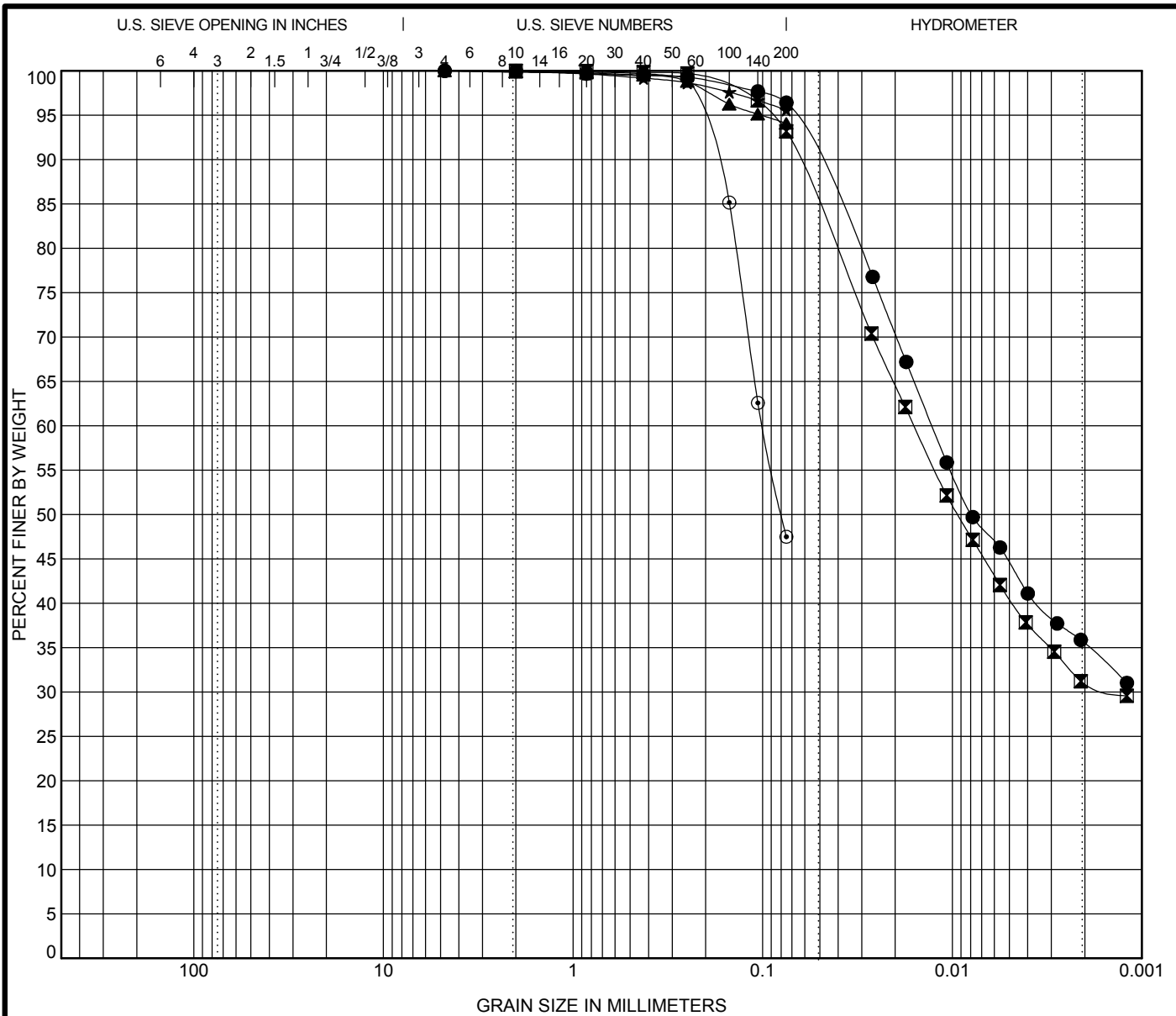


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GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
 Section: 60B-1
 County: Madison & St. Louis

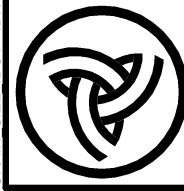
GRAIN SIZE IDOT - IDH.D8 - 2017-3167.101270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

| Specimen Identification | Classification | LL | PL | PI | Cc | Cu |
|-------------------------|-----------------|----|----|----|----|----|
| ● B-126 8.5-10 ft | SILTY CLAY | 51 | 21 | 30 | | |
| ☒ B-127 3.0-4.5 ft | SILTY CLAY | 54 | 20 | 34 | | |
| ▲ B-128 11.0-12.5 ft | SILTY CLAY LOAM | | | | | |
| ★ B-128 17.0-18.5 ft | SILTY LOAM | | | | | |
| ⊙ B-129 1.0-2.5 ft | SANDY LOAM | | | | | |

| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|-------------------------|------|-----|-----|-----|---------|-------|-------|-------|
| ● B-126 8.5-10 ft | 4.8 | 0.0 | | | 0.0 | 3.6 | 61.0 | 35.5 |
| ☒ B-127 3.0-4.5 ft | 2.0 | 0.0 | 0.0 | | 0.0 | 6.8 | 62.1 | 31.1 |
| ▲ B-128 11.0-12.5 ft | 4.8 | | | | 0.2 | 5.8 | | 94.1 |
| ★ B-128 17.0-18.5 ft | 4.8 | | | | 0.1 | 4.3 | | 95.6 |
| ⊙ B-129 1.0-2.5 ft | 4.8 | 0.1 | | | 0.0 | 52.5 | | 47.5 |

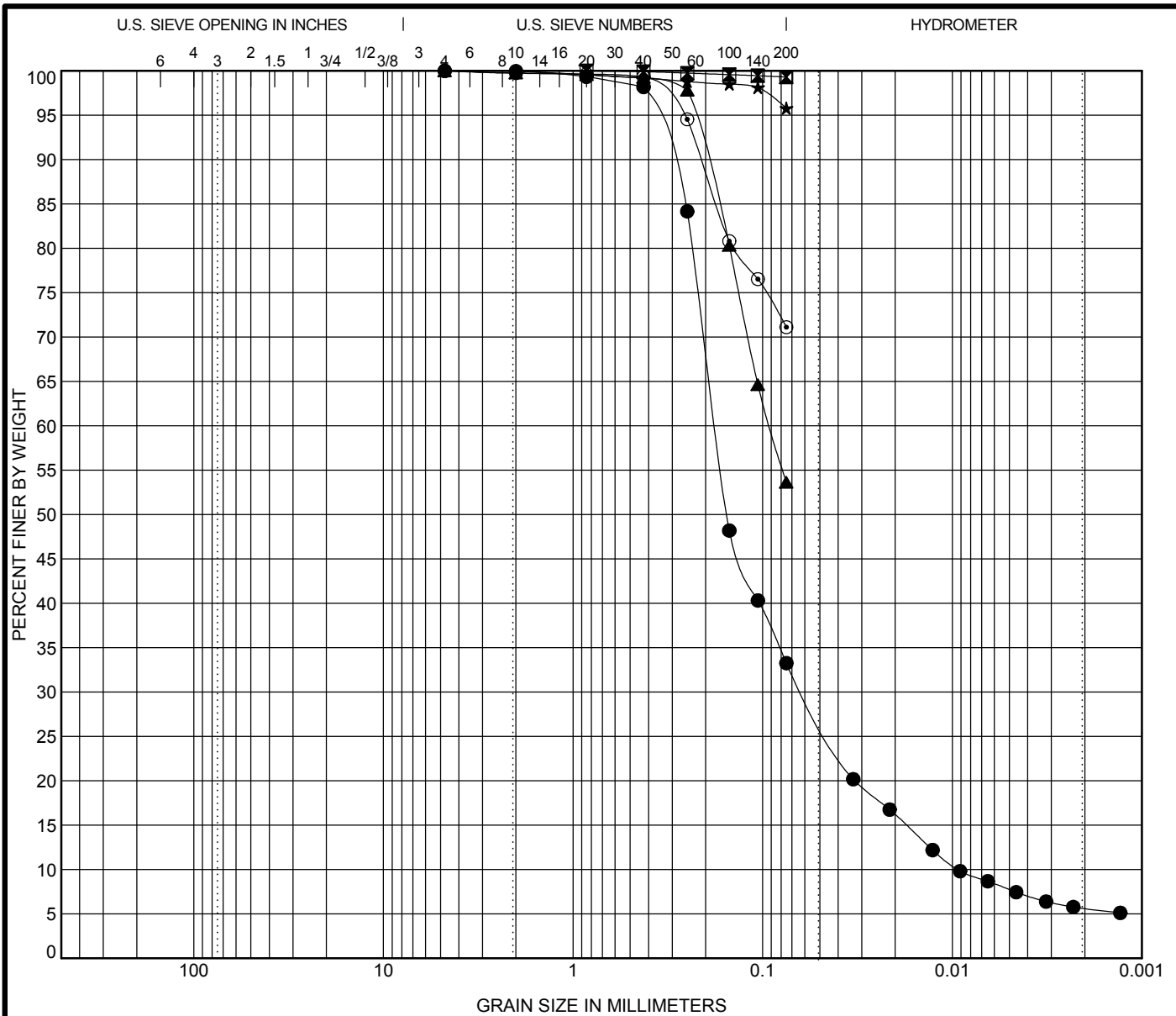


Illinois Department of Transportation
 Division of Highways
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GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
 Section: 60B-1
 County: Madison & St. Louis


GRAIN SIZE IDOT - IDH D8 - 2017-3167.10.1270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

| Specimen Identification | Classification | LL | PL | PI | Cc | Cu |
|-------------------------|----------------|----|----|----|------|-------|
| ● B-132 6.0-7.5 ft | SANDY LOAM | | | | 2.27 | 18.99 |
| ☒ B-132 28.5-30 ft | SILTY CLAY | | | | | |
| ▲ B-133 1.0-2.5 ft | CLAY | | | | | |
| ★ B-133 11.0-12.5 ft | SILTY LOAM | | | | | |
| ◎ B-136 6.0-7.5 ft | CLAY LOAM | | | | | |

| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|-------------------------|------|-----|-----|-----|---------|-------|-------|-------|
| ● B-132 6.0-7.5 ft | 4.8 | 0.2 | 0.1 | 0.0 | 0.0 | 66.7 | 27.6 | 5.6 |
| ☒ B-132 28.5-30 ft | 0.9 | | | | 0.0 | 0.7 | 99.3 | |
| ▲ B-133 1.0-2.5 ft | 4.8 | 0.1 | | | 0.2 | 46.1 | 53.6 | |
| ★ B-133 11.0-12.5 ft | 4.8 | | | | 0.1 | 4.2 | 95.8 | |
| ◎ B-136 6.0-7.5 ft | 4.8 | | | | 0.3 | 28.6 | 71.1 | |

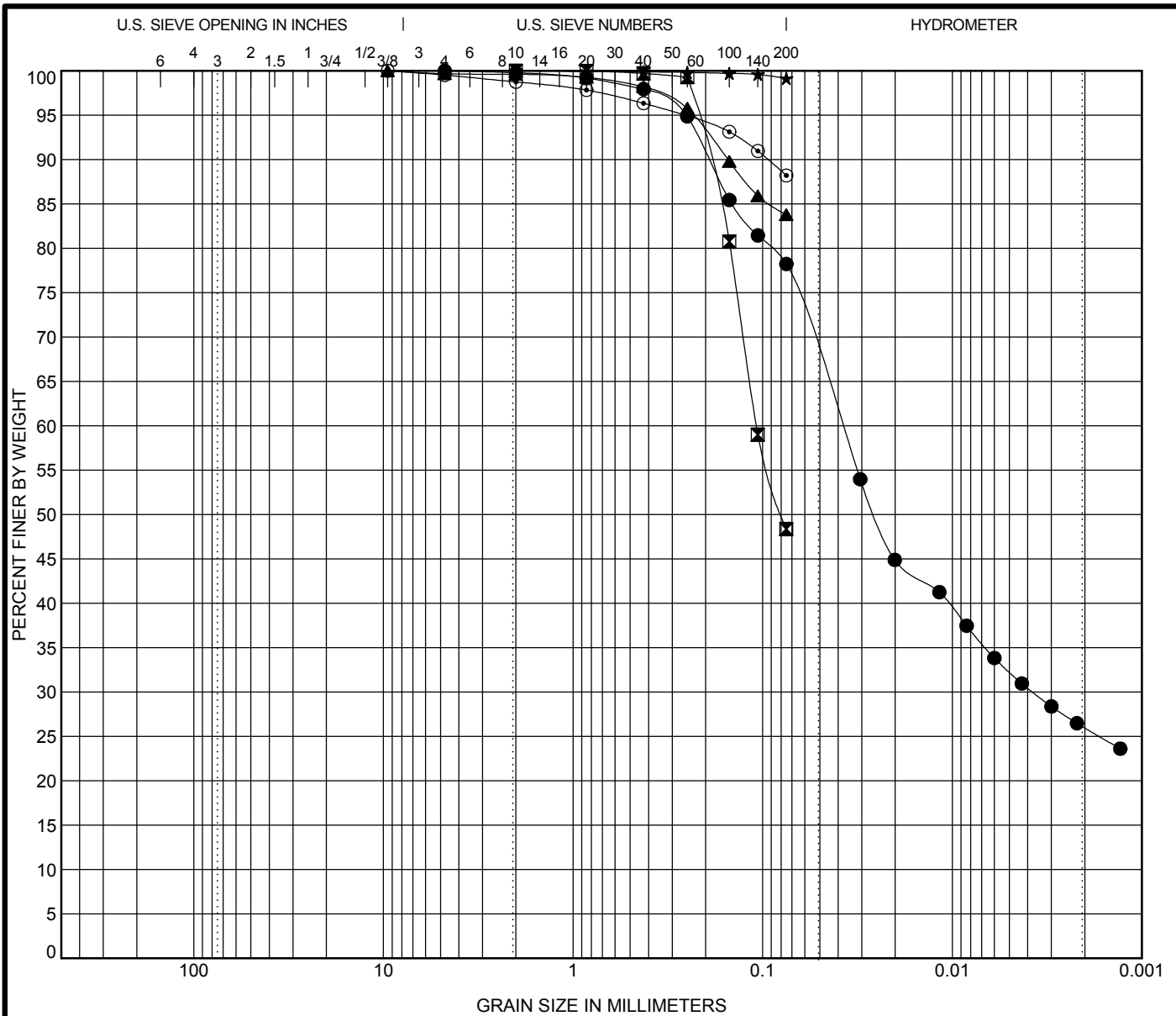


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GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

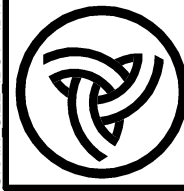
GRAIN SIZE IDOT - IDH.D8 - 2017-3167.10.1270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

| Specimen Identification | Classification | LL | PL | PI | Cc | Cu |
|-------------------------|-----------------|----|----|----|----|----|
| ● B-136 8.5-10 ft | SILTY CLAY LOAM | | | | | |
| ☒ B-136 11.0-12.5 ft | SANDY CLAY LOAM | | | | | |
| ▲ B-137 6.0-7.5 ft | SILTY CLAY | | | | | |
| ★ B-137 13.5-15 ft | SILT | | | | | |
| ◎ B-138 6.0-7.5 ft | CLAY | | | | | |

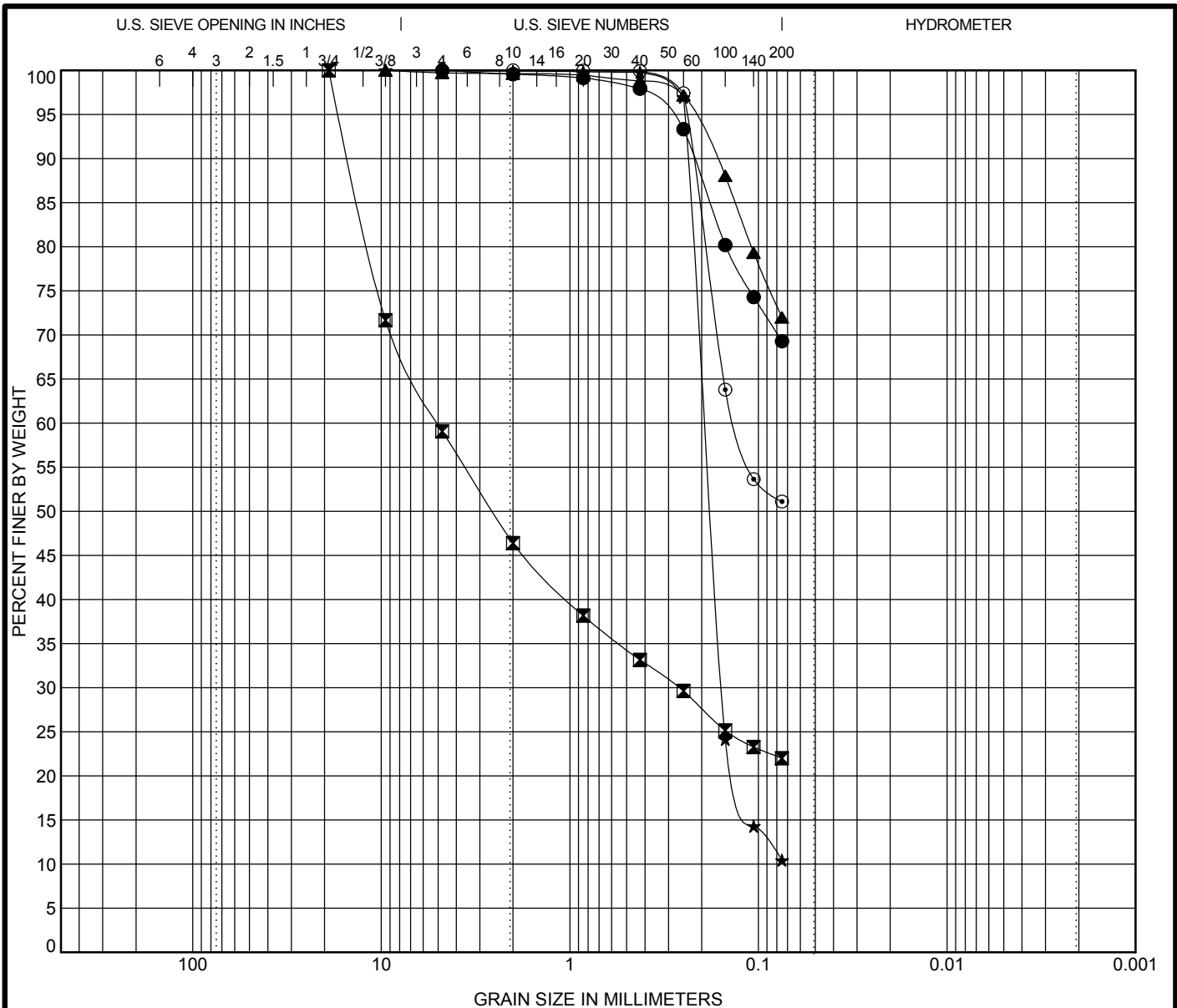
| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|-------------------------|------|-----|-----|-----|---------|-------|-------|-------|
| ● B-136 8.5-10 ft | 4.8 | 0.0 | 0.0 | | 0.2 | 21.6 | 52.3 | 26.0 |
| ☒ B-136 11.0-12.5 ft | 2.0 | 0.1 | | | 0.0 | 51.6 | 48.4 | |
| ▲ B-137 6.0-7.5 ft | 9.5 | | | | 0.4 | 15.8 | 83.8 | |
| ★ B-137 13.5-15 ft | 2.0 | | | | 0.0 | 0.9 | 99.1 | |
| ◎ B-138 6.0-7.5 ft | 9.5 | | | | 1.3 | 10.5 | 88.2 | |



Illinois Department of Transportation
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GRAIN SIZE DISTRIBUTION - IDH
 Route: FAI 270
 Section: 60B-1
 County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 - 2017-3167.10.1270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

| Specimen Identification | Classification | LL | PL | PI | Cc | Cu |
|-------------------------|----------------|----|----|----|------|------|
| ● B-138 13.5-15 ft | CLAY LOAM | | | | | |
| ☒ B-144 3.5-5 ft | CRUSHED ROCK | | | | | |
| ▲ B-145 3.5-5 ft | LOAM | | | | | |
| ★ B-145 11.0-12.5 ft | SAND | | | | 1.76 | 2.67 |
| ◎ B-145 18.5-20 ft | LOAM | | | | | |

| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|-------------------------|------|-----|-----|-----|---------|-------|-------|-------|
| ● B-138 13.5-15 ft | 4.8 | | | | 0.4 | 30.3 | 69.3 | |
| ☒ B-144 3.5-5 ft | 19.0 | 5.0 | 0.3 | | 53.6 | 24.4 | 22.0 | |
| ▲ B-145 3.5-5 ft | 9.5 | | | | 0.4 | 27.7 | 72.0 | |
| ★ B-145 11.0-12.5 ft | 9.5 | 0.2 | 0.2 | | 0.1 | 89.5 | 10.4 | |
| ◎ B-145 18.5-20 ft | 2.0 | 0.1 | | | 0.0 | 48.9 | 51.1 | |

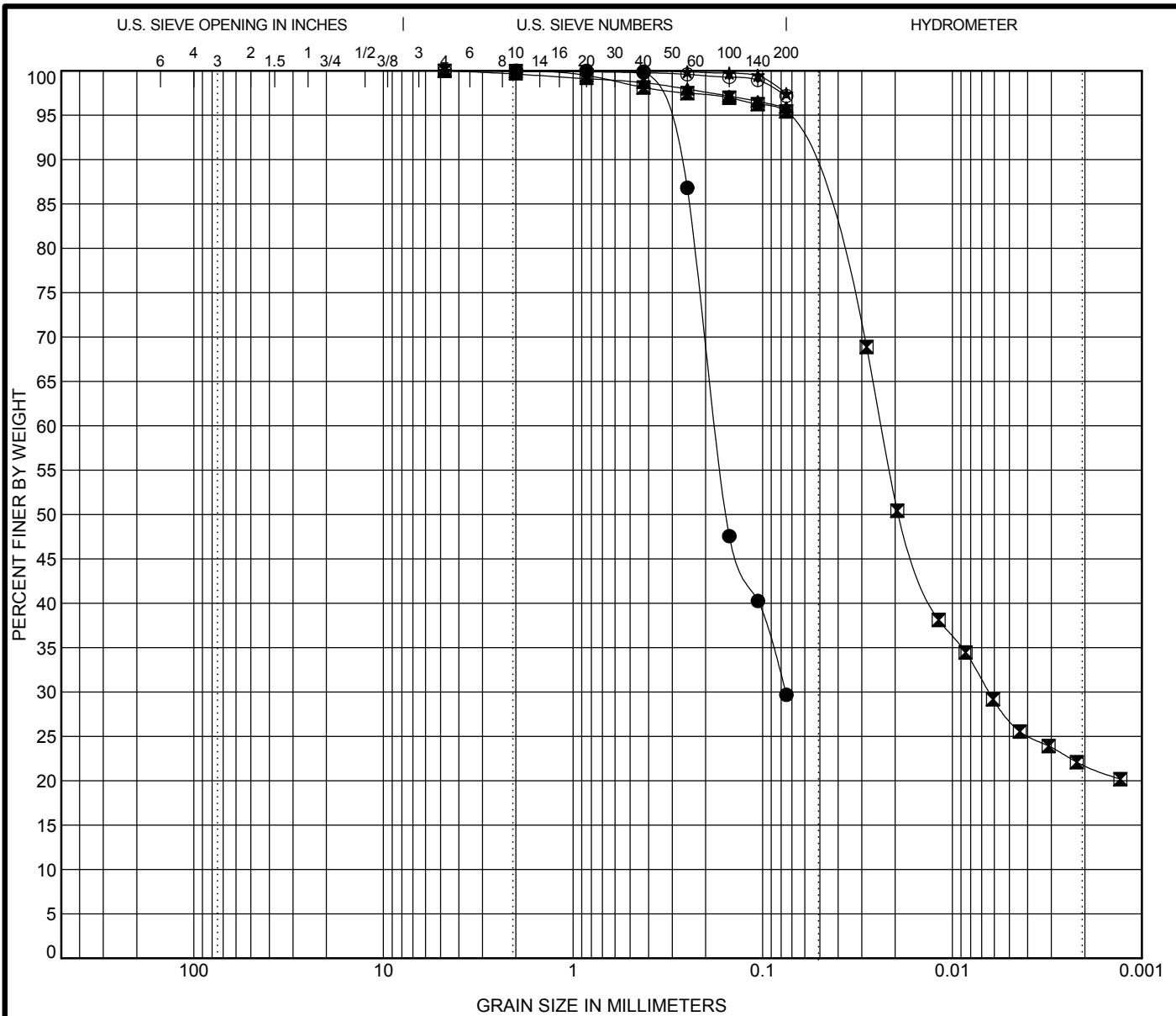


Illinois Department of Transportation
 Division of Highways
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GRAIN SIZE DISTRIBUTION - IDH

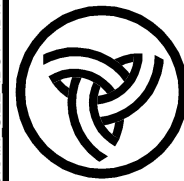
Route: FAI 270
 Section: 60B-1
 County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 - 2017-3167.10.1270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

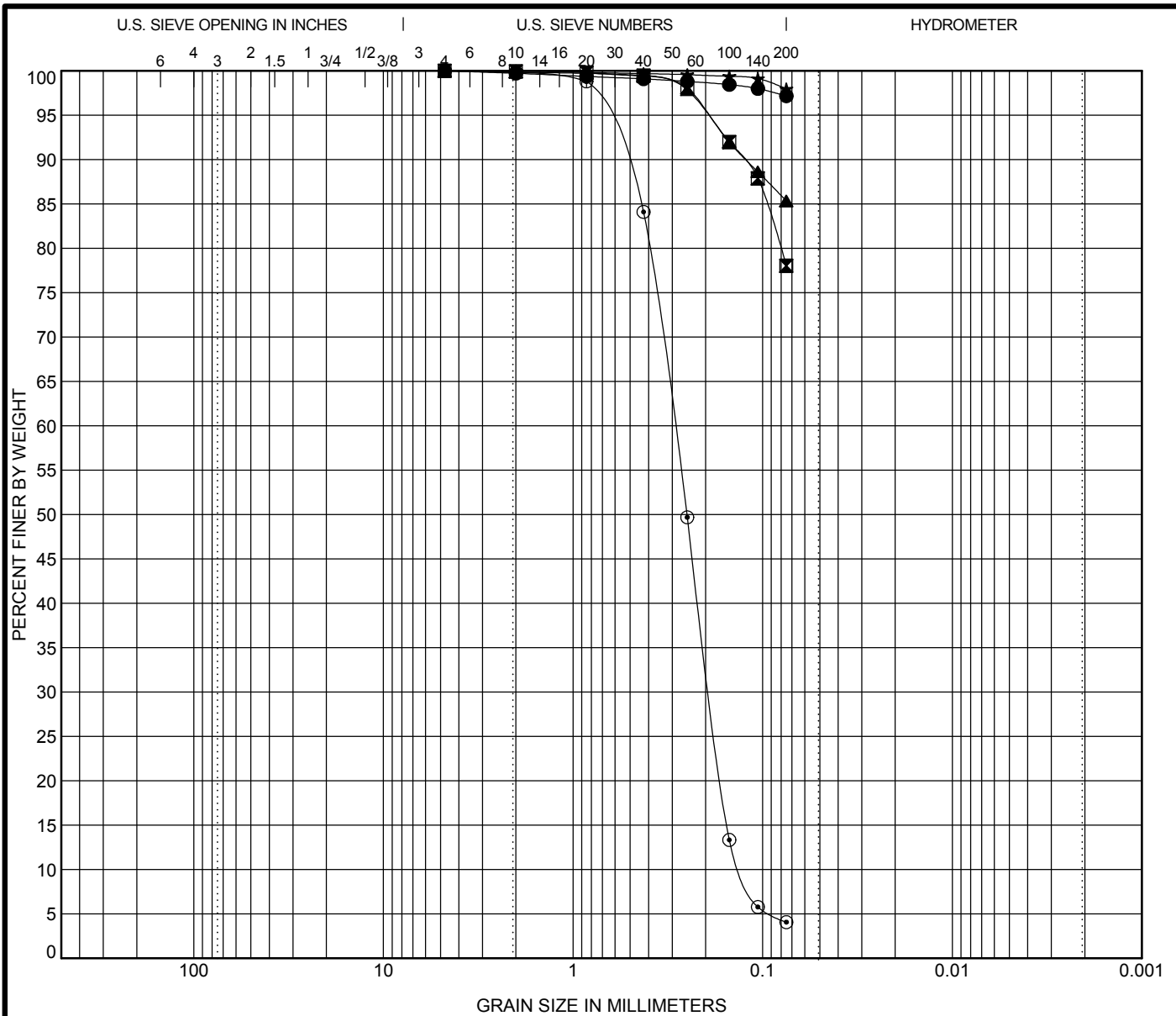
| Specimen Identification | Classification | LL | PL | PI | Cc | Cu | | |
|-------------------------|-----------------|-----|-----|-----|---------|-------|-------|-------|
| ● B-153 16.0-17.5 ft | SANDY LOAM | | | | | | | |
| ☒ B-154 3.5-5 ft | SILTY CLAY LOAM | | | | | | | |
| ▲ B-154 13.5-15 ft | SILTY CLAY | | | | | | | |
| ★ B-155 1.0-2.5 ft | SILT | | | | | | | |
| ◎ B-155 13.5-15 ft | SILT | | | | | | | |
| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
| ● B-153 16.0-17.5 ft | 2.0 | 0.2 | 0.1 | | 0.0 | 70.3 | 29.7 | |
| ☒ B-154 3.5-5 ft | 4.8 | 0.0 | 0.0 | | 0.0 | 4.5 | 73.7 | 21.7 |
| ▲ B-154 13.5-15 ft | 4.8 | | | | 0.4 | 3.8 | 95.9 | |
| ★ B-155 1.0-2.5 ft | 4.8 | | | | 0.0 | 2.5 | 97.4 | |
| ◎ B-155 13.5-15 ft | 4.8 | | | | 0.1 | 2.8 | 97.2 | |



Illinois Department of Transportation
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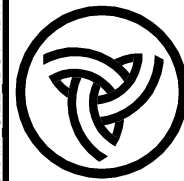
GRAIN SIZE DISTRIBUTION - IDH
 Route: FAI 270
 Section: 60B-1
 County: Madison & St. Louis

GRAIN SIZE IDOT - IDH.D8 2017-3167.10.1270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

| Specimen Identification | Classification | LL | PL | PI | Cc | Cu | | |
|-------------------------|-----------------|-----|-----|-----|---------|-------|-------|-------|
| ● B-160 3.5-5 ft | SILTY CLAY LOAM | | | | | | | |
| ☒ B-160 13.5-15 ft | SILTY LOAM | | | | | | | |
| ▲ B-161 1.0-2.5 ft | SILTY CLAY LOAM | | | | | | | |
| ★ B-161 11.0-12.5 ft | SILTY LOAM | | | | | | | |
| ◎ B-161 18.5-20 ft | SAND | | | | 0.95 | 2.28 | | |
| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
| ● B-160 3.5-5 ft | 4.8 | | | | 0.3 | 2.6 | 97.2 | |
| ☒ B-160 13.5-15 ft | 4.8 | | | | 0.1 | 21.9 | 78.0 | |
| ▲ B-161 1.0-2.5 ft | 4.8 | | | | 0.2 | 14.5 | 85.3 | |
| ★ B-161 11.0-12.5 ft | 4.8 | | | | 0.0 | 2.0 | 98.0 | |
| ◎ B-161 18.5-20 ft | 4.8 | 0.3 | 0.2 | 0.1 | 0.2 | 95.8 | 4.1 | |

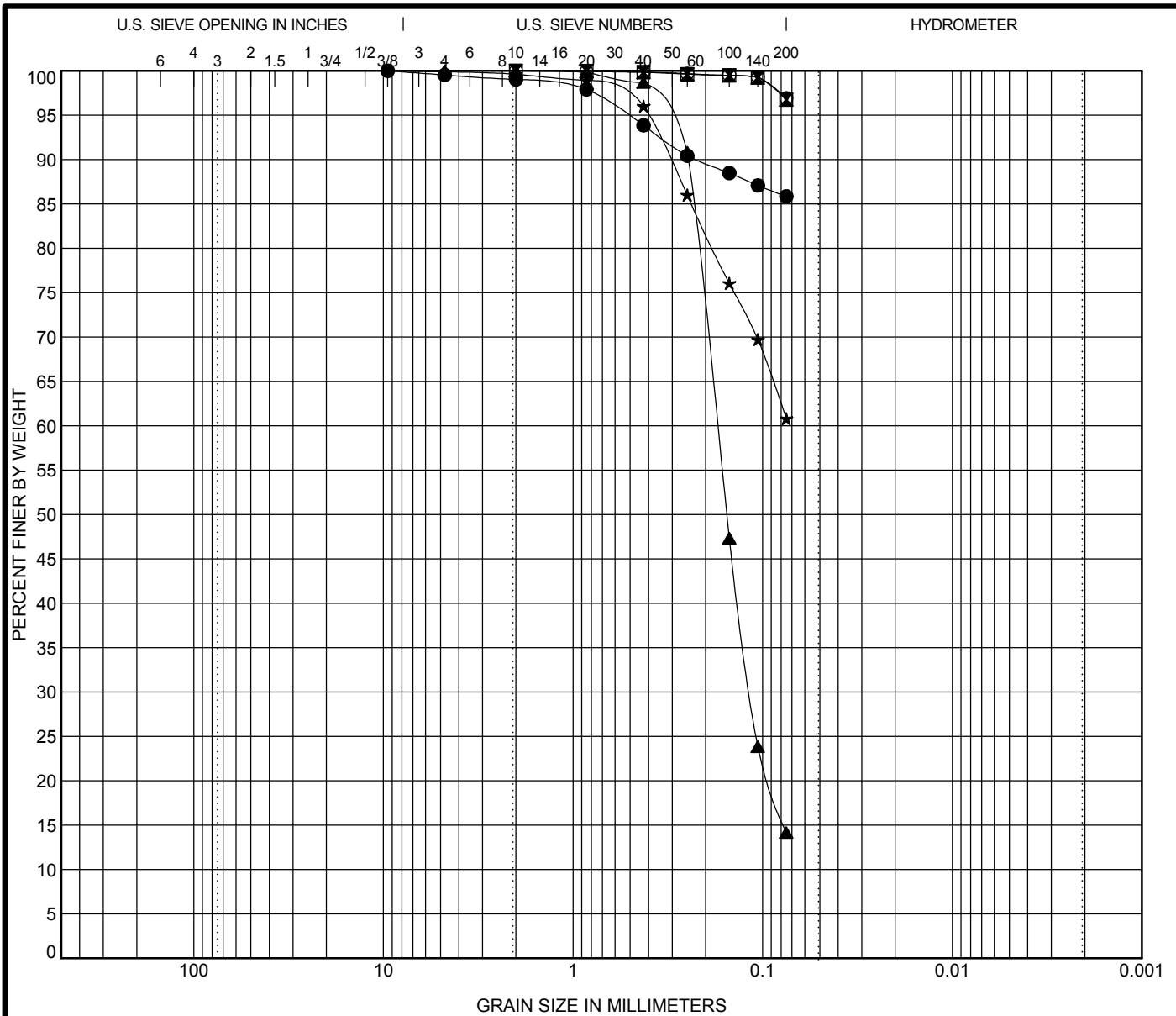


Illinois Department of Transportation
 Division of Highways
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GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
 Section: 60B-1
 County: Madison & St. Louis

GRAIN SIZE IDOT - IDH.D8 - 2017-3167.10.1270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | | | | |
|---------|--------|------|------|------|
| COBBLES | GRAVEL | SAND | SILT | CLAY |
|---------|--------|------|------|------|

| Specimen Identification | Classification | LL | PL | PI | Cc | Cu | | |
|-------------------------|-----------------|-----|-----|-----|---------|-------|-------|-------|
| ● B-162 3.5-5 ft | SILTY CLAY LOAM | | | | | | | |
| ☒ B-163 8.5-10 ft | SILT | | | | | | | |
| ▲ B-163 18.5-20 ft | SAND | | | | | | | |
| ★ B-169 1.0-2.5 ft | LOAM | | | | | | | |
| ◎ B-169 11.0-12.5 ft | SILTY LOAM | | | | | | | |
| Specimen Identification | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
| ● B-162 3.5-5 ft | 9.5 | | | | 1.0 | 13.2 | 85.8 | |
| ☒ B-163 8.5-10 ft | 2.0 | | | | 0.0 | 3.2 | 96.8 | |
| ▲ B-163 18.5-20 ft | 4.8 | 0.2 | 0.1 | | 0.0 | 85.8 | 14.2 | |
| ★ B-169 1.0-2.5 ft | 9.5 | | | | 0.4 | 38.8 | 60.8 | |
| ◎ B-169 11.0-12.5 ft | 2.0 | | | | 0.0 | 3.1 | 96.9 | |



Illinois Department of Transportation
 Division of Highways
 sci engineering inc

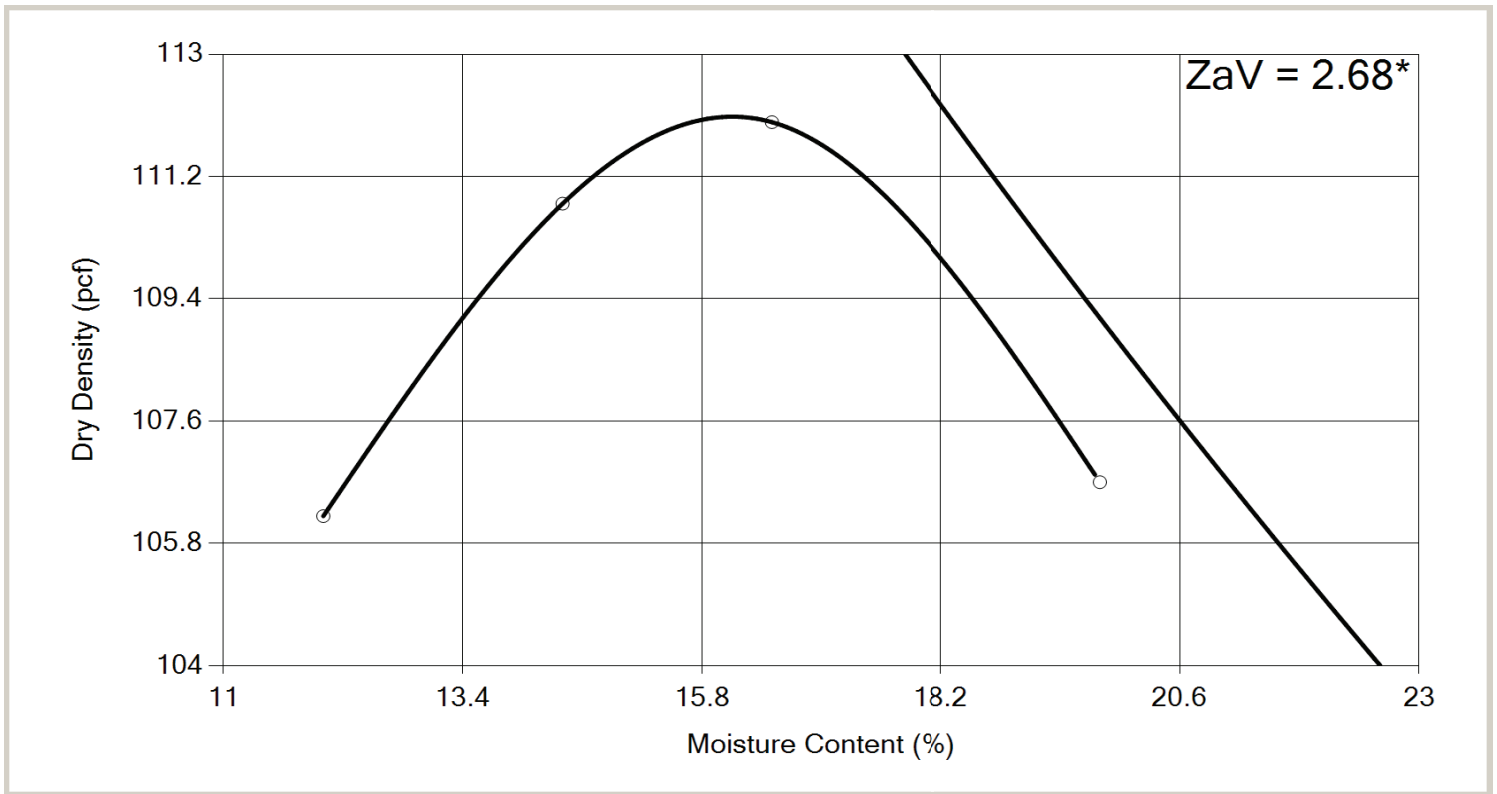
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
 Section: 60B-1
 County: Madison & St. Louis

GRAIN SIZE IDH D8 2017-3167 101270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21

COMPACTION TEST REPORT

ASTM D 698 Standard - Method A




* The Specific gravity is estimated.

| | |
|---|--|
| Maximum Dry Density (pcf): 112.1 | Optimum Moisture Content: 16.1% |
|---|--|

Test Data

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------------------------|---------|---------|---------|---------|---|---|
| Weight of Mold and Soil (g) | 3,865.0 | 3,982.1 | 4,037.2 | 3,998.1 | | |
| Weight of Mold (g) | 2,073.4 | 2,073.4 | 2,073.4 | 2,073.4 | | |
| Weight of Wet Soil & Tare (g) | 585.3 | 704.9 | 741.6 | 537.6 | | |
| Weight of Dry Soil & Tare (g) | 532.0 | 627.6 | 649.2 | 463.1 | | |
| Weight of Tare (g) | 86.9 | 89.1 | 88.3 | 87.5 | | |
| Moisture Content (%) | 12.0 | 14.4 | 16.5 | 19.8 | | |
| Dry Density (pcf) | 106.2 | 110.8 | 112.0 | 106.7 | | |

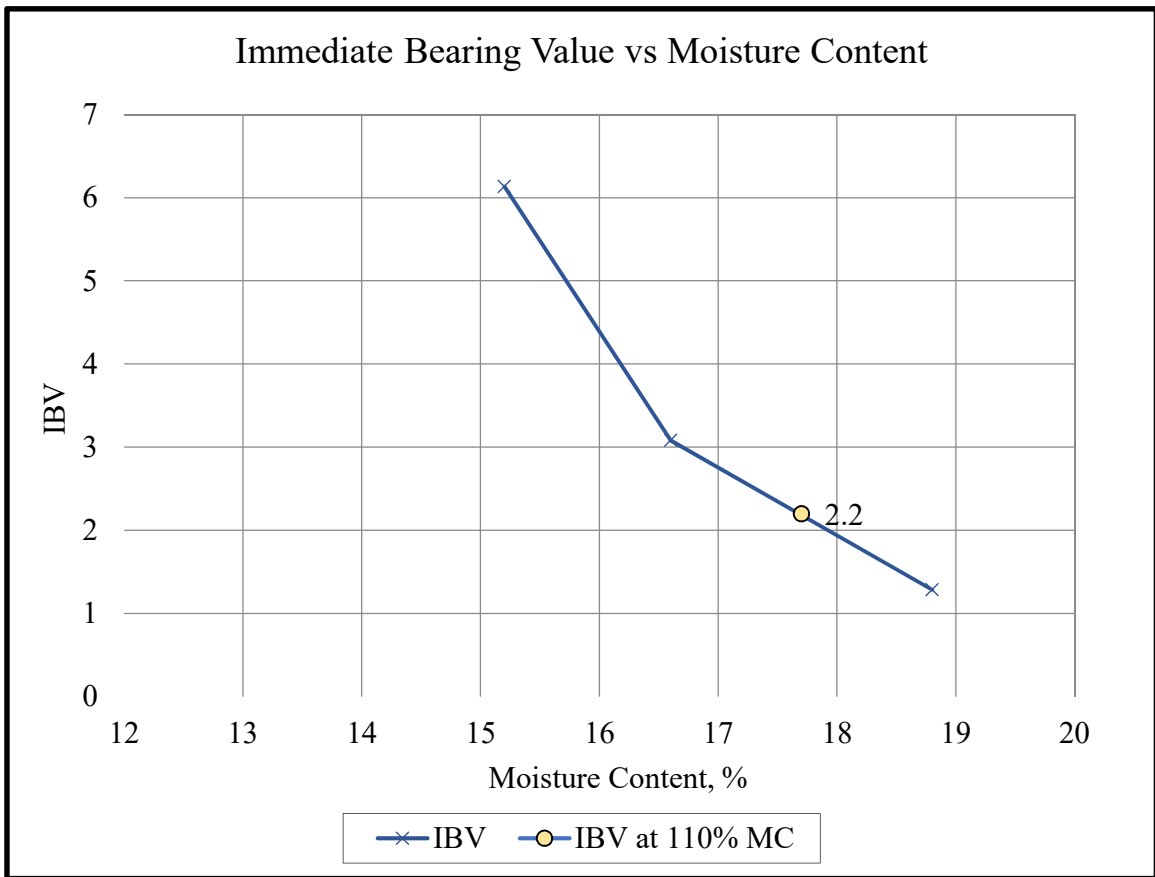
| | |
|---|---|
| Project Name: I-270 Bridge over COR | Project Number: 2017-3167.10 |
| Project Location: Madison County, Illinois | Client: Hornen & Shrifrin |
| Sample Location: B119 & B120 Bulk Composite 2-8' | Sample Number: |
| Material Description: SILTY CLAY LOAM A-6 (16) | Date Sampled: 12/1/2018 |
| NM: 12.0 LL: 39 PI: 22 Soil S.G.: | Source: N/A |
| % Oversize: | %<No.200: 76.8 Rammer: Mechanical Prep: Moist |

| | | | |
|--|---------------------------------|---|----------|
|  | Tested By: K. Strunk | Date Tested: 4/8/2019 | Remarks: |
| | Reviewed By: Mike LaJoye | Title: Senior Field Manager | |
| SCI Engineering, Inc. | | 650 Pierce Blvd O'Fallon, Illinois 62269 | |

Immediate Bearing Value

Project Name: I270 Over COR Bridge
 Sample Number: B119 and B120 Bulk Composite
 Soil Classification: SILTY CLAY LOAM A-6 (16)

Project Number: 2017-3167.10
 Depth: 2-8'
 Tested By: A. Smith
 Date: 4/19/2019

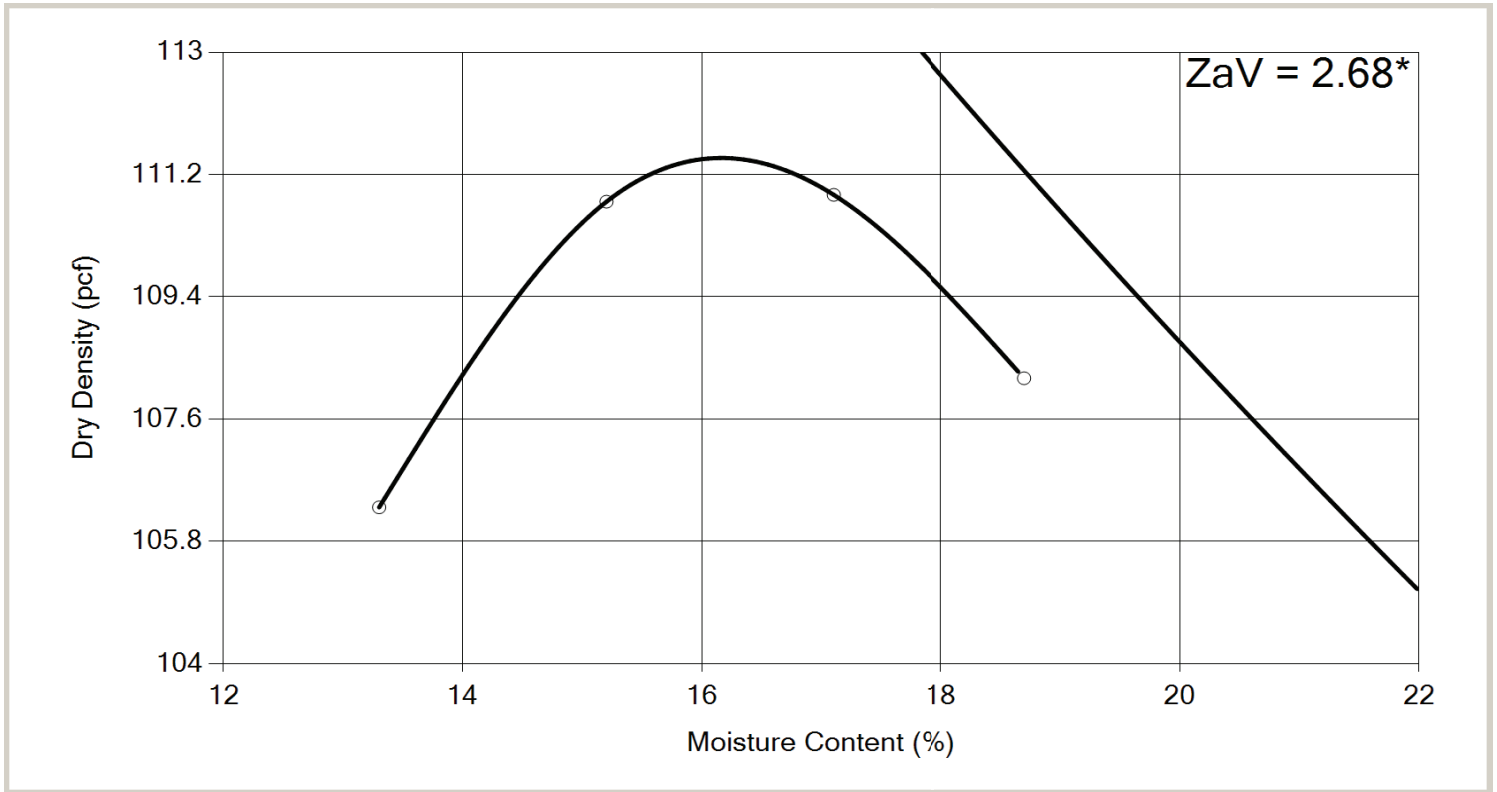


| IBV | Moisture Content % | Dry Density (pcf) |
|-----|--------------------|-------------------|
| 6.1 | 15.2 | 112.3 |
| 3.1 | 16.6 | 111.3 |
| 1.3 | 18.8 | 105.5 |

| Compaction Curve | |
|-------------------|-------|
| Max Density (pcf) | 112.1 |
| OMC | 16.1 |

COMPACTION TEST REPORT

ASTM D 698 Standard - Method A




* The Specific gravity is estimated.

| | |
|---|--|
| Maximum Dry Density (pcf): 111.4 | Optimum Moisture Content: 16.2% |
|---|--|

Test Data

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------------------------|---------|---------|---------|---------|---|---|
| Weight of Mold and Soil (g) | 3,887.3 | 3,995.1 | 4,028.7 | 4,007.7 | | |
| Weight of Mold (g) | 2,073.4 | 2,073.4 | 2,073.4 | 2,073.4 | | |
| Weight of Wet Soil & Tare (g) | 580.2 | 624.7 | 557.1 | 474.0 | | |
| Weight of Dry Soil & Tare (g) | 522.6 | 554.0 | 488.4 | 412.6 | | |
| Weight of Tare (g) | 89.0 | 89.1 | 87.0 | 85.0 | | |
| Moisture Content (%) | 13.3 | 15.2 | 17.1 | 18.7 | | |
| Dry Density (pcf) | 106.3 | 110.8 | 110.9 | 108.2 | | |

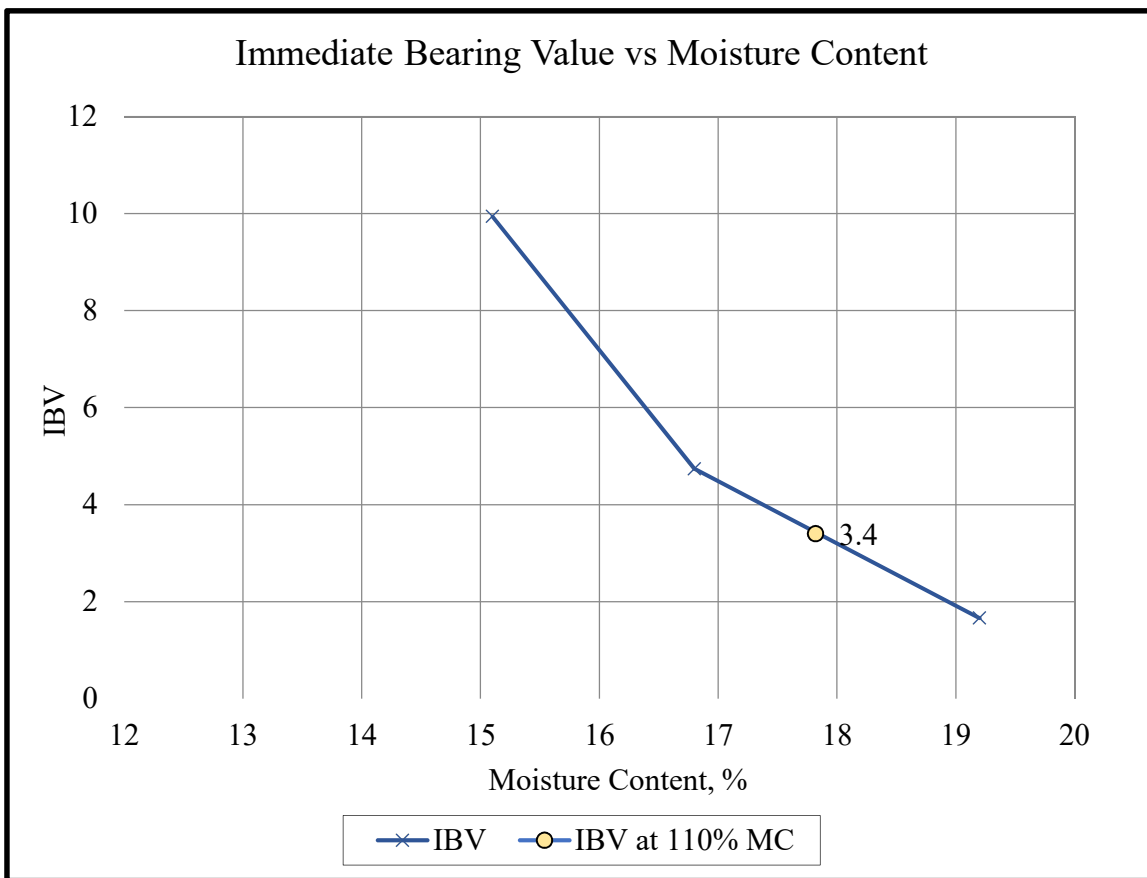
| | |
|---|---|
| Project Name: I-270 Bridge over COR | Project Number: 2017-3167.10 |
| Project Location: Madison County, Illinois | Client: Hornen & Shrifrin |
| Sample Location: B126 & B127 Bulk Composite 2-8' | Sample Number: |
| Material Description: SILTY CLAY LOAM A-7-6 (19) | Date Sampled: 12/1/2018 |
| NM: 11.1 LL: 42 PI: 24 Soil S.G.: | Source: N/A |
| % Oversize: | %<No.200: 81.3 Rammer: Mechanical Prep: Moist |

| | | | |
|--|---------------------------------|------------------------------------|---|
|  | Tested By: A. Smith | Date Tested: 4/9/2019 | Remarks: |
| | Reviewed By: Mike LaJoye | Title: Senior Field Manager | |
| | SCI Engineering, Inc. | | 650 Pierce Blvd O'Fallon, Illinois 62269 |

Immediate Bearing Value

Project Name: I270 Over COR Bridge
 Sample Number: B126 and B127 Bulk Composite
 Soil Classification: SILTY CLAY LOAM A-7-6 (19)

Project Number: 2017-3167.10
 Depth: 2-8'
 Tested By: A. Smith
 Date: 4/19/2019



| IBV | Moisture Content % | Dry Density (pcf) |
|-----|--------------------|-------------------|
| 9.9 | 15.1 | 106.2 |
| 4.7 | 16.8 | 109.2 |
| 1.7 | 19.2 | 105.6 |

| Compaction Curve | |
|-------------------------|-------|
| Max Density (pcf) | 111.4 |
| OMC | 16.2 |



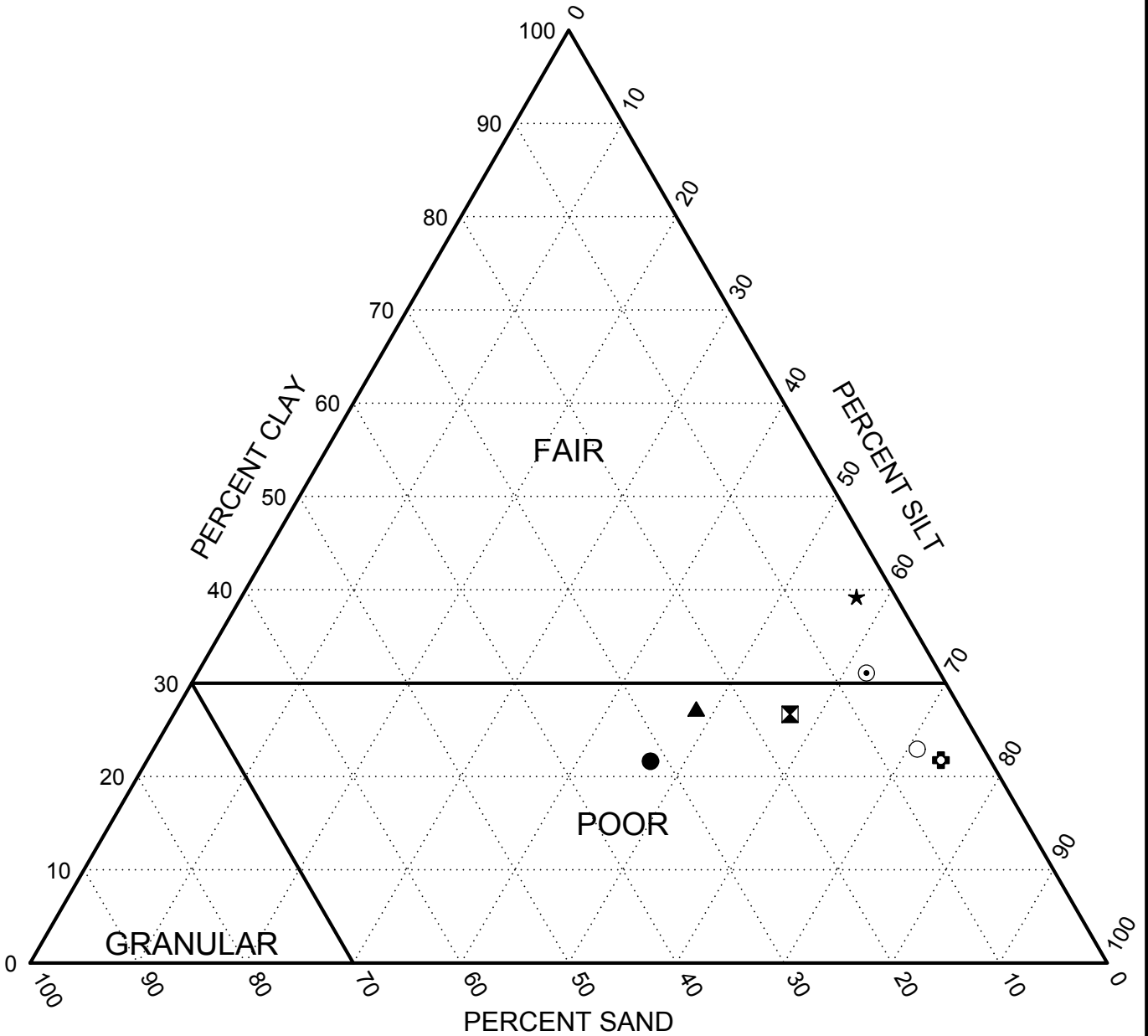
**Illinois Department
of Transportation**

Soil Test Data

Route FAI 270
 Section 60B-1
 County Madison & St. Louis
 Location Chouteau Township, Illinois
 Job No. 2017-3167.10

| | | | | |
|--------------------------------------|-----|-----------------|--|--|
| Boring No. | | B-170 | | |
| Station | | 1903+80.15 | | |
| Offset | | 8.0 ft L (WB) | | |
| Depth | ft | 3.5 - 5.0 | | |
| AASHTO Classification (AASHTO M 145) | | | | |
| Illinois Textural Classification | | Silty Clay Loam | | |
| Gradation Passing - 1" | % | 100 | | |
| 3/4" | % | 100 | | |
| 1/2" | % | 100 | | |
| No. 4 | % | 99.7 | | |
| No. 10 | % | 99.2 | | |
| No. 40 | % | 97.1 | | |
| No. 100 | % | 95.6 | | |
| No. 200 | % | 93.8 | | |
| Sand | % | 6.2 | | |
| Silt | % | 70.9 | | |
| CLAY | % | 22.9 | | |
| Liquid Limit | % | | | |
| Plasticity Index | % | | | |
| Organic Matter Content | % | | | |
| Std. Dry Density | pcf | | | |
| Optimum Moisture | % | | | |
| Subgrade Support Rating | | POOR | | |
| In situ Moisture | % | 22 | | |
| Immediate Bearing Value (IBV) | % | | | |
| | | | | |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |
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| | | | | |
| | | | | |
| | | | | |

SUBGRADE SUPPORT RATING - AASHTO 2017-3187-10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 7/9/21



| | Borehole | Station | Offset | Depth (ft) | Description |
|---|----------|------------|---------------|------------|-----------------|
| ● | B-121 | 1848+02.12 | 8.1ft R (EB) | 2.0 | CLAY LOAM |
| ⊠ | B-122 | 1850+88.90 | 11.2ft R (EB) | 3.0 | SILTY CLAY LOAM |
| ▲ | B-123 | 1854+11.03 | 14.9ft R (EB) | 1.0 | CLAY LOAM |
| ★ | B-124 | 1856+78.10 | 18.6ft R (EB) | 3.0 | SILTY CLAY |
| ⊙ | B-127 | 1866+21.89 | 25.5ft R (EB) | 3.0 | SILTY CLAY |
| ⊕ | B-154 | 1892+85.77 | 15.5ft L (WB) | 3.5 | SILTY CLAY LOAM |
| ○ | B-170 | 1903+80.15 | 8.0ft L (WB) | 3.5 | SILTY CLAY LOAM |
| | | | | | |
| | | | | | |
| | | | | | |



Illinois Department of Transportation
 Division of Highways
 sci engineering inc

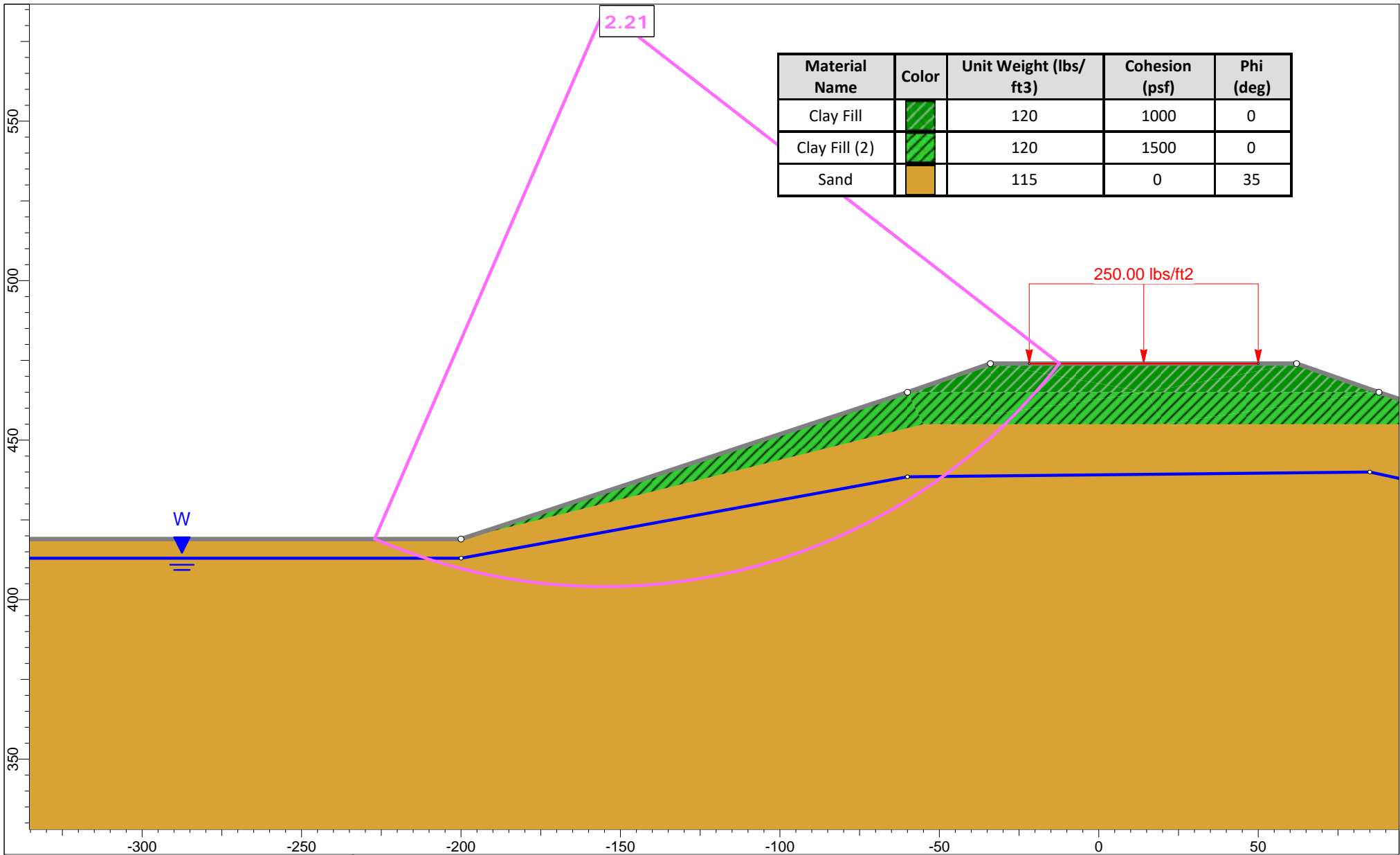
SUBGRADE SUPPORT RATING




Route: FAI 270

Section: 60B-1

County: Madison & St. Louis

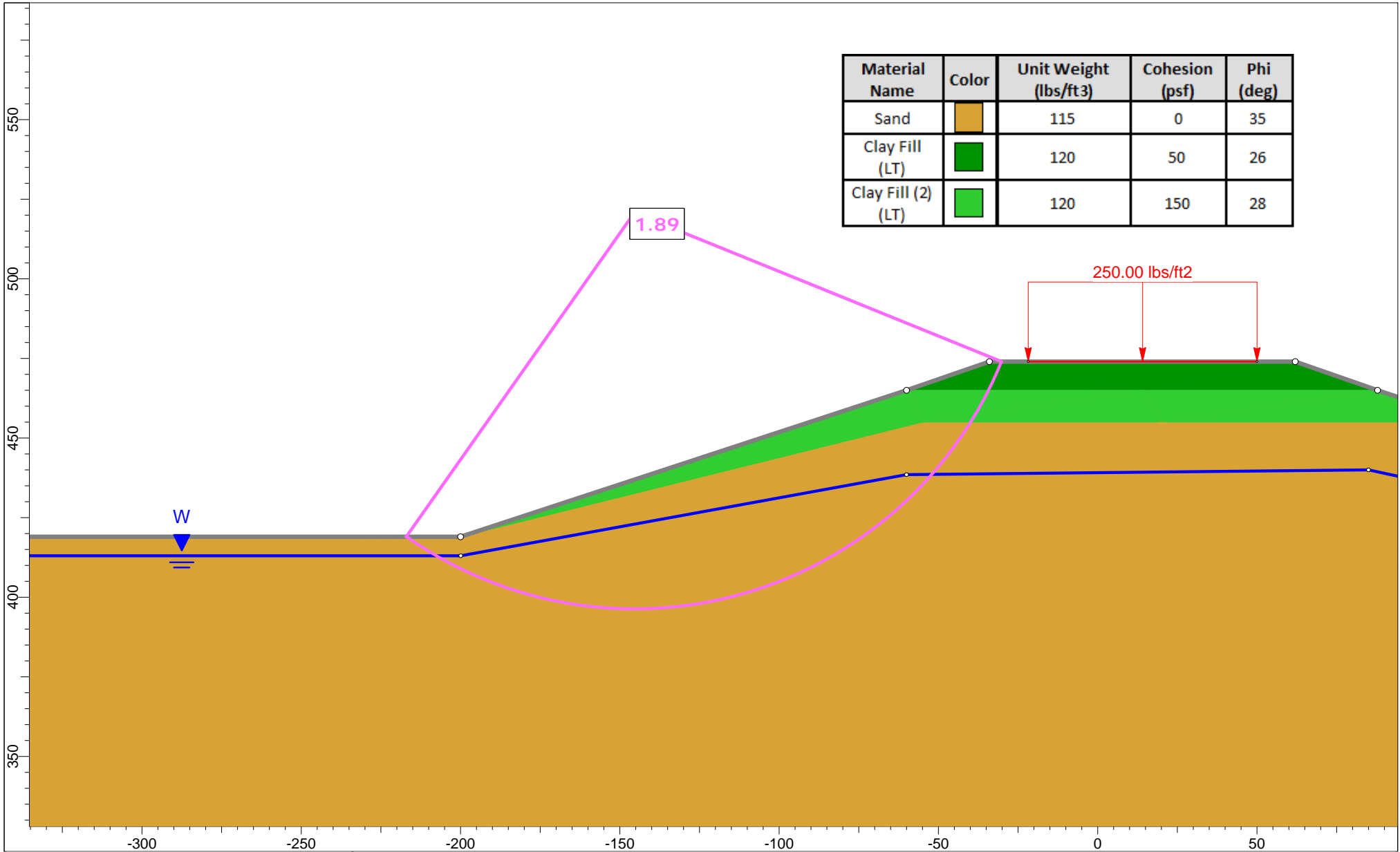
Appendix D







| Material Name | Color | Unit Weight (lbs/ft3) | Cohesion (psf) | Phi (deg) |
|---------------|---|-----------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Clay Fill (2) |  | 120 | 1500 | 0 |
| Sand |  | 115 | 0 | 35 |

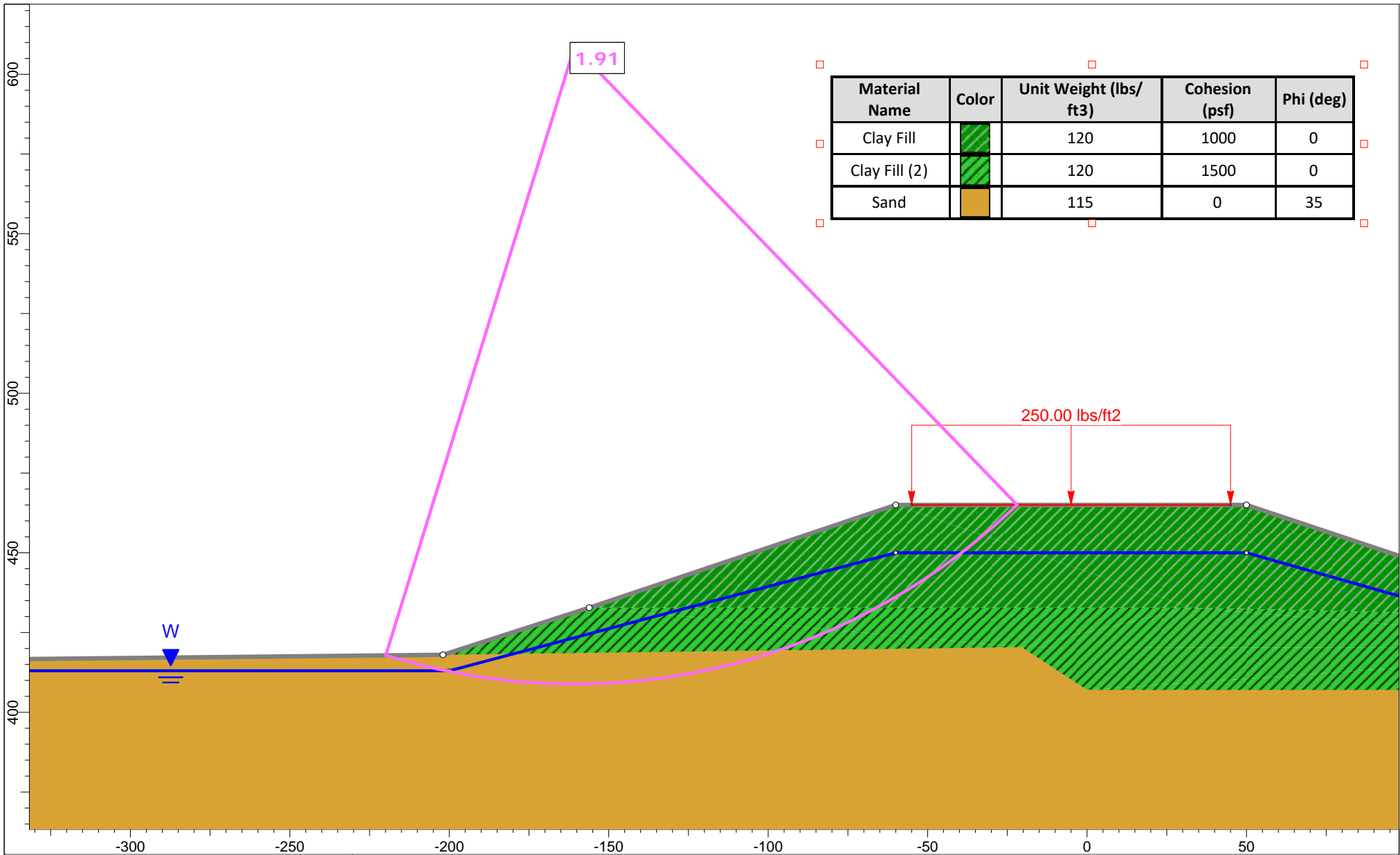





| | | | | |
|----------------------|-----------------------|-------------------------------------|--------------------------------|---|
| Project | | I-270 over COR - RGR - North Slopes | | |
| Analysis Description | | STA 1904+28 - Short Term | Location Madison County, IL | |
| Drawn By | TJC | Reviewed By: | PP | Scale 1:500 |
| Date | 5/12/2021, 4:38:23 PM | Project # | 2017-3167.10 | Company SCI Engineering, Inc |
| | | | | File Name 17-3167 RGR North Slope.slmd |



| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|--------------------|---|------------------------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
| Clay Fill (LT) |  | 120 | 50 | 26 |
| Clay Fill (2) (LT) |  | 120 | 150 | 28 |

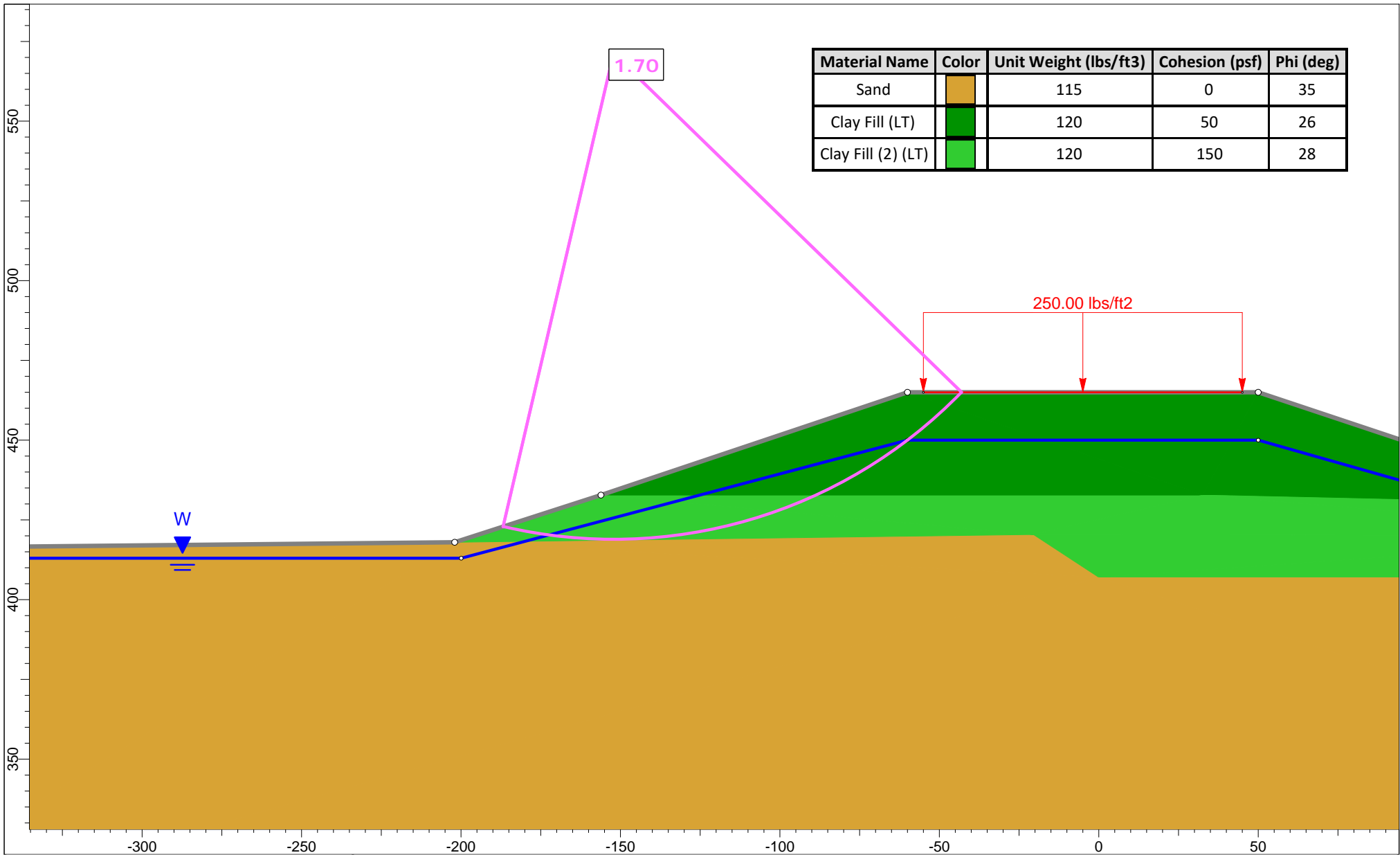
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|  | Project | | | | I-270 over COR - RGR - North Slopes | |
| | Analysis Description | | | | Location | |
| | STA 1904+28 - Long Term | | | | Madison County, IL | |
| | Drawn By | TJC | Reviewed By: | PP | Scale | 1:500 |
| | Company | | | | SCI Engineering, Inc | |
| Date | 5/12/2021, 4:38:23 PM | | Project # | 2017-3167.10 | | |
| File Name | | | | 17-3167 RGR North Slope.slmd | | |







| Material Name | Color | Unit Weight (lbs/ft3) | Cohesion (psf) | Phi (deg) |
|---------------|---|-----------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Clay Fill (2) |  | 120 | 1500 | 0 |
| Sand |  | 115 | 0 | 35 |

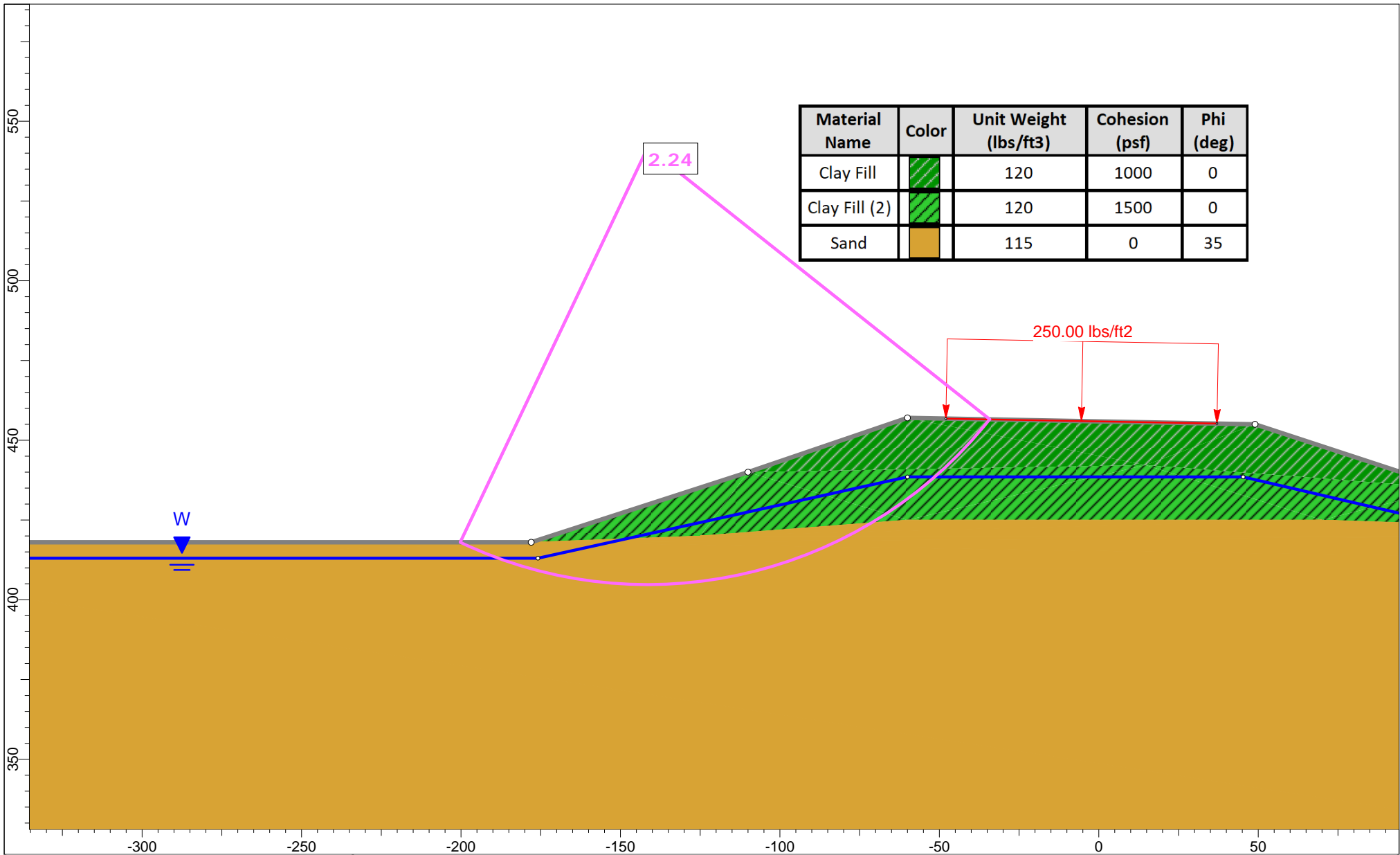





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|----------------------|-----------------------|-------------------------------------|--------------------------------|---|
| Project | | I-270 over COR - RGR - North Slopes | | |
| Analysis Description | | STA 1901+50 - Short Term | Location Madison County, IL | |
| Drawn By | TJC | Reviewed By: | PP | Scale 1:500 |
| Date | 5/12/2021, 4:38:23 PM | Project # | 2017-3167.10 | Company SCI Engineering, Inc |
| | | | | File Name 17-3167 RGR North Slope.slmd |



| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|--------------------|---|------------------------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
| Clay Fill (LT) |  | 120 | 50 | 26 |
| Clay Fill (2) (LT) |  | 120 | 150 | 28 |

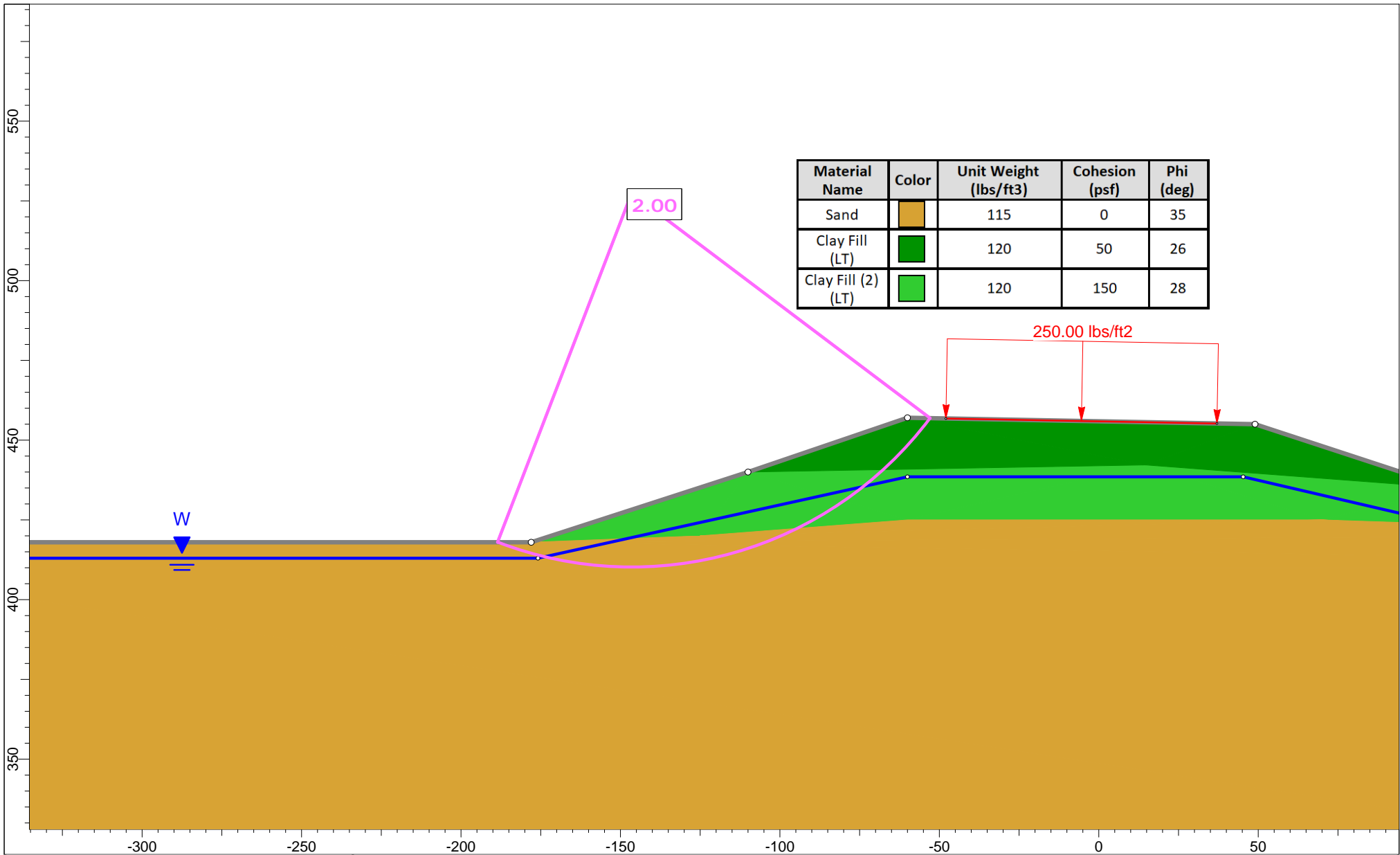
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|  | <i>Project</i> I-270 over COR - RGR - North Slopes | | | | |
| | <i>Analysis Description</i> STA 1901+50 - Long Term | | <i>Location</i> Madison County, IL | | |
| | <i>Drawn By</i> TJC | <i>Reviewed By:</i> PP | <i>Scale</i> 1:500 | <i>Company</i> SCI Engineering, Inc | |
| | <i>Date</i> 5/12/2021, 4:38:23 PM | <i>Project #</i> 2017-3167.10 | <i>File Name</i> 17-3167 RGR North Slope.slmd | | |






| Material Name | Color | Unit Weight (lbs/ft3) | Cohesion (psf) | Phi (deg) |
|---------------|---|-----------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Clay Fill (2) |  | 120 | 1500 | 0 |
| Sand |  | 115 | 0 | 35 |



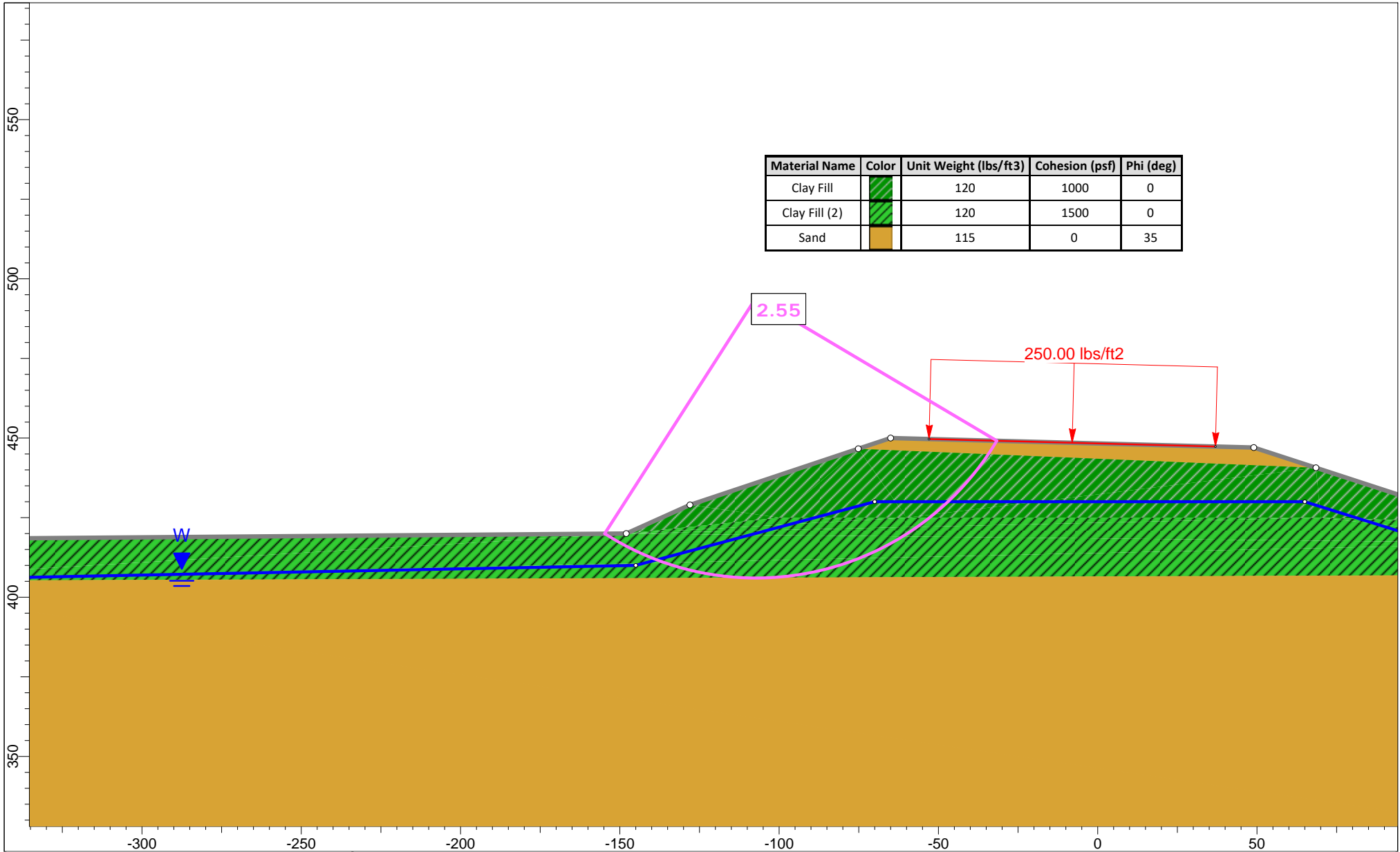
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| Project | | I-270 over COR - RGR - North Slopes | | |
| Analysis Description | | STA 1898+70 - Short Term | Location Madison County, IL | |
| Drawn By | TJC | Reviewed By: | PP | Scale 1:500 |
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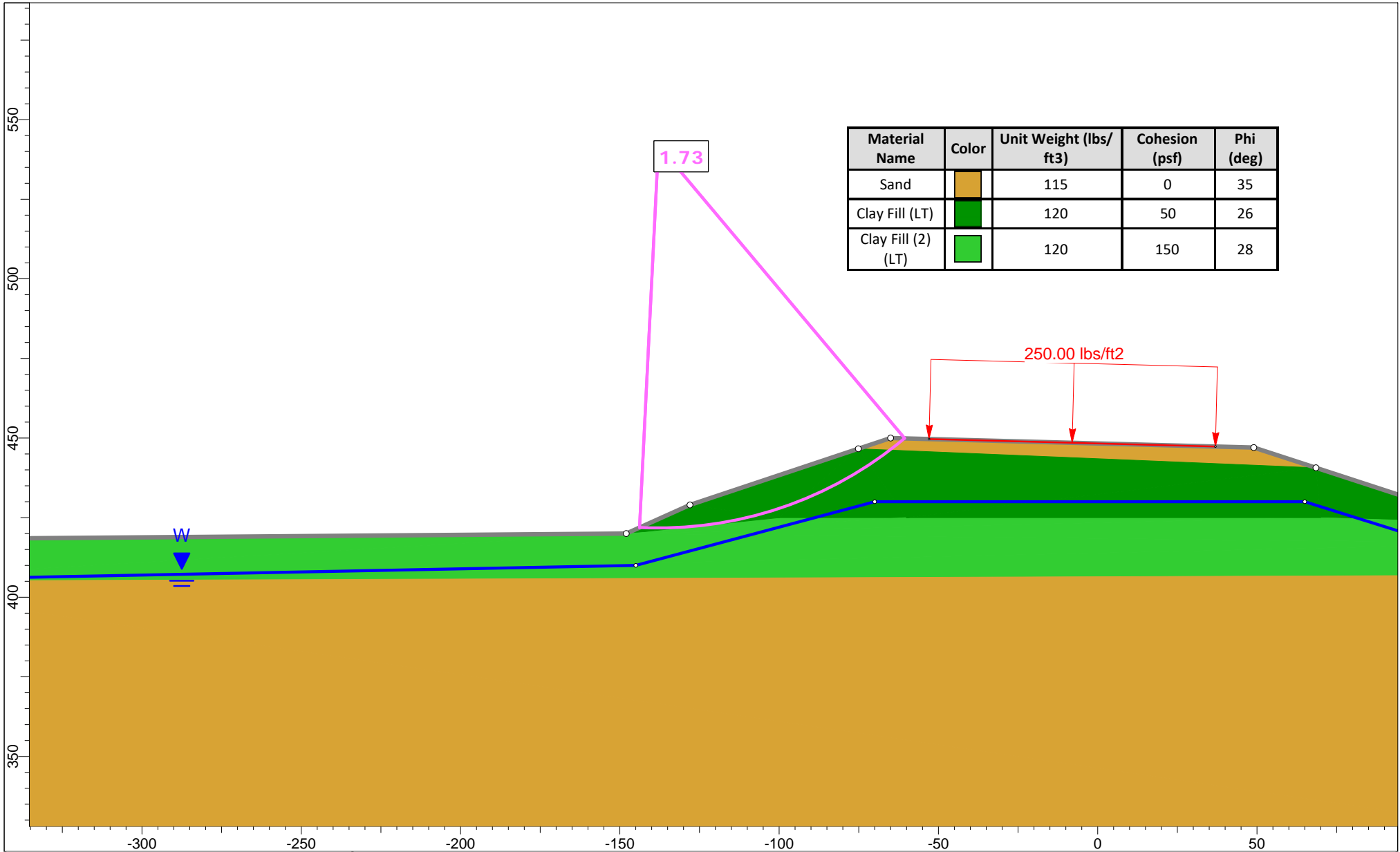
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|--------------------|---|-----------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
| Clay Fill (LT) |  | 120 | 50 | 26 |
| Clay Fill (2) (LT) |  | 120 | 150 | 28 |






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|----------------------|-----------------------|-------------------------------------|--------------------------------|---|
| Project | | I-270 over COR - RGR - North Slopes | | |
| Analysis Description | | STA 1898+70 - Long Term | Location Madison County, IL | |
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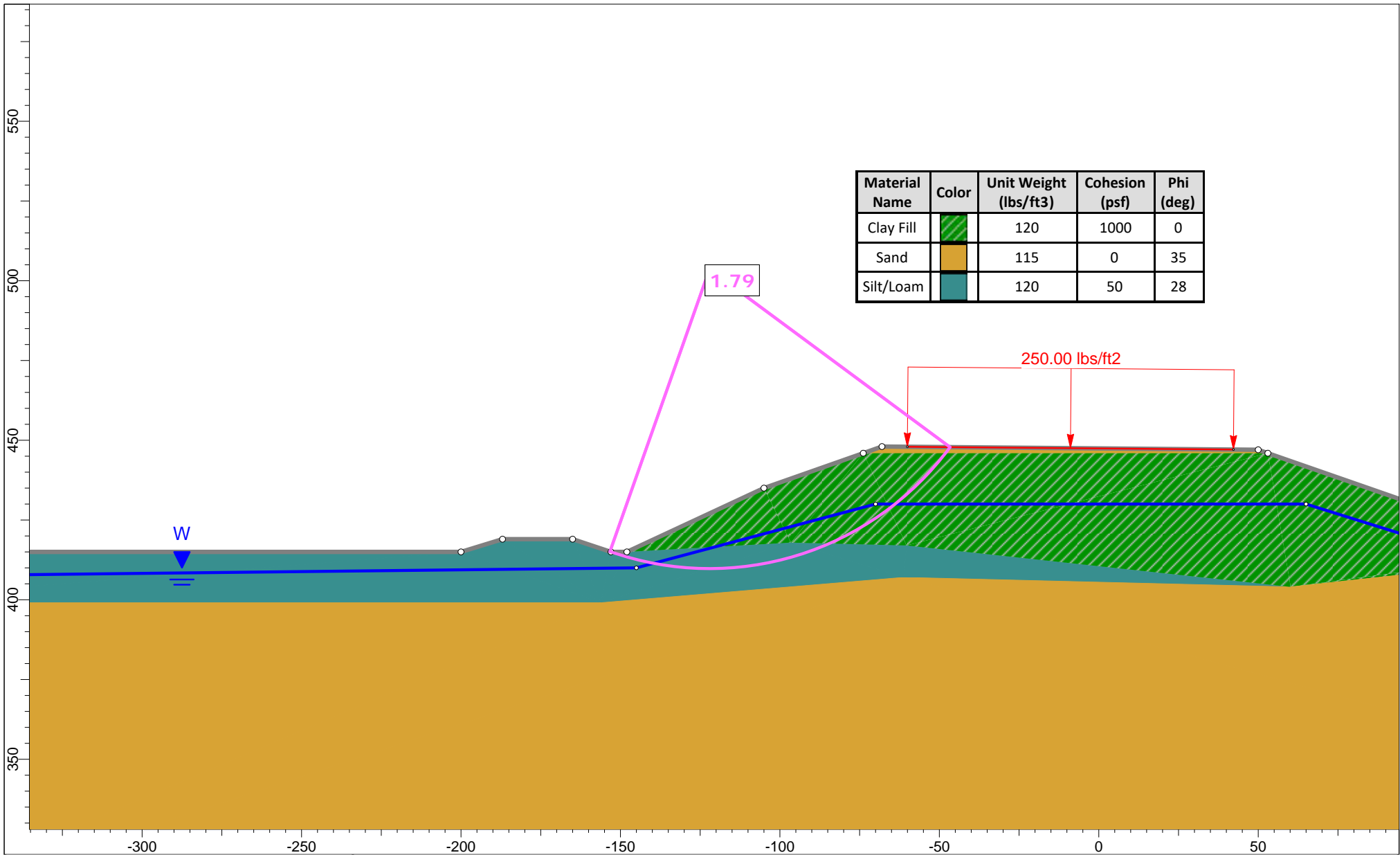
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| | STA 1894+50 - Short Term | | | | Madison County, IL | |
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| Material Name | Color | Unit Weight (lbs/ft3) | Cohesion (psf) | Phi (deg) |
|--------------------|---|-----------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
| Clay Fill (LT) |  | 120 | 50 | 26 |
| Clay Fill (2) (LT) |  | 120 | 150 | 28 |

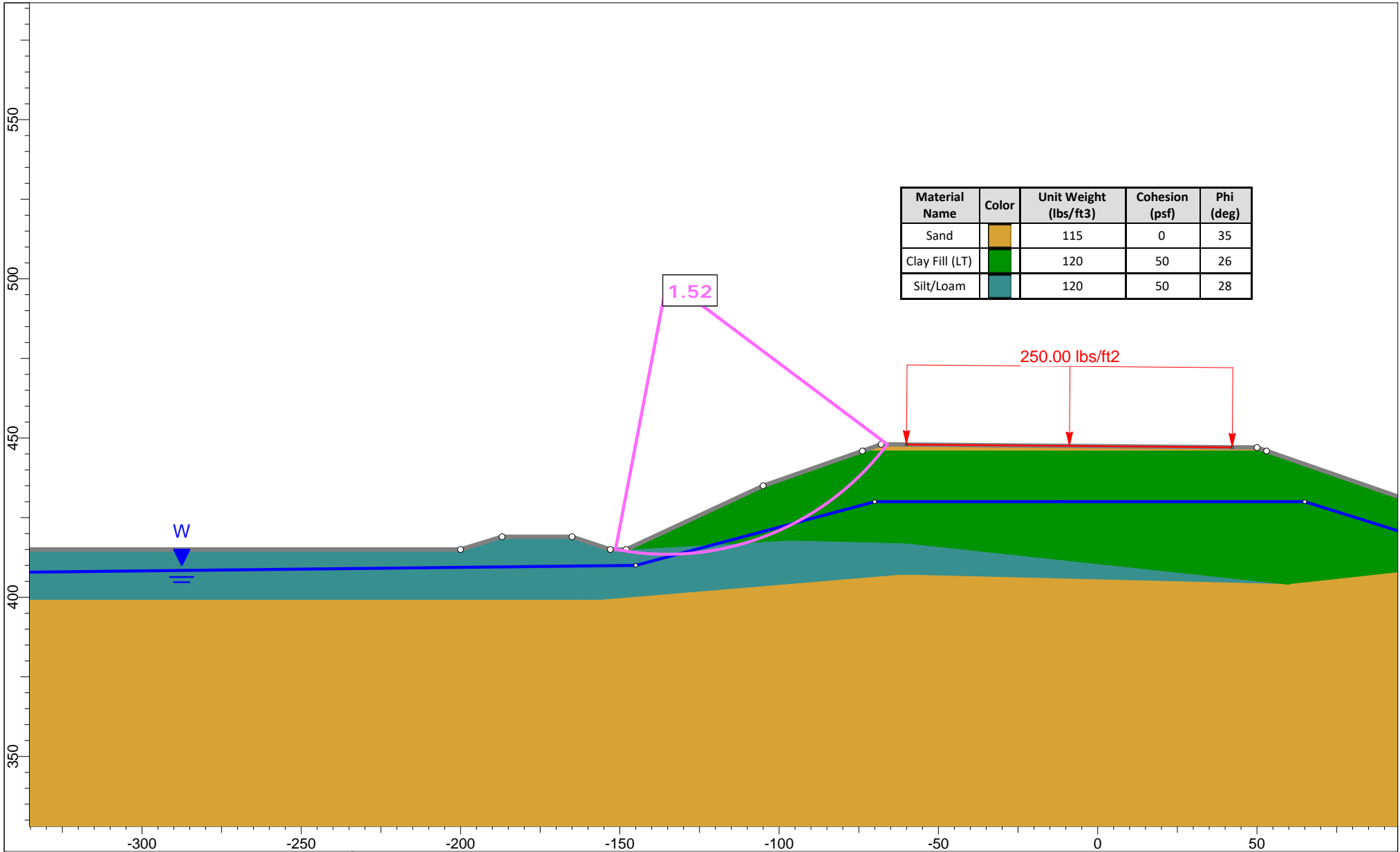





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|--------------------------------------|----------------------------------|--|--|
| <i>Project</i> | | I-270 over COR - RGR - North Slopes | |
| <i>Analysis Description</i> | | STA 1894+50 - Long Term | <i>Location</i> Madison County, IL |
| <i>Drawn By</i> TJC | <i>Reviewed By:</i> PP | <i>Scale</i> 1:500 | <i>Company</i> SCI Engineering, Inc |
| <i>Date</i> 5/12/2021, 4:38:23 PM | <i>Project #</i> 2017-3167.10 | <i>File Name</i> 17-3167 RGR North Slope.slmd | |



| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|---------------|---|------------------------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Sand |  | 115 | 0 | 35 |
| Silt/Loam |  | 120 | 50 | 28 |

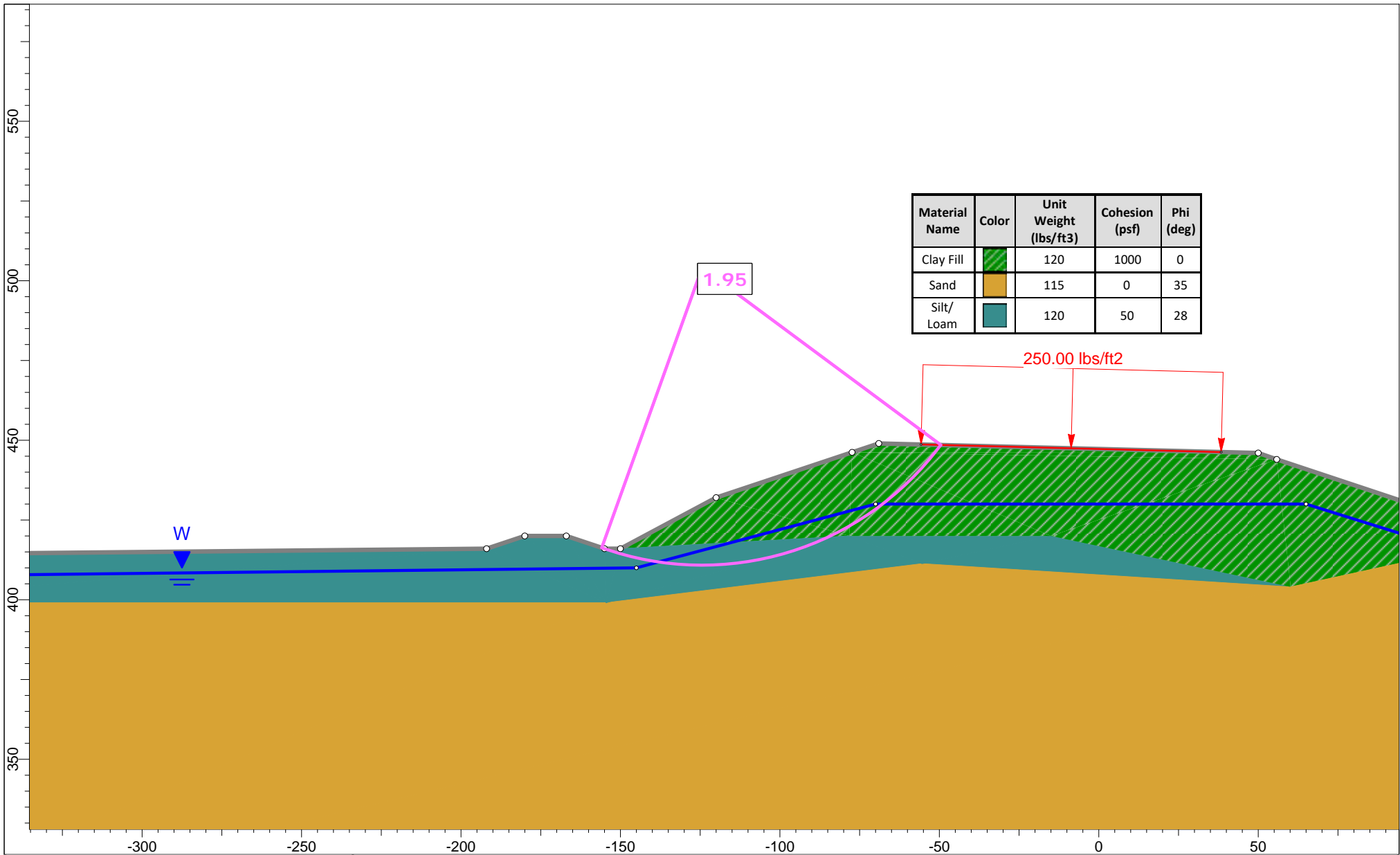
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| | <i>Date</i> 5/12/2021, 4:38:23 PM | <i>Project #</i> 2017-3167.10 | <i>File Name</i> 17-3167 RGR North Slope.slmd | |



| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|----------------|---|------------------------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
| Clay Fill (LT) |  | 120 | 50 | 26 |
| Silt/Loam |  | 120 | 50 | 28 |



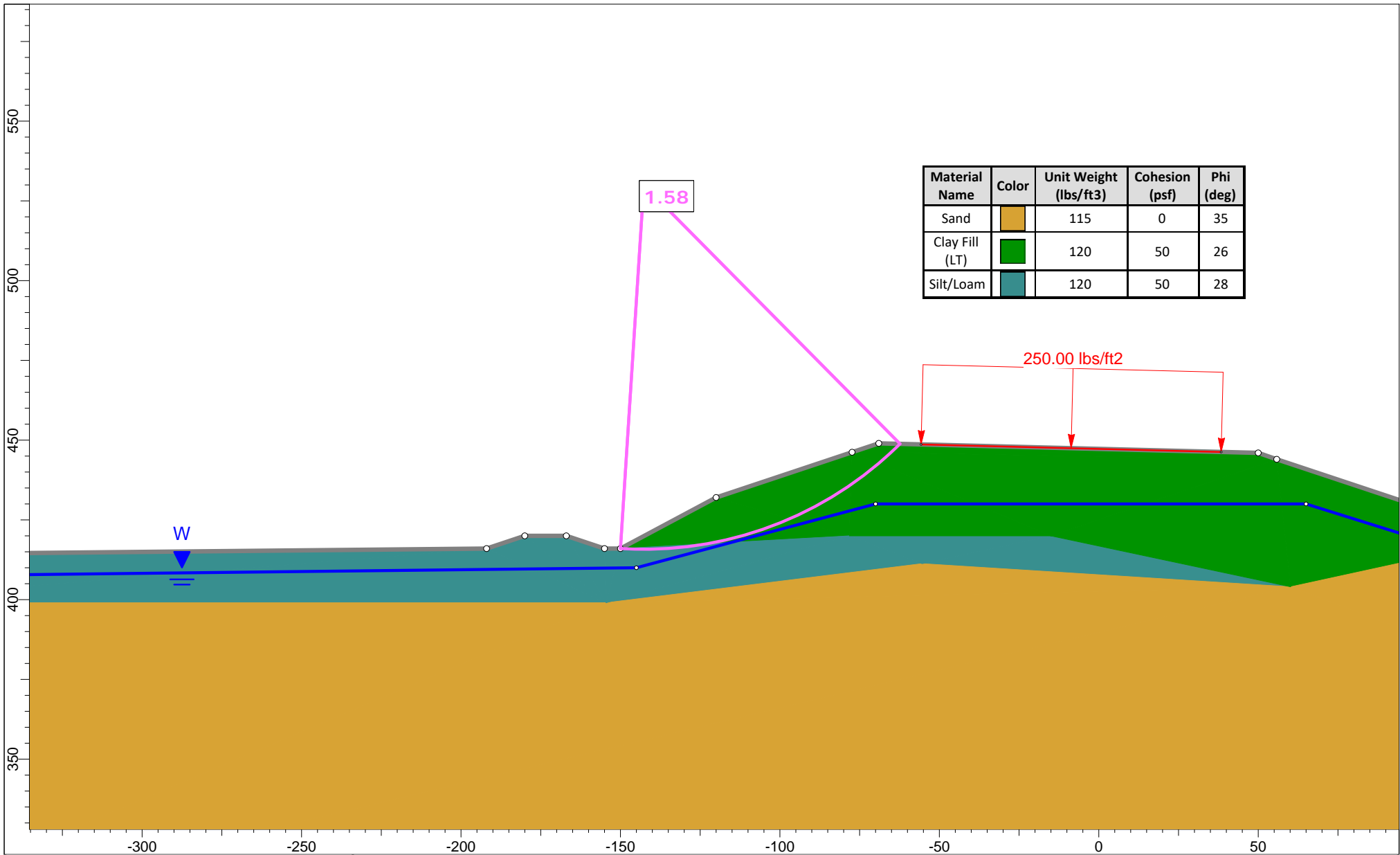
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| | | | Madison County, IL | |
| <i>Drawn By</i> | TJC | <i>Reviewed By:</i> | PP | <i>Scale</i> |
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| | | <i>Company</i> | | SCI Engineering, Inc |
| <i>Date</i> | 5/12/2021, 4:38:23 PM | <i>Project #</i> | 2017-3167.10 | <i>File Name</i> |
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| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|---------------|---|------------------------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Sand |  | 115 | 0 | 35 |
| Silt/Loam |  | 120 | 50 | 28 |






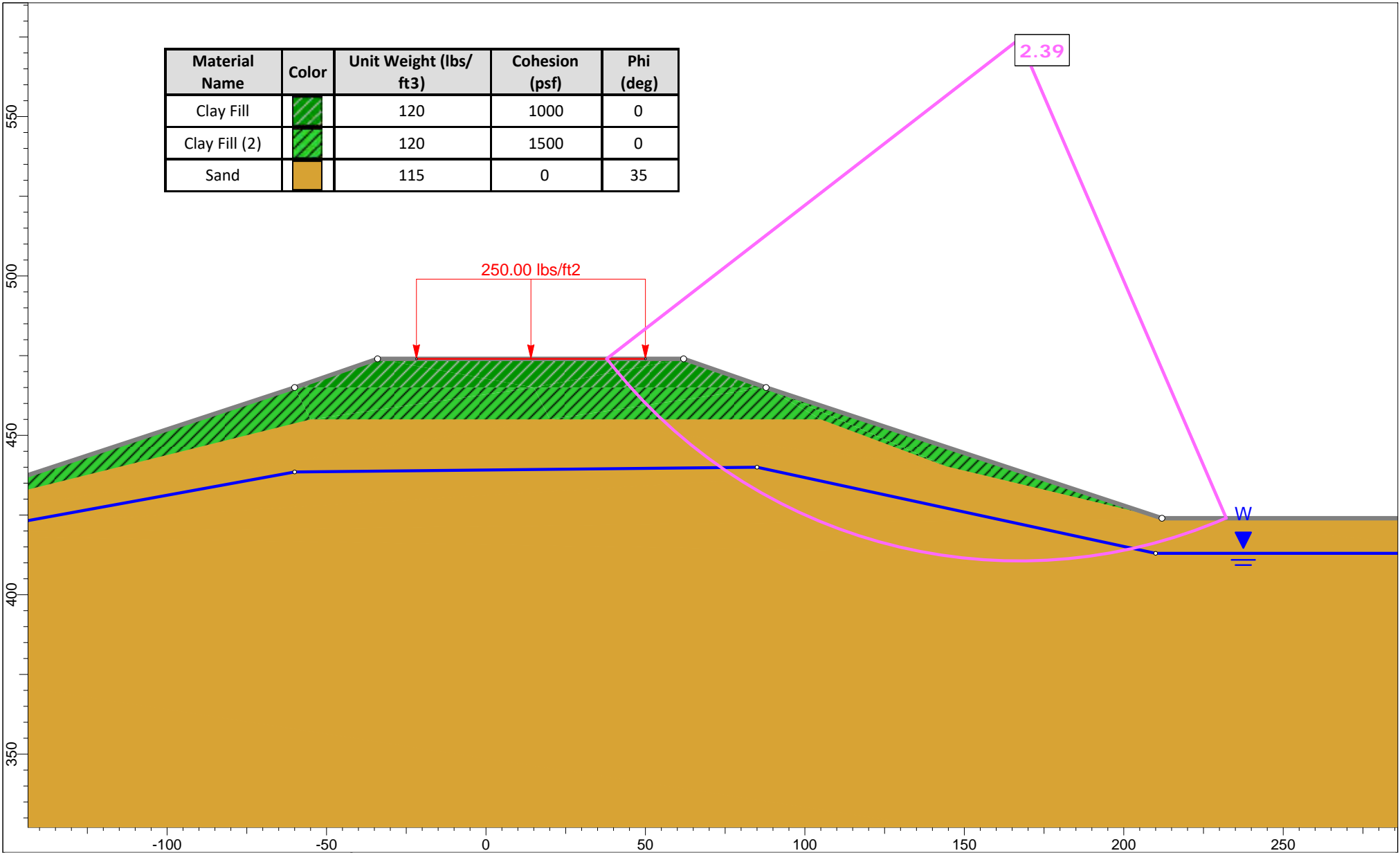
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| Project | | I-270 over COR - RGR - North Slopes | | |
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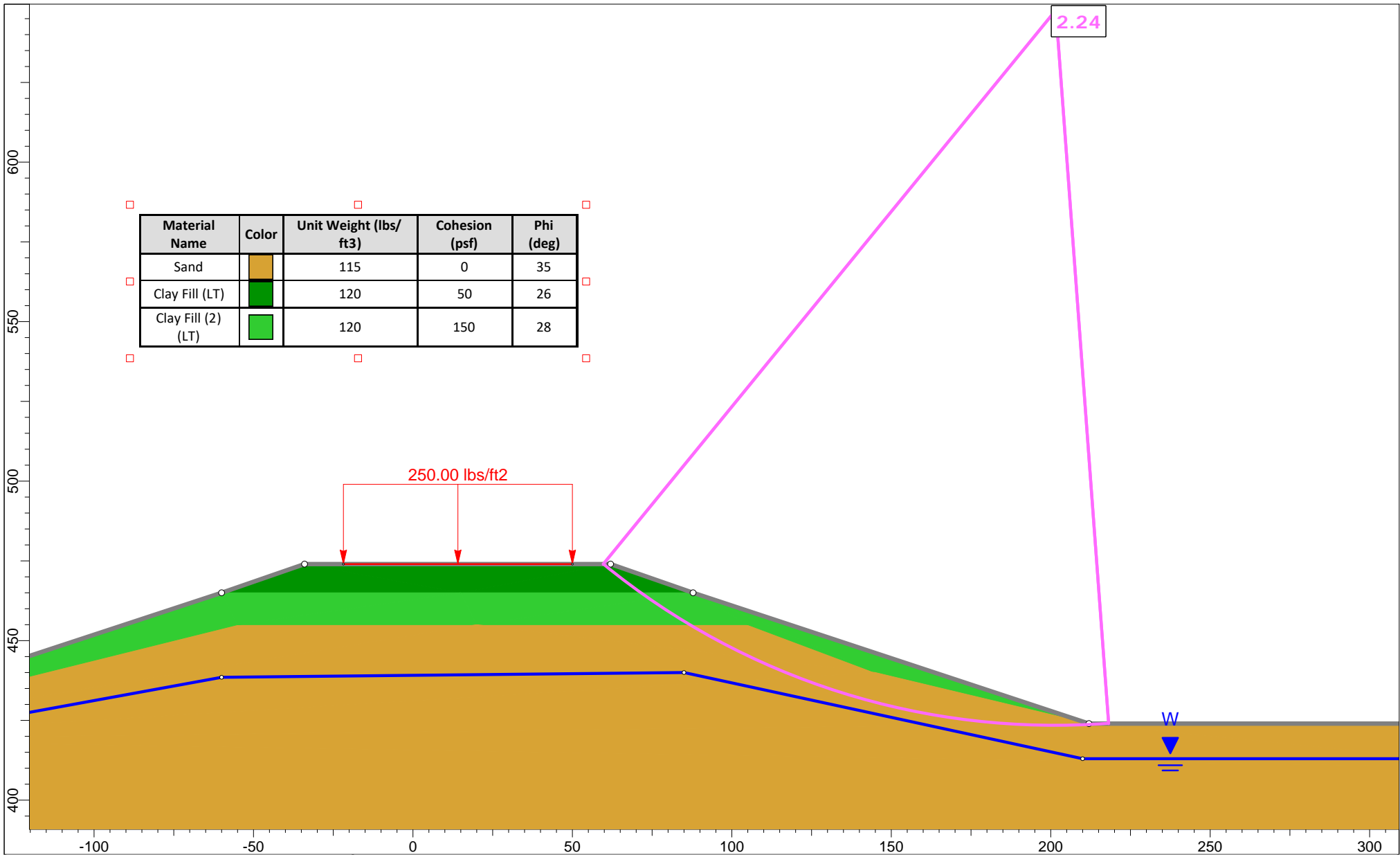
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| Silt/Loam |  | 120 | 50 | 28 |




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|---|---|-------------------------------|---|-------------------------------------|--|
|  | <i>Project</i> I-270 over COR - RGR - North Slopes | | | | |
| | <i>Analysis Description</i> STA 1889+50 - Long Term | | <i>Location</i> Madison County, IL | | |
| | <i>Drawn By</i> TJC | <i>Reviewed By:</i> PP | <i>Scale</i> 1:500 | <i>Company</i> SCI Engineering, Inc | |
| | <i>Date</i> 5/12/2021, 4:38:23 PM | <i>Project #</i> 2017-3167.10 | <i>File Name</i> 17-3167 RGR North Slope.slmd | | |

| Material Name | Color | Unit Weight (lbs/ft3) | Cohesion (psf) | Phi (deg) |
|---------------|---|-----------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Clay Fill (2) |  | 120 | 1500 | 0 |
| Sand |  | 115 | 0 | 35 |



| | | | | |
|---|--|-------------------------------|---|-------------------------------------|
|  | Project I-270 over COR - RGR - South Slopes | | | |
| | Analysis Description STA 1904+28 - Short Term | | Location Madison County, IL | |
| | Drawn By TJC | Reviewed By: PP | Scale 1:500 | Company SCI Engineering, Inc |
| | Date 5/12/2021, 4:38:23 PM | Project # 2017-3167.10 | File Name 17-3167 RGR South Slope.slmd | |



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|--------------------|---|-----------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
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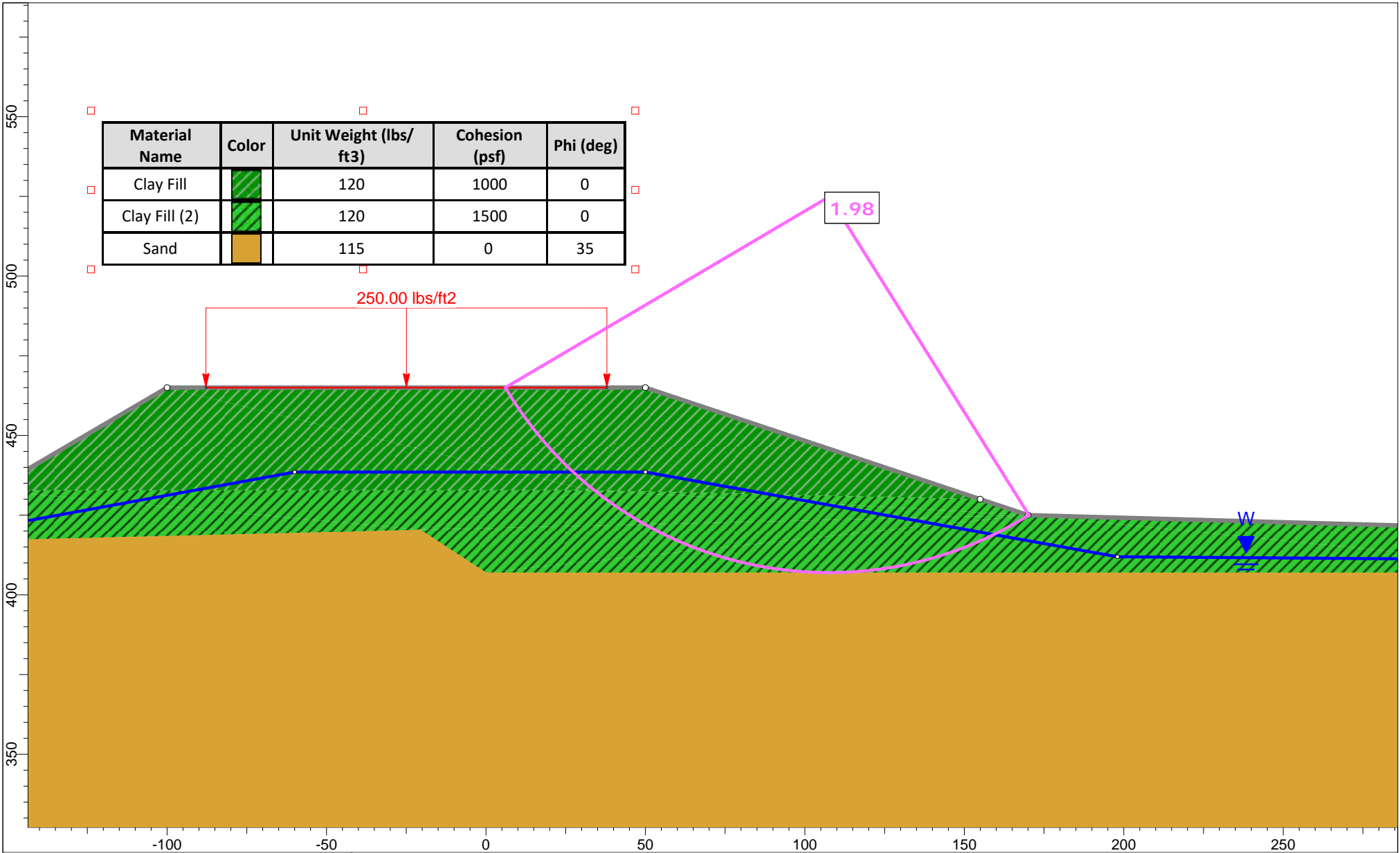
250.00 lbs/ft2

2.24

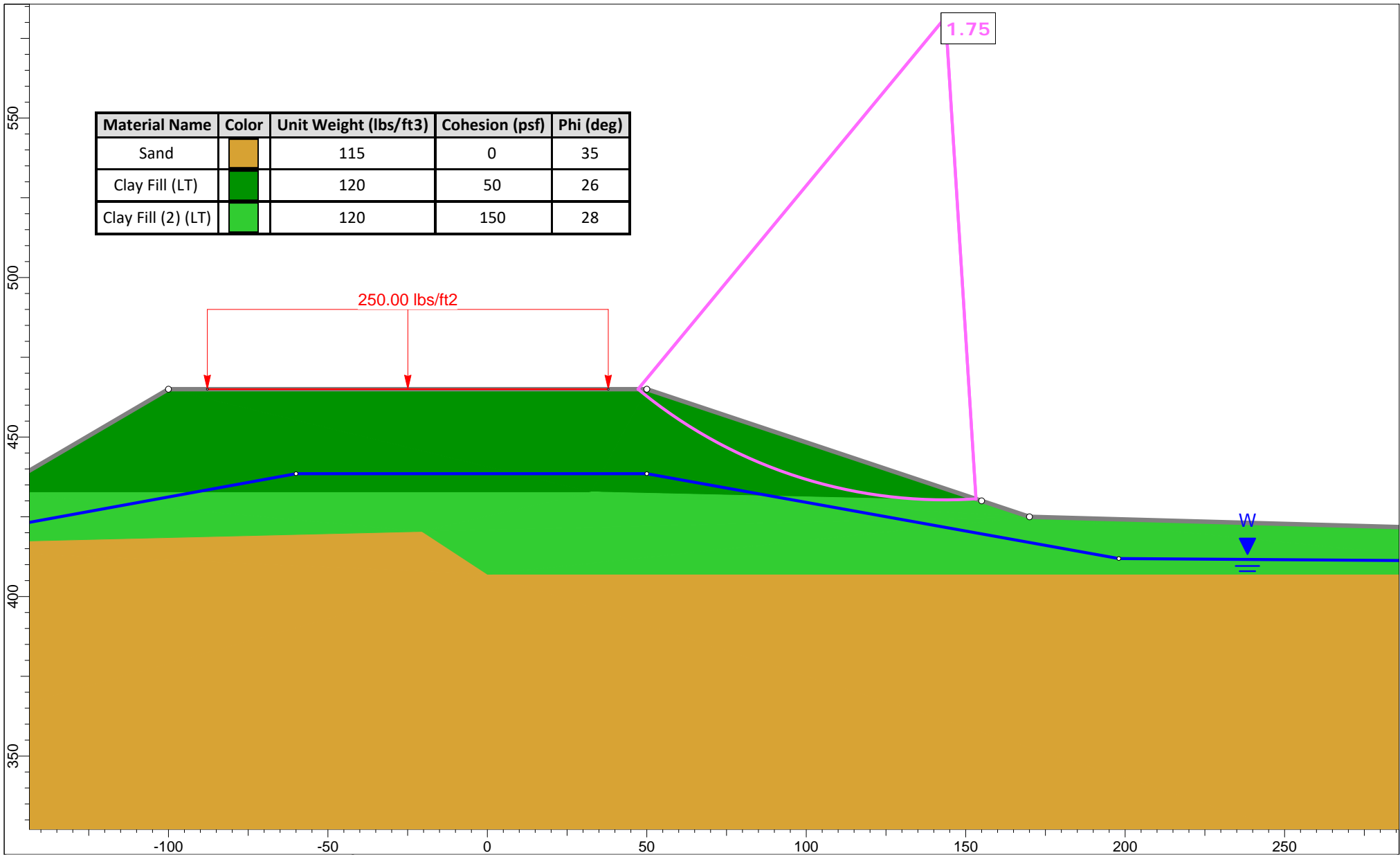
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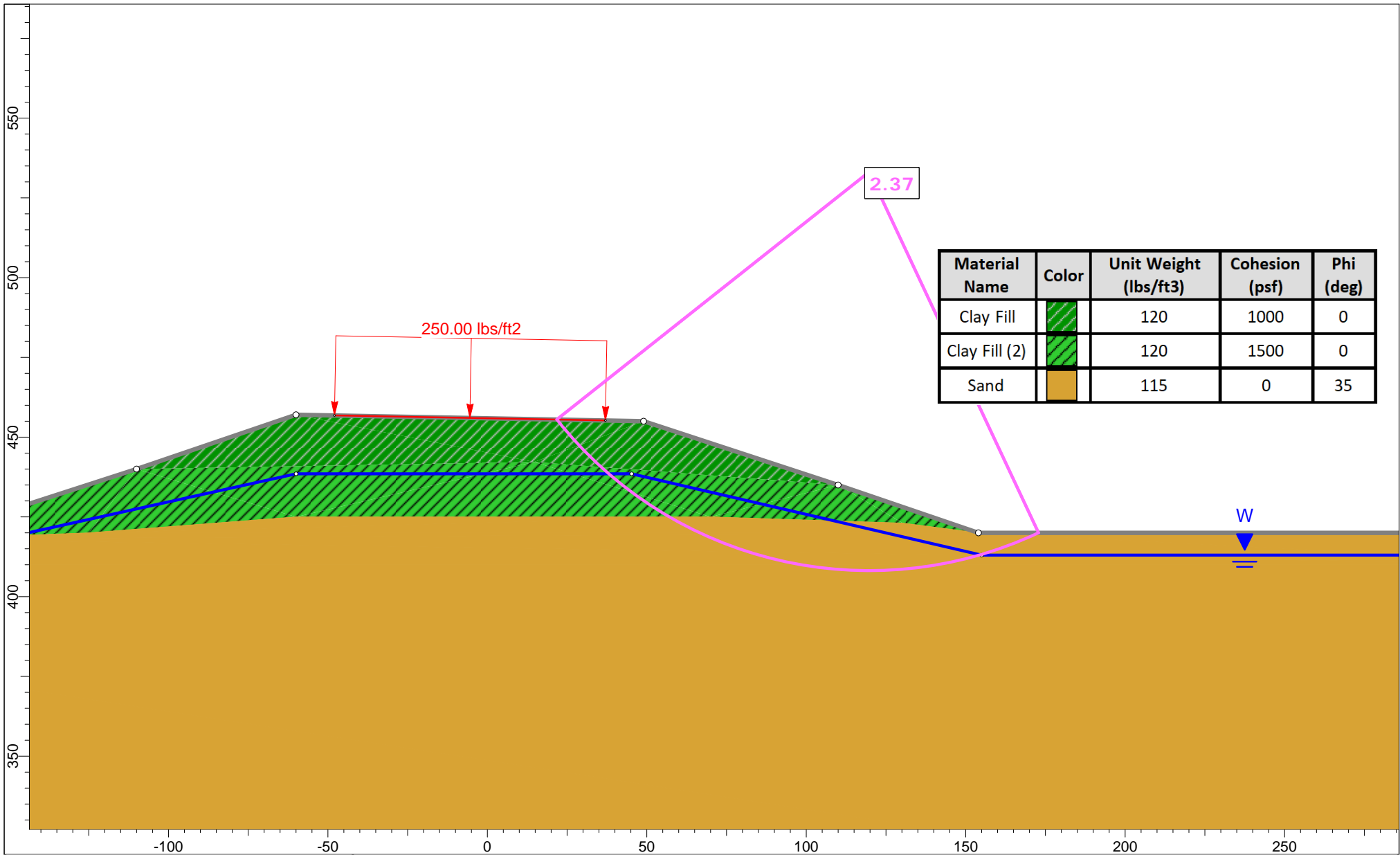
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| Project | | | | I-270 over COR - RGR - South Slopes | |
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| | | | | | Madison County, IL |
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| Project | | I-270 over COR - RGR - South Slopes | | |
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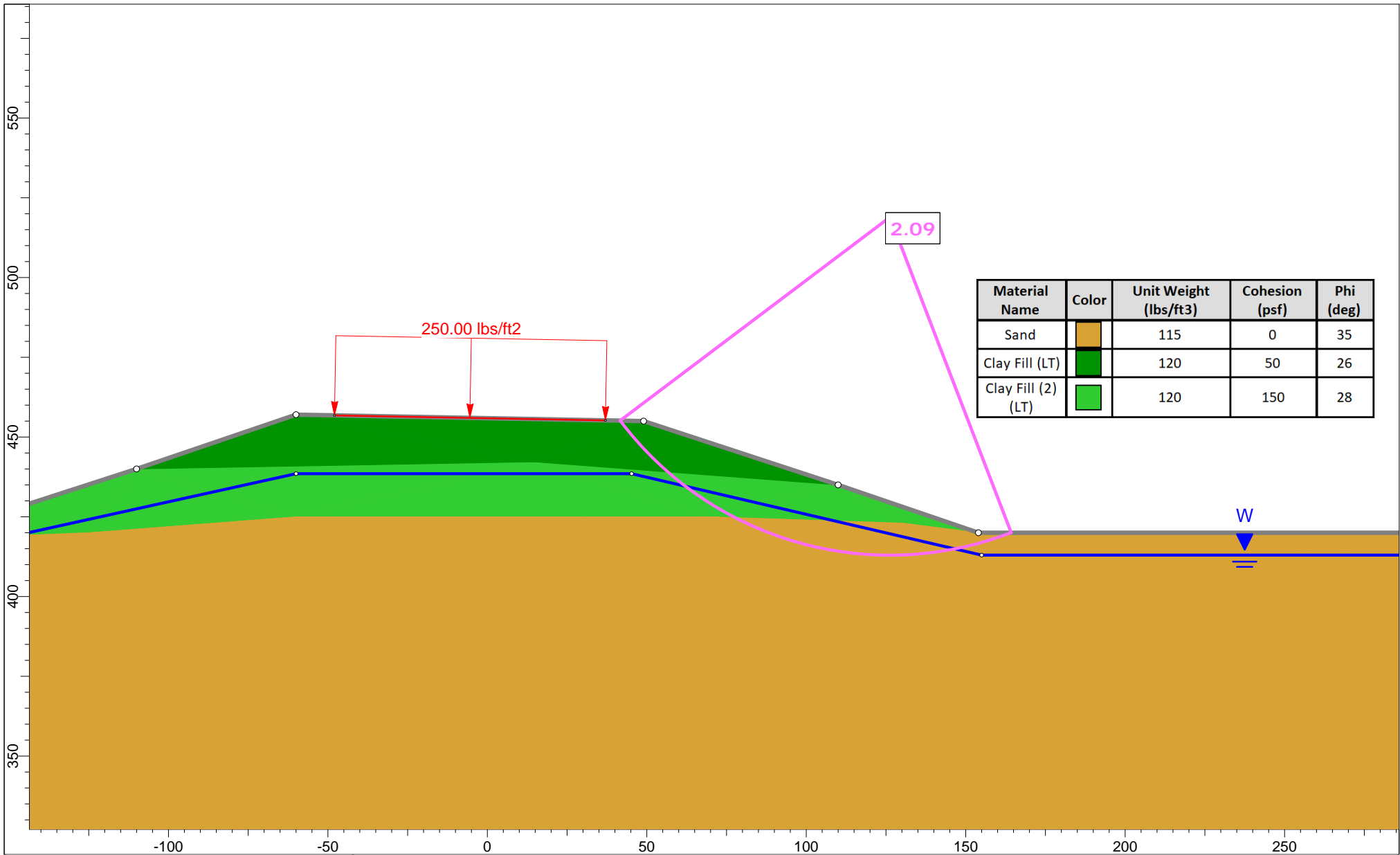
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|---------------|---|------------------------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Clay Fill (2) |  | 120 | 1500 | 0 |
| Sand |  | 115 | 0 | 35 |



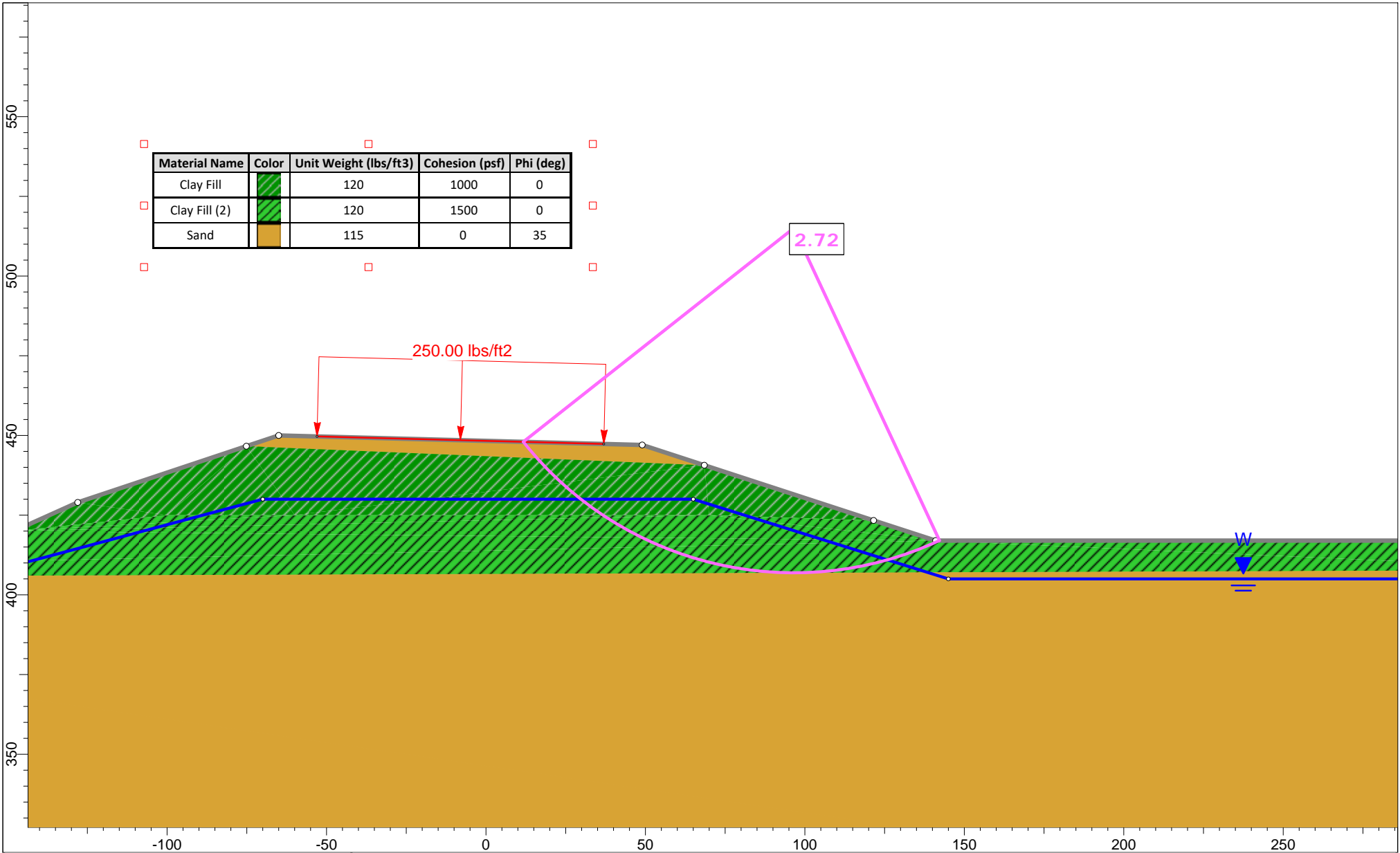
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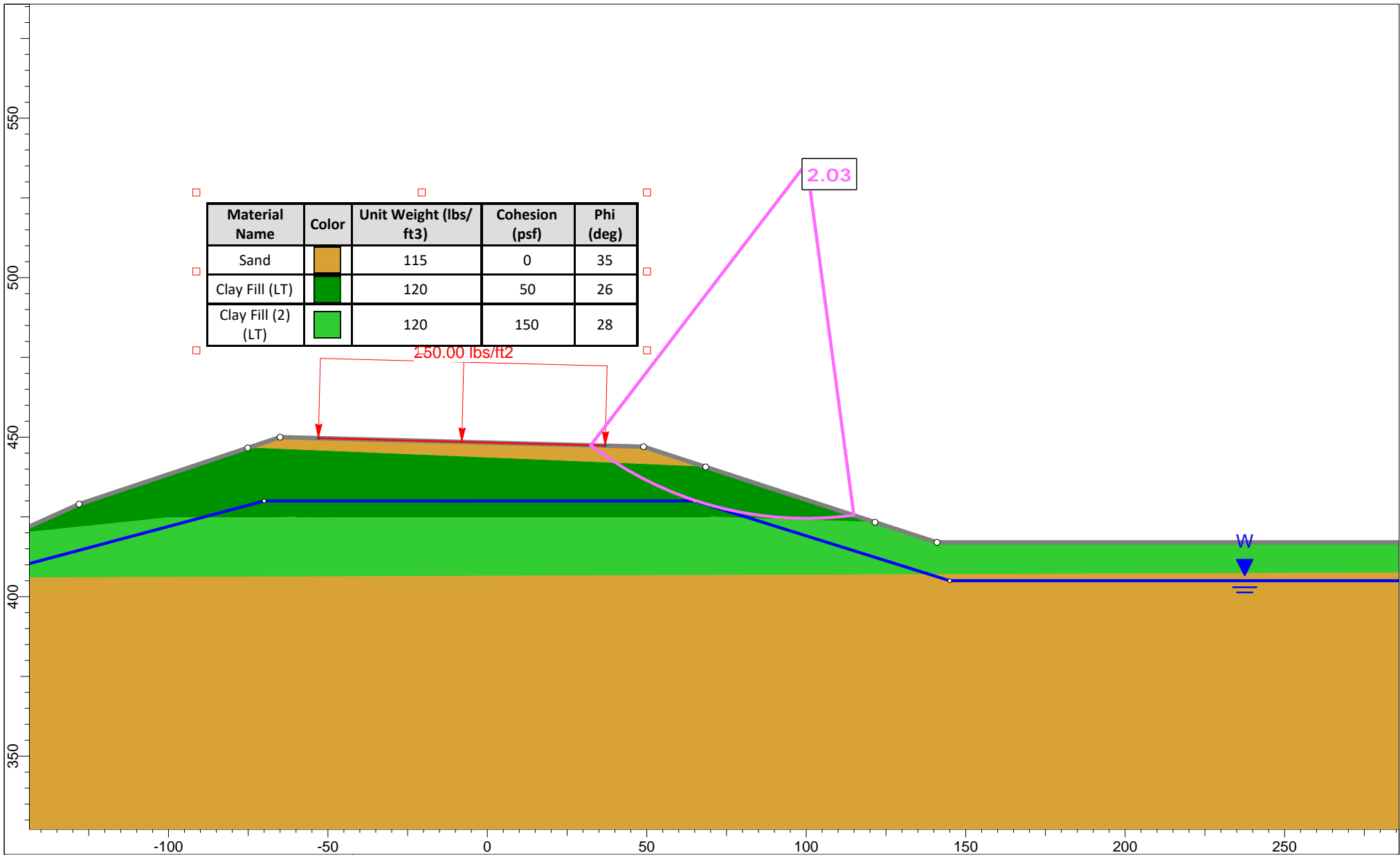
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|--------------------|---|-----------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
| Clay Fill (LT) |  | 120 | 50 | 26 |
| Clay Fill (2) (LT) |  | 120 | 150 | 28 |






| | | | | |
|----------------------|-----------------------|-------------------------------------|--------------------------------|---|
| Project | | I-270 over COR - RGR - South Slopes | | |
| Analysis Description | | STA 1898+70 - Long Term | Location Madison County, IL | |
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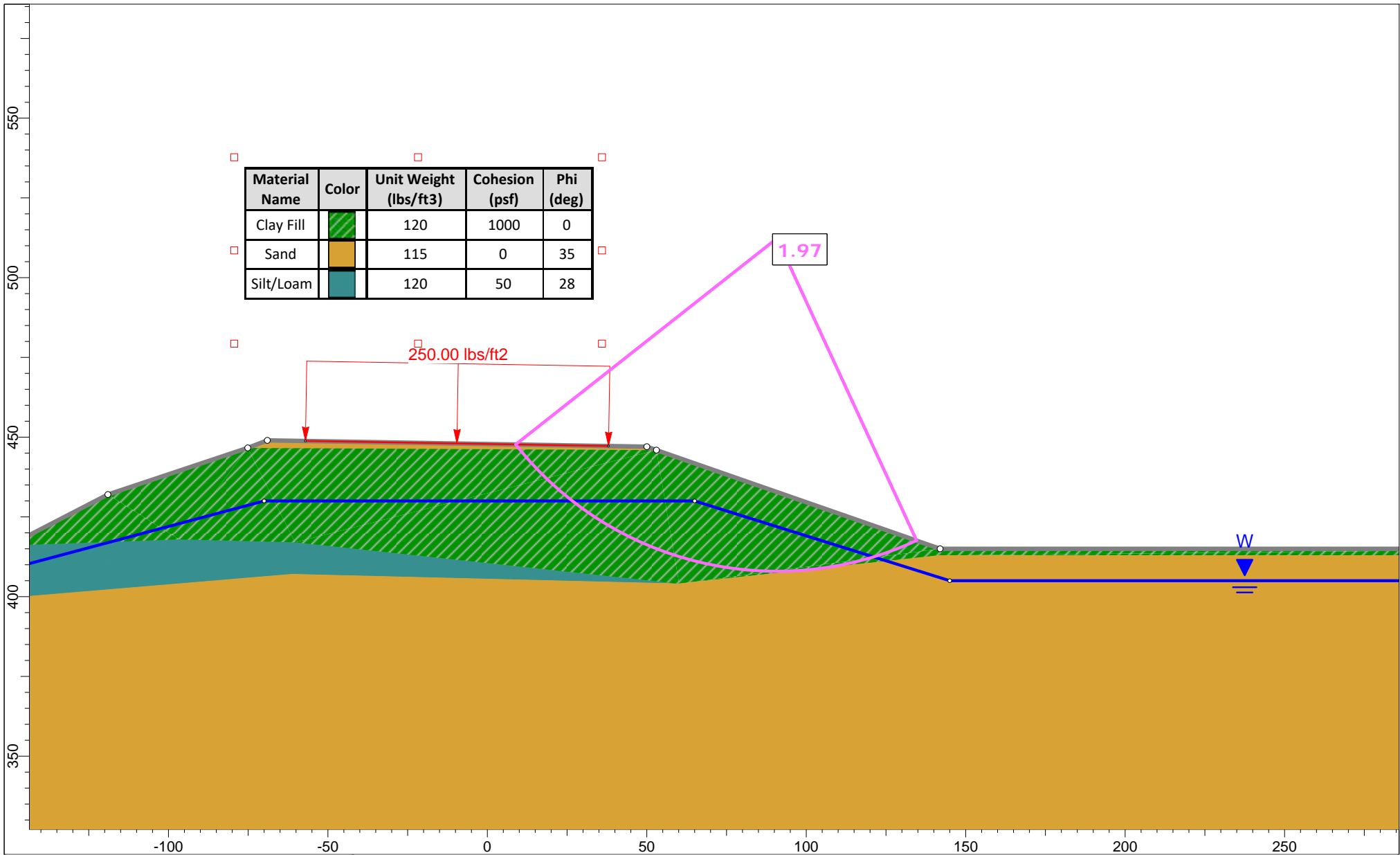
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| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
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| Sand |  | 115 | 0 | 35 |
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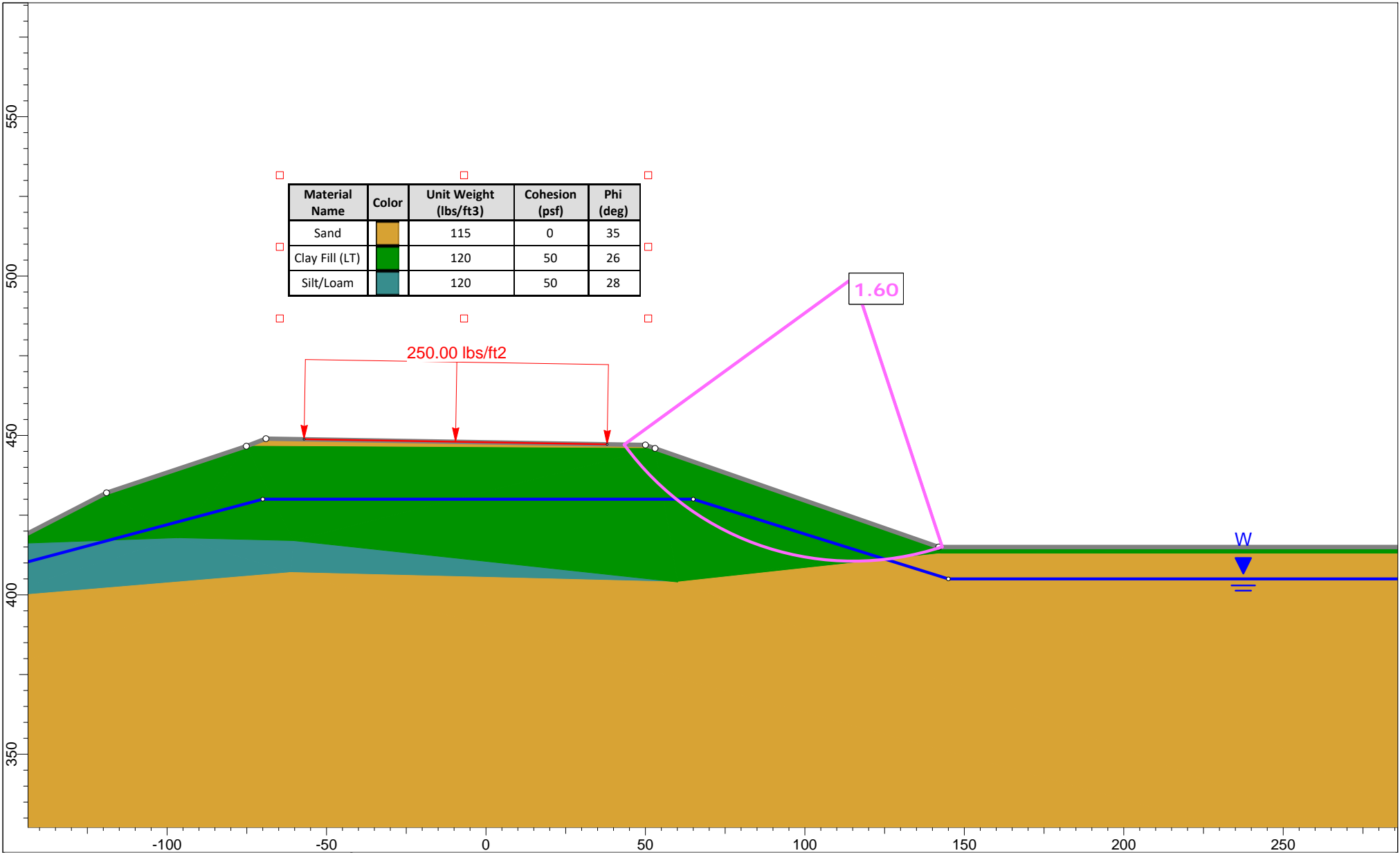
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| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|---------------|---|------------------------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Sand |  | 115 | 0 | 35 |
| Silt/Loam |  | 120 | 50 | 28 |



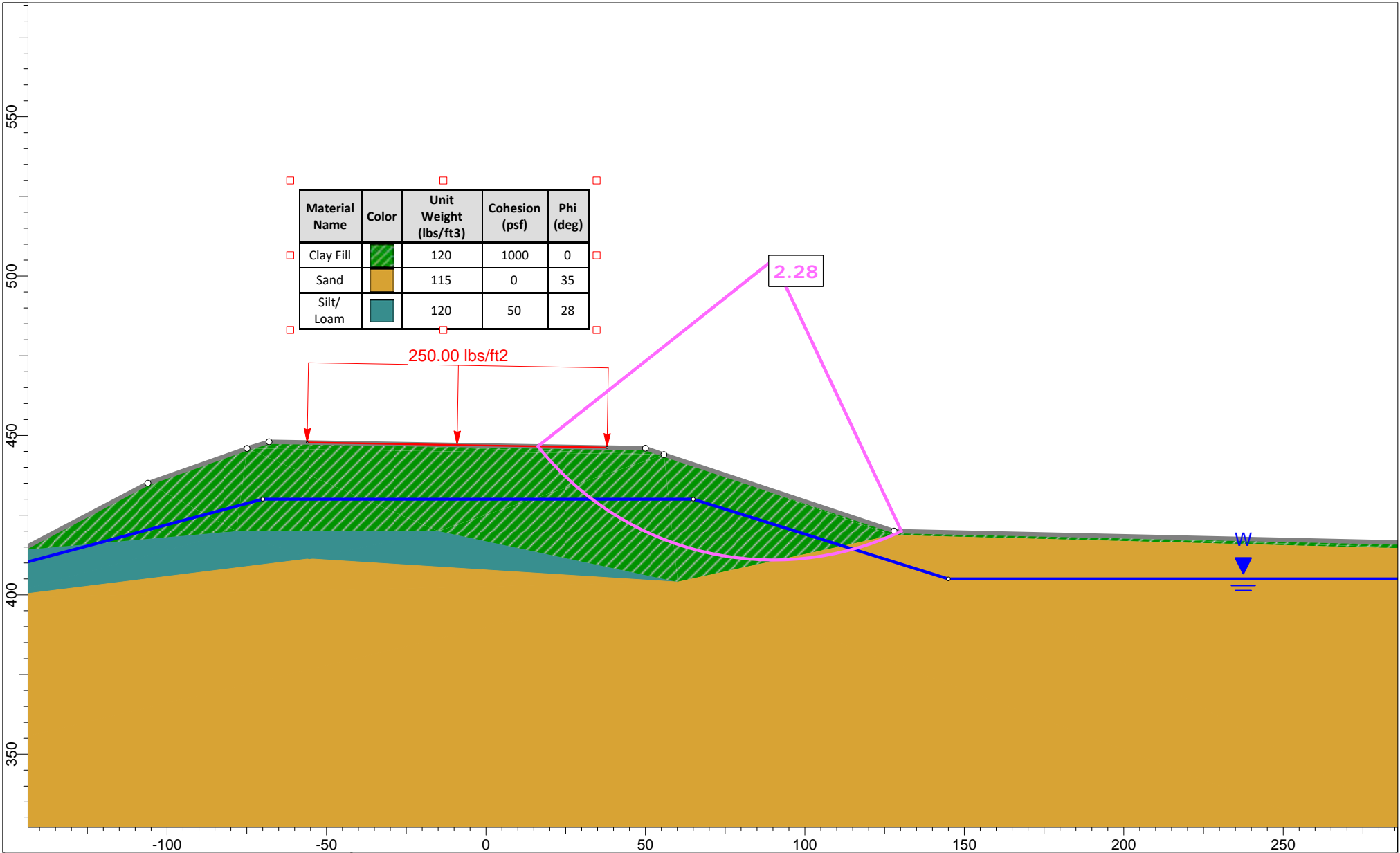
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| Clay Fill (LT) |  | 120 | 50 | 26 |
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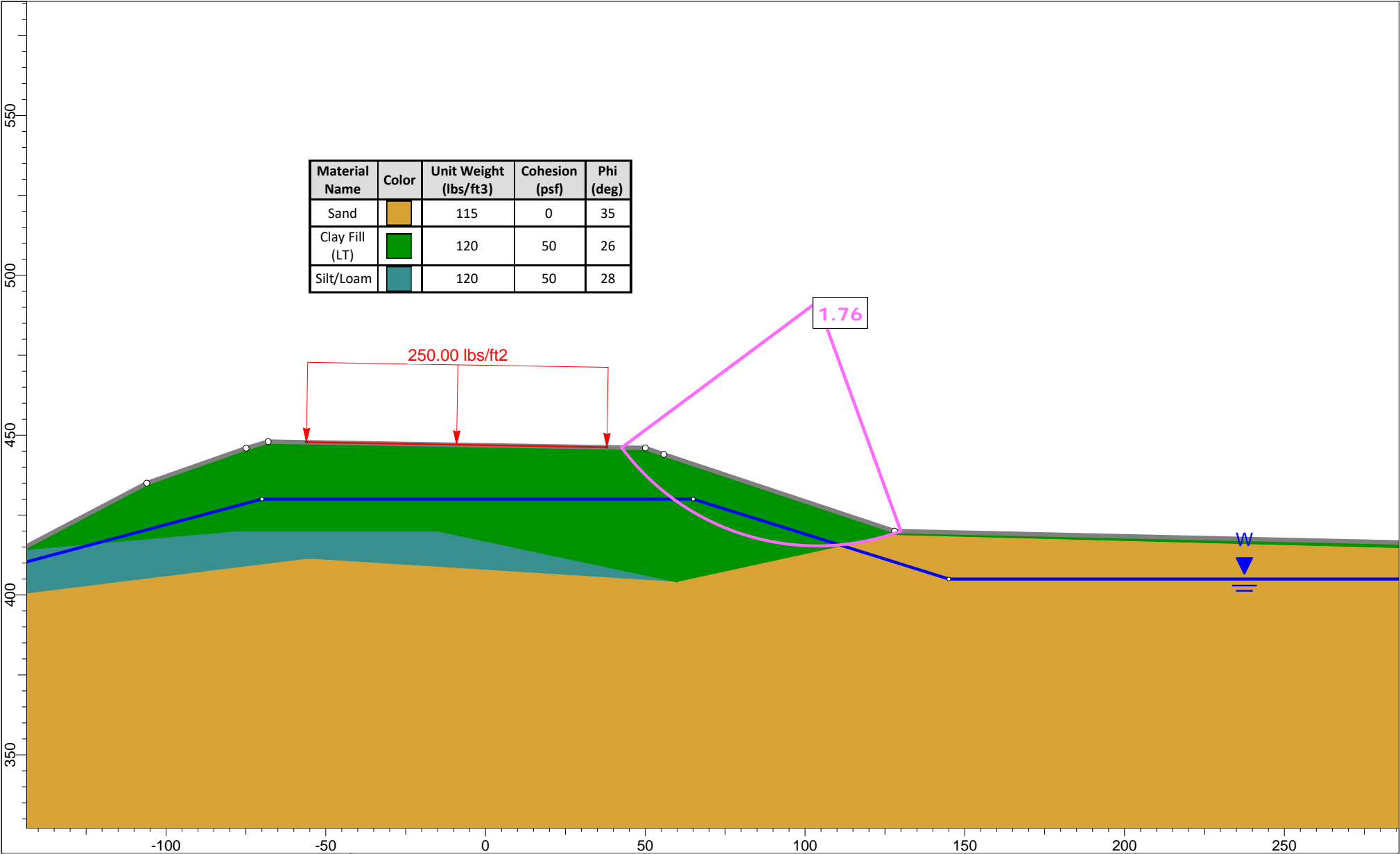
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| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|---------------|---|------------------------------------|----------------|-----------|
| Clay Fill |  | 120 | 1000 | 0 |
| Sand |  | 115 | 0 | 35 |
| Silt/Loam |  | 120 | 50 | 28 |



| | | | |
|----------------------|-----------------------|-------------------------------------|--------------------------------|
| Project | | I-270 over COR - RGR - South Slopes | |
| Analysis Description | | STA 1889+50 - Short Term | Location Madison County, IL |
| Drawn By | TJC | Reviewed By: | PP |
| Date | 5/12/2021, 4:38:23 PM | Scale | 1:500 |
| Project # | 2017-3167.10 | Company | SCI Engineering, Inc |
| | | File Name | 17-3167 RGR South Slope.slmd |



| Material Name | Color | Unit Weight (lbs/ft ³) | Cohesion (psf) | Phi (deg) |
|----------------|---|------------------------------------|----------------|-----------|
| Sand |  | 115 | 0 | 35 |
| Clay Fill (LT) |  | 120 | 50 | 26 |
| Silt/Loam |  | 120 | 50 | 28 |



| | | | |
|----------------------|-----------------------|-------------------------------------|--------------------------------|
| Project | | I-270 over COR - RGR - South Slopes | |
| Analysis Description | | STA 1889+50 - Long Term | Location Madison County, IL |
| Drawn By | TJC | Reviewed By: | PP |
| Date | 5/12/2021, 4:38:23 PM | Scale | 1:500 |
| Project # | 2017-3167.10 | Company | SCI Engineering, Inc |
| | | File Name | 17-3167 RGR South Slope.slmd |

Appendix E



GIS Information for the Explored RGR Borings/Soundings

Project: **I-270 over Mississippi River**
 SCI No. **2017-3167.10 Task 200**

| Boring/ Sounding | IL Northing | IL Easting | Project Northing | Project Easting | Latitude | Longitude | Section | Township | Range | EB Sta | EB OS FT | EB OS Side | WB Sta | WB OS FT | WB OS Side | Elevation FT |
|---------------------|-------------|--------------|---------------------|--------------------|------------|-------------|---------|----------|--------|------------|-------------|---------------|------------|-------------|---------------|-----------------|
| B-119 | 762605.3833 | 2298633.3980 | 762662.1559 | 298804.5210 | 38.7610421 | -90.1594832 | 36 | 4 North | 9 West | 1841+58.73 | 3.66 | LT | 2841+67.38 | 29.12 | RT | 442.4 |
| B-120 | 762557.9156 | 2298970.1410 | 762614.6846 | 299141.2891 | 38.7609117 | -90.1583023 | 36 | 4 North | 9 West | 1844+98.98 | 2.30 | RT | 2845+04.56 | 32.26 | RT | 443.7 |
| B-121 | 762542.8562 | 2299273.2950 | 762599.6241 | 299444.4656 | 38.7608703 | -90.1572391 | 36 | 4 North | 9 West | 1848+02.12 | 8.08 | RT | 2848+05.16 | 36.09 | RT | 444.7 |
| B-122 | 762555.1554 | 2299560.5250 | 762611.9242 | 299731.7170 | 38.7609039 | -90.1562318 | 36 | 4 North | 9 West | 1850+88.90 | 11.21 | RT | 2850+89.66 | 37.88 | RT | 444.9 |
| B-123 | 762596.8499 | 2299881.0340 | 762653.6218 | 300052.2499 | 38.7610183 | -90.1551078 | 36 | 4 North | 9 West | 1854+11.03 | 14.87 | RT | 2854+09.31 | 40.63 | RT | 444.1 |
| B-124 | 762653.0141 | 2300143.3750 | 762709.7902 | 300314.6104 | 38.7611725 | -90.1541877 | 36 | 4 North | 9 West | 1856+78.10 | 18.60 | RT | 2856+74.36 | 44.10 | RT | 443.1 |
| B-125 | 762753.7384 | 2300464.4140 | 762810.5220 | 300635.6733 | 38.7614489 | -90.1530618 | 36 | 4 North | 9 West | 1860+12.82 | 20.89 | RT | 2860+06.54 | 46.68 | RT | 442.5 |
| B-126 | 762866.1138 | 2300737.0910 | 762922.9058 | 300908.3706 | 38.7617573 | -90.1521054 | 36 | 4 North | 9 West | 1863+05.98 | 23.72 | RT | 2862+97.41 | 50.34 | RT | 442.5 |
| B-127 | 763013.4878 | 2301018.8850 | 763070.2908 | 301190.1856 | 38.7621619 | -90.1511171 | 25 | 4 North | 9 West | 1866+21.89 | 25.51 | RT | 2866+10.74 | 63.62 | RT | 442.5 |
| B-128 | 763381.7273 | 2301625.8660 | 763438.5577 | 301797.2118 | 38.7631727 | -90.1489881 | 30 | 4 North | 9 West | 1873+30.14 | 48.16 | RT | 2873+17.95 | 76.45 | RT | 441.5 |
| B-129 | 763278.9194 | 2301709.8660 | 763335.7421 | 301881.2180 | 38.7628904 | -90.1486936 | 30 | 4 North | 9 West | 1873+43.58 | 180.25 | RT | 2873+31.59 | 208.52 | RT | 419.5 |
| B-132 | 763673.9406 | 2302098.6670 | 763730.7927 | 302270.0480 | 38.7639748 | -90.1473297 | 30 | 4 North | 9 West | 1878+90.30 | 48.85 | RT | 2878+80.99 | 72.54 | RT | 441.4 |
| B-133 | 763583.4181 | 2302164.1130 | 763640.2635 | 302335.4989 | 38.7637262 | -90.1471003 | 30 | 4 North | 9 West | 1879+04.87 | 159.65 | RT | 2878+96.94 | 183.17 | RT | 412.4 |
| B-136 | 763901.4319 | 2302532.0200 | 763958.3010 | 302703.4332 | 38.7645992 | -90.1458097 | 30 | 4 North | 9 West | 1883+83.92 | 30.53 | RT | 2883+76.66 | 48.55 | RT | 442.2 |
| B-137 | 763802.5020 | 2302578.4750 | 763859.3637 | 302749.8917 | 38.7643275 | -90.1456469 | 30 | 4 North | 9 West | 1883+89.17 | 139.72 | RT | 2883+83.28 | 157.66 | RT | 419.1 |
| B-138 | 763985.9190 | 2302503.3450 | 764042.7943 | 302674.7561 | 38.7648312 | -90.1459102 | 30 | 4 North | 9 West | 1883+89.66 | 58.51 | LT | 2883+81.37 | 40.55 | LT | 446.3 |
| B-139 | 764072.8765 | 2302480.0110 | 764129.7583 | 302651.4204 | 38.7650700 | -90.1459920 | 30 | 4 North | 9 West | 1884+00.88 | 147.81 | LT | 2883+91.61 | 129.99 | LT | 419.7 |
| B-144 | 764057.3798 | 2302994.1500 | 764114.2605 | 303165.5976 | 38.7650271 | -90.1441888 | 30 | 4 North | 9 West | 1888+75.49 | 37.13 | RT | 2888+69.32 | 55.63 | RT | 441.9 |
| B-145 | 763970.2527 | 2303012.5300 | 764027.1269 | 303183.9790 | 38.7647879 | -90.1441244 | 30 | 4 North | 9 West | 1888+68.39 | 125.91 | RT | 2888+61.81 | 144.38 | RT | 429.7 |
| B-146 | 764134.7746 | 2302972.7030 | 764191.6610 | 303144.1491 | 38.7652396 | -90.1442640 | 30 | 4 North | 9 West | 1888+76.70 | 43.18 | LT | 2888+70.86 | 24.67 | LT | 447.8 |
| B-147 | 764228.5067 | 2302950.1620 | 764285.4001 | 303121.6064 | 38.7654970 | -90.1443429 | 30 | 4 North | 9 West | 1888+81.31 | 139.47 | LT | 2888+75.87 | 120.95 | LT | 417.4 |
| B-152 | 764149.5216 | 2303391.6780 | 764206.4091 | 303563.1552 | 38.7652799 | -90.1427945 | 30 | 4 North | 9 West | 1892+87.25 | 42.45 | RT | 2892+83.83 | 61.13 | RT | 442.1 |
| B-153 | 764054.6432 | 2303403.5000 | 764111.5237 | 303574.9781 | 38.7650193 | -90.1427531 | 30 | 4 North | 9 West | 1892+80.16 | 137.81 | RT | 2892+77.99 | 156.58 | RT | 439.3 |
| B-154 | 764224.4477 | 2303375.2720 | 764281.3408 | 303546.7480 | 38.7654856 | -90.1428520 | 30 | 4 North | 9 West | 1892+85.77 | 34.25 | LT | 2892+81.34 | 15.54 | LT | 449.0 |
| B-155 | 764330.1007 | 2303351.5690 | 764387.0017 | 303523.0433 | 38.7657757 | -90.1429350 | 30 | 4 North | 9 West | 1892+83.21 | 142.50 | LT | 2892+77.42 | 123.75 | LT | 418.6 |
| B-160 | 764214.3188 | 2303928.1310 | 764271.2111 | 304099.6482 | 38.7654564 | -90.1409262 | 30 | 4 North | 9 West | 1898+33.46 | 51.34 | RT | 2898+31.93 | 62.87 | RT | 448.8 |
| B-161 | 764047.1951 | 2303917.9870 | 764104.0750 | 304089.5034 | 38.7649985 | -90.1409487 | 30 | 4 North | 9 West | 1898+09.30 | 217.14 | RT | 2898+10.05 | 228.97 | RT | 429.4 |
| B-162 | 764284.9945 | 2303924.4420 | 764341.8921 | 304095.9589 | 38.7656514 | -90.1409259 | 30 | 4 North | 9 West | 1898+35.23 | 19.41 | LT | 2898+32.75 | 7.91 | LT | 456.7 |
| B-163 | 764413.8938 | 2303912.6660 | 764470.8010 | 304084.1820 | 38.7660054 | -90.1409670 | 30 | 4 North | 9 West | 1898+33.45 | 148.84 | LT | 2898+29.30 | 137.30 | LT | 419.7 |
| B-169 | 763978.1496 | 2304436.5570 | 764035.0244 | 304608.1120 | 38.7648085 | -90.1391301 | 30 | 4 North | 9 West | 1903+27.09 | 319.12 | RT | 2903+24.89 | 330.12 | RT | 427.5 |
| B-170 | 764318.8960 | 2304468.5540 | 764375.7961 | 304640.1114 | 38.7657441 | -90.1390175 | 30 | 4 North | 9 West | 1903+80.15 | 19.01 | LT | 2903+77.95 | 8.01 | LT | 472.8 |
| C-131 | 763393.6229 | 2301875.8730 | 763450.4542 | 302047.2374 | 38.7632052 | -90.1481113 | 30 | 4 North | 9 West | 1875+46.97 | 175.83 | RT | 2875+37.15 | 203.22 | RT | 419.5 |
| C-135 | 763643.4383 | 2302341.5330 | 763700.2881 | 302512.9321 | 38.7638909 | -90.1464780 | 30 | 4 North | 9 West | 1880+97.37 | 187.53 | RT | 2880+90.78 | 208.88 | RT | 410.1 |
| C-141 | 763893.4034 | 2302790.2210 | 763950.2719 | 302961.6535 | 38.7645770 | -90.1449042 | 30 | 4 North | 9 West | 1886+26.43 | 130.49 | RT | 2886+18.89 | 147.96 | RT | 424.6 |
| C-142 | 764069.5379 | 2302736.8050 | 764126.4195 | 302908.2335 | 38.7650607 | -90.1450914 | 30 | 4 North | 9 West | 1886+34.66 | 53.40 | LT | 2886+27.91 | 35.89 | LT | 447.2 |
| C-143 | 764160.7608 | 2302716.5320 | 764217.6492 | 302887.9590 | 38.7653112 | -90.1451624 | 30 | 4 North | 9 West | 1886+45.43 | 146.21 | LT | 2886+39.09 | 128.65 | LT | 418.5 |



GIS Information for the Explored RGR Borings/Soundings

Project: **I-270 over Mississippi River**
 SCI No. **2017-3167.10 Task 200**

| Boring/ Sounding | IL Northing | IL Easting | Project Northing | Project Easting | Latitude | Longitude | Section | Township | Range | EB Sta | EB OS FT | EB OS Side | WB Sta | WB OS FT | WB OS Side | Elevation FT |
|---------------------|-------------|--------------|---------------------|--------------------|------------|-------------|---------|----------|--------|------------|-------------|---------------|------------|-------------|---------------|-----------------|
| C-148 | 764109.8659 | 2303202.4780 | 764166.7505 | 303373.9412 | 38.7651711 | -90.1434581 | 30 | 4 North | 9 West | 1890+92.17 | 40.39 | RT | 2890+86.87 | 59.78 | RT | 441.7 |
| C-149 | 764018.0928 | 2303223.3660 | 764074.9705 | 303394.8307 | 38.7649191 | -90.1433849 | 30 | 4 North | 9 West | 1890+90.75 | 134.51 | RT | 2890+85.04 | 153.89 | RT | 433.8 |
| C-150 | 764187.5983 | 2303186.5180 | 764244.4887 | 303357.9800 | 38.7653845 | -90.1435140 | 30 | 4 North | 9 West | 1890+94.99 | 38.92 | LT | 2890+90.03 | 19.52 | LT | 448.4 |
| C-151 | 764271.1162 | 2303169.1280 | 764328.0128 | 303340.5887 | 38.7656139 | -90.1435749 | 30 | 4 North | 9 West | 1890+97.70 | 124.19 | LT | 2890+93.08 | 104.78 | LT | 421.5 |
| C-156 | 764187.7030 | 2303629.1290 | 764244.5934 | 303800.6239 | 38.7653845 | -90.1419617 | 30 | 4 North | 9 West | 1895+30.09 | 44.90 | RT | 2895+27.60 | 60.42 | RT | 443.2 |
| C-157 | 764085.5789 | 2303647.3810 | 764142.4617 | 303818.8773 | 38.7651041 | -90.1418978 | 30 | 4 North | 9 West | 1895+33.70 | 148.59 | RT | 2895+32.64 | 164.06 | RT | 443.8 |
| C-158 | 764258.7583 | 2303619.4950 | 764315.6540 | 303790.9892 | 38.7655796 | -90.1419954 | 30 | 4 North | 9 West | 1895+30.70 | 26.81 | LT | 2895+27.26 | 11.29 | LT | 450.5 |
| C-159 | 764362.4766 | 2303603.4870 | 764419.3800 | 303774.9800 | 38.7658644 | -90.1420515 | 30 | 4 North | 9 West | 1895+29.67 | 131.76 | LT | 2895+24.90 | 116.21 | LT | 421.0 |
| C-160 | 764213.9759 | 2303924.3580 | 764270.8682 | 304095.8749 | 38.7654564 | -90.1409262 | 30 | 4 North | 9 West | 1898+29.63 | 51.39 | RT | 2898+28.09 | 62.97 | RT | 448.9 |
| C-164 | 764126.5555 | 2304222.4290 | 764183.4413 | 304393.9681 | 38.7652160 | -90.1398810 | 30 | 4 North | 9 West | 1901+22.56 | 157.72 | RT | 2901+20.36 | 168.72 | RT | 457.6 |
| C-165 | 763997.9048 | 2304242.7810 | 764054.7810 | 304414.3216 | 38.7648629 | -90.1398097 | 30 | 4 North | 9 West | 1901+34.90 | 287.39 | RT | 2901+32.70 | 298.39 | RT | 424.3 |
| C-166 | 764305.5089 | 2304238.9570 | 764362.4080 | 304410.4973 | 38.7657075 | -90.1398228 | 30 | 4 North | 9 West | 1901+50.15 | 19.88 | LT | 2901+47.95 | 8.88 | LT | 465.9 |
| C-167 | 764468.1542 | 2304259.2890 | 764525.0654 | 304430.8308 | 38.7661541 | -90.1397513 | 30 | 4 North | 9 West | 1901+80.52 | 180.97 | LT | 2901+78.32 | 169.97 | LT | 419.3 |
| C-168 | 764145.3707 | 2304511.0040 | 764202.2579 | 304682.5646 | 38.7652680 | -90.1388690 | 30 | 4 North | 9 West | 1904+11.77 | 156.82 | RT | 2904+09.56 | 167.82 | RT | 466.6 |
| C-171 | 764491.8838 | 2304512.3950 | 764548.7968 | 304683.9557 | 38.7662191 | -90.1388636 | 30 | 4 North | 9 West | 1904+34.63 | 188.96 | LT | 2904+32.43 | 177.96 | LT | 420.7 |

Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time to perform additional study.* Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



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