



SUNOCO PIPELINE
535 Fritztown Road
Stinking Spring, PA 19608

October 16, 2017

Ms. Dana Drake, P.E.
Environmental Program Manager
Waterways & Wetlands Program
PA Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

**Re: Wetland C-17 Crossing, Horizontal Directional Drill Location (S2-0075)
Hydrological Reevaluation Report
PADEP Permit No. E11-352
Cambria Township, Cambria County**

Dear Ms. Drake:

SPLP Logistics, L.P. ("SPLP") submitted to the Department the above-referenced Reevaluation Report which meets all of the requirements of a reevaluation report as set forth in the Corrected Stipulated Order issued by the Environmental Hearing Board dated August 10, 2017 (the "Order"). By letter dated October 10, 2017, you transmitted the Department's response to the above-referenced Reevaluation Report, which requested five categories of additional information. Please accept this letter in response to your letter, with each of the Department's requests for information set forth in **bold** below, followed by the response.

- 1. The underground mining information provided is not complete. An underground mine, Rosebud Coal Company's Madison Mine in the Upper Freeport Coal Seam exists near the alignment and should be considered and discussed. Potential subsidence effects to the HDD construction and future integrity of the pipeline should be considered and discussed.**

SPLP contacted Rosebud Coal Company and obtained the currently permitted, and potential future, coal mining plans, and information on mine subsidence monitoring in the area of the Wetland C17 HDD. Attached is a technical report prepared by Groundwater and Environmental Services, Inc. (GES) that evaluates the potential effects of current and foreseeable mining operations on this section of the Mariner II pipeline installation. Based on that report, SPLP does not believe that current or potential future coal mining below the proposed pipeline alignment

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will result in any potential material subsidence effects to the HDD construction or have any impact on future pipeline integrity.

2. **While geotechnical borings have been provided, neither boring reaches the strata that will be penetrated by the majority of the length of the horizontal borings. Please provide geotechnical boring information for the strata that will be penetrated by the majority of the horizontal borings.**

Attached for your review are two geologic investigation cores obtained in near vicinity to the Wetland C17 HDD provided by Rosebud Coal Company. Notes have added to identify the depth of the HDD on these profiles. Core MAD 13-14 was obtained 450 foot south-southwest of the HDD's west exit point. Core MAD 15-016 was obtained 1,100 foot southeast of the HDD's east entry point. SPLP has not identified any geologic data on these cores that would induce a redesign of the HDD profiles as submitted.

3. **Please include a discussion and conclusion regarding the possible effects, or lack thereof, on the 25-acre impoundment located approximately 50 horizontal feet north of the alignment.**

The planned HDD profile occurs at a slight offset to the south edge of the 25-acre impoundment, and dam creating this impoundment, at a depth of 125 foot below the ground surface, at or near the middle of the HDD profile. Based upon SPLP calculations of drilling pressures and rock fracture strength, the impoundment is located over the HDD profile within the zone of least potential effect and greatest bedrock strength. The calculated HDD pressure versus rock fracture pressure at the profile depth under this surface feature has a 60 pounds per square inch (psi) buffer. Accordingly, the use of standard drilling practices during this HDD should result in no effect to this impoundment.

4. **Provide confirmation that you identified all water supplies within 450 feet from the HDD alignment.**
 - a. **Confirm that you provided the proper and adequate notice to all property owners within 450 feet from the HDD alignment and asked for their water supply information.**
 - b. **Provide all documentation from item 1.a.**
 - c. **Provide the property owners' responses to the notifications.**

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In accordance with the terms of the Order, SPLP has identified all landowners with property located within 450 feet of the HDD alignment. SPLP sent each of these landowners a notification letter via both certified and first class mail that includes an offer to sample the landowner's private water supply/well in accordance with the terms of the Order and the Water Supply Assessment, Preparedness, Prevention and Contingency Plan. SPLP requested each landowner contact the Right-of-Way agent for the local area and provide SPLP with information regarding: (1) whether the landowner has a well, (2) where that well is located, and (3) if the landowner would like to have the well sampled. A sample landowner notice letter is attached to this letter.

There is no requirement in the Order to provide this information along with the reevaluation reports to the Department's Regional Offices. Instead, in accordance with paragraph 10 the Order, copies of the certified mail receipts for the letters sent to landowners for each HDD location have already been provided to Karyn Yordy, Executive Assistant, Office of Programs at the Department's Central Office. If the Department's Regional Offices now request a copy of the certified mail receipts, we suggest that you contact Ms. Yordy directly.

With respect to the HDD which was the subject of the above-referenced reevaluation report, there are four landowners with property located within 450 feet of the HDD alignment. Each of these four landowners was sent a landowner notice letter requesting information on their private water supply/well on September 19, 2017. To date, no responses have been received.

5. Provide discussion and consideration of potential risks to private water supplies.

There is no requirement in the Order that the reevaluation reports include a discussion and consideration of potential risks to private water supplies. Instead, the Department agreed that the Order require, among other things, that (1) SPLP be required to send the reevaluation reports to all landowners who have a private water supply that are located within 450 feet of an horizontal directional drill ("HDD") (*see* Paragraph 7 of the Order); (2) SPLP notify landowners within 450 feet of an HDD of the start or restart of an HDD prior to 10 days of the start or restart of the HDD (*see* Paragraph 8 of the Order); (3) SPLP offer those landowners with private water supplies within 450 feet of the HDD the opportunity to have their private water supplies tested by SPLP before, during and after the start or restart of the HDD (*see* Paragraph 8 of the Order); and, (4) the Water Supply Assessment, Preparedness, Prevention and Contingency Plan (the "Water Supply Plan") be followed in instances where there was any report of an effect to a private well from any landowner, which requirements include reporting to the Department.

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SPLP has followed all of these requirements for any and all its HDDs, and as you may know, has provided in other instances alternate water supplies (e.g., bottled water and water buffaloes) to any landowner who makes a water supply complaint. In this way, SPLP has properly, and in accordance with the Order and Department-approved Water Supply Plan, considered and mitigated any potential risks to private water supplies.

In addition, the reevaluation reports are sent for review to the landowners and the Department 21 days prior to the Department's determination on the reevaluation report, whereas the notice to landowners regarding SPLP's offer to test their private water well, and inform SPLP that they have one, is sent thereafter, a minimum of 10 days prior to the start or restart of the HDD. The timing of these letters are further indication that the Order does not require that the reevaluation reports include a discussion and consideration of potential risks to private water supplies, and instead demonstrates that the Order provides other safeguards to private water supplies, as described above.

By sending this response to the Department's comments to the referenced Reevaluation Report, we request that the Department now approve this Reevaluation Report.

Sincerely,



Matthew Gordon
Project Director

Enclosures

cc: Monica Styles, SPLP
Larry Gremminger, Gremminger and Associates, Inc.
Brad Schaeffer, Tetra Tech, Inc.
Rob Simcik, Tetra Tech, Inc.

ATTACHMENTS



October 11, 2017

Larry Gremminger
Gremminger and Associates, Inc.
226 South Live Oak Street
Bellville, Texas 77418

Re: Response to comments
HDD Reevaluation Report for S2-0075
Wetland CC17, Cambria Township, Cambria County, PA

Dear Mr. Gremminger:

The purpose of this letter is to provide a response to preliminary comments received from the Pennsylvania Department of Environmental Protection (DEP) for the above referenced Hydrogeologic Reevaluation Report (HRR), concerning the presence of deep coal mining in the area of HDD S2-0075. The preliminary comments were discussed with PADEP technical reviewers Jon Smoyer and Rich Beam at their office in Ebensburg, PA on Tuesday, October 3, 2017.

At the suggestion of PADEP, GES contacted Rosebud Mining Company for information related to local deep coal mining. Rosebud Mining provided GES with a map (Attachment A) showing the general limits of Lower Kittanning (B seam) coal mining, precise locations for current Upper Freeport (E seam) coal mining, and limits defined in a current application for extension of the Upper Freeport coal mine, pending approval from PADEP. Rosebud plotted the entry/exit positions for the planned HDDs (20-inch and 16-inch, together referred to as HDD S2-0075) on the map, as well. In addition, Rosebud Mining provided geologic logs for four test borings advanced proximal to the planned HDD alignment.

On Attachment A, the limits of Lower Kittanning coal mining are shown by the solid red-brown lines (Mine 31 and Mine 33). Historic Lower Kittanning coal mining surrounds the proposed alignment to the west, north and east but does not underlie the planned alignment. The deepest part of the HDD profile along the planned alignment is at elevation 1,930 feet above mean sea level (ft amsl) and the base of the Lower Kittanning coal is approximately between 1600 and 1650 ft amsl as shown by Glover, Coal Resources of Cambria and Blair Counties, Part 1, Pa. Geol. Surv. 4th Ser., MRR 96., 1990.

On Attachment A, the current limits of Upper Freeport coal mining are shown as the grey pattern of mine workings (Madison E seam mine and works (Active)), south of the HDD S2-0075 alignment, and do not underlie the planned HDD. The limits of Rosebud Mining's active permit to mine Upper Freeport coal is shown as a red dashed line highlighted in yellow (Madison Active Permit). The current active permit would not allow expansion to the northeast under the planned alignment for the HDD. Also shown on Attachment A are grey parallel lines indicating the

paths of anticipated future mine workings in the Upper Freeport coal which are part of the current mine permit application by Rosebud Mining that is being reviewed by PADEP for expansion of the Upper Freeport workings northeast (Madison Permit Extension Area). Some of the paths for anticipated future E seam workings pass under the proposed alignment for HDD S2-0075.

Using the information shown on the test boring logs provided by Rosebud Mining (Attachment B) it is estimated that the top of the Upper Freeport coal seam is at approximate elevation 1812 ft amsl at the east entry/exit of the planned profile of S2-0075 and at approximate elevation 1794 ft amsl at the west entry/exit location (see Attachment C). The profile shows the deepest part of the pipe installations will be in the middle of the HDD profile at elevation 1930 ft amsl. Using the existing information it is estimated that the shortest distance between the top of the Upper Freeport coal and HDD profile will be approximately 120 feet at Station 22+00. Note, these estimates of Upper Freeport coal position are based on the surface of the top of the coal projected from information provided on the four boring logs provided by Rosebud Mining. Estimates of coal position elevation are dependent upon the surface elevations reported on the logs. According to Rosebud Mining the surface elevation for MAD 13-08, which is listed to the nearest hundredth of a foot, was supplied by a professional survey. The surface elevations for the three remaining logs (MAD 15-007, MAD 15-0016 and MAD 13-14) were taken off of topographic mapping obtained by Rosebud Mining and are accurate to +/- 5 feet. Taking this into consideration, a conservative estimate of the closest distance between the profile and the top of the Upper Freeport coal would be approximately 115 feet.

Rosebud Mining has not observed evidence of mine subsidence at the surface in the region of HDD S2-0075 from E seam mine collapse. The coal is estimated to be 3 to 3.5 feet thick in the region and mining does not extract more than the coal thickness except in the main trunks where equipment access, repair and maintenance might require limited additional space.

Based on the pattern of mine workings shown for the Madison E seam mine and works (Active) on Attachment A, Rosebud Mining has been using room and pillar or conventional mining practices to extract E seam coal. This practice leaves support pillars that can protect structures like the unnamed pond due north of the HDD alignment, State Route 219 over the HDD alignment, existing petroleum pipelines in the corridor and the two planned HDD pipelines for the Mariner East II project. Sunoco Pipeline, L. P. should interface with Rosebud mining to assure that the details of the permitted mine plan will provide enough subsurface support to eliminate unacceptable risk of stress on the two ME II pipelines from mine roof collapse and subsidence.



Response to comments
HDD Reevaluation Report for S2-0075
October 11, 2017

Sincerely,
Groundwater & Environmental Services, Inc.

A handwritten signature in blue ink that reads "Richard T. Wardrop". The signature is written in a cursive, flowing style.

Richard T. Wardrop, P. G
Senior Hydrogeologist

Attachments

ATTACHMENT A

HDD S2-0075 Local Deep Coal Mine Map

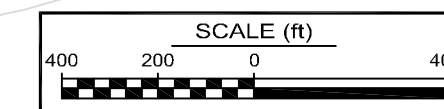
Mine 31

Mine 33

Madison Permit Extension Area

Madison Active Permit -

**Madison E seam mine and works
(Active)**



ATTACHMENT B

Geotechnical Boring Logs

Alpha Natural Resources - Lithology for Corehole MAD13-08

Hole Type:	Core Hole	Location:		North_CCC:		Latitude 27:	0.00000000	Surface Elevation:	2,149.19
North_SPC:	403,818.58	North_Loc:	0.00	East_CCC:		Longitude 27:	0.00000000	Drill Date:	7/22/2013
East_SPC:	1,682,182.32	East_Loc:	0.00						

Top Elev	Top Depth	Thick	Bot Depth	Bot Elev	Total Coal	Lith Code	Enhanced Log Description	Strata Name	Strata	Bn	Sp	Comments
2,149.19	0.00	23.00	23.00	2,126.19		301	SANDY SHALE, brownish gray					
2,126.19	23.00	7.50	30.50	2,118.69		301	SANDY SHALE, medium to dark gray					
2,118.69	30.50	20.50	51.00	2,098.19		301	SANDY SHALE, medium gray					
2,098.19	51.00	41.40	92.40	2,056.79		500	SANDSTONE UNDEFIND, gray					
2,056.79	92.40	1.60	94.00	2,055.19		124	DARK SHALE					
2,055.19	94.00	14.00	108.00	2,041.19		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
2,041.19	108.00	15.00	123.00	2,026.19		333	GRAY SANDY SILT SHALE, medium gray					
2,026.19	123.00	18.00	141.00	2,008.19		500	SANDSTONE UNDEFIND					
2,008.19	141.00	1.00	142.00	2,007.19		323	SANDY SHALE W/SANDSTONE STREAKS with coal streaks or bands, dark gray					
2,007.19	142.00	12.50	154.50	1,994.69		749	SANDSTONE W/COAL STREAKS					
1,994.69	154.50	8.50	163.00	1,986.19		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
1,986.19	163.00	31.50	194.50	1,954.69		322	INTERBEDDED SS & DARK SILT SHALE					
1,954.69	194.50	12.00	206.50	1,942.69		500	SANDSTONE UNDEFIND, gray					
1,942.69	206.50	5.00	211.50	1,937.69		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
1,937.69	211.50	2.80	214.30	1,934.89		543S	SHALEY SANDSTONE, gray					
1,934.89	214.30	4.70	219.00	1,930.19		301	SANDY SHALE, medium to dark gray					
1,930.19	219.00	5.00	224.00	1,925.19		124	DARK SHALE					
1,925.19	224.00	13.50	237.50	1,911.69	0.00	129	MARINE ZONE - DARK GRAY CLAY SHALE	Pine Creek marine zone	PCMZ			
1,911.69	237.50	1.50	239.00	1,910.19		124	DARK SHALE					
1,910.19	239.00	14.00	253.00	1,896.19		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
1,896.19	253.00	18.60	271.60	1,877.59		124	DARK SHALE					
1,877.59	271.60	0.50	272.10	1,877.09	0.00	894	MARINE ZONE - LIMESTONE	Brush Creek marine zone	BCMZ			
1,877.09	272.10	0.50	272.60	1,876.59	0.50	020	BRIGHT COAL	Brush Creek coal bed	BCC			
1,876.59	272.60	33.90	306.50	1,842.69		301	SANDY SHALE, gray					
1,842.69	306.50	53.00	359.50	1,789.69		301	SANDY SHALE, medium to dark gray					
1,789.69	359.50	9.20	368.70	1,780.49	0.00	500	SANDSTONE UNDEFIND, gray	Mahoning sandstone	MHSS			
1,780.49	368.70	15.95	384.65	1,764.54	0.00	544	SANDSTONE - MASSIVE-BEDDED micaceous, medium gray, coarse to medium grained, sharp basal contact - erosional	Mahoning sandstone	MHSS			
1,764.54	384.65	0.95	385.60	1,763.59		124	DARK SHALE with silt streaks or bands, pyritic-desseminated streaks or blebs, silty at base of interval gradational basal contact					
1,763.59	385.60	2.00	387.60	1,761.59		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray, silt to very fine-grained, planar-bedded with slightly churned bedding, gradational basal contact					
1,761.59	387.60	0.55	388.15	1,761.04		114	BLACK SHALE, sharp basal contact BRIGHT COAL					
1,761.04	388.15	2.20	390.35	1,758.84	0.00	008	LOST COAL	Upper Freeport coal bed	UFC			

Alpha Natural Resources - Lithology for Corehole MAD13-08

Hole Type:	Core Hole	Location:		North_CCC:		Latitude 27:	0.00000000	Surface Elevation:	2,149.19
North_SPC:	403,818.58	North_Loc:	0.00	East_CCC:		Longitude 27:	0.00000000	Drill Date:	7/22/2013
East_SPC:	1,682,182.32	East_Loc:	0.00						

Top Elev	Top Depth	Thick	Bot Depth	Bot Elev	Total Coal	Lith Code	Enhanced Log Description	Strata Name	Strata	Bn	Sp	Comments
1,758.84	390.35	0.25	390.60	1,758.59		124	DARK SHALE silty, carbonaceous at top of interval sharp basal contact - irregular					
1,758.59	390.60	1.85	392.45	1,756.74		324	SANDY SHALE MASSIVE w/ finely dess. mica flakes, fossiliferous-plant fossils, dark gray, massive-bedded with rootworking, sharp basal contact					
1,756.74	392.45	4.85	397.30	1,751.89		333	GRAY SANDY SILT SHALE with sandstone streaks or bands, siderite patches, medium to dark gray, silt to fine-grained becomes lighter in color downward, planar-bedded bioturbated, sand/silt content increasing downward gradational basal contact					
1,751.89	397.30	2.90	400.20	1,748.99		332	INTERBEDDED SS & SILT SHALE siderite patches, w/ finely dess. mica flakes, medium gray, fine to very fine grained, planar-bedded with soft sediment deformation, basal contact not sampled					
1,748.99	400.20	8.30	408.50	1,740.69		301	SANDY SHALE, dark gray					
1,740.69	408.50	17.00	425.50	1,723.69		500	SANDSTONE UNDEFIND					
1,723.69	425.50	23.10	448.60	1,700.59		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
1,700.59	448.60	1.95	450.55	1,698.64	0.00	543S	SHALEY SANDSTONE micaceous, medium to dark gray, medium to fine grained, massive-bedded, increasingly shaley downward gradational basal contact	Butler sandstone		BTSS		
1,698.64	450.55	1.65	452.20	1,696.99	0.00	333	GRAY SANDY SILT SHALE with sandstone streaks or bands, medium to dark gray, silt to fine-grained, planar-bedded with churned bedding, sand/silt content increasing downward gradational basal contact	Butler sandstone		BTSS		
1,696.99	452.20	4.35	456.55	1,692.64	0.00	543S	SHALEY SANDSTONE micaceous, medium to dark gray, coarse to medium grained, planar-bedded with slightly churned bedding, occasional, sandstone streaks, at base of interval, sharp basal contact - irregular	Butler sandstone		BTSS		
1,692.64	456.55	10.20	466.75	1,682.44	0.00	544	SANDSTONE - MASSIVE-BEDDED micaceous, w/ shale clasts and pebbles interbedded, medium gray, coarse to medium grained, massive-bedded, sporadic, silt streaks, throughout interval, sharp basal contact	Butler sandstone		BTSS		
1,682.44	466.75	1.25	468.00	1,681.19	0.00	749	SANDSTONE W/COAL STREAKS micaceous, w/ shale clasts and pebbles interbedded, medium gray, coarse to medium grained, massive-bedded, sharp basal contact - erosional	Butler sandstone		BTSS		
1,681.19	468.00	0.40	468.40	1,680.79	0.40	020	BRIGHT COAL with 2 cleats well developed, moderate to bright luster, sharp basal contact	Lower Freeport coal bed		LFC		
1,680.79	468.40	0.12	468.52	1,680.67	0.00	114	BLACK SHALE, sharp basal contact	Lower Freeport coal bed		LFC		
1,680.67	468.52	1.88	470.40	1,678.79	1.88	020	BRIGHT COAL with 2 cleats well developed, moderate to bright luster, blocky, sharp basal contact	Lower Freeport coal bed		LFC		
1,678.79	470.40	0.35	470.75	1,678.44		124	DARK SHALE slightly argillaceous, sharp basal contact					
1,678.44	470.75	1.30	472.05	1,677.14	0.00	804	ARGILLACEOUS LIMESTONE, medium to dark gray, becomes darker in color downward, massive-bedded, sharp basal contact - irregular	Lower Freeport limestone		LFLS		

Alpha Natural Resources - Lithology for Corehole MAD13-08

Hole Type:	Core Hole	Location:		North_CCC:		Latitude 27:	0.00000000	Surface Elevation:	2,149.19
North_SPC:	403,818.58	North_Loc:	0.00	East_CCC:		Longitude 27:	0.00000000	Drill Date:	7/22/2013
East_SPC:	1,682,182.32	East_Loc:	0.00						

Top Elev	Top Depth	Thick	Bot Depth	Bot Elev	Total Coal	Lith Code	Enhanced Log Description	Strata Name	Strata	Bn	Sp	Comments
1,677.14	472.05	0.70	472.75	1,676.44	0.00	234	CALCAREOUS (LIMEY) SHALE with calcareous nodules, with slickensided fractures, medium to dark gray, planar-bedded with churned bedding, sharp basal contact	Lower Freeport limestone	LFLS			
1,676.44	472.75	0.45	473.20	1,675.99	0.00	904	MASSIVE-BEDDED LIMESTONE with shale streaks or interbeds, medium gray, massive-bedded, sharp basal contact	Lower Freeport limestone	LFLS			
1,675.99	473.20	0.10	473.30	1,675.89	0.00	134	GRAY SHALE, medium to dark gray, sharp basal contact	Lower Freeport limestone	LFLS			
1,675.89	473.30	0.15	473.45	1,675.74	0.00	804	ARGILLACEOUS LIMESTONE, medium to dark gray, sharp basal contact	Lower Freeport limestone	LFLS			
1,675.74	473.45	0.35	473.80	1,675.39	0.00	124	DARK SHALE, planar-bedded with slightly churned bedding, sharp basal contact	Lower Freeport limestone	LFLS			
1,675.39	473.80	2.00	475.80	1,673.39	0.00	804	ARGILLACEOUS LIMESTONE w/ freshwater bivalve shell fossils, medium gray, massive-bedded with churned bedding, sharp basal contact - irregular	Lower Freeport limestone	LFLS			
1,673.39	475.80	2.90	478.70	1,670.49		137	GRAY CLAYSTONE with slickensided fractures, mottled gray, massive-bedded bioturbated, increasingly shaley downward gradational basal contact					
1,670.49	478.70	1.40	480.10	1,669.09		134	GRAY SHALE with sideritic veins and infillings, medium gray, planar-bedded with churned bedding, basal contact not sampled					
1,669.09	480.10	2.90	483.00	1,666.19		301	SANDY SHALE, medium to dark gray, total depth - bottom contact not sampled					
Thick =		483.00	483.00	483.00	2.78							

Alpha Natural Resources - Lithology for Corehole MAD13-14

Hole Type: Core Hole
North_SPC: 402,470.00
East_SPC: 1,683,250.00
Location:
North_Loc: 0.00
East_Loc: 0.00
North_CCC:
East_CCC:
Latitude 27: 0.00000000
Longitude 27: 0.00000000
Surface Elevation: 0.00
Drill Date: 9/10/2013

Top Elev	Top Depth	Thick	Bot Depth	Bot Elev	Total Coal	Lith Code	Enhanced Log Description	Strata Name	Strata	Bn	Sp	Comments
0.00	0.00	63.70	63.70	-63.70		500	SANDSTONE UNDEFIND, brownish gray					
-63.70	63.70	12.80	76.50	-76.50		124	DARK SHALE					
-76.50	76.50	10.50	87.00	-87.00	0.00	129	MARINE ZONE - DARK GRAY CLAY SHALE	Woods Run marine zone	WRMZ			
-87.00	87.00	20.30	107.30	-107.30		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
-107.30	107.30	2.20	109.50	-109.50		124	DARK SHALE					
-109.50	109.50	0.70	110.20	-110.20	0.70	020	BRIGHT COAL	Pine Creek coal bed	PCC			
-110.20	110.20	12.80	123.00	-123.00		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
-123.00	123.00	21.70	144.70	-144.70		500	SANDSTONE UNDEFIND, gray					
-144.70	144.70	43.30	188.00	-188.00		301	SANDY SHALE, medium to dark gray					
-188.00	188.00	15.00	203.00	-203.00		500	SANDSTONE UNDEFIND, gray					
-203.00	203.00	28.70	231.70	-231.70		301	SANDY SHALE, medium to dark gray					
-231.70	231.70	3.10	234.80	-234.80		093	SANDY FLINT CLAY with slickensided fractures, tan gray, planar-bedded with convoluted bedding, sharp basal contact					
-234.80	234.80	6.55	241.35	-241.35		333	GRAY SANDY SILT SHALE with sandstone streaks or bands, with sideritic veins and infillings, medium gray, silt to fine-grained, planar-bedded with churned bedding, sand/silt content decreasing downward sharp basal contact					
-241.35	241.35	3.95	245.30	-245.30		543K	SANDSTONE W/ SHALE STREAKS micaceous, medium gray, medium to fine grained, planar-bedded, increasingly shaley downward gradational basal contact					
-245.30	245.30	2.20	247.50	-247.50		333	GRAY SANDY SILT SHALE with sandstone streaks or bands, siderite patches, medium to dark gray, silt to very fine-grained, planar-bedded with slightly churned bedding, sharp basal contact					
-247.50	247.50	3.05	250.55	-250.55		124	DARK SHALE with silt streaks or bands, parts easily along bedding planes, planar-bedded, sharp basal contact					
-250.55	250.55	0.45	251.00	-251.00		114	BLACK SHALE, sharp basal contact					
-251.00	251.00	2.00	253.00	-253.00	2.00	020	BRIGHT COAL with 2 cleats well developed, with fusain streaks or bands, moderate to bright luster, blocky, friable, sharp basal contact	Upper Freeport coal bed	UFC			
-253.00	253.00	0.10	253.10	-253.10	0.00	114	BLACK SHALE, sharp basal contact	Upper Freeport coal bed	UFC			
-253.10	253.10	1.10	254.20	-254.20	1.10	020	BRIGHT COAL with 2 cleats well developed, pyritic-desseminated streaks or blebs, moderate to bright luster, blocky, friable, sharp basal contact	Upper Freeport coal bed	UFC			
-254.20	254.20	0.35	254.55	-254.55		127	DARK GRAY CLAYSTONE with carbonaceous streaks or bands, with slickensided fractures, massive-bedded with rootworking, silty at base of interval gradational basal contact					
-254.55	254.55	1.00	255.55	-255.55		324	SANDY SHALE MASSIVE w/ finely dess. mica flakes, fossiliferous-plant fossils, dark gray, silt to fine-grained, sharp basal contact					
-255.55	255.55	1.20	256.75	-256.75		543S	SHALEY SANDSTONE micaceous, medium gray, medium to fine grained, massive-bedded with burrowing, increasingly shaley downward sharp basal contact - irregular					

2059 ft amsl as per
C. Rinaman -
Rosebud Mining

Alpha Natural Resources - Lithology for Corehole MAD13-14

Hole Type: Core Hole	Location:		
North_SPC: 402,470.00	North_Loc: 0.00	North_CCC:	Latitude 27: 0.00000000
East_SPC: 1,683,250.00	East_Loc: 0.00	East_CCC:	Longitude 27: 0.00000000
			Surface Elevation: 0.00
			Drill Date: 9/10/2013

Top Elev	Top Depth	Thick	Bot Depth	Bot Elev	Total Coal	Lith Code	Enhanced Log Description	Strata Name	Strata	Bn	Sp	Comments
-256.75	256.75	3.50	260.25	-260.25		333	GRAY SANDY SILT SHALE with sandstone streaks or bands, siderite patches, medium to dark gray, silt to fine-grained, planar-bedded with churned bedding, sand/silt content decreasing downward sharp basal contact					
-260.25	260.25	0.15	260.40	-260.40		114	BLACK SHALE pyritic-desseminated streaks or blebs, sharp basal contact					
-260.40	260.40	1.70	262.10	-262.10		124	DARK SHALE with silt streaks or bands, siderite patches, planar-bedded with slightly churned bedding, gradational basal contact					
-262.10	262.10	0.80	262.90	-262.90		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray, silt to very fine-grained, planar-bedded, sharp basal contact					
-262.90	262.90	0.35	263.25	-263.25		543K	SANDSTONE W/ SHALE STREAKS micaceous, with carbonaceous streaks or bands, medium gray, coarse to fine grained, sharp basal contact - erosional					
-263.25	263.25	0.65	263.90	-263.90		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray, silt to very fine-grained fining downward, planar-bedded with slightly churned bedding, sand/silt content decreasing downward basal contact not sampled					
-263.90	263.90	4.10	268.00	-268.00		301	SANDY SHALE, medium to dark gray, total depth - bottom contact not sampled					
Thick =		268.00	268.00	268.00	3.80							

Rosebud Mining Company Drill Record

Drillhole: MAD15-007	Spotted Latitude: 40 26 28.7	Township: Cambria
Project: Madison	Spotted Longitude: 78 46 15.8	County: Cambria
Date Started: 5/26/2015	Spotted Elevation: 2150	Surface Owner: Stager
Date Completed: 5/27/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 162' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - UF 389'9", 390'0", 392'4", 392'6", 396'8", 398'4-1/2", 401'10", 403'4" - LF 452'10" thru 453'5", 454'1", 455'11", 458'7" -- Water Loss 87' 8"		Estimated from Rosebud Topographic Mapping

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
23.00	23.00	2127	Casing
6.17	29.17	2121	Gray / Green Claystone - Iron Stained
6.17	35.33	2115	Gray / Green Clayshale - Some Iron Stained
1.67	37.00	2113	Dark Gray Clayshale
5.75	42.75	2107	Gray / Green Claystone
1.58	44.33	2106	Green & Red Fireclay
4.33	48.67	2101	Gray / Green Shale - Some Iron Stained
16.67	65.33	2085	Gray / Green Shale W/ Sand Streaks
6.75	72.08	2078	Gray / Green Shale
3.42	75.50	2075	Dark Gray Shale W/ Sand Streaks
0.33	75.83	2074	Light Gray Shale W/ Sand Streaks
1.75	77.58	2072	Gray Sandstone W/ Shale Streaks
0.58	78.17	2072	Dark Gray Shale
1.83	80.00	2070	Light Gray Shale
2.42	82.42	2068	Dark Gray Shale W/ Sand Streaks
5.25	87.67	2062	Gray Sandstone W/ Coal Streaks
4.08	91.75	2058	Dark Gray Shale W/ Sand Streaks
2.67	94.42	2056	Dark Gray Shale - Laminated
0.83	95.25	2055	Black Shale - Fractured
1.75	97.00	2053	Gray / Green Claystone
8.17	105.17	2045	Gray / Green Limey Claystone
12.08	117.25	2033	Gray / Green Claystone - Slickensided
5.25	122.50	2028	Gray / Green Shale
9.67	132.17	2018	Gray / Green Shale W/ Sand Streaks
0.92	133.08	2017	Gray Sandstone W/ Shale Streaks
8.00	141.08	2009	Dark Gray Shale W/ Innerbedded Sand
20.50	161.58	1988	Dark Gray Shale
17.00	178.58	1971	Dark Gray Shale W/ Sand Streaks
2.83	181.42	1969	Dark Gray Shale
1.83	183.25	1967	Gray / Green Shale
0.33	183.58	1966	Dark Gray Shale
0.58	184.17	1966	Gray / Green Shale
13.33	197.50	1953	Gray / Green Shale W/ Sand Streaks
5.33	202.83	1947	Gray Sandstone W/ Shale Streaks
1.67	204.50	1946	Dark Gray Shale W/ Sand Streaks
1.00	205.50	1945	Gray Sandstone W/ Shale Streaks
0.67	206.17	1944	Dark Gray Shale W/ Sand Streaks

Rosebud Mining Company Drill Record

Drillhole: MAD15-007	Spotted Latitude: 40 26 28.7	Township: Cambria
Project: Madison	Spotted Longitude: 78 46 15.8	County: Cambria
Date Started: 5/26/2015	Spotted Elevation: 2150	Surface Owner: Stager
Date Completed: 5/27/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 162' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - UF 389'9", 390'0", 392'4", 392'6", 396'8", 398'4-1/2", 401'10", 403'4" - LF 452'10" thru 453'5", 454'1", 455'11", 458'7" -- Water Loss 87' 8"		

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
6.08	212.25	1938	Gray Sandstone W/ Shale Streaks
3.83	216.08	1934	Dark Gray Shale W/ Sand Streaks & Layers
3.58	219.67	1930	Gray Sandstone W/ Shale Streaks
3.17	222.83	1927	Dark Gray Shale W/ Innerbedded Sand
4.58	227.42	1923	Gray Fine Sandstone W/ Coal Streaks
4.67	232.08	1918	Dark Gray Shale W/ Innerbedded Sand
2.92	235.00	1915	Gray Sandstone W/ Coal Streaks
4.33	239.33	1911	Gray Sandstone W/ Shale Streaks
2.17	241.50	1909	Gray Sandstone W/ Coal Streaks
12.17	253.67	1896	Gray Sandstone W/ Shale Streaks
0.33	254.00	1896	Dark Gray Shale
1.25	255.25	1895	Gray Sandstone W/ Shale Pebbles
0.17	255.42	1895	Dark Gray Shale
0.08	255.50	1895	Coal - Unspecified Seam
1.67	257.17	1893	Green / Gray Shale W/ Sand Streaks
13.25	270.42	1880	Gray / Green Shale
1.50	271.92	1878	Dark Gray Shale
0.50	272.42	1878	Dark Gray Fireclay
21.75	294.17	1856	Gray / Green Shale W/ Sand Streaks
9.83	304.00	1846	Gray Sandstone W/ Shale Streaks
3.58	307.58	1842	Green / Gray Shale
4.17	311.75	1838	Green / Gray Shale W/ Sand Streaks
6.25	318.00	1832	Green / Gray Shale
0.50	318.50	1832	Dark Gray Claystone
6.25	324.75	1825	Green / Gray Claystone
2.42	327.17	1823	Green / Gray Sandy Fireclay
10.83	338.00	1812	Green / Gray Shale W/ Sand Streaks
23.00	361.00	1789	Gray Sandstone W/ Shale Streaks
1.33	362.33	1788	Gray & Dark Gray Clayshale
0.92	363.25	1787	Dark Gray Fireclay
3.17	366.42	1784	Green / Gray Clayshale
7.00	373.42	1777	Green / Gray Limey Shale
10.58	384.00	1766	Gray / Green Limey Fireclay
2.50	386.50	1764	Gray / Green Shale W/ Lime Streaks
1.17	387.67	1762	Gray / Green Shale W/ Sand Streaks
0.50	388.17	1762	Gray Sandstone
1.58	389.75	1760	Green / Gray Flintclay

Rosebud Mining Company Drill Record

Drillhole: MAD15-007	Spotted Latitude: 40 26 28.7	Township: Cambria
Project: Madison	Spotted Longitude: 78 46 15.8	County: Cambria
Date Started: 5/26/2015	Spotted Elevation: 2150	Surface Owner: Stager
Date Completed: 5/27/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 162' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - UF 389'9", 390'0", 392'4", 392'6", 396'8", 398'4-1/2", 401'10", 403'4" - LF 452'10" thru 453'5", 454'1", 455'11", 458'7" -- Water Loss 87' 8"		

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
0.42	390.17	1760	Dark Gray Claystone W/ Coal Streaks
0.67	390.83	1759	Gray / Green Claystone
1.17	392.00	1758	Gray / Green Shale W/ Sand Streaks
1.00	393.00	1757	Gray Sandstone W/ Shale Streaks
1.00	394.00	1756	Gray / Green Shale W/ Sand Streaks
1.00	395.00	1755	Dark Gray Shale
2.50	397.50	1753	Dark Gray Shale W/ Sand Streaks
0.88	398.38	1752	Gray Sandstone W/ Shale Streaks
2.46	400.83	1749	Dark Gray Shale W/ Sand Streaks
2.38	403.21	1747	Dark Gray Shale - Laminated
0.25	403.46	1747	Black Shale
2.04	405.50	1745	Coal - E - Upper Freeport W/ Bone & Pyrite Streaks
0.08	405.58	1744	Bone
0.96	406.54	1743	Coal - E - Upper Freeport W/ Bone Streaks
0.46	407.00	1743	Dark Gray Fireclay
2.67	409.67	1740	Green / Gray Fireclay
2.58	412.25	1738	Dark Gray Shale
0.17	412.42	1738	Gray Sandstone
2.33	414.75	1735	Dark Gray Shale - Few Iron Stained Nodules
4.25	419.00	1731	Dark Gray Shale
0.17	419.17	1731	Bone
0.33	419.50	1731	Dark Gray Shale
0.83	420.33	1730	Light Gray Fireclay
0.25	420.58	1729	Dark Gray Shale
0.92	421.50	1729	Dark Gray Fireclay
9.17	430.67	1719	Gray Shaley Limestone
1.08	431.75	1718	Dark Gray Claystone
3.42	435.17	1715	Gray / Green Claystone
2.25	437.42	1713	Gray / Green Shale W/ Sand Streaks
0.17	437.58	1712	Dark Gray Shale
1.58	439.17	1711	Light Gray Claystone
0.58	439.75	1710	Gray Shale W/ Sand Streaks
2.17	441.92	1708	Light Gray & Dark Gray Fireclay
1.00	442.92	1707	Dark Gray Shale W/ Sand Streaks
9.92	452.83	1697	Light Gray Shale W/ Sand Streaks
8.08	460.92	1689	Gray Sandstone W/ Shale Streaks
0.92	461.83	1688	Coal - D - Lower Freeport W/ Bone Streaks

Rosebud Mining Company Drill Record

Drillhole: MAD15-007	Spotted Latitude: 40 26 28.7	Township: Cambria
Project: Madison	Spotted Longitude: 78 46 15.8	County: Cambria
Date Started: 5/26/2015	Spotted Elevation: 2150	Surface Owner: Stager
Date Completed: 5/27/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 162' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - UF 389'9", 390'0", 392'4", 392'6", 396'8", 398'4-1/2", 401'10", 403'4" - LF 452'10" thru 453'5", 454'1", 455'11", 458'7" -- Water Loss 87' 8"		

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
0.21	462.04	1688	Bone
1.88	463.92	1686	Coal - D - Lower Freeport W/ Bone & Pyrite Streaks
2.17	466.08	1684	Dark Gray Fireclay
2.17	468.25	1682	Gray Shaley Limestone
2.17	470.42	1680	Gray / Green Claystone - Few Limestone Nodules
4.58	475.00	1675	Gray / Green Clayshale

Drillhole: MAD15-007

RQD

From Ft	In	To Ft	In	Interval (In)	Recovery (In)	Modified (+4") Recovery (In)	RQD
0	0	23	0	276	0	0	0%
23	0	26	8	44	7	0	0%
26	8	32	6	70	60	0	0%
32	6	41	6	108	60	13	12%
41	6	55	0	162	162	84	52%
55	0	69	0	168	168	150	89%
69	0	85	0	192	192	145	76%
85	0	100	0	180	180	133	74%
100	0	115	0	180	180	138	77%
115	0	130	0	180	180	164	91%
130	0	145	0	180	180	149	83%
145	0	160	0	180	180	176	98%
160	0	175	0	180	180	166	92%
175	0	190	0	180	180	168	93%
190	0	205	0	180	180	180	100%
205	0	220	0	180	180	170	94%
220	0	235	0	180	180	169	94%
235	0	250	0	180	180	178	99%
250	0	265	0	180	180	167	93%
265	0	280	0	180	180	168	93%
280	0	295	0	180	180	176	98%
295	0	310	0	180	180	180	100%
310	0	325	0	180	180	164	91%
325	0	340	0	180	180	167	93%
340	0	355	0	180	180	180	100%
355	0	370	0	180	180	179	99%
370	0	385	0	180	180	180	100%
385	0	395	0	120	120	109	91%
395	0	403	6	102	102	100	98%
403	6	406	6	36			COAL
406	6	410	0	42	42	38	90%
410	0	425	0	180	180	176	98%
425	0	440	0	180	180	162	90%
440	0	450	0	120	120	116	97%
450	0	460	0	120	120	112	93%
460	0	460	11	11	11	11	100%
460	11	463	11	36			COAL
463	11	475	0	133	133	84	63%

Rosebud Mining Company Drill Record

Drillhole: MAD15-016	Spotted Latitude: 40 26 04.4	Township: Cambria
Project: Madison	Spotted Longitude: 78 45 40.3	County: Cambria
Date Started: 12/8/2015	Spotted Elevation: 2150	Surface Owner: Rossman
Date Completed: 12/10/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 205' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - 297' 6-1/2", 298' 2-1/2", 298' 3", 300' 7", 301' 11", 302' 1" -- Water Loss - 22' 0", 202' 10"		

Estimated from
Rosebud
topographic
mapping

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
16.00	16.00	2134	Casing
16.50	32.50	2118	Gray Sandstone W/ Shale Streaks & Layers - Iron Stained
2.67	35.17	2115	Gray / Green Shale - Some Iron Stained
5.92	41.08	2109	Dark Gray Shale W/ Sand Streaks & Layers
23.58	64.67	2085	Dark Gray Shale
1.83	66.50	2084	Dark Gray Shale W/ Sand Streaks
9.08	75.58	2074	Dark Gray Shale
0.08	75.67	2074	Bone
1.50	77.17	2073	Green / Gray Sandy Fireclay
1.42	78.58	2071	Dark Gray Sandy Fireclay
7.50	86.08	2064	Gray / Green Shale W/ Sand Streaks
12.25	98.33	2052	Gray Sandstone W/ Shale Streaks
1.33	99.67	2050	Gray / Green Shale W/ Sand Streaks
17.17	116.83	2033	Gray Sandstone W/ Shale Streaks
8.83	125.67	2024	Gray Sandstone W/ Coal Spars
0.50	126.17	2024	Gray Sandstone W/ Coal Streaks - Iron Stained
11.58	137.75	2012	Gray Sandstone W/ Coal Streaks
1.08	138.83	2011	Gray Sandstone W/ Shale Streaks
5.33	144.17	2006	Dark Gray Shale W/ Sand Streaks - Very Fractured
4.08	148.25	2002	Gray / Green Shale
9.58	157.83	1992	Light Gray Shale W/ Sand Streaks
1.50	159.33	1991	Gray Sandstone W/ Shale Streaks
19.00	178.33	1972	Dark Gray Shale W/ Sand Streaks
0.67	179.00	1971	Gray Sandstone W/ Shale Streaks
3.92	182.92	1967	Dark Gray Shale W/ Sand Streaks
7.08	190.00	1960	Gray Sandstone - Hard
17.58	207.58	1942	Gray Sandstone W/ Few Coal Streaks - Hard
0.25	207.83	1942	Light Gray Shale
4.67	212.50	1938	Dark Gray Shale W/ Sand Streaks
0.25	212.75	1937	Gray Sandstone W/ Shale Streaks
4.75	217.50	1933	Gray / Green Shale
2.33	219.83	1930	Gray / Green Claystone
2.17	222.00	1928	Light Gray Sandy Claystone
8.50	230.50	1920	Light Gray Shale W/ Sand Streaks
9.50	240.00	1910	Gray Sandstone W/ Shale Streaks
16.58	256.58	1893	Gray Sandstone W/ Shale Streaks - Hard
0.25	256.83	1893	Dark Gray Fireclay

Rosebud Mining Company Drill Record

Drillhole: MAD15-016	Spotted Latitude: 40 26 04.4	Township: Cambria
Project: Madison	Spotted Longitude: 78 45 40.3	County: Cambria
Date Started: 12/8/2015	Spotted Elevation: 2150	Surface Owner: Rossman
Date Completed: 12/10/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 205' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - 297' 6-1/2", 298' 2-1/2", 298' 3", 300' 7", 301' 11", 302' 1" -- Water Loss - 22' 0", 202' 10"		

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
2.42	259.25	1891	Gray / Green Claystone
6.25	265.50	1885	Green / Gray Shale W/ Lime Streaks
1.75	267.25	1883	Green / Gray Shale
2.75	270.00	1880	Gray / Green Shale W/ Sand Streaks
8.42	278.42	1872	Green / Gray & Tan Flintclay
1.25	279.67	1870	Green / Gray Shale
12.50	292.17	1858	Gray Sandstone W/ Shale Streaks
1.17	293.33	1857	Green / Gray Shale
1.42	294.75	1855	Dark Gray Shale
2.25	297.00	1853	Gray Sandstone
1.42	298.42	1852	Dark Gray Shale W/ Sand Streaks
3.75	302.17	1848	Dark Gray Shale - Laminated
1.96	304.12	1846	Coal - E - Upper Freeport W/ Bone & Pyrite Streaks
0.13	304.25	1846	Black Shale
0.83	305.08	1845	Coal - E - Upper Freeport W/ Bone Streaks
1.83	306.92	1843	Light Gray Claystone
3.08	310.00	1840	Light Gray Shale W/ Sand Streaks
4.58	314.58	1835	Dark Gray Shale W/ Sand Streaks
0.17	314.75	1835	Coal - Unspecified Seam
0.25	315.00	1835	Dark Gray Shale

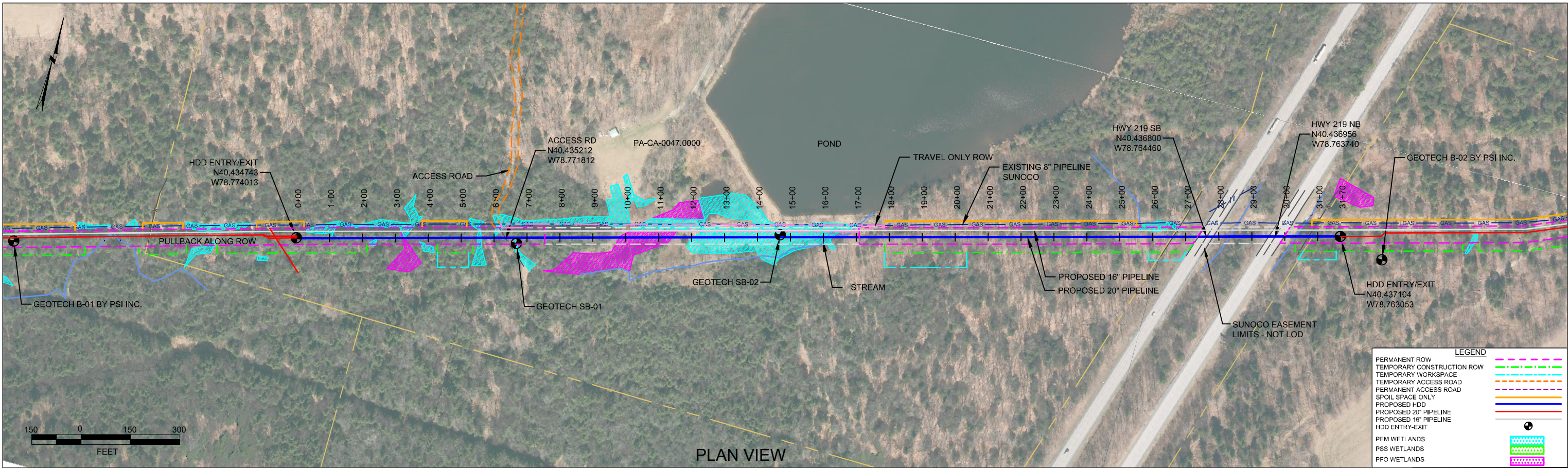
Drillhole: MAD15-016

RQD

From		To		Interval	Recovery	Modified (+4")	RQD
Ft	In	Ft	In	(In)	(In)	Recovery (In)	
0	0	16	0	192	0	0	0%
16	0	25	0	108	96	52	48%
25	0	40	0	180	180	70	39%
40	0	55	0	180	180	66	37%
55	0	70	0	180	180	132	73%
70	0	85	0	180	180	150	83%
85	0	100	0	180	180	158	88%
100	0	115	0	180	180	178	99%
115	0	130	0	180	180	168	93%
130	0	145	0	180	180	145	81%
145	0	160	0	180	180	160	89%
160	0	175	0	180	180	167	93%
175	0	190	0	180	180	171	95%
190	0	205	0	180	180	174	97%
205	0	217	10	154	154	139	90%
217	10	230	0	146	146	144	99%
230	0	245	0	180	180	174	97%
245	0	258	9	165	165	147	89%
258	9	274	0	183	183	165	90%
274	0	290	0	192	192	192	100%
290	0	300	0	120	120	119	99%
300	0	302	2	26	26	23	88%
302	2	305	1	35			COAL
305	1	314	10	117	117	108	92%

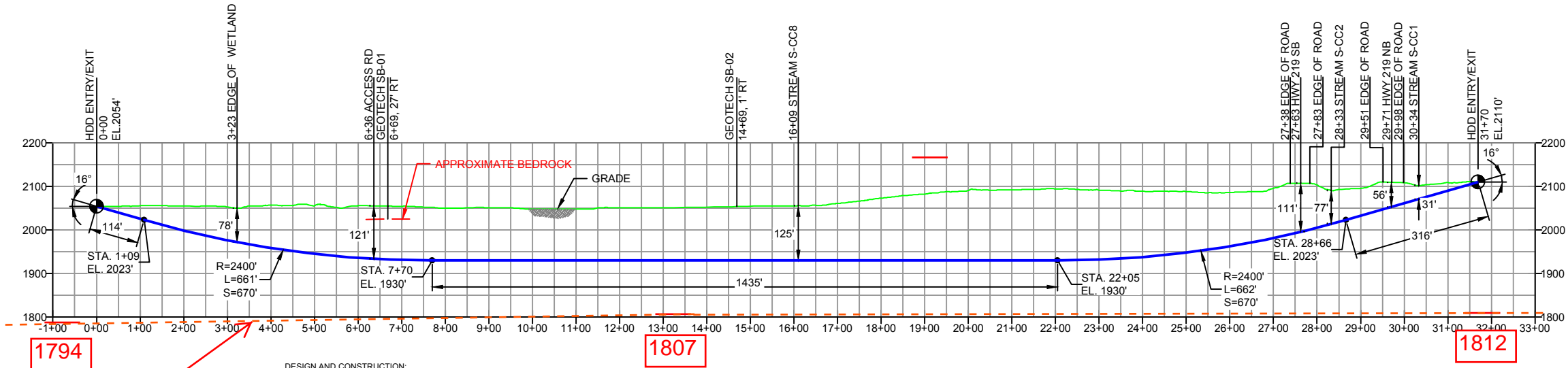
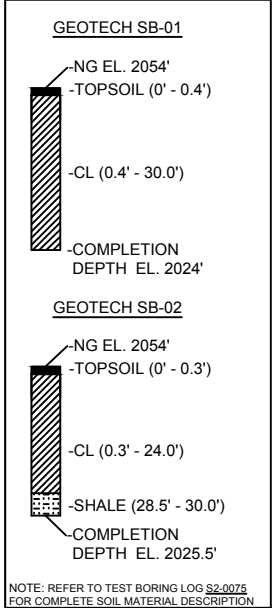
ATTACHMENT C

Proposed HDD S2-0075 Plan and Profile
Showing Position of Upper Freeport Coal



CAMBRIA COUNTY PENNSYLVANIA, CAMBRIA TOWNSHIP
S2-0075

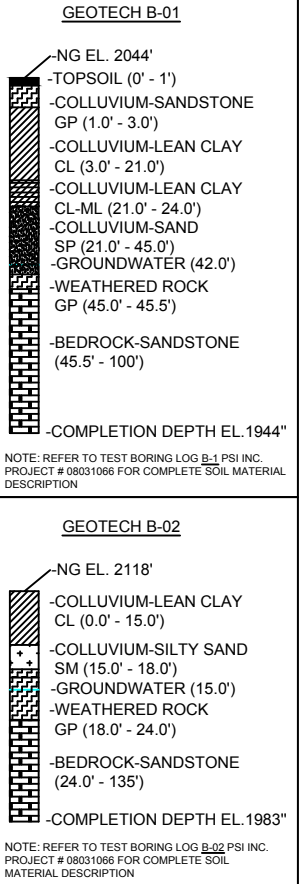
PLAN VIEW
PROFILE VIEW





Estimated surface
of top of Upper
Freeport coal

- DESIGN AND CONSTRUCTION:
1. CONTRACTOR SHALL FIELD VERIFY DEPTH OF ALL EXISTING UTILITIES SHOWN OR NOT SHOWN ON THIS DRAWING.
 2. 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.
 3. DESIGNED IN ACCORDANCE WITH CFR 49 195 & ASME B31.4
 4. CROSSING PIPE SPECIFICATION:
HDD HORZ. LENGTH (L=): 3170'
HDD PIPE LENGTH (S=): 3205'
20" x 0.456" W.T., X-65, API5L PSL2, ERW, BFW
COATING: 14-16 MILS FBE WITH 40 MILS MIN. ARO (POWERCRETE R95)
 5. INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGN FACTOR 0.50 (HOOP STRESS)).
 6. INSTALLATION METHOD: HORIZONTAL DIRECTIONAL DRILL (HDD).
 7. PIPELINE WARNING MARKERS SHALL BE INSTALLED ON BOTH SIDES OF ALL ROAD, RAILWAY, AND STREAM CROSSINGS.
 8. CARRIER PIPE NOT ENCASED.
 9. PIPE / AMBIENT TEMPERATURE MUST BE NO LESS THAN 30°F DURING PULLBACK WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER.
 10. CONDUCT 4-HOUR PRE-INSTALLATION HYDROTEST OF HDD PIPE STRING TO MINIMUM 1850 PSIG.
 11. SEE SUNOCO PENNSYLVANIA PIPELINE PROJECT ESRI WEBMAP FOR ACCESS ROAD ALIGNMENT.

PRELIMINARY DESIGN ONLY



NOTES		REVISIONS								<div><div>Sunoco Logistics Partners L.P.</div></div> <div><div>TETRA TECH ROONEY (303) 792-5911</div></div>		SUNOCO PIPELINE, L.P.	
1. ALL COORDINATES SHOWN ARE IN LATITUDE AND LONGITUDE. ALL MSL ELEVATIONS ARE NAD83 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.												HORIZONTAL DIRECTIONAL DRILL WETLAND CC17 PENNSYLVANIA PIPELINE PROJECT	
NO.	DESCRIPTION	BY	DATE	CHK	DATE	APP	DATE	SCALE: 1"=300'		DWG. NUMBER: PA-CA-0047.0000-SRa			
4	EXTENDED DRILL - DESIGN CHANGE BY CONTRACTOR	MRS	09/14/17	RMB	09/14/17	CAG	09/14/17						
3	REVISED PROFILE WITH 2017 LIDAR	MRS	03/17/17	RMB	03/17/17	CAG	03/17/17						
2	REVISED PER ENGINEERING COMMENTS	MRS	08/26/16	RMB	08/26/16	AAW	08/26/16						
1	ADDED "TRAVEL ONLY ROW" ANNOTATION	MRS	02/15/16	RMB	02/15/16	AAW	02/15/16						
0	ISSUED FOR CONSTRUCTION	MRS	12/21/15	RMB	12/21/15	AAW	12/21/15						

GEOLOGIC CORES WITH NOTES

Alpha Natural Resources - Lithology for Corehole MAD13-14

Hole Type: Core Hole	Location: Elevation approx 2056 amsl Lat 40.433557/Long -78.774497	Latitude 27: 0.00000000	Surface Elevation: 0.00
North_SPC: 402,470.00	North_Loc: 0.00	North_CCC:	
East_SPC: 1,683,250.00	East_Loc: 0.00	East_CCC:	Drill Date: 9/10/2013

Top Elev	Top Depth	Thick	Bot Depth	Bot Elev	Total Coal	Lith Code	Enhanced Log Description	Strata Name	Strata	Bn	Sp	Comments
0.00	0.00	63.70	63.70	-63.70		500	SANDSTONE UNDEFIND, brownish gray					
-63.70	63.70	12.80	76.50	-76.50		124	DARK SHALE					
-76.50	76.50	10.50	87.00	-87.00	0.00	129	MARINE ZONE - DARK GRAY CLAY SHALE	Woods Run marine zone	WRMZ			
-87.00	87.00	20.30	107.30	-107.30		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
-107.30	107.30	2.20	109.50	-109.50		124	DARK SHALE					
-109.50	109.50	0.70	110.20	-110.20	0.70	020	BRIGHT COAL	Pine Creek coal bed	PCC			
-110.20	110.20	12.80	123.00	-123.00		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray					
-123.00	123.00	21.70	144.70	-144.70		500	SANDSTONE UNDEFIND, gray					Wetland C17 profile depth
-144.70	144.70	43.30	188.00	-188.00		301	SANDY SHALE, medium to dark gray					
-188.00	188.00	15.00	203.00	-203.00		500	SANDSTONE UNDEFIND, gray					
-203.00	203.00	28.70	231.70	-231.70		301	SANDY SHALE, medium to dark gray					
-231.70	231.70	3.10	234.80	-234.80		093	SANDY FLINT CLAY with slickensided fractures, tan gray, planar-bedded with convoluted bedding, sharp basal contact					
-234.80	234.80	6.55	241.35	-241.35		333	GRAY SANDY SILT SHALE with sandstone streaks or bands, with sideritic veins and infillings, medium gray, silt to fine-grained, planar-bedded with churned bedding, sand/silt content decreasing downward sharp basal contact					
-241.35	241.35	3.95	245.30	-245.30		543K	SANDSTONE W/ SHALE STREAKS micaceous, medium gray, medium to fine grained, planar-bedded, increasingly shaley downward gradational basal contact					
-245.30	245.30	2.20	247.50	-247.50		333	GRAY SANDY SILT SHALE with sandstone streaks or bands, siderite patches, medium to dark gray, silt to very fine-grained, planar-bedded with slightly churned bedding, sharp basal contact					
-247.50	247.50	3.05	250.55	-250.55		124	DARK SHALE with silt streaks or bands, parts easily along bedding planes, planar-bedded, sharp basal contact					
-250.55	250.55	0.45	251.00	-251.00		114	BLACK SHALE, sharp basal contact					
-251.00	251.00	2.00	253.00	-253.00	2.00	020	BRIGHT COAL with 2 cleats well developed, with fusain streaks or bands, moderate to bright luster, blocky, friable, sharp basal contact	Upper Freeport coal bed	UFC			
-253.00	253.00	0.10	253.10	-253.10	0.00	114	BLACK SHALE, sharp basal contact	Upper Freeport coal bed	UFC			
-253.10	253.10	1.10	254.20	-254.20	1.10	020	BRIGHT COAL with 2 cleats well developed, pyritic-desseminated streaks or blebs, moderate to bright luster, blocky, friable, sharp basal contact	Upper Freeport coal bed	UFC			
-254.20	254.20	0.35	254.55	-254.55		127	DARK GRAY CLAYSTONE with carbonaceous streaks or bands, with slickensided fractures, massive-bedded with rootworking, silty at base of interval gradational basal contact					
-254.55	254.55	1.00	255.55	-255.55		324	SANDY SHALE MASSIVE w/ finely dess. mica flakes, fossiliferous-plant fossils, dark gray, silt to fine-grained, sharp basal contact					
-255.55	255.55	1.20	256.75	-256.75		543S	SHALEY SANDSTONE micaceous, medium gray, medium to fine grained, massive-bedded with burrowing, increasingly shaley downward sharp basal contact - irregular					

Alpha Natural Resources - Lithology for Corehole MAD13-14

Hole Type:	Core Hole	Location:		North_CCC:		Latitude 27:	0.00000000	Surface Elevation:	0.00
North_SPC:	402,470.00	North_Loc:	0.00	East_CCC:		Longitude 27:	0.00000000	Drill Date:	9/10/2013
East_SPC:	1,683,250.00	East_Loc:	0.00						

Top Elev	Top Depth	Thick	Bot Depth	Bot Elev	Total Coal	Lith Code	Enhanced Log Description	Strata Name	Strata	Bn	Sp	Comments
-256.75	256.75	3.50	260.25	-260.25		333	GRAY SANDY SILT SHALE with sandstone streaks or bands, siderite patches, medium to dark gray, silt to fine-grained, planar-bedded with churned bedding, sand/silt content decreasing downward sharp basal contact					
-260.25	260.25	0.15	260.40	-260.40		114	BLACK SHALE pyritic-desseminated streaks or blebs, sharp basal contact					
-260.40	260.40	1.70	262.10	-262.10		124	DARK SHALE with silt streaks or bands, siderite patches, planar-bedded with slightly churned bedding, gradational basal contact					
-262.10	262.10	0.80	262.90	-262.90		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray, silt to very fine-grained, planar-bedded, sharp basal contact					
-262.90	262.90	0.35	263.25	-263.25		543K	SANDSTONE W/ SHALE STREAKS micaceous, with carbonaceous streaks or bands, medium gray, coarse to fine grained, sharp basal contact - erosional					
-263.25	263.25	0.65	263.90	-263.90		323	SANDY SHALE W/SANDSTONE STREAKS, dark gray, silt to very fine-grained fining downward, planar-bedded with slightly churned bedding, sand/silt content decreasing downward basal contact not sampled					
-263.90	263.90	4.10	268.00	-268.00		301	SANDY SHALE, medium to dark gray, total depth - bottom contact not sampled					
Thick =		268.00	268.00	268.00	3.80							

Rosebud Mining Company Drill Record

Drillhole: MAD15-016	Spotted Latitude: 40 26 04.4	Township: Cambria
Project: Madison	Spotted Longitude: 78 45 40.3	County: Cambria
Date Started: 12/8/2015	Spotted Elevation: 2150	Surface Owner: Rossman
Date Completed: 12/10/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 205' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - 297' 6-1/2", 298' 2-1/2", 298' 3", 300' 7", 301' 11", 302' 1" -- Water Loss - 22' 0", 202' 10"		

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
16.00	16.00	2134	Casing
16.50	32.50	2118	Gray Sandstone W/ Shale Streaks & Layers - Iron Stained
2.67	35.17	2115	Gray / Green Shale - Some Iron Stained
5.92	41.08	2109	Dark Gray Shale W/ Sand Streaks & Layers
23.58	64.67	2085	Dark Gray Shale
1.83	66.50	2084	Dark Gray Shale W/ Sand Streaks
9.08	75.58	2074	Dark Gray Shale
0.08	75.67	2074	Bone
1.50	77.17	2073	Green / Gray Sandy Fireclay
1.42	78.58	2071	Dark Gray Sandy Fireclay
7.50	86.08	2064	Gray / Green Shale W/ Sand Streaks
12.25	98.33	2052	Gray Sandstone W/ Shale Streaks
1.33	99.67	2050	Gray / Green Shale W/ Sand Streaks
17.17	116.83	2033	Gray Sandstone W/ Shale Streaks
8.83	125.67	2024	Gray Sandstone W/ Coal Spars
0.50	126.17	2024	Gray Sandstone W/ Coal Streaks - Iron Stained
11.58	137.75	2012	Gray Sandstone W/ Coal Streaks
1.08	138.83	2011	Gray Sandstone W/ Shale Streaks
5.33	144.17	2006	Dark Gray Shale W/ Sand Streaks - Very Fractured
4.08	148.25	2002	Gray / Green Shale
9.58	157.83	1992	Light Gray Shale W/ Sand Streaks
1.50	159.33	1991	Gray Sandstone W/ Shale Streaks
19.00	178.33	1972	Dark Gray Shale W/ Sand Streaks
0.67	179.00	1971	Gray Sandstone W/ Shale Streaks
3.92	182.92	1967	Dark Gray Shale W/ Sand Streaks
7.08	190.00	1960	Gray Sandstone - Hard
17.58	207.58	1942	Gray Sandstone W/ Few Coal Streaks - Hard
0.25	207.83	1942	Light Gray Shale
4.67	212.50	1938	Dark Gray Shale W/ Sand Streaks
0.25	212.75	1937	Gray Sandstone W/ Shale Streaks
4.75	217.50	1933	Gray / Green Shale
2.33	219.83	1930	Gray / Green Claystone
2.17	222.00	1928	Light Gray Sandy Claystone
8.50	230.50	1920	Light Gray Shale W/ Sand Streaks
9.50	240.00	1910	Gray Sandstone W/ Shale Streaks
16.58	256.58	1893	Gray Sandstone W/ Shale Streaks - Hard
0.25	256.83	1893	Dark Gray Fireclay

Wetland C17 HDD Max depth

Rosebud Mining Company Drill Record

Drillhole: MAD15-016	Spotted Latitude: 40 26 04.4	Township: Cambria
Project: Madison	Spotted Longitude: 78 45 40.3	County: Cambria
Date Started: 12/8/2015	Spotted Elevation: 2150	Surface Owner: Rossman
Date Completed: 12/10/2015	Spotter: Jeremy Vasilko	Location Notes:
Driller: Randy Davis		
SWL: 205' 5"	Spot taken w/handheld GPS, geographic coords, NAD 83	
Driller's Notes: Roof Breaks - 297' 6-1/2", 298' 2-1/2", 298' 3", 300' 7", 301' 11", 302' 1" -- Water Loss - 22' 0", 202' 10"		

Unit Thickness (ft)	Total Depth (ft)	Approx. Elev. (ft)	Unit Description
2.42	259.25	1891	Gray / Green Claystone
6.25	265.50	1885	Green / Gray Shale W/ Lime Streaks
1.75	267.25	1883	Green / Gray Shale
2.75	270.00	1880	Gray / Green Shale W/ Sand Streaks
8.42	278.42	1872	Green / Gray & Tan Flintclay
1.25	279.67	1870	Green / Gray Shale
12.50	292.17	1858	Gray Sandstone W/ Shale Streaks
1.17	293.33	1857	Green / Gray Shale
1.42	294.75	1855	Dark Gray Shale
2.25	297.00	1853	Gray Sandstone
1.42	298.42	1852	Dark Gray Shale W/ Sand Streaks
3.75	302.17	1848	Dark Gray Shale - Laminated
1.96	304.12	1846	Coal - E - Upper Freeport W/ Bone & Pyrite Streaks
0.13	304.25	1846	Black Shale
0.83	305.08	1845	Coal - E - Upper Freeport W/ Bone Streaks
1.83	306.92	1843	Light Gray Claystone
3.08	310.00	1840	Light Gray Shale W/ Sand Streaks
4.58	314.58	1835	Dark Gray Shale W/ Sand Streaks
0.17	314.75	1835	Coal - Unspecified Seam
0.25	315.00	1835	Dark Gray Shale

Drillhole: MAD15-016

RQD

From		To		Interval	Recovery	Modified (+4")	RQD
Ft	In	Ft	In	(In)	(In)	Recovery (In)	
0	0	16	0	192	0	0	0%
16	0	25	0	108	96	52	48%
25	0	40	0	180	180	70	39%
40	0	55	0	180	180	66	37%
55	0	70	0	180	180	132	73%
70	0	85	0	180	180	150	83%
85	0	100	0	180	180	158	88%
100	0	115	0	180	180	178	99%
115	0	130	0	180	180	168	93%
130	0	145	0	180	180	145	81%
145	0	160	0	180	180	160	89%
160	0	175	0	180	180	167	93%
175	0	190	0	180	180	171	95%
190	0	205	0	180	180	174	97%
205	0	217	10	154	154	139	90%
217	10	230	0	146	146	144	99%
230	0	245	0	180	180	174	97%
245	0	258	9	165	165	147	89%
258	9	274	0	183	183	165	90%
274	0	290	0	192	192	192	100%
290	0	300	0	120	120	119	99%
300	0	302	2	26	26	23	88%
302	2	305	1	35			COAL
305	1	314	10	117	117	108	92%