

December 18, 2025

Pike County Engineer's Office
502 Pike Street
Waverly, Ohio 45690

Attention: Mr. John C. Slone, P.E.
Pike County Engineer

Reference: Geohazard Exploration Final Report
Green Ridge Road Slip Repair (CR2)
Pike County, Ohio
CTL Project No. 25050035COL

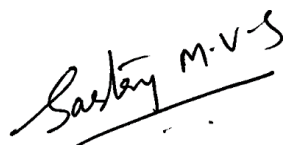
Dear Mr. Slone,

CTL Engineering, Inc. has completed the Geohazard Exploration for the above referenced project. Enclosed is the digital (pdf) copy of the final report.

Thank you for the opportunity to work with you on this project. If you have any questions or need further information, please feel free to contact our office.

Respectfully Submitted

CTL Engineering Inc.



Sastry Malladi, P.E.
Principal, Geotechnical Services

GEOHAZARD EXPLORATION FINAL REPORT

**GREEN RIDGE ROAD SLIP REPAIR (CR2)
PIKE COUNTY, OHIO
CTL PROJECT NO. 25050035COL**

PREPARED FOR:

**PIKE COUNTY ENGINEER'S OFFICE
502 PIKE STREET
WAVERLY, OHIO 45690**

PREPARED BY:

**CTL ENGINEERING, INC.
2860 FISHER ROAD
COLUMBUS, OHIO 43204
Phone 614-276-8123
Fax 614-276-6377**

December 18, 2025



TABLE OF CONTENTS

	<u>PAGE</u>
I. INTRODUCTION	1
II. SITE GEOLOGY AND OBSERVATIONS	1
III. EXPLORATION	2
IV. FINDINGS	4
V. GLOBAL STABILITY ANALYSES	8
VI. DISCUSSION AND RECOMMENDATIONS	8
A. Drilled Shaft Analysis	9
VII. CHANGED CONDITIONS	10
VIII. TESTING AND OBSERVATION	10
IX. CLOSING	11
APPENDIX A	BORING LOCATION PLAN
APPENDIX B	TEST BORING RECORDS
APPENDIX C	LABORATORY TEST RESULTS
APPENDIX D	ROCK CORE PHOTOS
APPENDIX E	GEOPHYSICAL TEST RESULTS
APPENDIX F	DRILLED SHAFT ANALYSIS



I. INTRODUCTION

The project involves the repair of approximately 350-foot-long slip along Green Ridge Road (CR 2) in Pike County, Ohio. The slip is approximately 0.5 miles east of the intersection of Lapperell and Green Ridge Road.

A total of six (6) test borings were performed for this project. The borings were extended to depths ranging from 25.5 to 40.0 feet below the existing grade. The top of bedrock was encountered at depths ranging from 4.5 to 15.0 feet below existing grade.

Based upon the conditions encountered in our exploration and the existing grades, it is CTL's opinion that the slope repair could be performed by installing a retaining wall system on the downhill side of the road. Initially, two alternatives were considered for the slip repair: a plug pile retaining wall or a drilled soldier pile and lagging (SPL) wall. However, based on input from the County Engineer's Office, it is understood that the plug pile retaining wall is the preferred solution. The piles should be extended into the underlying competent bedrock. Given the alignment of the retaining wall, the recommendations for the plug pile retaining wall is provided in this final report.

II. SITE GEOLOGY AND OBSERVATIONS

According to the Ohio Department of Natural Resources (ODNR), *Physiographic Regions of Ohio*, the site lies outside the limits of glaciation in Ohio, on the Allegheny Plateaus specifically on the Shawnee-Mississippian Plateau.

According to the Bedrock Geologic Map of Ohio, the bedrock below the site consists of Devonian age Ohio and Olentangy Shales Undivided. According to the Quaternary Geology map the surficial geology of the site consists of Holocene age Cenozoic Colluvium.

According to web-based mapping from United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), the soils at the site consist primarily of Trappist-Shelocta association, steep (TsF). According to the *Soil Survey of Pike County, Ohio*, these soils are considered well drained and exhibit very low to moderately high permeability (0.0 to 0.20 in/hr).

According to the ODNR website, the site is not near any mapped probable Karst areas, and is in a portion of the state not known to contain Karst features. Abandoned underground coal mines have not been mapped below the site according to information from the ODNR website. Historic geotechnical test boring records were searched for on the ODOT GeoMS website. No historic test borings were found.

On June 20, 2025, a site visit was performed by Mr. John Slone and Mr. Aaron Walls with



PCEO, Mr. Cody Beucler with McCarty Associates LLC, and Mr. Sastry Malladi with CTL. During the site visit, it was observed that the both lanes of CR 2 are experiencing instability consisting of a rotational/transitional slide with the head scarp developed along the roadway pavement into the slope below. Existing ground slopes down to the north towards a valley. Limestone rip rap has been piled up along the shoulder. The existing pavement is deteriorated within the slip area. The slope below the roadway is covered with vegetation extending down to the valley below. A relatively dry ditch was observed on the south side of the roadway leading to two (2) drain culverts that runs underneath the road near the begin and end slip limits.

III. EXPLORATION

Soil Borings

Six (6) test borings, identified as B-001-0-25 through B-003-0-25 (located along the northern edge of the roadway) and B-002-1-25, B-003-1-25 and B-004-0-25 (located along the southern edge of the roadway), were drilled for this project. Refer to Appendix A for the Boring Location Plan.

The test borings were performed from June 26 through June 30, 2025, with a track mounted rotary drill rig, utilizing 3¼ inch hollow stem augers (HSA). Standard Penetration Tests (SPT) were conducted using an automatic hammer providing a 140-pound force falling 30 inches to drive a 2-inch O.D. split barrel sampler for 18 inches. The hammer system used is assumed to have a drill rod energy ratio of 79.3 percent. Rock core sampling was performed in all test borings using an NQ-2, double tube core barrel and wire-line system.

Soil samples obtained from the drilling operation were preserved in glass jars, visually classified in the field and laboratory, and tested for natural moisture content.

Rock core samples from the coring operation were visually classified in the field and laboratory and the Rock Quality Designation (RQD) and percent core recovery values were determined. A Representative sample of the recovered rock was subjected to compressive strength testing.

The ground surface elevations and coordinates at the boring locations were determined by McCarty Associates.

Geophysical Testing

A method of exploration performed for this project is Two-Dimensional (2D) Electrical Resistivity Imaging (ERI). ERI is a non-destructive method which assess shallow geologic and groundwater conditions on the basis of the distribution of electrical resistivity of the subsurface materials. The electrical resistivity method has been used for decades to explore



and characterize geologic conditions for engineering, hydrogeologic and environmental applications. Electrical resistivity profiling can be an effective method for shallow geologic profiling, particularly with the recent introduction of advanced computer-based data inversion techniques. This geophysical technique delineates the depth to rock, identifies the surface contours of the rock, identifies the groundwater table, and indicates if anomalous features such as large voids and/or boulders may be present. This technique will also allow for the imaging of variations in the subsurface stratigraphy.

Electrical resistivity imaging involves measuring the resistivity of the earth along a single profile or a series of profiles (transects). For each profile, a number of stainless-steel electrodes are typically driven into the ground at evenly spaced intervals. The length of profile, depth of penetration, and resolution determine the electrode spacing, which can vary from a few feet to several hundred feet or more. When increasing electrode spacing, it enables measurements of greater depth; but in contrast, reduces the resolution of the imaging, especially at greater depths. Once the electrodes are seated and acceptable electrical contact established, resistivity measurements are made by placing a known current (measured in milli-amps) into the ground using two electrodes. The resulting potential (measured in milli-volts) is measured between two other electrodes. By changing relative positions between the potential and current electrodes, different resistivity measurements can be made using different electrode array configurations. Common ERI arrays include Wenner, Schlumberger, pole-dipole, dipole-dipole, and dipole-gradient. A typical resistivity dataset utilizes a 5-to-1 lateral distance to depth ratio. This means that to image to about 100 feet below ground surface, a resistivity profile needs to be approximately 500 feet in length.

ERI Data Collection

CTL performed the ERI testing using the electrode spacing, array, and survey configuration provided in Table 1. Test equipment utilized for the survey is presented in Table 2. The equipment has a relatively high power, lower electrical signal-to-noise ratio. The data collected during the field testing is saved to the equipment listed and downloaded to a laptop for field evaluation of the data sets and analyses.

ERI Data Analysis

Subsequent to the collection of the field data and it being downloaded to a computer, the data was processed for recognition of variations in subsurface materials and to obtain an “actual”, true resistivity cross-section of the subsurface. The processing was conducted using Earth Imager 2D software by Advanced Geosciences Inc. During data analysis, the apparent resistivity data of the subsurface materials was processed by generating a model resistivity cross-section, calculating the apparent resistivity pseudo-section that would result from such a model, and comparing the calculated pseudo-section to the one collected in the field. The model was then altered through a number of iterations until the two pseudo-sections closely match each other with minimal error.

Anomalous values, invalid data caused by noise, cultural interference, and poor ground contact by the electrodes were removed from the data sets during this process. Once the inversion process reduced the error to acceptable limits, the model was considered to be a reasonable estimation of the true resistivity of the actual subsurface. Inversion of the data also included data correction for ground surface topographic contours.

It should be noted that the resistivity cross sections presented in this report are 2-dimensional representations of the general distribution of electrical resistivity in the 3-dimensional subsurface. There is no unique direct conversion from resistivity values to lithology. However, based on site knowledge, geometric shapes and relationships of various anomalies, and the observed ranges of resistivity values, reasonable geologic interpretations can be made. An experienced interpreter can readily recognize geologic features on these cross-sections.

IV. FINDINGS

Soil Borings

The borings exhibited 8 to 12 inches of asphalt or gravel at the surface. Below the surface cover, the borings encountered both granular and cohesive soils exhibited material described as gravel and/or stone fragments with sand (A-1-b), or clay (A-7-6) soils to depths ranging from 4.5 to 15.0 feet below existing grade. These soils exhibited corrected standard penetration (N_{60}) values ranging from 13 to 37 blows per foot (bpf), with natural moisture content values ranging from 2 to 25 percent.

Beneath the soils, the borings encountered augerable bedrock consisting of brown to gray, severely weathered claystone or shale to depths ranging 10.5 to 25.0 feet below grade. The augerable bedrock exhibited N_{60} values ranging from 25 bpf to 50 blows for 2 inches of penetration. Rock coring was performed in all six borings to depths ranging from 25.5 to 40.0 feet below existing grade. The measured RQD values ranged from 8 to 87 percent and measured recovery values ranged from 82 to 100 percent in all core runs.

Groundwater was not encountered in the borings during drilling. Groundwater at the completion of drilling was not able to be measured in borings due to the introduction of water to the boring during rock coring operations.

Geophysical Testing

At the referenced project site, CTL conducted two (2) ERI transects at the test locations and using the test parameters listed in Table 1; and using the equipment and collection parameters listed in Table 2. Each of the transects were oriented in close proximity of each other, and portions of the transects overlapped the other. Because of the transect positioning and lapping orientation, and as a measure to simplify the reporting the ERI



findings; the two transects were merged during the data processing phase of the project so one (1) ERI survey line is presented for the project. This survey line includes both field transects and were merged in a manner where the horizontal positioning of the data was minimally compromised.

Table 1. Schedule of Survey Lines

Survey ID:	ER-1 (Field)	ER-2 (Field)	--	ER-1 (Combined)
Date Performed:	7/10/2025	7/10/2025	--	7/10/2025
Latitude:	39.128724	39.128825	--	39.128823
Longitude:	-83.261001	-83.260577	--	-83.260416
Heading:	77.6 deg.	91.3 deg.	--	84.6 deg.
Array Type:	Linear Dipole-Gradient			
No. Electrodes:	56	56	--	88
Electrode Spacing:	4 ft.	4 ft.	--	4 ft.
No. of Roll-Alongs:	0	0	--	0
Transect Length:	220 ft.	220 ft.	--	348 ft.
Approx. Depth:	50 ft.	50 ft.	--	50 ft.

Table 2. Data Acquisition Parameters

Survey Type:	2D Electrical Resistivity Imaging
Survey Purpose:	Bedrock Topography Study
Recording Device:	SuperSting R8/IP/SP
Electrode Type:	Stainless Steel Pins
Power Source:	12v Marine Batteries
Cycle Time:	800 ms
No. of Cycles:	2

The electrical resistivities from the ERI testing may be used in correlating the material types for the project. The tabulated data found in Tables 3 and 4 may be used in providing a general guideline of various soil and rock types, and their corresponding range of resistivity values. Please note that these are approximate values and the material's homogeneity, temperature, salinity, and moisture does affect the inverted values of the data.

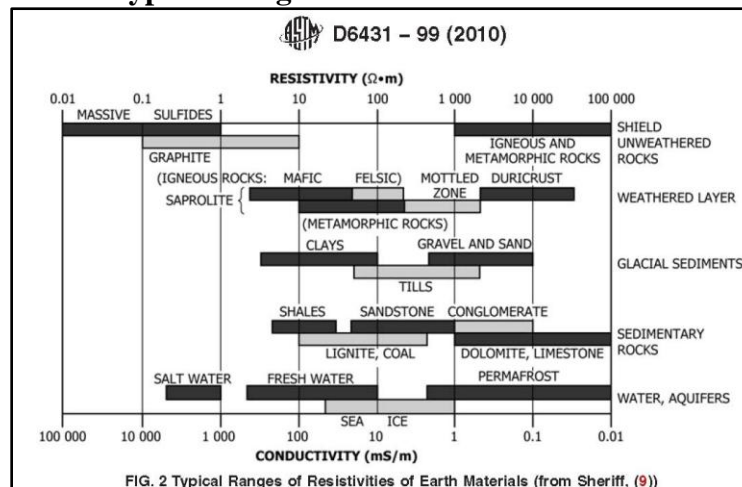
Table 3. Representative Resistivity Values for Soil Water, and Rock

Regional Soil Resistivity		Ohm-meter
- Wet regions		50 – 200
- Dry regions		100 – 500
- Arid regions		200 – 1000*
Waters		Ohm-meter
- Soil water		1 to 100
- Rain water		30 to 1000
- Sea water		Order of 0.2
- Ice		105 to 108
Rock Types		Ohm-meter
- Igneous and metamorphic		100 to 10,000
- Consolidated sediments		10 to 100
- Unconsolidated sediments		1 to 100

* (sometimes as low as 50 Ohm-m if soil is saline)

Source: ASTM Designation D6431-99 (Reapproved 2010), Table 1

Table 4. Typical Ranges of Resistivities of Earth Materials



Source: ASTM Designation D6431-99 (Reapproved 2010), Figure 2

A total of two (2) resistivity transects were collected in the field for this project and then merged in creating one (1) ERI survey line which extends the entire length of the survey area. The location of merged survey line is denoted on plan sheet attached to this report. The modeled resistivity values range from 15 (deep blue in color) to 4,500 Ohm-meters (red). The lowest range of values, *i.e.*, less than 50± ohm-meters, is interpreted to be materials consisting of soils with higher moisture contents, such as moist clays; possible wet sands and gravels; weathered claystone; and highly fractured rock containing groundwater (deep to light blue in color). Mid-range resistivity values (50± to 650± ohm-meters) are interpreted to be low moisture clays, mixed soils, and shales (greenish to yellow colors). Higher values (650± to 4500± ohm-meters) are interpreted as low

moisture sands, gravels, and aggregate fill materials; and below-grade sandstones (orange to red in color).

The interpretation of the modeled resistivity values to the soil descriptions were aided by the comparison of the resistivity data to soil test borings performed by CTL Engineering, Inc.

Based on the Electrical Resistivity transects performed, the following conclusions are presented:

- 1) Low to moderate resistivity materials, interpreted as damp to moist cohesive soils (clays and silts), low moisture granular (sands and gravel) soils, and aggregate fill materials were interpreted in the upper 2 to 15 feet. The low to moderate resistivity soils were interpreted as materials exhibiting resistivity values less than $650 \pm$ Ohm-m.
- 2) Higher conductive materials exhibiting resistivity values less than $50 \pm$ Ohm-m were encountered below the upper soils to depths of about 10 to 25 feet below existing grades. This layer is interpreted as highly weathered claystone.
- 3) Materials below elevation about 904 feet were interpreted at moderate to higher resistivity materials, including shale and possible sandstone features.
- 4) A zone of low resistivity materials interpreted as high moisture soil and/or highly fractured rock was identified between 150 to 192 feet east of the starting position of the ERI transect. This zone extended to depths greater than 50 feet.
- 5) A second zone of low resistivity materials interpreted as high moisture soil and/or highly fractured rock was identified about 250 feet east of the starting position of the ERI transect. This zone extended to depths of about 40 feet to greater than 50 feet.
- 6) Segments of the ERI modeling exhibited resistivity values which may reflect more than one lithologic condition and a clear distinction between the materials is difficult to establish when evaluating the electrical resistivity model alone. When comparing the resistivity modelling to the soil test borings, the deeper, lower resistivity materials are suspected to be weathered rock and the upper materials soil overburden. The exact delineation between the differing materials is uncertain in area represented by dark red colored dash lines.

V. GLOBAL STABILITY ANALYSES

A global stability analysis was performed to estimate the shape and depth of the failure surface. The stability of the slope was evaluated using the Morgenstern-Price method and the *SLIDE* computer program.

Cross sections in the area of the slip were prepared by McCarty Associates from the survey of the project site. The slope was modeled using a cross section at Station 38+50 which represents the apparent worst condition (area where the slip has occurred).

Initial soil and rock strength parameters used in the analyses were selected based upon the laboratory test results and published literature on shear strength and friction angle parameters of soils and rock.

Soil and rock parameters which are used to develop an assumed shear failure surface are summarized below. The results of the analysis are attached to this report under Appendix D.

Table 5. Soil and Rock Parameters

Material No.	γ_T (pcf)	C (psf)	ϕ (deg.)	Material Types
1	122	220	24	Clay Soil (A-7-6)
2	135	0	20	Soft Rock
3	140	2808	18.5	Weak Rock
4	148.7	4056	24.5	Competent Bedrock

The shear surface was estimated to intercept the ground surface at the observed head scarp in the global stability model. The failure surface was also assumed to travel along top of rock and exit near the toe of slope where the existing creek is located.

VI. DISCUSSION AND RECOMMENDATIONS

Based upon the conditions encountered in our exploration and the existing grades, it is CTL's opinion that the slope repair could be performed by installing a retaining wall system on the downhill side of the road. Initially, two alternatives were considered for the slip repair: a plug pile retaining wall or a drilled soldier pile and lagging (SPL) wall. However, based on input from the County Engineer's Office, it is understood that the plug pile retaining wall is the preferred solution. The piles should be extended into the underlying competent bedrock. Given the alignment of the retaining wall, the recommendations for the plug pile retaining wall is provided in this final report.

Under this option, the roadway can be supported by installing row of structural drilled shafts at an offset location from the edge of roadway. The structural drilled shafts should be reinforced with steel sections, and then filled to their full length with structural concrete. The structural shafts should be socketed into sound competent bedrock. The plug piles (non-reinforced shafts), should be installed between the structural shafts and should extend down to very weak bedrock, and serve the purpose of lagging between the structural drilled shafts.

A. Drilled Shaft Analysis

Drilled shaft analyses were also performed at the critical section of the assumed wall alignment, which was estimated to be near Station 38+50. This section (near borings B-003-0-25 and B-003-1-25) was estimated to represent the most critical section within the slip limits based on the observed conditions.

These analyses were performed to get an understanding of the steel type that will be required for the project if this remediation type is used for this project. The following assumptions were made for the analyses:

- 2.0-foot diameter reinforced shafts will be installed at 4.0 feet center to center spacing. The drilled shafts should be embedded 10 feet into the underlying competent (corable) bedrock.
- 2.5 feet diameter plug (unreinforced) shafts will be installed between and behind the structural shafts. The unreinforced shafts should extend to the top of weathered rock.
- The retaining wall is assumed to be constructed approximately 15.5 feet (8.5 feet lane width+ 2 feet to face of guardrail + 5.0 feet to the edge of wall) from the centerline of the roadway.

UA SLOPE Analysis

Using the shear plane surface estimated from the *SLIDE* analysis the shear plane was imputed into the *UA Slope Program Version 2.3* software. The model was initially checked to verify the FS of existing conditions closely resembled the results from the *SLIDE* analysis, which was near 1.0. Output of this initial run is provided in Appendix E.

The analysis then involves modeling drilled shafts at the southern (downslope) edge of the roadway. Screen shot of the *UA Slope Program* showing the force per shaft value at this assumed drilled shaft location is attached to this report in Appendix E.

L-Pile Analysis

The force per shaft value obtained from the *UA Slope Program*, was then entered into the L-pile program to estimate the deflection, shear, and moments within the shafts. Procedures outlined in GB7 along with AASHTO and LRFD manuals were followed while performing the L-pile analysis.

Design checks per GB7 Section 8 were performed for the strength and service limit state. Based on the analysis, the steel section that satisfied the necessary design checks are listed in the table below.

Table 6. Steel Section

Description	Wall Location	Force per Shaft (lbs)	Diameter of King Shaft (feet)	Center to Center Spacing (feet)	Recommended Steel Section
Plug Pile Retaining Wall	15.5 feet from the centerline of roadway	23,129	2.0	4.0	HP12x53

VII. CHANGED CONDITIONS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions using generally accepted geotechnical engineering practices. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates drilled, they are not necessarily representative of the subsurface conditions between boring locations or subsurface conditions during other seasons of the year.

In the event that changes in the project are proposed, additional information becomes available, or if it is apparent that subsurface conditions are different from those provided in this report, CTL Engineering should be notified so that our recommendations can be modified, if required.

VIII. TESTING AND OBSERVATION

During the design process, it is recommended that CTL Engineering work with the project designers to confirm that the geotechnical recommendations are properly incorporated into



the final plans and specifications, and to assist with establishing criteria for the construction observation and testing.

CTL Engineering is not responsible for independent conclusions, opinions and recommendations made by others based on the data and recommendations provided in this report. It is recommended that CTL be retained to provide construction quality control services on this project. If CTL Engineering is not retained for these services, CTL shall assume no responsibility for compliance with the design concepts or recommendations provided.

IX. CLOSING

The report was prepared by CTL Engineering, Inc. (Consultant) solely for the use of the Client in accordance with an executed contract. The Client's use of or reliance on this report is limited by the terms and conditions of the contract and by the qualifications and limitations stated in the report. It is also acknowledged that the Client's use of and reliance of this report is limited for reasons which include: actual site conditions that may change with time; hidden conditions, not discoverable within the scope of the assessment, may exist at the site; and the scope of the investigation may have been limited by time, budget and other constraints imposed by the Client.

Neither the report, nor its contents, conclusions nor recommendations are intended for the use of any party other than the Client. Consultant and the Client assume no liability for any reliance placed on this report by such party. The rights of the Client under contract may not be assigned to any person or entity, without the consent of the Consultant which consent shall not be unreasonably withheld.

This geotechnical report does not address the environmental conditions of the site. The Consultant is not responsible for consequences or conditions arising from facts that were concealed, withheld, or not fully disclosed at the time the assessment was conducted.

To the fullest extent permitted by law, the Consultant and Client agree to indemnify and hold each other, and their officers and employees harmless from and against claims, damages, losses and expenses arising out of unknown or concealed conditions. Furthermore, neither the Consultant nor its employees shall be liable to the Owner in an amount in excess of the available professional liability insurance coverage of the Consultant. In addition, Client and Consultant agree neither shall be liable for any special, indirect or consequential damages of any kind or nature.

The Consultant's services have been provided consistent with its professional standard of care. No other warranties are made, either expressed or implied.



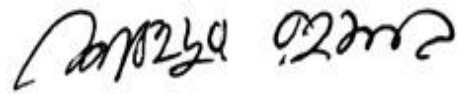
Specific recommendations have been provided in this report. Therefore, the report should be used in its entirety.

Respectfully submitted,

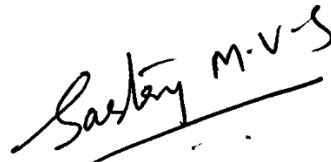
CTL Engineering, Inc.



Frederick Schoen, P.E.
Geotechnical Service Line Manager



Shahedur Rahman, P.E.
Geotechnical Project Engineer

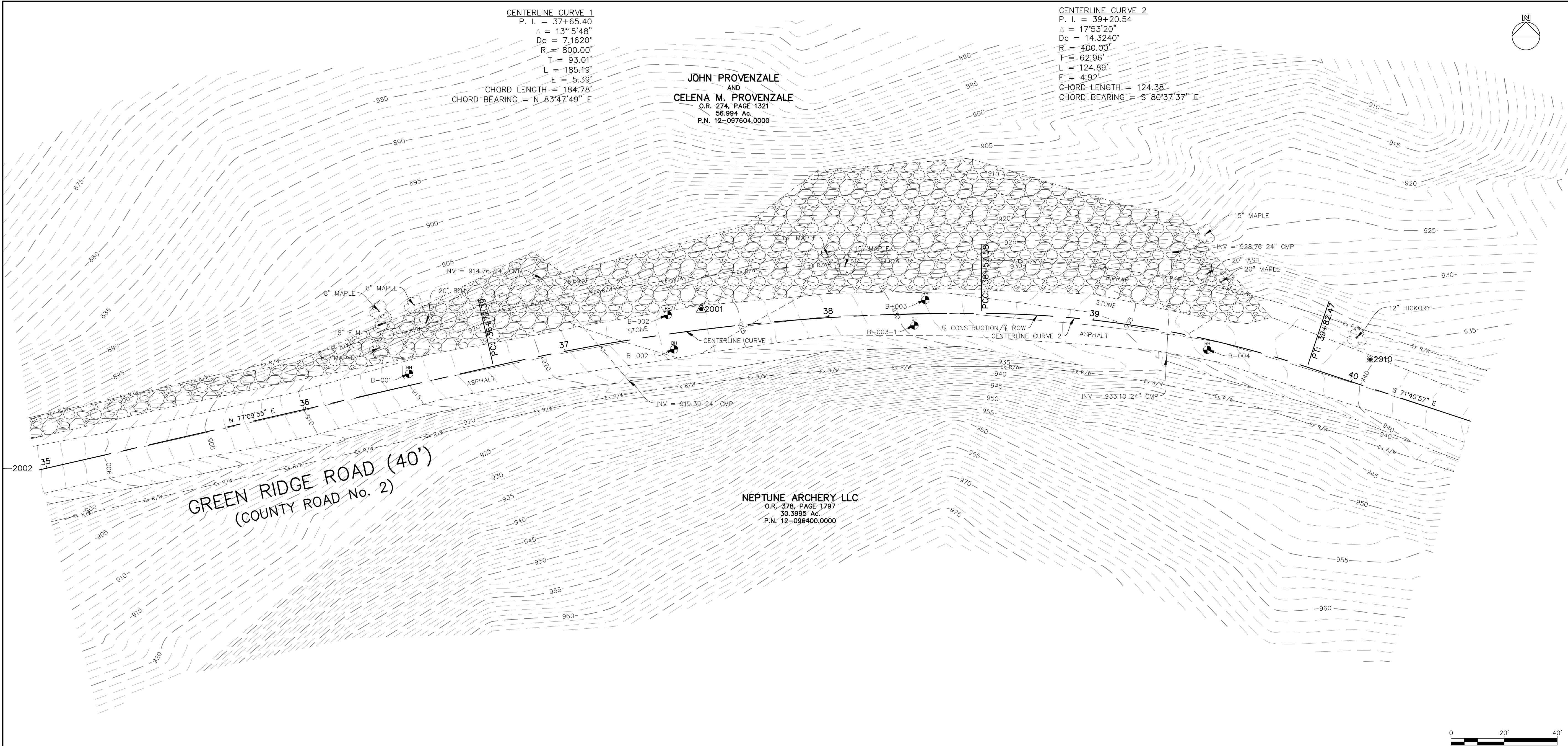


Sastry Malladi, P.E.
Principal, Geotechnical Services

APPENDIX A
BORING LOCATION/SOIL PROFILE SHEET



L:\2025\25-212 C:\Engineering\AutoCAD\DWG_Survey\25212 Topo Survey.dwg, C:\11 8/1/2025 9:57:47 AM, John



CONTROL POINTS (HORIZONTAL AND VERTICAL)

POINT No.	NORTHING	EASTING	ELEVATION	STATION	OFFSET	DESCRIPTION
2001	412029.517	1752777.907	923.96	37+52.82	7.70' L	5/8\"
2002	411960.987	1752468.328	889.07			MAG NAIL (SET)
2010	412010.665	1753029.750	939.69	40+04.00	10.27' L	MAG SPIKE (SET)

BORINGS

POINT No.	NORTHING	EASTING	ELEVATION	STATION	OFFSET	DESCRIPTION
2004	412005.177	1752667.916	915.33	36+40.81	4.33' L	B-001
2005	412027.330	1752765.287	923.23	37+40.14	7.19' L	B-002
2006	412014.366	1752767.710	923.19	37+40.74	5.99' R	B-002-1
2007	412032.971	1752862.293	931.05	38+36.60	5.15' L	B-003
2008	412023.335	1752858.218	930.37	38+32.32	4.40' R	B-003-1
2009	412014.219	1752968.469	936.24	39+44.28	3.81' R	B-004

BEARING NOTE

BEARINGS ARE BASED UPON THE GRID AZIMUTH (AZ 294° 46' 24.5\") BETWEEN NATIONAL GEODETIC SURVEY SURVEY MONUMENT \"PKTN\" AND MCCARTY ASSOCIATES GEODETIC SURVEY MONUMENT \"2001 OPUS\" AND DERIVED FROM GNSS OBSERVATIONS TAKEN JULY 9, 2025.

NAME	NATIONAL GEODETIC SURVEY CONTROL MONUMENTS			OHIO STATE PLANE COORDINATES			NAVD 88 ELEVATION
	NAD 83 (2011) LATITUDE	LONGITUDE	ELLIPSOID HEIGHT	NORTHING	EASTING		
PIKETON CORS PKTN	39°02'43.66599\"	83°01'27.83159\"	473.894	381206.700	1819565.836		583.372
HIGHLAND COUNTY CORS OHHI	39°12'00.73798\"	83°35'50.49434\"	1016.358	439022.718	1657529.765		1123.764
FAYETTE COUNTY CORS ARP OHFY	39°31'33.47397\"	83°28'34.39586\"	905.605	557270.985	1693139.324		1011.676
OPUS (2001 OPUS) 07-09-2025	39°07'43.62686\"	83°15'37.66590\"	815.668	412029.517	1752777.907		923.957
LOCAL CONTROL MONUMENT(2001 OPUS)	SITE BASE STATION 39°07'43.62686\"	\"BOWLING (2011)\" LOCAL SITE SETTINGS 83°15'37.66590\"	815.668	412029.517	1752777.907		923.957
GROUND SCALE FACTOR: 1.00009320790362			LOCAL GROUND COORDINATES			NAVD 88 ELEVATION	
GEOID MODEL: GEOID18 (CONUS)			NORTHING EASTING			412029.517 1752777.907	
						923.957	
						UNITS ARE IN U.S. SURVEY FEET (SFT)	

LEGEND

	MCCARTY ASSOCIATES GEODETIC LOCAL CONTROL MONUMENT \"2001\", 5/8\"
	BORE HOLE
	DECIDUOUS TREE
	MAG SPIKE (SET)
	EX. RIGHT-OF-WAY
	EDGE OF PAVEMENT
	EDGE OF STONE
	CENTERLINE OF DITCH
	STORM SEWER
	RIPRAP

NOTES

THE ABOVE LISTED DEED REFERENCES WERE USED AS A BASIS FOR CARRYING OUT THE WORK.

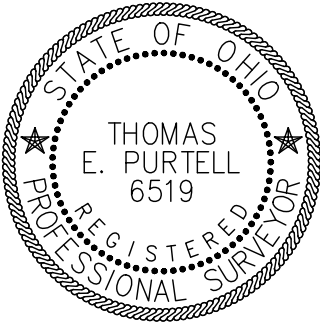
NO EVIDENCE OF OCCUPATION EXISTS ALONG PROPERTY LINES INDICATED BY SOLID LINES.

ALL MONUMENTS FOUND OR SET ARE IN GOOD CONDITION UNLESS OTHERWISE INDICATED.

THE SIZE AND/OR LOCATION OF UNDERGROUND UTILITIES WAS PROVIDED BY THE UTILITY COMPANIES AND IS NOT WARRANTED CORRECT OR COMPLETE BY THE SURVEYOR.

I HEREBY CERTIFY THIS TO BE A PLAT OF A SURVEY MADE UNDER MY DIRECTION IN JULY 2025.

Thomas E. Purcell
THOMAS E. PURTELL, P.S. 6519



REVISIONS

THESE DRAWINGS ARE THE PROPERTY OF MCCARTY ASSOCIATES, LLC AND SHALL NOT BE USED OR REPRODUCED WITHOUT WRITTEN CONSENT OF MCCARTY ASSOCIATES, LLC
© 2025 MCCARTY ASSOCIATES, LLC

ARCHITECTS | ENGINEERS | SURVEYORS

213 N. High St. Hillsboro, Oh 45133
O: 937.393.9971
MCCARTYASSOCIATES.COM

TOPOGRAPHIC SURVEY FOR
GREEN RIDGE ROAD PROJECT

GREEN RIDGE ROAD
MIFFLIN TOWNSHIP
PIKE COUNTY, OHIO
V.M.S. No. 16121

PROJECT NUMBER

25-212

TOPOGRAPHIC
SURVEY

DRAWING NUMBER

C101

APPENDIX B
TEST BORING RECORDS



SOIL DESCRIPTION

Descriptors for soil consistency used in this report are based upon the Standard Penetration Test (SPT), ASTM D 1587, with the penetration (N) values corrected to N_{60} , based upon the efficiency of the SPT Hammer used for the soil sampling.

Descriptors for both non-cohesive and cohesive soils are presented below, with the corresponding range of corrected penetration values.

NON-COHESIVE SOIL DESCRIPTION

CORRECTED PENETRATION VALUES BLOWS PER FOOT (BPF)

Very Loose.....	0 – 4
Loose.....	5 – 10
Medium Dense.....	11- 30
Dense.....	31 – 50
Very Dense.....	Over 50

COHESIVE SOIL DESCRIPTION

CORRECTED PENETRATION VALUES BLOWS PER FOOT (BPF)

Very Soft.....	0 – 1
Soft.....	2 – 4
Medium Stiff.....	5 – 8
Stiff.....	9 – 15
Very Stiff.....	16 –30
Hard.....	Over 30

Moisture term descriptors for both non-cohesive and cohesive soils are presented below.

NON-COHESIVE SOIL DESCRIPTION


MOISTURE TERMS

COHESIVE SOIL DESCRIPTION

Powdery.....	Dry.....	Powdery
Some Moisture.....	Damp.....	Below Plastic Limit
Damp to the Touch.....	Moist.....	Above Plastic, Below Liquid Limit
Free Water.....	Wet.....	Above Liquid Limit




STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 8/11/25 16:35 - O:\PROJECT\2025\COL-05\25050035COL_PIKE COUNTY ENGINEERS OFFICE_GREEN RIDGE ROAD_SLIP REPAIR\

PID: N/A	SFN: N/A	PROJECT: GREEN RIDGE ROAD SLIP REPAIR	STATION / OFFSET: 36+41, 4' LT.		START: 6/30/25	END: 6/30/25	PG 2 OF 2		B-001-0-25											
MATERIAL DESCRIPTION AND NOTES			ELEV. 885.3	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
SHALE , GRAY, HIGHLY WEATHERED, VERY WEAK TO WEAK; RQD 53%, REC 94%. <i>(continued)</i>					87	100	NQ2-3												CORE	
			879.3	EOB																
<div>NOTES: CAVED AT 14'</div> <div>ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS</div>																				

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 8/11/25 16:35 - O:\PROJECT\2025\COL-05\25050035COL PIKE COUNTY ENGINEERS OFFICE, GREEN RIDGE ROAD, SLIP REPAIR

PROJECTGREEN RIDGE ROAD SLIP REPAIR		DRILLING FIRM / OPERATOR: CTL / HARVEY		DRILL RIG: CME 55 #393		STATION / OFFSET: 37+41, 6' RT.		EXPLORATION ID B-002-1-25					
TYPE: LANDSLIDE		SAMPLING FIRM / LOGGER: CTL / HARVEY		HAMMER: CME AUTOMATIC		ALIGNMENT: CR 2							
PID: N/A SFN: N/A		DRILLING METHOD: 3.25" HSA / NQ2		CALIBRATION DATE: 11/4/22		ELEVATION: 923.2 (MSL) EOB: 30.0 ft.		PAGE 1 OF 1					
START: 6/27/25 END: 6/27/25		SAMPLING METHOD: SPT		ENERGY RATIO (%): 79.3		LAT / LONG: 39.128743, -83.260498							
MATERIAL DESCRIPTION AND NOTES		ELEV. 923.2	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)	ATTERBERG		ODOT CLASS (GI)	HOLE SEALED
									GR CS FS SI CL	LL PL PI	WC		
GRAVEL (12")		922.2		6									
STIFF, BROWN, CLAY, SOME GRAVEL, SOME SAND, DAMP @1.5'; HARD			1	5	15	100	SS-1	-	-	-	-	6	A-7-6 (V)
			2	6					-	-	-		
			3	7	19	83	SS-2	4.50	-	-	-	25	A-7-6 (V)
			4	7					-	-	-		
@3.0'; VERY STIFF, BROWN AND BLACK		918.7		8	21	89	SS-3	2.50	-	-	-	24	A-7-6 (V)
			5	8					-	-	-		
CLAYSTONE, GRAY, SEVERELY WEATHERED.			6	9	25	83	SS-4	4.50	-	-	-	16	Rock (V)
			7	10					-	-	-		
			8	11	48	100	SS-5	4.50	-	-	-	14	Rock (V)
			9	16					-	-	-		
			10	20					-	-	-		
			11	16	53	100	SS-6	4.50	-	-	-	12	Rock (V)
			12	19					-	-	-		
			13	21					-	-	-		
			14	18	63	100	SS-7	4.50	-	-	-	14	Rock (V)
			15	23					-	-	-		
			16	25					-	-	-		
			17	22	79	89	SS-8	4.50	-	-	-	7	Rock (V)
			18	28					-	-	-		
			19	32					-	-	-		
@12.0'; SHALE FRAGMENTS.			20	36	110	83	SS-9	-	-	-	-	5	Rock (V)
			21	40					-	-	-		
			22	43					-	-	-		
		908.2		50/3"	-	100	SS-10	-	-	-	-	4	Rock (V)
			23						-	-	-		
SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK; RQD 52%, REC 100%.			24										
			25										
@ 17.2' - 17.6'; γ = 135.3 pcf, Qu = 60 psi			26										
			27	48		100	NQ2-1						CORE
			28										
			29										
			30										
			31										
			32										
			33										
			34										
			35										
			36										
			37										
			38										
			39										
			40										
			41										
			42										
			43										
			44										
			45										
			46										
			47										
			48										
			49										
			50										
			51										
			52										
			53										
			54										
			55										
			56										
			57										
			58										
			59										
			60										
			61										
			62										
			63										
			64										
			65										
			66										
			67										
			68										
			69										
			70										
			71										
			72										
			73										
			74										
			75										
			76										
			77										
			78										
			79										
			80										
			81										
			82										
			83										
			84										
			85										
			86										
			87										
			88										
			89										
			90										
			91										
			92										
			93										
			94										
			95										
			96										
			97										
			98										
			99										
			100										
			101										
			102										
			103										
			104										
			105										
			106										
			107										
			108										
			109										
			110										
			111										
			112										
			113										
			114										
			115										
			116										
			117										
			118										
			119										
			120										
			121										
			122										
			123										
			124										
			125										
			126										
			127										
			128										
			129										
			130										
			131										
			132										
			133										
			134										
			135										
			136										
			137										
			138										
			139										
			140										
			141										
			142										
			143										
			144										
			145										
			146										
			147										
			148										
			149										
			150										
			151										
			152										
			153										
			154										
			155										
			156										
			157										
			158										
			159										
			160										
			161										
			162										
			163										
			164										
			165										
			166										
			167										
			168										
			169										
			170										
			171										
			172										
			173										
			174										
			175										
			176										

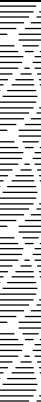
STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 8/11/25 16:35 - O:\PROJECT\2025\COL-05\25050035COL_PIKE COUNTY ENGINEERS OFFICE_GREEN RIDGE ROAD_SLIP REPAIR\

PID: N/A		SFN: N/A		PROJECT: GREEN RIDGE ROAD SLIP REPAIR		STATION / OFFSET: 38+37, 5' LT.		START: 6/26/25		END: 6/26/25		PG 2 OF 2		B-003-0-25									
MATERIAL DESCRIPTION AND NOTES				ELEV.	DEPTHS		SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED	
				901.1								GR	CS	FS	SI	CL	LL	PL	PI				
SHALE, GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG; RQD 53%, REC 99%. (continued)					896.1	EOB		77		97	NQ2-3											CORE	
					31																		
					32																		
					33																		
					34																		
				35																			
<div>NOTES: CAVED AT 18'</div> <div>ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS</div>																							

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 8/11/25 16:35 - O:\PROJECT\2025\COL-05\25060035COL PIKE COUNTY ENGINEERS OFFICE, GREEN RIDGE ROAD, SLIP REPAIR

PROJECTGREEN RIDGE ROAD SLIP REPAIR		DRILLING FIRM / OPERATOR: CTL / HARVEY		DRILL RIG: CME 55 #393		STATION / OFFSET: 38+32, 4' RT.		EXPLORATION ID B-003-1-25												
TYPE: LANDSLIDE		SAMPLING FIRM / LOGGER: CTL / HARVEY		HAMMER: CME AUTOMATIC		ALIGNMENT: CR 2														
PID: N/A SFN: N/A		DRILLING METHOD: 3.25" HSA / NQ2		CALIBRATION DATE: 11/4/22		ELEVATION: 930.4 (MSL) EOB: 25.5 ft.		PAGE 1 OF 1												
START: 6/27/25 END: 6/27/25		SAMPLING METHOD: SPT		ENERGY RATIO (%): 79.3		LAT / LONG: 39.128770, -83.260180														
MATERIAL DESCRIPTION AND NOTES		ELEV. 930.4	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED	
ASPHALT (10")		929.4	TR	5					GR	CS	FS	SI	CL	LL	PL	PI	WC			
HARD, BROWN, CLAY, SOME GRAVEL, LITTLE SAND, DAMP				7	19	100	SS-1	4.50	-	-	-	-	-	-	-	-	-	6	A-7-6 (V)	
@3.0'; VERY STIFF				6	17	94	SS-2	4.50	-	-	-	-	-	-	-	-	-	10	A-7-6 (V)	
				6	17	100	SS-3	3.50	-	-	-	-	-	-	-	-	-	23	A-7-6 (V)	
				4	13	89	SS-4	4.00	-	-	-	-	-	-	-	-	-	16	A-7-6 (V)	
				5	17	83	SS-5	4.00	-	-	-	-	-	-	-	-	-	16	A-7-6 (V)	
		922.9		8	87	100	SS-6	4.50	-	-	-	-	-	-	-	-	-	7	Rock (V)	
CLAYSTONE, GRAY AND BROWN, SEVERELY WEATHERED.				9	-	93	SS-7	-	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		919.9		10																
				11																
SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK TO WEAK; RQD 41%, REC 93%.			12																	
@ 12.7' - 13.2'; γ = 138.1 pcf, Qu = 100 psi			13	35	100	NQ2-1												CORE		
			14																	
			15																	
			16																	
			17																	
			18	35	93	NQ2-2												CORE		
			19																	
			20																	
			21																	
			22																	
			23	52	85	NQ2-3												CORE		
			24																	
		904.9	25																	
			EOB																	
NOTES: CAVED AT 8'																				
ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS																				

PID:	N/A	SFN:	N/A	PROJECT:	GREEN RIDGE ROAD SLIP REPAIR	STATION / OFFSET:	39+44, 4' RT.	START:	6/26/25	END:	6/26/25	PG 2 OF 2	B-004-0-25
------	-----	------	-----	----------	------------------------------	-------------------	---------------	--------	---------	------	---------	-----------	------------

MATERIAL DESCRIPTION AND NOTES		ELEV. 906.2	DEPTHS		SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED	
										GR	CS	FS	SI	CL	LL	PL	PI	WC			
SHALE, GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG; RQD 32%, REC 98%. (continued)		896.2	EOB	31	58		100	NQ2-2												CORE	
				32																	
				33																	
				34																	
				35	30		95	NQ2-3													CORE
				36																	
				37																	
				38																	
				39																	
				40																	

NOTES: CAVED AT 21'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

APPENDIX C

LABORATORY TEST RESULTS



PROJECT NO:	25050035COL
DATE:	7/26/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



Method C

BORING NUMBER	B-001-0-25
SAMPLE NUMBER	NQ2-1

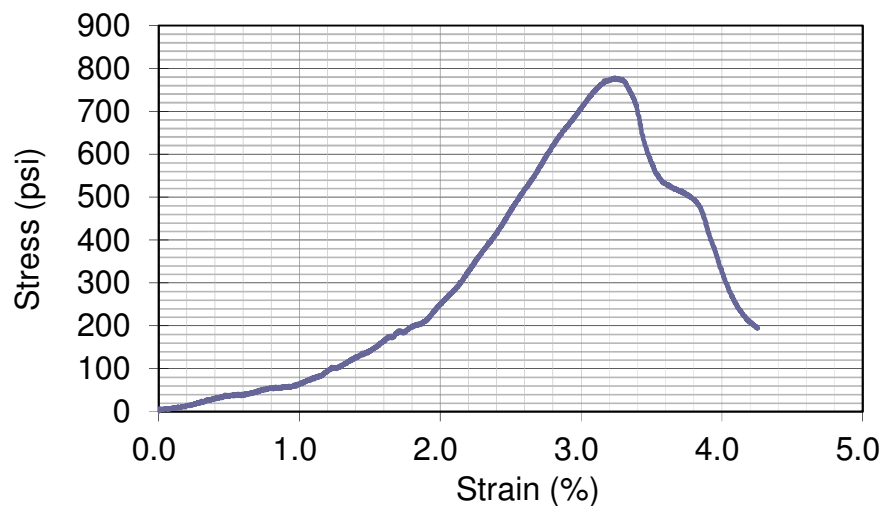
TOP DEPTH (FT)	25.2
BOTTOM DEPTH (FT)	25.6

FORMATION	Devonian age, Ohio and Olentangy Shales Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	3.607	1.976
2	3.614	1.983
3	3.609	1.975
AVERAGE	3.610	1.978

LENGTH/DIAMETER	1.8
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	416.1
UNIT WEIGHT(LBS/FT ³)	142.9

RATE OF LOADING (in/min)	0.11
COMPRESSIVE STRENGTH (PSI)	780
Equip. ID - 68897	
NON-CONFORMANCES - None	
TIME OF TEST (MINUTES)	1.21
LOADING DIRECTION	PERP. TO BEDDING
TECHNICIAN - MW	
TEMPERATURE - Room	



BEFORE TESTING	AFTER TESTING
Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface	

- ≤ Prepared in accordance with ASTM D 4543: **Yes; see report**
- ≤ Received sample preserved in accordance with SGE: **Yes**
- ≤ Sampled preserved after preparation: **N; Tested immediately after preparation.**

PROJECT NO:	25050035COL
DATE:	7/26/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



Method C

BORING NUMBER	B-002-0-25
SAMPLE NUMBER	NQ2-2

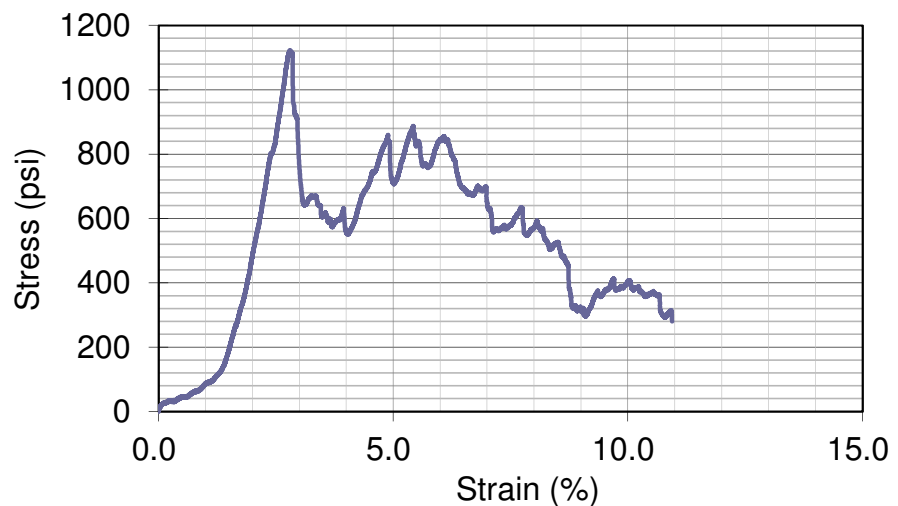
TOP DEPTH (FT)	29.5
BOTTOM DEPTH (FT)	30.0

FORMATION	Devonian age, Ohio and Olentangy Shales Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.125	1.978
2	4.130	1.973
3	4.134	1.970
AVERAGE	4.130	1.974

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	493.4
UNIT WEIGHT(LBS/FT ³)	148.8

RATE OF LOADING (in/min)	0.11
COMPRESSIVE STRENGTH (PSI)	1,120
Equip. ID - 68897	
NON-CONFORMANCES - None	
TIME OF TEST (MINUTES)	4.06
LOADING DIRECTION	PERP. TO BEDDING
TECHNICIAN - MW	
TEMPERATURE - Room	



BEFORE TESTING	AFTER TESTING
Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface	

- ≤ Prepared in accordance with ASTM D 4543: **Yes; see report**
- ≤ Received sample preserved in accordance with SGE: **Yes**
- ≤ Sampled preserved after preparation: **N; Tested immediately after preparation.**

PROJECT NO:	25050035COL
DATE:	7/26/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



Method C

BORING NUMBER	B-002-1-25
SAMPLE NUMBER	NQ2-1

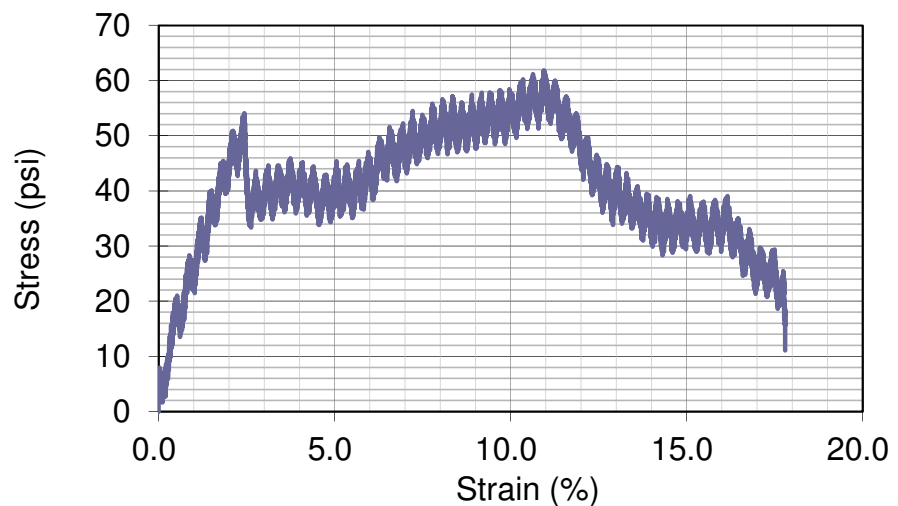
TOP DEPTH (FT)	17.2
BOTTOM DEPTH (FT)	17.6

FORMATION	Devonian age, Ohio and Olentangy Shales Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.086	1.987
2	4.081	1.983
3	4.075	1.985
AVERAGE	4.081	1.985

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	448.5
UNIT WEIGHT(LBS/FT ³)	135.3

RATE OF LOADING (in/min)	0.11
COMPRESSIVE STRENGTH (PSI)	60
Equip. ID - 68897	
NON-CONFORMANCES - None	
TIME OF TEST (MINUTES)	6.58
LOADING DIRECTION	PERP. TO BEDDING
TECHNICIAN - MW	
TEMPERATURE - Room	



BEFORE TESTING	AFTER TESTING
Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface	

- ≤ Prepared in accordance with ASTM D 4543: **Yes; see report**
- ≤ Received sample preserved in accordance with SGE: **Yes**
- ≤ Sampled preserved after preparation: **N; Tested immediately after preparation.**

PROJECT NO:	25050035COL
DATE:	7/26/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



Method C

BORING NUMBER	B-003-0-25
SAMPLE NUMBER	NQ2-1

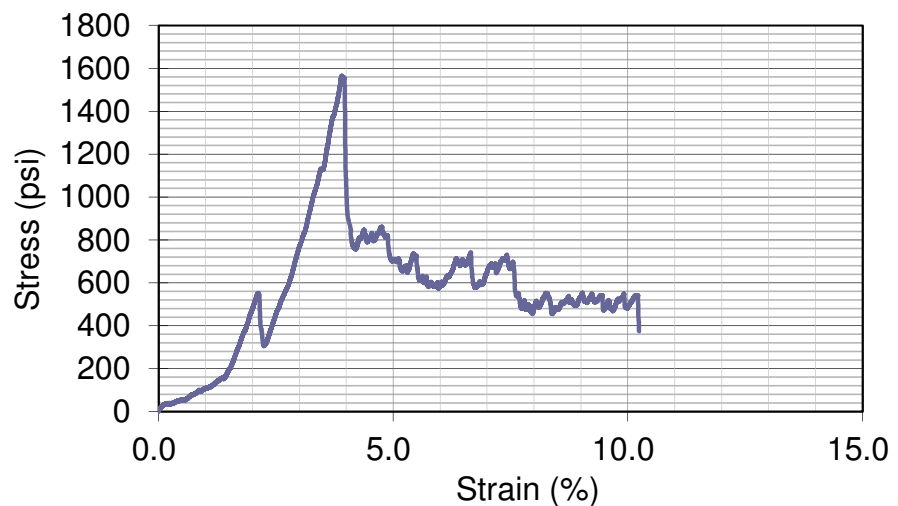
TOP DEPTH (FT)	20.5
BOTTOM DEPTH (FT)	21.0

FORMATION	Devonian age, Ohio and Olentangy Shales Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.131	1.958
2	4.100	1.961
3	4.115	1.960
AVERAGE	4.115	1.960

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	484.4
UNIT WEIGHT(LBS/FT ³)	148.7

RATE OF LOADING (in/min)	0.11
COMPRESSIVE STRENGTH (PSI)	1,570
Equip. ID - 68897	
NON-CONFORMANCES - None	
TIME OF TEST (MINUTES)	3.81
LOADING DIRECTION	PERP. TO BEDDING
TECHNICIAN - MW	
TEMPERATURE - Room	



BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

- ≤ Prepared in accordance with ASTM D 4543: **Yes; see report**
- ≤ Received sample preserved in accordance with SGE: **Yes**
- ≤ Sampled preserved after preparation: **N; Tested immediately after preparation.**

PROJECT NO:	25050035COL
DATE:	7/26/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



Method C

BORING NUMBER	B-003-1-25
SAMPLE NUMBER	NQ2-1

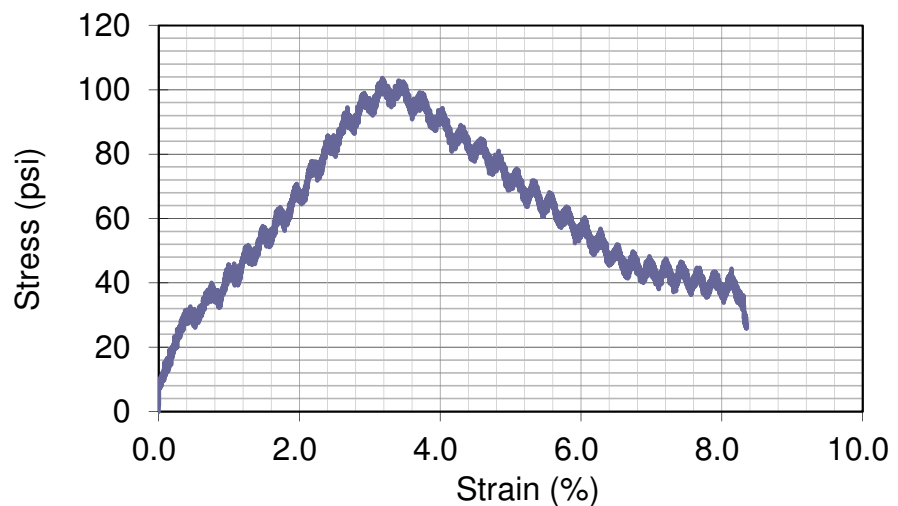
TOP DEPTH (FT)	12.7
BOTTOM DEPTH (FT)	13.2

FORMATION	Devonian age, Ohio and Olentangy Shales Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.127	1.985
2	4.128	1.987
3	4.125	1.992
AVERAGE	4.127	1.988

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	464.3
UNIT WEIGHT(LBS/FT ³)	138.1

RATE OF LOADING (in/min)	0.10
COMPRESSIVE STRENGTH (PSI)	100
Equip. ID - 68897	
NON-CONFORMANCES - None	
TIME OF TEST (MINUTES)	3.18
LOADING DIRECTION	PERP. TO BEDDING
TECHNICIAN - MW	
TEMPERATURE - Room	



BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

- ≤ Prepared in accordance with ASTM D 4543: **Yes; see report**
- ≤ Received sample preserved in accordance with SGE: **Yes**
- ≤ Sampled preserved after preparation: **N; Tested immediately after preparation.**

PROJECT NO:	25050035COL
DATE:	7/26/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



Method C

BORING NUMBER	B-004-0-25
SAMPLE NUMBER	NQ2-1

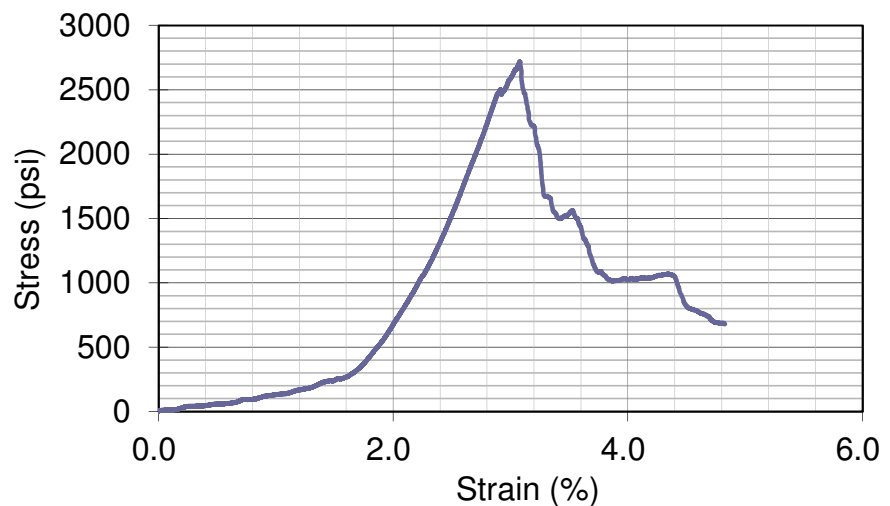
TOP DEPTH (FT)	28.3
BOTTOM DEPTH (FT)	28.8

FORMATION	Devonian age, Ohio and Olenangy Shales Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.122	1.976
2	4.130	1.971
3	4.133	1.974
AVERAGE	4.128	1.974

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	475.9
UNIT WEIGHT(LBS/FT ³)	143.5

RATE OF LOADING (in/min)	0.11
COMPRESSIVE STRENGTH (PSI)	2,720
Equip. ID - 68897	
NON-CONFORMANCES - None	
TIME OF TEST (MINUTES)	1.92
LOADING DIRECTION	PERP. TO BEDDING
TECHNICIAN - MW	
TEMPERATURE - Room	



BEFORE TESTING	AFTER TESTING
Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface	

- ≤ Prepared in accordance with ASTM D 4543: **Yes; see report**
- ≤ Received sample preserved in accordance with SGE: **Yes**
- ≤ Sampled preserved after preparation: **N; Tested immediately after preparation.**

APPENDIX D
ROCK CORE PHOTOS

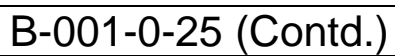




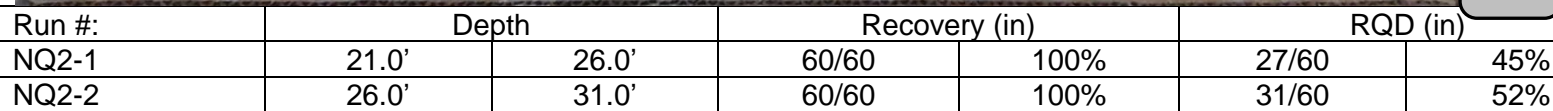
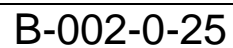
B-001-0-25



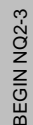
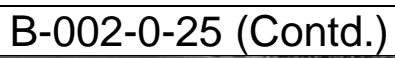
Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	21.0'	26.0'	60/60	100%	24/60	40%
NQ2-2	26.0'	31.0'	49/60	82%	20/60	33%
GREEN RIDGE ROAD SLIP REPAIR						



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	31.0'	36.0'	60/60	100%	52/60	87%
GREEN RIDGE ROAD SLIP REPAIR						



GREEN RIDGE ROAD SLIP REPAIR

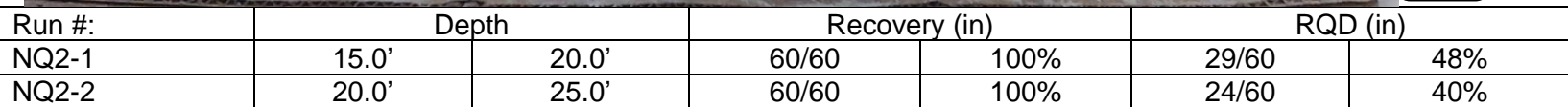
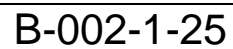


26.0'

END NQ2-3

31.0'


Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	26.0'	31.0'	54/60	90%	27/60	45%
GREEN RIDGE ROAD SLIP REPAIR						

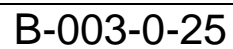


GREEN RIDGE ROAD SLIP REPAIR



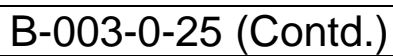
B-002-1-25 (Contd.)

					
Run #:	Depth		Recovery (in)		RQD (in)
NQ2-3	25.0'	30.0'	60/60	100%	40/60
GREEN RIDGE ROAD SLIP REPAIR					



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	20.0'	25.0'	60/60	100%	27/60	45%
NQ2-2	25.0'	30.0'	60/60	100%	22/60	37%

GREEN RIDGE ROAD SLIP REPAIR



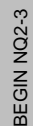
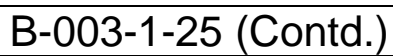


B-003-1-25



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	10.5'	15.5'	60/60	100%	21/60	35%
NQ2-2	15.5'	20.5'	56/60	93%	21/60	35%

GREEN RIDGE ROAD SLIP REPAIR

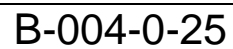


20.5'

END NQ2-3

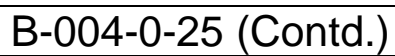
25.5'

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	20.5'	25.5'	51/60	85%	31/60	52%
GREEN RIDGE ROAD SLIP REPAIR						



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	25.0'	30.0'	60/60	100%	5/60	8%
NQ2-2	30.0'	35.0'	60/60	100%	35/60	58%

GREEN RIDGE ROAD SLIP REPAIR



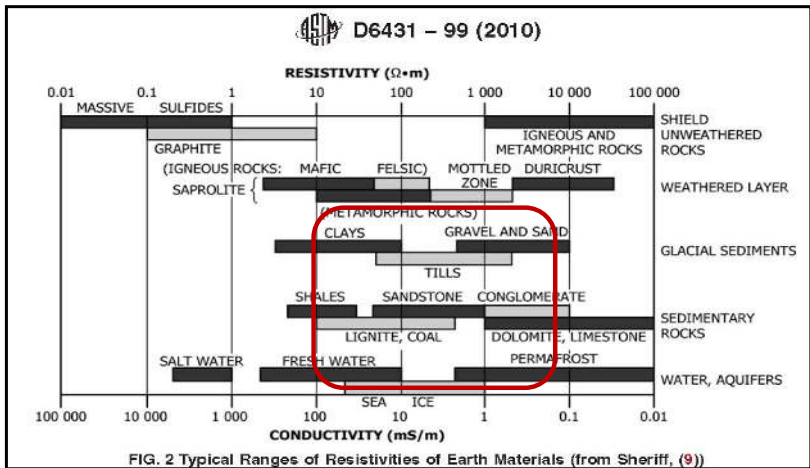
END NQ2-3
40.0'

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	35.0'	40.0'	57/60	95%	18/60	30%
GREEN RIDGE ROAD SLIP REPAIR						

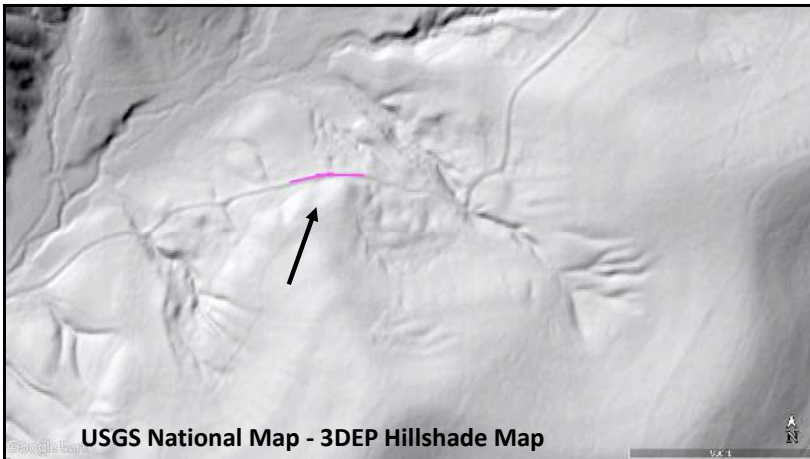
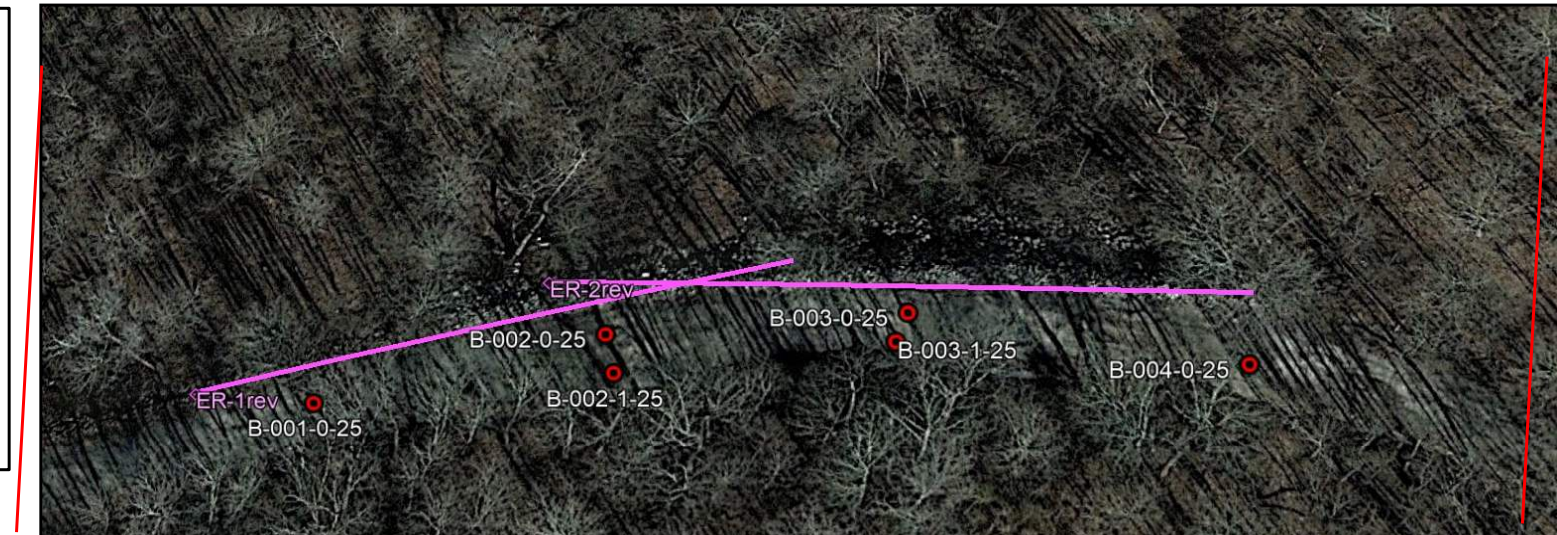
APPENDIX E

GEOPHYSICAL TEST RESULTS

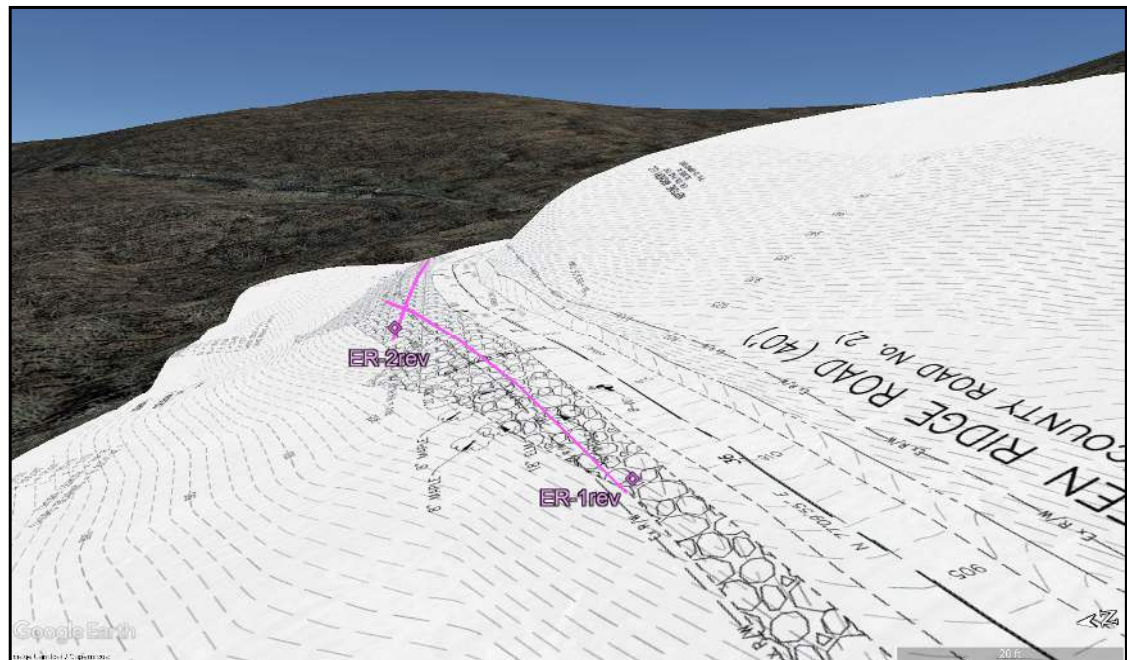
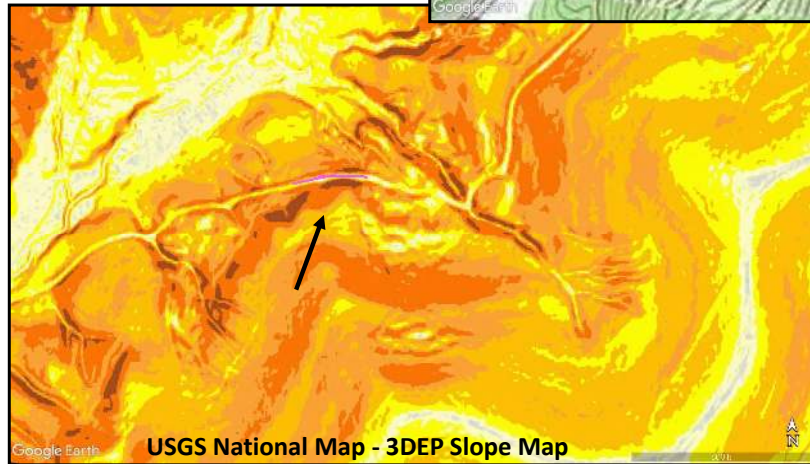
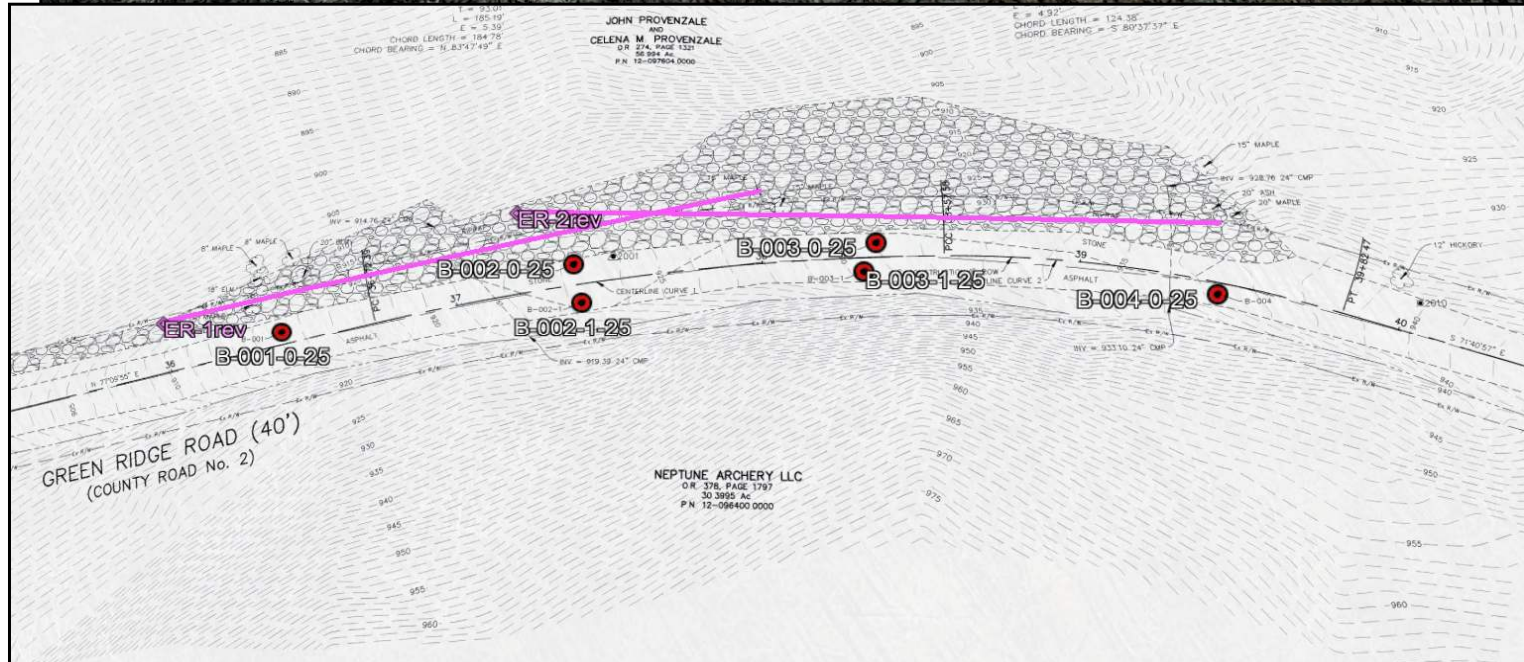




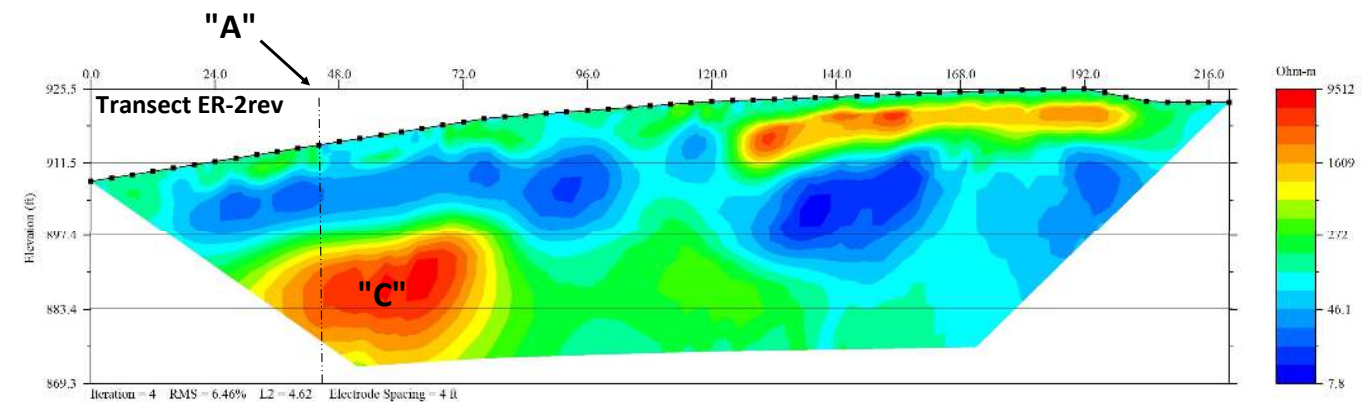
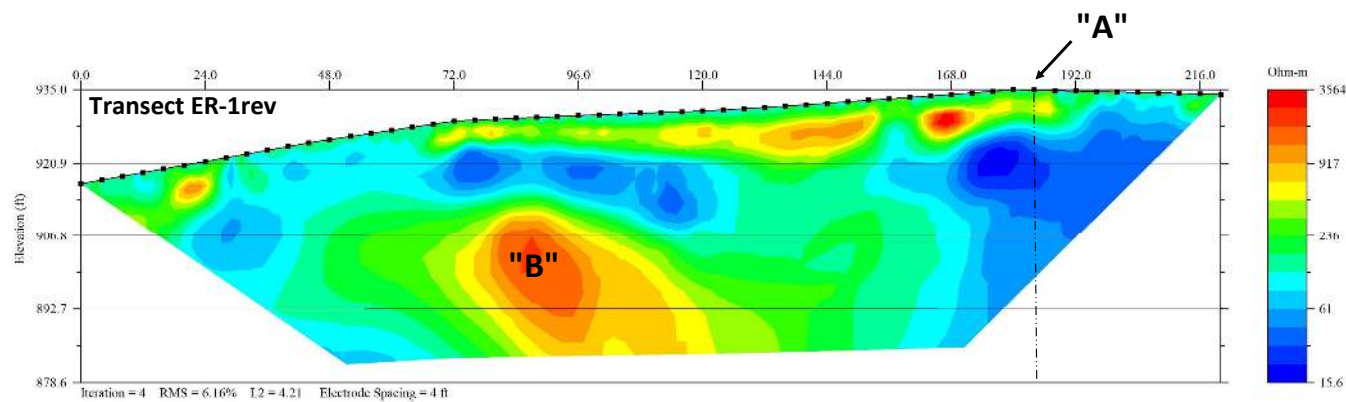
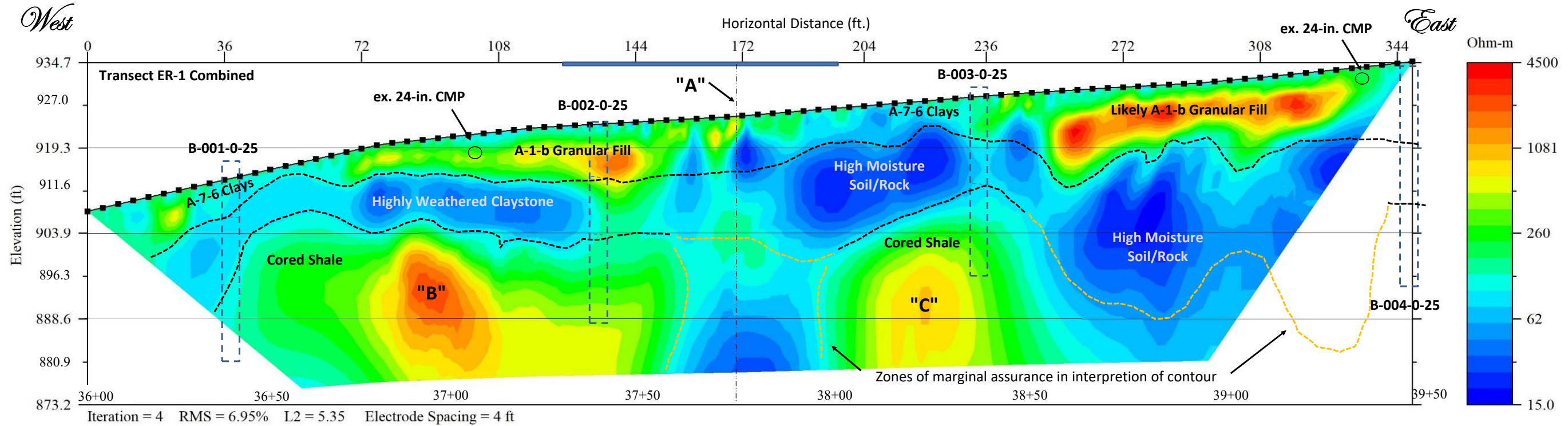
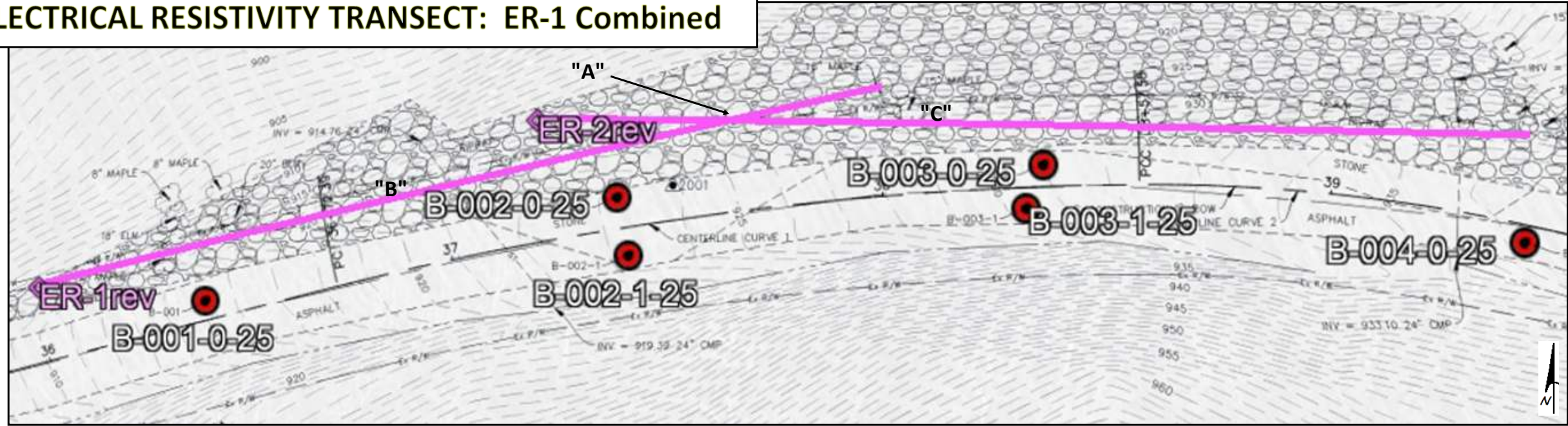
ERI Transect Details:
Test Date: July 10, 2025
Transect Label: ER-1 Combined
Map Length: 348.0 ft.
Ground Length: 348.0 ft.
Approx. Depth: 50 ft.
Electrode Spacing: 4.0 ft.
Array Type: Dipole-Gradient
RMS: 6.95% / L2: 5.35
Data Points: 1814
Location Coordinates:
N 39.128823, E -83.260416



USGS Topographical Map



ELECTRICAL RESISTIVITY TRANSECT: ER-1 Combined



Please Note: Scaling of Depth, Horizontal Distance, and Resistivity Color may Vary with each Model Presented





APPENDIX F

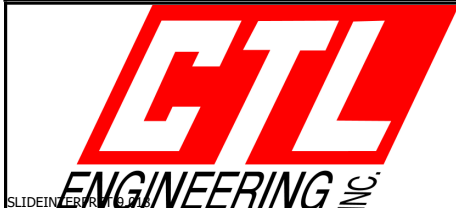
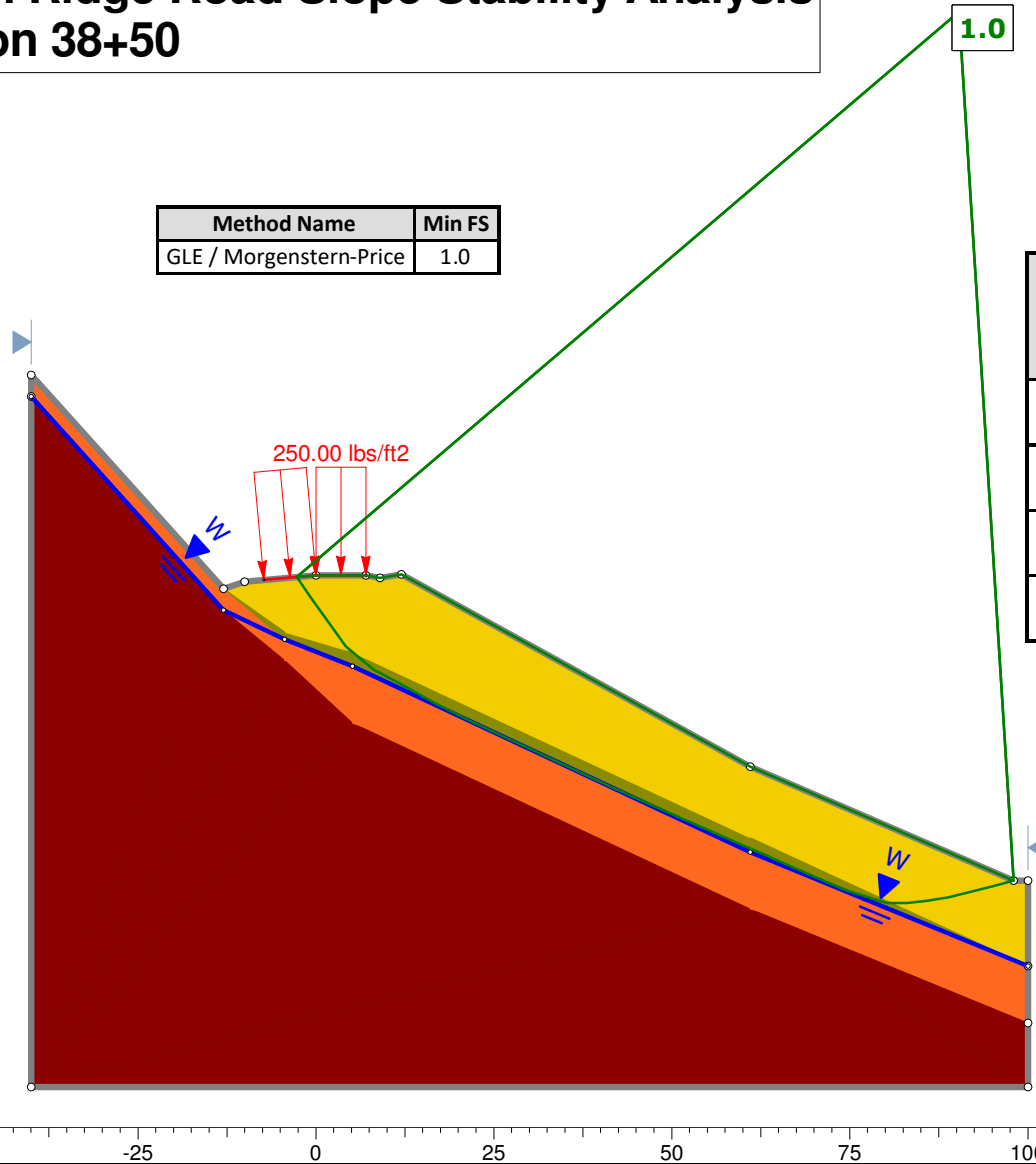
DRILLED SHAFT ANALYSIS



Green Ridge Road Slope Stability Analysis Station 38+50

Method Name	Min FS
GLE / Morgenstern-Price	1.0

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
A-7-6		122	Mohr-Coulomb	220	24	Water Surface
Soft Rock		135	Mohr-Coulomb	0	20	Water Surface
Weak rock		140	Mohr-Coulomb	2808	18.5	Water Surface
Competent Rock		148.7	Mohr-Coulomb	4056	24.5	Water Surface



Project	Green Ridge Road Slip Repair		
Group	Group 1	Scenario	Master Scenario
Drawn By	SR	Company	CTL Engineering, Inc.
Date	8/5/2025, 4:09:48 PM	File Name	Station 38+50.slmd

GREEN RIDGE ROAD SLIP REPAIR STATION 38+50 UASLOPE OUTPUT EXISTING CONDITION

UA Slope Program Version 2.3 - O:\PROJECT\2025\COL-05\25050035COL_Pike County Engineers Office_Green Ridge Road- Slip Repair\Design\UA Slope\Station 38+50 without shaft.ua3*

FileRunOptionsHelp

Calculated Results

Factor of Safety:1.01

Force per Shaft:0.000lb

Acting Point X:0.000ftY:0.000ft

Analysis Unit System

English

Metric

Number of Vertical Sections and Soil Layers

Vertical Section Num:12Soil Layer Num:4

Analysis Method

Total Stress

Effective Stress

Soil Properties

	Cohesion (psf)	Friction Angle	Total Unit Weight (pcf)
Layer1	220.0	24.0	122.0
Layer2	0.0	19.0	135.0
Layer3	2808.0	18.5	140.0
Layer4	4056.0	24.5	148.7

Chart (Double-Click for More Options)

Slope Profile Vertical Sections

	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Section 9	Section 10	Section 11	Section 12
X (ft)	0.00	27.00	30.00	35.60	40.00	45.15	47.00	49.00	52.00	101.00	138.00	140.00
Y1 (ft)	0.00	30.00	29.00	29.60	28.10	28.90	28.10	28.50	28.00	55.00	71.00	71.00
Y2 (ft)	0.00	30.00	32.10	36.10	37.40	38.90	39.80	40.70	42.10	65.00	82.10	83.00
Y3 (ft)	0.00	30.00	32.50	37.10	38.90	40.90	41.80	42.70	44.10	67.00	82.20	83.00
Y4 (ft)	3.00	33.00	35.50	40.10	44.20	48.90	49.80	50.70	52.10	75.00	90.20	91.00
Y5 (ft)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Coordinates of CrestX:52.00ftY:28.00ft

Coordinates of ToeX:138.00ftY:70.00ft

Drilled Shaft Information

Calculate without Drilled Shaft

Automatic Load Transfer Factor

Manually Defined Load Transfer Factor

Anchor (On/Off)

Anchor force:0.00lb

Anchor angle:0.00

Anchor spacing:0.00ft

Auto

OnOff

Xmin:0.00Diameter:0.30ft

Xmax:0.00CTC Spacing:0.00ft

XDelta:0.00X Coordinate:0.00ft

Auto Save Data

Run

Pore Water Pressure

Pore Pressure Options

No Pore Pressure

Constant Ratio

Specified phreatic surface

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
X (ft)	0.00	27.00	35.60	45.15	101.00	140.00
Y (ft)	3.00	33.00	37.10	40.90	67.00	83.00

Slip Surface

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17	Point 18
X (ft)	37.30	39.00	40.80	42.50	44.20	48.10	52.70	56.80	61.50	66.20	69.70	73.40	77.20	81.00	85.50	89.90	94.30	98.70
Y (ft)	28.30	30.96	33.30	35.70	38.10	41.35	43.79	46.10	48.40	50.60	52.30	54.10	55.80	57.60	59.60	61.60	63.50	65.40

GREEN RIDGE ROAD SLIP REPAIR STATION 38+50 UASLOPE OUTPUT WITH SHAFTS

UA Slope Program Version 2.3 - O:\PROJECT\2025\COL-05\25050035COL_Pike County Engineers Office_Green Ridge Road- Slip Repair\Design\UA Slope\Station 38+50 with shaft.ua3*

FileRunOptionsHelp

Calculated Results

Factor of Safety:1.12

Force per Shaft:23128.890lb

Acting Point X:55.500ftY:40.273ft

Analysis Unit System

English

Metric

Number of Vertical Sections and Soil Layers

Vertical Section Num:12

Soil Layer Num:4

Analysis Method

Total Stress

Effective Stress

Soil Properties

	Cohesion (psf)	Friction Angle	Total Unit Weight (pcf)
Layer1	220.0	24.0	122.0
Layer2	0.0	19.0	135.0
Layer3	2808.0	18.5	140.0
Layer4	4056.0	24.5	148.7

Chart (Double-Click for More Options)

Slope Profile Vertical Sections

	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Section 9	Section 10	Section 11	Section 12
X (ft)	0.00	27.00	30.00	35.60	40.00	45.15	47.00	49.00	52.00	101.00	138.00	140.00
Y1 (ft)	0.00	30.00	29.00	29.60	28.10	28.90	28.10	28.50	28.00	55.00	71.00	71.00
Y2 (ft)	0.00	30.00	32.10	36.10	37.40	38.90	39.80	40.70	42.10	65.00	82.10	83.00
Y3 (ft)	0.00	30.00	32.50	37.10	38.90	40.90	41.80	42.70	44.10	67.00	82.20	83.00
Y4 (ft)	3.00	33.00	35.50	40.10	44.20	48.90	49.80	50.70	52.10	75.00	90.20	91.00
Y5 (ft)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Coordinates of CrestX:52.00ftY:28.00ft

Coordinates of ToeX:138.00ftY:70.00ft

Drilled Shaft Information

Calculate without Drilled Shaft

Automatic Load Transfer Factor

Manually Defined Load Transfer Factor

Anchor (On/Off)

Anchor force:0.00lb

Anchor angle:0.00

Anchor spacing:0.00ft

Auto

OnOff

Xmin:0.00Diameter:2.00ft

Xmax:0.00CTC Spacing:4.00ft

XDelta:0.00X Coordinate:55.50ft

Auto Save Data

Run

Pore Water Pressure

Pore Pressure Options:

No Pore Pressure

Constant Ratio

Specified phreatic surface

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
X (ft)	0.00	27.00	35.60	45.15	101.00	140.00
Y (ft)	3.00	33.00	37.10	40.90	67.00	83.00

Slip Surface

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12	Point 13	Point 14	Point 15	Point 16	Point 17	Point 18
X (ft)	37.30	39.00	40.80	42.50	44.20	48.10	52.70	56.80	61.50	66.20	69.70	73.40	77.20	81.00	85.50	89.90	94.30	98.70
Y (ft)	28.30	30.96	33.30	35.70	38.10	41.35	43.79	46.10	48.40	50.60	52.30	54.10	55.80	57.60	59.60	61.60	63.50	65.40

L-PILE Soil and Rock Parameters

Green Ridge Road-- Slip Repair

Top of Drilled Shaft Elevation	931.9	feet	From Slide
Ground Surface Elevation	930	feet	From Slide
Top of Augerable Rock Elevation	914.2	feet	From Slide
Top of Coreable Rock Elevation	906.2	feet	From Slide
Grade in front of wall	29	degrees	From Slide
Depth of Shear surface below existing grade	15.8	feet	From Slide
Depth of Shear surface from top of wall	17.7	feet	
Anticipated Loss of Passive Resistance	8.8	feet	GDM 903.3
Passive Resistance depth to be Ignored	10.7	feet	GDM 903.3

From 10.7 to 17.7 feet

Use Soil Type-	Stiff Clay w/o Free Water (Reese)		
Effective Unit Weight =	122	pcf	From Slide
Undrained Cohesion =	2375	psf	GDM Section 404.1
Strain Factor E50 =	0.005		From L-pile Table 3-4
k =	1000	pci	From L-pile Table 3-3

From 17.7 to 25.7 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	77.6	pcf	From Slide
Strain Factor K_{rm} =	0.0005		From L-pile
Compressive Strength q_u =	44	psi	GDM Section 404.3
Initial Rock Modulus =	3950	psi	GDM Table 400-6, Very Weak Rock
RQD =	0%		Assumed

Below 25.7 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	86.3	pcf	From Slide
Strain Factor K_{rm} =	0.00005		From L-pile
Compressive Strength q_u =	1570.0	psi	Average Claystone compressive strength from B-2 and B-4
Initial Rock Modulus =	145600	psi	GDM Table 400-6, very weak rock
RQD =	40%		Average RQD - B2 CR1 and B4 CR1

P-y Modification Factors

P- modification factor $\beta_a = 0.64(S/D)^{0.34}$

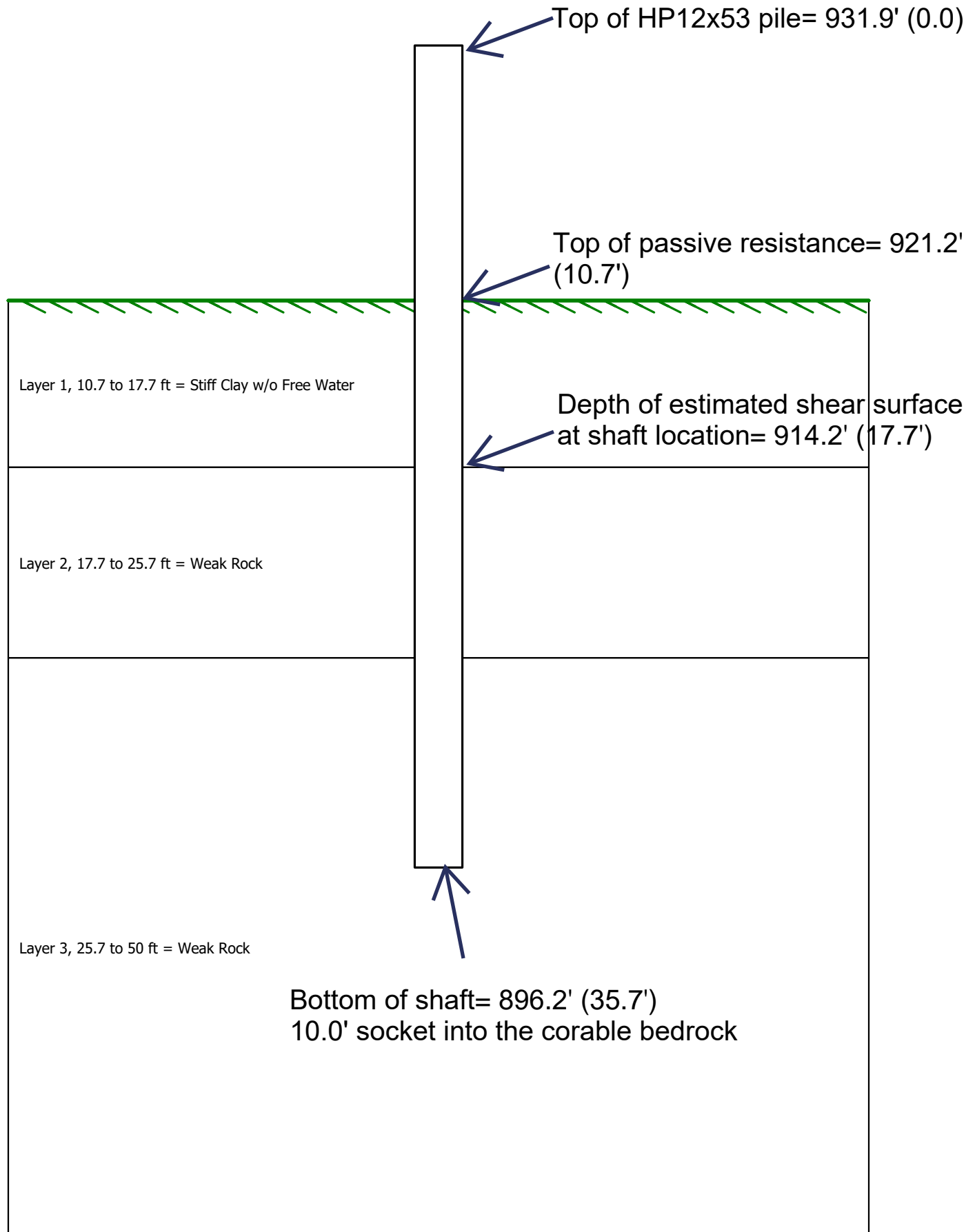
S= Center to Center Spacing between the Piles= 2 feet

D= Diameter of the Pile= 4 feet

$\beta_a = 0.51$

No P-Y modification factors are applied to the bedrock layers.

STATION 38+50



Green Ridge Road Slip Repair

From AASHTO 3.11.5.3, Active Earth Pressure

$$K_a = \frac{\sin^2(\Theta + \phi'_f)}{\Gamma [\sin^2(\Theta) \sin(\Theta - \delta)]}$$

in which $\Gamma = [1 + \nu \{ (\sin(\phi'_f + \delta) \sin(\phi'_f - \beta)) / (\sin(\Theta - \delta) \sin(\Theta + \beta)) \}]^2$

Where

Angle of back face of the wall to the horizontal (Degrees), Θ =	90
Effective angle of internal friction (degrees), ϕ'_f =	30 (Assumed)
Friction angle between fill and wall (degrees), δ =	20 (2/3 ϕ'_f)
Angle of fill to the horizontal, β =	0 Assumed)

Calculation

$\sin(\Theta - \delta)$ =	0.94
$\sin^2(\Theta)$ =	1.00
$\sin(\Theta + \phi'_f)$ =	0.87
$\sin^2(\Theta + \phi'_f)$ =	0.75
$\sin(\phi'_f - \beta)$ =	0.50
$\sin(\Theta + \beta)$ =	1.00
$\sin(\phi'_f + \delta)$ =	0.77
Γ =	2.68
K_a =	0.30

γ_{LS} = 125 pcf (GB7, Section E.7)

Case 1

Diameter of Shaft = 24 inches

C/C Spacing (CC) = 4 feet

Therefore for a 24-inch Shaft placed at 4 feet center to center

Surcharge Load q_{LS} , 24.8 lb/in $\gamma_{LS} * 2 * K_a * CC / 12$

Green Ridge Road Slip Repair

Conversion of force per Shaft to Distributed Load

The UA Slope 2.3 program calculates the unfactored earth pressure (EH), resultant load per shaft, however, for proper structural analysis of pile reaction, we need to convert this to a realistic load.

The triangular load distribution is a close enough approximation of the actual condition to develop a realistic calculation of distributed shear, moment and displacement in the drilled shaft

Case 1

Diameter of Shaft= 24 inches

C/C Spacing (CC)= 4 feet

For a 24-inch shaft at 4 feet center to center spacing

Load on Shaft (F_{sw})=	23,129 lbs
Depth of Shear plane at Shaft Location(D_s)=	17.7 feet
The Distibuted Load (F_D)=	193.0 lbs/in

Green Ridge Road Slip Repair

a) ***Following cases were evaluated:***

Case1

Diameter of Shaft = 24 inches

Center to Center Spacing = 4 feet

b) ***Unfactored Loads***

Case	Surcharge Loads(lbs/in)	Distributed Load(lbs/in)	Total Unfactored Load (lbs/in)
1	24.8	193.0	217.8

c) ***Load Factor per AASHTO Table 3.4.1.1 and 3.4.1.2***

Load Factor for Surcharge Load (LS) = 1.75

Load Factor for Distributed Load (EH) = 1.5

d) ***Factored Distributed loads***

Case	Factored Surcharge Load (lbs/in)	Factored Distributed Loads(lbs/in)	Total Factored Load(lbs/in)
1	43.4	289.5	332.9

e) ***Limit State Checks***

- 1 Use Factored Loads for Strength Limit State and check Moment capacity and Nominal Shear per AASHTO 6.10.8 and 6.10.9
- 2 Use Unfactored Loads for Service Limit State for deflection

Green Ridge Road Slip Repair

HP12x53

Thickness of Flange (t_f) =	0.435 in
Depth (d) =	11.80 in
Yield Strength of Steel (F_y) =	50 Ksi
$D = d - 2t_f =$	10.93 in
thickness of Web (t_w) =	0.435 in

$$V_p = 0.58 F_y D t_w = 137.9 \text{ Kips}$$
$$\text{Young's Modulus (E)} = 29000 \text{ Ksi}$$

Assume Unstiffened Web

$$\text{Shear Buckling Coefficient (K)} = 5.0$$
$$\text{Sqrt}(EK/F_y) = 53.9 \text{ Equation 1}$$
$$1.12 * \text{Sqrt}(EK/F_y) = 60.3 \text{ Equation 2}$$
$$1.4 * \text{Sqrt}(EK/F_y) = 75.4 \text{ Equation 3}$$

$$D/t_w = 25.1$$

$$\text{Since, } D/t_w \leq \text{Equation 1, } C = 1.0$$

Therefore,

$$\text{Nominal Shear Resistance (V}_n\text{)} = C V_p = 137.9 \text{ Kips}$$

$$\phi_v = 1.0$$

$$\text{Factored Shear Resistance (V}_u\text{)} = \phi_v V_n = 137.9 \text{ Kips}$$

Green Ridge Road Slip Repair

HP12x53

Per AASHTO, 6.10.8

For Continuously Braced Flanges in Tension or Compression

$$f_{bu} \leq \phi_f R_h F_{yf} \quad \text{Equation 1}$$

Where f_{bu} = Factored Bending Moment Obtained in Strength Limit State

ϕ_f = Flexural Resistance Factor

R_h = Hybrid Factor

F_{yf} = $f_y * S_{x-x}$

f_y = Yield Strength of Steel

S_{x-x} = Section Modulus of Steel Section

ϕ_f = 1.0 Per AASHTO 6.5.4.2

R_h = 1.0 Per AASHTO 6.10.1.10.1

S_{x-x} = 66.7 In³

f_y = 50.0 ksi

F_{yf} = 3,335,000 lb-in

Green Ridge Road Slip Repair

f) *L-pile Analysis*

Note: It is assumed that 50 Ksi steel will be used.

Section Used= HP12x53

Case1: 24 inch diameter Shafts with 4 feet center to center spacing

Checks:

Structural Strength Limit State Checks (HP12x53 Section)

Calculated Factored Moment(in-lbs)	Factored Nominal Moment Resistance(in-lbs)	Acceptable Or Unacceptable
1,803,951	3,335,000	Acceptable
23.668		
Calculated Factored Shear (Kips)	Factored Nominal Shear resistance (Kips)	Acceptable Or Unacceptable
44.2	137.9	Acceptable

and for nominal shear resistance calculation Per AASHTO 6.10.9

Service Limit State Checks (HP12x53 Section)

Drilled Shaft Length above bedrock= 17.7 feet

For the unfactored Service Limit State analysis, the maximum Pilehead deflection must be limited to 1% or less of the drilled shaft length above bedrock (17.7').

Calculated Deflection(in)	Allowable Deflection(in) Per ODOT Recommendations	Acceptable Or Unacceptable
0.7	2.1	Acceptable

=====

LPILE for Windows, Version 2022-12.008

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
© 1985-2022 by Ensoft, Inc.
All Rights Reserved

=====

This copy of LPILE is being used by:

CTL Engineering, Inc.
Columbus, Ohio

Serial Number of Security Device: 224802699

This copy of LPILE is licensed for exclusive use by:

CTL ENGINEERING INC, Columbus, OH

Use of this software by employees of CTL ENGINEERING INC
other than those of the office site in Columbus, OH
is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\PROJECT\2025\COL-05\25050035COL_Pike County Engineers Office_Green Ridge Road- Slip Repair\Design\Lpile\Station
38+50\

Name of input data file:

Station 38+50.lp12d

Name of output report file:

Station 38+50.lp12o

Name of plot output file:

Station 38+50.lp12p

Name of runtime message file:
Station 38+50.lp12r

Date and Time of Analysis

Date: August 13, 2025

Time: 15:22:31

Problem Title

Project Name: GREEN RIDGE ROAD SLIP REPAIR

Job Number: 25050035COL

Client: PIKE COUNTY ENGINEER'S OFFICE

Engineer: CTL ENGINEERING, INC.

Description: STATION 38+50

Program Options and Settings

Computational Options:

- Conventional Analysis

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Analysis uses p-y modification factors for p-y curves
- Analysis uses layering correction (Method of Georgiadis)
- Analysis includes loading by multiple distributed lateral loads acting on pile
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

- Number of pile sections defined = 1
- Total length of pile = 35.700 ft
- Depth of ground surface below top of pile = 10.7000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over

the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	35.700	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a drilled shaft with casing and H section core/insert
Length of section = 35.700000 ft
Section Diameter = 24.000000 in

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is stiff clay without free water

Distance from top of pile to top of layer = 10.700000 ft
Distance from top of pile to bottom of layer = 17.700000 ft
Effective unit weight at top of layer = 122.000000 pcf
Effective unit weight at bottom of layer = 122.000000 pcf
Undrained cohesion at top of layer = 2375. psf
Undrained cohesion at bottom of layer = 2375. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer = 17.700000 ft
Distance from top of pile to bottom of layer = 25.700000 ft

1	Stiff Clay	10.7000	122.0000	2375.	--	--	0.00500	--
	w/o Free Water	17.7000	122.0000	2375.	--	--	0.00500	--
2	Weak	17.7000	77.6000	--	44.0000	0.00	5.00E-04	3950.
	Rock	25.7000	77.6000	--	44.0000	0.00	5.00E-04	3950.
3	Weak	25.7000	86.3000	--	1570.	40.0000	5.00E-05	145600.
	Rock	50.0000	86.3000	--	1570.	40.0000	5.00E-05	145600.

Modification Factors for p-y Curves

Distribution of p-y modifiers with depth defined using 3 points

Point No.	Depth X ft	p-mult	y-mult
1	10.700	0.5100	1.0000
2	17.700	0.5100	1.0000
3	17.700	1.0000	1.0000

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Distributed Lateral Loading for Individual Load Cases

Distributed lateral load intensity for Load Case 1 defined using 2 points

Point No.	Depth X ft	Dist. Load lb/in
1	0.000	24.800
2	17.700	217.800

Distributed lateral load intensity for Load Case 2 defined using 2 points

Point No.	Depth X ft	Dist. Load lb/in
1	0.000	43.400
2	17.700	332.900

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	1	V = 0.0000 lbs	M = 0.0000 in-lbs	0.0000000	Yes	Yes
2	1	V = 0.0000 lbs	M = 0.0000 in-lbs	0.0000000	Yes	Yes

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	35.700000 ft
Outside Diameter of Casing	=	24.000000 in
Casing Wall Thickness	=	0.0000 in
Moment of Inertia of Steel Casing	=	0.0000 in^4
Width Flange of Core/Insert	=	12.000000 in
Depth of Core/Insert	=	11.800000 in
Flange Thickness of Core/Insert	=	0.435000 in
Web Thickness of Core/Insert	=	0.435000 in
Moment of Inertia of Steel Core/Insert	=	384.614130 in^4
Yield Stress of Casing	=	50000. psi
Elastic Modulus of Casing	=	29000000. psi
Yield Stress of Core/Insert	=	50000. psi
Elastic Modulus of Core/Insert	=	29000000. psi
Number of Reinforcing Bars	=	0 bars
Gross Area of Pile	=	452.389342 sq. in.
Area of Concrete	=	437.194792 sq. in.
Cross-sectional Area of Steel Casing	=	0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert	=	15.194550 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	15.194550 sq. in.
Area Ratio of All Steel to Gross Area	=	3.36 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = $0.85 F_c A_c + F_y A_s$	=	2246.190 kips
Tensile Load for Cracking of Concrete	=	-232.671 kips

Nominal Axial Tensile Capacity = -759.727 kips

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34165 psi
Compression Strain at Peak Stress = 0.001886
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
-----	-----
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318-14, Section 21.2.3.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending	Bending	Bending	Depth to	Max Comp	Max Tens	Max Conc	Max Steel	Max
---------	---------	---------	----------	----------	----------	----------	-----------	-----

Casing Curvature Stress rad/in. ksi	Max Core Stress ksi	Run Moment Msg in-kip	Stiffness kip-in2	N Axis in	Strain in/in	Strain in/in	Stress ksi	Stress ksi
0.00000125	98.0433232		78434659.	12.0000000	0.00001500	-0.00001500	0.0627335	0.00000
0.00000	0.2131500							
0.00000250	195.6277501		78251100.	12.0000000	0.00003000	-0.00003000	0.1249712	0.00000
0.00000	0.4263000							
0.00000375	292.7532804		78067541.	12.0000000	0.00004500	-0.00004500	0.1867130	0.00000
0.00000	0.6394500							
0.00000500	389.4199144		77883983.	12.0000000	0.00006000	-0.00006000	0.2479590	0.00000
0.00000	0.8526000							
0.00000625	485.6276518		77700424.	12.0000000	0.00007500	-0.00007500	0.3087091	0.00000
0.00000	1.0657500							
0.00000750	581.3764929		77516866.	12.0000000	0.00009000	-0.00009000	0.3689635	0.00000
0.00000	1.2789000							
0.00000875	676.6664375		77333307.	12.0000000	0.0001050	-0.000105	0.4287220	0.00000
0.00000	1.4920500							
0.00001000	676.6664375		67666644.	7.9679830	0.00007968	-0.000160	0.3259223	0.00000
0.00000	-2.874485 C							
0.00001125	676.6664375		60148128.	7.9709110	0.00008967	-0.000180	0.3658220	0.00000
0.00000	-3.232840 C							
0.00001250	676.6664375		54133315.	7.9738464	0.00009967	-0.000200	0.4055337	0.00000
0.00000	-3.590981 C							
0.00001375	676.6664375		49212105.	7.9767891	0.0001097	-0.000220	0.4450570	0.00000
0.00000	-3.948906 C							
0.00001500	676.6664375		45111096.	7.9797393	0.0001197	-0.000240	0.4843915	0.00000
0.00000	-4.306614 C							
0.00001625	676.6664375		41641012.	7.9826969	0.0001297	-0.000260	0.5235368	0.00000
0.00000	-4.664104 C							
0.00001750	676.6664375		38666654.	7.9856619	0.0001397	-0.000280	0.5624925	0.00000
0.00000	-5.021377 C							
0.00001875	676.6664375		36088877.	7.9886346	0.0001498	-0.000300	0.6012583	0.00000
0.00000	-5.378430 C							
0.00002000	676.6664375		33833322.	7.9916147	0.0001598	-0.000320	0.6398338	0.00000
0.00000	-5.735263 C							
0.00002125	676.6664375		31843126.	7.9946025	0.0001699	-0.000340	0.6782184	0.00000
0.00000	-6.091876 C							
0.00002250	676.6664375		30074064.	7.9975979	0.0001799	-0.000360	0.7164120	0.00000
0.00000	-6.448267 C							

0.00002375	676.6664375	28491218.	8.0006010	0.0001900	-0.000380	0.7544140	0.00000
0.00000	-6.804436 C						
0.00002500	676.6664375	27066658.	8.0036119	0.0002001	-0.000400	0.7922240	0.00000
0.00000	-7.160381 C						
0.00002625	694.9517009	26474351.	8.0066305	0.0002102	-0.000420	0.8298417	0.00000
0.00000	-7.516102 C						
0.00002750	727.6137603	26458682.	8.0096568	0.0002203	-0.000440	0.8672667	0.00000
0.00000	-7.871599 C						
0.00002875	760.2356336	26442979.	8.0126911	0.0002304	-0.000460	0.9044985	0.00000
0.00000	-8.226869 C						
0.00003000	792.8171829	26427239.	8.0157332	0.0002405	-0.000480	0.9415368	0.00000
0.00000	-8.581912 C						
0.00003125	825.3582697	26411465.	8.0187832	0.0002506	-0.000499	0.9783811	0.00000
0.00000	-8.936728 C						
0.00003250	857.8587547	26395654.	8.0218412	0.0002607	-0.000519	1.0150310	0.00000
0.00000	-9.291315 C						
0.00003375	890.3184973	26379807.	8.0249073	0.0002708	-0.000539	1.0514860	0.00000
0.00000	-9.645672 C						
0.00003500	922.7373565	26363924.	8.0279813	0.0002810	-0.000559	1.0877459	0.00000
0.00000	-9.999799 C						
0.00003625	955.1151898	26348005.	8.0310635	0.0002911	-0.000579	1.1238101	0.00000
0.00000	-10.353694 C						
0.00003750	987.4518541	26332049.	8.0341538	0.0003013	-0.000599	1.1596783	0.00000
0.00000	-10.707358 C						
0.00003875	1020.	26316057.	8.0372523	0.0003114	-0.000619	1.1953500	0.00000
0.00000	-11.060788 C						
0.00004000	1052.	26300028.	8.0403504	0.0003216	-0.000638	1.2308235	0.00000
0.00000	-11.413993 C						
0.00004125	1084.	26283969.	8.0433913	0.0003318	-0.000658	1.2660901	0.00000
0.00000	-11.767043 C						
0.00004250	1116.	26267873.	8.0464401	0.0003420	-0.000678	1.3011584	0.00000
0.00000	-12.119862 C						
0.00004375	1149.	26251741.	8.0494968	0.0003522	-0.000698	1.3360279	0.00000
0.00000	-12.472451 C						
0.00004500	1181.	26235572.	8.0525616	0.0003624	-0.000718	1.3706982	0.00000
0.00000	-12.824807 C						
0.00004625	1213.	26219367.	8.0556344	0.0003726	-0.000737	1.4051689	0.00000
0.00000	-13.176930 C						
0.00004750	1245.	26203124.	8.0587153	0.0003828	-0.000757	1.4394395	0.00000
0.00000	-13.528820 C						
0.00004875	1277.	26186844.	8.0618043	0.0003930	-0.000777	1.4735095	0.00000
0.00000	-13.880474 C						
0.00005125	1340.	26154171.	8.0680070	0.0004135	-0.000817	1.5410463	0.00000

0.00000	-14.583075	C						
0.00005375	1404.		26121346.	8.0742427	0.0004340	-0.000856	1.6077757	0.00000
0.00000	-15.284724	C						
0.00005625	1467.		26088369.	8.0805119	0.0004545	-0.000895	1.6736941	0.00000
0.00000	-15.985415	C						
0.00005875	1531.		26055237.	8.0868149	0.0004751	-0.000935	1.7387979	0.00000
0.00000	-16.685139	C						
0.00006125	1594.		26021949.	8.0931522	0.0004957	-0.000974	1.8030833	0.00000
0.00000	-17.383888	C						
0.00006375	1657.		25988504.	8.0995240	0.0005163	-0.001014	1.8665467	0.00000
0.00000	-18.081655	C						
0.00006625	1720.		25954899.	8.1059307	0.0005370	-0.001053	1.9291842	0.00000
0.00000	-18.778430	C						
0.00006875	1782.		25921133.	8.1123728	0.0005577	-0.001092	1.9909921	0.00000
0.00000	-19.474207	C						
0.00007125	1844.		25887204.	8.1188507	0.0005785	-0.001132	2.0519664	0.00000
0.00000	-20.168975	C						
0.00007375	1907.		25853111.	8.1253647	0.0005992	-0.001171	2.1121032	0.00000
0.00000	-20.862726	C						
0.00007625	1969.		25818852.	8.1319153	0.0006201	-0.001210	2.1713986	0.00000
0.00000	-21.555452	C						
0.00007875	2031.		25784425.	8.1385029	0.0006409	-0.001249	2.2298486	0.00000
0.00000	-22.247144	C						
0.00008125	2092.		25749828.	8.1451279	0.0006618	-0.001288	2.2874489	0.00000
0.00000	-22.937792	C						
0.00008375	2154.		25715060.	8.1517907	0.0006827	-0.001327	2.3441957	0.00000
0.00000	-23.627388	C						
0.00008625	2215.		25680118.	8.1584919	0.0007037	-0.001366	2.4000845	0.00000
0.00000	-24.315922	C						
0.00008875	2276.		25645001.	8.1652318	0.0007247	-0.001405	2.4551113	0.00000
0.00000	-25.003384	C						
0.00009125	2337.		25609707.	8.1720110	0.0007457	-0.001444	2.5092716	0.00000
0.00000	-25.689766	C						
0.00009375	2398.		25574233.	8.1788298	0.0007668	-0.001483	2.5625612	0.00000
0.00000	-26.375056	C						
0.00009625	2458.		25538579.	8.1856888	0.0007879	-0.001522	2.6149757	0.00000
0.00000	-27.059246	C						
0.00009875	2518.		25502741.	8.1925884	0.0008090	-0.001561	2.6665105	0.00000
0.00000	-27.742325	C						
0.0001013	2579.		25466714.	8.1995291	0.0008302	-0.001600	2.7171609	0.00000
0.00000	-28.424285	C						
0.0001038	2638.		25430503.	8.2065115	0.0008514	-0.001639	2.7669228	0.00000
0.00000	-29.105111	C						

0.0001063	2698.	25394103.	8.2135361	0.0008727	-0.001677	2.8157913	0.00000
0.00000 -29.784794	C						
0.0001088	2758.	25357511.	8.2206033	0.0008940	-0.001716	2.8637616	0.00000
0.00000 -30.463325	C						
0.0001113	2817.	25320725.	8.2277137	0.0009153	-0.001755	2.9108290	0.00000
0.00000 -31.140691	C						
0.0001138	2876.	25283743.	8.2348678	0.0009367	-0.001793	2.9569885	0.00000
0.00000 -31.816882	C						
0.0001163	2935.	25246562.	8.2420663	0.0009581	-0.001832	3.0022353	0.00000
0.00000 -32.491886	C						
0.0001188	2994.	25209180.	8.2493096	0.0009796	-0.001870	3.0465644	0.00000
0.00000 -33.165692	C						
0.0001213	3052.	25171594.	8.2565984	0.0010011	-0.001909	3.0899706	0.00000
0.00000 -33.838288	C						
0.0001238	3110.	25133803.	8.2639332	0.0010227	-0.001947	3.1324489	0.00000
0.00000 -34.509661	C						
0.0001263	3168.	25095804.	8.2713145	0.0010443	-0.001986	3.1739939	0.00000
0.00000 -35.179801	C						
0.0001288	3226.	25057595.	8.2787431	0.0010659	-0.002024	3.2146006	0.00000
0.00000 -35.848692	C						
0.0001313	3284.	25019225.	8.2860579	0.0010875	-0.002062	3.2542242	0.00000
0.00000 -36.516943	C						
0.0001338	3341.	24980657.	8.2933862	0.0011092	-0.002101	3.2928909	0.00000
0.00000 -37.184080	C						
0.0001363	3398.	24941877.	8.3007610	0.0011310	-0.002139	3.3306029	0.00000
0.00000 -37.849969	C						
0.0001388	3455.	24902882.	8.3081831	0.0011528	-0.002177	3.3673547	0.00000
0.00000 -38.514599	C						
0.0001413	3512.	24863669.	8.3156530	0.0011746	-0.002215	3.4031409	0.00000
0.00000 -39.177957	C						
0.0001438	3568.	24824236.	8.3231715	0.0011965	-0.002254	3.4379557	0.00000
0.00000 -39.840030	C						
0.0001463	3625.	24784579.	8.3307391	0.0012184	-0.002292	3.4717934	0.00000
0.00000 -40.500804	C						
0.0001488	3681.	24744697.	8.3383565	0.0012403	-0.002330	3.5046482	0.00000
0.00000 -41.160265	C						
0.0001588	3903.	24582851.	8.3693382	0.0013286	-0.002481	3.6261181	0.00000
0.00000 -43.784710	C						
0.0001688	4120.	24417150.	8.4011741	0.0014177	-0.002632	3.7313699	0.00000
0.00000 -46.387005	C						
0.0001788	4334.	24247384.	8.4339139	0.0015076	-0.002782	3.8199818	0.00000
0.00000 -48.966148	C						
0.0001888	4511.	23899357.	8.4428390	0.0015936	-0.002936	3.8882117	0.00000

0.00000	-50.000000	CY						
0.0001988		4585.	23069680.	8.3809626	0.0016657	-0.003104	3.9328462	0.00000
0.00000	-50.000000	CY						
0.0002088		4645.	22252263.	8.3181181	0.0017364	-0.003274	3.9656046	0.00000
0.00000	-50.000000	CY						
0.0002188		4698.	21478750.	8.2584462	0.0018065	-0.003443	3.9873716	0.00000
0.00000	-50.000000	CY						
0.0002288		4746.	20746685.	8.2012668	0.0018760	-0.003614	3.9984038	0.00000
0.00000	-50.000000	CY						
0.0002388		4788.	20053590.	8.1477072	0.0019453	-0.003785	3.9991831	0.00000
0.00000	-50.000000	CY						
0.0002488		4825.	19398662.	8.0980811	0.0020144	-0.003956	3.9994984	0.00000
0.00000	-50.000000	CY						
0.0002588		4859.	18778084.	8.0518737	0.0020834	-0.004127	3.9995413	0.00000
0.00000	-50.000000	CY						
0.0002688		4888.	18189376.	8.0075700	0.0021520	-0.004298	3.9993259	0.00000
0.00000	-50.000000	CY						
0.0002788		4915.	17631516.	7.9659040	0.0022205	-0.004470	3.9987213	0.00000
0.00000	-50.000000	CY						
0.0002888		4938.	17102759.	7.9270822	0.0022889	-0.004641	3.9974339	0.00000
0.00000	-50.000000	CY						
0.0002988		4960.	16601266.	7.8908376	0.0023574	-0.004813	3.9984115	0.00000
0.00000	-50.000000	CY						
0.0003088		4979.	16125127.	7.8570408	0.0024259	-0.004984	3.9997064	0.00000
0.00000	-50.000000	CY						
0.0003188		4996.	15672912.	7.8254703	0.0024944	-0.005156	3.9980025	0.00000
0.00000	-50.000000	CY						
0.0003288		5011.	15243244.	7.7957082	0.0025628	-0.005327	3.9981445	0.00000
0.00000	-50.000000	CY						
0.0003388		5025.	14833712.	7.7666657	0.0026310	-0.005499	3.9991397	0.00000
0.00000	-50.000000	CY						
0.0003488		5037.	14443376.	7.7391306	0.0026990	-0.005671	3.9950882	0.00000
0.00000	-50.000000	CY						
0.0003588		5048.	14071730.	7.7133646	0.0027672	-0.005843	3.9993974	0.00000
0.00000	-50.000000	CY						
0.0003688		5058.	13717682.	7.6892643	0.0028354	-0.006015	3.9947087	0.00000
0.00000	-50.000000	CY						
0.0003788		5067.	13378885.	7.6661859	0.0029036	-0.006186	3.9991153	0.00000
0.00000	-50.000000	CY						
0.0003888		5075.	13055908.	7.6446398	0.0029719	-0.006358	3.9960393	0.00000
0.00000	-50.000000	CY						
0.0003988		5083.	12746684.	7.6242008	0.0030402	-0.006530	3.9979817	0.00000
0.00000	-50.000000	CY						

0.0004088	5089.	12451147.	7.6048279	0.0031085	-0.006702	3.9999816	0.00000
0.00000 -50.000000	CY						
0.0004188	5095.	12167842.	7.5865942	0.0031769	-0.006873	3.9950829	0.00000
0.00000 -50.000000	CY						
0.0004288	5101.	11896551.	7.5692725	0.0032453	-0.007045	3.9989818	0.00000
0.00000 -50.000000	CY						
0.0004388	5105.	11636131.	7.5522701	0.0033136	-0.007216	3.9982011	0.00000
0.00000 -50.000000	CY						
0.0004488	5110.	11386218.	7.5358992	0.0033817	-0.007388	3.9950752	0.00000
0.00000 -50.000000	CY						
0.0004588	5113.	11145800.	7.5199211	0.0034498	-0.007560	3.9987789	0.00000
0.00000 -50.000000	CY						
0.0004688	5117.	10915333.	7.5049637	0.0035180	-0.007732	3.9998649	0.00000
0.00000 -50.000000	CY						
0.0004788	5119.	10693043.	7.4905981	0.0035861	-0.007904	3.9926063	0.00000
0.00000 -50.000000	CY						
0.0004888	5122.	10479334.	7.4768997	0.0036543	-0.008076	3.9971798	0.00000
0.00000 -50.000000	CY						
0.0004988	5124.	10273973.	7.4640213	0.0037227	-0.008247	3.9995967	0.00000
0.00000 -50.000000	CY						
0.0005088	5126.	10075389.	7.4512988	0.0037908	-0.008419	3.9962291	0.00000
0.00000 -50.000000	CY						
0.0005188	5126.	9881165.	7.4544058	0.0038670	-0.008583	3.9939188	0.00000
0.00000 -50.000000	CY						

Summary of Results for Nominal Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain	Max. Tens. Strain
----	-----	-----	-----	-----
1	0.000	5078.475	0.00300000	-0.00642891

Note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.75).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor	Nominal Ax. Thrust kips	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	0.0000	5078.	0.0000	3301.	25007642.
1	0.75	0.0000	5078.	0.0000	3809.	24651217.
1	0.90	0.0000	5078.	0.0000	4571.	23231726.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	10.7000	0.00	N.A.	No	0.00	135524.
2	17.7000	7.0000	No	Yes	N.A.	N.A.
3	25.7000	15.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

 Computed Values of Pile Loading and Deflection
 for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 0.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	0.6674	-8.07E-06	-5.54E-08	-0.00357	0.00	7.84E+10	0.00	0.00	25.7732
0.3570	0.6521	236.5031	116.6659	-0.00357	0.00	7.84E+10	0.00	0.00	28.6927
0.7140	0.6368	999.5937	247.9237	-0.00357	0.00	7.84E+10	0.00	0.00	32.5854
1.0710	0.6215	2361.	395.8578	-0.00357	0.00	7.84E+10	0.00	0.00	36.4781
1.4280	0.6062	4391.	560.4684	-0.00357	0.00	7.84E+10	0.00	0.00	40.3708
1.7850	0.5909	7163.	741.7553	-0.00357	0.00	7.84E+10	0.00	0.00	44.2636
2.1420	0.5756	10747.	939.7185	-0.00357	0.00	7.84E+10	0.00	0.00	48.1563
2.4990	0.5603	15214.	1154.	-0.00357	0.00	7.84E+10	0.00	0.00	52.0490
2.8560	0.5450	20637.	1386.	-0.00357	0.00	7.84E+10	0.00	0.00	55.9417
3.2130	0.5297	27087.	1634.	-0.00357	0.00	7.84E+10	0.00	0.00	59.8344
3.5700	0.5145	34634.	1898.	-0.00356	0.00	7.84E+10	0.00	0.00	63.7271
3.9270	0.4992	43352.	2180.	-0.00356	0.00	7.84E+10	0.00	0.00	67.6198
4.2840	0.4839	53310.	2478.	-0.00356	0.00	7.84E+10	0.00	0.00	71.5125
4.6410	0.4687	64581.	2792.	-0.00356	0.00	7.84E+10	0.00	0.00	75.4053
4.9980	0.4535	77235.	3124.	-0.00355	0.00	7.84E+10	0.00	0.00	79.2980
5.3550	0.4382	91345.	3472.	-0.00355	0.00	7.84E+10	0.00	0.00	83.1907
5.7120	0.4231	106982.	3837.	-0.00354	0.00	7.84E+10	0.00	0.00	87.0834
6.0690	0.4079	124217.	4218.	-0.00354	0.00	7.84E+10	0.00	0.00	90.9761
6.4260	0.3928	143121.	4616.	-0.00353	0.00	7.83E+10	0.00	0.00	94.8688
6.7830	0.3777	163767.	5031.	-0.00352	0.00	7.83E+10	0.00	0.00	98.7615
7.1400	0.3626	186225.	5462.	-0.00351	0.00	7.83E+10	0.00	0.00	102.6542
7.4970	0.3476	210567.	5910.	-0.00350	0.00	7.82E+10	0.00	0.00	106.5469
7.8540	0.3326	236865.	6375.	-0.00349	0.00	7.82E+10	0.00	0.00	110.4397
8.2110	0.3177	265189.	6857.	-0.00347	0.00	7.81E+10	0.00	0.00	114.3324
8.5680	0.3028	295612.	7355.	-0.00346	0.00	7.81E+10	0.00	0.00	118.2251
8.9250	0.2880	328205.	7870.	-0.00344	0.00	7.80E+10	0.00	0.00	122.1178
9.2820	0.2733	363038.	8401.	-0.00342	0.00	7.79E+10	0.00	0.00	126.0105

9.6390	0.2587	400184.	8949.	-0.00340	0.00	7.79E+10	0.00	0.00	129.9032
9.9960	0.2442	439715.	9514.	-0.00338	0.00	7.78E+10	0.00	0.00	133.7959
10.3530	0.2298	481701.	10096.	-0.00335	0.00	7.77E+10	0.00	0.00	137.6886
10.7100	0.2155	526214.	10096.	-0.00333	0.00	7.76E+10	-279.042	5548.	141.5814
11.0670	0.2013	568204.	9505.	-0.00330	0.00	7.75E+10	-284.159	6048.	145.4741
11.4240	0.1872	607648.	8909.	-0.00326	0.00	7.75E+10	-288.717	6606.	149.3668
11.7810	0.1733	644536.	8312.	-0.00323	0.00	7.74E+10	-292.667	7234.	153.2595
12.1380	0.1596	678865.	7716.	-0.00316	0.00	2.70E+10	-295.953	7946.	157.1522
12.4950	0.1463	710646.	7124.	-0.00305	0.00	2.65E+10	-298.662	8747.	161.0449
12.8520	0.1335	739902.	6538.	-0.00293	0.00	2.65E+10	-300.771	9654.	164.9376
13.2090	0.1212	766665.	5961.	-0.00281	0.00	2.64E+10	-302.254	10685.	168.8303
13.5660	0.1094	790979.	5396.	-0.00268	0.00	2.64E+10	-303.082	11865.	172.7231
13.9230	0.09822	812901.	4846.	-0.00255	0.00	2.64E+10	-303.221	13225.	176.6158
14.2800	0.08758	832500.	4313.	-0.00242	0.00	2.64E+10	-302.636	14803.	180.5085
14.6370	0.07752	849856.	3801.	-0.00228	0.00	2.64E+10	-301.286	16649.	184.4012
14.9940	0.06805	865068.	3313.	-0.00214	0.00	2.64E+10	-299.125	18830.	188.2939
15.3510	0.05918	878246.	2853.	-0.00200	0.00	2.64E+10	-296.100	21433.	192.1866
15.7080	0.05093	889517.	2425.	-0.00186	0.00	2.64E+10	-292.153	24577.	196.0793
16.0650	0.04329	899024.	2032.	-0.00171	0.00	2.64E+10	-287.213	28425.	199.9720
16.4220	0.03627	906930.	1680.	-0.00156	0.00	2.64E+10	-281.201	33211.	203.8647
16.7790	0.02989	913417.	1372.	-0.00142	0.00	2.64E+10	-274.020	39274.	207.7575
17.1360	0.02414	918688.	1115.	-0.00127	0.00	2.64E+10	-265.561	47120.	211.6502
17.4930	0.01904	922970.	913.4189	-0.00112	0.00	2.64E+10	-255.693	57541.	215.5429
17.8500	0.01457	926515.	-447.254	-9.67E-04	0.00	2.64E+10	-612.460	180058.	17.3750
18.2070	0.01075	919138.	-3213.	-8.17E-04	0.00	2.64E+10	-696.014	277315.	0.00
18.5640	0.00757	898987.	-6321.	-6.69E-04	0.00	2.64E+10	-755.203	427257.	0.00
18.9210	0.00502	864977.	-9626.	-5.26E-04	0.00	2.64E+10	-787.482	672310.	0.00
19.2780	0.00307	816514.	-13005.	-3.90E-04	0.00	2.64E+10	-789.977	1104157.	0.00
19.6350	0.00168	753553.	-16325.	-2.62E-04	0.00	2.64E+10	-760.374	1939599.	0.00
19.9920	8.17E-04	676637.	-19459.	-1.57E-04	0.00	3.25E+10	-702.391	3683926.	0.00
20.3490	3.37E-04	586831.	-21751.	-9.59E-05	0.00	7.75E+10	-367.768	4680570.	0.00
20.7060	-4.63E-06	490275.	-22527.	-6.61E-05	0.00	7.77E+10	5.4913	5083309.	0.00
21.0630	-2.30E-04	393819.	-21884.	-4.18E-05	0.00	7.79E+10	294.5956	5486048.	0.00
21.4200	-3.63E-04	302771.	-20185.	-2.26E-05	0.00	7.80E+10	498.5034	5888786.	0.00
21.7770	-4.24E-04	220871.	-17784.	-8.28E-06	0.00	7.82E+10	622.7792	6291525.	0.00
22.1340	-4.34E-04	150401.	-14998.	1.88E-06	0.00	7.83E+10	677.5883	6694264.	0.00
22.4910	-4.08E-04	92366.	-12099.	8.52E-06	0.00	7.84E+10	675.8003	7097003.	0.00
22.8480	-3.61E-04	46734.	-9299.	1.23E-05	0.00	7.84E+10	631.3474	7499742.	0.00
23.2050	-3.02E-04	12689.	-6752.	1.39E-05	0.00	7.84E+10	557.8298	7902481.	0.00
23.5620	-2.41E-04	-11119.	-4556.	1.40E-05	0.00	7.84E+10	467.6072	8305219.	0.00
23.9190	-1.83E-04	-26344.	-2782.	1.30E-05	0.00	7.84E+10	360.6349	8460900.	0.00
24.2760	-1.30E-04	-34951.	-1458.	1.13E-05	0.00	7.84E+10	257.0715	8460900.	0.00
24.6330	-8.59E-05	-38840.	-544.383	9.27E-06	0.00	7.84E+10	169.6598	8460900.	0.00

24.9900	-5.07E-05	-39615.	33.6500	7.13E-06	0.00	7.84E+10	100.1970	8460900.	0.00
25.3470	-2.48E-05	-38552.	353.3182	4.99E-06	0.00	7.84E+10	49.0413	8460900.	0.00
25.7040	-7.95E-06	-36588.	1698.	2.94E-06	0.00	7.84E+10	578.7580	3.12E+08	0.00
26.0610	3.70E-07	-24003.	2880.	1.29E-06	0.00	7.84E+10	-26.933	3.12E+08	0.00
26.4180	3.07E-06	-11912.	2343.	3.06E-07	0.00	7.84E+10	-223.758	3.12E+08	0.00
26.7750	2.99E-06	-3927.	1398.	-1.27E-07	0.00	7.84E+10	-217.678	3.12E+08	0.00
27.1320	1.99E-06	62.5236	621.3158	-2.32E-07	0.00	7.84E+10	-144.704	3.12E+08	0.00
27.4890	1.00E-06	1396.	155.4336	-1.92E-07	0.00	7.84E+10	-72.795	3.12E+08	0.00
27.8460	3.39E-07	1394.	-53.341	-1.16E-07	0.00	7.84E+10	-24.672	3.12E+08	0.00
28.2030	4.12E-09	939.3650	-106.832	-5.25E-08	0.00	7.84E+10	-0.300	3.12E+08	0.00
28.5600	-1.11E-07	478.9418	-90.188	-1.38E-08	0.00	7.84E+10	8.0706	3.12E+08	0.00
28.9170	-1.14E-07	166.6349	-55.159	3.87E-09	0.00	7.84E+10	8.2829	3.12E+08	0.00
29.2740	-7.77E-08	6.3416	-25.300	8.59E-09	0.00	7.84E+10	5.6568	3.12E+08	0.00
29.6310	-4.01E-08	-50.135	-6.923	7.40E-09	0.00	7.84E+10	2.9226	3.12E+08	0.00
29.9880	-1.43E-08	-52.974	1.5703	4.58E-09	0.00	7.84E+10	1.0425	3.12E+08	0.00
30.3450	-8.88E-10	-36.681	3.9417	2.13E-09	0.00	7.84E+10	0.06466	3.12E+08	0.00
30.7020	3.96E-09	-19.201	3.4626	6.07E-10	0.00	7.84E+10	-0.288	3.12E+08	0.00
31.0590	4.32E-09	-7.013	2.1720	-1.08E-10	0.00	7.84E+10	-0.314	3.12E+08	0.00
31.4160	3.03E-09	-0.591	1.0264	-3.16E-10	0.00	7.84E+10	-0.221	3.12E+08	0.00
31.7730	1.61E-09	1.7812	0.3031	-2.84E-10	0.00	7.84E+10	-0.117	3.12E+08	0.00
32.1300	6.00E-10	2.0062	-0.04111	-1.80E-10	0.00	7.84E+10	-0.04371	3.12E+08	0.00
32.4870	6.31E-11	1.4290	-0.145	-8.64E-11	0.00	7.84E+10	-0.00459	3.12E+08	0.00
32.8440	-1.40E-10	0.7675	-0.133	-2.64E-11	0.00	7.84E+10	0.01018	3.12E+08	0.00
33.2010	-1.63E-10	0.2929	-0.08532	2.53E-12	0.00	7.84E+10	0.01189	3.12E+08	0.00
33.5580	-1.18E-10	0.03644	-0.04143	1.15E-11	0.00	7.84E+10	0.00860	3.12E+08	0.00
33.9150	-6.45E-11	-0.06208	-0.01293	1.08E-11	0.00	7.84E+10	0.00470	3.12E+08	0.00
34.2720	-2.54E-11	-0.07438	0.00109	7.10E-12	0.00	7.84E+10	0.00185	3.12E+08	0.00
34.6290	-3.70E-12	-0.05271	0.00564	3.63E-12	0.00	7.84E+10	2.70E-04	3.12E+08	0.00
34.9860	5.68E-12	-0.02610	0.00533	1.48E-12	0.00	7.84E+10	-4.13E-04	3.12E+08	0.00
35.3430	8.95E-12	-0.00707	0.00305	0.00	0.00	7.84E+10	-6.52E-04	3.12E+08	0.00
35.7000	1.06E-11	0.00	0.00	0.00	0.00	7.84E+10	-7.70E-04	1.56E+08	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.66736591 inches

Computed slope at pile head = -0.0035706 radians
 Maximum bending moment = 926515. inch-lbs
 Maximum shear force = -22527. lbs
 Depth of maximum bending moment = 17.85000000 feet below pile head
 Depth of maximum shear force = 20.70600000 feet below pile head
 Number of iterations = 327
 Number of zero deflection points = 6
 Pile deflection at ground = 0.21585573 inches

 Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs
 Moment = 0. in-lbs
 Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
35.70000	0.66736591	926515.	-22527.
33.91500	0.69208055	955092.	-23238.
32.13000	0.70184268	974137.	-23790.
30.34500	0.70559096	975236.	-23637.
28.56000	0.68807349	963079.	-23308.
26.77500	0.66814988	935403.	-22820.
24.99000	0.67608332	944090.	-22858.
23.20500	0.71018304	976901.	-26724.
21.42000	0.92695931	824235.	-29943.
19.63500	2.95268331	715382.	-21646.
17.85000	14.54321011	632344.	-17364.

 Computed Values of Pile Loading and Deflection
 for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 0.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	1.5297	3.89E-05	0.00	-0.00795	0.00	7.84E+10	0.00	0.00	44.8598
0.3570	1.4957	411.6480	201.5597	-0.00795	0.00	7.84E+10	0.00	0.00	49.2391
0.7140	1.4616	1727.	425.0072	-0.00795	0.00	7.84E+10	0.00	0.00	55.0781
1.0710	1.4275	4053.	673.4692	-0.00795	0.00	7.84E+10	0.00	0.00	60.9172
1.4280	1.3935	7497.	946.9458	-0.00795	0.00	7.84E+10	0.00	0.00	66.7563
1.7850	1.3594	12167.	1245.	-0.00795	0.00	7.84E+10	0.00	0.00	72.5953
2.1420	1.3253	18168.	1569.	-0.00795	0.00	7.84E+10	0.00	0.00	78.4344
2.4990	1.2913	25609.	1917.	-0.00795	0.00	7.84E+10	0.00	0.00	84.2735
2.8560	1.2572	34597.	2291.	-0.00795	0.00	7.84E+10	0.00	0.00	90.1125
3.2130	1.2232	45239.	2690.	-0.00795	0.00	7.84E+10	0.00	0.00	95.9516
3.5700	1.1892	57641.	3113.	-0.00794	0.00	7.84E+10	0.00	0.00	101.7907
3.9270	1.1551	71912.	3562.	-0.00794	0.00	7.84E+10	0.00	0.00	107.6297
4.2840	1.1211	88158.	4035.	-0.00793	0.00	7.84E+10	0.00	0.00	113.4688
4.6410	1.0872	106486.	4534.	-0.00793	0.00	7.84E+10	0.00	0.00	119.3079
4.9980	1.0532	127004.	5058.	-0.00792	0.00	7.84E+10	0.00	0.00	125.1469
5.3550	1.0193	149819.	5606.	-0.00792	0.00	7.83E+10	0.00	0.00	130.9860
5.7120	0.9854	175037.	6180.	-0.00791	0.00	7.83E+10	0.00	0.00	136.8251
6.0690	0.9515	202767.	6778.	-0.00790	0.00	7.82E+10	0.00	0.00	142.6642
6.4260	0.9177	233115.	7402.	-0.00788	0.00	7.82E+10	0.00	0.00	148.5032
6.7830	0.8840	266189.	8051.	-0.00787	0.00	7.81E+10	0.00	0.00	154.3423
7.1400	0.8503	302095.	8725.	-0.00785	0.00	7.80E+10	0.00	0.00	160.1814
7.4970	0.8167	340941.	9423.	-0.00784	0.00	7.80E+10	0.00	0.00	166.0204
7.8540	0.7831	382834.	10147.	-0.00782	0.00	7.79E+10	0.00	0.00	171.8595
8.2110	0.7497	427880.	10896.	-0.00780	0.00	7.78E+10	0.00	0.00	177.6986
8.5680	0.7164	476189.	11670.	-0.00777	0.00	7.77E+10	0.00	0.00	183.5376
8.9250	0.6831	527865.	12468.	-0.00774	0.00	7.76E+10	0.00	0.00	189.3767
9.2820	0.6500	583017.	13292.	-0.00771	0.00	7.75E+10	0.00	0.00	195.2158
9.6390	0.6171	641752.	14141.	-0.00768	0.00	7.74E+10	0.00	0.00	201.0548
9.9960	0.5842	704177.	15015.	-0.00760	0.00	2.65E+10	0.00	0.00	206.8939
10.3530	0.5519	770398.	15914.	-0.00748	0.00	2.64E+10	0.00	0.00	212.7330
10.7100	0.5201	840524.	16092.	-0.00735	0.00	2.64E+10	-347.820	2865.	218.5720
11.0670	0.4889	908278.	15536.	-0.00721	0.00	2.64E+10	-354.751	3108.	224.4111

11.4240	0.4583	973640.	14977.	-0.00706	0.00	2.63E+10	-361.143	3376.	230.2502
11.7810	0.4284	1036600.	14416.	-0.00689	0.00	2.63E+10	-366.975	3669.	236.0892
12.1380	0.3993	1097157.	13857.	-0.00672	0.00	2.63E+10	-372.226	3994.	241.9283
12.4950	0.3708	1155323.	13301.	-0.00654	0.00	2.62E+10	-376.871	4354.	247.7674
12.8520	0.3432	1211120.	12752.	-0.00634	0.00	2.62E+10	-380.885	4754.	253.6064
13.2090	0.3165	1264581.	12212.	-0.00614	0.00	2.62E+10	-384.242	5201.	259.4455
13.5660	0.2906	1315751.	11684.	-0.00593	0.00	2.62E+10	-386.912	5703.	265.2846
13.9230	0.2657	1364690.	11171.	-0.00571	0.00	2.61E+10	-388.864	6270.	271.1236
14.2800	0.2417	1411467.	10677.	-0.00548	0.00	2.61E+10	-390.062	6914.	276.9627
14.6370	0.2187	1456169.	10204.	-0.00525	0.00	2.61E+10	-390.469	7649.	282.8018
14.9940	0.1967	1498895.	9756.	-0.00501	0.00	2.61E+10	-390.042	8494.	288.6408
15.3510	0.1758	1539760.	9337.	-0.00476	0.00	2.61E+10	-388.736	9472.	294.4799
15.7080	0.1560	1578895.	8951.	-0.00450	0.00	2.60E+10	-386.500	10615.	300.3190
16.0650	0.1373	1616448.	8601.	-0.00424	0.00	2.60E+10	-383.276	11962.	306.1581
16.4220	0.1197	1652586.	8292.	-0.00397	0.00	2.60E+10	-379.000	13565.	311.9971
16.7790	0.1033	1687494.	8029.	-0.00369	0.00	2.60E+10	-373.602	15496.	317.8362
17.1360	0.08807	1721379.	7817.	-0.00341	0.00	2.60E+10	-367.002	17853.	323.6753
17.4930	0.07407	1754469.	7661.	-0.00312	0.00	2.59E+10	-359.111	20771.	329.5143
17.8500	0.06131	1787016.	5775.	-0.00283	0.00	2.59E+10	-877.165	61294.	26.5574
18.2070	0.04981	1803951.	1766.	-0.00253	0.00	2.59E+10	-1021.	87817.	0.00
18.5640	0.03960	1802146.	-2868.	-0.00224	0.00	2.59E+10	-1142.	123550.	0.00
18.9210	0.03066	1779381.	-7966.	-0.00194	0.00	2.59E+10	-1238.	172992.	0.00
19.2780	0.02298	1733894.	-13418.	-0.00165	0.00	2.59E+10	-1307.	243680.	0.00
19.6350	0.01653	1664415.	-19103.	-0.00137	0.00	2.60E+10	-1347.	349055.	0.00
19.9920	0.01125	1570219.	-24887.	-0.00110	0.00	2.60E+10	-1353.	515177.	0.00
20.3490	0.00708	1451187.	-30615.	-8.54E-04	0.00	2.61E+10	-1321.	798987.	0.00
20.7060	0.00393	1307912.	-36101.	-6.28E-04	0.00	2.62E+10	-1240.	1350728.	0.00
21.0630	0.00170	1141877.	-41085.	-4.28E-04	0.00	2.63E+10	-1087.	2736541.	0.00
21.4200	2.67E-04	955897.	-44200.	-2.57E-04	0.00	2.63E+10	-367.383	5888786.	0.00
21.7770	-5.01E-04	763174.	-43411.	-1.17E-04	0.00	2.64E+10	735.5952	6291525.	0.00
22.1340	-7.39E-04	583952.	-39523.	-3.95E-05	0.00	7.75E+10	1079.	6255189.	0.00
22.4910	-8.39E-04	424541.	-34678.	-1.17E-05	0.00	7.78E+10	1182.	6032943.	0.00
22.8480	-8.40E-04	286827.	-29468.	7.86E-06	0.00	7.81E+10	1250.	6379078.	0.00
23.2050	-7.72E-04	172055.	-24026.	2.04E-05	0.00	7.83E+10	1291.	7160980.	0.00
23.5620	-6.64E-04	80971.	-18503.	2.74E-05	0.00	7.84E+10	1288.	8305219.	0.00
23.9190	-5.38E-04	13525.	-13469.	2.99E-05	0.00	7.84E+10	1062.	8460900.	0.00
24.2760	-4.08E-04	-34430.	-9469.	2.94E-05	0.00	7.84E+10	805.5629	8460900.	0.00
24.6330	-2.86E-04	-67602.	-6533.	2.66E-05	0.00	7.84E+10	565.0383	8460900.	0.00
24.9900	-1.80E-04	-90403.	-4560.	2.23E-05	0.00	7.84E+10	355.7540	8460900.	0.00
25.3470	-9.53E-05	-106675.	-3395.	1.69E-05	0.00	7.84E+10	188.2469	8460900.	0.00
25.7040	-3.55E-05	-119492.	2539.	1.07E-05	0.00	7.84E+10	2582.	3.12E+08	0.00
26.0610	-3.61E-06	-84917.	8634.	5.12E-06	0.00	7.84E+10	262.8477	3.12E+08	0.00
26.4180	8.38E-06	-45519.	7890.	1.56E-06	0.00	7.84E+10	-610.100	3.12E+08	0.00

26.7750	9.72E-06	-17317.	5067.	-1.60E-07	0.00	7.84E+10	-707.673	3.12E+08	0.00
27.1320	7.01E-06	-2103.	2458.	-6.90E-07	0.00	7.84E+10	-510.263	3.12E+08	0.00
27.4890	3.81E-06	3746.	771.9980	-6.46E-07	0.00	7.84E+10	-277.031	3.12E+08	0.00
27.8460	1.48E-06	4512.	-51.920	-4.20E-07	0.00	7.84E+10	-107.617	3.12E+08	0.00
28.2030	2.07E-07	3302.	-314.680	-2.07E-07	0.00	7.84E+10	-15.053	3.12E+08	0.00
28.5600	-2.92E-07	1815.	-301.363	-6.69E-08	0.00	7.84E+10	21.2705	3.12E+08	0.00
28.9170	-3.66E-07	719.4957	-198.672	2.33E-09	0.00	7.84E+10	26.6715	3.12E+08	0.00
29.2740	-2.72E-07	113.1330	-99.095	2.51E-08	0.00	7.84E+10	19.8163	3.12E+08	0.00
29.6310	-1.52E-07	-129.547	-33.013	2.46E-08	0.00	7.84E+10	11.0341	3.12E+08	0.00
29.9880	-6.12E-08	-169.722	0.1722	1.64E-08	0.00	7.84E+10	4.4586	3.12E+08	0.00
30.3450	-1.06E-08	-128.071	11.3807	8.32E-09	0.00	7.84E+10	0.7741	3.12E+08	0.00
30.7020	1.00E-08	-72.213	11.4780	2.85E-09	0.00	7.84E+10	-0.729	3.12E+08	0.00
31.0590	1.38E-08	-29.728	7.7719	6.27E-11	0.00	7.84E+10	-1.001	3.12E+08	0.00
31.4160	1.05E-08	-5.623	3.9822	-9.03E-10	0.00	7.84E+10	-0.768	3.12E+08	0.00
31.7730	6.02E-09	4.3912	1.3985	-9.36E-10	0.00	7.84E+10	-0.438	3.12E+08	0.00
32.1300	2.52E-09	6.3598	0.06592	-6.43E-10	0.00	7.84E+10	-0.184	3.12E+08	0.00
32.4870	5.15E-10	4.9560	-0.408	-3.34E-10	0.00	7.84E+10	-0.03746	3.12E+08	0.00
32.8440	-3.35E-10	2.8647	-0.436	-1.20E-10	0.00	7.84E+10	0.02441	3.12E+08	0.00
33.2010	-5.15E-10	1.2214	-0.303	-8.56E-12	0.00	7.84E+10	0.03748	3.12E+08	0.00
33.5580	-4.09E-10	0.2659	-0.159	3.21E-11	0.00	7.84E+10	0.02975	3.12E+08	0.00
33.9150	-2.40E-10	-0.144	-0.05811	3.54E-11	0.00	7.84E+10	0.01749	3.12E+08	0.00
34.2720	-1.05E-10	-0.232	-0.00422	2.51E-11	0.00	7.84E+10	0.00767	3.12E+08	0.00
34.6290	-2.48E-11	-0.180	0.01609	1.39E-11	0.00	7.84E+10	0.00181	3.12E+08	0.00
34.9860	1.37E-11	-0.09417	0.01783	6.42E-12	0.00	7.84E+10	-9.96E-04	3.12E+08	0.00
35.3430	3.02E-11	-0.02694	0.01099	3.11E-12	0.00	7.84E+10	-0.00220	3.12E+08	0.00
35.7000	4.03E-11	0.00	0.00	2.37E-12	0.00	7.84E+10	-0.00294	1.56E+08	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection	=	1.52973464 inches
Computed slope at pile head	=	-0.0079522 radians
Maximum bending moment	=	1803951. inch-lbs
Maximum shear force	=	-44200. lbs
Depth of maximum bending moment	=	18.20700000 feet below pile head
Depth of maximum shear force	=	21.42000000 feet below pile head

Number of iterations = 31
 Number of zero deflection points = 6
 Pile deflection at ground = 0.52100435 inches

 Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 0. lbs
 Moment = 0. in-lbs
 Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
35.70000	1.52973464	1803951.	-44200.
33.91500	1.57049182	1852183.	-45660.
32.13000	1.59807930	1876114.	-45896.
30.34500	1.59445215	1878019.	-46075.
28.56000	1.56992089	1854842.	-45501.
26.77500	1.55055878	1818396.	-45297.
24.99000	1.54669179	1830056.	-44740.
23.20500	1.82505994	1778946.	-54425.
21.42000	4.25591076	1323095.	-48567.

 Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	0.00	M, in-lb	0.00	0.00	0.6674	-0.00357	-22527.	926515.
2	V, lb	0.00	M, in-lb	0.00	0.00	1.5297	-0.00795	-44200.	1803951.

Maximum pile-head deflection = 1.5297346444 inches

Maximum pile-head rotation = -0.0079522425 radians = -0.455630 deg.

Summary of Warning Messages

The following warning was reported 10000 times

**** Warning ****

An unreasonable input value for compressive strength has been specified for a soil defined using the weak rock criteria. The input value is less than 100 psi. Please check your input data for correctness.

The following warning was reported 6828 times

**** Warning ****

An unreasonable input value for unconfined compressive strength has been specified for a soil defined using the weak rock criteria. The input value is greater than 500 psi. Please check your input data for correctness.

The analysis ended normally.