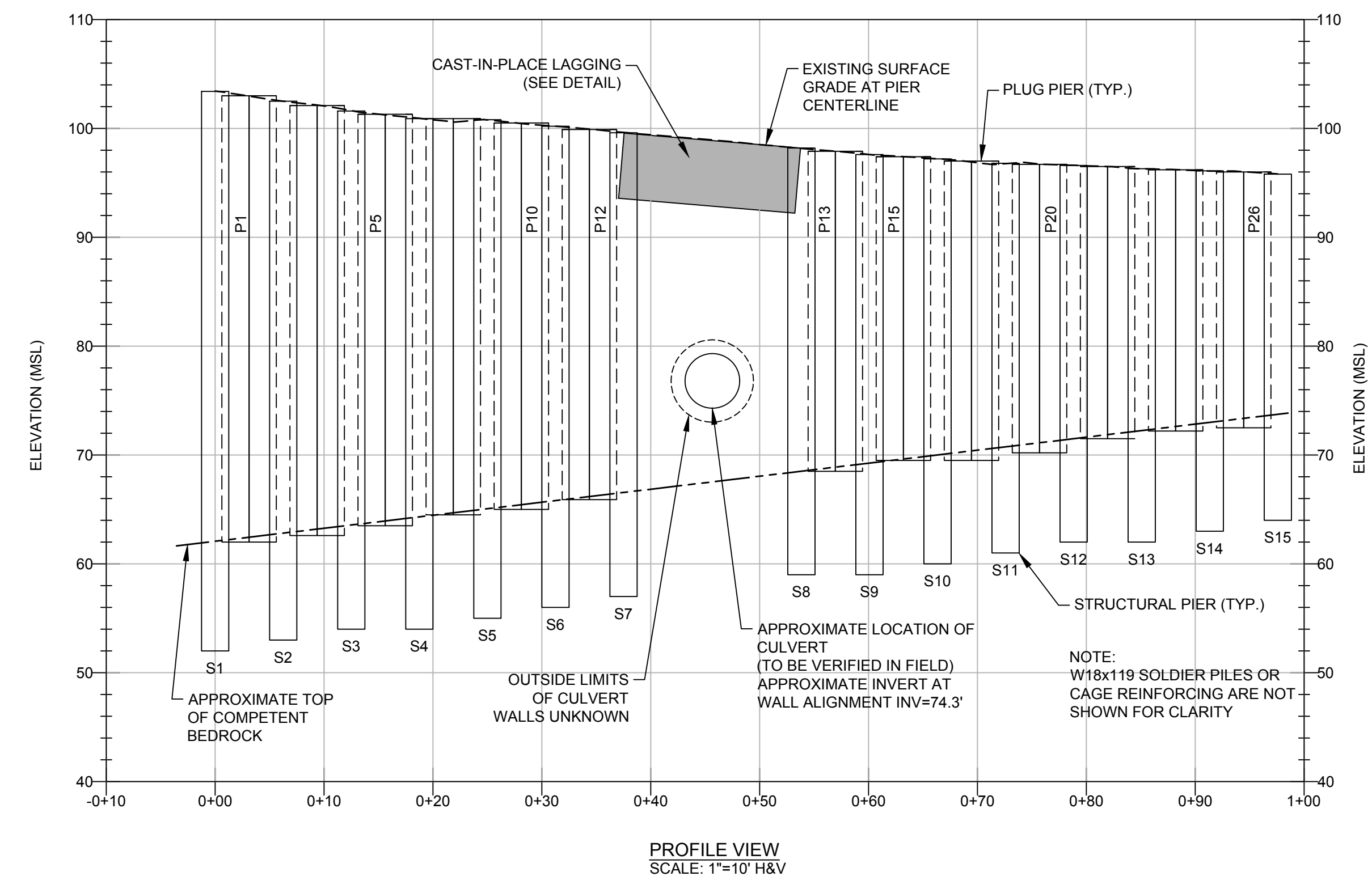


KEVIN L. MURPHY
5103 EMMONS ROAD
OREGONIA, OHIO 45054
PARCEL ID 09-01-300-004

JACKSON C. HEDGES
5202 OREGONIA ROAD
OREGONIA, OHIO 45054
MAILING ADDRESS
130 W. CONCORD DRIVE
LEBANON, OHIO 45036
PARCEL ID 09-01-300-001

NOTE:
BASEMAP PROVIDED BY WARREN COUNTY ENGINEER OFFICE.
ALL ELEVATION CONTOURS ARE RELATIVE TO HUB #1
ASSIGNED ELEVATION = 100.0 FEET.



NOTE:
TOP AND BOTTOM OF CIP
LAGGING PANEL TO FOLLOW
THE SLOPE OF THE
ROADWAY PROFILE

REV.	DATE	BY	DESCRIPTION

PLAN AND PROFILE
EMMONS ROAD LANDSLIDE - WARREN COUNTY
TURTLECREEK TOWNSHIP
5103 EMMONS ROAD
OREGONIA, WARREN COUNTY, OHIO

Terracon
Consulting Engineers and Scientists
611 LUNKEN PARK DRIVE
PH: (513) 321-5816
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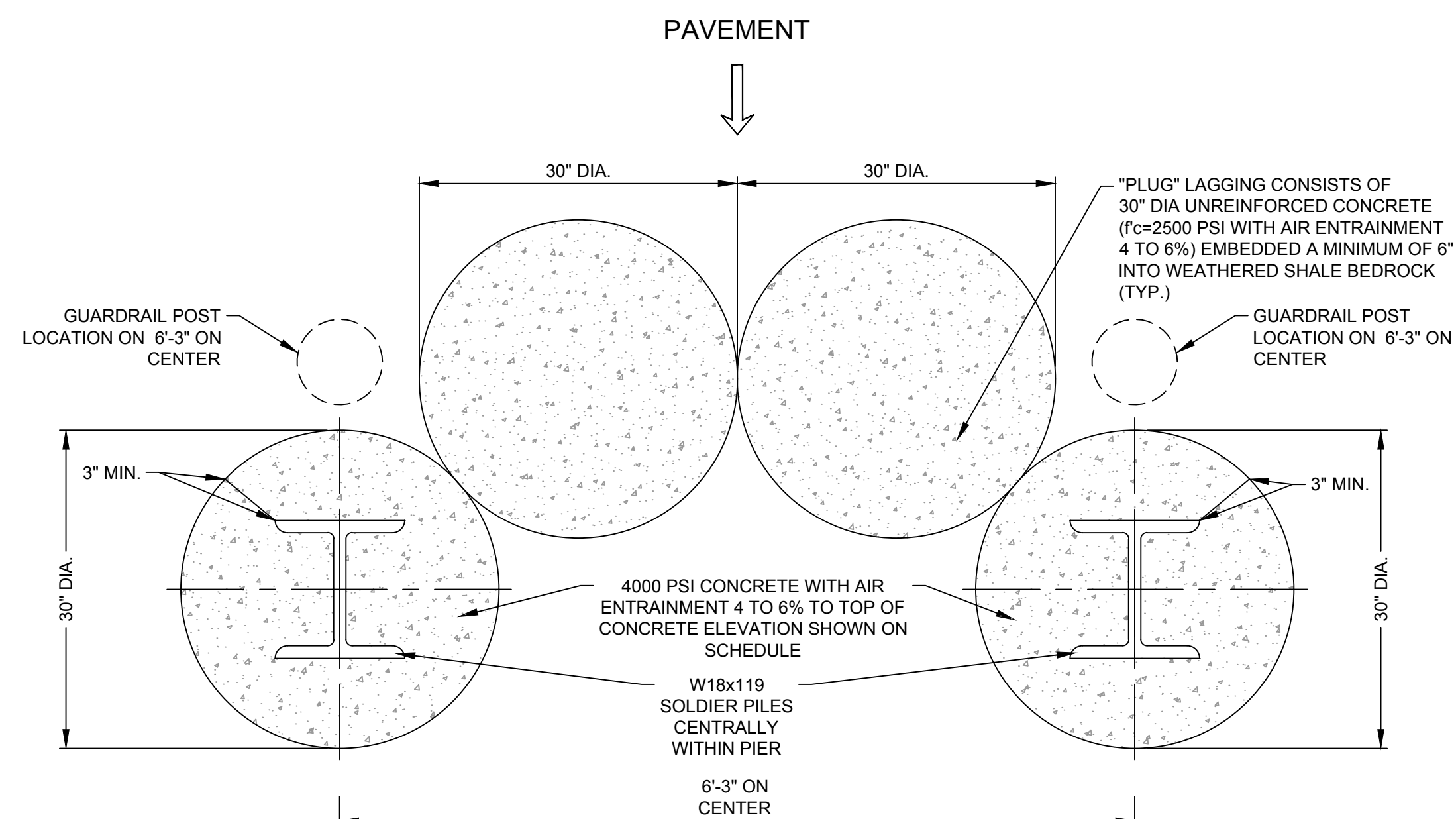


SHEET 1

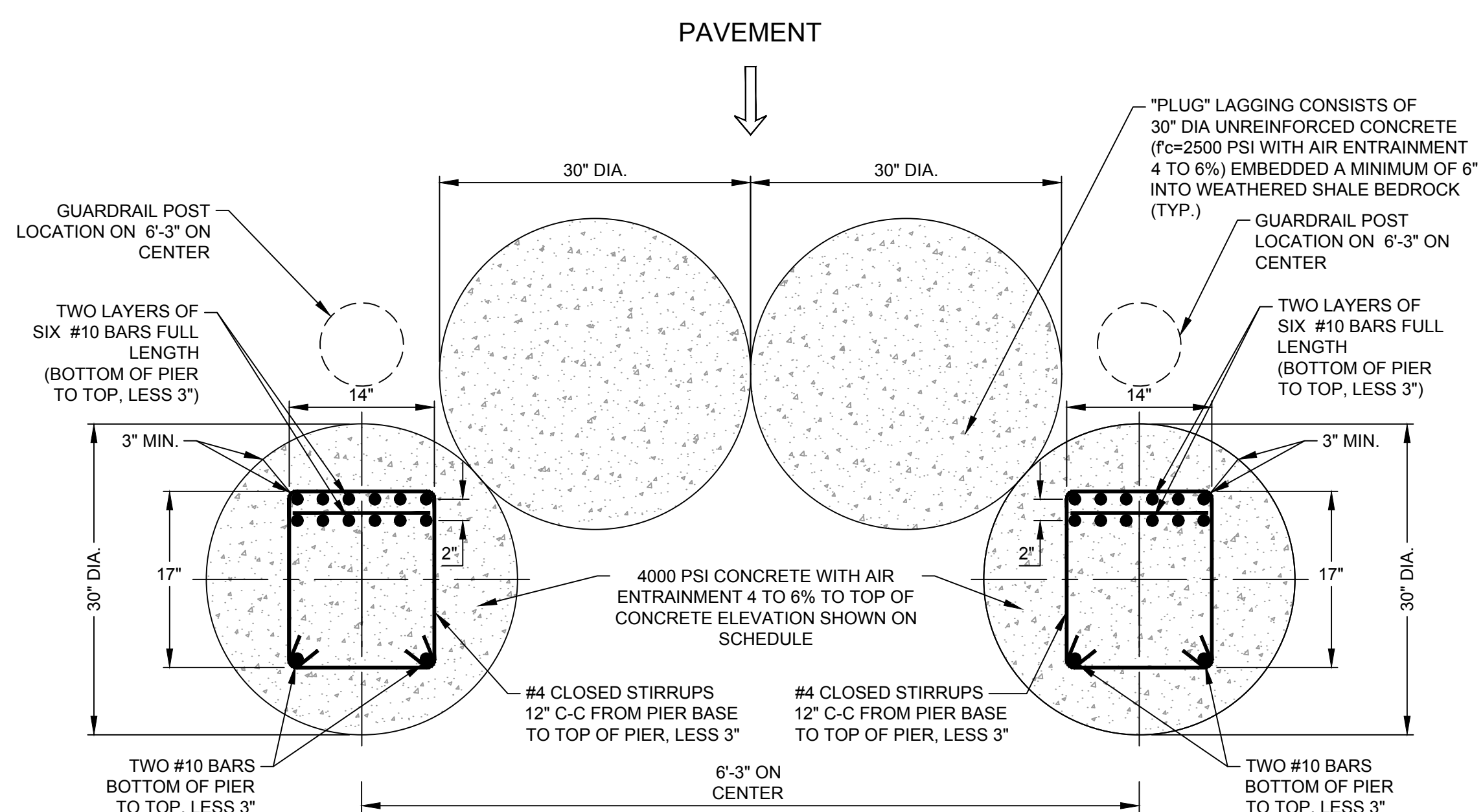
DESIGNED BY:	SK/DWW
DRAWN BY:	KM
APPVD. BY:	DWW
SCALE:	AS SHOWN
DATE:	02/26/2019
JOB NO.:	NT185468
ACAD NO.:	RW.DWG
SHEET NO.:	1

Date: 4/12/2019 6:05 AM File Path: N:\HCON PROJECTS\AUTOCAD\2018\181185468\RW.DWG

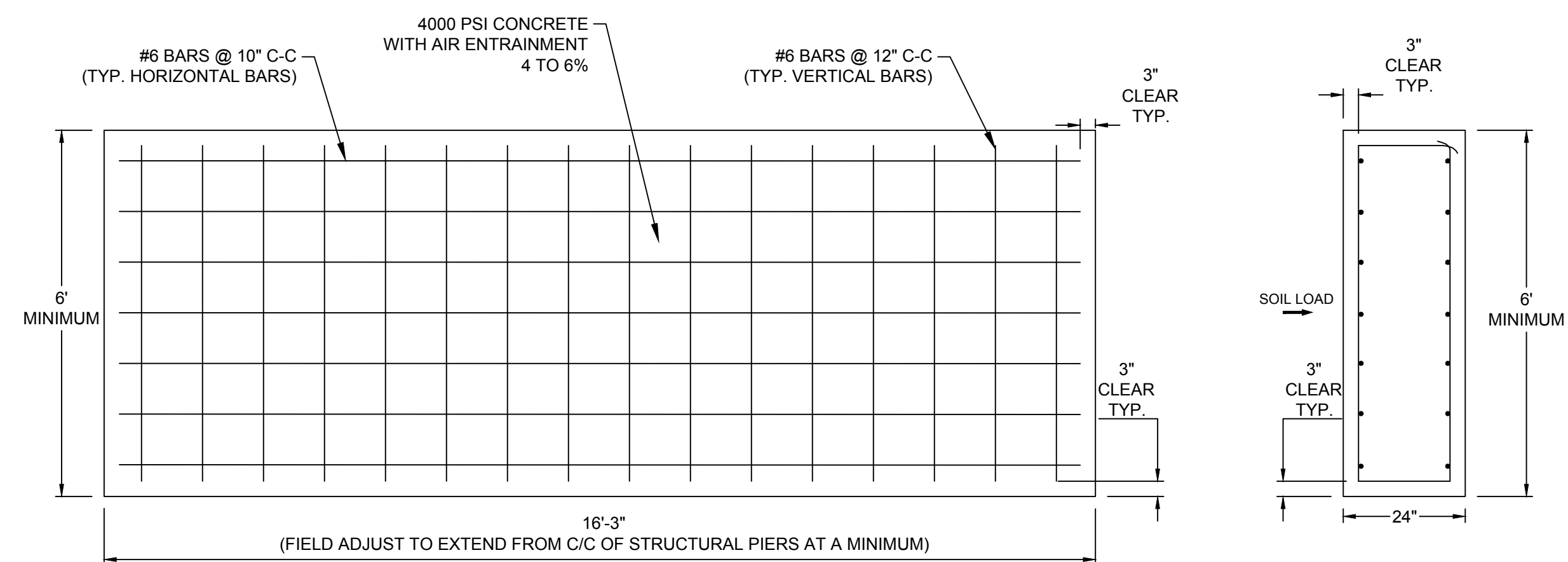




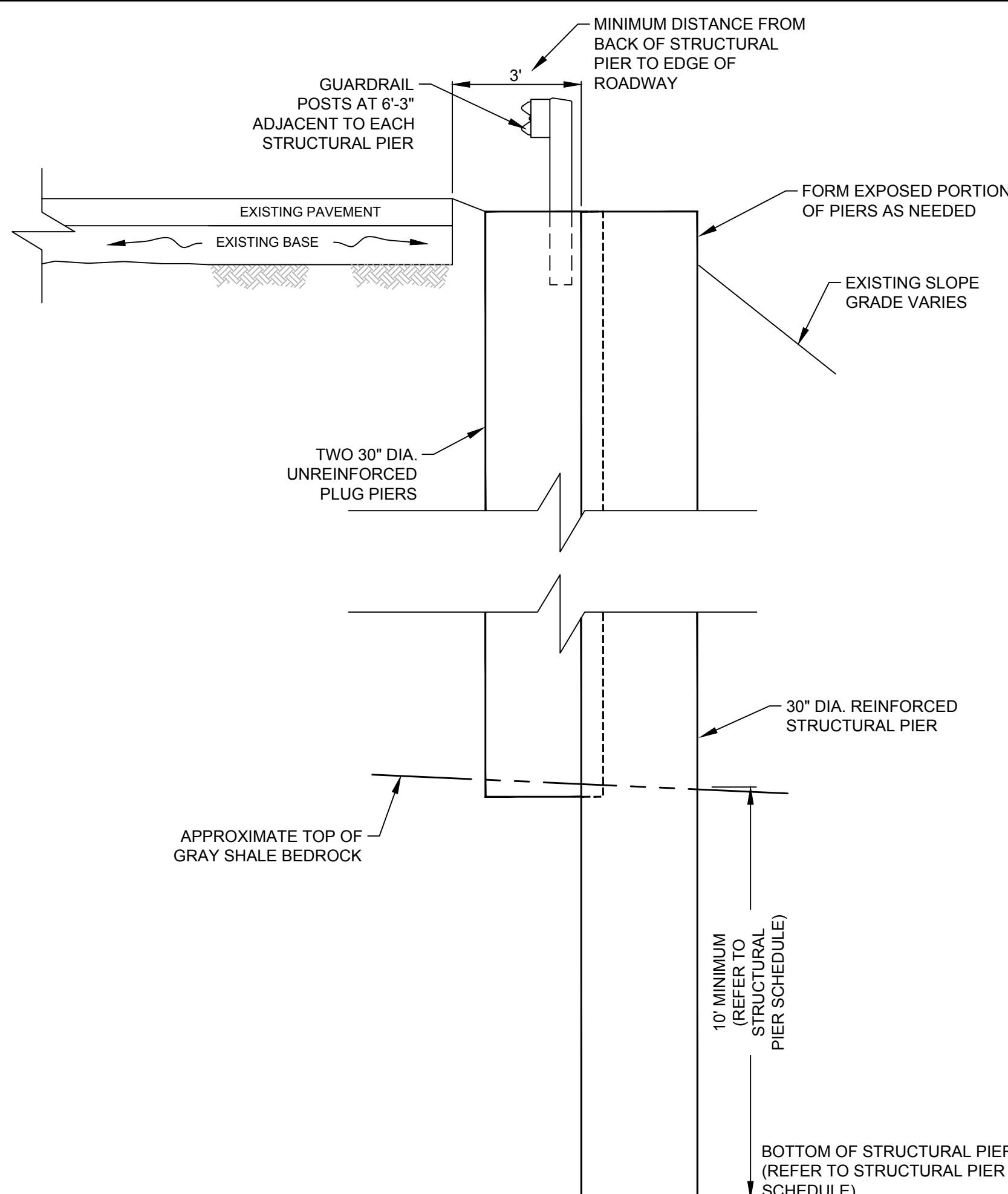
ALTERNATE 1: STRUCTURAL PIER WITH W18x119 REINFORCEMENT DETAIL AND "PLUG" PIER LAGGING
SCALE: 1"=1'



ALTERNATE 2: STRUCTURAL PIER WITH CAGE REINFORCEMENT DETAIL AND "PLUG" PIER LAGGING
SCALE: 1"=1'



CAST-IN-PLACE CONCRETE LAGGING DETAIL (BETWEEN S7 & S8)
SCALE: 1"=2'



STRUCTURAL PIER SECTION (TYPICAL)
SCALE: NOT TO SCALE

STRUCTURAL PIER SCHEDULE							
Pier No.	Diameter		Approximate Top of Pier Concrete Elevation	Approx. Top of Competent Bedrock Elevation	Minimum Rock Socket Length	Estimated Drilled Pier Bottom Elevation	Estimated Drilled Pier Length
	inches	feet					
S1	30	0+00	103.4	62	10	52	51.4
S2	30	0+06.25	102.5	63	10	53	49.5
S3	30	0+12.5	101.6	64	10	54	47.6
S4	30	0+18.75	100.9	64	10	54	46.9
S5	30	0+25	100.8	65	10	55	45.8
S6	30	0+31.25	100.2	66	10	56	44.2
S7	30	0+37.5	99.6	67	10	57	42.6
S8	30	0+53.75	98.2	69	10	59	39.2
S9	30	0+60	97.6	69	10	59	38.6
S10	30	0+66.25	97.2	70	10	60	37.2
S11	30	0+72.5	96.8	71	10	61	35.8
S12	30	0+78.75	96.6	72	10	62	34.6
S13	30	0+85	96.3	72	10	62	34.3
S14	30	0+91.25	96.1	73	10	63	33.1
S15	30	0+97.5	95.8	74	10	64	31.8

* TOP OF PIER CONCRETE TO BE APPROXIMATELY 4" BELOW PAVEMENT GRADE
** ACTUAL LENGTH TO BE DETERMINED BY CONDITIONS IN FIELD

PLUG PIER SCHEDULE					
Pier No.	Diameter	Approximate Top of Pier Concrete Elevation		Estimated Drilled Pier Bottom Elevation	Estimated Drilled Pier Length**
		inches	feet		
P1	30	103.0	62.0	41.0	
P2	30	103.0	62.0	41.0	
P3	30	102.1	62.6	39.5	
P4	30	102.1	62.6	39.5	
P5	30	101.3	63.5	37.8	
P6	30	101.3	63.5	37.8	
P7	30	100.9	64.5	36.4	
P8	30	100.9	64.5	36.4	
P9	30	100.5	65.0	35.5	
P10	30	100.5	65.0	35.5	
P11	30	99.9	65.9	34.0	
P12	30	99.9	65.9	34.0	
P13	30	97.9	68.5	29.4	
P14	30	97.9	68.5	29.4	
P15	30	97.4	69.5	27.9	
P16	30	97.4	69.5	27.9	
P17	30	97.0	69.5	27.5	
P18	30	97.0	69.5	27.5	
P19	30	96.7	70.2	26.5	
P20	30	96.7	70.2	26.5	
P21	30	96.5	71.5	25.0	
P22	30	96.5	71.5	25.0	
P23	30	96.2	72.2	24.0	
P24	30	96.2	72.2	24.0	
P25	30	96.0	72.5	23.5	
P26	30	96.0	72.5	23.5	

* TOP OF PIER CONCRETE TO BE APPROXIMATELY 4" BELOW PAVEMENT GRADE
** ACTUAL LENGTH TO BE DETERMINED BY CONDITIONS IN FIELD

DRILLED PIER CONSTRUCTION NOTES

DRILLED PIER INSTALLATION

- CONSTRUCT THE 30-INCH DRILLED STRUCTURAL PIER RETAINING WALL WITH PLUG PIERS USING EITHER ROLLED STEEL SECTIONS OR CAGE REINFORCEMENT AS SHOWN AND DESCRIBED ON PLANS. THE PURPOSE OF THIS WORK IS TO STOP LATERAL CREEP-TYPE MOVEMENT ON THE DOWNSLOPE (SOUTHEAST) SIDE OF EMMONS ROAD.
- CONTRACTOR IS RESPONSIBLE FOR CLEARING OVERHEAD AND UNDERGROUND UTILITIES AND PROVIDING ACCESS FOR EQUIPMENT.
- THE REINFORCED DRILLED PIER RETAINING WALL WILL CONSIST OF STRUCTURAL DRILLED PIERS SPACED APPROXIMATELY 6 FEET -3 INCH (6'-3") ON CENTER, AS SHOWN ON THE SITE PLAN DRAWING (SHEET 1). APPROXIMATE EMBEDMENT DEPTHS INTO SHALE AND LIMESTONE BEDROCK ARE SHOWN ON THE STRUCTURAL PIER SCHEDULE TABLE ON THIS SHEET; **HOWEVER, ACTUAL EMBEDMENT DEPTHS WILL BE BASED ON ACTUAL FIELD CONDITIONS AS DETERMINED BY THE GEOTECHNICAL CONSULTANT (OR GEOTECHNICAL REPRESENTATIVE).**
- THE PIERS SHALL BE LOCATED AS SHOWN ON PLAN WITHIN 6" OF PLAN LOCATION. THE PIERS SHALL MAINTAIN A PLUMBNESS DEVIATION OF A MAXIMUM OF 1" IN 12 FT. VERTICAL HEIGHT. A MINIMUM 3" CONCRETE COVER BETWEEN THE REINFORCING STEEL AND THE EXTERIOR (SIDES AND TOP) OF THE DRILLED PIER SHALL BE PROVIDED.
- TWO ALTERNATIVES FOR REINFORCEMENT OF STRUCTURAL PIERS HAVE BEEN PROVIDED. ALL REINFORCEMENT FOR THIS PROJECT SHOULD BE EPOXY COATED. REINFORCEMENT FOR THE STRUCTURAL PIERS SHALL CONSIST EITHER OF ROLLED STEEL SECTIONS HAVING YIELD STRENGTH OF 50 KSI OR CAGE REINFORCING STEEL HAVING A YIELD STRENGTH OF 60 KSI. ROLLED STEEL SECTIONS SHOULD CONSIST OF W 18X119 FOR ALTERNATIVE 1. THE CONFIGURATION OF THE REINFORCING CAGE FOR ALTERNATIVE 2 HAS BEEN SHOWN ON SHEET 2 AND CONSISTS OF A 14"x17" RECTANGULAR CAGE WITH A DOUBLE LAYER OF (6) #10 BARS, SPACED AT 2-INCHES CENTER-TO-CENTER.
- THE PRE-DRILLED PIER WILL BE BACKFILLED WITH CONCRETE TO THE TOP OF CONCRETE ELEVATION. THE TOP OF PIER CONCRETE ELEVATION SHALL BE ABOUT 4 INCHES BELOW THE TOP OF PAVEMENT ELEVATION, TO AVOID CONTACT BY SNOW PLOWS. STRUCTURAL PIER CONCRETE SHALL BE CONCRETE (FC = 4000 PSI, MAXIMUM SLUMP = 4 INCHES) WITH 4 TO 6% AIR-ENTRAINMENT PLACED USING FREE FALL METHOD OF PLACEMENT. CONCRETE SHALL BE PLACED INTO EACH PIER EXCAVATION ON THE SAME DAY THAT THE DRILLING IS COMPLETED. SEE ITEM 9 BELOW.
- TEMPORARY STEEL CASING SHOULD BE ON-SITE AND USED WHEREVER REQUIRED TO STABILIZE LOOSE OR CAVING MATERIALS. OR TO SEAL OFF WATER BEARING ZONES ENCOUNTERED DURING CONSTRUCTION.
- THE WALL DESIGN IS BASED ON MAXIMUM DEPTH TO COMPETENT BEDROCK (GRAY UNWEATHERED SHALE AND LIMESTONE) 35 FEET BELOW GRADE. AS NOTED ON PLAN, HOWEVER, IF BEDROCK IS ENCOUNTERED MORE THAN 2.0 FT. BELOW PLAN ELEVATION, TERRACON SHALL BE NOTIFIED IMMEDIATELY TO REVIEW AND PROVIDE ADDITIONAL RECOMMENDATIONS. LONGER OR ADDITIONAL REINFORCING MAY BE REQUIRED IN THIS CASE. EACH STRUCTURAL PIER SHALL BE SOCKETED INTO COMPETENT SHALE AND LIMESTONE BEDROCK (WEATHERED AND UNWEATHERED). A MINIMUM OF 10 FEET, AS DESCRIBED ON THE PLANS.
- THE CONTRACTOR SHALL MAINTAIN A RECORD OF EACH PIER DRILLED, WHICH WILL INCLUDE AS A MINIMUM: PIER NUMBER; GROUND ELEVATION; PIER TOP ELEVATION; TOP OF BROWN WEATHERED SHALE AND LIMESTONE ELEVATIONS; TOP OF GRAY SHALE AND LIMESTONE ELEVATIONS; AS-BUILT ROCK SOCKET DEPTH; ELEVATION OF THE TOP OF THE PIER CONCRETE; DATE DRILLED; DATE COMPLETED; AND WEATHER CONDITIONS.
- IT IS ANTICIPATED THAT WATER MAY ENTER SOME OF THE PIER EXCAVATIONS. THE DEPTH OF PONDED WATER AT THE BOTTOM OF THE PIER EXCAVATIONS SHOULD NOT EXCEED 2 INCHES, PRIOR TO PLACING CONCRETE. IF THE WATER CANNOT BE PUMPED DOWN, TREMIE PLACEMENT METHODS WILL BE REQUIRED.
- THE DRILLED PIER EXCAVATIONS SHOULD BE INSPECTED BY A QUALIFIED GEOTECHNICAL REPRESENTATIVE TO CONFIRM THAT THE DRILLED PIERS ARE SOCKETED INTO BEDROCK ACCORDING TO DESIGN, AND THAT THE DRILLED PIERS HAVE BEEN CONSTRUCTED PER SPECIFICATIONS.
- PIER SPOILS SHALL BE REMOVED FROM THE SITE (NOT WASTED ON THE HILLSIDE). NO FILL PLACEMENT SHOULD BE ALLOWED DOWNSLOPE OF THE SLOPE FACE.

PLUG PIER INSTALLATION

- PAIRS OF 30-INCH DIAMETER PLUG PIERS CONSISTING OF UNREINFORCED CONCRETE (FC = 2500 PSI, MAXIMUM SLUMP = 4 INCHES) WITH 4 TO 6% AIR ENTRAINMENT AS NOTED IN THE CROSS-SECTION DETAILS WILL ACT AS LAGGING FOR THE PIER WALL.
- PLUG PIER INSTALLATION FOR PIER WALL SHALL BEGIN AFTER THE STRUCTURAL PIER ELEMENTS HAVE GAINED STRENGTH (AT LEAST 24 HOURS AFTER PLACEMENT OF STRUCTURAL PIER CONCRETE).
- THE TOP OF THE PLUG PIER CONCRETE SHALL BE ABOUT 4 INCHES BELOW THE PAVEMENT.
- THE BOTTOM OF ALL THE PLUG PIERS INSTALLED SHOULD EXTEND TO THE ELEVATIONS DETAILED IN THE DRILLED PIER SCHEDULE (A MINIMUM OF 6 INCHES BELOW TOP OF WEATHERED OR UNWEATHERED BEDROCK).
- PLUG PIER SPOILS SHALL BE TRUCKED FROM THE SITE (NOT WASTED ON THE HILLSIDE).

CAST-IN PLACE LAGGING

- DUE TO THE PRESENCE OF AN EXISTING 60-INCH DIAMETER STONE CULVERT LOCATED BETWEEN STRUCTURAL PIERS S-7 AND S-8, CAST-IN PLACE LAGGING WILL BE REQUIRED TO PREVENT DAMAGE TO THE CULVERT, REDUCE EROSION, AND LOSS OF MATERIALS IN THIS AREA. THE LAGGING WILL NOT PREVENT LATERAL SOIL MOVEMENT BETWEEN STRUCTURAL PIERS S-7 AND S-8.
- THE EXACT LOCATION AND THICKNESS OF THE CULVERT IS UNKNOWN. THE LOCATION OF THE CULVERT SHOULD BE CONFIRMED BY THE CONTRACTOR AND THE PIER LAYOUT ADJUSTED BASED ON THIS LOCATION.
- THE CAST-IN-PLACE LAGGING SHALL CONSIST OF A 24-INCH WIDE EXCAVATION A MINIMUM OF 6 FEET DEEP, EXTENDING FROM AT LEAST THE CENTER OF STRUCTURAL PIER S-7 TO STRUCTURAL PIER S-8.
- REINFORCING STEEL SHALL BE PLACED PER THE INCLUDED DETAIL AND CONSIST OF 60 KSI STEEL. ALL REINFORCING STEEL FOR THIS PROJECT SHOULD BE EPOXY COATED. THE CONCRETE SHALL BE MINIMUM FC = 4000 PSI WITH 4 TO 6% AIR ENTRAINMENT.

CONSTRUCTION CONSIDERATIONS

- NEW STRUCTURAL FILL SHALL BE PLACED ON UPSLOPE SIDE OF PIERS TO RETAIN GRADE NEXT TO THE EDGE OF PAVEMENT. SONOTUBES OR EQUIVALENT WILL BE REQUIRED IN SOME AREAS. DUE TO THE STEEPLY SLOPING HILLSIDE BELOW THE WALL, FILL SHOULD BE PLACED AND COMPACTED PER ODOT SPECIFICATIONS (ITEM 203). ONLY HAND-OPERATED EQUIPMENT SHOULD BE USED WITHIN 5 FEET OF THE FRONT OF THE PIERS.
- EXISTING GUARDRAIL WILL BE REMOVED AND REPLACED IN THIS PROJECT.

FIELD QUALITY CONTROL

- OWNER WILL COORDINATE FIELD CONSTRUCTION INSPECTION AND REPORTING THROUGH IN-HOUSE PERSONNEL OR EXTERNAL TESTING AGENCY.
- DOCUMENTATION SHALL INCLUDE THE FOLLOWING AT EACH PIER (AND CAST-IN-PLACE LAGGING AS NOTED):
- GROUND ELEVATION
 - AS-BUILT PIER DIAMETER AND TOP AND BOTTOM PIER ELEVATIONS.
 - TOP OF WEATHERED BROWN SHALE ELEVATION.
 - TOP OF GRAY SHALE ELEVATION.
 - DESCRIPTION OF ENCOUNTERED SOIL MATERIALS.
 - DESCRIPTION, LOCATION, AND DIMENSIONS OF OBSTRUCTIONS.
 - FINAL TOP CENTERLINE LOCATION AND DEVIATIONS FROM REQUIREMENTS.
 - VARIATION OF PIER FROM PLUMB.
 - DRILLED PIER EXCAVATING METHOD.
 - LENGTH OF ROCK SOCKET.
 - LEVELNESS OF PIER BOTTOM AND ADEQUACY OF CLEANOUT.
 - GROUND-WATER CONDITIONS AND WATER-INFILTRATION RATE, DEPTH, AND PUMPING.
 - DESCRIPTION, DIAMETER, AND TOP AND BOTTOM ELEVATIONS OF TEMPORARY OR PERMANENT CASINGS.
 - DESCRIPTION OF SOIL OR WATER MOVEMENT, SIDEWALL STABILITY, LOSS OF GROUND, AND MEANS OF CONTROL.
 - DATE AND TIME OF STARTING AND COMPLETING DRILLED PIER EXCAVATION.
 - POSITION OF REINFORCING STEEL, INCLUDING IN CAST-IN-PLACE LAGGING.
 - CONCRETE PLACEMENT METHOD, INCLUDING DELAYS, INCLUDING IN CAST-IN-PLACE LAGGING.
 - ELEVATION OF CONCRETE DURING REMOVAL OF CASINGS, INCLUDING IN CAST-IN-PLACE LAGGING.
 - LOCATIONS OF CONSTRUCTION JOINTS, IF ANY, INCLUDING IN CAST-IN-PLACE LAGGING.
 - REMARKS, UNUSUAL CONDITIONS ENCOUNTERED, AND DEVIATIONS FROM REQUIREMENTS.

REV.	DATE	BY	DESCRIPTION

DETAILS, PIER SCHEDULES, AND CONSTRUCTION NOTES
EMMONS ROAD LANDSLIDE - WARREN COUNTY
TURTLE CREEK TOWNSHIP
5103 EMMONS ROAD
OREGONIA, WARREN COUNTY, OHIO

Terracon
Consulting Engineers and Scientists
CINCINNATI, OHIO 45226
FAX: (613) 321-4540
611 LUNKEN PARK DRIVE
PH: (513) 321-5816



SHEET 2

DESIGNED BY:	SK/DWW
DRAWN BY:	KM
APPVD. BY:	DWW
SCALE:	AS SHOWN
DATE:	02/26/2019
JOB NO.:	N1185468
ACAD NO.:	RW.DWG
SHEET NO.:	2



Date: 4/12/2019 8:05 AM File Path: N:\HCHN\PROJECTS\AUTOCAD\2018\1181185468\RW.DWG

BORING LOG NO. T-1									
PROJECT: Emmons Road Landslide-Warren County					CLIENT: Turtle Creek Township Lebanon, OH				
SITE: 5103 Emmons Raod Oregonia, OH					Page 1 of 2				
GRAPHIC LOG	LOCATION See SHEET-1 Latitude: 39.447267° Longitude: -84.103052°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	FIELD TEST RESULTS	LABORATORY RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		
	Surface Elev.: 774 (Ft.)						LL-PL-PI		
0									
2.5	RIP-RAP BOULDERS								
4.5	FILL lean clay, with gravel, trace fine to coarse sand, brown								
5	FILL lean clay, trace gravel, trace organic inclusions, brown								
10									
15									
20	SANDY SILT, dark brown, stiff								
25									
Stratification lines are approximate. In-situ, the transition may be gradual.									
Hammer Type: Automatic									
Advancement Method: Hollow Stem Auger									
Abandonment Method: Indrometer installed to 35 feet.									
Notes:									
WATER LEVEL OBSERVATIONS									
Not encountered during drilling									
Not observed immediately following completion									
Terracon		Boring Started: 09-06-2017		Boring Completed: 09-06-2017					
611 Lunken Park Dr Cincinnati, OH		Drill Rig: Track		Driller: R. Mann		Project No.: N1175147			

BORING LOG NO. T-1									
PROJECT: Emmons Road Landslide-Warren County					CLIENT: Turtle Creek Township Lebanon, OH				
SITE: 5103 Emmons Raod Oregonia, OH					Page 2 of 2				
GRAPHIC LOG	LOCATION See SHEET-1 Latitude: 39.447267° Longitude: -84.103052°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	FIELD TEST RESULTS	LABORATORY RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		
	Surface Elev.: 774 (Ft.)						LL-PL-PI		
24.0	SANDY SILT, dark brown, stiff (continued)								
24.0	SHALE grayish-brown, severely weathered, very soft								
30.0	SHALE with occasional limestone seams, gray, moderately weathered, soft								
31.5	Boring Terminated at 31.5 Feet								
Stratification lines are approximate. In-situ, the transition may be gradual.									
Hammer Type: Automatic									
Advancement Method: Hollow Stem Auger									
Abandonment Method: Indrometer installed to 35 feet.									
Notes:									
WATER LEVEL OBSERVATIONS									
Not encountered during drilling									
Not observed immediately following completion									
Terracon		Boring Started: 09-06-2017		Boring Completed: 09-06-2017					
611 Lunken Park Dr Cincinnati, OH		Drill Rig: Track		Driller: R. Mann		Project No.: N1175147			

BORING LOG NO. T-2									
PROJECT: Emmons Road Landslide-Warren County					CLIENT: Turtle Creek Township Lebanon, OH				
SITE: 5103 Emmons Raod Oregonia, OH					Page 1 of 1				
GRAPHIC LOG	LOCATION See SHEET-1 Latitude: 39.447298° Longitude: -84.10314°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	FIELD TEST RESULTS	LABORATORY RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		
	Surface Elev.: 775 (Ft.)						LL-PL-PI		
0	TOPSOIL, 6 inches thick								
2.0	FILL lean clay, with limestone cobbles, trace organics inclusions, trace gravel, brown								
5									
10	SAND, fine grained, brown, loose to medium dense								
13.5	LEAN CLAY, trace silt and limestone fragments, brownish-gray, very stiff								
15.0	SHALE with limestone fragments, brownish-gray, severely weathered, soft								
17.5	SHALE with limestone fragments, moderately weathered, medium stiff								
17.7	Boring Terminated at 17.7 Feet								
Stratification lines are approximate. In-situ, the transition may be gradual.									
Hammer Type: Automatic									
Advancement Method: Hollow Stem Auger									
Abandonment Method: Boring backfilled with auger cuttings upon completion.									
Notes:									
WATER LEVEL OBSERVATIONS									
Not encountered during drilling									
Not observed immediately following completion									
Terracon		Boring Started: 09-06-2017		Boring Completed: 09-06-2017					
611 Lunken Park Dr Cincinnati, OH		Drill Rig: Track		Driller: R. Mann		Project No.: N1175147			

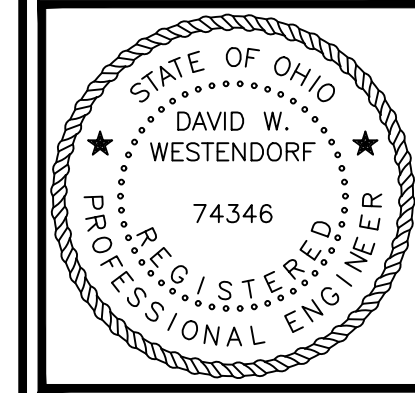
BORING LOG NO. T-3									
PROJECT: Emmons Road Landslide-Warren County					CLIENT: Turtle Creek Township Lebanon, OH				
SITE: 5103 Emmons Raod Oregonia, OH					Page 1 of 2				
GRAPHIC LOG	LOCATION See SHEET-1 Latitude: 39.447137° Longitude: -84.103182°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	FIELD TEST RESULTS	LABORATORY RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		
	Surface Elev.: 776 (Ft.)						LL-PL-PI		
1.3	ASPHALT, 16 inches thick								
1.8	BASE 6 inches thick								
3.5	FILL lean clay, with sand and gravel, brownish-black								
5	LEAN CLAY, trace gravel and sand, grayish-brown, very stiff								
10									
12.0	LEAN CLAY, trace organic inclusion, trace gravel, reddish-brown with black, stiff								
15	LEAN CLAY, with limestone fragments, brownish-gray, stiff								
17.5	LEAN CLAY, trace gravel, brownish-gray, medium stiff								
20									
25									
Stratification lines are approximate. In-situ, the transition may be gradual.									
Hammer Type: Automatic									
Advancement Method: Hollow Stem Auger									
Abandonment Method: Boring backfilled with Auger Cuttings Surface capped with asphalt.									
Notes:									
WATER LEVEL OBSERVATIONS									
Not encountered during drilling									
Not observed immediately following completion									
Terracon		Boring Started: 09-06-2017		Boring Completed: 09-06-2017					
611 Lunken Park Dr Cincinnati, OH		Drill Rig: Track		Driller: R. Mann		Project No.: N1175147			

BORING LOG NO. T-3									
PROJECT: Emmons Road Landslide-Warren County					CLIENT: Turtle Creek Township Lebanon, OH				
SITE: 5103 Emmons Raod Oregonia, OH					Page 2 of 2				
GRAPHIC LOG	LOCATION See SHEET-1 Latitude: 39.447137° Longitude: -84.103182°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	FIELD TEST RESULTS	LABORATORY RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		
	Surface Elev.: 776 (Ft.)						LL-PL-PI		
30.0	LEAN CLAY, trace gravel, brownish-gray, medium stiff (continued)								
30.0	LEAN CLAY, trace gravel with limestone fragments, brown, very stiff								
35.0	SHALE, with limestone fragments, gray, moderately weathered, soft								
40.0									
41.5	Boring Terminated at 41.5 Feet								
Stratification lines are approximate. In-situ, the transition may be gradual.									
Hammer Type: Automatic									
Advancement Method: Hollow Stem Auger									
Abandonment Method: Boring backfilled with Auger Cuttings Surface capped with asphalt.									
Notes:									
WATER LEVEL OBSERVATIONS									
Not encountered during drilling									
Not observed immediately following completion									
Terracon		Boring Started: 09-06-2017		Boring Completed: 09-06-2017					
611 Lunken Park Dr Cincinnati, OH		Drill Rig: Track		Driller: R. Mann		Project No.: N1175147			

REV.	DATE	BY	DESCRIPTION

BORING LOGS
EMMONS ROAD LANDSLIDE - WARREN COUNTY
TURTLE CREEK TOWNSHIP
5103 EMMONS ROAD
OREGONIA, WARREN COUNTY, OHIO

Terracon
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611 LUNKEN PARK DRIVE
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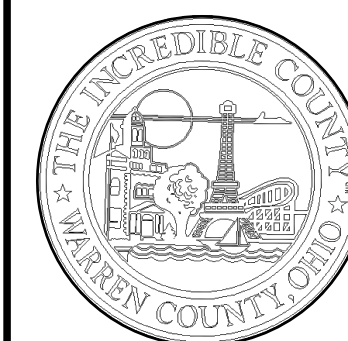
SHEET 3

DESIGNED BY:	SK/DWW
DRAWN BY:	KM
APPROV. BY:	DWM
SCALE:	AS SHOWN
DATE:	02/26/2019
JOB NO.:	N1185468
ACAD NO.:	RW/DWG
SHEET NO.:	3

Date: 4/9/2019 7:49 AM File Path: N:\HCN PROJECTS\AUTOCAD\2018\1181181\185468\RW.DWG



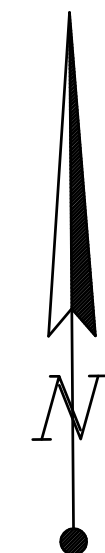
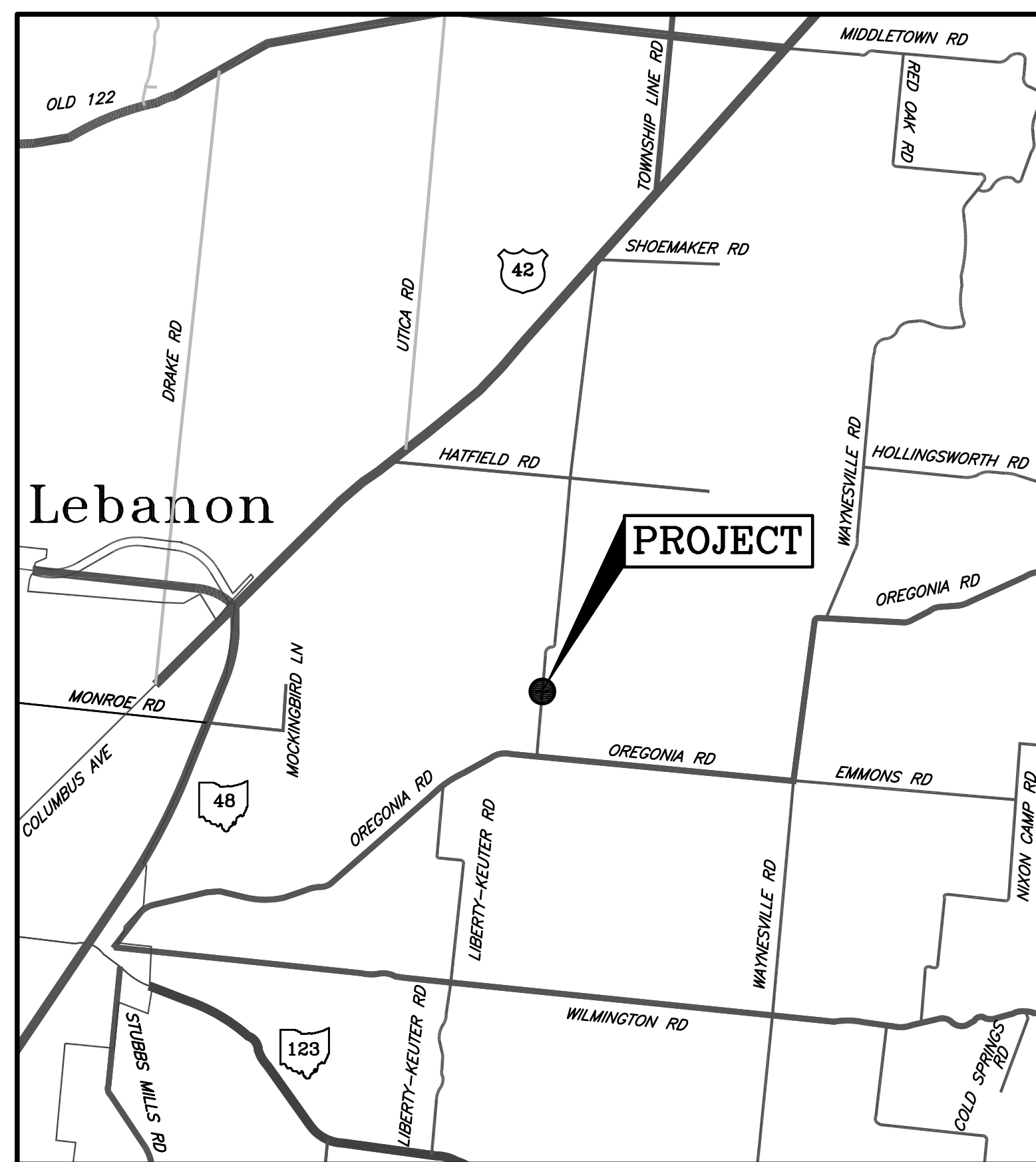
DRILLED PIER WALL PROJECT LIBERTY KEUTER ROAD



**Warren
County
Engineer's
Office**

Nail F. Junison, P.E., P.S.
Warren County Engineer
210 W Main Street
Lebanon, Ohio 45036
513 695 3301 Phone
513 695 7714 Fax

TURTLECREEK TOWNSHIP
WARREN COUNTY, OHIO



VICINITY MAP
NOT TO SCALE

SHEET NUMBER

TITLE SHEET
PIER WALL PLAN & PROFILE SHEET
DETAIL SHEET
BORING LOGS SHEET
DETOUR SHEET

1
2
3
4

UNDERGROUND UTILITIES
2 WORKING DAYS
BEFORE YOU DIG
CALL TOLL FREE 800-362-2764
OHIO UTILITIES PROTECTION SERVICE

NON-MEMBERS MUST BE
CALLED DIRECTLY

APPROVED: _____
DATE: _____ WARREN COUNTY ENGINEER

APPROVED: _____
DATE: _____ WARREN COUNTY COMMISSIONER

APPROVED: _____
DATE: _____ WARREN COUNTY COMMISSIONER

APPROVED: _____
DATE: _____ WARREN COUNTY COMMISSIONER

TITLE SHEET
LIBERTY KEUTER ROAD
DRILLED PIER WALL PROJECT
TURTLECREEK TOWNSHIP

DRAWING

PROJECT

REVISIONS
DESCRIPTION

NO.	DATE	BY	DESCRIPTION

SCALE

NONE

DATE

01/27/25

DRAWN BY

JL

CHECKED BY

DWB

PROJECT NO.

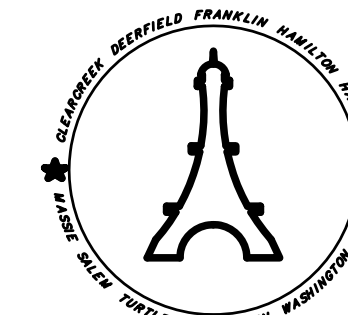
18-95-2025

FILE

18-95

DRAWING NO.

Plan Wall - 2025

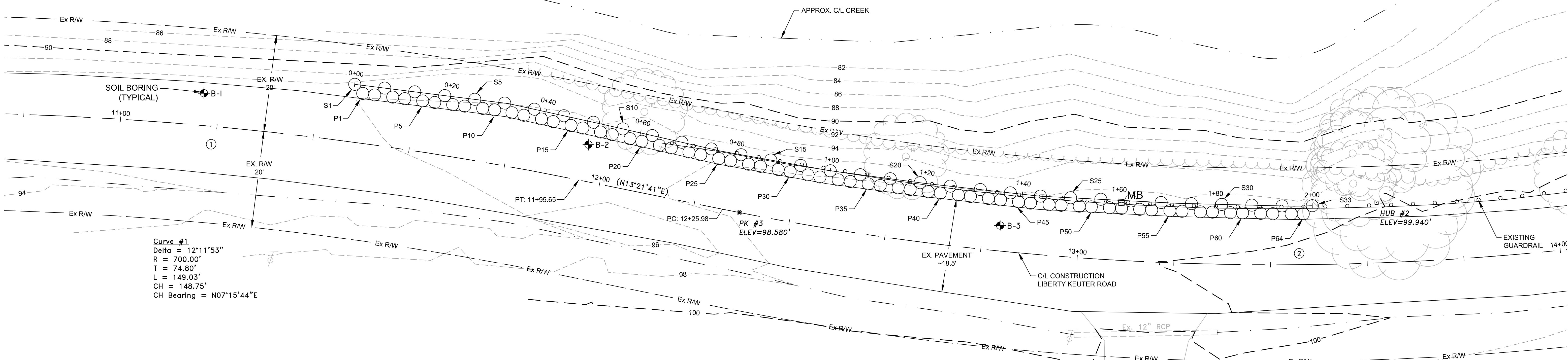


PLANS PREPARED BY:
THE WARREN COUNTY ENGINEERING DEPARTMENT
210 W MAIN STREET
LEBANON, OHIO 45036

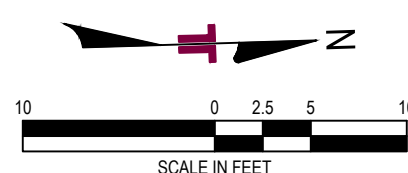
BANTA FAMILY PRESERVATION TRUST
 TRUSTEES:
 MICHAEL E. BANTA & MARSHA L. MORSIE
 1420 LIBERTY KEUTER ROAD
 LEBANON, OHIO 45036
 PARCEL ID 09-19-300-009

RODNEY L. MORSIE AND MARSHA L. MORSIE
 1327 LIBERTY KEUTER ROAD
 LEBANON, OHIO 45036
 PARCEL ID 09-19-400-0023

HUB #3
 ELEV=84.465'



Curve #1
 Delta = 12°11'53"
 R = 700.00'
 T = 74.80'
 L = 149.03'
 CH = 148.75'
 CH Bearing = N07°15'44"E



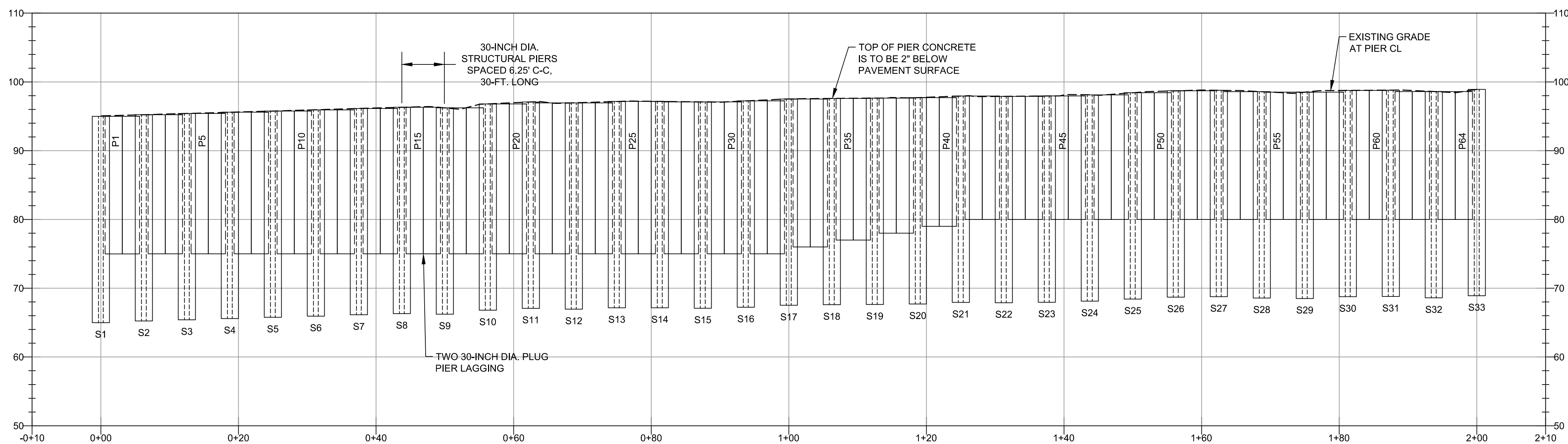
NICOLE C. LARSON
 1204 LIBERTY KEUTER ROAD
 LEBANON, OHIO 45036
 PARCEL ID 09-19-400-0002

Curve #2
 Delta = 22°57'28"
 R = 575.00'
 T = 116.77'
 L = 230.40'
 CH = 228.86'
 CH Bearing = N01°52'57"E

NOTE:
 BASE PLAN PROVIDED BY WARREN COUNTY ENGINEER'S OFFICE.

PLAN VIEW
 SCALE: 1"=10'

NOTE:
 BEGIN PIER WALL AT STATION 11+45 AND END PIER WALL AT STATION 13+45. ALONG C/L OF NORTH LIBERTY KEUTER ROAD. CENTER OF STRUCTURAL PIERS SHOULD BE OFFSET APPROXIMATELY 3-FT. FROM THE EXISTING EDGE OF PAVEMENT.

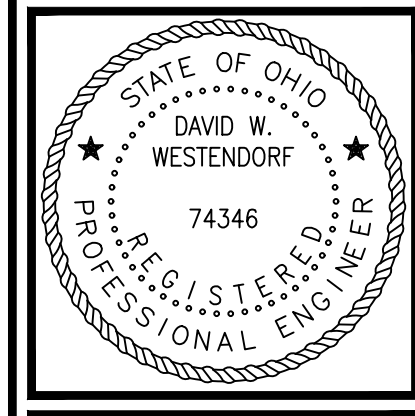


ELEVATION VIEW
 SCALE: 1"=10' H&V

REV	DATE	BY	DESCRIPTION

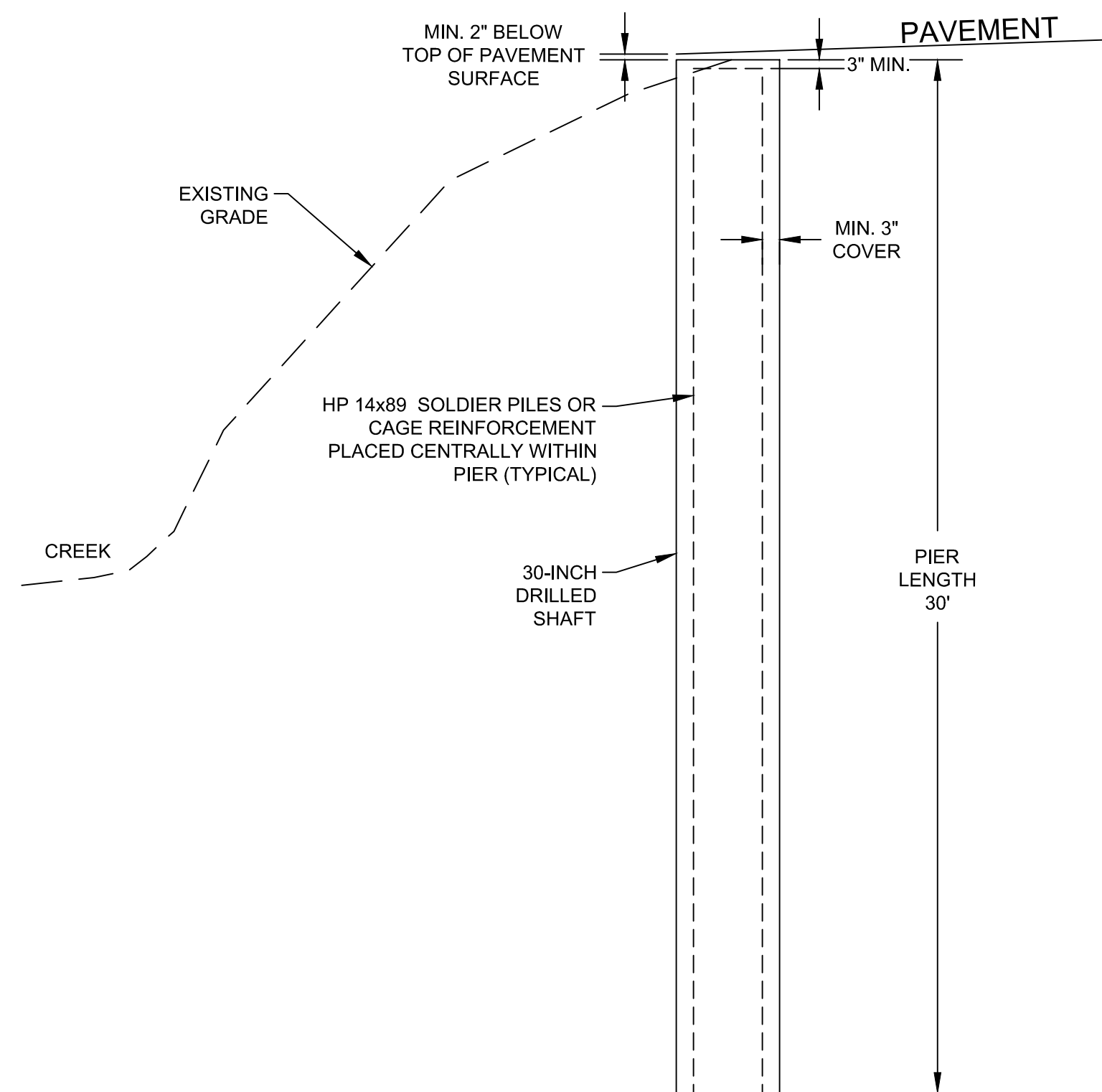
PLAN AND ELEVATION
 NORTH LIBERTY-KEUTER DRILLED PIER RETAINING WALL
 TURTLE CREEK TOWNSHIP
 TURTLE CREEK TOWNSHIP, WARREN COUNTY, OHIO

Terracon
 Consulting Engineers and Scientists
 611 LUNKEN PARK DRIVE
 CINCINNATI, OHIO 45226
 PH: (513) 321-5816 FAX: (513) 321-4540



SHEET 1

DESIGNED BY:	ASK
DRAWN BY:	KM
APPVD BY:	DWW
SCALE:	AS SHOWN
DATE:	10/08/2016
JOB NO.	N1185161
ACAD NO.	RW.DWG
SHEET NO.:	1



STRUCTURAL PIER SECTION (TYPICAL)
SCALE: 1"=4'

STRUCTURAL PIER SCHEDULE					
Pier No:	Station	Approximate Top of Pier Reference Elevation (ft.)	Diameter (inches)	Approximate Bottom of Pier Reference Elevation (ft.)	Length of Pier (ft.)
S1	0+00	94.8	30	64.8	30
S2	0+6.25	95.0	30	65.0	30
S3	0+12.5	95.2	30	65.2	30
S4	0+18.75	95.4	30	65.4	30
S5	0+25	95.6	30	65.6	30
S6	0+31.25	95.7	30	65.7	30
S7	0+37.5	95.9	30	65.9	30
S8	0+43.75	96.1	30	66.1	30
S9	0+50	96.0	30	66.0	30
S10	0+56.25	96.6	30	66.6	30
S11	0+62.5	96.9	30	66.9	30
S12	0+68.75	96.8	30	66.8	30
S13	0+75	97.0	30	67.0	30
S14	0+81.25	97.0	30	67.0	30
S15	0+87.5	96.9	30	66.9	30
S16	0+93.75	97.0	30	67.0	30
S17	1+00	97.3	30	67.3	30
S18	1+6.25	97.4	30	67.4	30
S19	1+12.5	97.4	30	67.4	30
S20	1+18.75	97.5	30	67.5	30
S21	1+25	97.7	30	67.7	30
S22	1+31.25	97.7	30	67.7	30
S23	1+37.5	97.7	30	67.7	30
S24	1+43.75	97.9	30	67.9	30
S25	1+50	98.2	30	68.2	30
S26	1+56.25	98.5	30	68.5	30
S27	1+62.5	98.6	30	68.6	30
S28	1+68.75	98.4	30	68.4	30
S29	1+75	98.3	30	68.3	30
S30	1+81.25	98.6	30	68.6	30
S31	1+87.5	98.6	30	68.6	30
S32	1+93.75	98.4	30	68.4	30
S33	2+00	98.7	30	68.7	30

PLUG PIER SCHEDULE				
Pier No:	Approximate Top of Pier Reference Elevation (ft.)	Diameter (inches)	Approximate Bottom of Pier Reference Elevation (ft.)	Length of Pier (ft.)
P1	94.8	30	75.0	19.8
P2	95.0	30	75.0	20.0
P3	95.0	30	75.0	20.0
P4	95.2	30	75.0	20.2
P5	95.2	30	75.0	20.2
P6	95.4	30	75.0	20.4
P7	95.4	30	75.0	20.4
P8	95.6	30	75.0	20.6
P9	95.6	30	75.0	20.6
P10	95.7	30	75.0	20.7
P11	95.7	30	75.0	20.7
P12	95.9	30	75.0	20.9
P13	95.9	30	75.0	20.9
P14	96.1	30	75.0	21.1
P15	96.1	30	75.0	21.1
P16	96.0	30	75.0	21.0
P17	96.0	30	75.0	21.0
P18	96.6	30	75.0	21.6
P19	96.6	30	75.0	21.6
P20	96.9	30	75.0	21.9
P21	96.9	30	75.0	21.9
P22	96.8	30	75.0	21.8
P23	96.8	30	75.0	21.8
P24	97.0	30	75.0	22.0
P25	97.0	30	75.0	22.0
P26	97.0	30	75.0	22.0
P27	97.0	30	75.0	22.0
P28	96.9	30	75.0	21.9
P29	96.9	30	75.0	21.9
P30	97.0	30	75.0	22.0
P31	97.0	30	75.0	22.0
P32	97.3	30	75.0	22.3
P33	97.3	30	76.0	21.3
P34	97.4	30	76.0	21.4
P35	97.4	30	77.0	20.4
P36	97.4	30	77.0	20.4
P37	97.4	30	78.0	19.4
P38	97.5	30	78.0	19.5
P39	97.5	30	79.0	18.5
P40	97.7	30	79.0	18.7
P41	97.7	30	80.0	17.7
P42	97.7	30	80.0	17.7
P43	97.7	30	80.0	17.7
P44	97.7	30	80.0	17.7
P45	97.7	30	80.0	17.7
P46	97.9	30	80.0	17.9
P47	97.9	30	80.0	17.9
P48	98.2	30	80.0	18.2
P49	98.2	30	80.0	18.2
P50	98.5	30	80.0	18.5
P51	98.5	30	80.0	18.5
P52	98.6	30	80.0	18.6
P53	98.6	30	80.0	18.6
P54	98.4	30	80.0	18.4
P55	98.4	30	80.0	18.4
P56	98.3	30	80.0	18.3
P57	98.3	30	80.0	18.3
P58	98.6	30	80.0	18.6
P59	98.6	30	80.0	18.6
P60	98.6	30	80.0	18.6
P61	98.6	30	80.0	18.6
P62	98.4	30	80.0	18.4
P63	98.4	30	80.0	18.4
P64	98.7	30	80.0	18.7

DRILLED PIER CONSTRUCTION NOTES

DRILLED PIER INSTALLATION

- CONSTRUCT THE 30-INCH DIAMETER DRILLED STRUCTURAL PIER WITH PLUG PIER LAGGING RETAINING WALL USING EITHER ROLLED STEEL SECTIONS OR CAGE REINFORCEMENT AS SHOWN AND DESCRIBED ON PLANS. THE PURPOSE OF THIS WORK IS TO CONTROL LATERAL CREEP-TYPE MOVEMENT ON THE DOWNSLOPE (WEST) SIDE OF LIBERTY-KEUTER ROAD. CONTRACTOR IS RESPONSIBLE FOR CLEARING OVERHEAD AND UNDERGROUND UTILITIES AND PROVIDING ACCESS FOR EQUIPMENT. THE PIER EXCAVATION SHALL BE UNCLASSIFIED. TURTLE CREEK TOWNSHIP WILL CLOSE THIS SECTION OF LIBERTY-KEUTER ROAD TO TRAFFIC DURING PIER WALL CONSTRUCTION.
- THE REINFORCED DRILLED PIER RETAINING WALL WILL CONSIST OF DRILLED PIERS SPACED APPROXIMATELY ON 6 FEET -3 INCH (6'-3") ON CENTER, AS SHOWN ON THE SITE PLAN DRAWING. APPROXIMATE BOTTOM OF DRILLED PIERS HAS BEEN SHOWN ON PIER SCHEDULE TABLE ON THIS SHEET. HOWEVER, ACTUAL LENGTHS WILL BE BASED ON ACTUAL FIELD CONDITIONS AS DETERMINED BY THE GEOTECHNICAL CONSULTANT.
- THE PIERS SHALL BE LOCATED AS SHOWN ON PLAN WITHIN 6" OF PLAN LOCATION. THE PIERS SHALL MAINTAIN A PLUMBNESS DEVIATION OF A MAXIMUM OF 1" IN 12 FT. VERTICAL HEIGHT. A MINIMUM 3" CONCRETE COVER BETWEEN THE REINFORCING STEEL AND THE EXTERIOR (SIDES AND TOP) OF THE DRILLED PIER SHALL BE PROVIDED.
- TWO ALTERNATIVES FOR REINFORCEMENT OF STRUCTURAL PIERS HAVE BEEN PROVIDED. REINFORCEMENT FOR THE STRUCTURAL PIERS SHALL CONSIST EITHER OF ROLLED STEEL SECTIONS HAVING A YIELD STRENGTH OF 50 KSI OR CAGE REINFORCING STEEL HAVING A YIELD STRENGTH OF 60 KSI. ROLLED STEEL SECTIONS SHOULD CONSIST OF HP 14X89 BEAMS FOR ALTERNATIVE 1 AS NOTED ON THESE PLANS. THE CONFIGURATION OF THE REINFORCING CAGE FOR ALTERNATIVE 2 HAS BEEN SHOWN ON SHEET 2 AND CONSISTS OF A 14"x19" RECTANGULAR CAGE WITH A LAYER OF (6) #8 BARS.
- THE PRE-DRILLED SHAFT WILL BE BACKFILLED WITH CONCRETE TO THE TOP OF CONCRETE ELEVATION, USING FREE FALL METHODS, UNLESS WATER CANNOT BE REMOVED FROM THE PIER HOLE. IF THERE IS MORE THAN 2-INCHES OF WATER IN THE PIER AT THE TIME OF CONCRETE PLACEMENT, PLEASE SEE ITEM 8 BELOW. THE TOP OF PIER CONCRETE ELEVATION SHALL BE ABOUT 2 INCHES BELOW THE TOP OF PAVEMENT ELEVATION, TO AVOID CONTACT BY SNOW PLOWS. STRUCTURAL PIER CONCRETE SHALL BE CONCRETE (F'C = 4000 PSI, MAXIMUM SLUMP = 4 INCHES, A/E = 64 : 2%) PLACED USING FREE FALL METHOD OF PLACEMENT. CONCRETE SHALL BE PLACED INTO EACH PIER EXCAVATION ON THE SAME DAY THAT THE DRILLING IS COMPLETED.
- TEMPORARY STEEL CASING SHOULD BE ON-SITE AND USED WHEREVER REQUIRED TO STABILIZE LOOSE OR CAVING MATERIALS, OR TO SEAL OFF WATER BEARING ZONES ENCOUNTERED DURING CONSTRUCTION.
- THE CONTRACTOR SHALL MAINTAIN A RECORD OF EACH PIER DRILLED, WHICH WILL INCLUDE AS A MINIMUM: PIER NUMBER; GROUND ELEVATION; DEPTH OR ELEVATION WHERE GROUNDWATER WAS ENCOUNTERED; PIER TOP ELEVATION; ELEVATION OF BOTTOM OF PIER OR PIER LENGTH; ELEVATION OF THE TOP OF THE PIER CONCRETE; DATE DRILLED; DATE COMPLETED; AND WEATHER CONDITIONS.
- IT IS ANTICIPATED THAT WATER MAY ENTER SOME OF THE PIER EXCAVATIONS. THE DEPTH OF PONDED WATER AT THE BOTTOM OF THE PIER EXCAVATIONS SHOULD NOT EXCEED 2 INCHES, PRIOR TO PLACING CONCRETE. IF THE WATER CANNOT BE PUMPED DOWN, TREMIE PLACEMENT METHODS WILL BE REQUIRED.
- THE DRILLED PIER EXCAVATIONS SHOULD BE INSPECTED BY A QUALIFIED GEOTECHNICAL REPRESENTATIVE TO CONFIRM THAT THE DRILLED PIERS HAVE BEEN EXTENDED TO THE DESIGN PIER LENGTH, AND THAT THE DRILLED PIERS HAVE BEEN CONSTRUCTED PER SPECIFICATIONS.
- PIER SPOILS SHALL BE TRUCKED FROM THE SITE (NOT WASTED ON THE HILLSIDE). NO FILL PLACEMENT SHOULD BE ALLOWED DOWNSLOPE OF THE WALL.

PLUG PIER INSTALLATION

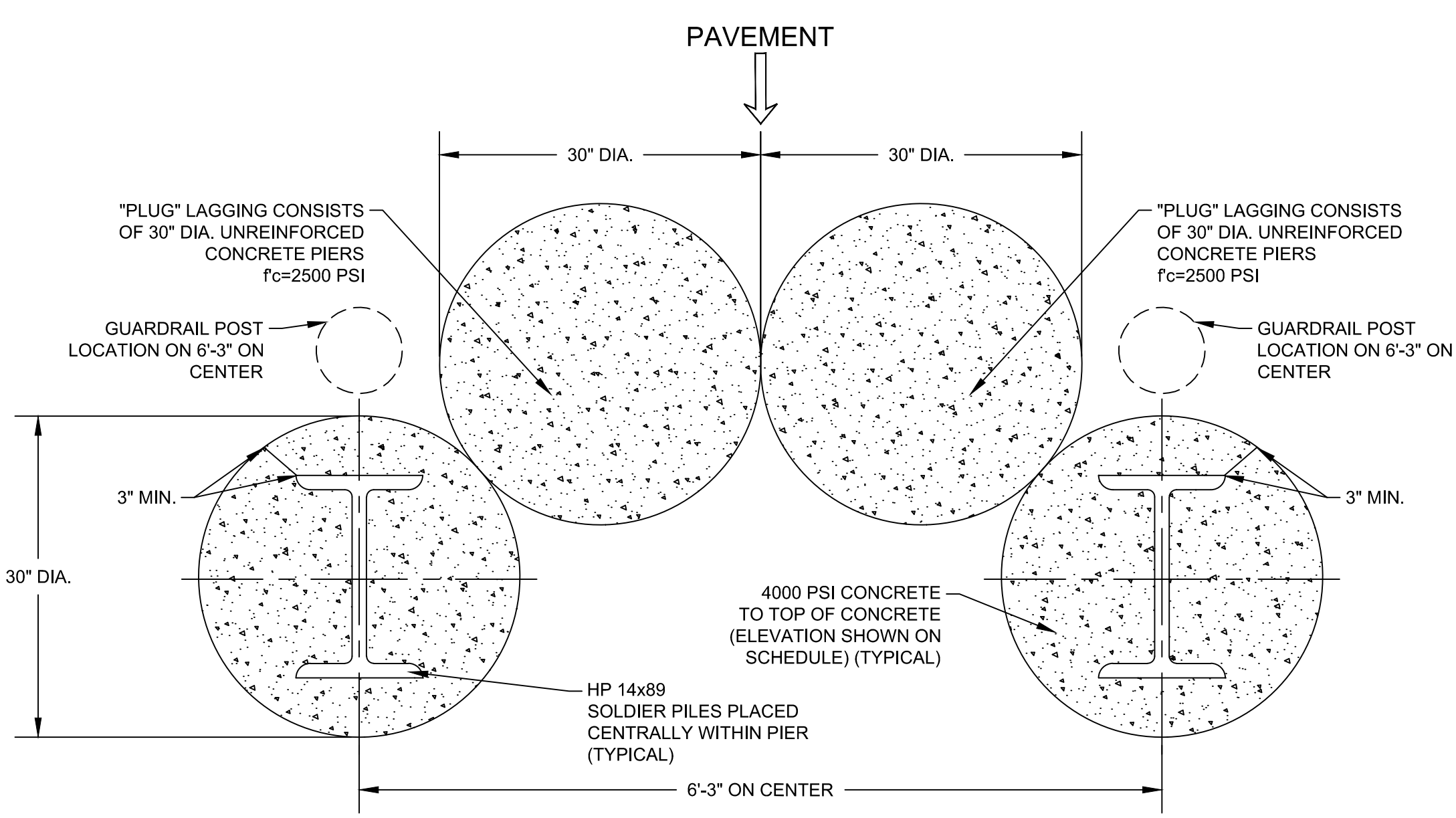
- TWO 30-INCH DIAMETER PLUG PIERS CONSISTING OF UNREINFORCED CONCRETE (F'C = 2500 PSI, MAXIMUM SLUMP = 4 INCHES), AS NOTED ON THE CROSS-SECTION DETAILS. THE PLUG PIERS WILL ACT AS LAGGING FOR THE PIER WALL.
- PLUG PIER INSTALLATION SHALL BEGIN AFTER THE STRUCTURAL PIER ELEMENTS HAVE GAINED STRENGTH (AT LEAST 24 HOURS AFTER PLACEMENT OF STRUCTURAL PIER CONCRETE).
- THE TOP OF THE PLUG PIER CONCRETE SHALL BE ABOUT 2 INCHES BELOW THE PAVEMENT.
- THE BOTTOM OF ALL THE PLUG PIERS INSTALLED SHOULD EXTEND TO THE ELEVATIONS DETAILED IN THE DRILLED PIER SCHEDULE.
- PLUG PIER SPOILS SHALL BE TRUCKED FROM THE SITE (NOT WASTED ON THE HILLSIDE).

DRAINAGE AND OTHER CONSTRUCTION CONSIDERATIONS

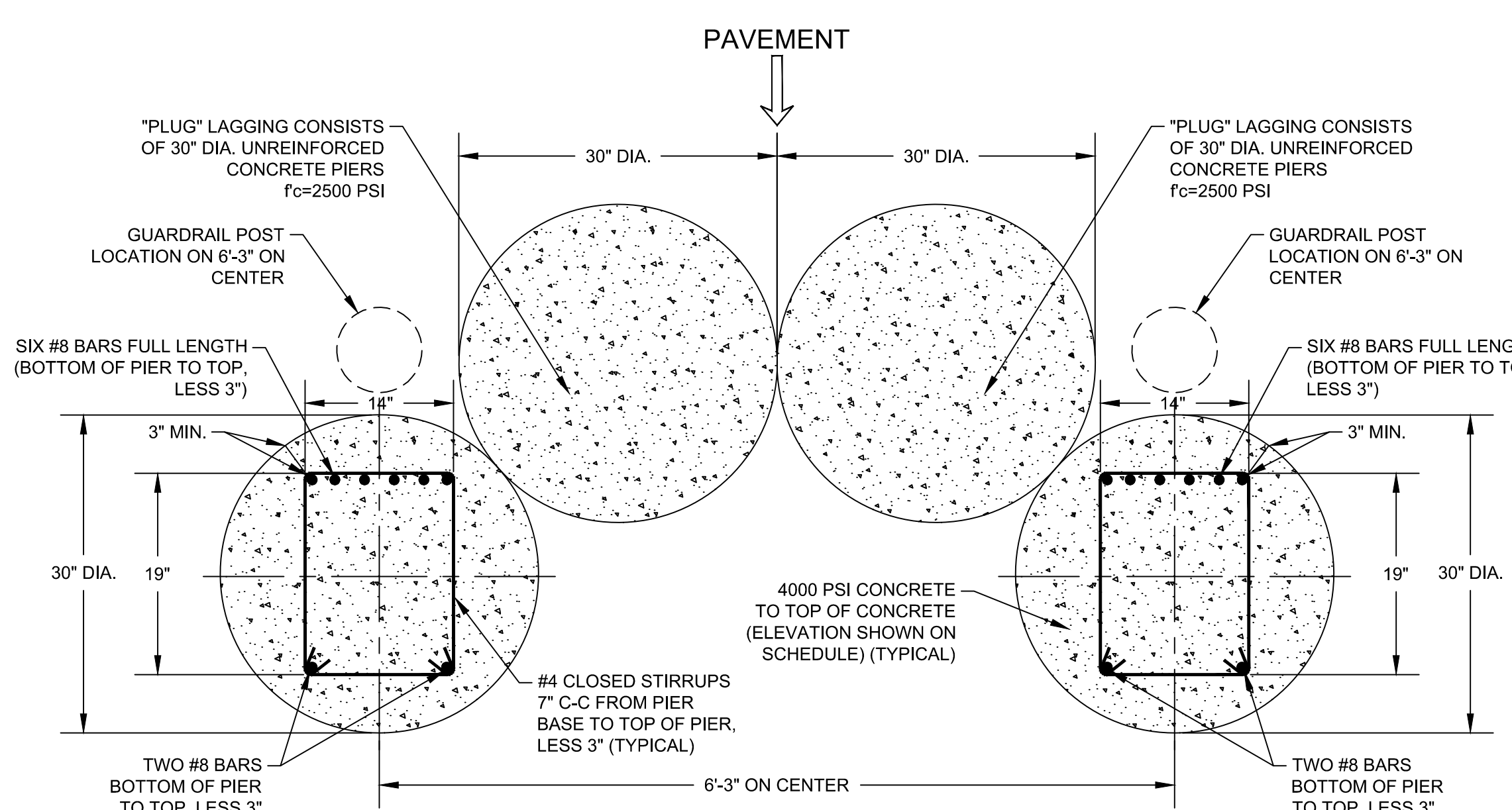
- NEW STRUCTURAL FILL MAY BE PLACED ON UPSLOPE SIDE OF PIERS TO RETAIN GRADE NEXT TO THE EDGE OF PAVEMENT. SONOTUBES OR EQUIVALENT WILL BE REQUIRED IN SOME AREAS, DUE TO THE STEEPLY SLOPING HILLSIDE BELOW THE WALL. FILL SHOULD BE PLACED AND COMPACTED PER ODOT SPECIFICATIONS (ITEM 203). ONLY HAND-OPERATED EQUIPMENT SHOULD BE USED WITHIN 5 FEET OF THE FRONT OF THE PIERS.
- EXISTING GUARDRAIL WILL BE REMOVED AND REPLACED IN THIS PROJECT.

FIELD QUALITY CONTROL

- OWNER WILL COORDINATE FIELD CONSTRUCTION INSPECTION AND REPORTING THROUGH IN-HOUSE PERSONNEL OR TERRACON. DOCUMENTATION SHALL INCLUDE THE FOLLOWING AT EACH PIER:
 - GROUND ELEVATION
 - AS-BUILT PIER DIAMETER AND TOP AND BOTTOM PIER ELEVATIONS.
 - AS-BUILT PIER LENGTH.
 - DESCRIPTION OF ENCOUNTERED SOIL MATERIALS.
 - DESCRIPTION, LOCATION, AND DIMENSIONS OF OBSTRUCTIONS.
 - FINAL TOP CENTERLINE LOCATION AND DEVIATIONS FROM REQUIREMENTS.
 - VARIATION OF SHAFT FROM PLUMB.
 - DRILLED SHAFT EXCAVATING METHOD.
 - LEVELNESS OF PIER BOTTOM AND ADEQUACY OF CLEANOUT.
 - GROUND-WATER CONDITIONS AND WATER-INFILTRATION RATE, DEPTH, AND PUMPING.
 - DESCRIPTION, DIAMETER, AND TOP AND BOTTOM ELEVATIONS OF TEMPORARY OR
 - DESCRIPTION OF SOIL OR WATER MOVEMENT, SIDEWALL STABILITY, LOSS OF GROUND, AND MEANS OF CONTROL.
 - DATE AND TIME OF STARTING AND COMPLETING DRILLED PIER EXCAVATION.
 - POSITION OF REINFORCING STEEL.
 - CONCRETE PLACEMENT METHOD, INCLUDING DELAYS.
 - ELEVATION OF CONCRETE DURING REMOVAL OF CASINGS.
 - LOCATIONS OF CONSTRUCTION JOINTS, IF ANY.
 - REMARKS, UNUSUAL CONDITIONS ENCOUNTERED, AND DEVIATIONS FROM REQUIREMENTS.



ALTERNATE 1: STRUCTURAL PIER WITH HP REINFORCEMENT DETAIL AND "PLUG" PIER LAGGING
SCALE: 1"=1'



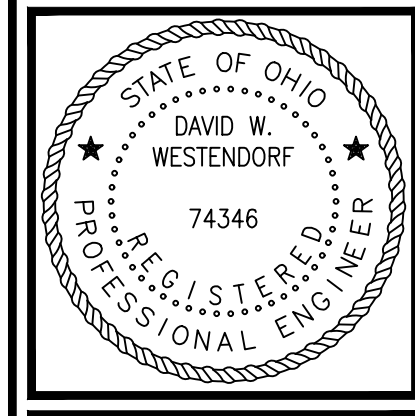
ALTERNATE 2: STRUCTURAL PIER WITH CAGE REINFORCEMENT DETAIL AND "PLUG" PIER LAGGING
SCALE: 1"=1'

REV#	DATE	BY	DESCRIPTION

DETAILS, PIER SCHEDULES, AND CONSTRUCTION NOTES

NORTH LIBERTY-KEUTER DRILLED PIER RETAINING WALL
TURTLE CREEK TOWNSHIP
TURTLE CREEK TOWNSHIP, WARREN COUNTY, OHIO

Terracon
Consulting Engineers and Scientists
611 LUNKEN PARK DRIVE
PH: (513) 321-5816
CINCINNATI, OHIO 45226
FAX: (513) 321-4540



SHEET 2

DESIGNED BY:	ASK
DRAWN BY:	KM
APPVD BY:	DWW
SCALE:	AS SHOWN
DATE:	10/08/2016
JOB NO.:	N1185161
ACAD NO.:	RW.DWG
SHEET NO.:	2

BORING LOG NO. B-1										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
LOCATION See Exploration Plan Latitude: 39.4484° Longitude: -84.1518° Reference Surface Elev: 95 (FL) +/- Approximate Surface Elev: 807 (FL) +/-										
DEPTH (FEET)	ELEVATION (FEET)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (HP)	WATER CONTENT (%)	LL-PL-PI	ATTERBERG LIMITS		
0.0	806.5+/-		ASPHALT (8 INCHES)							
1.0	806.5+/-		FILL - SILTY SAND (ML)	7-16-8 N=24			5			
3.5	803.5+/-		SILT WITH SAND (ML)	4-4-6 N=10			13			
6.0	801+/-		SILT WITH SAND (ML)	4-4-5 N=9			15			
8.5	798.5+/-		LEAN CLAY (CL)	3-4-8 N=12	3.75 (HP)		12			
11.0	796+/-		LEAN CLAY (CL)	4-7-7 N=14	4.0 (HP)		15	28-15-13		
13.5	793.5+/-		LEAN CLAY (CL)	3-3-7 N=10	4.0 (HP)					
16.0	791+/-		LEAN CLAY (CL)	2-3-5 N=8	2.75 (HP)					
				3-3-20 N=23	2.75 (HP)					
				20-27-28 N=55	3.0 (HP)					
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS No water encountered during drilling. Water encountered at 36 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

BORING LOG NO. B-1										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
LOCATION See Exploration Plan Latitude: 39.4484° Longitude: -84.1518° Reference Surface Elev: 95 (FL) +/- Approximate Surface Elev: 807 (FL) +/-										
DEPTH (FEET)	ELEVATION (FEET)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (HP)	WATER CONTENT (%)	LL-PL-PI	ATTERBERG LIMITS		
28.5	778.5+/-		LEAN CLAY (CL)		4-4-12 N=16	2.75 (HP)				
33.5	773.5+/-		LEAN CLAY (CL)							
33.5	773.5+/-		POORLY GRADED SAND WITH GRAVEL (SP)	23-50/3"						
38.5	768.5+/-		SILT (ML)	14-14-18 N=30						
43.5	763.5+/-		POORLY GRADED SAND (SP)	7-9-11 N=20						
45.0	762+/-		Boring Terminated at 45 Feet							
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS Water encountered at 42 ft during drilling. Water encountered at 36 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

BORING LOG NO. B-2										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
LOCATION See Exploration Plan Latitude: 39.4488° Longitude: -84.1517° Reference Surface Elev: 96 (FL) +/- Approximate Surface Elev: 808 (FL) +/-										
DEPTH (FEET)	ELEVATION (FEET)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (HP)	WATER CONTENT (%)	LL-PL-PI	ATTERBERG LIMITS		
0.0	807+/-		ASPHALT (12 INCHES)							
3.5	804.5+/-		FILL - LEAN CLAY WITH SILT (CL)	6-4-5 N=9			8			
6.0	802+/-		LEAN CLAY WITH SILT (CL)	4-3-5 N=8	3.0 (HP)		18			
8.5	799.5+/-		LEAN CLAY WITH SILT (CL)	3-4-4 N=8	3.75 (HP)		15			
11.0	797+/-		LEAN CLAY WITH SILT (CL)	2-5-6 N=11	3.5 (HP)		15			
				2-4-7 N=11	2.5 (HP)			25-14-11		
				3-3-5 N=8	3.0 (HP)					
				4-4-7 N=11	3.5 (HP)					
				3-4-7 N=11	3.0 (HP)			24-15-9		
				13-17-19 N=36	3.0 (HP)					
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS No water encountered during drilling. Water encountered at 27 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

BORING LOG NO. B-2										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
LOCATION See Exploration Plan Latitude: 39.4488° Longitude: -84.1517° Reference Surface Elev: 96 (FL) +/- Approximate Surface Elev: 808 (FL) +/-										
DEPTH (FEET)	ELEVATION (FEET)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (HP)	WATER CONTENT (%)	LL-PL-PI	ATTERBERG LIMITS		
33.5	774.5+/-		LEAN CLAY WITH SILT (CL)							
35.0	773+/-		POORLY GRADED SAND (SP)	7-12-40 N=52						
Boring Terminated at 35 Feet										
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS No water encountered during drilling. Water encountered at 27 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

BORING LOG NO. B-3										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
LOCATION See Exploration Plan Latitude: 39.4488° Longitude: -84.1518° Reference Surface Elev: 101 (FL) +/- Approximate Surface Elev: 813 (FL) +/-										
DEPTH (FEET)	ELEVATION (FEET)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (HP)	WATER CONTENT (%)	LL-PL-PI	ATTERBERG LIMITS		
1.0	812+/-		ASPHALT (12 INCHES)							
3.5	809.5+/-		LEAN CLAY WITH SILT (CL)	2-1-1 N=2	2.5 (HP)		24			
6.0	807+/-		POORLY GRADED SAND WITH CLAY (SP)	1-2-1 N=3			13			
8.5	804.5+/-		POORLY GRADED SAND WITH CLAY (SP)	3-4-6 N=10			13			
				2-5-7 N=12	3.0 (HP)		12	17-14-3		
				10-9-9 N=17	2.75 (HP)					
				4-5-8 N=13	3.5 (HP)					
				6-5-9 N=14	3.5 (HP)			24-13-11		
				3-5-8 N=13	3.5 (HP)					
				4-5-9 N=14	3.5 (HP)					
				3-6-7 N=13	3.5 (HP)					
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS No water encountered during drilling. Water encountered at 27 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

BORING LOG NO. B-3										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
LOCATION See Exploration Plan Latitude: 39.4488° Longitude: -84.1518° Reference Surface Elev: 101 (FL) +/- Approximate Surface Elev: 813 (FL) +/-										
DEPTH (FEET)	ELEVATION (FEET)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (HP)	WATER CONTENT (%)	LL-PL-PI	ATTERBERG LIMITS		
33.5	778.5+/-		POORLY GRADED SAND (SPSM)							
38.5	774.5+/-		POORLY GRADED SAND (SP)							
40.0	773+/-		Boring Terminated at 40 Feet							
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS No water encountered during drilling. Water encountered at 27 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

BORING LOG NO. B-3										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
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DEPTH (FEET)	ELEVATION (FEET)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (HP)	WATER CONTENT (%)	LL-PL-PI	ATTERBERG LIMITS		
4-4-5	809.5+/-		LEAN CLAY WITH SILT (CL)	4-4-5 N=9	3.5 (HP)					
4-9-12	807+/-		LEAN CLAY WITH SILT (CL)	4-9-12 N=20	3.5 (HP)					
9-30-50	798.5+/-		POORLY GRADED SAND (SPSM)	9-30-50 N=80						
25-37-21	774.5+/-		POORLY GRADED SAND (SP)	25-37-21 N=38						
Boring Terminated at 40 Feet										
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS No water encountered during drilling. Water encountered at 27 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

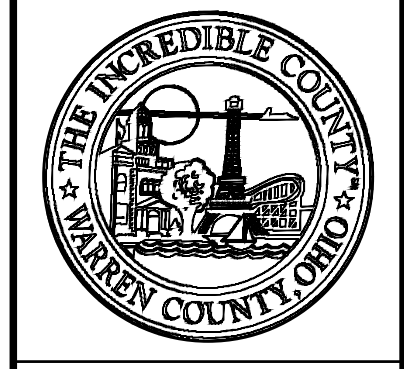
BORING LOG NO. B-3										
PROJECT: N. Liberty-Keuter Rd Landslide			CLIENT: Turtlecreek Township Lebanon, OH							
SITE: 1323 N. Liberty Keuter Rd. Turtlecreek Township, OH										
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3.5	809.5+/-		LEAN CLAY WITH SILT (CL)	2-1-1 N=2	2.5 (HP)		24			
6.0	807+/-		POORLY GRADED SAND WITH CLAY (SP)	1-2-1 N=3			13			
8.5	804.5+/-		POORLY GRADED SAND WITH CLAY (SP)	3-4-6 N=10			13			
				2-5-7 N=12	3.0 (HP)		12	17-14-3		
				10-9-9 N=17	2.75 (HP)					
				4-5-8 N=13	3.5 (HP)					
				6-5-9 N=14	3.5 (HP)			24-13-11		
				3-5-8 N=13	3.5 (HP)					
				4-5-9 N=14	3.5 (HP)					
				3-6-7 N=13	3.5 (HP)					
Stratification lines are approximate. In-situ, the transition may be gradual.										
Hammer Type: Automatic										
Advancement Method: Hollow Stem Auger			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).			Notes:				
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.			Boring Started: 05-31-2018 Boring Completed: 05-31-2018				
WATER LEVEL OBSERVATIONS No water encountered during drilling. Water encountered at 27 feet upon completion.			Terracon 611 Lunken Park Dr Cincinnati, OH			Drill Rig: Truck-mounted Driller: KMHM Project No.: N1185161				

BORING LOG SHEETS
 NORTH LIBERTY-KEUTER DRILLED PIER RETAINING WALL
 TURTLE CREEK TOWNSHIP
 TURTLE CREEK TOWNSHIP, WARREN COUNTY, OHIO

Terracon
 Consulting Engineers and Scientists
 611 LUNKEN PARK DRIVE
 PH. (513) 321-5816
 CINCINNATI, OHIO 45226
 FAX: (513) 321-4540

SHEET 3
 DESIGNED BY: ASK
 DRAWN BY: KM
 APPVD BY: DW
 SCALE: AS SHOWN
 DATE: 10/08/2018
 JOB NO: N1185161
 ACAD NO: RW.DWG
 SHEET NO: 3

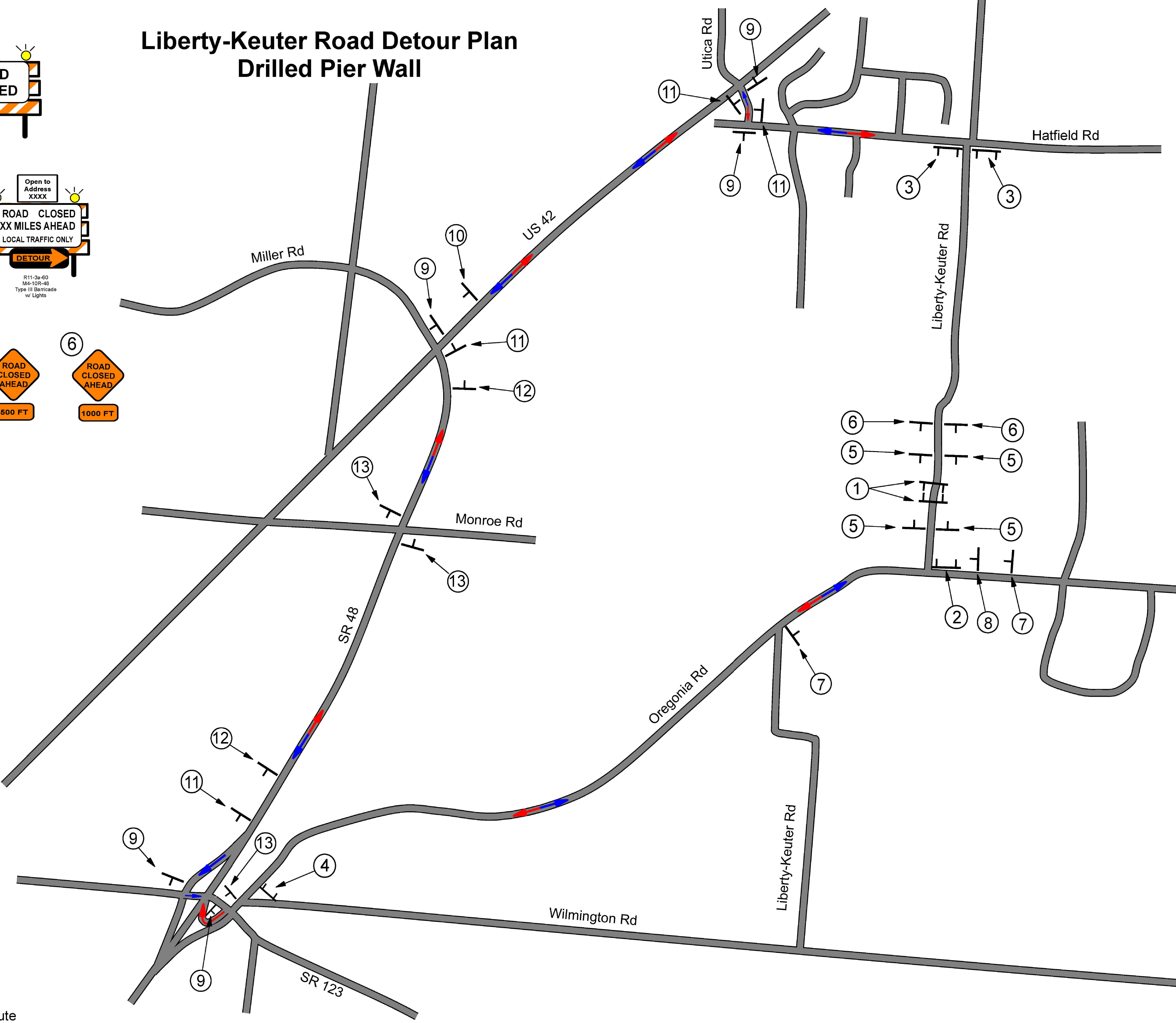
Liberty-Keuter Road Detour Plan Drilled Pier Wall



Warren County Engineer's Office

Ned F. Junison, P.E., P.S.
Warren County Engineer
210 W Main Street
Lebanon, Ohio 45036
513 695 3301 Phone
513 695 7714 Fax

- 1** ROAD CLOSED Type III Barricade w/ Lights
- 2** ROAD CLOSED XX MILES AHEAD LOCAL TRAFFIC ONLY DETOUR
- 3** ROAD CLOSED XX MILES AHEAD LOCAL TRAFFIC ONLY DETOUR
- 4** NORTHBOUND LIBERTY-KEUTER RD CLOSED AHEAD
- 5** ROAD CLOSED AHEAD 500 FT
- 6** ROAD CLOSED AHEAD 1000 FT
- 7** ROAD CLOSED AHEAD Liberty-Keuter Rd
- 8** DETOUR AHEAD Liberty-Keuter Rd
- 9** DETOUR Liberty-Keuter Rd
- 10** DETOUR Liberty-Keuter Rd
- 11** DETOUR Liberty-Keuter Rd
- 12** DETOUR Liberty-Keuter Rd
- 13** DETOUR Liberty-Keuter Rd



Southbound Detour Route
 Northbound Detour Route

DETOUR SHEET
 LIBERTY KEUTER ROAD
 DRILLED PIER WALL PROJECT
 TURTLE CREEK TOWNSHIP

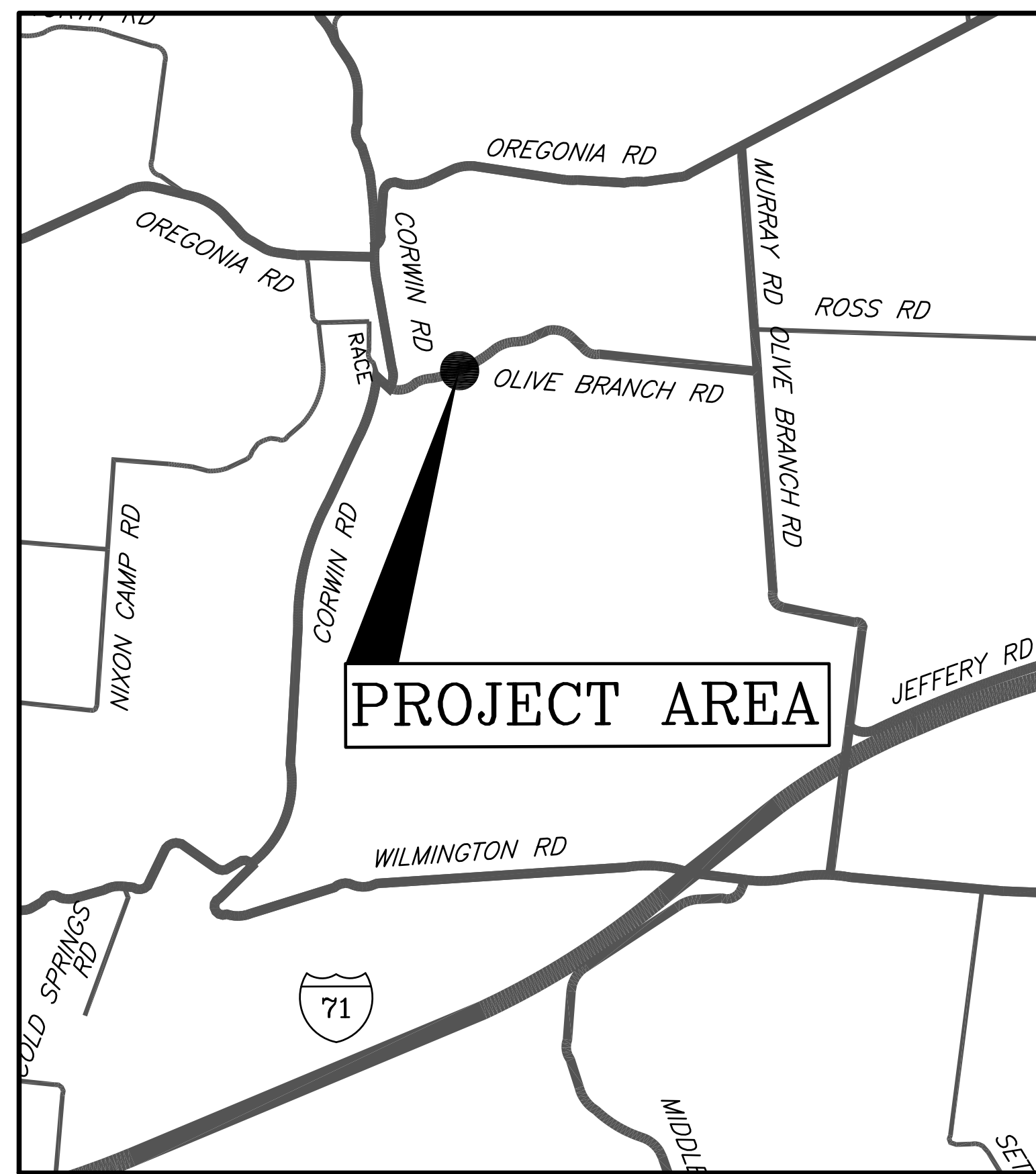
NO.	DATE	DESCRIPTION

SCALE	DATE
NONE	01/27/23
DRAWN BY	CHECKED BY
JSL	DWB
PROJECT NO.	FILE
18-95-2023	Per Wall - 2023
DRAWING NO.	

1 \ Warren \ Projects \ Per Wall \ 18-95 - 2023 \ Sheet 4a

DRILLED PIER WALL PROJECT OLIVE BRANCH ROAD

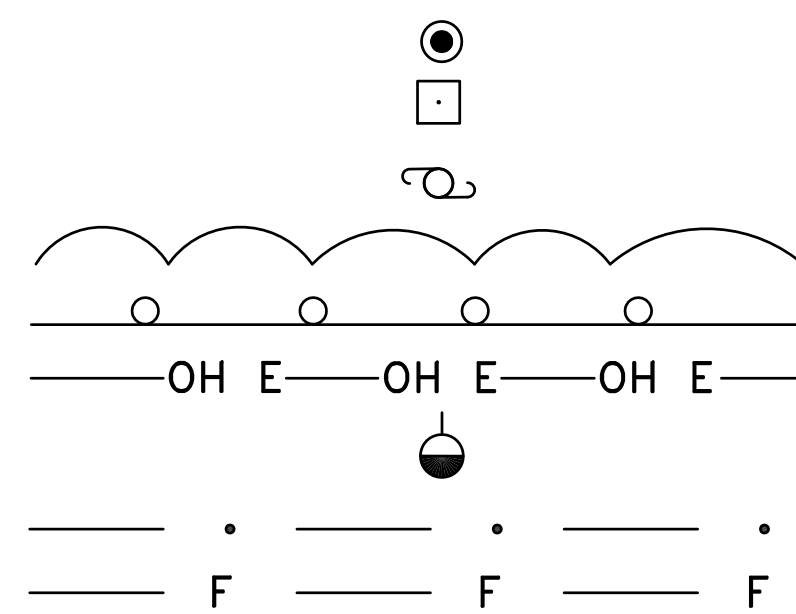
WASHINGTON TOWNSHIP
WARREN COUNTY, OHIO



VICINITY MAP
NOT TO SCALE

CONVENTIONAL SIGNS

- PK NAIL (SET)
- HUB & TACK (SET)
- EX. POLE
- EX. TREELINE
- EX. & PROP. GUARDRAIL
- EX. AERIAL ELECTRIC
- EX. GUY WIRE
- EX. FLOW LINE
- EX. FIBER LINE



SHEET NUMBER

- TITLE SHEET
- PIER WALL PLAN SHEET
- DETOUR SHEET

1
2-4
5

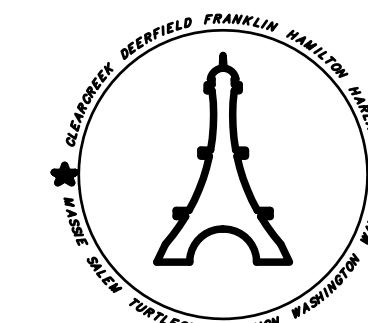
UNDERGROUND UTILITIES
2 WORKING DAYS
BEFORE YOU DIG
CALL TOLL FREE 800-362-2764
OHIO UTILITIES PROTECTION SERVICE
NON-MEMBERS MUST BE
CALLED DIRECTLY

APPROVED: _____
DATE: _____ WARREN COUNTY ENGINEER

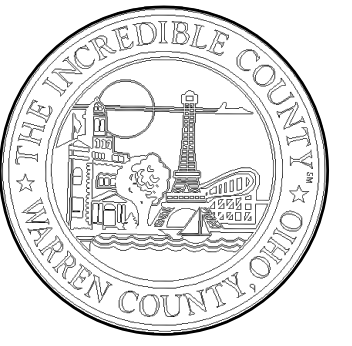
APPROVED: _____
DATE: _____ WARREN COUNTY COMMISSIONER

APPROVED: _____
DATE: _____ WARREN COUNTY COMMISSIONER

APPROVED: _____
DATE: _____ WARREN COUNTY COMMISSIONER



PLANS PREPARED BY:
THE WARREN COUNTY ENGINEERING DEPARTMENT
210 W. MAIN STREET
LEBANON, OHIO 45036



**Warren
County
Engineer's
Office**

Neil S. Fuison, P.E., P.S.
Warren County Engineer
210 W. Main Street
Lebanon, Ohio 45036
513 695 3301 Phone
513 695 7714 Fax

TITLE SHEET
OLIVE BRANCH ROAD
DRILLED PIER WALL PROJECT
WASHINGTON TOWNSHIP

NO.	DATE	BY	DESCRIPTION

SCALE: _____ DATE: 01/21/25

DRAWN BY: J.S. CHECKED BY: DMB

PROJECT NO.: 01-21-2025 FILE: 01-21-2025
Per Wall

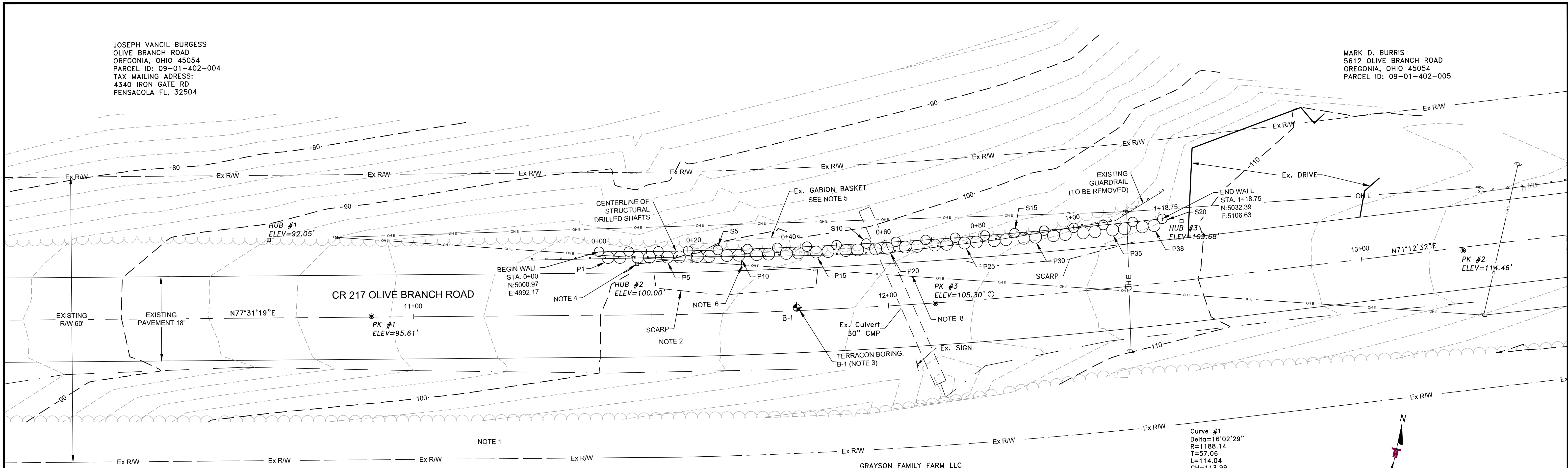
DRAWING NO. _____

1/20/2025 PROJECT: Per Wall 01-21-2025

SHEET 1 OF 5

JOSEPH VANCIL BURGESS
 OLIVE BRANCH ROAD
 OREGONIA, OHIO 45054
 PARCEL ID: 09-01-402-004
 TAX MAILING ADDRESS:
 4340 IRON GATE RD
 PENSACOLA FL, 32504

MARK D. BURRIS
 5512 OLIVE BRANCH ROAD
 OREGONIA, OHIO 45054
 PARCEL ID: 09-01-402-005



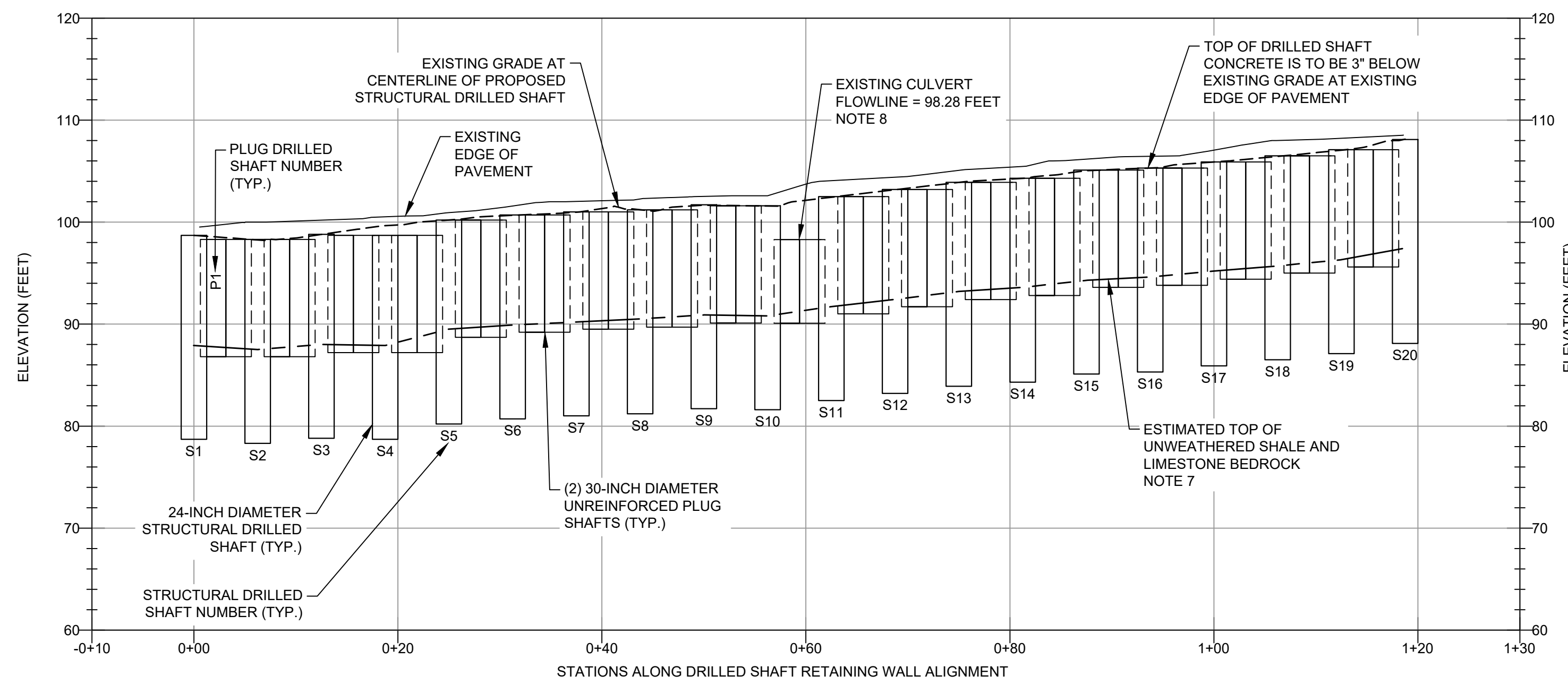
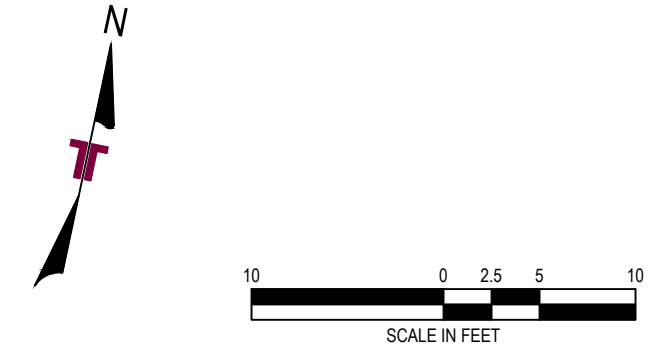
PLAN NOTES:

1. BASE MAP OBTAINED FROM CHAD HARVILLE (WARREN COUNTY ENGINEER'S OFFICE) ON JULY 22, 2020. ACTUAL ELEVATIONS AND FEATURES SHOULD BE CONFIRMED IN THE FIELD PRIOR TO CONSTRUCTION.
2. HEAD SCARP LIMITS BASED ON OBSERVATIONS MADE BY TERRACON ON FEBRUARY 28, 2020. HEAD SCARP LOCATION MAY HAVE CHANGED AND SHOULD BE CONFIRMED PRIOR TO CONSTRUCTION. IF HEAD SCARP AT THE TIME OF CONSTRUCTION IS BEYOND DRILLED SHAFT WALL LIMITS, TERRACON SHOULD BE IMMEDIATELY NOTIFIED.
3. AN ADDITIONAL BORING B-2 WAS ALSO PLANNED ON OLIVE-BRANCH ROAD BUT WAS NOT COMPLETED DUE TO INSUFFICIENT CLEARANCE FROM OVERHEAD UTILITIES. INSTEAD, MULTICHANNEL ANALYSIS OF SURFACE WAVES (MASW) GEOPHYSICAL TESTING WAS PERFORMED ALONG OLIVE-BRANCH ROAD WITHIN THE SLIDE LIMITS TO OBTAIN THE TOP OF BEDROCK PROFILE (SEE SHEET 3).
4. ELEVATIONS ARE RELATIVE TO A PROJECT BENCHMARK. HUB #2 IS TEMPORARY PROJECT BENCHMARK, ELEVATION = 100.00 FEET.
5. REMOVE EXISTING GABIONS PRIOR TO INSTALLING DRILLED SHAFTS.
6. DRILLED SHAFT WALL TO BE INSTALLED SUCH THAT BACK OF STRUCTURAL SHAFTS ARE SPACED A MINIMUM DISTANCE OF 3 1/2 FEET FROM EDGE OF PAVEMENT.
7. APPROXIMATE TOP OF UNWEATHERED (GRAY) SHALE AND LIMESTONE BEDROCK SURFACE IS ANTICIPATED TO BE ABOUT 11 FEET BELOW EXISTING SITE GRADES BASED ON BORING B-1 AND MASW TESTING. TOP OF COMPETENT BEDROCK SURFACE ELEVATIONS MAY VARY AND WILL NEED TO BE VERIFIED IN THE FIELD.
8. THE TOP OF PLUG SHAFTS P19 AND P20 WILL EXTEND UP TO THE FLOWLINE OF THE 30-INCH CONDUIT. BASED ON INFORMATION PROVIDED BY WARREN COUNTY THE CONDUIT FLOWLINE IN THE LOCATION OF THE DRILLED SHAFT WALL IS AT A PROJECT ELEVATION OF APPROXIMATELY 98.28 FEET. THE CONTRACTOR IS TO REMOVE THE ENTIRE CMP CONDUIT AT THE TIME OF WALL INSTALLATION. ONCE THE PLUG SHAFTS HAVE BEEN INSTALLED, THE NEW CONDUIT WILL BE PLACED, AND A CONCRETE COLLAR SHALL BE POURED AROUND THE CONDUIT AT THE LOCATION OF THE DRILLED SHAFT WALL.

PLAN VIEW
 SCALE: 1"=10'

GRAYSON FAMILY FARM LLC
 OLIVE BRANCH ROAD
 OREGONIA, OHIO 45054
 PARCEL ID: 09-01-476-002
 TAX MAILING ADDRESS:
 5304 CANYON RIDGE DR.
 LIBERTY TOWNSHIP OH, 45011

Curve #1
 Delta=16°02'29"
 R=1188.14
 T=57.06
 L=114.04
 CH=113.99
 CH Bearing=N73°37'31"E

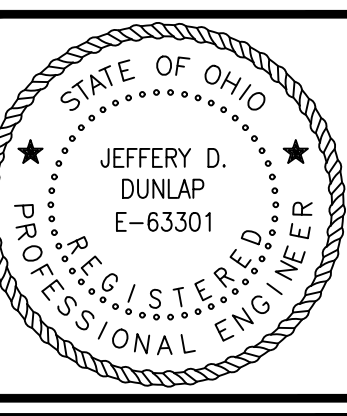


ELEVATION VIEW
 SCALE: 1"=10' H&V

REV. DATE BY DESCRIPTION

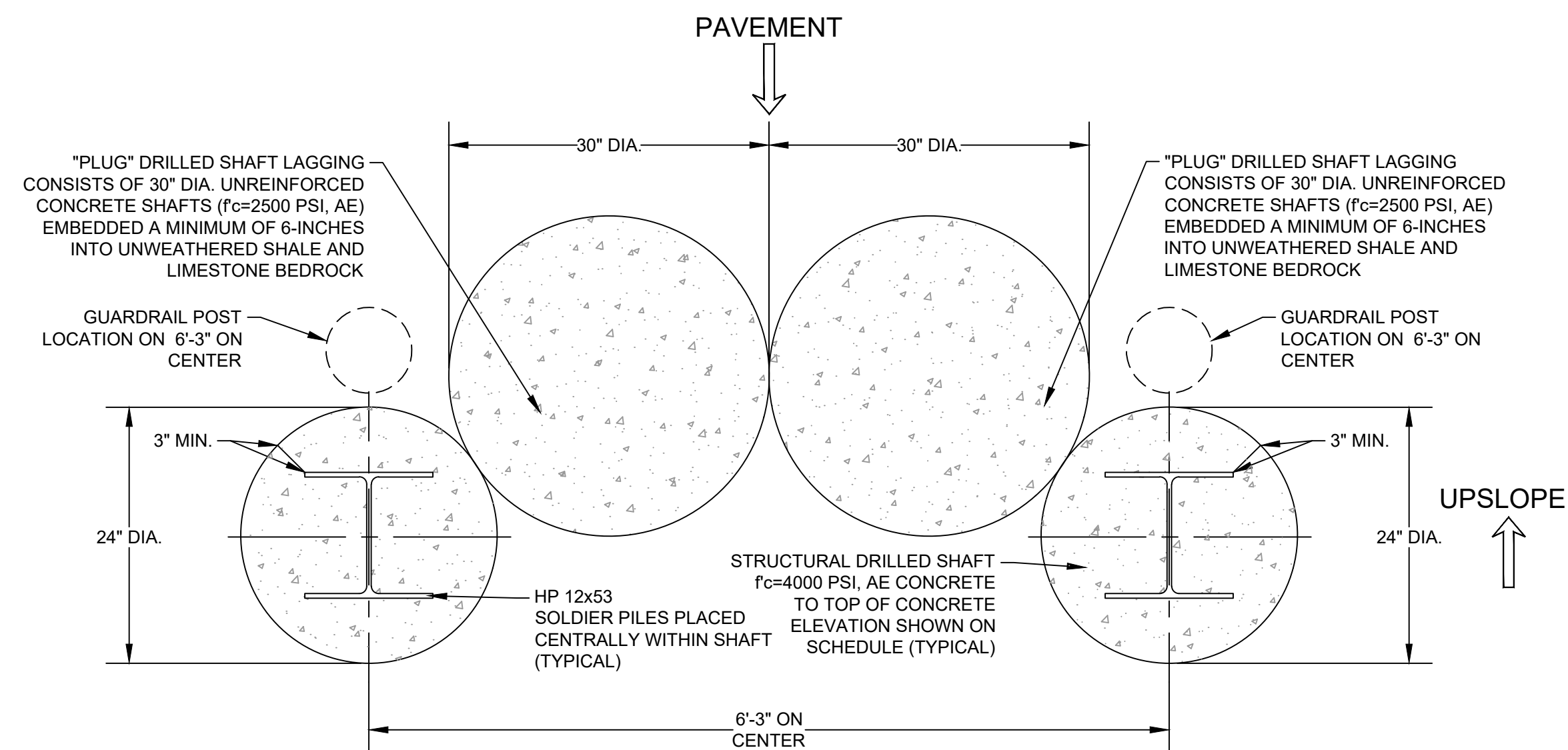
PLAN AND ELEVATION VIEW
 OLIVE BRANCH ROAD (CR 217) LANDSLIDE REMEDIATION
 WARREN COUNTY ENGINEER'S OFFICE
 WARREN COUNTY, OHIO

Terracon
 Consulting Engineers and Scientists
 611 LUNKENPARK DRIVE
 CINCINNATI, OHIO 45226
 PH: (513) 321-5816
 FAX: (513) 321-4540

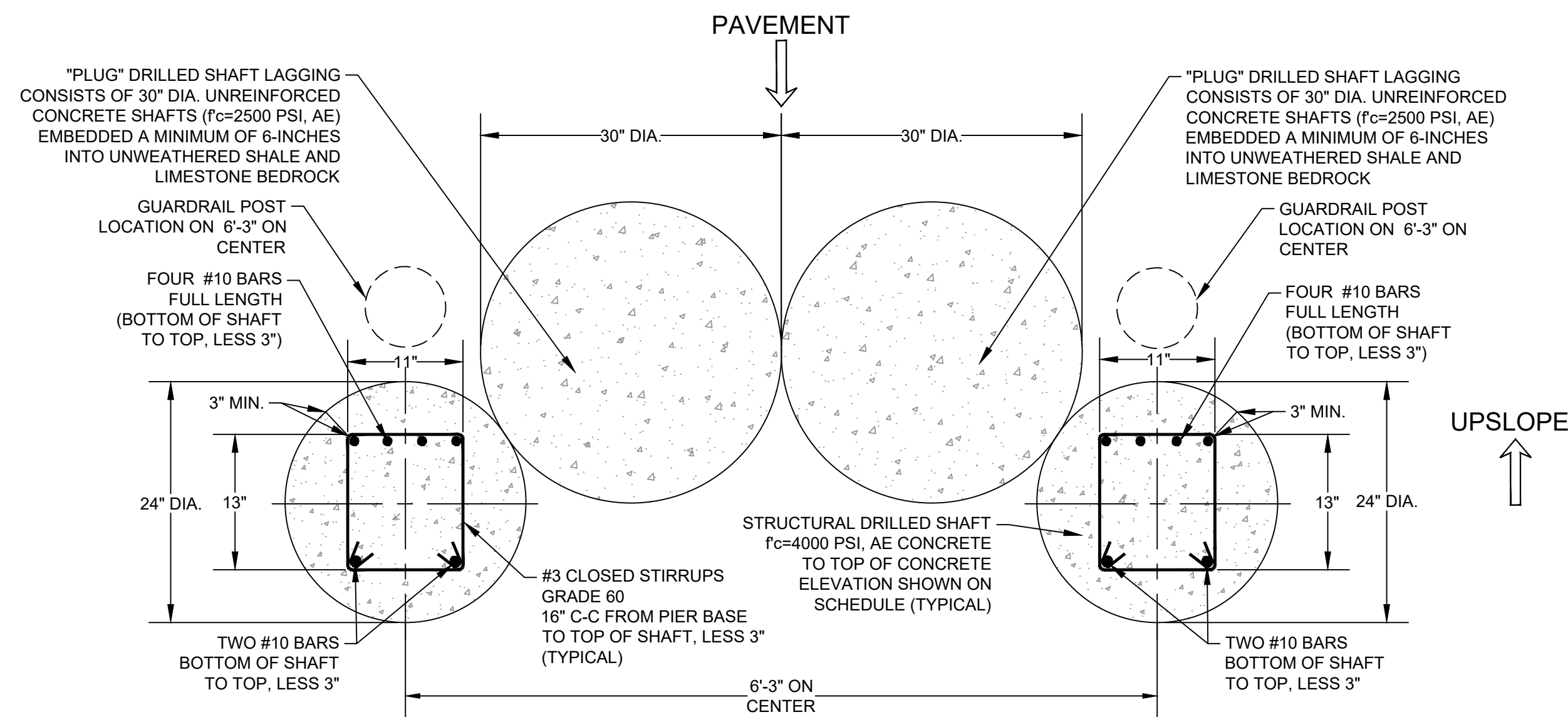


SHEET 2
 DESIGNED BY: ASK/DWW
 DRAWN BY: KM
 APPVD BY: JDD
 SCALE: AS SHOWN
 DATE: 07/29/2020
 JOB NO.: N1205222
 ACAD NO.: WC RW.DWG
 SHEET NO.: 2

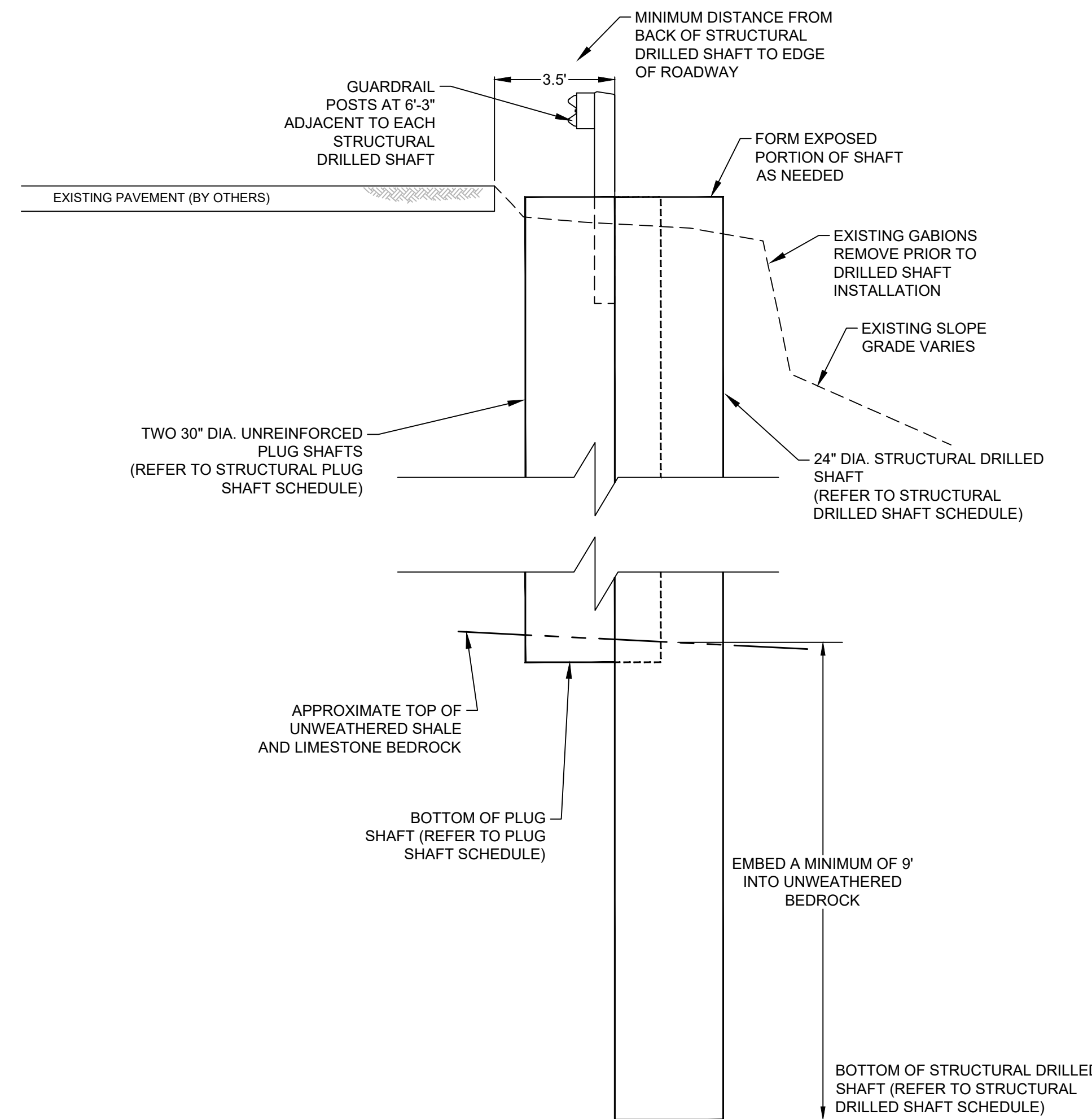
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(ALTERNATE 1):
STRUCTURAL DRILLED SHAFT WITH HP 12x53 REINFORCEMENT DETAIL AND "PLUG" SHAFT LAGGING
SCALE: 1"=1'



(ALTERNATE 2):
STRUCTURAL DRILLED SHAFT WITH STEEL CAGE REINFORCEMENT DETAIL AND "PLUG" SHAFT LAGGING
SCALE: 1"=1'



DRILLED SHAFT RETAINING WALL SECTION (TYPICAL)
SCALE: NOT TO SCALE

DRILLED SHAFT CONSTRUCTION NOTES

DRILLED SHAFT INSTALLATION

- CONSTRUCT THE RETAINING WALL CONSISTING OF 24-INCH DIAMETER DRILLED STRUCTURAL SHAFTS WITH PLUG SHAFT LAGGING USING ROLLED STEEL SECTIONS OR STEEL CAGE REINFORCEMENT AS SHOWN AND DESCRIBED ON PLANS. THIS PURPOSE OF THIS WORK IS TO STOP LATERAL CREEP-TYPE MOVEMENT ON THE DOWNSLOPE (NORTH) SIDE OF OLIVE BRANCH ROAD. CONTRACTOR IS RESPONSIBLE FOR CLEARING OVERHEAD AND UNDERGROUND UTILITIES AND PROVIDING ACCESS FOR EQUIPMENT. THE SHAFT EXCAVATION SHALL BE UNCLASSIFIED.
- THE REINFORCED DRILLED SHAFT RETAINING WALL WILL CONSIST OF DRILLED SHAFTS SPACED APPROXIMATELY ON 6 FEET -3 INCHES (6'-3") ON CENTER, AS SHOWN ON THE SITE PLAN DRAWING. ESTIMATED EMBEDMENT DEPTHS INTO INTERBEDDED SHALE AND LIMESTONE BEDROCK ARE SHOWN ON THE DRILLED SHAFT SCHEDULE TABLE ON THIS SHEET; HOWEVER, ACTUAL EMBEDMENT DEPTHS WILL BE BASED ON ACTUAL FIELD CONDITIONS AS DETERMINED BY THE GEOTECHNICAL CONSULTANT.
- THE SHAFTS SHALL BE LOCATED AS SHOWN ON PLAN WITHIN 6" OF PLAN LOCATION. THE SHAFTS SHALL MAINTAIN A PLUMBNESS DEVIATION OF A MAXIMUM OF 1" IN 12 FT. VERTICAL HEIGHT. A MINIMUM 3' CONCRETE COVER BETWEEN THE REINFORCING STEEL AND THE EXTERIOR (SIDES AND TOP) OF THE DRILLED SHAFT SHALL BE PROVIDED.
- TWO ALTERNATIVES FOR REINFORCEMENT OF STRUCTURAL SHAFTS HAVE BEEN PROVIDED. REINFORCEMENT FOR THE STRUCTURAL SHAFTS SHALL CONSIST OF EITHER ROLLED STEEL SECTIONS HAVING YIELD STRENGTH OF 50 KSI OR CAGE REINFORCING STEEL HAVING A YIELD STRENGTH OF 60 KSI. ROLLED STEEL SECTIONS (ALTERNATIVE 1) SHOULD CONSIST OF HP 12X53, AS NOTED ON THE PLANS. THE CONFIGURATION OF THE STEEL REINFORCING CAGE (ALTERNATIVE 2) HAS BEEN SHOWN ON THE PLANS.
- THE PRE-DRILLED SHAFT WILL BE BACKFILLED WITH CONCRETE TO THE TOP OF CONCRETE ELEVATION. THE TOP OF SHAFT CONCRETE ELEVATION SHALL BE ABOUT 3 INCHES BELOW THE APPROXIMATE EXISTING GRADE AT THE CENTERLINE OF THE PROPOSED DRILLED SHAFTS, TO AVOID CONTACT BY SNOW PLOWS. STRUCTURE SHAFT CONCRETE SHALL BE CONCRETE (28-DAY $f_c = 4000$ PSI, MAXIMUM SLUMP = 6 INCHES; 4% TO 6% AIR ENTRAINMENT) PLACED USING FREE FALL METHOD OF PLACEMENT. CONCRETE SHALL BE PLACED INTO EACH SHAFT EXCAVATION ON THE SAME DAY THAT THE DRILLING IS COMPLETED. SEE ITEM 9 BELOW.
- TEMPORARY STEEL CASING SHOULD BE ON-SITE AND USED WHEREVER REQUIRED TO STABILIZE LOOSE OR CAVING MATERIALS, OR TO SEAL OFF WATER BEARING ZONES ENCOUNTERED DURING CONSTRUCTION.
- THE WALL DESIGN IS BASED ON MAXIMUM DEPTH TO UNWEATHERED (GRAY) INTERBEDDED SHALE AND LIMESTONE BEDROCK ABOUT 11 FEET BELOW GRADE AS NOTED IN THE DRILLED SHAFT SCHEDULE. HOWEVER, IF BEDROCK IS ENCOUNTERED MORE THAN 1.0 FT. BELOW PLAN DESIGN ELEVATION, TERRACON SHALL BE NOTIFIED IMMEDIATELY TO REVIEW AND PROVIDE ADDITIONAL RECOMMENDATIONS. EACH SHAFT SHALL BE SOCKETED INTO BEDROCK A MINIMUM OF 9 FEET, AS DESCRIBED ON THE PLANS.
- THE CONTRACTOR SHALL MAINTAIN A RECORD OF EACH SHAFT DRILLED, WHICH WILL INCLUDE AT A MINIMUM: SHAFT NUMBER; GROUND ELEVATION; SHAFT TOP ELEVATION; TOP OF UNWEATHERED (GRAY) BEDROCK ELEVATIONS; AS-BUILT ROCK SOCKET DEPTH; ELEVATION OF THE TOP OF THE SHAFT CONCRETE; DATE DRILLED; DATE COMPLETED; AND WEATHER CONDITIONS.
- IT IS ANTICIPATED THAT WATER MAY ENTER SOME OF THE SHAFT EXCAVATIONS. THE DEPTH OF PONDED WATER AT THE BOTTOM OF THE SHAFT EXCAVATIONS SHOULD NOT EXCEED 2 INCHES, PRIOR TO PLACING CONCRETE. IF THE WATER CANNOT BE PUMPED DOWN, TREMIE PLACEMENT METHODS WILL BE REQUIRED.
- THE DRILLED SHAFT EXCAVATIONS SHOULD BE INSPECTED BY A QUALIFIED GEOTECHNICAL REPRESENTATIVE TO CONFIRM THAT THE DRILLED SHAFTS ARE SOCKETED INTO BEDROCK ACCORDING TO DESIGN, AND THAT THE DRILLED SHAFTS HAVE BEEN CONSTRUCTED PER SPECIFICATIONS.
- SHAFT SPOILS SHALL BE TRUCKED FROM THE SITE (NOT WASTED ON THE HILLSIDE). NO FILL PLACEMENT SHOULD BE ALLOWED DOWNSLOPE OF THE SLOPE FACE.

PLUG SHAFT INSTALLATION

- TWO 30-INCH DIAMETER PLUG SHAFTS CONSISTING OF UNREINFORCED CONCRETE (28-DAY $f_c = 2500$ PSI, MAXIMUM SLUMP = 6 INCHES; 4% TO 6% AIR ENTRAINMENT) AS NOTED ON THE CROSS-SECTION DETAILS WILL ACT AS LAGGING FOR THE SHAFT WALL.
- PLUG SHAFT INSTALLATION FOR THE DRILLED SHAFT RETAINING WALL SHALL BEGIN AFTER THE STRUCTURAL SHAFT ELEMENTS HAVE GAINED STRENGTH (AT LEAST 24 HOURS AFTER PLACEMENT OF STRUCTURAL SHAFT CONCRETE).
- THE TOP OF THE PLUG SHAFT CONCRETE SHALL BE ABOUT 3 INCHES BELOW THE PAVEMENT.
- THE BOTTOM OF ALL THE PLUG SHAFTS INSTALLED SHOULD EXTEND TO THE ELEVATIONS DETAILED IN THE DRILLED SHAFT SCHEDULE (A MINIMUM OF 6 INCHES BELOW TOP OF UNWEATHERED BEDROCK).
- PLUG SHAFT SPOILS SHALL BE TRUCKED FROM THE SITE (NOT WASTED ON THE HILLSIDE).

DRAINAGE AND OTHER CONSTRUCTION CONSIDERATIONS

- NEW STRUCTURAL FILL MAY BE PLACED ON UPSLOPE SIDE OF SHAFTS TO RETAIN GRADE NEXT TO THE EDGE OF PAVEMENT. SONOTUBES OR EQUIVALENT WILL BE REQUIRED IN SOME AREAS, DUE TO THE STEEPLY SLOPING HILLSIDE BELOW THE WALL. FILL SHOULD BE PLACED AND COMPACTED PER ODOT SPECIFICATIONS (ITEM 203). ONLY HAND-OPERATED EQUIPMENT SHOULD BE USED WITHIN 5 FEET OF THE FRONT OF THE SHAFTS.

FIELD QUALITY CONTROL

A. OWNER WILL COORDINATE FIELD CONSTRUCTION INSPECTION AND REPORTING THROUGH IN-HOUSE PERSONNEL OR EXTERNAL TESTING AGENCY.
DOCUMENTATION SHALL INCLUDE THE FOLLOWING AT EACH DRILLED SHAFT:

- GROUND ELEVATION
- AS-BUILT SHAFT DIAMETER AND TOP AND BOTTOM SHAFT ELEVATIONS.
- TOP OF WEATHERED (IF ANY) AND UNWEATHERED (GRAY) BEDROCK ELEVATION.
- DESCRIPTION OF ENCOUNTERED SOIL MATERIALS.
- DESCRIPTION, LOCATION, AND DIMENSIONS OF OBSTRUCTIONS.
- FINAL TOP CENTERLINE LOCATION AND DEVIATIONS FROM REQUIREMENTS.
- VARIATION OF SHAFT FROM PLUMB.
- DRILLED SHAFT EXCAVATING METHOD.
- LENGTH OF ROCK SOCKET.
- LEVELNESS OF SHAFT BOTTOM AND ADEQUACY OF CLEANOUT.
- GROUND-WATER CONDITIONS AND WATER-INFILTRATION RATE, DEPTH, AND PUMPING.
- DESCRIPTION, DIAMETER, AND TOP AND BOTTOM ELEVATIONS OF TEMPORARY OR PERMANENT CASINGS.
- DESCRIPTION OF SOIL OR WATER MOVEMENT, SIDEWALL STABILITY, LOSS OF GROUND, AND MEANS OF CONTROL.
- DATE AND TIME OF STARTING AND COMPLETING DRILLED SHAFT EXCAVATION.
- POSITION OF REINFORCING STEEL.
- CONCRETE PLACEMENT METHOD, INCLUDING DELAYS.
- ELEVATION OF CONCRETE DURING REMOVAL OF CASINGS.
- LOCATIONS OF CONSTRUCTION JOINTS, IF ANY.
- REMARKS, UNUSUAL CONDITIONS ENCOUNTERED, AND DEVIATIONS FROM REQUIREMENTS.

STRUCTURAL SHAFT SCHEDULE						
Shaft No.	Diameter		Approx. Top of Shaft Concrete Elevation ⁽¹⁾	Approx. Top of Unweathered Bedrock Elevation ⁽²⁾	Approximate Drilled Shaft Bottom Elevation	Design Drilled Shaft Length ⁽³⁾
	Inches	Feet				
S1	24	0+00	98.7	87.9	78.7	20
S2	24	0+06.25	98.3	87.5	78.3	20
S3	24	0+12.5	98.8	88.0	78.8	20
S4	24	0+18.75	98.7	87.9	78.7	20
S5	24	0+25	100.2	89.5	80.2	20
S6	24	0+31.25	100.7	89.9	80.7	20
S7	24	0+37.5	101.0	90.2	81.0	20
S8	24	0+43.75	101.2	90.5	81.2	20
S9	24	0+50	101.7	90.9	81.7	20
S10	24	0+56.25	101.6	90.8	81.6	20
S11	24	0+62.5	102.5	91.7	82.5	20
S12	24	0+68.75	103.2	92.4	83.2	20
S13	24	0+75	103.9	93.2	83.9	20
S14	24	0+81.25	104.3	93.6	84.3	20
S15	24	0+87.5	105.1	94.3	85.1	20
S16	24	0+93.75	105.3	94.6	85.3	20
S17	24	1+00	105.9	95.2	85.9	20
S18	24	1+6.25	106.5	95.7	86.5	20
S19	24	1+12.5	107.1	96.3	87.1	20
S20	24	1+18.75	108.1	97.4	88.1	20

1) TOP OF SHAFT CONCRETE ELEVATION IS 3" BELOW THE APPROXIMATE GRADES AT THE EDGE OF PAVEMENT.
2) THE DESIGN HAS BEEN BASED ON A MAXIMUM DEPTH TO COMPETENT UNWEATHERED (GRAY) SHALE AND LIMESTONE BEDROCK OF 11- FEET BELOW EXISTING SITE GRADES. IF COMPETENT BEDROCK IS ENCOUNTERED AT A GREATER DEPTH DURING CONSTRUCTION, PLEASE NOTIFY TERRACON FOR FURTHER EVALUATION.
3) ACTUAL DRILLED SHAFT LENGTH CAN BE ALTERED IN FIELD BY CONTRACTOR, PROVIDED THE MINIMUM SOCKET LENGTH OF 9- FEET INTO UNWEATHERED BEDROCK IS ACHIEVED AND CONFIRMED BY GEOTECHNICAL PERSONNEL IN THE FIELD.

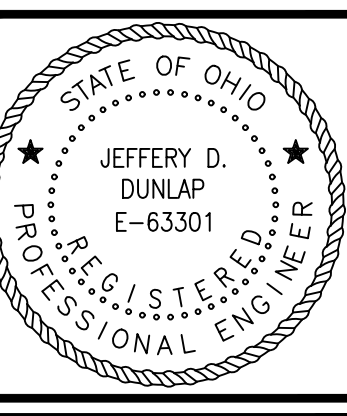
PLUG SHAFT SCHEDULE					
Plug Shaft No's.	Diameter	Approx. Top of Shaft Concrete Elevation ⁽¹⁾	Approximate Drilled Shaft Bottom Elevation	Approximate Drilled Shaft Length ⁽²⁾	
					inches
P1	P2	30	98.3	86.8	11.5
P3	P4	30	98.3	86.8	11.5
P5	P6	30	98.7	87.2	11.5
P7	P8	30	98.7	87.2	11.5
P9	P10	30	100.2	88.7	11.5
P11	P12	30	100.7	89.2	11.5
P13	P14	30	101.0	89.5	11.5
P15	P16	30	101.2	89.7	11.5
P17	P18	30	101.6	90.1	11.5
P19	P20	30	98.28	90.1	8.2
P21	P22	30	102.5	91.0	11.5
P23	P24	30	103.2	91.7	11.5
P25	P26	30	103.9	92.4	11.5
P27	P28	30	104.3	92.8	11.5
P29	P30	30	105.1	93.6	11.5
P31	P32	30	105.3	93.8	11.5
P33	P34	30	105.9	94.4	11.5
P35	P36	30	106.5	95.0	11.5
P37	P38	30	107.1	95.6	11.5

1) TOP OF PLUG SHAFT CONCRETE ELEVATION IS 3" BELOW THE APPROXIMATE GRADES AT THE EDGE OF PAVEMENT.
2) ACTUAL PLUG SHAFT LENGTH TO BE DETERMINED BY CONDITIONS ENCOUNTERED IN FIELD. PLUG SHAFTS SHOULD EXTEND A MINIMUM OF 6" INTO TOP OF UNWEATHERED (GRAY) BEDROCK.

REV.	DATE	BY	DESCRIPTION

DETAILS, SCHEDULES AND CONSTRUCTION NOTES
OLIVE BRANCH ROAD (CR 217) LANDSLIDE REMEDIATION
WARREN COUNTY ENGINEER'S OFFICE
WARREN COUNTY, OHIO

Terracon
Consulting Engineers and Scientists
CINCINNATI, OHIO 45226
PH: (513) 321-4540
FAX: (513) 321-5816
611 LUNKENPARK DRIVE
PH: (513) 321-5816



SHEET 3
DESIGNED BY: ASK/DWW
DRAWN BY: KM
APPVD BY: JDD
SCALE: AS SHOWN
DATE: 07/29/2020
JOB NO: N1205222
ACAD NO: WC RW.DWG
SHEET NO: 3

Date: 7/2/2020 10:30 AM File Path: \\DRAWINGS\1205222\WC RW.DWG

BORING LOG NO. B-1 Page 1 of 1

PROJECT: Warren County Landslide Exploration **CLIENT:** Warren County OH
Lebanon, OH

SITE: Various Locations in Warren County
Warren County, OH

LOCATION: See Exploration Plan
Latitude: 39.450303° Longitude: -84.092989°

DEPTH (ft)	DEPTH (ft) ELEVATION (ft)	SOIL TYPE	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD (%)	LABORATORY TESTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	SHRINKAGE (%)	WATER WEIGHT (%)	ATTERBERG LIMITS
0	754	ASPHALT, 14 inches										
1.1	754	FILL - SAND WITH CLAY AND GRAVEL, with asphalt and limestone fragments, brown		33	9-9-5 N=14							
3.0	752	LEAN CLAY, with gravel and sand, brownish gray, stiff to hard (Glacial Till)		56	3-5-7 N=12		3.25 (HP)					20
5				77	5-9-15 N=24		4.25 (HP)					21
10	745	INTERBEDDED SHALE AND LIMESTONE, gray, slightly weathered, very weak shale and strong limestone		67	9-14-14 N=28		4.5 (HP)					14
15				100	50/5"							13
16.0	739	INTERBEDDED SHALE AND LIMESTONE, Shale (75%); gray, unweathered, very weak to weak, bed thickness ranging from 1/4 inch to 6 inches		58			25					
20		Limestone (21%); light gray, unweathered, strong, bed thickness ranging from 1/4 inch to 3 inches		100			55	2.92	7			131
21.0	734	Boring Terminated at 21 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual. Hammer Type: Automatic

Advancement Method: 3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Spoon Sampler
NQZ Rock Core Barrel

See Exploration and Testing Procedures for a description of field and laboratory procedures (see additional data if any).

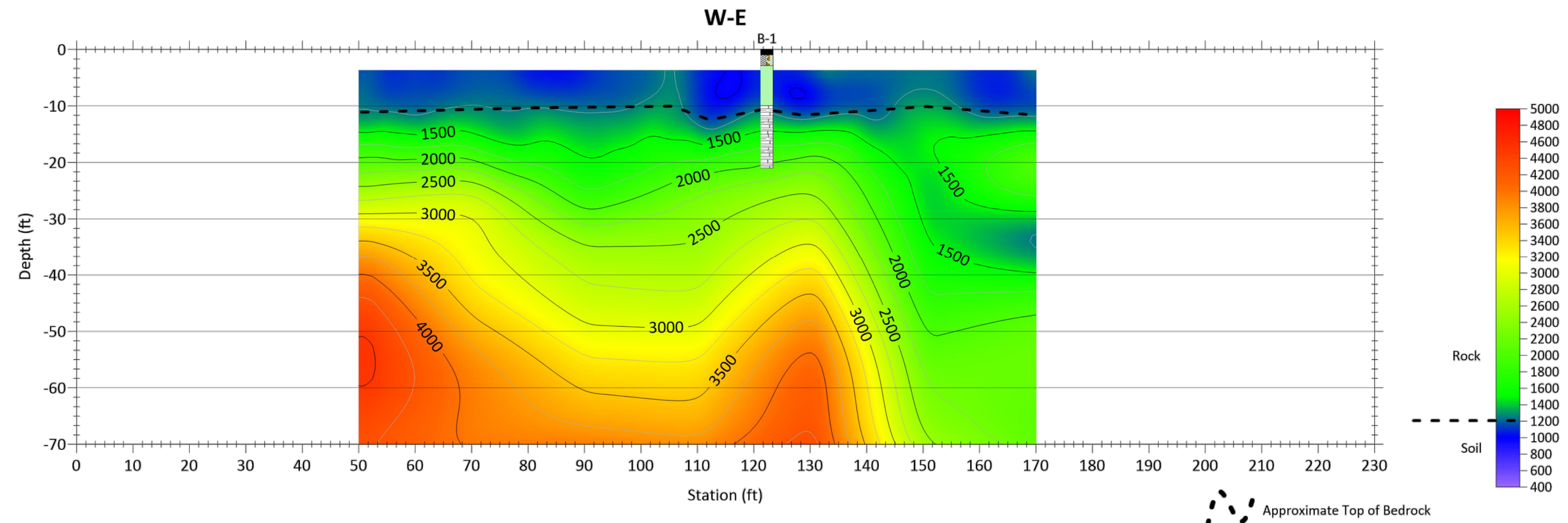
See Supporting Information for explanation of symbols and abbreviations.

Notes:
Boring installed with sugar cuttings and concrete plug and asphalt patch upon completion.
Elevation Reference: Leica Zeno GPS

WATER LEVEL OBSERVATIONS

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 03-23-2020 Boring Completed: 03-23-2020
Drill Rig: Diederich D90 Driller: A. Moore
Project No.: N1195431



Project Manager: ASK	Project No.: N1195431	Terracon Consulting Engineers & Scientists 611 Lunken Park Drive Cincinnati, Ohio 45226	MASW GEOPHYSICAL TEST RESULTS Warren County Landslide Remediation Olive Branch Road Warren County, Ohio
Drawn by: JCT	File Name: As Shown		
Checked by: KJS	Date: 03/23/2020		
Approved by: JDD			

GENERAL NOTES
DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	WATER LEVEL	FIELD TESTS
<ul style="list-style-type: none"> Rock Core Standard Penetration Test Split Spoon 	<ul style="list-style-type: none"> Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time <p>Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.</p>	<ul style="list-style-type: none"> N Standard Penetration Test Resistance (Blows/ft) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptions are boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

RELATIVE DENSITY OF COARSE-GRAINED SOILS		CONSISTENCY OF FINE-GRAINED SOILS	
Standard Penetration or N-Value	Density Determined by Standard Penetration Resistance	Consistency	Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance
Very Loose	0 - 3	Very Soft	less than 0.25
Loose	4 - 9	Soft	0.25 to 0.50
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00
Dense	30 - 50	Stiff	1.00 to 2.00
Very Dense	> 50	Very Stiff	2.00 to 4.00
		Hard	> 4.00

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	Particle Size	Term	Plasticity Index
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm)	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests		Soil Classification	
Group Symbol	Group Name	Group Symbol	Group Name
Cu ≥ 4 and 1 ≤ Cc ≤ 3	Well-graded gravel	GW	Well-graded gravel
Cu < 4 and/or (Cc < 1 or Cc > 3.0)	Poorly graded gravel	GP	Poorly graded gravel
Fines classify as ML or MH	Silty gravel	GM	Silty gravel
Fines classify as CL or CH	Clayey gravel	GC	Clayey gravel
Cu ≥ 6 and 1 ≤ Cc ≤ 3	Well-graded sand	SW	Well-graded sand
Cu < 6 and/or (Cc < 1 or Cc > 3.0)	Poorly graded sand	SP	Poorly graded sand
Fines classify as ML or MH	Silty sand	SM	Silty sand
Fines classify as CL or CH	Clayey sand	SC	Clayey sand
PI > 7 and plots on or above "A"	Lean clay	CL	Lean clay
PI < 4 or plots below "A" line	Silt	ML	Silt
Liquid limit - oven dried	Organic clay	OL	Organic clay
Liquid limit - not dried	Organic silt	OH	Organic silt
PI plots on or above "A" line	Fat clay	CH	Fat clay
PI plots below "A" line	Elastic silt	MH	Elastic silt
Liquid limit - oven dried	Organic clay	OL	Organic clay
Liquid limit - not dried	Organic silt	OH	Organic silt
Primarily organic matter, dark in color, and organic odor	Peat	PT	Peat

For classification of fine-grained soils and fine-grained fraction of coarse-grained soils

DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Term	Description
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	Field Identification	Uniaxial Compressive Strength, psi (MPa)
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Description	Fracture Spacing (Joints, Faults, Other Fractures)	Bedding Spacing (May Include Foliation or Banding)	
		Description	Spacing
Extremely close	< 1/4 in (<19 mm)	Laminated	< 1/2 in (<12 mm)
Very close	1/4 in - 2-1/2 in (19 - 60 mm)	Very thin	1/2 in - 2 in (12 - 50 mm)
Close	2-1/2 in - 8 in (60 - 200 mm)	Thin	2 in - 1 ft. (50 - 300 mm)
Moderate	8 in - 2 ft. (200 - 600 mm)	Medium	1 ft. - 3 ft. (300 - 900 mm)
Wide	2 ft. - 6 ft. (600 mm - 2.0 m)	Thick	3 ft. - 10 ft. (900 mm - 3 m)
Very Wide	6 ft. - 20 ft. (2.0 - 6 m)	Massive	> 10 ft. (3 m)

ROCK QUALITY DESIGNATION (RQD) 1	
Description	RQD Value (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than four inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels - Civil Elements

BORING LOG AND SUPPORTING INFO

OLIVE BRANCH ROAD (CR 217) LANDSLIDE REMEDIATION
WARREN COUNTY ENGINEER'S OFFICE
WARREN COUNTY, OHIO

CINCINNATI, OHIO 45226
FAX: (513) 321-4540

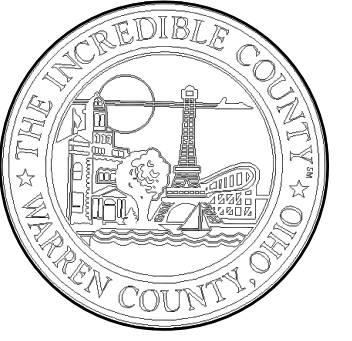
611 LUNKEN PARK DRIVE
PH: (513) 321-5816

Terracon
Consulting Engineers and Scientists

JEFFERY D. DUNLAP
E-63301
REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY: ASK/DWW
DRAWN BY: KM
APPVD. BY: JDD
SCALE: AS SHOWN
DATE: 07/29/2020
JOB NO.: N1205222
ACAD NO.: WC RW.DWG
SHEET NO.: 4

Date: 7/3/2020 7:51:46 AM File Path: DRAWINGS\1205222\WC RW.DWG

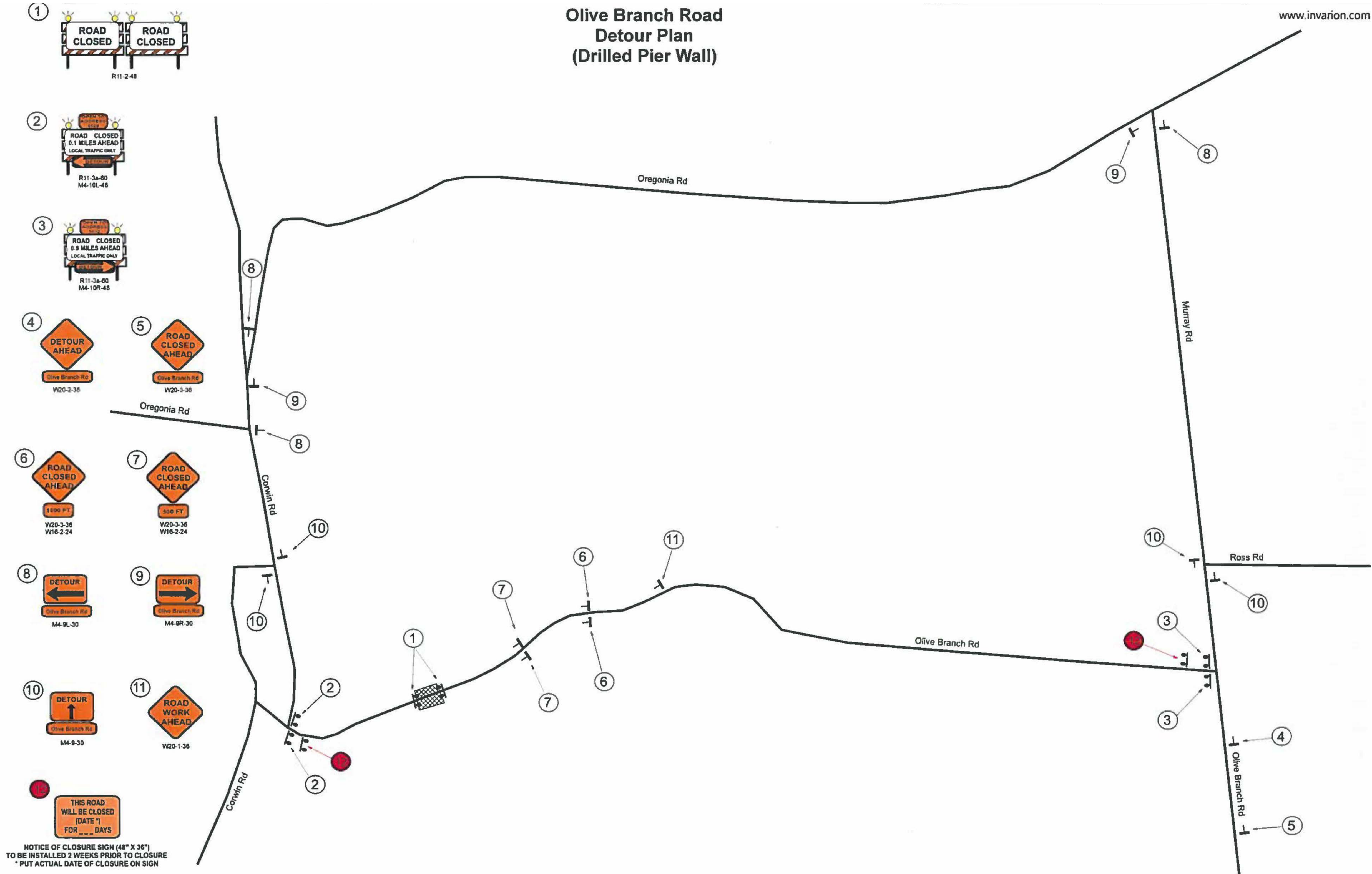


Warren County Engineer's Office

Neil J. Tuisson, P.E., P.S.
Warren County Engineer
210 W. Main Street
Lebanon, Ohio 45036
513 695 3301 Phone
513 695 7714 Fax

**Olive Branch Road
Detour Plan
(Drilled Pier Wall)**

www.invarion.com



NOTICE OF CLOSURE SIGN (48" X 36")
TO BE INSTALLED 2 WEEKS PRIOR TO CLOSURE
* PUT ACTUAL DATE OF CLOSURE ON SIGN

All signs to be installed per the Manual of
Uniform Traffic Control Devices

DETOUR SHEET
OLIVE BRANCH ROAD
DRILLED PIER WALL PROJECT
WASHINGTON TOWNSHIP

NO.	DATE	BY	REVISIONS DESCRIPTION

SCALE	DATE
	OK/21/25
DRAWN BY	CHECKED BY
JL	DMB
PROJECT NO.	FILE
OK 217 - 2025	OK 217 - 2025 Per Wall
DRAWING NO.	
\\s0128025\PROJECTS\Per Wall\OK217-2025\	
SHEET	OF
5	8