

***HDD PA-HU-0020.0008-WX (MP-140)***

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 630 feet from the edge of the western most boundary of the lake crossing MP-140. The drill will travel beneath MP-140 for 2100 feet. 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 siltstone to partially weathered siltstone. The drill will continue beneath MP-140 and will enter/exit 920 feet from the eastern most edge of MP-140.

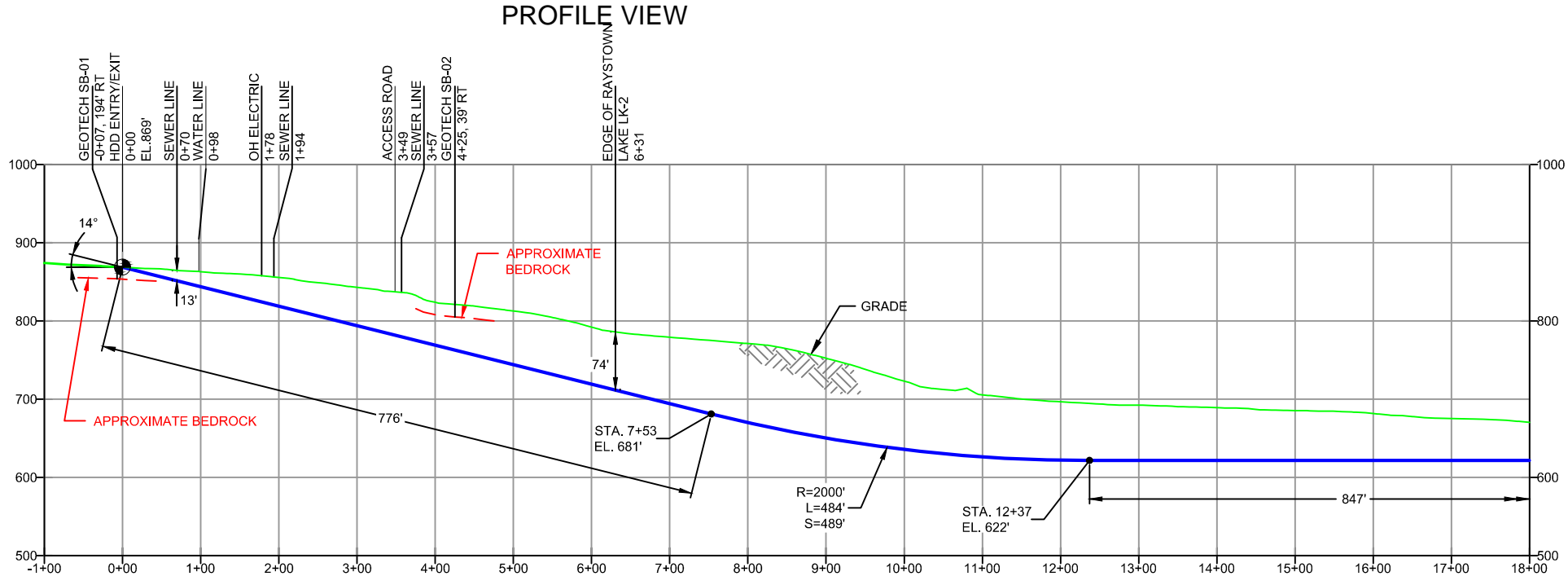


PLAN VIEW

HUNTINGDON COUNTY, PENNSYLVANIA - PENN TOWNSHIP  
S2-0150A

GEOTECH SB-01	
-NG EL. 882'	-TOPSOIL (<0.1')
-SM (0.0' - 12.5')	
-SILTSTONE (12.5' - 14.0')	
-COMPLETION DEPTH EL. 868'	
GEOTECH SB-02	
-NG EL. 824'	-TOPSOIL (0.0' - 0.3')
-SM (0.3' - 5.0')	
-SILTSTONE (5.0' - 16.0')	
-COMPLETION DEPTH EL. 808'	

NOTE: REFER TO TEST BORING LOG S2-0150 FOR COMPLETE SOIL MATERIAL DESCRIPTION



PROFILE VIEW

- DESIGN AND CONSTRUCTION:
- 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)=3650'  
HDD PIPE LENGTH (S)=3780'  
20" x 0.456" W.T., X-65, API6L, PS2, 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

- ALL COORDINATES SHOWN ARE IN LATITUDE AND LONGITUDE. ALL MSL ELEVATIONS ARE NAD83
- STATIONING IS BASED ON HORIZONTAL DISTANCES.
- ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, LP ARE NOT RESPONSIBLE FOR LOCATION OF FOREIGN UTILITIES SHOWN IN PLOT PLAN OR PROFILE. THE INFORMATION SHOWN HEREON IS FURNISHED WITHOUT LIABILITY ON THE PART OF ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, LP. FOR ANY DAMAGES RESULTING FROM ERRORS OR OMISSIONS THEREIN.
- 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	NO.	DESCRIPTION	NO.	DESCRIPTION	
ES-3.21	TO	ES-3.24	EROSION & SEDIMENT PLAN	EP2	REVISED PER PADEP COMMENTS RECEIVED 09-06-16
SHEET 14	TO	SHEET 15	AERIAL SITE PLAN	EP1	REVISED PER PADEP COMMENTS
				EP	
				C	ADDED GEOTECH INFO
				B	ISSUED FOR BID
				A	ISSUED FOR REVIEW

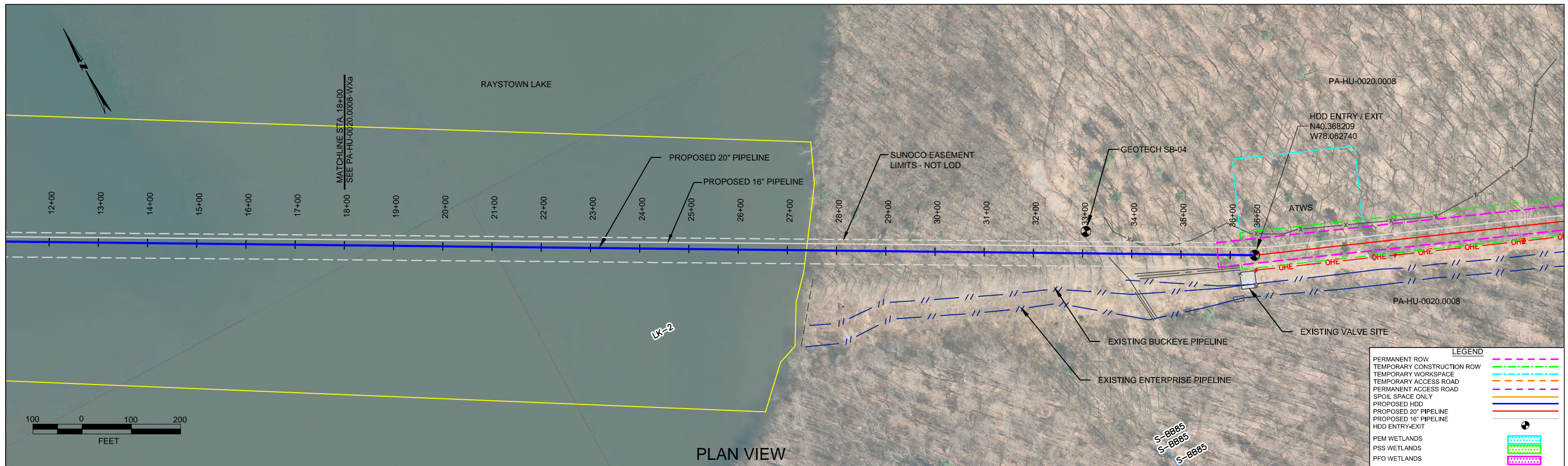
BY	DATE	CHK	DATE	APP	DATE
DLM	09/30/16	RMB	09/30/16	AAW	09/30/16
DLM	05/18/16	RMB	05/18/16	AAW	05/18/16
MRS	02/26/16	RMB	02/26/16	AAW	02/26/16
MRS	09/10/15	RMB	09/10/15	AAW	09/10/15
JAM	07/31/15	RMB	07/31/15	AAW	07/31/15
RTT	3/19/15	RMB	3/19/15	AAW	3/19/15



**SUNOCO PIPELINE, L.P.**

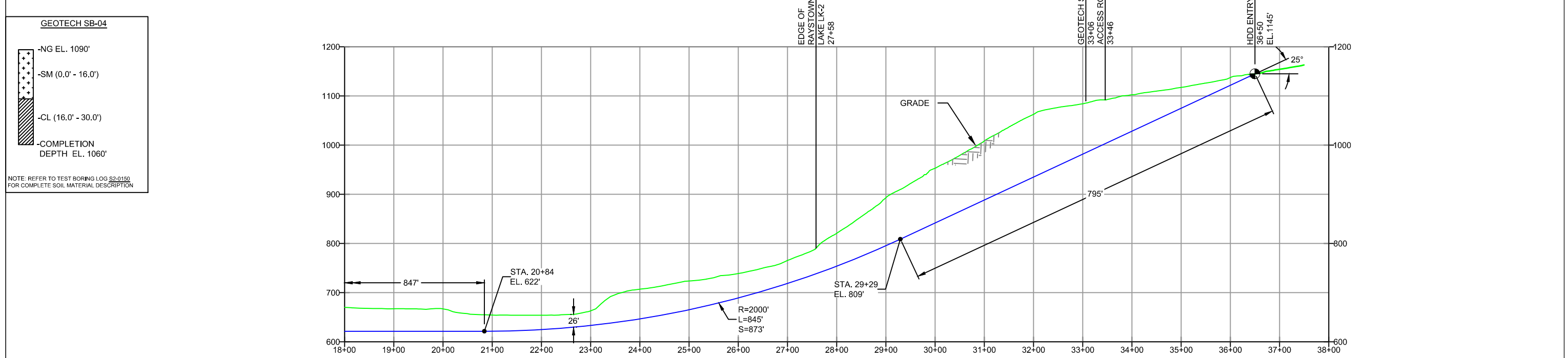
20-INCH HORIZONTAL DIRECTIONAL DRILL  
RAYSTOWN LAKE  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'      DWG. NO: PA-HU-0020.0008-WX



HUNTINGDON COUNTY, PENNSYLVANIA - PENN TOWNSHIP S2-0150B

**PROFILE VIEW**



**DESIGN AND CONSTRUCTION:**

- 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=): 3650'  
 HDD PIPE LENGTH (S=): 3780'  
 20" x 0.456" W.T., X-65, API5L, PSL2, ERW, BFW  
 COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCONCRETE 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**

- ALL COORDINATES SHOWN ARE IN LATITUDE AND LONGITUDE. ALL MSL ELEVATIONS ARE NAD83
- 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-3.21	TO ES-3.24	NO.	DESCRIPTION
ES-3.21	TO ES-3.24	EP2	REVISED PER PADEP COMMENTS RECEIVED 09-06-16
SHEET 14	TO SHEET 15	EP1	REVISED PER PADEP COMMENTS
		EP	
		C	ADDED GEOTECH INFO
		B	ISSUED FOR BID
		A	ISSUED FOR REVIEW
DWG NO	DWG NO	NO.	DESCRIPTION

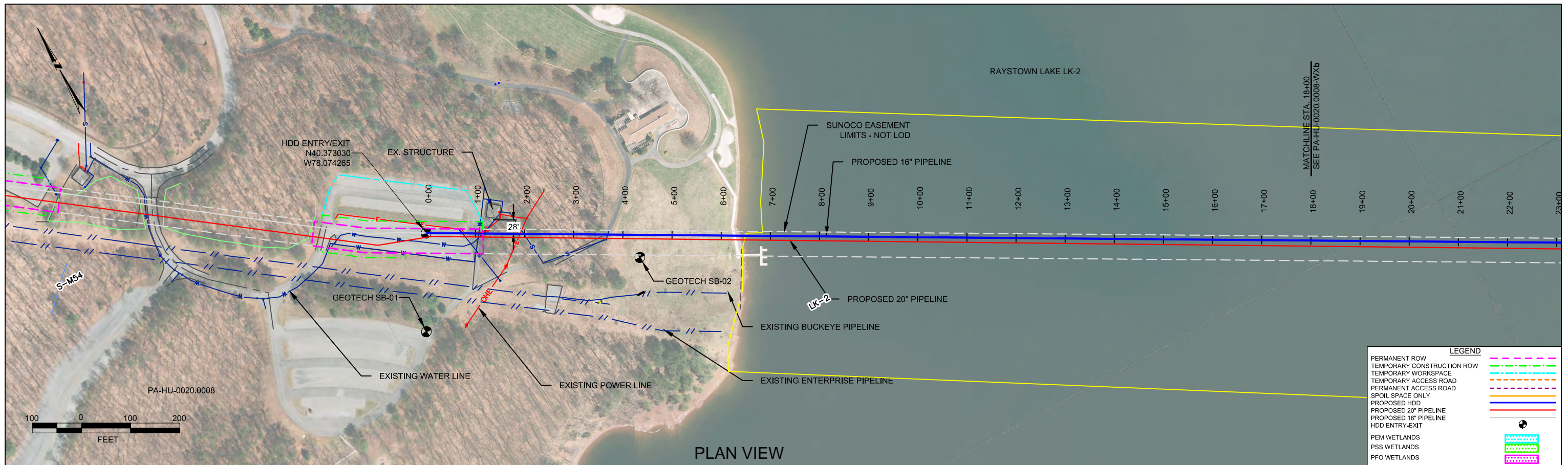
**Sunoco Logistics Partners L.P.**

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

**SUNOCO PIPELINE, L.P.**

20-INCH HORIZONTAL DIRECTIONAL DRILL  
RAYSTOWN LAKE  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'    DWG. NO: PA-HU-0020.0008-WX



LEGEND	
PERMANENT ROW	
TEMPORARY CONSTRUCTION ROW	
TEMPORARY WORKSPACE	
TEMPORARY ACCESS ROAD	
PERMANENT ACCESS ROAD	
SPOIL SPACE ONLY	
PROPOSED HDD	
PROPOSED 20\"/>	

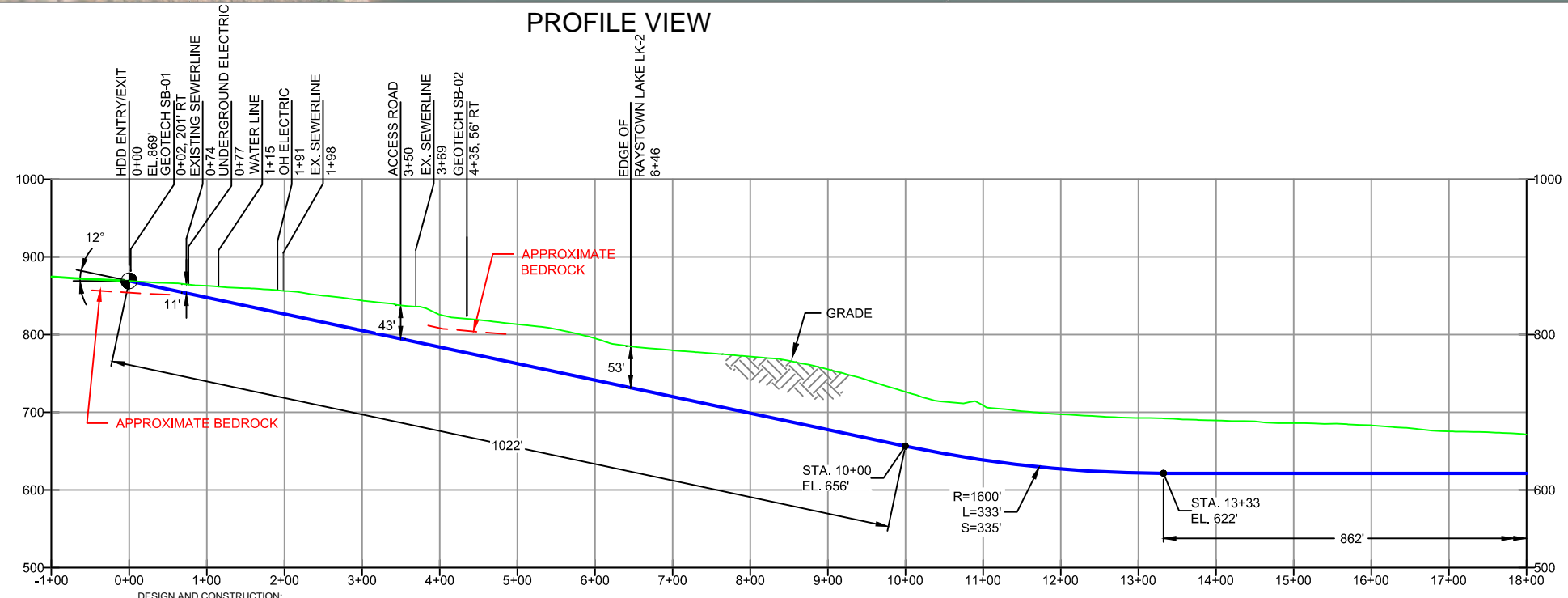
PLAN VIEW

HUNTINGDON COUNTY, PENNSYLVANIA - PENN TOWNSHIP  
S2-0150A-16

PROFILE VIEW

GEOTECH SB-01	
-NG EL. 882'	
-TOPSOIL (<0.1')	
-SM (0.0' - 12.5')	
-SILTSTONE (12.5' - 14.0')	
-COMPLETION DEPTH EL. 868'	
GEOTECH SB-02	
-NG EL. 824'	
-TOPSOIL (0.0' - 0.3')	
-SM (0.3' - 5.0')	
-SILTSTONE (5.0' - 16.0')	
-COMPLETION DEPTH EL. 808'	

NOTE: REFER TO TEST BORING LOG S2-0150 FOR COMPLETE SOIL MATERIAL DESCRIPTION



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  - DESIGNED IN ACCORDANCE WITH CFR 49 195 & ASME B31.4
  - CROSSING PIPE SPECIFICATION:  
HDD HORZ. LENGTH (L-): 3680'  
HDD PIPE LENGTH (S-): 3808'  
16" x 0.438" W.T., X-70, 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.
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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.
  - SUNOCO PIPELINE, L.P.'S HORIZONTAL DIRECTIONAL DRILL INADVERTENT RETURN CONTINGENCY PLAN WILL BE IMPLEMENTED AT ALL TIMES.
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NOTES	
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2.	STATIONING IS BASED ON HORIZONTAL DISTANCES
3.	ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, LP ARE NOT RESPONSIBLE FOR LOCATION OF FOREIGN UTILITIES SHOWN IN PLOT PLAN OR PROFILE. THE INFORMATION SHOWN HEREON IS FURNISHED WITHOUT LIABILITY ON THE PART OF ROONEY ENGINEERING, INC. AND SUNOCO PIPELINE, LP. FOR ANY DAMAGES RESULTING FROM ERRORS OR OMISSIONS THEREIN.
4.	CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES. CONTACT ONE CALL AT 811 PRIOR TO DIGGING.
5.	SUNOCO EMERGENCY HOTLINE NUMBER IS #1-800-786-7440.

REF. DRAWING		REVISIONS	
ES-3.21	TO ES-3.24	EROSION & SEDIMENT PLAN	
SHEET 14	TO SHEET 15	AERIAL SITE PLAN	EP2 REVISED PER PADEP COMMENTS RECEIVED 09-06-16
			EP1 REVISED PER PADEP COMMENTS
			EP ADDED GEOTECH INFO
			B ISSUED FOR CONSTRUCTION
DWG NO	DWG NO	DESCRIPTION	NO. DESCRIPTION

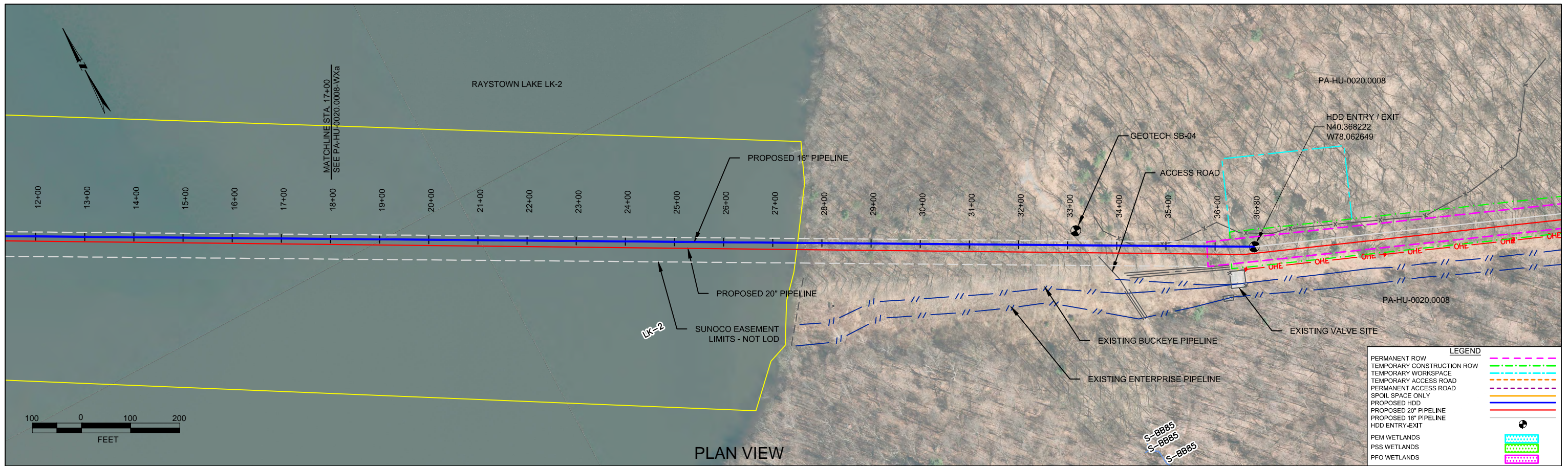
**Sunoco Logistics Partners L.P.**

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

**SUNOCO PIPELINE, L.P.**

16-INCH HORIZONTAL DIRECTIONAL DRILL  
RAYSTOWN LAKE  
PENNSYLVANIA PIPELINE PROJECT

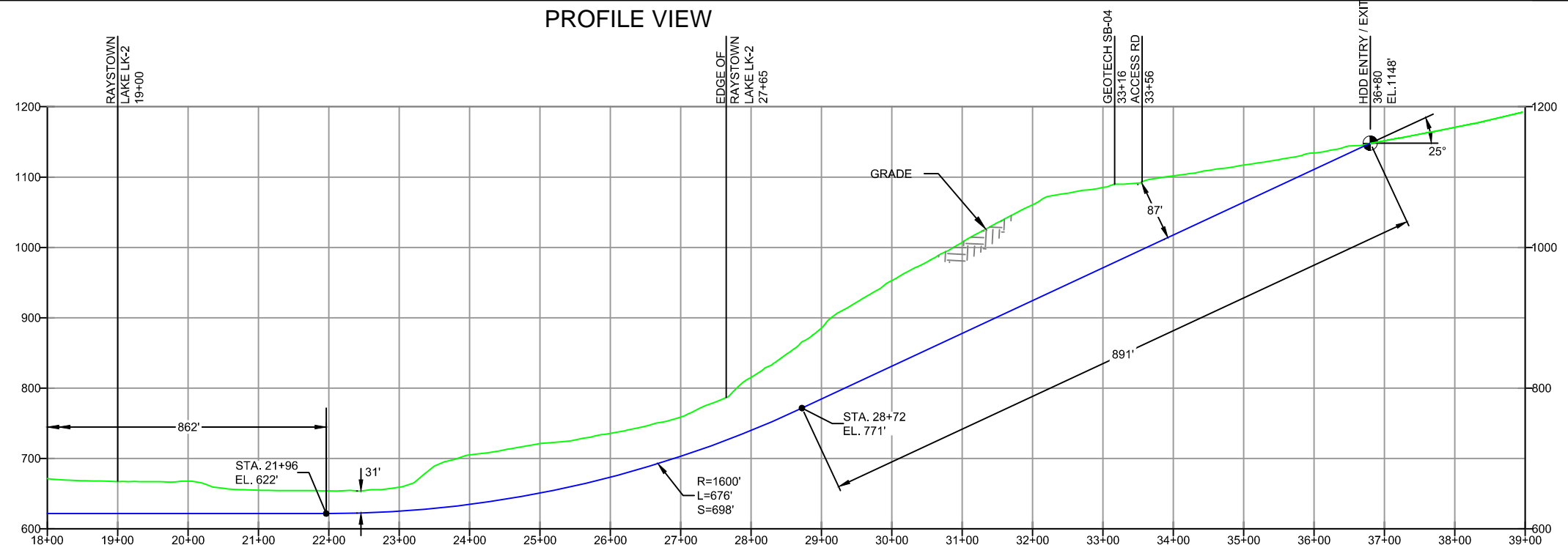
SCALE: 1"=200' DWG. NO: PA-HU-0020.0008-WX-16



PLAN VIEW

HUNTINGDON COUNTY, PENNSYLVANIA - PENN TOWNSHIP  
S2-0150B-16

PROFILE VIEW



**GEOTECH SB-04**

- NG EL. 1090'
- SM (0.0' - 16.0')
- CL (16.0' - 30.0')
- COMPLETION DEPTH EL. 1060'

NOTE: REFER TO TEST BORING LOG S2-0150 FOR COMPLETE SOIL MATERIAL DESCRIPTION

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16" x 0.438" W.T., X-70, 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).
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  - CONDUCT 4-HOUR PRE-INSTALLATION HYDROTEST OF HDD PIPE STRING TO MINIMUM 1850 PSIG.
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REF. DRAWING		REVISIONS	
DWG NO	DESCRIPTION	NO.	DESCRIPTION
ES-3.21	EROSION & SEDIMENT PLAN	EP2	REVISED PAR PADEP COMMENTS RECEIVED 09-06-16
SHEET 14	AERIAL SITE PLAN	EP1	REVISED PER PADEP COMMENTS
		EP	
		B	ISSUED FOR BID
		A	ISSUED FOR BID

**Sunoco Logistics Partners L.P.**

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

**SUNOCO PIPELINE, L.P.**

16-INCH HORIZONTAL DIRECTIONAL DRILL  
RAYSTOWN LAKE  
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'    DWG. NO: PA-HU-0020.0008-WXb-16



**LEGEND:**

⊙ Geotechnical Soil Boring (SB) Locations



**GEOTECHNICAL BORING LOCATIONS**  
 HDD S2-0150  
 HUNTINGDON COUNTY, PENN 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: WEST SIDE OF RAYSTOWN LAKE, PA			Page 1 of 1		
HDD No.: S2-0150		Dates(s) Drilled: 09-16-14		Inspector: E. WATT	
Boring No.: SB-01		Drilling Method: SPT - ASTM D1586		Driller: S. HOFFER	
Drilling Contractor: HAD DRILLING			Groundwater Depth (ft): NOT ENCOUNTERED		Total Depth (ft): 14.0

Sample No.	Sample Depth (ft)		Strata Depth (ft)		Recov. (ft)	Strata (USCS)	Description of Materials	6" Increment Blows *				N		
	From	To	From	To										
							TOPSOIL (<1")							
1	3.0	5.0	0.0		12		DR WEATHERED TO A REDDISH BROWN SILTY SAND, TRACE	2	5	6	6		11	
							UNWEATHERED SILTSTONE FRAGMENTS.							
2	8.0	8.9			9	SM	DR WEATHERED TO A REDDISH BROWN FINE SAND WITH SOME SILT,	2	50/4"				>50	
				8.5			TRACE UNWEATHERED SILTSTONE F-GRAVEL.							
			8.5				DR WEATHERED TO A REDDISH BROWN FINE SAND WITH SOME							
				12.5			UNWEATHERED SILTSTONE F-C GRAVEL.							
3	13.0	13.3	12.5	14.0	4		PARTIALLY WEATHERED SILTSTONE.	50/4"					>50	
							GRINDING AT 12.5'.							
							AUGER REFUSAL AT 14.0'. OFF-SET BORING 24' TO THE NW AND							
							CONTINUOUSLY AUGERED TO AUGER REFUSAL AT 12.0.							
							CAVED AT 12.0'.							

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.



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 Newark, Delaware 19713  
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**TEST BORING LOG**

Project Name: SUNOCO PENNSYLVANIA PIPELINE PROJECT			Project No.: 103IP3406		
Project Location: WEST SIDE OF RAYSTOWN LAKE, PA			Page 1 of 1		
HDD No.: S2-0150		Dates(s) Drilled: 09-16-14		Inspector: E. WATT	
Boring No.: SB-02		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. (ft)	Strata (USCS)	Description of Materials	6" Increment Blows *				N	
	From	To	From	To									
			0.0	0.3			TOPSOIL (3")						
1	3.0	3.9	0.3			SM	DR WEATHERED TO A REDDISH BROWN FINE SAND WITH A LITTLE SILT, WITH SOME UNWEATHERED F-C SILTSTONE GRAVEL.	5	50/5"				>50
				5.0	6		AUGER REFUSAL AT 5.0'.						
							<u>ROCK CORING</u>						
RUN 1	5.0	7.0	5.0		24	ROCK	HIGHLY FRACTURED REDDISH BROWN SILTSTONE, TRACE MICA.	TCR: 100%, SCR: 54%, RQD: 17%					
							FRACTURE ZONES: 5.0 TO 5.27', 6.44', AND INDIVIDUAL FRACTURES EVERY .1 TO .2' BETWEEN 5.27 TO 6.2'.						
RUN 2			7.0		60		HIGHLY FRACTURED REDDISH BROWN SILTSTONE, TRACE MICA.	TCR: 100%, SCR: 31%, RQD: 0%					
				12.0			FRACTURED THROUGHOUT, SOLID RECOVERY RANGES FROM 1" TO 3". MOST CORE SECTIONS <1".						
RUN 3	12.0	16.0	12.0		45		HIGHLY FRACTURED REDDISH BROWN SILTSTONE, TRACE MICA.	TCR: 94%, SCR: 54%, RQD: 29%					
				16.0			FRACTURE ZONES: 12.0 TO 13.2' AND 13.9 TO 14.3'; INDIVIDUAL FRACTURES AT 13.56', 14.5', 14.95', 15.14', 15.24' AND 15.45'.						
							CAVED AND DRY AT 5'.						
							<u>CORE TESTING RESULTS (DEPTH 15.7'):</u>						
							COMPRESSIVE STRENGTH: 6,280 PSI						
							UNIT WEIGHT: 167.0 PCF						

Notes/Comments:

Pocket Pentrometer Testing  
 S1: >4 TSF

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**

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 fax: 302.454.5988

**TEST BORING LOG**

Project Name: SUNOCO PENNSYLVANIA PIPELINE PROJECT			Project No.: 103IP3406		
Project Location: WEST SIDE OF RAYSTOWN LAKE, PA			Page 1 of 1		
HDD No.: S2-0150		Dates(s) Drilled: 09-17-14		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): 30.0

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.						
1	3.0	5.0	0.0		18	SM	DR WEATHERED TO A TAN TO BROWN FINE SAND, TRACE FINE GRAVEL.	2	14	15	13	29	
2	8.0	10.0			11		DR WEATHERED TO A TAN TO BROWN FINE SAND, WITH SOME FINE TO COARSE SILTSTONE GRAVEL.	14	18	15	16	33	
3	13.0	13.9		16.0	11	CL	DR WEATHERED TO A LIGHT BROWN TO ORANGE BROWN FINE SAND, WITH SOME F-C SANDSTONE? GRAVEL.	6	50/5"			>50	
4	18.0	18.8	16.0		10		DR WEATHERED TO A REDDISH BROWN CLAY AND FINE SAND, TRACE TO A LITTLE FINE SILTSTONE GRAVEL. (USCS: CL)	16	50/4"			>50	
5	23.0	23.9			11	CL	DR WEATHERED TO A REDDISH BROWN CLAY AND FINE SAND, TRACE TO A LITTLE FINE SILTSTONE GRAVEL.	3	50/5"			>50	
6	28.0	28.4		30.0	6		DR WEATHERED TO A REDDISH BROWN CLAY AND FINE SAND, TRACE TO A LITTLE FINE SILTSTONE GRAVEL.	50/5"				>50	
							AUGERED TO 30'.						
							CAVED AND DRY AT 27'.						
							CONCRETE PLUG PLACED FROM 1' TO 4' BGS.						

Notes/Comments:  
Pocket Pentrometer Testing DR: DECOMPOSED ROCK  
 S4-S6: >3 TSF

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 S2-0150 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, %	
S2-0150	SB-01	1	3.0	5.0	13.6	46.3	-	-	-	-
		2	8.0	8.9	6.4	22.2	-	-	-	-
		3	13.0	13.3	1.6	8.2	-	-	-	-
	SB-02	1	3.0	3.9	2.2	19.7	-	-	-	-
		2	8.0	10.0	2.3	8.2	-	-	-	-
	SB-04	4	18.0	18.8	5.6	67.0	28	17	11	CL
		6	28.0	28.4	4.6	55.8	-	-	-	-

Notes:

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

Sunoco Pennsylvania Pipeline Project  
Regional Geological Description  
HDD S2-0150 Raystown 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	NOTES / COMMENTS
S2-0150	Raystown Lake	SB-01	Catskill Fm - succession of greenish-gray-red sandstone, siltstone, shale, and mudstone, generally in fining-upward cycles.	Lake	Catskill Fm	Sandstone-siltstone-shale-conglomerate	900-3,900	39-46	Bedding ranges in thickness from <1ft to 16 ft.
		SB-02							
		SB-03							
		SB-04							

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

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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					
S2-0150	SB-2	1	5	7	100	54	13							
S2-0150	SB-2	2	7	12	100	31	0	5	16	Moderate	Siltstone	11+	Red	Heavily fractured throughout boring; dip angles range from 0° to 70°; slight laminations visible; fractures do not orient to lamination
S2-0150	SB-2	3	12	16	94	54	29							