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ROADWAY GEOTECHNICAL REPORT_REVISION 2

IL 127 near Amphitheater Campground, Slope Stability PTB 199-039 – WO 2 and 3, Loc. 1

JACKSON COUNTY, ILLINOIS

SHANNON & WILSON

July 25, 2022

Shannon & Wilson No: 106747-005

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Submitted To: Illinois Department of Transportation – District 9
2801 W Murphysboro Road
Carbondale, IL 62901
Attn: Aaron W. Hayes

Subject: ROADWAY GEOTECHNICAL REPORT_REVISION 2, IL 127 NEAR AMPHITHEATER CAMPGROUND, SLOPE STABILITY PTB 199-039 – WO 2 AND 3, LOC. 1, JACKSON COUNTY, ILLINOIS

Shannon & Wilson prepared this revised report and participated in the project as a subconsultant to Holcomb Foundation Engineering Company, Inc. (Holcomb). Holcomb is contracted to the Illinois Department of Transportation (IDOT) to provide geotechnical services as part of PTB 199, Item #39, under Job No. P-99-004-21, which is a various/various contract for IDOT District 9. The project summarized in this report is Location 1 under contract Work Order Nos. 2 and 3, which were assigned to the consultant team in December 2021 and April 2022, respectively.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON, INC.
Illinois Professional Design Firm
License No. 184-001377

LICENSED PROFESSIONAL ENGINEER
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7/25/22

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1 INTRODUCTION

This report has been revised following our teleconference with you and Tim Holcomb (Holcomb) on June 26, 2022, to incorporate results of additional stability analyses requested by you. This revised report presents our geotechnical stability assessment and concept-level remediation alternatives to improve stability for the eastern slope of IL 127 near Amphitheatre Campground, which is referred to as Location 1 of Work Order Nos. 2 and 3 for PTB 199-039. This report has been revised to incorporate additional field data collected since our previous report and to include additional analyses based on our phone and email conversations. The recommendations presented in this report are based on our review of provided boring logs and inclinometer data and results of our slope stability analysis. The remediation alternatives are intended as concept-level design for planning and costing purposes only. Additional design effort will be required to advance the selected alternative to final design.

We prepared this report in accordance with the IDOT Geotechnical Manual (IDOT, 2020). The report format and content match the requirements for a Roadway Geotechnical Report, as defined in the manual.

1.1 Project Description and Location

The project is located near mile post 4.0 along IL 127 in Jackson County, northeast of the town of Pomona, Illinois, as shown on Figures 1 and 2. IDOT reports that the eastern slope of the embankment failed, a temporary repair was implemented, and the pavement repaired. IDOT provided “WO #1 Loc #1 IL 127 slide binder.pdf” which included boring logs performed by IDOT in April 2020 and photos of the site. IDOT also provided inclinometer data for Borings 1-SF and 2-SF, as well as site survey data in CAD format. As part of Work Order No. 1, Holcomb Foundation Engineering Company, Inc. (Holcomb) and Gonzalez Companies (Gonzalez) performed additional borings and lab testing in September 2021, and this additional data was provided for our use.

1.2 Scope of Services

Our scope of services for this project under Work Order Nos. 2 and 3 consists of engineering analyses and reporting related to analyzing the improvement in stability of the embankment by repairing with a buttress and also with a full removal and reconstruction of the embankment. The scope of services performed by our teammate consulting firms under

Work Order No. 1 included borings, which were performed by Holcomb and logged by Gonzalez. Laboratory testing was conducted by Gonzalez.

2 GEOLOGY AND PEDOLOGY

The project site is along a ridge above Big Branch, a tributary to Cedar Creek. The Pomona Fault, is mapped by Seid, Nelson, and Devera (2007) approximately 1.5 miles southwest of the site. The Web Soil Survey (2022) indicates the surficial soils at the site consist of the Menfro Silt Loam (79E3) and the Neotomoa-Wellston complex (977G). The Menfro Silt Loam is characterized by 18 to 25 percent slopes and is severely eroded in the project area. The soil classifies as a lean clay (CL) to silty lean clay (CL-ML). The Neotomoa-Wellston complex is characterized by 35 to 70 percent slopes in the project area and composed of lean clays, silts, gravel and sand. Geologic maps indicate the site is underlain by the Lower Tradewater Formation (Ptl) and Caseville Formation (Pcv). Seid, Nelson, and Devera (2007) indicate the Lower Tradewater Formation is composed of sandstone, shale and conglomerate, while the Caseville Formation is composed of sandstone, siltstone, and shale.

3 FIELD EXPLORATION

Field exploration performed for the project consisted of borings and instrumentation which were performed by others. The sections below summarize the field exploration program.

3.1 Borings

Subsurface explorations consist of six borings performed by IDOT and two borings performed by Holcomb. The IDOT borings are designated 1-SF through 6-SF and were performed off the east and west shoulders of IL 127 in the vicinity of the embankment failure, as shown in Appendix A, Figure A-1. IDOT performed Borings 1-SF and 2-SF in April 2020. Borings 3-SF through 6-SF were performed in June 2021. Holcomb performed Borings 7-SF and 8-SF in September 2021 as part of Work Order No. 1. A representative from Gonzalez logged Borings 7-SF and 8-SF and transported the samples to their laboratory for further classification and index testing.

All borings were drilled with an 8-inch-diameter hollow stem auger. Borings were sampled with a split-spoon sampler using the Standard Penetration Test (SPT). Coring of sandstone was conducted in Borings 2-SF and 8-SF. Coring of shale was conducted in Boring 4-SF. Appendix A presents the log for each boring.

3.2 Instrumentation

IDOT instrumented Borings 1-SF and 2-SF with inclinometer casing. IDOT representatives subsequently collected deflection measurements of the casing in 2020 and 2021, with the first reading on May 26, 2020, and the last reading on May 25, 2021. The inclinometer data indicates progressive slope displacement in the depth interval between the ground surface and about 16 to 18 feet below the ground surface, which corresponds to the transition zone between clay and shale. See Appendix B for figures presenting the inclinometer data.

3.3 Laboratory Testing

Laboratory testing was conducted by others (IDOT and Gonzalez) on selected samples retrieved from the borings, including index testing and soil strength testing on SPT and core samples. Index testing consisted of water content determination and Atterberg limits tests. Soil/rock strength testing consisted of unconfined compression testing. Laboratory test results and boring logs are included in Appendix A.

3.4 Site Visit

S&W conducted a site visit on April 15, 2022 with Aaron Hayes from Illinois Department of Transportation and Tim Holcomb of Holcomb Foundation Engineering. Two cross sections were surveyed during the site visit along the slope to aid in slope stability analyses. A buried fiber optic line located within the eastern slope of the embankment about 40-feet from the edge of the pavement was also noted. Seepage was observed near the center of the slide about 88-feet from the centerline of the road.

4 GENERAL SUBGRADE CONDITIONS

We characterized subsurface conditions at the project site using local geologic maps and the available subsurface data. The sections below present our characterization of subsurface conditions.

4.1 Stratigraphy

The project site includes the following stratigraphic units:

- Lean Clay (CL) – This unit is a soft to stiff lean clay. The unit is brown to gray.
- Slip Plane (clay/shale transition zone) – This unit is a medium stiff to stiff clay to weathered shale.
- Shale – This unit is a stiff to hard weathered to unweathered shale.

- Sandstone – This unit is a sandstone bedrock that is likely the Grindstaff Member of the Lower Tradewater Formation. Sandstone bedrock was encountered at the bottom of Borings 2-SF, 7-SF, and 8-SF.

Appendix C presents results of our stability analyses for the embankment incorporating these units. The profiles represent our interpretation of subsurface conditions based on our review of the available subsurface data. Soil units shown in the profile may not be laterally extensive and soil density or consistency may change rapidly.

4.2 Groundwater

Groundwater at the project site may be variable depending on seasonal groundwater conditions. Borings 3-SF, 6-SF, and 7-SF encountered groundwater at elevations of 520.1 feet 534.4 feet, and 517.2 feet, respectively, during drilling. An assumed groundwater level was used in our stability analyses in the absence of long-term groundwater monitoring data.

5 SLOPE STABILITY ANALYSIS AND RESULTS

We evaluated the slope stability for the existing IL 127 embankment at the project location. In accordance with Work Order Nos. 2 and 3, we evaluated both a full reconstruction of the embankment and installation of a rock buttress to improve the stability of the existing slope. The mitigation alternatives presented in this report are intended to be concept-level designs for planning and costing purposes only. As previously discussed, additional design effort will be required to advance the selected alternative to final design. Slope stability cross sections and results are located in Appendix C.

5.1 Stability Evaluation

Our stability evaluation incorporated the following analyses:

- Base-level back analyses to evaluate soil strength and groundwater parameters needed to generate a factor of safety (FS) equal to 1.0 using the slope geometry based on survey data provided by IDOT and incorporating results of drilling, sampling, lab testing and instrumentation data, and observations from our site visit on April 15, 2022.
- Forward analyses to evaluate the stability improvements generated by each mitigation alternative.
- Stabilization parametric analysis evaluating different buttress configurations and design parameters.

We designed the slope replacement option for a minimum FS of 1.30 and the buttress mitigation alternative for a target FS of 1.50. Three cross sections were evaluated in our stability analyses at Stations 24+31, 25+25, and 25+84. We performed stability analyses using the SLOPE/W analysis tool in Geostudio 2021 (GEOSLOPE International Ltd., 2021). We performed the analysis using Morgenstern-Price methodology with block specified failure planes with optimization to focus the slip surface in the zone of observed movement indicated by the inclinometer data. Slip surfaces were optimized to yield the lowest factor of safety for a given failure geometry.

We analyzed the embankment stability for static loading conditions using effective stress-based drained strength parameters. No triaxial testing, from which drained strength parameters could be determined, were provided for this project. This required that we estimate drained strengths using correlations. The drained strength parameters in our analyses represented residual friction angles in the transition zone from clay to shale (where movement has been observed) to account for reduced strength due to particle reorientation, and fully-softened friction angle in the underlying shale. A nominal cohesion of 100 psf was also assigned to the underlying shale where we anticipate the consolidated bedrock will exhibit more monolithic behavior. We estimated these parameters using correlations by Stark and Hussain (2013). The fully-softened and residual friction angle estimates are based on the soil liquid limits and clay-size fractions. No hydrometer analyses were provided for this project. Therefore, we evaluated drained friction angles using assumed clay-size fractions. The lowest drained friction angles were predicted for the highest clay-size fraction. The lowest drained friction angles were used as a starting point in our stability analysis. For each section we also analyzed the end of construction (undrained) condition, assuming the groundwater was still perched within the embankment, but drained to the base of the buttress once that was intersected. The clay/shale transition zone was modeled using drained strengths as discussed below to account for layers that may be slickensided, which results in a conservative analysis.

The drained friction angle of the overlying soft, lean clay and medium stiff to stiff, lean clay was assumed to be 26 degrees and 28 degrees, respectively, based on our experience with similar materials. The friction angle of crushed rock/rip rap was assumed to be 38 degrees.

No long-term groundwater monitoring was performed so it is unknown what phreatic surface in the embankment induces slope movement. We assumed that the phreatic surface extends from the base of the ditch upslope of the embankment, through the embankment at a straight line, to either the down-slope ditch in the case of Section 24+31 or the change in slope at Sections 25+25 and 25+84. This phreatic surface was assumed to represent the wet-weather conditions that likely result in episodic movements. Groundwater was observed seeping from the change in slope at station 25+25 during our April 15, 2022 site visit and agrees with our assumed groundwater level. The slope movement appears to be centered near station 25+25. Seepage was not observed at stations 24+31 or 25+84 during our site visit. These groundwater conditions were used in the back analysis of the slope by varying the drained strength of the clay/shale transition zone to come to a condition that resulted in a factor of safety of 1. Through this process, a drained friction angle of 19 degrees for the clay/shale transition zone was determined and used for the forward analyses. This drained friction angle compares well to the correlation based on Atterberg limits and clay-size fraction.

5.2 Drainage

Our analyses indicate fluctuation in groundwater levels is likely causing episodic slope movement. Our provided remediation alternatives and associated factors of safety assume that drainage is improved and maintained. If deficiencies are identified in any of the existing drainage features not part of our analysis (grade of ditches, leaky culverts, etc.) they should be mitigated as part of this work.

5.3 Instability Mitigation Alternatives

Per your request, we've evaluated both a rock buttress and full reconstruction of the embankment alternatives to assist IDOT in assessing means to mitigate slope instability. A rock buttress option is recommended because it reduces the disruptions to local traffic over a complete reconstruction of the slope. We anticipate at least one lane of the highway could remain open during construction of the buttress. The buttress option also likely eliminates the need to relocate the existing fiber optic line because the layout is such that it should be east of the fiber optic line, however risk of slope movement and potential damage to the fiber optic line during construction should be considered. The actual location of the fiber optic line should be verified prior to construction, and protected or relocated, as necessary.

Similar access difficulties, traffic control requirements, traffic disruptions, and limits of disturbance are anticipated for any of the buttress options considered. The main variable cost between the options is related to the amount of material removed and replaced with rock/riprap. It appears the increased factor of safety provided by the more robust buttress option is desirable since there is a relatively small difference in the estimated cost. Exhibit 1 below presents a cost estimate for the recommended buttress configuration. We recommend improving the stability along the entire embankment, approximately 215 lineal feet (LF). The costs shown in the table assume that 215 LF of slope will be repaired.

S&W provided the estimated quantities of soil excavation, riprap fill, and filter fabric for the recommended buttress option, as shown below. The associated unit prices presented in Exhibit 1 below were provided by IDOT.

Exhibit 1: Rock Buttress Cost Estimate

Description	Quantity	Unit	Unit Price	Cost
Tree Removal	1	Acre	$20,000	$20,000
Earth Excavation	3550	CY	$35	$124,250
Rock Excavation	50	CY	$100	$5,000
Seeding Class 2	1	Acre	$5,000	$5,000
Rock Fill (RR3)	5395	Ton	$40	$215,800
Filter Fabric	260	SQ YD	$5	$1,300
Pipe Culverts, CL C, TY 2, 24 IN	50	FT	$95	$4,750
Concrete Collar	0.56	CU YD	$1,500	$840
Insertion Culvert Liner	100	FT	$400	$40,000
Mobilization	1	L SUM	$10,000	$10,000
TC & P STD 701316	1	L SUM	$15,000	$15,000
Temp Bridge Traffic Signals	1	L SUM	$10,000	$10,000
Temp Rumble Strips	6	EA	$900	$5,400
CH Message Sign	60	CAL DAY	$75	$4,500
Contingency & Miscellaneous	1	EA	$45,000	$45,000
			TOTAL	$506,840

NOTES:

1 Unit Prices provided by IDOT.

CY = cubic yard
FS = factor of safety
SF = square foot
k = thousands
m = millions

The sections below include a discussion of each mitigation alternative, including the likely construction sequence, and commentary on the advantages and disadvantages of each alternative.

5.3.1 Rock Buttress

The slide instability is largely occurring along a weak soil layer at the transition from clay to shale within the slope, below the existing embankment based on the boring and inclinometer data. A rock buttress may be installed through this weak layer at the base of the slope to provide greater resistance to sliding along the slip surface and improve slope stability. The rock buttress would be excavated into the base of the slope and filled with free draining riprap. Based on our conversations with you, we understand 50-pound riprap (RR 3) is readily available to the project site. Our analyses are based on the use of RR 3 for the buttress fill. We should be contacted to reevaluate our analyses if RR 3 is not used for the buttress. Significant earthwork will be required to excavate the rock buttress.

The geometry of the underlying shale and sandstone varies along the embankment. Available borings and our interpretation of the subsurface conditions suggest that the rock buttress at Station 24+31 would be founded in sandstone, while the buttress would be founded in intact shale at Stations 25+25 and 25+84. The geometry of the required rock buttress is dependent on the subsurface variation and the desired FS, as shown in Appendix C.

We estimate that a rock buttress with a 22.5-foot-wide base and bench at elevation 525 feet would satisfy your requested minimum factor of safety of 1.50 along the buttress alignment. The buttress at Station 24+31 must extend to sandstone bedrock from the drainage channel with a rock invert for a distance of at least 30 feet or to an offset of approximately 89 feet from centerline to meet the minimum factor of safety of 1.50. Flattening of the slope above the buttress at Station 24+31 did not improve the FS in our analysis. Flattening the slope could also affect the fiber optic line within the embankment.

The rock buttress will aid in lowering the phreatic surface within the slope. At locations where the rock buttress is excavated into clay/shale, trench drains should be installed to allow water to drain to daylight downslope at or below the base of the buttress. Water should not be allowed to pool within the buttress as this will tend to degrade the shale over time and could result in future slope movement.

Filter fabric should be installed between the sidewalls of the rock buttress excavation and the riprap to limit migration of fines from the embankment into the buttress. No filter fabric is required along the base of the buttress or within the trench drains.

The riprap for the buttress should be placed and compacted in lifts. Compaction testing of the riprap will be prohibitive due to the particle size. The riprap should be placed in lifts and compacted with a piece of equipment to knock down the riprap into a tight and firm layer prior to placement of more riprap. The thickness of the lift will depend on the particle size and size of equipment available to compact the material and should be determined based on field observations during construction.

It is imperative that the base of the rock buttress be either extended to sandstone as is the case as Station 24+31, or into intact shale as is the case at Stations 25+25 and 25+84. In no case should the base of the rock buttress be founded on the weakened clay/shale transition zone. A representative from Shannon & Wilson should observe the excavation to determine whether the weakened zone has been sufficiently removed prior to rock placement.

Our recommended buttress configuration is shown on Figure 3. The ground surface and amount of material to be removed/replaced will vary along the alignment. Refer to the slope stability outputs in Appendix C for the offsets, elevations, and other geometry used in the final buttress configuration. We can provide additional geometric information upon request.

The existing slope should be closely monitored for movement during rock buttress construction because the excavation temporarily removes buttressing material from the toe of an active slide. Construction of the buttress should be performed during a period of dry weather to partially mitigate the risk of slope movement. We recommend that the buttress be excavated and backfilled in maximum 20-foot-long segments and that no more than 20 LF of the slope be removed at a time. The temporary stability of the slope may be only marginally greater than one during excavation of the buttress. No rock buttress excavations should be left open overnight. Rock buttress excavations should be backfilled as quickly as practically possible during construction. Shallow slumping or raveling of the upper part of the excavated buttress may occur. The material from these shallow slumps should be removed and replaced with RR 3 riprap. We recommend monitoring the slope above and roadway for ground cracking or visible signs of subsidence indicating more significant movement. If movement is observed during construction of the buttress the contractor may need to modify his means and methods to reduce the risk of additional movement during construction. These conclusions and recommendations should be reviewed when the contractor selects the actual configuration of the temporary excavation.

It is anticipated that the rock buttress option would result in less traffic disruption than the embankment reconstruction option discussed later in this report. We understand that the northbound lane of IL 127 may be used for a construction staging area. Traffic control will be required during construction.

The culvert near station 26+05 should be extended 50 feet to the east such that the pipe outfall is beyond the toe of the buttress. A mechanical coupler and concrete encasement should be used at the connection to the existing culvert. The buttress should extend through the existing ditch of the culvert outfall as shown on Figure 3. Care should be taken during construction of the buttress to not damage the culvert.

5.3.2 Rock Buttress Stabilization Parametric Analysis

We evaluated the effects of various buttress configurations and design parameters per your request to develop our recommended buttress configuration. The analysis is summarized in Exhibit 2 below. The discussions that follow reference this table.

Exhibit 2: Stabilization Parametric Analysis Results Summary for Station 25+25

Item	Slope/W Model	Condition	Buttress Base Width	Bench Elevation	FS
A	Drained 1 (existing)	Drained	None	None	1.0
B	Drained 1 (low water)	Drained	None	None	1.4
C	Drained 1 (Buttress)	Drained	15.0 feet	None	1.5
D	Drained 1 (Buttress) (2)	Drained	22.5 feet	None	1.6
E	Drained 1 (Buttress) (2) 2	Drained	22.5 feet	525 feet	1.8
F	Drained 1 (Buttress) (2) 2 elevated water	Drained	22.5 feet	525 feet	1.6
G	Drained 1 (Buttress) (3)	Drained	15.0 feet	525 feet	1.7
H	Drained 1 (Buttress) (3) elevated water	Drained	15.0 feet	525 feet	1.5
I	Fully Softened Drained 1 (existing)	Drained	None	None	1.1
J	Fully Softened Drained 1 (Buttress (2) 2	Drained	22.5 feet	525 feet	1.9
K	Undrained 1 (existing) (2)	Undrained	None	None	2.2
L	Undrained 1 (Buttress) (2) 2	Undrained	22.5 feet	525 feet	2.2
M	Drained 1 (existing) 125 pcf	Drained	None	None	1.0
N	Drained 1 (Buttress) (2) 2 (125 pcf)	Drained	22.5 feet	525 feet	1.8

NOTES:
Shaded rows indicate the design buttress configuration recommended for construction and resulting factors of safety.

5.3.2.1 Groundwater

The effect of the groundwater elevation on the slope's stability can be observed by comparing Items A and B in Exhibit 2. The assumed groundwater elevation in Item A was used to model the failed slope and represents a period of wet weather where the groundwater is elevated in the slope. Comparing to Item B, where the groundwater is lower in elevation along the clay-shale interface (representing a period of dry weather), indicates that lowering the groundwater elevation improves the slope's stability. Lowering the groundwater elevation reduces the driving forces that induce slope movement.

Lowering the groundwater level to that shown for the condition modeled in Item B alone produces a 40% improvement in stability at station 25+25.

A rock buttress would tend to lower the groundwater elevation within the slope (provided drains are installed such that water does not pool within the buttress) since it is a free-draining material vs. the relatively low permeability clay embankment. We evaluated several buttress options against an unlikely case where the groundwater was elevated in the slope (simulating a case where the buttress cannot drain properly). Comparing Item E to F and Item G to H shows that an increase in the groundwater elevation causes a reduction in factor of safety of about 20%. Promoting drainage of the slope is imperative for improving stability.

5.3.2.2 Buttress Base Width

The width of the buttress base was varied to see how it affected slope stability, as represented in comparing Item C to Item D in Exhibit 2. The width of the buttress base was increased by 50% from Item C to Item D, which resulted in a 6.7% improvement in stability. Increasing the width of the buttress base provides an improvement in stability because more of the weak slip surface material is removed and replaced with stronger material than the case with a narrower base.

5.3.2.3 Buttress Height

The buttress will be constructed of riprap which relies on frictional resistance between the riprap particles and underlying shale. The frictional resistance is a function of the material friction angle and weight of the material. Increasing the height of the buttress with a bench at elevation 525 feet for example, increases the frictional resistance and results in an increase in stability as represented by comparing Item E to Item D in Exhibit 2. Item E includes a buttress with a bench at elevation 525 while Item D consists of a buttress without the added weight of the bench. The percent improvement in factor of safety with the bench is 12.5% over that without the bench.

5.3.2.4 Residual vs. Fully-Softened Strengths

The existing slope has moved and has therefore “failed”. This movement has caused a reorientation of the clay particles in the direction of movement or slickensides along the slip surface. This reorientation of particles results in a reduction in shear strength and is referred to as “residual” strength. Our analysis as described in Section 5.3.1 uses a residual strength for the weakened clay/shale transition zone where the inclinometers indicate movement has occurred. Had the slope not already failed and was being designed for the first time, fully-softened strengths would have been used, similar to Item I. We were able to back calculate the residual shear strength of the slope by matching our stability model to observed field conditions. This reduced the uncertainty in the shear strength value used for our design of the slope stabilization.

5.3.2.5 Unit Weight

No unit weights were provided in the laboratory analysis for the embankment materials. In lieu of laboratory data, we assumed a unit weight of 120 pcf for the clay. We understand that the IDOT Geotechnical Manual recommends using a unit weight of 125 pcf for clay. An increase in unit weight would result in an increase in driving forces in the slope, but also an increase in the resisting forces in the slope. We compared the existing slope factor of safety using 120 pcf for clay (Item A) to the case with 125 pcf for clay (Item M). The difference in factor of safety was negligible. We varied the unit weight of soil in the buttress options as well, as represented in Items E and N. Again, the difference in factor of safety was negligible. Our analyses are based on an assumed unit weight of 120 pcf for the clay because increasing to 125 pcf does not change the results of our analyses.

5.3.2.6 Drained vs. Undrained Strength

The drained case was analyzed for this slope failure because the slope has been in place for several decades such that increased pore pressures within the embankment and foundation from construction have dissipated. We evaluated the end-of-construction or undrained case per your request for comparison to the existing case with the drained condition as represented by Items A and K above. The drained case in item A relies on the frictional resistance of the soil/rock while the undrained case relies on the undrained shear strength of the clay/shale and frictional resistance of rock. The factor of safety for the undrained case is much higher than that of the drained case for the existing slope. Comparing Items E and L for the buttress shows that the factor of safety for undrained conditions after construction of the buttress is also much higher than that of the drained case. The drained case controlled the analyses.

5.3.2.7 Conclusions

Lowering the groundwater elevation in the slope and increasing the weight and width of the buttress, all improve stability of the slope. We recommend Item E in Exhibit 2 corresponding to the buttress with a 22.5-foot-wide base and a bench at elevation 525 feet for stabilizing the slope. This option benefits from a wider base, added weight of the bench, and improved drainage over the other options evaluated.

5.3.3 Embankment Reconstruction

Our analyses indicate the slide is occurring below the embankment along the weak clay/shale transition zone. Removal of the weak transition zone and replacement with stronger, free-draining material would improve slope stability. The reconstruction option requires removal of the existing embankment, excavation of the weak clay/shale transition zone, placement of free-draining riprap along the excavation surface, a layer of filter fabric above the riprap, then reconstruction of the embankment with compacted soil.

Significant earthwork would be required to excavate and rebuild the embankment. Embankment material excavated above the clay/shale transition zone could be stockpiled and reused for the new embankment but may require some moisture conditioning prior to compaction. The clay/shale transition zone that is excavated is not suitable for use as fill and would need to be disposed of. The clay/shale transition zone is estimated to be about 3-feet thick based on the boring logs but could vary across the site. Excavation of this zone should be benched into the underlying shale. Benches should be graded such that they do not allow groundwater to pond on the benches as this would tend to degrade the shale over time. A representative from Shannon & Wilson should observe the excavation to determine if the weak zone has been sufficiently removed and graded prior to placement of crushed rock.

We estimate that removal of the transition zone and reconstruction of the embankment would generate a FS = 1.4 at Station 24+21 and FS = 1.5 at Station 25+25. The difference in FS has to do with the geometry of the slope at those locations. Regardless, the weak zone along which the embankment is currently failing is improved and the factors of safety reported above are controlled by shallow failures within the embankment itself rather than below it. The reported factors of safety above correspond to a minimum slip surface depth of 5-feet.

A complete reconstruction of the slope within the right-of-way would have a much greater impact on local traffic, will require the relocation of the fiber optic line, and does not provide as great of an improvement in the factor of safety as the buttress option discussed above. In addition, if movement occurs downslope of the reconstructed section, the result may be movement or loosening of the reconstructed embankment, requiring future stabilization measures.

6 SPECIAL CONDITIONS

Earthwork required to construct the mitigation alternatives proposed in this report will occur in an active slide area. Excavations on unstable slopes can be unpredictable and excavation conditions may degrade rapidly; therefore, the existing slope should be closely monitored for stability during construction. If movement is observed, then the staging and sequencing of temporary excavations may need to be modified.

Our recommendations are not intended to dictate methods or sequences used by contractors. Prospective contractors must undertake their own independent review and evaluation of the subsurface data to arrive at decisions concerning the planning of the work; the selection of equipment, means and methods, techniques and sequences of construction; establishment of safety precautions; and evaluation of the influence of construction on adjacent sites.

6.1 Excavation Slopes

Temporary slopes are the responsibility of the Contractor. The Contractor shall determine the appropriate measures to ensure that all excavation work complies with local, state, and federal safety codes. Excavations are likely to encounter disturbed slide material that may ravel or slough into the excavation. Selection of temporary excavation slopes in disturbed or undisturbed material is the responsibility of the Contractor, who is solely responsible for site safety. For planning purposes, we anticipate that unsupported temporary slopes could be graded at 1 horizontal (H) to 1 vertical (V) in dry weather conditions for slopes without significant seepage.

Groundwater seepage zones should be expected in the proposed excavation areas. Where significant groundwater seepage is encountered, erosion could occur such that the stability of temporary excavation slopes is adversely affected. The Contractor should be prepared to control groundwater seepage and prevent erosion that could cause slope instability.

Heavy rainfall or other inclement weather may magnify the complexities of excavation and maintaining excavation slopes. Excavation should be performed during the dry season, if possible. Wet season excavation may require temporary slope stabilization. Erosion control measures should be installed to maintain the excavation, including jute mats, straw wattles, or other means.

6.2 Groundwater Control

We do not anticipate that dewatering will be required; however, the Contractor should be prepared to control groundwater with sumps, pumps, or onsite grading.

6.3 Restoration

Disturbed portions of the slope should be restored with either vegetation or rip rap to control erosion of surficial soil. Restoration should address existing scarps and other erosional features that may exist, as well as planned excavations that will be part of the project. Restoration should include improvements to the ditch along the west shoulder of the highway and other surface grading to protect the slide from surface water infiltration and to convey stormwater runoff to adjacent culverts. Restoration should also include erosion control measures installed downslope, including jute mats, straw wattles, or other means. The erosion control should be installed over excavated slopes restored as part of the final project configuration. Erosion control measures should also be installed downslope in areas that have previously experienced erosion due to high-energy culvert discharge or stormwater runoff.

7 CONSTRUCTION MONITORING

Continuous slope monitoring during construction is critical in active slide areas. The slope should be monitored visually, by construction personnel, and using survey monitoring points strategically located on the slope to avoid construction activities. Visual monitoring should be performed by the contractor selected for project construction, because the contractor has a unique understanding of their own means and methods and full control over the sequencies and operation of work. Survey monitoring should be performed daily during periods of heavy earthwork construction.

A comprehensive construction monitoring plan should be prepared once the design team selects the preferred mitigation alternative for construction. The monitoring plan should be tailored to the specific alternative selected and to the anticipated means and methods of the contractor. The monitoring plan may require modification after the contractor selects specific means and methods for the project. The monitoring plan should include prescriptive information on duration and frequency of survey monitoring, the number of survey monitoring points, responsibilities for personnel tasked with visual slope monitoring, and an action plan if personnel observe movement or survey displacement exceeding a given threshold.

8 LIMITATIONS

This report was prepared for the exclusive use of IDOT and other members of the design team for specific application to this project. Our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions. The analyses, conclusions, and recommendations contained in this report are based on our understanding of site conditions as they presently exist, and further assume that the explorations are representative of the subsurface conditions throughout the site; that is, the subsurface conditions everywhere are not significantly different from those disclosed by the existing explorations. If subsurface conditions different from those encountered in the explorations are encountered or appear to be present during construction, we should be advised at once so that we can review these conditions and reconsider our recommendations, where necessary. If there is a substantial lapse of time between the submission of this report and the start of construction at the site, or if conditions have changed because of natural forces or construction operations at or adjacent to the site, we recommend that we review our report to determine the applicability of the conclusions and recommendations.

Within the limitations of scope, schedule, and budget, the analyses, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted professional geotechnical engineering principles and practice in this area at the time this report was prepared. We make no other warranty, either express or implied. These conclusions and recommendations were based on our understanding of the project as described in this report and the site conditions as observed at the time of the explorations.

The scope of our present work did not include environmental assessments or evaluations regarding the presence or absence of wetlands, or hazardous or toxic substances in the soil, surface water, groundwater, or air, on or below or around this site, or for the evaluation or disposal of contaminated soils or groundwater should any be encountered.

9 REFERENCES

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Seid, M.J., W.J. Nelson, and J.A. Devera, 2007, Bedrock Geology of Pomona Quadrangle, Jackson County, Illinois: Illinois State Geological Survey, Illinois Preliminary Geologic Map, IPGM Pomona-BG, 2 Sheets, 1:24,000 scale.

Stark T. D.; and Hussain, M, 2013, Empirical Correlations: Drained Shear Strength for Slope Stability Analyses: Journal of Geotechnical and Geoenvironmental Engineering, v. 139, no. 6, p. 853-862.

United States Department of Agriculture, Natural Resources Conservation Service, "Web Soil Survey", Jackson County, IL., Web Soil Survey (usda.gov), Date accessed: 1/27/2022.

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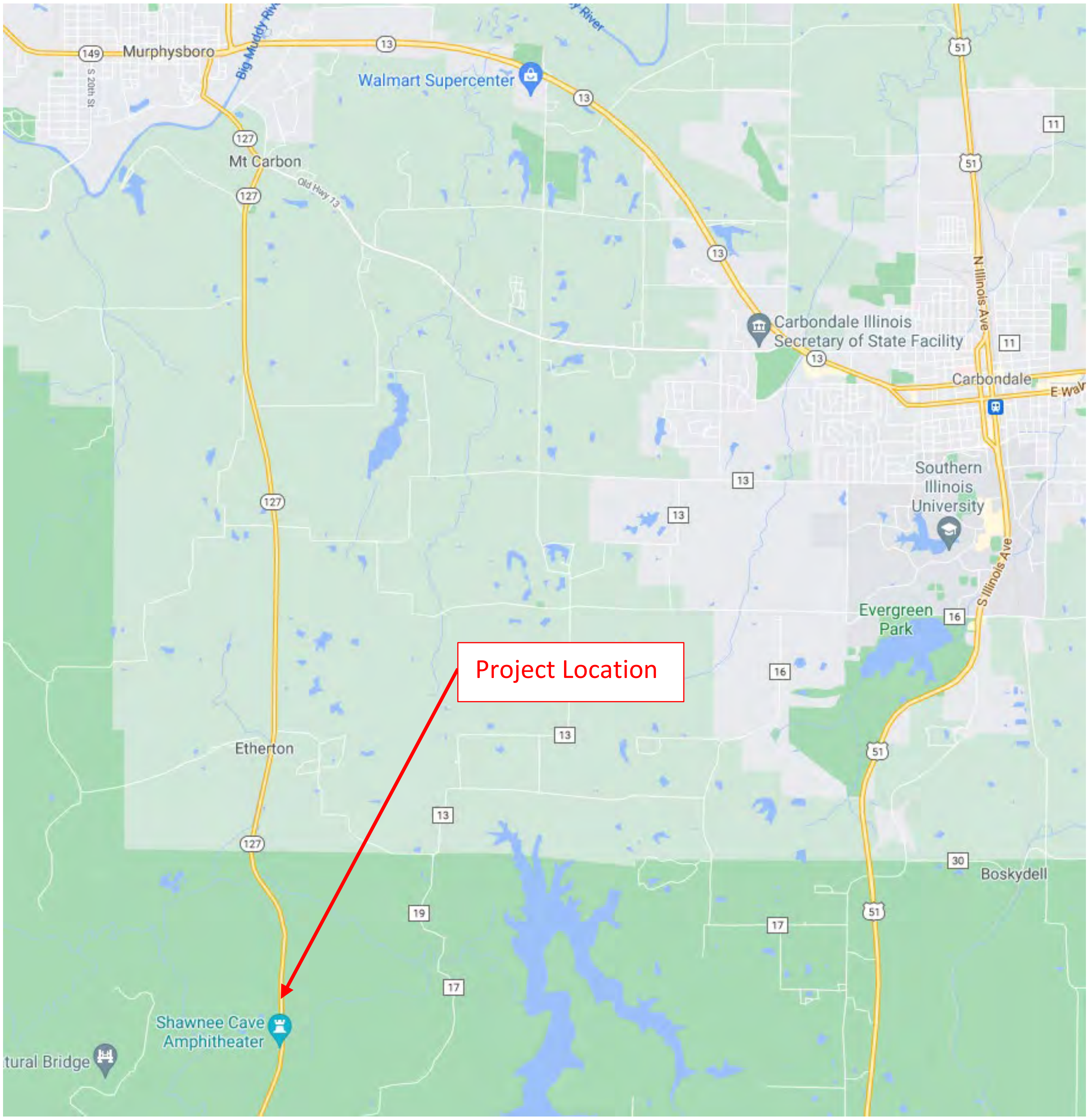
FIGURES

Figures

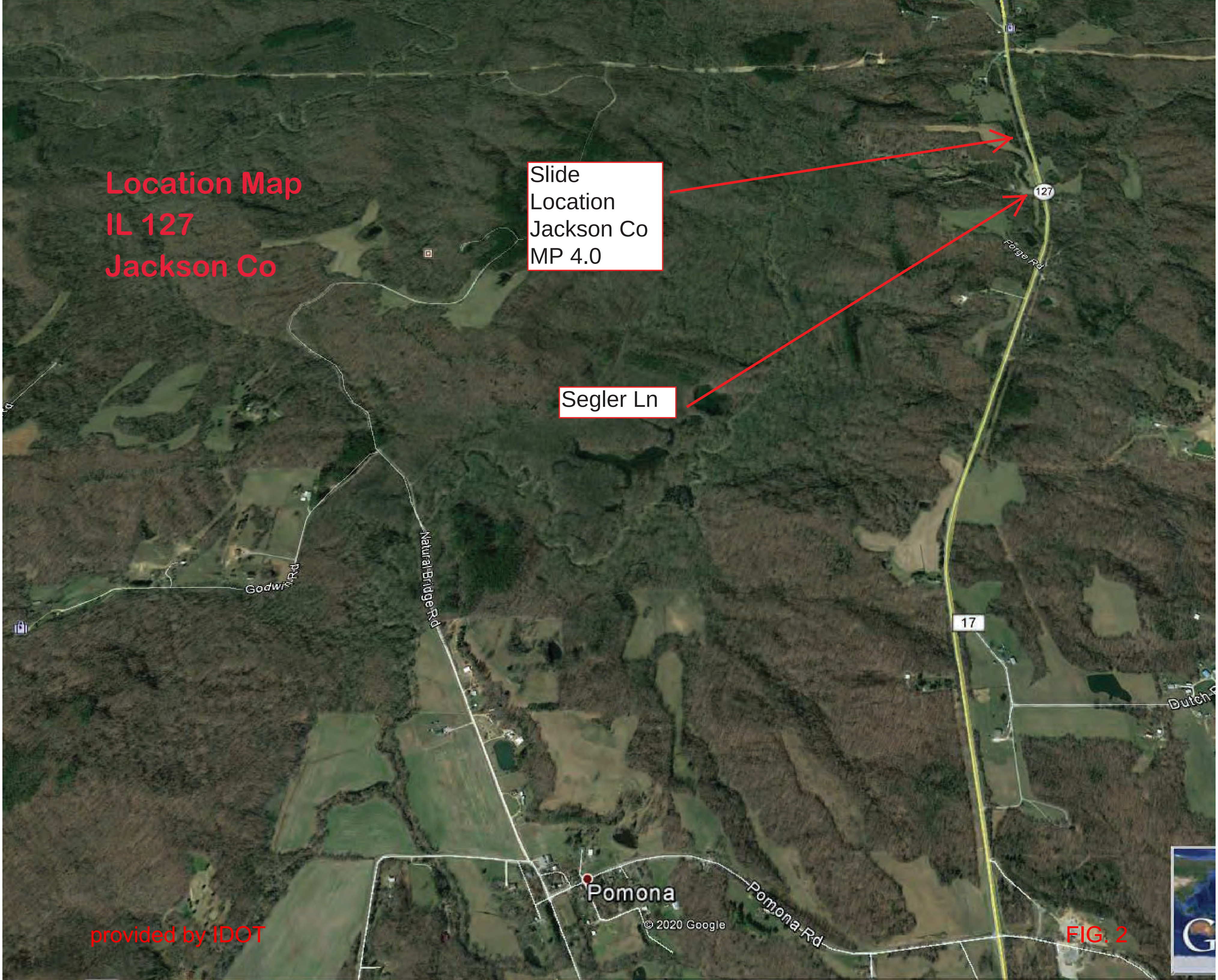
FIGURES

Location Map
Location #1
IL 127 near Amphitheatre Campground



provided by IDOT

FIG. 1



Location Map
IL 127
Jackson Co
Slide
Location
Jackson Co
MP 4.0
Segler Ln
127
Forge Rd
17
Natural Bridge Rd
Godwin Rd
Dutch
Pomona
Pomona Rd
© 2020 Google
provided by IDOT

FIG. 2

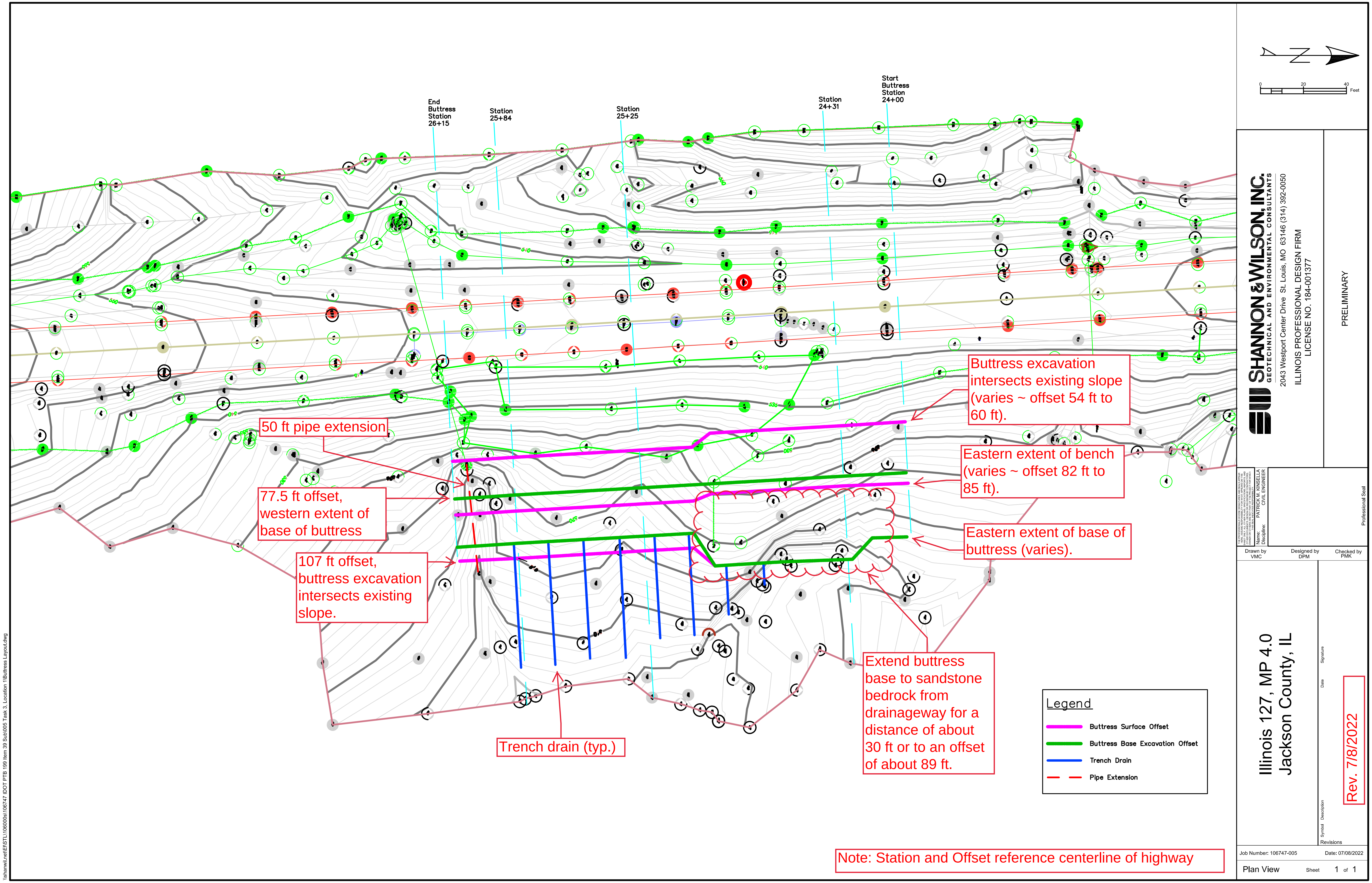

End Buttress Station 26+15
Station 25+84
Station 25+25
Station 24+31
Start Buttress Station 24+00
Buttress excavation intersects existing slope (varies ~ offset 54 ft to 60 ft).
Eastern extent of bench (varies ~ offset 82 ft to 85 ft).
Eastern extent of base of buttress (varies).
50 ft pipe extension
77.5 ft offset, western extent of base of buttress
107 ft offset, buttress excavation intersects existing slope.
Trench drain (typ.)
Extend buttress base to sandstone bedrock from drainageway for a distance of about 30 ft or to an offset of about 89 ft.
Legend
Buttress Surface Offset
Buttress Base Excavation Offset
Trench Drain
Pipe Extension
Note: Station and Offset reference centerline of highway
SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2043 Westport Center Drive St. Louis, MO 63146 (314) 392-0050
ILLINOIS PROFESSIONAL DESIGN FIRM
LICENSE NO. 184-001377
PRELIMINARY
Drawn by VMC
Designed by DPM
Checked by PMK
Illinois 127, MP 4.0
Jackson County, IL
Rev. 7/8/2022
Job Number: 106747-005
Date: 07/08/2022
Plan View
Sheet 1 of 1

FIG. 3

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APPENDIX A: BORING LOGS AND LABORATORY TESTING

Appendix A

Boring Logs and Laboratory Testing

CONTENTS

- Boring Locations
- Soil Boring Logs 1-SF through 8-SF
- Laboratory Test Results

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MODEL: Default
FILE NAME: pw:\\planroom.dot.illinois.gov:PWIDOT\Documents\IDOT Offices\District 9\Projects\78825\CADData\CADsheets\D9xxxxx-ShtC-Plan Prof.dgn

USER NAME = maesbl	DESIGNED -	REVISED -	
	DRAWN -	REVISED -	STATE OF ILLINOIS
PLOT SCALE = 56.6667 ' / in.	CHECKED -	REVISED -	DEPARTMENT OF TRANSPORTATION
PLOT DATE = 6/22/2021	DATE -	REVISED -	

SCALE: SHEET OF SHEETS STA. TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CONTRACT NO.		
	ILLINOIS	FED. AID PROJECT		

FIG. A-1

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Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 4/6/20

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (East side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lb

STRUCT. NO. ______
Station ______

BORING NO. 1-SF
Station 24+31
Offset 20.0ft Left
Ground Surface Elev. 541.7 ft

Surface Water Elev. ______ ft
Stream Bed Elev. ______ ft

Groundwater Elev.:
▽ **First Encounter** ______ ft
▼ **Upon Completion** ______ ft
▼ **After** ____ **Hrs.** ______ ft

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
M. Stiff Brown, Moist CLAY		2 3 3	1.0 B	23
	-5	2 2 4	0.8 B	22
		1 2 3	1.0 B	25
	-10	1 3 3	0.8 B	25
(Brown and Grey)		WOH 1 3	0.5 B	28
	-15	1 2 4	0.8 B	24
524.70				
V. Stiff Brown and Grey, Slightly Moist Weathered CLAY SHALE		2 9 11	3.7 S	15
522.20	-20	5		

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
Hard Brown and Grey, Slightly Moist Weathered CLAY SHALE *(continued)*		16 23	5.7 S	12
		7 16 24	5.8 S	11
517.20				
V. Stiff Brown and Grey, Slightly Moist Weathered CLAY SHALE	-25	4 18 36	3.9 S	12
		10 20 40	3.7 S	10
512.20				
Hard Grey, Dry CLAY SHALE Performed Modified SPT @ 29.5 ft; qu = 18.6 ksf (see attached report)	-30	34 66/4.5"		
	-35			
	-40			

Bottom of hole @ 30.4 ft

Benchmark referenced to BM 224, Cut "X" on top of westernmost flange bolt on F.H. on E. side of IL 127 at Sta 9+00; Elev. 624.47

TBM CL Sta 24+00; Elev. 542.79

To convert "N" values to "N60", multiply by 1.5. Hammer efficiency = 93%

No groundwater encountered while drilling

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

provided by IDOT

FIG. A-2

File Name S:\MATERIALS GEOTECHNICAL UNIT\GINT\PROJECTS\PROJECTS FILE\JACKSON\POINT LOCATIONS\SLOPEIN\IL127 AMPHITHEATER2020.GPJ Data Template D6TEMPLT.GDT Date Printed 7/22/21
Latitude 37 39 16.99 Longitude -89 19 07.93 Datum NAD83 Job Number

Modified SPT Log

Illinois Department of Transportation

Route: IL 127 Structure No.: (Exist.) (Prop.) Date: 4/6/20 Page: 1 of 1

Section: Description: Slope Failure (East side) 4.0 mi South of Old IL 13

County: Jackson Logged by: A Hayes Sampler Tube Length: 18 in.

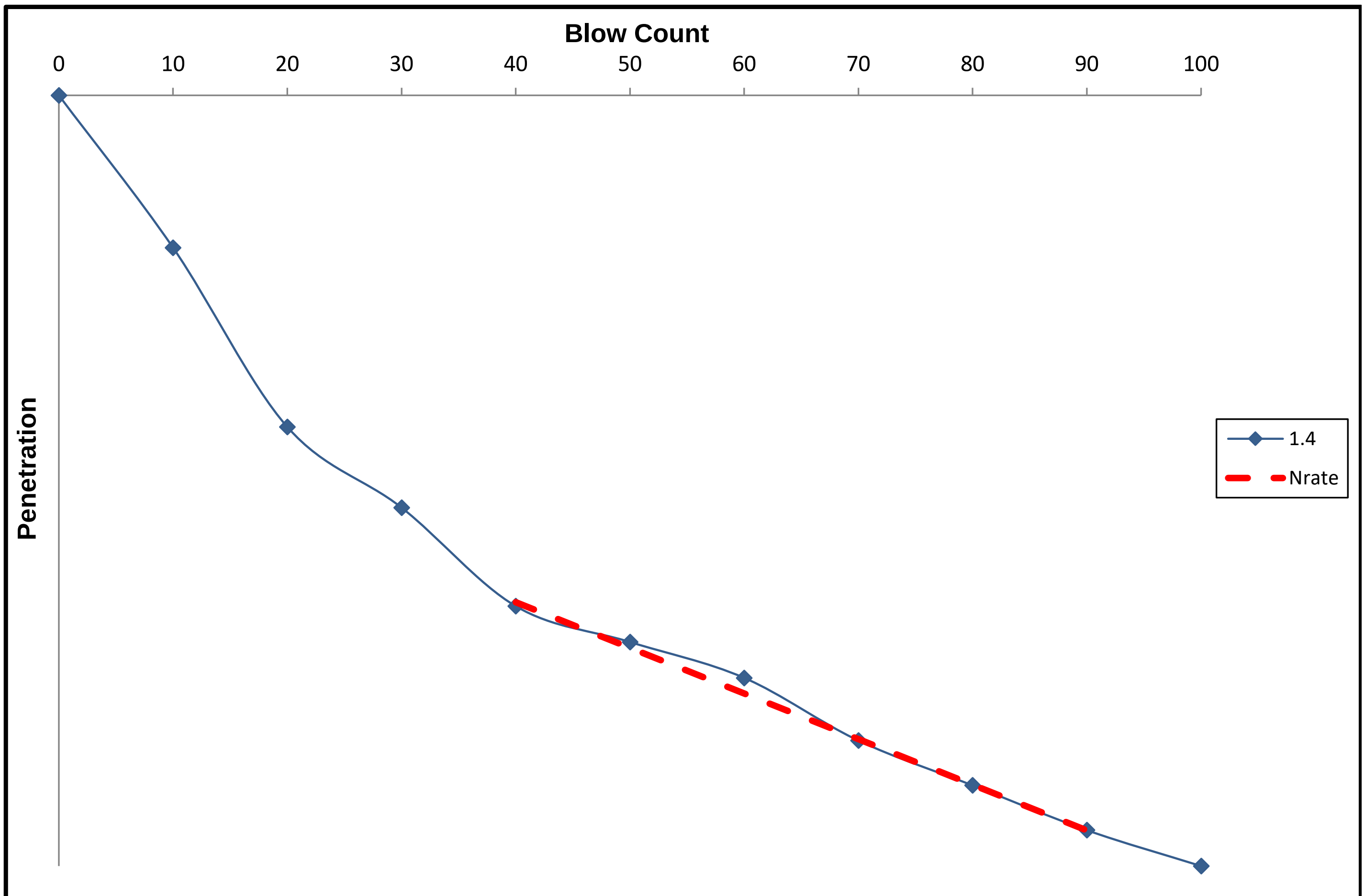
Boring No.: 1-SF Station: 24+31 Offset: 20' Lt Latitude: 37 39 16.99 Longitude: -89 19 07.93

Drill Rig: CME 75 Hammer Type: Auto 140# Hammer Efficiency (%): 89 Surface Elevation: 541.70

Borehole Diameter. (in.) 8 Split-barrel Sampler Description: 1.375-in. I.D.

Test Elevation	Measured Rod Length (ft)	Blows where exposed rod length is measured (blows) 0	10	20	30	40	50	60	70	80	90	100	$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
	1.42	1.42	1.25	1.05	0.96	***0.85***	***0.81***	0.77	***0.7***	***0.65***	***0.6***	0.56	194.2	18.6	4.15

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 4/8/20

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (East side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lb

STRUCT. NO. ______
Station ______

BORING NO. 2-SF
Station 25+31
Offset 19.0ft Left
Ground Surface Elev. 541.2 ft

Surface Water Elev. ______ ft
Stream Bed Elev. ______ ft

Groundwater Elev.:
First Encounter ______ ft
Upon Completion ______ ft
After ______ **Hrs.** ______ ft

Description	Elev.	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
RIP RAP	538.70				
V. Stiff Brown, Moist CLAY		-5	1		
			3	2.3	21
	534.20		3	B	
Soft Grey, Moist CLAY			WOH		
			1	0.4	25
			1	B	
(Brown)		-10	WOH		
			1	0.4	26
			3	B	
			WOH		
			WOH	0.4	26
	526.70		1	B	
M. Stiff Brown, Moist CLAY		-15	WOH		
			2	0.9	25
	524.20		3	B	
Stiff Brown and Tan, Dry to Moist CLAY with SANDSTONE Pebbles			1		
			7	1.6	13
	521.70		6	S	
		-20	5		
Hard Grey, Dry to Moist Weathered CLAY SHALE *(continued)*			17	4.5	13
	519.20		22	S	
V. Stiff Grey, Dry to Moist Weathered CLAY SHALE			22		
			43	2.2	12
			35/3.75"	S	
		-25	23		
			37	2.3	10
			30/4"	S	
			18		
			52	2.3	10
			30/2"	S	
		-30	32		
			51	2.7	10
			17/2.75"	S	
	508.70		9		
Hard Grey, Dry to Moist Weathered CLAY SHALE with SANDSTONE Layers			12	7.3	16
	506.70		9/3"	S	
(Borehole continued with rock coring.)		-35			
		-40			

Bottom of hole @ 44.5 ft

Benchmark referenced to TBM Top of pipe culvert, west side @ Sta 23+05; Elev. 541.19
To convert "N" values to "N60", multiply by 1.5;
Hammer efficiency = 93%
No groundwater encountered

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

provided by IDOT

Illinois Department of Transportation
Division of Highways
District 9

ROCK CORE LOG

Date 4/8/20

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (East side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **CORING METHOD** Conventional rotary with water

STRUCT. NO. ______
Station ______

CORING BARREL TYPE & SIZE NV3 5FT NWJ

Core Diameter 1.78 **in**
Top of Rock Elev. 506.70 **ft**
Begin Core Elev. 506.70 **ft**

BORING NO. 2-SF
Station 25+31
Offset 19.0ft Left
Ground Surface Elev. 541.2 **ft**

Description	Elev.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Hard Brown, Dry SANDSTONE	506.70	-35	1	98	87	10	258.1 376.3 492.3 274.5 195.8 245.4
		-40	2	100	75	10	369.4 289.2 356.5 208.6
	496.70						
		-45					
Bottom of hole @ 44.5 ft TBM Top of pipe culvert, west side @ Sta 23+05; Elev. 541.19							
		-50					

Color pictures of the cores Yes, attached
Cores will be stored for examination until 5 Years after Const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)
RQD is the ratio of the total length of sound core specimens >4" to total length of core run

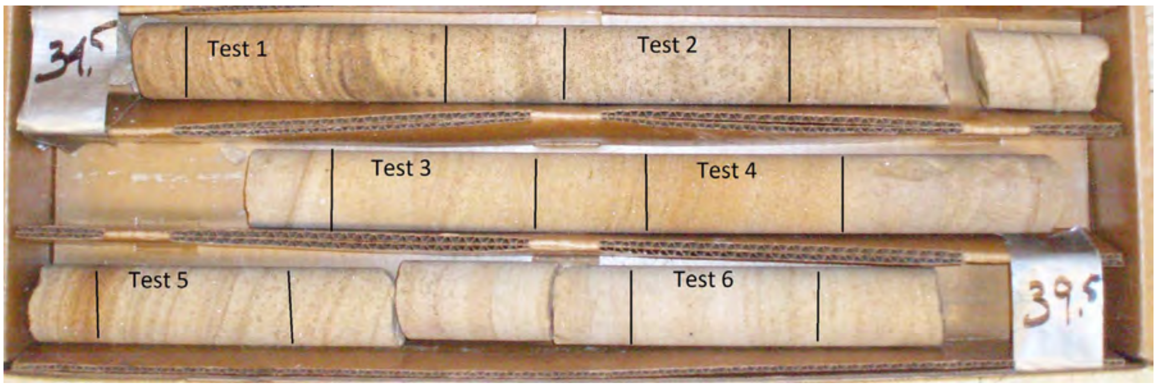
provided by IDOT

FIG. A-5

Illinois Department of Transportation
District Nine Materials
Unconfined Compressive Strength

IL 127 Slope Failure
Jackson Co.
Boring 2-SF

Top



Bottom

Boring #	Specimen#	Depth	Unconfined Compression
2-SF	1	34' 10"	3,585 psi
2-SF	2	35'6"	5,227 psi
2-SF	3	37'	6,838 psi
2-SF	4	37'7"	3,812 psi
2-SF	5	38'5"	2,720 psi
2-SF	6	39'5"	3,408 psi

Foundation Core Instructions
Use 1.78" for the diameter
3.8" is the length

$$\frac{\pi d^2}{4} = 2.487$$

Pounds divided by 2.487 = psi

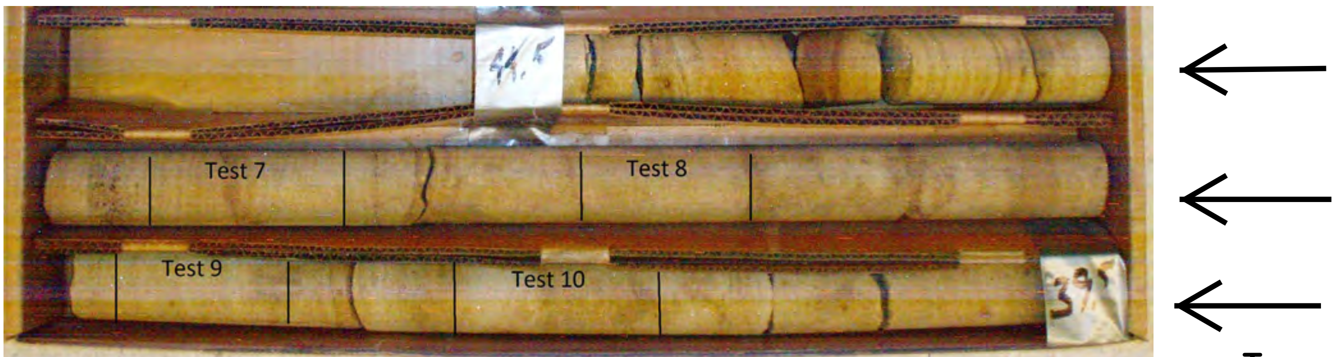
provided by IDOT

FIG. A-6

Illinois Department of Transportation
District Nine Materials
Unconfined Compressive Strength

IL 127 Slope Failure
Jackson Co.
Boring 2-SF

Bottom



Top

Boring #	Specimen#	Depth	Unconfined Compression
2-SF	10	40’5”	5,131 psi
2-SF	9	41’5”	4,017 psi
2-SF	8	42’5”	4,952 psi
2-SF	7	43’1”	2,897 psi

Foundation Core Instructions
Use 1.78" for the diameter
3.8" is the length

$$\frac{\pi d^2}{4} = 2.487$$

Pounds divided by 2.487 = psi

provided by IDOT

Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 6/10/21

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (East side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lb

STRUCT. NO. ______
Station ______

BORING NO. 3-SF
Station 26+15
Offset 15.0ft Left
Ground Surface Elev. 544.6 ft

Surface Water Elev. ______ ft
Stream Bed Elev. ______ ft

Groundwater Elev.:
First Encounter 520.1 ft
Upon Completion ______ ft
After ______ **Hrs.** ______ ft

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
Stiff Brown, Moist SILTY CLAY				
		1		
		4	1.6	18
		5	B	
540.10				
M. Stiff Brown, Moist SILTY CLAY	-5	1		
		2	0.6	21
		3	B	
537.60				
Stiff Brownish Grey, Moist CLAY		1		
		3	1.4	25
		4	B	
(Grey)	-10	1		
		4	1.7	23
		5	B	
532.60				
Stiff Brown and Grey, Moist CLAY		1		
		3	1.2	25
		5	B	
(Brown)	-15	1		
		2	1.3	24
		3	B	
		1		
		2	1.5	23
		4	B	
(Grey)	-20	1		

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
(Grey) *(continued)*		2	1.5	19
		3	B	
522.60				
M. Stiff Grey, Moist CLAY with SANDSTONE Pebbles		1		
		1	0.7	21
		3	B	
∇	-25	2		
		7		
		10		
517.60				
Hard Grey, Dry CLAY SHALE		10		
		23		11
		25		
Modified SPT performed at 29.5 ft qu = 11.1 tsf (see attachment for results)	-30	30		
		45		11
		25/3.5"		
Modified SPT performed at 32.0 ft qu = 14.4 tsf (see attachment for results)		7		
		13		12
511.10		50/5.5"		
Bottom of Hole @ 33.5 ft				
Benchmark referenced to BM 224, Cut "X" on top of westernmost flange bolt on F.H. on E. side of IL 127 at Sta 9+00; Elev. 624.47	-35			
TBM Top of pipe culvert, west side @ Sta 23+05; Elev. 541.19				
To convert "N" value to "N60" multiply by 1.44; Hammer efficiency = 86.5%				
	-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

File Name S:\MATERIALS GEOTECHNICAL UNIT\GINT\PROJECTS\PROJECTS FILE\JACKSON\POINT LOCATIONS\SLOPEIN\IL127 AMPHITHEATER2020.GPJ Data Template D6TEMPLT.GDT Date Printed 7/23/21
Latitude 37 39 15.16 Longitude -89 19 07.83 Datum NAD83 Job Number

provided by IDOT

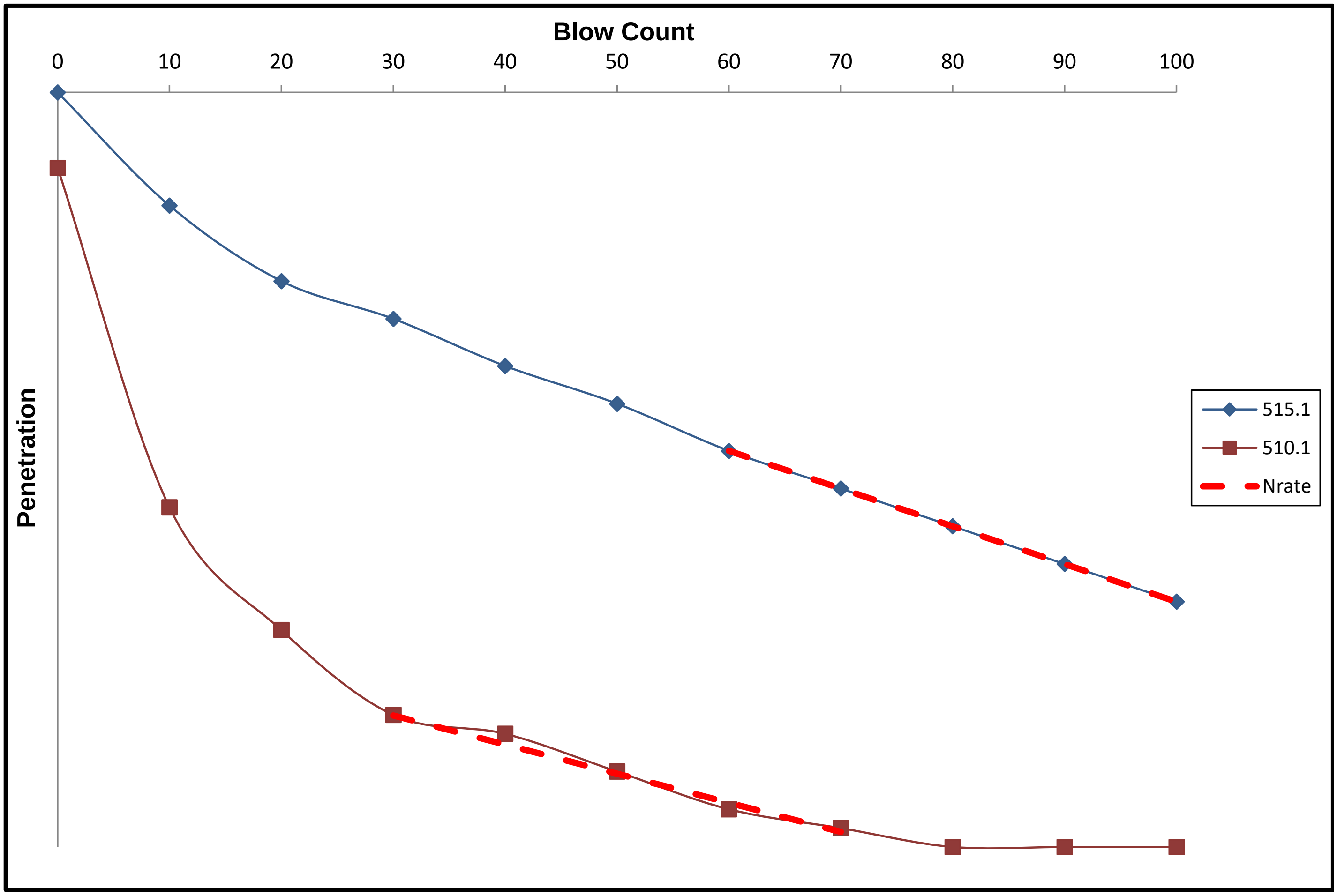
Modified SPT Log

Illinois Department of Transportation

Route:	IL 127	Structure No.:	N/A (Exist.)	N/A (Prop.)	Date:	6/10/21	Page:	1	of 1
Section:	12SLP-1	Description:	Subsurface inv. for landslide near Amphitheatre Campground						
County:	Jackson	Logged by:	Lee Estel		Sampler Tube Length:	18 in.			
Boring No.:	3-SF	Station:	26+15	Offset:	15' Lt	Latitude:	37 39 15.16	Longitude:	-89 19 07.83
Drill Rig:	CME 75	Hammer Type:	Auto 140#	Hammer Efficiency (%):	87	Surface Elevation:	544.60		
Borehole Diameter. (in.)	8	Split-barrel Sampler Description:	1.375-in. I.D.						

Test Elevation	Measured Rod Length (in.)	0	10	20	30	40	50	60	70	80	90	100	$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
		Blows where exposed rod length is measured (blows)													
	515.10	18	15	13	12	10.75	9.75	***8.5***	***7.5***	***6.5***	***5.5***	***4.5***	115.3	11.1	2.55
	512.60	18	9	5.75	***3.5***	3	***2***	***1***	***0.5***				149.5	14.4	3.25

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
District Nine Materials
Split-spoon Sample Photos

IL 127 Slope Failure
Jackson Co.
Boring 3-SF
Lab #23 6-10-21

Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 6/7/21

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (West side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lb

STRUCT. NO.
Station

BORING NO. 4-SF
Station 24+31
Offset 18.0ft Right
Ground Surface Elev. 542.2 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

Description	Elev.	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
V. Stiff Brown, Moist SILTY CLAY with SANDSTONE GRAVEL			6		
			6	2.0	14
			7	S	
	537.70				
V. Stiff Tan and Brown, Dry to Moist SILTY CLAY with SANDSTONE GRAVEL		-5	9		
			17		6
			25		
	535.20				
Stiff Brown, Moist CLAY with SANDSTONE GRAVEL			1		
			2	1.6	18
			3	S	
	532.70				
Hard Tan and Brown, Dry to Moist CLAY SHALE with SANDSTONE GRAVEL		-10	18		
			29		8
			31/3"		
	530.20				
Hard Grey, Brown, and Tan, Dry CLAY SHALE with SANDSTONE LENSES			18		
			70		6
			12/3"		
	527.70				
Hard Brown and Grey, Dry CLAY SHALE		-15	36		
			37		9
			7/4"		
(Borehole continued with rock coring)					
		-20			

Bottom of hole @ 20.75 ft

No free water encountered

To convert "N" values to "N60", multiply by 1.44; Hammer efficiency = 86.5%

Benchmark referenced to BM 224, Cut "X" on top of westernmost flange bolt on F.H. on E. side of IL 127 at Sta 9+00; EL. 624.47

TBM Top of pipe culvert, west side @ Sta 23+05; EL. 541.19

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

File Name S:\MATERIALS GEOTECHNICAL UNIT\GINT\PROJECTS\PROJECTS FILE\JACKSON\POINT LOCATIONS\SLOPEIN\IL127 AMPHITHEATER2020.GPJ Data Template D6TEMPLT.GDT Date Printed 7/23/21
Latitude 37 39 16.93 Longitude -89 19 08.38 Datum NAD83 Job Number

provided by IDOT

Illinois Department of Transportation
Division of Highways
District 9

ROCK CORE LOG

Date 6/7/21

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (West side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **CORING METHOD** Conventional rotary with water

STRUCT. NO.
Station

CORING BARREL TYPE & SIZE NV3 5FT NWJ

Core Diameter 1.78 in
Top of Rock Elev. 530.20 ft
Begin Core Elev. 526.45 ft

BORING NO. 4-SF
Station 24+31
Offset 18.0ft Right
Ground Surface Elev. 542.2 ft

Description	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Hard Brown and Grey, Dry CLAY SHALE		1	33	50	10	2.1
						1
521.45	-20					
Bottom of hole @ 20.75 ft	-25					
Benchmark referenced to BM 224, Cut "X" on top of westernmost flange bolt on F.H. on E. side of IL 127 at Sta 9+00; Elev. 624.47						
TBM Top of pipe culvert, west side @ Sta 23+05; Elev. 541.19	-30					
	-35					

Color pictures of the cores Yes, attached
Cores will be stored for examination until 5 Years after Construction
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)
RQD is the ratio of the total length of sound core specimens >4" to total length of core run

BBS, form 138 (Rev. 8-99)

provided by IDOT

FIG. A-12

Illinois Department of Transportation
District Nine Materials
Unconfined Compressive Strength

IL 127
Jackson Co. Slope Failure N. of Pomona Rd.
Boring 4-SF
6-7-21 Lab #22

Boring #	Specimen#	Thickness	L/D ratio	Depth	Unconfined Compression Reading (lbs)	(psi)
4-SF	1	3.0"	*1.7:1	16.0	75	30 psi
4-SF	2	2.9"	*1.6:1	17.75'	35	14 psi

*Desirable specimen length to diameter ratios are between 2.0:1 and 2.5:1. The results may differ from results obtained from a test specimen that meets the requirements.

Foundation Core Instructions
Use 1.78" for the diameter
(Pounds divided by 2.487)=psi

$$\frac{\pi d^2}{4} = 2.487$$

provided by IDOT

FIG. A-13

Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 6/9/21

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (West side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lb

STRUCT. NO. ____
Station ____

BORING NO. 5-SF
Station 25+25
Offset 15.0ft Right
Ground Surface Elev. 542.7 ft

Surface Water Elev. ____ ft
Stream Bed Elev. ____ ft

Groundwater Elev.:
First Encounter ____ ft
Upon Completion ____ ft
After ____ **Hrs.** ____ ft

Description	Elev.	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
Very Stiff Brown, Moist SILTY CLAY			2		
			5	3.5	17
			5	B	
	538.20				
Stiff Brown, Moist SILTY CLAY		-5	1		
			2	1.1	23
			3	B	
	535.70				
Stiff Brown, Dry to Moist CLAY to CLAY SHALE			1		
			6	2.5	12
			7	P	
	533.20				
Hard Brown and Grey, Dry CLAY SHALE Modified SPT performed at 9.5 ft; qu = 7.5 ksf (see attached report)		-10	35		
			45		6
			10/1.25"		
Modified SPT performed at 12 ft; qu = 3.6 ksf			16		
			20		7
			14/3.5"		
	528.20				
Hard Grey, Dry CLAY SHALE Modified SPT performed at 14.5 ft; qu = 5.0 ksf		-15	9		
			16		13
			15/4.25"		
Modified SPT performed at 17.0 ft; qu = 4.4 ksf			10		
			20		13
			20/4.25"		
		-20	16		
Modified SPT performed at 19.5 ft; qu = 5.6 ksf *(continued)*			30		11
	521.80		24/4.5"		
		-25			
		-30			
		-35			
		-40			

Bottom of hole @ 20.9 ft

No free water encountered

To convert "N" value to "N60" multiply by 1.44; Hammer effeciency =86.5%

Benchmark referenced to BM 224, Cut "X" on top of westernmost flange bolt on F.H. on E. side of IL 127 at Sta 9+00; Elev. 624.47

TBM Top of pipe culvert, west side @ Sta 23+05; Elev. 541.19

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

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Latitude 37 39 15.87 Longitude -89 19 08.30 Datum NAD83 Job Number

provided by IDOT

Illinois Department of Transportation

Modified SPT Log

Route: IL 127 Structure No.: N/A (Exist.) N/A (Prop.) Date: 6/9/21 Page: 1 of 1

Section: 12SLP-1 Description: Subsurface inv. for landslide near Amphitheatre Campground

County: Jackson Logged by: Lee Estel Sampler Tube Length: 18 in.

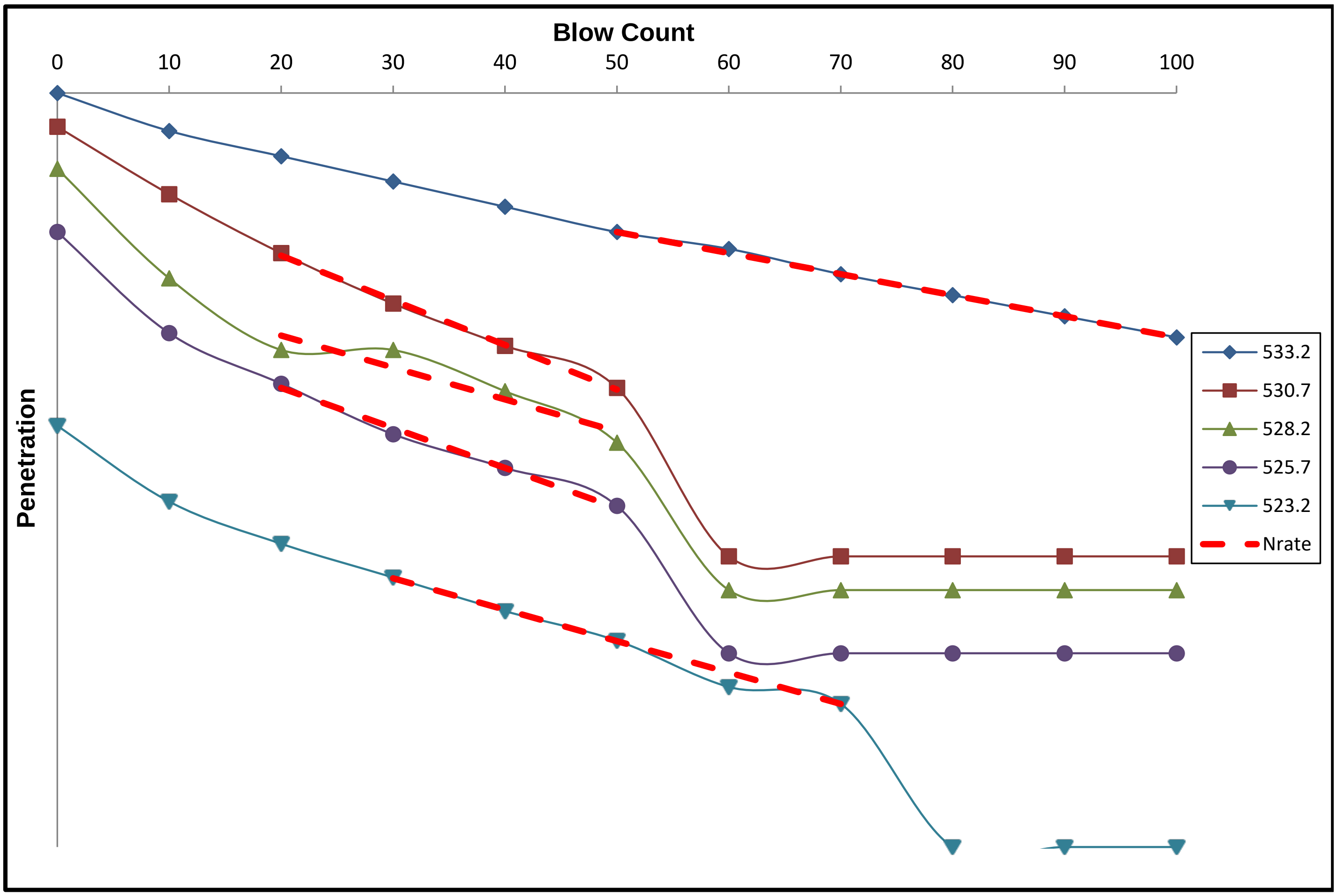
Boring No.: 5-SF Station: 25+25 Offset: 15' Rt Latitude: 37 39 15.87 Longitude: -89 19 08.30

Drill Rig: CME 75 Hammer Type: Auto 140# Hammer Efficiency (%): 87 Surface Elevation: 542.70

Borehole Diameter. (in.) 8 Split-barrel Sampler Description: 1.375-in. I.D.

Test Elevation	Measured Rod Length (in.): Blows where exposed rod length is measured (blows) 0	10	20	30	40	50	60	70	80	90	100	$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
533.20	18	15.75	14.25	12.75	11.25	***9.75***	8.75	***7.25***	***6***	***4.75***		78.4	7.5	1.78
530.70	25.5	21.5	***18***	***15***	***12.5***	***10***						37.0	3.6	0.87
528.20	25	18.5	***14.3***	***14.3***	***11.8***	***8.75***						51.7	5.0	1.20
525.70	25	19	***16***	***13***	***11***	***8.75***						46.1	4.4	1.08
523.20	25	20.5	18	***16***	***14***	***12.25***	9.5	***8.5***				58.8	5.6	1.35

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
District Nine Materials
Split-spoon Sample Photos

IL 127 Slope Failure
Jackson Co.
Boring 5-SF
Lab #24 6-9-21

Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 6/9/21

ROUTE IL 127 **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** L. Estel

SECTION 12SLP-1 **LOCATION** 4 mi S of Old IL 13 (West side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lb

STRUCT. NO.
Station

BORING NO. 6-SF
Station 26+15
Offset 15.0ft Right
Ground Surface Elev. 544.4 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
▽ **First Encounter** 534.4 ft
▼ **Upon Completion** ft
▼ **After** Hrs. ft

Description	Elev.	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
V. Stiff Brown, Moist SILTY CLAY			5		
			8	3.5	17
			6	P	
	539.90				
Stiff Brown and Grey, Moist SILTY CLAY		-5	2		
			3	1.9	21
			3	B	
	537.40				
Stiff Brown, Moist SILTY CLAY			1		
			3	1.0	22
			5	B	
▽		-10	1		
			3	1.3	24
			3	B	
			1		
			3	1.9	22
			3	B	
	529.90				
Stiff Brown and mottled Grey, Moist CLAY		-15	1		
			2	1.4	24
			3	B	
(Blue Grey)			1		
			2	1.0	26
			3	B	
	524.90				
Soft Blue Grey, Moist CLAY		-20	WOH		

Description	Elev.	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
Soft Blue Grey, Moist CLAY *(continued)*			WOH	0.4	26
			WOH	B	
	522.40				
V. Stiff Brown, Red and Tan, Moist CLAY to CLAY SHALE with SANDSTONE GRAVEL			5		
			5	2.6	19
			9	B	
	519.90				
Hard Grey, Dry CLAY SHALE		-25	15		
			40		10
			30		
Modified SPT performed @ 27 ft; qu = 12.0 ksf (see attached report)			24		
			46		10
			30/2.5"		
Modified SPT performed @ 29.5 ft; qu = 11.1 ksf		-30	30		
			55		9
	513.40		15/1.75"		
Bottom of hole @ 30.6 ft					
To convert "N" value to "N60" multiply by 1.44; Hammer effeciency =86.5%		-35			
Benchmark referenced to BM 224, Cut "X" on top of westernmost flange bolt on F.H. on E. side of IL 127 at Sta 9+00; Elev. 624.47					
TBM Top of pipe culvert, west side @ Sta 23+05; Elev. 541.19					
		-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

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Latitude 37 39 15.17 Longitude -89 19 08.27 Datum NAD83 Job Number

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FIG. A-17

Illinois Department of Transportation

Modified SPT Log

Route: IL 127 Structure No.: N/A (Exist.) N/A (Prop.) Date: 6/9/21 Page: 1 of 1

Section: 12SLP-1 Description: Subsurface inv. for landslide near Amphitheatre Campground

County: Jackson Logged by: Lee Estel Sampler Tube Length: 18 in.

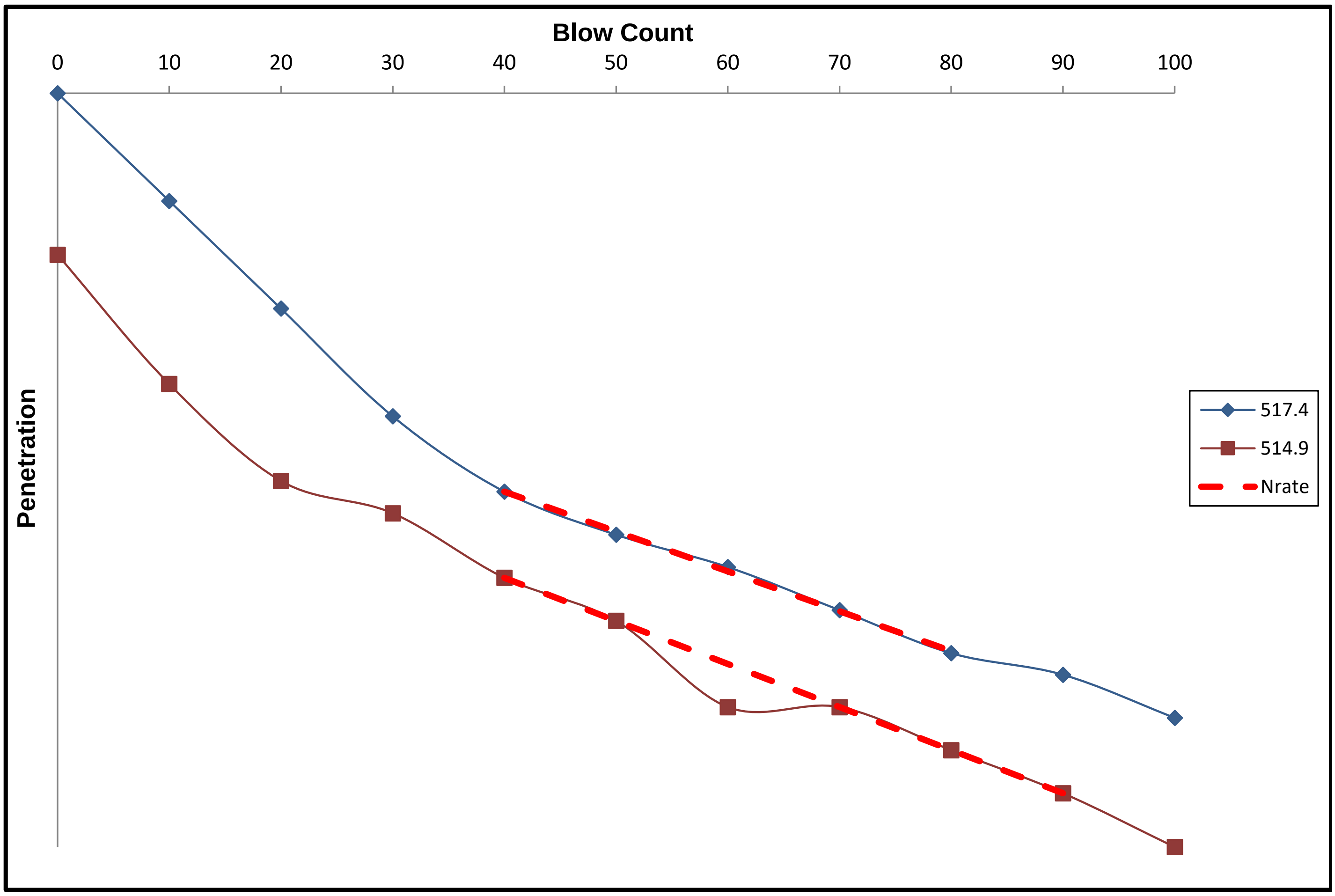
Boring No.: 6-SF Station: 26+15 Offset: 15' Rt Latitude: 37 39 15.17 Longitude: -89 19 08.27

Drill Rig: CME 75 Hammer Type: Auto 140# Hammer Efficiency (%): 87 Surface Elevation: 544.40

Borehole Diameter. (in.) 8 Split-barrel Sampler Description: 1.375-in. I.D.

Test Elevation: Measured Rod Length (in.)	Blows where exposed rod length is measured (blows): 0	10	20	30	40	50	60	70	80	90	100	$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
517.40	18	15.5	13	10.5	***8.75***	***7.75***	***7***	***6***	***5***	4.5	3.5	124.7	12.0	2.74
514.90	18	15	12.75	12	***10.5***	***9.5***	7.5	***7.5***	***6.5***	***5.5***	4.25	115.3	11.1	2.55

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
District Nine Materials
Split-spoon Sample Photos

IL 127 Slope Failure
Jackson Co.
Boring 6-SF
Lab #25 6-9-21

gonzalez COMPANIES, LLC

SOIL BORING LOG

Date 9/13/21

ROUTE IL 127 (FAS 1909) **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** NRK (Gonzalez)

SECTION 12SLP-1 **LOCATION** 4 mi S of Orchard Hill Rd (E side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto 140 lb HE 92%

STRUCT. NO. ____
Station ____
BORING NO. 7-SF
Station 24+45
Offset 50.0ft Left
Latitude 37.654685
Longitude -89.318769
Ground Surface Elev. 533.5 ft

Surface Water Elev. ____ ft
Stream Bed Elev. ____ ft

Groundwater Elev.:
▽ **First Encounter** 517.2 ft
▼ **Upon Completion** Dry ft
▼ **After** ____ **Hrs.** ____ ft

Description	Elev.	DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)
Stiff Brown, Dry CLAY (Modified Loess)			4 6 8		15
	530.50				
Medium Stiff Brown and Gray, Dry to Moist CLAY (Modified Loess)		-5	3 4 5	2.3 S	21
			2 2 3	1.2 S	25
		-10	2 3 3	1.5 S	24
			2 2 4	1.2 S	25
		-15	2 4 4	1.0 S	25
	517.50 ▽				
V. Stiff Brown, Moist CLAY with SANDSTONE Pebbles			10 14 11		12
	514.00	-20	6 10 27	3.3 P	13

Description	Elev.	DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)
Hard Gray, Dry to Moist Weathered CLAY SHALE *(continued)* Modified SPT performed at 22 ft qu = 8.9 tsf (see MSPT log)			24 50/5" 50/4"		14
Modified SPT performed at 23.5 ft qu = 4.8 tsf (see MSPT log) LL=37, PL=23, PI=14		-25	30 80 20/2"		6
	508.00				
Stiff Reddish Brown, Dry WEATHERED SANDSTONE Modified SPT performed at 26 ft qu = 15 tsf (see MSPT log)	507.00		15 85/4"		11
Hard Light Brown, Dry SANDSTONE	504.80		50/3"		
Boring terminated at 28.7 ft.		-30			
Benchmark referenced: BM 224, cut "X" on top of westernmost flange bolt on fire hydrant on east side of IL 127 at Sta 9+00; Elev 624.47.		-35			
		-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

File Name C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTCL\PROJECTS\21-123.GPJ Data Template D6TEMPLT.GDT Date Printed 21/09/23
Latitude 37.654685 Longitude -89.318769 Datum NAD83 Job Number 21-123

provided by Gonzalez

Modified SPT Log

Route: IL 127 Structure No.: (Exist.) (Prop.) Date: 9/13/21 Page: 1 of 1

Section: 12SLP-1 Description: Slope Failure North of Pomona Rd.

County: Jackson Logged by: N. Kurfman (Gonzalez) Sampler Tube Length: 24 in.

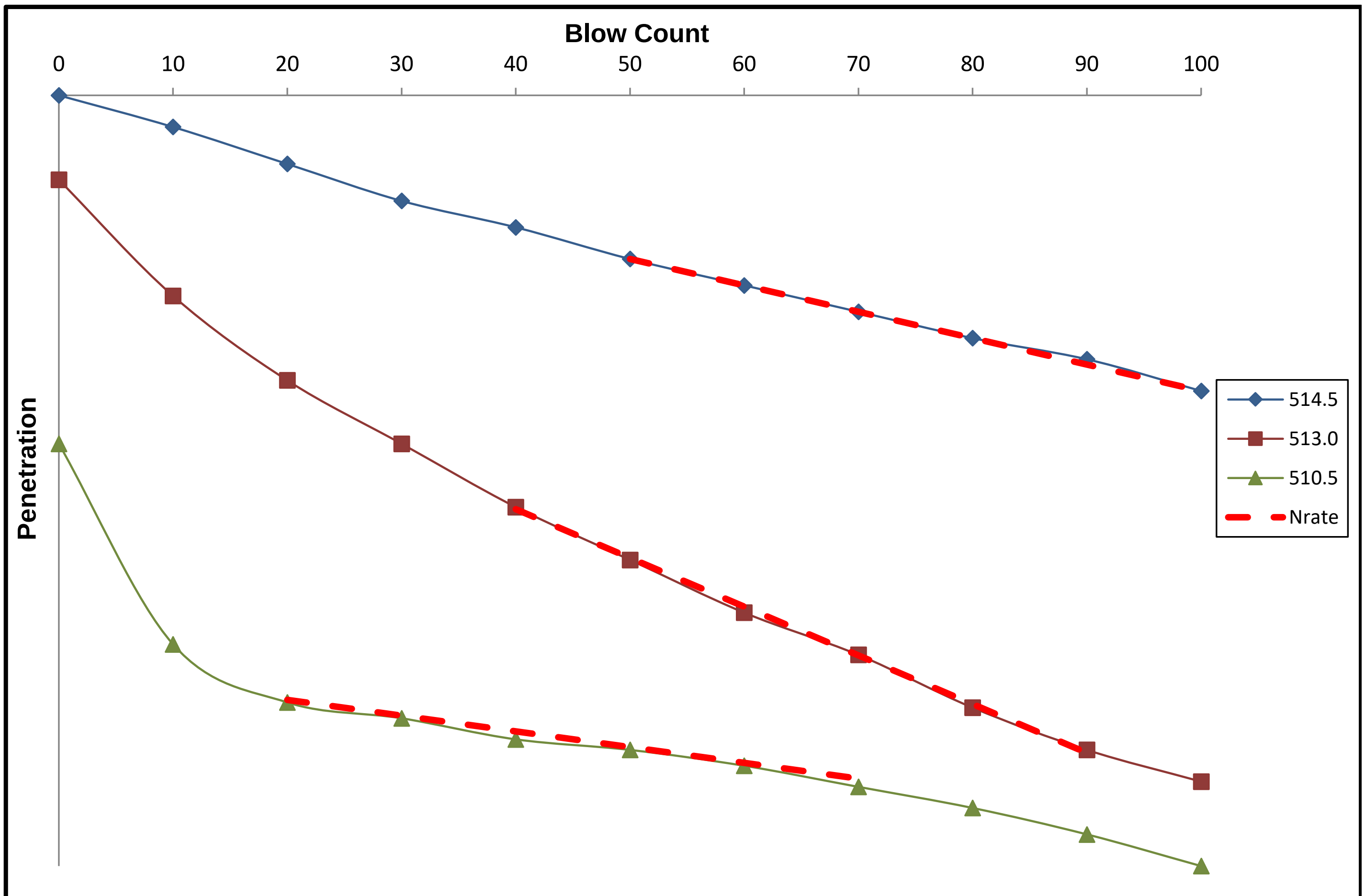
Boring No.: 7-SF Station: 24+45 Offset: 50 ft LT Latitude: 37.654685 Longitude: -89.318769

Drill Rig: CME 750X Hammer Type: Auto 140# Hammer Efficiency (%): 92 Surface Elevation: 533.50

Borehole Diameter. (in.) 8 Split-barrel Sampler Description: 1.375-in. I.D.

Test Elevation	Blows where exposed rod length is measured (blows) — Measured Rod Length (in.) 0	10	20	30	40	50	60	70	80	90	100	$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
514.50	13.75	13	12.13	11.25	10.63	***9.875***	***9.25***	***8.63***	***8***	7.5	***6.75***	186.5	17.9	4.00
513.00	25.75	23	21	19.5	***18***	***16.75***	15.5	***14.5***	***13.3***	***12.3***	11.5	101.0	9.7	2.25
510.50	26.25	21.5	***20.1***	***19.8***	19.25	***19***	***18.6***	***18.1***	17.63	17	16.25	312.6	30.0	6.80
												#N/A	#N/A	#N/A

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Holcomb Foundation Engineering Company, Inc.

Modified SPT Sample Photos

IL 127 Slope Failure
Jackson Co.
Boring 7-SF

Top

Bottom

0 1 2 3 4 5 **6** 7 8 9 10 11 **12** 13 14 15 16 17 **18** 19 20 21 22 23 **24** **SCALE (inches)**

SOIL BORING LOG

Date 9/13/21

ROUTE IL 127 (FAS 1909) **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** NRK (Gonzalez)

SECTION 12SLP-1 **LOCATION** 4 mi S of Orchard Hill Rd (E side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto 140 lb HE 92%

STRUCT. NO.
Station
BORING NO. 8-SF
Station 24+90
Offset 63.0ft Left
Latitude 37.6546846
Longitude -89.318768
Ground Surface Elev. 525.7 ft

Surface Water Elev. ft
Stream Bed Elev. ft
Groundwater Elev.:
First Encounter Dry ft
Upon Completion ft
After Hrs. ft

Description	Elev.	DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)
Stiff Brown and Gray, Dry CLAY (Modified Loess)			5		
			6	>4.5	13
			6	P	
	522.70				
Medium Stiff Brown, Moist CLAY (Modified Loess)			2		
			3	1.2	24
		-5	3	S	
			3		
	518.70		3	1.3	22
Medium Stiff Light Brown, Moist CLAY with SANDSTONE Pebbles			4	S	
			3		
	516.50		3	1.7	16
Medium Stiff Light Gray, Moist Shaly CLAY		-10	4	S	
LL=32, PL=20, PI=12	515.20				
Stiff Brown, Dry Weathered CLAY SHALE LL=44, PL=27, PI=17			5		
			9	2.8	14
			11	P	
LL=36, PL=25, PI=11	511.80		5		
Hard Gray, Dry Weathered CLAY SHALE Modified SPT performed at 14 ft qu = 2.6 tsf (see MSPT log)			24	1.6	10
		-15	30	S	
Modified SPT performed at 16 ft qu = 3.9 tsf (see MSPT log)			18		
			23	>4.5	13
			42	P	
Modified SPT performed at 18.5 ft qu = 3.5 tsf (see MSPT log)	507.00		5		
Medium Stiff Light Gray, Moist Shaly CLAY	506.50		7		20
		-20	33		

Description	Elev.	DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)
Hard Reddish Brown, Dry Highly Weathered SANDSTONE *(continued)*	505.20				
Borehole continued with rock coring.					
		-25			
		-30			
		-35			
		-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

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Latitude 37.6546846 Longitude -89.318768 Datum NAD83 Job Number 21-123

provided by Gonzalez

FIG. A-23

gonzalez COMPANIES, LLC

ROCK CORE LOG

Date 9/13/21

ROUTE IL 127 (FAS 1909) **DESCRIPTION** Slope Failure North of Pomona Rd. **LOGGED BY** NRK (Gonzalez)

SECTION 12SLP-1 **LOCATION** 4 mi S of Orchard Hill Rd (E side of road), **SEC.** 15, **TWP.** 10S, **RNG.** 2W, 3 **PM**

COUNTY Jackson **CORING METHOD** Water

STRUCT. NO.
Station
BORING NO. 8-SF
Station 24+90
Offset 63.0ft Left
Latitude 37.6546846
Longitude -89.318768
Ground Surface Elev. 525.7 ft

CORING BARREL TYPE & SIZE NQ

Core Diameter 2 in
Top of Rock Elev. 505.20 ft
Begin Core Elev. 505.20 ft

Description	Elev.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Hard Light Brown, Dry Slightly Weathered SANDSTONE	505.20		1	85	68	1.6	1088.8
		-25					735.5
	500.20						
Boring terminated at 25.5 ft.							
Benchmark referenced: BM 224, cut "X" on top of westernmost flange bolt on fire hydrant on east side of IL 127 at Sta 9+00; Elev 624.47.							
		-30					
		-35					
		-40					

Color pictures of the cores Yes, On File
Cores will be stored for examination until 5 Years after Construction
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)
RQD is the ratio of the total length of sound core specimens >4" to total length of core run **BBS, form 138 (Rev. 8-99)**

FIG. A-24

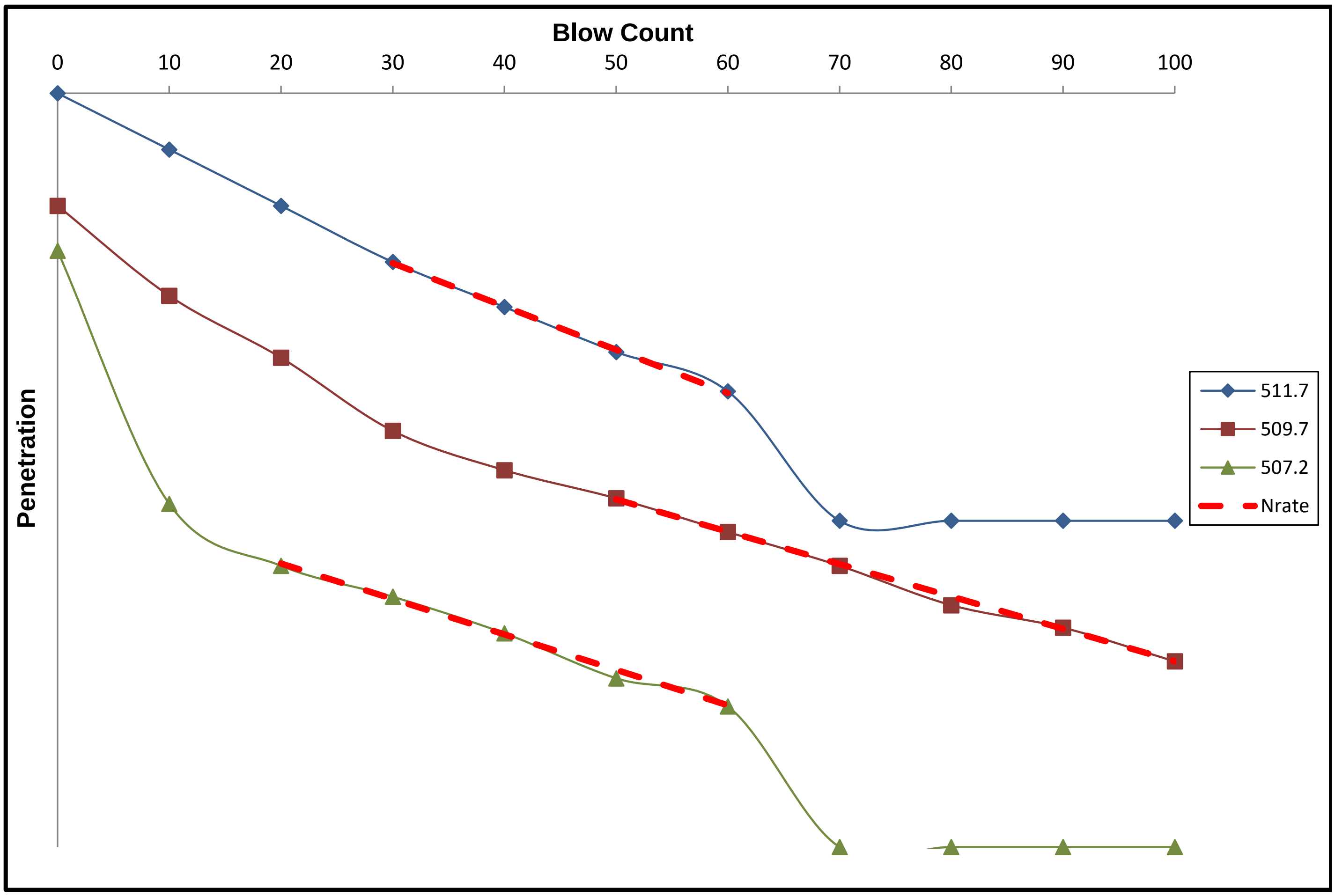
Modified SPT Log

gonzalez COMPANIES LLC

Route:	IL 127	Structure No.:		(Exist.)		(Prop.)	Date:	9/13/21	Page:	1 of 1
Section:	12SLP-1	Description:	Slope Failure North of Pomona Rd.							
County:	Jackson	Logged by:	NRK (Gonzalez)		Sampler Tube Length:	24 in.				
Boring No.:	8-SF	Station:	24+90	Offset:	63 ft LT	Latitude:	37.6546846	Longitude:	-89.318768	
Drill Rig:	CME 750X	Hammer Type:	Auto 140#	Hammer Efficiency (%):	92	Surface Elevation:	525.70			
Borehole Diameter. (in.)	8	Split-barrel Sampler Description:	1.375-in. I.D.							

Test Elevation / Measured Rod Length (in.)	Blows where exposed rod length is measured (blows) 0	10	20	30	40	50	60	70	80	90	100	$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
511.70	19	16.5	14	***11.5***	***9.5***	***7.5***	***5.75***					54.2	5.2	1.25
509.70	27	23	20.25	17	15.25	***14***	***12.5***	***11***	9.25	***8.25***	***6.75***	81.0	7.8	1.83
507.20	26.5	15.25	***12.5***	***11.1***	***9.5***	7.5	***6.25***					74.0	7.1	1.68

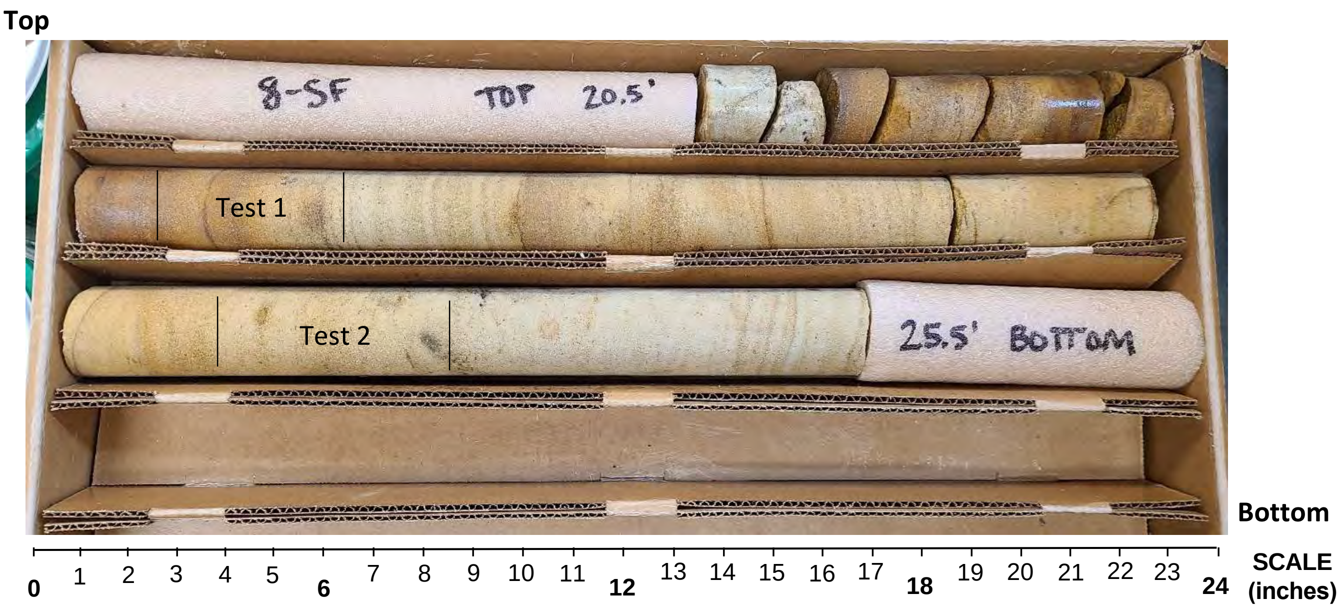
Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Holcomb Foundation Engineering Company, Inc.

Unconfined Compressive Strength

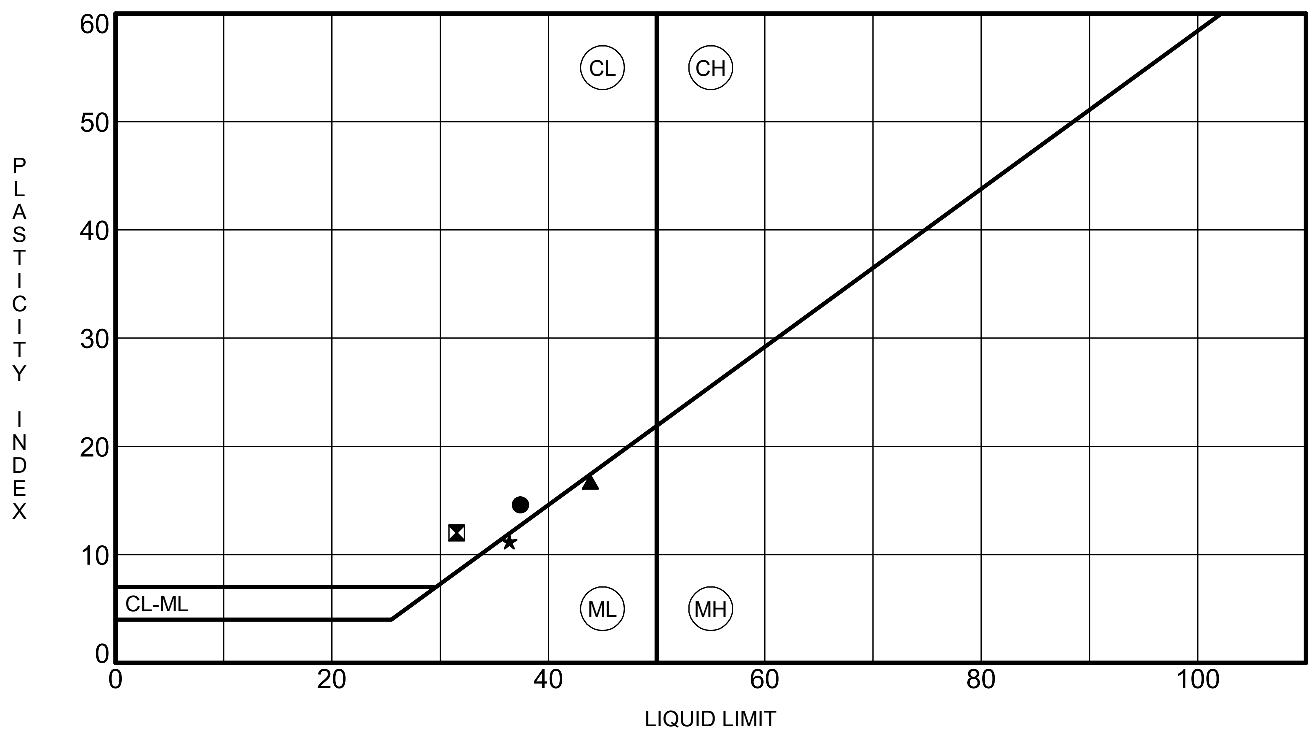
IL 127 Slope Failure
Jackson Co.
Boring 8-SF



Boring#	Specimen#	Depth	Unconfined Compression
8-SF	1	21.5’	15,122 psi
8-SF	2	24.5’	10,215 psi

provided by Gonzalez

FIG. A-26



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**7-SF**	**23.5**	**37**	**23**	**14**		
⧗	**8-SF**	**9.2**	**32**	**20**	**12**		
▲	**8-SF**	**11.0**	**44**	**27**	**17**		
★	**8-SF**	**13.5**	**36**	**25**	**11**		

ATTERBERG LIMITS' RESULTS

Route: IL 127 (FAS 1909)

Section: 12SLP-1

County: Jackson

gonzalez COMPANIES, LLC

ATTERBERG LIMITS 21-123.GPJ D6TEMPLT.GDT 21/09/23

provided by Gonzalez

FIG. A-27

APPENDIX B: INSTRUMENTATION DATA

Appendix B

Instrumentation Data

CONTENTS

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Inclinometer Locations
Inclinometer_2-SF
Inclinometer_1-SF
provided by IDOT
FIG. B-1

Illinois Department of Transportation

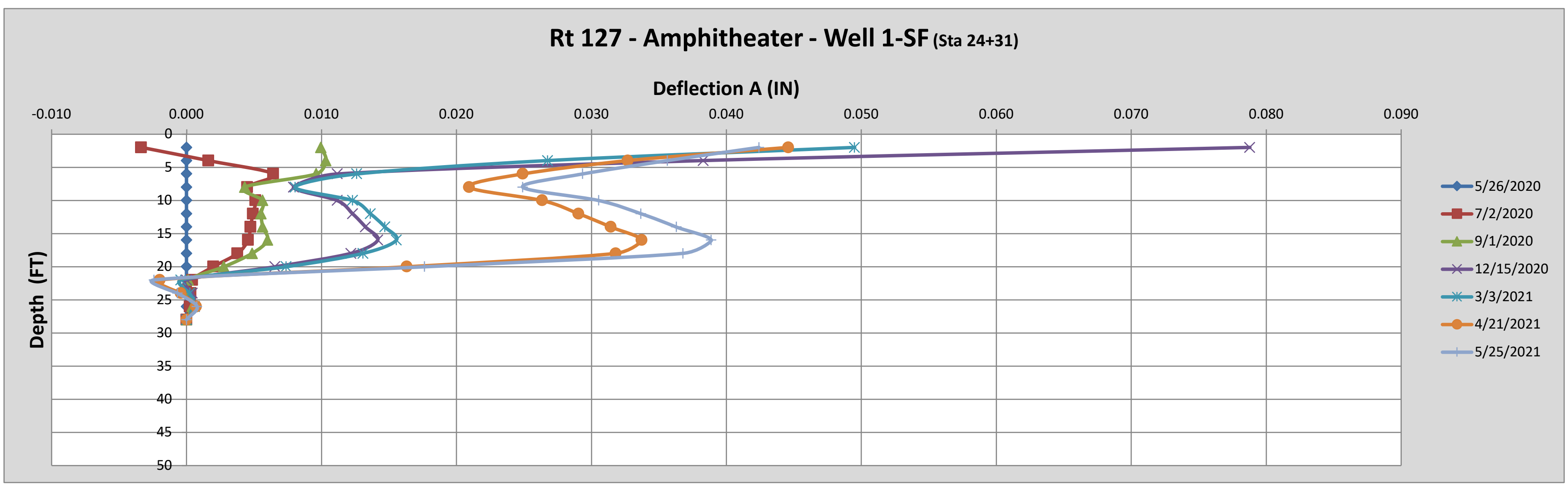
SLOPE INDICATOR DEFLECTION DATA

DATE:	2/1/2022
OBSERVATION WELL:	1-SF
DESCRIPTION:	Amphitheater
RTE:	Rt 127
STA:	24+31
INITIAL OFFSET:	20' FT LT

TOP OF TUBE ELEV:	543.9
GROUND ELEV:	541.7
TUBE LENGTH:	28
H_20 DEPTH:	0

Defl_A	Deflections for 5/26/2020	Deflections for 7/2/2020	Deflections for 9/1/2020	Deflections for 12/15/2020	Deflections for 3/3/2021	Deflections for 4/21/2021	Deflections for 5/25/2021
DEPTH	DataSheet00	DataSheet01	DataSheet02	DataSheet03	DataSheet04	DataSheet05	DataSheet06
2	0.00000	-0.00336	0.00996	0.07878	0.04950	0.04458	0.04242
4	0.00000	0.00162	0.01032	0.03828	0.02676	0.03270	0.03564
6	0.00000	0.00642	0.00960	0.01116	0.01260	0.02490	0.02934
8	0.00000	0.00450	0.00432	0.00792	0.00804	0.02094	0.02490
10	0.00000	0.00510	0.00564	0.01116	0.01230	0.02634	0.03054
12	0.00000	0.00492	0.00552	0.01230	0.01362	0.02904	0.03366
14	0.00000	0.00474	0.00564	0.01326	0.01470	0.03144	0.03630
16	0.00000	0.00456	0.00600	0.01416	0.01554	0.03372	0.03888
18	0.00000	0.00378	0.00486	0.01218	0.01308	0.03180	0.03678
20	0.00000	0.00198	0.00276	0.00654	0.00738	0.01632	0.01764
22	0.00000	0.00042	0.00012	0.00000	-0.00042	-0.00198	-0.00240
24	0.00000	0.00030	0.00024	0.00042	0.00024	-0.00042	-0.00066
26	0.00000	0.00024	0.00042	0.00060	0.00060	0.00072	0.00078
28	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Max movement near EL 525.9
(15.8 feet below ground surface)



provided by IDOT

FIG. B-2

Illinois Department of Transportation

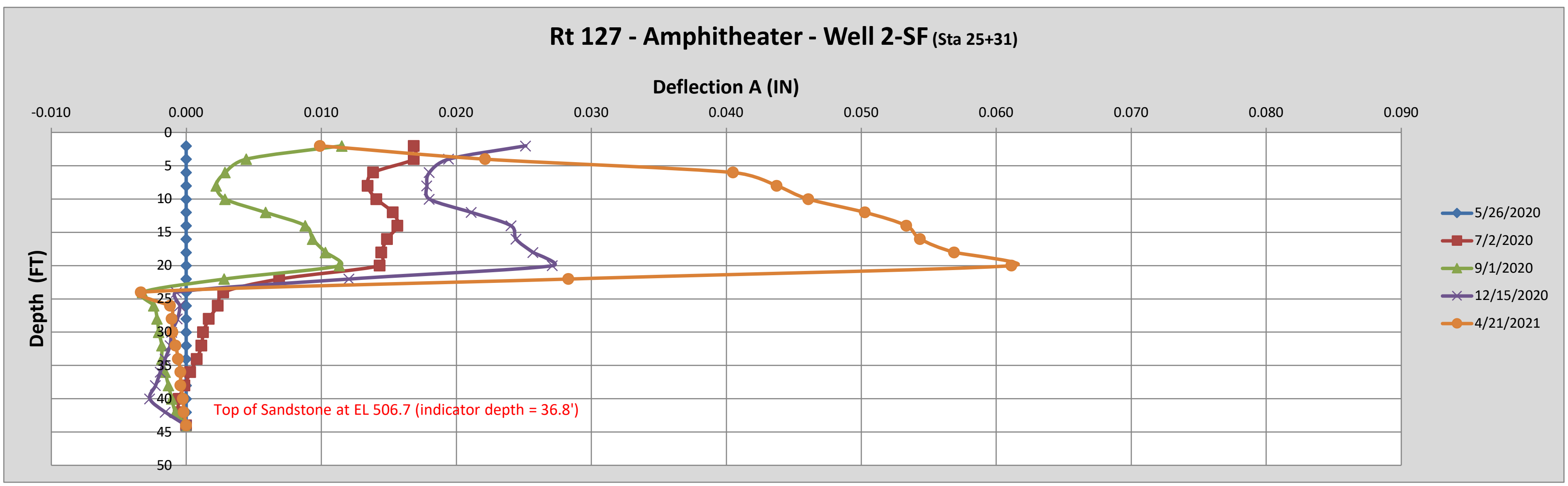
SLOPE INDICATOR DEFLECTION DATA

DATE:	2/1/2022
OBSERVATION WELL:	2-SF
DESCRIPTION:	Amphitheater
RTE:	Rt 127
STA:	25+31
INITIAL OFFSET:	19.0 FT LT

TOP OF TUBE ELEV:	543.5
GROUND ELEV:	541.2
TUBE LENGTH:	44
H_20 DEPTH:	0

	Defl_A	Deflections for 5/26/2020	Deflections for 7/2/2020	Deflections for 9/1/2020	Deflections for 12/15/2020	Deflections for 3/3/2021	Deflections for 4/21/2021
EL	DEPTH	DataSheet00	DataSheet01	DataSheet02	DataSheet03	DataSheet04	DataSheet05
541.5	2	0.00000	0.01686	0.01152	0.02514	0.01308	0.00990
539.5	4	0.00000	0.01686	0.00444	0.01944	0.01122	0.02214
537.5	6	0.00000	0.01386	0.00288	0.01800	0.01404	0.04050
535.5	8	0.00000	0.01344	0.00222	0.01782	0.01710	0.04374
533.5	10	0.00000	0.01410	0.00288	0.01800	0.02550	0.04608
531.5	12	0.00000	0.01530	0.00588	0.02112	0.02616	0.05028
529.5	14	0.00000	0.01566	0.00882	0.02406	0.02700	0.05334
527.5	16	0.00000	0.01488	0.00936	0.02442	0.02706	0.05436
525.5	18	0.00000	0.01446	0.01032	0.02568	0.02844	0.05688
523.5	20	0.00000	0.01434	0.01134	0.02712	0.02904	0.06114
521.5	22	0.00000	0.00690	0.00282	0.01206	0.00264	0.02832
519.5	24	0.00000	0.00276	-0.00324	-0.00072	-0.00270	-0.00336
517.5	26	0.00000	0.00234	-0.00240	-0.00048	-0.00222	-0.00120
515.5	28	0.00000	0.00168	-0.00216	-0.00066	-0.00258	-0.00108
513.5	30	0.00000	0.00126	-0.00204	-0.00108	-0.00222	-0.00102
511.5	32	0.00000	0.00114	-0.00180	-0.00120	-0.00204	-0.00078
509.5	34	0.00000	0.00078	-0.00180	-0.00156	-0.00276	-0.00060
507.5	36	0.00000	0.00030	-0.00156	-0.00192	-0.00300	-0.00042
505.5	38	0.00000	-0.00012	-0.00132	-0.00228	-0.00270	-0.00042
503.5	40	0.00000	-0.00054	-0.00108	-0.00270	-0.00216	-0.00024
501.5	42	0.00000	-0.00054	-0.00078	-0.00156	-0.00174	-0.00018
499.5	44	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Max movement near EL 523.5
(17.7 feet below ground surface)



provided by IDOT

FIG. B-3

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APPENDIX C: STABILITY MODEL RESULTS

Appendix C

Stability Model Results

CONTENTS

- Item L - Undrained 1 (Buttress) (2) 2
- Item M - Drained 1 (existing) 125 pcf
- Item N - Drained 1 (Buttress) (2) 2 (125 pcf)
- Drained 1 (Rebuild)
- Rebuild (undrained)

Station 24+31 Existing Slope and Buttress

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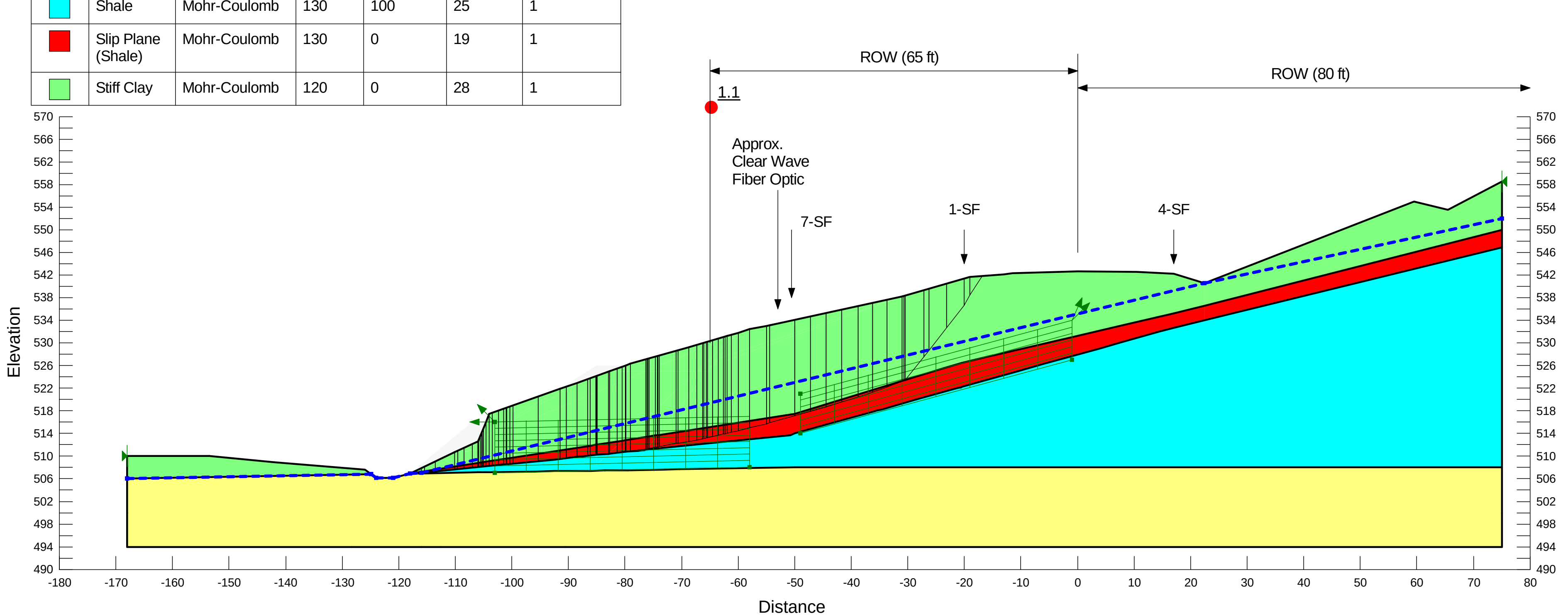
Illinois 127, MP 4.0, Jackson County, IL
Station 24+31 stability analysis_Rev.3.gsz
Drained 1 (existing)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Sandstone	High Strength	140			1
	Shale	Mohr-Coulomb	130	100	25	1
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19	1
	Stiff Clay	Mohr-Coulomb	120	0	28	1

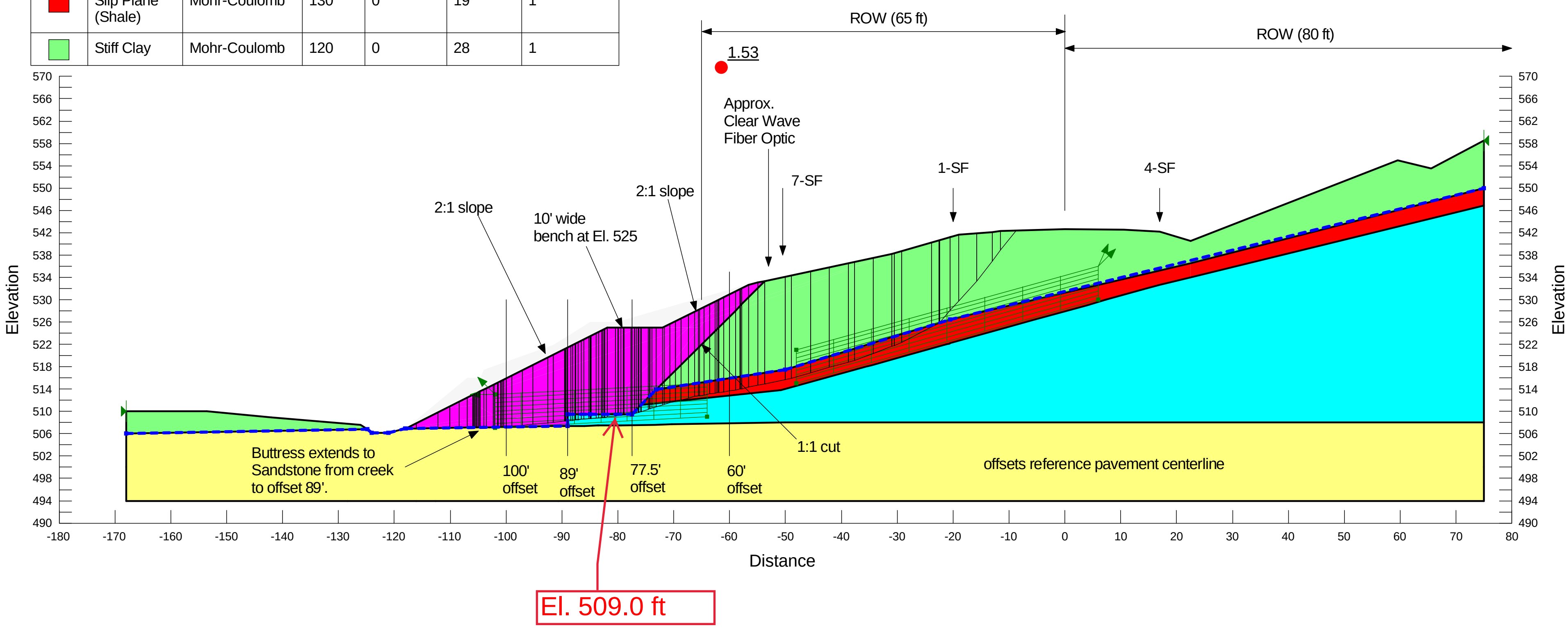


Illinois 127, MP 4.0, Jackson County, IL
Station 24+31 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (2) 2
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
(magenta)	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38	1
(yellow)	Sandstone	High Strength	140			1
(cyan)	Shale	Mohr-Coulomb	130	100	25	1
(red)	Slip Plane (Shale)	Mohr-Coulomb	130	0	19	1
(green)	Stiff Clay	Mohr-Coulomb	120	0	28	1

STATION 24+31



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INDOT PTB 199 Item 39
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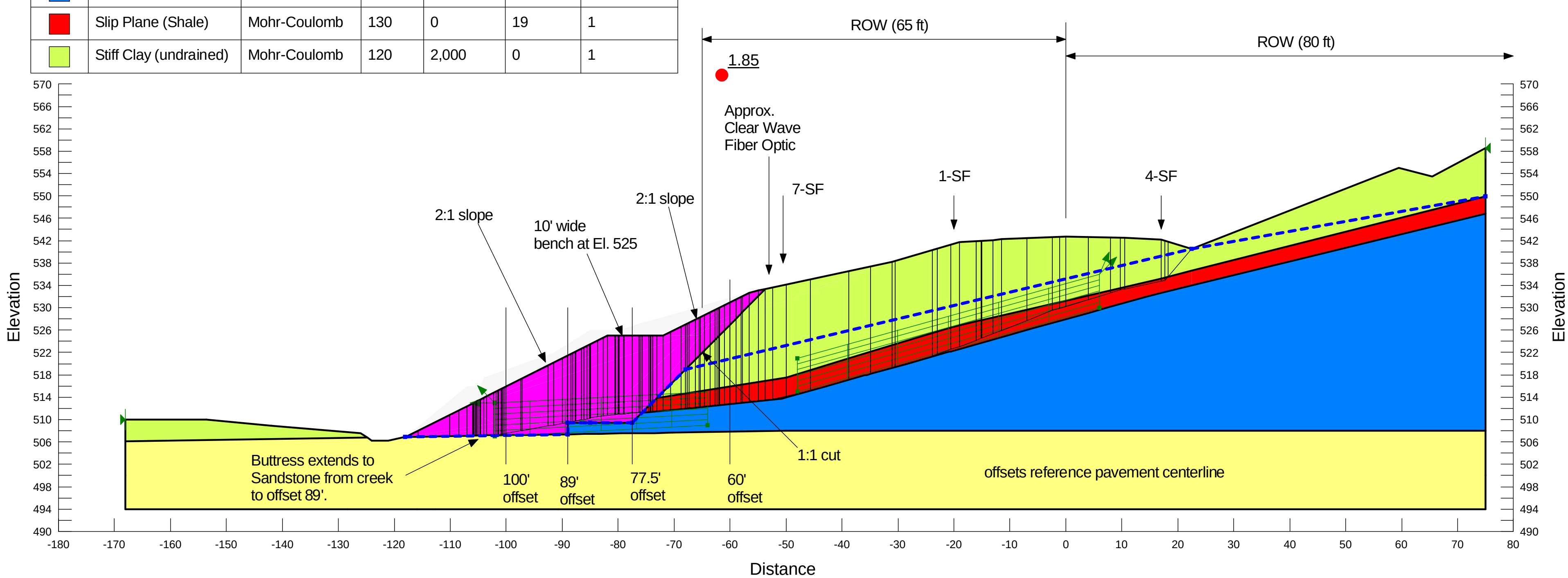
Illinois 127, MP 4.0, Jackson County, IL
Station 24+31 stability analysis_Rev.3.gsz
Undrained 1 (Buttress) (2) 2 (4)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38	1
	Sandstone	High Strength	140			1
	Shale (undrained)	Mohr-Coulomb	130	4,000	0	1
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19	1
	Stiff Clay (undrained)	Mohr-Coulomb	120	2,000	0	1



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Station 25+25 Existing Slope and Buttress

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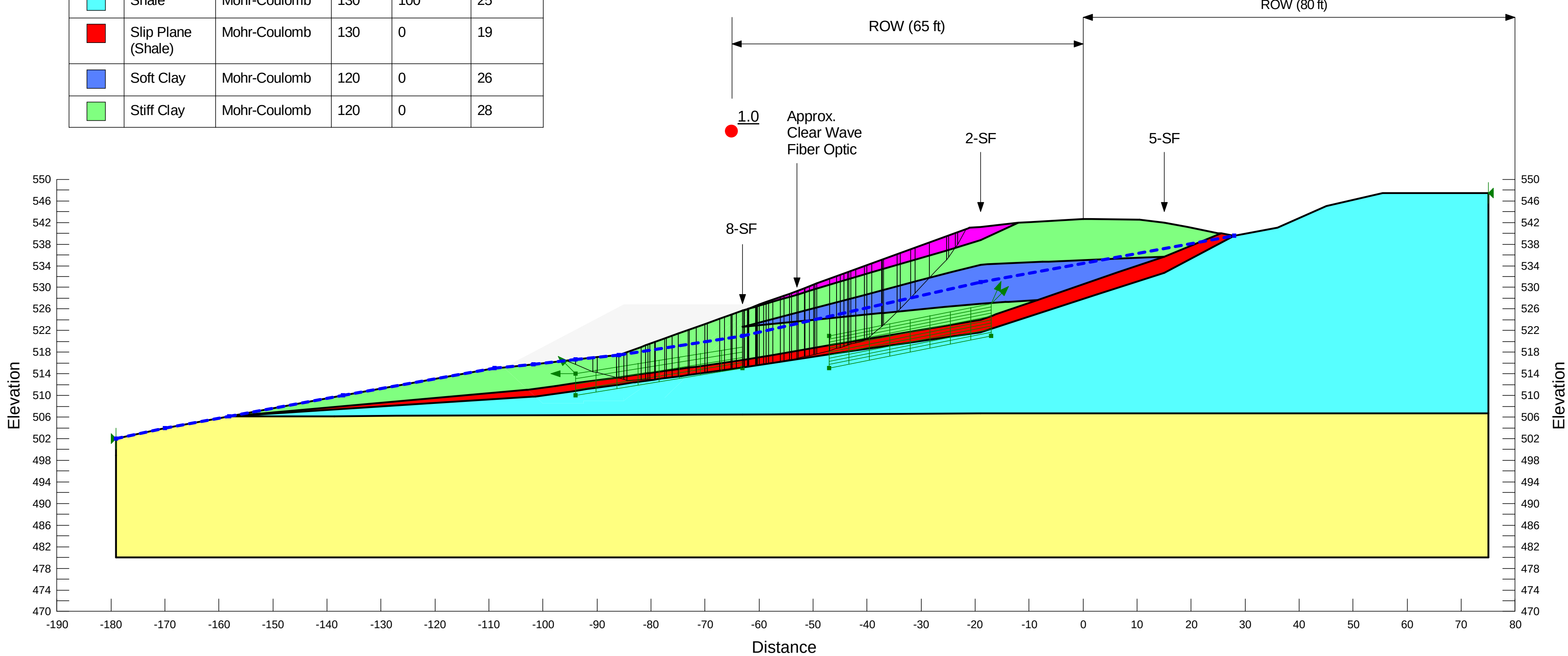
Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (existing)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
(magenta)	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
(yellow)	Sandstone	High Strength	140		
(cyan)	Shale	Mohr-Coulomb	130	100	25
(red)	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
(blue)	Soft Clay	Mohr-Coulomb	120	0	26
(green)	Stiff Clay	Mohr-Coulomb	120	0	28

STATION 25+25



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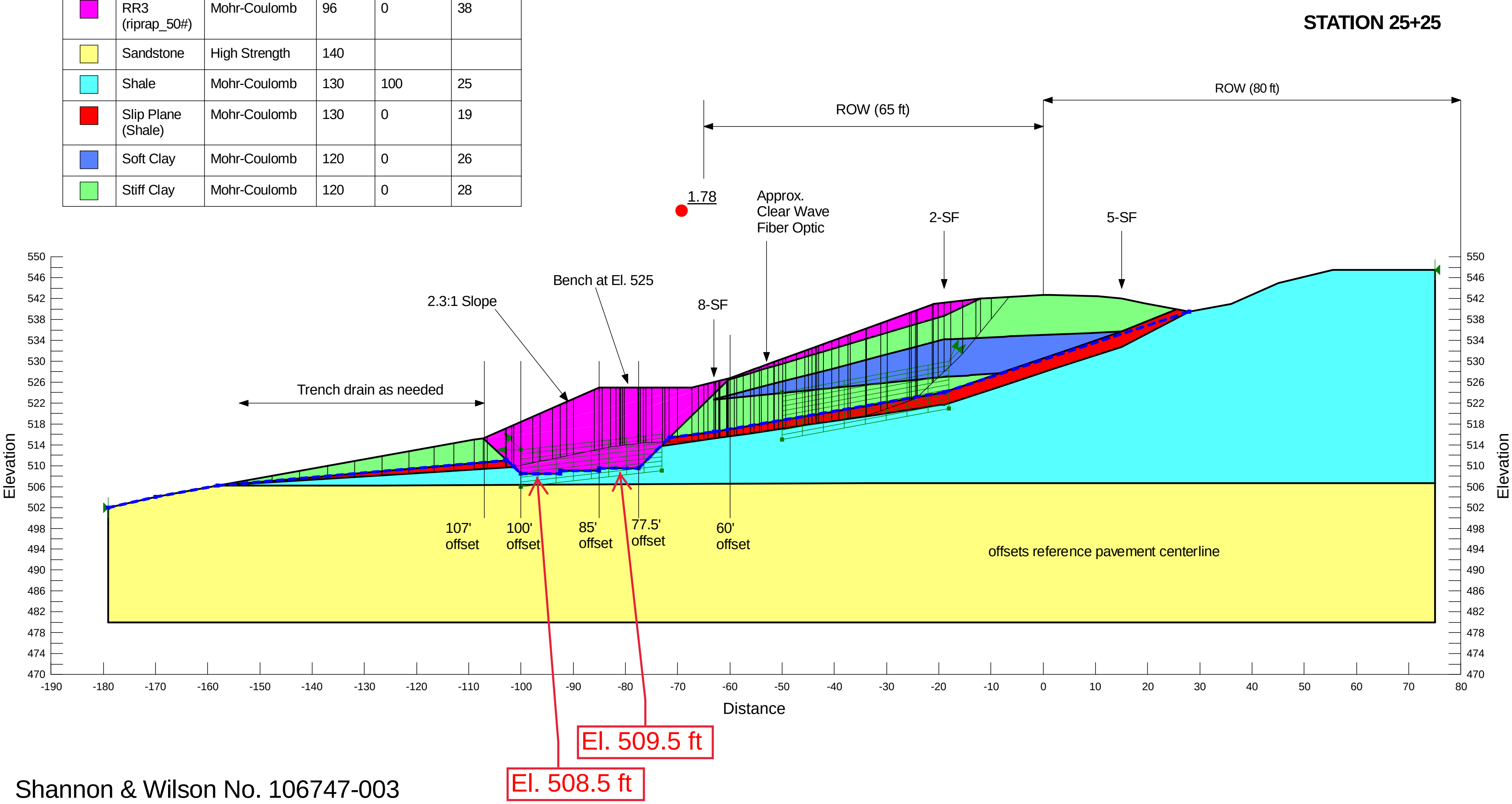
Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (2) 2
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28



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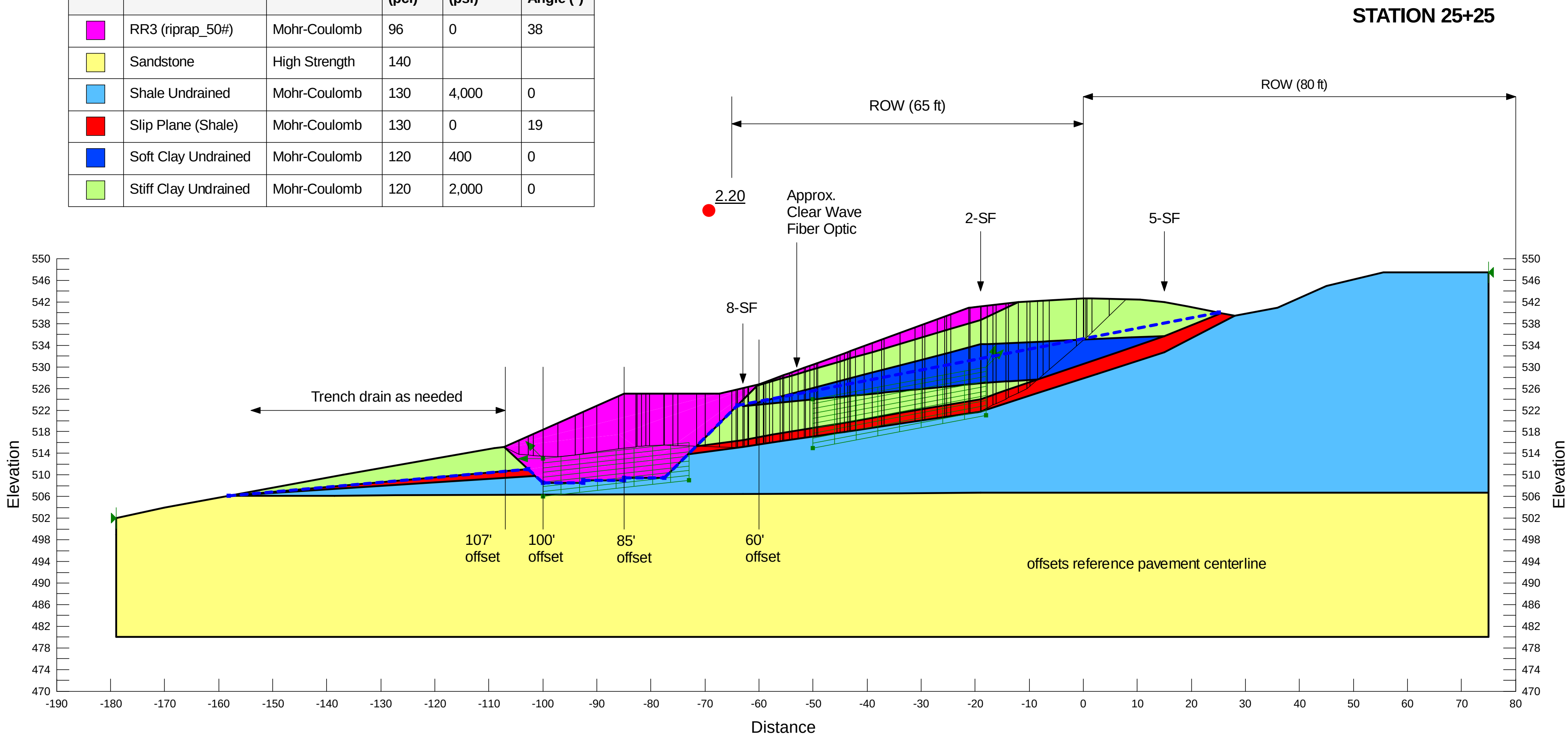
Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Undrained 1 (Buttress) (2) 2
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale Undrained	Mohr-Coulomb	130	4,000	0
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay Undrained	Mohr-Coulomb	120	400	0
	Stiff Clay Undrained	Mohr-Coulomb	120	2,000	0



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Station 25+84 Existing Slope and Buttress

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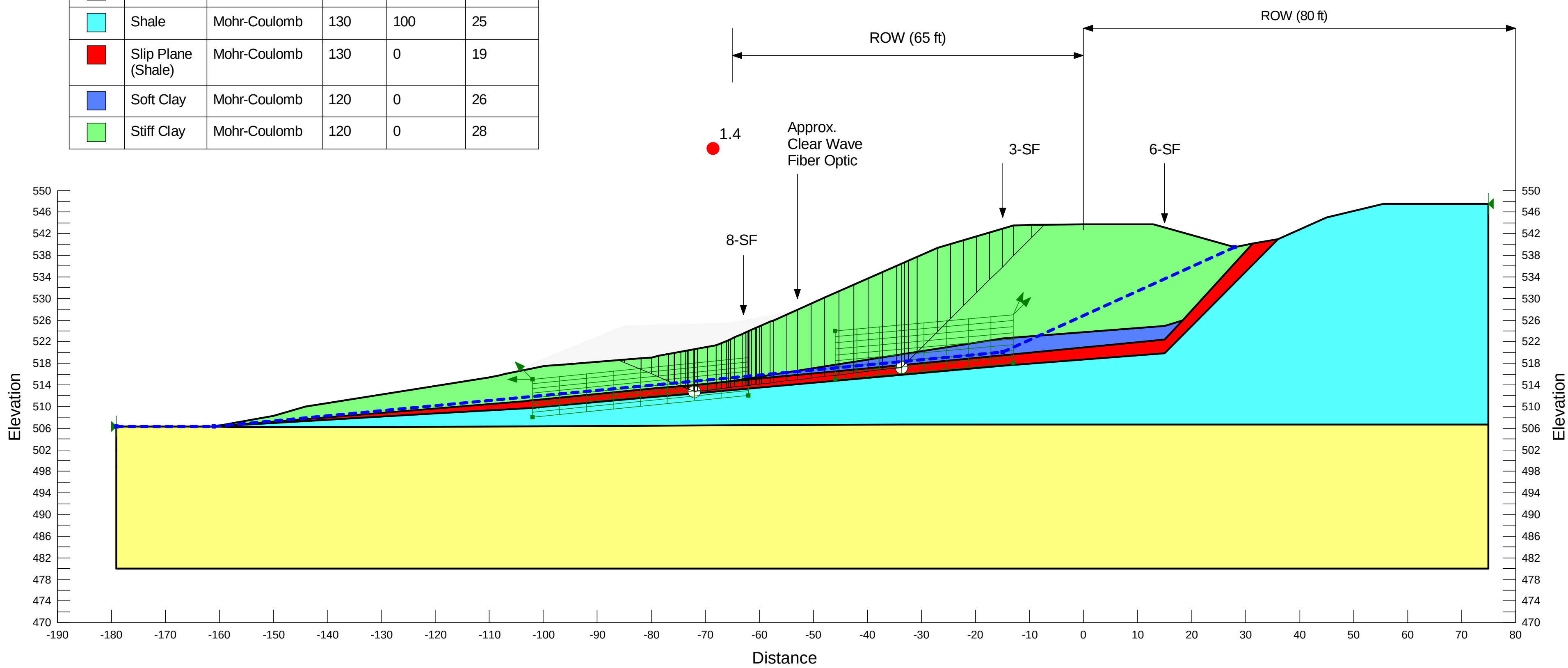
Illinois 127, MP 4.0, Jackson County, IL
Station 25+84 stability analysis_Rev.3.gsz
Drained 1 (existing)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
(yellow)	Sandstone	High Strength	140		
(cyan)	Shale	Mohr-Coulomb	130	100	25
(red)	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
(blue)	Soft Clay	Mohr-Coulomb	120	0	26
(green)	Stiff Clay	Mohr-Coulomb	120	0	28



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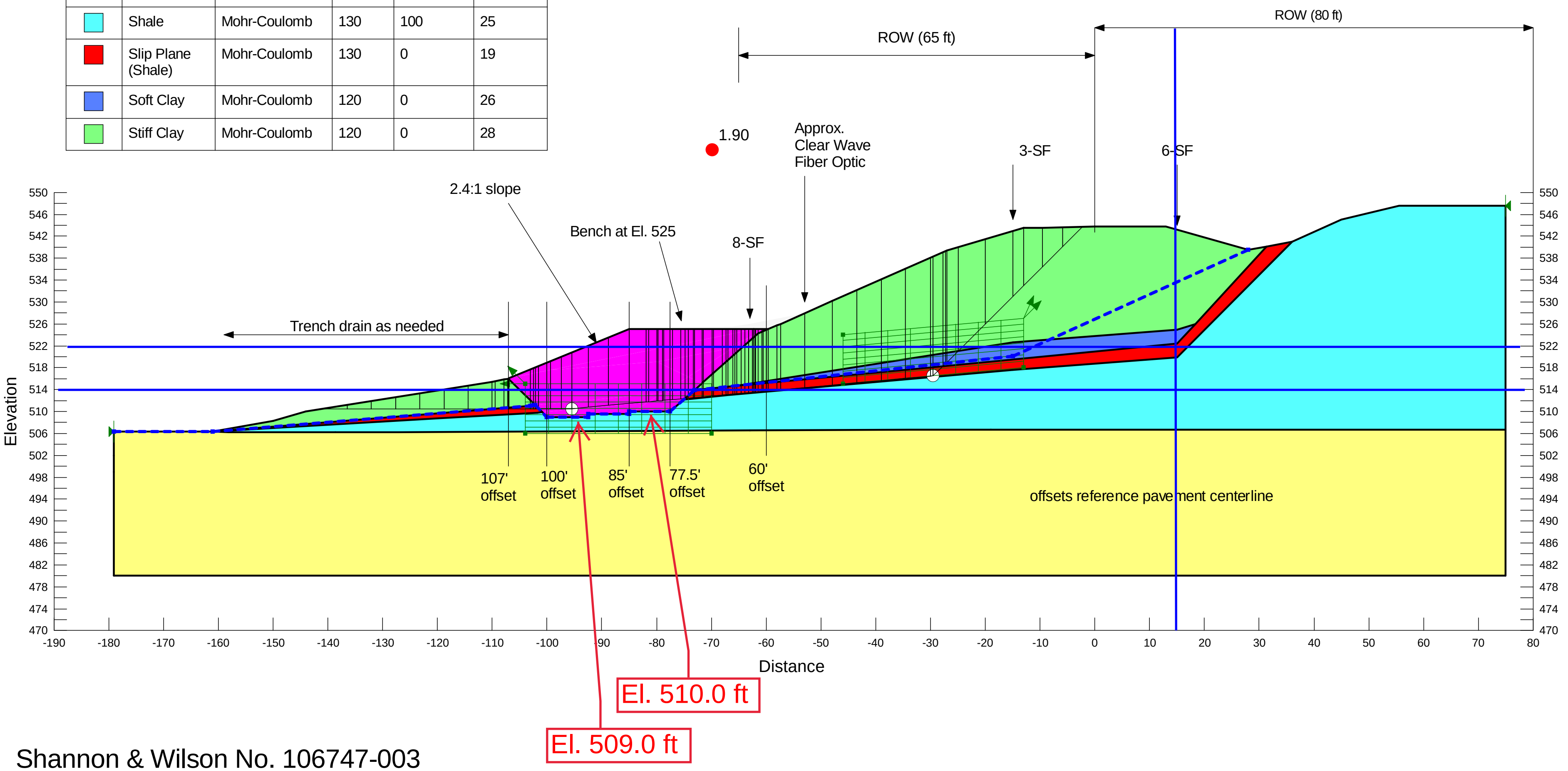
Illinois 127, MP 4.0, Jackson County, IL
Station 25+84 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (2) 2
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
Magenta	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
Yellow	Sandstone	High Strength	140		
Cyan	Shale	Mohr-Coulomb	130	100	25
Red	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
Blue	Soft Clay	Mohr-Coulomb	120	0	26
Green	Stiff Clay	Mohr-Coulomb	120	0	28



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Created By: Dale Miller, Date: 07/01/2022
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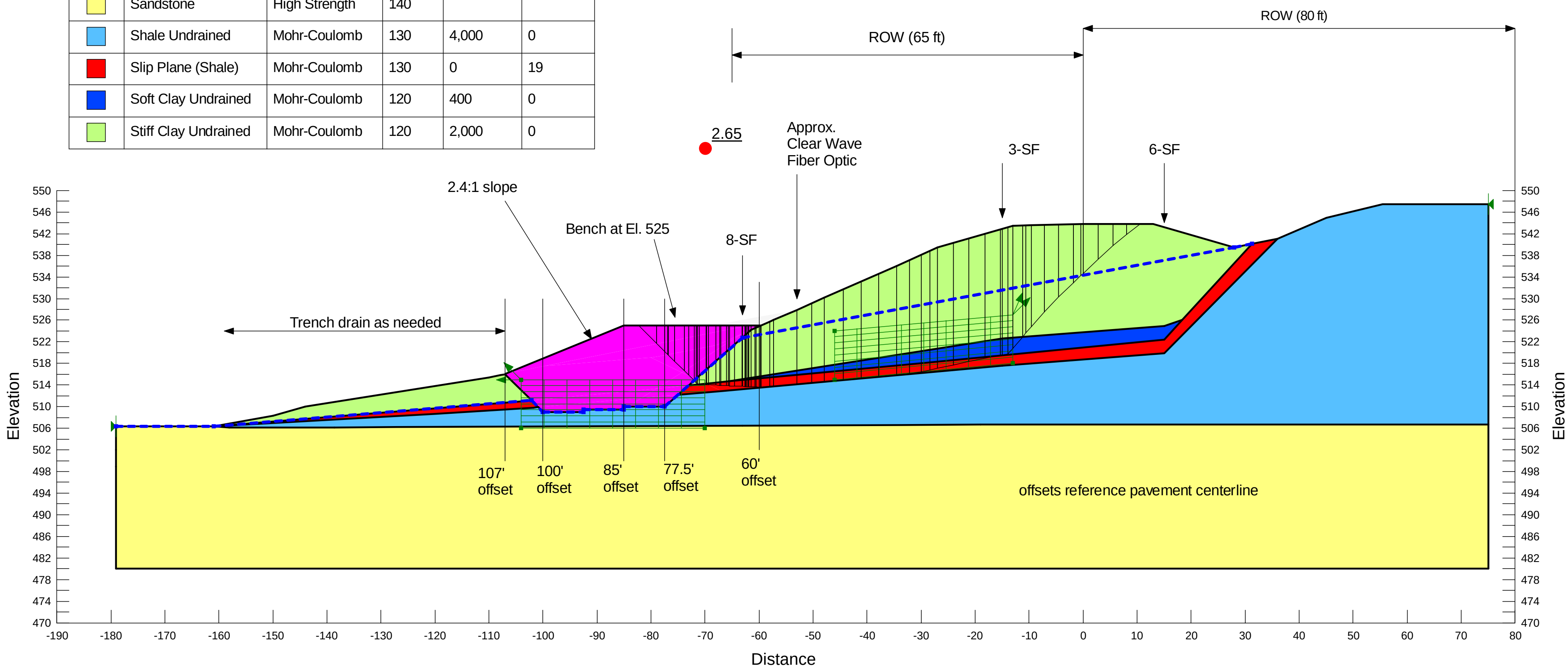
Illinois 127, MP 4.0, Jackson County, IL
Station 25+84 stability analysis_Rev.3.gsz
Undrained 1 (Buttress) (2) 2 (high water) (2)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale Undrained	Mohr-Coulomb	130	4,000	0
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay Undrained	Mohr-Coulomb	120	400	0
	Stiff Clay Undrained	Mohr-Coulomb	120	2,000	0



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SHANNON & WILSON

Stabilization Parametric Study at Station 25+25

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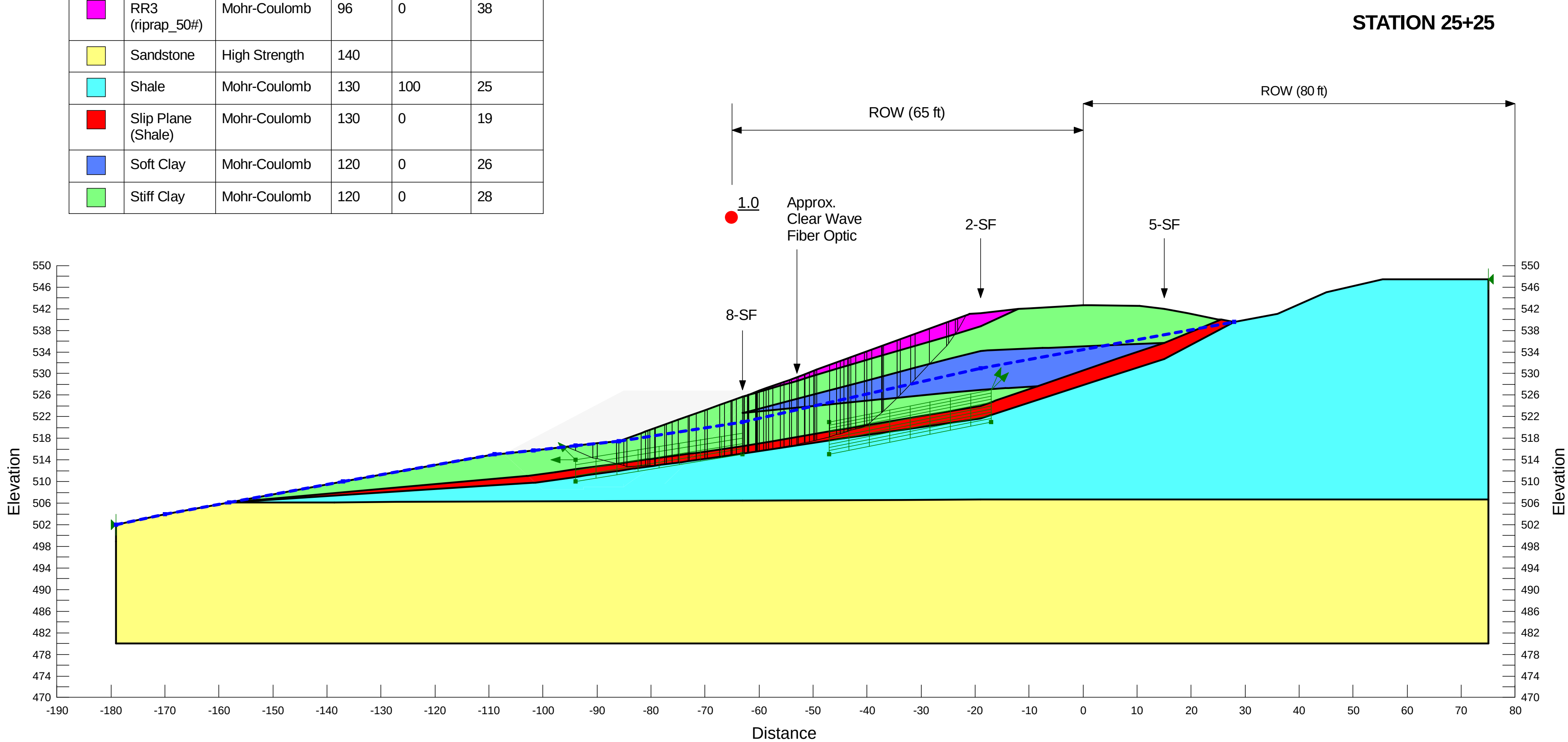
Item A

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (existing)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
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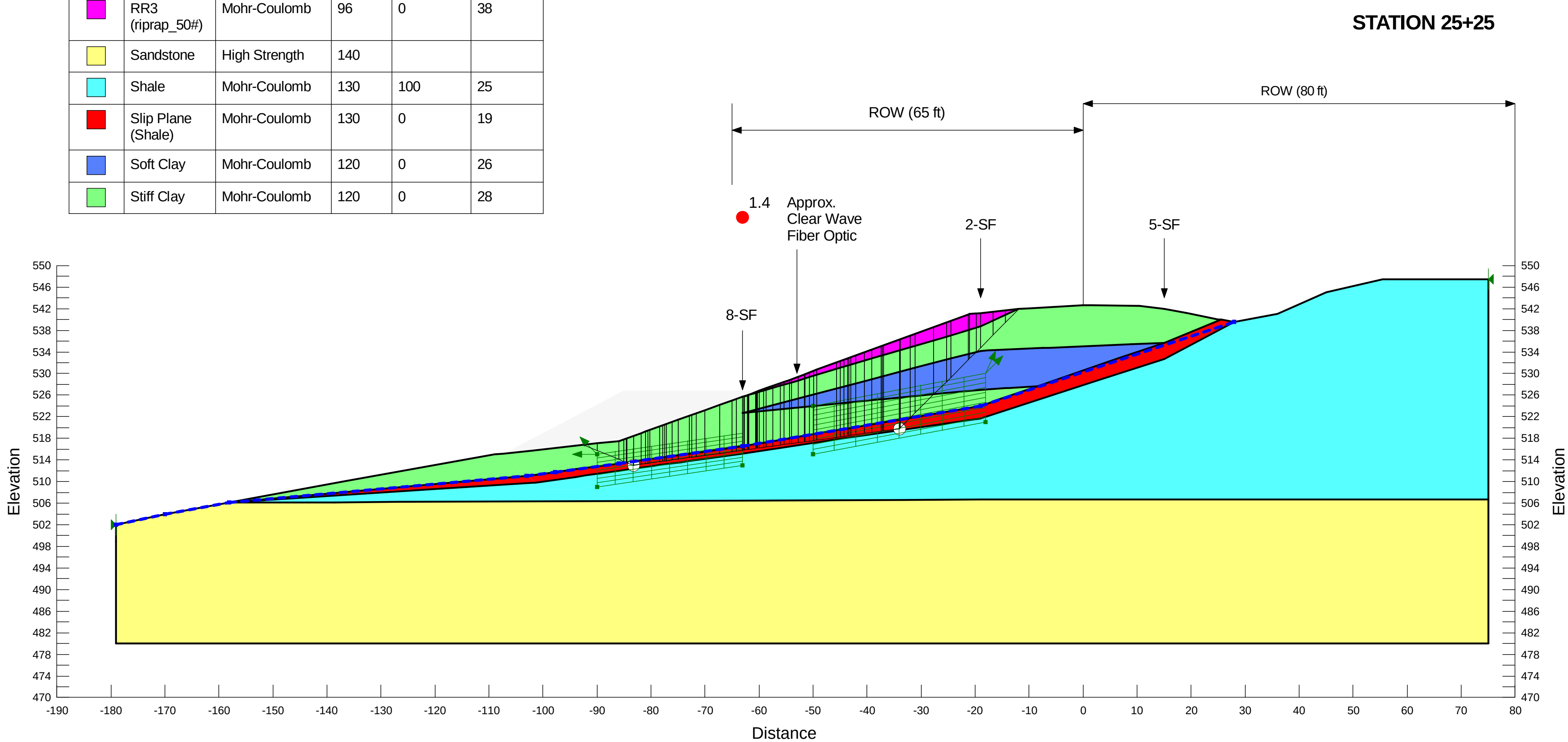
Item B

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (low water)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/06/2022
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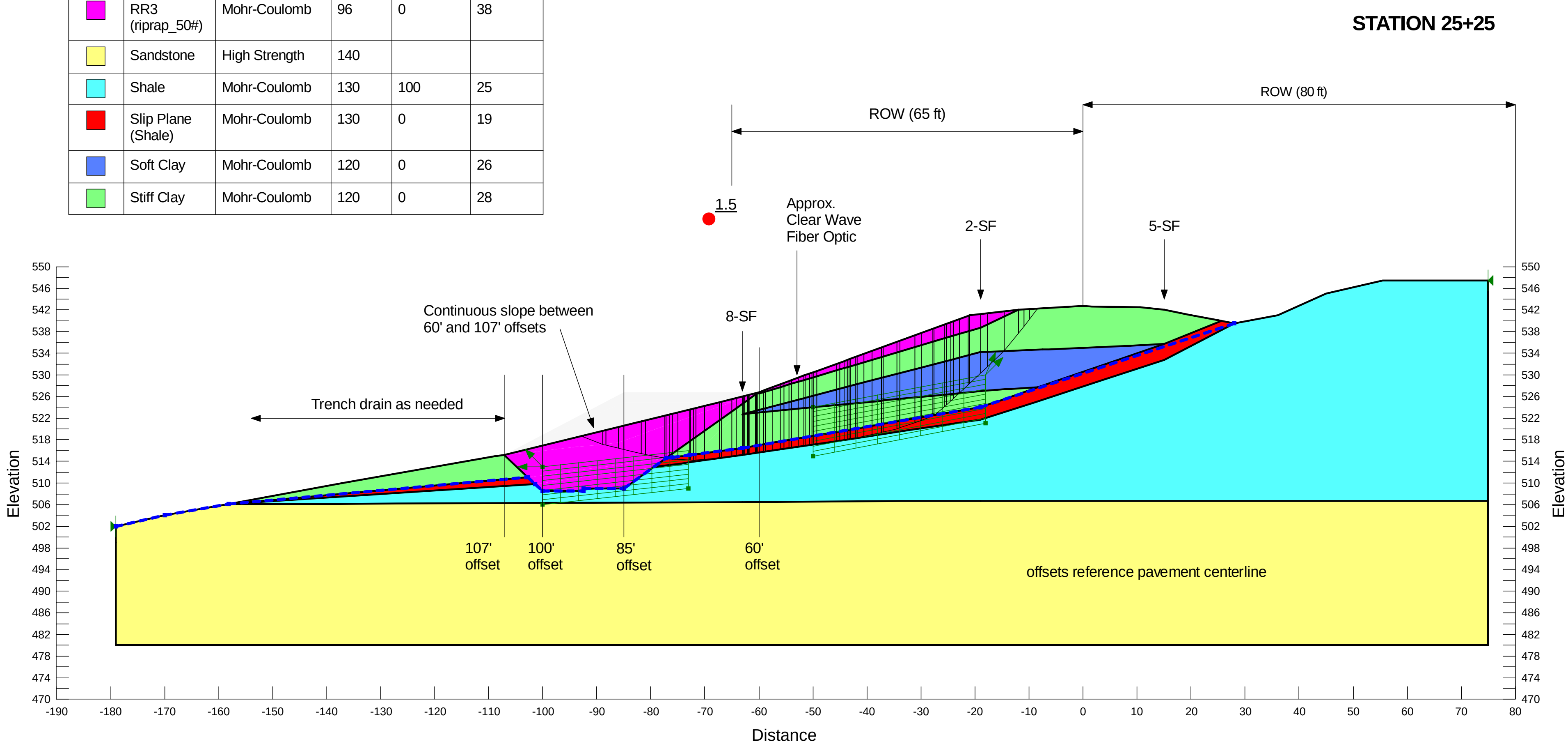
Item C

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/06/2022
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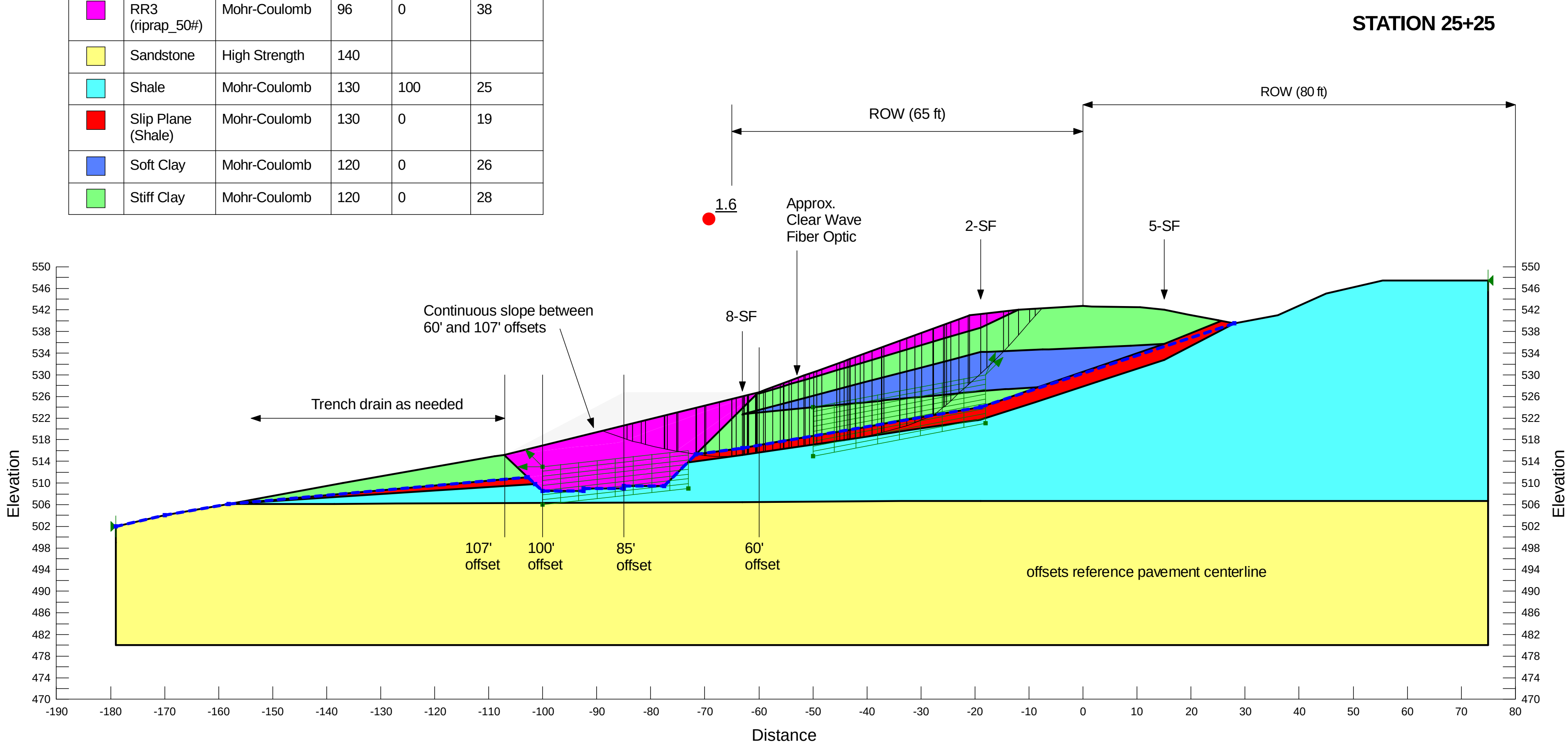
Item D

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (2)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/06/2022
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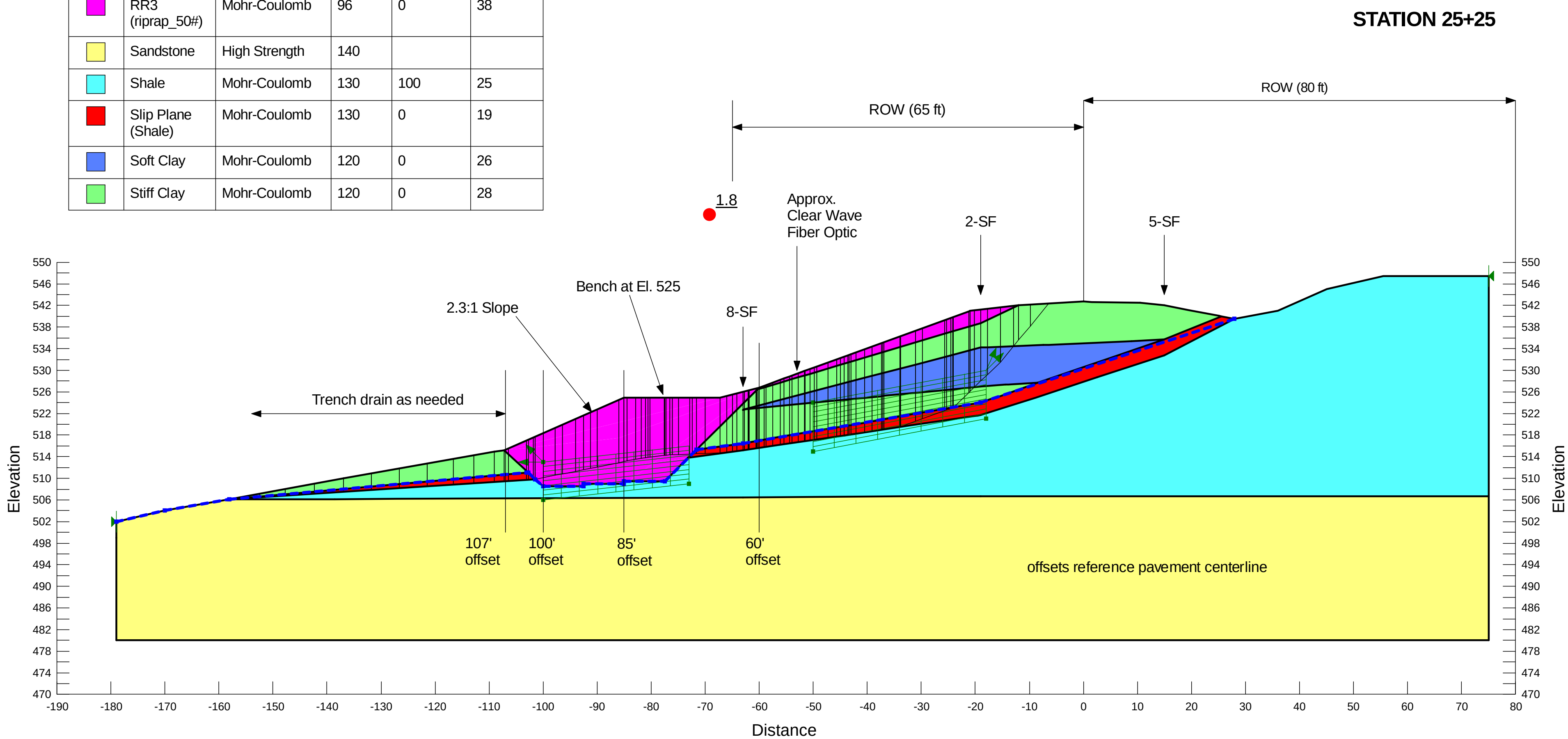
Item E

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (2) 2
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/24/2022
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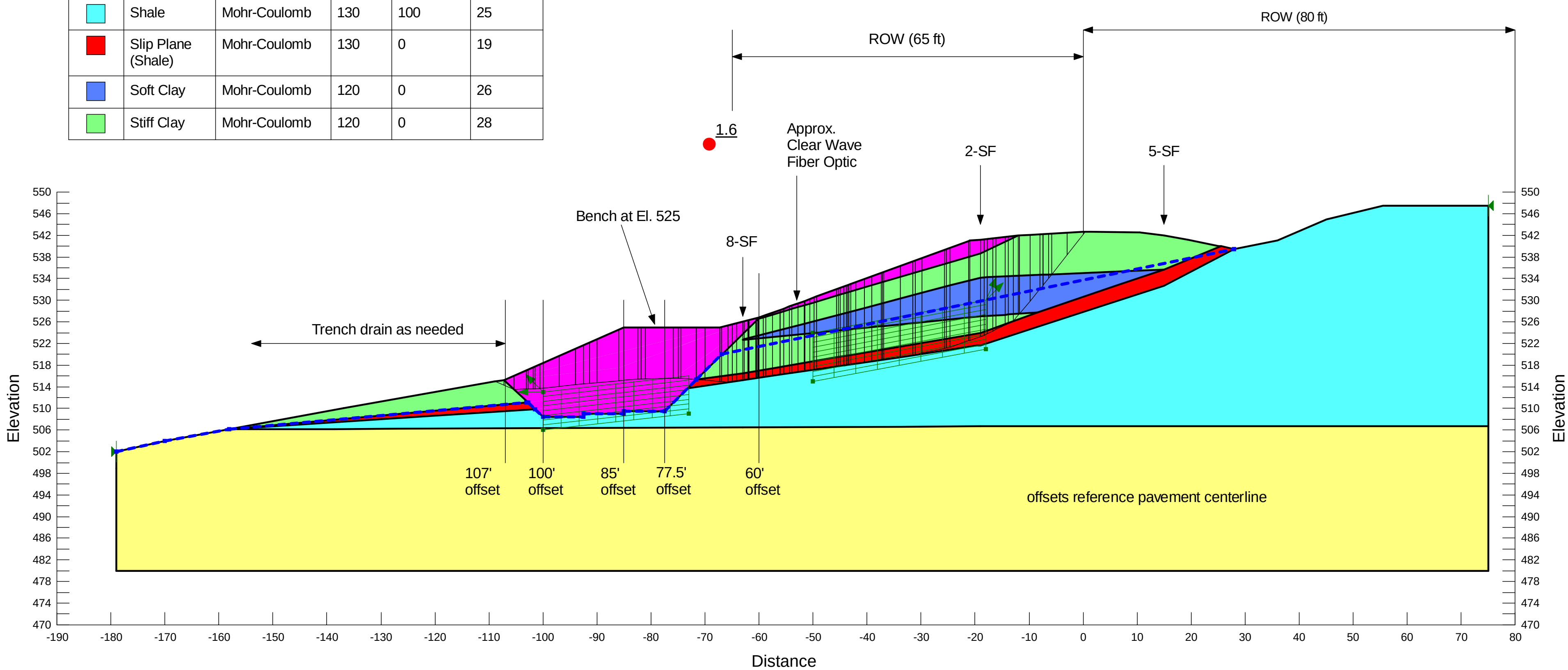
Item F

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (2) 2 elevated water
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
(magenta)	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
(yellow)	Sandstone	High Strength	140		
(cyan)	Shale	Mohr-Coulomb	130	100	25
(red)	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
(blue)	Soft Clay	Mohr-Coulomb	120	0	26
(green)	Stiff Clay	Mohr-Coulomb	120	0	28

STATION 25+25



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INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/24/2022
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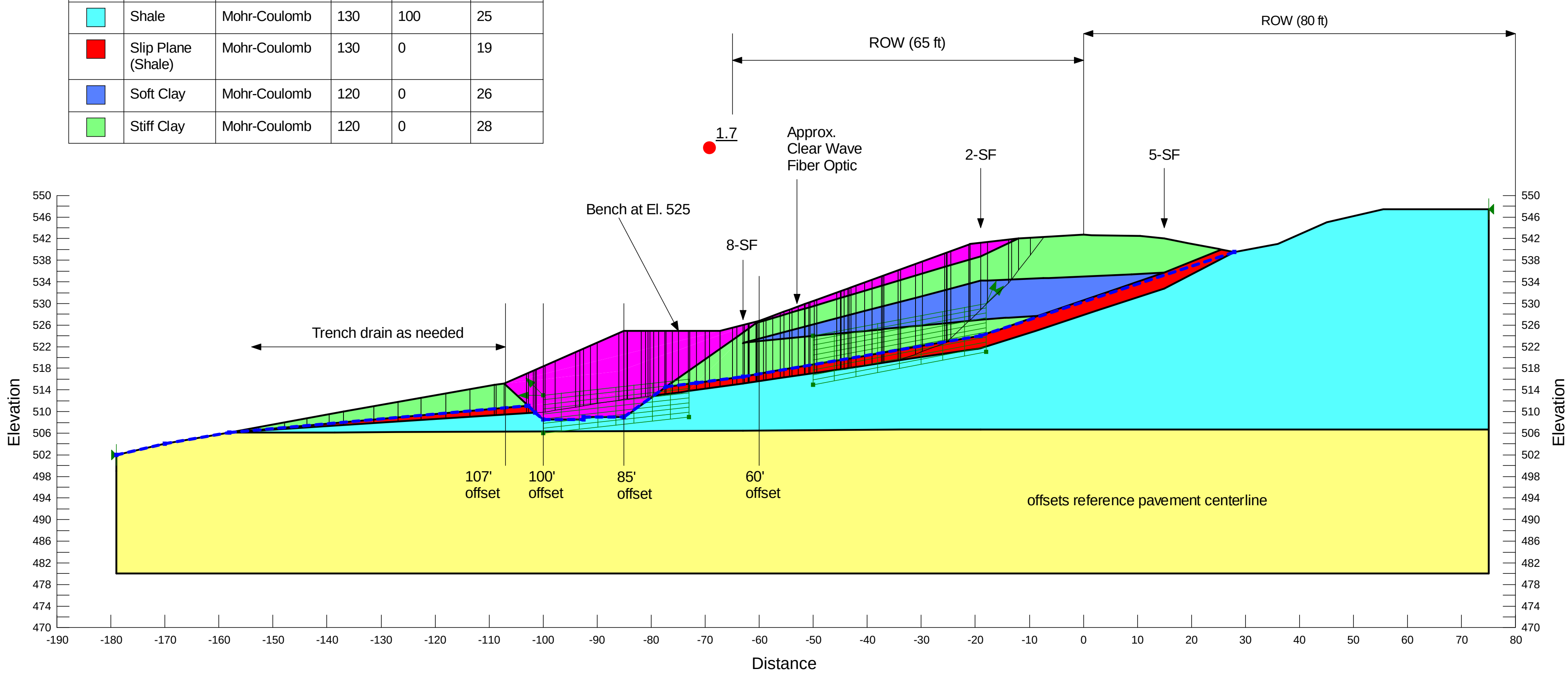
Item G

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (3)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28

STATION 25+25



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Created By: Dale Miller, Date: 05/24/2022
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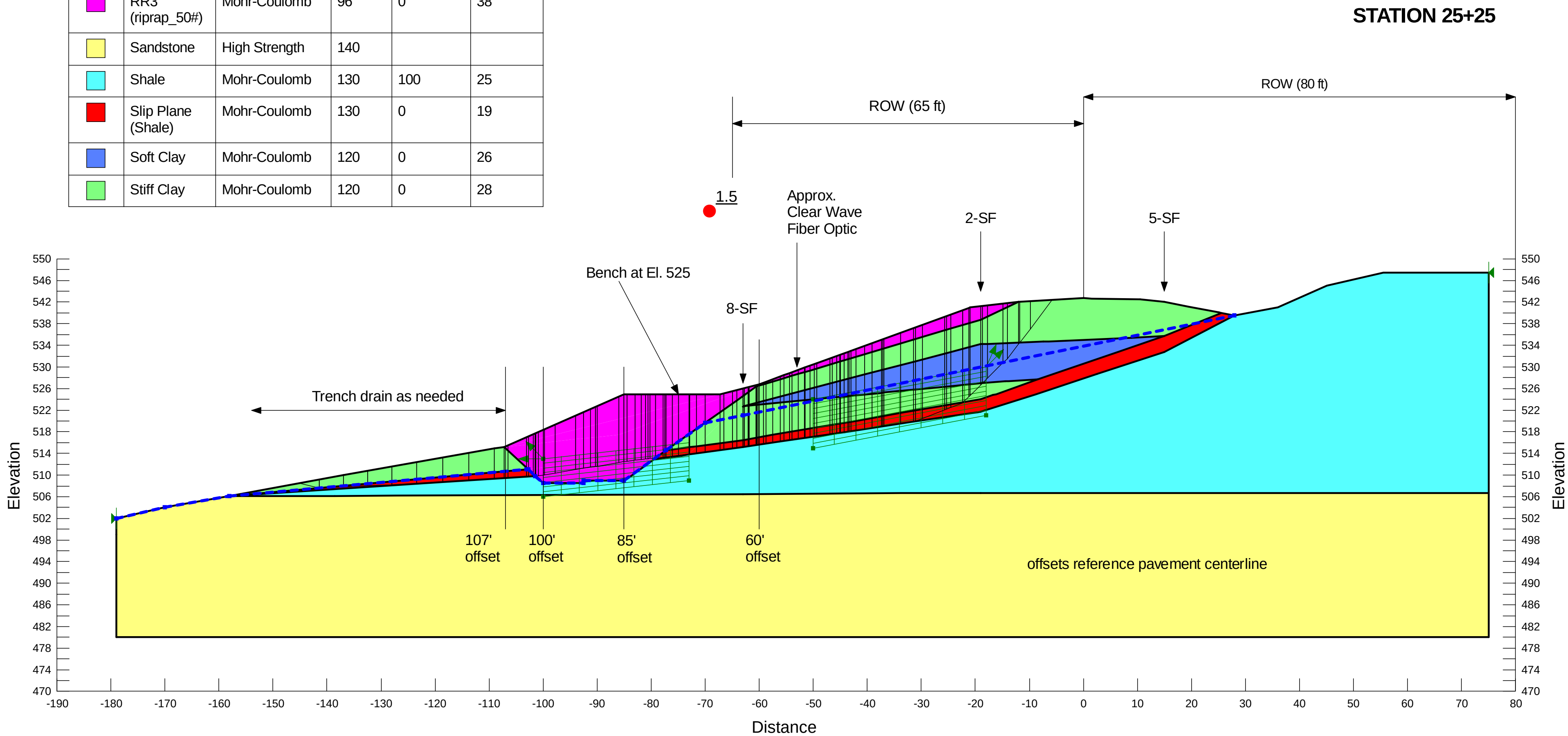
Item H

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (3) elevated water
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
(magenta)	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
(yellow)	Sandstone	High Strength	140		
(cyan)	Shale	Mohr-Coulomb	130	100	25
(red)	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
(blue)	Soft Clay	Mohr-Coulomb	120	0	26
(green)	Stiff Clay	Mohr-Coulomb	120	0	28



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/24/2022
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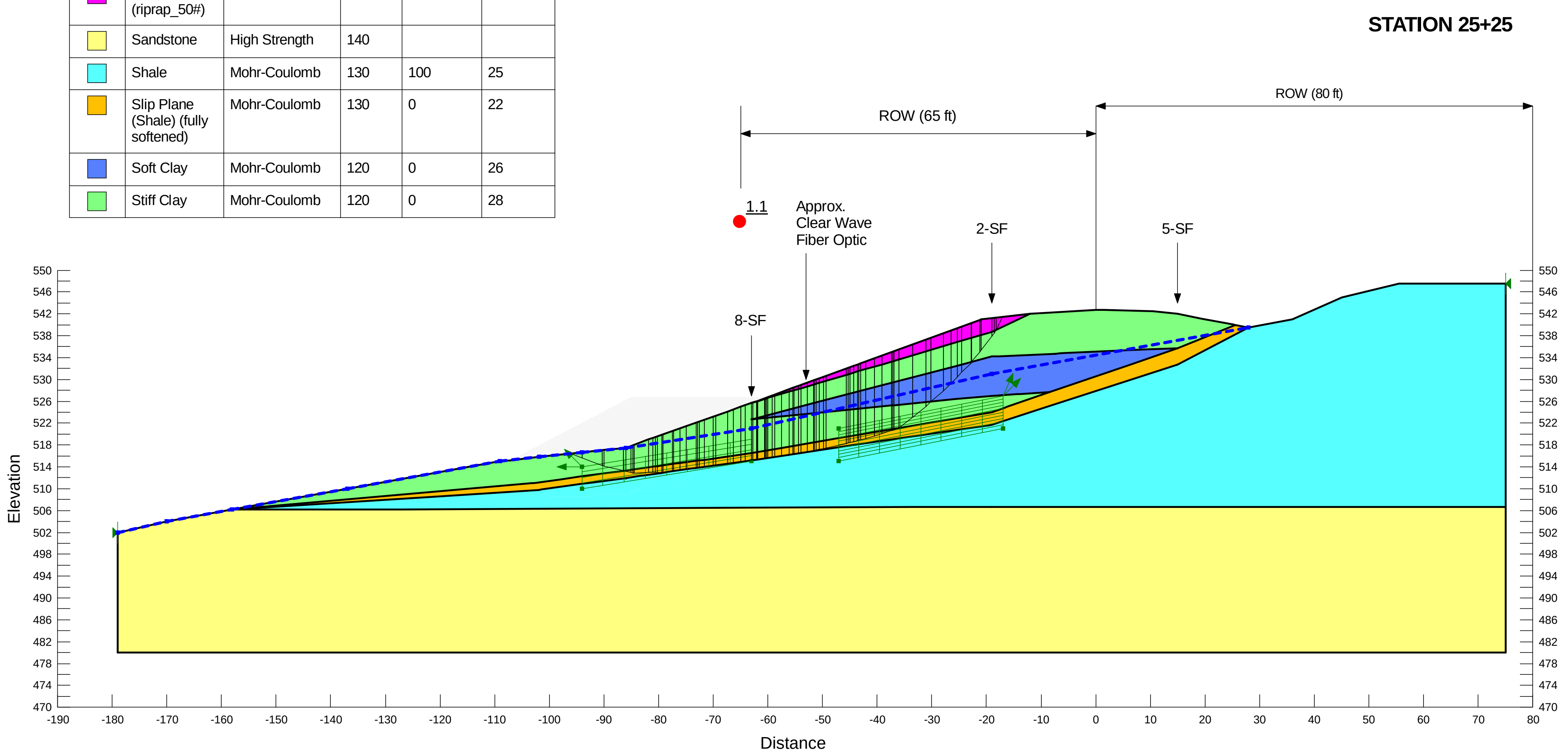
Item I

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Fully Softened Drained 1 (existing)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale) (fully softened)	Mohr-Coulomb	130	0	22
	Soft Clay	Mohr-Coulomb	120	0	26
	Stiff Clay	Mohr-Coulomb	120	0	28



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/06/2022
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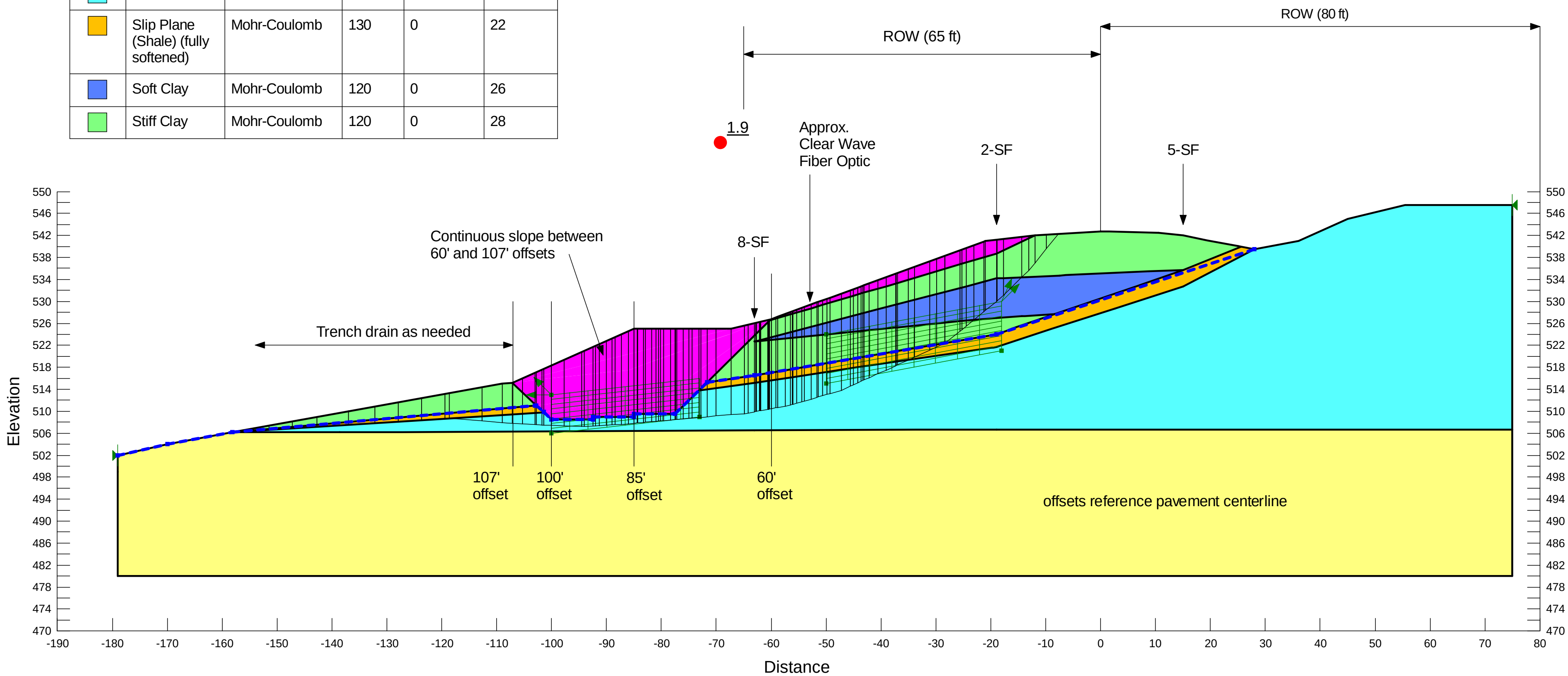
Item J

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Fully Softened Drained 1 (Buttress) (2) 2
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
(magenta)	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
(yellow)	Sandstone	High Strength	140		
(cyan)	Shale	Mohr-Coulomb	130	100	25
(orange)	Slip Plane (Shale) (fully softened)	Mohr-Coulomb	130	0	22
(blue)	Soft Clay	Mohr-Coulomb	120	0	26
(green)	Stiff Clay	Mohr-Coulomb	120	0	28



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INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 05/31/2022
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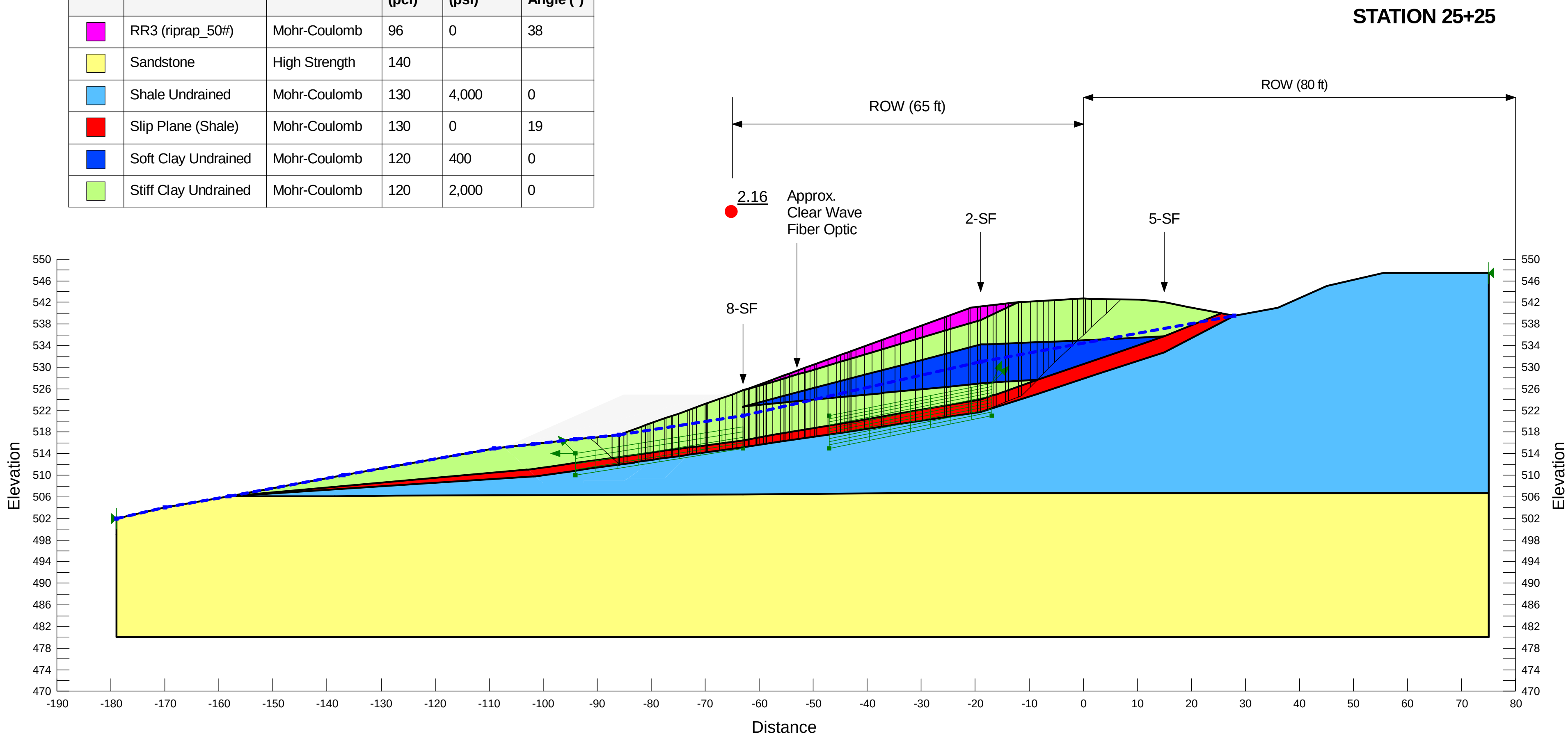
Item K

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Undrained 1 (existing) (2)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale Undrained	Mohr-Coulomb	130	4,000	0
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay Undrained	Mohr-Coulomb	120	400	0
	Stiff Clay Undrained	Mohr-Coulomb	120	2,000	0



Shannon & Wilson No. 106747-003
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Created By: Dale Miller, Date: 07/08/2022
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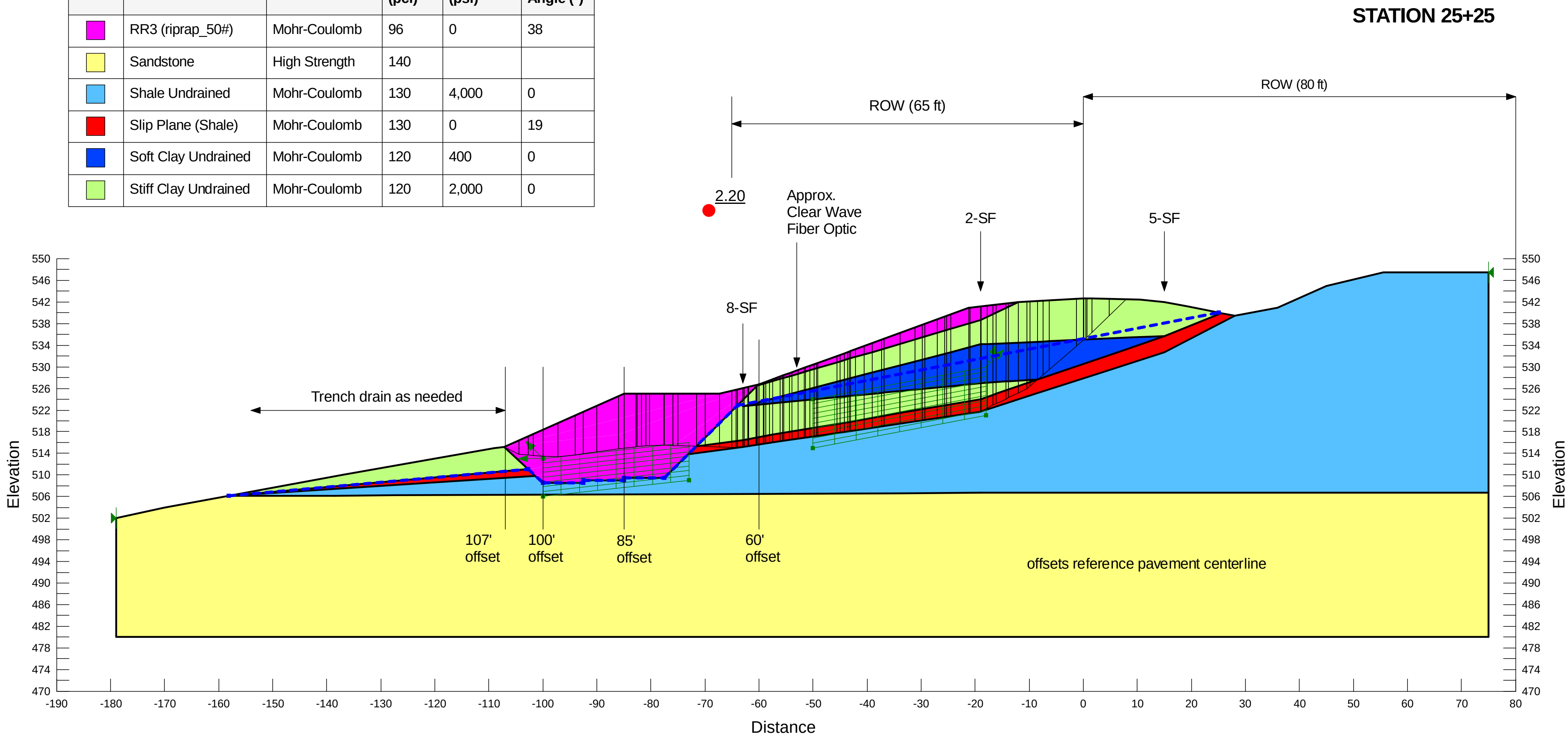
Item L

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Undrained 1 (Buttress) (2) 2
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale Undrained	Mohr-Coulomb	130	4,000	0
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay Undrained	Mohr-Coulomb	120	400	0
	Stiff Clay Undrained	Mohr-Coulomb	120	2,000	0



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INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 07/08/2022
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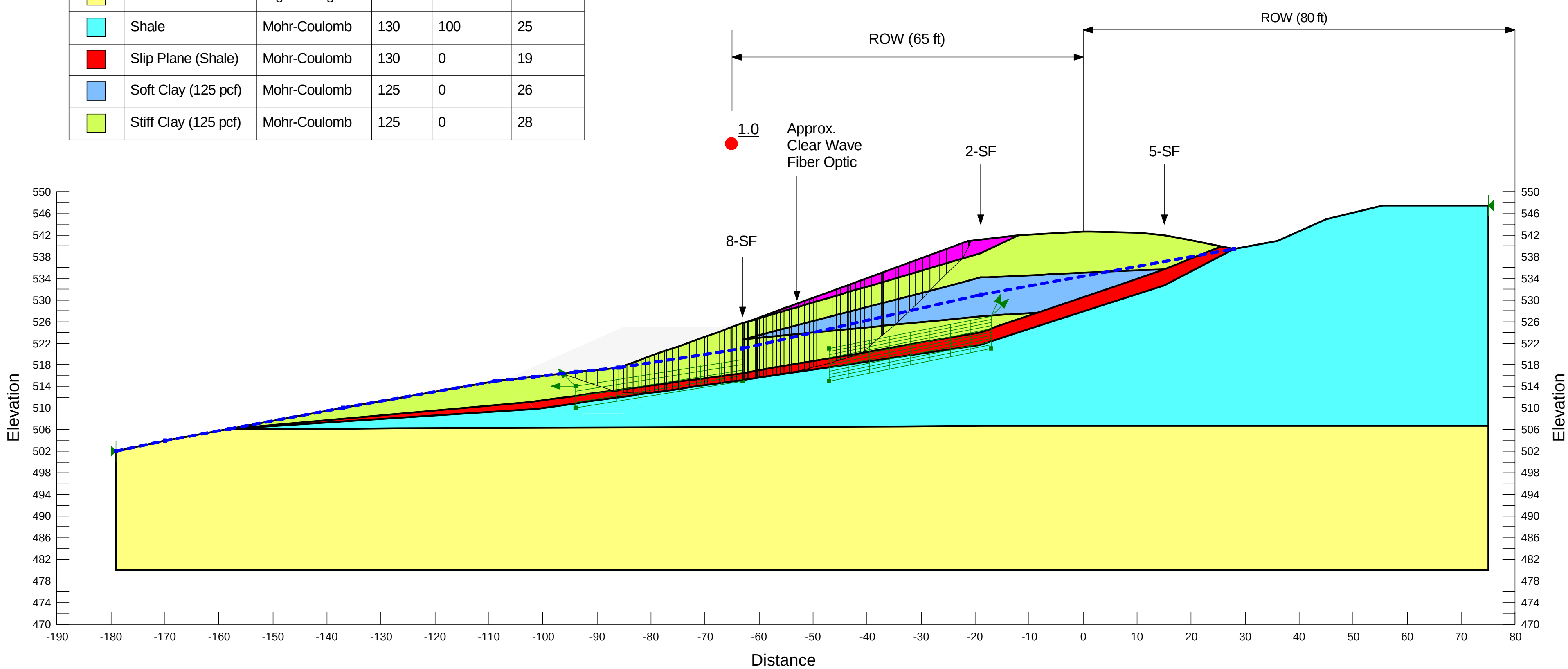
Item M

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (existing) 125 pcf
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay (125 pcf)	Mohr-Coulomb	125	0	26
	Stiff Clay (125 pcf)	Mohr-Coulomb	125	0	28

STATION 25+25



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Created By: Dale Miller, Date: 06/01/2022
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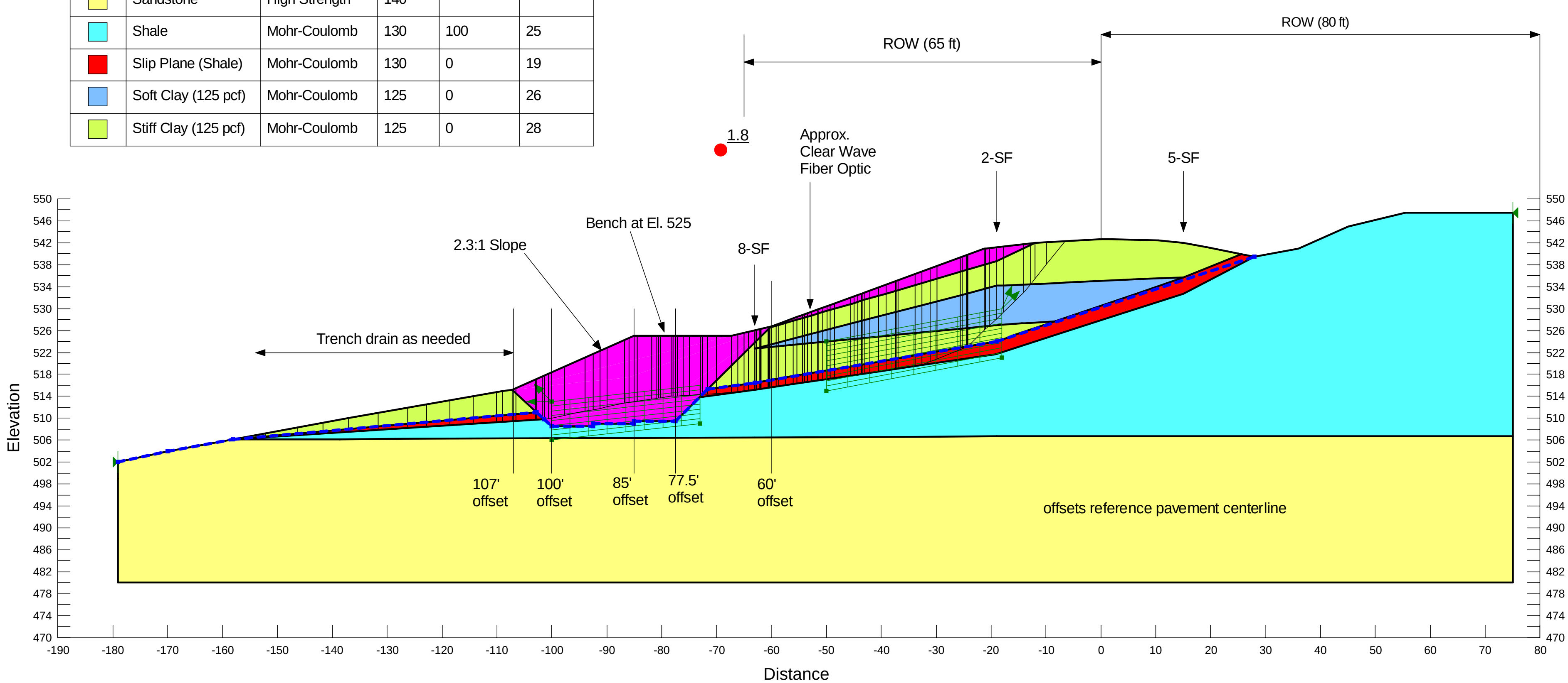
Item N

Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Buttress) (2) 2 (125 pcf)
Slip Surface Option: Block
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Soft Clay (125 pcf)	Mohr-Coulomb	125	0	26
	Stiff Clay (125 pcf)	Mohr-Coulomb	125	0	28



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Created By: Dale Miller, Date: 06/01/2022
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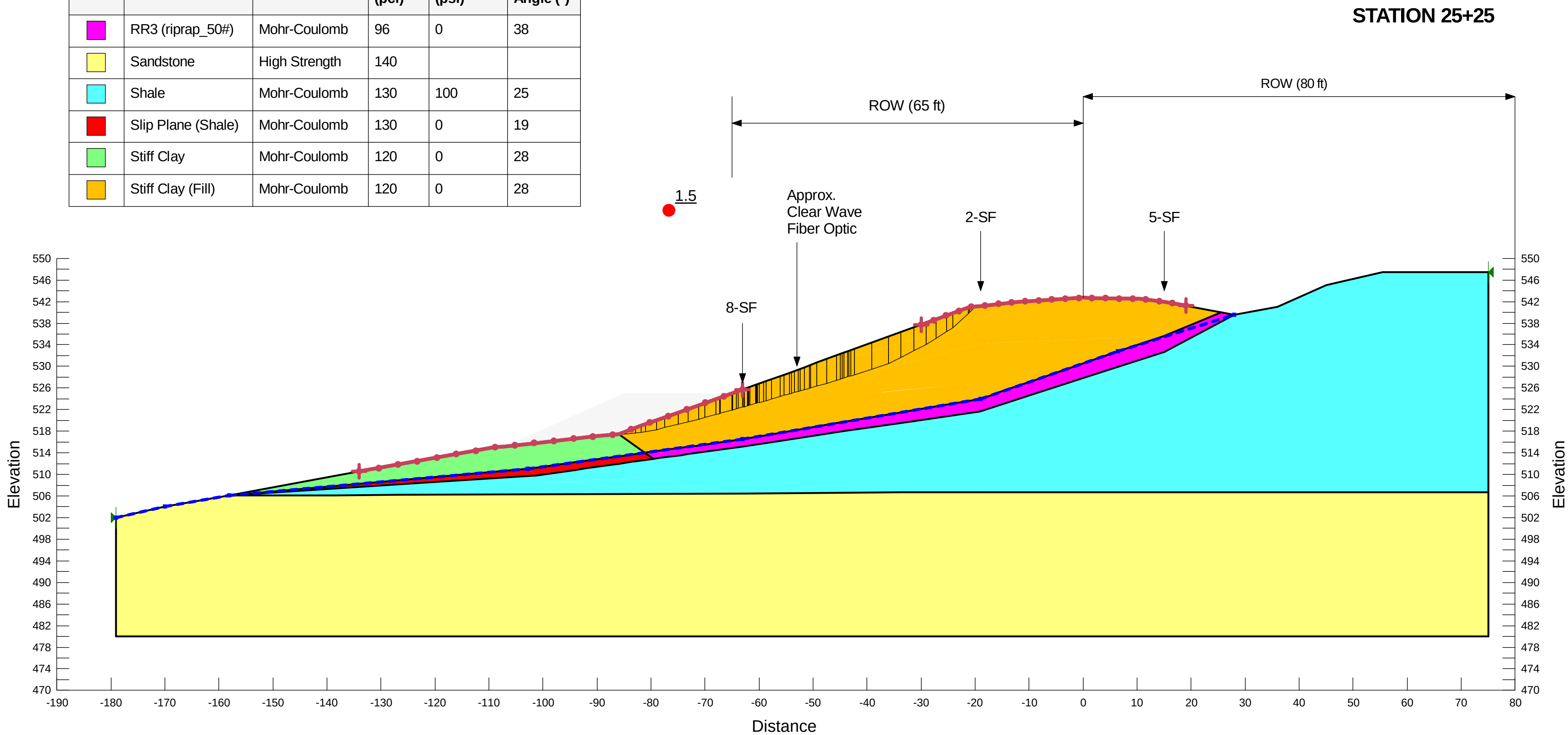
Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Drained 1 (Rebuild)
Slip Surface Option: Entry and Exit
Analysis Type: Morgenstern-Price

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Slip Plane (Shale)	Mohr-Coulomb	130	0	19
	Stiff Clay	Mohr-Coulomb	120	0	28
	Stiff Clay (Fill)	Mohr-Coulomb	120	0	28



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INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 06/01/2022
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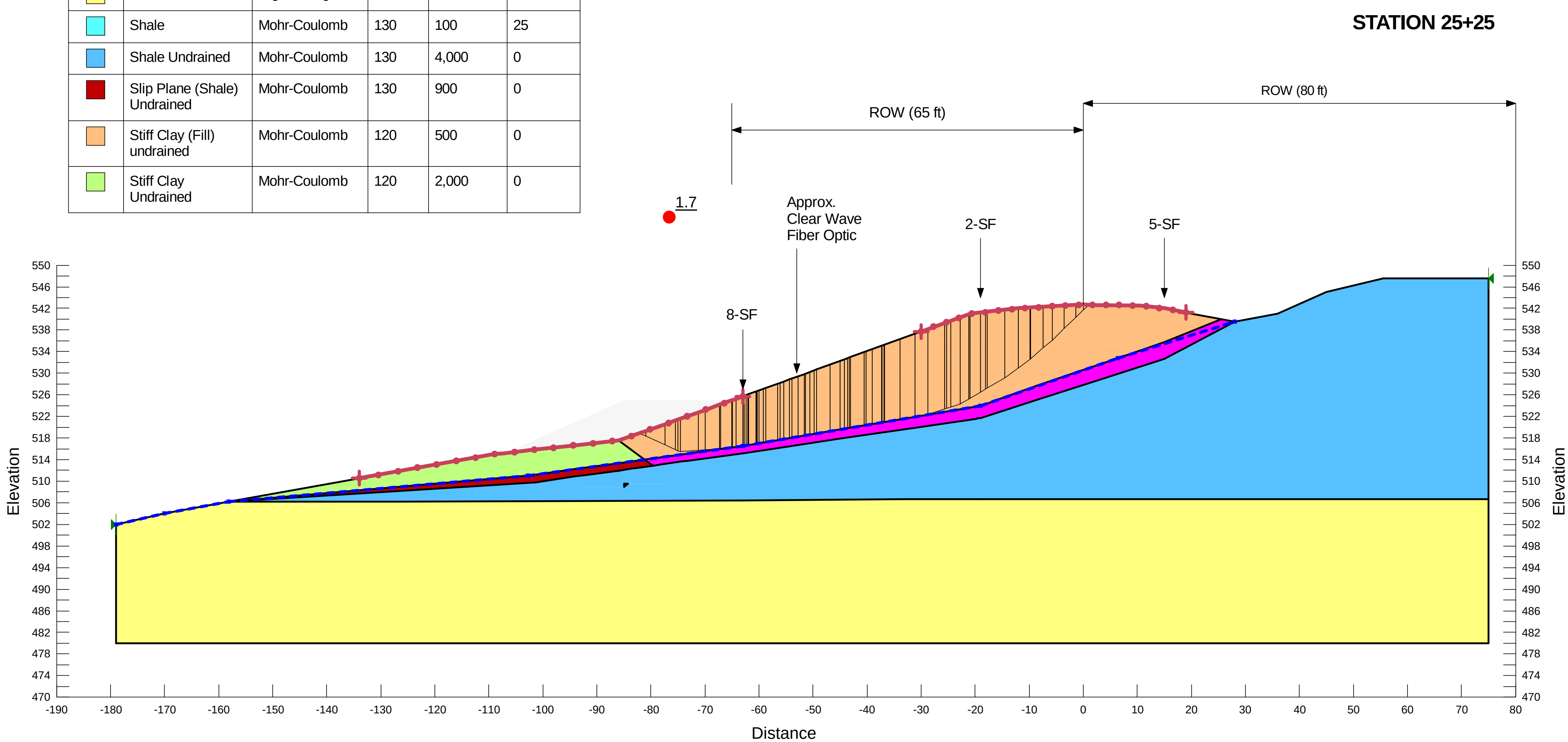
Illinois 127, MP 4.0, Jackson County, IL
Station 25+25 stability analysis_Rev.3.gsz
Rebuild (undrained)
Slip Surface Option: Entry and Exit
Analysis Type: Morgenstern-Price

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	RR3 (riprap_50#)	Mohr-Coulomb	96	0	38
	Sandstone	High Strength	140		
	Shale	Mohr-Coulomb	130	100	25
	Shale Undrained	Mohr-Coulomb	130	4,000	0
	Slip Plane (Shale) Undrained	Mohr-Coulomb	130	900	0
	Stiff Clay (Fill) undrained	Mohr-Coulomb	120	500	0
	Stiff Clay Undrained	Mohr-Coulomb	120	2,000	0



Shannon & Wilson No. 106747-003
INDOT PTB 199 Item 39
Created By: Dale Miller, Date: 06/01/2022
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IMPORTANT INFORMATION

Important Information

About Your Geotechnical Report

IMPORTANT INFORMATION

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent

IMPORTANT INFORMATION

such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

IMPORTANT INFORMATION

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland