Technical Memorandum

Date:	Monday, January 06, 2025
Project:	ATH-13 13.71
To:	Andrew Moreland, P.E.
From:	Will Brandenberger, P.E., P.G., Douglas Voegele, P.E.
Subject:	Evaluation of Rock Slope Stability and Remediation

Executive Summary

This technical memorandum is in response to a recent rockfall event that occurred along State Route 13 (SR 13) near milepost 13.71 in Athens County, Ohio, approximately 1.3 miles north of the Village of Glouster. Debris from the rockfall crossed both active traffic lanes and was estimated at upwards of 1 to 2 feet in diameter based upon our review of photographs provided by the Ohio Department of Transportation (ODOT). The rockfall failure was most likely a kinematic wedge failure of the exposed rock surface based upon our site observations, field measurements, and subsequent geotechnical evaluation. Our analyses have found that the kinematic risk can be significantly reduced if the exposed competent bedrock material (sandstone, siltstone) is cut back to a 0.5H:1V slope with the encountered materials above the competent rock material laid back at a 2H:1V slope. The inclusion of a 10-foot wide bench is also recommended at the initial contact of the incompetent shale at the base of the competent material to prevent future undercutting, with a second lithologic bench located at the contact between the competent bedrock and the overlying claystone to provide a drainage break in the slope given the overall height of the cut as well as an area for any potential sloughed material to accumulate. A 10-foot wide overburden bench is likewise recommended at the interface between the soil overburden and the underlying bedrock. This proposed design has a significantly reduced kinematic wedge failure risk and passes all performed checks for global stability. A conceptual model of the proposed cut slope with an interpretive geologic model has been generated and can be found at the following web link:
https://publicscenes.seequent.com/96987669-b71f-481c-a9e7-fe1c5ab343df

Introduction

The ATH-13-13.71 project consists of rockfall hazard mitigation in response to a significant rockfall event which blocked both travel lanes on SR 13 approximately 1.3 miles north of the Village of Glouster in Athens County, Ohio. The project location is shown in both Exhibit 1: Site Vicinity Map and Exhibit 2: Topographic Map, with photographs of this rockfall event as provided by ODOT presented in Attachment 2. As shown, SR 13 is located on the west valley wall of Sunday Creek within the project area, with the specific area of interest being the exposed rock outcrop/rock cut and soil slopes located to the left of the alignment (upslope of the roadway). HDR Engineering, Inc. (HDR) was tasked to evaluate the existing rock cut slope and prepare recommendations to mitigate the rockfall and provide the needed catchment (95%) to help protect SR 13 and the travelling public from future rockfall events.

Data Collection and Investigation

Geologic Setting

The project site is located geologically within the Conemaugh Group of Pennsylvanian age. A geologic map of the discrete area of interest is provided as Exhibit 3. The Conemaugh Group is defined as shale, siltstone, sandstone, mudstone and lesser amounts of limestone and coal, nonbedded to massively bedded, and of 350 to 490 feet in thickness. Diagnostic features include multicolored mudstones, rare coal beds, thin to thick marine shale and limestone in the lower 2/3^{rds} of the unit, and rapid vertical or horizontal changes of rock types (Shrake, Swinford, Schumacher, Larsen, & Sluchjer, 2011). The formation is known to have a general dip slightly south of east, and small areas of the Pittsburgh coal bed and the Upper Freeport coal beds have been known to outcrop in the area (Debrosse, 1957). The Upper Freeport coal beds are described as outcropping to the west of Bishopville and marks the base of the Conemaugh while the Pittsburgh coal bed marks the top of the Conemaugh. The project site is located approximately 1.3 miles west of Bishopville and at an elevation just above the contact of the Allegheny and Pottsville Groups (Undivided), which places this project firmly within the lower members of the Conemaugh Group. A very thin coal bed was encountered in Boring B-001-0-24 during the subsurface exploration program, which is likely an exposure of the Upper Freeport coal beds. In addition, an active surface mine (Buckingham Mine No. 2) is located less than ¼ mile from the project site on the opposite side of the ridge.

Rock Face Data

Available LiDAR data for the project region (Woolpert, 2021) and a detailed survey LiDAR scan of the rock face performed by ODOT were combined to create a three dimensional (3D) surface of the site topography with high resolution at the rock face (blue shading) and moderate resolution surrounding the rock face (yellow shading), as shown in Figure 1. A closer view of the rock face with several annotated points of interest is provided as Figure 2.

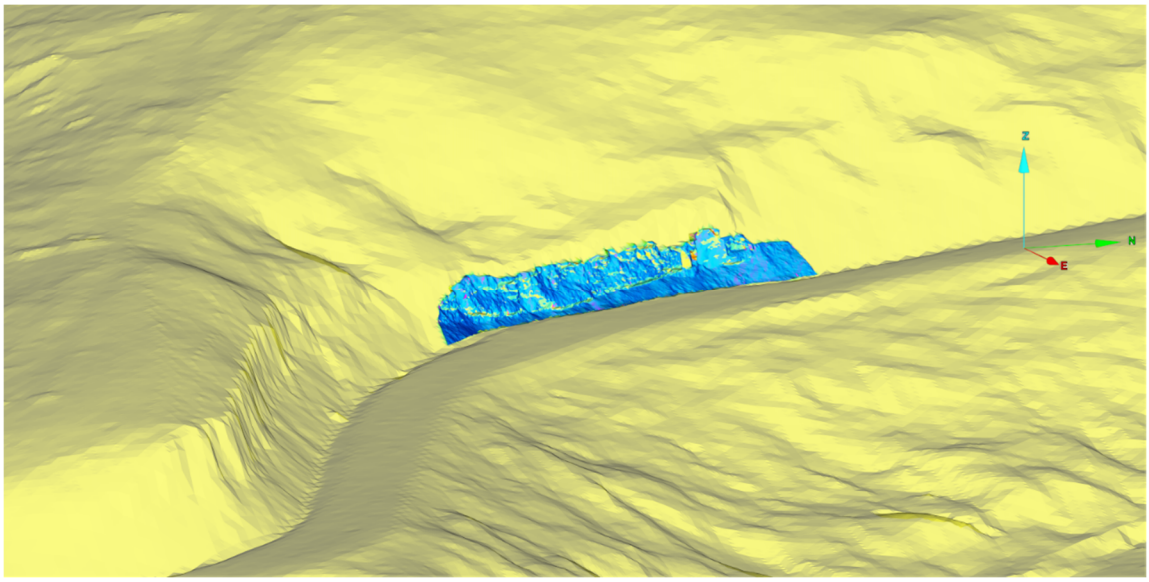


Figure 1: View of detailed rock slope LiDAR and surrounding statewide USGS LiDAR

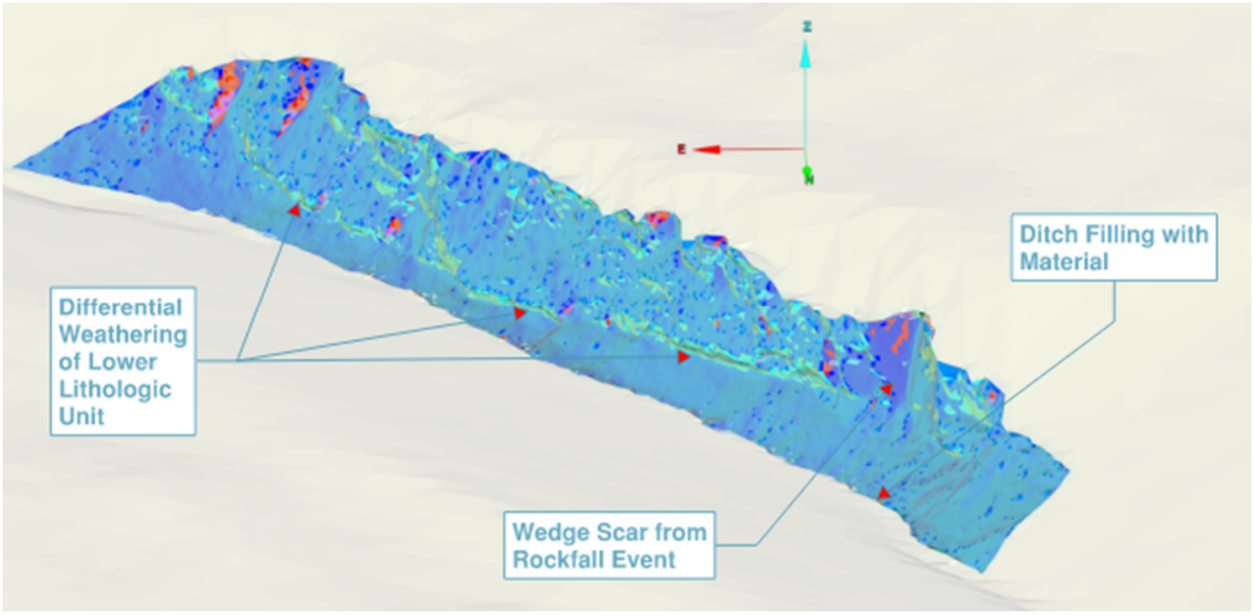
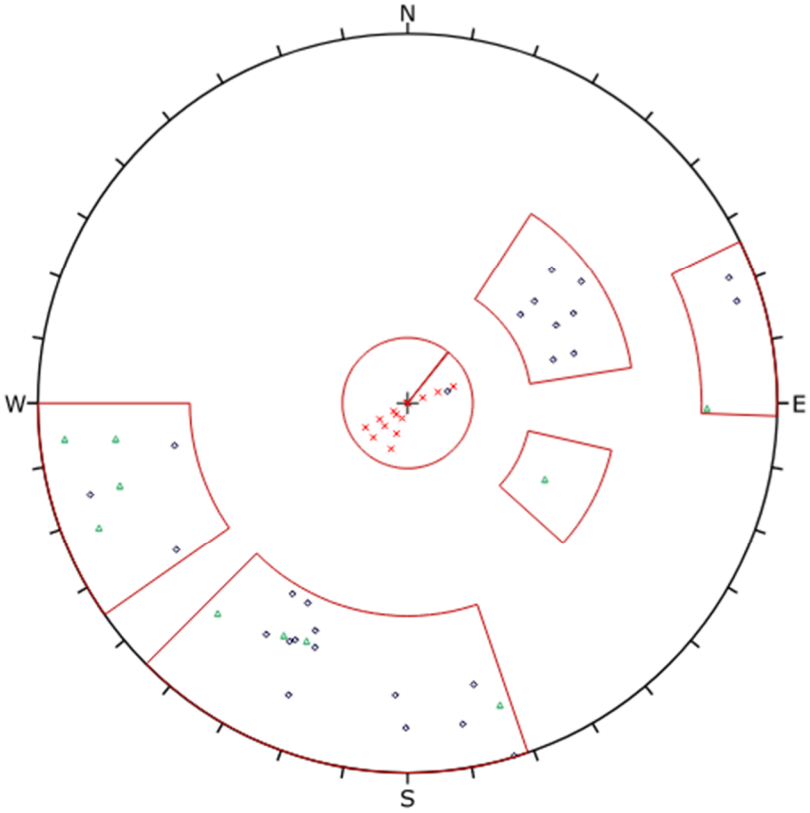


Figure 2: Annotated view of detailed rock slope LiDAR

To investigate the propensity of the rock face for different kinematic modes of failure, it is essential to collect dip and dip direction of the predominant joint sets and bedding. This data was collected by electronically measuring within the high resolution LiDAR scan and also by hand in the field by an HDR geotechnical engineer using the GeoCompass (v 1.10.0) mobile app during the subsurface exploration program. A spread of 5° to 15° bedding joints was also estimated to account for the waviness of the horizontally bedded sedimentary rock. These data points are plotted on a stereonet in Figure 3, with different symbology used to depict if the collection was measured by hand, electronically, or estimated.



Symbol	METHOD	Quantity
◇	Electronic	27
×	Estimated Bedding Dip	16
△	Hand	10

Plot Mode	Pole Vectors
Vector Count	53 (53 Entries)
Hemisphere	Lower
Projection	Equal Angle

Figure 3: Stereonet of discontinuities with symbology split by collection method

Subsurface Data

The geotechnical exploration program consisted of two borings, designated as B-001-0-24 and B-002-0-24, to evaluate the subsurface at the locations shown on Exhibit No. 4: Boring Location Map. Boring B-001-0-24 was performed at the crest of the rock cut slope to the south of the recent rockfall location. Boring B-002-0-24 was performed near the crest of the slope above the area of the recent rock fall. The borings were performed in general accordance with the *Specifications for Geotechnical Explorations* (ODOT revised July 2024) utilizing 3.25-inch internal diameter hollow stem augers to advance the borings to the top of bedrock. The sampling of the soils and weathered bedrock was accomplished in accordance with the *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*, ASTM D 1586. Sampling of the underlying bedrock was performed in accordance with the *Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation*, ASTM D 2113, using an NQ2-size double tube-swivel barrel with a diamond bit. The boring logs and photographs of the recovered rock core samples are provided in Attachment 3. A summary of the boring results is provided as Table 1, and an angled view of the borings on the 3D topography is shown as Figure 4.

Table 1: Summary of subsurface exploration

Boring	Surface Elevation (ft)	Latitude	Longitude	Top of Weathered Rock Depth (ft)	Top of Rock Depth (ft)	Boring Total Depth (ft)
B-001-0-24	792.1	39.5188	-82.0714	5.0	10.0	50.5
B-002-0-24	821.8	39.5196	-82.0734	17.5	24.5	84.0

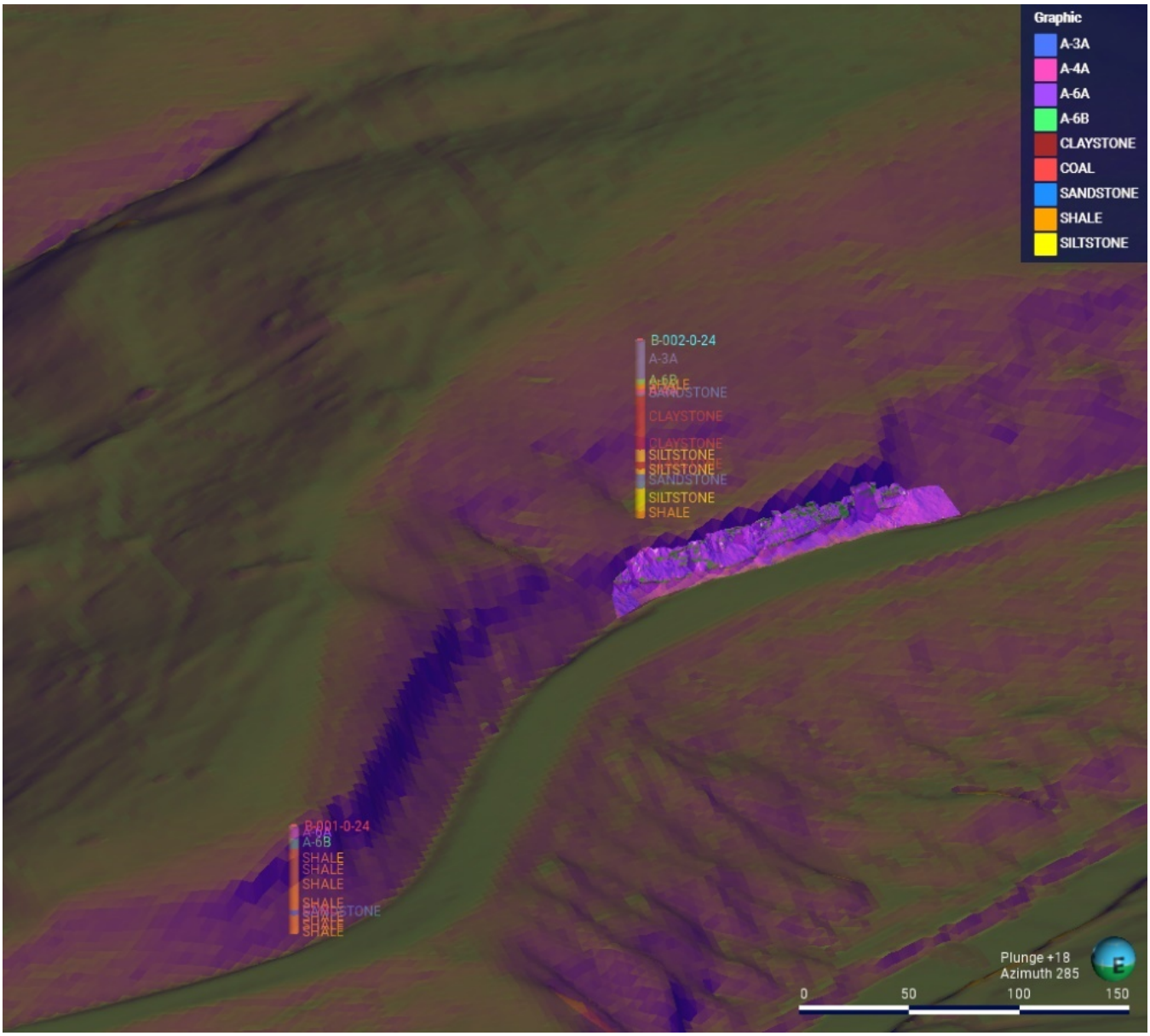


Figure 4: View of as-drilled boring locations on 3D topography

Laboratory Testing

Laboratory testing was performed on select soil and rock samples to confirm field descriptions and quantify intact rock strength with regards to cut slope stability. Soil index testing included 17 natural moisture content tests (per ASTM D 2216), 5 Atterberg limit determinations (per ASTM D 4318), and 5 grain size analyses (per ASTM D 422). Testing of the encountered bedrock included 7 Uniaxial Compressive Strength Tests on Rock (ASTM D7012) and 7 Slake Durability Index Testing (ASTM D 4644). The laboratory test results have been incorporated into the boring logs as provided in Attachment 3. The detailed laboratory test results are provided as Attachment 4.

Analyses and Interpretation

Subsurface Interpretation

The design of rock cuts in sedimentary bedrock with varying durability and strength is based on many factors. Using guidance provided in ODOT's Rock Slope Design Guide (ODOT, 2016) and the Geotechnical Design Manual (ODOT, 2023), the subsurface strata were split into competent and incompetent design units. Competent units are defined as

- limestone or sandstone visually described as moderately strong or stronger, or meeting one of the following conditions:
    - a unit weight of at least 140 pcf or
    - a second cycle slake durability index (SDI) of 85% or greater.
- Siltstone with a second cycle SDI greater than 85%.

Incompetent units are defined as shale or claystone, or other lithology falling below the following minimum descriptions:

- visually described as slightly strong, weak, or very weak,
- unit weight less than 140 pcf, and/or
- a second cycle SDI less than 85%.

A geotechnical profile of the two borings with lithology, N60 values, RQD, SDI and UCS along with HDR's interpretation of ODOT's rock slope design unit categories is provided as Figure 5. This interpreted profile is based on the guidance provided by ODOT, the encountered subsurface conditions, laboratory testing results, and HDR's local experience working within the Conemaugh formation.

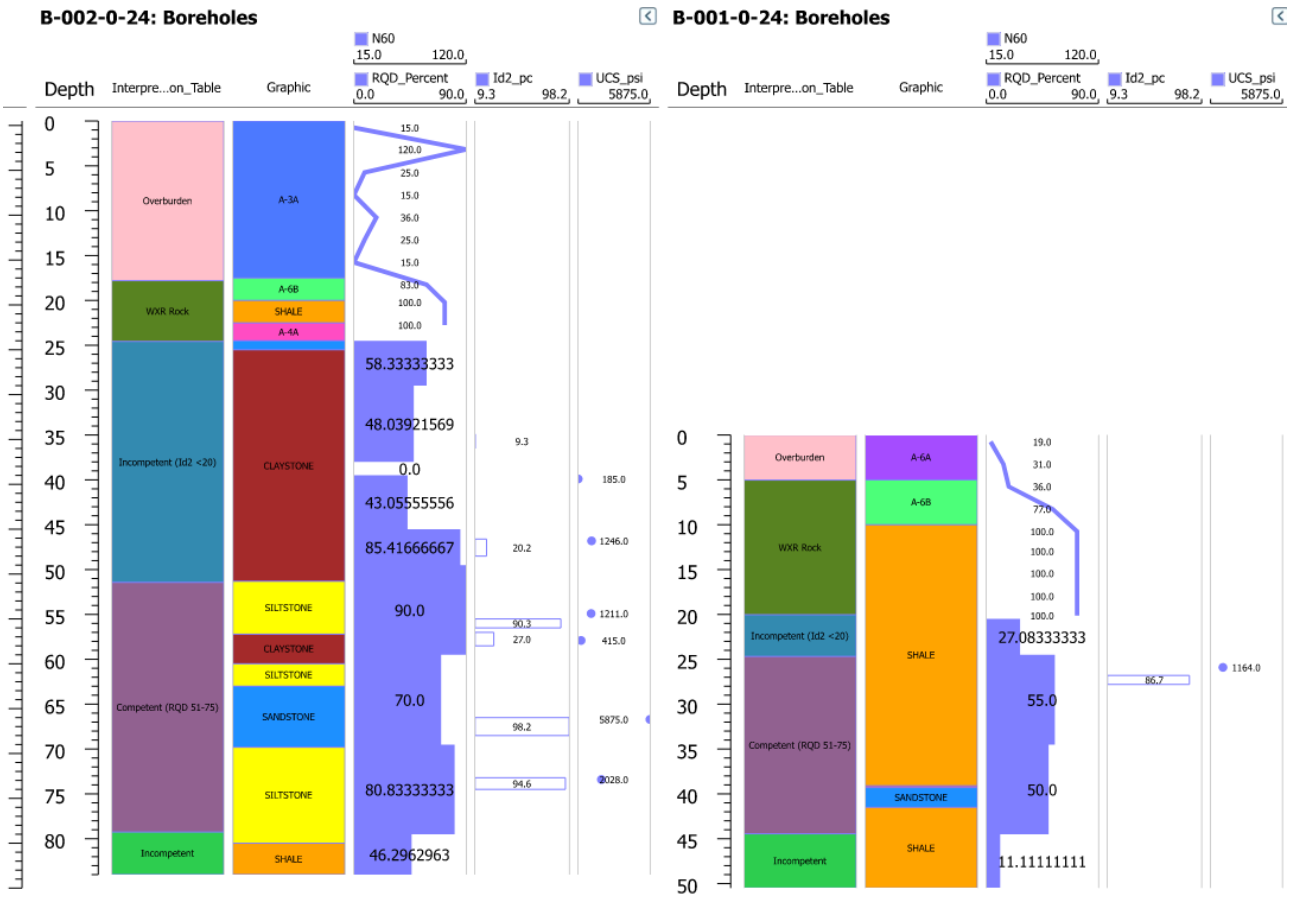


Figure 5: Interpreted profile showing interpreted rock slope design units alongside strata, N60, RQD, SDI and UCS values

Utilizing the 3D geologic modeling software Leapfrog Works 2024.1.1 (Leapfrog), HDR has produced a 3D interpretation of the lithologic units. A cross-sectional view of this model looking south is provided as Figure 6.

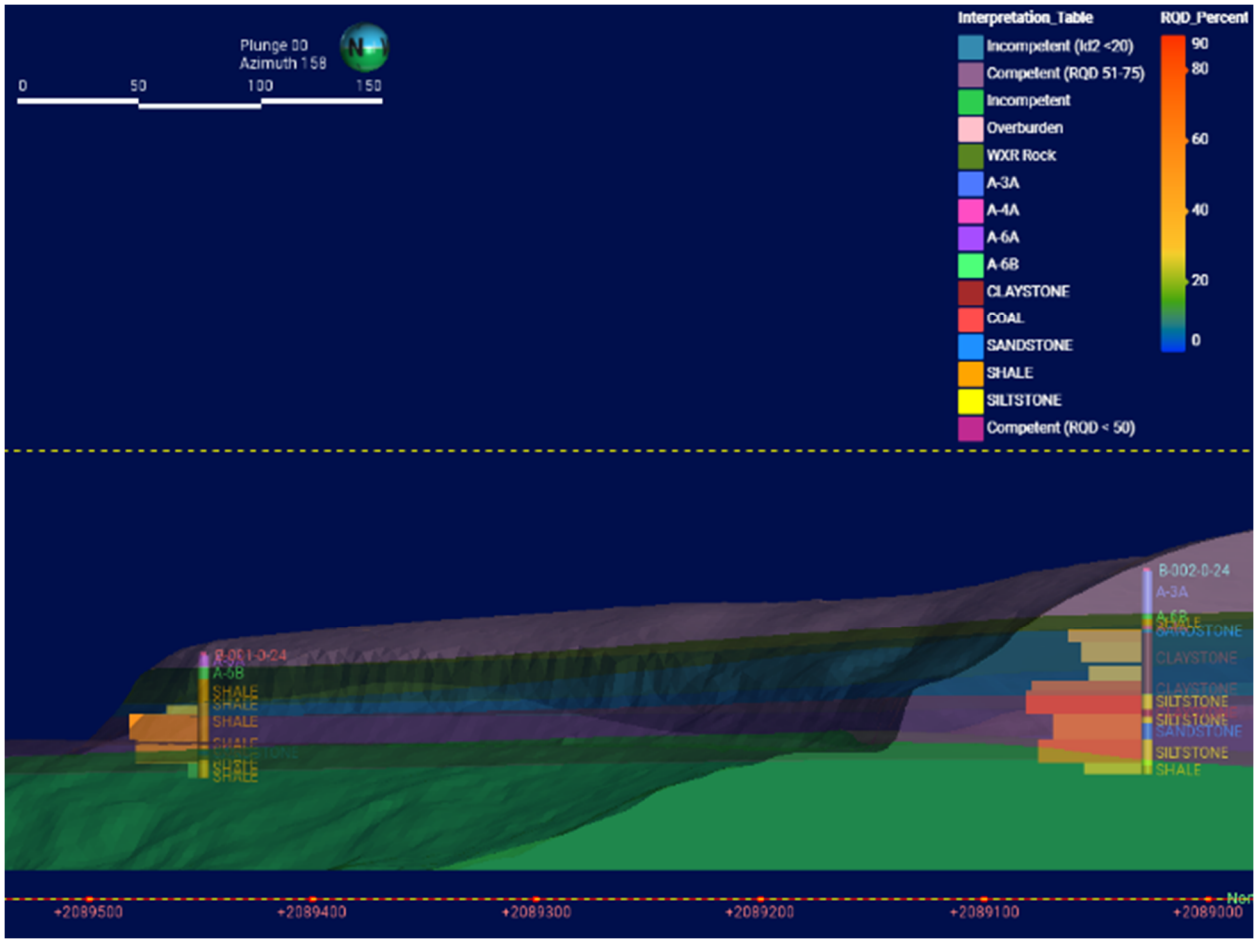


Figure 6: Cross sectional view of geologic model adjacent to B-002-0-24 with Strata and RQD plotted downhole

Kinematics

Kinematic stability of the slope was evaluated utilizing the RocScience RocSlope2 program, a comprehensive stability analysis software for evaluating rock slopes susceptible to wedge, planar, and toppling failures. The RocSlope2 software recently replaced the RocScience SWedge, RocPlane and RocTopple software. Joint and bedding data were input into the program based on the previously discussed field and electronic data collection methods. A critical block was evaluated near the recent rockfall area for the input geometry, resulting in the geometry as shown in Figure 7.

Type	Data
Origin point	0, 0, 0
Slope face	
Dip (°)	75
Dip direction (°)	13
Height (ft)	40
Overhanging	☐
Use default length	☐
Length (ft)	250
Upper face	
Dip (°)	20
Dip direction (°)	15
Use default bench width	☐
Bench width (ft)	100
Overall base inclination (for toppling)	
Dip (°)	28
☐ Tension crack exists	

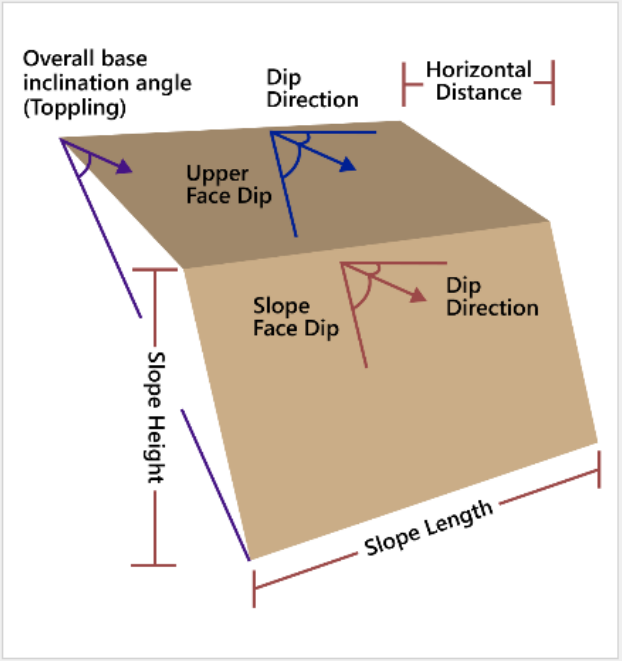


Figure 7: Critical block section geometry

The Mohr-Coulomb strength criterion was utilized to model the strength of the exposed rock face. A peak friction angle of 32° and cohesion of 1250 psf for a typical clay was conservatively utilized as the infilling material of the joint sets. These values were selected from *A Review of the Shear Strength of Filled Discontinuities in Rock* (Barton, 1974). Equation 1, below, was utilized to solve for the instantaneous shear strength of a discontinuity, assuming 5 feet of overburden contributing to the normal stress on the exposed rock face.

$$\tau = C' + \sigma \tan(\varphi') = 1{,}719psf \quad \text{(Eq. 1, Barton, 1974)}$$

RocSlope2 found no planar or toppling was likely to occur within the geometry of the rock slope. A potential wedge failure was identified which was similar in geometry to the wedge scar left behind by the recent rockfall. This wedge and the corresponding Factor of Safety (FS) of 3.411 is shown as Figure 8.

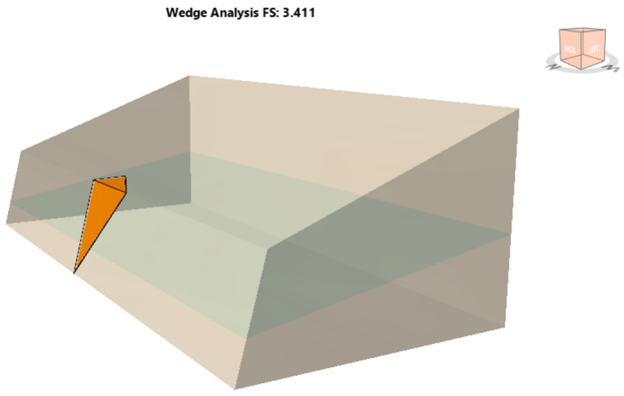


Figure 8: Critical wedge within described geometry

The FS of this wedge reduced to zero when water was introduced behind the wedge, which may have been the cause of the rockfall failure. A sensitivity analysis was performed within RocSlope2 varying the dip angle of the exposed rock face. The graph of the FS against Slope Face Dip is provided as Figure 9, but the most critical observation of this sensitivity analysis is that wedge failure becomes obsolete once the slope angle of the rock face is reduced below a 0.5H:1.0V angle, or approximately 63 degrees. Thusly, kinematic failure risk can be appropriately mitigated by cutting the competent rock face back at an angle less than 0.5H:1.0V. Detailed kinematic analyses reports are provided in Attachment 5 – Kinematic Analyses.

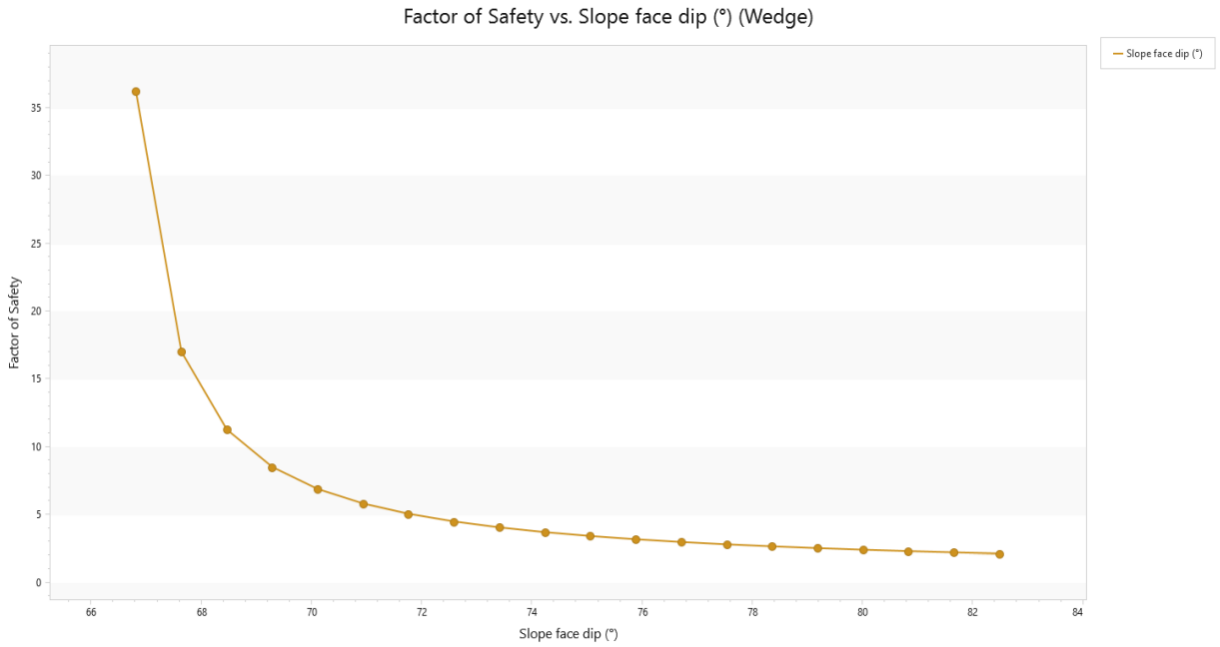


Figure 9: Sensitivity analysis of slope face dip against Factor of Safety

Slope Stability

The results of the subsurface interpretation indicate that there are 4 primary lithologic unit types featured in the subsurface: 1.) Overburden, 2.) Weathered Rock, 3.) Incompetent Rock with SDI Less Than 20%, and 4.) Competent Rock of RQD Between 51% and 75%. Guidelines for cut slope angle within the Rock Slope Design Guide/GDM are provided along with these lithologic units in Table 2.

Table 2: Anticipated lithologic units and slope angles recommended by the Rock Slope Design Guide

Lithologic Unit	Slope Angle
Overburden	2(H):1(V) or Flatter
Weathered Rock	2(H):1(V) or Flatter
Incompetent (SDI<20%)	2(H):1(V) or Flatter – Special Design, Contact the DGE
Competent (RQD of 51%-75%)	Between 1(H):1(V) and 0.5(H):1(V), based on global stability and design based on engineering judgement

Based on the previous kinematic analysis, an angle at 0.5H:1V would be ideal for the competent material as that would be shallow enough to preclude risk of a kinematic wedge failure. The geologic model previously created in Leapfrog was brought into GeoStudio 2024.2.1 Slope3D to evaluate critical stability areas. Determination of soil and rock parameters for the interpreted profile were based on the laboratory tested values, published correlations and our engineering experience and judgement in conjunction with Standard Penetration Test (SPT) data, recorded pocket penetrometer readings, and the encountered conditions and descriptions of the recovered rock core samples. A summary of the recommended soil and rock strength parameters and design profiles are provided within the attached Slope3D and SlopeW graphical outputs. The results of the 3D slope stability analysis indicate that the only area of concern is along the discrete area of the problematic exposed rock face, as shown in Figure 10. While outside of our area of interest, it is of note that the slopes south of the exposed rock face pass a cursory evaluation of global stability. These slopes also visually appear to be performing adequately.

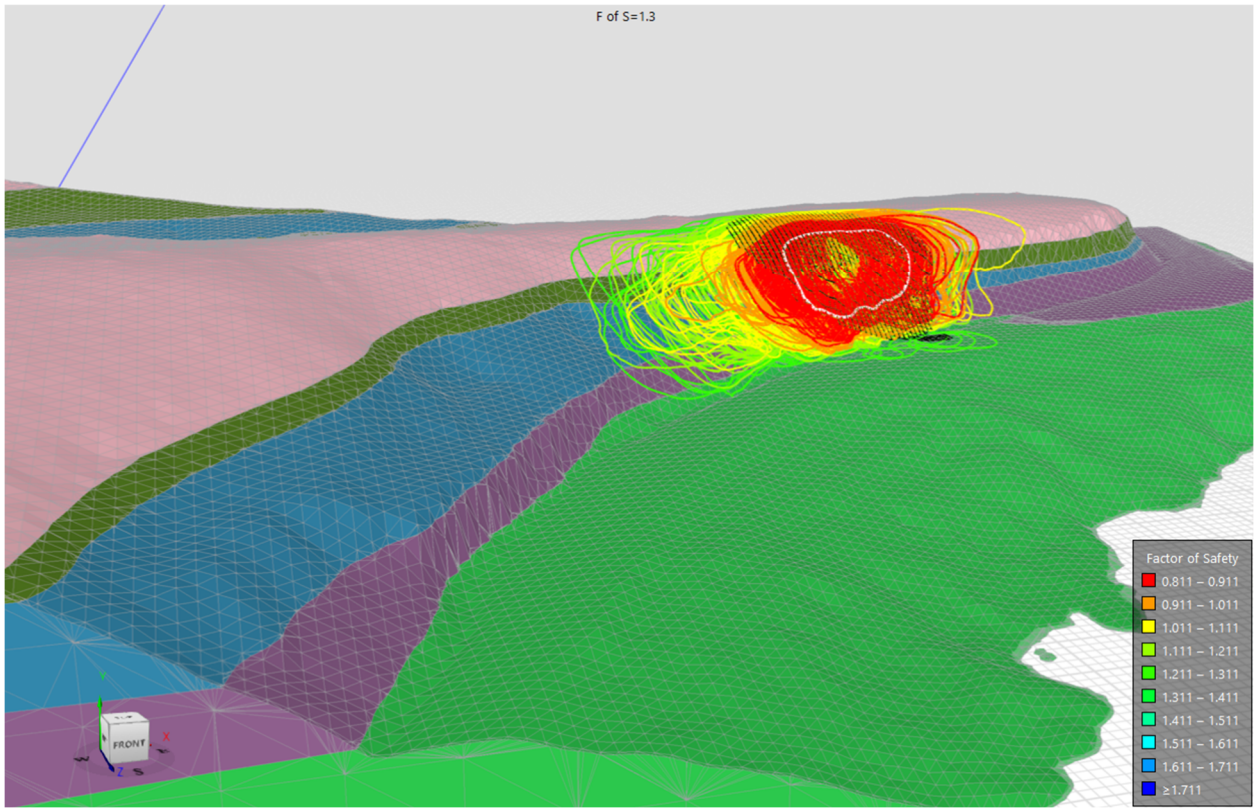


Figure 10: View of failure circles along SR 13, looking West

To further evaluate the proposed cut slope angles, a critical section at the exposed rock face was selected for consideration. The location of this section and a view of it with the interpreted geologic model is provided as Figure 11. Preliminary cut angles of 2H:1V for the overburden, weathered rock, and incompetent rock were selected, as well as 0.5H:1V for the competent rock. Additionally, a 10-foot wide lithologic bench was modeled at the base and the top of the competent rock unit, and a 10-foot wide overburden bench were included to improve the longevity of the cut slope design life. The lithologic bench in particular at the base of the

competent unit is critical due to the poor SDI values, and should provide adequate protection against undercutting of the weaker lower layer in the future. A visual of the proposed geometry is provided in 2D on the critical section and in 3D as Figure 12.

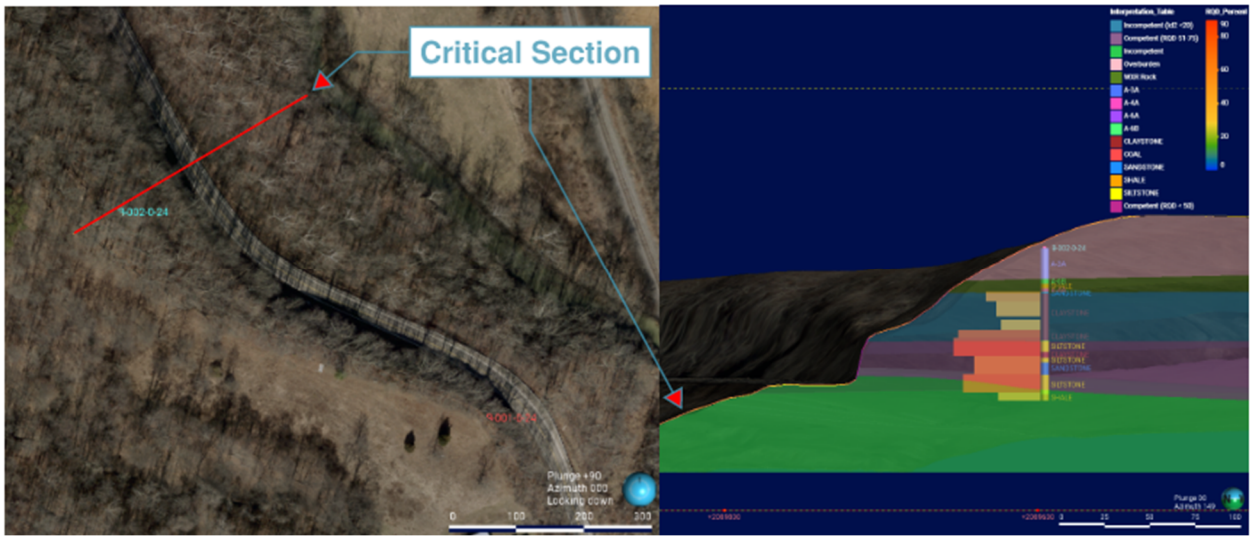


Figure 11: View of critical section location on geologic model

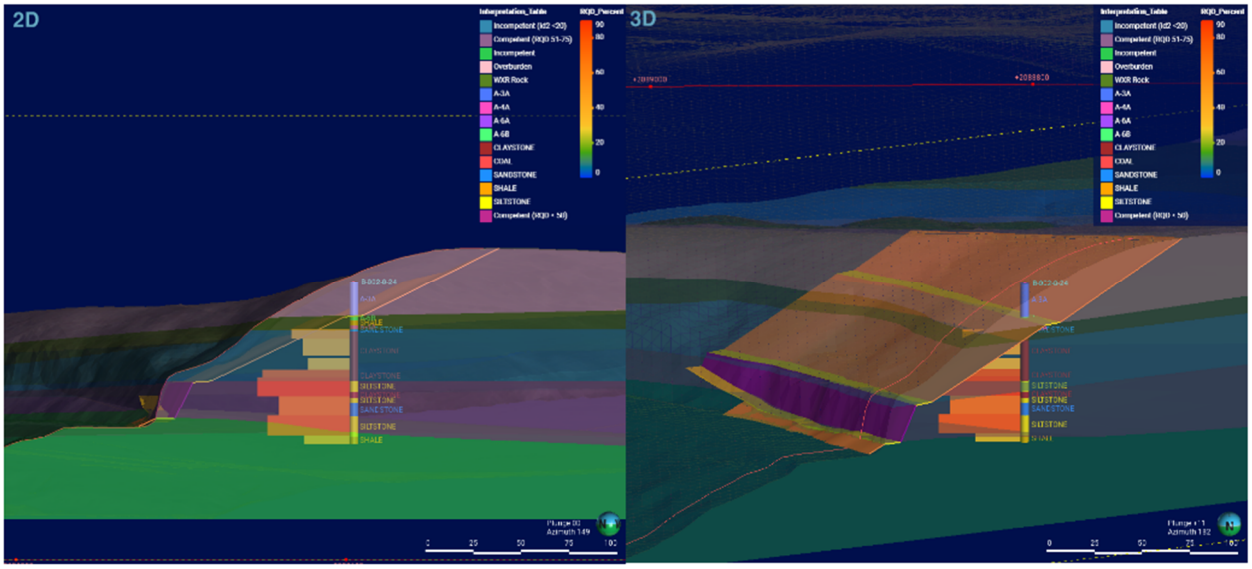


Figure 12: 2D and 3D view of geologic model at critical section with proposed geometry

Based on the 2D and 3D slope stability evaluations, the proposed cut slope is well above the required FS of 1.3. Detailed slope stability analysis reports are provided as Attachment 6.

Rockfall Analysis

Rockfall analyses were performed utilizing RocScience RocFall2, a 2D statistical analysis program developed to assess rockfall hazards for design of barriers and rock cut slopes. The proposed geometry was selected based on the previously discussed geologic model and utilizing typical ditch configurations according to the ODOT Rock Slope Design Manual and

GDM. RocFall2 is capable of modeling the rock slope as lump mass, which is a comparable methodology to the Colorado Rockfall Simulation Program (CRSP). One notable distinction from CRSP with regard to rockfall parameters is that RocFall2 evaluates parameters on a normal distribution, effectively adding error potential to the high and low end of each parameter. Slope parameters were split into three distinct classes: Competent Rock Outcrop, Slightly Vegetated Soil, and Asphalt. A table of the parameters utilized for each of these three classes is provided as Table 3. Parameters were based on those suggested by RocFall2 for competent sandstone (Competent Rock Outcrop), slightly vegetated soil slopes (Incompetent rock, weathered rock, and overburden) and Asphalt.

Table 3: RocFall2 material parameters for evaluation of proposed cut slope design

Material Class	Normal Restitution	Tangential Restitution	Friction Angle (°)
Competent Rock Outcrop	Mean: 0.38 Std Dev: 0.04	Mean: 0.82 Std Dev: 0.04	25
Slightly Vegetated Soil	Mean: 0.30 Std Dev: 0.04	Mean: 0.81 Std Dev: 0.04	12.79
Asphalt	Mean: 0.40 Std Dev: 0.04	Mean: 0.9 Std Dev: 0.03	6.34

Rock geometry was conservatively set to spheres, and sphere radii of 1', 2', and 4' were set with densities of 150 pcf. The analyses indicate that the 95% catchment requirement is met with zero rocks entering the roadway. It is worth noting that the bench configuration and primarily 2H:1V geometry lend itself to rockfall not being a major concern. The detailed RocFall2 calculations are provided in Attachment 7.

Recommendations

- Cut the competent rock (sandstone/siltstone) at 0.5H:1V or flatter slope.
- Cut the incompetent rock (shale/claystone), weathered rock, and overburden soil at 2H:1V or flatter slope.
- Construct a 10-foot wide lithologic bench at the contact of the incompetent and competent rock to prevent future undercutting of the competent material. Place a second 10-foot wide lithologic bench at the contact between the competent bedrock and the overlying claystone to provide a drainage break in the slope given the overall height of the cut as well as an area for any potential sloughed material to accumulate.
- Include a 10-foot wide overburden bench to create an area where adjustments can be made during construction due to unexpected variations in the soil-rock interface elevation and provide a drainage break along the long 2H:1V slope.
- All cut slopes should be evaluated by the District Geotechnical Engineer to ensure competence and that the excavated conditions match those anticipated.
- The 2H:1V slopes should be hydroseeded and maintained until acceptable vegetation growth is achieved.

- A private residence is located within a 1,500’ radius of the proposed cut slope. If blasting is anticipated, conduct a pre-blast survey.

References

Barton, N. (1974). A Review of the Shear Strength of Filled Discontinuities in Rock. *Norwegion Geotechnical Institute*, Publication No. 105.

Debrosse, T. A. (1957). *REPORT OF INVESTIGATIONS NO. 34; COAL BEDS OF THE CONEMAUGH FORMATION IN OHIO.* COLUMBUS: STATE OF OHIO DEPARTMENT OF NATURAL RESOURCES DIVISION OF GEOLOGICAL SURVEY.

ODNR. (2024, December). *24k Bedrock Geologic Map, Ohio Division of Geologic Survey, Department of Natural Resources*. Retrieved from Ohio Geology Interactive Map: https://gis.ohiodnr.gov/website/dgs/geologyviewer/#

ODOT. (2016). *Rock Slope Design Guide.* Ohio Department of Transportation.

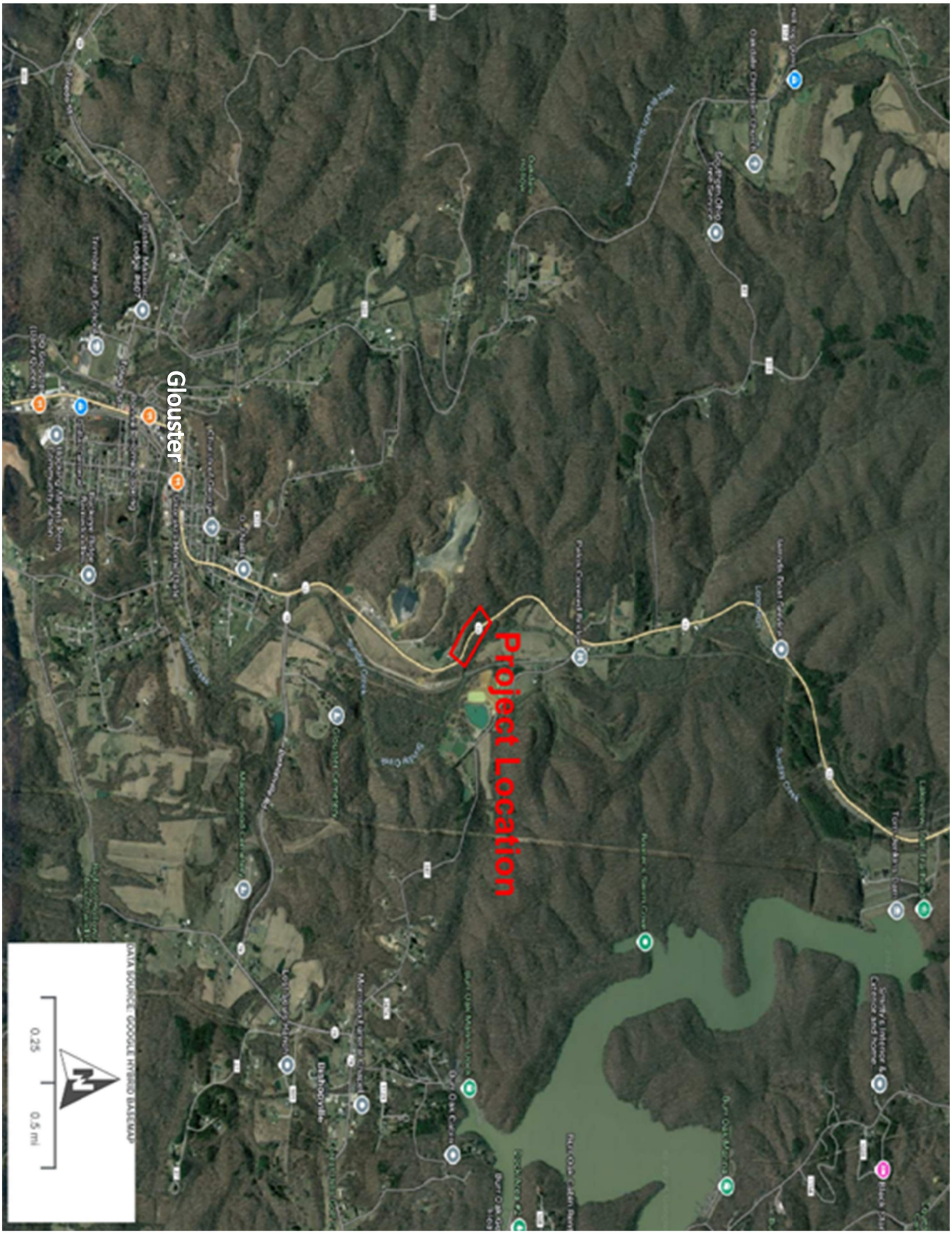
Shrake, D. L., Swinford, E. M., Schumacher, G. A., Larsen, G. E., & Sluchjer, E. R. (2011). *OPEN-FILE REPORT 98-1; DESCRIPTIONS OF GEOLOGIC MAP UNITS; A COMPENDIUM TO ACCOMPANY DIVISION OF GEOLOGICAL SURVEY OPEN-FILE BEDROCK GEOLOGY MAPS.* OHIO: OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SURVEY.

Woolpert. (2021). *OH Statewide Phase 2 20-20 B20; Project ID 197536 - Work Unit ID: 224682.* United States Geologic Survey.

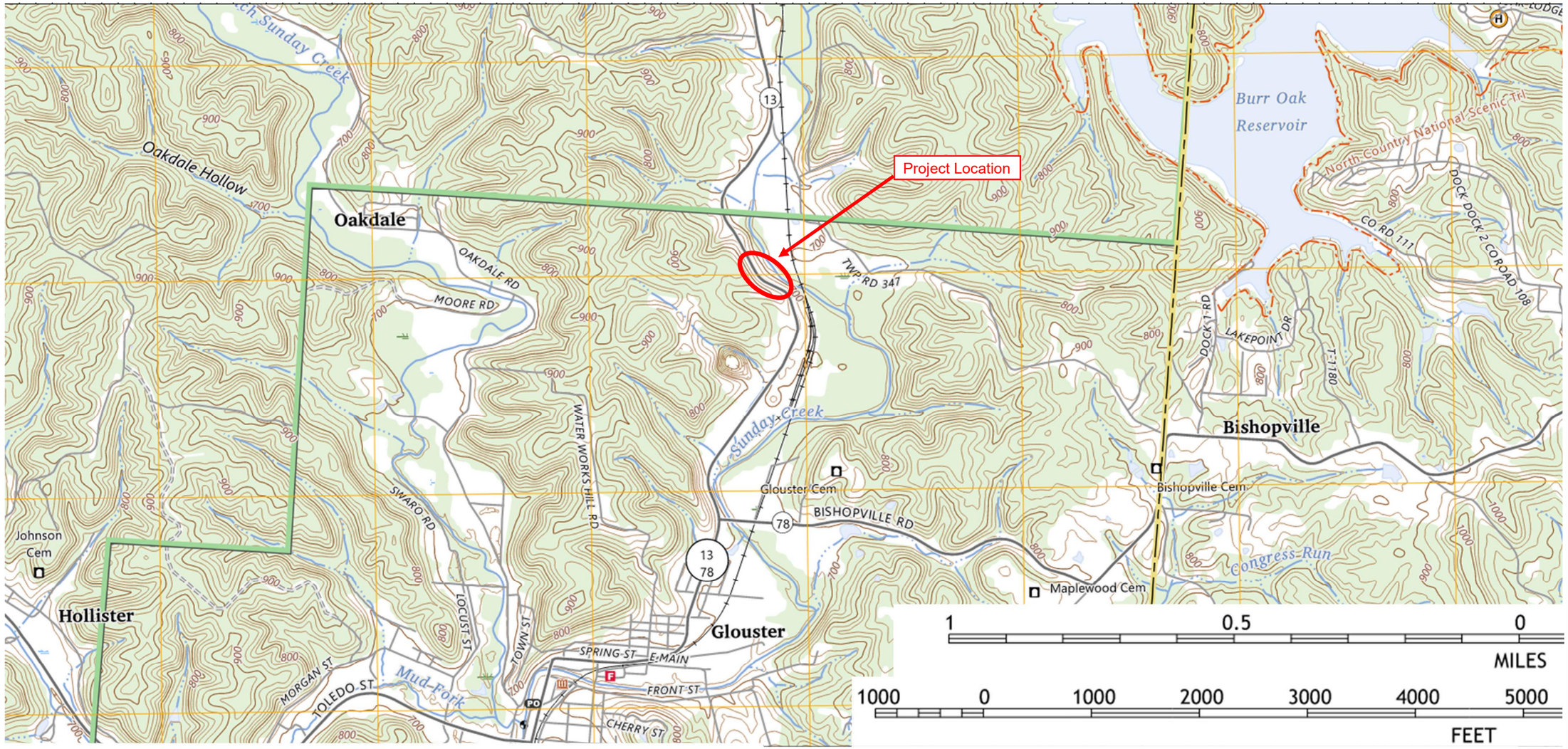
ATTACHMENTS

1

EXHIBITS



Project: ATH-13-13.71 **PID:** 119011	**Exhibit No. 1 : Site Vicinity Map**	**Calculated:** DCM **Checked:** DMV

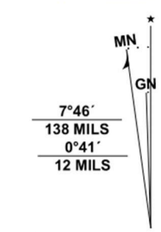


Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

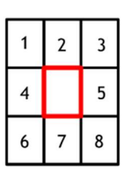
Imagery	NAIP, June 2017 - December 2017
Roads	U.S. Census Bureau, 2016
Roads within US Forest Service Lands	FSTopo Data with limited Forest Service updates, 2016
Names	GNIS, 1979 - 2023
Hydrography	National Hydrography Dataset, 2002 - 2019
Contours	National Elevation Dataset, 2010
Boundaries	Multiple sources; see metadata file 2017 - 2022
Public Land Survey System	BLM, 2017
Wetlands	FWS National Wetlands Inventory 2004 - 2007



UTM GRID AND 2023 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
MD
Grid Zone Designation
17S

QUADRANGLE LOCATION



1 New Lexington
2 Deavertown
3 Rokeby Lock
4 New Straitsville
5 Ringgold
6 Nelsonville
7 Jacksonville
8 Amesville

ADJOINING QUADRANGLES

ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD
Interstate Route	US Route
State Route	
FS Primary Route	FS Passenger Route
FS High Clearance Route	

Check with local Forest Service unit
for current travel conditions and restrictions.

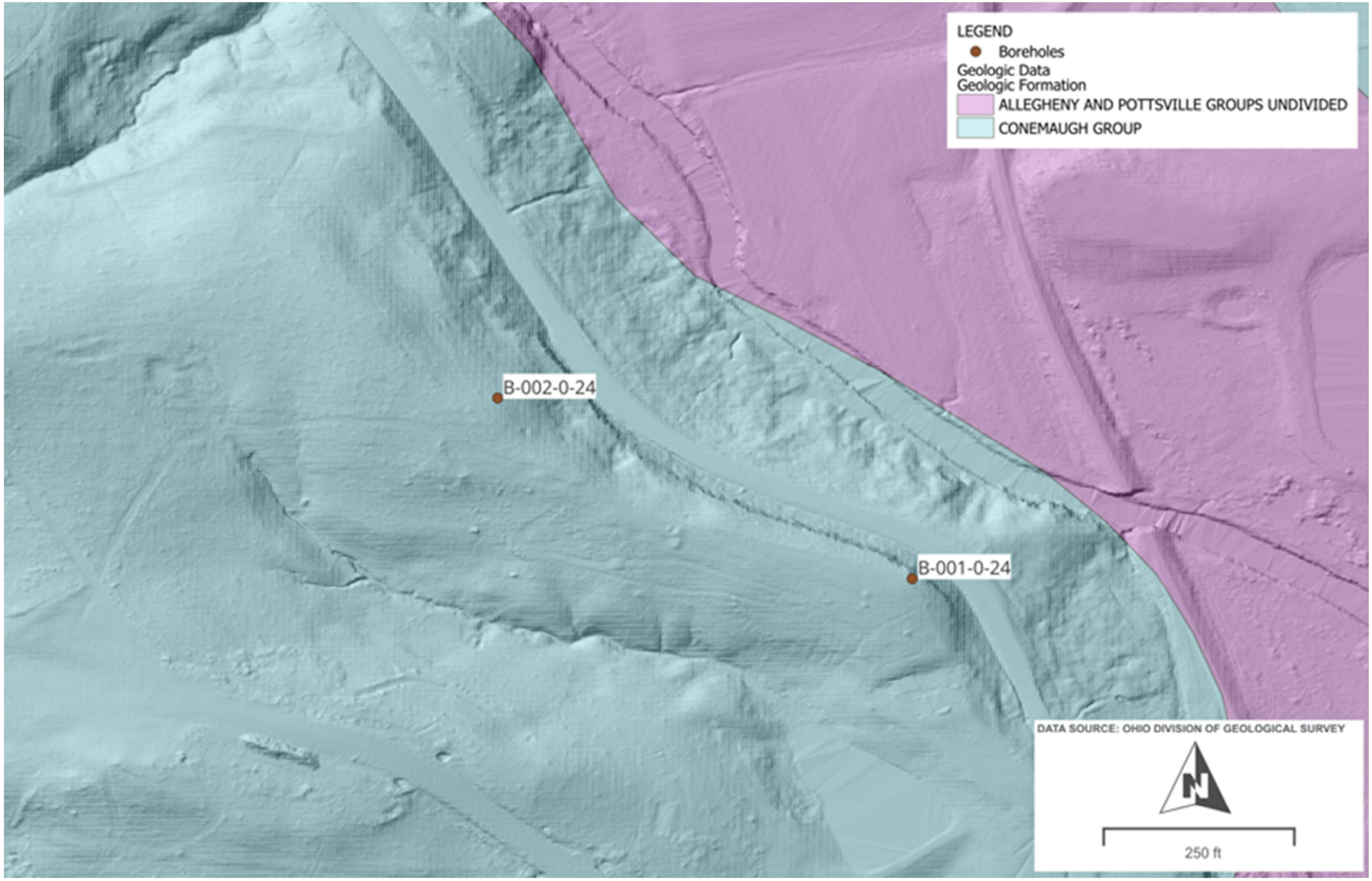
CORNING, OH

2023

Calculated: DCM
Checked: DMV

Exhibit No. 2 : Topographic Map

Project: ATH-13-13.71
PID: 119011



REFERENCE: ODNR. (2024, December). *24k Bedrock Geologic Map, Ohio Division of Geologic Survey, Department of Natural Resources*. Retrieved from Ohio Geology Interactive Map: https://gis.ohiodnr.gov/website/dgs/geologyviewer/#

Calculated: DCM
Checked: DMV

Exhibit No. 3 : Geologic Map

Project: ATH-13-13.71
PID: 119011

Exhibit No. 4 : Boring Location Map

Project: ATH-13-13.71
PID: 119011

Calculated: DCM
Checked: DMV

2

SITE PHOTOS

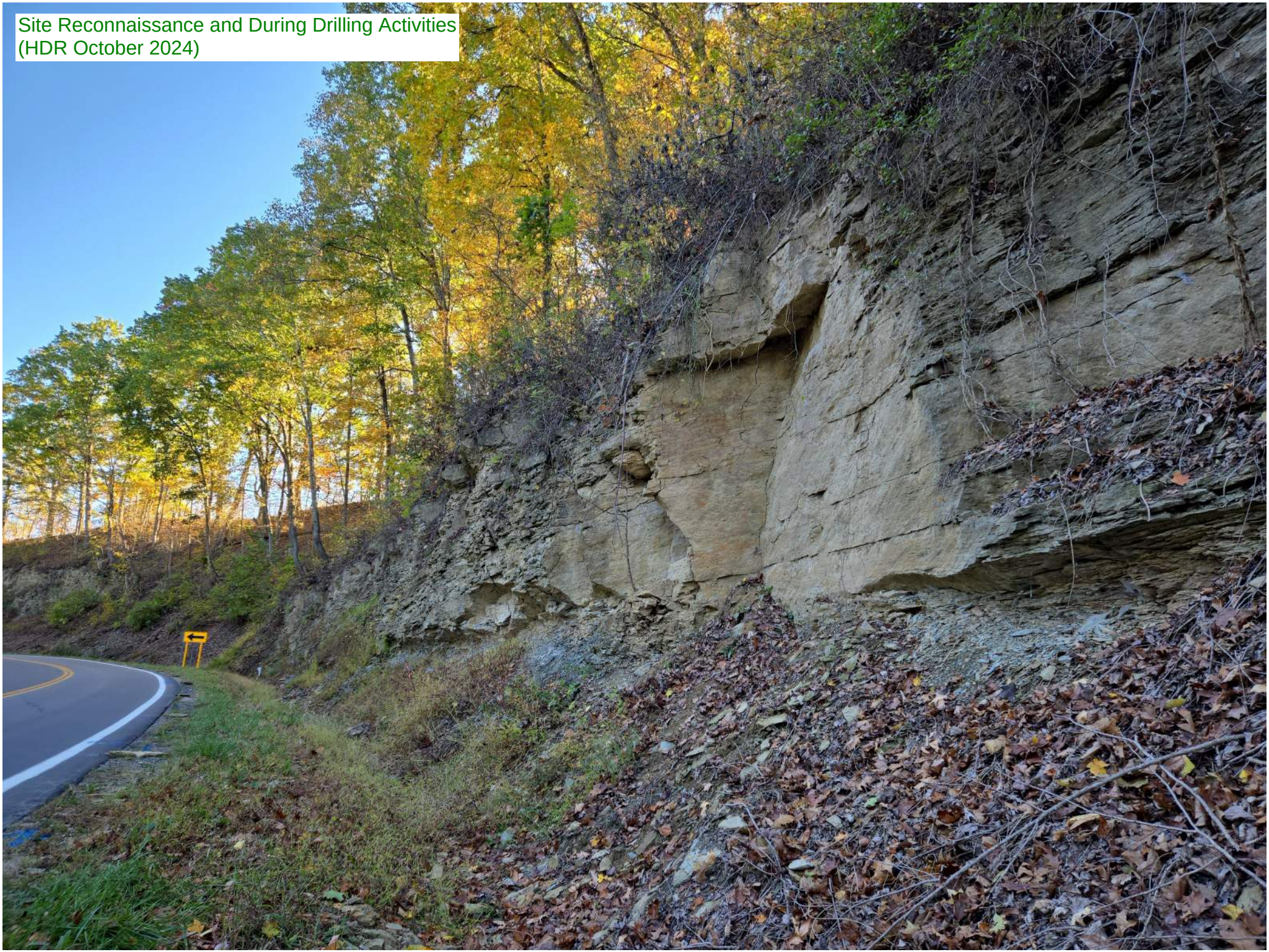
Rockfall photos from ODOT
(September 2024)

Rockfall photos from ODOT
(September 2024)

Rockfall photos from ODOT
(September 2024)

Rockfall photos from ODOT
(September 2024)

Site Reconnaissance and During Drilling Activities
(HDR October 2024)


Site Reconnaissance and During Drilling Activities
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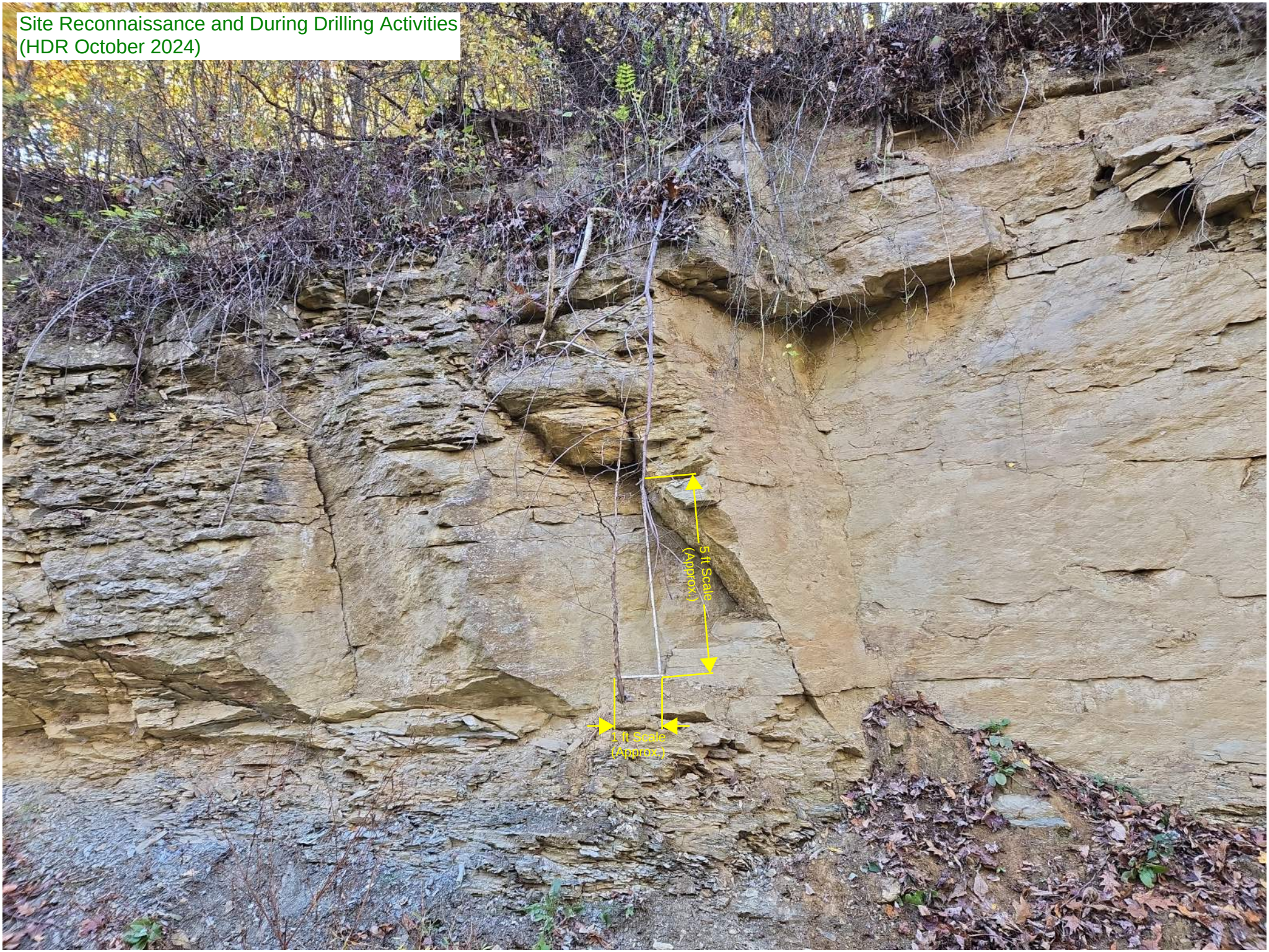
Site Reconnaissance and During Drilling Activities
(HDR October 2024)



Site Reconnaissance and During Drilling Activities
(HDR October 2024)

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(HDR October 2024)


Site Reconnaissance and During Drilling Activities
(HDR October 2024)

3

BORING LOGS AND ROCK CORE PHOTOS

PROJECT: ATH-13-13.70	DRILLING FIRM / OPERATOR: CENTRAL STAR / TS	DRILL RIG: DIEDRICH D-50 (SN 481)	STATION / OFFSET: 719+70, 69' LT.
TYPE: ROCKFALL	SAMPLING FIRM / LOGGER: HDR / DCM	HAMMER: AUTOMATIC HAMMER	ALIGNMENT: SR 13
PID: 119011 SFN:	DRILLING METHOD: 2.25 HSA / NQ2	CALIBRATION DATE: 7/1/24	ELEVATION: 792.1 (MSL) EOB: 50.5 ft.
START: 10/15/24 END: 10/15/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80.9	LAT / LONG: 39.518811, -82.071537

EXPLORATION ID B-001-0-24

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
VERY STIFF, LIGHT BROWN, **SILT AND CLAY**, "AND" SAND, LITTLE GRAVEL, DAMP	792.1	1	3 6 8	19	67	SS-1	-	-	-	-	-	-	-	-	-	3	A-6a (V)	
		2																
		3	10 11 12	31	67	SS-2	-	11	7	32	28	22	33	22	11	8	A-6a (3)	
	787.1	4																
HARD, LIGHT BROWN, **SILTY CLAY**, LITTLE SAND, (RELIC ROCK STRUCTURE), DRY		5	9 13 14	36	100	SS-3	-	-	-	-	-	-	-	-	-	3	A-6b (V)	
		6																
		7																
		8	17 25 33	78	89	SS-4	-	0	8	10	50	32	38	22	16	9	A-6b (10)	
	782.1	9																
SHALE, BROWN TRACE GRAY, VERY WEAK, FRIABLE, ARENACEOUS.		TR 10	21 37 43	108	100	SS-5	-	-	-	-	-	-	-	-	-	-	Rock (V)	
		11																
		12																
		13	30 50/5"	-	100	SS-6	-	-	-	-	-	-	-	-	-	2	Rock (V)	
		14																
		15	47 50/4"	-	100	SS-7	-	-	-	-	-	-	-	-	-	-	Rock (V)	
		16																
		17																
		18	30 50/5"	-	100	8	-	-	-	-	-	-	-	-	-	2	Rock (V)	
		19																
	772.1	20																
SHALE, GRAY, VERY WEAK, FRIABLE, ARENACEOUS.	771.6		50/3"	-	100	SS-9	-	-	-	-	-	-	-	-	-	-	Rock (V)	
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED TO VERY THIN BEDDED, ARENACEOUS, JOINT AND BEDDING DISCONTINUITIES, FRACTURED TO MODERATELY FRACTURED, NARROW APERTURE, SLICKENSIDED TO SLIGHTLY ROUGH, LAMINATED, FAIR SURFACE CONDITIONS; RQD 48%, REC 100%.		21 22 23 24	27		100	NQ2-1											CORE	
@ 25.7' - 26.1' = 1164 psi		25 26 27 28 29	55		100	NQ2-2											CORE	
@ 26.8' - 27.8' : Id2 = 86.7%																		

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/18/24 11:23 - C:\PW\WORKING\EAST01\D4121033\20241016_ATH-13-13.71_BORING LOGS.GPJ

PID: 119011	SFN:	PROJECT: ATH-13-13.70	STATION / OFFSET: 719+70, 69' LT.	START: 10/15/24	END: 10/15/24	PG 2 OF 2	B-001-0-24

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
SHALE, GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED TO VERY THIN BEDDED, ARENACEOUS, JOINT AND BEDDING DISCONTINUITIES, FRACTURED TO MODERATELY FRACTURED, NARROW APERTURE, SLICKENSIDED TO SLIGHTLY ROUGH, LAMINATED, FAIR SURFACE CONDITIONS; RQD 48%, REC 100%. *(continued)*	762.1	31 32 33 34																
SHALE, DARK GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED TO VERY THIN BEDDED, ARGILLACEOUS, JOINT AND BEDDING DISCONTINUITIES, FRACTURED TO MODERATLY FRACTURED, TIGHT TO NARROW APERTURE, SLICKENSIDED, LAMINATED, FAIR TO POOR SURFACE CONDITIONS; RQD 20%, REC 100%.	757.8	35 36 37 38 39																
@ 39.1' - 39.2' : Coal	752.8		50		100	NQ2-3											CORE	
SANDSTONE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG, FINE GRAINED, THICK BEDDED, FOSSILIFEROUS, BEDDING DISCONTINUITIES, INTACT, TIGHT, SLIGHTLY ROUGH, INTACT TO BLOCKY, GOOD SURFACE CONDITIONS; RQD 91%, REC 100%.	750.6	40 41 42																
SHALE, DARK GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED TO VERY THIN BEDDED, ARGILLACEOUS, JOINT AND BEDDING DISCONTINUITIES, FRACTURED TO MODERATLY FRACTURED, TIGHT TO NARROW APERTURE, SLICKENSIDED, LAMINATED, FAIR TO POOR SURFACE CONDITIONS; RQD 71%, REC 100%.	747.8	43 44 45																
SHALE, DARK GRAY, MODERATELY WEATHERED, VERY WEAK, THINLY LAMINATED TO LAMINATED, ARGILLACEOUS, FRIABLE, JOINT AND BEDDING DISCONTINUITIES, NARROW TO OPEN APERTURE, SLICKENSIDED, LAMINATED TO DISINTEGRATED, POOR TO VERY POOR SURFACE CONDITIONS; RQD 0%, REC 100%.	742.6	46 47 48 49	11		100	NQ2-4											CORE	
SHALE, DARK GRAY, SLIGHTLY WEATHERED, WEAK, LAMINATED TO VERY THIN BEDDED, ARGILLACEOUS, JOINT AND BEDDING DISCONTINUITIES, FRACTURED TO MODERATLY FRACTURED, TIGHT TO NARROW APERTURE, SLICKENSIDED, LAMINATED, FAIR TO POOR SURFACE CONDITIONS; RQD 70%, REC 100%.	741.6 EOB	50																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED 30 LB. BENTONITE POWDER; 94 LB. CEMENT; 55 GAL. WATER

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/18/24 11:23 - C:\PWWORKING\EAST01\D41210333\20241016_ATH-13-13.71_BORING LOGS.GPJ

PROJECT: ATH-13-13.70	DRILLING FIRM / OPERATOR: CENTRAL STAR / TS	DRILL RIG: DIEDRICH D-50 (SN 481)	STATION / OFFSET: 725+72, 130' LT.	EXPLORATION ID B-002-0-24
TYPE: ROCKFALL	SAMPLING FIRM / LOGGER: HDR / DCM	HAMMER: AUTOMATIC HAMMER	ALIGNMENT: SR 13	
PID: 119011 SFN:	DRILLING METHOD: 2.25 HSA / NQ2	CALIBRATION DATE: 7/1/24	ELEVATION: 821.8 (MSL) EOB: 84.0 ft.	PAGE 1 OF 3
START: 10/16/24 END: 10/17/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 80.9	LAT / LONG: 39.519727, -82.073454	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
MEDIUM DENSE, LIGHT BROWN, **COARSE AND FINE SAND**, TRACE CLAY, TRACE STONE FRAGMENTS, DRY	821.8		3 4 7	15	100	SS-1	-	-	-	-	-	-	-	-	-	2	A-3a (V)	
			17 40 50/4"	-	100	SS-2	-	-	-	-	-	-	-	-	-	2	A-3a (V)	
			5 8 11	26	78	SS-3	-	3	28	44	15	10	NP	NP	NP	3	A-3a (0)	
			6 6 5	15	67	SS-4	-	-	-	-	-	-	-	-	-	2	A-3a (V)	
			8 15 12	36	89	SS-5A	-	-	-	-	-	-	-	-	-	2	A-3a (V)	
@ 11.0' - 11.5' : Completely Weathered Sandstone Layer						SS-5B	-	-	-	-	-	-	-	-	-	-	Rock (V)	
			11 10 9	26	89	SS-6	-	0	2	66	20	12	NP	NP	NP	5	A-3a (0)	
			4 4 7	15	67	SS-7A	-	-	-	-	-	-	-	-	-	3	A-3a (V)	
@ 16.0' - 16.5' : Black to Dark Brown Carbonaceous Layer	804.3					SS-7B	-	-	-	-	-	-	-	-	-	5	A-3a (V)	
HARD, LIGHT BROWN TRACE BROWN AND ORANGE BROWN, **SILTY CLAY**, LITTLE SAND, (RELIC ROCK STRUCTURE), DAMP			15 25 37	84	78	SS-8	-	-	-	-	-	-	-	-	-	3	A-6b (V)	
@ 17.5' - 18.0' : Grayish-Brown and Orange-brown	801.8																	
SHALE, BROWN, HIGHLY WEATHERED, VERY WEAK.	799.3		50/5"	-	100	SS-9	-	-	-	-	-	-	-	-	-	2	Rock (V)	
VERY DENSE, BROWN, **SANDY SILT**, LITTLE CLAY, (RELIC ROCK STRUCTURE), DAMP	797.3		50	-	100	SS-10	-	0	6	47	35	12	NP	NP	NP	13	A-4a (2)	
SANDSTONE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG, FINE TO MEDIUM GRAINED, THIN BEDDED, JOINT AND BEDDING DISCONTINUITIES, FRACTURED, TIGHT APERTURE, SLIGHTLY ROUGH, BLOCKY, GOOD SURFACE CONDITIONS; RQD 70%, REC 100%.	796.3	TR	58		100	NQ2-1											CORE	

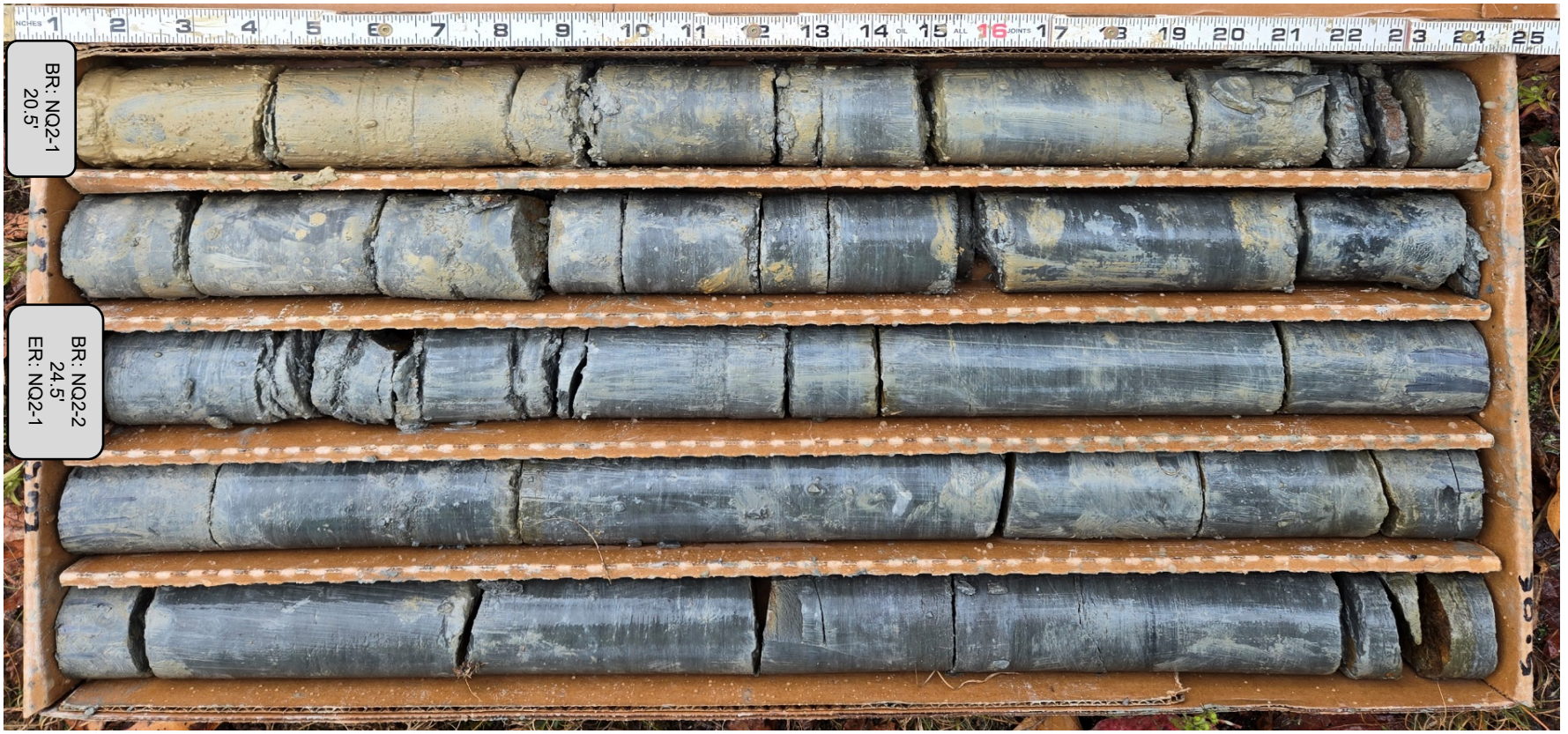
STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/18/24 11:23 - C:\PWWORKING\EAST01\D4121033\20241016_ATH-13-13.71_BORING LOGS.GPJ

PID: 119011	SFN:	PROJECT: ATH-13-13.70	STATION / OFFSET: 725+72, 130' LT.	START: 10/16/24	END: 10/17/24	PG 2 OF 3	B-002-0-24

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	ABAN-DONED
@ 29.5' - 29.8' : Vertical Fracture **CLAYSTONE**, GRAY, SLIGHTLY TO MODERATELY WEATHERED, WEAK, LAMINATED TO THIN BEDDED, JOINT AND BEDDING DISCONTINUITIES, MODERATELY FRACTURED TO FRACTURED, SLICKENSIDED, LAMINATED TO VERY BLOCK, FAIR SURFACE CONDITIONS, OCCASSIONAL LIMESTONE NODULES AND INCLUSIONS; RQD 47%, REC 100%. *(continued)* @ 31.5' - 33.1' : Highly Fractured @ 34.9' - 36.5' : Id2 = 9.3% @ 36.6' - 39.5' : Highly Fractured @ 38.0' : Core Barrel Plugged During Coring @ 38.0' - 38.5' : Vertical Fracture @ 39.7' - 40.1': Qu =185 psi @ 44.5' - 45.5' : Highly Fractured @ 45.5' : Core Barrel Plugged During Coring	791.8	31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46	48		100	NQ2-2											CORE	
			0		100	NQ2-3												CORE	
			43		100	NQ2-4												CORE	
CLAYSTONE, GRAY, SLIGHTLY WEATHERED, WEAK TO SLIGHTLY STRONG, FINE GRAINED, MEDIUM TO THICK BEDDED, ARENACEOUS, JOINT AND BEDDING DISCONTINUITIES, INTACT TO SLIGHTLY FRCTURED, TIGHT TO NARROW APERTURE, SLIGHTLY ROUGH, BLOCKY, FAIR SURFACE CONDITIONS; RQD 88%, REC 100%. @ 46.6' - 47.0' : Qu = 1246 psi @ 46.6' - 48.5' : Id2 = 20.2%	775.3	47 48 49 50	85		100	NQ2-5											CORE	
SILTSTONE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG, FINE GRAINED, THIN TO MEDIUM BEDDED, ARGILLACEOUS, JOINT AND BEDDING DISCONTINUITIES, INTACT, TIGHT TO NARROW APERTURE, SLIGHTLY ROUGH, BLOCKY, GOOD TO FAIR SURFACE CONDITIONS WITH CLAYSTONE INTERBEDS; RQD 100%, REC 100%. (Very gradual transition to siltstone) @ 54.7' - 55.1' : Qu = 1211 psi @ 55.5' - 56.5' : Id2 = 90.3% @ 57.0' - 58.5' : Id2 = 27.0%	770.5	51 52 53 54 55 56 57	90		100	NQ2-6											CORE	
CLAYSTONE, GRAY, MODERATELY WEATHERED, WEAK, LAMINATED, ARENACEOUS, JOINT AND BEDDING DISCONTINUITIES, MODERATELY FRACTURED, NARROW TO OPEN APERTURE, SLICKENSIDED, LAMINATED, FAIR TO POOR SURFACE CONDITIONS; RQD 36%, REC 100%. @ 57.5' : 45 Degree Fracture, Slickensided @ 57.7' - 58.1' : Qu = 415 psi	764.6 761.3	58 59 60 61																

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 12/18/24 11:23 - C:\PWWORKING\EAST01\D41210333\20241016_ATH-13-13.71_BORING LOGS.GPJ

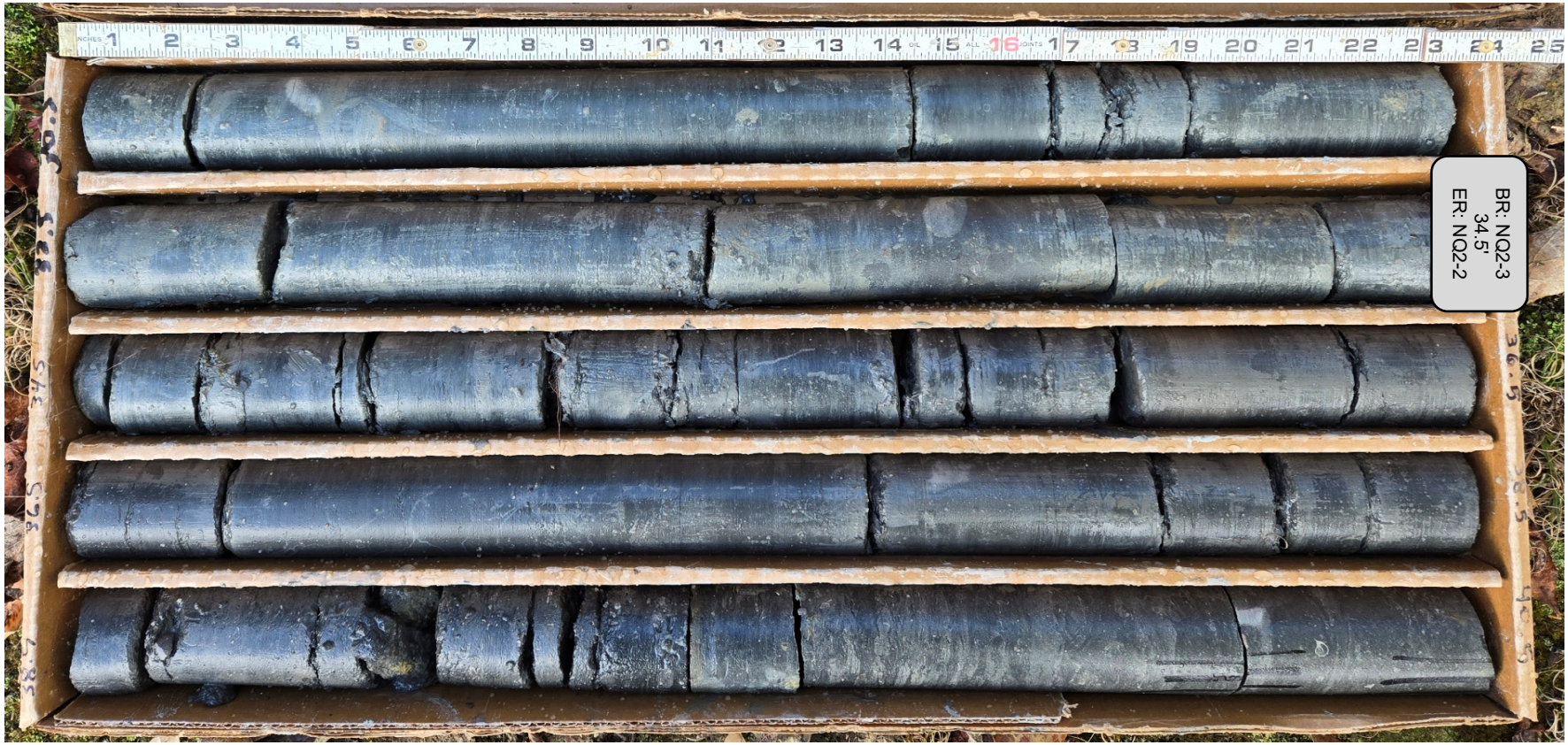
B-001-0-20



Run #	Depth (ft)		Recovery		RQD	
NQ2-1	20.5	24.5	48 in. / 48 in.	100%	13 in. / 48 in.	27%
NQ2-2	24.5	34.5	120 in. / 120 in.	100%	66 in. / 120 in.	55%

ATH-13-13.71 PID 119011

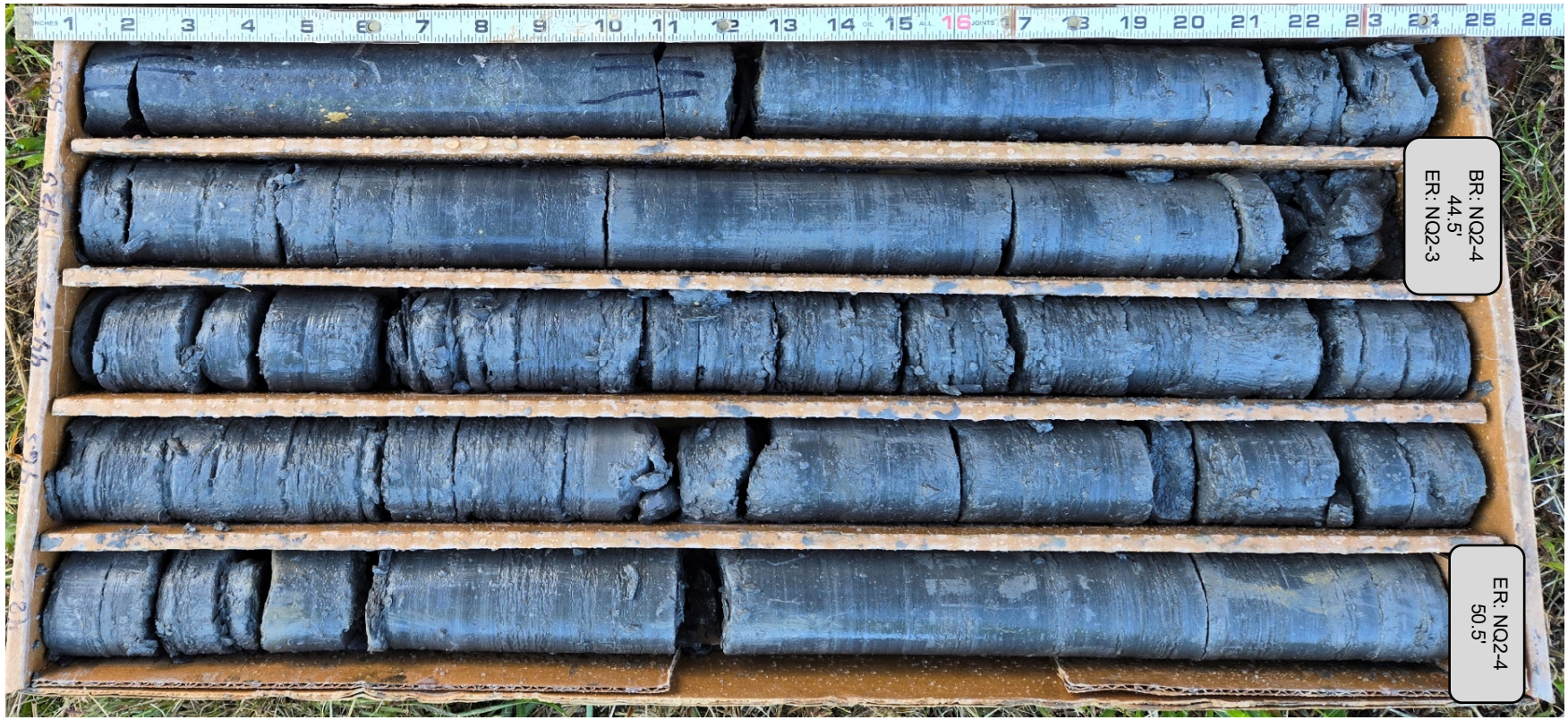
B-001-0-20



Run #	Depth (ft)		Recovery		RQD	
NQ2-2	24.5	34.5	120 in. / 120 in.	100%	66 in. / 120 in.	55%
NQ2-3	34.5	44.5	120 in. / 120 in.	100%	60 in. / 120 in.	50%

ATH-13-13.71 PID 119011

B-001-0-20



Run #	Depth (ft)		Recovery		RQD	
NQ2-3	34.5	44.5	120 in. / 120 in.	100%	60 in. / 120 in.	50%
NQ2-4	44.5	50.5	72 in. / 72 in.	100%	8 in. / 72 in.	11%

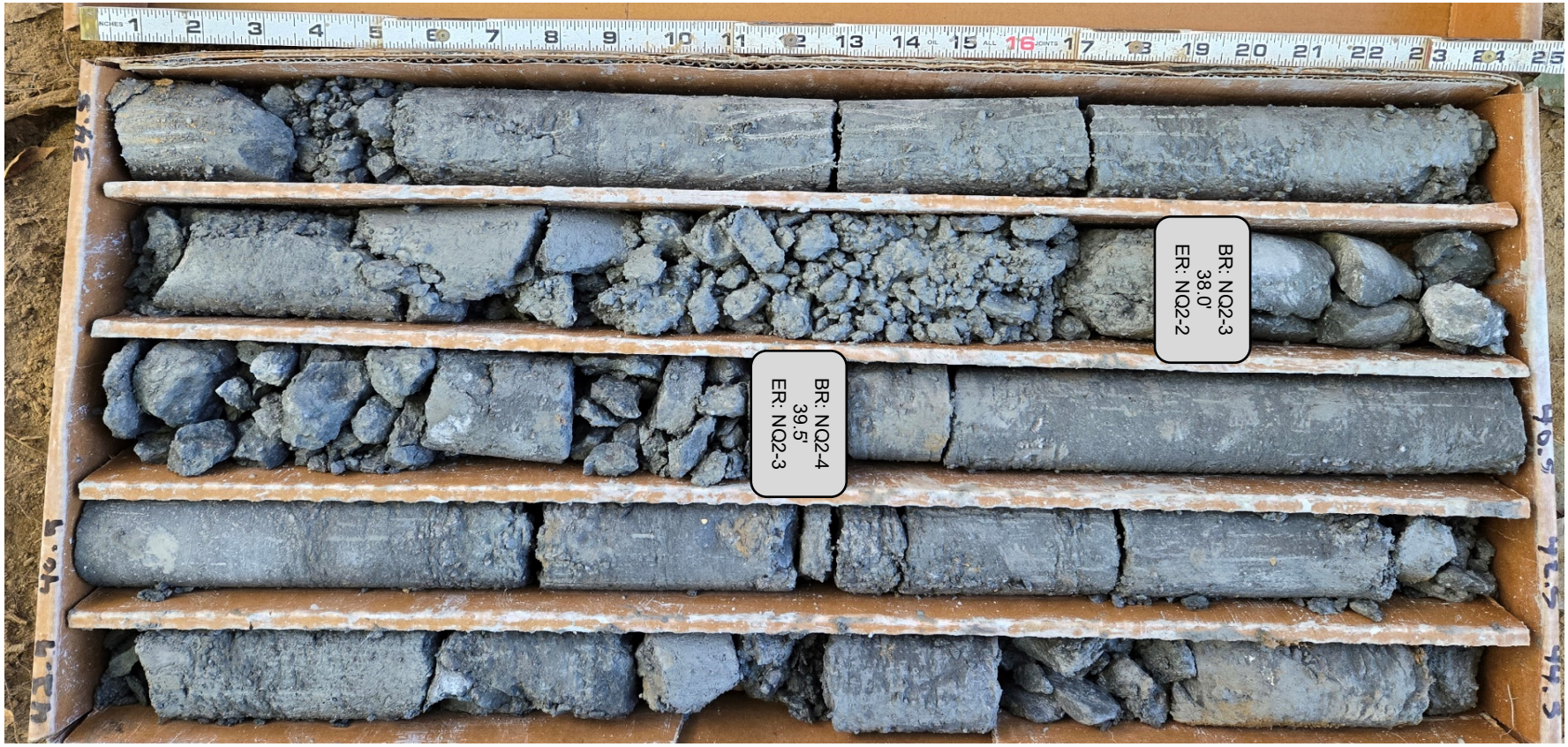
ATH-13-13.71 PID 119011

B-002-0-20

Run #	Depth (ft)		Recovery		RQD	
NQ2-1	24.5	29.5	60 in. / 60 in.	100%	35 in. / 60 in.	58%
NQ2-2	29.5	38	102 in. / 102 in.	100%	49 in. / 102 in.	48%

ATH-13-13.71 PID 119011

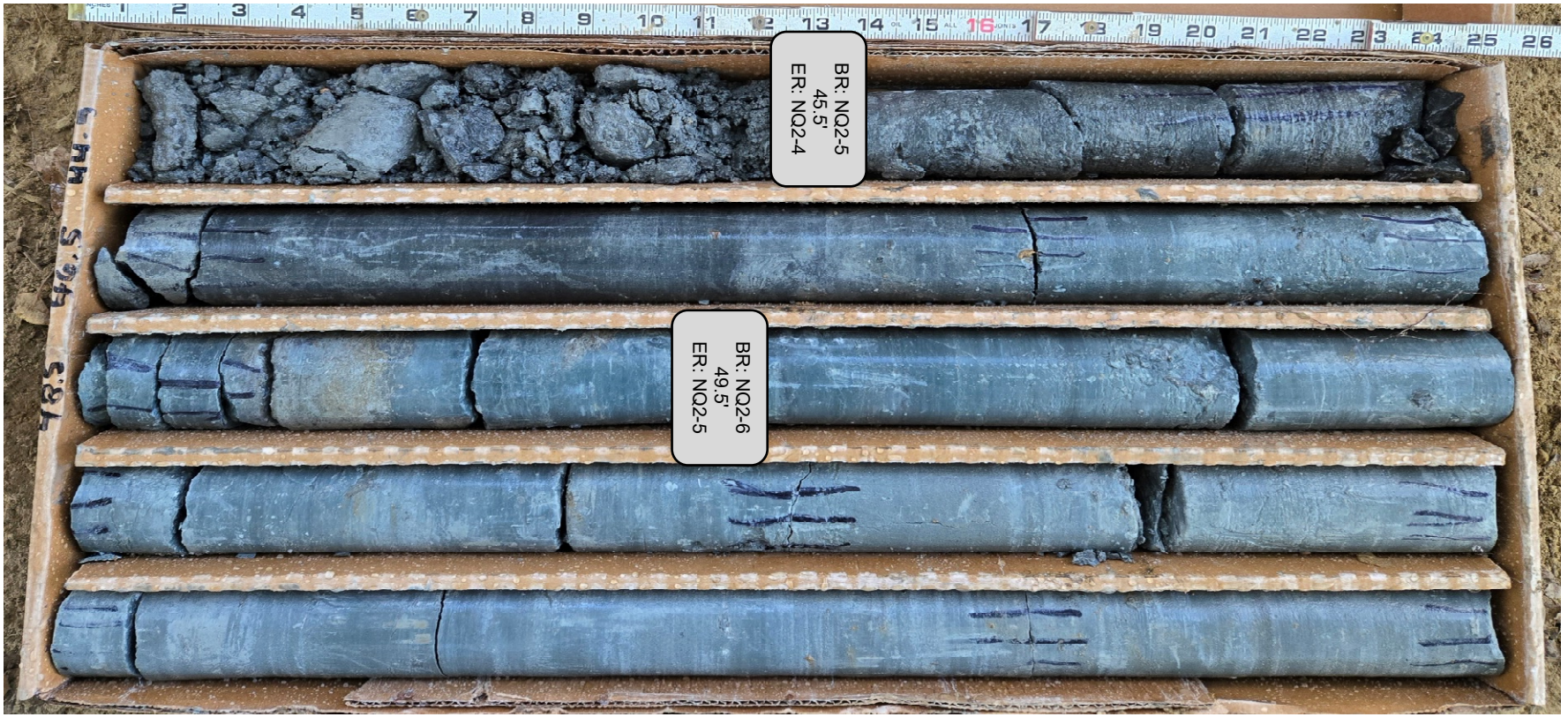
B-002-0-20



Run #	Depth (ft)		Recovery		RQD	
NQ2-2	29.5	38	102 in. / 102 in.	100%	49 in. / 102 in.	48%
NQ2-3	38	39.5	18 in. / 18 in.	100%	0 in. / 18 in.	0%
NQ2-4	39.5	45.5	72 in. / 72 in.	100%	31 in. / 72 in.	43%

ATH-13-13.71 PID 119011

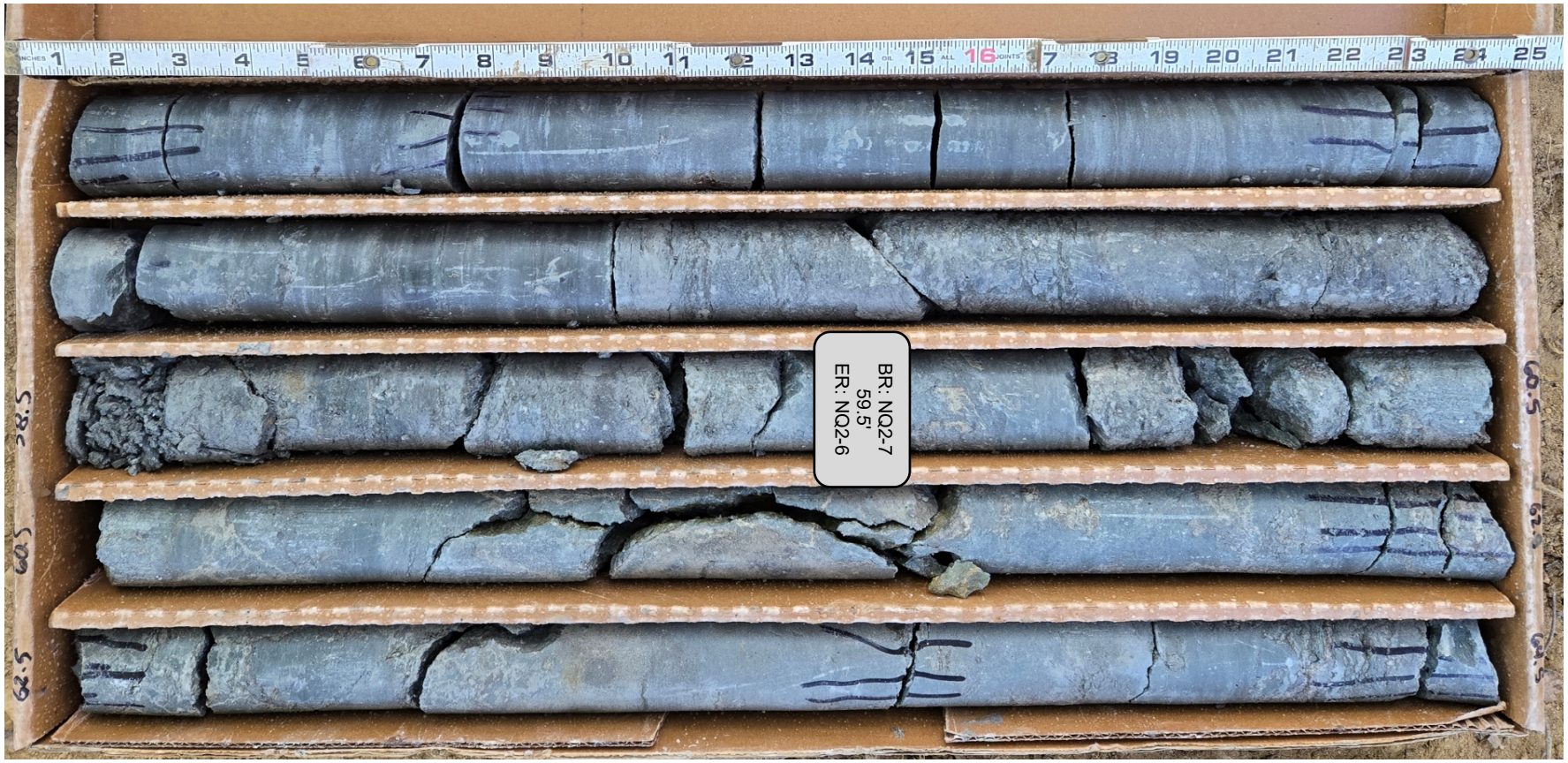
B-002-0-20



Run #	Depth (ft)		Recovery		RQD	
NQ2-4	39.5	45.5	72 in. / 72 in.	100%	31 in. / 72 in.	43%
NQ2-5	45.5	49.5	48 in. / 48 in.	100%	41 in. / 48 in.	85%
NQ2-6	49.5	59.5	120 in. / 120 in.	100%	108 in. / 120 in.	90%

ATH-13-13.71 PID 119011

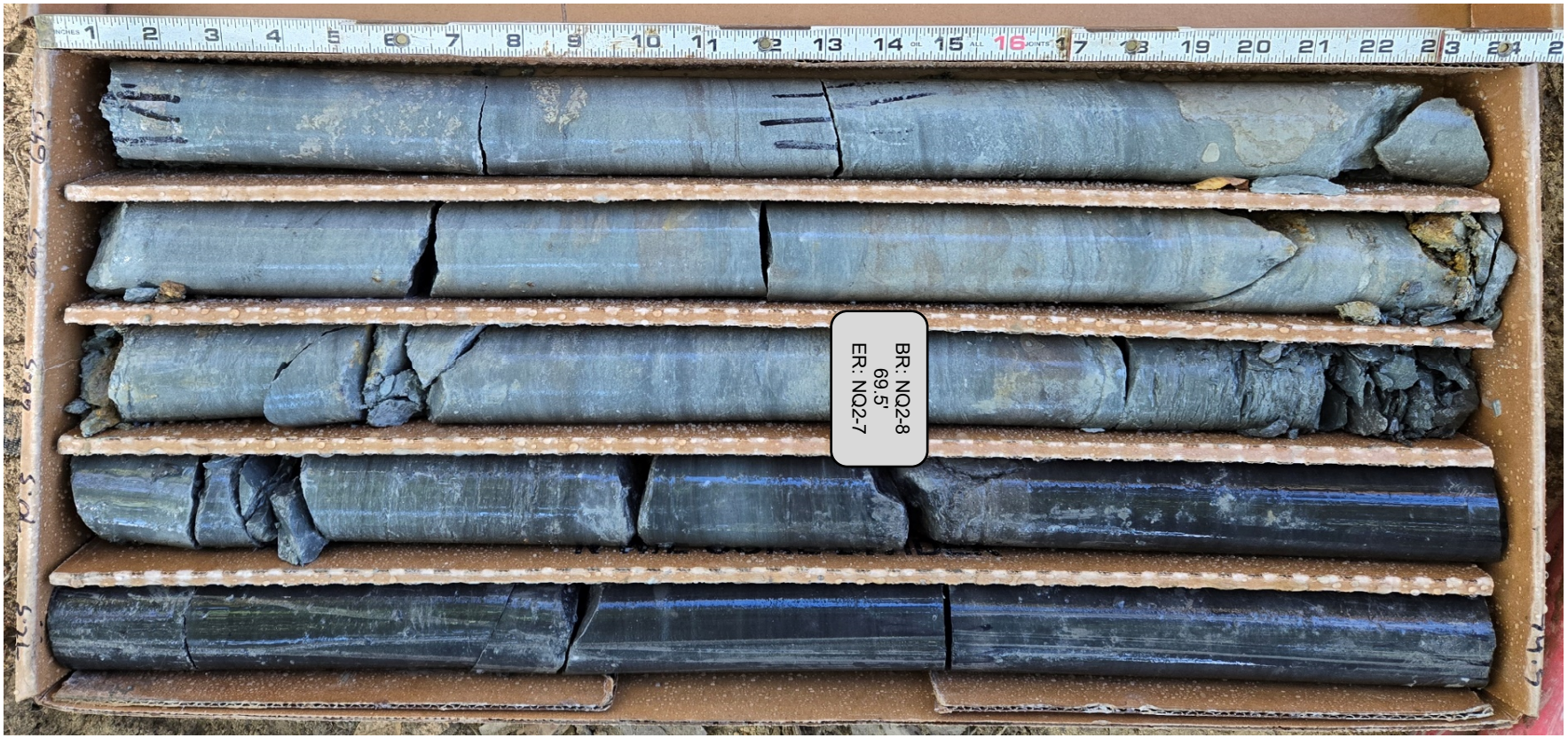
B-002-0-20



Run #	Depth (ft)		Recovery		RQD	
NQ2-6	49.5	59.5	120 in. / 120 in.	100%	108 in. / 120 in.	90%
NQ2-7	59.5	69.5	120 in. / 120 in.	100%	84 in. / 120 in.	70%

ATH-13-13.71 PID 119011

B-002-0-20



Run #	Depth (ft)		Recovery		RQD	
NQ2-7	59.5	69.5	120 in. / 120 in.	100%	84 in. / 120 in.	70%
NQ2-8	69.5	79.5	120 in. / 120 in.	100%	97 in. / 120 in.	81%

ATH-13-13.71 PID 119011

B-002-0-20

Run #	Depth (ft)		Recovery		RQD	
NQ2-8	69.5	79.5	120 in. / 120 in.	100%	97 in. / 120 in.	81%
NQ2-9	79.5	84.0	54 in. / 54 in.	100%	25 in. / 54 in.	46%

ATH-13-13.71 PID 119011

4

LABORATORY TESTING

SUMMARY OF LABORATORY RESULTS

OHIO DEPARTMENT OF TRANSPORTION
OFFICE OF GEOTECHNICAL ENGINEERING

PROJECT ATH-13-13.70 **PID** 119011

OGE NUMBER 11111 **PROJECT TYPE** GEOHAZARD EXPLORATION

Borehole	Depth	Sample	Lab ID	G (%)	CS (%)	FS (%)	M (%)	C (%)	LL	PL	PI	M (%)	LOI (%)	ODOT CLASS	USCS CLASS	FLAGS				
																LL	PL	M	OC	NP
B-001-0-24	0.0	SS- 1	1									3								
B-001-0-24	2.5	SS- 2	2	11	7	32	28	22	33	22	11	8		A-6a	CL					
B-001-0-24	5.0	SS- 3	3									3								
B-001-0-24	7.5	SS- 4	4	0	8	10	50	32	38	22	16	9		A-6b	CL				X	
B-001-0-24	10.0	SS- 5	5																	
B-001-0-24	12.5	SS- 6	6									2								
B-001-0-24	15.0	SS- 7	7																	
B-001-0-24	17.5	SS- 8	8									2								
B-001-0-24	20.0	SS- 9	9																	
B-002-0-24	0.0	SS- 1	1									2								
B-002-0-24	2.5	SS- 2	2									2								
B-002-0-24	5.0	SS- 3	3	3	28	44	15	10	NP	NP	NP	3		A-3a	SM				X	X
B-002-0-24	7.5	SS- 4	4									2								
B-002-0-24	10.0	SS- 5A	5									2								
B-002-0-24	11.0	- 5B	5																	
B-002-0-24	12.5	SS- 6	6	0	2	66	20	12	NP	NP	NP	5		A-3a	SM				X	X
B-002-0-24	15.0	SS- 7A	7									3								
B-002-0-24	16.0	- 7B	7									5								
B-002-0-24	17.5	SS- 8	8									3								
B-002-0-24	20.0	SS- 9	9									2								
B-002-0-24	22.5	SS- 10	10	0	6	47	35	12	NP	NP	NP	13		A-4a	SM				X	

EXPLANATION OF FLAGS

LL - Check LL (flagged if less than PL or greater than 60)
PL - Check PL (flagged if greater than 50)
M - Check Moisture (flagged if greater than LL)
OC - Check ODOT Class (flagged if different from Visual class)
NP - Check NP (flagged if NP sample has significant clay content vs silt)

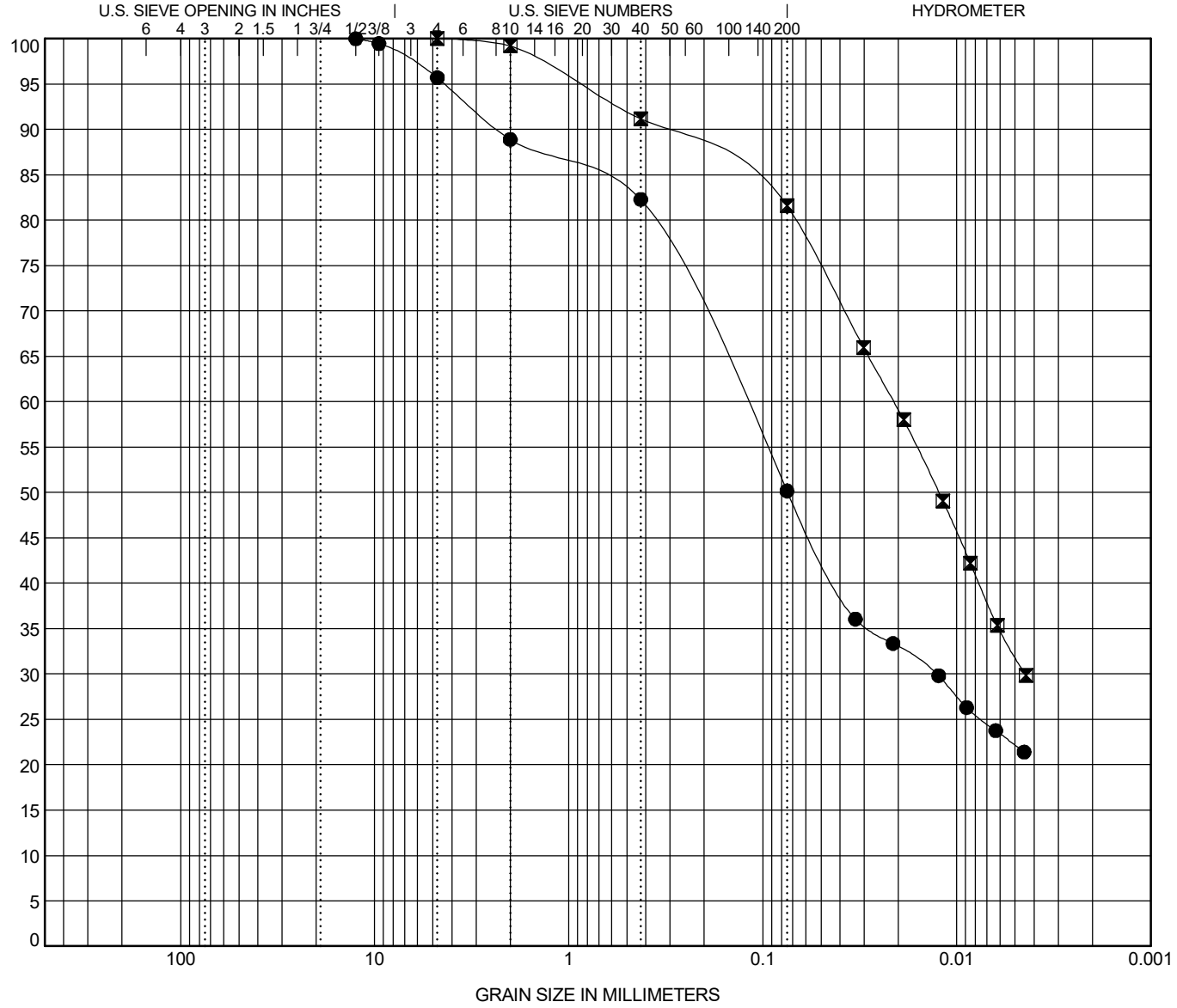
LAB SUMMARY - OH DOT.GDT - 11/21/24 10:42 - X:\1ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\ATH-13-13.71 (HDR)\GINT FILES\20241016_ATH-13-13.71_BORING LOGS_NEAS LAB DATA.GPJ

GRAIN SIZE DISTRIBUTION

OHIO DEPARTMENT OF TRANSPORTION
OFFICE OF GEOTECHNICAL ENGINEERING

PROJECT ATH-13-13.70 **PID** 119011

OGE NUMBER 11111 **PROJECT TYPE** GEOHAZARD EXPLORATION



COBBLES	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

	Specimen Identification		ODOT (Modified AASHTO) ~ USCS Classification	LL	PL	PI
●	**B-001-0-24**	**2.5**	**A-6a ~ SANDY LEAN CLAY(CL)**	**33**	**22**	**11**
⊠	**B-001-0-24**	**7.5**	**A-6b ~ LEAN CLAY with SAND(CL)**	**38**	**22**	**16**

	Specimen Identification		D90	D50	D30	D10	%G	%CS	%FS	%M	%C	Cc	Cu
●	**B-001-0-24**	**2.5**	**2.299**	**0.074**	**0.013**		**11**	**7**	**32**	**28**	**22**		
⊠	**B-001-0-24**	**7.5**	**0.344**	**0.012**	**0.004**		**0**	**8**	**10**	**50**	**32**		

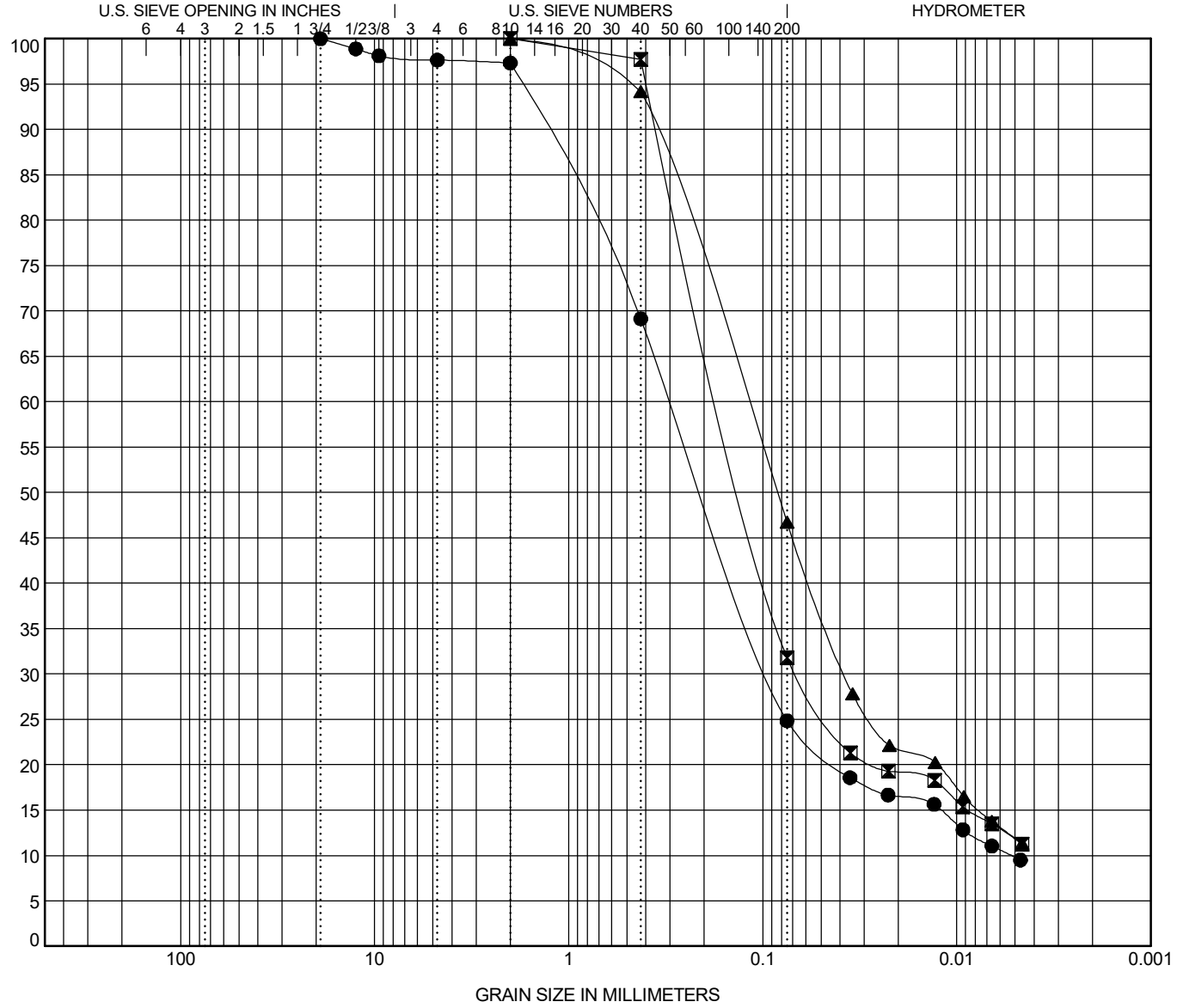
GRAIN SIZE - OH DOT.GDT - 11/21/24 10:40 - X:\1ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\ATH-13-13.71 (HDR)\GINT FILES\20241016_ATH-13-13.71_BORING LOGS_NEAS LAB DATA.GPJ

GRAIN SIZE DISTRIBUTION

OHIO DEPARTMENT OF TRANSPORTION
OFFICE OF GEOTECHNICAL ENGINEERING

PROJECT ATH-13-13.70 **PID** 119011

OGE NUMBER 11111 **PROJECT TYPE** GEOHAZARD EXPLORATION



COBBLES	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

Specimen Identification			ODOT (Modified AASHTO) ~ USCS Classification	LL	PL	PI
●	B-002-0-24	5.0	A-3a ~ SILTY SAND(SM)	NP	NP	NP
⊠	B-002-0-24	12.5	A-3a ~ SILTY SAND(SM)	NP	NP	NP
▲	B-002-0-24	22.5	A-4a ~ SILTY SAND(SM)	NP	NP	NP

Specimen Identification			D90	D50	D30	D10	%G	%CS	%FS	%M	%C	Cc	Cu
●	B-002-0-24	5.0	1.337	0.201	0.092	0.005	3	28	44	15	10	5.40	56.64
⊠	B-002-0-24	12.5	0.347	0.121	0.066		0	2	66	20	12		
▲	B-002-0-24	22.5	0.365	0.085	0.038		0	6	47	35	12		

GRAIN SIZE - OH DOT.GDT - 11/21/24 10:41 - X:\1ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\ATH-13-13.71 (HDR)\GINT FILES\20241016_ATH-13-13.71_BORING LOGS_NEAS LAB DATA.GPJ

NEAS
National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: ATH-13-13.71, Boring Location: B-001-0-24, NQ2-2, Depth: 25.7-26.1 ft)

Tested Date: 11/18/2024

Specimen Properties

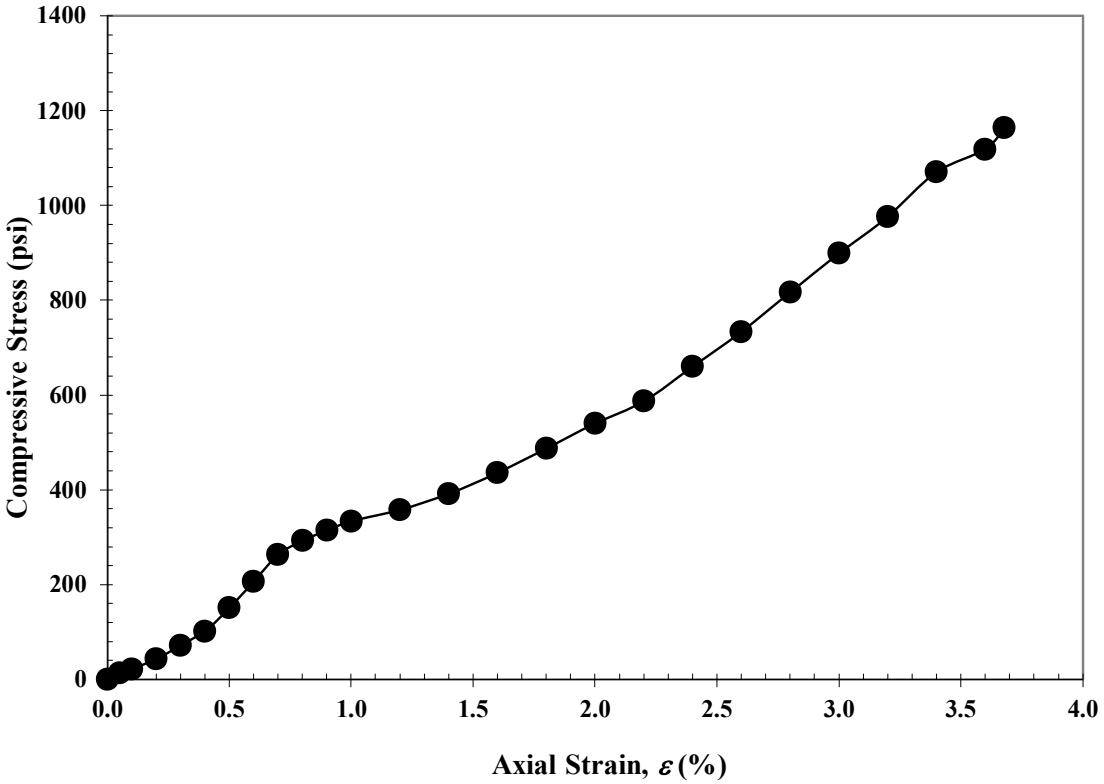
Average Dia., D_{avg} (in):	1.96
Average Height, H_{avg} (in):	4.38
Length to Diameter Ratio:	2.23
Area, A (in^2):	3.03
Volume, V (in^3):	13.27
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	5.1
Dry Mass of Specimen (lb):	1.2
Wet Unit Weight, γ (lb/ft^3):	157.9
Dry Unit Weight, γ_d (lb/ft^3):	150.2

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **1164** **8** (MPa)

Strain (%): **3.7**



Notes: Shale, gray, slightly weathered, weak, silty.

NEAS
National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: ATH-13-13.71, Boring Location: B-002-0-24, NQ2-4, Depth: 39.7-40.1 ft)

Tested Date: 11/18/2024

Specimen Properties

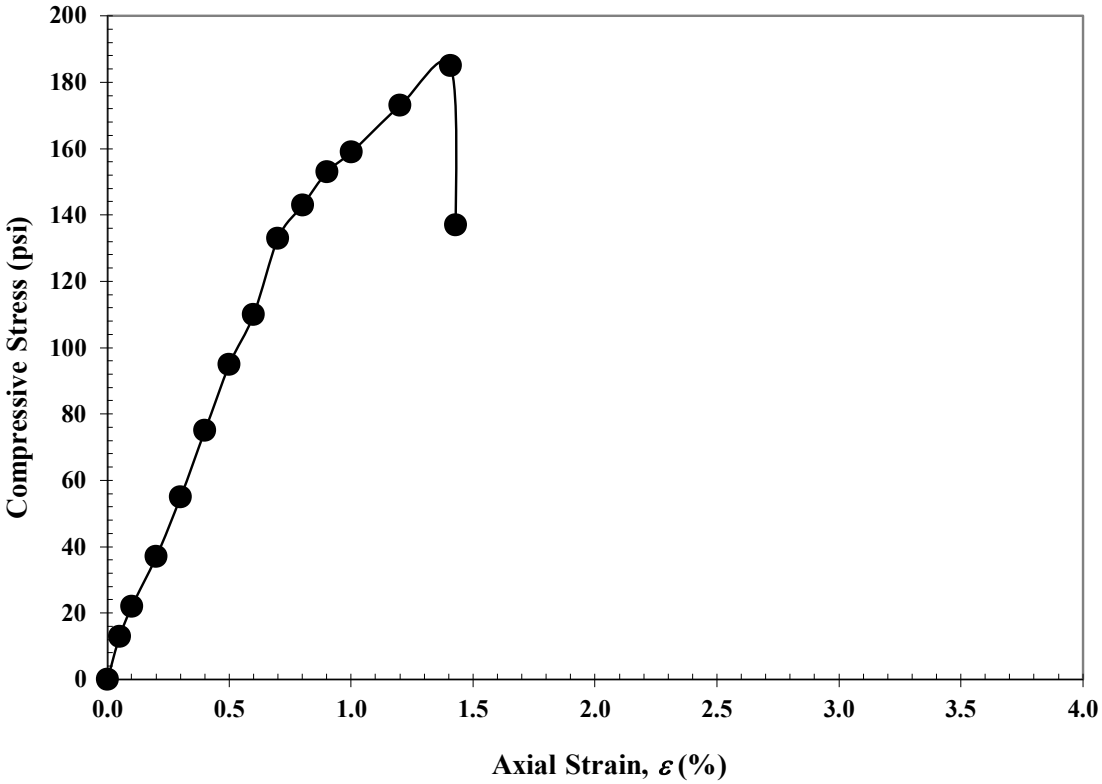
Average Dia., D_{avg} (in):	2.62
Average Height, H_{avg} (in):	4.41
Length to Diameter Ratio:	1.68
Area, A (in^2):	5.40
Volume, V (in^3):	23.80
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	5.6
Dry Mass of Specimen (lb):	1.1
Wet Unit Weight, γ (lb/ft^3):	85.3
Dry Unit Weight, γ_d (lb/ft^3):	80.8

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **185** **1** (MPa)

Strain (%): **1.4**



Notes: Claystone, gray, moderately weathered, very weak, silty.

National Engineering & Architectural Services Inc.
5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: ATH-13-13.71, Boring Location: B-002-0-24, NQ2-5, Depth: 46.6-47.0 ft)

Tested Date: 11/19/2024

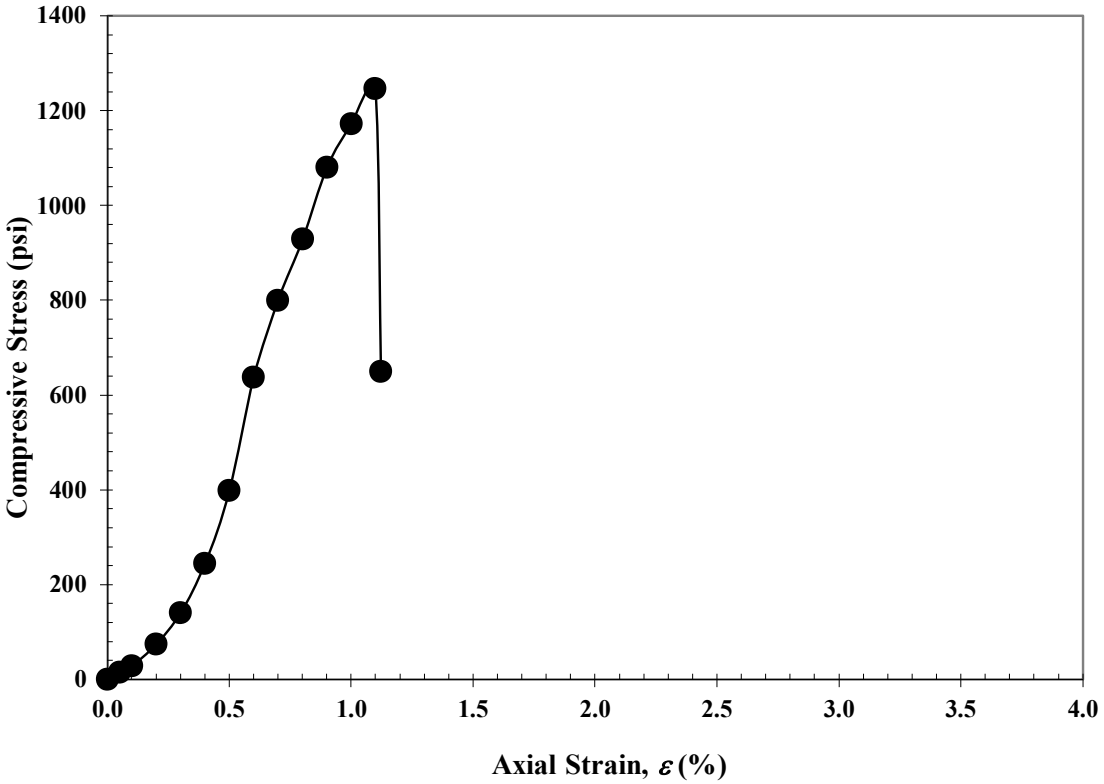
Specimen Properties

Average Dia., D_{avg} (in):	1.97
Average Height, H_{avg} (in):	4.28
Length to Diameter Ratio:	2.18
Area, A (in^2):	3.04
Volume, V (in^3):	13.04
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	5.4
Dry Mass of Specimen (lb):	1.1
Wet Unit Weight, γ (lb/ft^3):	158.5
Dry Unit Weight, γ_d (lb/ft^3):	150.4

Final Specimen Figure

Results

Unconfined Compressive Strength (psi):	**1246**	**9**	(MPa)
Strain (%):	**1.1**		



Notes: Siltstone, gray, slightly weathered, weak, argillaceous, slickensided.

National Engineering & Architectural Services Inc.
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Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: ATH-13-13.71, Boring Location: B-002-0-24, NQ2-6, Depth: 54.7-55.1 ft)

Tested Date: 11/19/2024

Specimen Properties

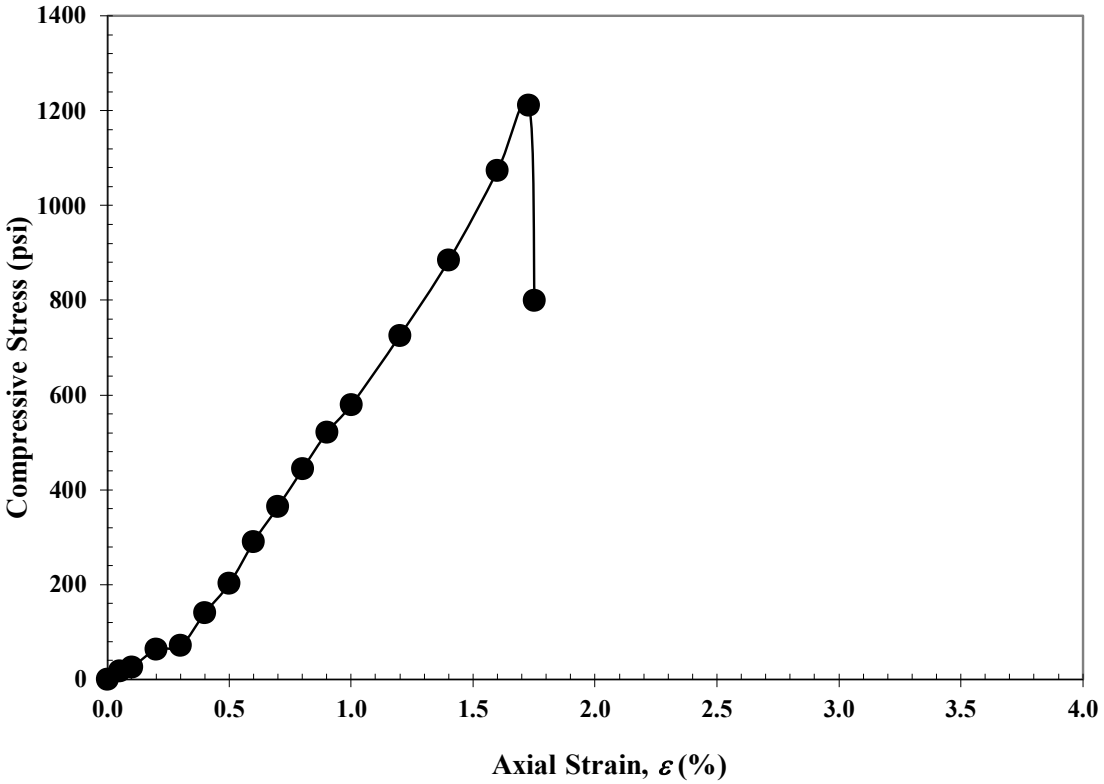
Average Dia., D_{avg} (in):	1.98
Average Height, H_{avg} (in):	4.28
Length to Diameter Ratio:	2.16
Area, A (in^2):	3.07
Volume, V (in^3):	13.17
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	3.6
Dry Mass of Specimen (lb):	1.2
Wet Unit Weight, γ (lb/ft^3):	159.7
Dry Unit Weight, γ_d (lb/ft^3):	154.1

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **1211** **8** (MPa)

Strain (%): **1.7**



Notes: Siltstone, gray, slightly weathered, weak, slightly argillaceous.

National Engineering & Architectural Services Inc.
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Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: ATH-13-13.71, Boring Location: B-002-0-24, NQ2-6, Depth: 57.7-58.1 ft)

Tested Date: 11/19/2024

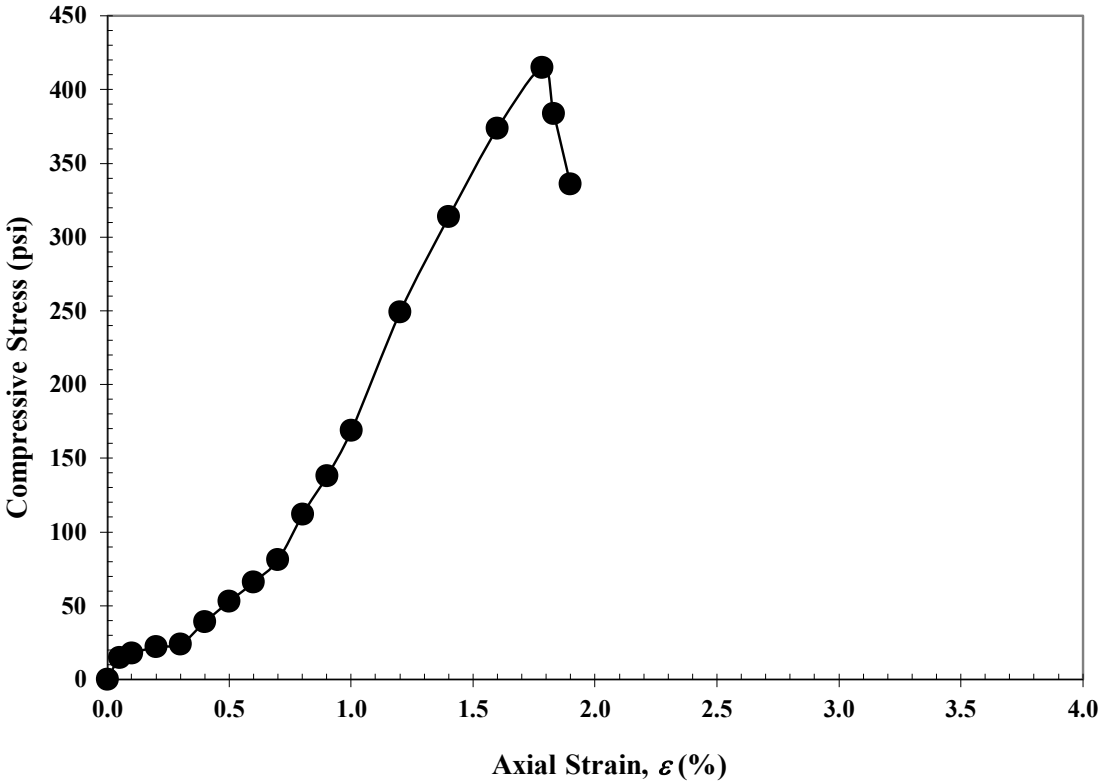
Specimen Properties

Average Dia., D_{avg} (in):	1.98
Average Height, H_{avg} (in):	4.32
Length to Diameter Ratio:	2.19
Area, A (in^2):	3.06
Volume, V (in^3):	13.23
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	6.5
Dry Mass of Specimen (lb):	1.1
Wet Unit Weight, γ (lb/ft^3):	150.7
Dry Unit Weight, γ_d (lb/ft^3):	141.5

Final Specimen Figure

Results

Unconfined Compressive Strength (psi):	**415**	**3**	(MPa)
Strain (%):	**1.8**		



Notes: Claystone, gray, moderately weathered, very weak, silty, slickensided.

NEAS
National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, OH 43213
614-892-0162

Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: ATH-13-13.71, Boring Location: B-002-0-24, NQ2-7, Depth: 66.5-66.9 ft)

Tested Date: 11/19/2024

Specimen Properties

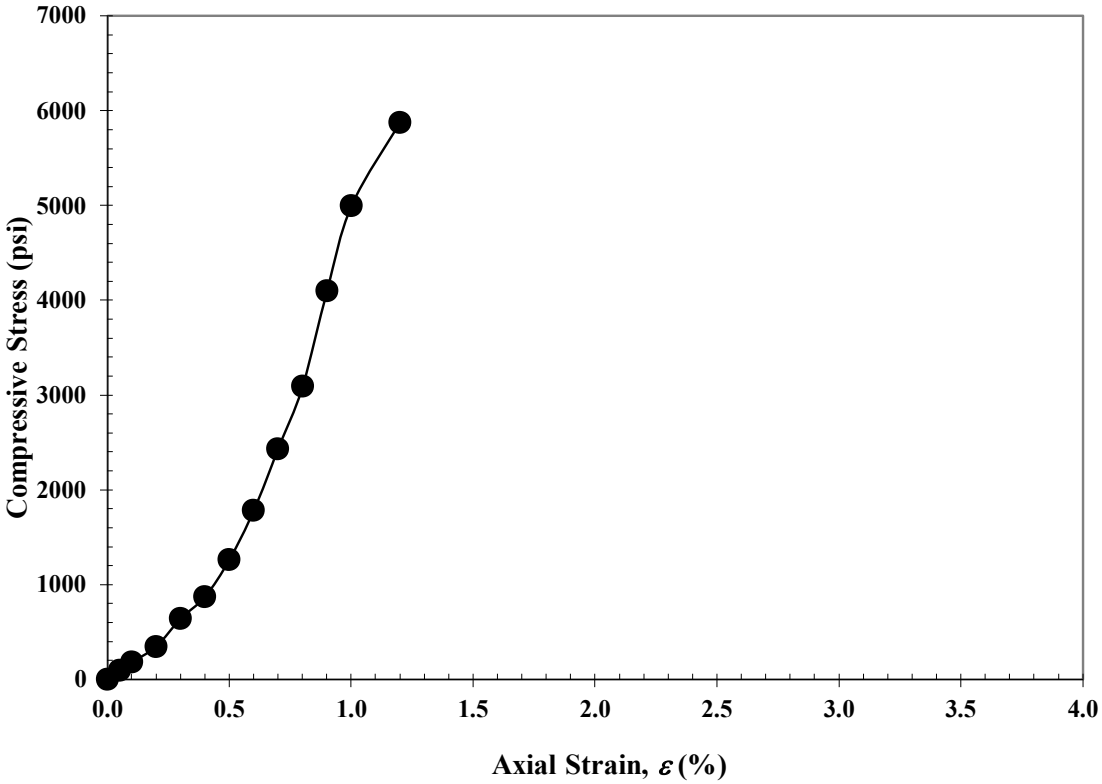
Average Dia., D_{avg} (in):	1.98
Average Height, H_{avg} (in):	4.18
Length to Diameter Ratio:	2.11
Area, A (in^2):	3.08
Volume, V (in^3):	12.88
Wet Mass of Specimen (lb):	1.2
Moisture Content (%):	3.1
Dry Mass of Specimen (lb):	1.2
Wet Unit Weight, γ (lb/ft^3):	159.3
Dry Unit Weight, γ_d (lb/ft^3):	154.5

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **5875** **41** (MPa)

Strain (%): **1.2**



Notes: Sandstone, gray, slightly weathered, moderately strong, very fine to fine grained.

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Unconfined Compressive Strength of Rock Core (ASTM D7012 Method C)

(Project: ATH-13-13.71, Boring Location: B-002-0-24, NQ2-8, Depth: 73.2-73.6 ft)

Tested Date: 11/19/2024

Specimen Properties

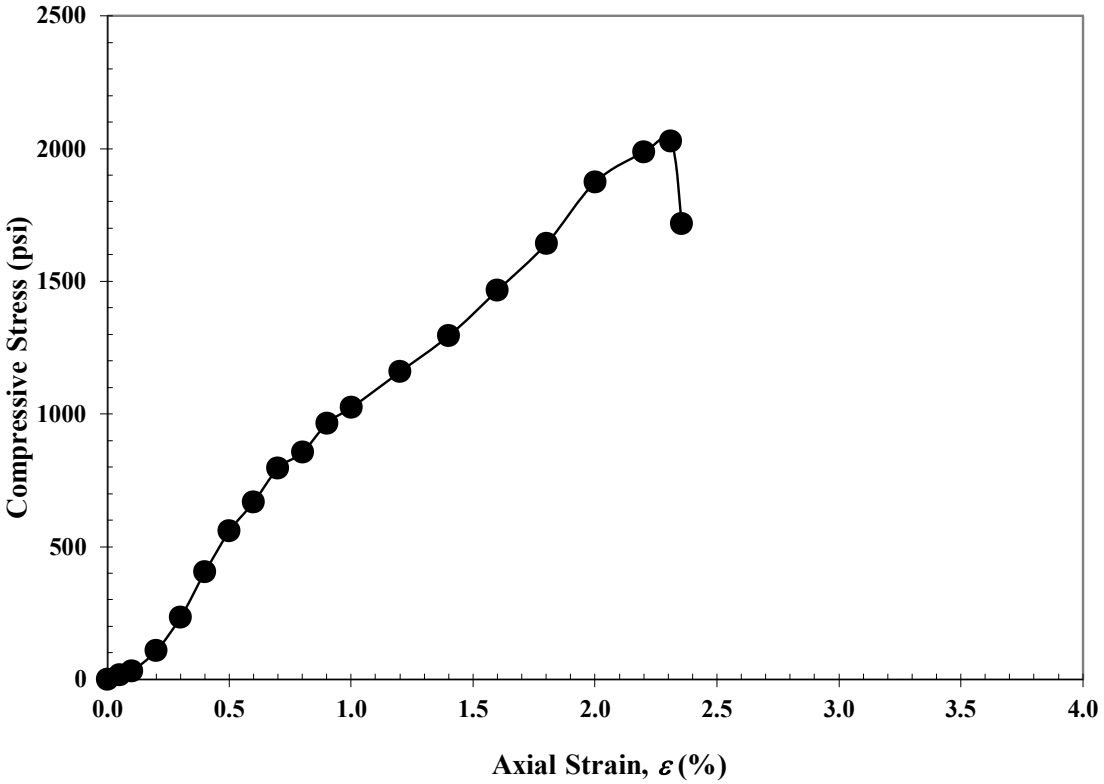
Average Dia., D_{avg} (in):	1.98
Average Height, H_{avg} (in):	4.41
Length to Diameter Ratio:	2.23
Area, A (in^2):	3.07
Volume, V (in^3):	13.56
Wet Mass of Specimen (lb):	1.3
Moisture Content (%):	4.1
Dry Mass of Specimen (lb):	1.2
Wet Unit Weight, γ (lb/ft^3):	159.7
Dry Unit Weight, γ_d (lb/ft^3):	153.4

Final Specimen Figure

Results

Unconfined Compressive Strength (psi): **2028** **14** (MPa)

Strain (%): **2.3**



Notes: Siltstone, dark gray and black, unweathered, slightly strong, argillaceous.

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	PJ	Checked	LR	Report Date:	11/20/2024
County	ATH	Route	13	Section	13.71
Boring Number	B-001-0-24	District	10	PID	119011
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-2	Top Depth	26.8'	Bottom Depth	27.8'

Description	Shale, gray, slightly weathered, weak, silty.

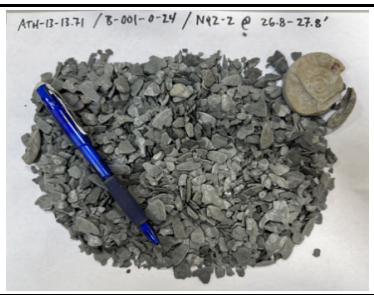
NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 11/15/24	OUT: 11/18/24	Moisture Content (%)
SWEET	503.28	161.10	Time	16:12	13:00	
			Mass	664.36	638.04	5.52%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
15:52	16:02		Drum ID	Tare Weight (g)		IN: 11/18/24	OUT: 11/19/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	1166.92	Time	16:12	9:10	
20.8	21.3	21.025			Mass	1650.73	1607.18	440.26

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
12:05	12:15		Drum ID	Tare Weight (g)		IN: 11/19/24	OUT: 11/19/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	1166.92	Time	12:24	15:30	
22.2	22.2	22.2			Mass	1627.07	1580.39	413.47

Before First Cycle



After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **86.7%**

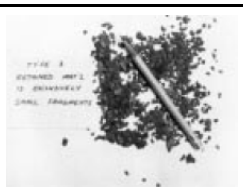
Retained Material Type: **T 2** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1	Retained pieces remain virtually unchanged

T 2	Retained material consists of large and small pieces



T 3	Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	PJ	Checked	LR	Report Date:	11/21/2024
County	ATH	Route	13	Section	13.71
Boring Number	B-002-0-24	District	10	PID	119011
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-2	Top Depth	34.9'	Bottom Depth	36.5'

Description	Claystone, gray, moderately weathered, weak. Selected specimens were non equidimensional prior to testing.

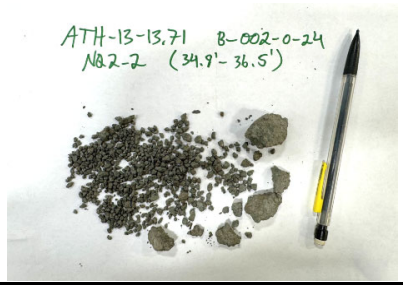
NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 11/19/24	OUT: 11/20/24	Moisture Content (%)
Ericka	569.04	159.91	Time	1:42p	10:05a	
			Mass	729.04	699.40	5.49%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
11:21a	11:31a		Drum ID	Tare Weight (g)		IN: 11/20/24	OUT: 11/20/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	1167.11	Time	12:10p	3:35p	
22.7	22.7	22.675			Mass	1312.76	1292.26	125.15

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
4:45p	4:55p		Drum ID	Tare Weight (g)		IN: 11/20/24	OUT: 11/21/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	1167.11	Time	5:02p	8:40a	
22.0	21.9	21.95			Mass	1227.23	1217.26	50.15

Before First Cycle



After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **9.3%**

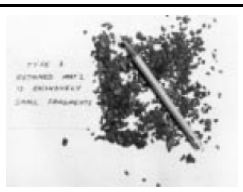
Retained Material Type: **T 3** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



T 3 — Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	PJ	Checked	LR	Report Date:	11/21/2024
County	ATH	Route	13	Section	13.71
Boring Number	B-002-0-24	District	10	PID	119011
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-5	Top Depth	46.6'	Bottom Depth	48.5'

Description	Claystone, gray, slightly weathered, weak, silty.

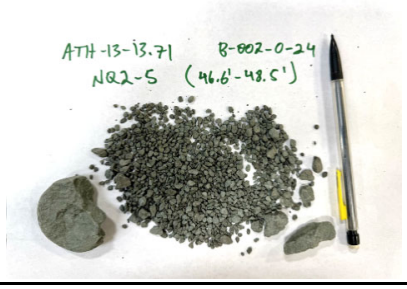
NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 11/19/24	OUT: 11/20/24	Moisture Content (%)
Lyon	540.99	115.77	Time	2:35p	10:05a	
			Mass	656.74	630.40	5.12%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
11:21a	11:31a		Drum ID	Tare Weight (g)		IN: 11/19/24	OUT: 11/19/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1170.74	Time	12:10p	3:35p	
22.6	22.7	22.625			Mass	1508.52	1473.78	303.04

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
4:45p	4:55p		Drum ID	Tare Weight (g)		IN: 11/20/24	OUT: 11/21/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1170.74	Time	5:02p	8:40a	
22.2	22.2	22.175			Mass	1288.51	1274.80	104.06

Before First Cycle



After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **20.2%**

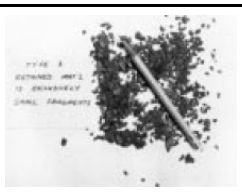
Retained Material Type: **T 2**
(Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



T 3 — Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	PJ	Checked	LR	Report Date:	11/22/2024
County	ATH	Route	13	Section	13.71
Boring Number	B-002-0-24	District		PID	119011
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-6	Top Depth	55.5'	Bottom Depth	56.5'

Description	Siltstone, gray, slightly weathered, weak.

NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 11/19/24	OUT: 11/20/24	Moisture Content (%)
BETH	545.92	161.13	Time	14:45	13:08	
			Mass	707.03	687.30	3.75%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
9:44	9:54		Drum ID	Tare Weight (g)		IN: 11/22/24	OUT: 11/22/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	1166.82	Time	10:05	13:08	
21.3	21.0	21.125			Mass	1687.51	1669.45	502.63

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
14:16	14:26		Drum ID	Tare Weight (g)		IN: 11/22/24	OUT: 11/22/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	A	1166.82	Time	14:33	16:50	
					Mass	1659.90	1641.75	474.93

Before First Cycle

After Second Cycle

Slake Durability Index
I_{d2}={(W_F-C)/(B-C)}*100

I_{d2} = **90.3%**

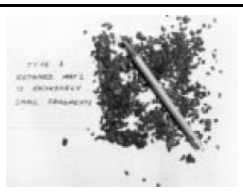
Retained Material Type: **T 2**
(Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



T 3 — Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	PJ	Checked	LR	Report Date:	11/22/2024
County	ATH	Route	13	Section	13.71
Boring Number	B-002-0-24	District		PID	119011
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-6	Top Depth	57.0'	Bottom Depth	58.5'

Description	Claystone, gray, moderately weathered, very weak, silty, slickensided. Selected specimens were non-equidimensional prior to testing

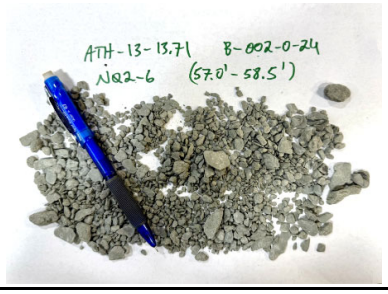
NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 11/19/24	OUT: 11/20/24	Moisture Content (%)
PHILLIPS	446.29	113.21	Time	15:02	10:05	
			Mass	559.43	532.89	6.32%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
10:07	10:17		Drum ID	Tare Weight (g)		IN: 11/21/24	OUT: 11/21/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1171.07	Time	10:27	13:15	
21.0	20.9	20.925			Mass	1393.73	1368.24	197.17

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
14:48	14:58		Drum ID	Tare Weight (g)		IN: 11/21/24	OUT: 11/22/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1171.07	Time	15:07	9:05	
20.7	20.6	20.65			Mass	1302.43	1284.37	113.3

Before First Cycle



After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **27.0%**

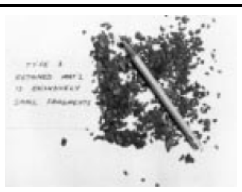
Retained Material Type: **T 3** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



T 3 — Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	PJ	Checked	LR	Report Date:	11/22/2024
County	ATH	Route	13	Section	13.71
Boring Number	B-002-0-24	District		PID	119011
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-7	Top Depth	66.5'	Bottom Depth	68.5'

Description	Sandstone, gray, slightly weathered, moderately strong, very fine to fine grained.

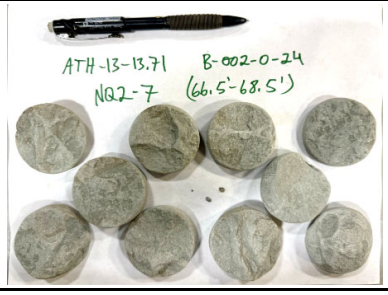
NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 11/19/24	OUT: 11/20/24	Moisture Content (%)
HAMMER	569.16	114.11	Time	13:16	10:05	
			Mass	683.31	667.70	2.82%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
9:44	9:54		Drum ID	Tare Weight (g)		IN: 11/22/24	OUT: 11/22.24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1170.49	Time	10:05	13:08	
21.3	21.2	21.225			Mass	1739.04	1718.06	547.57

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
14:16	6:14		Drum ID	Tare Weight (g)		IN: 11/22/24	OUT: 11/22/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1170.49	Time	14:33	16:50	
20.5	20.6	20.55			Mass	1731.29	1713.93	543.44

Before First Cycle



After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **98.2%**

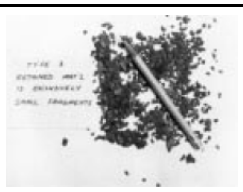
Retained Material Type: **T 1** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



T 3 — Retained material is exclusively small pieces

SLAKE DURABILITY TEST
ASTM D4644

National Engineering & Architectural Services Inc.

5710 Westbourne Avenue
Columbus, Ohio 43213
614-892-0162

Tech	PJ	Checked	LR	Report Date:	11/20/2024
County	ATH	Route	13	Section	13.71
Boring Number	B-002-0-24	District	10	PID	119011
Station		Offset		Offsest Direction	
Latitude		Longitude		Ground Elev. (Ft)	
Sample Number	NQ2-8	Top Depth	73.2'	Bottom Depth	74.5'

Description	Silststone, gray and dark gray, unweathered, slightly strong.

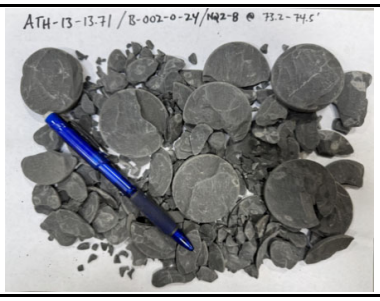
NATURAL MOISTURE DETERMINATION

Pan ID	Sample Weight (g)	Tare Weight (g)		IN: 11/15/24	OUT: 11/18/24	Moisture Content (%)
P-2	528.33	249.92	Time	15:25	13:00	
			Mass	778.26	758.60	3.86%

Start Time (mil):	End Time (mil):		First Cycle (I_{d1})					
15:52	16:02		Drum ID	Tare Weight (g)		IN: 11/18/24	OUT: 11/19/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1170.53	Time	16:12	9:10	
20.4	20.9	20.65			Mass	1687.3	1668.36	497.83

Start Time (mil):	End Time (mil):		Second Cycle (Id2)					
12:05	12:15		Drum ID	Tare Weight (g)		IN: 11/19/24	OUT: 11/19/24	Final Dry Mass (g)
Start Temp (ºC):	End Temp (ºC):	Avg. Temp (ºC)	B	1170.53	Time	12:24	15:30	
22.1	22.2	22.125			Mass	1677.78	1651.90	481.37

Before First Cycle



After Second Cycle

Slake Durability Index
$I_{d2}=\{(W_F-C)/(B-C)\}*100$

I_{d2} = **94.6%**

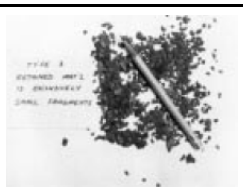
Retained Material Type: **T 2** (Reference Below)

WF = Drum mass + oven dried specimen after second cycle; B = Drum mass + specimen prior to test; C = Drum mass

From ASTM D4644

T 1 — Retained pieces remain virtually unchanged

T 2 — Retained material consists of large and small pieces



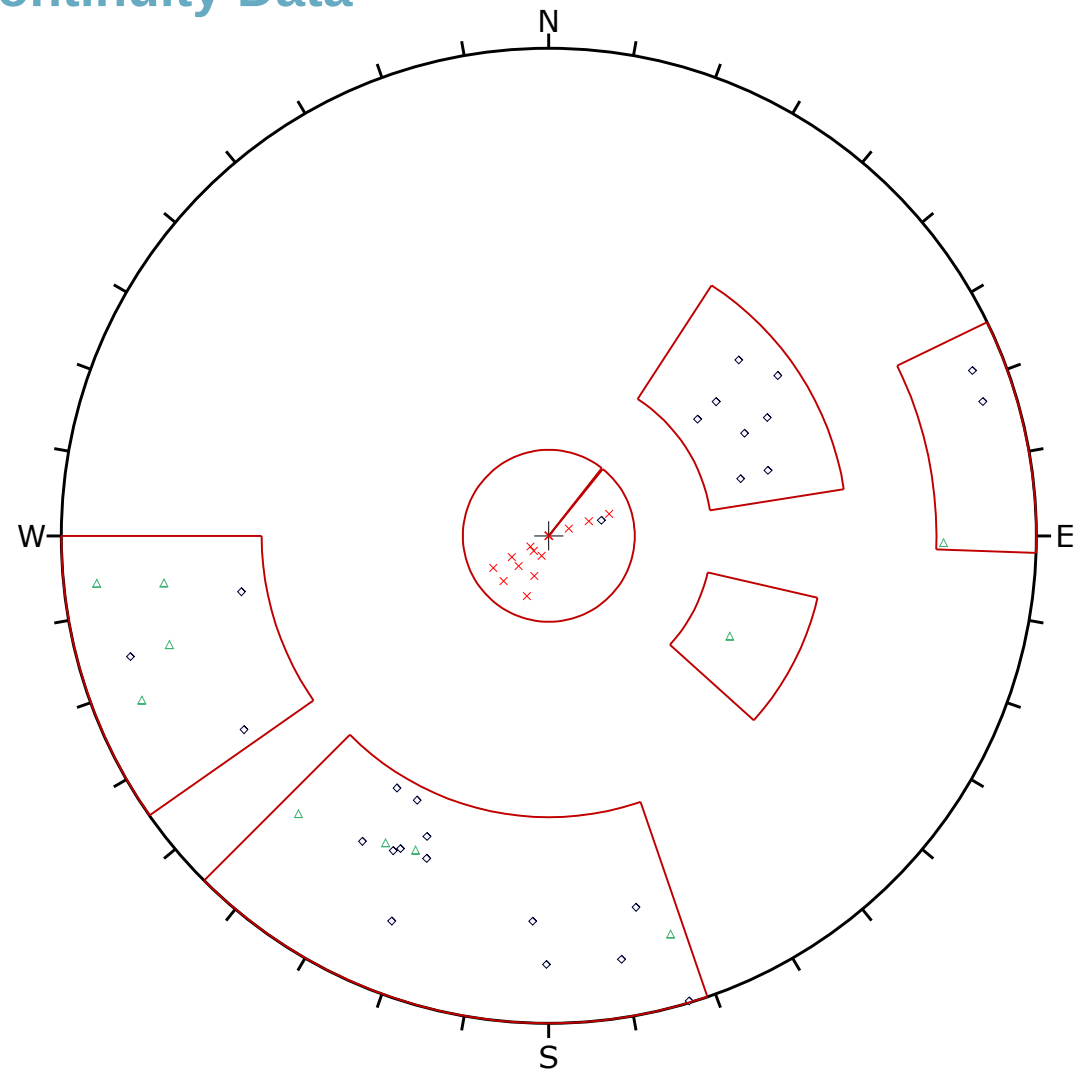
T 3 — Retained material is exclusively small pieces

5

KINEMATIC ANALYSES

Discontinuity Data

By: WNB 12/10/2024
Chk: DSC 12/30/2024



Symbol	METHOD	Quantity
◇	Electronic	27
×	Estimated Bedding Dip	16
△	Hand	10

Plot Mode	Pole Vectors
Vector Count	53 (53 Entries)
Hemisphere	Lower
Projection	Equal Angle

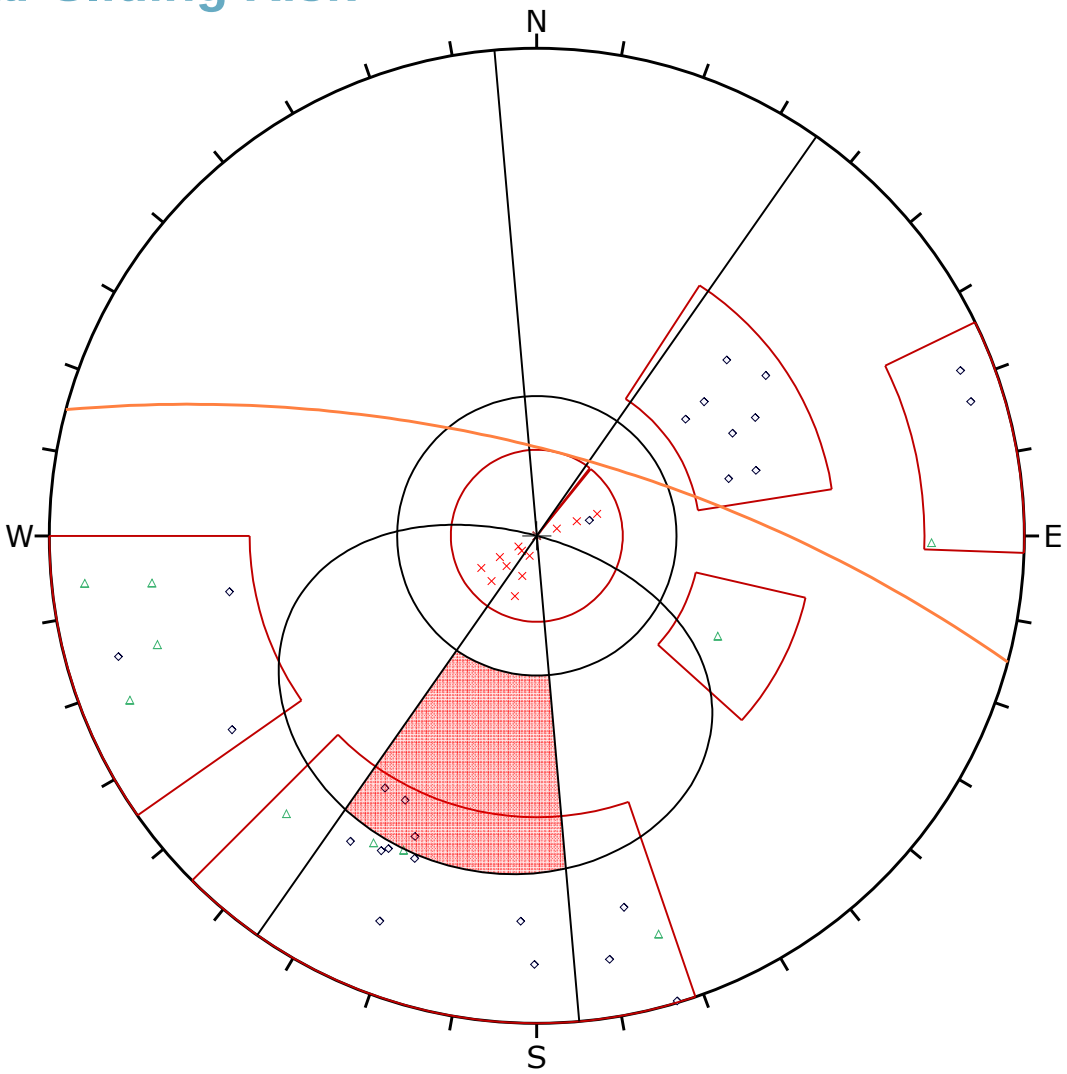
rocscience

DIPS 8.028

Project	ATH-13 Rockfall Remediation		
Analysis Description	Kinematic Analysis of Exposed Rock Slope Along SR - 13		
Drawn By	WNB	*Company*	HDR
Date	12/2/2024, 3:05:55 PM	*File Name*	Athens Rockfall Kinematics.dips8

Planar Sliding Risk

By: WNB 12/10/2024
Chk: DSC 12/30/2024



Symbol	METHOD	Quantity
◇	Electronic	27
×	Estimated Bedding Dip	16
△	Hand	10

Kinematic Analysis	Planar Sliding
Slope Dip	70
Slope Dip Direction	15
Friction Angle	32°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	3	53	5.66%
Planar Sliding (Set 3: Joint 2)	3	17	17.65%

Plot Mode	Pole Vectors
Vector Count	53 (53 Entries)
Hemisphere	Lower
Projection	Equal Angle

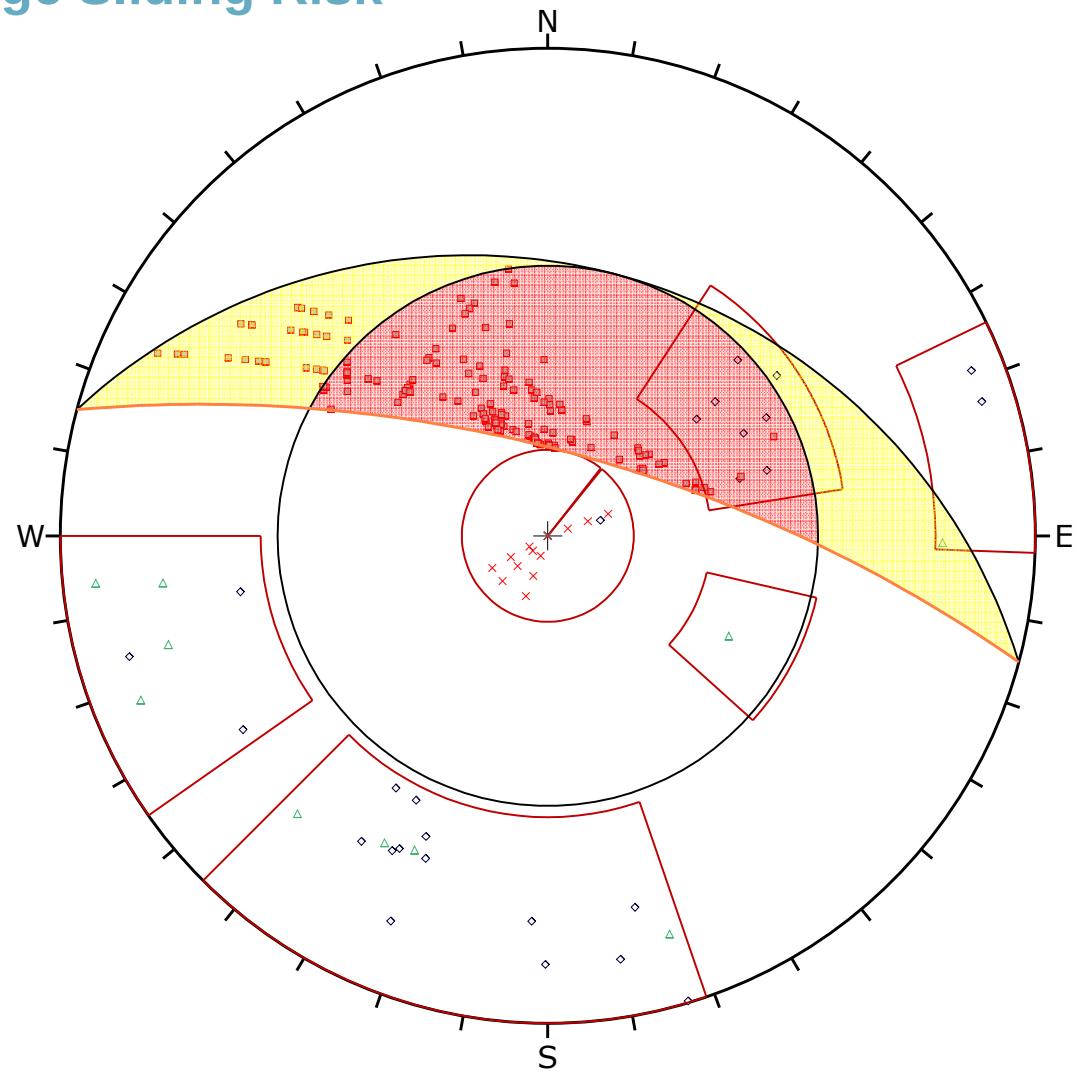
rocscience

DIPS 8.028

Project	ATH-13 Rockfall Remediation		
Analysis Description	Kinematic Analysis of Exposed Rock Slope Along SR - 13		
Drawn By	WNB	*Company*	HDR
Date	12/2/2024, 3:05:55 PM	*File Name*	Athens Rockfall Kinematics.dips8

Wedge Sliding Risk

By: WNB 12/10/2024
Chk: DSC 12/30/2024



Symbol	METHOD	Quantity
◇	Electronic	27
×	Estimated Bedding Dip	16
△	Hand	10
Symbol	**Feature**	
▫	Critical Intersection	

Kinematic Analysis	Wedge Sliding
Slope Dip	70
Slope Dip Direction	15
Friction Angle	32°

	Critical	Total	%
Wedge Sliding	166	1378	12.05%

Plot Mode	Pole Vectors
Vector Count	53 (53 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	1378
Hemisphere	Lower
Projection	Equal Angle

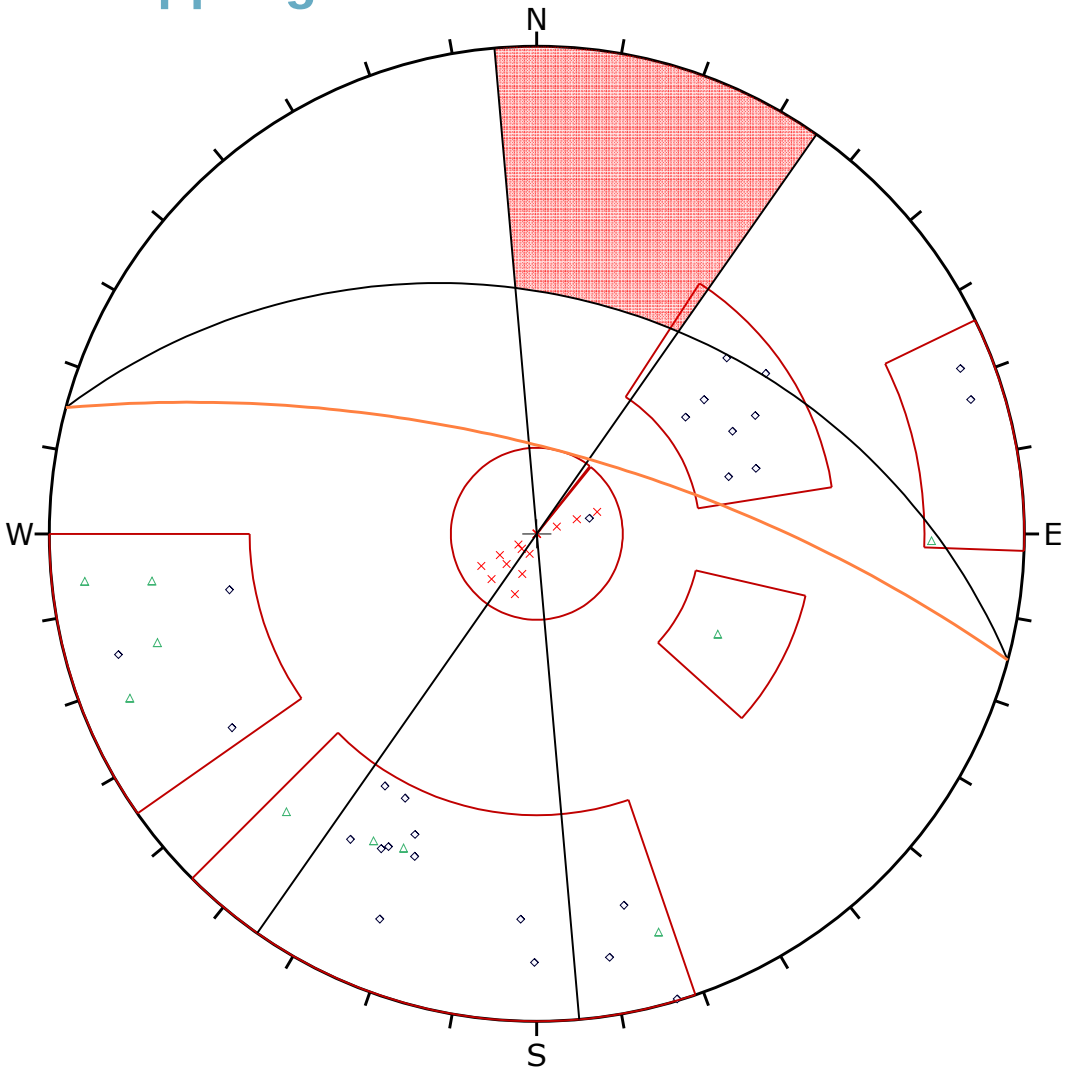
rocscience

DIPS 8.028

Project	ATH-13 Rockfall Remediation		
Analysis Description	Kinematic Analysis of Exposed Rock Slope Along SR - 13		
Drawn By	WNB	*Company*	HDR
Date	12/2/2024, 3:05:55 PM	*File Name*	Athens Rockfall Kinematics.dips8

Flexural Toppling Risk

By: WNB 12/10/2024
Chk: DSC 12/30/2024



Symbol	METHOD	Quantity
◇	Electronic	27
×	Estimated Bedding Dip	16
△	Hand	10

Kinematic Analysis	Flexural Toppling
Slope Dip	70
Slope Dip Direction	15
Friction Angle	32°
Lateral Limits	20°

	Critical	Total	%
Flexural Toppling (All)	0	53	0.00%

Plot Mode	Pole Vectors
Vector Count	53 (53 Entries)
Hemisphere	Lower
Projection	Equal Angle

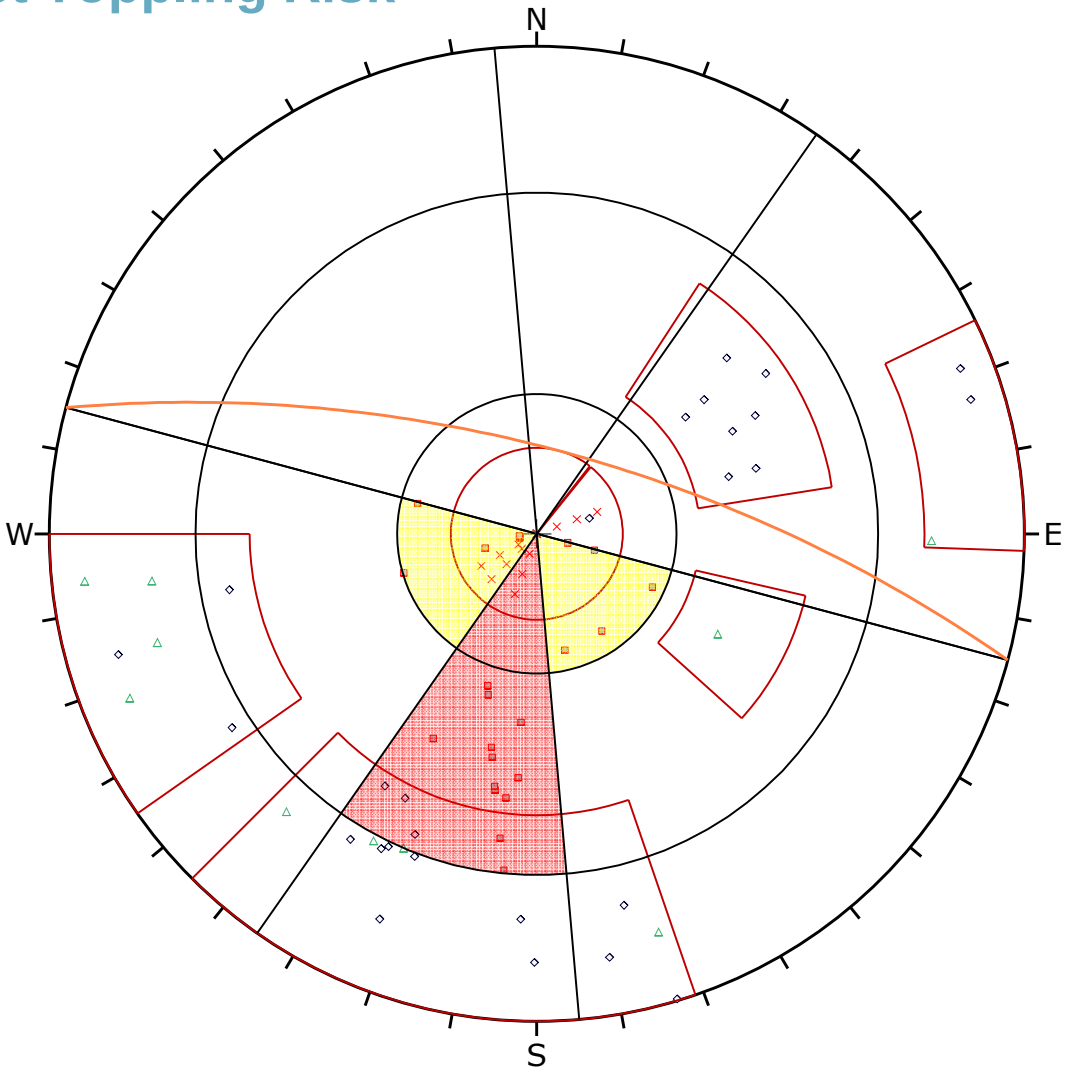
rocscience

DIPS 8.028

Project	ATH-13 Rockfall Remediation		
Analysis Description	Kinematic Analysis of Exposed Rock Slope Along SR - 13		
Drawn By	WNB	*Company*	HDR
Date	12/2/2024, 3:05:55 PM	*File Name*	Athens Rockfall Kinematics.dips8

Direct Toppling Risk

By: WNB 12/10/2024
Chk: DSC 12/30/2024



Symbol	METHOD	Quantity
◇	Electronic	27
×	Estimated Bedding Dip	16
△	Hand	10
Symbol	**Feature**	
▫	Critical Intersection	

Kinematic Analysis	Direct Toppling
Slope Dip	70
Slope Dip Direction	15
Friction Angle	32°
Lateral Limits	20°

	Critical	Total	%
Direct Toppling (Intersection)	12	1378	0.87%
Oblique Toppling (Intersection)	11	1378	0.80%
Base Plane (All)	16	53	30.19%
Base Plane (Set 2: Bedding)	12	17	70.59%
Base Plane (Set 3: Joint 2)	4	17	23.53%

Plot Mode	Pole Vectors
Vector Count	53 (53 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	1378
Hemisphere	Lower
Projection	Equal Angle

rocscience

DIPS 8.028

Project	ATH-13 Rockfall Remediation		
Analysis Description	Kinematic Analysis of Exposed Rock Slope Along SR - 13		
Drawn By	WNB	*Company*	HDR
Date	12/2/2024, 3:05:55 PM	*File Name*	Athens Rockfall Kinematics.dips8

6

SLOPE STABILITY ANALYSES

Incompetent Bedrock
and
Incompetent Bedrock (Id2 < 20%)
(Claystone and Shale)

By: WNB 12/10/2024
Chk: DSC 12/30/2024

SOIL DESIGN PARAMETERS

USCS Soil Type	AASHTO Soil Type (Most Probable)[9]	N-value[10] (Blows/Ft)	Consistency[8] /Density[3]	Unconfined Compression Strength[8] Q_u (TSF)	Undrained Shear $c=S_u=Q_u/2$ (TSF)	Q_{all}[3] (TSF)	Drained Shear Strength[1, 2, 3, 4] c' (PSF)	Drained Shear Strength[1, 2, 3, 4] Φ′ (°)	Unit Weight[1, 2, 3, 4] γ_{SAT} (PCF)	Bearing[5] Capacity Index (BCI)		k[6, 7] (PCI)		ε_{50}[6, 7] (Below WT)
										Clay	Silt	Static*	Cyclic*	
Cohesive ML/CL (Silt or Clay)	a-4/a-6	<2	Very Soft	<0.25	<0.12	0.25	0	20	100	10	10	15	10	0.030
		2-4	Soft	0.25-0.5	0.12-0.25	0.5	0	20	110	15	10	50	20	0.020
		5-8	Med. Stiff	0.5-1.0	0.25-0.5	1.0	50	25	125	25	28	200	80	0.010
		9-16	Stiff	1.0-2.0	0.5-1.0	1.5	100	28	130	28-33	32-38	500	200	0.007
		17-32	V. Stiff	2.0-4.0	1.0-2.0	2.0	150	30	135	34-52	39-60	1000	400	0.005
		>32	Hard	>4.0	>2.0	3.0	200	32	140	60+	70+	2000	800	0.004
												Above WT	Below WT	
Granular SW/SP (Well-Graded or Poorly-Graded Gravel)	a-1-b	0-4	Very Loose	---	---	0.5	0	25	90	25		15	10	---
		5-10	Loose	---	---	1.0	0	28	100	30-40		25	20	---
		11-30	Med. Dense	---	---	1.5	0	30-33	115	40-80		90	60	---
		31-50	Dense	---	---	2.0	0	33-36	120	80-120		225	125	---
		>50	Very Dense	---	---	3.0	0	36-40	130	140+		300	200	---
Granular SM/SC (Silty or Clayey Sand)	a-2-4/a-2-6 /A-3a	0-4	Very Loose	---	---	0.5	0	25	90	20		15	10	---
		5-10	Loose	---	---	1.0	0	25	105	25-30		30	20	---
		11-30	Med. Dense	---	---	1.5	50	28-30	115	30-60		110	80	---
		31-50	Dense	---	---	2.0	75	30-34	125	60-100		250	150	---
		>50	Very Dense	---	---	3.0	100	34-36	135	120+		350	225	---
Granular GW/GP (Well-Graded or Poorly-Graded Gravel)	a-1-a	0-4	Very Loose	---	---	1.0	0	28	90	30		20	15	---
		5-10	Loose	---	---	2.0	0	30	100	40-50		50	30	---
		11-30	Med. Dense	---	---	3.0	0	32-34	115	50-90		150	100	---
		31-50	Dense	---	---	4.0	0	34-36	120	90-150		300	200	---
		>50	Very Dense	---	---	5.0	0	36-42	130	180+		500	330	---
Granular GM/GC (Silty or Clayey Gravel)	a-2-4/a-2-6	0-4	Very Loose	---	---	1.0	0	26	95	25		15	10	---
		5-10	Loose	---	---	2.0	0	28	110	30-40		30	20	---
		11-30	Med. Dense	---	---	3.0	25	28-32	120	40-80		110	80	---
		31-50	Dense	---	---	4.0	50	32-36	130	80-120		250	150	---
		>50	Very Dense	---	---	5.0	75	36-40	140	140+		350	225	---
Bedrock		---	---	---	---	3-30	5000	---	150	---		4000		0.001

*Below Water Table (WT)

Overburden material

WXR Rock

REFERENCES:

1. AASHTO LRFD Bridge Design Specifications, 9th Edition - Table 10.4.6.2.4-1, Table C10.6.2.5.1-1, 2020
2. NAVFAC DM-7.1 - Table 8-4, February 2022.
3. Terzaghi, K.E, Peck, R.B, Mesri, G., "Soil Mechanics in Engineering Practice, 3rd edition," John Wiley & Sons, Inc., 1996.
4. Teng, W.C., "Foundation Design," Prentice-Hall, Inc. 1952 - Tables 1.1 and 1.2.
5. Johnson, S.M. and T.C. Kavanagh, "The Design of Foundations for Buildings," McGraw Hill Book Company, 1968 - Fig. 5-11.
6. Reese, L.C. and J. Allen, "Drilled Shaft Design and Construction Guidelines Manual," U.S. DOT, FHWA - Vol. 2, Appendix A, Tables A.1 thru A.4, 1977.
7. Wang, S.T. and L.C. Reese, "Analyses of Piles Under Lateral Load - Computer Program COMP624P for the Micro Computer," Report No. FHWA-SA-91-048, Chapter 3 - Tables 3.1 thru 3.5. June 1993.
8. Unconfined compressive strength of cohesive soils based on Pocket Penetrometer Readings. SPT N-values are an unreliable indicator of soil consistency for cohesive soils.
9. From "Comparison of USCS & AASHTO Soils" table, PennDOT BC-795M (2010) and PennDOT Pub. 222 (2022).
10. SPT N-values corrected for overburden pressure (and hammer efficiency, if appropriate) in accordance with Section 10.4.6.2.4, PennDOT DM-4 (2019).

Parameter Tables from: GSI: A Geologically Friendly Tool for Rock Mass Strength Estimation. Paul Marinos and Evert Hoek, 2000

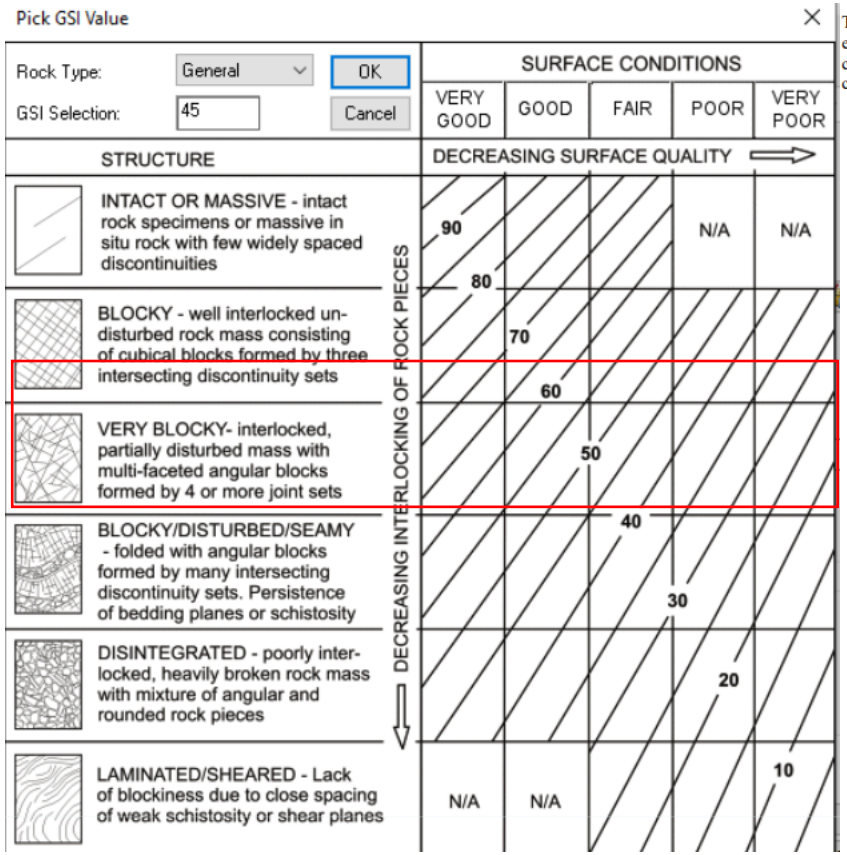


Table 2: Values of the constant m_i for intact rock, by rock group[4]. Note that values in parenthesis are estimates. The range of values quoted for each material depends upon the granularity and interlocking of the crystal structure – the higher values being associated with tightly interlocked and more frictional characteristics.

Rock type	Class	Group	Texture: Coarse	Texture: Medium	Texture: Fine	Texture: Very fine
SEDIMENTARY	Clastic		Conglomerates * Breccias *	Sandstones 17 ± 4	Siltstones 7 ± 2 Greywackes (18 ± 3)	Claystones 4 ± 2 Shales (6 ± 2) Marls (7 ± 2)
	Non-Clastic	Carbonates	Crystalline Limestone (12 ± 3)	Sparitic Limestones (10 ± 2)	Micritic Limestones (9 ± 2)	Dolomites (9 ± 3)
		Evaporites		Gypsum 8 ± 2	Anhydrite 12 ± 2	
		Organic				Chalk 7 ± 2
METAMORPHIC	Non Foliated		Marble 9 ± 3	Hornfels (19 ± 4) Metasandstone (19 ± 3)	Quartzites 20 ± 3	
	Slightly foliated		Migmatite (29 ± 3)	Amphibolites 26 ± 6	Gneiss 28 ± 5	
	Foliated**			Schists 12 ± 3	Phyllites (7 ± 3)	Slates 7 ± 4
IGNEOUS	Plutonic	Light	Granite 32 ± 3	Diorite 25 ± 5 Granodiorite (29 ± 3)		
		Dark	Gabbro 27 ± 3 Norite 20 ± 5	Dolerite (16 ± 5)		
	Hypabyssal		Porphyries (20 ± 5)		Diabase (15 ± 5)	Peridotite (25 ± 5)
	Volcanic	Lava		Rhyolite (25 ± 5) Andesite 25 ± 5	Dacite (25 ± 3) Basalt (25 ± 5)	
		Pyroclastic	Agglomerate (19 ± 3)	Breccia (19 ± 5)	Tuff (13 ± 5)	

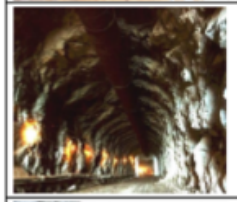
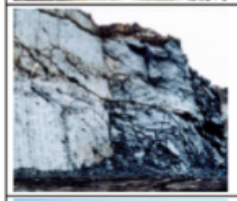
* Conglomerates and breccias may present a wide range of m_i values depending on the nature of the cementing material and the degree of cementation, so they may range from values similar to sandstone, to values used for fine grained sediments (even under 10).
** These values are for intact rock specimens tested normal to bedding or foliation. The value of mi will be significantly different if failure occurs along a weakness plane.

Average of Competent UCS Test Data

Calculated automatically from mi and GSI

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	UCS Intact (psf)	Parameter mb	Parameter s	Parameter a	Calculated from	Intact Rock Parameter mi	Geological Strength Index GSI	Disturbance Factor D	Max Confining Stress Sigma 3 (psf)	Phi-B (°)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Competent_RQD_51-75_	Hoek-Brown	150	30,000	0.75934209	0.0014711084	0.50404815	Yes	9	55	0.7	9,500	0		
	Incompetent	Mohr-Coulomb	140										0	200	32
	Incompetent_Id2_20_	Mohr-Coulomb	140										0	200	32
	Overburden	Mohr-Coulomb	125										0	100	30
	WXR_Rock	Mohr-Coulomb	135										0	50	34

- Disturbance Factor (D). From the Table below:

Appearance of rock mass	Description of rock mass	Suggested value of D
	Excellent quality controlled blasting or excavation by Tunnel Boring Machine results in minimal disturbance to the confined rock mass surrounding a tunnel.	$D = 0$
	Mechanical or hand excavation in poor quality rock masses (no blasting) results in minimal disturbance to the surrounding rock mass. Where squeezing problems result in significant floor heave, disturbance can be severe unless a temporary invert, as shown in the photograph, is placed.	$D = 0$ $D = 0.5$ No invert
	Very poor quality blasting in a hard rock tunnel results in severe local damage, extending 2 or 3 m, in the surrounding rock mass.	$D = 0.8$
	Small scale blasting in civil engineering slopes results in modest rock mass damage, particularly if controlled blasting is used as shown on the left hand side of the photograph. However, stress relief results in some disturbance.	$D = 0.7$ Good blasting $D = 1.0$ Poor blasting
	Very large open pit mine slopes suffer significant disturbance due to heavy production blasting and also due to stress relief from overburden removal. In some softer rocks excavation can be carried out by ripping and dozing and the degree of damage to the slopes is less.	$D = 1.0$ Production blasting $D = 0.7$ Mechanical excavation

Parameter Tables from: GSI: A Geologically Friendly Tool for Rock Mass Strength Estimation. Paul Marinos and Evert Hoek, 2000

Based on 5' of overburden

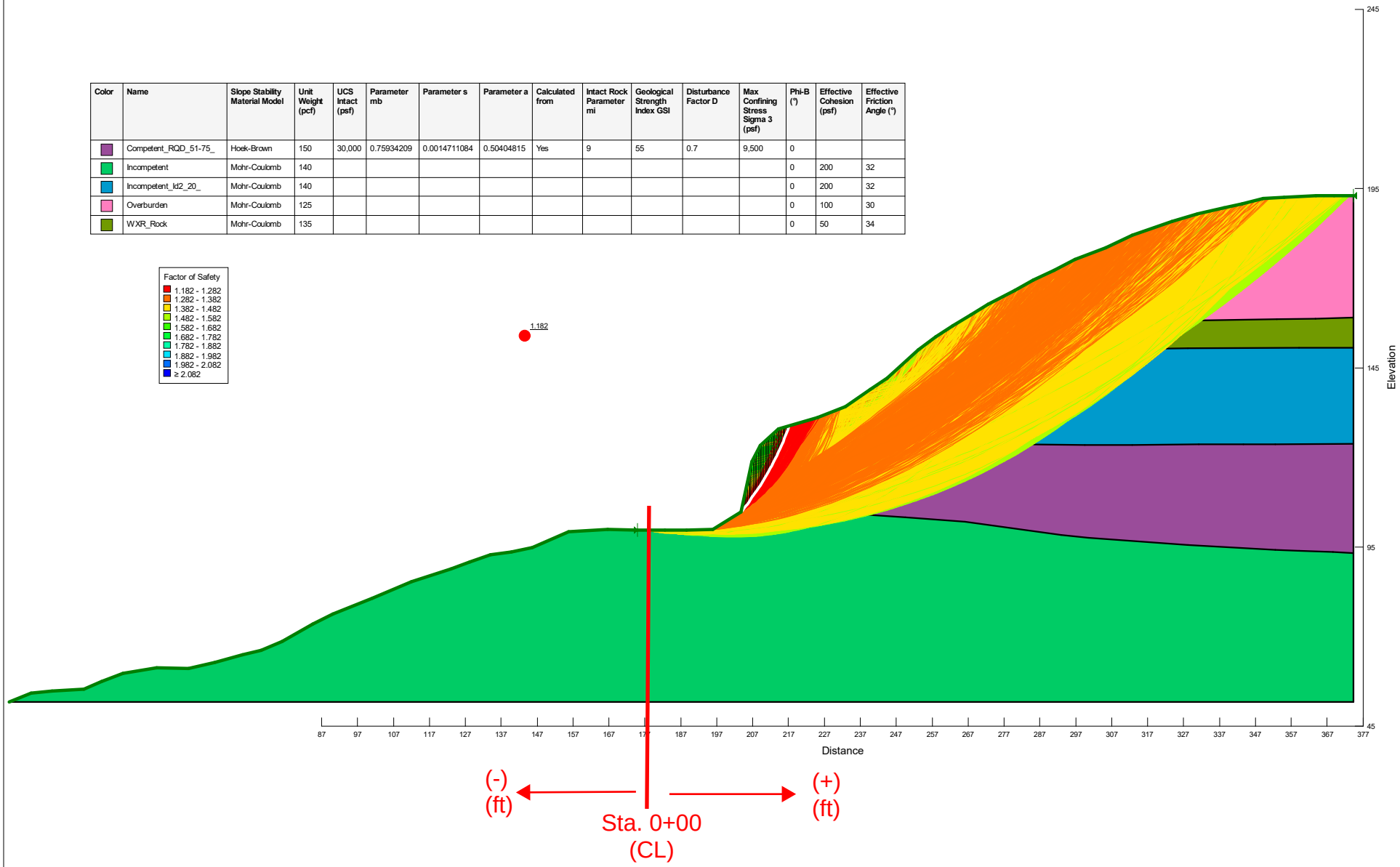
From Soil Design Parameters Table

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	UCS Intact (psf)	Parameter mb	Parameter s	Parameter a	Calculated from	Intact Rock Parameter mi	Geological Strength Index GSI	Disturbance Factor D	Max Confining Stress Sigma 3 (psf)	Phi-B (°)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Competent_RQD_51-75_	Hoek-Brown	150	30,000	0.75934209	0.0014711084	0.50404815	Yes	9	55	0.7	9,500	0		
	Incompetent	Mohr-Coulomb	140										0	200	32
	Incompetent_Id2_20_	Mohr-Coulomb	140										0	200	32
	Overburden	Mohr-Coulomb	125										0	100	30
	WXR_Rock	Mohr-Coulomb	135										0	50	34

Existing 2D Slope Stability at Critical Section
ATH - 13

By: WNB 12/10/2024
Chk: DSC 12/30/2024

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	UCS Intact (psf)	Parameter mb	Parameter s	Parameter a	Calculated from	Intact Rock Parameter mi	Geological Strength Index GSI	Disturbance Factor D	Max Confining Stress Sigma 3 (psf)	Phi-B (°)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Competent_RQD_51-75_	Hoek-Brown	150	30,000	0.75934209	0.0014711084	0.50404815	Yes	9	55	0.7	9,500	0		
	Incompetent	Mohr-Coulomb	140										0	200	32
	Incompetent_ld2_20_	Mohr-Coulomb	140										0	200	32
	Overburden	Mohr-Coulomb	125										0	100	30
	WXR_Rock	Mohr-Coulomb	135										0	50	34



Existing (Longer)

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File Information

File Version: 11.07
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Created By: Brandenberger, Will
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Revision Number: 39
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Directory: O:\Transportation_Geotech_Projects\Ohio\Athens Rockfall\Calculations and Checks\Slope Stability and UA Slope\
Last Solved Date: 12/10/2024
Last Solved Time: 07:14:33 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Existing (Longer)

Kind: SLOPE/W
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Half-Sine
- PWP Conditions from: (none)
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Cuckoo
- Critical slip surfaces saved: 25
- Optimize Critical Slip Surface Location: No
- Cuckoo Search
  - No. of Iterations: 100
  - No. of Nests: 30
  - No. of Trials: 3,000
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 3 ft
  - Minimum Slip Surface Volume: 35.314667 ft³
  - Number of Columns: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Under-Relaxation Criteria
  - Initial Rate: 1
  - Minimum Rate: 0.1
  - Rate Reduction Factor: 0.65
  - Reduction Frequency (iterations): 50
- Solution Settings
  - Search Method: Root Finder
  - Tolerable difference between starting and converged F of S: 3
  - Maximum iterations to calculate converged lambda: 20
  - Max Absolute Lambda: 2

Materials

Competent_RQD_51-75_

Slope Stability Material Model: Hoek-Brown
Unit Weight: 150 pcf
UCS Intact: 30,000 psf
Parameter mb: 0.75934209
Parameter s: 0.0014711084
Parameter a: 0.50404815

Calculated from: Yes
Intact Rock Parameter mi: 9
Geological Strength Index GSI: 55
Disturbance Factor D: 0.7
Max Confining Stress Sigma 3: 9,500 psf
Phi-B: 0 °

Incompetent

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 140 pcf
Effective Cohesion: 200 psf
Effective Friction Angle: 32 °
Phi-B: 0 °

Incompetent_Id2_20_

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 140 pcf
Effective Cohesion: 200 psf
Effective Friction Angle: 32 °
Phi-B: 0 °

Overburden

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 100 psf
Effective Friction Angle: 30 °
Phi-B: 0 °

WXR_Rock

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 135 pcf
Effective Cohesion: 50 psf
Effective Friction Angle: 34 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (175, 99.724816) ft
Right Coordinate: (374.27839, 193.13068) ft

Geometry

Name: 2D Geometry (3)

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	203.71872 ft	104.73234 ft
Point 2	206.87953 ft	118.8764 ft
Point 3	209.1084 ft	123.41007 ft
Point 4	219.66051 ft	123.47958 ft
Point 5	250.60793 ft	123.62374 ft
Point 6	281.50888 ft	123.65826 ft
Point 7	299.58266 ft	123.52716 ft
Point 8	312.66221 ft	123.46704 ft
Point 9	331.1675 ft	123.58457 ft
Point 10	343.59985 ft	123.69664 ft
Point 11	352.55273 ft	123.71163 ft
Point 12	374.27839 ft	123.77858 ft
Point 13	374.27839 ft	93.33251 ft
Point 14	368.64891 ft	93.55724 ft
Point 15	359.14124 ft	93.99637 ft
Point 16	352.54025 ft	94.25781 ft
Point 17	328.20058 ft	95.55166 ft
Point 18	300.49617 ft	97.58059 ft
Point 19	292.93699 ft	98.43581 ft
Point 20	266.185 ft	102.11578 ft
Point 21	249.61195 ft	103.23403 ft
Point 22	238.90322 ft	104.04401 ft
Point 23	219.4663 ft	104.47612 ft
Point 24	0 ft	51.8623 ft

Point 25	6.17851 ft	54.19307 ft
Point 26	11.99085 ft	54.78968 ft
Point 27	20.76585 ft	55.30162 ft
Point 28	25.76416 ft	57.50267 ft
Point 29	31.71371 ft	59.6988 ft
Point 30	41.05255 ft	61.32015 ft
Point 31	49.96015 ft	61.18716 ft
Point 32	57.25873 ft	62.8712 ft
Point 33	64.98817 ft	64.94522 ft
Point 34	70.11426 ft	66.27275 ft
Point 35	75.9266 ft	68.7069 ft
Point 36	84.60017 ft	73.50303 ft
Point 37	90.10232 ft	76.35326 ft
Point 38	101.05018 ft	80.72746 ft
Point 39	111.99805 ft	85.36537 ft
Point 40	122.94591 ft	88.81162 ft
Point 41	128.23767 ft	90.85854 ft
Point 42	134.05002 ft	92.80891 ft
Point 43	139.86236 ft	93.62777 ft
Point 44	145.6747 ft	94.9118 ft
Point 45	155.7895 ft	99.33864 ft
Point 46	166.73736 ft	99.858 ft
Point 47	174.7364 ft	99.72488 ft
Point 48	182.66019 ft	99.72296 ft
Point 49	188.63309 ft	99.70217 ft
Point 50	195.93167 ft	99.84531 ft
Point 51	374.27839 ft	51.8623 ft
Point 52	214.17811 ft	127.90739 ft
Point 53	225.12597 ft	131.17503 ft
Point 54	232.85982 ft	134.20176 ft
Point 55	239.72312 ft	138.95737 ft
Point 56	244.4845 ft	142.13304 ft
Point 57	253.10378 ft	150.07634 ft
Point 58	266.0559 ft	150.25398 ft
Point 59	296.47798 ft	150.07835 ft
Point 60	328.15765 ft	150.39927 ft
Point 61	359.07054 ft	150.56342 ft
Point 62	374.27839 ft	150.57924 ft
Point 63	262.69523 ft	156.67117 ft
Point 64	267.73387 ft	159.75593 ft
Point 65	272.56671 ft	162.77003 ft
Point 66	279.86529 ft	166.48749 ft
Point 67	285.17089 ft	169.40285 ft
Point 68	290.98323 ft	172.22681 ft
Point 69	296.79557 ft	175.24248 ft
Point 70	305.4103 ft	178.56314 ft
Point 71	312.70888 ft	182.04052 ft
Point 72	323.65674 ft	185.93106 ft
Point 73	330.95532 ft	188.07641 ft
Point 74	338.25389 ft	189.7268 ft
Point 75	343.2943 ft	190.78733 ft
Point 76	349.10664 ft	192.22369 ft
Point 77	354.91899 ft	192.53563 ft
Point 78	363.79891 ft	193.12601 ft
Point 79	368.97422 ft	193.05569 ft
Point 80	374.27839 ft	193.13068 ft
Point 81	374.27839 ft	158.98553 ft
Point 82	363.76069 ft	158.78309 ft
Point 83	352.93817 ft	158.61162 ft
Point 84	332.82643 ft	158.22809 ft
Point 85	301.39852 ft	157.77479 ft
Point 86	270.65997 ft	156.88454 ft
Point 87	257.96956 ft	153.70988 ft

Regions

	Material	Points	Area
Region 1	Competent_RQD_51-75_	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23	4,105.4 ft²
Region 2	Incompetent	24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,1,23,22,21,20,19,18,17,16,15,14,13,51	13,698 ft²

Region 3	Incompetent_Id2_20_	3,52,53,54,55,56,57,58,59,60,61,62,12,11,10,9,8,7,6,5,4	3,747 ft²
Region 4	Overburden	63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86	2,570.5 ft²
Region 5	WXR_Rock	57,87,63,86,85,84,83,82,81,62,61,60,59,58	883.08 ft²

Slip Results

Slip Surfaces Analysed: 2677 of 3000 converged

Current Slip Surface

Slip Surface: 1,333
Factor of Safety: E994
Volume: 200.70122 ft³
Weight: 28,699.34 lbf
Slip Rank: 2,679 of 3,000 slip surfaces
Exit: (253.3019, 150.22428) ft
Entry: (205.98384, 114.86833) ft
Radius: 143.86818 ft
Center: (145.36284, 245.34112) ft

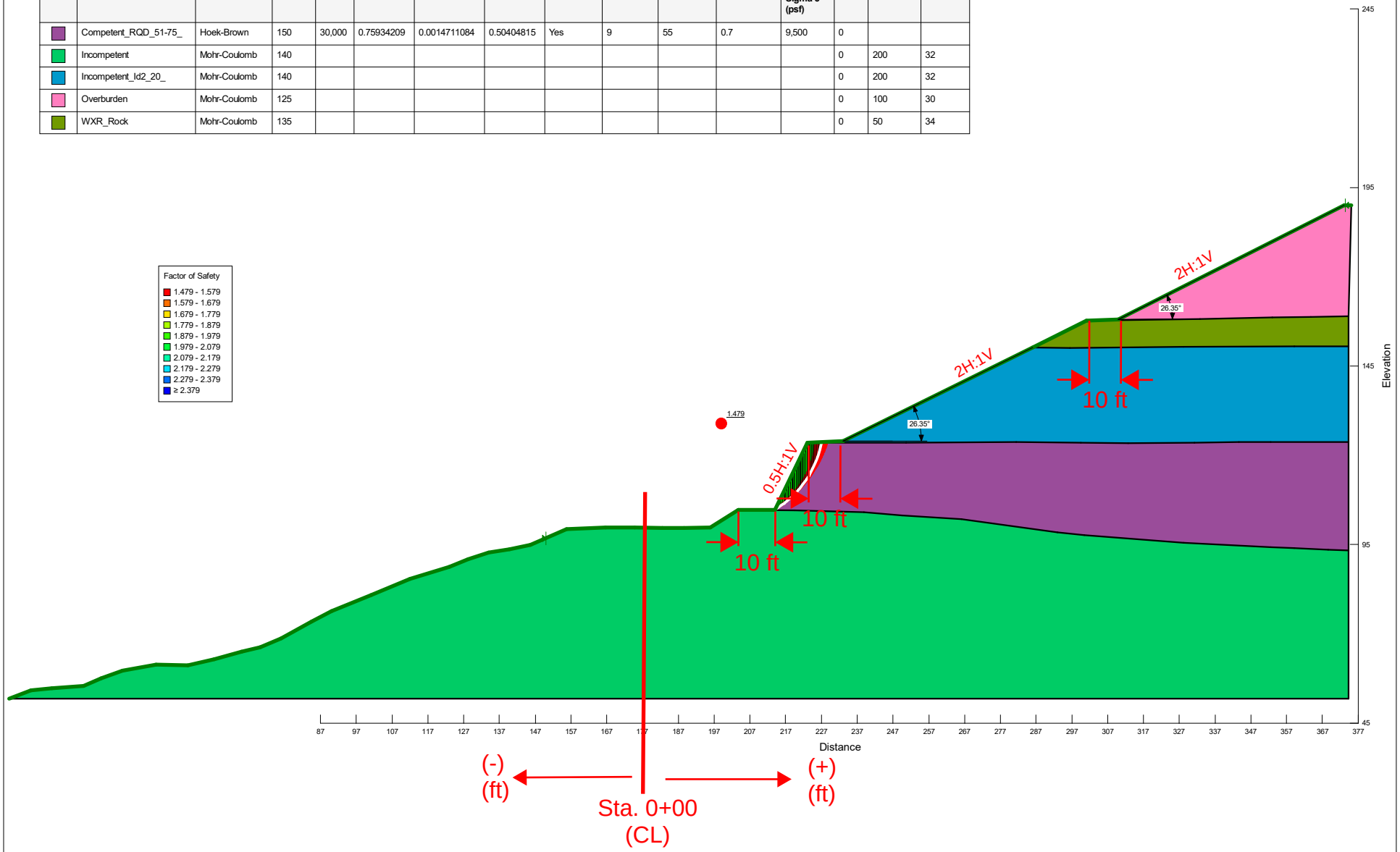
Slip Columns

	X	Y	PWP	Column Base Material
Column 1	253.23704 ft	150.15078 ft	0 psf	WXR_Rock
Column 2	253.13798 ft	150.03860 ft	0 psf	Incompetent_Id2_20_
Column 3	252.24185 ft	149.04329 ft	0 psf	Incompetent_Id2_20_
Column 4	250.51800 ft	147.16347 ft	0 psf	Incompetent_Id2_20_
Column 5	248.79414 ft	145.34872 ft	0 psf	Incompetent_Id2_20_
Column 6	247.07028 ft	143.59554 ft	0 psf	Incompetent_Id2_20_
Column 7	245.34643 ft	141.90081 ft	0 psf	Incompetent_Id2_20_
Column 8	243.69094 ft	140.32466 ft	0 psf	Incompetent_Id2_20_
Column 9	242.10381 ft	138.86066 ft	0 psf	Incompetent_Id2_20_
Column 10	240.51668 ft	137.43987 ft	0 psf	Incompetent_Id2_20_
Column 11	238.86521 ft	136.00638 ft	0 psf	Incompetent_Id2_20_
Column 12	237.14938 ft	134.56187 ft	0 psf	Incompetent_Id2_20_
Column 13	235.43356 ft	133.16221 ft	0 psf	Incompetent_Id2_20_
Column 14	233.71773 ft	131.80573 ft	0 psf	Incompetent_Id2_20_
Column 15	232.08643 ft	130.55379 ft	0 psf	Incompetent_Id2_20_
Column 16	230.53967 ft	129.40131 ft	0 psf	Incompetent_Id2_20_
Column 17	228.99290 ft	128.28061 ft	0 psf	Incompetent_Id2_20_
Column 18	227.44612 ft	127.19079 ft	0 psf	Incompetent_Id2_20_
Column 19	225.89936 ft	126.13101 ft	0 psf	Incompetent_Id2_20_
Column 20	224.30701 ft	125.07096 ft	0 psf	Incompetent_Id2_20_
Column 21	222.66908 ft	124.01159 ft	0 psf	Incompetent_Id2_20_
Column 22	220.75531 ft	122.81612 ft	0 psf	Competent_RQD_51-75_
Column 23	218.74678 ft	121.60058 ft	0 psf	Competent_RQD_51-75_
Column 24	216.91931 ft	120.53481 ft	0 psf	Competent_RQD_51-75_
Column 25	215.09184 ft	119.50461 ft	0 psf	Competent_RQD_51-75_
Column 26	213.33316 ft	118.54534 ft	0 psf	Competent_RQD_51-75_
Column 27	211.64326 ft	117.65379 ft	0 psf	Competent_RQD_51-75_
Column 28	209.95335 ft	116.79064 ft	0 psf	Competent_RQD_51-75_
Column 29	207.99397 ft	115.82717 ft	0 psf	Competent_RQD_51-75_
Column 30	206.43168 ft	115.07829 ft	0 psf	Competent_RQD_51-75_

Proposed 2D Slope Stability at Critical Section
ATH - 13

By: WNB 12/10/2024
Chk: DSC 12/30/2024

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	UCS Intact (psf)	Parameter mb	Parameter s	Parameter a	Calculated from	Intact Rock Parameter mi	Geological Strength Index GSI	Disturbance Factor D	Max Confining Stress Sigma 3 (psf)	Phi-B (°)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Competent_RQD_51-75_	Hoek-Brown	150	30,000	0.75934209	0.0014711084	0.50404815	Yes	9	55	0.7	9,500	0		
	Incompetent	Mohr-Coulomb	140										0	200	32
	Incompetent_ld2_20_	Mohr-Coulomb	140										0	200	32
	Overburden	Mohr-Coulomb	125										0	100	30
	WXR_Rock	Mohr-Coulomb	135										0	50	34



Proposed (Longer 2:1)

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File Information

File Version: 11.07
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Created By: Brandenberger, Will
Last Edited By: Brandenberger, Will
Revision Number: 45
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File Name: Section 100 - Slope Stability _.gsz
Directory: O:\Transportation_Geotech_Projects\Ohio\Athens Rockfall\Calculations and Checks\Slope Stability and UA Slope\
Last Solved Date: 01/06/2025
Last Solved Time: 01:58:23 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Proposed (Longer 2:1)

Kind: SLOPE/W
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Half-Sine
- PWP Conditions from: (none)
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Cuckoo
- Critical slip surfaces saved: 25
- Optimize Critical Slip Surface Location: No
- Cuckoo Search
  - No. of Iterations: 100
  - No. of Nests: 30
  - No. of Trials: 3,000
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 3 ft
  - Minimum Slip Surface Volume: 35.314667 ft³
  - Number of Columns: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Under-Relaxation Criteria
  - Initial Rate: 1
  - Minimum Rate: 0.1
  - Rate Reduction Factor: 0.65
  - Reduction Frequency (iterations): 50
- Solution Settings
  - Search Method: Root Finder
  - Tolerable difference between starting and converged F of S: 3
  - Maximum iterations to calculate converged lambda: 20
  - Max Absolute Lambda: 2

Materials

Competent_RQD_51-75_

Slope Stability Material Model: Hoek-Brown
Unit Weight: 150 pcf
UCS Intact: 30,000 psf
Parameter mb: 0.75934209
Parameter s: 0.0014711084
Parameter a: 0.50404815

Calculated from: Yes
Intact Rock Parameter mi: 9
Geological Strength Index GSI: 55
Disturbance Factor D: 0.7
Max Confining Stress Sigma 3: 9,500 psf
Phi-B: 0 °

Incompetent

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 140 pcf
Effective Cohesion: 200 psf
Effective Friction Angle: 32 °
Phi-B: 0 °

Incompetent_Id2_20_

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 140 pcf
Effective Cohesion: 200 psf
Effective Friction Angle: 32 °
Phi-B: 0 °

Overburden

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 100 psf
Effective Friction Angle: 30 °
Phi-B: 0 °

WXR_Rock

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 135 pcf
Effective Cohesion: 50 psf
Effective Friction Angle: 34 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (150, 96.804809) ft
Right Coordinate: (373.3663, 189.9952) ft

Geometry

Name: 2D Geometry (4)

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	203.71872 ft	104.73234 ft
Point 2	223.00037 ft	123.47958 ft
Point 3	250.60793 ft	123.62374 ft
Point 4	281.50888 ft	123.65826 ft
Point 5	299.58266 ft	123.52716 ft
Point 6	312.66221 ft	123.46704 ft
Point 7	331.1675 ft	123.58457 ft
Point 8	343.59985 ft	123.69664 ft
Point 9	352.55273 ft	123.71163 ft
Point 10	374.27839 ft	123.77858 ft
Point 11	374.27839 ft	93.33251 ft
Point 12	368.64891 ft	93.55724 ft
Point 13	359.14124 ft	93.99637 ft
Point 14	352.54025 ft	94.25781 ft
Point 15	328.20058 ft	95.55166 ft
Point 16	300.49617 ft	97.58059 ft
Point 17	292.93699 ft	98.43581 ft
Point 18	266.185 ft	102.11578 ft
Point 19	249.61195 ft	103.23403 ft
Point 20	238.90322 ft	104.04401 ft
Point 21	219.4663 ft	104.47612 ft
Point 22	0 ft	51.8623 ft
Point 23	6.17851 ft	54.19307 ft
Point 24	11.99085 ft	54.78968 ft

Point 25	20.76585 ft	55.30162 ft
Point 26	25.76416 ft	57.50267 ft
Point 27	31.71371 ft	59.6988 ft
Point 28	41.05255 ft	61.32015 ft
Point 29	49.96015 ft	61.18716 ft
Point 30	57.25873 ft	62.8712 ft
Point 31	64.98817 ft	64.94522 ft
Point 32	70.11426 ft	66.27275 ft
Point 33	75.9266 ft	68.7069 ft
Point 34	84.60017 ft	73.50303 ft
Point 35	90.10232 ft	76.35326 ft
Point 36	101.05018 ft	80.72746 ft
Point 37	111.99805 ft	85.36537 ft
Point 38	122.94591 ft	88.81162 ft
Point 39	128.23767 ft	90.85854 ft
Point 40	134.05002 ft	92.80891 ft
Point 41	139.86236 ft	93.62777 ft
Point 42	145.6747 ft	94.9118 ft
Point 43	155.7895 ft	99.33864 ft
Point 44	166.73736 ft	99.858 ft
Point 45	174.7364 ft	99.72488 ft
Point 46	182.66019 ft	99.72296 ft
Point 47	188.63309 ft	99.70217 ft
Point 48	195.93167 ft	99.84531 ft
Point 49	374.27839 ft	51.8623 ft
Point 50	286.01163 ft	150.25398 ft
Point 51	296.47798 ft	150.07835 ft
Point 52	328.15765 ft	150.39927 ft
Point 53	359.07054 ft	150.56342 ft
Point 54	374.27839 ft	150.57924 ft
Point 55	309.99998 ft	158 ft
Point 56	373.01276 ft	189.99525 ft
Point 57	375.00085 ft	189.99499 ft
Point 58	374.27839 ft	158.98553 ft
Point 59	363.76069 ft	158.78309 ft
Point 60	352.93817 ft	158.61162 ft
Point 61	332.82643 ft	158.22809 ft
Point 62	300.99918 ft	157.77479 ft
Point 63	213.9993 ft	104.70085 ft
Point 64	233 ft	124 ft

Regions

	Material	Points	Area
Region 1	Competent_RQD_51-75_	1,63,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21	3,870.2 ft²
Region 2	Incompetent	22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,1,21,20,19,18,17,16,15,14,13,12,11,49	13,698 ft²
Region 3	Incompetent_ld2_20_	50,51,52,53,54,10,9,8,7,6,5,4,3,2,64	3,079.9 ft²
Region 4	Overburden	55,56,57,58,59,60,61,62	1,033.4 ft²
Region 5	WXR_Rock	62,61,60,59,58,54,53,52,51,50	638.86 ft²

Slip Results

Slip Surfaces Analysed: 2975 of 3000 converged

Current Slip Surface

Slip Surface: 1,265
Factor of Safety: 1.479
Volume: 74.237388 ft³
Weight: 11,131.868 lbf
Resisting Moment: 367,424.16 lbf·ft
Activating Moment: 248,324.12 lbf·ft
Resisting Force: 7,814.9007 lbf
Activating Force: 5,283.915 lbf
Slip Rank: 1 of 3,000 slip surfaces
Exit: (227.01523, 123.68853) ft
Entry: (214.00259, 104.70772) ft
Radius: 28.488602 ft

Center: (199.0138, 128.93449) ft

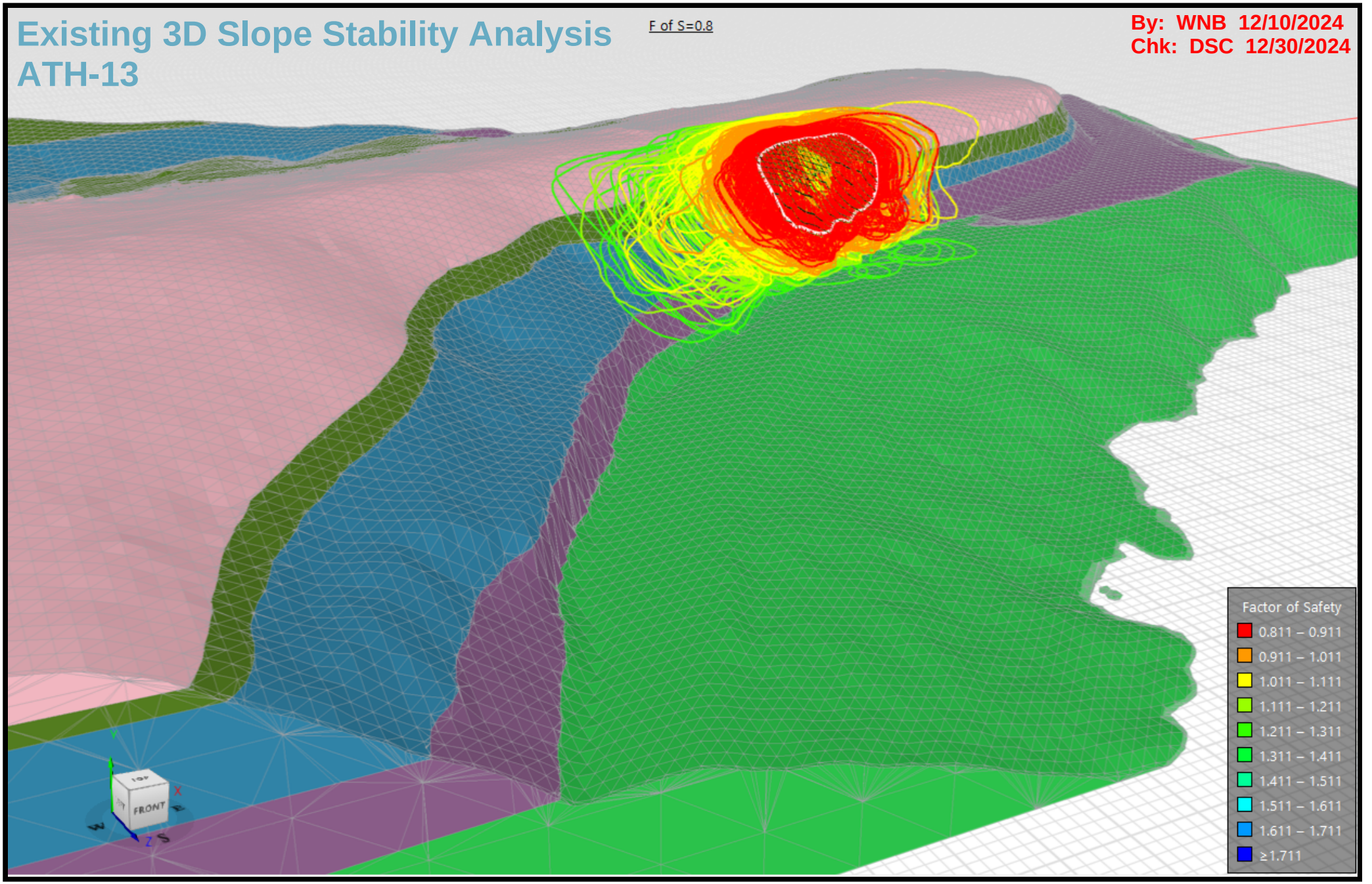
Slip Columns

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Column Base Material
Column 1	226.99728 ft	123.59444 ft	0 psf	-212.92087 psf	-133.04773 psf	200 psf	0 psf	Incompetent_Id2_20_
Column 2	226.75827 ft	122.54109 ft	0 psf	-32.971179 psf	-92.81507 psf	173.79117 psf	0 psf	Competent_RQD_51-75_
Column 3	226.31617 ft	120.83653 ft	0 psf	22.685064 psf	40.695843 psf	154.85735 psf	0 psf	Competent_RQD_51-75_
Column 4	225.87406 ft	119.46428 ft	0 psf	83.722099 psf	127.30823 psf	167.86917 psf	0 psf	Competent_RQD_51-75_
Column 5	225.43195 ft	118.28875 ft	0 psf	144.01381 psf	197.38349 psf	184.65375 psf	0 psf	Competent_RQD_51-75_
Column 6	224.98985 ft	117.24881 ft	0 psf	202.53037 psf	257.78246 psf	201.4571 psf	0 psf	Competent_RQD_51-75_
Column 7	224.54774 ft	116.31033 ft	0 psf	259.56868 psf	311.41181 psf	218.25927 psf	0 psf	Competent_RQD_51-75_
Column 8	224.10564 ft	115.45183 ft	0 psf	315.93235 psf	360.62436 psf	234.96561 psf	0 psf	Competent_RQD_51-75_
Column 9	223.66353 ft	114.65875 ft	0 psf	372.51815 psf	407.24503 psf	251.53709 psf	0 psf	Competent_RQD_51-75_
Column 10	223.22142 ft	113.92065 ft	0 psf	430.21336 psf	452.28522 psf	268.32626 psf	0 psf	Competent_RQD_51-75_
Column 11	222.78614 ft	113.23974 ft	0 psf	465.85749 psf	479.07907 psf	278.5918 psf	0 psf	Competent_RQD_51-75_
Column 12	222.35767 ft	112.60892 ft	0 psf	477.59499 psf	487.71728 psf	281.98186 psf	0 psf	Competent_RQD_51-75_
Column 13	221.92921 ft	112.01248 ft	0 psf	488.96696 psf	496.00915 psf	285.26421 psf	0 psf	Competent_RQD_51-75_
Column 14	221.50074 ft	111.44689 ft	0 psf	499.7859 psf	503.83241 psf	288.38146 psf	0 psf	Competent_RQD_51-75_
Column 15	221.07227 ft	110.90925 ft	0 psf	509.71853 psf	510.96296 psf	291.23576 psf	0 psf	Competent_RQD_51-75_
Column 16	220.64381 ft	110.39710 ft	0 psf	518.2876 psf	517.07781 psf	293.69037 psf	0 psf	Competent_RQD_51-75_
Column 17	220.21534 ft	109.90840 ft	0 psf	524.87216 psf	521.75497 psf	295.5705 psf	0 psf	Competent_RQD_51-75_
Column 18	219.78688 ft	109.44137 ft	0 psf	528.70935 psf	524.47247 psf	296.66342 psf	0 psf	Competent_RQD_51-75_
Column 19	219.35841 ft	108.99449 ft	0 psf	528.90119 psf	524.60818 psf	296.718 psf	0 psf	Competent_RQD_51-75_
Column 20	218.92995 ft	108.56643 ft	0 psf	524.43122 psf	521.44231 psf	295.44478 psf	0 psf	Competent_RQD_51-75_
Column 21	218.50148 ft	108.15603 ft	0 psf	514.19651 psf	514.16251 psf	292.5195 psf	0 psf	Competent_RQD_51-75_
Column 22	218.07302 ft	107.76225 ft	0 psf	497.06225 psf	501.86863 psf	287.59738 psf	0 psf	Competent_RQD_51-75_
Column 23	217.64455 ft	107.38419 ft	0 psf	471.946 psf	483.57042 psf	280.35032 psf	0 psf	Competent_RQD_51-75_
Column 24	217.21608 ft	107.02103 ft	0 psf	437.93891 psf	458.16983 psf	270.54377 psf	0 psf	Competent_RQD_51-75_
Column 25	216.78762 ft	106.67204 ft	0 psf	394.46643 psf	424.60912 psf	257.98094 psf	0 psf	Competent_RQD_51-75_
Column 26	216.35915 ft	106.33657 ft	0 psf	341.48749 psf	382.05513 psf	242.41228 psf	0 psf	Competent_RQD_51-75_
Column 27	215.93069 ft	106.01401 ft	0 psf	279.71342 psf	329.34394 psf	224.26805 psf	0 psf	Competent_RQD_51-75_
Column 28	215.50222 ft	105.70384 ft	0 psf	210.82539 psf	265.846 psf	203.90214 psf	0 psf	Competent_RQD_51-75_
Column 29	215.07376 ft	105.40555 ft	0 psf	137.63111 psf	190.43334 psf	182.81451 psf	0 psf	Competent_RQD_51-75_
Column 30	214.64529 ft	105.11871 ft	0 psf	64.210371 psf	101.55423 psf	163.36832 psf	0 psf	Competent_RQD_51-75_
Column 31	214.21683 ft	104.84291 ft	0 psf	-3.8636887 psf	-7.509808 psf	153.08684 psf	0 psf	Competent_RQD_51-75_

Existing 3D Slope Stability Analysis
ATH-13

F of S=0.8

By: WNB 12/10/2024
Chk: DSC 12/30/2024



SLOPE3D Analysis

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File Information

File Version: 11.07
Product Version: 24.2.1.28
Created By: Brandenberger, Will
Last Edited By: Brandenberger, Will
Revision Number: 32
Date: 12/10/2024
Time: 08:51:51 PM
File Name: Athens Rockfall.gsz
Directory: C:\Users\WBRANDENBE\Desktop\
Last Solved Date: 12/10/2024
Last Solved Time: 09:00:43 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

SLOPE3D Analysis

Kind: SLOPE3D
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Half-Sine
- PWP Conditions from: (none)
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Shape of slip surface: Ellipsoid
- Slip Surface Option: Cuckoo
- Critical slip surfaces saved: 5
- Optimize Critical Slip Surface Location: No
- Cuckoo Search
  - No. of Iterations: 100
  - No. of Nests: 30
  - No. of Trials: 3,000

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 3 ft
  - Minimum Slip Surface Volume: 10,000 ft^3
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Under-Relaxation Criteria
  - Initial Rate: 1
  - Minimum Rate: 0.1
  - Rate Reduction Factor: 0.65
  - Reduction Frequency (iterations): 50
- Solution Settings
  - Search Method: Root Finder
  - Tolerable difference between starting and converged F of S: 3
  - Maximum iterations to calculate converged lambda: 20

Max Absolute Lambda: 2

Materials

Overburden

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 100 psf
Effective Friction Angle: 30 °
Phi-B: 0 °

WXR Rock

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 135 pcf
Effective Cohesion: 50 psf
Effective Friction Angle: 34 °
Phi-B: 0 °

Incompetent (Id2 <20)

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 140 pcf
Effective Cohesion: 200 psf
Effective Friction Angle: 32 °
Phi-B: 0 °

Competent (RQD 51-75)

Slope Stability Material Model: Hoek-Brown
Unit Weight: 150 pcf
UCS Intact: 30,000 psf
Parameter mb: 0.75934209
Parameter s: 0.0014711084
Parameter a: 0.50404815
Calculated from: Yes
Intact Rock Parameter mi: 9
Geological Strength Index GSI: 55
Disturbance Factor D: 0.7
Max Confining Stress Sigma 3: 9,500 psf
Phi-B: 0 °

Incompetent

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 140 pcf
Effective Cohesion: 200 psf
Effective Friction Angle: 32 °
Phi-B: 0 °

3D Slip Surface Limits

Option: Specified Points on the Ground Surface
Polygon
- Coordinate: (15.581793, 627.0657) ft
  - X: 15.581793 ft
  - Z: 627.0657 ft
- Coordinate: (269.28768, 621.90835) ft
  - X: 269.28768 ft
  - Z: 621.90835 ft
- Coordinate: (313.43908, 551.72311) ft
  - X: 313.43908 ft
  - Z: 551.72311 ft

Coordinate: (372.72651, 471.72311) ft
X: 372.72651 ft
Z: 471.72311 ft
Coordinate: (453.32393, 389.28313) ft
X: 453.32393 ft
Z: 389.28313 ft
Coordinate: (554.28768, 330.74275) ft
X: 554.28768 ft
Z: 330.74275 ft
Coordinate: (684.28768, 284.51365) ft
X: 684.28768 ft
Z: 284.51365 ft
Coordinate: (629.28768, 186.72311) ft
X: 629.28768 ft
Z: 186.72311 ft
Coordinate: (574.28768, 200.33676) ft
X: 574.28768 ft
Z: 200.33676 ft
Coordinate: (429.28768, 238.77935) ft
X: 429.28768 ft
Z: 238.77935 ft
Coordinate: (333.39931, 270.64751) ft
X: 333.39931 ft
Z: 270.64751 ft
Coordinate: (259.28768, 328.19775) ft
X: 259.28768 ft
Z: 328.19775 ft
Coordinate: (198.54804, 371.67677) ft
X: 198.54804 ft
Z: 371.67677 ft
Coordinate: (129.28768, 445.77041) ft
X: 129.28768 ft
Z: 445.77041 ft
Coordinate: (76.368836, 519.35753) ft
X: 76.368836 ft
Z: 519.35753 ft

Geometry

Name: 3D Geometry

Settings

View: 3D

Slip Results

Slip Surfaces Analysed: 2712 of 3000 converged

Current Slip Surface

Slip Surface: 2,753
Factor of Safety: 1.3
Volume: 121,683.57 ft^3
Weight: 16,271,986 lbf
Resisting Moment: 1.3553916e+09 lbf·ft
Activating Moment: 1.0122157e+09 lbf·ft
Resisting Force: 9,889,782.6 lbf
Activating Force: 7,383,769.3 lbf
Sliding Direction: 509.790000 °

Total Active Columns: 809
Total Sliding Surface Area: 10,290.948 ft²
Projected Failure Surface Area: 7,281 ft²
Projected Failure Surface Centroid (X,Z): 3.8877e+05 ft, 2.143e+05 ft
Maximum Depth: 35.865735 ft
Ellipsoid Center Point (X,Y,Z): 517.850967 ft, 174.449384 ft, 296.553121 ft
Ellipsoid Aspect Ratio (Y,Z): 1, 0.61489
Eliipsoid Curvature (n Exponent): 2.0400597
Radii (rx,ry,rz): 123.52 ft, 123.52 ft, 75.954 ft
Order of Rotations: X, Y, Z
Rotation Angles: 0 °, 162.41 °, 0 °
Slip Rank: 632 of 3,000 slip surfaces

Slip Columns

	X	Y	Z	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Column Base Material
Column 1	466.500000 ft	108.242681 ft	229.500000 ft	0 psf	9.3406654 psf	5.3928357 psf	100 psf	0 psf	Overburden
Column 2	469.500000 ft	107.097961 ft	229.500000 ft	0 psf	84.048775 psf	48.525583 psf	100 psf	0 psf	Overburden
Column 3	472.500000 ft	106.125079 ft	229.500000 ft	0 psf	135.09076 psf	77.994688 psf	100 psf	0 psf	Overburden
Column 4	475.500000 ft	105.316803 ft	229.500000 ft	0 psf	174.15057 psf	100.54588 psf	100 psf	0 psf	Overburden
Column 5	478.500000 ft	104.667438 ft	229.500000 ft	0 psf	205.3177 psf	118.54023 psf	100 psf	0 psf	Overburden
Column 6	481.500000 ft	104.172601 ft	229.500000 ft	0 psf	231.77574 psf	133.81579 psf	100 psf	0 psf	Overburden
Column 7	484.500000 ft	103.829066 ft	229.500000 ft	0 psf	238.30123 psf	137.58328 psf	100 psf	0 psf	Overburden
Column 8	487.500000 ft	103.634652 ft	229.500000 ft	0 psf	240.0213 psf	138.57636 psf	100 psf	0 psf	Overburden
Column 9	490.500000 ft	103.588153 ft	229.500000 ft	0 psf	224.16016 psf	129.41893 psf	100 psf	0 psf	Overburden
Column 10	493.500000 ft	103.689300 ft	229.500000 ft	0 psf	194.46886 psf	112.27665 psf	100 psf	0 psf	Overburden
Column 11	496.500000 ft	103.938748 ft	229.500000 ft	0 psf	147.0116 psf	84.877188 psf	100 psf	0 psf	Overburden
Column 12	499.500000 ft	104.338101 ft	229.500000 ft	0 psf	88.836507 psf	51.289781 psf	100 psf	0 psf	Overburden
Column 13	502.500000 ft	104.889962 ft	229.500000 ft	0 psf	22.193725 psf	12.813553 psf	100 psf	0 psf	Overburden
Column 14	505.500000 ft	105.598018 ft	229.500000 ft	0 psf	-52.78262 psf	-30.47406 psf	100 psf	0 psf	Overburden
Column 15	454.500000 ft	108.401829 ft	232.500000 ft	0 psf	3.6333775 psf	2.0977315 psf	100 psf	0 psf	Overburden
Column 16	457.500000 ft	106.569045 ft	232.500000 ft	0 psf	125.96032 psf	72.723227 psf	100 psf	0 psf	Overburden
Column 17	460.500000 ft	104.934374 ft	232.500000 ft	0 psf	234.7385 psf	135.52634 psf	100 psf	0 psf	Overburden
Column 18	463.500000 ft	103.484151 ft	232.500000 ft	0 psf	334.39182 psf	193.06121 psf	100 psf	0 psf	Overburden
Column 19	466.500000 ft	102.207291 ft	232.500000 ft	0 psf	403.82496 psf	233.14845 psf	100 psf	0 psf	Overburden
Column 20	469.500000 ft	101.094767 ft	232.500000 ft	0 psf	472.19208 psf	272.62022 psf	100 psf	0 psf	Overburden
Column 21	472.500000 ft	100.139221 ft	232.500000 ft	0 psf	516.48249 psf	298.1913 psf	100 psf	0 psf	Overburden

Column 22	475.500000 ft	99.334685 ft	232.500000 ft	0 psf	551.88884 psf	318.63317 psf	100 psf	0 psf	Overburden
Column 23	478.500000 ft	98.676372 ft	232.500000 ft	0 psf	583.45499 psf	336.8579 psf	100 psf	0 psf	Overburden
Column 24	481.500000 ft	98.160519 ft	232.500000 ft	0 psf	601.48359 psf	347.26671 psf	100 psf	0 psf	Overburden
Column 25	484.500000 ft	97.784271 ft	232.500000 ft	0 psf	608.2979 psf	351.20096 psf	100 psf	0 psf	Overburden
Column 26	487.500000 ft	97.545600 ft	232.500000 ft	0 psf	605.05053 psf	349.32609 psf	100 psf	0 psf	Overburden
Column 27	490.500000 ft	97.443248 ft	232.500000 ft	0 psf	589.26239 psf	340.2108 psf	100 psf	0 psf	Overburden
Column 28	493.500000 ft	97.476692 ft	232.500000 ft	0 psf	563.77896 psf	325.49793 psf	100 psf	0 psf	Overburden
Column 29	496.500000 ft	97.646130 ft	232.500000 ft	0 psf	524.22402 psf	302.66088 psf	100 psf	0 psf	Overburden
Column 30	499.500000 ft	97.952485 ft	232.500000 ft	0 psf	471.97454 psf	272.49463 psf	100 psf	0 psf	Overburden
Column 31	502.500000 ft	98.397431 ft	232.500000 ft	0 psf	409.93387 psf	236.67543 psf	100 psf	0 psf	Overburden
Column 32	505.500000 ft	98.983439 ft	232.500000 ft	0 psf	335.13229 psf	193.48872 psf	100 psf	0 psf	Overburden
Column 33	508.500000 ft	99.713847 ft	232.500000 ft	0 psf	250.20008 psf	144.45308 psf	100 psf	0 psf	Overburden
Column 34	511.500000 ft	100.592959 ft	232.500000 ft	0 psf	150.55401 psf	86.9224 psf	100 psf	0 psf	Overburden
Column 35	514.500000 ft	101.626178 ft	232.500000 ft	0 psf	43.720887 psf	25.242266 psf	100 psf	0 psf	Overburden
Column 36	517.500000 ft	102.820194 ft	232.500000 ft	0 psf	-68.524931 psf	-39.562887 psf	100 psf	0 psf	Overburden
Column 37	445.500000 ft	109.436510 ft	235.500000 ft	0 psf	-25.442928 psf	-14.689481 psf	100 psf	0 psf	Overburden
Column 38	448.500000 ft	107.042595 ft	235.500000 ft	0 psf	127.67333 psf	73.712232 psf	100 psf	0 psf	Overburden
Column 39	451.500000 ft	104.880446 ft	235.500000 ft	0 psf	266.08579 psf	153.6247 psf	100 psf	0 psf	Overburden
Column 40	454.500000 ft	102.929071 ft	235.500000 ft	0 psf	377.49013 psf	217.94403 psf	100 psf	0 psf	Overburden
Column 41	457.500000 ft	101.171657 ft	235.500000 ft	0 psf	484.57343 psf	279.7686 psf	100 psf	0 psf	Overburden
Column 42	460.500000 ft	99.594570 ft	235.500000 ft	0 psf	583.47283 psf	336.86819 psf	100 psf	0 psf	Overburden
Column 43	463.500000 ft	98.186648 ft	235.500000 ft	0 psf	671.01837 psf	387.41264 psf	100 psf	0 psf	Overburden
Column 44	466.500000 ft	96.938699 ft	235.500000 ft	0 psf	726.78263 psf	419.60815 psf	100 psf	0 psf	Overburden
Column 45	469.500000 ft	95.843126 ft	235.500000 ft	0 psf	790.30465 psf	456.2826 psf	100 psf	0 psf	Overburden
Column 46	472.500000 ft	94.893659 ft	235.500000 ft	0 psf	829.74145 psf	479.05145 psf	100 psf	0 psf	Overburden
Column 47	475.500000 ft	94.085142 ft	235.500000 ft	0 psf	864.00472 psf	498.83336 psf	100 psf	0 psf	Overburden
Column 48	478.500000 ft	93.413378 ft	235.500000 ft	0 psf	890.49593 psf	514.12807 psf	100 psf	0 psf	Overburden
Column 49	481.500000 ft	92.875011 ft	235.500000 ft	0 psf	907.55399 psf	523.97654 psf	100 psf	0 psf	Overburden
Column 50	484.500000 ft	92.467435 ft	235.500000 ft	0 psf	909.75635 psf	525.24807 psf	100 psf	0 psf	Overburden

Column 51	487.500000 ft	92.188726 ft	235.500000 ft	0 psf	906.72217 psf	523.49629 psf	100 psf	0 psf	Overburden
Column 52	490.500000 ft	92.037597 ft	235.500000 ft	0 psf	894.6104 psf	516.50356 psf	100 psf	0 psf	Overburden
Column 53	493.500000 ft	92.013367 ft	235.500000 ft	0 psf	870.04314 psf	502.31964 psf	100 psf	0 psf	Overburden
Column 54	496.500000 ft	92.115944 ft	235.500000 ft	0 psf	837.82337 psf	483.71755 psf	100 psf	0 psf	Overburden
Column 55	499.500000 ft	92.345822 ft	235.500000 ft	0 psf	789.52564 psf	455.83284 psf	100 psf	0 psf	Overburden
Column 56	502.500000 ft	92.704095 ft	235.500000 ft	0 psf	732.46716 psf	422.89011 psf	100 psf	0 psf	Overburden
Column 57	505.500000 ft	93.192480 ft	235.500000 ft	0 psf	664.43204 psf	383.61002 psf	100 psf	0 psf	Overburden
Column 58	508.500000 ft	93.813361 ft	235.500000 ft	0 psf	600.44325 psf	346.66607 psf	100 psf	0 psf	Overburden
Column 59	511.500000 ft	94.569845 ft	235.500000 ft	0 psf	506.04247 psf	292.16376 psf	100 psf	0 psf	Overburden
Column 60	514.500000 ft	95.465849 ft	235.500000 ft	0 psf	402.08228 psf	232.14231 psf	100 psf	0 psf	Overburden
Column 61	517.500000 ft	96.506201 ft	235.500000 ft	0 psf	291.02685 psf	168.02443 psf	100 psf	0 psf	Overburden
Column 62	520.500000 ft	97.696790 ft	235.500000 ft	0 psf	167.13638 psf	96.496234 psf	100 psf	0 psf	Overburden
Column 63	523.500000 ft	99.044751 ft	235.500000 ft	0 psf	27.670594 psf	15.975625 psf	100 psf	0 psf	Overburden
Column 64	526.500000 ft	100.558715 ft	235.500000 ft	0 psf	-108.19564 psf	-62.466784 psf	100 psf	0 psf	Overburden
Column 65	439.500000 ft	109.703055 ft	238.500000 ft	0 psf	-29.290457 psf	-16.910853 psf	100 psf	0 psf	Overburden
Column 66	442.500000 ft	106.924200 ft	238.500000 ft	0 psf	160.13992 psf	92.456823 psf	100 psf	0 psf	Overburden
Column 67	445.500000 ft	104.403696 ft	238.500000 ft	0 psf	316.69427 psf	182.84352 psf	100 psf	0 psf	Overburden
Column 68	448.500000 ft	102.114566 ft	238.500000 ft	0 psf	456.31735 psf	263.45494 psf	100 psf	0 psf	Overburden
Column 69	451.500000 ft	100.035485 ft	238.500000 ft	0 psf	583.85395 psf	337.08823 psf	100 psf	0 psf	Overburden
Column 70	454.500000 ft	98.149313 ft	238.500000 ft	0 psf	682.7018 psf	394.15807 psf	100 psf	0 psf	Overburden
Column 71	457.500000 ft	96.442083 ft	238.500000 ft	0 psf	783.56415 psf	452.39097 psf	100 psf	0 psf	Overburden
Column 72	460.500000 ft	94.902301 ft	238.500000 ft	0 psf	869.32596 psf	501.90557 psf	100 psf	0 psf	Overburden
Column 73	463.500000 ft	93.520436 ft	238.500000 ft	0 psf	950.74069 psf	548.91039 psf	100 psf	0 psf	Overburden
Column 74	466.500000 ft	92.288545 ft	238.500000 ft	0 psf	999.55138 psf	577.09126 psf	100 psf	0 psf	Overburden
Column 75	469.500000 ft	91.199996 ft	238.500000 ft	0 psf	1,058.8558 psf	611.33068 psf	100 psf	0 psf	Overburden
Column 76	472.500000 ft	90.249251 ft	238.500000 ft	0 psf	1,097.1845 psf	633.45979 psf	100 psf	0 psf	Overburden
Column 77	475.500000 ft	89.431713 ft	238.500000 ft	0 psf	1,111.6761 psf	749.83503 psf	50 psf	0 psf	WXR Rock
Column 78	478.500000 ft	88.743590 ft	238.500000 ft	0 psf	1,139.2832 psf	768.45623 psf	50 psf	0 psf	WXR Rock
Column 79	481.500000 ft	88.181809 ft	238.500000 ft	0 psf	1,153.0388 psf	777.7345 psf	50 psf	0 psf	WXR Rock

Column 80	484.500000 ft	87.743936 ft	238.500000 ft	0 psf	1,162.5194 psf	784.12925 psf	50 psf	0 psf	WXR Rock
Column 81	487.500000 ft	87.428119 ft	238.500000 ft	0 psf	1,162.0833 psf	783.83509 psf	50 psf	0 psf	WXR Rock
Column 82	490.500000 ft	87.233056 ft	238.500000 ft	0 psf	1,146.3359 psf	773.2133 psf	50 psf	0 psf	WXR Rock
Column 83	493.500000 ft	87.157955 ft	238.500000 ft	0 psf	1,126.0427 psf	759.52538 psf	50 psf	0 psf	WXR Rock
Column 84	496.500000 ft	87.202527 ft	238.500000 ft	0 psf	1,097.5036 psf	740.27549 psf	50 psf	0 psf	WXR Rock
Column 85	499.500000 ft	87.366976 ft	238.500000 ft	0 psf	1,045.3459 psf	705.0947 psf	50 psf	0 psf	WXR Rock
Column 86	502.500000 ft	87.652002 ft	238.500000 ft	0 psf	992.48312 psf	669.43832 psf	50 psf	0 psf	WXR Rock
Column 87	505.500000 ft	88.058817 ft	238.500000 ft	0 psf	928.64443 psf	626.37857 psf	50 psf	0 psf	WXR Rock
Column 88	508.500000 ft	88.589172 ft	238.500000 ft	0 psf	887.21779 psf	512.23543 psf	100 psf	0 psf	Overburden
Column 89	511.500000 ft	89.245391 ft	238.500000 ft	0 psf	796.15868 psf	459.66243 psf	100 psf	0 psf	Overburden
Column 90	514.500000 ft	90.030429 ft	238.500000 ft	0 psf	702.62096 psf	405.6584 psf	100 psf	0 psf	Overburden
Column 91	517.500000 ft	90.947936 ft	238.500000 ft	0 psf	599.68202 psf	346.22658 psf	100 psf	0 psf	Overburden
Column 92	520.500000 ft	92.002355 ft	238.500000 ft	0 psf	483.54156 psf	279.17285 psf	100 psf	0 psf	Overburden
Column 93	523.500000 ft	93.199032 ft	238.500000 ft	0 psf	346.4942 psf	200.04852 psf	100 psf	0 psf	Overburden
Column 94	526.500000 ft	94.544378 ft	238.500000 ft	0 psf	209.71126 psf	121.07685 psf	100 psf	0 psf	Overburden
Column 95	529.500000 ft	96.046064 ft	238.500000 ft	0 psf	53.027426 psf	30.615399 psf	100 psf	0 psf	Overburden
Column 96	532.500000 ft	97.713286 ft	238.500000 ft	0 psf	-95.875519 psf	-55.353757 psf	100 psf	0 psf	Overburden
Column 97	436.500000 ft	108.035187 ft	241.500000 ft	0 psf	90.662068 psf	52.343769 psf	100 psf	0 psf	Overburden
Column 98	439.500000 ft	105.109290 ft	241.500000 ft	0 psf	292.55 psf	168.90382 psf	100 psf	0 psf	Overburden
Column 99	442.500000 ft	102.446202 ft	241.500000 ft	0 psf	456.42698 psf	263.51824 psf	100 psf	0 psf	Overburden
Column 100	445.500000 ft	100.017747 ft	241.500000 ft	0 psf	594.01921 psf	342.95715 psf	100 psf	0 psf	Overburden
Column 101	448.500000 ft	97.801653 ft	241.500000 ft	0 psf	729.23361 psf	421.02322 psf	100 psf	0 psf	Overburden
Column 102	451.500000 ft	95.780006 ft	241.500000 ft	0 psf	853.53669 psf	492.78964 psf	100 psf	0 psf	Overburden
Column 103	454.500000 ft	93.938188 ft	241.500000 ft	0 psf	951.42472 psf	549.30532 psf	100 psf	0 psf	Overburden
Column 104	457.500000 ft	92.264138 ft	241.500000 ft	0 psf	1,038.2025 psf	599.40648 psf	100 psf	0 psf	Overburden
Column 105	460.500000 ft	90.747817 ft	241.500000 ft	0 psf	1,097.9964 psf	740.60791 psf	50 psf	0 psf	WXR Rock
Column 106	463.500000 ft	89.380819 ft	241.500000 ft	0 psf	1,174.4216 psf	792.15736 psf	50 psf	0 psf	WXR Rock
Column 107	466.500000 ft	88.156072 ft	241.500000 ft	0 psf	1,228.2744 psf	828.48156 psf	50 psf	0 psf	WXR Rock
Column 108	469.500000 ft	87.067622 ft	241.500000 ft	0 psf	1,290.156 psf	870.22122 psf	50 psf	0 psf	WXR Rock

Column 109	472.500000 ft	86.110454 ft	241.500000 ft	0 psf	1,336.7456 psf	901.64628 psf	50 psf	0 psf	WXR Rock
Column 110	475.500000 ft	85.280365 ft	241.500000 ft	0 psf	1,375.8365 psf	928.01344 psf	50 psf	0 psf	WXR Rock
Column 111	478.500000 ft	84.573856 ft	241.500000 ft	0 psf	1,399.955 psf	944.28159 psf	50 psf	0 psf	WXR Rock
Column 112	481.500000 ft	83.988055 ft	241.500000 ft	0 psf	1,420.7897 psf	958.33478 psf	50 psf	0 psf	WXR Rock
Column 113	484.500000 ft	83.520650 ft	241.500000 ft	0 psf	1,435.9994 psf	968.59384 psf	50 psf	0 psf	WXR Rock
Column 114	487.500000 ft	83.169844 ft	241.500000 ft	0 psf	1,428.9731 psf	963.85452 psf	50 psf	0 psf	WXR Rock
Column 115	490.500000 ft	82.934318 ft	241.500000 ft	0 psf	1,416.3737 psf	955.35614 psf	50 psf	0 psf	WXR Rock
Column 116	493.500000 ft	82.813201 ft	241.500000 ft	0 psf	1,398.0308 psf	942.98365 psf	50 psf	0 psf	WXR Rock
Column 117	496.500000 ft	82.806062 ft	241.500000 ft	0 psf	1,366.0147 psf	921.38855 psf	50 psf	0 psf	WXR Rock
Column 118	499.500000 ft	82.912893 ft	241.500000 ft	0 psf	1,312.6402 psf	885.38698 psf	50 psf	0 psf	WXR Rock
Column 119	502.500000 ft	83.134112 ft	241.500000 ft	0 psf	1,260.3727 psf	850.1321 psf	50 psf	0 psf	WXR Rock
Column 120	505.500000 ft	83.470575 ft	241.500000 ft	0 psf	1,199.164 psf	808.8463 psf	50 psf	0 psf	WXR Rock
Column 121	508.500000 ft	83.923585 ft	241.500000 ft	0 psf	1,134.102 psf	764.96144 psf	50 psf	0 psf	WXR Rock
Column 122	511.500000 ft	84.494920 ft	241.500000 ft	0 psf	1,044.1311 psf	704.27533 psf	50 psf	0 psf	WXR Rock
Column 123	514.500000 ft	85.186872 ft	241.500000 ft	0 psf	957.94806 psf	646.14412 psf	50 psf	0 psf	WXR Rock
Column 124	517.500000 ft	86.002290 ft	241.500000 ft	0 psf	853.25304 psf	575.52644 psf	50 psf	0 psf	WXR Rock
Column 125	520.500000 ft	86.944643 ft	241.500000 ft	0 psf	739.62554 psf	498.88372 psf	50 psf	0 psf	WXR Rock
Column 126	523.500000 ft	88.018101 ft	241.500000 ft	0 psf	608.66016 psf	351.41011 psf	100 psf	0 psf	Overburden
Column 127	526.500000 ft	89.227636 ft	241.500000 ft	0 psf	474.95889 psf	274.21764 psf	100 psf	0 psf	Overburden
Column 128	529.500000 ft	90.579153 ft	241.500000 ft	0 psf	333.09143 psf	192.31043 psf	100 psf	0 psf	Overburden
Column 129	532.500000 ft	92.079660 ft	241.500000 ft	0 psf	181.03827 psf	104.52249 psf	100 psf	0 psf	Overburden
Column 130	535.500000 ft	93.737483 ft	241.500000 ft	0 psf	13.060714 psf	7.5406066 psf	100 psf	0 psf	Overburden
Column 131	433.500000 ft	107.029041 ft	244.500000 ft	0 psf	148.97233 psf	86.009216 psf	100 psf	0 psf	Overburden
Column 132	436.500000 ft	103.935222 ft	244.500000 ft	0 psf	358.33804 psf	206.88657 psf	100 psf	0 psf	Overburden
Column 133	439.500000 ft	101.113017 ft	244.500000 ft	0 psf	535.29801 psf	309.05445 psf	100 psf	0 psf	Overburden
Column 134	442.500000 ft	98.532169 ft	244.500000 ft	0 psf	692.63019 psf	399.89023 psf	100 psf	0 psf	Overburden
Column 135	445.500000 ft	96.168843 ft	244.500000 ft	0 psf	824.3158 psf	475.91895 psf	100 psf	0 psf	Overburden
Column 136	448.500000 ft	94.003901 ft	244.500000 ft	0 psf	956.97663 psf	552.51072 psf	100 psf	0 psf	Overburden
Column 137	451.500000 ft	92.021745 ft	244.500000 ft	0 psf	1,079.6747 psf	623.35047 psf	100 psf	0 psf	Overburden

Column 138	454.500000 ft	90.209504 ft	244.500000 ft	0 psf	1,154.217 psf	778.52921 psf	50 psf	0 psf	WXR Rock
Column 139	457.500000 ft	88.556454 ft	244.500000 ft	0 psf	1,248.4851 psf	842.11385 psf	50 psf	0 psf	WXR Rock
Column 140	460.500000 ft	87.053590 ft	244.500000 ft	0 psf	1,338.1478 psf	902.59209 psf	50 psf	0 psf	WXR Rock
Column 141	463.500000 ft	85.693313 ft	244.500000 ft	0 psf	1,414.6461 psf	954.19081 psf	50 psf	0 psf	WXR Rock
Column 142	466.500000 ft	84.469183 ft	244.500000 ft	0 psf	1,478.0186 psf	996.9361 psf	50 psf	0 psf	WXR Rock
Column 143	469.500000 ft	83.375737 ft	244.500000 ft	0 psf	1,538.0775 psf	1,037.4464 psf	50 psf	0 psf	WXR Rock
Column 144	472.500000 ft	82.408341 ft	244.500000 ft	0 psf	1,590.3884 psf	1,072.7305 psf	50 psf	0 psf	WXR Rock
Column 145	475.500000 ft	81.563083 ft	244.500000 ft	0 psf	1,635.791 psf	1,103.355 psf	50 psf	0 psf	WXR Rock
Column 146	478.500000 ft	80.836677 ft	244.500000 ft	0 psf	1,661.3149 psf	1,120.571 psf	50 psf	0 psf	WXR Rock
Column 147	481.500000 ft	80.226399 ft	244.500000 ft	0 psf	1,685.5933 psf	1,136.9471 psf	50 psf	0 psf	WXR Rock
Column 148	484.500000 ft	79.730025 ft	244.500000 ft	0 psf	1,685.7926 psf	1,137.0815 psf	50 psf	0 psf	WXR Rock
Column 149	487.500000 ft	79.345795 ft	244.500000 ft	0 psf	1,682.9416 psf	1,135.1585 psf	50 psf	0 psf	WXR Rock
Column 150	490.500000 ft	79.072374 ft	244.500000 ft	0 psf	1,674.392 psf	1,129.3916 psf	50 psf	0 psf	WXR Rock
Column 151	493.500000 ft	78.908832 ft	244.500000 ft	0 psf	1,649.9007 psf	1,112.8721 psf	50 psf	0 psf	WXR Rock
Column 152	496.500000 ft	78.854626 ft	244.500000 ft	0 psf	1,616.9308 psf	1,090.6336 psf	50 psf	0 psf	WXR Rock
Column 153	499.500000 ft	78.909590 ft	244.500000 ft	0 psf	1,570.0924 psf	1,059.0407 psf	50 psf	0 psf	WXR Rock
Column 154	502.500000 ft	79.073931 ft	244.500000 ft	0 psf	1,518.3801 psf	1,024.1603 psf	50 psf	0 psf	WXR Rock
Column 155	505.500000 ft	79.348236 ft	244.500000 ft	0 psf	1,454.6291 psf	981.15974 psf	50 psf	0 psf	WXR Rock
Column 156	508.500000 ft	79.733481 ft	244.500000 ft	0 psf	1,383.6124 psf	933.25835 psf	50 psf	0 psf	WXR Rock
Column 157	511.500000 ft	80.231044 ft	244.500000 ft	0 psf	1,296.581 psf	874.55496 psf	50 psf	0 psf	WXR Rock
Column 158	514.500000 ft	80.842735 ft	244.500000 ft	0 psf	1,211.1835 psf	816.95359 psf	50 psf	0 psf	WXR Rock
Column 159	517.500000 ft	81.570827 ft	244.500000 ft	0 psf	1,104.8494 psf	745.23036 psf	50 psf	0 psf	WXR Rock
Column 160	520.500000 ft	82.418102 ft	244.500000 ft	0 psf	979.20699 psf	660.48345 psf	50 psf	0 psf	WXR Rock
Column 161	523.500000 ft	83.387903 ft	244.500000 ft	0 psf	837.09849 psf	564.63006 psf	50 psf	0 psf	WXR Rock
Column 162	526.500000 ft	84.484212 ft	244.500000 ft	0 psf	703.35297 psf	474.41757 psf	50 psf	0 psf	WXR Rock
Column 163	529.500000 ft	85.711736 ft	244.500000 ft	0 psf	549.88024 psf	370.89891 psf	50 psf	0 psf	WXR Rock
Column 164	532.500000 ft	87.076021 ft	244.500000 ft	0 psf	370.08291 psf	213.66747 psf	100 psf	0 psf	Overburden
Column 165	535.500000 ft	88.583605 ft	244.500000 ft	0 psf	208.18872 psf	120.19781 psf	100 psf	0 psf	Overburden
Column 166	538.500000 ft	90.242202 ft	244.500000 ft	0 psf	48.034705 psf	27.73285 psf	100 psf	0 psf	Overburden

Column 167	430.500000 ft	106.651870 ft	247.500000 ft	0 psf	165.52614 psf	95.566563 psf	100 psf	0 psf	Overburden
Column 168	433.500000 ft	103.367208 ft	247.500000 ft	0 psf	385.42709 psf	222.52643 psf	100 psf	0 psf	Overburden
Column 169	436.500000 ft	100.367614 ft	247.500000 ft	0 psf	573.88834 psf	331.33459 psf	100 psf	0 psf	Overburden
Column 170	439.500000 ft	97.619739 ft	247.500000 ft	0 psf	745.60393 psf	430.47463 psf	100 psf	0 psf	Overburden
Column 171	442.500000 ft	95.097474 ft	247.500000 ft	0 psf	901.82493 psf	520.66886 psf	100 psf	0 psf	Overburden
Column 172	445.500000 ft	92.779955 ft	247.500000 ft	0 psf	1,036.3568 psf	598.34085 psf	100 psf	0 psf	Overburden
Column 173	448.500000 ft	90.650231 ft	247.500000 ft	0 psf	1,154.6728 psf	778.83663 psf	50 psf	0 psf	WXR Rock
Column 174	451.500000 ft	88.694347 ft	247.500000 ft	0 psf	1,274.2754 psf	859.50964 psf	50 psf	0 psf	WXR Rock
Column 175	454.500000 ft	86.900686 ft	247.500000 ft	0 psf	1,385.7517 psf	934.7013 psf	50 psf	0 psf	WXR Rock
Column 176	457.500000 ft	85.259493 ft	247.500000 ft	0 psf	1,485.4439 psf	1,001.9446 psf	50 psf	0 psf	WXR Rock
Column 177	460.500000 ft	83.762522 ft	247.500000 ft	0 psf	1,575.3847 psf	1,062.6104 psf	50 psf	0 psf	WXR Rock
Column 178	463.500000 ft	82.402767 ft	247.500000 ft	0 psf	1,654.7884 psf	1,116.1689 psf	50 psf	0 psf	WXR Rock
Column 179	466.500000 ft	81.174255 ft	247.500000 ft	0 psf	1,725.7779 psf	1,164.0519 psf	50 psf	0 psf	WXR Rock
Column 180	469.500000 ft	80.071888 ft	247.500000 ft	0 psf	1,789.7953 psf	1,207.2322 psf	50 psf	0 psf	WXR Rock
Column 181	472.500000 ft	79.091319 ft	247.500000 ft	0 psf	1,837.3464 psf	1,148.1015 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 182	475.500000 ft	78.228849 ft	247.500000 ft	0 psf	1,884.0442 psf	1,177.2815 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 183	478.500000 ft	77.481352 ft	247.500000 ft	0 psf	1,914.7445 psf	1,196.4652 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 184	481.500000 ft	76.846212 ft	247.500000 ft	0 psf	1,927.3282 psf	1,204.3283 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 185	484.500000 ft	76.321268 ft	247.500000 ft	0 psf	1,929.7779 psf	1,205.8591 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 186	487.500000 ft	75.904785 ft	247.500000 ft	0 psf	1,931.9156 psf	1,207.1948 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 187	490.500000 ft	75.595411 ft	247.500000 ft	0 psf	1,917.2856 psf	1,198.053 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 188	493.500000 ft	75.392166 ft	247.500000 ft	0 psf	1,890.6634 psf	1,181.4176 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 189	496.500000 ft	75.294419 ft	247.500000 ft	0 psf	1,864.7251 psf	1,165.2096 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 190	499.500000 ft	75.301877 ft	247.500000 ft	0 psf	1,818.0262 psf	1,136.0289 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 191	502.500000 ft	75.414585 ft	247.500000 ft	0 psf	1,760.7457 psf	1,100.236 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 192	505.500000 ft	75.632922 ft	247.500000 ft	0 psf	1,699.4031 psf	1,061.9049 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 193	508.500000 ft	75.957612 ft	247.500000 ft	0 psf	1,616.545 psf	1,010.1294 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 194	511.500000 ft	76.389728 ft	247.500000 ft	0 psf	1,514.2648 psf	946.21768 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 195	514.500000 ft	76.930720 ft	247.500000 ft	0 psf	1,442.9896 psf	973.30881 psf	50 psf	0 psf	WXR Rock

Column 196	517.500000 ft	77.582428 ft	247.500000 ft	0 psf	1,324.8463 psf	893.62013 psf	50 psf	0 psf	WXR Rock
Column 197	520.500000 ft	78.347125 ft	247.500000 ft	0 psf	1,190.1313 psf	802.7537 psf	50 psf	0 psf	WXR Rock
Column 198	523.500000 ft	79.227551 ft	247.500000 ft	0 psf	1,047.3101 psf	706.41959 psf	50 psf	0 psf	WXR Rock
Column 199	526.500000 ft	80.226967 ft	247.500000 ft	0 psf	904.63421 psf	610.18348 psf	50 psf	0 psf	WXR Rock
Column 200	529.500000 ft	81.349224 ft	247.500000 ft	0 psf	746.59125 psf	503.58216 psf	50 psf	0 psf	WXR Rock
Column 201	532.500000 ft	82.598843 ft	247.500000 ft	0 psf	548.57868 psf	370.02099 psf	50 psf	0 psf	WXR Rock
Column 202	535.500000 ft	83.981119 ft	247.500000 ft	0 psf	379.16829 psf	255.75224 psf	50 psf	0 psf	WXR Rock
Column 203	538.500000 ft	85.502254 ft	247.500000 ft	0 psf	228.38591 psf	154.04824 psf	50 psf	0 psf	WXR Rock
Column 204	541.500000 ft	87.169527 ft	247.500000 ft	0 psf	40.477187 psf	23.369515 psf	100 psf	0 psf	Overburden
Column 205	427.500000 ft	106.889307 ft	250.500000 ft	0 psf	128.50287 psf	74.191166 psf	100 psf	0 psf	Overburden
Column 206	430.500000 ft	103.387209 ft	250.500000 ft	0 psf	368.57054 psf	212.7943 psf	100 psf	0 psf	Overburden
Column 207	433.500000 ft	100.189061 ft	250.500000 ft	0 psf	570.6898 psf	329.48791 psf	100 psf	0 psf	Overburden
Column 208	436.500000 ft	97.257131 ft	250.500000 ft	0 psf	756.72163 psf	436.89344 psf	100 psf	0 psf	Overburden
Column 209	439.500000 ft	94.562157 ft	250.500000 ft	0 psf	934.03339 psf	539.26443 psf	100 psf	0 psf	Overburden
Column 210	442.500000 ft	92.080925 ft	250.500000 ft	0 psf	1,074.7915 psf	724.956 psf	50 psf	0 psf	WXR Rock
Column 211	445.500000 ft	89.794684 ft	250.500000 ft	0 psf	1,228.5521 psf	828.66886 psf	50 psf	0 psf	WXR Rock
Column 212	448.500000 ft	87.688060 ft	250.500000 ft	0 psf	1,371.2472 psf	924.91788 psf	50 psf	0 psf	WXR Rock
Column 213	451.500000 ft	85.748296 ft	250.500000 ft	0 psf	1,497.2309 psf	1,009.895 psf	50 psf	0 psf	WXR Rock
Column 214	454.500000 ft	83.964697 ft	250.500000 ft	0 psf	1,624.8947 psf	1,096.0053 psf	50 psf	0 psf	WXR Rock
Column 215	457.500000 ft	82.328227 ft	250.500000 ft	0 psf	1,725.5266 psf	1,163.8824 psf	50 psf	0 psf	WXR Rock
Column 216	460.500000 ft	80.831206 ft	250.500000 ft	0 psf	1,818.7782 psf	1,226.7814 psf	50 psf	0 psf	WXR Rock
Column 217	463.500000 ft	79.467070 ft	250.500000 ft	0 psf	1,888.7422 psf	1,180.2171 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 218	466.500000 ft	78.230200 ft	250.500000 ft	0 psf	1,980.6424 psf	1,237.6427 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 219	469.500000 ft	77.115774 ft	250.500000 ft	0 psf	2,051.9571 psf	1,282.2051 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 220	472.500000 ft	76.119655 ft	250.500000 ft	0 psf	2,112.1611 psf	1,319.8248 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 221	475.500000 ft	75.238308 ft	250.500000 ft	0 psf	2,158.4845 psf	1,348.7708 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 222	478.500000 ft	74.468725 ft	250.500000 ft	0 psf	2,184.0243 psf	1,364.7298 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 223	481.500000 ft	73.808366 ft	250.500000 ft	0 psf	2,197.7505 psf	1,373.3069 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 224	484.500000 ft	73.255119 ft	250.500000 ft	0 psf	2,197.1179 psf	1,372.9116 psf	200 psf	0 psf	Incompetent (Id2 <20)

Column 225	487.500000 ft	72.807257 ft	250.500000 ft	0 psf	2,193.7625 psf	1,370.8149 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 226	490.500000 ft	72.463416 ft	250.500000 ft	0 psf	2,177.8056 psf	1,360.844 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 227	493.500000 ft	72.222568 ft	250.500000 ft	0 psf	2,161.4886 psf	1,350.648 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 228	496.500000 ft	72.084009 ft	250.500000 ft	0 psf	2,133.9273 psf	1,333.4258 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 229	499.500000 ft	72.047345 ft	250.500000 ft	0 psf	2,084.4302 psf	1,302.4966 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 230	502.500000 ft	72.112488 ft	250.500000 ft	0 psf	2,037.9532 psf	1,273.4545 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 231	505.500000 ft	72.279653 ft	250.500000 ft	0 psf	1,982.2144 psf	1,238.6251 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 232	508.500000 ft	72.549361 ft	250.500000 ft	0 psf	1,852.0603 psf	1,157.2957 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 233	511.500000 ft	72.922451 ft	250.500000 ft	0 psf	1,745.879 psf	1,090.9463 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 234	514.500000 ft	73.400086 ft	250.500000 ft	0 psf	1,638.3016 psf	1,023.7245 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 235	517.500000 ft	73.983777 ft	250.500000 ft	0 psf	1,510.2851 psf	943.73089 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 236	520.500000 ft	74.675405 ft	250.500000 ft	0 psf	1,360.462 psf	850.11101 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 237	523.500000 ft	75.477250 ft	250.500000 ft	0 psf	1,222.0363 psf	763.61303 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 238	526.500000 ft	76.392035 ft	250.500000 ft	0 psf	1,095.1882 psf	738.7138 psf	50 psf	0 psf	WXR Rock
Column 239	529.500000 ft	77.422974 ft	250.500000 ft	0 psf	924.69163 psf	623.71238 psf	50 psf	0 psf	WXR Rock
Column 240	532.500000 ft	78.573830 ft	250.500000 ft	0 psf	717.20091 psf	483.75813 psf	50 psf	0 psf	WXR Rock
Column 241	535.500000 ft	79.848999 ft	250.500000 ft	0 psf	559.55153 psf	377.42227 psf	50 psf	0 psf	WXR Rock
Column 242	538.500000 ft	81.253601 ft	250.500000 ft	0 psf	353.44714 psf	238.4031 psf	50 psf	0 psf	WXR Rock
Column 243	541.500000 ft	82.793605 ft	250.500000 ft	0 psf	81.604348 psf	55.042828 psf	50 psf	0 psf	WXR Rock
Column 244	424.500000 ft	107.743263 ft	253.500000 ft	0 psf	32.850413 psf	18.966195 psf	100 psf	0 psf	Overburden
Column 245	427.500000 ft	103.991524 ft	253.500000 ft	0 psf	298.71687 psf	172.46426 psf	100 psf	0 psf	Overburden
Column 246	430.500000 ft	100.569415 ft	253.500000 ft	0 psf	523.71915 psf	302.36939 psf	100 psf	0 psf	Overburden
Column 247	433.500000 ft	97.433057 ft	253.500000 ft	0 psf	727.33664 psf	419.92801 psf	100 psf	0 psf	Overburden
Column 248	436.500000 ft	94.548857 ft	253.500000 ft	0 psf	921.9132 psf	532.26683 psf	100 psf	0 psf	Overburden
Column 249	439.500000 ft	91.890443 ft	253.500000 ft	0 psf	1,088.0012 psf	733.86608 psf	50 psf	0 psf	WXR Rock
Column 250	442.500000 ft	89.436686 ft	253.500000 ft	0 psf	1,261.763 psf	851.06991 psf	50 psf	0 psf	WXR Rock
Column 251	445.500000 ft	87.170375 ft	253.500000 ft	0 psf	1,428.3411 psf	963.42826 psf	50 psf	0 psf	WXR Rock
Column 252	448.500000 ft	85.077295 ft	253.500000 ft	0 psf	1,578.8379 psf	1,064.9396 psf	50 psf	0 psf	WXR Rock
Column 253	451.500000 ft	83.145576 ft	253.500000 ft	0 psf	1,714.3531 psf	1,156.3458 psf	50 psf	0 psf	WXR Rock

Column 254	454.500000 ft	81.365214 ft	253.500000 ft	0 psf	1,857.7902 psf	1,253.0953 psf	50 psf	0 psf	WXR Rock
Column 255	457.500000 ft	79.727713 ft	253.500000 ft	0 psf	1,956.3132 psf	1,222.4402 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 256	460.500000 ft	78.225816 ft	253.500000 ft	0 psf	2,062.8826 psf	1,289.0321 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 257	463.500000 ft	76.853298 ft	253.500000 ft	0 psf	2,155.6661 psf	1,347.0097 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 258	466.500000 ft	75.604802 ft	253.500000 ft	0 psf	2,262.4453 psf	1,413.7328 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 259	469.500000 ft	74.475715 ft	253.500000 ft	0 psf	2,328.1965 psf	1,454.8187 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 260	472.500000 ft	73.462062 ft	253.500000 ft	0 psf	2,389.82 psf	1,493.3253 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 261	475.500000 ft	72.560426 ft	253.500000 ft	0 psf	2,434.0048 psf	1,520.935 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 262	478.500000 ft	71.767885 ft	253.500000 ft	0 psf	2,466.6226 psf	1,541.3168 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 263	481.500000 ft	71.081956 ft	253.500000 ft	0 psf	2,481.9871 psf	1,550.9177 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 264	484.500000 ft	70.500557 ft	253.500000 ft	0 psf	2,493.4132 psf	1,558.0575 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 265	487.500000 ft	70.021965 ft	253.500000 ft	0 psf	2,489.1536 psf	1,555.3958 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 266	490.500000 ft	69.644797 ft	253.500000 ft	0 psf	2,472.8738 psf	1,545.223 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 267	493.500000 ft	69.367985 ft	253.500000 ft	0 psf	2,448.0812 psf	1,529.7309 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 268	496.500000 ft	69.190760 ft	253.500000 ft	0 psf	2,407.4046 psf	1,504.3134 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 269	499.500000 ft	69.112642 ft	253.500000 ft	0 psf	2,360.091 psf	1,474.7485 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 270	502.500000 ft	69.133433 ft	253.500000 ft	0 psf	2,318.2397 psf	1,448.5969 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 271	505.500000 ft	69.253213 ft	253.500000 ft	0 psf	2,212.4231 psf	1,382.4754 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 272	508.500000 ft	69.472341 ft	253.500000 ft	0 psf	2,076.1064 psf	1,297.2953 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 273	511.500000 ft	69.791462 ft	253.500000 ft	0 psf	1,965.8269 psf	1,228.385 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 274	514.500000 ft	70.211515 ft	253.500000 ft	0 psf	1,833.3915 psf	1,145.6302 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 275	517.500000 ft	70.733747 ft	253.500000 ft	0 psf	1,697.9836 psf	1,061.0179 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 276	520.500000 ft	71.359729 ft	253.500000 ft	0 psf	1,551.2307 psf	969.31653 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 277	523.500000 ft	72.091384 ft	253.500000 ft	0 psf	1,404.1071 psf	877.3835 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 278	526.500000 ft	72.931016 ft	253.500000 ft	0 psf	1,236.2536 psf	772.49697 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 279	529.500000 ft	73.881349 ft	253.500000 ft	0 psf	920.06687 psf	574.92159 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 280	532.500000 ft	74.945572 ft	253.500000 ft	0 psf	741.02285 psf	463.04247 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 281	535.500000 ft	76.127403 ft	253.500000 ft	0 psf	500.21183 psf	337.39714 psf	50 psf	0 psf	WXR Rock
Column 282	538.500000 ft	77.431158 ft	253.500000 ft	0 psf	315.61925 psf	212.88787 psf	50 psf	0 psf	WXR Rock

Column 283	424.500000 ft	105.190162 ft	256.500000 ft	0 psf	178.28236 psf	102.93137 psf	100 psf	0 psf	Overburden
Column 284	427.500000 ft	101.512675 ft	256.500000 ft	0 psf	432.40577 psf	249.64959 psf	100 psf	0 psf	Overburden
Column 285	430.500000 ft	98.146935 ft	256.500000 ft	0 psf	661.2939 psf	381.79821 psf	100 psf	0 psf	Overburden
Column 286	433.500000 ft	95.053374 ft	256.500000 ft	0 psf	877.14877 psf	506.42208 psf	100 psf	0 psf	Overburden
Column 287	436.500000 ft	92.201351 ft	256.500000 ft	0 psf	1,061.8616 psf	716.2347 psf	50 psf	0 psf	WXR Rock
Column 288	439.500000 ft	89.566585 ft	256.500000 ft	0 psf	1,263.0364 psf	851.9288 psf	50 psf	0 psf	WXR Rock
Column 289	442.500000 ft	87.129473 ft	256.500000 ft	0 psf	1,442.7152 psf	973.12368 psf	50 psf	0 psf	WXR Rock
Column 290	445.500000 ft	84.873938 ft	256.500000 ft	0 psf	1,626.5134 psf	1,097.0971 psf	50 psf	0 psf	WXR Rock
Column 291	448.500000 ft	82.786629 ft	256.500000 ft	0 psf	1,786.6115 psf	1,205.0847 psf	50 psf	0 psf	WXR Rock
Column 292	451.500000 ft	80.856342 ft	256.500000 ft	0 psf	1,932.366 psf	1,303.3973 psf	50 psf	0 psf	WXR Rock
Column 293	454.500000 ft	79.073587 ft	256.500000 ft	0 psf	2,089.0914 psf	1,305.4092 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 294	457.500000 ft	77.430277 ft	256.500000 ft	0 psf	2,214.9275 psf	1,384.0403 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 295	460.500000 ft	75.919476 ft	256.500000 ft	0 psf	2,328.8051 psf	1,455.1989 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 296	463.500000 ft	74.535210 ft	256.500000 ft	0 psf	2,426.3499 psf	1,516.1517 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 297	466.500000 ft	73.272324 ft	256.500000 ft	0 psf	2,540.6102 psf	1,587.5495 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 298	469.500000 ft	72.126357 ft	256.500000 ft	0 psf	2,604.1503 psf	1,627.2537 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 299	472.500000 ft	71.093456 ft	256.500000 ft	0 psf	2,666.5143 psf	1,666.2231 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 300	475.500000 ft	70.170290 ft	256.500000 ft	0 psf	2,719.5985 psf	1,699.3937 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 301	478.500000 ft	69.354000 ft	256.500000 ft	0 psf	2,761.9308 psf	1,725.8459 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 302	481.500000 ft	68.642141 ft	256.500000 ft	0 psf	2,794.177 psf	1,745.9956 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 303	484.500000 ft	68.032645 ft	256.500000 ft	0 psf	2,817.0871 psf	1,760.3114 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 304	487.500000 ft	67.523790 ft	256.500000 ft	0 psf	2,806.7272 psf	1,753.8378 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 305	490.500000 ft	67.114170 ft	256.500000 ft	0 psf	2,782.9938 psf	1,739.0075 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 306	493.500000 ft	66.802678 ft	256.500000 ft	0 psf	2,737.6197 psf	1,710.6547 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 307	496.500000 ft	66.588488 ft	256.500000 ft	0 psf	2,691.7263 psf	1,681.9773 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 308	499.500000 ft	66.471045 ft	256.500000 ft	0 psf	2,650.5921 psf	1,656.2738 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 309	502.500000 ft	66.450057 ft	256.500000 ft	0 psf	2,551.6952 psf	1,594.4761 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 310	505.500000 ft	66.525490 ft	256.500000 ft	0 psf	2,447.8061 psf	1,529.559 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 311	508.500000 ft	66.697570 ft	256.500000 ft	0 psf	2,312.1823 psf	1,444.8119 psf	200 psf	0 psf	Incompetent (Id2 <20)

Column 312	511.500000 ft	66.966781 ft	256.500000 ft	0 psf	2,181.9577 psf	1,363.4385 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 313	514.500000 ft	67.333878 ft	256.500000 ft	0 psf	2,023.5744 psf	1,264.4696 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 314	517.500000 ft	67.799891 ft	256.500000 ft	0 psf	1,892.2712 psf	1,182.4223 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 315	520.500000 ft	68.366146 ft	256.500000 ft	0 psf	1,727.04 psf	1,079.1744 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 316	523.500000 ft	69.034276 ft	256.500000 ft	0 psf	1,559.7083 psf	974.61394 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 317	526.500000 ft	69.806255 ft	256.500000 ft	0 psf	1,224.2769 psf	765.01309 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 318	529.500000 ft	70.684418 ft	256.500000 ft	0 psf	803.91235 psf	502.34019 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 319	532.500000 ft	71.671507 ft	256.500000 ft	0 psf	470.11037 psf	293.75756 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 320	535.500000 ft	72.770714 ft	256.500000 ft	0 psf	215.05071 psf	134.3786 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 321	421.500000 ft	107.007653 ft	259.500000 ft	0 psf	2.5980433 psf	1.499981 psf	100 psf	0 psf	Overburden
Column 322	424.500000 ft	103.034870 ft	259.500000 ft	0 psf	291.80812 psf	168.4755 psf	100 psf	0 psf	Overburden
Column 323	427.500000 ft	99.408547 ft	259.500000 ft	0 psf	545.86838 psf	315.15726 psf	100 psf	0 psf	Overburden
Column 324	430.500000 ft	96.080705 ft	259.500000 ft	0 psf	781.93783 psf	451.45202 psf	100 psf	0 psf	Overburden
Column 325	433.500000 ft	93.014855 ft	259.500000 ft	0 psf	1,006.2814 psf	580.97682 psf	100 psf	0 psf	Overburden
Column 326	436.500000 ft	90.182493 ft	259.500000 ft	0 psf	1,216.1618 psf	820.31147 psf	50 psf	0 psf	WXR Rock
Column 327	439.500000 ft	87.560870 ft	259.500000 ft	0 psf	1,436.2933 psf	968.79206 psf	50 psf	0 psf	WXR Rock
Column 328	442.500000 ft	85.131505 ft	259.500000 ft	0 psf	1,624.8758 psf	1,095.9926 psf	50 psf	0 psf	WXR Rock
Column 329	445.500000 ft	82.879166 ft	259.500000 ft	0 psf	1,829.8542 psf	1,234.2523 psf	50 psf	0 psf	WXR Rock
Column 330	448.500000 ft	80.791144 ft	259.500000 ft	0 psf	1,996.1989 psf	1,247.3635 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 331	451.500000 ft	78.856730 ft	259.500000 ft	0 psf	2,162.2817 psf	1,351.1436 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 332	454.500000 ft	77.066824 ft	259.500000 ft	0 psf	2,339.8087 psf	1,462.0747 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 333	457.500000 ft	75.413641 ft	259.500000 ft	0 psf	2,475.053 psf	1,546.5847 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 334	460.500000 ft	73.890485 ft	259.500000 ft	0 psf	2,594.336 psf	1,621.121 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 335	463.500000 ft	72.491573 ft	259.500000 ft	0 psf	2,700.5167 psf	1,687.4701 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 336	466.500000 ft	71.211896 ft	259.500000 ft	0 psf	2,827.1749 psf	1,766.6149 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 337	469.500000 ft	70.047107 ft	259.500000 ft	0 psf	2,893.5434 psf	1,808.0866 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 338	472.500000 ft	68.993438 ft	259.500000 ft	0 psf	2,962.0208 psf	1,850.876 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 339	475.500000 ft	68.047623 ft	259.500000 ft	0 psf	3,018.3523 psf	1,886.0759 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 340	478.500000 ft	67.206841 ft	259.500000 ft	0 psf	3,051.9903 psf	1,907.0952 psf	200 psf	0 psf	Incompetent (Id2 <20)

Column 341	481.500000 ft	66.468671 ft	259.500000 ft	0 psf	3,085.9348 psf	1,928.3061 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 342	484.500000 ft	65.831053 ft	259.500000 ft	0 psf	3,075.6472 psf	1,702.6995 psf	902.66249 psf	0 psf	Competent (RQD 51-75)
Column 343	487.500000 ft	65.292253 ft	259.500000 ft	0 psf	3,072.1274 psf	1,701.4832 psf	901.92974 psf	0 psf	Competent (RQD 51-75)
Column 344	490.500000 ft	64.850844 ft	259.500000 ft	0 psf	3,048.8165 psf	1,693.411 psf	897.07277 psf	0 psf	Competent (RQD 51-75)
Column 345	493.500000 ft	64.505678 ft	259.500000 ft	0 psf	2,998.3839 psf	1,675.8417 psf	886.54272 psf	0 psf	Competent (RQD 51-75)
Column 346	496.500000 ft	64.255878 ft	259.500000 ft	0 psf	2,949.4112 psf	1,658.6349 psf	876.29375 psf	0 psf	Competent (RQD 51-75)
Column 347	499.500000 ft	64.100823 ft	259.500000 ft	0 psf	2,904.3397 psf	1,642.6637 psf	866.84599 psf	0 psf	Competent (RQD 51-75)
Column 348	502.500000 ft	64.040138 ft	259.500000 ft	0 psf	2,797.2504 psf	1,604.2123 psf	844.30887 psf	0 psf	Competent (RQD 51-75)
Column 349	505.500000 ft	64.073692 ft	259.500000 ft	0 psf	2,682.5791 psf	1,562.4351 psf	819.81465 psf	0 psf	Competent (RQD 51-75)
Column 350	508.500000 ft	64.201594 ft	259.500000 ft	0 psf	2,528.8333 psf	1,505.2136 psf	786.51777 psf	0 psf	Competent (RQD 51-75)
Column 351	511.500000 ft	64.424196 ft	259.500000 ft	0 psf	2,383.0926 psf	1,449.3509 psf	754.69843 psf	0 psf	Competent (RQD 51-75)
Column 352	514.500000 ft	64.742097 ft	259.500000 ft	0 psf	2,192.6632 psf	1,374.2022 psf	712.29819 psf	0 psf	Competent (RQD 51-75)
Column 353	517.500000 ft	65.156151 ft	259.500000 ft	0 psf	1,940.0892 psf	1,269.8761 psf	654.89786 psf	0 psf	Competent (RQD 51-75)
Column 354	520.500000 ft	65.667477 ft	259.500000 ft	0 psf	1,595.2712 psf	996.83609 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 355	523.500000 ft	66.277476 ft	259.500000 ft	0 psf	1,296.9182 psf	810.40445 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 356	526.500000 ft	66.987848 ft	259.500000 ft	0 psf	882.85628 psf	551.66983 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 357	529.500000 ft	67.800620 ft	259.500000 ft	0 psf	600.76671 psf	375.4007 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 358	532.500000 ft	68.718173 ft	259.500000 ft	0 psf	329.94011 psf	206.16947 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 359	535.500000 ft	69.743282 ft	259.500000 ft	0 psf	95.397514 psf	59.610982 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 360	421.500000 ft	105.164885 ft	262.500000 ft	0 psf	103.32388 psf	59.654069 psf	100 psf	0 psf	Overburden
Column 361	424.500000 ft	101.238278 ft	262.500000 ft	0 psf	387.01621 psf	223.44392 psf	100 psf	0 psf	Overburden
Column 362	427.500000 ft	97.644926 ft	262.500000 ft	0 psf	650.69079 psf	375.6765 psf	100 psf	0 psf	Overburden
Column 363	430.500000 ft	94.340171 ft	262.500000 ft	0 psf	894.25877 psf	516.30054 psf	100 psf	0 psf	Overburden
Column 364	433.500000 ft	91.289763 ft	262.500000 ft	0 psf	1,126.3026 psf	759.70067 psf	50 psf	0 psf	WXR Rock
Column 365	436.500000 ft	88.466763 ft	262.500000 ft	0 psf	1,372.4548 psf	925.73245 psf	50 psf	0 psf	WXR Rock
Column 366	439.500000 ft	85.849548 ft	262.500000 ft	0 psf	1,609.3108 psf	1,085.4938 psf	50 psf	0 psf	WXR Rock
Column 367	442.500000 ft	83.420468 ft	262.500000 ft	0 psf	1,808.211 psf	1,219.6537 psf	50 psf	0 psf	WXR Rock
Column 368	445.500000 ft	81.164915 ft	262.500000 ft	0 psf	2,026.5178 psf	1,266.3089 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 369	448.500000 ft	79.070657 ft	262.500000 ft	0 psf	2,222.582 psf	1,388.8234 psf	200 psf	0 psf	Incompetent (Id2 <20)

Column 370	451.500000 ft	77.127353 ft	262.500000 ft	0 psf	2,397.3741 psf	1,498.0456 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 371	454.500000 ft	75.326190 ft	262.500000 ft	0 psf	2,588.9166 psf	1,617.7346 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 372	457.500000 ft	73.659608 ft	262.500000 ft	0 psf	2,731.5078 psf	1,706.8355 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 373	460.500000 ft	72.121086 ft	262.500000 ft	0 psf	2,860.1216 psf	1,787.2023 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 374	463.500000 ft	70.704978 ft	262.500000 ft	0 psf	2,978.3595 psf	1,861.0856 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 375	466.500000 ft	69.406383 ft	262.500000 ft	0 psf	3,119.7045 psf	1,949.4077 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 376	469.500000 ft	68.221034 ft	262.500000 ft	0 psf	3,182.8128 psf	1,988.8422 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 377	472.500000 ft	67.145221 ft	262.500000 ft	0 psf	3,256.71 psf	2,035.0183 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 378	475.500000 ft	66.175720 ft	262.500000 ft	0 psf	3,301.1738 psf	1,779.3905 psf	949.15404 psf	0 psf	Competent (RQD 51-75)
Column 379	478.500000 ft	65.309734 ft	262.500000 ft	0 psf	3,343.7432 psf	1,793.6336 psf	957.80101 psf	0 psf	Competent (RQD 51-75)
Column 380	481.500000 ft	64.544853 ft	262.500000 ft	0 psf	3,374.2359 psf	1,803.7994 psf	963.96391 psf	0 psf	Competent (RQD 51-75)
Column 381	484.500000 ft	63.879013 ft	262.500000 ft	0 psf	3,390.5944 psf	1,809.2404 psf	967.2599 psf	0 psf	Competent (RQD 51-75)
Column 382	487.500000 ft	63.310466 ft	262.500000 ft	0 psf	3,390.1089 psf	1,809.0791 psf	967.1621 psf	0 psf	Competent (RQD 51-75)
Column 383	490.500000 ft	62.837758 ft	262.500000 ft	0 psf	3,360.0795 psf	1,799.0835 psf	961.10609 psf	0 psf	Competent (RQD 51-75)
Column 384	493.500000 ft	62.459703 ft	262.500000 ft	0 psf	3,307.4482 psf	1,781.4938 psf	950.43156 psf	0 psf	Competent (RQD 51-75)
Column 385	496.500000 ft	62.175376 ft	262.500000 ft	0 psf	3,250.2499 psf	1,762.266 psf	938.74907 psf	0 psf	Competent (RQD 51-75)
Column 386	499.500000 ft	61.984094 ft	262.500000 ft	0 psf	3,215.104 psf	1,750.3874 psf	931.53262 psf	0 psf	Competent (RQD 51-75)
Column 387	502.500000 ft	61.885408 ft	262.500000 ft	0 psf	3,099.0565 psf	1,710.7717 psf	907.5313 psf	0 psf	Competent (RQD 51-75)
Column 388	505.500000 ft	61.879101 ft	262.500000 ft	0 psf	2,967.8024 psf	1,665.1142 psf	880.14498 psf	0 psf	Competent (RQD 51-75)
Column 389	508.500000 ft	61.965184 ft	262.500000 ft	0 psf	2,807.7074 psf	1,607.9907 psf	846.52338 psf	0 psf	Competent (RQD 51-75)
Column 390	511.500000 ft	62.143893 ft	262.500000 ft	0 psf	2,557.4317 psf	1,515.9788 psf	792.73991 psf	0 psf	Competent (RQD 51-75)
Column 391	514.500000 ft	62.415696 ft	262.500000 ft	0 psf	2,252.2966 psf	1,397.9979 psf	725.69562 psf	0 psf	Competent (RQD 51-75)
Column 392	517.500000 ft	62.781295 ft	262.500000 ft	0 psf	1,745.7155 psf	1,185.7309 psf	609.46981 psf	0 psf	Competent (RQD 51-75)
Column 393	520.500000 ft	63.241639 ft	262.500000 ft	0 psf	1,321.1645 psf	986.48448 psf	506.82363 psf	0 psf	Competent (RQD 51-75)
Column 394	523.500000 ft	63.797933 ft	262.500000 ft	0 psf	936.84664 psf	782.21496 psf	408.30678 psf	0 psf	Competent (RQD 51-75)
Column 395	526.500000 ft	64.451653 ft	262.500000 ft	0 psf	680.02297 psf	626.58208 psf	339.07799 psf	0 psf	Competent (RQD 51-75)
Column 396	529.500000 ft	65.204571 ft	262.500000 ft	0 psf	414.0558 psf	439.85509 psf	263.68171 psf	0 psf	Competent (RQD 51-75)
Column 397	532.500000 ft	66.058774 ft	262.500000 ft	0 psf	256.0336 psf	159.98755 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 398	421.500000 ft	103.666111 ft	265.500000 ft	0 psf	170.67622 psf	98.539964 psf	100 psf	0 psf	Overburden

Column 399	424.500000 ft	99.768500 ft	265.500000 ft	0 psf	462.39778 psf	266.96548 psf	100 psf	0 psf	Overburden
Column 400	427.500000 ft	96.193922 ft	265.500000 ft	0 psf	732.67387 psf	423.00946 psf	100 psf	0 psf	Overburden
Column 401	430.500000 ft	92.900402 ft	265.500000 ft	0 psf	977.73539 psf	659.49085 psf	50 psf	0 psf	WXR Rock
Column 402	433.500000 ft	89.855431 ft	265.500000 ft	0 psf	1,252.0802 psf	844.53879 psf	50 psf	0 psf	WXR Rock
Column 403	436.500000 ft	87.033267 ft	265.500000 ft	0 psf	1,516.8487 psf	1,023.1273 psf	50 psf	0 psf	WXR Rock
Column 404	439.500000 ft	84.413141 ft	265.500000 ft	0 psf	1,772.0092 psf	1,195.2353 psf	50 psf	0 psf	WXR Rock
Column 405	442.500000 ft	81.978026 ft	265.500000 ft	0 psf	1,981.5993 psf	1,336.6056 psf	50 psf	0 psf	WXR Rock
Column 406	445.500000 ft	79.713782 ft	265.500000 ft	0 psf	2,225.4166 psf	1,390.5946 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 407	448.500000 ft	77.608532 ft	265.500000 ft	0 psf	2,433.749 psf	1,520.7751 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 408	451.500000 ft	75.652204 ft	265.500000 ft	0 psf	2,625.7269 psf	1,640.7363 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 409	454.500000 ft	73.836198 ft	265.500000 ft	0 psf	2,831.3233 psf	1,769.2071 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 410	457.500000 ft	72.153114 ft	265.500000 ft	0 psf	2,981.7721 psf	1,863.218 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 411	460.500000 ft	70.596559 ft	265.500000 ft	0 psf	3,121.0448 psf	1,950.2453 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 412	463.500000 ft	69.160983 ft	265.500000 ft	0 psf	3,251.8109 psf	2,031.957 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 413	466.500000 ft	67.841557 ft	265.500000 ft	0 psf	3,394.883 psf	2,121.3583 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 414	469.500000 ft	66.634069 ft	265.500000 ft	0 psf	3,445.1212 psf	2,152.7507 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 415	472.500000 ft	65.534846 ft	265.500000 ft	0 psf	3,527.8267 psf	1,854.3209 psf	994.85584 psf	0 psf	Competent (RQD 51-75)
Column 416	475.500000 ft	64.540686 ft	265.500000 ft	0 psf	3,592.8946 psf	1,875.3656 psf	1,007.8931 psf	0 psf	Competent (RQD 51-75)
Column 417	478.500000 ft	63.648804 ft	265.500000 ft	0 psf	3,636.7012 psf	1,889.425 psf	1,016.646 psf	0 psf	Competent (RQD 51-75)
Column 418	481.500000 ft	62.856790 ft	265.500000 ft	0 psf	3,670.7791 psf	1,900.305 psf	1,023.4392 psf	0 psf	Competent (RQD 51-75)
Column 419	484.500000 ft	62.162568 ft	265.500000 ft	0 psf	3,681.3142 psf	1,903.6588 psf	1,025.5362 psf	0 psf	Competent (RQD 51-75)
Column 420	487.500000 ft	61.564371 ft	265.500000 ft	0 psf	3,672.6464 psf	1,900.8998 psf	1,023.811 psf	0 psf	Competent (RQD 51-75)
Column 421	490.500000 ft	61.060715 ft	265.500000 ft	0 psf	3,640.1346 psf	1,890.5234 psf	1,017.3311 psf	0 psf	Competent (RQD 51-75)
Column 422	493.500000 ft	60.650378 ft	265.500000 ft	0 psf	3,589.1409 psf	1,874.1569 psf	1,007.1421 psf	0 psf	Competent (RQD 51-75)
Column 423	496.500000 ft	60.332384 ft	265.500000 ft	0 psf	3,536.3153 psf	1,857.0778 psf	996.55881 psf	0 psf	Competent (RQD 51-75)
Column 424	499.500000 ft	60.105996 ft	265.500000 ft	0 psf	3,515.5494 psf	1,850.3274 psf	992.39179 psf	0 psf	Competent (RQD 51-75)
Column 425	502.500000 ft	59.970698 ft	265.500000 ft	0 psf	3,374.9293 psf	1,804.0302 psf	964.10373 psf	0 psf	Competent (RQD 51-75)
Column 426	505.500000 ft	59.926196 ft	265.500000 ft	0 psf	3,227.5671 psf	1,754.6056 psf	934.09476 psf	0 psf	Competent (RQD 51-75)
Column 427	508.500000 ft	59.972412 ft	265.500000 ft	0 psf	2,652.8315 psf	1,551.4819 psf	813.40612 psf	0 psf	Competent (RQD 51-75)

Column 428	511.500000 ft	60.109483 ft	265.500000 ft	0 psf	2,301.2323 psf	1,417.3336 psf	736.61633 psf	0 psf	Competent (RQD 51-75)
Column 429	514.500000 ft	60.337762 ft	265.500000 ft	0 psf	1,812.7054 psf	1,215.1638 psf	625.23893 psf	0 psf	Competent (RQD 51-75)
Column 430	517.500000 ft	60.657823 ft	265.500000 ft	0 psf	1,425.1908 psf	1,037.5802 psf	532.41783 psf	0 psf	Competent (RQD 51-75)
Column 431	520.500000 ft	61.070468 ft	265.500000 ft	0 psf	1,059.3076 psf	850.34813 psf	440.40354 psf	0 psf	Competent (RQD 51-75)
Column 432	523.500000 ft	61.576737 ft	265.500000 ft	0 psf	838.89061 psf	725.0006 psf	382.33049 psf	0 psf	Competent (RQD 51-75)
Column 433	526.500000 ft	62.177918 ft	265.500000 ft	0 psf	595.76371 psf	570.98355 psf	315.51924 psf	0 psf	Competent (RQD 51-75)
Column 434	529.500000 ft	62.875569 ft	265.500000 ft	0 psf	372.02931 psf	406.85438 psf	251.39323 psf	0 psf	Competent (RQD 51-75)
Column 435	532.500000 ft	63.671535 ft	265.500000 ft	0 psf	248.50971 psf	301.35831 psf	214.97395 psf	0 psf	Competent (RQD 51-75)
Column 436	421.500000 ft	102.473798 ft	268.500000 ft	0 psf	186.94133 psf	107.93062 psf	100 psf	0 psf	Overburden
Column 437	424.500000 ft	98.592715 ft	268.500000 ft	0 psf	498.81877 psf	287.99315 psf	100 psf	0 psf	Overburden
Column 438	427.500000 ft	95.028395 ft	268.500000 ft	0 psf	786.09458 psf	453.85191 psf	100 psf	0 psf	Overburden
Column 439	430.500000 ft	91.738779 ft	268.500000 ft	0 psf	1,063.8139 psf	717.55153 psf	50 psf	0 psf	WXR Rock
Column 440	433.500000 ft	88.691899 ft	268.500000 ft	0 psf	1,353.0473 psf	912.64196 psf	50 psf	0 psf	WXR Rock
Column 441	436.500000 ft	85.863908 ft	268.500000 ft	0 psf	1,633.083 psf	1,101.5284 psf	50 psf	0 psf	WXR Rock
Column 442	439.500000 ft	83.234946 ft	268.500000 ft	0 psf	1,905.3882 psf	1,285.2006 psf	50 psf	0 psf	WXR Rock
Column 443	442.500000 ft	80.788563 ft	268.500000 ft	0 psf	2,130.8969 psf	1,331.5322 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 444	445.500000 ft	78.511013 ft	268.500000 ft	0 psf	2,401.2839 psf	1,500.4887 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 445	448.500000 ft	76.390705 ft	268.500000 ft	0 psf	2,624.2842 psf	1,639.8348 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 446	451.500000 ft	74.417784 ft	268.500000 ft	0 psf	2,832.5966 psf	1,770.0028 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 447	454.500000 ft	72.583804 ft	268.500000 ft	0 psf	3,037.0862 psf	1,897.7821 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 448	457.500000 ft	70.881487 ft	268.500000 ft	0 psf	3,199.9544 psf	1,999.5534 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 449	460.500000 ft	69.304530 ft	268.500000 ft	0 psf	3,354.9302 psf	2,096.3931 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 450	463.500000 ft	67.847450 ft	268.500000 ft	0 psf	3,493.4256 psf	2,182.9346 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 451	466.500000 ft	66.505464 ft	268.500000 ft	0 psf	3,626.4115 psf	2,266.0334 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 452	469.500000 ft	65.274395 ft	268.500000 ft	0 psf	3,699.4883 psf	1,909.434 psf	1,029.1502 psf	0 psf	Competent (RQD 51-75)
Column 453	472.500000 ft	64.150589 ft	268.500000 ft	0 psf	3,786.939 psf	1,937.0474 psf	1,046.4698 psf	0 psf	Competent (RQD 51-75)
Column 454	475.500000 ft	63.130853 ft	268.500000 ft	0 psf	3,848.8089 psf	1,956.4218 psf	1,058.6433 psf	0 psf	Competent (RQD 51-75)
Column 455	478.500000 ft	62.212401 ft	268.500000 ft	0 psf	3,905.3677 psf	1,974.0287 psf	1,069.7054 psf	0 psf	Competent (RQD 51-75)
Column 456	481.500000 ft	61.392815 ft	268.500000 ft	0 psf	3,943.7873 psf	1,985.9371 psf	1,077.1801 psf	0 psf	Competent (RQD 51-75)

Column 457	484.500000 ft	60.670002 ft	268.500000 ft	0 psf	3,947.4758 psf	1,987.0783 psf	1,077.8959 psf	0 psf	Competent (RQD 51-75)
Column 458	487.500000 ft	60.042171 ft	268.500000 ft	0 psf	3,938.0836 psf	1,984.1717 psf	1,076.0725 psf	0 psf	Competent (RQD 51-75)
Column 459	490.500000 ft	59.507806 ft	268.500000 ft	0 psf	3,915.0587 psf	1,977.0362 psf	1,071.594 psf	0 psf	Competent (RQD 51-75)
Column 460	493.500000 ft	59.065645 ft	268.500000 ft	0 psf	3,791.2693 psf	1,938.4076 psf	1,047.3241 psf	0 psf	Competent (RQD 51-75)
Column 461	496.500000 ft	58.714669 ft	268.500000 ft	0 psf	3,681.1603 psf	1,903.6099 psf	1,025.5056 psf	0 psf	Competent (RQD 51-75)
Column 462	499.500000 ft	58.454084 ft	268.500000 ft	0 psf	3,484.3057 psf	1,840.1307 psf	986.11616 psf	0 psf	Competent (RQD 51-75)
Column 463	502.500000 ft	58.283315 ft	268.500000 ft	0 psf	3,316.8361 psf	1,784.6381 psf	952.3411 psf	0 psf	Competent (RQD 51-75)
Column 464	505.500000 ft	58.201997 ft	268.500000 ft	0 psf	2,934.683 psf	1,653.4306 psf	873.20782 psf	0 psf	Competent (RQD 51-75)
Column 465	508.500000 ft	58.209974 ft	268.500000 ft	0 psf	2,409.4837 psf	1,459.5959 psf	760.47204 psf	0 psf	Competent (RQD 51-75)
Column 466	511.500000 ft	58.307294 ft	268.500000 ft	0 psf	1,982.4395 psf	1,287.7729 psf	664.61579 psf	0 psf	Competent (RQD 51-75)
Column 467	514.500000 ft	58.494209 ft	268.500000 ft	0 psf	1,586.8124 psf	1,113.7381 psf	571.76673 psf	0 psf	Competent (RQD 51-75)
Column 468	517.500000 ft	58.771181 ft	268.500000 ft	0 psf	1,262.8135 psf	957.19587 psf	492.2161 psf	0 psf	Competent (RQD 51-75)
Column 469	520.500000 ft	59.138886 ft	268.500000 ft	0 psf	1,047.7112 psf	844.03078 psf	437.39547 psf	0 psf	Competent (RQD 51-75)
Column 470	523.500000 ft	59.598221 ft	268.500000 ft	0 psf	828.87454 psf	719.02829 psf	379.63037 psf	0 psf	Competent (RQD 51-75)
Column 471	526.500000 ft	60.150316 ft	268.500000 ft	0 psf	610.63108 psf	581.00152 psf	319.69853 psf	0 psf	Competent (RQD 51-75)
Column 472	529.500000 ft	60.796547 ft	268.500000 ft	0 psf	379.027 psf	412.42941 psf	253.4517 psf	0 psf	Competent (RQD 51-75)
Column 473	532.500000 ft	61.538555 ft	268.500000 ft	0 psf	247.80653 psf	300.71352 psf	214.76572 psf	0 psf	Competent (RQD 51-75)
Column 474	421.500000 ft	101.583744 ft	271.500000 ft	0 psf	142.57256 psf	82.314305 psf	100 psf	0 psf	Overburden
Column 475	424.500000 ft	97.697907 ft	271.500000 ft	0 psf	492.01824 psf	284.06686 psf	100 psf	0 psf	Overburden
Column 476	427.500000 ft	94.126858 ft	271.500000 ft	0 psf	814.41602 psf	470.20331 psf	100 psf	0 psf	Overburden
Column 477	430.500000 ft	90.830025 ft	271.500000 ft	0 psf	1,114.8653 psf	751.98612 psf	50 psf	0 psf	WXR Rock
Column 478	433.500000 ft	87.775818 ft	271.500000 ft	0 psf	1,413.6683 psf	953.5313 psf	50 psf	0 psf	WXR Rock
Column 479	436.500000 ft	84.938984 ft	271.500000 ft	0 psf	1,710.5551 psf	1,153.784 psf	50 psf	0 psf	WXR Rock
Column 480	439.500000 ft	82.298597 ft	271.500000 ft	0 psf	1,999.8124 psf	1,348.8905 psf	50 psf	0 psf	WXR Rock
Column 481	442.500000 ft	79.837523 ft	271.500000 ft	0 psf	2,265.93 psf	1,415.9102 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 482	445.500000 ft	77.543243 ft	271.500000 ft	0 psf	2,541.777 psf	1,588.2786 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 483	448.500000 ft	75.404678 ft	271.500000 ft	0 psf	2,776.32 psf	1,734.8373 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 484	451.500000 ft	73.412243 ft	271.500000 ft	0 psf	2,991.9762 psf	1,869.5942 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 485	454.500000 ft	71.557666 ft	271.500000 ft	0 psf	3,198.0891 psf	1,998.3879 psf	200 psf	0 psf	Incompetent (Id2 <20)

Column 486	457.500000 ft	69.833782 ft	271.500000 ft	0 psf	3,379.4595 psf	2,111.7207 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 487	460.500000 ft	68.234367 ft	271.500000 ft	0 psf	3,543.1985 psf	2,214.0361 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 488	463.500000 ft	66.753990 ft	271.500000 ft	0 psf	3,681.3343 psf	2,300.353 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 489	466.500000 ft	65.387904 ft	271.500000 ft	0 psf	3,835.6272 psf	1,952.3044 psf	1,056.0558 psf	0 psf	Competent (RQD 51-75)
Column 490	469.500000 ft	64.131950 ft	271.500000 ft	0 psf	3,911.6072 psf	1,975.9653 psf	1,070.9216 psf	0 psf	Competent (RQD 51-75)
Column 491	472.500000 ft	62.982486 ft	271.500000 ft	0 psf	3,994.7779 psf	2,001.6822 psf	1,087.0482 psf	0 psf	Competent (RQD 51-75)
Column 492	475.500000 ft	61.936316 ft	271.500000 ft	0 psf	4,068.1168 psf	2,024.1485 psf	1,101.201 psf	0 psf	Competent (RQD 51-75)
Column 493	478.500000 ft	60.990649 ft	271.500000 ft	0 psf	4,140.9762 psf	2,046.2425 psf	1,115.2343 psf	0 psf	Competent (RQD 51-75)
Column 494	481.500000 ft	60.143050 ft	271.500000 ft	0 psf	4,177.0559 psf	2,057.1049 psf	1,122.1704 psf	0 psf	Competent (RQD 51-75)
Column 495	484.500000 ft	59.391404 ft	271.500000 ft	0 psf	4,180.429 psf	2,058.1178 psf	1,122.8184 psf	0 psf	Competent (RQD 51-75)
Column 496	487.500000 ft	58.733893 ft	271.500000 ft	0 psf	4,187.1958 psf	2,060.1486 psf	1,124.118 psf	0 psf	Competent (RQD 51-75)
Column 497	490.500000 ft	58.168968 ft	271.500000 ft	0 psf	4,090.5642 psf	2,030.9788 psf	1,105.5279 psf	0 psf	Competent (RQD 51-75)
Column 498	493.500000 ft	57.695328 ft	271.500000 ft	0 psf	3,777.6317 psf	1,934.1217 psf	1,044.6325 psf	0 psf	Competent (RQD 51-75)
Column 499	496.500000 ft	57.311909 ft	271.500000 ft	0 psf	3,449.7768 psf	1,828.8036 psf	979.17335 psf	0 psf	Competent (RQD 51-75)
Column 500	499.500000 ft	57.017866 ft	271.500000 ft	0 psf	3,142.4385 psf	1,725.6565 psf	916.53188 psf	0 psf	Competent (RQD 51-75)
Column 501	502.500000 ft	56.812567 ft	271.500000 ft	0 psf	2,883.6308 psf	1,635.2799 psf	862.50152 psf	0 psf	Competent (RQD 51-75)
Column 502	505.500000 ft	56.695583 ft	271.500000 ft	0 psf	2,548.5328 psf	1,512.6354 psf	790.80487 psf	0 psf	Competent (RQD 51-75)
Column 503	508.500000 ft	56.666685 ft	271.500000 ft	0 psf	2,154.7329 psf	1,358.9182 psf	703.73579 psf	0 psf	Competent (RQD 51-75)
Column 504	511.500000 ft	56.725842 ft	271.500000 ft	0 psf	1,845.6505 psf	1,229.4587 psf	632.95933 psf	0 psf	Competent (RQD 51-75)
Column 505	514.500000 ft	56.873217 ft	271.500000 ft	0 psf	1,498.6039 psf	1,072.606 psf	550.38356 psf	0 psf	Competent (RQD 51-75)
Column 506	517.500000 ft	57.109174 ft	271.500000 ft	0 psf	1,300.245 psf	976.03711 psf	501.60942 psf	0 psf	Competent (RQD 51-75)
Column 507	520.500000 ft	57.434278 ft	271.500000 ft	0 psf	1,090.5507 psf	867.25942 psf	448.45451 psf	0 psf	Competent (RQD 51-75)
Column 508	523.500000 ft	57.849302 ft	271.500000 ft	0 psf	878.99998 psf	748.69109 psf	393.05107 psf	0 psf	Competent (RQD 51-75)
Column 509	526.500000 ft	58.355239 ft	271.500000 ft	0 psf	643.38854 psf	602.73787 psf	328.88777 psf	0 psf	Competent (RQD 51-75)
Column 510	529.500000 ft	58.953310 ft	271.500000 ft	0 psf	400.09897 psf	429.01475 psf	259.62656 psf	0 psf	Competent (RQD 51-75)
Column 511	532.500000 ft	59.644981 ft	271.500000 ft	0 psf	197.30678 psf	252.65117 psf	199.91975 psf	0 psf	Competent (RQD 51-75)
Column 512	421.500000 ft	100.995423 ft	274.500000 ft	0 psf	58.871299 psf	33.98936 psf	100 psf	0 psf	Overburden
Column 513	424.500000 ft	97.087611 ft	274.500000 ft	0 psf	439.45562 psf	253.71982 psf	100 psf	0 psf	Overburden
Column 514	427.500000 ft	93.494766 ft	274.500000 ft	0 psf	801.67418 psf	462.8468 psf	100 psf	0 psf	Overburden

Column 515	430.500000 ft	90.176462 ft	274.500000 ft	0 psf	1,128.5847 psf	761.23999 psf	50 psf	0 psf	WXR Rock
Column 516	433.500000 ft	87.101252 ft	274.500000 ft	0 psf	1,448.2212 psf	976.83754 psf	50 psf	0 psf	WXR Rock
Column 517	436.500000 ft	84.244103 ft	274.500000 ft	0 psf	1,756.9481 psf	1,185.0764 psf	50 psf	0 psf	WXR Rock
Column 518	439.500000 ft	81.584681 ft	274.500000 ft	0 psf	2,049.7158 psf	1,280.8046 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 519	442.500000 ft	79.106187 ft	274.500000 ft	0 psf	2,341.4319 psf	1,463.089 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 520	445.500000 ft	76.794491 ft	274.500000 ft	0 psf	2,607.0555 psf	1,629.0691 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 521	448.500000 ft	74.637342 ft	274.500000 ft	0 psf	2,864.6453 psf	1,790.0291 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 522	451.500000 ft	72.624000 ft	274.500000 ft	0 psf	3,101.3763 psf	1,937.955 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 523	454.500000 ft	70.747127 ft	274.500000 ft	0 psf	3,275.6119 psf	2,046.8295 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 524	457.500000 ft	68.999979 ft	274.500000 ft	0 psf	3,458.9058 psf	2,161.3642 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 525	460.500000 ft	67.376511 ft	274.500000 ft	0 psf	3,607.3652 psf	2,254.1319 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 526	463.500000 ft	65.871387 ft	274.500000 ft	0 psf	3,807.0899 psf	1,943.3715 psf	1,050.4425 psf	0 psf	Competent (RQD 51-75)
Column 527	466.500000 ft	64.479914 ft	274.500000 ft	0 psf	3,953.4274 psf	1,988.919 psf	1,079.0503 psf	0 psf	Competent (RQD 51-75)
Column 528	469.500000 ft	63.197964 ft	274.500000 ft	0 psf	4,019.82 psf	2,009.3801 psf	1,091.8832 psf	0 psf	Competent (RQD 51-75)
Column 529	472.500000 ft	62.021902 ft	274.500000 ft	0 psf	4,104.3774 psf	2,035.1714 psf	1,108.1891 psf	0 psf	Competent (RQD 51-75)
Column 530	475.500000 ft	60.948535 ft	274.500000 ft	0 psf	4,169.87 psf	2,054.9455 psf	1,120.7897 psf	0 psf	Competent (RQD 51-75)
Column 531	478.500000 ft	59.975061 ft	274.500000 ft	0 psf	4,263.3015 psf	2,082.8728 psf	1,138.7068 psf	0 psf	Competent (RQD 51-75)
Column 532	481.500000 ft	59.099028 ft	274.500000 ft	0 psf	4,312.3662 psf	2,097.4151 psf	1,148.0817 psf	0 psf	Competent (RQD 51-75)
Column 533	484.500000 ft	58.318300 ft	274.500000 ft	0 psf	4,366.2487 psf	2,113.2944 psf	1,158.3455 psf	0 psf	Competent (RQD 51-75)
Column 534	487.500000 ft	57.631029 ft	274.500000 ft	0 psf	4,189.3274 psf	2,060.788 psf	1,124.5273 psf	0 psf	Competent (RQD 51-75)
Column 535	490.500000 ft	57.035632 ft	274.500000 ft	0 psf	3,710.6281 psf	1,912.9675 psf	1,031.3631 psf	0 psf	Competent (RQD 51-75)
Column 536	493.500000 ft	56.530772 ft	274.500000 ft	0 psf	3,420.6778 psf	1,819.2086 psf	973.3175 psf	0 psf	Competent (RQD 51-75)
Column 537	496.500000 ft	56.115340 ft	274.500000 ft	0 psf	3,059.0911 psf	1,696.9726 psf	899.21442 psf	0 psf	Competent (RQD 51-75)
Column 538	499.500000 ft	55.788443 ft	274.500000 ft	0 psf	2,839.8393 psf	1,619.5723 psf	853.30524 psf	0 psf	Competent (RQD 51-75)
Column 539	502.500000 ft	55.549394 ft	274.500000 ft	0 psf	2,601.5821 psf	1,532.4842 psf	802.32339 psf	0 psf	Competent (RQD 51-75)
Column 540	505.500000 ft	55.397707 ft	274.500000 ft	0 psf	2,333.5166 psf	1,430.006 psf	743.77789 psf	0 psf	Competent (RQD 51-75)
Column 541	508.500000 ft	55.333087 ft	274.500000 ft	0 psf	2,074.1865 psf	1,326.0309 psf	685.47995 psf	0 psf	Competent (RQD 51-75)
Column 542	511.500000 ft	55.355430 ft	274.500000 ft	0 psf	1,816.5994 psf	1,216.8593 psf	626.15287 psf	0 psf	Competent (RQD 51-75)
Column 543	514.500000 ft	55.464820 ft	274.500000 ft	0 psf	1,544.009 psf	1,093.8939 psf	561.42799 psf	0 psf	Competent (RQD 51-75)

Column 544	517.500000 ft	55.661532 ft	274.500000 ft	0 psf	1,326.9145 psf	989.34664 psf	508.25173 psf	0 psf	Competent (RQD 51-75)
Column 545	520.500000 ft	55.946034 ft	274.500000 ft	0 psf	1,119.8336 psf	882.97902 psf	455.92257 psf	0 psf	Competent (RQD 51-75)
Column 546	523.500000 ft	56.318991 ft	274.500000 ft	0 psf	897.84378 psf	759.71359 psf	398.02583 psf	0 psf	Competent (RQD 51-75)
Column 547	526.500000 ft	56.781275 ft	274.500000 ft	0 psf	647.32372 psf	605.32084 psf	329.98798 psf	0 psf	Competent (RQD 51-75)
Column 548	529.500000 ft	57.333973 ft	274.500000 ft	0 psf	412.47579 psf	438.63296 psf	263.22451 psf	0 psf	Competent (RQD 51-75)
Column 549	421.500000 ft	100.706704 ft	277.500000 ft	0 psf	-65.624709 psf	-37.888444 psf	100 psf	0 psf	Overburden
Column 550	424.500000 ft	96.760786 ft	277.500000 ft	0 psf	326.8653 psf	188.71577 psf	100 psf	0 psf	Overburden
Column 551	427.500000 ft	93.132453 ft	277.500000 ft	0 psf	725.94894 psf	489.65874 psf	50 psf	0 psf	WXR Rock
Column 552	430.500000 ft	89.780770 ft	277.500000 ft	0 psf	1,086.7155 psf	732.99886 psf	50 psf	0 psf	WXR Rock
Column 553	433.500000 ft	86.673939 ft	277.500000 ft	0 psf	1,434.5489 psf	967.61542 psf	50 psf	0 psf	WXR Rock
Column 554	436.500000 ft	83.786676 ft	277.500000 ft	0 psf	1,755.1622 psf	1,183.8719 psf	50 psf	0 psf	WXR Rock
Column 555	439.500000 ft	81.098487 ft	277.500000 ft	0 psf	2,056.0079 psf	1,284.7363 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 556	442.500000 ft	78.592489 ft	277.500000 ft	0 psf	2,370.0992 psf	1,481.0023 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 557	445.500000 ft	76.254579 ft	277.500000 ft	0 psf	2,623.4784 psf	1,639.3313 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 558	448.500000 ft	74.072832 ft	277.500000 ft	0 psf	2,895.2859 psf	1,809.1754 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 559	451.500000 ft	72.037040 ft	277.500000 ft	0 psf	3,098.9886 psf	1,936.463 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 560	454.500000 ft	70.138347 ft	277.500000 ft	0 psf	3,272.4417 psf	2,044.8485 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 561	457.500000 ft	68.368860 ft	277.500000 ft	0 psf	3,435.8137 psf	2,146.9347 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 562	460.500000 ft	66.721205 ft	277.500000 ft	0 psf	3,615.0957 psf	2,258.9625 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 563	463.500000 ft	65.190697 ft	277.500000 ft	0 psf	3,839.8829 psf	1,953.6343 psf	1,056.8915 psf	0 psf	Competent (RQD 51-75)
Column 564	466.500000 ft	63.773085 ft	277.500000 ft	0 psf	3,939.3476 psf	1,984.563 psf	1,076.3181 psf	0 psf	Competent (RQD 51-75)
Column 565	469.500000 ft	62.464391 ft	277.500000 ft	0 psf	4,030.0289 psf	2,012.5103 psf	1,093.8537 psf	0 psf	Competent (RQD 51-75)
Column 566	472.500000 ft	61.261052 ft	277.500000 ft	0 psf	4,102.0382 psf	2,034.462 psf	1,107.7385 psf	0 psf	Competent (RQD 51-75)
Column 567	475.500000 ft	60.159906 ft	277.500000 ft	0 psf	4,191.7845 psf	2,061.5248 psf	1,124.999 psf	0 psf	Competent (RQD 51-75)
Column 568	478.500000 ft	59.158157 ft	277.500000 ft	0 psf	4,300.6032 psf	2,093.9361 psf	1,145.8365 psf	0 psf	Competent (RQD 51-75)
Column 569	481.500000 ft	58.253347 ft	277.500000 ft	0 psf	4,299.1265 psf	2,093.499 psf	1,145.5545 psf	0 psf	Competent (RQD 51-75)
Column 570	484.500000 ft	57.443325 ft	277.500000 ft	0 psf	4,210.353 psf	2,067.0854 psf	1,128.5625 psf	0 psf	Competent (RQD 51-75)
Column 571	487.500000 ft	56.726219 ft	277.500000 ft	0 psf	3,620.094 psf	1,884.105 psf	1,013.3303 psf	0 psf	Competent (RQD 51-75)
Column 572	490.500000 ft	56.100417 ft	277.500000 ft	0 psf	3,239.2465 psf	1,758.5525 psf	936.49271 psf	0 psf	Competent (RQD 51-75)

Column 573	493.500000 ft	55.564545 ft	277.500000 ft	0 psf	2,947.3639 psf	1,657.9123 psf	875.86488 psf	0 psf	Competent (RQD 51-75)
Column 574	496.500000 ft	55.117455 ft	277.500000 ft	0 psf	2,729.254 psf	1,579.5205 psf	829.82783 psf	0 psf	Competent (RQD 51-75)
Column 575	499.500000 ft	54.758209 ft	277.500000 ft	0 psf	2,540.4432 psf	1,509.5911 psf	789.04495 psf	0 psf	Competent (RQD 51-75)
Column 576	502.500000 ft	54.486072 ft	277.500000 ft	0 psf	2,371.905 psf	1,444.9967 psf	752.24273 psf	0 psf	Competent (RQD 51-75)
Column 577	505.500000 ft	54.300502 ft	277.500000 ft	0 psf	2,194.0639 psf	1,374.7643 psf	712.61385 psf	0 psf	Competent (RQD 51-75)
Column 578	508.500000 ft	54.201144 ft	277.500000 ft	0 psf	2,001.0062 psf	1,295.5818 psf	668.8478 psf	0 psf	Competent (RQD 51-75)
Column 579	511.500000 ft	54.187829 ft	277.500000 ft	0 psf	1,806.9933 psf	1,212.6738 psf	623.89764 psf	0 psf	Competent (RQD 51-75)
Column 580	514.500000 ft	54.260569 ft	277.500000 ft	0 psf	1,537.4749 psf	1,090.8462 psf	559.84299 psf	0 psf	Competent (RQD 51-75)
Column 581	517.500000 ft	54.419561 ft	277.500000 ft	0 psf	1,315.708 psf	983.76472 psf	505.46633 psf	0 psf	Competent (RQD 51-75)
Column 582	520.500000 ft	54.665185 ft	277.500000 ft	0 psf	1,106.0939 psf	875.61991 psf	452.42655 psf	0 psf	Competent (RQD 51-75)
Column 583	523.500000 ft	54.998011 ft	277.500000 ft	0 psf	872.42135 psf	744.82789 psf	391.30435 psf	0 psf	Competent (RQD 51-75)
Column 584	526.500000 ft	55.418806 ft	277.500000 ft	0 psf	628.76272 psf	593.08662 psf	324.79039 psf	0 psf	Competent (RQD 51-75)
Column 585	529.500000 ft	55.928539 ft	277.500000 ft	0 psf	367.21551 psf	402.99772 psf	249.97628 psf	0 psf	Competent (RQD 51-75)
Column 586	424.500000 ft	96.717554 ft	280.500000 ft	0 psf	154.14738 psf	88.997032 psf	100 psf	0 psf	Overburden
Column 587	427.500000 ft	93.040271 ft	280.500000 ft	0 psf	584.2441 psf	394.07762 psf	50 psf	0 psf	WXR Rock
Column 588	430.500000 ft	89.643668 ft	280.500000 ft	0 psf	973.80337 psf	656.83867 psf	50 psf	0 psf	WXR Rock
Column 589	433.500000 ft	86.495146 ft	280.500000 ft	0 psf	1,364.6153 psf	920.44467 psf	50 psf	0 psf	WXR Rock
Column 590	436.500000 ft	83.568837 ft	280.500000 ft	0 psf	1,691.9885 psf	1,141.2607 psf	50 psf	0 psf	WXR Rock
Column 591	439.500000 ft	80.843812 ft	280.500000 ft	0 psf	1,991.567 psf	1,244.4692 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 592	442.500000 ft	78.302866 ft	280.500000 ft	0 psf	2,330.3313 psf	1,456.1526 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 593	445.500000 ft	75.931654 ft	280.500000 ft	0 psf	2,561.1151 psf	1,600.3624 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 594	448.500000 ft	73.718083 ft	280.500000 ft	0 psf	2,790.9236 psf	1,743.9626 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 595	451.500000 ft	71.651845 ft	280.500000 ft	0 psf	3,005.3583 psf	1,877.9563 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 596	454.500000 ft	69.724083 ft	280.500000 ft	0 psf	3,180.6441 psf	1,987.487 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 597	457.500000 ft	67.927111 ft	280.500000 ft	0 psf	3,356.0477 psf	2,097.0913 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 598	460.500000 ft	66.254208 ft	280.500000 ft	0 psf	3,569.6321 psf	1,867.8647 psf	1,003.2367 psf	0 psf	Competent (RQD 51-75)
Column 599	463.500000 ft	64.699424 ft	280.500000 ft	0 psf	3,688.3339 psf	1,905.891 psf	1,026.9327 psf	0 psf	Competent (RQD 51-75)
Column 600	466.500000 ft	63.257352 ft	280.500000 ft	0 psf	3,787.444 psf	1,937.2061 psf	1,046.5695 psf	0 psf	Competent (RQD 51-75)
Column 601	469.500000 ft	61.922675 ft	280.500000 ft	0 psf	3,908.5329 psf	1,975.0113 psf	1,070.3225 psf	0 psf	Competent (RQD 51-75)

Column 602	472.500000 ft	60.692150 ft	280.500000 ft	0 psf	4,012.1187 psf	2,007.0157 psf	1,090.3965 psf	0 psf	Competent (RQD 51-75)
Column 603	475.500000 ft	59.563123 ft	280.500000 ft	0 psf	4,121.6804 psf	2,040.4123 psf	1,111.5209 psf	0 psf	Competent (RQD 51-75)
Column 604	478.500000 ft	58.532951 ft	280.500000 ft	0 psf	3,881.0175 psf	1,966.46 psf	1,064.9511 psf	0 psf	Competent (RQD 51-75)
Column 605	481.500000 ft	57.599237 ft	280.500000 ft	0 psf	3,753.4399 psf	1,926.5029 psf	1,039.8499 psf	0 psf	Competent (RQD 51-75)
Column 606	484.500000 ft	56.759851 ft	280.500000 ft	0 psf	3,382.9802 psf	1,806.7093 psf	965.72622 psf	0 psf	Competent (RQD 51-75)
Column 607	487.500000 ft	56.012921 ft	280.500000 ft	0 psf	3,032.6107 psf	1,687.7814 psf	893.69221 psf	0 psf	Competent (RQD 51-75)
Column 608	490.500000 ft	55.356820 ft	280.500000 ft	0 psf	2,784.0697 psf	1,599.4429 psf	841.5126 psf	0 psf	Competent (RQD 51-75)
Column 609	493.500000 ft	54.790151 ft	280.500000 ft	0 psf	2,697.8363 psf	1,568.0331 psf	823.09371 psf	0 psf	Competent (RQD 51-75)
Column 610	496.500000 ft	54.311734 ft	280.500000 ft	0 psf	2,527.7149 psf	1,504.7914 psf	786.27425 psf	0 psf	Competent (RQD 51-75)
Column 611	499.500000 ft	53.920593 ft	280.500000 ft	0 psf	2,418.7321 psf	1,463.1734 psf	762.49306 psf	0 psf	Competent (RQD 51-75)
Column 612	502.500000 ft	53.615950 ft	280.500000 ft	0 psf	2,268.4572 psf	1,404.4013 psf	729.31015 psf	0 psf	Competent (RQD 51-75)
Column 613	505.500000 ft	53.397214 ft	280.500000 ft	0 psf	2,047.3703 psf	1,279.3389 psf	200 psf	0 psf	Incompetent
Column 614	508.500000 ft	53.263978 ft	280.500000 ft	0 psf	1,892.8901 psf	1,182.809 psf	200 psf	0 psf	Incompetent
Column 615	511.500000 ft	53.216013 ft	280.500000 ft	0 psf	1,700.6712 psf	1,062.6973 psf	200 psf	0 psf	Incompetent
Column 616	514.500000 ft	53.253269 ft	280.500000 ft	0 psf	1,430.6426 psf	893.9647 psf	200 psf	0 psf	Incompetent
Column 617	517.500000 ft	53.375870 ft	280.500000 ft	0 psf	1,260.5791 psf	956.06468 psf	491.65317 psf	0 psf	Competent (RQD 51-75)
Column 618	520.500000 ft	53.584120 ft	280.500000 ft	0 psf	1,042.69 psf	841.28801 psf	436.09008 psf	0 psf	Competent (RQD 51-75)
Column 619	523.500000 ft	53.878505 ft	280.500000 ft	0 psf	813.07211 psf	709.55349 psf	375.35597 psf	0 psf	Competent (RQD 51-75)
Column 620	526.500000 ft	54.259698 ft	280.500000 ft	0 psf	542.71225 psf	534.34244 psf	300.63196 psf	0 psf	Competent (RQD 51-75)
Column 621	424.500000 ft	96.960219 ft	283.500000 ft	0 psf	-28.361392 psf	-16.374457 psf	100 psf	0 psf	Overburden
Column 622	427.500000 ft	93.220179 ft	283.500000 ft	0 psf	386.89827 psf	260.96618 psf	50 psf	0 psf	WXR Rock
Column 623	430.500000 ft	89.766922 ft	283.500000 ft	0 psf	794.21332 psf	535.70365 psf	50 psf	0 psf	WXR Rock
Column 624	433.500000 ft	86.566574 ft	283.500000 ft	0 psf	1,205.8065 psf	813.32674 psf	50 psf	0 psf	WXR Rock
Column 625	436.500000 ft	83.592341 ft	283.500000 ft	0 psf	1,533.4875 psf	1,034.3504 psf	50 psf	0 psf	WXR Rock
Column 626	439.500000 ft	80.822606 ft	283.500000 ft	0 psf	1,823.4969 psf	1,139.4473 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 627	442.500000 ft	78.239636 ft	283.500000 ft	0 psf	2,195.0381 psf	1,371.6121 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 628	445.500000 ft	75.828682 ft	283.500000 ft	0 psf	2,354.2787 psf	1,471.1166 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 629	448.500000 ft	73.577333 ft	283.500000 ft	0 psf	2,596.6608 psf	1,622.5737 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 630	451.500000 ft	71.475035 ft	283.500000 ft	0 psf	2,823.4369 psf	1,764.2792 psf	200 psf	0 psf	Incompetent (Id2 <20)

Column 631	454.500000 ft	69.512739 ft	283.500000 ft	0 psf	2,988.1122 psf	1,867.1798 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 632	457.500000 ft	67.682626 ft	283.500000 ft	0 psf	3,175.5873 psf	1,984.3272 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 633	460.500000 ft	65.977892 ft	283.500000 ft	0 psf	3,333.0239 psf	1,790.0529 psf	955.62825 psf	0 psf	Competent (RQD 51-75)
Column 634	463.500000 ft	64.392582 ft	283.500000 ft	0 psf	3,442.6951 psf	1,826.4727 psf	977.74862 psf	0 psf	Competent (RQD 51-75)
Column 635	466.500000 ft	62.921450 ft	283.500000 ft	0 psf	3,520.3489 psf	1,851.8894 psf	993.35518 psf	0 psf	Competent (RQD 51-75)
Column 636	469.500000 ft	61.559845 ft	283.500000 ft	0 psf	3,693.9083 psf	1,907.6622 psf	1,028.0411 psf	0 psf	Competent (RQD 51-75)
Column 637	472.500000 ft	60.303593 ft	283.500000 ft	0 psf	3,818.4284 psf	1,946.9239 psf	1,052.6746 psf	0 psf	Competent (RQD 51-75)
Column 638	475.500000 ft	59.148859 ft	283.500000 ft	0 psf	3,534.4863 psf	1,856.4841 psf	996.19193 psf	0 psf	Competent (RQD 51-75)
Column 639	478.500000 ft	58.091711 ft	283.500000 ft	0 psf	3,233.7063 psf	1,756.681 psf	935.3556 psf	0 psf	Competent (RQD 51-75)
Column 640	481.500000 ft	57.129730 ft	283.500000 ft	0 psf	2,871.991 psf	1,631.1167 psf	860.05893 psf	0 psf	Competent (RQD 51-75)
Column 641	484.500000 ft	56.261372 ft	283.500000 ft	0 psf	2,702.0864 psf	1,569.5902 psf	824.00613 psf	0 psf	Competent (RQD 51-75)
Column 642	487.500000 ft	55.484925 ft	283.500000 ft	0 psf	2,494.8314 psf	1,492.3346 psf	779.10816 psf	0 psf	Competent (RQD 51-75)
Column 643	490.500000 ft	54.798823 ft	283.500000 ft	0 psf	2,448.6626 psf	1,474.7004 psf	769.03172 psf	0 psf	Competent (RQD 51-75)
Column 644	493.500000 ft	54.201689 ft	283.500000 ft	0 psf	2,406.3501 psf	1,458.382 psf	759.7872 psf	0 psf	Competent (RQD 51-75)
Column 645	496.500000 ft	53.692337 ft	283.500000 ft	0 psf	2,257.1268 psf	1,410.4094 psf	200 psf	0 psf	Incompetent
Column 646	499.500000 ft	53.269773 ft	283.500000 ft	0 psf	2,143.8028 psf	1,339.5967 psf	200 psf	0 psf	Incompetent
Column 647	502.500000 ft	52.933191 ft	283.500000 ft	0 psf	2,014.5712 psf	1,258.8438 psf	200 psf	0 psf	Incompetent
Column 648	505.500000 ft	52.681962 ft	283.500000 ft	0 psf	1,907.0177 psf	1,191.6369 psf	200 psf	0 psf	Incompetent
Column 649	508.500000 ft	52.515634 ft	283.500000 ft	0 psf	1,753.8806 psf	1,095.9463 psf	200 psf	0 psf	Incompetent
Column 650	511.500000 ft	52.433931 ft	283.500000 ft	0 psf	1,557.0683 psf	972.96429 psf	200 psf	0 psf	Incompetent
Column 651	514.500000 ft	52.436745 ft	283.500000 ft	0 psf	1,297.8997 psf	811.01776 psf	200 psf	0 psf	Incompetent
Column 652	517.500000 ft	52.524139 ft	283.500000 ft	0 psf	1,037.1761 psf	648.09953 psf	200 psf	0 psf	Incompetent
Column 653	520.500000 ft	52.696351 ft	283.500000 ft	0 psf	841.79762 psf	526.01354 psf	200 psf	0 psf	Incompetent
Column 654	523.500000 ft	52.953790 ft	283.500000 ft	0 psf	613.01869 psf	383.05659 psf	200 psf	0 psf	Incompetent
Column 655	526.500000 ft	53.297047 ft	283.500000 ft	0 psf	366.60704 psf	402.50894 psf	249.79715 psf	0 psf	Competent (RQD 51-75)
Column 656	427.500000 ft	93.676280 ft	286.500000 ft	0 psf	154.20627 psf	89.031034 psf	100 psf	0 psf	Overburden
Column 657	430.500000 ft	90.154018 ft	286.500000 ft	0 psf	554.84208 psf	374.24571 psf	50 psf	0 psf	WXR Rock
Column 658	433.500000 ft	86.891265 ft	286.500000 ft	0 psf	966.33871 psf	651.80369 psf	50 psf	0 psf	WXR Rock
Column 659	436.500000 ft	83.859923 ft	286.500000 ft	0 psf	1,284.1731 psf	866.18567 psf	50 psf	0 psf	WXR Rock

Column 660	439.500000 ft	81.037407 ft	286.500000 ft	0 psf	1,567.8593 psf	979.70725 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 661	442.500000 ft	78.405247 ft	286.500000 ft	0 psf	1,909.0141 psf	1,192.8844 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 662	445.500000 ft	75.948124 ft	286.500000 ft	0 psf	2,057.257 psf	1,285.5169 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 663	448.500000 ft	73.653176 ft	286.500000 ft	0 psf	2,306.8073 psf	1,441.4532 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 664	451.500000 ft	71.509491 ft	286.500000 ft	0 psf	2,518.714 psf	1,573.8672 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 665	454.500000 ft	69.507733 ft	286.500000 ft	0 psf	2,680.6195 psf	1,675.037 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 666	457.500000 ft	67.639847 ft	286.500000 ft	0 psf	2,838.8169 psf	1,773.8897 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 667	460.500000 ft	65.898846 ft	286.500000 ft	0 psf	2,961.0129 psf	1,662.7247 psf	878.72352 psf	0 psf	Competent (RQD 51-75)
Column 668	463.500000 ft	64.278628 ft	286.500000 ft	0 psf	3,055.0293 psf	1,695.5654 psf	898.36794 psf	0 psf	Competent (RQD 51-75)
Column 669	466.500000 ft	62.773843 ft	286.500000 ft	0 psf	3,171.6766 psf	1,735.6365 psf	922.57981 psf	0 psf	Competent (RQD 51-75)
Column 670	469.500000 ft	61.379776 ft	286.500000 ft	0 psf	3,398.2457 psf	1,811.7804 psf	968.80086 psf	0 psf	Competent (RQD 51-75)
Column 671	472.500000 ft	60.092257 ft	286.500000 ft	0 psf	3,098.9246 psf	1,710.7263 psf	907.50389 psf	0 psf	Competent (RQD 51-75)
Column 672	475.500000 ft	58.907581 ft	286.500000 ft	0 psf	2,737.3962 psf	1,582.4891 psf	831.56885 psf	0 psf	Competent (RQD 51-75)
Column 673	478.500000 ft	57.822439 ft	286.500000 ft	0 psf	2,301.807 psf	1,417.5598 psf	736.74414 psf	0 psf	Competent (RQD 51-75)
Column 674	481.500000 ft	56.833842 ft	286.500000 ft	0 psf	2,152.3073 psf	1,357.9366 psf	703.18735 psf	0 psf	Competent (RQD 51-75)
Column 675	484.500000 ft	55.939025 ft	286.500000 ft	0 psf	2,092.3574 psf	1,333.5045 psf	689.60493 psf	0 psf	Competent (RQD 51-75)
Column 676	487.500000 ft	55.135071 ft	286.500000 ft	0 psf	2,077.8712 psf	1,327.549 psf	686.31665 psf	0 psf	Competent (RQD 51-75)
Column 677	490.500000 ft	54.420055 ft	286.500000 ft	0 psf	2,071.5367 psf	1,324.9382 psf	684.87817 psf	0 psf	Competent (RQD 51-75)
Column 678	493.500000 ft	53.793247 ft	286.500000 ft	0 psf	2,059.4785 psf	1,286.905 psf	200 psf	0 psf	Incompetent
Column 679	496.500000 ft	53.253641 ft	286.500000 ft	0 psf	2,003.3776 psf	1,251.8493 psf	200 psf	0 psf	Incompetent
Column 680	499.500000 ft	52.800306 ft	286.500000 ft	0 psf	1,878.9995 psf	1,174.1292 psf	200 psf	0 psf	Incompetent
Column 681	502.500000 ft	52.432455 ft	286.500000 ft	0 psf	1,798.645 psf	1,123.9181 psf	200 psf	0 psf	Incompetent
Column 682	505.500000 ft	52.149452 ft	286.500000 ft	0 psf	1,687.8276 psf	1,054.6717 psf	200 psf	0 psf	Incompetent
Column 683	508.500000 ft	51.950825 ft	286.500000 ft	0 psf	1,526.6604 psf	953.96332 psf	200 psf	0 psf	Incompetent
Column 684	511.500000 ft	51.836262 ft	286.500000 ft	0 psf	1,330.8692 psf	831.61939 psf	200 psf	0 psf	Incompetent
Column 685	514.500000 ft	51.805615 ft	286.500000 ft	0 psf	1,088.499 psf	680.16964 psf	200 psf	0 psf	Incompetent
Column 686	517.500000 ft	51.858898 ft	286.500000 ft	0 psf	825.85691 psf	516.05267 psf	200 psf	0 psf	Incompetent
Column 687	520.500000 ft	51.996289 ft	286.500000 ft	0 psf	623.06012 psf	389.33118 psf	200 psf	0 psf	Incompetent
Column 688	523.500000 ft	52.218136 ft	286.500000 ft	0 psf	377.71304 psf	236.0213 psf	200 psf	0 psf	Incompetent

Column 689	427.500000 ft	94.415206 ft	289.500000 ft	0 psf	-92.896984 psf	-53.634099 psf	100 psf	0 psf	Overburden
Column 690	430.500000 ft	90.810551 ft	289.500000 ft	0 psf	267.67011 psf	180.54577 psf	50 psf	0 psf	WXR Rock
Column 691	433.500000 ft	87.474028 ft	289.500000 ft	0 psf	641.59654 psf	432.76233 psf	50 psf	0 psf	WXR Rock
Column 692	436.500000 ft	84.375787 ft	289.500000 ft	0 psf	953.09262 psf	642.86909 psf	50 psf	0 psf	WXR Rock
Column 693	439.500000 ft	81.491955 ft	289.500000 ft	0 psf	1,189.1416 psf	743.05814 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 694	442.500000 ft	78.803088 ft	289.500000 ft	0 psf	1,542.8206 psf	964.06128 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 695	445.500000 ft	76.293113 ft	289.500000 ft	0 psf	1,689.0171 psf	1,055.415 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 696	448.500000 ft	73.948576 ft	289.500000 ft	0 psf	1,930.8211 psf	1,206.5109 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 697	451.500000 ft	71.758093 ft	289.500000 ft	0 psf	2,135.8295 psf	1,334.6144 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 698	454.500000 ft	69.711943 ft	289.500000 ft	0 psf	2,090.7886 psf	1,306.4697 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 699	457.500000 ft	67.801763 ft	289.500000 ft	0 psf	2,120.0884 psf	1,324.7783 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 700	460.500000 ft	66.020305 ft	289.500000 ft	0 psf	1,969.9947 psf	1,282.5265 psf	661.76915 psf	0 psf	Competent (RQD 51-75)
Column 701	463.500000 ft	64.361256 ft	289.500000 ft	0 psf	2,013.2426 psf	1,300.7139 psf	671.62994 psf	0 psf	Competent (RQD 51-75)
Column 702	466.500000 ft	62.819091 ft	289.500000 ft	0 psf	2,118.0681 psf	1,344.0239 psf	695.4358 psf	0 psf	Competent (RQD 51-75)
Column 703	469.500000 ft	61.388952 ft	289.500000 ft	0 psf	2,318.5314 psf	1,424.1318 psf	740.45835 psf	0 psf	Competent (RQD 51-75)
Column 704	472.500000 ft	60.066557 ft	289.500000 ft	0 psf	2,088.8295 psf	1,332.0561 psf	688.8043 psf	0 psf	Competent (RQD 51-75)
Column 705	475.500000 ft	58.848119 ft	289.500000 ft	0 psf	1,878.6921 psf	1,243.6884 psf	640.67125 psf	0 psf	Competent (RQD 51-75)
Column 706	478.500000 ft	57.730282 ft	289.500000 ft	0 psf	1,737.0839 psf	1,181.8998 psf	607.43308 psf	0 psf	Competent (RQD 51-75)
Column 707	481.500000 ft	56.710067 ft	289.500000 ft	0 psf	1,718.8505 psf	1,173.776 psf	603.12829 psf	0 psf	Competent (RQD 51-75)
Column 708	484.500000 ft	55.784819 ft	289.500000 ft	0 psf	1,732.2347 psf	1,179.7434 psf	606.2885 psf	0 psf	Competent (RQD 51-75)
Column 709	487.500000 ft	54.952168 ft	289.500000 ft	0 psf	1,722.8128 psf	1,175.545 psf	604.06399 psf	0 psf	Competent (RQD 51-75)
Column 710	490.500000 ft	54.209975 ft	289.500000 ft	0 psf	1,743.6412 psf	1,184.811 psf	608.98043 psf	0 psf	Competent (RQD 51-75)
Column 711	493.500000 ft	53.556255 ft	289.500000 ft	0 psf	1,677.0185 psf	1,047.9175 psf	200 psf	0 psf	Incompetent
Column 712	496.500000 ft	52.988885 ft	289.500000 ft	0 psf	1,590.2595 psf	993.70441 psf	200 psf	0 psf	Incompetent
Column 713	499.500000 ft	52.506264 ft	289.500000 ft	0 psf	1,519.5564 psf	949.52425 psf	200 psf	0 psf	Incompetent
Column 714	502.500000 ft	52.108285 ft	289.500000 ft	0 psf	1,439.8165 psf	899.69719 psf	200 psf	0 psf	Incompetent
Column 715	505.500000 ft	51.794516 ft	289.500000 ft	0 psf	1,330.5971 psf	831.44933 psf	200 psf	0 psf	Incompetent
Column 716	508.500000 ft	51.564554 ft	289.500000 ft	0 psf	1,195.3014 psf	746.90724 psf	200 psf	0 psf	Incompetent
Column 717	511.500000 ft	51.418108 ft	289.500000 ft	0 psf	1,010.7461 psf	631.58428 psf	200 psf	0 psf	Incompetent

Column 718	514.500000 ft	51.355019 ft	289.500000 ft	0 psf	761.69765 psf	475.96152 psf	200 psf	0 psf	Incompetent
Column 719	517.500000 ft	51.375278 ft	289.500000 ft	0 psf	530.76142 psf	331.65655 psf	200 psf	0 psf	Incompetent
Column 720	520.500000 ft	51.479025 ft	289.500000 ft	0 psf	379.07474 psf	236.87219 psf	200 psf	0 psf	Incompetent
Column 721	430.500000 ft	91.744593 ft	292.500000 ft	0 psf	-45.462161 psf	-30.664615 psf	50 psf	0 psf	WXR Rock
Column 722	433.500000 ft	88.321770 ft	292.500000 ft	0 psf	279.72637 psf	188.67782 psf	50 psf	0 psf	WXR Rock
Column 723	436.500000 ft	85.145932 ft	292.500000 ft	0 psf	544.09468 psf	366.99649 psf	50 psf	0 psf	WXR Rock
Column 724	439.500000 ft	82.191530 ft	292.500000 ft	0 psf	761.86035 psf	476.06318 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 725	442.500000 ft	79.437863 ft	292.500000 ft	0 psf	1,097.6716 psf	685.90135 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 726	445.500000 ft	76.867894 ft	292.500000 ft	0 psf	1,192.8921 psf	745.40173 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 727	448.500000 ft	74.467413 ft	292.500000 ft	0 psf	1,429.0601 psf	892.97584 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 728	451.500000 ft	72.224436 ft	292.500000 ft	0 psf	1,322.974 psf	826.68592 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 729	454.500000 ft	70.128757 ft	292.500000 ft	0 psf	1,328.0229 psf	829.84083 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 730	457.500000 ft	68.171615 ft	292.500000 ft	0 psf	1,076.6207 psf	672.74728 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 731	460.500000 ft	66.345437 ft	292.500000 ft	0 psf	900.18078 psf	761.0748 psf	398.64127 psf	0 psf	Competent (RQD 51-75)
Column 732	463.500000 ft	64.643637 ft	292.500000 ft	0 psf	912.8793 psf	768.44165 psf	401.98714 psf	0 psf	Competent (RQD 51-75)
Column 733	466.500000 ft	63.060461 ft	292.500000 ft	0 psf	1,067.3201 psf	854.69973 psf	442.47604 psf	0 psf	Competent (RQD 51-75)
Column 734	469.500000 ft	61.590858 ft	292.500000 ft	0 psf	1,258.2696 psf	954.89465 psf	491.07107 psf	0 psf	Competent (RQD 51-75)
Column 735	472.500000 ft	60.230384 ft	292.500000 ft	0 psf	1,220.7889 psf	935.78448 psf	481.59487 psf	0 psf	Competent (RQD 51-75)
Column 736	475.500000 ft	58.975117 ft	292.500000 ft	0 psf	1,223.6669 psf	937.26037 psf	482.32424 psf	0 psf	Competent (RQD 51-75)
Column 737	478.500000 ft	57.821590 ft	292.500000 ft	0 psf	1,216.3229 psf	933.49132 psf	480.46258 psf	0 psf	Competent (RQD 51-75)
Column 738	481.500000 ft	56.766733 ft	292.500000 ft	0 psf	1,284.1445 psf	967.95732 psf	497.57819 psf	0 psf	Competent (RQD 51-75)
Column 739	484.500000 ft	55.807828 ft	292.500000 ft	0 psf	1,310.0842 psf	980.95773 psf	504.06534 psf	0 psf	Competent (RQD 51-75)
Column 740	487.500000 ft	54.942472 ft	292.500000 ft	0 psf	1,319.4806 psf	985.64551 psf	506.40496 psf	0 psf	Competent (RQD 51-75)
Column 741	490.500000 ft	54.168534 ft	292.500000 ft	0 psf	1,289.3416 psf	970.56932 psf	498.88106 psf	0 psf	Competent (RQD 51-75)
Column 742	493.500000 ft	53.484132 ft	292.500000 ft	0 psf	1,214.6808 psf	759.01683 psf	200 psf	0 psf	Incompetent
Column 743	496.500000 ft	52.887596 ft	292.500000 ft	0 psf	1,192.0326 psf	744.86465 psf	200 psf	0 psf	Incompetent
Column 744	499.500000 ft	52.377435 ft	292.500000 ft	0 psf	1,098.4586 psf	686.39309 psf	200 psf	0 psf	Incompetent
Column 745	502.500000 ft	51.952279 ft	292.500000 ft	0 psf	1,019.1683 psf	636.84706 psf	200 psf	0 psf	Incompetent
Column 746	505.500000 ft	51.610660 ft	292.500000 ft	0 psf	924.60932 psf	577.76003 psf	200 psf	0 psf	Incompetent

Column 747	508.500000 ft	51.351230 ft	292.500000 ft	0 psf	805.18882 psf	503.13782 psf	200 psf	0 psf	Incompetent
Column 748	511.500000 ft	51.174367 ft	292.500000 ft	0 psf	633.93425 psf	396.12608 psf	200 psf	0 psf	Incompetent
Column 749	514.500000 ft	51.080150 ft	292.500000 ft	0 psf	459.68365 psf	287.24222 psf	200 psf	0 psf	Incompetent
Column 750	433.500000 ft	89.443878 ft	295.500000 ft	0 psf	-136.98595 psf	-92.39819 psf	50 psf	0 psf	WXR Rock
Column 751	436.500000 ft	86.178483 ft	295.500000 ft	0 psf	116.53582 psf	78.604403 psf	50 psf	0 psf	WXR Rock
Column 752	439.500000 ft	83.143252 ft	295.500000 ft	0 psf	324.74846 psf	219.0456 psf	50 psf	0 psf	WXR Rock
Column 753	442.500000 ft	80.315883 ft	295.500000 ft	0 psf	464.1403 psf	290.02705 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 754	445.500000 ft	77.678115 ft	295.500000 ft	0 psf	532.99544 psf	333.05251 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 755	448.500000 ft	75.214793 ft	295.500000 ft	0 psf	209.90656 psf	131.16418 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 756	451.500000 ft	72.913178 ft	295.500000 ft	0 psf	181.20192 psf	113.22753 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 757	454.500000 ft	70.762465 ft	295.500000 ft	0 psf	342.25721 psf	213.86604 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 758	457.500000 ft	68.753399 ft	295.500000 ft	0 psf	216.01145 psf	134.97894 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 759	460.500000 ft	66.878002 ft	295.500000 ft	0 psf	70.023397 psf	43.755475 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 760	463.500000 ft	65.129353 ft	295.500000 ft	0 psf	237.82221 psf	291.482 psf	211.82104 psf	0 psf	Competent (RQD 51-75)
Column 761	466.500000 ft	63.501412 ft	295.500000 ft	0 psf	372.70891 psf	407.39742 psf	251.59323 psf	0 psf	Competent (RQD 51-75)
Column 762	469.500000 ft	61.988892 ft	295.500000 ft	0 psf	494.13798 psf	499.75599 psf	286.75501 psf	0 psf	Competent (RQD 51-75)
Column 763	472.500000 ft	60.587144 ft	295.500000 ft	0 psf	529.12669 psf	524.76768 psf	296.78215 psf	0 psf	Competent (RQD 51-75)
Column 764	475.500000 ft	59.292070 ft	295.500000 ft	0 psf	562.36774 psf	548.08224 psf	306.1457 psf	0 psf	Competent (RQD 51-75)
Column 765	478.500000 ft	58.100055 ft	295.500000 ft	0 psf	672.33454 psf	621.61326 psf	336.95052 psf	0 psf	Competent (RQD 51-75)
Column 766	481.500000 ft	57.007900 ft	295.500000 ft	0 psf	752.53966 psf	672.57198 psf	358.88355 psf	0 psf	Competent (RQD 51-75)
Column 767	484.500000 ft	56.012782 ft	295.500000 ft	0 psf	812.03884 psf	708.93162 psf	375.07594 psf	0 psf	Competent (RQD 51-75)
Column 768	487.500000 ft	55.112204 ft	295.500000 ft	0 psf	829.2272 psf	719.239 psf	379.72557 psf	0 psf	Competent (RQD 51-75)
Column 769	490.500000 ft	54.303967 ft	295.500000 ft	0 psf	805.3329 psf	704.88842 psf	373.25715 psf	0 psf	Competent (RQD 51-75)
Column 770	493.500000 ft	53.586135 ft	295.500000 ft	0 psf	825.58069 psf	515.88007 psf	200 psf	0 psf	Incompetent
Column 771	496.500000 ft	52.957014 ft	295.500000 ft	0 psf	789.85572 psf	493.55663 psf	200 psf	0 psf	Incompetent
Column 772	499.500000 ft	52.415126 ft	295.500000 ft	0 psf	666.95246 psf	416.75815 psf	200 psf	0 psf	Incompetent
Column 773	502.500000 ft	51.959189 ft	295.500000 ft	0 psf	595.42346 psf	372.06187 psf	200 psf	0 psf	Incompetent
Column 774	505.500000 ft	51.588098 ft	295.500000 ft	0 psf	514.97442 psf	321.79173 psf	200 psf	0 psf	Incompetent
Column 775	508.500000 ft	51.300891 ft	295.500000 ft	0 psf	472.39416 psf	295.18463 psf	200 psf	0 psf	Incompetent

Column 776	511.500000 ft	51.096715 ft	295.500000 ft	0 psf	366.65269 psf	229.11003 psf	200 psf	0 psf	Incompetent
Column 777	514.500000 ft	50.974666 ft	295.500000 ft	0 psf	326.25841 psf	203.86888 psf	200 psf	0 psf	Incompetent
Column 778	517.500000 ft	50.933663 ft	295.500000 ft	0 psf	1.1738344 psf	0.73349314 psf	200 psf	0 psf	Incompetent
Column 779	520.500000 ft	50.974448 ft	295.500000 ft	0 psf	14.54391 psf	9.0880436 psf	200 psf	0 psf	Incompetent
Column 780	523.500000 ft	51.097601 ft	295.500000 ft	0 psf	15.556935 psf	9.7210518 psf	200 psf	0 psf	Incompetent
Column 781	526.500000 ft	51.303643 ft	295.500000 ft	0 psf	1.0206214 psf	0.637755 psf	200 psf	0 psf	Incompetent
Column 782	529.500000 ft	51.593184 ft	295.500000 ft	0 psf	-36.390837 psf	-22.739518 psf	200 psf	0 psf	Incompetent
Column 783	442.500000 ft	81.445359 ft	298.500000 ft	0 psf	-441.26856 psf	-275.7352 psf	200 psf	0 psf	Incompetent (Id2 <20)
Column 784									
Column 785									
Column 786									
Column 787									
Column 788									
Column 789									
Column 790									
Column 791									
Column 792	469.500000 ft	62.586966 ft	298.500000 ft	0 psf	-99.210201 psf	-339.51947 psf	198.90094 psf	0 psf	Competent (RQD 51-75)
Column 793	472.500000 ft	61.140595 ft	298.500000 ft	0 psf	-7.9293281 psf	-15.475188 psf	153.13248 psf	0 psf	Competent (RQD 51-75)
Column 794	475.500000 ft	59.802634 ft	298.500000 ft	0 psf	91.857588 psf	137.50532 psf	169.94598 psf	0 psf	Competent (RQD 51-75)
Column 795	478.500000 ft	58.569282 ft	298.500000 ft	0 psf	204.49322 psf	259.69964 psf	202.03545 psf	0 psf	Competent (RQD 51-75)
Column 796	481.500000 ft	57.437185 ft	298.500000 ft	0 psf	310.61381 psf	356.09143 psf	233.41452 psf	0 psf	Competent (RQD 51-75)
Column 797	484.500000 ft	56.403380 ft	298.500000 ft	0 psf	330.1872 psf	372.66161 psf	239.10773 psf	0 psf	Competent (RQD 51-75)
Column 798	487.500000 ft	55.465251 ft	298.500000 ft	0 psf	354.89693 psf	393.04291 psf	246.35064 psf	0 psf	Competent (RQD 51-75)
Column 799	490.500000 ft	54.620496 ft	298.500000 ft	0 psf	384.97813 psf	417.14297 psf	255.20006 psf	0 psf	Competent (RQD 51-75)
Column 800	493.500000 ft	53.867090 ft	298.500000 ft	0 psf	446.06991 psf	278.73542 psf	200 psf	0 psf	Incompetent
Column 801	496.500000 ft	53.203264 ft	298.500000 ft	0 psf	403.21952 psf	251.95952 psf	200 psf	0 psf	Incompetent
Column 802									
Column 803									
Column 804									

Column 805									
Column 806									
Column 807	514.500000 ft	51.029506 ft	298.500000 ft	0 psf	352.2168 psf	220.08948 psf	200 psf	0 psf	Incompetent
Column 808	517.500000 ft	50.960573 ft	298.500000 ft	0 psf	74.531203 psf	46.572265 psf	200 psf	0 psf	Incompetent
Column 809	520.500000 ft	50.974007 ft	298.500000 ft	0 psf	87.877652 psf	54.912052 psf	200 psf	0 psf	Incompetent
Column 810	523.500000 ft	51.069406 ft	298.500000 ft	0 psf	87.746371 psf	54.830018 psf	200 psf	0 psf	Incompetent
Column 811	526.500000 ft	51.246061 ft	298.500000 ft	0 psf	71.000295 psf	44.365908 psf	200 psf	0 psf	Incompetent
Column 812	529.500000 ft	51.504946 ft	298.500000 ft	0 psf	24.609324 psf	15.377613 psf	200 psf	0 psf	Incompetent
Column 813	514.500000 ft	51.253582 ft	301.500000 ft	0 psf	338.59618 psf	211.57837 psf	200 psf	0 psf	Incompetent
Column 814	517.500000 ft	51.153242 ft	301.500000 ft	0 psf	101.70809 psf	63.554269 psf	200 psf	0 psf	Incompetent
Column 815	520.500000 ft	51.136022 ft	301.500000 ft	0 psf	117.72814 psf	73.564708 psf	200 psf	0 psf	Incompetent
Column 816	523.500000 ft	51.201748 ft	301.500000 ft	0 psf	88.955082 psf	55.585304 psf	200 psf	0 psf	Incompetent
Column 817	526.500000 ft	51.350375 ft	301.500000 ft	0 psf	26.693896 psf	16.680198 psf	200 psf	0 psf	Incompetent
Column 818	529.500000 ft	51.581963 ft	301.500000 ft	0 psf	-54.06429 psf	-33.783118 psf	200 psf	0 psf	Incompetent
Column 819	517.500000 ft	51.519721 ft	304.500000 ft	0 psf	19.540988 psf	12.210565 psf	200 psf	0 psf	Incompetent
Column 820	520.500000 ft	51.470186 ft	304.500000 ft	0 psf	41.502205 psf	25.933456 psf	200 psf	0 psf	Incompetent
Column 821	523.500000 ft	51.504189 ft	304.500000 ft	0 psf	15.674025 psf	9.7942177 psf	200 psf	0 psf	Incompetent
Column 822	526.500000 ft	51.621702 ft	304.500000 ft	0 psf	-46.619934 psf	-29.131368 psf	200 psf	0 psf	Incompetent

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ROCKFALL ANALYSES

rocscience

By: WNB 12/10/2024
Chk: DSC 12/30/2024

ATH-13 Rockfall Model Section 100_Proposed
Date Created: 12/10/2024, 4:11:16 PM
Software Version: 8.022

Table of Contents

ATH-13 Rockfall Model Section 100_Proposed

RocFall2 Analysis Information

Project Summary

File Name	ATH-13 Rockfall Model Section 100_Proposed.fal8
File Version	8.022
Date Created	12/10/2024, 4:11:16 PM

Project Settings

General Settings

Engine	Lump Mass
Units	Imperial Foot-Pounds (ft, lbm, ft-lbf)
Rock throw mode	Number of rocks controlled by seeder

Engine Conditions

Friction angle	Use friction angle from material editor
Consider angular velocity	Yes
Maximum steps per rock	20000
Normal velocity cutoff (ft/s)	0.33
Stopped velocity cutoff (ft/s)	0.33
Maximum timestep (s)	0.01
Switch velocity (ft/s)	-3.3e-09

Random Number Generation

Sampling method	Latin-Hypercube
Material Properties Sampling	Per simulation
Random seed	Pseudo-random seed: 12345234

Slope Geometry

Vertex	X	Y	X Std.Dev.	Y Std.Dev.
1	0	39.2066		
2	2.45576	40.3237		
3	2.69601	40.4222		
4	2.83841	40.4779		
5	6.3453	42.1682		
6	8.65076	43.1532		
7	9.99459	43.7157		
8	12.2618	44.702		

9	13.6439	45.2272
10	14.4631	45.5879
11	17.2932	46.9751
12	20.2754	48.5594
13	20.9425	48.9425
14	22.0678	49.6072
15	24.5917	51.2655
16	26.0878	52.0557
17	28.241	52.8411
18	31.8738	54.1861
19	31.9001	54.1931
20	35.5396	54.4809
21	37.7125	54.7897
22	39.1889	54.7886
23	41.6798	54.9371
24	42.8382	54.9529
25	43.5248	55.032
26	46.4875	55.3016
27	49.3371	56.5839
28	50.1368	56.9671
29	51.4858	57.5027
30	53.786	58.5895
31	55.1495	58.9834
32	57.4353	59.6988
33	60.9618	60.0874
34	61.0846	60.1102
35	61.2918	60.1669
36	64.7339	61.0524
37	66.7742	61.3201
38	68.3832	61.2489
39	71.0978	61.1585
40	72.0325	61.0549
41	72.5865	61.0087
42	75.6818	61.1872
43	78.3989	61.9097
44	79.3311	62.0036
45	80.9038	62.425
46	82.9803	62.8712
47	84.2112	63.2099
48	86.6296	63.892
49	90.0235	64.7563
50	90.2789	64.8301
51	90.7098	64.9452
52	93.9282	65.782
53	95.8359	66.2728
54	97.5775	66.8766
55	100.516	68.2094
56	101.227	68.5363
57	101.648	68.7069
58	104.876	70.4748
59	107.461	71.947
60	108.525	72.5078
61	110.322	73.503

62	112.175	74.4559
63	113.273	75.0718
64	115.824	76.3533
65	119.085	77.6609
66	119.473	77.8137
67	120.128	78.0233
68	123.123	79.333
69	124.898	80.0364
70	126.772	80.7275
71	129.934	82.058
72	130.421	82.2466
73	130.71	82.3711
74	134.07	83.7847
75	136.522	84.8564
76	137.72	85.3654
77	139.74	86.0137
78	141.369	86.5282
79	142.335	86.7908
80	145.018	87.6085
81	148.147	88.6646
82	148.668	88.8116
83	149.546	89.1752
84	152.317	90.1134
85	153.959	90.8585
86	155.966	91.5721
87	159.352	92.674
88	159.615	92.7643
89	159.772	92.8089
90	163.265	93.3125
91	165.584	93.6278
92	166.914	93.8429
93	169.158	94.378
94	170.563	94.663
95	171.396	94.9118
96	174.213	96.0049
97	177.209	97.5866
98	177.862	97.973
99	178.964	98.3501
100	181.511	99.3386
101	183.021	99.395
102	185.16	99.4234
103	188.77	99.7976
104	188.81	99.8028
105	188.833	99.8035
106	192.459	99.858
107	194.646	99.813
108	196.108	99.7754
109	198.576	99.7456
110	199.758	99.7362
111	200.458	99.7249
112	203.407	99.7127
113	206.27	99.7165
114	207.056	99.7135

115	208.382	99.723
116	210.705	99.7443
117	215.653	98.0037
118	227.336	103.154
119	229.827	104.297
120	230.903	104.313
121	239.607	104.465
122	248.964	122.968
123	258.893	123.832
124	328.232	157.223
125	337.681	157.91
126	400	188.994

Slope Material Assignment

Material	From Vertex	To Vertex
Slightly Vegetated Soil	1	100
Asphalt	100	116
Slightly Vegetated Soil	116	119
Competent Rock Outcrop	119	123
Slightly Vegetated Soil	123	124
Competent Rock Outcrop	124	125
Slightly Vegetated Soil	125	126

Material Properties

Competent Rock Outcrop

"Competent Rock Outcrop" Properties

Color

	Mean	Distribution	Std.Dev.	Rel. Min	Rel. Max
Normal Restitution	0.38	Normal	0.04	0.12	0.12
Tangential Restitution	0.82	Normal	0.04	0.12	0.12
Friction Angle (°)	25	None			
Slope Roughness (°)		None			

Slightly Vegetated Soil

"Slightly Vegetated Soil" Properties					
Color					
	Mean	Distribution	Std.Dev.	Rel. Min	Rel. Max
Normal Restitution	0.3	Normal	0.04	0.12	0.12
Tangential Restitution	0.81	Normal	0.04	0.12	0.12
Friction Angle (°)	12.79	None			
Slope Roughness (°)		None			

Asphalt

"Asphalt" Properties					
Color					
	Mean	Distribution	Std.Dev.	Rel. Min	Rel. Max
Normal Restitution	0.4	Normal	0.04	0.12	0.12
Tangential Restitution	0.9	Normal	0.03	0.09	0.09
Friction Angle (°)	6.34	None			
Slope Roughness (°)		None			

Seeders

Seeder 1

Seeder Properties					
Name	Seeder 1				
Location	(248.964, 122.968), (239.537, 104.327)				
Rocks to Throw					
Number of Rocks	100 Per Rock Type				
Rock Types	Group 1,	Group 2,	Group 3		
Initial Conditions					
	Mean	Distribution	Std.Dev.	Rel. Min	Rel. Max
Horizontal Velocity (ft/s)	-1	None			
Vertical Velocity (ft/s)	1	None			
Rotational Velocity (deg/s)	0	None			
Initial Rotation (deg/s)	0	Uniform		0	360

Rock Types

Group 1

Properties					
Name	Group 1				
Color					
	Mean	Distribution	Std.Dev.	Rel. Min	Rel. Max
Mass (lbm)	706.1	None			
Density (lbm/ft3)	150	None			

Group 2

Properties					
Name	Group 2				
Color					
	Mean	Distribution	Std.Dev.	Rel. Min	Rel. Max
Mass (lbm)	5648.5	None			
Density (lbm/ft3)	150	None			

Group 3

Properties					
Name	Group 3				
Color					
	Mean	Distribution	Std.Dev.	Rel. Min	Rel. Max
Mass (lbm)	45188	None			
Density (lbm/ft3)	150	None			

Collectors

Record paths' first impacts only?	No
Collector 1	
Name	Collector 1
Location	(210.762, 99.5528) to (210.762, 127.441)

Summary Results

Run Properties			
Simulation Time (s)	0.08		
Envelope data:			
	Max	Mean	95%
Envelope Bounce Height (ft)	1.972	0.7806	1.768
Envelope Total Kinetic Energy (ft-lbf)	5.296e+05	1.157e+05	5.296e+05
Envelope Translational Kinetic Energy (ft-lbf)	5.225e+05	1.136e+05	5.225e+05
Envelope Rotational Kinetic Energy (ft-lbf)	2.802e+04	7256	2.802e+04
Envelope Translational Kinetic Velocity (ft/s)	28.73	19.28	28.73
Envelope Rotational Kinetic Velocity (rad/s)	9.581	4.48	9.581

Stopping Reason	
CONTINUE	0
Invalid Start Location	0
Invalid Slope Geometry	0
Invalid bad crest loss definition	0
Invalid relative size between rock and slope	0
Max Steps	0
Edge Model	0
Stopped	300
Stopped (wedged)	0
Stopped (chattering)	0
Hit Barrier	0
Hit Berm with infinite capacity	0
No collision found	0
Bad Collision Geometry (location before)	0
Rock is freefalling onto a spike or a trough	0
END_ERROR_UNKNOWN	0
END_ERROR_POSITIVE_GAP	0
Bad collision calculation	0
Bad Collision Geometry (0 intersection)	0
Bad Collision Geometry (location after)	0
Bad Collision Geometry (missing intersection)	0
Error during results reading	0
Total Rocks	300

Generated Path Details

Run ID	Rock Type	Shape	X (ft)	Y (ft)	Rotation (deg)	VX (ft/s)	VY (ft/s)	VR (deg/s)
0	Group 1	Sphere	241.3	107.8	264.1	-1	1	0
1	Group 1	Sphere	240.5	106.2	120.1	-1	1	0
2	Group 1	Sphere	239.8	104.9	279.9	-1	1	0
3	Group 1	Sphere	240.2	105.7	335	-1	1	0
4	Group 1	Sphere	241.4	108	19.38	-1	1	0
5	Group 1	Sphere	244.3	113.7	110.5	-1	1	0
6	Group 1	Sphere	242.9	111	291.6	-1	1	0
7	Group 1	Sphere	240.1	105.4	202.2	-1	1	0
8	Group 1	Sphere	248.5	122	38.4	-1	1	0
9	Group 1	Sphere	241.4	107.9	270	-1	1	0
10	Group 1	Sphere	246.2	117.5	345.5	-1	1	0
11	Group 1	Sphere	245.6	116.4	121.7	-1	1	0
12	Group 1	Sphere	243.7	112.5	47.92	-1	1	0
13	Group 1	Sphere	240.8	106.9	212	-1	1	0
14	Group 1	Sphere	243.6	112.3	223	-1	1	0
15	Group 1	Sphere	246.5	118.1	166.3	-1	1	0
16	Group 1	Sphere	242.2	109.6	194	-1	1	0
17	Group 1	Sphere	242.2	109.5	270.2	-1	1	0
18	Group 1	Sphere	242.3	109.7	326.7	-1	1	0
19	Group 1	Sphere	241.1	107.5	123.6	-1	1	0
20	Group 1	Sphere	243.5	112.1	104.6	-1	1	0
21	Group 1	Sphere	247.9	120.9	274.9	-1	1	0
22	Group 1	Sphere	240.9	107	81.58	-1	1	0
23	Group 1	Sphere	245.8	116.7	160.2	-1	1	0
24	Group 1	Sphere	241.6	108.4	316.2	-1	1	0
25	Group 1	Sphere	240.7	106.6	44.37	-1	1	0
26	Group 1	Sphere	243.2	111.6	25.03	-1	1	0
27	Group 1	Sphere	243.7	112.6	68.22	-1	1	0
28	Group 1	Sphere	239.7	104.6	76.74	-1	1	0
29	Group 1	Sphere	239.8	104.9	119.6	-1	1	0
30	Group 1	Sphere	243.6	112.4	127.3	-1	1	0
31	Group 1	Sphere	247.1	119.2	247	-1	1	0
32	Group 1	Sphere	248.1	121.2	226.9	-1	1	0
33	Group 1	Sphere	244.9	114.8	221.3	-1	1	0
34	Group 1	Sphere	245.4	116	30.74	-1	1	0
35	Group 1	Sphere	247.7	120.5	158.9	-1	1	0
36	Group 1	Sphere	247.2	119.5	226	-1	1	0
37	Group 1	Sphere	247.1	119.3	233	-1	1	0
38	Group 1	Sphere	243.5	112.2	139.6	-1	1	0
39	Group 1	Sphere	243.5	112.2	20.41	-1	1	0
40	Group 1	Sphere	248.3	121.7	256.7	-1	1	0
41	Group 1	Sphere	245.4	116	2.734	-1	1	0
42	Group 1	Sphere	248.6	122.2	189.2	-1	1	0
43	Group 1	Sphere	242.1	109.3	228.6	-1	1	0
44	Group 1	Sphere	246.5	118.1	306.1	-1	1	0

Run ID	Rock Type	Shape	X (ft)	Y (ft)	Rotation (deg)	VX (ft/s)	VY (ft/s)	VR (deg/s)
45	Group 1	Sphere	245.1	115.3	241.8	-1	1	0
46	Group 1	Sphere	245.5	116.1	151.4	-1	1	0
47	Group 1	Sphere	244.8	114.7	117.7	-1	1	0
48	Group 1	Sphere	245.2	115.6	74.08	-1	1	0
49	Group 1	Sphere	241.9	109	4.495	-1	1	0
50	Group 1	Sphere	240.9	107	311.9	-1	1	0
51	Group 1	Sphere	247.6	120.3	192.5	-1	1	0
52	Group 1	Sphere	242.4	110	148.3	-1	1	0
53	Group 1	Sphere	240.3	105.9	33.4	-1	1	0
54	Group 1	Sphere	246.2	117.6	204.6	-1	1	0
55	Group 1	Sphere	246.4	117.9	219.2	-1	1	0
56	Group 1	Sphere	239.8	104.8	103.3	-1	1	0
57	Group 1	Sphere	248.1	121.2	163.8	-1	1	0
58	Group 1	Sphere	248.9	122.8	248.6	-1	1	0
59	Group 1	Sphere	243.9	113	285.7	-1	1	0
60	Group 1	Sphere	247.6	120.4	91.48	-1	1	0
61	Group 1	Sphere	241.1	107.4	58.37	-1	1	0
62	Group 1	Sphere	241	107.2	32.14	-1	1	0
63	Group 1	Sphere	245	115.1	174.9	-1	1	0
64	Group 1	Sphere	247.1	119.3	28.83	-1	1	0
65	Group 1	Sphere	244	113.2	86.13	-1	1	0
66	Group 1	Sphere	241.7	108.6	95.86	-1	1	0
67	Group 1	Sphere	239.6	104.5	99.61	-1	1	0
68	Group 1	Sphere	243.2	111.6	51.1	-1	1	0
69	Group 1	Sphere	246.9	118.9	145	-1	1	0
70	Group 1	Sphere	240.8	106.8	358.6	-1	1	0
71	Group 1	Sphere	246.5	118	351.3	-1	1	0
72	Group 1	Sphere	246.3	117.7	181.5	-1	1	0
73	Group 1	Sphere	244.8	114.8	312.9	-1	1	0
74	Group 1	Sphere	248.9	122.9	320.1	-1	1	0
75	Group 1	Sphere	242.1	109.4	353.9	-1	1	0
76	Group 1	Sphere	241.6	108.4	261.1	-1	1	0
77	Group 1	Sphere	240	105.2	147.5	-1	1	0
78	Group 1	Sphere	248.7	122.5	80.35	-1	1	0
79	Group 1	Sphere	245.9	116.8	333.4	-1	1	0
80	Group 1	Sphere	246.7	118.4	87.53	-1	1	0
81	Group 1	Sphere	248.2	121.5	244	-1	1	0
82	Group 1	Sphere	242.2	109.6	134.1	-1	1	0
83	Group 1	Sphere	247	119.1	336.1	-1	1	0
84	Group 1	Sphere	241.3	107.8	45.26	-1	1	0
85	Group 1	Sphere	245.7	116.6	5.468	-1	1	0
86	Group 1	Sphere	242.1	109.4	356.5	-1	1	0
87	Group 1	Sphere	246.6	118.3	10.24	-1	1	0
88	Group 1	Sphere	247.2	119.5	102.9	-1	1	0
89	Group 1	Sphere	246.7	118.4	141.3	-1	1	0

Run ID	Rock Type	Shape	X (ft)	Y (ft)	Rotation (deg)	VX (ft/s)	VY (ft/s)	VR (deg/s)
90	Group 1	Sphere	242.8	110.8	114.1	-1	1	0
91	Group 1	Sphere	243.1	111.5	78.11	-1	1	0
92	Group 1	Sphere	241	107.3	0.3566	-1	1	0
93	Group 1	Sphere	242.7	110.6	252.3	-1	1	0
94	Group 1	Sphere	245.4	115.9	9.598	-1	1	0
95	Group 1	Sphere	243.5	112.1	87.77	-1	1	0
96	Group 1	Sphere	245.5	116.1	175.9	-1	1	0
97	Group 1	Sphere	242.3	109.8	180.1	-1	1	0
98	Group 1	Sphere	245.7	116.5	231.7	-1	1	0
99	Group 1	Sphere	243.1	111.3	273.7	-1	1	0
100	Group 2	Sphere	244.5	114.2	338	-1	1	0
101	Group 2	Sphere	244.1	113.3	48.89	-1	1	0
102	Group 2	Sphere	244.2	113.6	93.7	-1	1	0
103	Group 2	Sphere	242.5	110.2	325.8	-1	1	0
104	Group 2	Sphere	241.6	108.4	213.8	-1	1	0
105	Group 2	Sphere	241.7	108.6	302.3	-1	1	0
106	Group 2	Sphere	243.6	112.4	98.87	-1	1	0
107	Group 2	Sphere	248	121	52.91	-1	1	0
108	Group 2	Sphere	243.3	111.7	322	-1	1	0
109	Group 2	Sphere	247.9	120.8	167.6	-1	1	0
110	Group 2	Sphere	245.6	116.4	82.94	-1	1	0
111	Group 2	Sphere	245.7	116.5	243.3	-1	1	0
112	Group 2	Sphere	244.7	114.5	255.3	-1	1	0
113	Group 2	Sphere	242.8	110.7	200.6	-1	1	0
114	Group 2	Sphere	240	105.3	132	-1	1	0
115	Group 2	Sphere	243.4	112	348.7	-1	1	0
116	Group 2	Sphere	244	113.2	138.9	-1	1	0
117	Group 2	Sphere	248.2	121.4	17.19	-1	1	0
118	Group 2	Sphere	244.7	114.6	237.4	-1	1	0
119	Group 2	Sphere	242.3	109.8	250.5	-1	1	0
120	Group 2	Sphere	245.8	116.7	191.7	-1	1	0
121	Group 2	Sphere	248.6	122.3	293.4	-1	1	0
122	Group 2	Sphere	240.5	106.2	101.7	-1	1	0
123	Group 2	Sphere	245	115.1	129.4	-1	1	0
124	Group 2	Sphere	247.9	120.9	265.6	-1	1	0
125	Group 2	Sphere	248.4	121.9	40.24	-1	1	0
126	Group 2	Sphere	247.4	119.9	42.36	-1	1	0
127	Group 2	Sphere	243.1	111.4	206.1	-1	1	0
128	Group 2	Sphere	240.1	105.5	259.9	-1	1	0
129	Group 2	Sphere	240.3	105.7	339.1	-1	1	0
130	Group 2	Sphere	247.8	120.7	217.9	-1	1	0
131	Group 2	Sphere	246	117.1	346.1	-1	1	0
132	Group 2	Sphere	246.1	117.3	157.8	-1	1	0
133	Group 2	Sphere	245.2	115.4	96.29	-1	1	0
134	Group 2	Sphere	245.5	116.2	136	-1	1	0

Run ID	Rock Type	Shape	X (ft)	Y (ft)	Rotation (deg)	VX (ft/s)	VY (ft/s)	VR (deg/s)
135	Group 2	Sphere	240.6	106.5	145.5	-1	1	0
136	Group 2	Sphere	244.4	114	154.8	-1	1	0
137	Group 2	Sphere	245.9	116.9	309.8	-1	1	0
138	Group 2	Sphere	245.3	115.7	271.3	-1	1	0
139	Group 2	Sphere	245.6	116.3	224	-1	1	0
140	Group 2	Sphere	246.4	117.8	247.7	-1	1	0
141	Group 2	Sphere	246.2	117.5	272.7	-1	1	0
142	Group 2	Sphere	242.6	110.5	6.79	-1	1	0
143	Group 2	Sphere	246.3	117.7	1.512	-1	1	0
144	Group 2	Sphere	244	113.1	170.5	-1	1	0
145	Group 2	Sphere	241.7	108.7	303.6	-1	1	0
146	Group 2	Sphere	243.8	112.8	352.1	-1	1	0
147	Group 2	Sphere	242.5	110.2	143.9	-1	1	0
148	Group 2	Sphere	247.8	120.7	68.57	-1	1	0
149	Group 2	Sphere	243.8	112.7	299.5	-1	1	0
150	Group 2	Sphere	242	109.1	281.6	-1	1	0
151	Group 2	Sphere	246	117.1	263.1	-1	1	0
152	Group 2	Sphere	240.6	106.4	116.6	-1	1	0
153	Group 2	Sphere	245.1	115.3	186.6	-1	1	0
154	Group 2	Sphere	240.4	106	65.15	-1	1	0
155	Group 2	Sphere	246.7	118.6	216.2	-1	1	0
156	Group 2	Sphere	248	121.1	162.1	-1	1	0
157	Group 2	Sphere	245.3	115.8	141.9	-1	1	0
158	Group 2	Sphere	247	119	177.4	-1	1	0
159	Group 2	Sphere	248.3	121.6	97.35	-1	1	0
160	Group 2	Sphere	244.3	113.8	331.2	-1	1	0
161	Group 2	Sphere	243.3	111.9	198.8	-1	1	0
162	Group 2	Sphere	247.2	119.4	131.6	-1	1	0
163	Group 2	Sphere	241.5	108.1	37.08	-1	1	0
164	Group 2	Sphere	248.1	121.3	317.2	-1	1	0
165	Group 2	Sphere	246.8	118.6	70.69	-1	1	0
166	Group 2	Sphere	240.4	106.1	359.1	-1	1	0
167	Group 2	Sphere	239.9	105.1	294.7	-1	1	0
168	Group 2	Sphere	244.5	114.2	289.9	-1	1	0
169	Group 2	Sphere	240.3	105.9	72.21	-1	1	0
170	Group 2	Sphere	246.4	117.9	209.7	-1	1	0
171	Group 2	Sphere	247.5	120.2	61.67	-1	1	0
172	Group 2	Sphere	240.7	106.6	152.5	-1	1	0
173	Group 2	Sphere	240.5	106.3	334.4	-1	1	0
174	Group 2	Sphere	240.8	106.8	239.2	-1	1	0
175	Group 2	Sphere	245.1	115.2	37.71	-1	1	0
176	Group 2	Sphere	244.5	114.1	339.6	-1	1	0
177	Group 2	Sphere	245.2	115.5	25.62	-1	1	0
178	Group 2	Sphere	243.3	111.8	49.31	-1	1	0
179	Group 2	Sphere	246.7	118.6	169.2	-1	1	0

Run ID	Rock Type	Shape	X (ft)	Y (ft)	Rotation (deg)	VX (ft/s)	VY (ft/s)	VR (deg/s)
180	Group 2	Sphere	242.9	110.9	156.7	-1	1	0
181	Group 2	Sphere	241.8	108.9	126.7	-1	1	0
182	Group 2	Sphere	247.9	120.8	16.57	-1	1	0
183	Group 2	Sphere	247	119.1	52.21	-1	1	0
184	Group 2	Sphere	241	107.2	288.2	-1	1	0
185	Group 2	Sphere	248	121.1	90.1	-1	1	0
186	Group 2	Sphere	240.1	105.4	213.6	-1	1	0
187	Group 2	Sphere	246.4	117.8	35.9	-1	1	0
188	Group 2	Sphere	241.7	108.5	207.2	-1	1	0
189	Group 2	Sphere	242.9	111.1	285.1	-1	1	0
190	Group 2	Sphere	248.7	122.5	300.1	-1	1	0
191	Group 2	Sphere	246.6	118.3	89.06	-1	1	0
192	Group 2	Sphere	242.7	110.6	279.6	-1	1	0
193	Group 2	Sphere	241.8	108.9	92.42	-1	1	0
194	Group 2	Sphere	242.6	110.3	63.24	-1	1	0
195	Group 2	Sphere	243.9	112.9	171.6	-1	1	0
196	Group 2	Sphere	244.9	114.9	124.6	-1	1	0
197	Group 2	Sphere	246.5	118.2	45.7	-1	1	0
198	Group 2	Sphere	243	111.2	71.09	-1	1	0
199	Group 2	Sphere	247.7	120.5	324.8	-1	1	0
200	Group 3	Sphere	242.8	110.7	107.1	-1	1	0
201	Group 3	Sphere	241.2	107.6	203.5	-1	1	0
202	Group 3	Sphere	242.9	111	10.87	-1	1	0
203	Group 3	Sphere	244.1	113.4	347.4	-1	1	0
204	Group 3	Sphere	245.9	116.9	341	-1	1	0
205	Group 3	Sphere	244.9	115	219.7	-1	1	0
206	Group 3	Sphere	240	105.2	14.56	-1	1	0
207	Group 3	Sphere	240.9	107.1	230.4	-1	1	0
208	Group 3	Sphere	241.3	107.7	342.1	-1	1	0
209	Group 3	Sphere	241.4	108.1	60.86	-1	1	0
210	Group 3	Sphere	239.8	104.8	108.6	-1	1	0
211	Group 3	Sphere	248.9	122.8	328.2	-1	1	0
212	Group 3	Sphere	244.3	113.8	55.19	-1	1	0
213	Group 3	Sphere	248.8	122.7	8.067	-1	1	0
214	Group 3	Sphere	247.4	119.9	115.7	-1	1	0
215	Group 3	Sphere	242.6	110.4	283.4	-1	1	0
216	Group 3	Sphere	242.6	110.3	184.1	-1	1	0
217	Group 3	Sphere	247.4	119.8	63.61	-1	1	0
218	Group 3	Sphere	244.6	114.3	12.03	-1	1	0
219	Group 3	Sphere	243	111.2	292.1	-1	1	0
220	Group 3	Sphere	247.5	120.1	137.5	-1	1	0
221	Group 3	Sphere	240.1	105.5	237.8	-1	1	0
222	Group 3	Sphere	246.2	117.4	178	-1	1	0
223	Group 3	Sphere	244.3	113.7	106.4	-1	1	0
224	Group 3	Sphere	241.5	108.2	82.35	-1	1	0

Run ID	Rock Type	Shape	X (ft)	Y (ft)	Rotation (deg)	VX (ft/s)	VY (ft/s)	VR (deg/s)
225	Group 3	Sphere	247.3	119.7	305.8	-1	1	0
226	Group 3	Sphere	244.4	113.9	241	-1	1	0
227	Group 3	Sphere	240.2	105.6	113.7	-1	1	0
228	Group 3	Sphere	244.1	113.4	229.9	-1	1	0
229	Group 3	Sphere	240.6	106.3	257.8	-1	1	0
230	Group 3	Sphere	247.6	120.2	109.6	-1	1	0
231	Group 3	Sphere	243.4	112	55.8	-1	1	0
232	Group 3	Sphere	240.7	106.7	165.2	-1	1	0
233	Group 3	Sphere	244.6	114.3	84.35	-1	1	0
234	Group 3	Sphere	245	115	199.6	-1	1	0
235	Group 3	Sphere	240.3	105.8	331.7	-1	1	0
236	Group 3	Sphere	248.7	122.4	151.1	-1	1	0
237	Group 3	Sphere	239.6	104.4	253.3	-1	1	0
238	Group 3	Sphere	239.6	104.4	355.6	-1	1	0
239	Group 3	Sphere	243	111.1	173.4	-1	1	0
240	Group 3	Sphere	246	117.2	287.2	-1	1	0
241	Group 3	Sphere	248.7	122.5	74.53	-1	1	0
242	Group 3	Sphere	246.8	118.7	56.91	-1	1	0
243	Group 3	Sphere	247.2	119.6	235.2	-1	1	0
244	Group 3	Sphere	242.4	109.9	77.39	-1	1	0
245	Group 3	Sphere	243.3	111.8	329.9	-1	1	0
246	Group 3	Sphere	248.4	121.8	262.8	-1	1	0
247	Group 3	Sphere	247.3	119.6	314.4	-1	1	0
248	Group 3	Sphere	248.8	122.6	196.3	-1	1	0
249	Group 3	Sphere	242.7	110.5	59.52	-1	1	0
250	Group 3	Sphere	247.6	120.2	187.5	-1	1	0
251	Group 3	Sphere	241.5	108.3	190.1	-1	1	0
252	Group 3	Sphere	247.8	120.6	321.5	-1	1	0
253	Group 3	Sphere	248.2	121.5	23.96	-1	1	0
254	Group 3	Sphere	245.1	115.4	28.48	-1	1	0
255	Group 3	Sphere	242	109.2	277.9	-1	1	0
256	Group 3	Sphere	245.4	115.9	154.2	-1	1	0
257	Group 3	Sphere	246.9	118.9	349.6	-1	1	0
258	Group 3	Sphere	246	117	66.78	-1	1	0
259	Group 3	Sphere	248.5	122	183.1	-1	1	0
260	Group 3	Sphere	241.8	108.8	22.14	-1	1	0
261	Group 3	Sphere	244.2	113.5	208.5	-1	1	0
262	Group 3	Sphere	248.6	122.3	125.3	-1	1	0
263	Group 3	Sphere	244.6	114.4	277.1	-1	1	0
264	Group 3	Sphere	243.2	111.5	283	-1	1	0
265	Group 3	Sphere	243.8	112.7	307.4	-1	1	0
266	Group 3	Sphere	239.6	104.5	323.8	-1	1	0
267	Group 3	Sphere	247.5	120	225.3	-1	1	0
268	Group 3	Sphere	248.4	121.8	251.4	-1	1	0
269	Group 3	Sphere	245.3	115.7	34.09	-1	1	0

Run ID	Rock Type	Shape	X (ft)	Y (ft)	Rotation (deg)	VX (ft/s)	VY (ft/s)	VR (deg/s)
270	Group 3	Sphere	241	107.3	195	-1	1	0
271	Group 3	Sphere	243.9	112.9	197.3	-1	1	0
272	Group 3	Sphere	242	109.3	314.4	-1	1	0
273	Group 3	Sphere	241.9	109	234.4	-1	1	0
274	Group 3	Sphere	243.9	113	309.3	-1	1	0
275	Group 3	Sphere	248.5	122.1	179.6	-1	1	0
276	Group 3	Sphere	243.7	112.5	354.4	-1	1	0
277	Group 3	Sphere	239.7	104.6	215.4	-1	1	0
278	Group 3	Sphere	248.5	122.1	13.54	-1	1	0
279	Group 3	Sphere	239.9	105.1	344	-1	1	0
280	Group 3	Sphere	241.2	107.7	185.6	-1	1	0
281	Group 3	Sphere	244.8	114.7	298.4	-1	1	0
282	Group 3	Sphere	248.9	122.9	18.01	-1	1	0
283	Group 3	Sphere	244.7	114.5	169.1	-1	1	0
284	Group 3	Sphere	244.2	113.6	266.6	-1	1	0
285	Group 3	Sphere	240.8	106.7	161.5	-1	1	0
286	Group 3	Sphere	247.3	119.8	210.5	-1	1	0
287	Group 3	Sphere	240.4	106	111.7	-1	1	0
288	Group 3	Sphere	242.4	110	258.1	-1	1	0
289	Group 3	Sphere	239.9	105	319	-1	1	0
290	Group 3	Sphere	241.4	108	130	-1	1	0
291	Group 3	Sphere	245.8	116.8	41.41	-1	1	0
292	Group 3	Sphere	248.2	121.5	303.3	-1	1	0
293	Group 3	Sphere	244.4	114	268.5	-1	1	0
294	Group 3	Sphere	241.9	109.1	149.1	-1	1	0
295	Group 3	Sphere	246.1	117.3	134.6	-1	1	0
296	Group 3	Sphere	246.8	118.8	26.79	-1	1	0
297	Group 3	Sphere	241.1	107.5	296.9	-1	1	0
298	Group 3	Sphere	246.9	119	295.7	-1	1	0
299	Group 3	Sphere	242.5	110.1	244.9	-1	1	0

Path Results Summary

ID	Compute Time (s)	Events	Stopping Reason	End Loc
0	0	18	Stopped	237.3
1	0	18	Stopped	238.6
2	0	11	Stopped	239.3
3	0	16	Stopped	238.8
4	0	16	Stopped	237.5
5	0	20	Stopped	234.4
6	0	18	Stopped	235.8
7	0	16	Stopped	239
8	0	63	Stopped	215.7
9	0	18	Stopped	237.9
10	0	23	Stopped	230.2
11	0	18	Stopped	232.9
12	0	24	Stopped	233.9
13	0	18	Stopped	238
14	0	18	Stopped	234.8
15	0	23	Stopped	230.6
16	0	22	Stopped	236.3
17	0	18	Stopped	236.5
18	0	18	Stopped	235.9
19	0	18	Stopped	237
20	0	18	Stopped	236.4
21	0	57	Stopped	215.7
22	0	18	Stopped	237.8
23	0	20	Stopped	231.6
24	0	18	Stopped	237.1
25	0	16	Stopped	238.2
26	0	18	Stopped	235.3
27	0	22	Stopped	233.7
28	0	9	Stopped	239.5
29	0	11	Stopped	239.2
30	0	18	Stopped	236.2
31	0	23	Stopped	230.6
32	0	18	Stopped	231.1
33	0	22	Stopped	231.4
34	0	20	Stopped	232.4
35	0	21	Stopped	230.2
36	0	18	Stopped	233.6
37	0	68	Stopped	215.7
38	0	24	Stopped	234.1
39	0	18	Stopped	235.1
40	0	59	Stopped	215.7
41	0	20	Stopped	233.7
42	0	60	Stopped	215.7
43	0	22	Stopped	235.8
44	0	18	Stopped	232.1

ID	Compute Time (s)	Events	Stopping Reason	End Loc
45	0	18	Stopped	233.6
46	0	22	Stopped	232.2
47	0	20	Stopped	232.8
48	0	20	Stopped	232.5
49	0	18	Stopped	236.7
50	0	18	Stopped	238
51	0	61	Stopped	215.7
52	0	22	Stopped	235.1
53	0	16	Stopped	238.8
54	0	27	Stopped	230.8
55	0	20	Stopped	231.4
56	0	9	Stopped	239.4
57	0	21	Stopped	230.3
58	0	21	Stopped	230
59	0	20	Stopped	234.1
60	0	66	Stopped	215.7
61	0	18	Stopped	237.6
62	0	18	Stopped	236.9
63	0	20	Stopped	233
64	0	67	Stopped	215.7
65	0	24	Stopped	232.7
66	0	18	Stopped	237.1
67	0	9	Stopped	239.4
68	0	24	Stopped	233.9
69	0	18	Stopped	231.6
70	0	20	Stopped	238
71	0	18	Stopped	231.9
72	0	20	Stopped	232.3
73	0	20	Stopped	233.5
74	0	20	Stopped	229.9
75	0	22	Stopped	236.7
76	0	18	Stopped	236.9
77	0	13	Stopped	239
78	0	72	Stopped	215.7
79	0	18	Stopped	233
80	0	66	Stopped	215.7
81	0	20	Stopped	229.9
82	0	18	Stopped	236
83	0	69	Stopped	215.7
84	0	18	Stopped	237.6
85	0	22	Stopped	231.6
86	0	18	Stopped	236.9
87	0	20	Stopped	231
88	0	21	Stopped	230.5
89	0	25	Stopped	230.3

ID	Compute Time (s)	Events	Stopping Reason	End Loc
90	0	18	Stopped	235.9
91	0	22	Stopped	234.3
92	0	20	Stopped	237.5
93	0	18	Stopped	236.4
94	0	20	Stopped	232.4
95	0	22	Stopped	233.9
96	0	20	Stopped	231.1
97	0	18	Stopped	236.3
98	0	20	Stopped	232.8
99	0	18	Stopped	234.8
100	0	20	Stopped	233.2
101	0	24	Stopped	233.1
102	0	18	Stopped	235.3
103	0	18	Stopped	236
104	0	22	Stopped	236.9
105	0	22	Stopped	236.9
106	0	18	Stopped	234.8
107	0	65	Stopped	215.7
108	0	18	Stopped	235.5
109	0	65	Stopped	215.7
110	0	20	Stopped	231.9
111	0	20	Stopped	231.7
112	0	22	Stopped	232.6
113	0	18	Stopped	235.8
114	0	16	Stopped	239
115	0	24	Stopped	232.8
116	0	22	Stopped	233.3
117	0	18	Stopped	231.4
118	0	18	Stopped	233.7
119	0	18	Stopped	236.1
120	0	24	Stopped	230
121	0	57	Stopped	215.7
122	0	20	Stopped	238
123	0	22	Stopped	232
124	0	18	Stopped	233.6
125	0	61	Stopped	215.7
126	0	18	Stopped	231.8
127	0	20	Stopped	234.7
128	0	20	Stopped	239
129	0	16	Stopped	239
130	0	67	Stopped	215.7
131	0	20	Stopped	231.8
132	0	18	Stopped	233.8
133	0	18	Stopped	234.2
134	0	18	Stopped	233.4

ID	Compute Time (s)	Events	Stopping Reason	End Loc
135	0	18	Stopped	238.3
136	0	22	Stopped	232.5
137	0	20	Stopped	232.1
138	0	20	Stopped	232.8
139	0	20	Stopped	231.6
140	0	20	Stopped	231.9
141	0	18	Stopped	233.4
142	0	22	Stopped	235.1
143	0	18	Stopped	232.3
144	0	18	Stopped	235
145	0	18	Stopped	236.8
146	0	18	Stopped	235.4
147	0	18	Stopped	236.5
148	0	58	Stopped	215.7
149	0	18	Stopped	234.7
150	0	18	Stopped	236.9
151	0	20	Stopped	232.8
152	0	16	Stopped	238.2
153	0	22	Stopped	231.9
154	0	16	Stopped	238.9
155	0	58	Stopped	215.7
156	0	64	Stopped	215.7
157	0	20	Stopped	233.9
158	0	60	Stopped	215.7
159	0	65	Stopped	215.7
160	0	18	Stopped	235.4
161	0	18	Stopped	234.9
162	0	23	Stopped	230.6
163	0	18	Stopped	237.2
164	0	18	Stopped	231.1
165	0	18	Stopped	233.2
166	0	20	Stopped	238.6
167	0	13	Stopped	239
168	0	20	Stopped	233.1
169	0	16	Stopped	239
170	0	23	Stopped	230.4
171	0	67	Stopped	215.7
172	0	18	Stopped	238.2
173	0	18	Stopped	238.4
174	0	20	Stopped	237.5
175	0	22	Stopped	231.8
176	0	20	Stopped	233.4
177	0	18	Stopped	233.8
178	0	18	Stopped	235.8
179	0	20	Stopped	231.3

ID	Compute Time (s)	Events	Stopping Reason	End Loc
180	0	18	Stopped	236.4
181	0	18	Stopped	237.1
182	0	23	Stopped	230.4
183	0	61	Stopped	215.7
184	0	16	Stopped	237.9
185	0	72	Stopped	215.7
186	0	16	Stopped	239.1
187	0	18	Stopped	232.7
188	0	16	Stopped	237.9
189	0	22	Stopped	234.9
190	0	65	Stopped	215.7
191	0	23	Stopped	230.5
192	0	18	Stopped	236.4
193	0	18	Stopped	237.1
194	0	22	Stopped	235.5
195	0	18	Stopped	234.4
196	0	22	Stopped	233
197	0	18	Stopped	231.6
198	0	18	Stopped	236.2
199	0	67	Stopped	215.7
200	0	22	Stopped	234.8
201	0	18	Stopped	237.5
202	0	18	Stopped	235.3
203	0	22	Stopped	233.4
204	0	20	Stopped	232.2
205	0	20	Stopped	232.6
206	0	13	Stopped	239.1
207	0	18	Stopped	237.5
208	0	16	Stopped	238.3
209	0	16	Stopped	237.6
210	0	9	Stopped	239.4
211	0	23	Stopped	230
212	0	20	Stopped	233.4
213	0	59	Stopped	215.7
214	0	61	Stopped	215.7
215	0	20	Stopped	236.2
216	0	18	Stopped	235.8
217	0	55	Stopped	215.7
218	0	18	Stopped	234.5
219	0	22	Stopped	233.7
220	0	18	Stopped	231
221	0	16	Stopped	239
222	0	18	Stopped	233.1
223	0	20	Stopped	234.6
224	0	18	Stopped	237.2

ID	Compute Time (s)	Events	Stopping Reason	End Loc
225	0	20	Stopped	230
226	0	18	Stopped	234.8
227	0	16	Stopped	239
228	0	18	Stopped	233.4
229	0	18	Stopped	238.2
230	0	23	Stopped	230.3
231	0	18	Stopped	235.6
232	0	20	Stopped	238
233	0	18	Stopped	235
234	0	27	Stopped	230.6
235	0	20	Stopped	238.6
236	0	63	Stopped	215.7
237	0	7	Stopped	239.5
238	0	7	Stopped	239.5
239	0	22	Stopped	235.5
240	0	18	Stopped	233.2
241	0	59	Stopped	215.7
242	0	61	Stopped	215.7
243	0	61	Stopped	215.7
244	0	18	Stopped	236.4
245	0	18	Stopped	235.8
246	0	55	Stopped	215.7
247	0	23	Stopped	230.2
248	0	53	Stopped	215.7
249	0	20	Stopped	234.4
250	0	65	Stopped	215.7
251	0	18	Stopped	236.9
252	0	57	Stopped	215.7
253	0	61	Stopped	215.7
254	0	18	Stopped	234.1
255	0	18	Stopped	236.9
256	0	20	Stopped	231.4
257	0	18	Stopped	232.6
258	0	23	Stopped	230.1
259	0	56	Stopped	215.7
260	0	18	Stopped	236.3
261	0	18	Stopped	234.2
262	0	21	Stopped	229.9
263	0	18	Stopped	233.2
264	0	18	Stopped	234.8
265	0	18	Stopped	235.2
266	0	7	Stopped	239.5
267	0	18	Stopped	231.6
268	0	23	Stopped	230.1
269	0	18	Stopped	232.9

ID	Compute Time (s)	Events	Stopping Reason	End Loc
270	0	18	Stopped	237.8
271	0	20	Stopped	234.4
272	0	22	Stopped	236.5
273	0	18	Stopped	236.8
274	0	20	Stopped	233.6
275	0	74	Stopped	215.7
276	0	18	Stopped	235.4
277	0	9	Stopped	239.4
278	0	23	Stopped	230
279	0	11	Stopped	239
280	0	18	Stopped	237.2
281	0	20	Stopped	233.4
282	0	21	Stopped	230.4
283	0	18	Stopped	232.8
284	0	18	Stopped	234.5
285	0	16	Stopped	238.3
286	0	23	Stopped	230.2
287	0	16	Stopped	238.8
288	0	16	Stopped	237
289	0	11	Stopped	239.2
290	0	18	Stopped	236.8
291	0	20	Stopped	232.1
292	0	18	Stopped	232
293	0	20	Stopped	233.8
294	0	18	Stopped	237.1
295	0	25	Stopped	230.5
296	0	20	Stopped	231.3
297	0	18	Stopped	238.1
298	0	23	Stopped	230.4
299	0	18	Stopped	236.7

Collector(s) Impact Results

Report Views

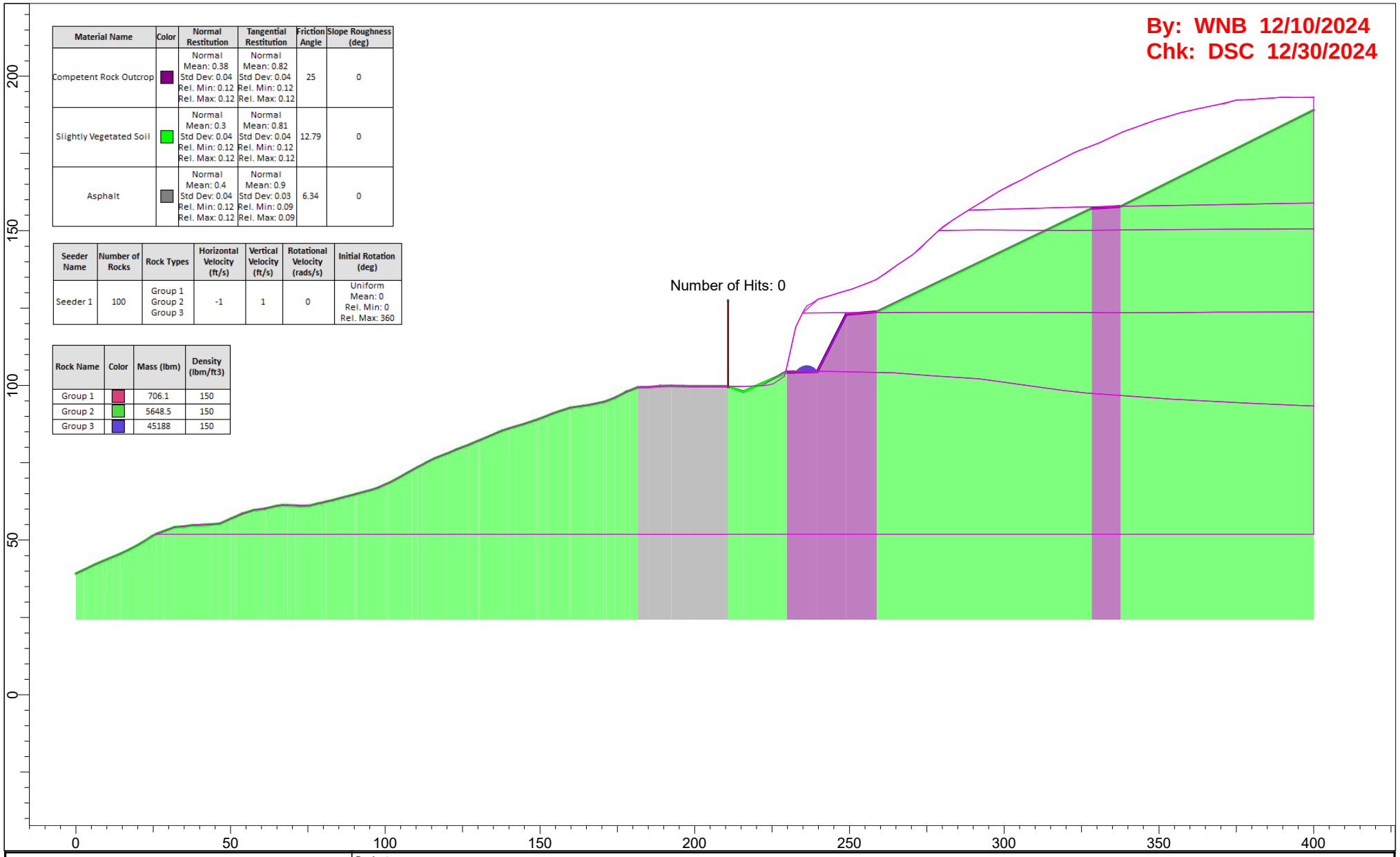
1: ATH-13 Rockfall Model Section 100_Proposed - Plan View

By: WNB 12/10/2024
Chk: DSC 12/30/2024

Material Name	Color	Normal Restitution	Tangential Restitution	Friction Angle	Slope Roughness (deg)
Competent Rock Outcrop		Normal Mean: 0.38 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.82 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	25	0
Slightly Vegetated Soil		Normal Mean: 0.3 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.81 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	12.79	0
Asphalt		Normal Mean: 0.4 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.9 Std Dev: 0.03 Rel. Min: 0.09 Rel. Max: 0.09	6.34	0

Seeder Name	Number of Rocks	Rock Types	Horizontal Velocity (ft/s)	Vertical Velocity (ft/s)	Rotational Velocity (rads/s)	Initial Rotation (deg)
Seeder 1	100	Group 1 Group 2 Group 3	-1	1	0	Uniform Mean: 0 Rel. Min: 0 Rel. Max: 360

Rock Name	Color	Mass (lbm)	Density (lbm/ft3)
Group 1		706.1	150
Group 2		5648.5	150
Group 3		45188	150



rocscience

ROCFALL 8.022

Project	**ATH-13 Rockfall**		
Analysis Description	**Proposed Design Rockfall Evaluation**		
Drawn By	**WNB**	Company	**HDR**
Date	12/10/2024, 4:11:16 PM	File Name	ATH-13 Rockfall Model Section 100_Proposed.fal8