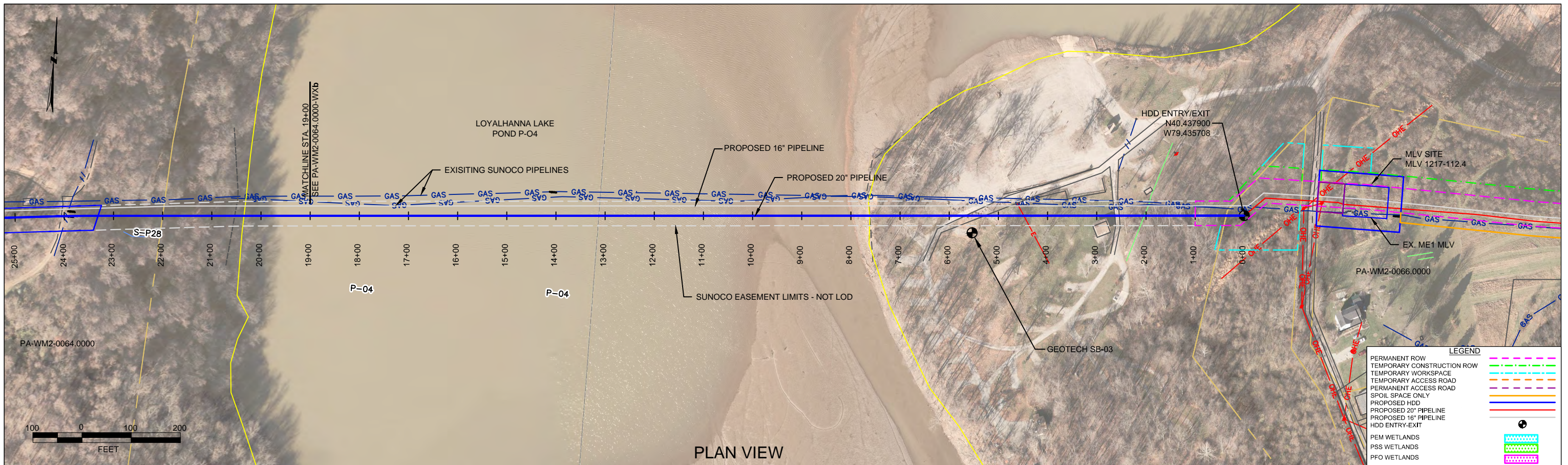


***HDD PA-WM2-0064.0000-WX (Loyalhanna Lake)***

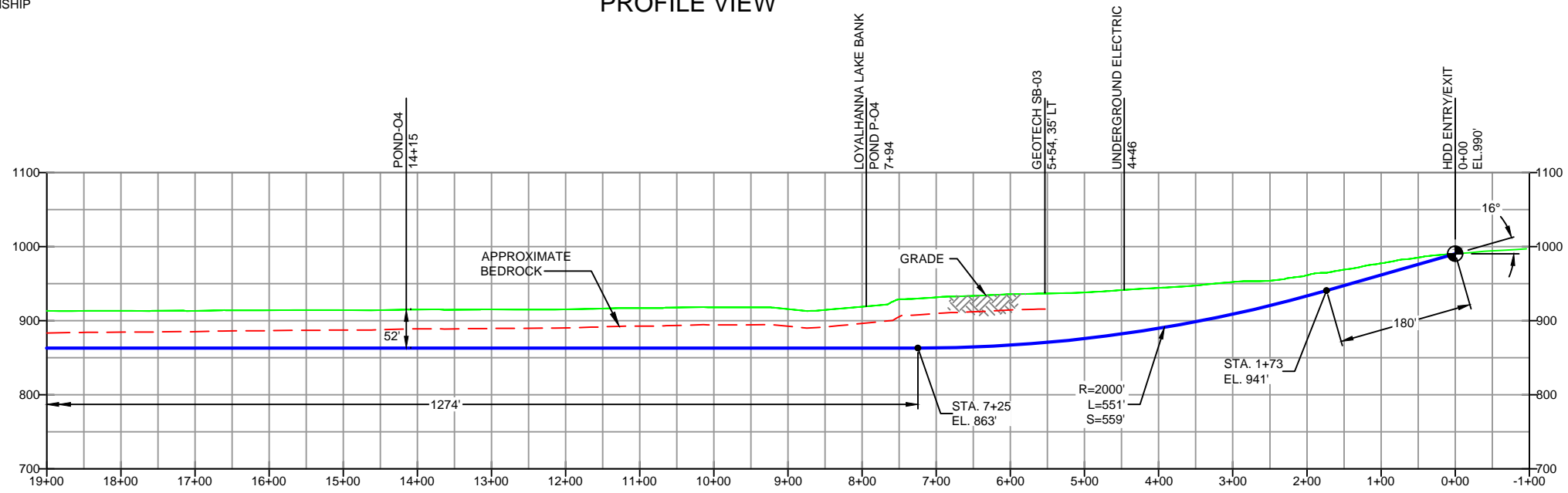
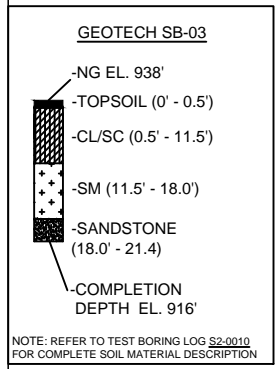
Given the design, the threat of inadvertent return has been reduced to the maximum extent practicable and in this case that threat is considered to be low. Implementing this design, along with adherence to the Pennsylvania Pipeline Project Inadvertent Return Contingency Plan will ensure inadvertent impacts, if they were to occur, are also minimized to the maximum extent.

The drill will enter/exit 794 feet east of Loyalhanna Lake. The drill will pass 50 feet under this lake and maintain that depth throughout the crossing. The west entry/exit point is 1682 feet west of this lake. Using the results of the geotechnical investigation, as well as several other data points, the entry/exit, angles, and depths have been configured to pass through the best substrates while maintaining pipe integrity (e.g., no large bends). The majority of the substrate that will be passed through is estimated to be clay, sand, and sandstone east of the lake, silty sand and sandstone gravel west of the lake, and sandstone rock beneath the lake.



WESTMORELAND COUNTY, PENNSYLVANIA - LOYALHANNA TOWNSHIP  
S2-0010A

PROFILE VIEW



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- CONTRACTOR SHALL FIELD VERIFY DEPTH OF ALL EXISTING UTILITIES SHOWN OR NOT SHOWN ON THIS DRAWING.
  - THE MINIMUM SEPARATION DISTANCE FROM EXISTING SUBSURFACE UTILITIES SHALL NOT BE LESS THAN 10 FEET AS MEASURED FROM THE OUTSIDE EDGE OF THE UTILITY TO OUTSIDE OF PROPOSED PIPELINE.
  - DESIGNED IN ACCORDANCE WITH CFR 49 195 & ASME B31.4
  - CROSSING PIPE SPECIFICATION:  
HDD HORZ. LENGTH (L=): 3772'  
HDD PIPE LENGTH (S=): 3806'  
20" x 0.456" W.T., X-65, API5L, PSL2, ERW, BFW  
COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCRETE R95)
  - INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGN FACTOR 0.50).
  - INSTALLATION METHOD: HORIZONTAL DIRECTIONAL DRILL (HDD).
  - PIPELINE WARNING MARKERS SHALL BE INSTALLED ON BOTH SIDES OF ALL ROAD, RAILWAY, AND STREAM CROSSINGS.
  - CARRIER PIPE NOT ENCASED.
  - PIPE / AMBIENT TEMPERATURE MUST BE NO LESS THAN 30°F DURING PULLBACK WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER.
  - CONDUCT 4-HOUR PRE-INSTALLATION HYDROTEST OF HDD PIPE STRING TO MINIMUM 1850 PSIG.
  - SEE SUNOCO PENNSYLVANIA PIPELINE PROJECT ESRI WEBMAP FOR ACCESS ROAD ALIGNMENT.
  - SUNOCO PIPELINE, L.P.'S HORIZONTAL DIRECTIONAL DRILL INADVERTENT RETURN CONTINGENCY PLAN WILL BE IMPLEMENTED AT ALL TIMES.
  - SUNOCO PIPELINE, L.P.'S EROSION AND SEDIMENTATION CONTROL PLAN WILL BE IMPLEMENTED AT ALL TIMES.

NOTES

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- STATIONING IS BASED ON HORIZONTAL DISTANCES.
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- CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES. CONTACT ONE CALL AT 811 PRIOR TO DIGGING.
- SUNOCO EMERGENCY HOTLINE NUMBER IS #1-800-786-7440.

REF. DRAWING		REVISIONS	
ES-2.22	TO ES-2.24	EROSION & SEDIMENT PLAN	EP2 REVISED PER PADEP COMMENTS RECEIVED 09-06-16
SHEET 66	TO SHEET 67	AERIAL SITE PLAN	EP1 REVISED PER PADEP COMMENTS
			EP
			C ADDED GEOTECH INFO
			B ISSUED FOR BID
			A ISSUED FOR REVIEW
DWG NO	DWG NO	DESCRIPTION	NO.

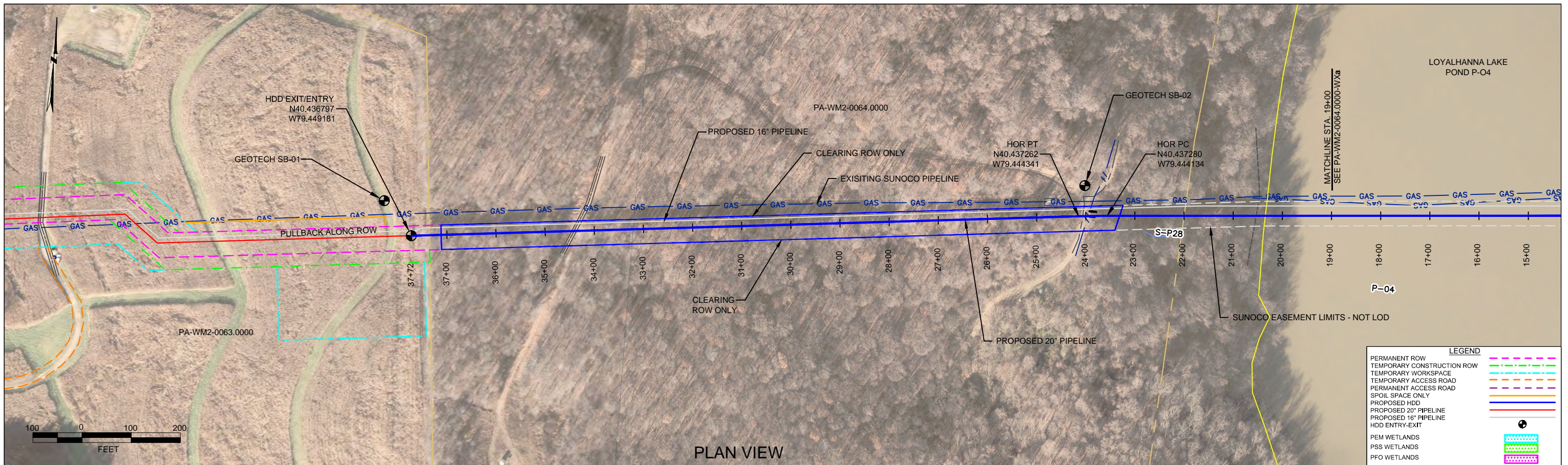
**Sunoco Logistics  
Partners L.P.**

**TETRA TECH ROONEY**  
(303) 792-5911

**SUNOCO PIPELINE, L.P.**

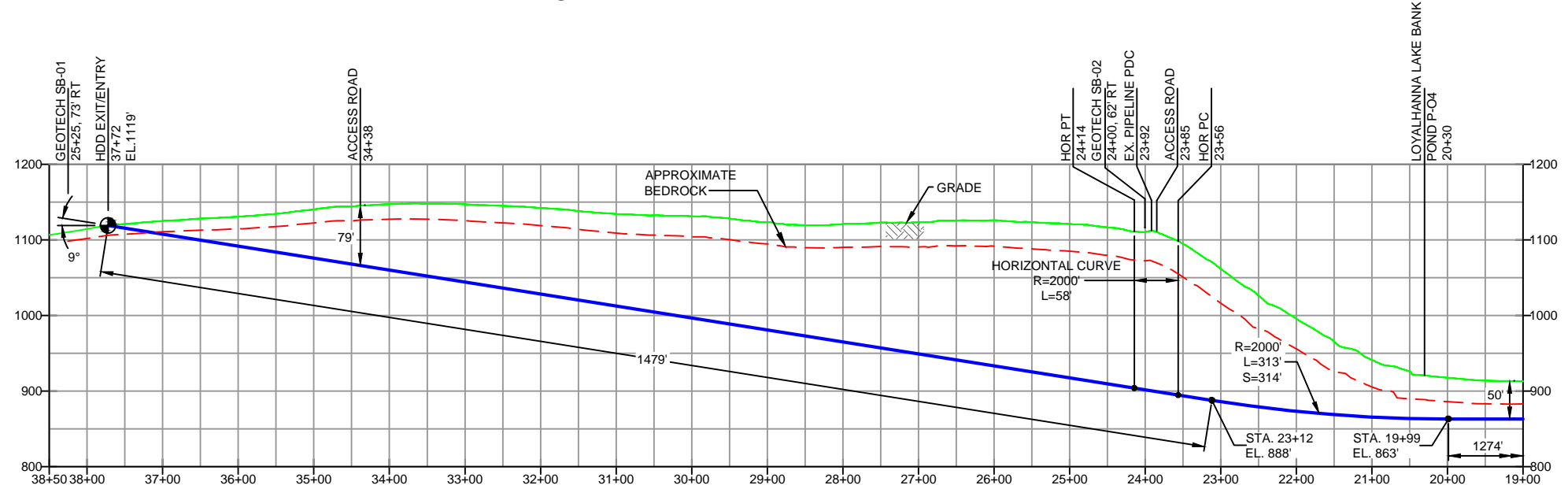
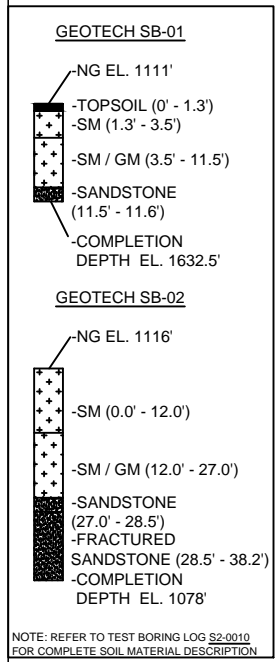
20-INCH HORIZONTAL DIRECTIONAL DRILL  
LOYALHANNA LAKE  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'    DWG. NO: PA-WM2-0064.0000-WXa



PLAN VIEW  
PROFILE VIEW

WESTMORELAND COUNTY, PENNSYLVANIA - LOYALHANNA TOWNSHIP  
S2-0010B



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COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCRETE OR ENGINEER APPROVED EQUAL)
  - INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGN FACTOR 0.50).
  - INSTALLATION METHOD: HORIZONTAL DIRECTIONAL DRILL (HDD).
  - PIPELINE WARNING MARKERS SHALL BE INSTALLED ON BOTH SIDES OF ALL ROAD, RAILWAY, AND STREAM CROSSINGS.
  - CARRIER PIPE NOT ENCASED.
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  - CONDUCT 4-HOUR PRE-INSTALLATION HYDROTEST OF HDD PIPE STRING TO MINIMUM 1850 PSIG.
  - SEE SUNOCO PENNSYLVANIA PIPELINE PROJECT ESRI WEBMAP FOR ACCESS ROAD ALIGNMENT.
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SHEET 66	TO SHEET 67	AERIAL SITE PLAN	EP1 REVISED PER PADEP COMMENTS
			C ADDED GEOTECH INFO
			B ISSUED FOR BID
			A ISSUED FOR REVIEW
DWG NO	DWG NO	DESCRIPTION	NO.

**Sunoco Logistics Partners L.P.**

**TETRA TECH ROONEY**  
(303) 792-5911

**SUNOCO PIPELINE, L.P.**

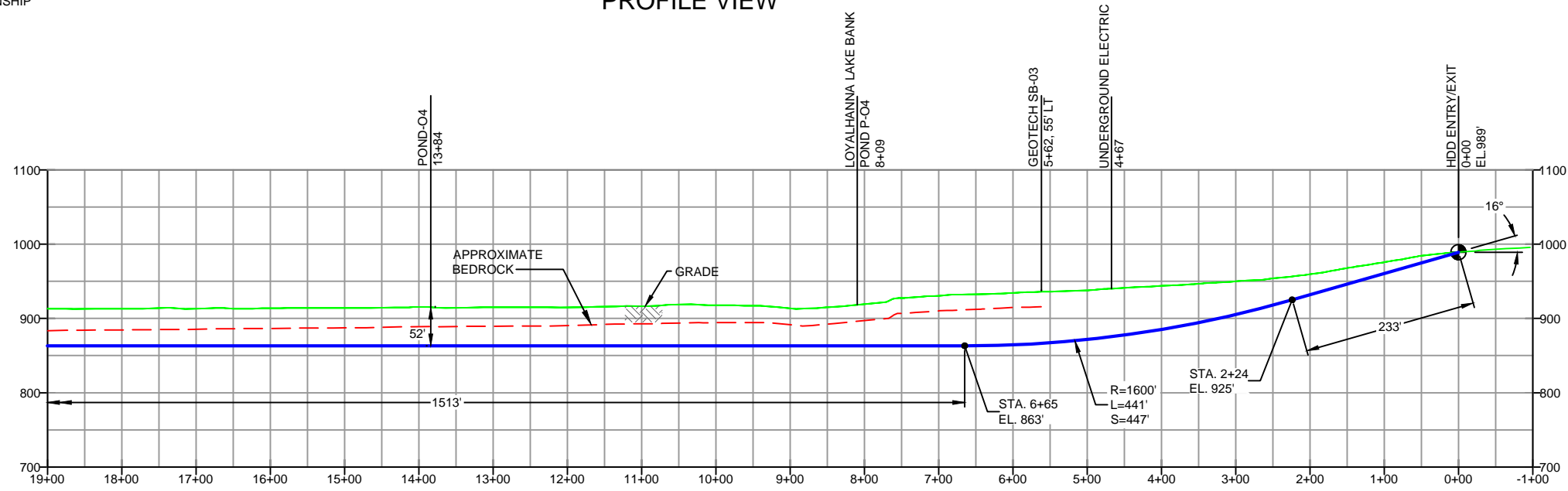
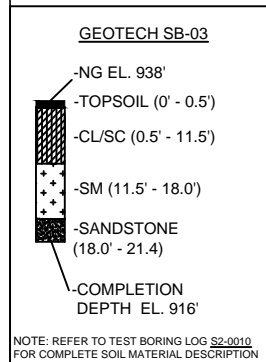
20-INCH HORIZONTAL DIRECTIONAL DRILL  
LOYALHANNA LAKE  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'  
DWG. NO: PA-WM2-0064.0000-WXb



WESTMORELAND COUNTY, PENNSYLVANIA - LOYALHANNA TOWNSHIP  
S2-0010A-16

**PROFILE VIEW**



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  - CROSSING PIPE SPECIFICATION:  
HDD HORZ. LENGTH (L-): 3761'  
HDD PIPE LENGTH (S-): 3799'  
16" x 0.438" W.T., X-70, APISL, PSL2, ERW, BFW  
COATING: 14-16 MILS FBW WITH 30-35 MIL ARO (POWERCRETE OR ENGINEER APPROVED EQUAL)
  - INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGN FACTOR 0.50).
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REF. DRAWING		REVISIONS	
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SHEET 66	TO SHEET 67	EP2	REVISED PER PADEP COMMENTS RECEIVED 09-06-16
		EP1	REVISED PER PADEP COMMENTS
		EP	
		B	ADDED GEOTECH INFO
		A	ISSUED FOR BID
DWG NO	DWG NO	NO.	DESCRIPTION

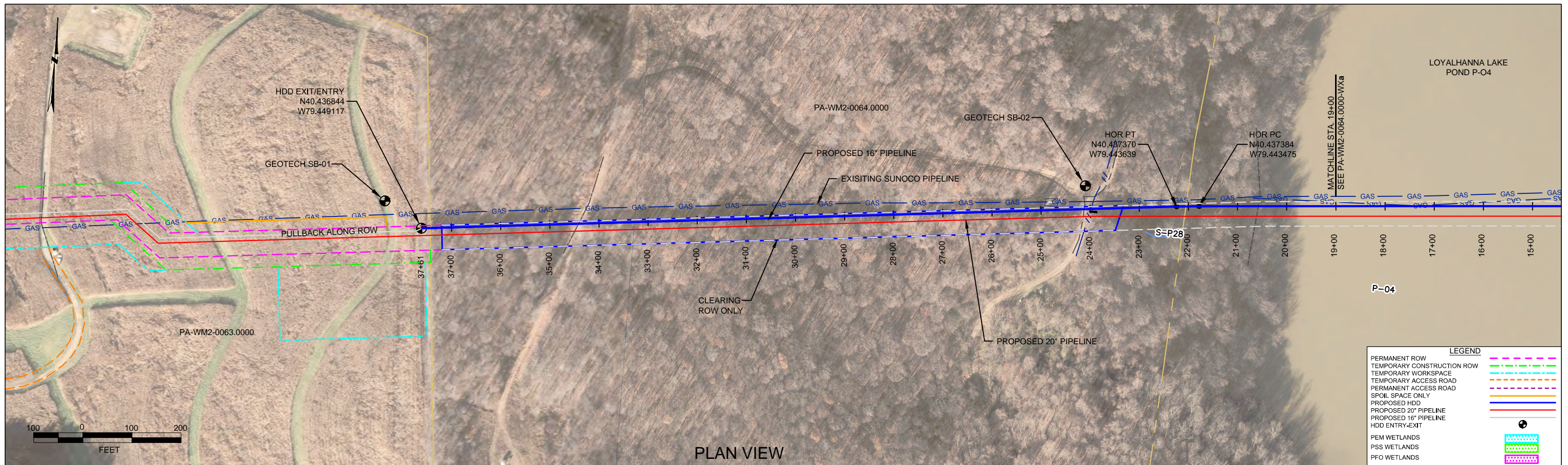
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**SUNOCO PIPELINE, L.P.**

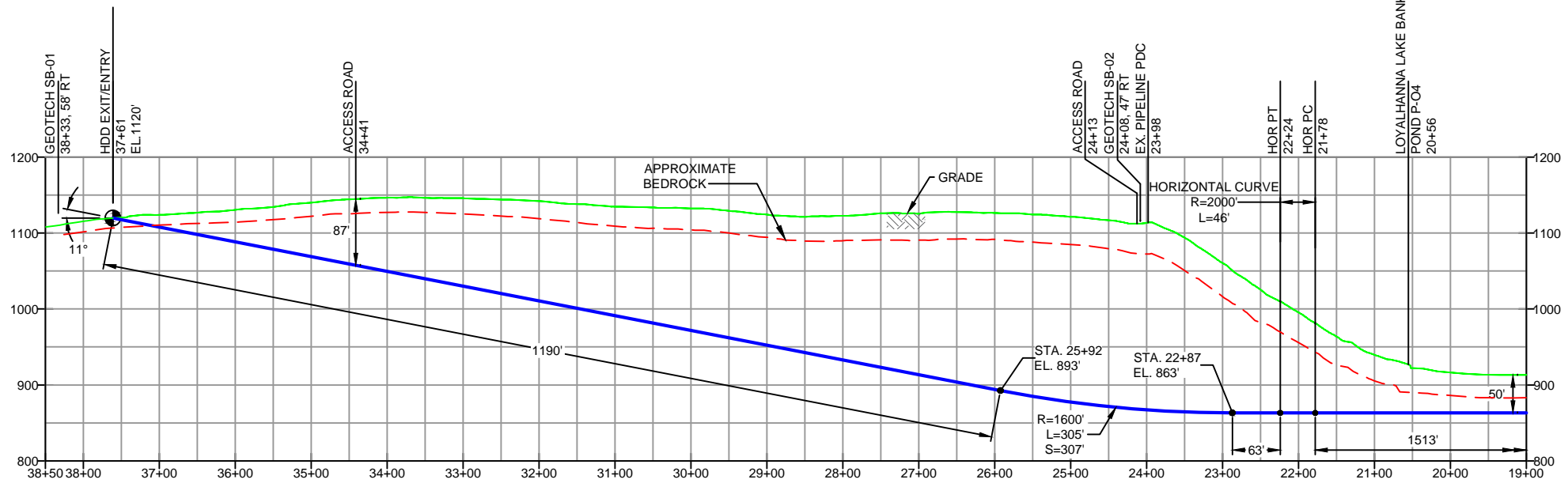
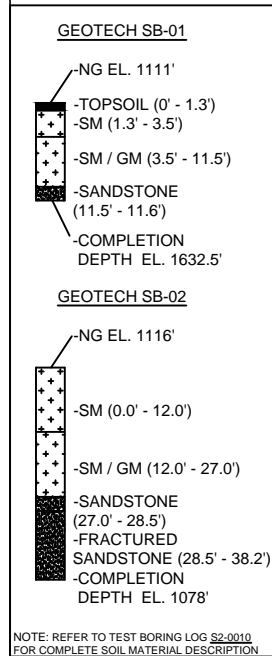
16-INCH HORIZONTAL DIRECTIONAL DRILL  
LOYALHANNA LAKE  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200' DWG. NO: PA-WM2-0064.0000-WXa-16



PLAN VIEW

WESTMORELAND COUNTY, PENNSYLVANIA - LOYALHANNA TOWNSHIP  
S2-0010B-16



PROFILE VIEW

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REF. DRAWING	NO.	DESCRIPTION	NO.	DESCRIPTION
ES-2.22	TO	ES-2.24	EROSION & SEDIMENT PLAN	
SHEET 66	TO	SHEET 67	AERIAL SITE PLAN	EP2
				REVISD PER PADEP COMMENTS RECEIVED 09-06-16
				EP1
				REVISD PER PADEP COMMENTS
				EP
				B
				ADDED GEOTECH INFO
				A
				ISSUED FOR REVIEW

**Sunoco Logistics Partners L.P.**

**TETRA TECH ROONEY**  
(303) 792-5911

**SUNOCO PIPELINE, L.P.**

16-INCH HORIZONTAL DIRECTIONAL DRILL  
LOYALHANNA LAKE  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'  
DWG. NO: PA-WM2-0064.0000-WXb-16



**LEGEND:**

⊙ Geotechnical Soil Boring (SB) Locations



GEOTECHNICAL BORING LOCATIONS  
 HDD S2-0010  
 WESTMORELAND COUNTY, LOYALHANNA TOWNSHIP, PA  
 SUNOCO PENNSYLVANIA PIPELINE PROJECT





**TETRA TECH**

240 Continental Drive, Suite 200  
 Newark, Delaware 19713  
 302.738.7551  
 fax: 302.454.5988

**TEST BORING LOG**

Project Name:	SUNOCO PENNSYLVANIA PIPELINE PROJECT	Project No.:	103IP3406
Project Location:	LOYALHANNA LAKE (WEST SIDE), SALTZBURG, PA	Page 1 of 1	
HDD No.:	S2-0010	Dates(s) Drilled:	09-10-14
Boring No.:	SB-02	Inspector:	E. WATT
Drilling Contractor:	HAD DRILLING	Drilling Method:	SPT - ASTM D1586
		Driller:	S. HOFFER
		Groundwater Depth (ft):	NOT ENCOUNTERED
		Total Depth (ft):	38.2

Sample No.	Sample Depth (ft)		Strata Depth (ft)		Recov. (ft)	Strata (USCS)	Description of Materials	6" Increment Blows *				N	
	From	To	From	To									
							NO TOPSOIL						
			0.0				MOTTLED (VARYING SHADES OF BROWN) FINE SAND WITH TRACE SILT.						
				3.5			DR WEATHERED TO A LIGHT BROWN FINE SAND, WITH A LITTLE SILT.						
1	3.0	5.0	3.5		16	SM	DR WEATHERED TO A LIGHT BROWN FINE SAND, WITH A LITTLE SILT.	7	14	17	17	31	
							SILT.						
2	8.0	10.0			14	SM	DR WEATHERED TO A LIGHT BROWN FINE SAND, WITH A LITTLE SILT.	2	19	25	40	44	
				12.0			SILT.						
3	13.0	13.8	12.0		4	SM/GM	DR WEATHERED TO A LIGHT BROWN AND GRAY FINE SAND WITH SOME SILT, AND WITH SOME F-C UNWEATHERED GRAVEL.	6	50/3"			>50	
							SILT.						
4	18.0	18.7			8	SM/GM	DR WEATHERED TO A FINE TO MEDIUM SAND, LITTLE SILT, WITH SOME F-C UNWEATHERED SANDSTONE GRAVEL.	10	50/2"			>50	
							SILT.						
5	23.0	23.7			8	SM/GM	DR WEATHERED TO A FINE TO MEDIUM SAND, LITTLE SILT, WITH SOME F-C UNWEATHERED SANDSTONE GRAVEL.	20	50/2"			>50	
				27.0			SILT.						
6	28.0	28.2	27.0	28.5	<1		PARTIALLY WEATHERED SANDSTONE.	50/2"				>50	
							AUGUR REFUSAL AT 28.5'.						
							<u>ROCK CORING</u>						
RUN 1	28.5	30.5	28.5		21	ROCK	HIGHLY FRACTURED BROWN AND GRAY MICACEOUS THINLY BEDED SANDSTONE.	TCR: 88%, SCR: 60%, RQD: 48%					
				29.0			BROWN AND GRAY MICACEOUS SANDSTONE. FRACTURE AT 29.63', 29.9 TO 30.12'. ZONES OF WEATHERING/OXIDATION.						
				29.0									
				30.5									
RUN 2	30.5	35.5	30.5		59	ROCK	SIMILAR SANDSTONE, FRACTURES AT 31.2, 32.1, 33.03, 33.89, AND 34.05 TO 34.2.	TCR: 98%, SCR: 87%, RQD: 69%					
				35.5									
RUN 3	35.5	38.2	35.5	38.2	30	ROCK	SIMILAR SANDSTONE, FRACTURES AT 35.5 TO 37.5, 35.93, 36.81, 37.14, 37.25.	TCR: 94%, SCR: 70%, RQD: 48%					
							CAVED AT 28'.						
							<u>CORE TESTING RESULTS (DEPTH 31.8')</u>						
							COMPRESSIVE STRENGTH: 10,820 PSI						
							UNIT WEIGHT: 157.4 PCF						

Notes/Comments:

Pocket Pentrometer Testing

DR: DECOMPOSED ROCK

Strata (USCS) Designations are approximated based on visual review, except where indicated in Description of Materials.

\* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.

N: Number of blows to drive spoon from 6" to 18" interval.





**TETRA TECH**

240 Continental Drive, Suite 200  
 Newark, Delaware 19713  
 302.738.7551  
 fax: 302.454.5988

**TEST BORING LOG**

Project Name: SUNOCO PENNSYLVANIA PIPELINE PROJECT			Project No.: 103IP3406		
Project Location: LOYALHANNA LAKE (EAST SIDE), SALTZBURG, PA			Page 1 of 1		
HDD No.: S2-0010		Dates(s) Drilled: 09-08-14		Inspector: E. WATT	
Boring No.: SB-04		Drilling Method: SPT - ASTM D1586		Driller: S. HOFFER	
Drilling Contractor: HAD DRILLING		Groundwater Depth (ft): NOT ENCOUNTERED		Total Depth (ft): 16.0	

Sample No.	Sample Depth (ft)		Strata Depth (ft)		Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N	
	From	To	From	To									
			0.0	0.4			TOPSOIL (4.5")						
1	3.0	5.0	0.4	4.5		SM	BROWN FINE SAND AND SILT, TRACE F-SANDSTONE GRAVEL.	3	9	9	21	18	
2	8.0	8.4	4.5				WEATHERED TO PARTIALLY WEATHERED DARK BROWN SANDSTONE.	50/4"				0	
				9.0									
							AUGER REFUSAL AT 9'.						
							<u>ROCK CORING</u>						
RUN 1	9.0	11.0	9.0			PARTIALLY WEATHERED ROCK	GRAY TO DARK GRAY MICACEOUS SANDSTONE, WITH WEATHERING AND OXIDATION THROUGHOUT. COAL SEAM AT 10.03'. FRACTURES AT 9.33', 9.57', 9.75', 9.84', 9.95'.	TCR: 83%, SCR: 73%, RQD: 17%					
				10.1			MIX OF LIGHT BROWN TO DARK GRAY LIMESTONE/CALCARIOUS SANDSTONE.						
				10.1			HIGHLY FRACTURED, VARIOUS SHADES OF BROWN SANDSTONE.						
				10.3			HIGHLY FRACTURED DARK GRAY SILTSTONE/MUDSTONE. ZONES OF WEATHERING/OXIDATION THROUGHOUT.						
RUN 2	11.0	16.0	11.0	16.0			COULD NOT RE-ENTER CORE HOLE TO ADVANCE FURTHER DUE TO CAVE.						
							CAVED AT 14'.						

Notes/Comments: Pocket Pentrometer Testing DR: DECOMPOSED ROCK

Strata (USCS) Designations are approximated based on visual review, except where indicated in Description of Materials.

\* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.  
 N: Number of blows to drive spoon from 6" to 18" interval.

**LABORATORY TESTING SUMMARY  
SUNOCO PENNSYLVANIA PIPELINE PROJECT  
HDD S2-0010 LOYALHANNA LAKE SOIL BORINGS**

HDD No.	Test Boring No.	Sample No.	Depth of Sample (ft.)		Water Content, % (ASTM D2216)	Percent Silts/Clays, % (ASTM D1140)	Atterburg Limits (ASTM D4318)			USCS Classif. (ASTM D2487)
			From	To			Liquid Limit, %	Plastic Limit, %	Plasticity Index, %	
S2-0010	SB-01	1	3.0	3.7	5.3	10.9	-	-	-	-
		2	8.0	8.5	4.6	13.2	-	-	-	-
	SB-02	1	3.0	5.0	8.0	21.0	-	-	-	-
		3	13.0	13.8	4.1	23.5	-	-	-	-
		4	18.0	18.7	3.6	10.4	-	-	-	-
		5	23.0	23.7	3.5	11.3	-	-	-	-
	SB-03	6	28.0	28.2	3.5	16.5	-	-	-	-
		1	3.0	5.0	11.8	48.5	-	-	-	-
		2	8.0	10.0	18.1	51.3	26	15	11	CL/SC
		3	13.0	15.0	19.0	29.7	-	-	-	-
	SB-04	5	21.0	21.4	8.2	14.1	-	-	-	-
		1	3.0	5.0	12.3	43.4	-	-	-	-

**Notes:**

- 1) Sample depths based on feet below grade at time of exploration.

Sunoco Pennsylvania Pipeline Project  
Regional Geological Description  
HDD S2-0010 Loyalhanna Lake

HDD No.	Name	Boring No.	Geology Description	GENERAL TOPOGRAPHIC SETTING	BEDROCK FORMATION	GENERAL ROCK TYPE	APPROX MAX FM THICKNESS (FT)	DEPTH TO ROCK (Ft bgs) based on nearby well drilling logs
S2-0010	Loyalhanna Lake	SB-01	<b>Glenshaw Formation</b> - Cyclic sequences of shale, sandstone, red beds, and thin limestone and coal; includes four marine limestone or shale horizons; red beds are involved in landslides; base is at top of Upper Freeport coal.	Lake bottom	Glenshaw	Shale-sandstone with limestone-clastic-coal	280-375	10-30
		SB-02						
		SB-03						
		SB-04						

**SUNOCO PENNSYLVANIA PIPELINE  
ROCK CORE DESCRIPTION SUMMARY TABLE**

Page 1 of 1

Location	Boring No.	Core Run	Core Depth (ft)		TCR (%)	SCR (%)	RQD (%)	Depth (ft)		Weathering	Classification	Bedding Thickness (ft)	Color	Discontinuity Data
			From	To				From	To					
S2-0010	SB-2	1	28.5	30.5	87.5	60	48	28.5	30.5	Slight	Sandstone	2	Gray	Moderately fractured - Avg. Dip 19° (5° - 25°)
S2-0010	SB-2	2	30.5	35.5	98	82.5	69	30.5	35.5	Slight	Sandstone	5 (continuous from above)	Gray	Moderately to heavily fractured - Avg. Dip 3° (0° - 5°)
S2-0010	SB-2	3	35.5	38.2	94	70	48	35.5	38.2	Moderate	Sandstone	2.7 (continuous from above)	Gray	Heavily fractured - Avg. Dip 18° (2° - 46°)
S2-0010	SB-4	1	9	11	83	73	17	9	11	Moderate	Sandstone	2	Gray	Heavily fractured - Avg. Dip 4° (0° - 11°)
S2-0010	SB-4	2	11	16	94	70	48	11	16	Heavily	Siltstone	5	Gray	Heavily to extremely fractured - Rubble

# FIELD DESCRIPTION AND LOGGING SYSTEM FOR SOIL EXPLORATION

## GRANULAR SOILS

(Sand, Gravel & Combinations)

<u>Density</u>	<u>N (blows)*</u>
Very Loose	5 or less
Loose	6 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	51 or more

### Particle Size Identification

Boulders	8 in. diameter or more
Cobbles	3 to 8 in. diameter
Gravel	Coarse (C) 3 in. to ¾ in. sieve
	Fine (F) ¾ in. to No. 4 sieve
Sand	Coarse (C) No. 4 to No. 10 sieve (4.75mm-2.00mm)
	Medium (M) No. 10 to No. 40 sieve (2.00mm – 0.425mm)
	Fine (F) No. 40 to No. 200 sieve (0.425 – 0.074mm)
Silt/Clay	Less Than a No. 200 sieve (<0.074mm)

### Relative Proportions

<u>Description Term</u>	<u>Percent</u>
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

## COHESIVE SOILS

(Silt, Clay & Combinations)

<u>Consistency</u>	<u>N (blows)*</u>
Very Soft	3 or less
Soft	4 to 5
Medium Stiff	6 to 10
Stiff	11 to 15
Very Stiff	16 to 30
Hard	31 or more

### Plasticity

<u>Degree of Plasticity</u>	<u>Plasticity Index</u>
None to Slight	0 - 4
Slight	5 - 7
Medium	8- 22
High to Very High	> 22

## ROCK

(Rock Cores)

<u>Rock Quality Designation (RQD), %</u>	<u>Rock Quality Description</u>
0-25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

**\*N - Standard Penetration Resistance.** Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 18 inches into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. The number of hammer blows to drive the sampler through each 6 inch interval is recorded; the number of blows required to drive the sampler through the final 12 inch interval is termed the Standard Penetration Resistance (SPR) N-value. For example, blow counts of 6/8/9 (through three 6-inch intervals) results in an SPR N-value of 17 (8+9).

**Groundwater** observations were made at the times indicated. Groundwater elevations fluctuate throughout a given year, depending on actual field porosity and variations in seasonal and annual precipitation.

**UNIFIED SOIL CLASSIFICATION SYSTEM [Casagrande (1948)]**

Major Divisions		Group Symbols	Typical Descriptions	Laboratory Classifications				
Coarse Grained Soils (More than half of material is larger than No. 200 sieve)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravel (Little or no fines)	GW Well-graded gravels, gravel-sand mixtures, little or no fines	Determine Percentage of sand and gravel from grain size curve. Depending on Percentage of fines (fraction smaller than No. 200 sieve), coarse-grained soils are classified as follows:  Less than 5 percent GW, GP, SW, SP More than 12 percent GM, GC, SM, SC 5 to 12 percent Borderline cases requiring dual symbols <sup>(1)</sup>	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4: $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3			
		GP Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting $C_u$ or $C_c$ requirements for GW					
		Gravel with fines (Appreciable amount of fines)	GM Silty gravels, gravel-sand-silt mixtures		Atterberg limits below A Line or $I_p$ less than 4	Limits plotting in hatched zone with $I_p$ between 4 and 7 are borderline cases requiring use of dual symbols		
			GC Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above A line with $I_p$ greater than 7			
	Sands (More than half of coarse fraction is smaller than No. 4 Sieve)	Clean sands (Little or no fines)	SW Well graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6: $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3			
			SP Poorly graded sands, gravelly sands, little or no fines		Not meeting $C_u$ or $C_c$ requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM Silty sands, sand-silt mixtures		Atterberg limits below A Line or $I_p$ less than 4	Limits Plotting in hatched zone with $I_p$ between 4 and 7 are borderline cases requiring use of dual symbols		
			SC Clayey sands, sand-clay mixtures		Atterberg limits above A line with $I_p$ greater than 7			
						For soils plotting nearly on A line use dual symbols i.e., $I_p = 29.5$ , $w_L = 60$ gives CH-MH. When $w_L$ is near 50 use CL-CH or ML-MH. Take near as $\pm 2$ percent.		
		Fine-grained soils (More than half of material is smaller than No. 200 sieve)	Silt and clays (Liquid limit less than 50)		ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays								
OL Organic silts and organic silty clays of low plasticity								
Silt and Clays (Liquid limit greater than 50)	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts							
	CH Inorganic clays of high plasticity, fat clays							
	OH Organic clays of medium to high plasticity, organic silts							
Highly organic soils	Pt Peat and other highly organic soils							

(1) Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC. well-graded gravel-sand mixture with clay binder.