

February 28, 2025

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

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

Reference: Structure Foundation Exploration- Final Report
PIK-TR252-0.02 Newland Hill Road Bridge Replacement
PID No. 119422, Structure File No. 6633889
Pebble Township, Pike County, Ohio
CTL Project No. 23050098COL

Dear Mr. Slone:

CTL Engineering, Inc. has completed the Structure Foundation Exploration report for the above referenced project. A pdf copy of the final report is being submitted.

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

Respectfully Submitted

CTL ENGINEERING, INC.



Joe Grani, P.E
Project Engineer

STRUCTURE FOUNDATION EXPLORATION FINAL REPORT

**PIK-TR252-0.02 NEWLAND HILL ROAD BRIDGE REPLACEMENT
PID NO. 119422, STRUCTURE FILE NO. 6633889
PEBBLE TOWNSHIP
PIKE COUNTY, OHIO
CTL PROJECT NO. 23050098COL**

PREPARED FOR:

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

PREPARED BY:

**CTL ENGINEERING, INC.
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Phone 614-276-8123
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February 28, 2025



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I. EXECUTIVE SUMMARY

The project designated as PIK-TR252-0.02 involves replacement of an existing bridge (SFN: 6633889) along TR 252 (Newland Hill Road) over Leeth Creek in Pebble Township, Pike County, Ohio. The proposed structure will be a single-span bridge with a span of 53.0 feet. The bridge will consist of prestressed concrete box beam with composite reinforced concrete deck supported on integral reinforced concrete abutments.

Two (2) test borings, identified as B-001-0-23 and B-002-0-23, were drilled for this bridge structure. Below the surface cover, the borings generally exhibited layers of gravel and/or stone fragments with sand (A-1-b), sandy silt (A-4a), or silt (A-4b) extending down to the top of rock. Beneath the soil overburden, borings B-001-0-23 and B-002-0-23 encountered top of bedrock at depths 16.0 and 18.5 feet below ground surface, corresponding to elevations 664.4 and 663.0 feet, respectively. The upper portion of the bedrock was augered and sampled using soil techniques. Rock coring was performed below depths of 25.0 feet in B-001-0-23, and 26.4 feet in B-002-0-23. The bedrock was described as shale.

Free water was noted in borings B-001-0-23 and B-002-0-23 at elevations 671.4 and 665.5 feet, respectively.

Based upon the soil and rock data obtained from the field and laboratory testing, it is CTL's opinion that the proposed bridge abutments may be supported onto HP10x42 steel piles placed in prebored holes extending into the underlying bedrock. Refer to the *Analyses and Recommendations* section of this report for additional information.

II. INTRODUCTION

The project designated as PIK-TR252-0.02 involves replacement of an existing bridge (SFN: 6633889) along TR 252 (Newland Hill Road) over Leeth Creek in Pebble Township, Pike County, Ohio. The proposed structure will be a single-span bridge with a span of 53.0 feet. The bridge will consist of prestressed concrete box beam with composite reinforced concrete deck supported on integral reinforced concrete abutments.

This is a Final Structure Foundation Exploration Report.

III. GEOLOGY AND OBSERVATIONS OF THE PROJECT

According to the Ohio Department of Natural Resources (ODNR), Physiographic Regions of Ohio map, the project area is located within the Shawnee-Mississippian Plateau region, which is in the Allegheny Plateaus section of Ohio.



According to the Bedrock Geologic Map of Ohio (2006), the underlying bedrock within the project area is mapped as Ohio Shale of Devonian age.

According to the ODNR's Karst Interactive Map, no karst features have been identified in the immediate vicinity of the project. According to the ODNR's Mines of Ohio website, no deep mining or surface mining activities have been mapped in the area.

According to the Natural Resources Conservation Service Web Soil Survey, surficial soils in the site vicinity are mapped as Clifty silt loam, occasionally flooded (Cf). The soils are described as having a moderate corrosion risk to concrete and steel.

The most recent site visit was performed by an engineer from CTL on December 15, 2023. The existing bridge is a single span structure with steel beams and a timber deck overlaid by asphalt. The bridge is supported on concrete abutments on both ends. Some erosion was noted along the creek. The surrounding land use of the project area was noted as being wooded and rural residential.

IV. EXPLORATION

Two (2) test borings, identified as B-001-0-23 and B-002-0-23, were drilled and cored to the depths of 40.0 and 41.4 feet below the existing ground surface, respectively.

The borings were performed with a CME-55 track mounted drill rig utilizing 3.25-inch inside diameter (I.D) hollow stem augers (HSA) on December 19, 2023. Standard Penetration Tests (SPTs) were conducted using a 140-pound automatic hammer, falling 30 inches, to drive 2-inch outside diameter (O.D) split barrel samplers. The automatic hammer system used was calibrated on November 4, 2022. The energy transfer ratio associated with the automatic SPT hammer was 79.3 percent. Both borings were advanced into bedrock and rock coring was performed using an NQ-size core barrel.

Soil samples obtained were preserved in glass jars, visually classified in the field and laboratory, and tested for natural moisture content. Representative soil samples were subjected to laboratory testing including grain size distribution and Atterberg limits.

The recovered rock from the coring operations were placed in core boxes, visually described and the Rock Quality Designation (RQD) and percent core recovery values were determined. Representative samples of the recovered rock were subjected to compressive strength and unit weight testing.

Ground surface elevations, latitude, longitude, station, and offset information were provided by personnel from Jacobs.



V. FINDINGS

The borings exhibited 3 to 6 inches of gravel at the surface. Below the surface cover, the borings exhibited layers of gravel and/or stone fragments with sand (A-1-b), sandy silt (A-4a), or silt (A-4b) extending down to the top of bedrock. These soils exhibited corrected standard penetration N_{60} values ranging from 9 to 40 blows per foot (bpf), with moisture content values ranging from 4 to 21 percent.

Beneath the soil overburden, the borings encountered the top of bedrock at depths of 16.0 and 18.5 feet below ground surface, corresponding to elevations 664.4 and 663.0 feet, respectively. The upper portion of the bedrock was augered and sampled using soil techniques. Rock coring was performed below depths of 25.0 feet in B-001-0-23, and 26.4 feet in B-002-0-23. The bedrock was described as shale. The rock cores exhibited rock quality designation (RQD) values ranging from 63 to 100 percent, with core recovery values ranging from 97 to 100 percent.

Unconfined Compressive Strength (UCS) testing was performed on selected bedrock core samples representative of the bedrock units. Table 1 shows the results of these UCS tests.

Table 1. Rock UCS Results

Boring No.	Elevation	Rock Type	Unit Weight (pcf)	UCS (psi)
B-001-0-23	650.0-649.5	Shale	147.4	3,620
B-002-0-23	648.8-648.3	Shale	149.3	8,730

Prior to rock coring operations, groundwater was measured in borings B-001-0-23 and B-002-0-23 at depths of 9.0 and 16.0 feet below grade, corresponding to elevations 671.4 and 665.5 feet, respectively.

VI. ANALYSES AND RECOMMENDATIONS

Based on the soil and rock data obtained from the field and laboratory testing, the following recommendations are provided for the proposed structure.

A. Creek Bed Material

Scour parameters were developed in general accordance with ODOT's Geotechnical Design Manual Section 1302. Table 2 summarizes the scour parameters.



Table 2. Scour Information

Boring No.	Sample	Elevation (ft)	D ₅₀ (mm)	τ_c (psf)	D _{50, equiv} (mm)	Erosion Category (EC)
B-001-0-23 (Rear Abutment)	SS-3	674.4 - 672.9	0.1047	0.0367	1.7595	2.211
	SS-4	672.9 - 671.4	0.1470	0.0723	3.4606	2.361
	SS-5	671.4 - 669.9	0.0596	0.0440	2.1048	2.211
	SS-6	669.9 - 668.4	0.0666	0.0222	1.0644	2.211
B-002-0-23 (Forward Abutment)	SS-2	678.0 - 676.5	0.0687	0.0315	1.5102	2.211
	SS-3	675.5 - 674.0	0.0594	0.0930	4.4532	2.211
	SS-5	672.5 - 671.0	0.1440	0.1062	5.0868	2.754
	SS-6	671.0 - 669.5	0.2009	0.0042	0.2009	1.364

B. Foundation Support

According to the Stage 2 Plan provided to us, the bottom of footings for the Rear and Forward Abutments will be constructed at elevations 669.22 and 672.70 feet, respectively.

The abutments for the proposed structure may be supported onto HP10x42 steel piles placed in prebored holes.

The preboring and pile installation should be performed per Section 1305 of the ODOT Geotechnical Design Manual (GDM). The maximum factored structural resistance ($P_{r \max}$) for steel piles placed in prebored holes without driving and extended into the bedrock are provided in Table 3.

Table 3. Maximum Factored Structural Resistance of Piles

Pile Type	Maximum Factored Structural Resistance ($P_{r \max}$) (Kips)
HP10x42	580

The $P_{r \max}$ for piles placed in prebored holes into the bedrock were determined using a structural resistance factor $\phi_c = 0.95$ in accordance with ODOT BDM Section 305.3.5.7, and GDM Section 1305.1.

Estimated pile lengths and pile tip elevations are provided in Table 4. The estimated pile length includes an assumed two-foot embedment into the pile cap (per ODOT BDM 305.3.5.1).

Table 4. Estimated Pile Lengths and Pile Tip Elevations

Boring No.	Bottom of Pile Cap Elevation	Top of Bedrock Elevation	Estimated Pile Tip Elevation*	Estimated Pile Length (feet)**	Order Length (feet) **
B-001-0-23 (Rear Abutment)	669.22	664.4	654.4	20	25
B-002-0-23 (Forward Abutment)	672.70	663.0	653.0	25	30

* Pile tip is 10 feet into bedrock per ODOT BDM Section 305.3.5.7 & GDM Section 1305

** Per ODOT BDM Section 305.3.5.2

C. Lateral Parameters

Please refer to Appendix E for the Lpile parameters which can be utilized while performing lateral pile analysis.

D. General Construction and Earthwork

1. Site preparation and earthwork should be performed in accordance with the ODOT Construction and Material Specifications, and applicable sections of the ODOT Geotechnical Design Manual (GDM).
2. Embankment side slopes should be seeded and vegetation growth permitted to limit erosion, sloughing and slope failure.
3. Temporary excavations in excess of 4 feet in depth should be sloped or shored according to OSHA requirements.

VII. CHANGED CONDITIONS

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

In the event that changes in the project are proposed, additional information becomes available, or if it is apparent that subsurface conditions are different from those provided



in this report, CTL Engineering should be notified so that our recommendations can be modified, if required.

VIII. TESTING AND OBSERVATION

During the design process, it is recommended that CTL Engineering work with the project designers to confirm that the geotechnical recommendations are properly incorporated into the final plans and specifications, and to assist with establishing criteria for the construction observation and testing.

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

IX. CLOSING

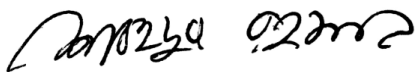
This report has been prepared for the exclusive use by the client for use only on this project. Our services have been performed in accordance with generally accepted Geotechnical Engineering principles and practices. No warranty is either expressed or implied.

CTL Engineering's assignment does not include, nor does this geotechnical report address the environmental aspects of this particular site.

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

Respectfully Submitted,

CTL ENGINEERING, INC.



Shahedur Rahman
Project Engineer



Joe Grani, P.E.
Project Engineer



APPENDIX A
GEO TECHNICAL PROFILE BRIDGE



PROJECT DESCRIPTION

THE PROJECT DESIGNATED AS PIK- TR252-0.02 INVOLVES REPLACEMENT OF AN EXISTING BRIDGE (SFN: 6633889) ALONG TR 252 (NEWLAND HILL ROAD) OVER LEETH CREEK IN PIKE COUNTY, OHIO.

HISTORIC RECORDS

HISTORIC GEOTECHNICAL RECORDS WERE SEARCHED FOR ON THE ODOT TIMS WEBSITE. NO HISTORIC GEOTECHNICAL RECORDS WERE FOUND FOR THIS STRUCTURE.

GEOLOGY

ACCORDING TO THE OHIO DEPARTMENT OF NATURAL RESOURCES (ODNR), PHYSIOGRAPHIC REGIONS OF OHIO MAP, THE PROJECT AREA IS LOCATED WITHIN THE SHAWNEE-MISSISSIPPIAN PLATEAU REGION, WHICH IS IN THE ALLEGHENY PLATEAUS SECTION OF OHIO. ACCORDING TO THE BEDROCK GEOLOGIC MAP OF OHIO (2006), THE UNDERLYING BEDROCK WITHIN THE PROJECT AREA IS MAPPED AS OHIO SHALE OF DEVONIAN AGE. ACCORDING TO ODN'R'S KARST INTERACTIVE MAP, NO KARST FEATURES HAVE BEEN IDENTIFIED IN THE IMMEDIATE VICINITY OF THE PROJECT. ACCORDING TO ODN'R'S MINES OF OHIO WEBSITE, NO DEEP MINING OR SURFACE MINING ACTIVITIES HAVE BEEN MAPPED IN THE AREA.

RECONNAISSANCE

A MOST RECENT SITE VISIT WAS PERFORMED BY AN ENGINEER FROM CTL ON DECEMBER 15, 2023. THE EXISTING BRIDGE IS A SINGLE SPAN STRUCTURE WITH STEEL BEAMS AND A TIMBER DECK OVERLAYED BY ASPHALT. THE BRIDGE IS SUPPORTED ON CONCRETE ABUTMENTS ON BOTH ENDS. SOME EROSION WAS NOTED ALONG THE CREEK. THE SURROUNDING LAND USE OF THE PROJECT AREA WAS NOTED AS BEING WOODED AND RURAL RESIDENTIAL.

SUBSURFACE EXPLORATION

TWO (2) TEST BORINGS, IDENTIFIED AS B-001-0-23 AND B-002-0-23, WERE DRILLED AT THE SITE ON DECEMBER 19, 2023. THE BORINGS WERE PERFORMED WITH A CME-55 TRACK MOUNTED DRILL RIG UTILIZING 3.25-INCH INSIDE DIAMETER (I.D) HOLLOW STEM AUGERS (HSA). STANDARD PENETRATION TESTS (SPTS) WERE CONDUCTED USING A 140- POUND AUTOMATIC HAMMER, FALLING 30 INCHES, TO DRIVE 2-INCH OUTSIDE DIAMETER (O.D) SPLIT BARREL SAMPLERS. THE AUTOMATIC HAMMER SYSTEM USED WAS CALIBRATED ON NOVEMBER 4, 2022. THE ENERGY TRANSFER RATIO ASSOCIATED WITH THE AUTOMATIC SPT HAMMER WAS 79.3 PERCENT. BOTH BORINGS WERE ADVANCED INTO BEDROCK AND ROCK CORING WAS PERFORMED USING AN NQ-SIZE CORE BARREL.

EXPLORATION FINDINGS

THE BORINGS EXHIBITED 3 TO 6 INCHES OF GRAVEL AT THE SURFACE. BELOW THE SURFACE COVER, THE BORINGS EXHIBITED LAYERS OF GRAVEL AND/OR STONE FRAGMENTS WITH SAND (A-1-b), SANDY SILT (A-4a), OR SILT (A-4b) EXTENDING DOWN TO THE TOP OF BEDROCK. BENEATH THE SOIL OVERBURDEN, THE BORINGS ENCOUNTERED THE TOP OF BEDROCK AT DEPTHS OF 16.0 AND 18.5 FEET BELOW GROUND SURFACE, CORRESPONDING TO ELEVATIONS 664.4 AND 663.0 FEET, RESPECTIVELY. THE UPPER PORTION OF THE BEDROCK WAS AUGERED AND SAMPLED USING SOIL TECHNIQUES. ROCK CORING WAS PERFORMED BELOW DEPTHS OF 25.0 FEET IN B-001-0-23, AND 26.4 FEET IN B-002-0-23. THE BEDROCK WAS DESCRIBED AS SHALE.

FREE WATER WAS NOTED IN BORINGS B-001-0-23 AND B-002-0-23 AT ELEVATIONS 671.4 AND 665.5 FEET, RESPECTIVELY.

SPECIFICATIONS

THIS GEOTECHNICAL EXPLORATION WAS PERFORMED IN ACCORDANCE WITH THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, OFFICE OF GEOTECHNICAL ENGINEERING, SPECIFICATIONS FOR GEOTECHNICAL EXPLORATIONS, DATED JANUARY 2024.

AVAILABLE INFORMATION

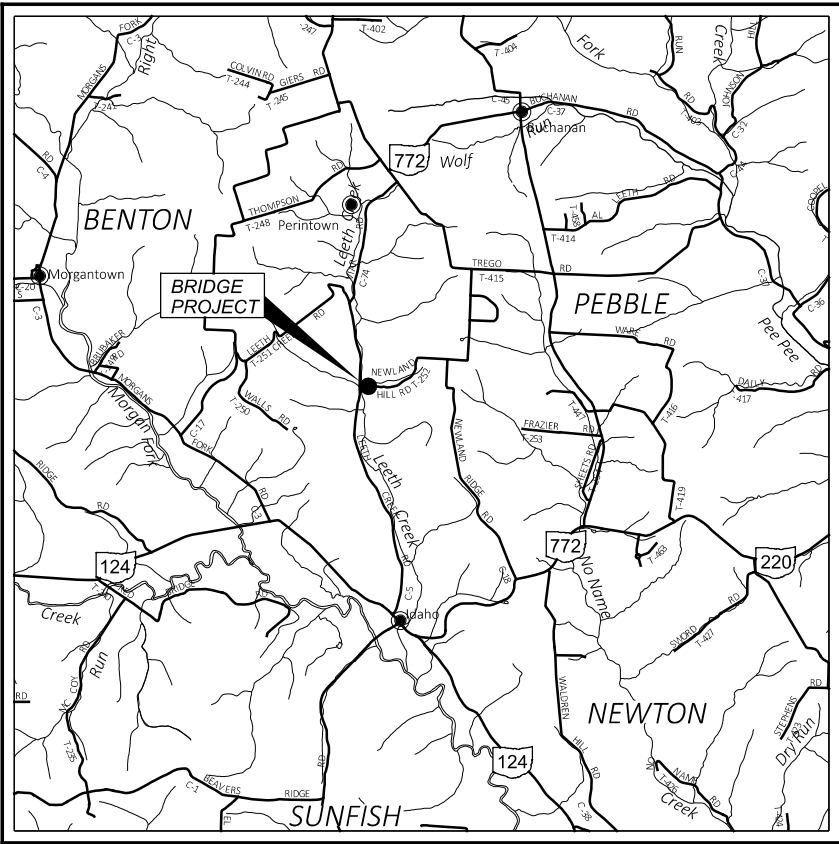
THE SOIL, BEDROCK, AND GROUNDWATER INFORMATION COLLECTED FOR THIS SUBSURFACE EXPLORATION THAT CAN BE CONVENIENTLY DISPLAYED ON THE SOIL PROFILE SHEETS HAS BEEN PRESENTED. GEOTECHNICAL REPORTS, IF PREPARED, ARE AVAILABLE FOR REVIEW ON THE OFFICE OF CONTRACT SALES WEBSITE.

LEGEND

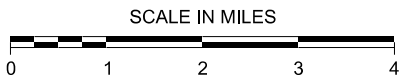
DESCRIPTION	ODOT CLASS	CLASSIFIED MECH./VISUAL	
GRAVEL AND/OR STONE FRAGMENTS WITH SAND	A-1-b (0)	1	0
SANDY SILT	A-4a (3)	8	6
SILT	A-4b (5)	1	1
	TOTAL	10	7
SHALE	VISUAL		
PAVEMENT OR BASE = X = APPROXIMATE THICKNESS	VISUAL		
BORING LOCATION - PLAN VIEW			
DRIVE SAMPLE AND/OR ROCK CORE BORING PLOTTED TO VERTICAL SCALE ONLY. HORIZONTAL BAR INDICATES A CHANGE IN STRATIGRAPHY.			
WC	INDICATES WATER CONTENT IN PERCENT.		
N ₆₀	INDICATES STANDARD PENETRATION RESISTANCE NORMALIZED TO 60% DRILL ROD ENERGY RATIO.		
X/D"	NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT): X/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" PENETRATION AT REFUSAL.		
X/Y/D"	NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT): X = NUMBER OF BLOWS FOR 6 INCHES (UNCORRECTED). Y/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" PENETRATION AT REFUSAL.		
W	INDICATES FREE WATER ELEVATION.		
INDICATES A NON-PLASTIC MATERIAL WITH A MOISTURE CONTENT GREATER THAN 25% OR GREATER THAN 19% WITH A WET APPEARANCE.			
SS	INDICATES A SPLIT-SPOON SAMPLE.		
NP	INDICATES A NON-PLASTIC SAMPLE.		
NQ	"N" SERIES ROCK CORE BARREL OF "Q" WIRELINE BIT SIZE.		
Qu	INDICATES UNCONFINED COMPRESSION TEST, ASTM D7012.		
TR	INDICATES TOP OF ROCK ELEVATION.		

BEDROCK TEST SUMMARY				
BORING ID	SAMPLE ELEVATION (FEET)	SAMPLE DEPTH (FEET)	QU (PSI)	LITHOLOGY
B-001-0-23	650.0 - 649.5	30.4 - 30.9	3,620	SHALE
B-002-0-23	648.8 - 648.3	32.7 - 33.2	8,730	SHALE

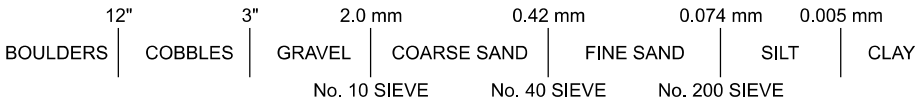
SCOUR SAMPLES						
BORING NO.	SAMPLE ID	ELEVATION (FEET)	D ₅₀ (mm)	T _c (PSF)	D ₅₀ equi. (mm)	EROSION CATEGORY (EC)
B-001-0-23 (REAR ABUTMENT)	SS-3	674.4 - 672.9	0.1047	0.0367	1.7595	2.211
	SS-4	672.9 - 671.4	0.147	0.0723	3.4606	2.361
	SS-5	671.4 - 669.9	0.0596	0.0440	2.1048	2.211
	SS-6	669.9 - 668.4	0.0666	0.0222	1.0644	2.211
B-002-0-23 (FORWARD ABUTMENT)	SS-2	678.0 - 676.5	0.0687	0.0315	1.5102	2.211
	SS-3	675.5 -674.0	0.0594	0.0930	4.4532	2.211
	SS-5	672.5 - 671.0	0.1440	0.1062	5.0868	2.754
	SS-6	671.0 - 669.5	0.2009	0.0042	0.2009	1.364



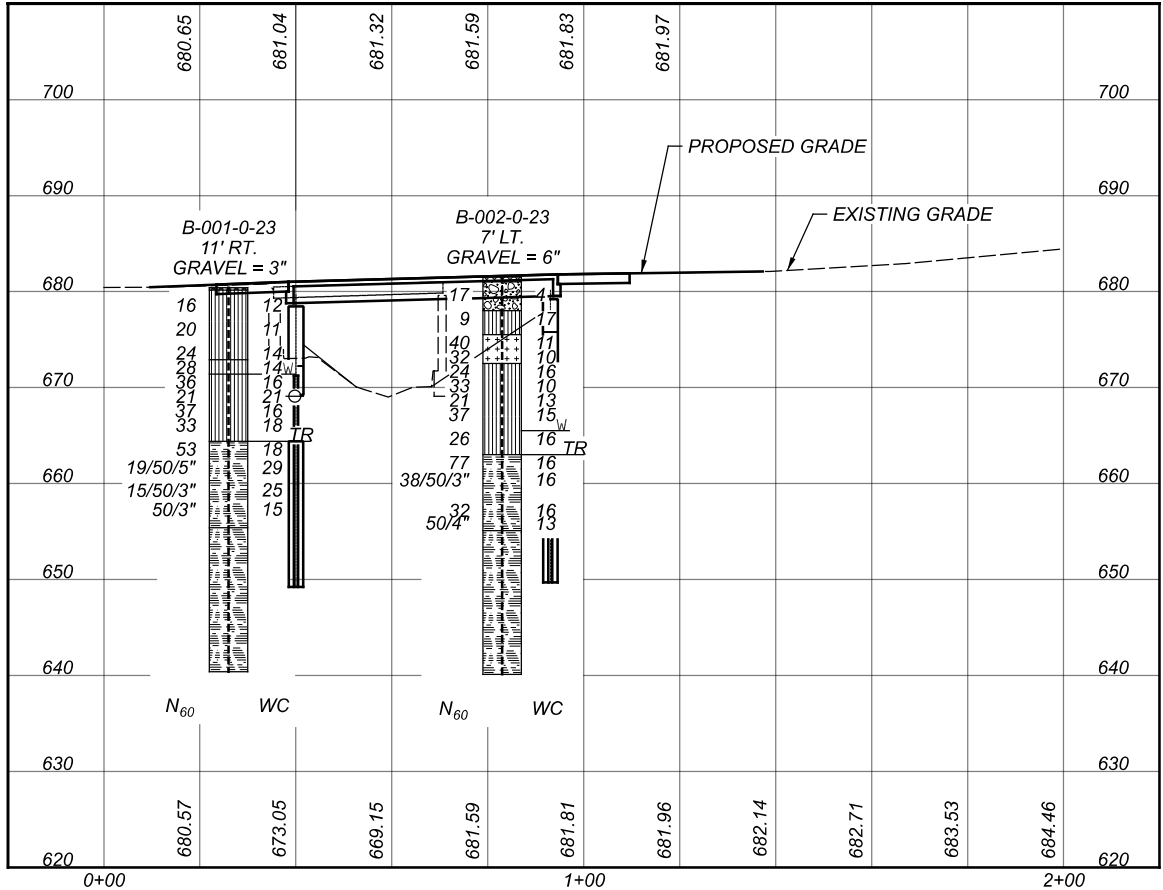
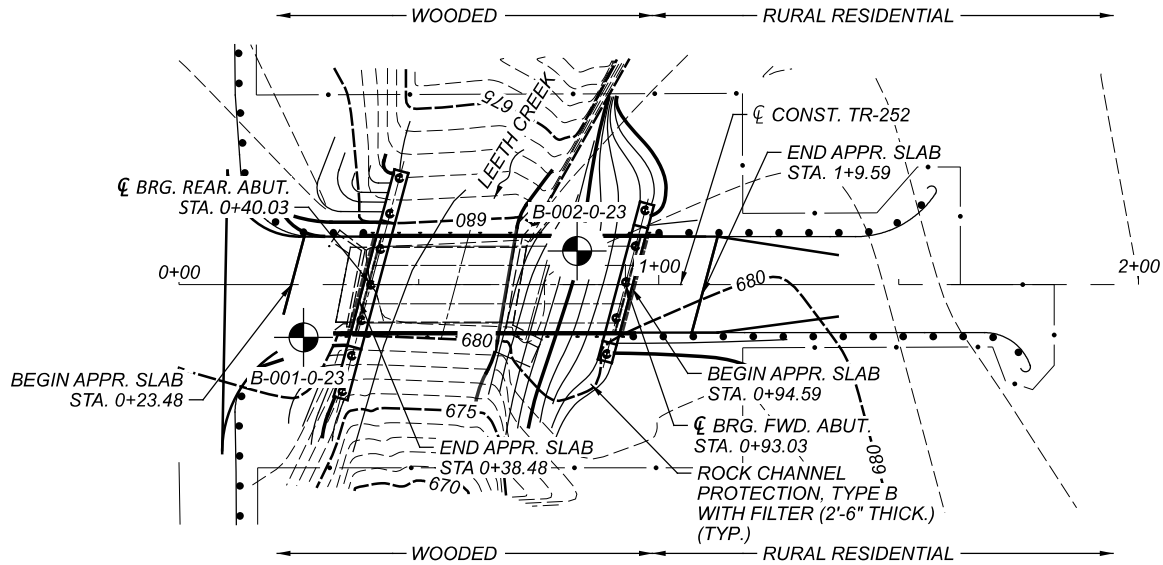
LOCATION MAP
SCALE IN MILES



PARTICLE SIZE DEFINITIONS



RECON. - SM 12/15/2023
DRILLING - CTL ENGINEERING, INC. 12/19/2023
DRAWN - N.K.S 02/26/2025
REVIEWED - JG 02/26/2025



GEOTECHNICAL PROFILE - BRIDGE
BRIDGE NO. PIK-TR252-0.02
T.R. 252 OVER LEETH CREEK

DESIGN AGENCY



DESIGNER

N.K.S

REVIEWER

SM 02-26-25

PROJECT ID

119422

SUBSET TOTAL

2 6

SHEET TOTAL

P.22 26



PIK-TR252-0.02

MODEL: Sheet PAPER:SIZE: 17x11 (in.) DATE: 26-02-2025 TIME: 17:53:40 USER: hp
D:\Drop_Box\CTL, 2025\Fbruary\Dept.05\COL\Shohed\23050098COL_ODOT\Mod_26.02.25\119422ZL001.dgn

PROJECT: PIK-TR252-0.02				DRILLING FIRM / OPERATOR: CTL / T. MILLER				DRILL RIG: CME 55 #393				STATION / OFFSET: 0+26, 11' RT.				EXPLORATION ID																									
TYPE: BRIDGE				SAMPLING FIRM / LOGGER: CTL / T. MILLER				HAMMER: CME AUTOMATIC				ALIGNMENT: TR 252				B-001-0-23																									
PID: 119422 SFN: 6633889				DRILLING METHOD: 3.25" HSA / NQ				CALIBRATION DATE: 11-4-22				ELEVATION: 680.4 (MSL) EOB: 40.0 ft.				PAGE																									
START: 12-19-23 END: 12-19-23				SAMPLING METHOD: SPT				ENERGY RATIO (%): 79.3				LAT / LONG: 39.116453, -83.148364				1 OF 1																									
MATERIAL DESCRIPTION AND NOTES								ELEV.		DEPTHS		SPT/ RQD		REC SAMPLE ID		HP (tsf)		GRADATION (%)				ATTERBERG				ODOT CLASS (GI)		WC		SO4 ppm		HOLE SEALED									
GRAVEL (3")								680.4																																	
MEDIUM DENSE, BROWN, SANDY SILT, SOME GRAVEL, TRACE CLAY, DAMP								680.2		1		5																													
										2		6		16		56		SS-1		21		16		19		38		6		NP		NP		12		A-4a (2)					
										3																															
										4		5		20		78		SS-2		2.00																11		A-4a (V)			
										5																															
@6.0'; LITTLE CLAY, LITTLE GRAVEL										6																															
										7		9		24		100		SS-3		11		30		11		32		16		NP		NP		14		A-4a (3)					
										8		8		10																											
										9		8		7		28		83		SS-4		3.25		12		30		21		24		19		5		14		A-4a (2)			
										10		12		15		36		78		SS-5		8		19		13		48		12		NP		NP		16		A-4a (5)			
DENSE, BROWN, SANDY SILT, LITTLE CLAY, TRACE GRAVEL, WET										11		2		21		56		SS-6		8		16		20		45		11		NP		NP		21		A-4a (4)					
										12		2		14		37		67		SS-7		4.00																16		A-4a (V)	
										13		12		14		14																									
										14		12		14		33		78		SS-8		4.50																18		A-4a (V)	
										15		14		11																											
SHALE, BROWN, SEVERELY WEATHERED, VERY WEAK.								664.4		16		9		53		100		SS-9		3.00												18		Rock (V)							
										17		16		24																											
										18																															
										19		19		50/5"		100		SS-10																		29		Rock (V)			
										20																															
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG; RQD 82%, REC 100%.										21		15		50/3"		100		SS-11		3.00												25		Rock (V)							
										22																															
										23																															
										24		50/3"		100		SS-12		2.50																		15		Rock (V)			
										25																															
@30.4'; COMPRESSIVE STRENGTH (Qu)=3,620 PSI								655.4		26																															
										27		77		100		NQ2-1																								CORE	
										28																															
										29																															
										30																															
										31																															
										32		75		100		NQ2-2																								CORE	
										33																															
										34																															
										35																															
										36																															
										37		95		100		NQ2-3																								CORE	
										38																															
										39																															
										40																															

STANDARD ODOT LOG W/ SULFATES (11 X 17) - OH DOT.GDT - 8-10-24 11:38 - G:\2024\OCTOBER\B0108\23050098COL\23050098COL.GPJ

NOTES: CAVED AT 21'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

DESIGN AGENCY



ENGINEERING

2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE: (614) 276-8123
FAX: (614) 276-8377

DESIGNER

N.K.S

REVIEWER

SM 02-26-25

PROJECT ID

119422

SUBSET

3

TOTAL

6

SHEET

P.23

TOTAL

26

GEOTECHNICAL PROFILE - BRIDGE
BORING LOG B-001-0-23



B-001-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	25.0'	30.0'	60/60	100%	46/60	77%
NQ2-2	30.0'	35.0'	60/60	100%	45/60	75%
PIK-TR252-0.02 BRIDGE REPLACEMENT; PID 119422						



B-001-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	35.0'	40.0'	60/60	100%	57/60	95%
PIK-TR252-0.02 BRIDGE REPLACEMENT; PID 119422						

PROJECT: PIK-TR252-0.02			DRILLING FIRM / OPERATOR: CTL / T. MILLER			DRILL RIG: CME 55 #393			STATION / OFFSET: 0+83, 7' LT.			EXPLORATION ID						
TYPE: BRIDGE			SAMPLING FIRM / LOGGER: CTL / T. MILLER			HAMMER: CME AUTOMATIC			ALIGNMENT: TR 252			B-002-0-23						
PID: 119422 SFN: 6633889			DRILLING METHOD: 3.25" HSA / NQ			CALIBRATION DATE: 11-4-22			ELEVATION: 681.5 (MSL) EOB: 41.4 ft.			PAGE						
START: 12-19-23 END: 12-19-23			SAMPLING METHOD: SPT			ENERGY RATIO (%): 79.3			LAT / LONG: 39.116500, -83.148161			1 OF 1						
MATERIAL DESCRIPTION AND NOTES			ELEV.	DEPTHS	SPT/ RQD	REC SAMPLE ID	HP (tsf)	GRADATION (%)			ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED	
GRAVEL (6") MEDIUM DENSE, GRAY, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, DAMP		681.5																
		681.0	1	8														
			2	8	5													
		678.0	3															
			4	2	3	4												
MEDIUM STIFF, BROWN, SANDY SILT, LITTLE CLAY, TRACE GRAVEL, DAMP		675.5	5															
			6	7														
			7	18	12													
			8	12	12													
		672.5	9	8	12	12												
DENSE, BROWN, SILT, "AND" SAND, TRACE CLAY, DAMP			10	7														
			11	10	12	13												
			12	6	8	8												
			13	8	21	100	SS-7	4.00	-	-	-	-	-	-	-	13	A-4a (V)	-
			14	10	11	17												
HARD, BROWN, SANDY SILT, LITTLE CLAY, TRACE GRAVEL, DAMP @10.5'; VERY STIFF			15															
			16	9	9	11												
		663.0	17															
			18															
			19	10	28	30												
SHALE, GRAY, SEVERELY WEATHERED, VERY WEAK.			20															
			21	38	50/3"													
			22															
			23															
			24	13	14	10												
SHALE, GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG TO STRONG; RQD 81%, REC 99%.		655.1	25															
			26	50/4"														
			27															
			28															
			29	80														
@32.7'; COMPRESSIVE STRENGTH (Qu)=8,730 PSI			30															
			31															
			32															
			33															
			34	63														
			35															
			36															
			37															
			38															
			39	100														
			40															
			41															

STANDARD ODOT LOG W/ SULFATES (11 X 17) - OH DOT.GDT - 8-10-24 11:38 - G:\2024\OCTOBER\0812\23050098COL\23050098COL.GPJ

NOTES: CAVED AT 20'
ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT



B-002-0-23



Run #:	Depth	Recovery (in)	RQD (in)
NQ2-1	26.4'	60/60	48/60
NQ2-2	31.4'	58/60	38/60
PIK-TR252-0-02 BRIDGE REPLACEMENT; PID 119422			
		100%	80%
		97%	63%



B-002-0-23



Run #:	Depth	Recovery (in)	RQD (in)
NQ2-3	36.4'	60/60	60/60
PIK-TR252-0-02 BRIDGE REPLACEMENT; PID 119422			
		100%	100%

APPENDIX B
TEST BORING RECORDS



PID: 119422	SFN: 6633889	PROJECT: PIK-TR252-0.02	STATION / OFFSET: 0+26, 11' RT.	START: 12/19/23	END: 12/19/23	PG 2 OF 2	B-001-0-23
-------------	--------------	-------------------------	---------------------------------	-----------------	---------------	-----------	------------

MATERIAL DESCRIPTION AND NOTES		ELEV. 650.4	DEPTHS		SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED
										GR	CS	FS	SI	CL	LL	PL	PI			
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG; RQD 82%, REC 100%. (continued) @30.4'; COMPRESSIVE STRENGTH (Qu)=3,620 PSI		640.4	EOB	31	75		100	NQ2-2									CORE			
				32																
				33																
				34																
				35	95		100	NQ2-3								CORE				
				36																
				37																
				38																
				39																
				40																

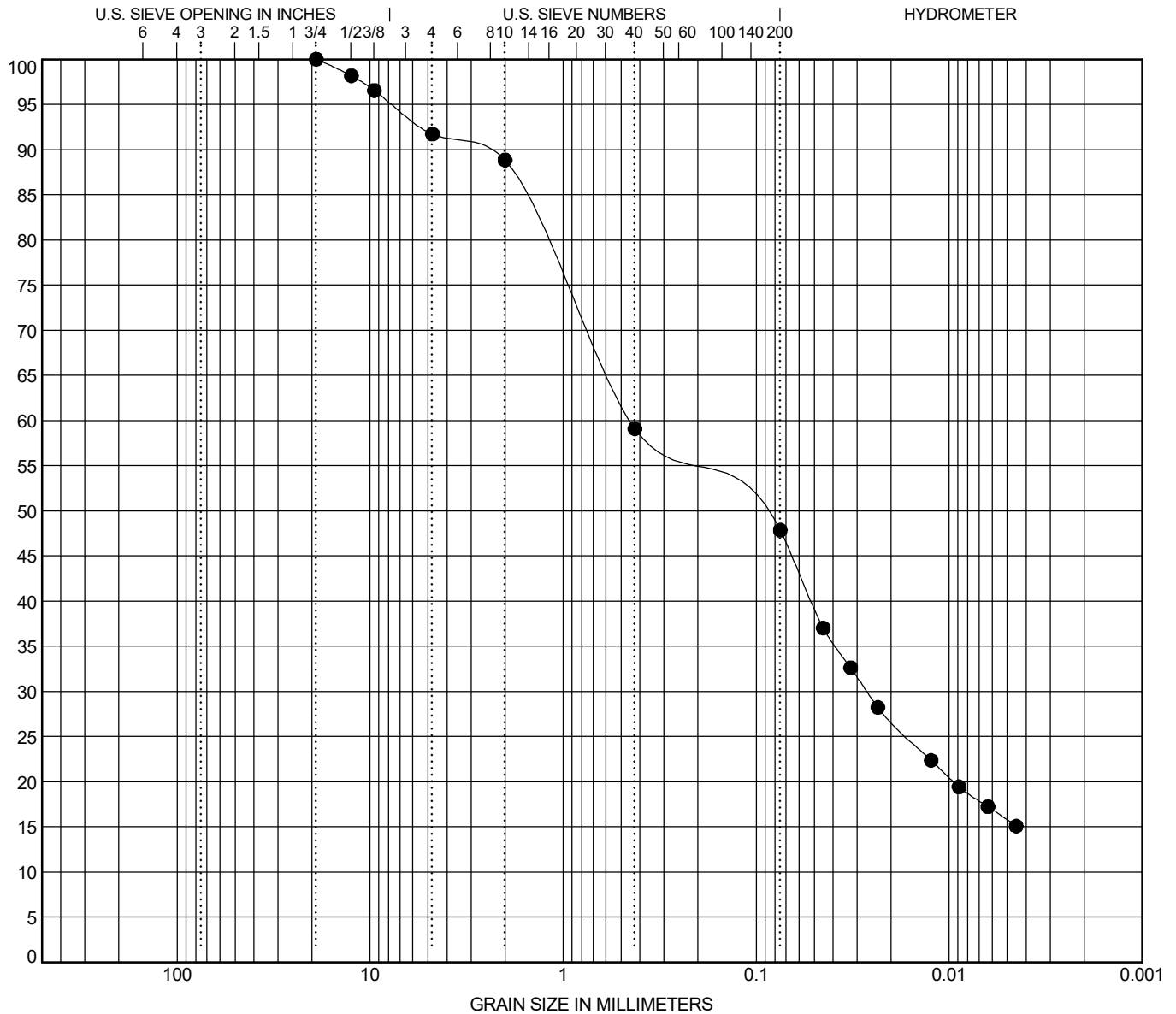
NOTES: CAVED AT 21'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

APPENDIX C
LABORATORY TEST RESULTS



PERCENT FINER BY WEIGHT



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-001-0-23	6.0	A-4a(0)					14	NP	NP	NP		
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay	
B-001-0-23	6.0	19	0.446	0.105	0.027		11	30	11	32	16	

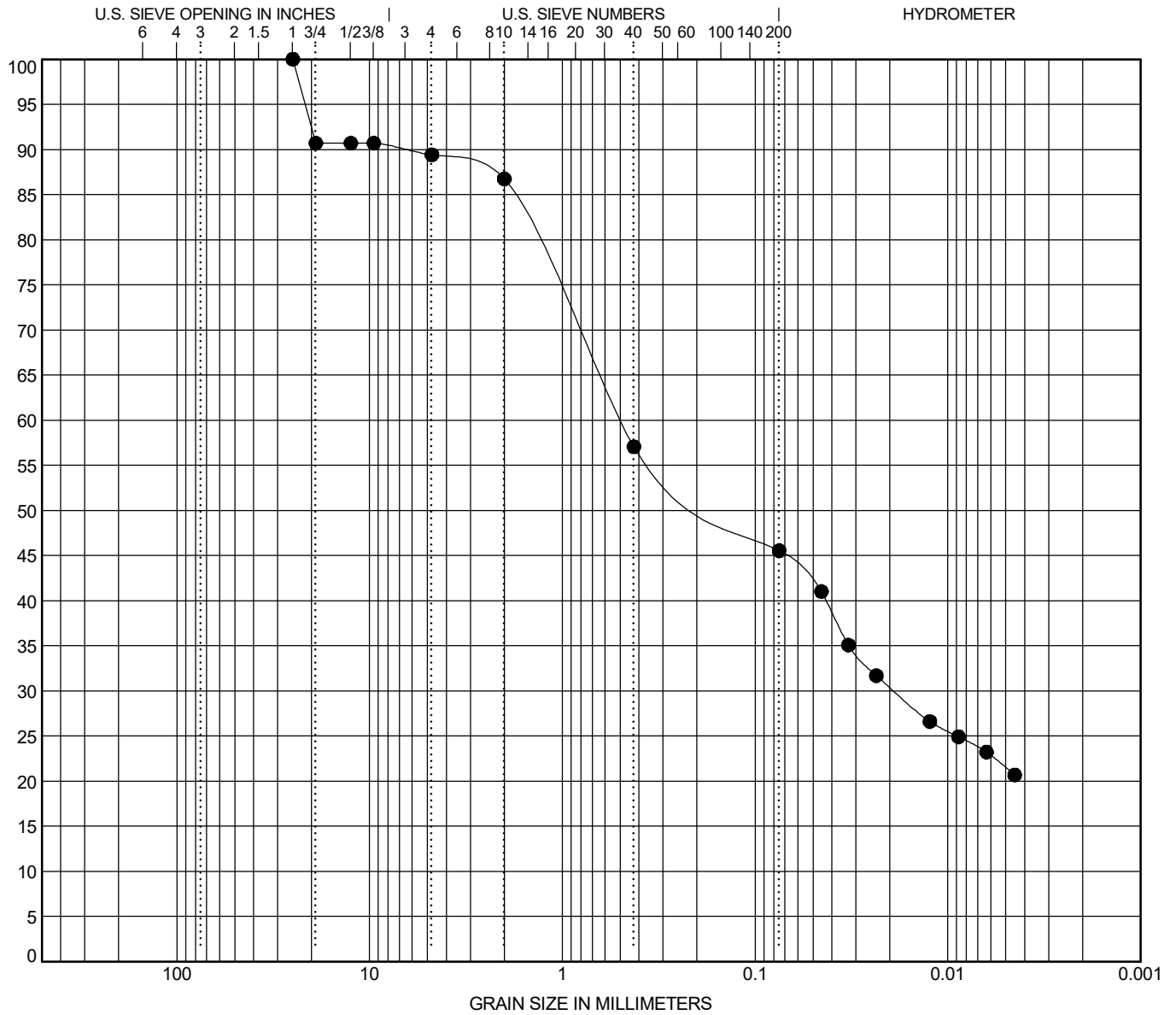


CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR252-0.02
Location: PIKE COUNTY
CTL Project Number:

PERCENT FINER BY WEIGHT



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-001-0-23	7.5	A-4a(2)					14	24	19	5		
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay	
B-001-0-23	7.5	25	0.496	0.147	0.019		12	30	12	25	21	

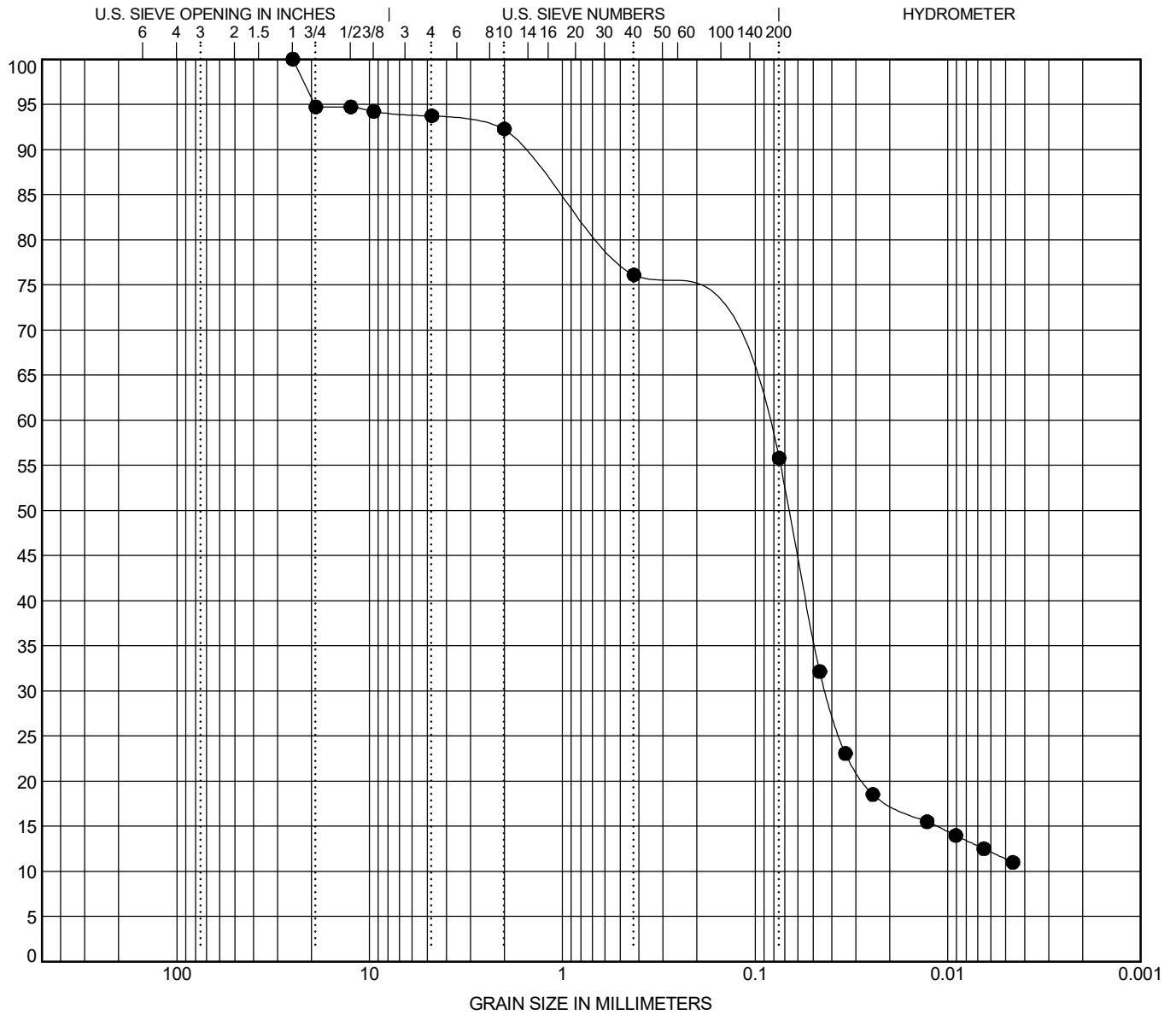


CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR252-0.02
Location: PIK COUNTY
CTL Project Number:

PERCENT FINER BY WEIGHT



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-001-0-23	10.5	A-4a(0)					21	NP	NP	NP		
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay	
B-001-0-23	10.5	25	0.107	0.067	0.043		8	16	20	45	11	

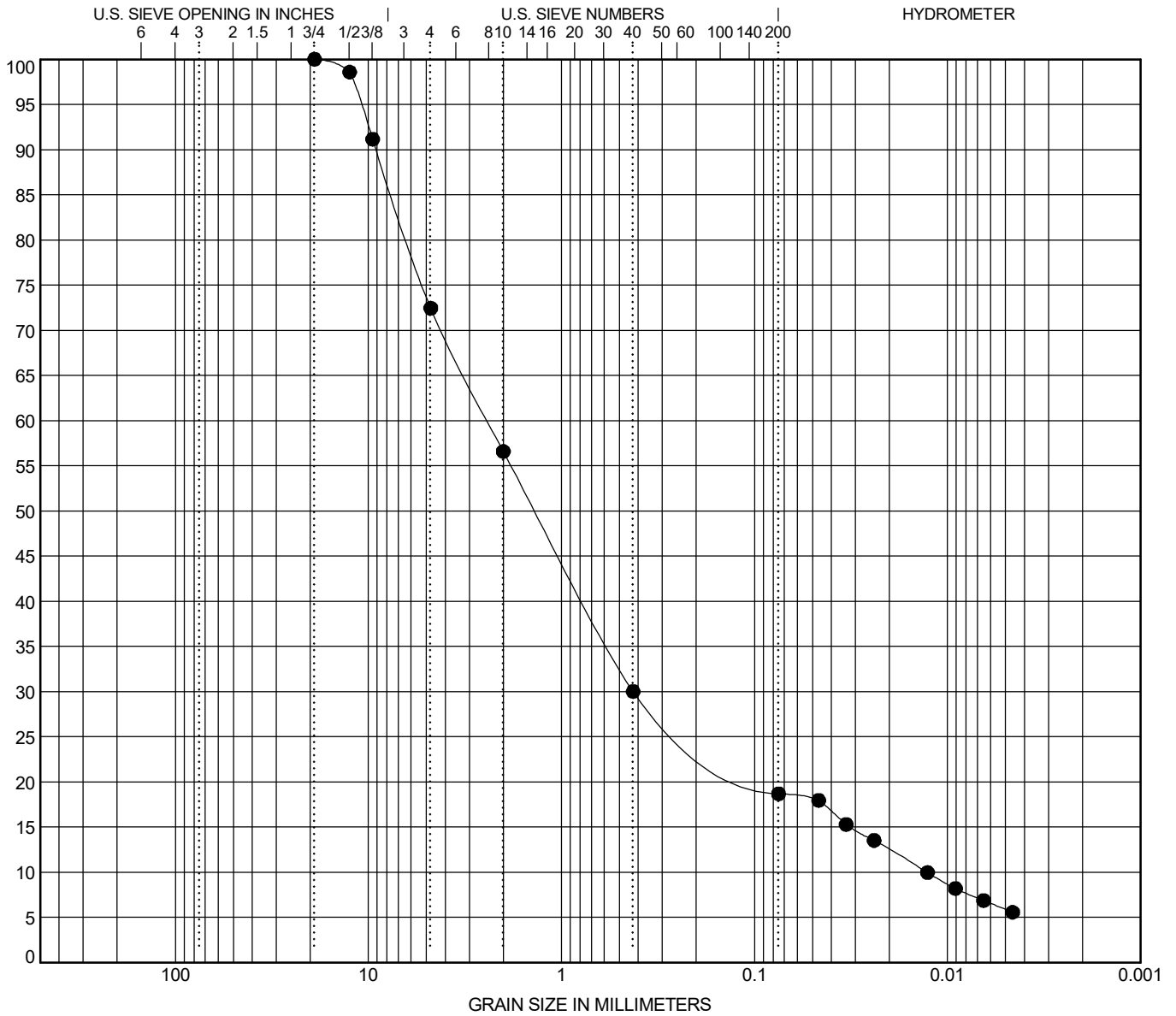


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2860 Fisher Road
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Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR252-0.02
Location: PIKE COUNTY
CTL Project Number:

PERCENT FINER BY WEIGHT



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification						MC	LL	PL	PI	Cc	Cu
B-002-0-23	1.0	A-1-b(0)						4	NP	NP	NP	5.86	188.35
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay		
B-002-0-23	1.0	19	2.411	1.364	0.425	0.013	43	27	11	13	6		

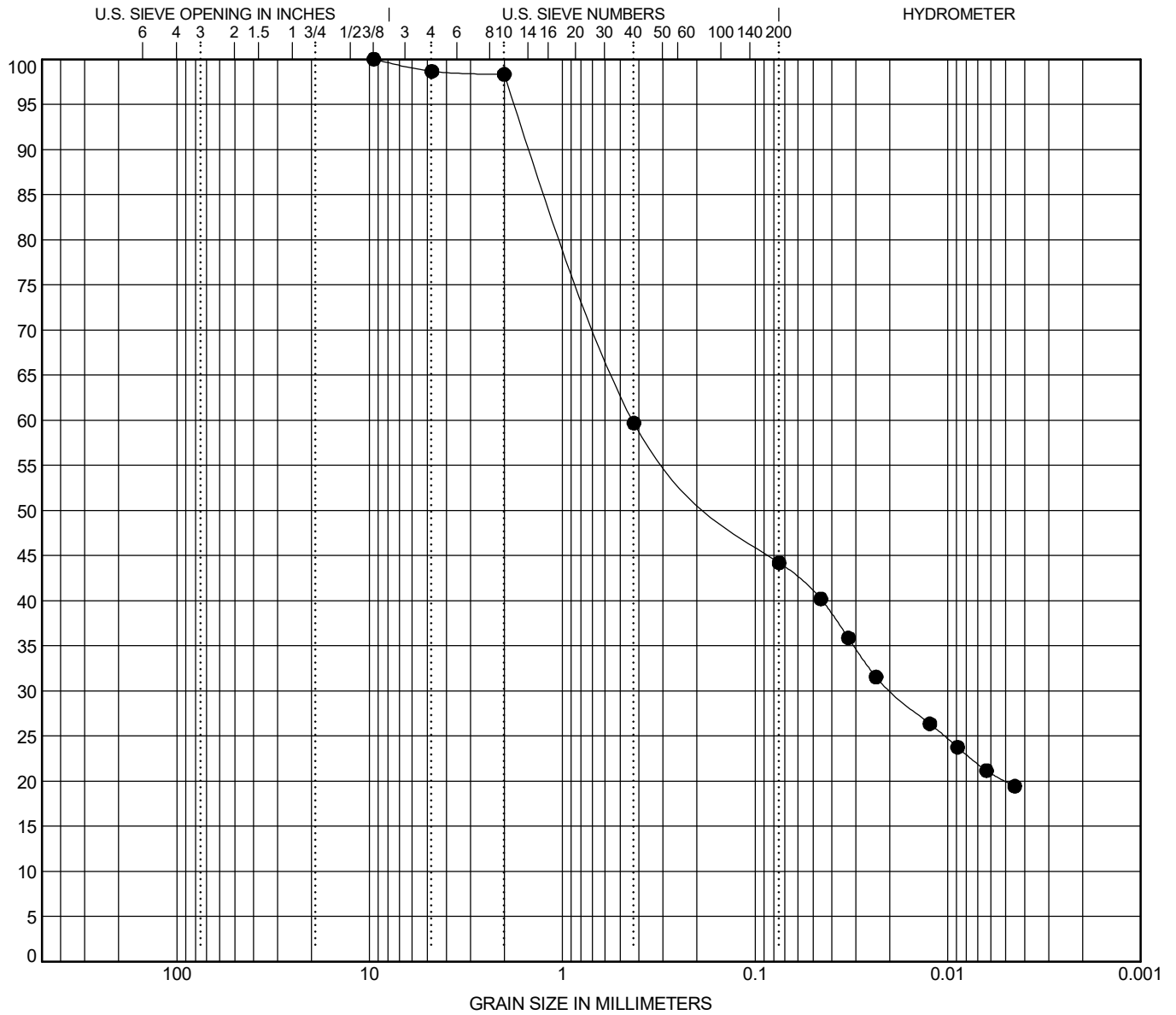


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GRAIN SIZE DISTRIBUTION

Project: PIK-TR252-0.02
Location: PIKE COUNTY
CTL Project Number:

PERCENT FINER BY WEIGHT



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-002-0-23	9.0	A-4a(2)					16	29	21	8		
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay	
B-002-0-23	9.0	9.5	0.431	0.144	0.02		2	39	15	24	20	

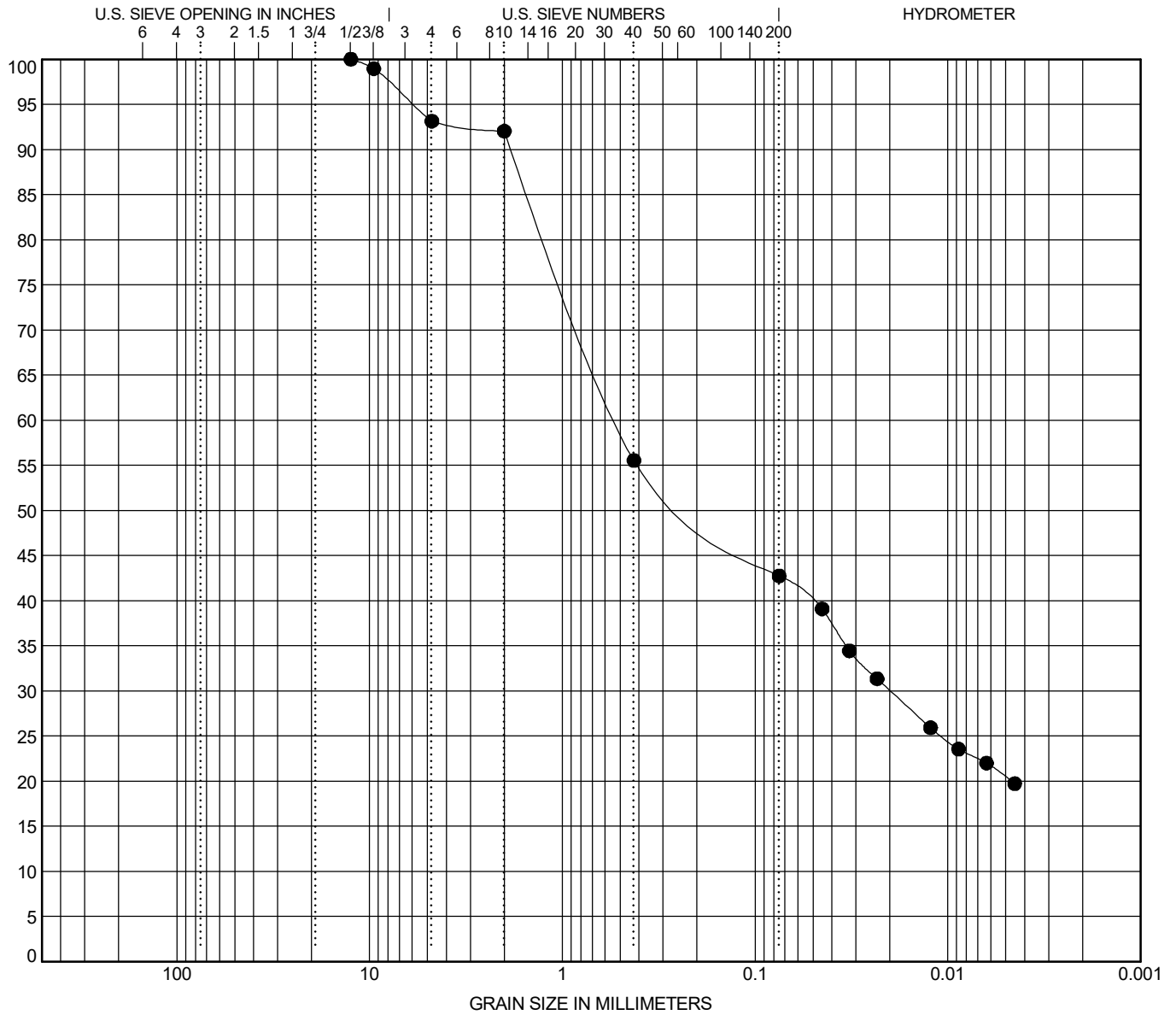


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GRAIN SIZE DISTRIBUTION

Project: PIK-TR252-0.02
Location: PIK COUNTY
CTL Project Number:

PERCENT FINER BY WEIGHT



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-002-0-23	10.5	A-4a(2)					10	29	21	8		
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay	
B-002-0-23	10.5	12.5	0.514	0.201	0.02		7	37	13	23	20	



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Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR252-0.02
Location: PIKE COUNTY
CTL Project Number:

PROJECT NO:	23050098COL
DATE:	9/30/2024

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



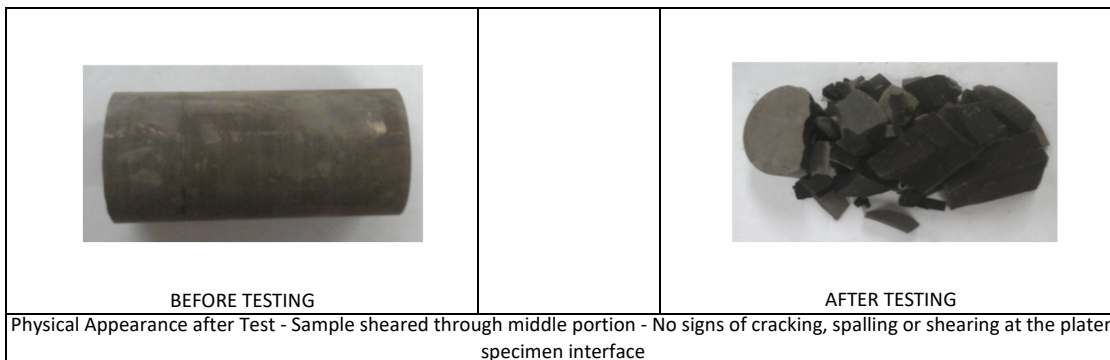
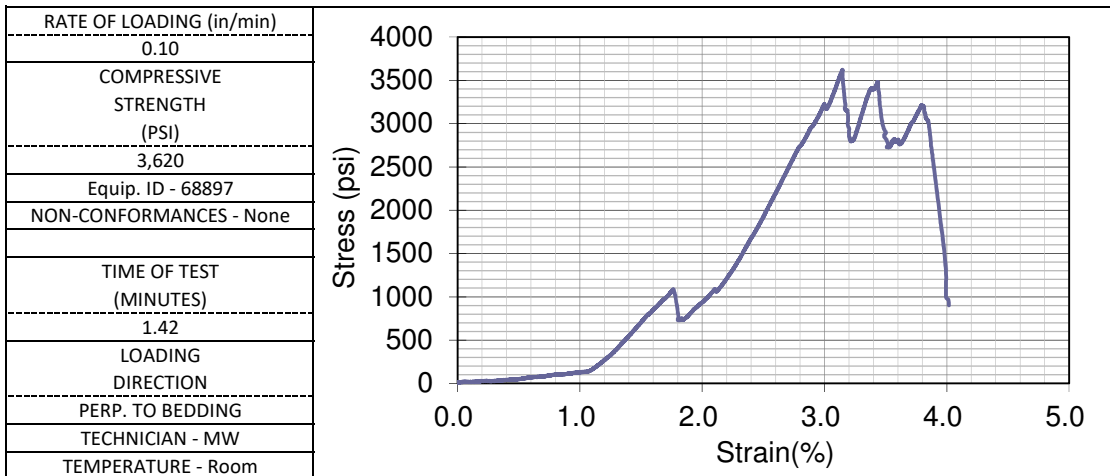
Method C

BORING NUMBER	B-001-0-23	TOP DEPTH(FT)	30.4	BOTTOM DEPTH(FT)	30.9
SAMPLE NUMBER	NQ 2	DISTRICT	9	PID NO.	119422
COUNTY	PIK	ROUTE	TR252	SECTION	0.02

FORMATION	Devonian age Ohio Shale
DESCRIPTION	Shale, Gray, Slightly Weathered, Moderately Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.041	1.991
2	4.042	1.993
3	4.043	1.987
AVERAGE	4.042	1.990

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	486.8
UNIT WEIGHT(LBS/FT ³)	147.4



PROJECT NO:	23050098COL
DATE:	9/30/2024

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012



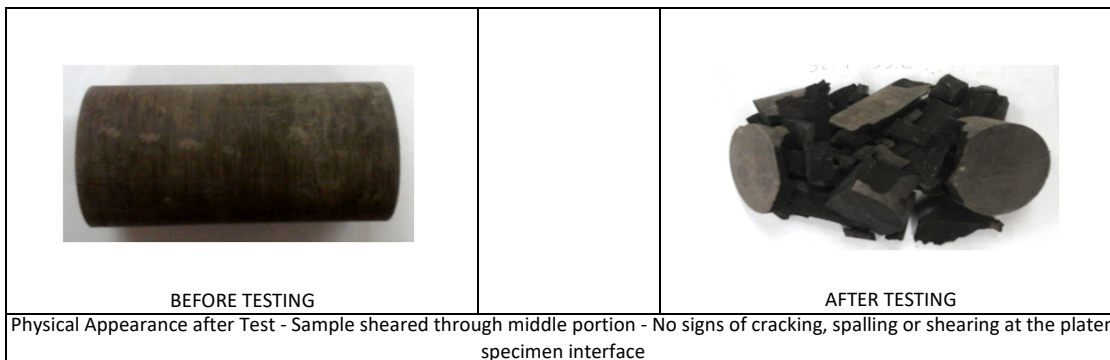
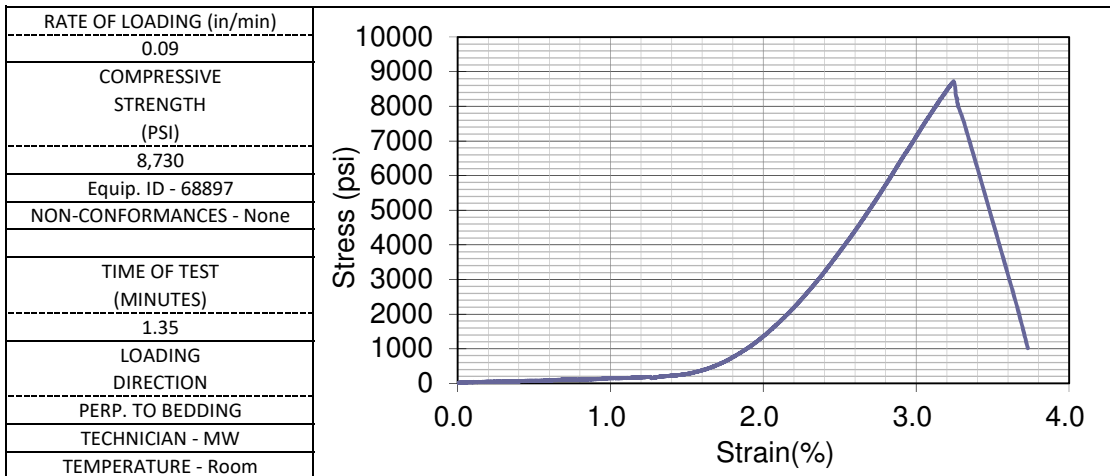
Method C

BORING NUMBER	B-002-0-23	TOP DEPTH(FT)	32.7	BOTTOM DEPTH(FT)	33.2
SAMPLE NUMBER	NQ 2	DISTRICT	9	PID NO.	119422
COUNTY	PIK	ROUTE	TR252	SECTION	0.02

FORMATION	Devonian age Ohio Shale
DESCRIPTION	Shale, Gray, Slightly Weathered, Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.032	1.986
2	4.032	1.984
3	4.032	1.985
AVERAGE	4.032	1.985

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	489.0
UNIT WEIGHT(LBS/FT ³)	149.3

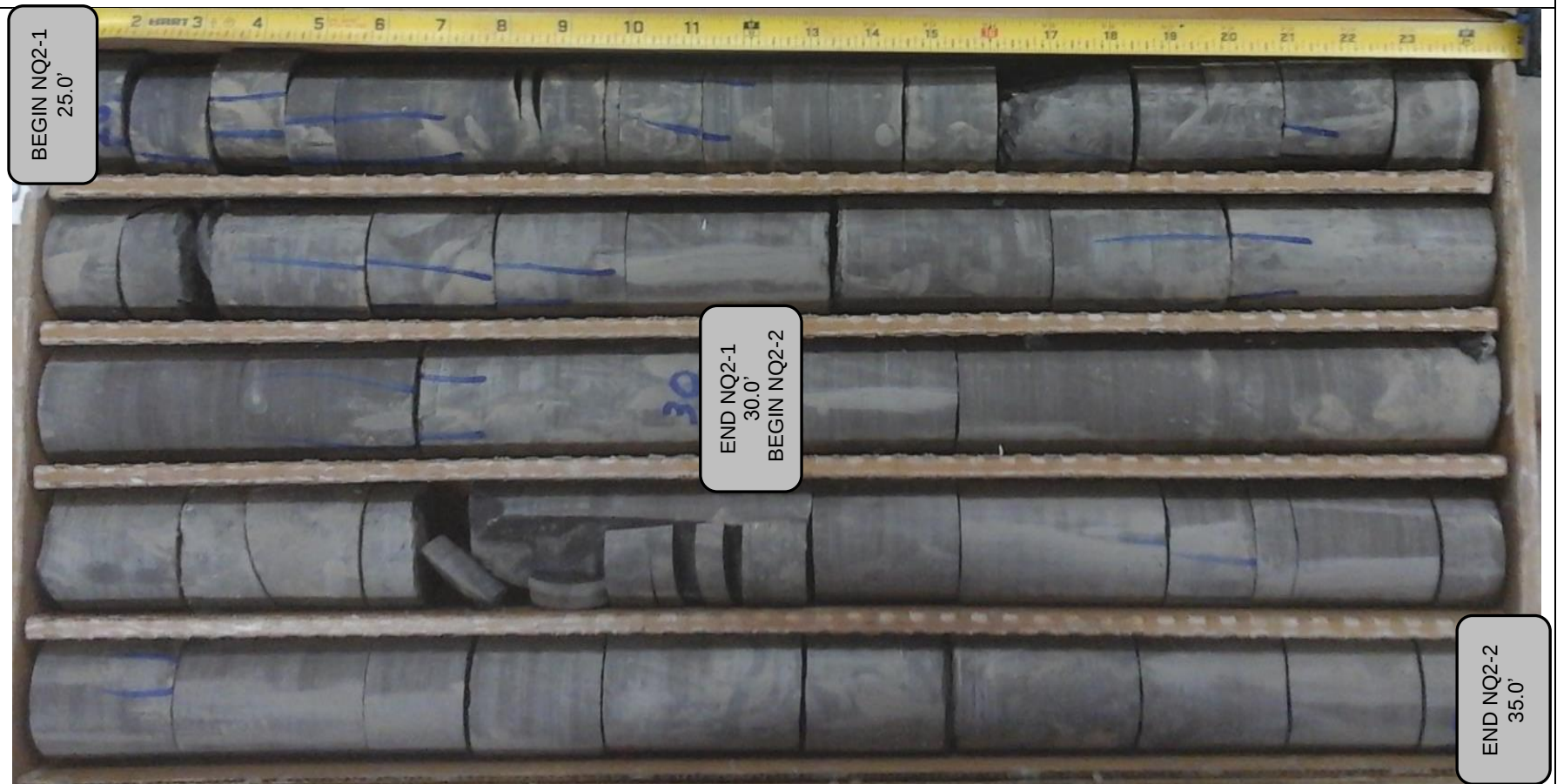


APPENDIX D
ROCK CORE PHOTOS





B-001-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	25.0'	30.0'	60/60	100%	46/60	77%
NQ2-2	30.0'	35.0'	60/60	100%	45/60	75%
PIK-TR252-0.02 BRIDGE REPLACEMENT; PID 119422						



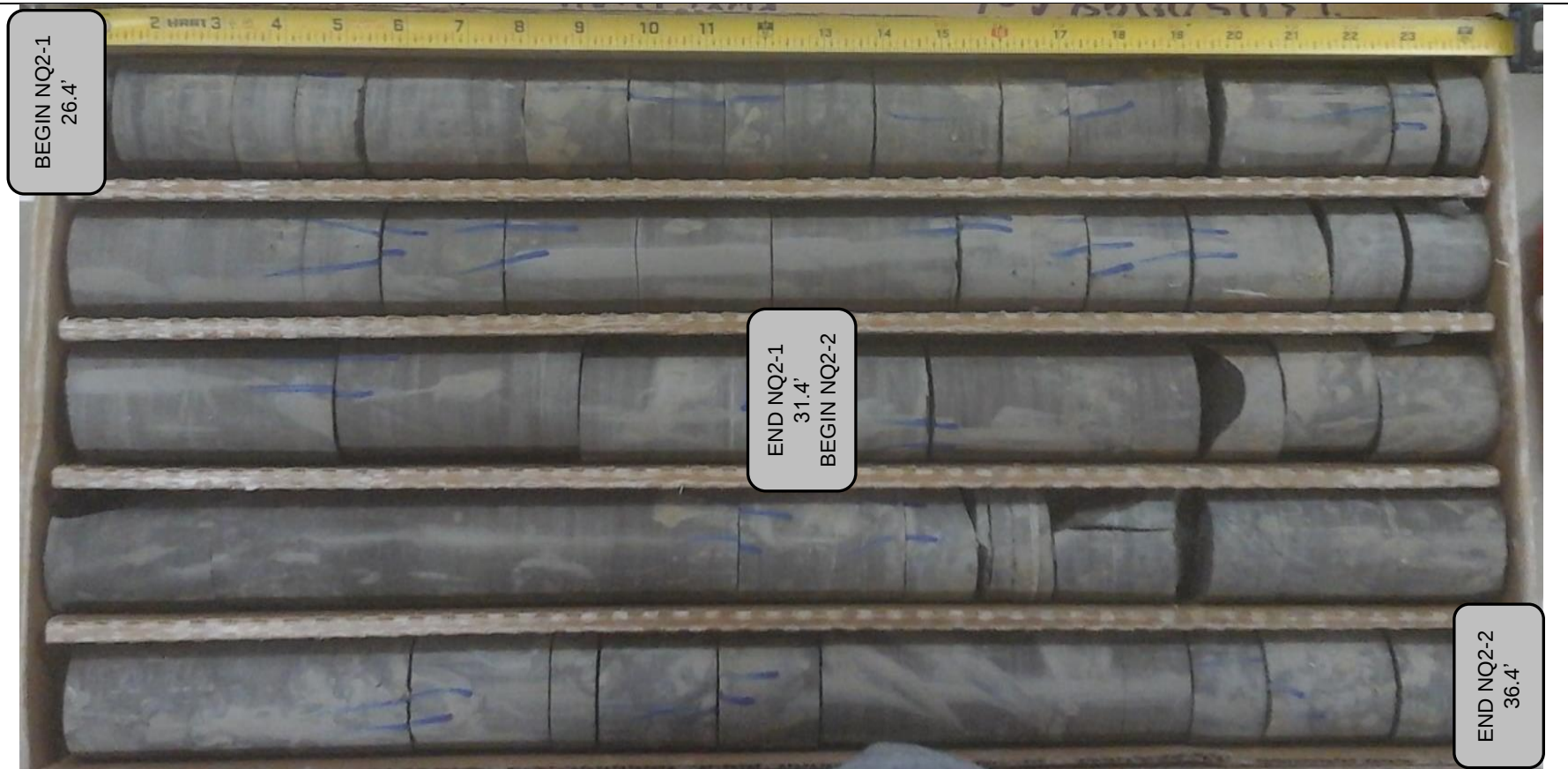
B-001-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	35.0'	40.0'	60/60	100%	57/60	95%
PIK-TR252-0-02 BRIDGE REPLACEMENT; PID 119422						



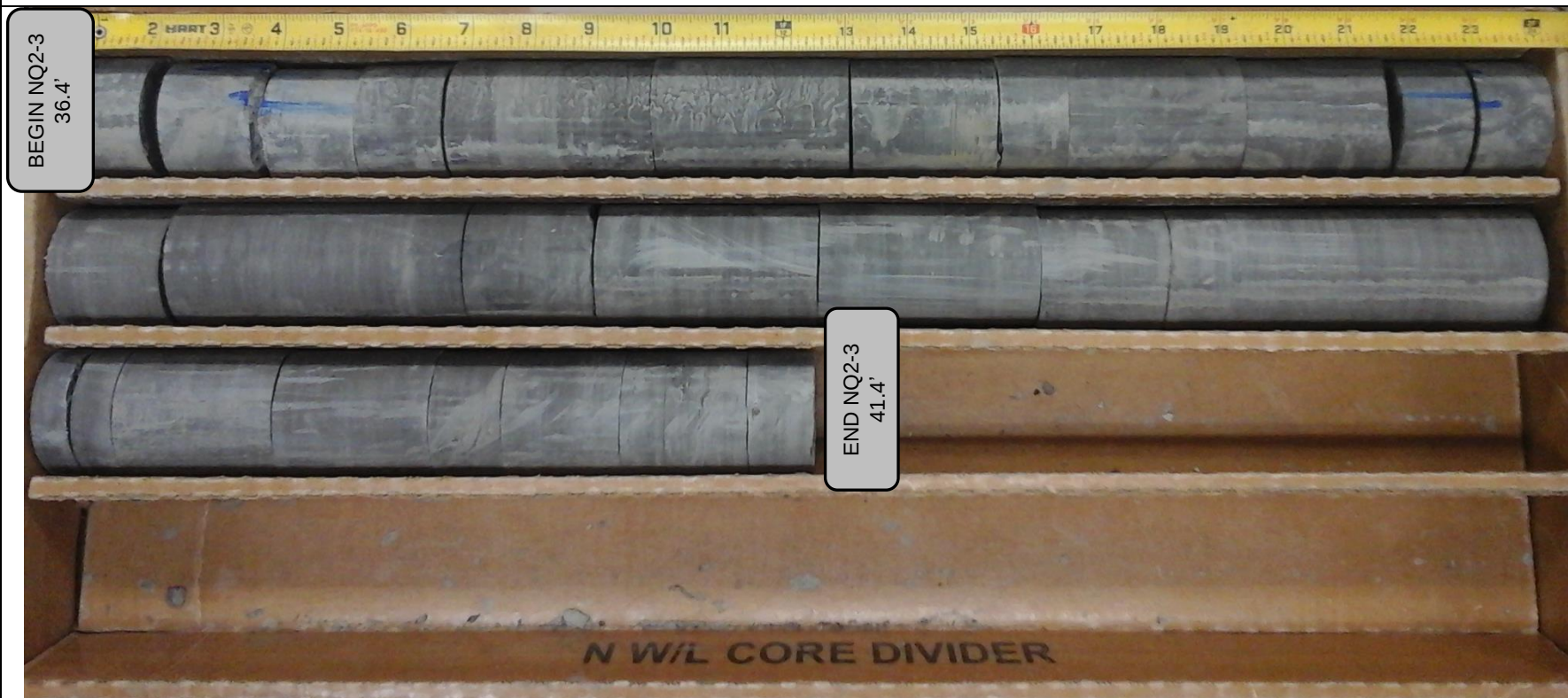
B-002-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	26.4'	31.4'	60/60	100%	48/60	80%
NQ2-2	31.4'	36.4'	58/60	97%	38/60	63%
PIK-TR252-0-02 BRIDGE REPLACEMENT; PID 119422						



B-002-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	36.4'	41.4'	60/60	100%	60/60	100%
PIK-TR252-0-02 BRIDGE REPLACEMENT; PID 119422						

APPENDIX E

LPILE PARAMETERS



L-PILE Soil and Rock Parameters

PIK-TR252-0.02

TR 252 over Leeth Creek

Rear Abutment

Boring No B-001-0-23
Bottom of Foundation Elevation 669.22 feet

From Bottom of Footing Elevation to 664.4 feet

Use Soil Type-	Sand (Reese)	
Effective Unit Weight =	65.6	pcf
Friction Angle=	35	Degrees
k =	60	pci

ODOT GDM Table 400-4
ODOT GDM Section 404.2
From L-pile Table 3.6

From 664.4 to 655.4 feet

Use Rock Type-	Weak Rock (Reese)	
Effective Unit Weight =	85.0	pcf
Strain Factor K_{rm} =	0.0005	
Compressive Strength q_u =	78.8	psi
Initial Rock Modulus =	7090	psi
RQD =	0%	

B-001-0-23, NQ2-2, Compressive strength test result
From L-pile
ODOT GDM Section 404.3
GDM Table 400-6, very weak rock
Assumed

Below 655.4 feet

Use Rock Type-	Weak Rock (Reese)	
Effective Unit Weight =	85.0	pcf
Strain Factor K_{rm} =	0.00005	
Compressive Strength q_u =	3620	psi
Initial Rock Modulus =	320000	psi
RQD =	82%	

B-001-0-23, NQ2-2, Compressive strength test result
From L-pile
B-001-0-23, NQ2-2, Compressive strength test result
ODOT GDM Table 400-6, moderately strong rock
B-001-0-23, Average RQD

L-PILE Soil and Rock Parameters

PIK-TR252-0.02

TR 252 over Leeth Creek

Forward Abutment

Boring No B-002-0-23
Bottom of Foundation Elevation 672.70 feet

From Bottom of Footing Elevation to 663.0 feet

Use Soil Type-	Stiff Clay with Free Water (Reese)	
Effective Unit Weight =	65.6 pcf	ODOT GDM Table 400-4
Undrained Cohesion =	3600 psf	ODOT GDM Section 404.1
Strain Factor E_{50} =	0.005	From L-pile Table 3.4
k =	1000 pci	From L-pile Table 3.3

From 663.0 to 655.1 feet

Use Rock Type-	Weak Rock (Reese)	
Effective Unit Weight =	86.9 pcf	B-002-0-23, NQ2-2, Compressive strength test result
Strain Factor K_{rm} =	0.0005	From L-pile
Compressive Strength q_u =	60.8 psi	ODOT GDM Section 404.3
Initial Rock Modulus =	5470 psi	GDM Table 400-6, very weak rock
RQD =	0%	Assumed

Below 655.1 feet

Use Rock Type-	Weak Rock (Reese)	
Effective Unit Weight =	86.9 pcf	B-002-0-23, NQ2-2, Compressive strength test result
Strain Factor K_{rm} =	0.00005	From L-pile
Compressive Strength q_u =	8730 psi	B-002-0-23, NQ2-2, Compressive strength test result
Initial Rock Modulus =	790000 psi	ODOT GDM Table 400-6, strong rock
RQD =	81%	B-002-0-23, Average RQD