HORIZONTAL DIRECTIONAL DRILL ANALYSIS
NORTH POTTSTOWN PIKE CROSSING
PADEP SECTION 105 PERMIT NO.: E15-862
PA-CH-0212.0000-RD
(SPLP HDD No. S3-0370)

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This reanalysis of the horizontal directional drill (HDD) installation of a 16-inch and 20-inch diameter pipeline crossing under North Pottstown Pike and streams S-C59, S-C60, and S-C61, is in accordance with Stipulated Order issued under Environmental Hearing Board Docket No. 2017-009-L for HDDs listed on Exhibit 2 of the Stipulated Order. This HDD is number 20 on the list of HDDs included on Exhibit 2 of the Stipulated Order.

As a result of further studies conducted by SPLP, the plans for pipeline installation by HDD in this area have been changed to open cut and conventional bore due to concerns with the underlying geology.

GEOLOGIC AND HYDROGEOLOGIC ANALYSIS

The HDD S3-0370 location lies within the Piedmont Physiographic province of Pennsylvania, which is the southeastern-most province of the Appalachian mountain chain. The HDD S3-0370 path is underlain by the Ledger Formation, a gray, massive, crystalline dolomite that is siliceous in the middle part. The Ledger is mapped as being in contact with the underlying Chickies quartzite and Harper phyllite – this contact is mapped as a transverse fault just west of the HDD S3-0370 entry location. The Chester Valley Geologic map (Kochanov 2016) shows this fault (the Valley Creek Fault) running nearly east-west several hundred feet north of the northwestern entry/exit point location. Kochanov's map indicates that the regional bedrock fabric (relict bedding and structure) trends are sub-parallel to the Valley Creek Fault and other local faults striking in the N70°E to E-W range.

The HDD S3-0370 was proposed to reach a maximum depth of approximately 77 feet below ground surface (bgs) and approximately 1,600 of the total 2,065 feet of HDD length will be at depths expected to coincide with or exceed bedrock depth. When in bedrock, most of the HDD S3-0370 bore will be in the Ledger Formation. The subsurface and terrain are characterized by interconnected fractures, bedding planes, solution openings, sinkholes and closed depressions that represent an elevated risk for loss of drilling fluid and inadvertent returns. The proximity of faults, geologic contacts, and water supply wells also add a degree of risk to the HDD S3-0370 installation. It is very possible that the HDD path could intercept high-yielding fractures in the Ledger Formation. The pinnacle weathering surface of the Ledger Formation and potential for karst features (voids) could introduce problems for drill bit control during advance of the HDD pilot hole.

Attachment 1 provides an extensive discussion on the geology, hydrogeology, and results of the geotechnical investigation performed at this location.

As a result of further investigations, this HDD will be abandoned, and a conventional construction plan has been developed and submitted to the Pennsylvania Department of Environmental Protection (PADEP) for authorization, or by concurrence to this HDD reanalysis. A copy of the permit modification materials is included as Attachment 2.

HYDROGEOLOGY, GROUND WATER, AND WELL PRODUCTION ZONES

The Ledger dolomite unit mapped beneath the HDD S3-0370 location is identified as a unit of moderate to good groundwater production. Existing well and geotechnical drilling records suggest that groundwater may exist within the top 20 to 70 feet of grade – within the HDD S3-0370 depth interval. Groundwater in the immediate HDD S3-0370 area exists in the saprolite above both the Ledger Dolomite and Chickies Quartzite under unconfined conditions. Groundwater is used locally for both private and public potable supply in depth ranges from approximately 75 to 300 feet bgs. Public water supply wells are operated by Aqua America (Aqua) at distances of approximately 1,170 and 1,600 feet west/southwest of the northwestern HDD S3-0370 entry/exit point (the Shoen Road supply wells) and approximately 1,900 feet southeast of the southwestern HDD S3-0370 entry/exit location (the Hillside supply wells).

A review of hydrogeology along the HDD S3-0381 alignment (immediately southeast of HDD S3-0370) was conducted in an attempt to better define geology, hydraulics and potential effects from HDD work on the existing Aqua Hillside supply wells. Aquifer testing in the Ledger Formation associated with the two Aqua Hillside supply wells demonstrated hydraulic interconnection across three zones screened between 0 and 160 feet bgs. These studies illustrate the karst development in the Ledger Formation and characteristic potential for extensive hydraulic communication between and throughout the overburden and lithified bedrock. The proximity of faults, geologic contacts and water supply wells add a degree of risk to the HDD S3-0370 installation. It is very possible that the bore path could intercept high-yielding fractures in the Ledger Formation. If this water is not controlled or retained in the native formation, impacts to local wells could result.

Because of the change in trenchless methodology from HDD to conventional construction methods there is no anticipated impact to public or private water wells.

Attachment 1 provides an extensive discussion on the geology, hydrogeology and results of the geotechnical investigations performed at this location.

INADVERTENT RETURNS DISCUSSION

Based on the further analysis of the underlying geology and hydrogeological factors such as fractured geology, cobble and voids, the original design was determined to pose a moderate to high risk of subsurface and/or surface loss of drilling fluid.

Because of the change of plans for this segment of the pipeline project from HDD to conventional construction methods, there is no possibility of an inadvertent return.

ADJACENT FEATURES ANALYSIS

HDD S3-0370 is primarily within an urban area located approximately 0.5 mile north/northwest of Exton, Pennsylvania. The HDD would have crossed under, from west to east: a parking lot and driveway for a residential area; Streams S-C61, S-C59, and S-C60 (unnamed tributaries to Valley Creek); a parking lot for commercial establishments, and North Pottstown Pike, a 6-lane highway. The crossing of Stream S-C61 is located approximately 550 feet west of the western terminus of Sunrise Boulevard (at the intersection of Pottstown Pike). The crossing of Stream S-C59 is located approximately 300 feet west/southwest of this intersection, and the crossing of Stream S-C60 is located approximately 225 feet southwest of this intersection. The four newly proposed conventional bores would allow for trenchless pipeline installation beneath a residential parking lot, Stream S-C61, Stream S-C59, and Stream S-C60 and North Pottstown Pike. .

Based on review of 2015 aerial photography, the nearest residences (apartment buildings) are 80 feet southwest of the conventional auger bore of Stream S-C61, 340 feet west of the conventional auger bore of Stream S-C59, and 470 feet west of and S-C60, respectively.

ALTERNATIVES ANALYSIS

Proposed Modification to Construction Methods Resulting from Additional Investigation

SPLP is requesting that PADEP to approve a change in the proposed installation methodology for the previously proposed HDD to an open cut trench crossing and four conventional bores. SPLP performed further investigation of the proposed HDD design and options for redesign of the HDD profile. A shallower HDD was determined to not be feasible due to the changes in topography/elevation along the route. As is discussed above and in greater detail in the hydrogeologic evaluation report in Attachment 1,

the subsurface geology is not supportive of an HDD with the range of depths feasible for the installation of the pipelines. Based on this evaluation, SPLP determined that the best method for installation of the pipelines in this area is a combination of four conventional bores and open cut trench excavation. Through the use of these alternative installation methods, SPLP would be able to avoid potential HDD inadvertent returns or loss of fluids and returns. The newly proposed conventional bore methods would continue to ensure the avoidance of surface disturbance and impacts to existing infrastructure (including a residential apartment complex driveway/parking lot and North Pottstown Pike), and Streams S-C59, S-C60, and S-C61 (unnamed tributaries to Valley Creek).

The conventional bores will be added at: Stations 15083+50 to 15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Stream S-C60 and North Pottstown Pike). The pipelines in the remainder of the areas within the formerly proposed HDD will be installed using conventional open trench methods.

Although the pipeline alignment will remain within Sunoco's currently approved permanent easement in this area, the requested modification requires a larger construction workspace / limit of disturbance to accommodate the revised installation techniques and revised vertical depth plans for the pipeline. Coordination with the land owners and municipality regarding the revised installation methods and workspace is being conducted and agreements will be in place prior to construction.

Open-cut Analysis

As introduced above, conversion of this HDD to open cut trench method (in uplands) and conventional auger bore construction method (in streams) would continue to avoid trench-related disturbances/impacts to streams S-C59, S-C60, and S-C61, given these streams would now be crossed using conventional bore (no surface impacts, similar to HDD methodology). However, a temporary bridge crossing in each stream would be required to support the newly modified construction methods.

SPLP specifications require a minimum of 48 inches of cover between the installed pipeline and the bottom of the watercourse. To meet this cover requirement, during construction under the affected aquatic resources (Streams S-C59, S-C60, and S-C60), additional temporary workspace will be added outside of the aquatic resources to provide sufficient space for bore pits, receiving pits, spoil storage, and allowing the pipeline to be installed with sufficient separation from the existing 8-inch and 12-inch Sunoco pipelines for integrity management.

Using PADEP's Chapter 105 permit impact calculation methods, the actual surface disturbance area / impacts of the newly proposed conventional bore plan would be larger than that of the previously proposed HDD due to the proposed temporary bridge at each stream (whereas the HDD would not require temporary bridges). However, the area of the actual surface disturbance impacts to the bed and bank would be similar to the previously reported HDD "impact area" as expressed in the application (which used the width of the pipes times the length of the resource, as per PADEP guidance). Proposed temporary impacts would total approximately 889 square feet in stream S-C59, 444 square feet in stream S-C60, and 552 square feet in stream S-C61. PADEP Chapter 105 "50-foot floodway impacts" would be 0.561 acre in the shared floodway of streams S-C59 and S-C60, and 0.287 acre in the shared floodway of streams S-C61 and S-C62. The change would also occupy 2.398 acres of Federal Emergency Management Agency (FEMA) -designated 100-year floodway. All three streams affected by this modification are unnamed tributaries to Valley Creek. Streams S-C59 and S-C61 are have a perennial flow regime and Stream S-C60 has an ephemeral flow regime. Stream S-C59 is designated a PADEP Chapter 93 Coldwater Fishery (CWF). Streams S-C60 and S-C61 drain to a PADEP Chapter 93 CWF. All three streams drain to a Pennsylvania Fish and Boat Commission (PFBC) -designated approved trout water (ATW) and stocked trout stream (STS).

To make the crossings of these stream by conventional open cut trench method would involve the damming the streams using upstream and downstream dams (using sandbags, geotubes or other acceptable dam material), while simultaneously pumping all stream flows around the in-stream workspace, and pumping out (from the in-stream workspace or excavated areas) any produced groundwater discharge or seepage around/under the dams, for the duration of the crossing event. Although the temporary impacts would be controlled and managed using these appropriate best management practices, SPLP's preferred method in this case is to bore below these resources using conventional bore.

Re-Route Analysis

In accordance with state and federal guidance, SPLP has routed the Project to be co-located with existing pipeline and other utility corridors to avoid new "greenfield" routing alignments, to the maximum extent practicable. This avoids and minimizes new and permanent impacts on previously undisturbed land, new land use encumbrance, and site-specific and cumulative impacts on land, environmental, and community resources. The North Pottstown Pike HDD (S3-0370) was co-located with the existing SPLP pipeline ROW and the new design is also co-located within the existing SPLP pipeline ROW. Rerouting would result in new impacts by creating a new greenfield ROW in areas that are not currently ROW. In addition, given the length and general perpendicular direction of Streams S-C59, S-C60, and S-C61 (unnamed tributaries to Valley Creek), the location of additional aquatic resources north of Stream S-C61 (i.e., Stream S-C62, Wetland BB31a, and Wetland BB31b), no reasonably practicable re-route option lies immediately to the north or south of the proposed route that would not ultimately cross these streams. This also holds true for the crossing of North Pottstown Pike. In addition, due to the developed congestion of the area including residences, businesses, roads, and other utilities, there are no reasonably practicable reroutes for the pipeline in this area.

Conventional bores and open trench construction measures will be done in accordance with the Project Impact Avoidance, Minimization, and Mitigation Procedures (Project Procedures), the Project Erosion and Sediment Control and Site Restoration Plan (E&S Plan), and other Project Plans, as applicable to these types of pipeline installation methods.

CONCLUSION

Based on the further analysis of the underlying geology and hydrogeological factors, the original HDD design and redesign options were determined to pose a moderate to high risk of subsurface and/or surface loss of drilling fluid. In addition, due to the limited available workspace in the area (congestion of the area including residences, businesses, roads, and other utilities), SPLP his proposing and submitting for review and approval a construction methodology change. SPLP proposes to abandon the originally proposed HDD design and to pursue a combination of open cut trench method (in uplands) and four conventional auger bores (to cross an existing residential driveway/parking lot, three streams, and North Pottstown Pike/PA Highway 100).

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PADEP SECTION 105 PERMIT NO.: E15-862
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ATTACHMENT 1

GEOLOGY AND HYDROGEOLOGICAL EVALUATION REPORT

HDD HYDROGEOLOGICAL REEVALUATION REPORT

Mariner East II
Spread 6
HDD S3-0370
North Pottstown Pike
West Whiteland Township, Chester County, Pennsylvania

Prepared for:

Sunoco Pipeline, L.P.

Prepared by:

Groundwater & Environmental Services, Inc.
440 Creamery Way, Suite 500
Exton, Pennsylvania 19341

November 2017

HDD HYDROGEOLOGIC REEVALUATION REPORT

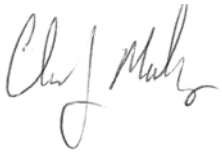
Mariner East II
Spread 6
HDD S3-0370
North Pottstown Pike
West Whiteland Township, Chester County, Pennsylvania

November 2017

Prepared For:

Sunoco Pipeline, L.P.
535 Fritztown Road
Sinking Spring, Pennsylvania 19608

Prepared By:



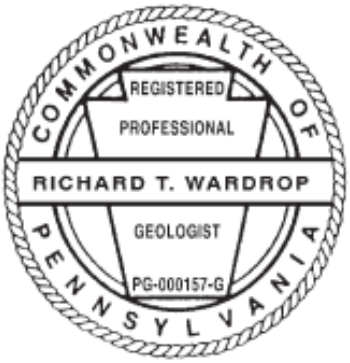
Christopher J. Mulry, P.G.
Principal Hydrogeologist

Reviewed By:

David Demko, P.G.
Principal Hydrogeologist

Groundwater & Environmental Services, Inc.
440 Creamery Way, Suite 500
Exton, Pennsylvania 19341
(610) 458-1077

By affixing my seal to this document, I am certifying that the information is true and correct. I further certify that I am licensed to practice in the Commonwealth of Pennsylvania and that it is within my professional expertise to verify the correctness of the information.



November 07, 2017

Richard T. Wardrop, P. G. Date

Lic. No. PG000157G

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1.0 INTRODUCTION

Sunoco Pipeline, L. P., (SPLP) retained Groundwater & Environmental Services, Inc. (GES) to prepare HDD Hydrogeological Reevaluation Reports for certain higher-risk horizontal directional drilling (HDD) locations listed on Exhibit 2 of Stipulated Order EHB Docket No. 2017-009-L signed August 10, 2017. This report discusses the hydrogeologic reevaluation for HDD S3-0370 and HDD S3-0370-16 (the 20-inch and 16-inch HDDs for this location, respectively), hereinafter collectively referred to as HDD S3-0370. The planned alignment for HDD S3-0370 crosses beneath Pottstown Pike (US Route 100) between Shoen and Swedesford Roads in West Whiteland Township, Chester County, PA. This evaluation is based on a plan and profile for the 20-inch line revised February 15, 2017 and provided in **Attachment A**. A map depicting the location of the HDD with topographic information for the surrounding area is presented as **Figure 1**.

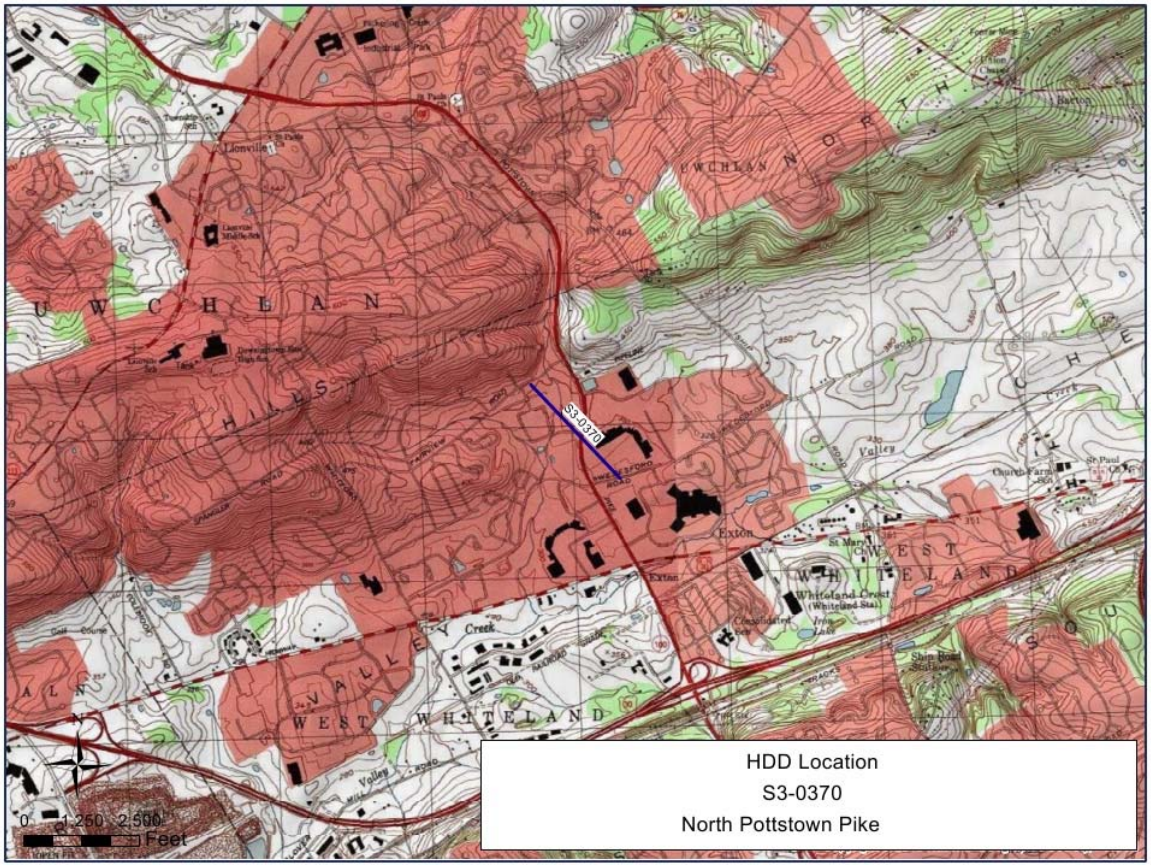


Figure 1. Site Location Map (modified from USGS Downingtown 1:24000 Topo. Quad., rev. 1984)

This report presents the following information:

- Geologic and hydrogeologic characteristics in the area of the HDD;
- Summaries of studies performed pertinent to reevaluation, including fracture trace analysis; geotechnical borings and aquifer analysis;
- A site conceptual model; and
- A reevaluation summary with recommendations.

The contents of this report were developed from interpretation of published information, field observations, and related field studies. Site geotechnical boring programs were conducted by Tetra Tech in June 2015 and more recently by Terracon Consultants, Inc. (Terracon), in August 2017 in support of the HDD S3-0370 reevaluation. Please note that GES did not oversee or direct either geotechnical drilling program, including, but not limited to, the selection of number and location of borings, determination of surface elevations, target depths, observations of rock cores during drilling operations, or preparation of boring logs. The geotechnical reports, boring logs, and any core photographs that resulted from these programs were generated by the two SPLP contractors. GES relied on these reports and incorporated their data into the general geologic and hydrogeologic framework for this hydrogeologic reevaluation report.

2.0 HDD GEOLOGY / HYDROGEOLOGY

2.1 Physiography

The HDD S3-0370 location lies within the Piedmont Physiographic province of Pennsylvania. The Piedmont is the southeastern-most province of the Appalachian mountain chain and is overlapped to the southeast by much younger, non-metamorphosed sedimentary deposits of the Atlantic Coastal Plain. The Piedmont is comprised of highly metamorphosed crystalline rocks of PreCambrian to lower Paleozoic age. These rocks are extensively weathered and are typically mantled by a weathered-in-place saprolite ranging in thickness up to 50 or 60 feet. Due to extensive and prolonged weathering and erosion, the Piedmont is characterized by gently rounded hills. As is found in all of the Appalachian provinces, the Piedmont is grossly characterized by rocks with structural trends from northeast to southwest (Hall, 1934).

2.1.1 Topography

The topography in the immediate HDD S3-0370 area is very flat with the ground surface elevation at the northwestern entry/exit point for the boring identified as approximately 353 feet above mean sea level (ft amsl) and the exit point 2056 feet to the southeast at an elevation of 346 ft amsl. Regionally, this HDD location sits diagonally astride the base of the northwestern limb of the Chester Valley, a regionally extensive southwest to northeast trending limestone valley with a width of slightly over one mile in the Exton-Downingtown, PA area and a ground surface elevation along the valley floor of approximately 350 ft amsl. The topography between entry/exit points shows a very modest decrease and most features and surface grades are likely to be engineered as a function of extensive local development – including the crossing of North Pottstown Pike (US Route 100), a large, four-lane highway with turn lanes and shoulders.

The area surrounding the HDD is comprised of both residential and commercial properties with a residential apartment complex located at the northwest entry/exit point and a strip shopping center located just south of the southeast entry/exit point. The site location is depicted on **Figure 1**.

2.1.2 Hydrology

Several surface water bodies are found in close proximity to the HDD S3-0370 location. The HDD crosses three drainage ways west of North Pottstown Pike (S-C59, S-C60, and S-C61) and one drainage way east of the Pike (S-C66). The HDD will pass approximately 55 feet beneath an unnamed tributary of Valley Creek (S-C61) at a distance of approximately 645 feet southeast of the drill northwestern entry/exit point. Fox Run, another tributary of Valley Creek is located approximately 1,000 feet to the southwest of the northwestern HDD entry/exit point; the HDD will not pass beneath or be any closer to Fox Run. Both creeks flow south/southwest into Valley Creek.

2.2 Geology

Bedrock in the area of HDD S3-0370 is comprised of crystalline, Cambrian-aged quartzite and dolomite of the Chester Valley. The HDD S3-0370 path is underlain by the Ledger Formation, a gray, massive, crystalline dolomite that is siliceous in the middle part. The Ledger is mapped as being in contact with the underlying Chickies quartzite and Harper phyllite – this contact is mapped as a transverse fault just west of the HDD S3-0370 entry location. The Chester Valley Geologic map (Kochanov, 2016) shows this fault (the Valley Creek Fault) running nearly east-west several hundred feet north of the northwestern entry/exit point location. Kochanov's map indicates that the regional bedrock fabric (relict bedding and structure) trends are sub-parallel to the Valley Creek Fault and other local faults striking in the N70°E to E-W range.

Three Tetra Tech geotechnical borings (S3-0360 SB-03, S3-0370 SB-01, and S3-0370 SB-02) were placed in close proximity to two entry/exit points and midpoint of the HDD-0370 alignment in 2015. The borings were advanced to depths of 30 feet near the northwestern entry/exit point and the center point adjacent to

Pottstown Pike and to a depth of 37 feet near the southeastern end entry/exit point near the northern end of the Fairfield Place Shopping Center. A fourth boring was later installed by Terracon (B6-4W) in August, 2017, north of the northwestern entry/exit location which was advanced to a depth of 130 feet and never hit the top of competent bedrock. A fifth boring was also installed by Terracon (B6-4E) near the southwestern entry/exit point. This boring also hit the top of rock surface at a depth of 36.5 feet. The boring continued via wireline coring into the crystalline rock. Thus, the weathered overburden appears to range locally in thickness from 30 feet to 40 feet, but can be more than 130 feet thick as demonstrated by boring B6-4W. The overburden material is primarily composed of weathered in-situ bedrock and has been logged according to Unified Soil Classification System (USCS) methods as ML (inorganic silts, fine sands and rock flour) underlain by SM (silty sands and sand/silt mixtures). Boring logs are provided in **Attachment B** and **Figure 2** depicts the regional bedrock geology.

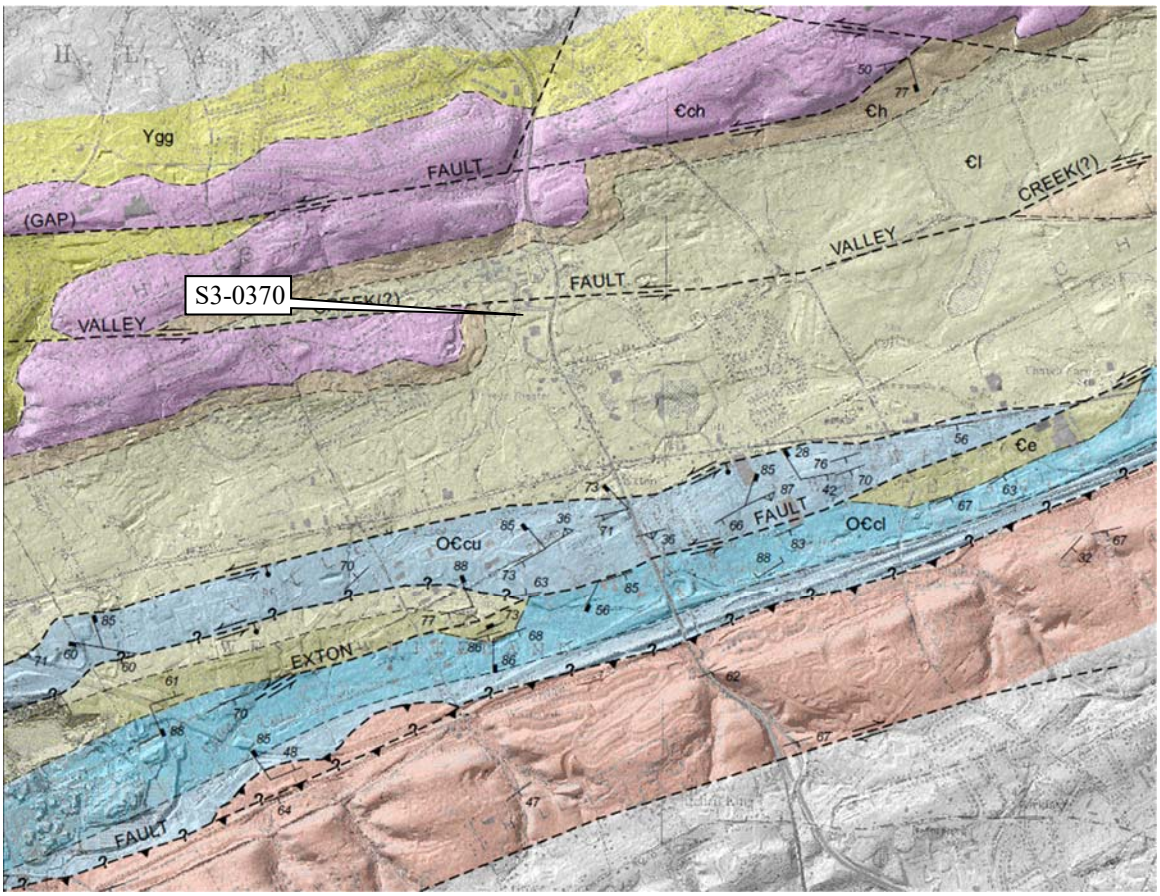


Figure 2. Regional Geologic Map (modified from Kochanov, 2016)

2.2.1 Soils

Soils across the profile are mapped as EdB, CtB, or UugB; being the Edgemont Channery Loam, Conestoga Silt Loam and Urban land Udorthents, respectively. The loams are described as having moderate texture and typical of weathered rock in areas of low slope. The Urban Udorthents soil horizon is typical of highly developed areas overlying a limestone complex. USDA descriptions identify all three soil types as having moderate infiltration rates and moderate drainage capability (USDA NRCS Web Soil Survey for Chester County [http:\\websoilsurvey.nrcs.usda.gov]).

2.2.2 Bedrock lithology

The S3-0370 HDD bore lies in an area of the Piedmont physiographic province of Pennsylvania mapped as the Piedmont Lowlands Section (Potter, 1999). This is exclusively due to the site location within the Chester Valley, where the underlying carbonate rock has been eroded to a surface elevation on the order of 200 or more feet lower than the surrounding clastic metamorphic rocks. The map description for the Ledger Formation is provided as "*Light-gray, locally mottled, massive, pure, coarsely crystalline dolomite…moderately well bedded; massive… pinnacles characterize the interface between mantle and bedrock."*; and for the Chickies*: "Light-gray to white, hard quartzite and quartz schist… moderately well bedded…highly resistant…overlying mantle is thin."* (Geyer and Wilshusen, 1982).

Both the Chickies quartzite and Ledger dolomite are metamorphosed crystalline units with limited primary porosity. The Ledger thickness is up to approximately 2,000 feet and the Chickies is approximately 400 feet thick. Depth to bedrock in the HDD-0370 area is anticipated to be in the 30 to 40 foot below grade range but can be over 130 feet deep as demonstrated by boring B6-4W. The maximum proposed HDD boring depth for the HDD S3-0370 is approximately 77 feet below surface grade; thus approximately 1,600 feet of the 2,065 foot bore (or 77% of the bore length) is expected to penetrate bedrock, assuming overburden ranging from 30 to 40 feet thick.

2.2.3 Structure

As identified in the regional geologic map, gross structural trends for the HDD 0370 location include faulting and foliation patterns striking northeast to nearly east-west. Cross Section A-A' from the Kochanov map (**Figure 3**) best represents the regional structural setting of the HDD-0370 location. This cross section is aligned nearly north-south and shows bedding and foliation dipping steeply to the south along the northwest limb of the Chester Valley syncline. It should be noted that regional interpretations show the Harper Formation pinching out east of the A-A' section, thus, absent from the immediate HDD S3-0370 area (as shown in the Kochanov map). A small number of faults are mapped in the Chester Valley region with orientations ranging from northwest/southeast to nearly north-south. These features cut across the more prevalent east-west structural attitude of the Chester Valley and are evident in topographic expression and in air photo analysis (see **Section 2.2.5**). One such fault is shown on the geologic map to truncate along the Ketch Gap Fault less than one mile north of the HDD S3-0370 location. However, the fracture trace study completed via analysis of stereo air photo pairs and shown below as **Figure 4** suggests that this nearly north-south trending fault passes just west of the northwestern HDD entry/exit point. The primary lineament trends in the HDD S3-0370 vicinity are approximately N4°E and N76°E. Both orientations are also evident on the regional geologic map.

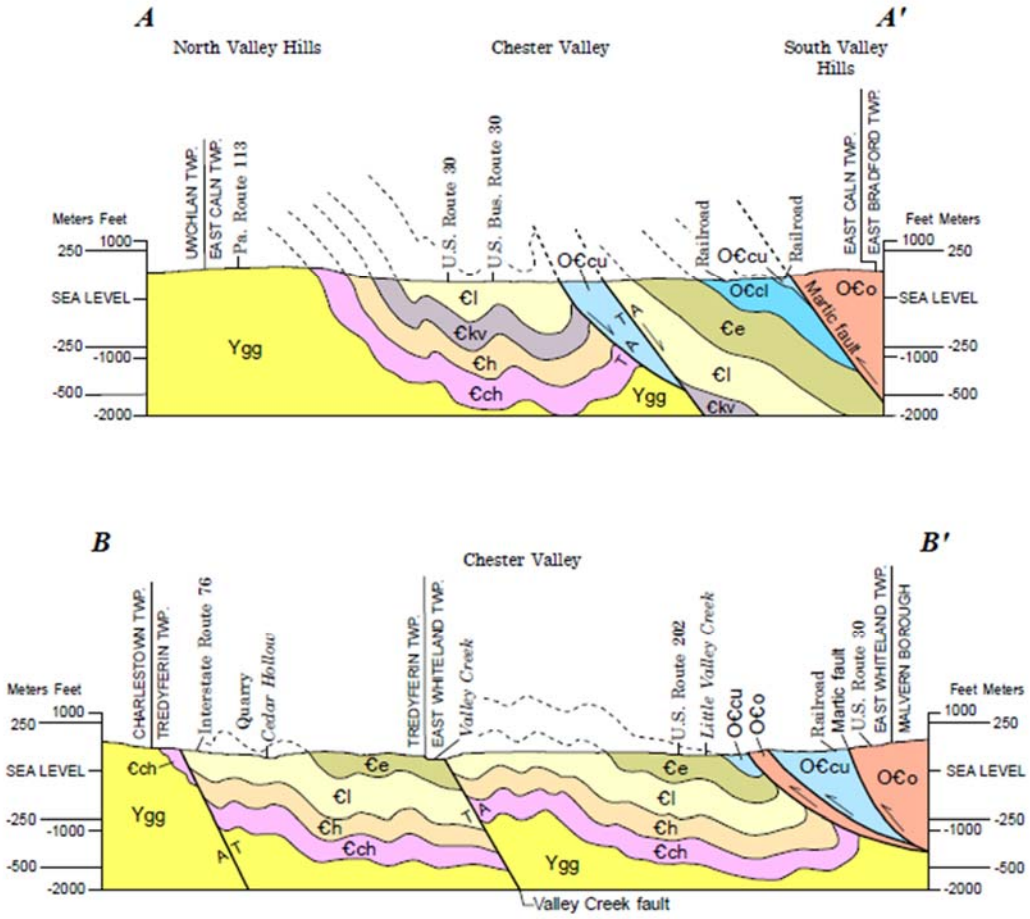


Figure 3. Regional Geologic Cross-Sections; west (A-A') and east (B-B') of HDD-0370 (from Kochanov, 2016)

2.2.4 Fracture Trace Analysis

Fracture trace analysis using high altitude aerial photography was performed for the area of interest to identify potential zones of bedrock weakness along drill paths. Fracture traces (one mile in length or less) and lineaments (greater than one mile in length) are the surficial expression on natural landscapes of vertical zones of bedrock fracture concentration. Fracture trace analysis is partly subjective; therefore, every mapped fracture trace does not necessarily represent a zone of bedrock fracture concentration.

Figure 4 shows a fracture trace map prepared for this reevaluation. This mapping was performed using aerial stereographic pairs flown in the fall of 1937. As such, much of the land surface appears undeveloped therefore; fracture traces are more easily seen. This fracture trace analysis identified nearly orthogonal fractures pairs evident on a regional scale. The approximate fracture lineament traces strike N4°E and N76°E, respectively. Both alignments are expressed in regional topographic features and the latter is coincident with large, regional fault structures defining the extensive Chester and Great Valley structures of southeastern Pennsylvania. A likely intersection of two prominent fracture features was identified just northwest of HDD S3-0370. Note that the Ketch-Gap fault has also been noted on the air photo to facilitate a direct tie-in with mapped geologic structure. This fault location is approximately one mile north of HDD

S3-0370. None of the identified lineament features intersect the HDD-0370 pathway. Also note the wide lineament mapped due west of HDD S3-0370 by the operator.

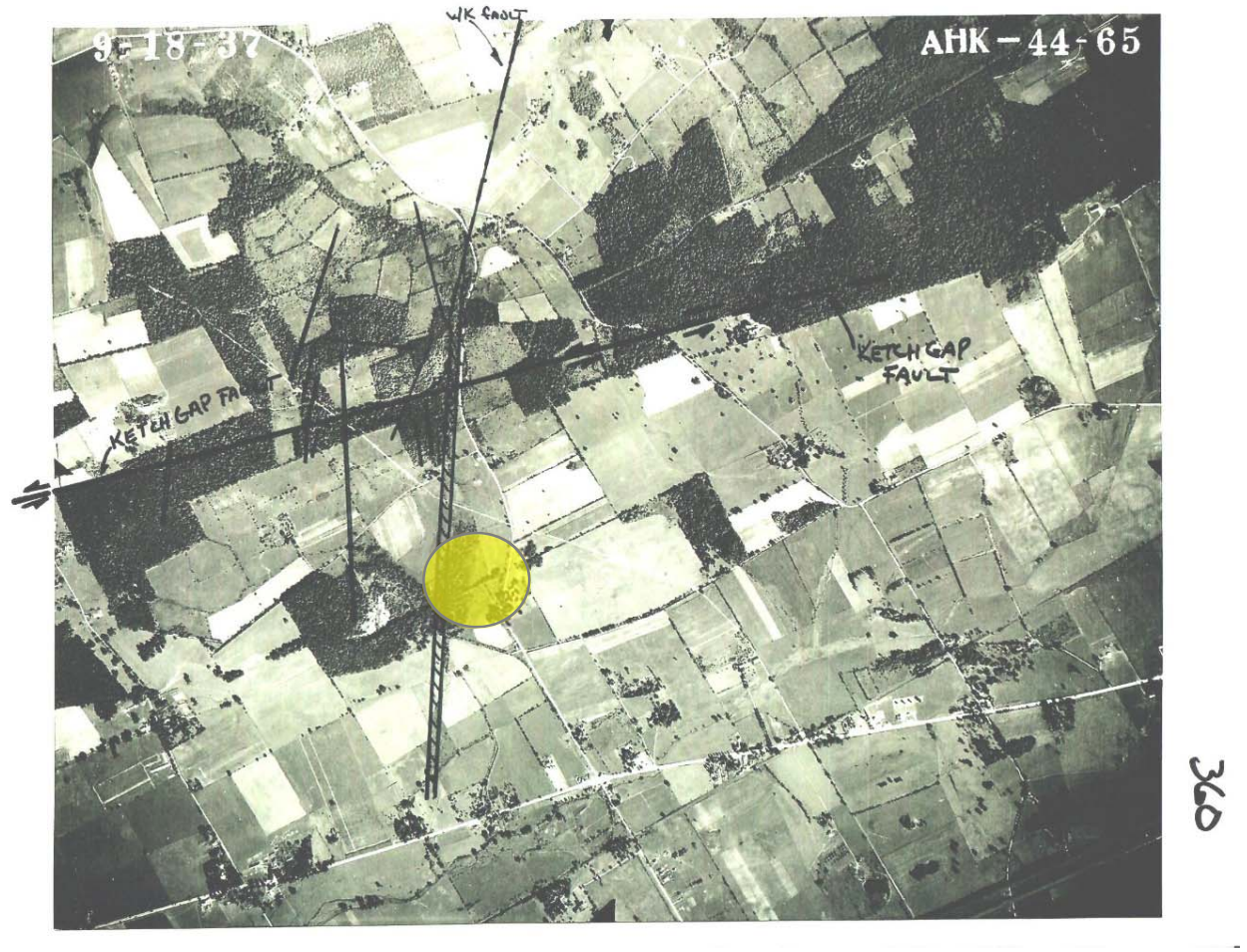


Figure 4. Fracture Trace Analysis (approximate HDD-0370 location in highlighted area)

2.2.5 Karst

Mapping by Kochanov and others (1993) suggests that a small number of individual sinkholes or closed depression features exist near the HDD S3-0370 entrance location south of Shoen Road and west of Pottstown Pike in the Ledger dolomite. None visually appear to be in the immediate path of HDD S3-0370. However, this map indicates a cluster of sinkhole features near the HDD S3-0370 entry/exit point north of Swedesford Road and east of Pottstown Pike. A copy of the Kochanov, et al. (1993) map is provided as **Figure 5**. Also, as discussed in **Section 2.2.8**, rock coring along the HDD S3-0370 path produced evidence of fracturing and voids in mixed calcareous and siliceous rock units. These findings are consistent with the karst terrain developed on Ledger Formation dolomite.

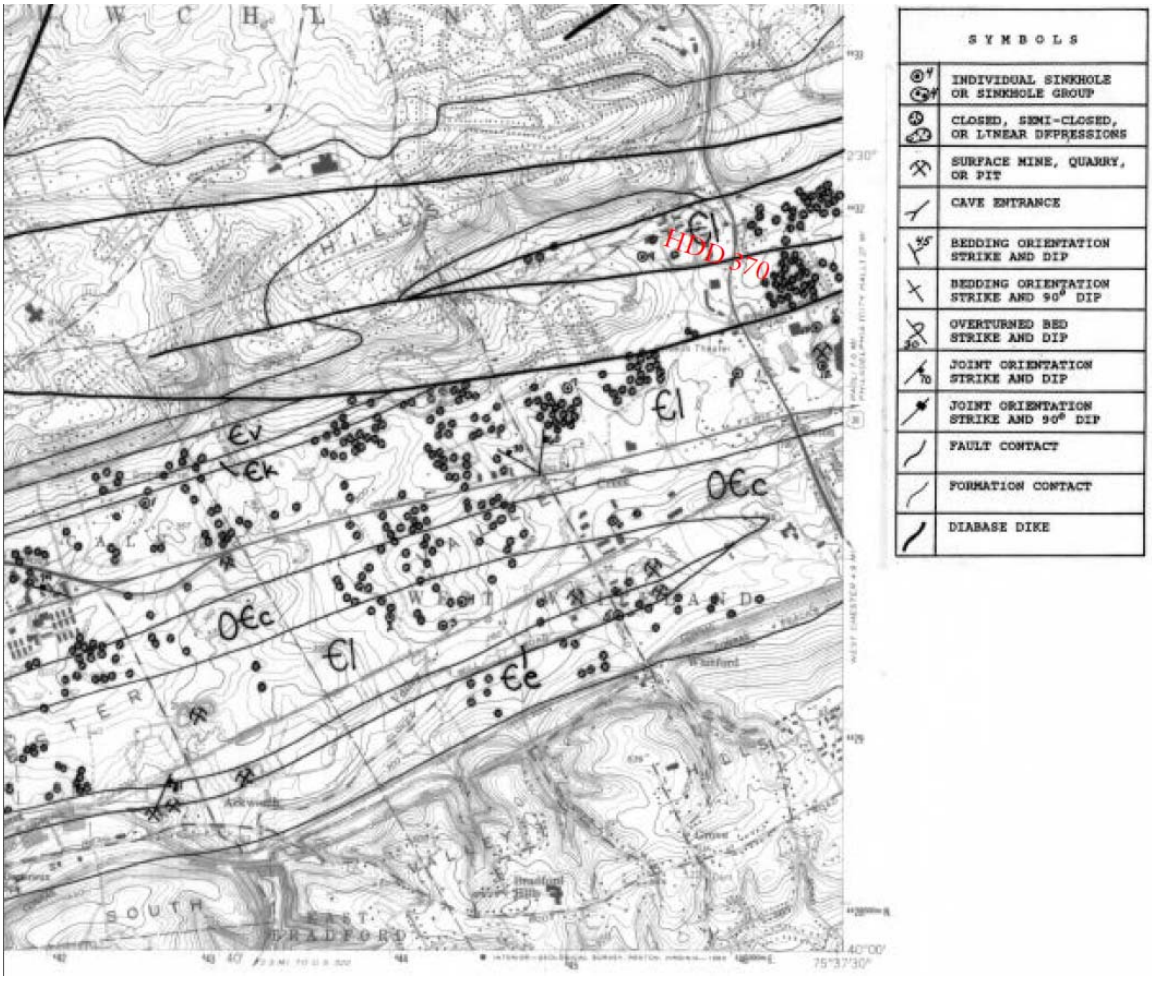


Figure 5. Map of Sinkholes and Karst Features of the Downingtown Quadrangle (From Kochanov, et al., 1993)

2.2.6 Mining

Dolostone of the Ledger Formation is mined in nearby Downingtown and Malvern, to the southwest and northeast of the HDD S3-0370 location, respectively. No historical mine locations have been identified in close proximity to HDD S3-0370 via map review. The closest mines are greater than two miles from the HDD site and therefore, mine activities are not likely to have any effect upon conditions or activities at the subject HDD location. Symbols noting mining/quarrying activity are noted in the Ledger and Elbrook Formations just east of Downingtown near the lower-left corner of **Figure 5**.

2.2.7 Rock Engineering Properties

The rock properties of the Ledger Formation are as follows (Geyer and Wilshusen 1982):

- Bedding is moderate to massive.
- Fracture joints have a blocky pattern and are moderately to well developed, irregularly spaced and abundant. Fractures are further described as open and steeply dipping with a wide distance between fractures.
- Surface drainage is good.

- Joint and bedding plane openings and solution channels provide secondary porosity of low to high magnitude. Median well yields are reported as 30 gallons per minute (gpm) with a range from 1 to 400 gpm.
- Drilling rate is fast and bedrock pinnacles can be problematic for excavation or drilling.

The rock properties of the Chickies Formation are described as (Geyer and Wilshusen 1982):

- Bedding is moderately well to well developed and thick.
- Joint and cleavage planes display a blocky pattern; are moderately developed and moderately abundant, are widely spaced, fairly regular, steeply dipping and open.
- Surface drainage is good.
- Joint and cleavage plane openings provide a secondary porosity of very low magnitude. Median well yield is 20 gpm; most water is obtained from the fractured, weathered zone at the top of bedrock.
- Drilling rate is slow; quartz veins and large boulders may be problematic.

2.2.8 Results of Geotechnical Borings

Three shallow geotechnical borings were completed by Tetra Tech to support the original design of HDD S3-0370. These three initial borings were terminated at the top of rock surface at depths ranging from approximately 30 to 37 below ground surface (bgs). A fourth boring was later installed by Terracon (B6-4W) in August, 2017, north of the northwestern entry/exit location which was advanced to a depth of 130 feet and never hit the top of competent bedrock. A fifth boring was also installed by Terracon (B6-4E) near the southwestern entry/exit point. This boring, identified a B6-4E, hit rock at a depth of 36.5 feet and was continued via wire-line coring to a total depth of 122 feet. The bedrock was alternately described as schist, schist interbedded with marble and quartzite and variations of these three rock types. These descriptions appear to denote a mix of Ledger (dolomite or marble), Chickies (quartzite), and Harpers (schist or phyllite) that are all mapped in the immediate HDD S3-0370 vicinity. Of particular note are the B6-4E log descriptions of voids, vugs and rock quality designation (RQD) determinations for the rock in the interval of proposed HDD penetration (i.e., from top of rock to depths of 65 bgs). The RQD values for boring B6-4E in the 50 to 70 foot depth interval ranged from 0% to 50%; suggesting significant rock fracturing or dissolution. It should be noted that the RQD values were significantly higher in the 40 to 50 foot bgs range; between 72 and 88%. Accompanying lithologic descriptions identify six voids ranging in thickness from 1 to 10 inches in the depth interval from 45 to 65 bgs.

One groundwater monitoring well was also recently installed south of Swedesford Road along the HDD S3-0381 alignment approximately 1,740 feet southeast of the HDD S3-0370 entry/exit point. Geophysical and aquifer testing was performed at this location to ascertain potential hydraulic connection to the Aqua PA Hillside production wells as it related to the proposed HDD drill path depth. Test data were summarized by Tetra Tech (March 2017) and results indicated hydraulic influence from the operation of the Aqua Hillside (Aqua) supply wells and also suggested vertical integration of three water bearing zones within the top 160 feet.

The Tetra Tech report offered further opinion relative to the potential for two other Aqua wells located approximately 1,170 and 1,600 feet west/southwest of the HDD S3-0370 northwestern entry/exit point (the Shoen Road wells) to be impacted by HDD activities. The Tetra Tech report concludes that any such impacts are unlikely due to the extent and orientation of operational supply well capture zone areas relative to the HDD S3-0370 path.

2.3 Hydrogeology

The Ledger dolomite unit mapped beneath the HDD S3-0370 location is identified as a unit of moderate to good groundwater production. Existing well and geotechnical drilling records suggest that groundwater may exist within the top 20 to 70 feet of grade –within the proposed HDD depth interval. Yields reported for the Chickies quartzite are slightly lower and regional production (i.e., the four identified Aqua PA supply wells) appears to be exclusively from the Ledger Formation.

2.3.1 Occurrence of Groundwater

Groundwater in the immediate HDD S3-0370 area exists in the saprolite above both the Ledger Dolomite and Chickies Quartzite under unconfined conditions. Groundwater is used locally for both private and public potable supply in depth ranges from approximately 75 to 300 feet bgs. As noted above, public water supply wells are operated by Aqua PA at distances of approximately 1,170 and 1,600 feet west/southwest of the northwestern HDD S3-0370 entry/exit point (the Shoen Road supply wells) and approximately 1,900 feet southeast of the southwestern HDD S3-0370 entry/exit location (the Hillside supply wells). The Hillside wells are considerably closer to the HDD S3-0381 path and additional testing work has been completed by Tetra Tech to ascertain potential hydraulic connectivity between these wells and HDD activities. The two Hillside Aqua supply wells are completed at depths of 85 and 107 feet in the Ledger Formation and the two Shoen Road wells are completed at depths of 300 and 410 feet in either the Ledger or adjacent Harper Formations.

2.3.2 Ground Elevation Between HDD Entry/Exits

The ground surface elevation at the northwestern entry/exit point is identified on the Plan and Profile drawing as approximately 353 ft amsl and the entry/exit point 2,056 feet to the southeast is shown at an elevation of approximately 346 ft amsl. Thus, a gentle surface grade of less than 0.4% exists across the HDD pathway.

2.3.3 Water Level

Information obtained from the Pennsylvania Groundwater Information System (PaGWIS) database indicates static groundwater levels within approximately one mile of the HDD S3-0370 alignment as ranging from approximately 20 to 75 feet bgs. Geotechnical borings installed as part of the Mariner East II planning program found static water levels in the immediate HDD S3-0370 site as ranging from 12 to 28 feet bgs along the full length of the HDD. The monitoring well installed along Swedesford Road approximately 1,740 feet southeast of the southeastern HDD S3-0370 exit point reported a static water level of 40 feet bgs. Another monitoring well installed by Tetra Tech to the northwest of the northwest entry/exit location showed static groundwater levels at a depth of approximately 73 feet bgs.

2.3.4 Well Yields

Medan well yields for this geologic setting are reported as variable but are approximately 30 gpm on average (Geyer and Wilshusen, 1982). Hall (1934) reported yields from the Ledger Dolomite as being between 1 and 110 gpm with an average of about 22 gpm. Median well yields for the Chickies quartzite are reported by Geyer and Wilshusen as 20 gpm.

2.3.5 Water Supply Wells

During the original planning by SPLP for advance of the HDD S3-0370 drills, a survey of land owners within 150 feet of the ROW was performed. A total of four private supply well owners within 150 feet of the HDD S3-0370 alignment requested pre-construction sampling of their water supplies. The PaGWIS database has records for 20 withdrawal wells within an approximate one-mile radius of HDD S3-0370. Not all records are complete and the PaGWIS database does not include the two known Aqua PA public water production wells located approximately 1,170 feet (0.22 miles) and 1,600 feet (0.3 miles) west/southwest of the northwestern entry/exit point. These two wells were installed in 1968 and 1974 and are actively used

for public supply production. The wells, identified as Shoen Road #3 and #4, are cased to depths of 81 and 83 feet, are completed at depths of 410 and 300 feet, and provide an estimated average sustained yield of 650 and 300 gpm, respectively.

Two additional Aqua PA supply wells are located approximately 2,000 feet southeast of the southeastern entry/exit point along Swedesford Road. Extensive hydraulic testing was conducted at that location as part of investigations related to HDD S3-0381.

A more restricted search of PaGWIS database records identified eight domestic and two commercial withdrawal wells within an approximate 450 foot radius of the HDD S3-0370 location. The wells are completed at depths ranging from 88 to 300 feet with casing depths ranging from 26 to 90 feet below grade. Reported well yields are between 1 and 100 gpm.

2.4 Summary of Geophysical Studies

No geophysical studies have been completed for the HDD S3-0370 alignment. However, downhole geophysical testing and aquifer testing was completed at the monitoring well located close to the Aqua Hillside production wells on Swedesford Road. This well, also completed in the Ledger Formation, yielded evidence of significant groundwater yields, extensive bedrock fracturing and dissolution and vertical hydraulic integration in depth zones from approximately 72 to 160 feet bgs.

3.0 OBSERVATIONS TO DATE

3.1 On This HDD Alignment

3.1.1 ME I

ME I inadvertent returns (IRs) are listed in the ME II IR PPC Plan for Chester County for the Ledger, Conestoga or Chickies Formation.

3.1.2 ME II

No ME II HDD construction has occurred along the HDD S3-0370 alignment, to date.

3.2 On Other HDD Alignments in Similar Hydrogeologic Settings

HDD S3-0370 is located approximately 1.3 miles northwest of the northern entry/exit point for HDD S3-400. Moving southeast from the northern entry/exit point for HDD S3-400, for approximately the first 880 feet, this drill has passed through the Conestoga Formation (limestone), before entering the Octoraro Formation, a phylllite with some schist. Due to the karst character of the Conestoga, the drill has gone through voids, has had difficulties staying on alignment, has experienced high groundwater production, and significant losses of drilling fluids. Despite the losses of drilling fluids, no IRs have been detected to date. Other potential challenges of drilling though carbonate rock, like the Conestoga and Ledger Formation, would be development of sinkholes or lowering of water level in local domestic supply wells.

As noted above, significant hydrogeologic work has been undertaken by Tetra Tech along the HDD S3-0381 alignment (immediately southeast of HDD S3-0370) in an attempt to better define geology, hydraulics and potential effects from HDD work on the existing Aqua Hillside supply wells. Aquifer testing in the Ledger Formation associated with the two Hillside Aqua wells demonstrated hydraulic interconnection across three zones screened between 0 and 160 ft bgs. These studies illustrate the karst development in the Ledger Formation and characteristic potential for extensive hydraulic communication between and throughout the overburden and lithified bedrock.

4.0 SUMMARY AND CONCLUSIONS OF HHD HYDROGEOLOGIC EVALUATION

4.1 HDD Site Conceptual Model

Fractured crystalline siliceous dolomite rock underlies the site. This geologic unit (the Ledger Formation) may interface with quartzite of the Chickies Formation and Schist/Phyllite of the Harpers Formation along the path of the HDD S3-0370 alignment. On average, fine-grained soils comprised of in-situ weathered dolomite and quartzite likely exist to depths of approximately 30 to 40 feet bgs; however, bedrock weathering to a depth greater than 130 feet was demonstrated by a recent test boring (B6-4W). The fine-grained soils in the overburden have moderate water retention and moderate water storage capacity, are relatively cohesive, and would not be expected to pose an elevated IR risk, given appropriate entry/exit boring design (sufficient angle of entry). Furthermore, HDD elevation changes from entry to exit are minimal and no issues of groundwater flow back are expected to arise from differential elevation concerns.

Individual depressions, sinkholes and sinkhole groups (karst features) have been identified and mapped in the immediate area of the HDD S3-0370 location. A geotechnical boring located near the southeast entry/exit point (B6-4E), was drilled into bedrock across the proposed HDD depth interval, and identified small voids and highly fractured rock (low RQD values) over most of the rock core interval from 36.5 to 122 ft bgs. A zone of better RQDs (72 to 88%) was recorded between 40 and 50 ft bgs. The aforementioned boring, B6-4W, was advanced to a depth of 130 feet yet never encountered competent bedrock. Aquifer testing in the Ledger Formation associated with the two Hillside Aqua wells demonstrated hydraulic interconnection across three zones screened between 0 and 160 ft bgs. In addition, based on fracture trace analysis, elements of a regionally-extensive fracture system appear to exist in proximity to the HDD S3-0370 location, although no lineaments or fracture traces were mapped that intersect the alignment. Regional fracture orientations are steeply dipping to nearly vertical.

Available data also suggests that a significant number of active water supply wells, including two large-capacity public supply wells owned and operated by Aqua Pennsylvania exist within 1/3 mile of HDD S3-0370. Initial analysis by Tetra Tech suggests that the two closest Aqua supply wells will not be affected by installation of the HDD.

The HDD S3-0370 bore is proposed to reach a maximum depth of approximately 77 bgs and approximately 1,600 of the total 2,065 feet of HDD bore length will be at depths expected to coincide with or exceed bedrock depth. When in bedrock, most of the HDD-S3-0370 bore will be in the Ledger Formation, which is a highly productive groundwater source upon which karst terrain develops. As demonstrated, the subsurface and terrain are characterized by interconnected fractures, bedding planes, solution openings, sinkholes and closed depressions that represent an elevated risk for loss of drilling fluid and IRs. The proximity of faults, geologic contacts and water supply wells also add a degree of risk to the HDD S3-0370 installation. It is very possible that the bore path could intercept high-yielding fractures in the Ledger Formation. If this water is not controlled or retained in the native formation, impacts to local wells could result. Lastly, the pinnacle weathering surface of the Ledger and potential for karst features (voids) could introduce problems for drill bit control during advance of the HDD pilot hole.

4.2 Recommendations

The compilation of regional and local hydrogeologic information for HDD S3-0370 strongly indicates an elevated risk for drilling mud loss and IRs. In order to ameliorate the elevated risks, the proposed HDD design and procedures should address the karstic nature of the Ledger Formation through which the boring will advance. At a minimum, geophysical studies or an expanded geotechnical boring program, could be used to reduce these risks by improving predictability as to where, along the profile, issues may occur.

Once better subsurface characterization is achieved, potential solutions to reduce the risk of IRs when installing HDD S3-0370 include:

- Installing the pipeline via open cut trenching, utilizing a conventional bore to install the pipe under the North Pottstown Pike; and,
- Utilizing HDD drilling methods that utilize lower fluid pressures to take into account highly variable subsurface material strength.

5.0 REFERENCES

Geyer, A. R. and J. P. Wilshusen, *Engineering Characteristics of the Rocks of Pennsylvania.* Pennsylvania Department of Environmental Resources, Office of Resource Management, Bureau of Topographic and Geologic Survey, 1982.

Hall, G.M., Ground Water in Southeastern Pennsylvania. Pennsylvania Geologic Survey, Bulletin W 2, 1934.

Kochanov, W. E., "Bedrock Geologic Map of Part of the Chester, Delaware, Montgomery, and Philadelphia Counties, Pennsylvania. Pennsylvania Geologic Survey, 2016.

Kochanov, W. E., Lichtinger, J. F., and Becker, Mona, Sinkholes and karst-related features of Chester County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open-File Report 93–01, 9 p., 10 maps, scale 1:24,000, 1993. [Available online.]

Pennsylvania Groundwater Information System (PaGWIS). Pennsylvania Geological Survey, SQL database, http://dcnr.state.pa.us/topogeo/groundwater/pagwis/records/index.htm.

Potter, Noel Jr., "Southeast of Blue Mountain" in The Geology of Pennsylvania, Pennsylvania Geological Survey and Pittsburgh Geological Society, Charles H. Shultz, Editor, Chapter 28, 1999.

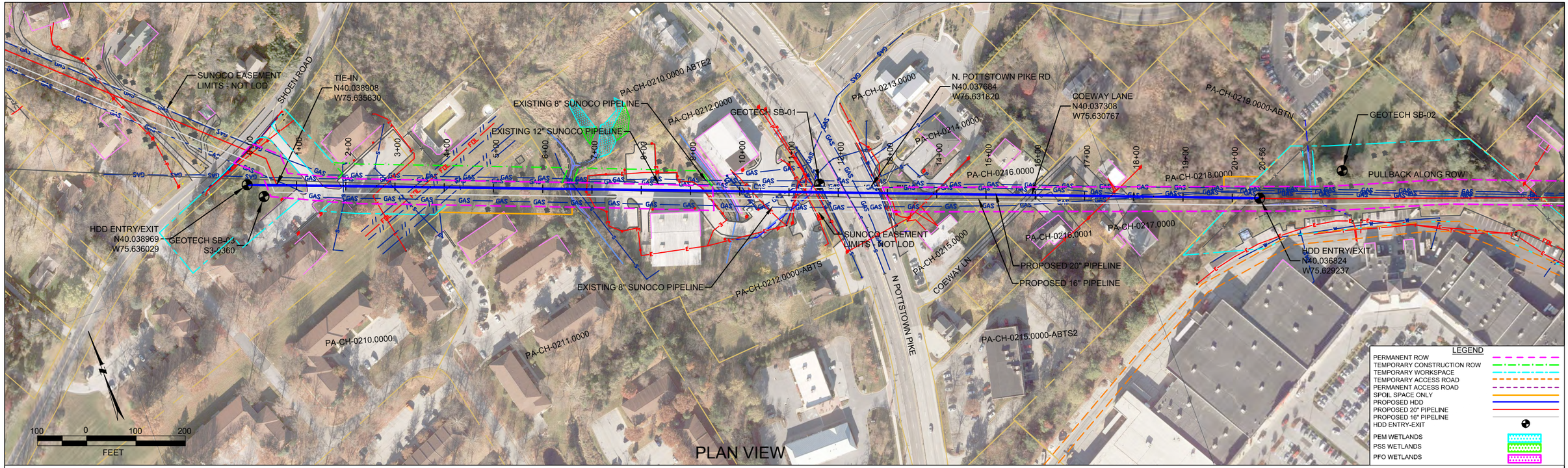
Tetra Tech, Inc., "*Summary of Results of Aquifer Testing Vertical HDD Monitoring Well as Swedesford Road"*, March 24, 2017 (Filed with PADEP October 3, 2017 as part of HDD S3-0381 modification package).

United States Department of Agriculture (USDA) NRCS Web Soil Survey for Chester County (http:\\websoilsurvey.nrcs.usda.gov).

United States Geologic Survey (USGS) 7.5 Minute Series Topographic Quadrangle, Downingtown, Pennsylvania, revised 1983.

Attachment A

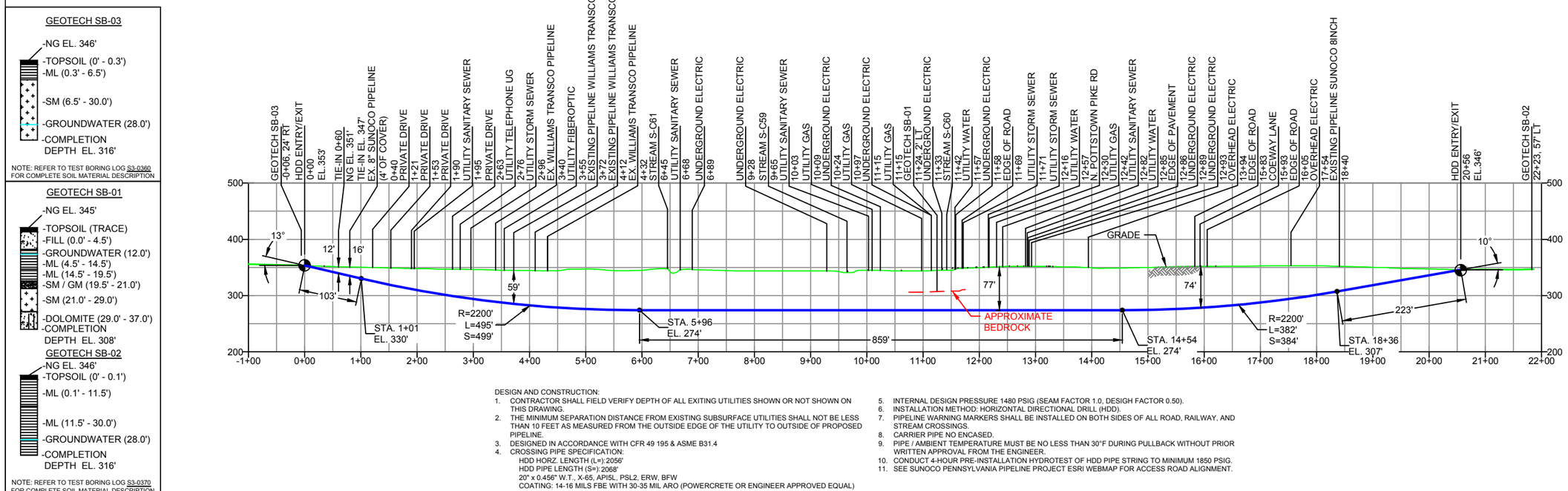
HDD Plan and Profile



PLAN VIEW

PROFILE VIEW

CHESTER COUNTY, PENNSYLVANIA - WEST WHITELAND TOWNSHIP
S3-0370



DESIGN AND CONSTRUCTION:

1. CONTRACTOR SHALL FIELD VERIFY DEPTH OF ALL EXITING 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=):2056'
   HDD PIPE LENGTH (S=):2068'
   20" x 0.456" W.T., X-65, API5L, PSL2, ERW, BFW
   COATING: 14-16 MILS FBE WITH 30-35 MIL ARO (POWERCRETE OR ENGINEER APPROVED EQUAL)
5. INTERNAL DESIGN PRESSURE 1480 PSIG (SEAM FACTOR 1.0, DESIGH FACTOR 0.50).
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 NO 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.

NOTES

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.

REVISIONS

NO.	DESCRIPTION	BY	DATE	CHK	DATE	APP	DATE
5	REVISED PROFILE WITH 2017 LIDAR	MRS	02/15/17	RMB	02/15/17	AMC	02/15/17
4	DESIGN CHANGE (OZ HDD DESIGN - RFI 0100)	DLM	12/05/16	RMB	12/05/16	AMC	12/05/16
3	REVISED PER ENGINEERING COMMENTS	MRS	08/12/16	RMB	08/12/16	AAW	08/12/16
2	DESIGN CHANGE	DLM	04/28/16	RMB	04/28/16	AAW	04/28/16
1	REVISED PER COMMENTS FROM REI REVIEW	MRS	03/03/16	RMB	03/03/16	AAW	03/03/16
0	ISSUED FOR CONSTRUCTION	MRS	02/19/16	RMB	02/19/16	AAW	02/19/16

Sunoco Logistics Partners L.P.

TETRA TECH ROONEY
(303) 792-5911

SUNOCO PIPELINE, L.P.

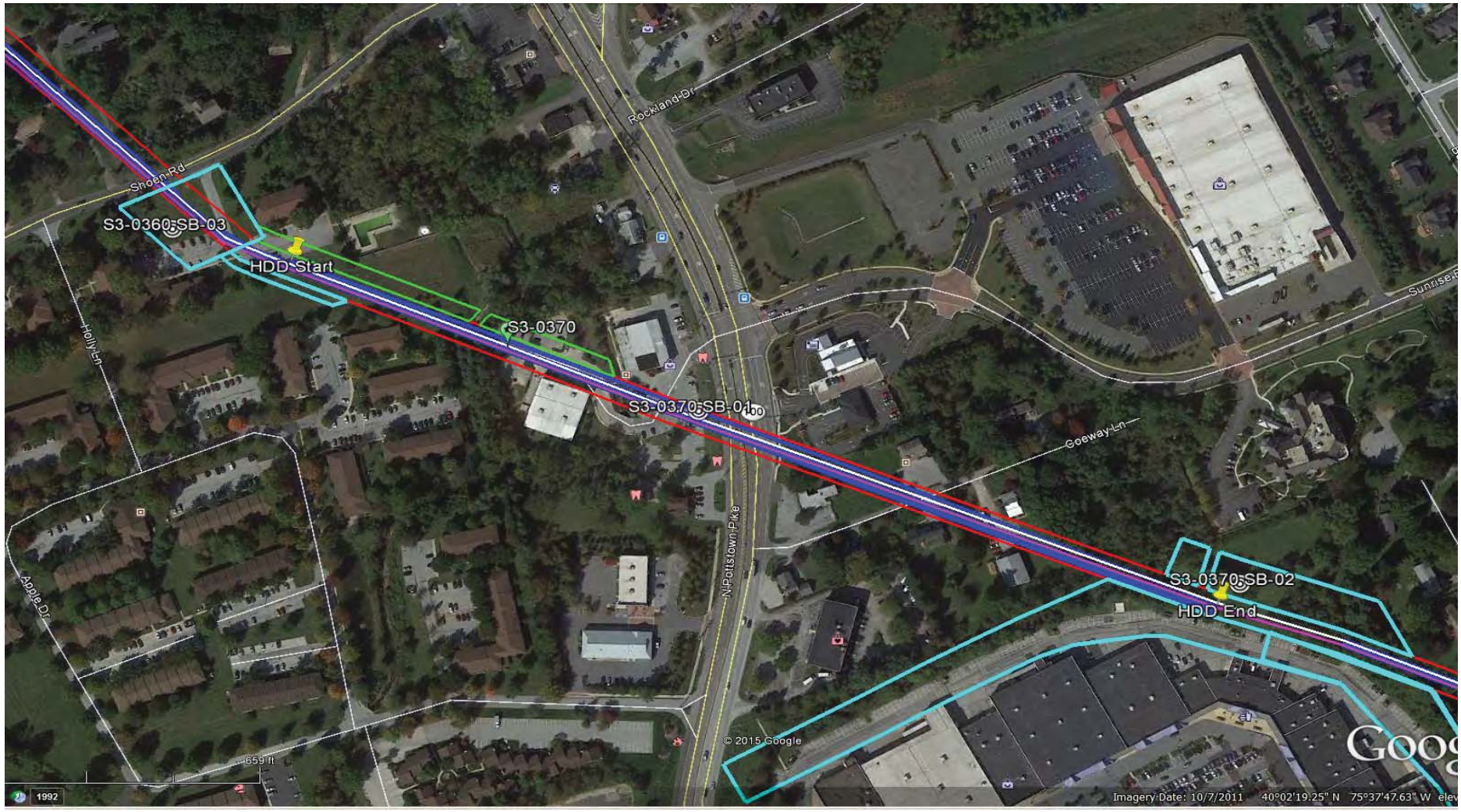
HORIZONTAL DIRECTIONAL DRILL
N POTTSTOWN PIKE
PENNSYLVANIA PIPELINE PROJECT

SCALE: 1"=200'

DWG. NUMBER: PA-CH-0212.0000-RD

Attachment B

Geotechnical Boring Logs



LEGEND:

Geotechnical Soil Boring (SB) Locations

TETRA TECH

GEOTECHNICAL BORING LOCATIONS
HDD S3-0370
CHESTER COUNTY, WEST WHITELAND 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:	SHOEN ROAD, EXTON, PA		Page 1 of 1
HDD No.:	S3-0360	Dates(s) Drilled: 06-14-15	Inspector: J. COSTELLO
Boring No.:	SB-03	Drilling Method: SPT - ASTM D1586	Driller: GREGG
Drilling Contractor:	HAD DRILLING	Groundwater Depth (ft): 28.0	Total Depth (ft): 30.0
Boring Location Coordinates:		40° 2' 19.944" N	75° 38' 9.409" W

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.3			TOPSOIL (4")					
1	3.0	5.0	0.3		22	ML	YELLOWISH BROWN SILT WITH A LITTLE FINE SAND, TRACE FINE	1	6	7	9	**13**
				6.5			GRAVEL (USCS: ML).					
2	8.0	10.0	6.5		14	SM	DR WEATHERED TO A GRAY FINE TO COARSE SAND WITH SOME SILT,	1	8	10	15	**18**
							WITH A LITTLE FINE TO COARSE GRAVEL.					
3	13.0	15.0			16		DR WEATHERED TO A BROWNISH GRAY TO BROWN, FINE TO MEDIUM	2	4	4	8	**8**
							SAND WITH SOME SILT, TRACE UNWEATHERED FINE GRAVEL.					
4	18.0	20.0			14		YELLOWISH BROWN FINE TO COARSE SAND WITH SOME SILT, WITH	3	4	13	13	**17**
							A LITTLE UNWEATHERED FINE GRAVEL. (DR)					
5	23.0	25.0			25		DR WEATHERED TO A YELLOWISH BROWN TO REDDISH BROWN, FINE	1	4	8	9	**12**
							TO MEDIUM SAND, SOME SILT, WITH A LITTLE F-C GRAVEL.					
6	28.0	30.0			14		DR WEATHERED TO A YELLOWISH BROWN TO REDDISH BROWN, FINE	2	11	22	20	**33**
				30.0			TO MEDIUM SAND, SOME SILT, WITH A LITTLE F-C GRAVEL.					

Notes/Comments:

Pocket Pentrometer Testing
S1: 3.25 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
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:	SHOPS AT 344, EXTON, PA		Page 1 of 1
HDD No.:	S3-0370	Dates(s) Drilled: 06-15 & 7-31-15	Inspector: J. COSTELLO
Boring No.:	SB-01	Drilling Method: SPT - ASTM D1586	Driller: GREG
Drilling Contractor:	HAD DRILLING	Groundwater Depth (ft): 12.0	Total Depth (ft): 29.8
Boring Location Coordinates:		40° 2' 16.086" N	75° 37' 56.320" W

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.0			TOPSOIL (TRACE)					
			0.0			ML (FILL)	HISTORICAL FILL - MATRIX OF FINE TO MEDIUM SAND, SILT, A LITTLE					
				4.5			F-C GRAVEL, TRACE ASPHALT FRAGMENTS.					
1	3.0	5.0	4.5		14	ML	DARK BROWN SILT AND FINE SAND, TRACE FINE GRAVEL.	2	2	4	4	**6**
2	8.0	10.0			24		MOTTLED LIGHT BROWN AND GRAY SILT WITH SOME FINE SAND,	1	4	5	4	**9**
				14.5			TRACE FINE GRAVEL.					
3	13.0	15.0	14.5		24	ML	DR WEATHERED TO A BANDED GRAY, BROWN, AND WHITE SILT AND	1	1	1	6	**2**
				19.0			FINE SAND, TRACE FINE GRAVEL. (USCS: ML).					
4	18.0	19.5	19.0		8	SM/ GM)	DR WEATHERED TO A REDDISH BROWN FINE TO COARSE SAND AND	1	10	50		**60**
				21.0			FINE TO COARSE GRAVEL, SOME SILT.					
5	23.0	25.0	21.0		8	SM	DR WEATHERED TO A BROWN FINE SAND AND SILT, WITH SILTY	1	1	1	1	**2**
							FINE GRAVEL LENSES.					
6	28.0	28.8			6		DR WEATHERED TO A LAYERED GRAY AND BROWN FINE SAND AND	4	50/4"			**>50**
				29.0			SILT, WITH LAYERS OF UNWEATHERED ROCK FRAGS. (USCS: SM)					
7/31/2015							AUGER REFUSAL AT 29'.					
							ROCK CORING					
RUN 1	29.0	32.0	29.0		32	FRACTURED ROCK	LIGHT GRAY AND REDDISH BROWN INTENSELY FRACTURED	TCR: 89%, SCR: 29%, RQD: 11.8%				
							DOLOMITE					
RUN 2	32.0	34.0			24		VARIEGATED GRAY, RED, YELLOW VERY INTENSELY FRACTURED	TCR: 100%, SCR: 19%, RQD: 19%				
							DOLOMITE.					
RUN 3	34.0	37.0			36		MARBLED WHITE, GRAY, BROWNISH RED INTENSELY FRACTURED	TCR: 100%, SCR: 43%, RQD: 31%				
				37.0			DOLOMITE.					
							CORE TESTING RESULTS (RUN 1, DEPTH 30-30.5'):					
							COMPRESSIVE STRENGTH: 2,040PSI					
							UNIT WEIGHT: 152.9 PCF					

Notes/Comments:

Pocket Pentrometer Testing
S2: 2.0 TSF
S3: 2.75 TSF

DR: DECOMPOSED ROCK

WET ON SPOON AT 12'.
WATER LEVEL THROUGH AUGERS AT 12'.
CAVED AT 16'.

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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Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	SUNOCO PENNSYLVANIA PIPELINE PROJECT		Project No.: 103IP3406
Project Location:	BEHIND FAIRVIEW PLAZA (SUPERCUTS), EXTON, PA		Page 1 of 1
HDD No.:	S3-0370	Dates(s) Drilled: 06-14-15	Inspector: E. WATT
Boring No.:	SB-02	Drilling Method: SPT - ASTM D1586	Driller: S. HOFFER
Drilling Contractor:	HAD DRILLING	Groundwater Depth (ft): 28.0	Total Depth (ft): 30.0
Boring Location Coordinates:		40° 2' 12.471" N	75° 37' 42.989" W

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.1			TOPSOIL (1")					
1	3.0	5.0	0.1		21	ML	MOTTLED (SHADES OF BROWN) SILT AND FINE TO MEDIUM SAND,	2	8	6	7	**14**
							WITH A LITTLE FINE TO COARSE GRAVEL.					
2	8.0	10.0			22		BROWN SILT WITH A LITTLE FINE SAND. (USCS: ML).	2	3	3	5	**6**
				11.5								
3	13.0	15.0	11.5		24	ML	DR WEATHERED TO A BROWN SILT WITH A LITTLE FINE SAND, TRACE	1	4	5	7	**9**
							FINE QUARTZ GRAVEL, TRACE MICA.					
4	18.0	19.5			24		DR WEATHERED TO A BROWN AND BLACK SILT WITH A LITTLE FINE	2	5	9	15	**14**
							SAND, TRACE FINE GRAVEL.					
5	23.0	25.0			24		DR WEATHERED TO A BROWN TO ORANGE BROWN SILT AND FINE	2	4	4	5	**8**
							SAND, TRACE FINE QUARTZ GRAVEL. (USCS: ML).					
6	28.0	30.0		30.0	16		SAME.	3	4	6	9	**10**
							WET ON SPOON AT 23'.					
							WATER LEVEL THROUGH AUGERS AT 28'.					
							CAVED AT 27', WATER LEVEL ON CAVE AT 25'.					

Notes/Comments:

Pocket Pentrometer Testing
8': 3.0 TSF 15': 2.5 TSF
10': 3.75 TSF 18': 2.75 TSF
13': 4.0 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.

GEOTECHNICAL LABORATORY TESTING SUMMARY
SUNOCO PENNSYLVANIA PIPELINE PROJECT
HDD S3-0370

HDD No.	Test Boring No.	Sample No.	Depth of Sample (ft.) From	Depth of Sample (ft.) To	Water Content, % (ASTM D2216)	Percent Silts/Clays, % (ASTM D1140)	Atterburg Limits (ASTM D4318) Liquid Limit, %	Atterburg Limits (ASTM D4318) Plastic Limit, %	Atterburg Limits (ASTM D4318) Plasticity Index, %	USCS Classif. (ASTM D2487)
S3-0360	SB-03	1	3.0	5.0	22.6	81.1	36	27	9	ML
		2	8.0	10.0	12.2	33.3	-	-	-	-
		3	13.0	15.0	16.5	35.8	-	-	-	-
		4	18.0	20.0	11.3	26.1	-	-	-	-
		5	23.0	25.0	16.3	29.3	-	-	-	-
S3-0370	SB-01	2	8.0	10.0	18.3	79.8	-	-	-	-
		3	13.0	15.0	41.2	69.8	44	28	16	ML
		4	18.0	19.5	12.0	22.4	-	-	-	-
		5	23.0	25.0	17.6	42.6	-	-	-	-
		6	28.0	29.8	22.0	45.9	39	27	12	SM
	SB-02	1	3.0	5.0	18.7	64.9	-	-	-	-
		2	8.0	10.0	28.3	85.4	45	37	8	ML
		4	18.0	19.5	26.0	88.2	-	-	-	-
		5	23.0	25.0	34.6	63.9	41	33	8	ML
		6	28.0	30.0	27.6	68.9	-	-	-	-

Rock Core Testing Results				
Boring No.	Core Run	Approximate Depth (ft)	Compressive Strength (psi)	Unit Weight (pcf)
S3-0370 SB-01	1	30.0-30.5	2,040	152.9

Notes:

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

ROCK CORE DESCRIPTION SUMMARY
SUNOCO PENNSYLVANIA PIPELINE PROJECT
HDD S3-0370

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					
S3-0370	SB-01	1	29	32	89	29	12	29	34	Heavily	Dolostone	Massive	Gray	Rubble
		2	32	34	100	19	19							
		3	34	37	100	43	31	34	37	Moderate	Dolostone	Massive	Gray	Fractures ranging from 32° to 67°, Avg. 57°

REGIONAL GEOLOGY SUMMARY
SUNOCO PENNSYLVANIA PIPELINE PROJECT
HDD S3-0370

HDD No.	NAME	BORING NO.	REGIONAL 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
S3-360		SB-03	Chickies Formation - Light-gray, hard, massive, Scolithus-bearing quartzite and quartz schist; thin, interbedded dark slate at top; conglomerate (Hellam Member) at base.	Generally level, slight slope to the south	Chickies Formation (Cambrian)	Quartzite, schist, slate, conglomerate	600	Ranges from 20 to 78 ft bgs, Avg. 51 ft bgs (.25 mile radius)	
S3-0370		SB-01	Ledger Formation - Light-gray, locally mottled, massive, pure, coarsely crystalline dolomite; siliceous in middle part.	Generally level, slight slope to the west	Ledger Formation (Cambrian)	Dolostone (Dolomite)	2,000	Ranges from 20 to 78 ft bgs, Avg. 51 ft bgs (.25 mile radius)	
		SB-02	Chickies Formation - Light-gray, hard, massive, Scolithus-bearing quartzite and quartz schist; thin, interbedded dark slate at top; conglomerate (Hellam Member) at base.	Generally level, slight slope to the west	Chickies Formation (Cambrian)	Quartzite, schist, slate, conglomerate	600	Ranges from 20 to 78 ft bgs, Avg. 56 ft bgs (.5 mile radius)	

Note : Source of well log data - http://www.dcnr.state.pa.us/topogeo/groundwater/pagwis/records/index.htm. All other sources as referenced in comments section.

October 13, 2017

Directional Project Support, Inc.
33311 Lois Lane, Suite A
Magnolia, TX 77354

Attn: Mr. Robert Sessions
P: (318) 542 6657
E: fielduspl@Hotmail.com

Re: Geotechnical Site Characterization
Mariner East 2 Pipeline Project
Spread 6 – North Pottstown Pike
Commonwealth of Pennsylvania
Drawing # PA-CH-0212.0000-RD
PO #20170804-19
Terracon Project No. J217P078

Dear Mr. Sessions:

This letter provides a summary of the bedrock characterization for the Mariner East 2 Pipeline Project crossing to be located at North Pottstown Pike (Drawing # PA-CH-0212.0000-RD) in the Commonwealth of Pennsylvania. Our services were performed in general accordance with our proposal number PJ2175108 dated July 28, 2017. Our scope of services included advancing two borings, designated as B6-4W and B6-4E, visual classification and photography of the rock core samples, and laboratory testing of representative rock samples.

Test borings, B6-4W and B6-4E were drilled between August 12 and 16, 2017 to depths of 130.0 and 122.0 feet, respectively as shown on the attached **Test Boring Location Plan**. Bedrock typically consisted of metamorphic rock comprised of schist, quartzite, and marble at B6-4E. Competent bedrock was not encountered at B6-4W. Final test boring logs documenting overburden soil and bedrock conditions as well as photographs of the rock core samples are attached.

Rock compressive strength testing was performed on samples from approximately 20-foot intervals within the bedrock strata at B6-4E. Unconfined compressive strength test results are shown on the attached reports.

When laboratory soil testing results are available, we will submit a complete data report for the subject crossing. In the meantime, if you have questions, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Marc A. Gullison, E.I.T.
Staff Geotechnical Engineer

Lawrence J. Dwyer, P.E. (CT 15120)
Principal

Attch:

TEST BORING LOCATION PLAN
EXPLORATION RESULTS (Boring Logs, Laboratory Data, Rock Core Photographs)
SUPPORTING INFORMATION (Unified Soil Classification System, Description of Rock Properties)

TEST BORING LOCATION PLAN

N

APPROXIMATE BORING LOCATION

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: JGS	Project No. J217P078
Drawn by: SBL	Scale: N.T.S.
Checked by: LJD	File Name: J217P078 BLP
Approved by: LJD	Date: September. 2017

Terracon
Consulting Engineers & Scientists
201 Hammer Mill Road Rocky Hill, Ct 06067
PH. (860) 721-1900 FAX. (860) 721-1939

TEST BORING LOCATION PLAN

North Pottstown Pike HDD Cores B6-4W and B6-4E
PA-CH-0212.0000-RD
Chester County, Pennsylvania

Exhibit

A-2

EXPLORATION RESULTS

BORING LOG NO. B6-4W North Pottstown Pike West

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.038964° Longitude: -75.636034°

Approximate Surface Elev: 353 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	Penetrometer Test (tsf)
0.2 Gravel	353+/-					
0.5 **FILL - POORLY GRADED SAND (SP)**, brown	352.5+/-					
SANDY LEAN CLAY (CL), red brown, stiff						
			X	9	1-4-6 N=10	1.5
		5				
9.0	344+/-					
CLAYEY SAND WITH GRAVEL (SC), red brown, very stiff			X	16	7-11-9 N=20	
		10				
11.0	342+/-					
SANDY LEAN CLAY WITH GRAVEL (CL), dark brown to red brown, stiff			X	14	1-3-7 N=10	1.0
		15				
18.5	334.5+/-					
SANDY LEAN CLAY (CL), trace gravel, red brown, very soft to medium stiff			X	16	1-2-3 N=5	2.0
		20				
			X	17	1-1-3 N=4	1.0
		25				
			X	9	1-2-3 N=5	1.0
		30				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-15-2017 | Boring Completed: 08-16-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

Project No.: J217P078 | Exhibit: A-1

BORING LOG NO. B6-4W North Pottstown Pike West

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.038964° Longitude: -75.636034°

Approximate Surface Elev: 353 (Ft.) +/-

DEPTH ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
SANDY LEAN CLAY (CL), trace gravel, red brown, very soft to medium stiff *(continued)*								
	35		X	9	1-1-1 N=2			1.0
	40		X	18	1-1-2 N=3			1.5
	45		X	0	wor-1-2			
Sand seam at 49.5 feet	50		X	17	1-2-3 N=5			1.75
	55		X	18	4-4-3 N=7			0.75
58.5 294.5+/- **SANDY LEAN CLAY (CL)**, trace gravel, red brown to dark brown to black, soft to medium stiff	60		X	15	1-2-6 N=8			1.75

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-15-2017 | Boring Completed: 08-16-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

Project No.: J217P078 | Exhibit: A-1

BORING LOG NO. B6-4W North Pottstown Pike West

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.038964° Longitude: -75.636034°

Approximate Surface Elev: 353 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
		65		X	18	1-1-1 N=2			1.5
		70		X	18	1-1-3 N=4			2.25
		75		X	18	1-2-3 N=5			2.0
		80		X	18	2-3-5 N=8			0.75
		85		X	6	11-13-8 N=21			
		90		X	18	3-6-5 N=11			

SANDY LEAN CLAY (CL), trace gravel, red brown to dark brown to black, soft to medium stiff *(continued)*

82.0 271+/-

SANDY LEAN CLAY WITH GRAVEL (CL), red brown, very stiff

85.0 268+/-

SANDY LEAN CLAY (CL), trace gravel, with sand seams, red brown, stiff

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-15-2017 | Boring Completed: 08-16-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

Project No.: J217P078 | Exhibit: A-1

BORING LOG NO. B6-4W North Pottstown Pike West

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.038964° Longitude: -75.636034°

Approximate Surface Elev: 353 (Ft.) +/-

DEPTH ELEVATION (Ft.)

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
		X	17	8-6-50/5"			
95							
			6		0	1 1 15s 8s	
100							
			10		0	0.5 0.5 0.5 0.5 1	
105							
			14		0	1.5 1 2.5 1 1.5	
110							
		X	10	10-10-22 N=32			
115							
		X	18	8-16-37 N=53			
120							

SANDY LEAN CLAY (CL), trace gravel, with sand seams, red brown, stiff *(continued)*

94.5 258.5+/-

SANDY LEAN CLAY WITH GRAVEL (CL), brown to red brown, hard, (DEGRADED BEDROCK), occasional sand seams
Attempted to core from 96 to 110 feet. Frequent quartzite boulders.

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-15-2017 Boring Completed: 08-16-2017

Drill Rig: CME-850XR Driller: Terracon/Allen S.

Project No.: J217P078 Exhibit: A-1

BORING LOG NO. B6-4W North Pottstown Pike West

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.038964° Longitude: -75.636034°

Approximate Surface Elev: 353 (Ft.) +/-

DEPTH | ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
SANDY LEAN CLAY WITH GRAVEL (CL), brown to red brown, hard, (DEGRADED BEDROCK), occasional sand seams *(continued)*	125			17	21-23-34 N=57			
130.0 223+/-	130			18	8-10-16 N=26			
Boring Terminated at 130 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-15-2017 | Boring Completed: 08-16-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

Project No.: J217P078 | Exhibit: A-1

BORING LOG NO. B6-4E North Pottstown Pike East

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.033234° Longitude: -75.629239°

Approximate Surface Elev: 346 (Ft.) +/-

DEPTH | ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
			X	18	3-4-6 N=10			2.5
SANDY LEAN CLAY (CL), trace organic matter, orange, stiff	5							
Similar, trace gravel			X	16	2-3-3 N=6			1.5
	10							
			X	18	1-2-2 N=4			1.0
	15							
			X	12	woh-1-1			1.0
	20	▽						
			X	12	2-1-1 N=2			1.5
	25							
			X	7	1-1-1			1.0
	30							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

▽ *22' AB*

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-12-2017 | Boring Completed: 08-15-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

Project No.: J217P078 | Exhibit: A-2

BORING LOG NO. B6-4E North Pottstown Pike East

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.033234° Longitude: -75.629239°
Approximate Surface Elev: 346 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
					N=2			
				8	7-3-4 N=7			0.5
36.5	309.5+/-	35						
Refusal at 36.5 feet, set up to core Run 1, Hard, light gray with brown crypto-microcrystalline SCHIST with interbedded marble and quartzite, foliated with occasional vertical bedding/fractures (slight)				40		83%	.5 1 1 1	
40.0	306+/-	40						
Run 2, Similar vugs 40.5' - 41'				59		88%	1 1 1.5 1.5 1	
45.0	301+/-	45						
Run 3, Similar, 3" -thick void at 45.75' 6" -thick void at 47'				46		72%	1 1.5 1.5 1.5 1	
50.0	296+/-	50						
Run 4, Similar, 1"-thick void at 51.5' Change at 52.5' 52.5-60': Hard, slightly weathered, gray-blue with brown SCHIST, foliated with folds 45 deg. bedding, trace hematite ~1-inch thick				37		47%	1 .5 1.5 1.5 1	
55.0 vf-microcrystalline	291+/-	55						
Run 5, Similar, 2' thick void at 56' 6" thick void at 58.5'				20		27%	2 1 13sec 23sec 12sec	
60.0	286+/-	60						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

▽ *22' AB*

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-12-2017 | Boring Completed: 08-15-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

Project No.: J217P078 | Exhibit: A-2

BORING LOG NO. B6-4E North Pottstown Pike East

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.033234° Longitude: -75.629239°
Approximate Surface Elev: 346 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
		Run 6, 60-64.5' : Hard, vuggy, microcrystalline, gray with brownSCHIST and QUARTZITE, foliated 45°, occasional vertical fractures 64.5' : hard, moderately weathered, brown with dark brown, microcrystalline SCHIST, degraded, very foliated with fractures at multiple angles, occasional medium crystalline oxidized in part, micaceous				36		50%	1.5 2 1.5 3.5 2	
65.0	281+/-		65							
		Run 7, Similar, 10" -thick void at 65' 2.5" -thick void at 66.5 feet 1" -thick void at 69'				12		0%	.5 .5 2.5 1.5 .5	
70.0	276+/-		70							
		Run 8, Similar				38.5		27%	1 2 2.5 2.5 2	
75.0	271+/-		75							
		Run 9, Similar to 78' 78' - 80' : Hard, light gray-white QUARTZITE with MARBLE, non-foliated				24.5		38%	1.5 0.5 2 4 1.5	
80.0	266+/-		80							
		Run 10, Hard, gray/brown QUARTZITE with MARBLE and GNEISS, multiple fracture planes, larger feldspar and quartz crystals, hematite				40.5		46%	2 4.5 2.5 3 2.5	
85.0	261+/-		85							
		Run 11, Hard, light gray and brown QUARTZ and MARBLE, non foliated, vertical fractures, trace hematite, micaceous at 90-93', also vuggy				43		66%	2 2 2 3 2.5	
90.0	256+/-		90							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

▽ *22' AB*

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-12-2017 | Boring Completed: 08-15-2017
Drill Rig: CME-850XR | Driller: Terracon/Allen S.
Project No.: J217P078 | Exhibit: A-2

BORING LOG NO. B6-4E North Pottstown Pike East

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.033234° Longitude: -75.629239°
Approximate Surface Elev: 346 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	RECOVERY (In.)	RQD (%)	Core rate (min/ft)
95.0	251+/-	95	60	75%	2 3 3 3 3
Run 12, Similar					
100.0	246+/-	100	59	98%	3.5 3 2.5 1.5 4
Run 13, Similar					
105.0	241+/-	105	60	84%	3 2.5 3 3 3
Run 14, Similar					
110.0	236+/-	110	31	32%	2 2 1 10sec 10sec
Run 15, Hard, moderately weathered, light gray with brown MARBLE with QUARTZITE and SCHIST , angled and vertical fractures 6" - thick void at 108'					
115.0	231+/-	115	6	0%	.5 .5 10sec 10sec .5
Run 16, Similar to above 114 - 122': Hard, slightly to moderately weathered, light gray with brown SCHIST with MARBLE, occasional angled fractures, foliated (60°), trace hematite, vuggy					
120.0	226+/-	120	57	70%	2.5 2.5 3 1 3
Run 17, Similar					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

▽ *22' AB*

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-12-2017 | Boring Completed: 08-15-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

Project No.: J217P078 | Exhibit: A-2

BORING LOG NO. B6-4E North Pottstown Pike East

PROJECT: Mariner East Pipeline Borings

CLIENT: Directional Project Support Incorporated
Magnolia, TX 77354

SITE: Spread 6

LOCATION PA-CH-0212.0000-RD
20170804-19
Latitude: 40.033234° Longitude: -75.629239°

Approximate Surface Elev: 346 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	Core rate (min/ft)	Penetrometer Test (tsf)
	Run 18, Similar					22		75%	2.5 3	
	122.0	224+/-								
	Boring Terminated at 122 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary with wireline

Abandonment Method:
Grouted to surface

Notes:

WATER LEVEL OBSERVATIONS

▽ *22' AB*

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 08-12-2017 | Boring Completed: 08-15-2017

Drill Rig: CME-850XR | Driller: Terracon/Allen S.

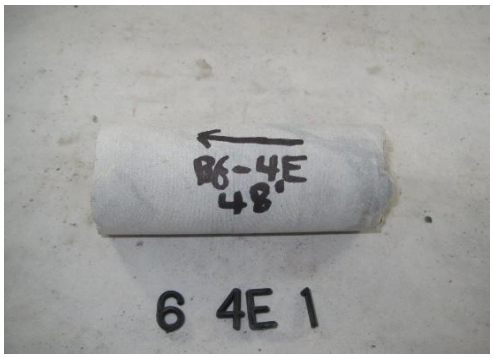
Project No.: J217P078 | Exhibit: A-2

ASTM D7012 (Method C) Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

Boring No.:	B6-4E	Lithology :	Schist
Sample No.:	1	Moisture Content :	As received
Sample Depth:	48 feet	Lab Temperature :	70° F
Sampling Date:	8/12/17	Loading Rate:	55 psi/s
		Time to Failure:	24 min

Diameter:	1.98 in	Maximum Axial Load at Failure:	80,530 lb
Length:	4.13 in	Compressive Strength:	26,154 psi
L/D:	2.09	Compressive Strength:	180.32 Mpa
End Area:	3.08 in^2	Unit Weight	177 pcf

Before the Test



After the Test

Drawing # : PA-CH-0212.0000-RD
PO # : 20170804-19
Crossing : North Pottstown Pike
Spread : Spread 6

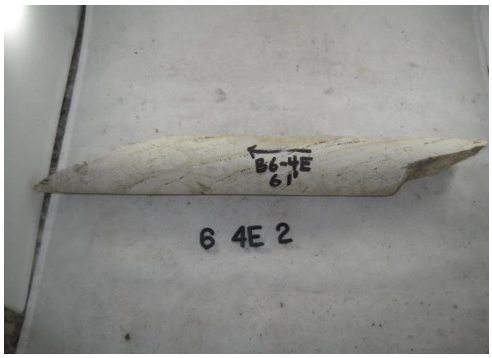
Project:	Mariner East Pipeline	Terracon	Performed by:	C. Santana
Project No.	J217P078		Test Date:	10/13/2017
Location:	Spread 6		Reviewed By :	L. Dwyer
Client :	Directional Project Support Inc.	77 Sundial Ave., Suite 401 W Manchester, New Hampshire	Review Date :	10/13/2017

ASTM D7012 (Method C) Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

Boring No.:	B6-4E	Lithology :	Schist
Sample No.:	2	Moisture Content :	As received
Sample Depth:	61 feet	Lab Temperature :	70° F
Sampling Date:	8/12/17	Loading Rate:	55 psi/s
		Time to Failure:	3 min

Diameter:	1.98 in	Maximum Axial Load at Failure:	9,380 lb
Length:	4.46 in	Compressive Strength:	3,046 psi
L/D:	2.25	Compressive Strength:	21.00 Mpa
End Area:	3.08 in^2	Unit Weight	169 pcf

Before the Test



After the Test

Drawing # : PA-CH-0212.0000-RD
PO # : 20170804-19
Crossing : North Pottstown Pike
Spread : Spread 6

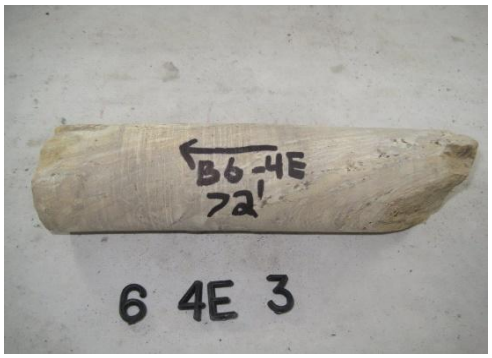
Project:	Mariner East Pipeline	Terracon	Performed by:	C. Santana
Project No.	J217P078		Test Date:	10/13/2017
Location:	Spread 6		Reviewed By :	L. Dwyer
Client :	Directional Project Support Inc.	77 Sundial Ave., Suite 401 W Manchester, New Hampshire	Review Date :	10/13/2017

ASTM D7012 (Method C) Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

Boring No.:	B6-4E	Lithology :	Schist
Sample No.:	3	Moisture Content :	As received
Sample Depth:	72 feet	Lab Temperature :	70° F
Sampling Date:	8/12/17	Loading Rate:	55 psi/s
		Time to Failure:	3 min

Diameter:	1.97 in	Maximum Axial Load at Failure:	10,640 lb
Length:	4.11 in	Compressive Strength:	3,491 psi
L/D:	2.09	Compressive Strength:	24.07 Mpa
End Area:	3.05 in^2	Unit Weight	168 pcf

Before the Test



After the Test

Drawing # : PA-CH-0212.0000-RD
PO # : 20170804-19
Crossing : North Pottstown Pike
Spread : Spread 6

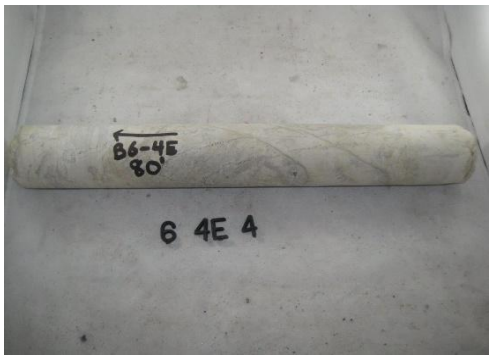
Project:	Mariner East Pipeline	Terracon	Performed by:	C. Santana
Project No.	J217P078		Test Date:	10/13/2017
Location:	Spread 6		Reviewed By :	L. Dwyer
Client :	Directional Project Support Inc.	77 Sundial Ave., Suite 401 W Manchester, New Hampshire	Review Date :	10/13/2017

ASTM D7012 (Method C) Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

Boring No.:	B6-4E	Lithology :	Quartzite
Sample No.:	4	Moisture Content :	As received
Sample Depth:	80 feet	Lab Temperature :	70° F
Sampling Date:	8/12/17	Loading Rate:	55 psi/s
		Time to Failure:	11 min

Diameter:	1.98 in	Maximum Axial Load at Failure:	34,800 lb
Length:	4.65 in	Compressive Strength:	11,302 psi
L/D:	2.35	Compressive Strength:	77.93 Mpa
End Area:	3.08 in^2	Unit Weight	172 pcf

Before the Test



After the Test

Drawing # : PA-CH-0212.0000-RD
PO # : 20170804-19
Crossing : North Pottstown Pike
Spread : Spread 6

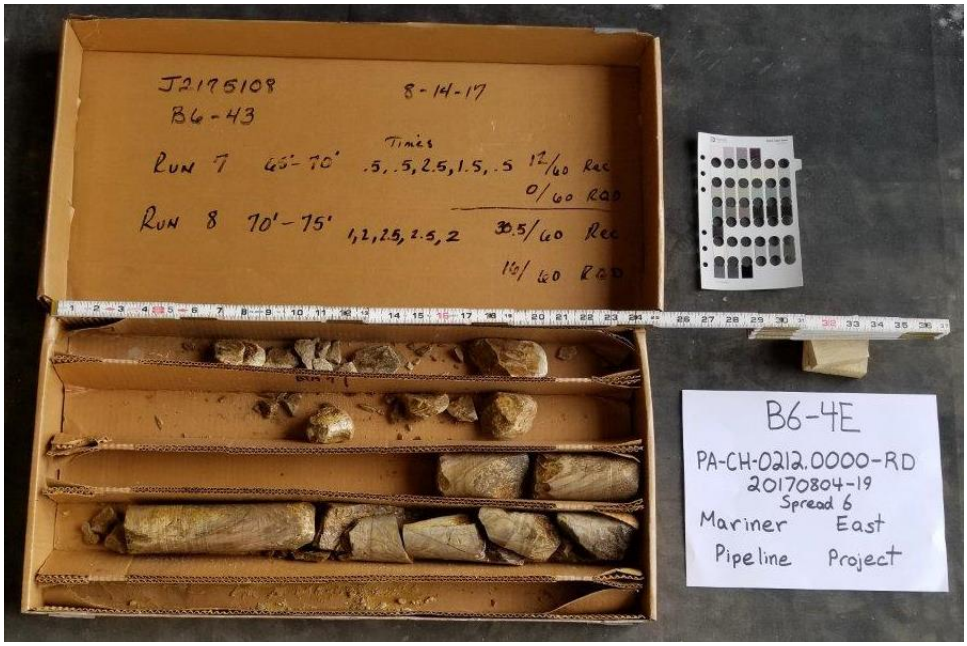
Project:	Mariner East Pipeline	Terracon	Performed by:	C. Santana
Project No.	J217P078		Test Date:	10/13/2017
Location:	Spread 6		Reviewed By :	L. Dwyer
Client :	Directional Project Support Inc.	77 Sundial Ave., Suite 401 W Manchester, New Hampshire	Review Date :	10/13/2017

Photograph 1: B6-4W, Samples C-1 to C-3 (96 to 110 feet)

Photograph 1: B6-4E, Samples C-1 to C-2 (36.5 to 45 feet)

Photograph 2: B6-4E, Samples C-3 to C-4 (45 to 55 feet)

Photograph 3: B6-4E, Samples C-5 to C-6 (55 to 65 feet)



Photograph 4: B6-4E, Samples C-7 to C-8 (65 to 75 feet)

Photograph 5: B6-4E, Samples C-9 to C-10 (75 to 85 feet)

Photograph 6: B6-4E, Samples C-11 to C-12 (85 to 95 feet)

Photograph 7: B6-4E, Samples C-13 to C-14 (95 to 105 feet)

Photograph 8: B6-4E, Samples C-15 to C-16 (105 to 115 feet)

Photograph 9: B6-4E, Samples C-17 to C-18 (115 to 122 feet)

SUPPORTING INFORMATION

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ³ 4 and 1 £ Cc £ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or 1 > Cc > 3 [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ³ 6 and 1 £ Cc £ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or 1 > Cc > 3 [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above “A”		CL	Lean clay [K,L,M]
			PI < 4 or plots below “A” line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K,L,M,N] / Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above “A” line		CH	Fat clay [K,L,M]
			PI plots below “A” line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K,L,M,P] / Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ³ 15% sand, add “with sand” to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add “with organic fines” to group name.

[I] If soil contains ³ 15% gravel, add “with gravel” to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

[L] If soil contains ³ 30% plus No. 200 predominantly sand, add “sandy” to group name.

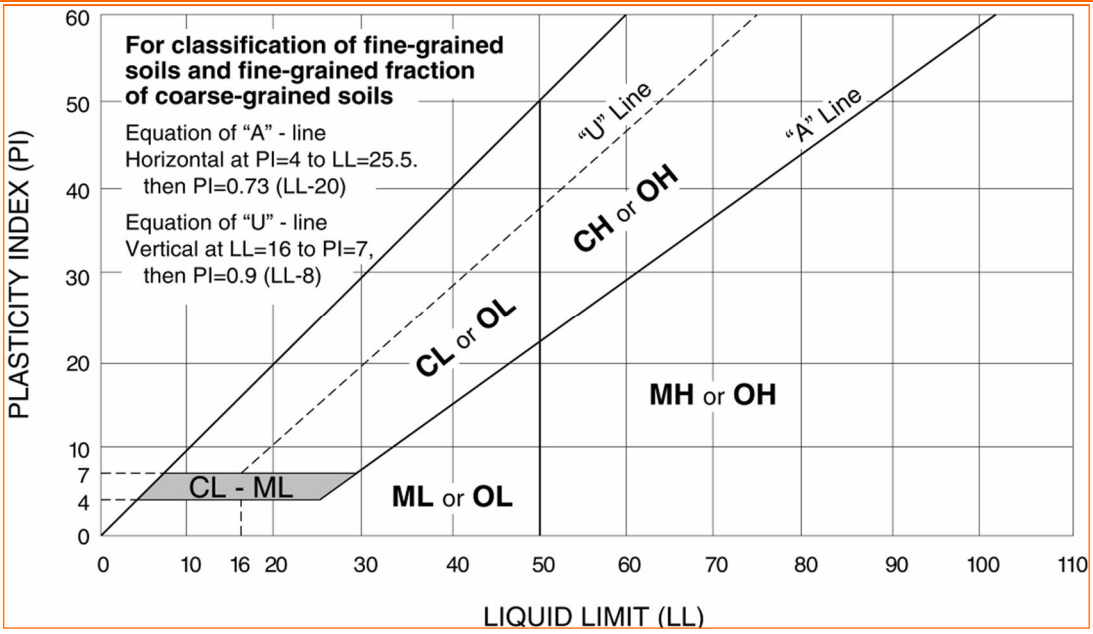
[M] If soil contains ³ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ³ 4 and plots on or above “A” line.

[O] PI < 4 or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.



DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very Slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately Severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very Severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" no discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.
HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)	
Very Hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to ¼ in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very Soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Joint, Bedding, and Foliation Spacing in Rock [1]

Spacing	Joints	Bedding/Foliation
Less than 2 in.	Very close	Very thin
2 in. – 1 ft.	Close	Thin
1 ft. – 3 ft.	Moderately close	Medium
3 ft. – 10 ft.	Wide	Thick
More than 10 ft.	Very wide	Very thick

1. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.

Rock Quality Designator (RQD) [1]

RQD, as a percentage	Diagnostic description
Exceeding 90	Excellent
90 – 75	Good
75 – 50	Fair
50 – 25	Poor
Less than 25	Very poor

1. RQD (given as a percentage) = length of core in pieces 4 inches and longer / length of run

Joint Openness Descriptors

Openness	Descriptor
No Visible Separation	Tight
Less than 1/32 in.	Slightly Open
1/32 to 1/8 in.	Moderately Open
1/8 to 3/8 in.	Open
3/8 in. to 0.1 ft.	Moderately Wide
Greater than 0.1 ft.	Wide

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. Subsurface Investigation for Design and Construction of Foundations of Buildings. New York: American Society of Civil Engineers, 1976. U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

NORTH POTTSTOWN PIKE CROSSING
PADEP SECTION 105 PERMIT NO.: E15-862
PA-CH-0212.0000-RD
(SPLP HDD No. S3-0370)

ATTACHMENT 2

PADEP PERMIT MODIFICATION PACKAGE

TETRA TECH

PITT-10-17-017

October 17, 2017

Project Number 112IC05958

Mr. Domenic Rocco
Program Manager
Department of Environmental Protection
Waterways and Wetlands Program
Southeast Regional Office
2 East Main Street
Norristown, Pennsylvania 19401

Re: **Sunoco Pipeline L.P. – Pennsylvania Pipeline Project (Mariner East II)**
Chapter 102 Permit No. ESG 01 000 15 001 Modification Request Two
Request for additional LOD associated with revised pipeline installation technique
North Pottstown Pike-HDD S3-0370
West Whiteland Township, Chester County, PA

Dear Mr. Rocco:

On behalf of Sunoco Pipeline LP (SPLP), please accept this letter and the enclosed information as a request for a major modification to the above-referenced Chapter 102 authorization. The modification requested is a change in construction methodologies to convert a portion of the project from a single long horizontal directional drill (HDD) to a combination of open trenching and four conventional auger bores.

A single HDD (HDD-S3-0370) was initially designed for this area to avoid adverse impacts to the extensive urban development. A shallower HDD was determined to not be feasible due to the changes in topography/elevation along the route. Consideration of deeper depths required additional information on the underlying geology. SPLP performed an analysis of the hydrogeology along segment S3-0370. Drilling indicated that the path of the HDD was either in a vertical fracture or in the fault between the northern formations and the Ledger Fm dolostone that underlies S3-0370. Additionally, SPLP perform MASW (Multichannel Analysis of Surface Waves) seismic testing along a large portion of the S3-0370 HDD. This testing was used to locate the approximate location of fracturing or voids along the alignment and to select locations for confirmation drilling cores. Two cores were completed, one near the S3-0370 HDD entry point and one near Pottstown Pike. Overall, the data indicates that while there may be solid rock pinnacles, as indicated in the geophysics cross sections, there are also significant voids and fractures along the length of S3-0370 which will make the installation of an HDD line difficult and the fractures appear large enough that drilling fluid loss would likely occur during a HDD.

The approximate construction stations which are affected by this modification request are STA 15084+00 to STA 15102+00. The proposed changes include an open trench pipeline installation with four conventional auger bore sections. Conventional auger bores will be added at: Stations 15083+50 to15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Pottstown Pike/PA HWY 100). Through the utilization of these alternative installation methods, SPLP is able to avoid geology which would make a HDD installation difficult, while maintaining the avoidance of impacts to resources and sensitive areas.

This modification does not alter Sunoco's permanent utility easement. The permit modification is needed to allow a larger limit of disturbance (LOD) to accommodate the revised installation techniques, as well as the associated revised erosion and sediment (E&S) controls. Coordination with the applicable land owners regarding the revised

Tetra Tech, Inc.
661 Andersen Drive, Pittsburgh, PA 15220
Tel 412-921-7090 Fax 412-921-4040 tetratech.com

installation methods has been conducted and modified agreements, if any are required, will be in place prior to construction.

Attachment 1 contains the Major Modification Two to address the additional LOD and revised E&S controls associated with the revised installation method. The table of content has been modified to identify the sections revised and included for this modification.

Please let us know if there are any questions. We look forward to your timely review and approval of this requested permit modification.

Sincerely,

Robert F. Simcik, P.E.
Project Manager
Tetra Tech, Inc.

RFS/clm

Enclosures: Attachments

cc:
File 112IC05958
Joseph Sofranko, Chester County Conservation District
Josh Prosceno, Tetra Tech
Matt Gordon, Sunoco Pipeline L.P.
Monica Styles, Sunoco Pipeline L.P.
Chris Embry, Sunoco Pipeline L.P.
Chris Cable, Tetra Tech
Brad Schaeffer, Tetra Tech

Attachment 1

Major Modification Two

ESCGP-2 Permit Application
Sunoco Pennsylvania Pipeline Project
Southeast Region Submission: Construction Spread 6

Major Modification Two

Prepared By:

Tetra Tech, Inc.

For

Sunoco Pipeline, L.P.

Pennsylvania

October 2017

TABLE OF CONTENTS
ESCGP-2 APPLICATION FOR COVERAGE
SOUTHEAST REGION
MAJOR MODIFICATION II

SECTION (TAB) SECTIONS IN RED WERE MODIFIED

TABLE OF CONTENTS
ESCGP-2 APPLICATION FOR COVERAGE
SOUTHEAST REGION
MAJOR MODIFICATION II

TABLE OF CONTENTS
ESCGP-2 APPLICATION FOR COVERAGE
SOUTHEAST REGION
MAJOR MODIFICATION II

PREFACE I

CONSERVATION DISTRICT APPLICATIONS, FEES AND CHECKS

Chester County Conservation District

688 Unionville Road, Suite 200, Kennett Square, PA 19348-1704
(610) 925-4920 ~ Fax (610) 925-4925 ~ www.chesco.org/conservation

APPLICATION FOR DISTRICT SERVICES – Effective 10.01.2014

- **Application will not be accepted unless signed and completed in its entirety.**
- **Please update the information on this form with each submission.**
- **Only folded plans will be accepted.**

E&SPC Submission:
☐ New ☐ Additional Information ☐ *2nd Review ☑ *Revision to an Approved Plan *Note: Additional Base Fee Due

NPDES Submission:
☐ New ☐ Revision ☐ **Renewal ☑ **Major Modification **Note: Additional NPDES Fee Due

Project Name: Pennsylvania Pipeline Project Date: October 10, 2017
Project Site Location: See Attached Map Municipality: See Attached Table Tax Parcel ID: NA
Project Acres: 181 (1.8 for Major Mod) Total Cumulative Acres Disturbed Over Project Life: 181 (1.8 for Major Mod)
Development Type:
☐ Single Residential ☑ Residential/Industrial/Commercial/Institutional ☐ Timber Harvest ☐ Municipal
☐ Miscellaneous: ☐ Small Agricultural ☐ Large Agricultural ☐ Chapter 105 ☐ Pond/Stream Work
Other Info:
Applicant (Owner/Firm): Sunoco Pipeline L.P. Name: Matthew Gordon
Applicant Mailing Address: 535 Fritztown Road Email: mlgordon@sunocolog
City: Sinking Spring State: PA Zip Code: 19608 Phone: (610) 670-3284 Fax:
Plan Designer (Firm): Tetra Tech, Inc. Name: Robert Simcik
Plan Designer Mailing Address: 661 Andersen Drive, Foster Plaza 7 Email: robert.simcik@tetratech
City: Pittsburgh State: PA Zip Code: 15220 Phone: (412) 921-8163 Fax: (412) 921-4040

E&SPC Fees: Base Fee: $ 1500.00 2nd Review Fee (25% of Original Base Fee): $
Tier II Fee: $ 1000.00 Emergency Review Fee: $

E&SPC fees are payable to Chester County Conservation District – Submit one check for Base Fee and Tier II, if applicable. Submit one check for the 2nd Review Fee, if applicable. Submit one check for Emergency Review, if applicable.

Refer to District Services Fee Schedule, and check appropriate Tier II:
☐ 9% or more slopes ☐ deficient infiltration of 2 year storm ☐ more than 25% total area disturbance
☐ less than 150 foot buffer ☐ adjacent property discharge

NPDES Fees: Base Fee: $ Disturbed Acreage Fee: $
Base Fee is payable to Chester County Conservation District Clean Water Fund
Disturbed Acreage Fee is payable to Commonwealth of PA Clean Water Fund

Complete the following:
Receiving Stream Name: See Attached Receiving Waters Table Designation (HQ, EV, etc): HQ, EV, TSF, CWF

Fee Attached	☑	Act 2 Site (requires Individual NPDES Permit)	☐
Stormwater Narrative	☑	Emergency Prep. Plan	☑
Stormwater Management	☑	E&S Narrative	☑
Post Construction Stormwater Plans & Details	☑	E&S Calculations	☑
		E&S Plans & Details	☑

Incentive BMPs: ☐ Green Roof ☐ Community Redevelopment
☐ Use of Spent Mushroom Compost as a soil amendment for stabilization

Plan Information: Check if the project contains any of the following

Stream Crossing	☑	Public Sewer	☐
Wetlands	☑	On Site Septic	☐
Flood Plain	☑	Steep Slopes	☐
Water Encroachment	☐	Open Space	☐

Permits Required: Enclose copies if applicable

NPDES Individual Permit	☐	General Permit (Chapter 105)	☐
NPDES General Permit	☐	Water Encroachment	☐
		Joint Permit 401/404	☐

Fees and plans showing the required information are to be submitted with this application. Any additional plans or information required by the Chester County Conservation District should be submitted promptly. Emergency plan reviews require an additional request form that can be found on our website. There is a 25% review fee reduction incentive for Best Management Practices. The request for this reduction must be submitted in writing and attached with this submission. Please see our website for more information. The undersigned agrees to comply with all of the requirements of TITLE 25, CHAPTER 102, EROSION AND SEDIMENTATION CONTROL RULES AND REGULATIONS as set forth by the Pennsylvania Department of Environmental Protection, and further agrees to obtain all necessary permits in connection with the above referenced project. District Service Fees are non-refundable.

(Applicant Signature)

Municipalities

Pennsylvania Pipeline Project

Chester County

County	Muncipality
Chester	Elverson Borough
	West Nantmeal Township
	East Nantmeal Township
	Wallace Township
	Upper Uwchlan Township
	Uwchlan Township
	West Whiteland Township*
	East Whiteland Township
	West Goshen Township
	East Goshen Township
	Westtown Township

* Major Modification II

Receiving Waters Table
Pennsylvania Pipeline Project
Chester County

Stream Name	County	Township	Chapter 93 Designated Use (Existing Use, if applicable)	Chapter 93 Code	Impaired	Impairment	TMDL	TMDL Limits
UNT to Conestoga River	Chester	West Nantmeal	WARM WATER FISHES	WWF	Yes	Agriculture- Nutrients; Other- Nutrients; Other- Organic Enrichment/Low D.O.; Source Uknown- Pathogens	Yes	Nutrients; Organic Enrichment/Low D.O.
UNT to South Branch French Creek	Chester	West Nantmeal	EXCEPTIONAL VALUE	EV	Yes	Source Unknown- Pathogens	No	N/A
South Branch French Creek	Chester	West Nantmeal	EXCEPTIONAL VALUE	EV	Yes	Source Unknown- Pathogens	No	N/A
UNT to Marsh Creek	Chester	West Nantmeal	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
UNT to Marsh Creek	Chester	East Nantmeal	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
UNT to Upper East Branch Brandywine Creek	Chester	Wallace	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
UNT to Marsh Creek	Chester	Wallace	WARM WATER FISHES	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
UNT to Marsh Creek	Chester	Upper Uwchlan	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
Marsh Creek	Chester	Upper Uwchlan	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
Black Horse Creek	Chester	Upper Uwchlan	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
UNT to Black Horse Creek	Chester	Upper Uwchlan	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
Shamona Creek	Chester	Uwchlan	HIGH QUALITY-TROUT STOCKING	HQ	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers- Siltation	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids

Receiving Waters Table
Pennsylvania Pipeline Project
Chester County

Stream Name	County	Township	Chapter 93 Designated Use (Existing Use, if applicable)	Chapter 93 Code	Impaired	Impairment	TMDL	TMDL Limits
UNT to Shamona Creek	Chester	Uwchlan	HIGH QUALITY-TROUT STOCKING	HQ	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
UNT to Upper East Branch Brandywine Creek	Chester	Uwchlan	HIGH QUALITY-TROUT STOCKING	HQ	No	N/A	No	N/A
UNT to Valley Creek	Chester	Uwchlan	COLD WATER FISHES	CWF	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
UNT to Valley Creek*	Chester	West Whiteland	COLD WATER FISHES	CWF	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
Valley Creek*	Chester	West Whiteland	COLD WATER FISHES	CWF	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation	Yes	Cause Uknown; Pesticides; Nutrients; Siltation; Organic Enrichment/Low D.O.; Suspended Solids
East Branch Chester Creek	Chester	West Whiteland	TROUT STOCKING	TSF	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation; Habitat Modification- Other Habitat Alterations	No	N/A
East Branch Chester Creek	Chester	West Goshen	TROUT STOCKING	TSF	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation; Habitat Modification- Other Habitat Alterations	No	N/A
UNT to Chester Creek	Chester	West Goshen	TROUT STOCKING	TSF	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation; Habitat Modification- Other Habitat Alterations	No	N/A

Receiving Waters Table
Pennsylvania Pipeline Project
Chester County

Stream Name	County	Township	Chapter 93 Designated Use (Existing Use, if applicable)	Chapter 93 Code	Impaired	Impairment	TMDL	TMDL Limits
UNT to Ridley Creek	Chester	West Goshen	HIGH QUALITY-TROUT STOCKING	HQ	Yes	Urban Runoff/Storm Sewers - Siltation ; Urban Runoff/Storm Sewers - Water/Flow Variability ; Urban Runoff/Storm Sewers - Cause Unknow	No	N/A
UNT to Chester Creek	Chester	Westtown	TROUT STOCKING	TSF	Yes	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers- Siltation; Habitat Modification- Other Habitat Alterations	No	N/A
UNT to Ridley Creek	Chester	Westtown	HIGH QUALITY-TROUT STOCKING	TSF	Yes	Urban Runoff/Storm Sewers - Siltation ; Urban Runoff/Storm Sewers - Water/Flow Variability ; Urban Runoff/Storm Sewers - Cause Unknow	No	N/A

*Major Modification II

Recieving Wetlands

Pennsylvania Pipeline Project

Chester County

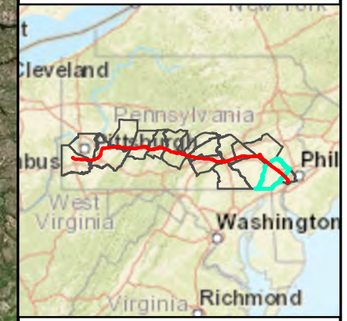
Municipality	Receiving Water	Number of Wetlands	Number of EV Wetlands (Classification)
CHESTER COUNTY			
West Nantmeal	UNT to South Branch French Creek	9	7 (EV Stream)
West Nantmeal	UNT to Marsh Creek	1	0
East Nantmeal	UNT to Marsh Creek	2	0
Wallace	UNT to Marsh Creek	6	0
Upper Uwchlan	UNT to Marsh Creek	18	0
Upper Uwchlan	UNT to Black Horse Creek	4	2 (Wild Trout/Bog Turtle)
Uwchlan	UNT to Shamona Creek	5	1 (Wild Trout)
West Whiteland*	UNT to Valley Creek	17	0
West Whiteland	UNT to Chester Creek	2	0
West Goshen	UNT to Chester Creek	1	0
East Goshen	UNT to Chester Creek	2	0
Westtown	UNT to Chester Creek	1	0

*Major Modification II

Legend

- Limit of Disturbance (Major Modification)
- Limit of Disturbance (Previously Permitted)
- Alignment Centerline (Previously Permitted)
- County Boundary
- Township Boundary

Sheet Identifier



N

0 2.5 5 Miles

0 4.025 8.05 Kilometers

PROJECT LOCATION MAP
FIGURE 2-16
PENNSYLVANIA PIPELINE PROJECT
MAY 26, 2017 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2015 ESRI and its data suppliers).

PGH P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ACT14\PENNPIPELINE_MAJORMOD_ACT14_COUNTIES.MXD 10/06/17 SP

Legend

- Limit of Disturbance (Major Modification)
- Limit of Disturbance (Previously Permitted)
- Alignment Centerline (Previously Permitted)
- County Boundary
- Township Boundary

Sheet Identifier

N

Feet
0 3,500 7,000

Meters
0 1,066.8 2,133.6

PROJECT LOCATION MAP
WEST WHITELAND TOWNSHIP
FIGURE 3 -74
PENNSYLVANIA PIPELINE PROJECT
MAY 26, 2017 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2015 ESRI and its data suppliers).

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2.

NOTICE OF INTENT APPLICATION

(NO CHANGES TO ATTACHMENTS)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER MANAGEMENT
OFFICE OF OIL AND GAS MANAGEMENT

OFFICIAL USE ONLY
ID # _____
Date Received _____

NOTICE OF INTENT (NOI) FOR COVERAGE UNDER THE EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-2) FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION, PRODUCTION, PROCESSING, OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES

READ THE INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM.

PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

SECTION A. APPLICANT INFORMATION

APPLICATION TYPE **NEW** ☐ **RENEWAL** ☐ **MAJOR MODIFICATIONS** ☒ **EXPEDITED** ☐ **PHASED** ☐

Applicant's Last Name (If applicable)	First Name	MI	Phone (610) 216-0583 (cell)
Gordon	Matthew	L	FAX
Organization Name or Registered Fictitious Name			Phone (610) 670-3284 (office)
Sunoco Pipeline L.P.			FAX
Mailing Address	City		State ZIP + 4
535 Fritztown Road	Sinking Spring		PA 19608
Email Address Matthew.Gordon@energytransfer.com			
Co-Applicant's Last Name (If applicable)	First Name	MI	Phone (585) 808-8622
Newcomer	Scott		FAX
Organization Name or Registered Fictitious Name			Phone
Otis Eastern Services L.L.C			FAX
Mailing Address	City		State ZIP + 4
2971 Andover Road	Wellsville		NY 14895
Email Address sdn@otiseastern.com			

SECTION B. SITE INFORMATION

Site Name		
Pennsylvania Pipeline Project		
Site Location		
Chester and Delaware Counties		
Site Location – City	State	ZIP+4
Elverson Township, Chester County to Upper Chichester Township, Delaware County (Modification located in Chester County)	PA	
Detailed Written Directions to Site		
See Directions in Attachment 1		

County	Municipality	City	Boro	Twp.
Chester and Delaware (Modification located in Chester County)	See Municipalities Table in Attachment 2 (Modification located in West Whiteland Township	☐	☒	☒

SECTION C. PROJECT INFORMATION			
1. Total Project Area/Project Site (Ac):	Total: 278 (Mod=1.8 Acres)	Total Disturbed Area (Ac):	Total: 278 (Mod= 1.8 Acres)
2. Project Name Pennsylvania Pipeline Project			
3. Project Type (Check all that apply) ☐ Oil/Gas Well ☒ Transmission Facility ☐ Gathering Facility ☐ Processing Facility ☐ Treatment Facility ☐ Centralized Fresh Water Impoundment ☐ Centralized Wastewater Impoundment ☐ Water Pipeline ☐ Ground/Surface Water Withdrawal Site ☐ Other If Oil/Gas well, is the well conventional or unconventional? ☐ Conventional ☐ Unconventional			

Project Description

Sunoco Pipeline, L.P. (SPLP) proposes to construct and operate the Pennsylvania Pipeline Project that would expand existing pipeline systems to provide natural gas liquid (NGL). The project involves the installation of approximately two parallel pipelines within a 306.8-mile, 50-foot-wide right-of-way (ROW) from Houston, Washington County, Pennsylvania (PA) to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306.8 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255.8 miles. The majority of the new ROW will be co-located adjacent to existing utility corridors, including approximately 230 miles of pipeline that will be co-located in the existing SPLP Mariner East pipeline system. The 20-inch pipeline will be installed first, followed by the 16-inch line. Any temporary stabilization required will be implemented in accordance with the project's Erosion and Sediment (E&S) Plans. For a conventional lay, the pipelines would be installed within the same disturbance to the maximum extent practicable. For safety purposes, the installation would be staggered by what is estimated to be no more than 60 days. At some HDDs with longer drills, however, the time period between installation of the two pipelines may exceed 60 days. Any temporary stabilization required would be implemented in accordance with project's E&S Plans. Any permanent or temporary impacts associated with the second pipeline installation will be similar to the first installation, as described in more detail in the Application and the balance of these responses.

Construction activities will involve clearing and grubbing, trenching, pipe installation, site restoration, and access road construction/improvement. Erosion and sediment controls will be in place during earth disturbance activities. Following completion of pipeline installation, the area will be returned to the general grade present prior to pipeline installation in order to maintain preconstruction elevations and drainage patterns. Disturbed areas will be seeded and mulched. Erosion and sedimentation control devices will be maintained until site work is complete and revegetation is successful.

The project will be constructed for 35 miles in the PADEP South East Region. The project disturbance by county is as follows:

Chester County: 181 Acres
Delaware County: 94 Acres, Twin Oaks Pump Station Expansion 2.39 acres (Total 97 acres)

This permit Modification is a change in installation methodology for the portion of the project in Chester County from a single long horizontal directional drill (HDD) to an open cut with some shorter auger bores. 1.92 acres of additional limit of disturbance (LOD). The approximate construction stations which are affected by this modification are STA 15084+00 to STA 15102+00. The proposed changes include an open trench pipeline installation with four conventional bore sections. Conventional bores will be added at: Stations 15083+50 to15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Pottstown Pike/PA HWY 100). Through the utilization of these two installation methods, SPLP is able to avoid impacts to the Shoen Drive well and maintain its avoidance of impacts to resources and sensitive areas.

4. Please provide the latitude and longitude coordinates for the center of the project. The coordinates should be in degrees, minutes seconds (DD MM SS.SS) and North American Datum 1983. For linear projects provide the project's termini.

Latitude 40º degrees 9' minutes 20.15" seconds Longitude -75º degrees 50' minutes 34.44" seconds

Latitude 39º degrees 50' minutes 40.48" seconds Longitude -75º degrees 25' minutes 7.23" seconds

Horizontal Collection Method: ☐ GPS ☒ Interpolated from U.S.G.S. Topographic Map ☐ DEP's eMAP

5. U.S.G.S. 7.5 min. Quad Map Name Elverson, Pottstown, Downingtown, Wagontown, Malvern, West Chester, Media, Marcus Hook, and Bridgeport (Include a copy of the project area on the 7.5 min quad map)

6. Will the project be conducted as a phased permit project? ☐ Yes ☒ No

If Yes, Include Master Site Plan Estimated Timetable for Phased Projects. ☐ Additional sheet(s) attached.

Phase No. or Name	Description	Total Area	Disturbed Area	Start Date	End Date

7. List existing and previous land use for a minimum of the previous 5 years. Forested/ agricultural/ rural residential

8. Other Pollutants: Will the stormwater discharge contain pollutional substances other than sediment? ☐ Yes ☒ No
   If yes, explain and provide any available quantitative data.

9. Will fuels, chemicals, solvents, other hazardous waste or materials be used or stored on site during earth disturbance activities?
   Yes ☒ No ☐ **(If yes, a PPC Plan must be maintained on site during earth disturbance.)**

10. Does the project have the potential to discharge to siltation-impaired waters?
    Yes ☒ No ☐ **(If yes, show how the project will not result in a net change in volume, rate or water quality. See section G below.)**

11. Has the project site been investigated to identify naturally occurring geologic formations or soil types that may cause pollution when disturbed?
    Yes ☒ No ☐
    Have naturally occurring geologic formations or soil types that may cause pollution when disturbed been identified?
    Yes ☒ No ☐ **(If yes, BMPs to avoid or minimize the potential pollution must be utilized.)**

12. Has the project site been analyzed to determine potential thermal impacts to surface waters of the Commonwealth?
    Yes ☒ No ☐
    Have potential thermal impacts to surface water of the Commonwealth from earth disturbance activity been identified?
    Yes ☒ No ☐ **(If yes, BMPs to avoid, minimize or mitigated the thermal pollution must be utilized.)**

13. Have the E&S Plan and PCSM/SR Plan been planned, designed and implemented to be consistent?
    Yes ☒ No ☐

14. Have existing and/or proposed Riparian Forest Buffers been identified?
    Yes ☒ N/A ☐ **(If not, they must be shown on the plans.)**

15. Is a riparian buffer waiver being requested?
    Yes ☒ No ☐
    If yes, the applicant requesting a waiver must submit a written request that demonstrates that reasonable alternatives will meet the requirements of 25 Pa. Code § 102.14 and to demonstrate that any existing riparian buffer will remain undisturbed to the extent practicable.

16. Have antidegradation implementation requirements for special protection waters been addressed?
    Yes ☒ No ☐ **(If no, antidegradation requirements must be included in the plan.)** N/A ☐

17. Has the seasonal high groundwater level been identified at all excavation locations for pits and impoundments other than those which will contain top-hole water, fresh water and uncontaminated drill cuttings?
    Yes ☐ No ☐ N/A ☒ **(If no, be advised that a 20-inch separation between the seasonal high groundwater and the bottom of all pits and impoundments containing pollutional substances is required.)**

18. Receiving Water/Watershed Name	Name of Municipal or Private Separate Storm Sewer Operator
See Table in Attachment 3. Chapter 93, Designated Use and Existing Use Stream Classification ☒ High Quality ☒ Exceptional Value ☒ Other WWF, CWF, TSF ☒ Siltation-impaired Secondary Receiving Water	See Table in Attachment 4

19. Is an Expedited Review being requested? Yes ☐ No ☒

If yes, be advised that the Expedited Review is not available for all projects. Refer to the "Expedited Review Process" Item 8, Page 17 of the ESCGP-2 Instructions to determine if your project is eligible.

SECTION D. EROSION AND SEDIMENT CONTROL PLAN BMPS
See the attached Instructions on how to complete this section.

Erosion and Sediment Control Plan BMPs should be designed to minimize accelerated erosion and sedimentation through limiting the extent and duration of earth disturbance, protection of existing drainage and vegetation, limiting soil compaction and controlling the generation of increased runoff. The Department recommends the use of the Erosion and Sediment Control BMP Manual to achieve this goal. The E&S Plan must meet the requirements of Pa. Code § 102.4(b) and submitted with the NOI.

1. E & S Plan

The E & S Plan must satisfy at least one of subparagraph A or B below.

Provide a brief summary of proposed BMPs and their performance to manage E & S for the project. If E & S BMPs and their application do not follow the guidelines referenced in the Pa. Erosion and Sediment Pollution Control Program Manual, provide documentation to demonstrate performance equivalent to, or better than, the BMPs in the Manual.

Compost Filter Socks - This temporary sedimentation control measure consists of wood or metal posts driven through a compost filled mesh tube. Filter socks will be located as needed on side-slope and down-slope boundaries of disturbed areas. Compost filter socks will be sized using the DEP Construction Detail.

Tarpaulin Covers - Tarpaulin covers may be used, as necessary, to protect topsoil storage stockpiles from wind and precipitation erosion. Stockpile slopes will be 2:1 or less. A minimal amount of soil will be stockpiled so that the height of the stockpile is less than 35 feet.

Rock Filter Outlet – Rock filter outlets will be used, as necessary, to address problems of concentrated flows to sediment barriers. In the event of unanticipated concentrated flow and sediment barrier failure, install a rock filter outlet unless the concentrated flow can be diverted away from the barrier. Rock filter outlets used in drainage areas with HQ and EV waters need a 6" layer of compost installed on the upslope side of the rock.

Rock Construction Entrance – Temporary access routes will be established on and proximate to the site to facilitate construction activities. The use of access routes will help confine truck and equipment traffic to specific corridors thus minimizing land disturbance and protecting vegetation. Site traffic during wet weather will be limited. No vehicles will be permitted in streams or rivers.

Wash Racks – Wash racks will be used at rock construction entrances and will be designed to accommodate anticipated vehicular traffic. A water supply will be made available at wash racks to wash the wheels of vehicles exiting the site.

Pumped Water Filter Bag – Pumped water filter bags may be used to filter water pumped from disturbed areas prior to discharging to surface waters. Compost filter socks shall be installed within 50 feet of any receiving surface water or where grassy area is not available.

Erosion Control Blanket - A manufactured erosion control blanket shall be installed on all slopes 3:1 (H:V) or steeper and within 100 feet of stream banks, where applicable. The blanket shall be biodegradable but capable of providing protection for two growing seasons. Straw or similar fiber material shall be placed between two biodegradable nets. The top net shall be heavyweight and UV stabilized; the bottom net shall be a lightweight netting. Erosion control blankets shall be anchored and stapled in place in accordance with the manufacturer's recommendations and the detail on the construction drawings. For slopes between 3:1 and 1:1 (H:V) use erosion control blanket SC 150 as manufactured by North American Green or Owner approved equal material or equal method.

Waterbars – Waterbars shall be installed across the right-of-way on all slopes greater than 5%. Waterbars should be constructed at a slope of 2% and discharge to a well-vegetated area. Waterbars should not discharge into an open trench. Waterbars should be oriented so that the discharge does not flow back onto the right-of-way. Obstructions (e.g. compost filter socks etc.) should not be placed in any waterbars. Where needed, they should be located below the discharge end of the waterbar.

Trench Plugs - To be used to prevent piping along the pipeline.

A. ☒ E & S plan is designed using BMPs in the Pennsylvania Erosion & Sedimentation Pollution Control Manual (ESPC) (Technical Guidance #3632134-008/March 2012)

OR

B. ☐ E & S plan is designed using an alternative BMP or design standard

2. Riparian Buffer Information

A. Will you be protecting, converting or establishing a riparian buffer or a riparian forest buffer as a part of this project?

Protect ☒ Yes ☐ No Convert ☒ Yes ☐ No Establish ☐ Yes ☒ No

B. Will you be protecting, converting or establishing a voluntary riparian forest buffer as part of this project?

☐ Yes ☒ No

C. Are you proposing to conduct oil and gas activities for which site reclamation or restoration is required as part of the Chapter 78 permit authorization in a high quality or exceptional value watershed that is currently attaining its designated use and within 150 ft of a perennial or intermittent river, stream or creek or lake, pond or reservoir?

☐ Yes ☒ No If yes, provide a demonstration that any existing riparian buffer is undisturbed to the extent practicable.

D. If the regulations require a riparian buffer or riparian forest buffer and you are not providing one, list the waiver provisions in the Chapter 102 regulations, Section 102.14(d)(2)(i)-(vi), that you are requesting and provide additional documentation to demonstrate reasonable alternatives for compliance with 102.14 requirements and to demonstrate that any existing reparian buffer will remain undisturbed to the extent practicable.

(See Attachment 6 for Riparian Buffer Waiver Request Information)
This project qualifies for an exception of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix). Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan. Existing riparian forest buffers will be protected to the extent practicable by minimizing the limit of disturbance at stream crossings. In addition to the exception, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area.

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the extent practicable. The limit of disturbance has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide surrounding the stream channel. The operations within the LOD near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing the LOD to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible.

Note: If the proposed activity protects, converts or establishes a riparian or riparian forest buffer a Buffer Management Plan is required in the PCSM Plan.

3. Thermal Impacts Analysis

Please explain how thermal impacts associated with this project were avoided, minimized, or mitigated.

Potential thermal impacts to surface waters will be minimized by minimizing clearing and retaining existing vegetation where possible. The disturbed areas will be reseeded as soon as practicable following construction

SECTION E. SITE RESTORATION (SR) PLAN BMPS

See the attached Instructions on how to complete this section.

If this section is not applicable to your project, please indicate by checking this box: N/A ☐

For earth disturbance projects involving oil and gas activities authorized by Chapter 78 (well pads) or pipelines and other similar utility infrastructure provide the information outlined below. If your project includes both oil and gas activities authorized by Chapter 78 (well pads) or pipelines and other similar utility infrastructure and other activities requiring Post Construction Stormwater Management, provide the information outlined in this Section as well as Section F.

Site Restoration BMPs should be designed to use natural measures to eliminate pollution, infiltrate runoff, not require extensive construction/maintenance activity, promote pollutant reduction, and preserve the integrity of stream channels. The Department recommends the use of PA Stormwater BMP manual to achieve this goal. The SR Plan must meet the requirements of Pa Code § 102.8(n) and be submitted with the NOI.

1. Site Restoration Plan Information – The Site Restoration Plan should be designed to maximize volume reduction technologies, eliminate (where possible) or minimize point source discharges to surface waters, preserve the integrity of stream channels, and protect the physical, biological and chemical qualities of the receiving surface water.

Design standards applied to develop the Site Restoration Plan. Check those that apply.

☒ Act 167 Plan – The attached SR Plan is consistent with an applicable approved Act 167 Plan.

Complete the following for all approved Act 167 Stormwater Management Plans. (Use additional sheets if necessary)

Act 167 Plan Name	Date Adopted	Consistency Letter Included	
See Table in Attachment 5		Verification Report Included	☒

***NOTE**: A consistency letter is not required if a verification report is provided. Please see NOI Instructions.* The Site Restoration Plan must satisfy either sub paragraph A, B, **or** C below. Check those that apply.

A. ☒ Act 167 Plan approvals on or after January 2005 - The attached PCSM Plan, in its entirety, is consistent with all requirements pertaining to rate, volume, and water quality from an Act 167 Stormwater Management Plan approved by DEP on or after January 2005. Letter A must be checked if a current, DEP approved Act 167 plan exists.

B. ☒ The PCSM meets the standard design criteria from the PA Stormwater BMP Manual. For projects involving oil and gas activities authorized by a permit issued under Chapter 78 (well pads) or pipelines and other similar utility infrastructure, post construction stormwater management requirements are met for all areas that are restored to preconstruction conditions or to a condition of meadow in good condition or better.

C. ☐ Alternative Design Standard – The attached PCSM Plan was developed using approaches other than 102.8(g)(2). Demonstrate/explain in the space provided below how this standard will be either more protective than what is required in 102.8(g)(2) or will maintain and protect existing water quality and existing and designated uses.

2. Riparian Buffer Information

A. Will you be protecting, converting or establishing a riparian buffer or a riparian forest buffer as part of this activity?
Protect ☒ Yes ☐ No Convert ☒ Yes ☐ No Establish ☐ Yes ☒ No

B. Will you be protecting, converting or establishing a voluntary riparian forest buffer as part of this activity?
☐ Yes ☒ No

C. Are you proposing to conduct oil and gas activities for which site reclamation or restoration is required under a permit issued under the auhtority of the 2012 Oil and Gas Act and Chapter 78 in a high quality or exceptional value watershed that is currently attaining its designated use and within 150 ft of a perennial or intermittent river, stream or creek or lake, pond or reservoir?

☐ Yes ☒ No If yes, provide a demonstration that any existing riparian buffer is undisturbed to the extent practicable.

D. If the regulations require a riparian buffer or riparian forest buffer and you are **not** providing one, list below the waiver provisions in the Chapter 102 regulations, Section 102.14(d)(i)-(vi), that you are requesting and provide additional documentation to demonstrate reasonable alternatives for compliance with 102.14 requirements and to demonstrate that any existing reparian buffer will remain undisturbed to the extent practicable.

(See Attachment 6 for Riparian Buffer Waiver Request Information)
This project qualifies for an exception of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix). Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan. Existing riparian forest buffers will be protected to the extent practicable by minimizing the limit of disturbance at stream crossings. In addition to the exception, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area.

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the extent practicable. The limit of disturbance has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide surrounding the stream channel. The operations within the LOD near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing the LOD to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible.

Note: If the proposed activity protects, converts or establishes a riparian or riparian forest buffer a Buffer Management Plan is required in the PCSM Plan.

3. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA
See Attachment D in the Instructions on how to Complete This Section

This section does not need to be completed for areas of projects involving oil and gas activities authorized by Chapter 78 (well pads) or pipelines and other similar utility infrastructure which will be restored to meadow in good condition or better or existing conditions.

Watershed Name: N/A - Restoring pipeline right of way to a meadow condition. See Section F for stormwater management calculations associated with the permanent access roads and block valves.			
Design storm frequency _____ Rainfall amount _____ inches	Pre-construction	Post Construction	Net Change
Impervious area (acres)			
Volume of stormwater runoff (acre-feet) without planned stormwater BMPs			
Volume of stormwater runoff (acre-feet) with planned stormwater BMPs			
Stormwater discharge rate for the design frequency storm	Pre-construction	Post Construction	Net Change
1) 2-Year/24-Hour			
2) 10-Year/24-Hour			
3) 50-year/24-Hour			
4) 100-year/24-Hour			

4. SUMMARY DESCRIPTION OF SITE RESTORATION BMPs

In the lists below, check the BMPs identified in the Post Construction Stormwater Management Plan. The primary function(s) of the BMP listed in the functions column (infiltration/recharge; detention/retention; water quality). Additional functions may be added if applicable to that BMP. List the stormwater volume and area of runoff to be treated by each BMP type when calculations are required. If any BMP in the Site Restoration Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
Site Restoration ☒ Restore Site to Meadow in Good Condition or Better, or Existing Conditions	Infiltration/Recharge Detention/WQ Treatment	_____	_____
Bio-infiltration areas ☐ Infiltration Trench ☐ Infiltration Bed ☐ Infiltrated Basin	Infiltration/Recharge	_____ _____ _____	_____ _____ _____
Natural Area Conservation ☐ Streamside Buffer Zone ☐ Wetland Buffer Zone ☐ Sensitive Area Buffer Zone ☒ Pre-Construction Drainage Pattern Intact	Infiltration/Recharge	_____ _____ _____ _____	_____ _____ _____ _____
Stormwater Retention ☐ Constructed Wetlands ☐ Wet Ponds ☐ Retention Basin	Detention/Retention	_____ _____ _____	_____ _____ _____
Sediment and Pollutant Removal ☐ Vegetated Filter Strips ☐ Detention Basins	Water Quality Treatment	_____ _____	_____ _____

Access Road Design ☐ Road Crowning ☐ Ditches ☒ Turnouts ☐ Culverts ☐ Roadside Vegetated Filter Strips	Infiltration/Recharge	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
Stormwater Energy Dissipaters ☐ Level Spreaders ☐ Riprap Aprons ☐ Upslope Diversions ☐ _____	Infiltration/Recharge	_____ _____ _____ _____	_____ _____ _____ _____

5. Off-site Discharge Analysis.

Does the activity propose any off-site discharges to areas other than surface waters? ☒ Yes ☐ No

If yes, it is the applicant's responsibility to ensure that they have legal authority for any off-site discharge.

The Applicant must provide a demonstration in both the E&S and Site Restoration Plans that the discharge will not cause erosion, damage, or a nuisance to off-site properties.

See Attachement 8

6. Thermal Impact Analysis.

Explain how thermal impacts associated with this project were avoided, minimized, or mitigated.

Potential themal impacts to surface waters will be minimized by minimizing clearing and retaining existing vegetation where possible. Permanent seeding will occur as soon as practicable during germinating months.

SECTION F. POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN BMPS
See the attached Instructions on how to complete this section.

If this section is not applicable to your project, please indicate by checking this box: N/A ☐

For earth disturbance projects requiring post construction stormwater management, provide the information outlined below. If your project includes both oil and gas activities authorized under a well permit issued under the 2012 Oil and Gas Act and Chapter 78 (well pads) or pipelines and other similar utility infrastructure and other activities requiring Post Construction Stormwater Management, provide the information outlined in this Section as well as Section E.

Post Construction Stormwater Management BMPs should be designed to use natural measures to eliminate pollution, infiltrate runoff, not require extensive construction/maintenance activity, promote pollutant reduction, and preserve the integrity of stream channels. The Department recommends the use of PA Stormwater BMP manual to achieve this goal. If PCSM BMPS and their application do not follow the guidelines referenced in the PA Stormwater BMP Manual, provide documentation to demonstrate performance equivalent to, or better than, the BMPs in the Manual.

1. Post Construction Stormwater Management Plan Information – The Post Construction Stormwater Management Plan must meet the requirements in 25 Pa. Code §102.8 and should be designed to maximize volume reduction technologies, eliminate (where possible) or minimize point source discharges to surface waters, preserve the integrity of stream channels, and protect the physical, biological and chemical qualities of the receiving surface water.

Design standards applied to develop the Post Construction Stormwater Management Plan. Check those that apply.

☒ Act 167 Plan – The attached PCSM Plan is consistent with an applicable approved Act 167 Plan.

Complete the following for all approved Act 167 Stormwater Management Plans. (Use additional sheets if necessary)

Act 167 Plan Name	Date Adopted	Consistency Letter Included ☐
See Table in Attachment 5		Verification Report Included ☒

NOTE: A consistency letter is not required if a verification report is provided. Please see NOI Instructions.

The PCSM Plan must satisfy either subparagraph A, B, **or** C below. Check those that apply. If a current, DEP approved Act 167 Plan exists, letter A must be checked.

A. ☒ Act 167 Plan approvals on or after January 2005 - The attached PCSM Plan, in its entirety, is consistent with all requirements pertaining to rate, volume, and water quality from an Act 167 Stormwater Management Plan approved by DEP on or after January 2005.

B. ☒ The PCSM meets the standard design criteria from 102.8(g)(2) and (3) the PA Stormwater BMP Manual. [Note: PCSM plans have to meet both the volume and rate requirements in the regulations, which are provided in these 2 sections].

C. ☐ Alternative Design Standard – The attached PCSM Plan was developed using alternative approaches as provided in 102.8(g)(2)(iv) and 102.(g)(3)(iii). Demonstrate/explain in the space provided below how this standard will be either more protective than what is required in 102.8(g)(2) and 102.8(g)(3) or will maintain and protect existing water quality and existing and designated uses.

2. Riparian Buffer Information

A. Will you be protecting, converting or establishing a riparian buffer or a riparian forest buffer as part of this activity?
Protect ☒ Yes ☐ No Convert ☒ Yes ☐ No Establish ☐ Yes ☒ No

B. Will you be protecting, converting or establishing a voluntary riparian forest buffer as part of this activity?
☐ Yes ☒ No

C. Are you proposing to conduct oil and gas activities for which site reclamation or restoration is is required under a well permit issued under the authority of the 2012 Oil and Gas Act and Chapter 78 and in a high quality or exceptional value watershed that is currently attaining its designated use and within 150 ft of a perennial or intermittent river, stream or creek or lake, pond or reservoir?

☐ Yes ☒ No If yes, provide a demonstration that any existing riparian buffer is undisturbed to the extent practicable.

D. If the regulations require a riparian buffer or riparian forest buffer and you are not providing one, list below the waiver provisions in the Chapter 102 regulations, Section 102.14(d)(i)-(vi), that you are requesting and provide additional documentation to demonstrate reasonable alternatives for compliance with 102.14 requirements and to demonstrate that any existing reparian buffer will remain undisturbed to the extent practicable.

(See Attachment 6 for Riparian Buffer Waiver Request Information)

This project qualifies for an exception of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix). Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan. Existing riparian forest buffers will be protected to the extent practicable by minimizing the limit of disturbance at stream crossings. In addition to the exception, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area.

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the extent practicable. The limit of disturbance has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide surrounding the stream channel. The operations within the LOD near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing the LOD to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible

Note: If the proposed activity protects, converts or establishes a riparian or riparian forest buffer a Buffer Management Plan is required in the PCSM Plan.

3. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA
See Attachment D in the Instructions on how to Complete This Section

Watershed Name:

Design storm frequency 2-yr Rainfall amount _____ inches	Pre-construction	Post Construction	Net Change
Impervious area (acres)			
Volume of stormwater runoff (acre-feet) without planned stormwater BMPs			
Volume of stormwater runoff (acre-feet) with planned stormwater BMPs			
Stormwater discharge rate for the design frequency storm			
1) 2-Year/24-Hour			
2) 10-Year/24-Hour			
3) 50-year/24-Hour			
4) 100-year/24-Hour			

4. SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs

In the lists below, check the BMPs identified in the Post Construction Stormwater Management Plan. The primary function(s) of the BMP listed in the functions column (infiltration/recharge; detention/retention; water quality). Additional functions may be added if applicable to that BMP. List the stormwater volume and area of runoff to be treated by each BMP type when calculations are required. If any BMP in the Site Restoration Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
Bio-infiltration areas ☐ Infiltration Trench ☐ Infiltration Bed ☐ Infiltrated Basin	Infiltration/Recharge	_____ _____ _____	_____ _____ _____
Natural Area Conservation ☐ Streamside Buffer Zone ☐ Wetland Buffer Zone ☐ Sensitive Area Buffer Zone ☐ Pre-Construction Drainage Pattern Intact	Infiltration/Recharge	_____ _____ _____ _____	_____ _____ _____ _____
Stormwater Retention ☐ Constructed Wetlands ☐ Wet Ponds ☐ Retention Basin	Detention/Retention	_____ _____ _____	_____ _____ _____
Sediment and Pollutant Removal ☐ Vegetated Filter Strips ☐ Compost Filter Sock ☐ Detention Basins	Water Quality Treatment	_____ _____ _____	_____ _____ _____

Access Road Design ☐ Road Crowning ☐ Ditches ☐ Turnouts ☐ Culverts ☐ Roadside Vegetated Filter Strips	Infiltration/Recharge	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
Stormwater Energy Dissipaters ☐ Level Spreaders ☐ Riprap Aprons ☐ Upslope Diversions ☐ _____	Infiltration/Recharge	_____ _____ _____ _____	_____ _____ _____ _____

5. Off-site Discharge Analysis.

Does the activity propose any off-site discharges to areas other than surface waters? ☐ Yes ☒ No

If yes, it is the applicant's responsibility to ensure that they have legal authority for any off-site discharge.

The Applicant must provide a demonstration in both the E&S and PCSM Plans that the discharge will not cause erosion, damage, or nuisance to off-site properties.

6. Thermal Impact Analysis.

Explain how thermal impacts associated with this project were avoided, minimized, or mitigated.

7. Critical PCSM Plan stages.

Identify and list critical stages of implementation of the PCSM Plan for which a licensed professional or designee shall be present on site.

SECTION G. ANTIDEGRADATION ANALYSIS

This section must be completed where earth disturbance activities will be conducted in special protection or siltation-impaired watersheds.

Part 1 NONDISCHARGE ALTERNATIVES EVALUATION

The applicant must consider and describe any and all nondischarge alternatives for the entire project area which are environmentally sound and will**:**

- Minimize accelerated erosion and sedimentation during the earth disturbance activity
- Achieve no net change from pre-development to post-development volume, rate and concentration of pollutants in water quality

E & S Plan	*Official Use Only*	PCSM/Site Restoration Plan	*Official Use Only*
Check off the environmentally sound nondischarge Best Management Practices (BMPs) listed below to be used prior to, during, and after earth disturbance activities that have been incorporated into your E & S Plan based on your site analysis. For non-discharge BMPs not checked, provide an explanation of why they were not utilized. Also for BMPs checked, provide an explanation of why they were utilized. (Provide your analysis and attach additional sheets if necessary) The best possible pipeline route was selected based on landowner agreements, and minimization of environmental impacts, and engineering/constructibiliy factors. The project's disturbed area will be limited to the area required for construction, and the duration of construction will be minimized to the extent practicable. Riparian forest buffers will be protected to the extent practicable during construcion activities at stream crossings.		Check off the environmentally sound nondischarge Best Management Practices (BMPs) listed below to be used after construction that have been incorporated into your PCSM/SR Plan based on your site analysis. For non-discharge BMPs not checked, provide an explanation of why they were not utilized. Also for BMPs checked, provide an explanation of why they were utilized. (Provide your analysis and attach additional sheets if necessary) The best possible pipeline route was selected based on landowner agreements, and minimization of environmental impacts, and engineering/constructibility factors. The pipeline right of way will be restored to a meadow condition at original contours to maintain the pre-construction drainage patterns. Riparian forest buffers will be protected to the extent practicable.	
Nondischarge BMPs ☐ Alternative Siting ☐ Alternative location ☐ Alternative configuration ☐ Alternative location of discharge ☒ Limited Disturbed Area ☒ Limiting Extent & Duration of Disturbance (Phasing, Sequencing) ☐ Riparian Buffers (150 ft. min.) ☐ Riparian Forest Buffer (150 ft. min.) ☐ Other _____		**Nondischarge BMPs** ☐ Alternative Siting ☐ Alternative location ☐ Alternative configuration ☐ Alternative location of discharge ☐ Low Impact Development (LID / BSD) ☐ Riparian Buffers (150 ft. min.) ☐ Riparian Forest Buffer (150 ft. min.) ☐ Infiltration ☐ Water Reuse ☒ Other re-construction drainage pattern intact within the right of way	

Will the non-discharge alternative BMPs eliminate the net change in rate, volume and quality during and after construction?

☐ Yes ☒ No

If yes, antidegradation analysis is complete.
If no, proceed to Part 2.

PART 2 ANTIDEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES (ABACT)

If the net change in stormwater discharge from or after construction is not fully managed by nondischarge BMPs, the applicant must utilize ABACT BMPs to manage the difference. The Applicant must specify whether the discharge will occur during construction, post-construction or both, and identify the technologies that will be used to ensure that the discharge will be a non-degrading discharge. ABACT BMPs include but are not limited to:

E & S Plan	*Official Use Only*	PCSM/Site Restoration Plan	*Official Use Only*
☒ **Treatment BMPs:** ☐ Sediment basin with skimmer ☐ Sediment basin ratio of 4:1 or greater (flow length to basin width) ☐ Sediment basin with 4-7 day detention ☐ Flocculants ☒ Compost Filter Socks ☐ Compost Filter Sock Sediment Basin ☒ RCE w/ Wash Rack ☐ **Land disposal:** ☐ Vegetated filters ☐ Riparian buffers <150ft. ☐ Riparian Forest Buffer <150ft. ☒ Immediate stabilization ☒ **Pollution prevention:** ☒ PPC Plans ☐ Street sweeping ☐ Channels, collectors and diversions lined with permanent vegetation, rock, geotextile or other non-erosive materials ☐ **Stormwater reuse technologies:** ☐ Sediment basin water for dust control ☐ Sediment basin water for irrigation ☒ **Other** Rock construction entrances with wash racks, compost filter socks, erosion control blanket placed within 100-feet of streams		☐ **Treatment BMPs:** ☒ Infiltration Practices ☐ Wet ponds ☐ Created wetland treatment systems ☐ Vegetated swales ☐ Manufactured devices ☐ Bio-retention/infiltration ☐ Green Roofs ☐ **Land disposal:** ☐ Vegetated filters ☐ Riparian Buffers <150ft. ☐ Riparian Forest Buffer <150ft. ☐ Disconnection of roof drainage ☐ Bio-retention/bio-infiltration ☒ **Pollution prevention:** ☐ Street sweeping ☐ Nutrient, pesticide, herbicide or other chemical application plan alternatives ☒ PPC Plans ☐ Non-structural Practices ☒ Restoration BMPs ☐ **Stormwater reuse technologies:** ☐ Divert rainwater into impoundment ☐ Underground storage ☐ Spray/Drip Irrigation ☐ **Other** _____	

SECTION H. COMPLIANCE REVIEW

Is the applicant in violation of any existing permit, regulation, order, or schedule of compliance issued by the Department within the last 5 years?

☒ Yes ☐ No

If yes, provide the permit number or facility name, a brief description of the violation, the compliance schedule (including dates and steps to achieve compliance) and the current compliance status. (Attach additional information on a separate sheets, when necessary)

Notices of Violations can be found in Tab 9 of the ESCGP-2 Permit Application

SECTION I. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plans are true and correct, represent actual field conditions, and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Print Name Robert F. Simcik, P.E. | Signature | Professional Seal

Company Tetra Tech

Address 661 Andersen Drive, Foster Plaza 7, Pittsburgh, PA 15220

Phone (412) 921-8163

Most Recent DEP Training Attended Location Greensburg, PA Date 04/03/2014

e-Mail Address robert.simcik@tetratech.com

COMMONWEALTH OF PENNSYLVANIA
REGISTERED
PROFESSIONAL
ROBERT F. SIMCIK
ENGINEER
PE-050435-E

EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plans developed and sealed by a licensed professional engineer, surveyor or professional geologist. The plans shall contain the following certification:

I do hereby certify to the best of my knowledge, information, and belief, that the E & S Control and SR/PCSM BMPs are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SECTION J. APPLICANT CERTIFICATION

Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Matthew L. Gordon - Principal Engineer - Sunoco
Print Name and Title of Applicant

Signature of Applicant

Date Application Signed

Scott Newcomer - Project Manager - Otis Eastern
Print Name and Title of Co-Applicant (if applicable)

Signature of Co-Applicant

10-9-2017
Date Application Signed

Notarization

Sworn to and subscribed to before me this 9 day of October, 2017

Robert B. Reilly
Notary Public

Commonwealth of Pennsylvania
County of Chester

My Commission expires Jan 21, 2020

AFFIX SEAL

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Robert B. Reilly, Notary Public
East Lampeter Twp., Lancaster County
My Commission Expires Jan. 21, 2020
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

SECTION I. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plans are true and correct, represent actual field conditions, and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Print Name Robert F. Simcik, P.E. | Signature

Professional Seal

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT F. SIMCIK
ENGINEER
PE-050435-E

Company Tetra Tech

Address 661 Andersen Drive, Foster Plaza 7, Pittsburgh, PA 15220

Phone (412) 921-8163

Most Recent DEP Training Attended Location Greensburg, PA Date 04/03/2014

e-Mail Address robert.simcik@tetratech.com

EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plans developed and sealed by a licensed professional engineer, surveyor or professional geologist. The plans shall contain the following certification:

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Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Matthew L. Gordon - Principal Engineer - Sunoco
Print Name and Title of Applicant

Signature of Applicant

10/9/2017
Date Application Signed

Scott Newcomer - Project Manager - Otis Eastern
Print Name and Title of Co-Applicant (if applicable)

Signature of Co-Applicant

Date Application Signed

Notarization

Sworn to and subscribed to before me this 9 day of October, 2017

Notary Public

Commonwealth of Pennsylvania

County of BERKS

My Commission expires DECEMBER 16, 2018

AFFIX SEAL

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
CONNIE L CHADWICK
Notary Public
SPRING TWP, BERKS COUNTY
My Commission Expires Dec 16, 2018

SECTION K. CONTACT FOR ADDITIONAL INFORMATION				
Contact's Last Name	First Name	MI	Phone	(412) 921-8163
Simcik	Robert	F	FAX	
Mailing Address	City		State	ZIP + 4
661 Andersen Drive, Foster Plaza 7	Pittsburgh		PA	15220
e-Mail Address robert.simcik@tetratech.com				

3.

EROSION AND SEDIMENT CONTROL PLAN (Narrative)

Erosion and Sediment Control Plan

Pennsylvania Pipeline Project – Southeast Region: Spread 6

Major Modification II

October 2017

Prepared for:

Sunoco Pipeline, L.P.
535 Fritztown Road
Sinking Spring, PA 19608

Prepared by:

Tetra Tech, Inc.
661 Andersen Drive
Pittsburgh, PA 15220

TABLE OF CONTENTS

Section **Page**

TABLES

LIST OF ATTACHMENTS

LIST OF ACRONYMS

ACRONYM	MEANING
% CCE	Calcium carbonate equivalent
% ENV	Effective neutralizing value
ABACT	Antidegradation Best Available Combination of Technologies
BMPs	Best management practices
CWF	Cold water fisheries
DELCORA	Delaware County Regional Water Quality Control Authority
E&S	Erosion and sediment
E&SC	Erosion and sediment control

EV	Exceptional value
FEMA	Federal Emergency Management Agency
HDD	Horizontal directional drill
HQ	High quality
LOD	Limit of disturbance
NGL	Natural gas liquid
OSHA	Occupational Safety and Health Administration
PA	Pennsylvania
PADEP	Pennsylvania Department of Environmental Protection
PASDA	Pennsylvania Spatial Data Access
PCSM	Post Construction Stormwater Management
PWS	Public water source
Pls	Pure live seed
ROW	Right of way
SPLP	Sunoco Pipeline, L.P.
SPPP	Sunoco Pennsylvania Pipeline Project
SWS	Surface water source
Tt	Tetra Tech, Inc.
TSF	Trout stock fishery
UNT	Unnamed tributary
USGS	United States Geological Survey
WWF	Warm water fisheries

1.0 INTRODUCTION

Tetra Tech, Inc. (Tt) has prepared this Erosion & Sediment Control (E&SC) Plan for Sunoco Pipeline, L.P. (SPLP) – Pennsylvania Pipeline Project, South East Region: Spread 6. The plan addresses activities associated with the Sunoco Pennsylvania Pipeline Project (SPPP) installation. Spread 6 (South East Region) of this project is located in Chester and Delaware Counties, Pennsylvania (PA). Site location maps are provided in Attachment 1. This E&SC Plan, if properly implemented, will provide for effective E&SCs throughout construction.

1.1 PROJECT DESCRIPTION

Sunoco Pipeline, L.P. (SPLP) proposes to construct and operate the Pennsylvania Pipeline Project that would expand existing pipeline systems to provide natural gas liquid (NGL). The project involves the installation of approximately two parallel pipelines within a 306.8-mile, 50-foot-wide right-of-way (ROW) from Houston, Washington County, Pennsylvania (PA) to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306.8 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255.8 miles. The majority of the new ROW will be co-located adjacent to existing utility corridors, including approximately 230 miles of pipeline that will be co-located in the existing SPLP Mariner East pipeline system. The 20-inch pipeline will be installed first, followed by the 16-inch line. Any temporary stabilization required will be implemented in accordance with this Erosion and Sediment (E&S) Plan. Both pipelines will be installed within the same limit of disturbance (LOD) and in the same construction period. This E&S Plan specifically relates to impacts associated with the South East Region, Construction Spread 6.

Fifty feet will be maintained as permanent ROW. In addition, temporary use areas or extra workspaces will be required at some stream and road/railroad crossings; these will typically expand the construction ROW by 25 feet where needed. Construction activities will involve tree removal, clearing and grubbing within the ROW, trenching, pipe installation, and site restoration. The total LOD in the South East Region will be approximately 278 acres. Acres disturbed by county will be as follows: Chester County with 181 acres disturbed, and Delaware County with 97 acres disturbed.

The Major Modification I is a change in installation methodology for a portion of the project located in West Whiteland Township, Chester County. The change in installation method will be from a long horizontal directional drill (HDD) to an open cut with three short conventional auger bores and one shorter HDD. This modification will result in the addition of 7.5 acres of limit of disturbance (LOD) within Sunoco's existing ROW. The modification will occur from construction stations STA 15105+00 to STA 15159+00. A shorter HDD will be installed under stream S-B79 and Lincoln Highway from construction stations STA 15144+00

to 15153+00. Conventional bores will be installed from Stations: 15111+00 to15112+50 (Exton Lane), 15114+00 to 15116+00 (utilities avoidance), 15221+00 to 15122+50 (Swedesford Road), and 15135+00 to 15141+00 (CR sensitive area by stream S-B81 and wetland WL-B71).

Major Modification II was a change in installation methodology for the portion of the project in Chester County from a single long horizontal directional drill (HDD) to an open cut with some shorter auger bores. 1.8 acres of additional limit of disturbance (LOD). The approximate construction stations which are affected by this modification are STA 15084+00 to STA 15102+00. The proposed changes include an open trench pipeline installation with four conventional bore sections. Conventional bores will be added at: Stations 15083+50 to15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Pottstown Pike/PA HWY 100). Through the utilization of these two installation methods, SPLP is able to avoid impacts to the Shoen Drive well and maintain its avoidance of impacts to resources and sensitive areas.

For a conventional lay, the pipelines would be installed within the same disturbance to the maximum extent practicable. For safety purposes, the installation would be staggered by what is estimated to be no more than 60 days. At some HDDs with longer drills, however, the time period between installation of the two pipelines may exceed 60 days. Any temporary stabilization required would be implemented in accordance with project's E&S Plans. Any permanent or temporary impacts associated with the second pipeline installation will be similar to the first installation.

There are locations where the Project lines (16" and 20") share the ROW with another Sunoco 8" line, and in some cases, the Project line will cross the Sunoco 8" line. The new lines are still expected to be installed underneath the existing line. If for some reason, the Project lines must cross over top of the Sunoco 8" line while still maintaining the minimum necessary cover, Sunoco will be able to stop flow through any line, as necessary, to facilitate safe access to their crossed line.

Past and present land use of the project area and surrounding area is agricultural and forested land. Future land use will be a maintained vegetated natural gas pipeline ROW and agricultural land and forested land. Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items along the gas line alignment are indicated on the plans, where applicable.

1.2 APPROACH AND OVERVIEW

This E&SC Plan was developed using Pennsylvania Department of Environmental Protection (PADEP) guidance documents and sound engineering judgment. When implemented properly, the E&SC practices identified herein will minimize uncontrolled surface water runoff from disturbed areas and minimize the migration of construction-generated sediment. The following general principals apply:

- Planning. Site topography, soil types, and potential effects of construction-related activities on E&S migration have been considered in developing this E&SC Plan. Areas of steep, erodible slopes and erodible soils, if encountered during construction activities, will not be disturbed without instituting proper engineering controls to minimize these concerns.

- Minimize Land Disturbance. To the extent possible and practical, disturbed areas and the duration of exposure to erosion elements will be minimized. Clearing of vegetation will be limited to only those areas of the site to be disturbed. To the extent possible and practical, existing vegetation will be retained and protected.

- Installation of Erosion and Sediment Controls. E&SC best management practices (BMPs) will be constructed, stabilized, and functional before earth disturbance activities begin within the tributary areas of those BMPs.

- Maintenance of Erosion and Sediment Controls. Until the site is stabilized, E&SCs will be properly maintained. Maintenance will entail inspections of E&SC features on a weekly basis and after runoff events. Preventative and corrective maintenance work, including clean out, repair, replacement, regrading, reseeding, and remulching will be performed as soon as practical. If E&SCs fail to perform as expected, replacements or modifications of those installed will be required.

- Stabilization of Disturbed Areas. If a cessation of earth disturbance activities lasts 4 days or longer, the site will be immediately seeded, mulched, or otherwise protected from accelerated E&S. BMPs will remain in place and be maintained until permanent stabilization is achieved. Disturbed areas will be stabilized as soon as is practical, including areas disturbed during the removal of BMPs. Temporary and permanent vegetation, mulch, gravel cover, repaving or a combination of these measures, will be employed immediately following the completion of backfilling and final grading activities. Any areas adversely impacted while acquiring access to the dig sites will be repaired to previous conditions.

- Floodplain. (See 25 Pa. Code § 105.1) – The lands adjoining a river or stream that have been or may be expected to be inundated by flood waters in a 100-year frequency flood. Unless otherwise specified, the boundary of the floodplain is as indicated on maps and flood insurance studies provided by Federal Emergency Management Agency (FEMA). In an area where no FEMA maps or studies have defined the boundary of the 100-year frequency floodplain, it is assumed absent evidence to the contrary, that the floodplain extends from (1) any perennial stream to 100 feet horizontally from the top of the bank, and (2) from any intermittent stream to 50 feet horizontally from the top of the bank of such intermittent stream.

- Floodway – The channel of the watercourse and portions of the adjoining floodplains which are reasonably required to carry and discharge the 100-year frequency flood. Unless otherwise specified,

the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year frequency floodway, it is assumed, absent evidence to the contrary, that the floodway extends from the stream to 50 feet from the top of the bank of the stream (See 25 Pa. Code § 105.1). The FEMA boundary is shown on the E&S Sheets (Attachment 2), when this information is available. When this information is not available, the floodway is shown as defined above for perennial and intermittent streams only.

2.0 SITE DESCRIPTION

The South East Region of SPPP will involve the installation of a 20-inch and a 16-inch diameter NGL pipeline approximately 35 miles long, primarily across agricultural and forested areas from the western border of Chester County to the eastern portion of Delaware County. Past and present land use of the project area and surrounding area is agricultural and forested land. Future land use will be a vegetated, maintained pipeline ROW and agricultural land and forested land.

Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items along the gas line alignment are indicated on the E&S plans, where applicable (Attachment 2). The E&S Plan Sheets also provide information regarding the typical controls and construction sequence to be followed. The construction details provided in Attachment 4 are the standard E&SCs to be used.

2.1 TOPOGRAPHY

The work zone is located on ground of varying elevations. Site elevations vary from 23 feet (Chester Creek in Delaware County) to 741 feet (western border of Chester County) above mean sea level based on the Pennsylvania Spatial Data Access (PASDA). The construction plans show the topography of the site and the surrounding area.

2.2 GEOLOGY AND SOILS

The soils and geologic formations surrounding the project are shown on the figures provided in Attachment 5. Attachment 5 also provides the soil descriptions and properties of the soils found at the site. Attachment 5 also provides the Void Mitigation Plan for Karst Terrain and Underground Mining. In general, the following actions will be taken to counteract soil limitations:

- E&S BMPs will be in place and functional prior to earth disturbance to counteract erodible soils. Prompt stabilization practices will be implemented.
- Cut slopes will be stabilized as soon as possible with seed and mulch or erosion control blanket to prevent sliding. Cut slopes are not designed to exceed 3:1.
- The pipeline being installed will be coated steel.
- If a high groundwater table is encountered, water will be drained away from disturbed areas to a well vegetated area or a placed compost filter sock prior to being discharged off the site. If dewatering is required during construction activities or diversion of a stream is required, the water will be pumped through a pumped water filter bag in accordance with the details provided. Saturated soils are to be dried prior to being used on site.

- Soils will be evaluated throughout the construction process to determine whether additional measures will need to be taken to make the soil suitable for its intended use on site.
- Where necessary, trench plugs will be used to prevent piping.
- Soil amendments will be added to site soils to promote vegetative growth.
- A wetland delineation and stream investigation has been conducted to determine the presence and location of hydric soils.
- If a sinkhole is encountered, repair should be done under the direct observation and supervision of a professional geologist or licensed geotechnical engineer. Site specific sinkhole repairs should be developed on a case by case basis.

In accordance with PADEP's guidance for avoiding and handling acid-producing rock formations encountered during site development, this plan has been prepared to address acid-producing rock formations which may be present at the Pennsylvania pipeline project. USGS topographic mapping shows that the pipeline traverses through areas that were previously strip mined.

PADEP recommends two strategies for handling acid-producing rock formations – avoidance and handling. Acid-producing rock formations will be avoided to the maximum extent practicable at the site. If coal or other acid-producing rock is encountered at the project site, the acid producing rock will either be removed from the site or handled onsite. If coal or other acid-producing rock must be handled on site is should be sampled and analyzed for total percent sulfur. The percent sulfur can be used to predict if the material is acid-producing and can also provide the ability to develop remedial strategies, such as using neutralizing agents and encapsulating with a layer of low permeability clay. Determination of percent sulfur shall be conducted in accordance with PADEP's guidance.

Soil Maps were generated and the soil types are shown on the Limiting Soil Characteristics Table of Attachment 5. **Detailed descriptions of the soil types are presented in Attachment 5.**

To prevent sediment from leaving the site, E&SCs will be in place and functional prior to earth disturbances, and stabilization practices will be implemented in disturbed areas as soon as practical. Geologic formations or soil conditions that may have the potential to cause pollution after earth disturbance were not observed during field activities.

2.3 SURFACE WATER HYDROLOGY

The SPPP area surface water runoff drains to surface waters and unnamed tributaries (UNT's) designated as high quality (HQ), warm water fisheries (WWF), exceptional value (EV), cold water fisheries (CWF), and trout stock fisheries (TSF) under Pa. Code 25 Chapter 93. This E&S plan contains Antidegradation Best

Available Combination of Technologies (ABACT) BMPs to maintain the designated use of the receiving waters. The locations of the receiving waters relative to the project area can be seen on the USGS location map in Attachment 1 and the plan drawings in Attachment 2.

The proposed pipeline route has been designed to maximize the use of existing utility corridors, and minimize the number and linear footage of crossings of all surface waters, including those classified as High Quality (HQ) or Exceptional Value (EV). The Trenchless Construction Feasibility Study sets forth an analysis of the possible implementation of trenchless construction methods at each stream or wetland crossing, and indicates the use of trenchless crossing installation methods where feasible. For those surface water crossings crossed by the open cut installation method, the E&S Plan identifies and incorporates ABACT E&S best management practices (BMPs).

Descriptions of the Primary Receiving Waters are presented in Table 1.

3.0 EROSION AND SEDIMENT CONTROL PRACTICES

Two general types of E&SCs will be used on site during construction: stabilization controls and structural controls. Stabilization controls are implemented as needed to preserve existing vegetation or disturbed areas. Structural controls are used to divert or convey runoff, prevent sediment migration, and reduce the erosive runoff forces. For the purposes of this plan, structural controls are mainly temporary; however, some of the controls may be permanent. The following sections describe the construction sequence and the E&SCs.

3.1 CONSTRUCTION SEQUENCE

Refer to the E&SC plan drawings for the location of the proposed work and the associated BMPs. A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent soil erosion and sedimentation controls. Necessary parts for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. It is not intended that the drawings and this report show detailed information on methods and materials. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on effectiveness of controls or differing conditions encountered in the field. A preconstruction meeting is required prior to the start of any construction activity. The PADEP, contractors, the landowner, appropriate municipal officials, and the E&S plan preparer must be invited to this meeting at least seven days in advance.

This E&SC Plan does not outline specific steps for the protocols for the construction of pipelines in regards to Health and Safety. A Site-Specific Health and Safety Plan should be developed and followed during the construction of the pipeline; however, general guidelines are attached as follows:

- **Attachment 6 includes OSHA Trenching and Shoring Tables and Construction Sequence.**
- **Attachment 7 includes OSHA Construction Standard 1926 Subpart P – Excavations**.

1. Make all appropriate modifications as indicated in general notes on plan sheet ES-0.01.
2. Flag or fence project limits of disturbance and approved access. Sign and flag wetland boundaries and streams.
3. Orange construction fence will be provided and installed at wetland areas adjacent to the LOD and not planned to be impacted to identify and deter construction equipment, vehicles and personnel from entering wetland.
4. Locate staging areas and access points including construction entrances. Install compost filter socks down slope of these areas.

5. Install rock construction entrances as needed. Refer to the rock construction entrance detail on plan sheet ES-0.05.

6. Construct the proposed access roads and implement temporary improvements as identified in access road summary table and detailed on the plan sheets.

7. Install compost filter socks as shown on the construction drawings. Installations sizing, and spacing must conform to the chart and details provided on plan sheet ES-0.05. Install temporary upslope diversions and temporary slope pipes as shown on plan sheets and details.

8. Clearing, grubbing, and topsoil stripping shall commence along the pipeline route and be limited to those areas described in each stage of the construction sequence. General site clearing, grubbing and topsoil stripping may not commence in any stage or phase of the project until the E&S BMPs specified by the bmp sequence for that stage or phase have been installed and are functioning as described in this E&S plan. For clearing, grubbing, and topsoil removal in all stream, river, wetland or other water body crossings, refer to construction sequence notes below. Topsoil will be segregated at locations throughout the project where topsoil exists.

9. Temporary waterbars or approved interceptor dykes will be installed along the alignment prior to pipe installation at the end of each work day. During the periods of time where pipe trench is open contractors will provide positive control of all storm water on site, temporary waterbars will be constructed by the end the work day, or during each work day if required contractor will install compost filter sock to control erosion until 70% vegetation growth has been achieved.

10. Minimize total area of disturbance. Maintain temporary soil stockpiles within existing soil erosion and sediment controls. Should excavation enter streams, follow specific details for these areas shown on the drawings and include the steps detailed in the specific sections below. Pullback areas for HDDs will be cleared and prepared as needed to support staging, welding and testing of the HDD pipe sections. Areas not utilized for construction activities should be avoided to minimize impacts.

11. Install pipe and trench plugs in accordance with details on plan sheet ES-0.07. When open cutting driveways and access roads, contractor shall have road plates available to maintain access for landowners. The 20-inch pipeline will be installed first, followed by the 16-inch line. Any temporary stabilization required between the two installations will be implemented in accordance with this E&S Plan. Both pipelines will be installed within the same limit of disturbance and in the same construction period.

12. For open-cut areas, the length of time required to clear and grade the area, excavate the trench, install the pipelines, backfill the trench and begin stabilization of disturbed areas will not exceed 30 calendar days for most installations. Longer time periods may be approved on a case-by-case basis.

13. Backfill excavated area and cover with topsoil (where topsoil was segregated).

14. Before restoration of grade, the second 16-inch pipeline will be installed. All temporary BMPs will be implemented between the two installations in accordance with the notes and details for temporary seeding and cover.

15. Restore grade to original surface elevations as soon as practicable following completion of installation of pipes. Install permanent waterbars in accordance with plan sheet ES-0.08. Immediately seed and mulch disturbed areas or prepare for paving in roadway areas.

16. Install erosion control blanket on all slopes 3:1 or greater and all areas, regardless of slope and within 100 feet of special protection waters or 50 feet of non-special protection surface waters. Locations are shown on plan sheets.

17. In areas that used stone or timber mats for temporary stabilization and/or access, the stone or mats will be removed and, if needed, the soil will be scarified or ripped to a depth of 8-12 inches to de-compact the soil. After reestablishing preconstruction contours, topsoil will be replaced to a minimum depth of 4-8 inches and seeded and mulched. Vehicular traffic after site restoration should be restricted from areas to prevent soil compaction.

18. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established. Remove soil and erosion sediment control measures upon establishment of a uniform 70% perennial vegetative coverage over the disturbed area. Re-grade and revegetate areas disturbed during the removal of the soil erosion and sediment controls.

19. As part of the ongoing storm water bmp inspection and maintenance program any structural bmp recorded on this project will be inspected maintained, and repaired in accordance with the plan filed with the deed.

20. In accordance with 25 pa code 102.7, upon completion of all steps in the construction sequence, a notice of termination form will be submitted to terminate the authorization of coverage indicating all activities under this permit have been completed.

21. For all EV wetland and stream crossings, SPLP will install the second pipeline immediately following the installation of the first pipeline, as long as no unanticipated, extraneous circumstances or safety issues are encountered. The two pipes will be installed in a single disturbance that will not require interim temporary stabilization/restoration.

For stream, river, wetlands or other water body utility crossings that will be open cut:

1. No work shall commence through a stream, river, wetlands or other water body during inclement weather.

2. A utility line crossing of a stream channel 10 feet in bottom width or less shall be completed within 24 hours from start to finish including trench backfill, stabilization of stream banks and stabilization of the area 50 feet back from the top of each stream bank.

3. A utility line crossing of a stream channel between 10 feet and 100 feet in bottom width shall be completed within 48 hours from start to finish including trench backfill, stabilization of stream banks and stabilization of the area 50 feet back from the top of each stream bank.

4. Wetland crossings are to be completed along with the mainline installation and will be dependent upon the length of the crossing.

5. Facilities for removing sediment from pumped water should be available at the stream crossing site before trenching commences and maintained until trench backfilling is completed. Assembly areas, temporary equipment and non-hazardous material storage areas shall be located at least 50 feet back from the top of any bank.

6. Install temporary equipment crossings at streams and temporary timber mats at wetland crossings in accordance with notes and details.

7. For dry stream crossings install pump bypass, dry flume, or cofferdam in accordance with notes and details.

8. Dewatering work area. Water from the excavation shall be pumped to a sediment filter bag. Where possible, excavation shall be from the top of the stream bank, where technically feasible.

9. Stabilize channel excavation and stream banks prior to redirecting stream flow.

For conventional and HDD bore crossings:

<u>Conventional bores</u>

1. Conventional bores will be conducted along with main line installation to limit the time of disturbance in those areas.

2. Install compost filter socks downgradient of the bore and receiving pits.

3. Excavate pits as shown in the typical stream crossing detail on plan sheet ES-0.17

4. Bore beneath streams where indicated on the construction drawings.

5. Water from the bore pits and work areas shall be pumped to a pumped water filter bag in accordance with detail on plan sheet ES-0.07.

6. Upon completion, backfill all pits.

HDD bores

1. Install compost filter socks at staging and pullback areas in accordance with E&S plan sheets. Where applicable temporary grading of staging areas is provided on plan sheets.

2. Bore and pullback areas shall be located a minimum of 50 feet back from each top of stream bank unless authorized by PADEP.

3. The HDD bore alignment shall be monitored for inadvertent returns. An inadvertent return plan has been developed for this project. This plan is to be reviewed, onsite, and implemented for each drill conducted.

4. Upon completion of HDD bore, restore bore and pullback areas to pre-construction conditions in accordance with E&S plans and details.

See Attachment 3 for the HDD Plans and Profiles.

For working within a wetland area:

1. Locate staging areas and access points. Staging areas should be located at least 50 feet from the edge of the wetland. Install sediment barriers down slope of these areas.

2. Install rock construction entrance as needed. Refer to the rock construction entrance detail on drawings for suggested dimensions.

3. Install orange flagging around perimeter of wetland and sediment barriers along the perimeters of the site as shown on the construction drawings.

4. Mats, pads, or similar devices shall be used during the crossings of wetlands. Original grades through wetlands must be restored after trenching and backfilling. Any excess fill materials must be removed from the wetland and not spread on-site.

5. Soil excavated from wetland areas shall be carefully removed with the roots intact. This soil should be placed in a separate stockpile to be reused during the wetland surface restitution.

6. Dewater work area; water from the excavation shall be pumped to a sediment trap or a filter bag.

7. Install pipe.

8. Install trench plugs in wetland areas to prevent the trench from draining the wetland or changing its hydrology.

9. Backfill pipe trench. Backfill the top 12-inches of the excavated trench with the stockpiled wetland soil to match original surface grades.

10. No soil amendments such as agricultural lime, fertilizer, etc. Will be used within wetland areas.

11. Compact backfill and grade the surface of the trench area to allow for positive drainage to soil erosion and sediment controls and to prepare disturbed areas for permanent trench restoration.

12. Maintain all erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established.

13. Remove all soil and erosion sediment control measures upon establishment of a uniform 70% vegetative cover over the disturbed area. Re-grade and revegetate areas disturbed during the removal of the soil erosion and sediment controls.

For temporary stream and wetland crossings:

1. Install temporary equipment crossings and temporary timber mat wetland crossings in accordance with plan sheet ES-0.10.

2. Temporary stream crossings shall be inspected on a daily basis. Damaged crossings shall be repaired within 24 hours of the inspection and before any subsequent use. Sediment deposits on the crossing or its approaches shall be removed within 24 hours of the inspection.

3. As soon as the temporary crossing is no longer needed, remove temporary crossing. All materials shall be disposed of properly and disturbed areas stabilized. Remove all soil and erosion sediment control measures upon establishment of a uniform 70% vegetation cover over the disturbed area.

3.2 BEST MANAGEMENT PRACTICES

An effective method to minimize E&S migration is to promote and implement BMPs. BMPs are relatively simple, inexpensive, and cost-effective protocols to prevent E&S migration. The basic BMPs that are anticipated to be employed during the construction activities include:

- Minimizing disturbances to site areas, especially those currently covered with pavement or vegetation.
- Minimize the time that soil is exposed.
- Prevent the runoff from flowing across disturbed areas (divert the flow to vegetated areas).
- Stabilize disturbed soils as soon as possible.

- Slow down the runoff flowing across the site.
- Remove sediment from surface water runoff before it leaves the site.

3.3 SEQUENCE OF BMP INSTALLATION

General stabilization and structural controls will be used in E&SC practices to (1) divert stormwater flows away from exposed areas, (2) convey runoff, (3) prevent sediments from moving off-site, and (4) reduce the erosive forces of runoff waters. Compost filter socks and other structural controls that will be utilized during construction activities will include the following:

Vegetative Stabilization Controls

Grounds disturbed by any of the operations necessary to complete the work for this project are to be permanently seeded, or if specified, sodded, unless occupied by structures or paved. A temporary cessation of earth disturbance activities that lasts for four days or longer requires temporary stabilization. Disturbed areas, which are at final grade, will be seeded and mulched immediately.

If seeding cannot be completed immediately after the area reaches final grade due to weather conditions, the disturbed area will be stabilized and mulched with straw at the rate of 3 tons per acre. This straw will be anchored using a method described under Mulching of this narrative.

Structural Controls

Temporary control facilities to be used during construction include the use of compost filter socks and rock construction entrances. Other structural controls as described below may also be used as deemed necessary based on conditions encountered in the field. Installation guidelines and locations for the below devices are as shown on standard drawings and plans. The temporary control measures that will be used on this project include, but are not limited to:

- Compost Filter Socks - This temporary sedimentation control measure consists of wood or metal posts driven through a compost filled mesh tube. Filter socks will be located as needed on side-slope and down-slope boundaries of disturbed areas. Both ends of each compost filter sock should be extended at least 8 feet upslope. Compost filter socks will be sized using the PADEP Construction Detail provided in Attachment 4. Compost filter socks will be used in drainage areas with HQ and EV waters.
- Rock Filter Outlet – Rock filter outlets will be used, as necessary, to address problems of concentrated flows to sediment barriers. In the event of unanticipated concentrated flow and sediment barrier failure, install a rock filter outlet unless the concentrated flow can be diverted away from the barrier. Rock filter outlets used in drainage areas with HQ and EV waters need a 6” layer of compost installed on the upslope side of the rock.

- Rock Filter – Rock filters are proposed to trap sediment in a newly constructed channel, diversion of channels, and at the inlet of pipe diversions.

- Compost Sock Sediment Trap - This temporary sedimentation control measure is useful in controlling runoff from access roads and may also be used at other locations where a temporary sediment trap is appropriate. The minimum base width will be equivalent to the height of the trap and sediment accumulation will not exceed 1/3 the total height of the trap. Ends of the trap will be a minimum of 1 foot higher in elevation that the mid-section, which will be located at the point of discharge. Compost sock sediment trap will be sized using the PADEP Construction Detail provided in Attachment 4. Compost sock sediment traps can be used in drainage areas with HQ and EV waters.

- Tarpaulin Covers - Tarpaulin covers will be used, as necessary, to protect topsoil storage stockpiles from wind and precipitation erosion. Stockpile slopes will be 2:1 or less. A minimal amount of soil will be stockpiled so that the height of the stockpile is less than 35 feet. Compost filter sock is also proposed to protect sediment runoff from stockpile areas.

- Rock Construction Entrance – Temporary access routes will be established on and proximate to the site to facilitate construction activities. The use of access routes will help confine truck and equipment traffic to specific corridors thus minimizing land disturbance and protecting vegetation. Site traffic during wet weather will be limited. No vehicles will be permitted in streams or rivers.

- Wash Racks – Wash racks will be used at rock construction entrances and will be designed to accommodate anticipated vehicular traffic. A water supply will be made available at wash racks to wash the wheels of vehicles exiting the site. Reasonable methods which are sanctioned by the PADEP as alternatives to installation of tire wash stations on public road access points for gathering pipeline projects in EV/HQ or siltation impaired watersheds include:

    1. For paved surface public roads: use of a vacuum truck sweeper or sweeper with a catch bin attachment.

    2. For dirt or gravel surface public roads: rigorous manual removal of mud/dirt from vehicle/equipment tires prior to exiting construction site, supplemented by immediate recover, by manual or mechanical means, of soil which may become discharged onto public roadways. Dust control and/or compaction via rolling of the dirt public road surface will be implemented as needed.

    A predicate for utilizing alternative 1 and 2 above is that the rock pad construction entrance must be extended to a minimum total length of 100 feet and will be constantly maintained including structure thickness to insure its effectiveness remains intact at all times.

Frequency of mechanical and/or manual controls will be dependent upon construction traffic intensity, weather, and soil moisture conditions. At a minimum for paved roads – any day in which construction traffic is exiting the rock construction entrance, the vacuum truck sweeper or sweeper with a catch bin attachment will clean the roadway at the end of the work day and prior to any forecasted rain event. The requirement is to not introduce sediment load from construction traffic onto public road surfaces and into road ditches which will flow into the EV/HQ or siltation impaired water resources which are the subject of the increased protection measures.

- Pumped Water Filter Bag – Pumped water filter bags may be used to filter water pumped from disturbed areas prior to discharging to surface waters. Compost filter socks will be installed within 50 feet of any receiving surface water or where grassy area is not available. Filter bags will be installed according to the details shown in the PADEP Construction Detail provided in Attachment 4.

- Erosion Control Blanket - A manufactured erosion control blanket will be installed on all slopes 3:1 or steeper and within 50 feet of surface water or 100 feet of special protected water. The blanket will be biodegradable but capable of providing protection for two growing seasons. Straw or similar fiber material will be placed between two biodegradable nets. The top net will be heavyweight and UV stabilized; the bottom net will be a lightweight netting. Erosion control blankets will be anchored and stapled in place in accordance with the manufacturer's recommendations and the detail on the construction drawings. For slopes between 3:1 and 1:1 use erosion control blanket SC 150 as manufactured by North American Green or Owner approved equal material or equal method. In areas where livestock is kept use erosion control blanket BioNet SC150BN as manufactured by North American Green or Owner approved equal material or equal method

- Waterbars – Waterbars will be installed across the ROW on all slopes greater than 5 percent. Waterbars will be constructed at a slope of 2 percent and discharge to a well-vegetated area. Waterbars will not discharge into an open trench. Waterbars will be oriented so that the discharge does not flow back onto the ROW. Obstructions (e.g. compost filter socks etc.) will not be placed in any waterbars. Where needed, they will be located below the discharge end of the waterbar. Waterbars will be installed in accordance with the detail provided in Attachment 4.

- Trench Plugs – Impervious trench plugs are required for all stream, river, wetland, or other water body crossings. Trench plugs are also used on slope run spacing. See drawings.

- Upslope Diversion Berms – Diversion berms are proposed to divert clean water runoff around the disturbed area for the project.

- Slope Pipes – Slope pipes are proposed to convey the water from the upslope diversion berms through the disturbed area. The slope pipes will outlet to a triple stack of compost filter sock to act as a level spreader to minimize outlet velocities so that they are non-erosive and dissipate flows.

- Water Deflectors – Water deflectors are proposed to direct runoff off of rock construction entrances and temporary access roads to discharge to stabilized vegetated areas. Compost filter socks can also be used at the outlet ends to trap sediment and minimize velocities.

- Public Rights of Way - In an effort to reduce the tracking of sediment onto public ROW, stabilized construction entrances of crushed stone located at points where traffic will be entering or leaving the site will be installed. Mud and soil accumulating on roadways, as a result of construction activities, will be removed with hand tools, such as shovels, and disposed of properly. The contractor will check the road a minimum of twice daily to verify cleanliness at road crossings and take necessary corrective action. Gravel will be used to limit dust and erodability.

- Restoration - All improved areas disturbed by construction will be restored.

- Additional Requirements – Any additional requirements to adequately control E&S pollution will be the responsibility of the contractor and will be considered incidental to construction activities.

3.4 PRIMARY CONSTRUCTION ACTIVITIES

Clearing and Grubbing

When required, brush, scrub growth, saplings and trees so directed to be cut and removed will be completely removed from the site of the work. The contractor will remove stumps and large roots and refill the depressions with suitable compacted earth fill where necessary to bring the grade back to its original elevation or final design grade. The contractor will protect exposed bare earth by mulch, or other appropriate measures if clearing and grubbing operations are completed more than two days prior to pipeline installation.

Vegetation clearing, grubbing, or removal within the permanent ROW is not anticipated to occur as part of the operations and maintenance of the pipelines to be installed via an HDD or bore except in the areas within the LOD, which is depicted in the plan drawings. However, in instances where the LOD extends into wetlands, floodplains, and floodways, no maintenance clearing, cutting, removal, or other alteration will occur. Instead, alternative methods of inspections (e.g., foot patrol) will be employed to maintain the pipeline ROW in wetlands, floodplains, and floodways.

Grading and Topsoil Stockpiling

Before beginning excavation and/or filling work, the topsoil from all areas to be affected will be stripped and stockpiled in a separate stockpile from the other excavated soil material. After completion of the major construction work, the topsoil will then be replaced as the upper layer of backfill. In general, all topsoil stockpiles will be located within the LOD away from nearby streams and/or drainage ditches or watercourses. Temporary erosion protection devices such as compost filter socks will be used to protect

all stockpiled topsoil from being carried into nearby water courses by the action of any overland runoff water.

As topsoil stockpiles become completely depleted, the disturbed areas will be graded and revegetated. The compost filter socks will be removed only after a uniform 70-percent perennial vegetative coverage has been established across the disturbed area.

Topsoil will not be placed when the subgrade is frozen or when it is excessively wet or dry, and will not be handled when in a frozen or muddy condition.

Vegetation

Grounds disturbed by any of the operations necessary to complete the work for this project are to be permanently seeded, unless occupied by structures or paved. *The disturbed areas will be restored to meadow conditions or to the pre-existing condition (residential lawn or previously existing paved, gravel, or dirt roads).* Any temporary cessation of earth disturbance activities which lasts for four days or longer requires temporary stabilization. Disturbed areas, which are at final grade, will be seeded and mulched immediately.

If seeding cannot be completed immediately after the area reaches final grade due to weather conditions, the disturbed area will be stabilized and mulched with straw at the rate of 3 tons per acre. This straw will be anchored using a method described under Mulching of this narrative.

Seeded areas will be inspected weekly and after each runoff event. Necessary repairs will be made by the end of the week.

Permanent Seeding

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
SLOPES AND BANKS (NOT MOWED) WELL-DRAINED VARIABLE DRAINAGE	 1 PLUS 1 PLUS	 3, 5, 8, OR 12 (1) 3 OR 7
SLOPES AND BANKS (MOWED) WELL-DRAINED SLOPES AND BANKS (GRAZED/HAY) WELL-DRAINED	1 PLUS 1 PLUS	2 OR 10 2,3, OR 13

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
GULLIES AND ERODED AREAS EROSION CONTROL FACILITIES (BMPS)	1 PLUS	3, 5, 7, OR 12 (1)
SOD WATERWAYS, SPILLWAYS, FREQUENT WATER FLOW AREAS	1 PLUS	2, 3, OR 4
DRAINAGE DITCHES		
SHALLOW, LESS THAN THREE FEET DEEP	1 PLUS	2, 3, OR 4
DEEP, NOT MOWED	1 PLUS	5 OR 7
POND BANKS, DIKES, LEVEES, DAMS, DIVERSION CHANNELS, AND OCCASIONAL WATER FLOW AREAS		
MOWED AREAS	1 PLUS	2 OR 3
NON-MOWED AREAS	1 PLUS	5 OR 7
FOR HAY OR SILAGE ON DIVERSION CHANNELS AND OCCASIONAL WATER FLOW AREAS	1 PLUS	3 OR 13
HIGHWAYS (2)		
NON-MOWED AREAS		
WELL-DRAINED	1 PLUS	5, 7, 8, 9, OR 10
VARIABLE DRAINED	1 PLUS	3 OR 7
POORLY DRAINED	1 PLUS	3 OR 9
AREAS MOWED SEVERAL TIMES PER YEAR	1 PLUS	2, 3, OR 10
UTILITY ROW		
WELL-DRAINED	1 PLUS	5, 8, OR 12 (1)
VARIABLE DRAINED	1 PLUS	3 OR 7
WELL-DRAINED AREAS FOR GRAZING/HAY	1 PLUS	2, 3, OR 13
EFFLUENT DISPOSAL AREAS	1 PLUS	3 OR 4
SANITARY LANDFILLS	1 PLUS	3, 5, 7, 11 (1), OR 12 (1)
SURFACE MINES		
SPOILS, MINE WASTES, FLY ASH, SLAG, SETTLING BASIN RESIDUES AND OTHER SEVERELY DISTURBED AREAS (LIME TO SOIL TEST)	1 PLUS	3, 4, 5, 7, 8, 9,11 (1) OR 12(1)
SEVERELY DISTURBED AREAS FOR GRAZING/HAY	1 PLUS	3 OR 13

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	SPECIES	SEEDING RATES – PLS (1)	
		MOST SITES	ADVERSE SITES
1 (2)	spring oats (spring), or 64 96	64	96
	annual ryegrass (spring or fall), or	10	15
	winter wheat (fall), or	90	120
	winter rye (fall)	56	112
2 (3)	tall fescue, or 75	60	75
	fine fescue, or 40	35	40
	kentucky bluegrass, plus 25 30	25	30
	redtop(4), or	3	3
	perennial ryegrass	15	20
3	birdsfoot trefoil, plus 6 10	6	10
	tall fescue	30	35
4	birdsfoot trefoil, plus	6	10
	reed canarygrass	10	15
5 (5)	Big Bluestem, plus	10	15
	tall fescue, or	20	25
	perennial ryegrass	20	25
6 (5,6)	Big Bluestem, plus	10	15

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES
	annual ryegrass	20	25
7 (5)	birdsfoot trefoil, plus	20	30
	Big Bluestem, plus	20	30
	tall fescue	20	25
8	flatpea, plus	20	30
	tall fescue, or	20	30
	perennial ryegrass	20	25
9 (7)	serecia lespedeza, plus	10	20
	tall fescue, plus	20	25
	redtop(4)	3	3
10	tall fescue, plus	40	60
	fine fescue	10	15
11	deertongue, plus	15	20
	birdsfoot trefoil	6	10
12(8)	switchgrass, or	15	20
	big bluestem, plus	15	20
	birdsfoot trefoil	6	10
13	orchardgrass, or	20	30
	smooth bromegrass, plus	25	35
	birdsfoot trefoil	6	10

1. Pure live seed (pls) is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds pls shown on the seed tag. Thus, if the pls content of a given seed lot is 35 percent, divide 12 pls by 0.35 to obtain 34.3 pounds of seed required to plant one-acre. All mixtures in this table are shown in terms of pls.

2. If high-quality seed is used, for most sites seed spring oats at a rate of two bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at one bushel per acre. If germination is below 90 percent, increase these suggested seeding rates by 0.5 bushel per acre.

3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.

4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.

5. Use for highway slopes and similar sites where the desired species after establishment is Big Bluestem.

6. Use only in extreme southeastern or extreme southwestern PA. Serecia lespedeza is not well adapted to most of PA.

7. Do not mow shorter than 9 to 10 inches.

8. If liming, fertilization, and preparation of seedbed are properly done and if care is taken to drill and cover the seed (or mulch applied), the rate for "most sites" should suffice. However, on eroded or coarse and poorly prepared seedbeds, particularly if the soil is very acidic or infertile, the rate for "adverse sites" should be used.

9. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.

In lawn areas, permanent cover will be established using the following PENNDOT seed mixture:

PENNDOT FORMULA B				
Seeding Rate	3 lbs. per 1,000 square feet			
Species	**% by Weight**	**Purity %**	**Minimum % Germination**	**Maximum % Weed Seed**
Kentucky Bluegrass	50	98	80	0.20
Perennial Rye	20	98	90	0.15
Red Fescue	30	98	85	0.15

PEM WETLAND SEED MIX		
ERNST CONSERVATION SEED MIX NO. ERNMX-122		
FACW Meadow Mix		
Seeding Rate	20 lb per acre, or ½ lb per 1,000 sq ft	
Mix Type	Wet Meadow & Wetland Sites	
Species List	31%	Fox Sedge (Carex vulpinoidea)
	20%	Virginia Wildrye (Elymus virginicus)
	14%	Lurid (Shallow) Sedge (Carex lurida)
	5%	Green Bulrush (Scipus atrovirens)
	4%	Blue Vervain (Verbena hastate)
	3.5%	Wood Reedgrass (Cinna arundinacea)
	3%	Soft Rush (Juncus effuses)
	3%	Blunt Broom Sedge (Carex scoparia)
	3%	Hop Sedge (Carex luputina)
	2%	Sensitive Fern (Onoclea sensibilis)
	2%	Oxeye Sunflower (Heliopsis helianthoides)
	1%	Rattlesnake Grass (Glyceria Canadensis)
	1%	Woolgrass (Scirpus cyperinus)
	1%	Swamp Milkweed (Asclepias incarnata)
	1%	New England Aster (Aster novae-angliae (Symphyotrichum n.))
	1%	Flat Topped White Aster (Aster umbellatus (Doellingeria umbellate))
	0.5%	Joe Pye Weed (Eupatorium fistulosum)
	0.5%	Boneset (Eupatorium perfoliatum)
	0.5%	Ditch Stonecrop (Penthorum sedoides)
	0.5%	Narrowleaf Blue Eyed Grass (sisyrinchlum angustifolium)
	0.5%	Seedbox (Ludwigia alternifolia)

0.5%	Great Blue Lobelia (Lobelia siphilitica)
0.5%	Mud Plantain (Water Plantain) (Alisma subcordatum (A. plantago-aquatica))
0.5%	Square Stemmed Monkeyflower (Mimulus ringens)
0.4%	Bladder (Star) Sedge (Carex intumescens)
0.1%	Slender Mountainmint (Pycnanthemum tenuifolium)
Total 100%	

Planting Specifications for PFO or PSS Wetland Restoration Areas (see ES-0.17 for restoration detail)

Vegetation Planting Type	Size	Species [a]		Wetland Status [b]
Shrub Species	Two to three-foot whip[c]	*Alnus serrulata*	Smooth Alder	OBL
		Cornus amomum	Silky Dogwood	FACW
		Lindera benzoin	Spicebush	FAC
		Viburnum dentatum	Northern arrow-wood	FAC
Tree Species	Containerized (1-inch DBH)[c]	*Acer rubrum*	Red maple	FAC
		Betula alleghaniensis	Yellow Birch	FAC
		Platanus occidentalis	American Sycamore	FACW
		Quercus bicolor	Swamp White Oak	FACW
		Salix nigra	Black Willow	OBL

a – If the listed species is unavailable during planting, a comparable native substitute will be used.

b - USACE Eastern Mountains and Piedmont Wetland Status Trees and shrubs will be planted at a density of at least 400 plants/trees per acre in accordance with USACE guidance.

c - DBH = Diameter at breast height

Liming Rates

Minimum 6 tons per acre at 100% effective neutralizing value (% ENV), unless the soil test determines that a lesser amount is needed. To determine the actual amount of regular lime to apply, divide the amount called for by the soil test by the % ENV for the product used. For example, if 6 tons per acre is needed and the env for the lime used is 88%, divide 6 by 0.88 resulting in 6.8 tons needing to be applied. For dolomitic lime, which has a significant amount of magnesium in it, divide the amount called for by the soil test by the % calcium carbonate equivalent (% CCE) listed for the product instead of the % ENV. The % CCE may be above 100% which accounts for the fact that magnesium has a greater effect per pound than the calcium

in regular lime. Note: When a soil test requires more than 8,000 pounds of lime per acre, the lime must be mixed into the top 6 inches of soil.

Fertilization Rates

Apply 10-20-20 at 600 pounds/acre, if top dressed or 1,000 pounds/ac, if incorporated, unless the soil test determines that the rate can be less than these minimums.

SOIL AMENDMENT APPLICATION RATE EQUIVALENTS				
Soil Amendment	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yds.	
AGRICULTURAL LIME	6 TONS	240 LBS.	240 LBS.	or as per soil test; may not be required in agricultural fields
10-20-20 FERTILIZER	1,000 LBS.	25 LBS.	25 LBS.	or as per soil test; may not be required in agricultural fields

Temporary Seeding

Temporary grass cover will be established in the following areas:

1. Where soil stockpiles are to be exposed for a period greater than four (4) days, the stockpile will be seeded.

2. Where vegetative filters must be established below filter bags, a minimum distance of 10 feet will be seeded down slope of the trap outlet.

Temporary Cover - Seed mixture for temporary cover will consist of 100-percent annual ryegrass. Seed will be applied at the rate of 40 lb per acre or as recommended by a local recognized seed supplier approved by the owner's representative. Prior to seeding, apply 1 ton of agricultural grade limestone per acre plus 10-10-10 fertilizer at the rate of 500 lb. per acre and work into soil.

Mulching

The purpose of mulch is to reduce runoff and erosion, prevent surface compaction or crusting, conserve moisture, and control weeds. Mulch will be applied on any area subject to erosion, or which has unfavorable conditions for plant establishment and growth. The practice may be used alone or in conjunction with other structural and vegetative conservation practices, such as waterways, ponds, sedimentation traps or critical area planting. On sediment producing areas where the period of exposure is less than 2 months, mulch materials will be applied according to the following guidelines:

1. Straw mulch will be applied at the rate of three tons per acre. Chemically treated or salted straw is not acceptable as mulch.

2. Straw mulch will be anchored immediately after application by at least one of the following methods.

    A. "Crimped" into the soil using tractor drawn equipment (straight bladed coulter or similar). This method is limited to slopes no steeper than 3:1. Machinery should be operated on the contour. (Crimping of hay or straw by running it over with tracked machinery is not recommended)

    B. Asphalt, either emulsified or cut-back, containing no solvents or other diluting agents toxic to plant or animal life, uniformly applied at the rate of 31 gallons per 1,000 square feet.

    C. Synthetic binders (chemical binders) may be used as recommended by the manufacturer to anchor mulch provided sufficient documentation is provided to show that it is non-toxic to native plant and animal species.

    D. Lightweight plastic, fiber, or paper nets may be stapled over the mulch according to the manufacturer's recommendations.

Mulched areas will be checked periodically and after each runoff event (e.g. rain, snowmelt, etc.) for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

Protection of Streams and Wetlands

If a stream or wetland crossing or encroachment is required, work will be in accordance with all PADEP permits. Refer to E&SC detail sheets for stream and wetland crossing details for diversion of stream channel flow and protection of wetlands.

1. Contractor will minimize construction area through and along streams. When wetland areas are temporarily disturbed, isolate and stockpile soil for replacement after grading is completed.
2. Native stream bed material will be separated from other spoil for reinstallation after restoration (see the E&S Plan provided in Attachment 12). An evaluation was completed for sheer stress of stream flow against restored native stream bed material. If the evaluation indicated that the stream will not be stable with native material, then rip rap will be used. Site specific waterbody crossing and restoration plans providing direction for the installation of rip rap at these streams are included within the E&S Plans provided in Attachment 12. In these cases where rip rap is used and the stream bed is composed of rock, cobble, or gravel, then the native stone will be used for the top six inches of rip rap. Every effort will be made to segregate the entire top layer of native stone in streams with less than six inches of native stone where rip rap is proposed.

Furthermore, stream restoration will involve the application of rip rap for bank stabilization must comply with site specific drawings included within the E&S Plan provided in Attachment 12. Rip rap will be used to the minimum extent necessary to stabilize the stream bank, which is typically no more than 12 inches above the normal flow depth often evidenced by a lack of vegetation or a strand line. Stream banks above this elevation will be stabilized with erosion control blanket and revegetated.

3. Immediately upon completion of encroachment or crossing, stabilize stream bed and banks (i.e. seeding, erosion blanket, and native substrate material) prior to removal of temporary E&SC devices.
4. Should excavation extend to within 50 feet of the stream bank, construct compost filter socks (Standard Details on construction plans) parallel to the stream, a minimum of 1 foot beyond disturbed earth, to protect the stream. Disturbed areas within 50 feet of a stream or wetland will be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized. Seed and mulch all disturbed areas.

Temporary Stream and Wetland Equipment Crossings

No vehicular traffic will be permitted in the streams at any time during construction.

If crossing a stream by vehicles is required to facilitate construction, a temporary stream crossing will be installed for this purpose. Work will be in accordance with PADEP Permit Requirements.

Travel Lanes

Portions of the project LOD have been identified as travel lanes. These areas exist along the project ROW and will be used for travel between HDD workspaces. Some of these areas will also be mechanically-cleared of trees and brush to improve travel and/or line-of-sight for HDD activities. For travel lanes involving mechanical clearing, the LOD limits have been sighted outside of wetlands and most floodplains and floodways. For any portions of the travel lanes that are crossing resources, an equipment bridge/working platform will be installed per details provided in the E&S Plan Sheets (Attachment 2).

Travel lanes have also been labeled on the E&S Plan Sheets and designated as either “ROW-Travel LOD” (temporary impacts) or “ROW-Travel and Clearing LOD” (permanent impacts). Necessary E&S control have been added as well.

Minimization of Soil Compaction

Pre-construction planning and final design has reduced the LOD, and therefore the area subjected to compaction, to the maximum extent while allowing safe installation of the pipeline. During construction, all land disturbance is limited to the defined LOD. Within the LOD, contractors are to minimize land disturbance to the maximum extent. Repeated travel is restricted to travel lanes and travel throughs are limited to those

necessary to complete the work. Implementation of construction sequencing ensures the number of passes with equipment and duration of the project is minimized. In wetlands and other sensitive areas, the installation of timber mats (or equal such as composite matting), and limiting equipment and vehicle travel, ensures compaction is minimized. In addition, top soil segregation and restoration BMPs offer significant protection to the layer most vulnerable to compaction. Upon completion of pipeline installation and trench backfill, replace segregated topsoil to pre-construction grades. Contractor is to take every precaution to minimize compaction during placement of topsoil. Provide surface roughening in accordance with PADEP E&S Pollution Control Program Manual. Surface roughing is the practice of providing a rough soil surface with horizontal depressions for the purpose of reducing runoff velocity, increasing infiltration, aiding the establishment of vegetation, and reducing erosion. During the preparation for seeding on slopes 3H:1V or steeper, unless a stable rock face is provided, surface roughening is to be conducted by tracking the slopes by running tracked equipment (with blades up) across the surface as to leave track marks parallel to the contour. Any area where stone and/or timber mats are used for temporary stabilization, soil will be decompacted through multiple passes using tracked equipment to roughen the surface. The tracking method can be used elsewhere to aid in the decompaction of soils as deemed necessary to facilitate successful restoration. This tracking method can be used on the subsoil before topsoil replacement and/or on the topsoil prior to seeding. In agricultural areas, severely compacted areas are to be plowed with a harrow, paraplow, paratill or other equipment before subsoil replacement. Vehicular traffic is to be restricted from areas that are ready to be seeded.

A note consistent with the Department's Manual will be included on all construction plans which states that any area that used stone and/or timber mats for temporary stabilization and/or access will be completely removed, soil will be decompacted by using tracked equipment making multiple passes over area, reestablish preconstruction contours, and replace topsoil to a minimum of 4-8 inches deep and seed and mulch areas. Vehicular traffic should be restricted from areas to prevent soil compaction.

Waste Considerations

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with the PADEP's solid waste management regulations at 25 Pa. Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Excess material brought into the site areas to facilitate construction access will be completely removed prior to rough grading and final surface stabilization. Expected construction wastes will consist of packaging material and sediment cleaned from BMPs. Packaging from the materials brought on site will be disposed of by a licensed hauler. Sediment removed from BMPs will either be spread in a protected area to dry and then recycled as fill material or disposed of off-site. In cases where disposal is necessary, waste materials are to be disposed of at an approved PADEP waste disposal site.

Thermal Impacts

Thermal impacts are most commonly associated with urbanization (i.e., increased impervious surfaces) that results in heated stormwater runoff flowing into receiving waters where it mixes, and potentially increases the base temperature of the surface water in streams. However, another contributing factor for stream temperature is solar exposure (radiant energy input) to the surface water, typically ponded, standing waters. The amount of heat transferred, and the degree of thermal pollution is of importance for fisheries management and the ecological integrity of receiving waters. Among the attributes that determine the contribution of solar energy to thermal impacts are the presence of riparian vegetation, as well as stream width, depth, flow regime (perennial, intermittent, ephemeral), and orientation. However, a singular linear crossing of minimal width and vegetation clearing is not considered a contributing factor to thermal impacts.

Potential pollution to surface waters from thermal impacts will be minimized by minimizing the clearing of riparian vegetation at stream crossings along the ROW and avoiding the addition/creation of impervious surfaces in riparian areas, The Project does not have thermal impacts. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth during germinating months.

Specifically, thermal impacts will be avoided by implementing the following:

- Siting parallel to and overlapping with existing ROWs to minimize vegetation clearing at stream crossings;
- Reducing the construction ROW width and additional temporary workspaces at stream crossings;
- No grubbing, grading, or clearing of trees will occur within 50 feet of the top of stream bank until pipeline construction/installation is ready to proceed through that area.
- Restoring (seeding) disturbed areas/ROW as soon as practicable and /or directing runoff to vegetated areas to reduce the temperature of runoff prior to discharge into the streams; and,
- Restoring the stream banks and seeding/planting as soon as practicable to facilitate vegetative growth along the stream channel.

At locations where the addition/creation of a permanent compacted aggregate surface is proposed, an infiltration berm and/or soil amendments will be implemented as a PCSM BMP to mitigate associated increases in runoff volume. No thermal impacts from aggregate surfaces are anticipated as the infiltration berms or soil ammendments will capture runoff and allow infiltration time prior to downstream discharge, thereby mitigating any possible thermal impact which may exist. Thermal impacts associated with gravel areas are not anticipated as a result of subsurface infiltration.

Riparian Forest Buffers

A separate waiver request has been prepared and is provided as Attachment 6 to the NOI application. The following summarizes that request. The Pennsylvania Pipeline Project qualifies for an exemption of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix) for areas within the Chapter 105 permit area. Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan.

In addition to the exemption, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area. **Demonstration of Waiver Necessity**

A riparian forest buffer waiver is necessary to complete the intended scope of the pipeline project. The project is from Houston to Delmont, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. The project crosses through Chester County for approximately 23.6 miles, and Delaware County for approximately 11.4 miles. Due to the linear nature of the project and the surrounding topography, riparian forest buffers could not be avoided altogether.

Alternatives Analysis

Impacts to environmental resources, including riparian forest buffers, were evaluated during the pipeline routing phase of the project. Field teams were deployed to evaluate alternate routes based on environmental and constructability constraints. The final route that was selected minimizes environmental impacts to the maximum extent practicable while still maintaining the project's overall constructability and ensuring a safe working environment while also taking landowner constraints into consideration. Additionally, several variations of horizontal direction drill profiles were evaluated to minimize pullback areas, additional workspaces, and overall disturbance within riparian forest buffers. Permanent features, such as access roads and block valves, were evaluated to locate the features outside of the riparian forest buffer, where possible.

Demonstration of Minimizing Impacts

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the maximum extent practicable. The LOD has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible adjacent to the stream area required for crossing and construction. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide within 10 feet of the stream banks to limit the proximity of the work areas as per the stream crossing detail from the PADEP manual. The operations within the LOD near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing

the LOD to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible.

Meeting Requirements of Chapter 102

All other requirements of Chapter 102 to minimize impacts to riparian buffers are being met in the project's Erosion and Sediment Control Plan and Site Restoration/Post-Construction Stormwater Management Plans which have been designed in accordance with Chapter 102 and in HQ/EV watersheds to implement ABACT controls where non discharge alternatives do not exist. In accordance with Chapter 102, and E&S plan has been developed to minimize the sediment entering the buffer areas through the use of properly designed E&S bmp's such as, but not limited to, waterbars, compost filter sock, diversion berms, slope pipes and erosion control blanket. A site restoration plan is proposed to revegetate the buffer areas within the right of way. The post construction stormwater management plan has been designed to control runoff rate and volume at permanent above ground facilities through infiltration practices.

Stormwater Runoff Analysis

The pre-construction drainage patterns surrounding the project will be maintained. All disturbed areas within the LOD will be restored to a meadow in good condition. As a result of restoring the pipeline ROW and associated workspaces to a meadow in good condition and maintaining pre-construction drainage patterns, there will be no increase in stormwater runoff rate or volume attributed to those areas.

The permanent access roads and block valve sites proposed for Spreads 3, 4, and 5 will remain as permanent gravel drives and pads after construction is complete. A minimal increase in runoff volume and rate occurs as a result of the additional gravel to be installed. Stormwater runoff calculations have been provided in Attachment 4 of the Pennsylvania Pipeline Project Site Restoration and PCSM Plan. The PCSM calculations show that the minimal increase in runoff volume and rate will be accounted for providing an infiltration berm and/or infiltration trench downslope of the runoff from the access road and pad areas. The infiltration berm and soil amendments will be constructed in accordance with the PA Stormwater BMP Manual. Following implementation of the infiltration berm there will be no increase in the 2-year 24-hour runoff volume or the stormwater runoff rate for the 24-hour 2-, 10-, 50-, and 100-year storm events.

3.5 MAINTENANCE AND INSPECTION PROCEDURES

Maintenance to the temporary E&SC structures will be performed by the contractor during the construction period. A log or written report showing dates that E&S bmp's were inspected as well as any deficiencies found and the date they were corrected shall be maintained on the site and be made available to regulatory agency officials at the time of inspection.

Compost Filter Socks

- Accumulated sediment will be removed as required, and in all cases where uniform accumulations are half the above ground height of the filter sock. Any accumulated earth behind the filter sock will be disposed of by the contractor in such a manner that the removed earth will not be excessively eroded and transported into a waterbody.

- The filter sock/silt fence installation will be inspected weekly and after every runoff event. Loosened support stakes will be removed and new stakes driven. Filter socks will be maintained and repaired as per manufacturer specifications.

- Temporary E&SCs will be removed by the contractor only after a uniform 70-percent perennial vegetative coverage has been established across the disturbed area. Temporary E&SCs will be disposed of by the contractor at an approved PADEP waste disposal facility.

Rock Construction Entrances

- Rock construction entrance thickness will be constantly maintained to the specified dimensions by adding rock. A stockpile will be maintained on site for this purpose.

Access Road

- The proposed access roads will be inspected weekly and after runoff events. Additional aggregate will be applied to the road as needed to maintain an adequate thickness, and ruts will be smoothed to prevent channelizing flow.

Water bars

- Water bars will be inspected weekly, daily on active roads, and after each runoff event.

- Damaged or eroded water bars will be restored to original dimensions within 24 hours of inspection.

- Maintenance of water bars will be provided until roadway, skid trail or ROW has achieved permanent stabilization.

Pumped Water Filter Bags

- Filter bags will be replaced when they become half full of sediment.

- Filter bags will be inspected daily. If any problem is detected, pumping will cease immediately and not resume until the problem is corrected.

Vegetation

Seeded areas will be inspected weekly and after each runoff event. Necessary repairs will be made immediately.

Mulch

Mulched areas will be checked periodically and after severe storms for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

Inspection and Maintenance

Until the site is stabilized, E&SC BMP's will be maintained properly. Preventative and corrective maintenance work, including clean-out, repair, replacement, regarding, reseeding, mulching, and reknitting will be performed as soon as practical. If E&SC BMP's fail to perform as expected, replacement BMP's, or modifications to those installed will be required. The following inspection and maintenance practices will be used to maintain E&SCs on-site during activities.

- E&SC measures will be in-place and inspected at the end of the workday. E&SC measures will also be inspected after each runoff event. The contractor will immediately repair any deficiencies.
- Maintenance and inspection of sediment control facilities will conform to PADEP Chapter 102 and 105 rules and regulations.
- Sediment will be removed when it accumulates half the aboveground height of the compost filter sock. All undercutting of erosion of the toe anchor will be repaired with compacted backfill material. The contractor will adhere to the manufacturer's recommendations for replacing filter socks due to weathering.
- Sediment removed from filter socks and any other control devices will be mixed in with the other waste soil on the construction site and properly disposed of as discussed in Section 3.4.
- Sediment will be removed from the sediment removal facilities associated with wash racks as necessary. Sediment deposited on paved roadways will be removed and returned to the construction site daily, at a minimum.
- Re-vegetated areas will be inspected for bare spots, washouts, and healthy growth during the construction. Identified bare spots and washouts will be repaired as soon as practical.
- All soil stockpiles that are to remain more than 4 days will be seeded with temporary grass, as noted in the seeding specification on the construction drawings.
- The contractor will make certain that all runoff is directed to the sedimentation control devices.
- All sedimentation control measures will remain in place until the disturbed areas are stabilized and a uniform 70-percent perennial vegetative cover is established. Any area not achieving a 70-percent vegetative cover will be re-seeded and mulched within 24 hours of detection.

If E&S BMPs are found to be inoperative or ineffective during an inspection, PADEP should be contacted within 24 hours, followed by the submission of a written noncompliance report to PADEP within 5 days of the initial contact.

3.6 ANTIDEGRADATION

Portions of the earth disturbance activities associated with the SPPP will be located within a HQ/EV watershed. A combination of non-discharge alternatives and the use of ABACT BMPs will be implemented during construction to protect and maintain the existing water quality of the receiving waters. For HQ/EV special protection watersheds 25 Code §§102.8 (h) was followed, for all the HQ/EV special protection watersheds listed in Table 1 non discharge alternatives were evaluate and included when possible. For areas where non discharge alternatives were not available the ABACT site restoration BMPs were incorporated. Due to the linear nature of this project all of the HQ/EV special protection watersheds received the same incorporation of ABACT site restoration BMPs throughout the pipeline.

In Berks County numerous EV wetlands are located within the project boundary. All of these wetlands underwent a combination of non-discharge alternative analysis and the use of ABACT BMP's onsite. These measures are discussed in more detail below. Table 1 lists all of the receiving waters for the project boundary.

Non-discharge alternatives were evaluated to minimize accelerated E&S and achieve zero net change in runoff between the pre and post-construction conditions. Non–discharge alternatives exist when the existing land use is revegetated and grade is restored therefore no increase in runoff rate or volume from pre to post construction results. Other non-discharge alternatives implemented are limiting and minimizing the extent of disturbed areas and limiting the extent and duration of disturbance (phasing and sequencing) then stabilizing disturbed areas as soon as practicable. ABACT BMPs will be used onsite to protect and maintain the existing water quality of receiving waters also in areas where non-discharge alternatives exist.

Where non-discharge alternatives do not exist, ABACT BMPs will be used onsite to protect and maintain the quality of the receiving HQ and EV resources. The extent of the disturbed area will be minimized, and the duration of disturbance will be minimized by stabilizing disturbed areas as soon as practicable. ABACT BMPs will be used onsite to protect and maintain the existing water quality of receiving waters. A supplemental Antidegredation Analysis is provided in Attachment 11 of this report.

The following ABACT E&S BMPs will be used onsite:

- Wash racks located at rock construction entrances,
- Compost filter sock is to be used
- Erosion control blanket on disturbed areas within 100 feet of a receiving surface waters, where applicable, and on slopes 3:1 or steeper.

4.0 SITE RESTORATION PRACTICES

Following completion of pipeline installation and trench backfilling, the pipeline right of way, associated workspaces, and temporary access roads shall be returned to the general grade present prior to pipeline installation to maintain pre-construction drainage patterns. After completion of major construction work, topsoil that was stockpiled during construction will be placed along the ROW. Grounds disturbed by any of the operations necessary to complete the work for this project within the ROW are to be permanently seeded, or if specified, sodded, unless occupied by structures, paved, or designated as a permanent access road. Disturbed areas, which are at final grade, shall be seeded and mulched once final grades are achieved. The permanent seed mixture will restore disturbed areas to a meadow in good condition or better. If seeding cannot be completed within a four (4) day period due to weather conditions, the disturbed area will be mulched with straw at the rate of three (3) tons per acre. This straw will be anchored using a method described in Section 3.4.

4.1 BMP DESCRIPTION AND CONSTRUCTION SEQUENCE

A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action to conform to the applicable regulatory agency requirements for restoration and post-construction stormwater management of the site. Necessary steps for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on the effectiveness of controls or differing conditions encountered in the field. The appropriate county conservation district and DEP shall be contacted and must approve any deviation to the authorized plans.

A pre-construction meeting is required prior to the start of any construction activity. The Pennsylvania Department of Environmental Protection (PADEP) or applicable county conservation district, contractors, the landowner, appropriate municipal officials, and the plan preparer must be invited to this meeting at least 7 days in advance.

General Construction Sequence

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.

2. Surface roughening will be utilized to rough the soil surface with horizontal depressions for the purpose of reducing runoff velocity, increasing infiltration, aiding the establishment of vegetation, and reducing erosion. Surface roughening should be applied to slopes 3H:1V or steeper unless a stable rock face is provided or it can be shown that there is not a potential for sediment pollution to surface waters. For roughened surfaces within 50 feet of a surface water, and where blanketing of seeded areas is proposed as the means to achieving permanent stabilization, spray-on type blankets are

recommended. Surface roughening shall be accomplished using dozers affixed with grouser tracked equipment. Dozers shall run up and down the slopes leaving horizontal grooves perpendicular to the slope. Dozer blades shall be raised and not used during surface roughening. Where compaction does occur, contractor shall scarifiy the soil or provide additional roughening such as deep ripping or chisel ripping to restore the area to a minimal compacted state. In areas of proposed infiltration, soils shall be amended to 2' below grade. See Soil Amendment and Restoration construction sequence below.

3. Place topsoil from topsoil stockpiles as the upper layer of backfill. Topsoil shall not be placed when the subgrade is frozen or when it is excessively wet or dry and shall not be handled when in a frozen or muddy condition.

4. Remove gravel and geotextile from the temporary access roads and scarify the soil. Refer to step 2 of this sequence to address compaction at access roads. After addressing compaction concerns, place topsoil that was stripped prior to installation of the access roads.

5. Immediately seed and mulch disturbed areas in accordance with the permanent seeding schedule once final grade is established and topsoil is placed.

6. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70-percent perennial vegetative cover is established. Regrade and revegetate areas disturbed during the removal of the erosion and sediment controls.

Soil Amendment and Restoration Construction Sequence

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.

2. In the designated soil amendment area, till the ground and mix in the compost at a ratio of 2:1 (soil compost) to a depth of 24 inches.

3. Immediately seed and mulch disturbed areas once final grade is established in accordance with the permanent seeding schedule.

4. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established.

5.0 HYDROSTATIC TESTING AND ASSOCIATED PERMITTING

A combination of surface water sources (SWSs) and public water sources (PWSs) will be used to provide the water required for an HDD, hydrostatically testing pipeline segments installed by HDD, and hydrostatically testing the main pipeline. The pipelines were broken into 6 spreads for construction purposes. Before being put into service, the 20-inch and 16-inch pipelines in PPP will be hydrostatically tested. Any segments of the pipeline that will be installed within a spread by HDD will be tested during the installation process. Subsequently, once the entire pipeline has been installed within a spread, the full pipeline will be hydrostatically tested.

The pipelines will be installed across the following counties in the South East Region (Construction Spread 6): Chester and Delaware. The regulatory agencies that control the withdrawal and discharge of water for hydrostatic testing varies by county and includes Pennsylvania Department of Environmental Protection (PADEP), Susquehanna River Basin Commission (SRBC), and Delaware River Basin Commission (DRBC).

Based on a docket agreement between Sunoco and DRBC, only PWSs are allowed to be used to complete drilling and hydrostatic testing of the HDDs and pipeline in DRBC territory. Spread 6 is in DRBC territory and will only use PWSs. A list of available PWSs was developed and provided to the construction contractors.

A preliminary assessment of the water needed for both the HDDs and mainline tests was completed using estimated pipeline lengths and pipeline diameters. The estimated water volumes were subsequently used to determine if local PWSs and/or SWSs could provide the required quantities of water. Potential PWSs were contacted to determine available allocations, contact information, pricing, type of water available (raw or treated), potential withdrawal points, and contract information. This information was consolidated into spread-specific lists that were provided to the construction contractors for their discretionary use. PWSs will need to be used for certain portions of spreads because of the lack of viable SWSs, but in other spreads, SWSs will be primarily used because they are located in close proximity, minimal to no trucking is required, and the overall costs associated with use of SWSs is much lower than water from PWSs. The construction contractors are required to coordinate with the PWSs to finalize contracts and other issues if PWS will be used for hydrostatic testing.

Any drilling fluid from HDDs will be collected, containerized, and properly disposed of at an approved disposal facility. Water discharged at the completion of hydrostatic testing of HDDs or main pipeline can be discharged to the ground surface or directly back to the source water according to the approved PADEP NPDES/PAG-10 permit. The permits require sampling and analysis of the water, and possibly pretreatment of the water, prior to discharge. PAG-10 permits were obtained for non-SRBC and SRBC areas of the PPP. As discussed above, the same docket agreement between Sunoco and DRBC excludes any surface

discharges within DRBC territory. All hydrostatic test water in DRBC territory will be collected, transported, and disposed of under Sunoco's Industrial Discharge Permit with the Delaware County Regional Water Quality Control Authority (DELCORA). The water will need to meet pretreatment limits before being discharge to DELCORA at Sunoco's Marcus Hook facility.

6.0 REFERENCES

Erosion and Sediment Pollution Control Program Manual, Commonwealth of Pennsylvania, Department of Environmental Protection, Office of Water Management, March 2012.

Stormwater Management for Construction Activities - Developing Pollution Prevention Plans and Best Management Practices, United States Environmental Protection Agency, Office of Water, 1993.

Pennsylvania Stormwater Best Management Practices Manual Draft, Pennsylvania Department of Environmental Protection, Bureau of Watershed Management, October 2009.

Downingtown, Elverson, Pottstown, Wagontown, Malvern, West Chester, and Media Quadrangles, Pennsylvania – Chester County, Geological Survey, United States Department of Interior.

Soil Survey of Chester County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Media, West Chester, Marcus Hook, and Bridgeport Quadrangles, Pennsylvania – Delaware County, Geological Survey, United States Department of Interior.

Soil Survey of Delaware County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

DCNR, 2016. *Invasive Plants in Pennsylvania, Crown Vetch,* Coronilla varia. Accessed October 25, 2016. http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_010284.pdf.

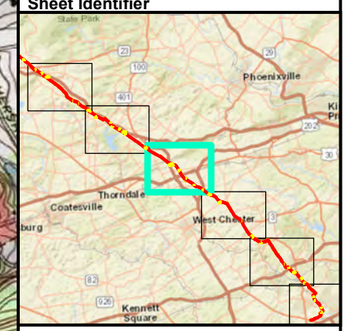
ATTACHMENT 1

USGS LOCATION MAP

Legend

- Access Road
- Major Modification
- Limit of Disturbance
- Alignment Centerline
- Block Valve/Station

Sheet Identifier



N

0 1,000 2,000 Feet

0 300 600 Meters

PROJECT LOCATION MAP
ATTACHMENT 1-3
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12, 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY,
PENNSYLVANIA

TETRA TECH

Notes:
1) Topographic map provided by ESRI's ArcGIS Online USA Topo Maps map service (© 2013 National Geographic Society, i-cubed).
2) Quadrangles being displayed are Downingtown, Malvern

PGH P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ESC\GPP\PENNPIPELINE_SOUTHEAST_USGS_ESCGP MXD 10/09/17 JN

ATTACHMENT 2

E&S PLAN SHEETS

PENNSYLVANIA PIPELINE PROJECT
CONSTRUCTION SPREAD 6

CHESTER COUNTY CONSERVATION DISTRICT
EROSION & SEDIMENT CONTROL AND
SITE RESTORATION PLAN
MAJOR MODIFICATION II

OCTOBER 2017

DRAWING INDEX	
SHEET No.	DRAWING TITLE
ES-0.01 TO ES-0.23	EROSION & SEDIMENT CONTROL & SITE RESTORATION PLAN NOTES AND DETAILS NO REVISIONS
ES-0.24 TO ES-0.25	KEY PLAN
ES-6.45 TO ES-6.49	REVISED EROSION & SEDIMENT CONTROL & SITE RESTORATION PLANS

PREPARED BY:

TETRA TECH

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TEL: (412) 921-7090 | FAX: (412) 921-4040

PREPARED FOR:

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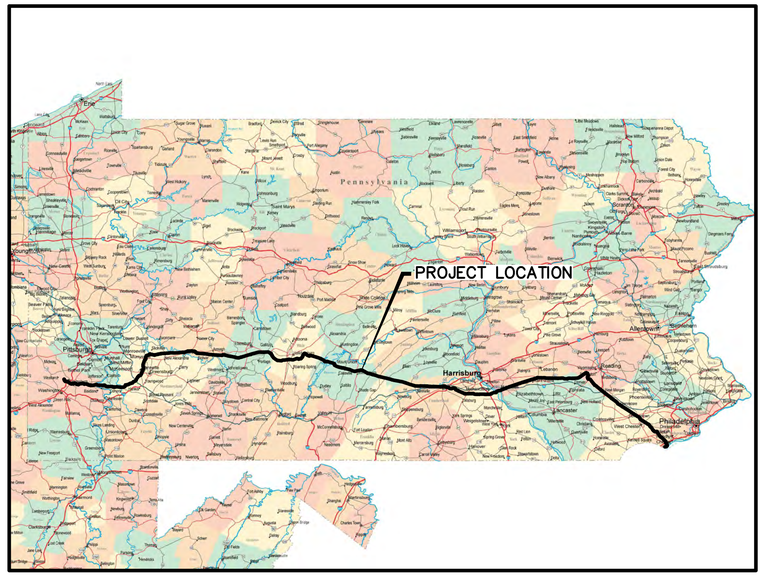
SINKING SPRING, PENNSYLVANIA



LOCATION MAP
PENNSYLVANIA PIPELINE PROJECT
HOUSTON, PENNSYLVANIA TO MARCUS HOOK, PENNSYLVANIA

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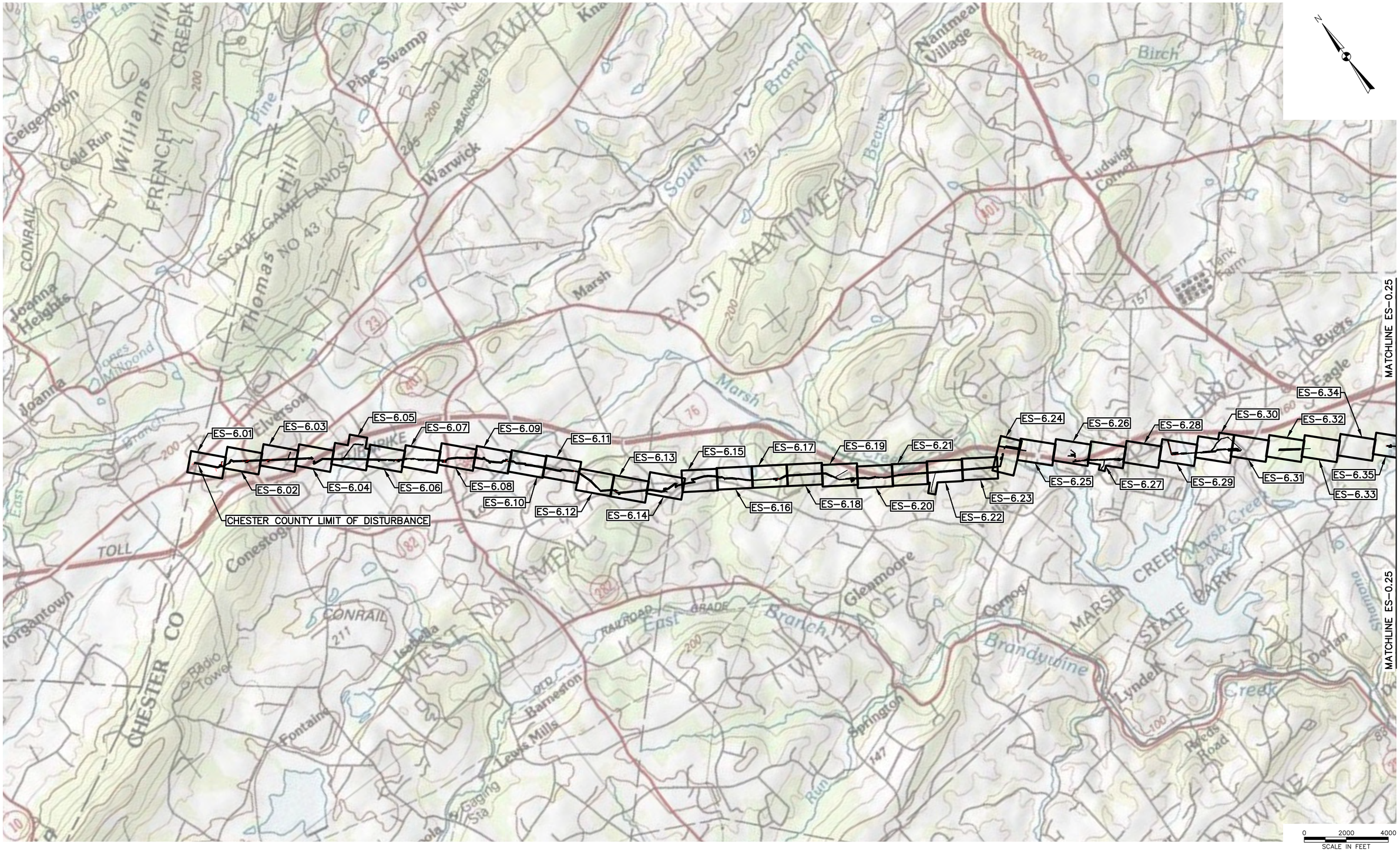

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REVISIONS

NO.	BY	DATE	REMARKS
1	RS	3/28/17	INCORPORATED THE SPECIAL CONDITIONS SET FORTH IN DEP'S CHAPTER 102 AND CHAPTER 105 PERMITS
2	RS	5/25/17	REDLINE REVISIONS

COMMONWEALTH OF PENNSYLVANIA — ROBERT F. SIMCIK — REGISTERED PROFESSIONAL ENGINEER

SUNOCO PIPELINE L.P.
SINKING SPRING, PENNSYLVANIA

PENNSYLVANIA PIPELINE PROJECT
CONSTRUCTION SPREAD 6

1–20" & 1–16" WELDED STEEL NATURAL GAS PIPELINES

CHESTER COUNTY CONSERVATION DISTRICT
EROSION & SEDIMENT CONTROL &
SITE RESTRORATION PLAN
KEY PLAN (SHEET 1 OF 2)

DATE:	2/6/17
PROJECT NO.:	112C05958
DESIGNED BY:	JB
DRAWN BY:	BH
CHECKED BY:	RS

ES–0.24
SHEET 0.24 OF 99

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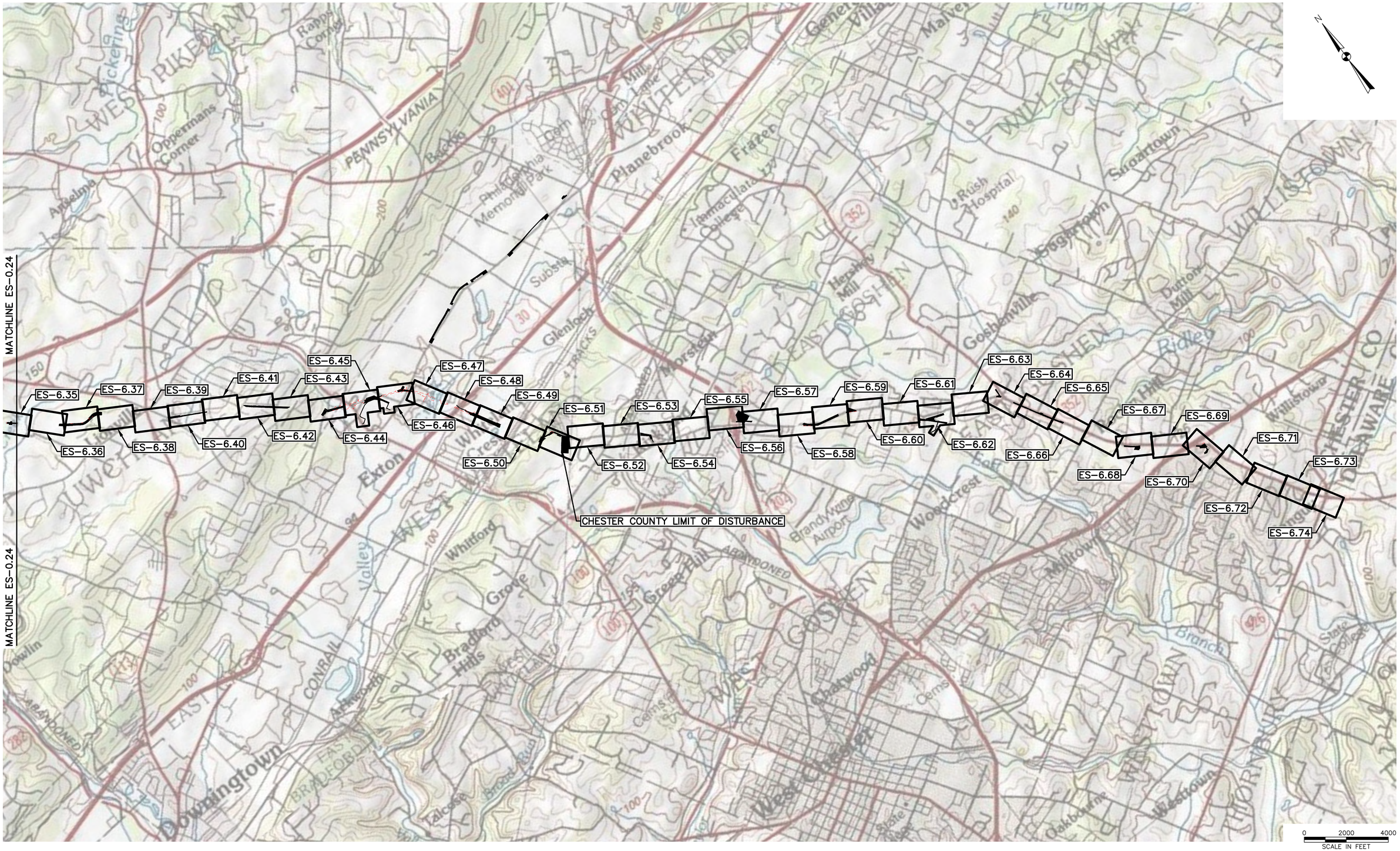

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REVISIONS

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1	RS	3/28/17	INCORPORATED THE SPECIAL CONDITIONS SET FORTH IN DEP'S CHAPTER 102 AND CHAPTER 105 PERMITS
2	RS	5/25/17	REDLINE REVISIONS

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SUNOCO PIPELINE L.P.
SINKING SPRING, PENNSYLVANIA

PENNSYLVANIA PIPELINE PROJECT
CONSTRUCTION SPREAD 6

1-20" & 1-16" WELDED STEEL NATURAL GAS PIPELINES

CHESTER COUNTY CONSERVATION DISTRICT
EROSION & SEDIMENT CONTROL &
SITE RESTRORATION PLAN
KEY PLAN (SHEET 2 OF 2)

DATE:	2/6/17
PROJECT NO.:	112C05958
DESIGNED BY:	JB
DRAWN BY:	BH
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ES-0.25
SHEET 0.25 OF 99

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MATCHLINE ES-6.43

MATCHLINE ES-6.45

VALLEYVIEW DRIVE

N POTTSTOWN PIKE

SHOEN ROAD

HOLLY LANE

ASPHALT DRIVE

WOODED AREA

WELL VEGETATED AREA

100-YEAR FEMA FLOODPLAIN (TYP.)

UNT TO VALLEY CREEK (CWF)

PAVED PARKING LOT

GAS

15076+00

15078+00

15080+00

15082+00

15084+00

15086+00

AREA TO BE BORED

LIMIT OF DISTURBANCE

EROSION CONTROL BLANKET (TYP.)

AASHTO #1 ROCK CONSTRUCTION ENTRANCE WITH WASH RACKS (TYP.)

RELOCATED AASHTO #1 ROCK CONSTRUCTION ENTRANCE WITH WASH RACKS (TYP.)

EARTH DISTURBANCE TO BE MINIMIZED TO THE AREA REQUIRED FOR CONSTRUCTION. TOPSOIL TO BE STRIPPED AND STOCKPILED WHERE EARTH DISTURBANCE IS REQUIRED.

HDD STAGING AREA (SEE TYPICAL LAYOUT ON SHEET ES-0.16)

COMPOST FILTER SOCK (TYP.)

TRENCH PLUGS (TYP.)

TEMPORARY TIMBER MAT

TEMPORARY EQUIPMENT CROSSING

ENTRY/EXIT FOR FORMER HDD S3-0370

WL-BB31B (PSS)

WL-BB31A (PEM)

WL-BB31B (PEM)

WL-BB31A (PSS)

S-C59

S-C62

S-C61

NOTES:

1. SEE ES-0.01 & ES-0.02 FOR GENERAL NOTES & LEGEND.
2. SEE ES-0.03 FOR STREAM & WETLAND CROSSING TABLES.
3. EROSION & SEDIMENT CONTROL BMP INSTALLATION TO BE ADJUSTED AS NEEDED TO ACCOMMODATE ACTUAL CONTOURS IDENTIFIED IN FIELD DURING VARIOUS PHASES OF THE PROJECT.

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REVISIONS

NO.	BY	DATE	REMARKS
1	RS	3/28/17	INCORPORATED THE SPECIAL CONDITIONS SET FORTH IN DEP'S CHAPTER 102 AND CHAPTER 105 PERMITS
2	RS	5/25/17	REDLINE REVISIONS
3	RS	8/18/17	INSTALLATION CHANGE HDD TO OPEN CUT

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER ROBERT F. SIMCIK

SUNOCO PIPELINE L.P.
SINKING SPRING, PENNSYLVANIA

PENNSYLVANIA PIPELINE PROJECT CONSTRUCTION SPREAD 6

1-20" & 1-16" WELDED STEEL NATURAL GAS PIPELINES

CHESTER COUNTY CONSERVATION DISTRICT EROSION & SEDIMENT CONTROL & SITE RESTORATION PLAN SHEET 44 OF 74

DATE:	2/6/17
PROJECT NO.:	112C05958
DESIGNED BY:	JB
DRAWN BY:	BH
CHECKED BY:	RS

ES-6.44

SHEET 6.44 OF 99

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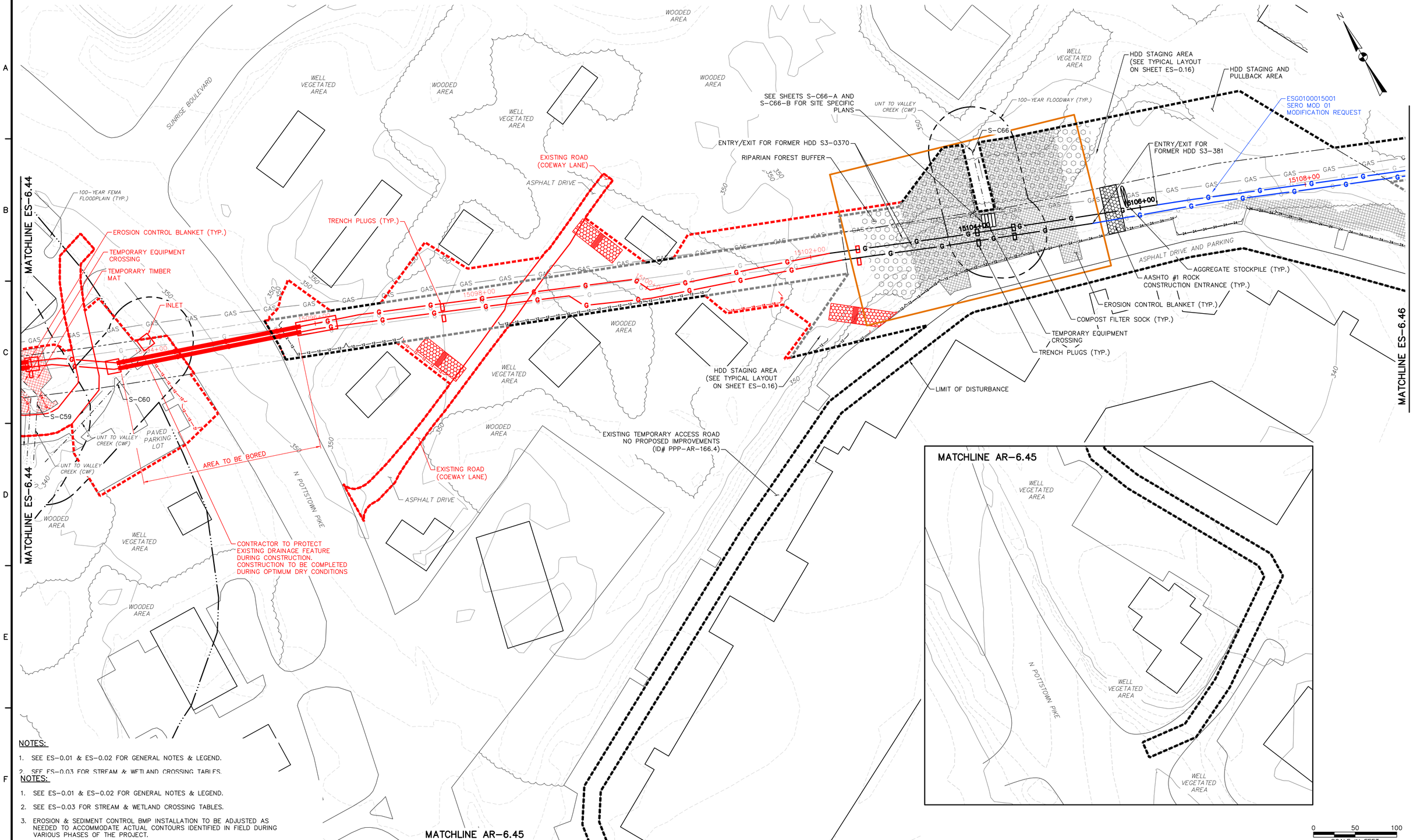

NOTES:

1. SEE ES-0.01 & ES-0.02 FOR GENERAL NOTES & LEGEND.
2. SEE ES-0.03 FOR STREAM & WETLAND CROSSING TABLES.
3. EROSION & SEDIMENT CONTROL BMP INSTALLATION TO BE ADJUSTED AS NEEDED TO ACCOMMODATE ACTUAL CONTOURS IDENTIFIED IN FIELD DURING VARIOUS PHASES OF THE PROJECT.

NOTES:

1. SEE ES-0.01 & ES-0.02 FOR GENERAL NOTES & LEGEND.
2. SEE ES-0.03 FOR STREAM & WETLAND CROSSING TABLES.
3. EROSION & SEDIMENT CONTROL BMP INSTALLATION TO BE ADJUSTED AS NEEDED TO ACCOMMODATE ACTUAL CONTOURS IDENTIFIED IN FIELD DURING VARIOUS PHASES OF THE PROJECT.

SCALE IN FEET: 0 50 100

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1	RS	3/28/17	INCORPORATED THE SPECIAL CONDITIONS SET FORTH IN DEP'S CHAPTER 102 AND CHAPTER 105 PERMITS
2	RS	5/25/17	REDLINE REVISIONS
3	RS	5/26/17	HDD TO OPEN CUT-MAJOR MODIFICATION I-STA 15106+00 TO STA 15159+00
4	RS	8/18/17	HDD TO OPEN CUT-MAJOR MODIFICATION II-STA 15084+00 TO STA 15102+00

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PENNSYLVANIA PIPELINE PROJECT CONSTRUCTION SPREAD 6

1-20" & 1-16" WELDED STEEL NATURAL GAS PIPELINES

CHESTER COUNTY CONSERVATION DISTRICT EROSION & SEDIMENT CONTROL & SITE RESTORATION PLAN SHEET 45 OF 74

DATE:	2/6/17
PROJECT NO.:	112C05958
DESIGNED BY:	JB
DRAWN BY:	BH
CHECKED BY:	RS

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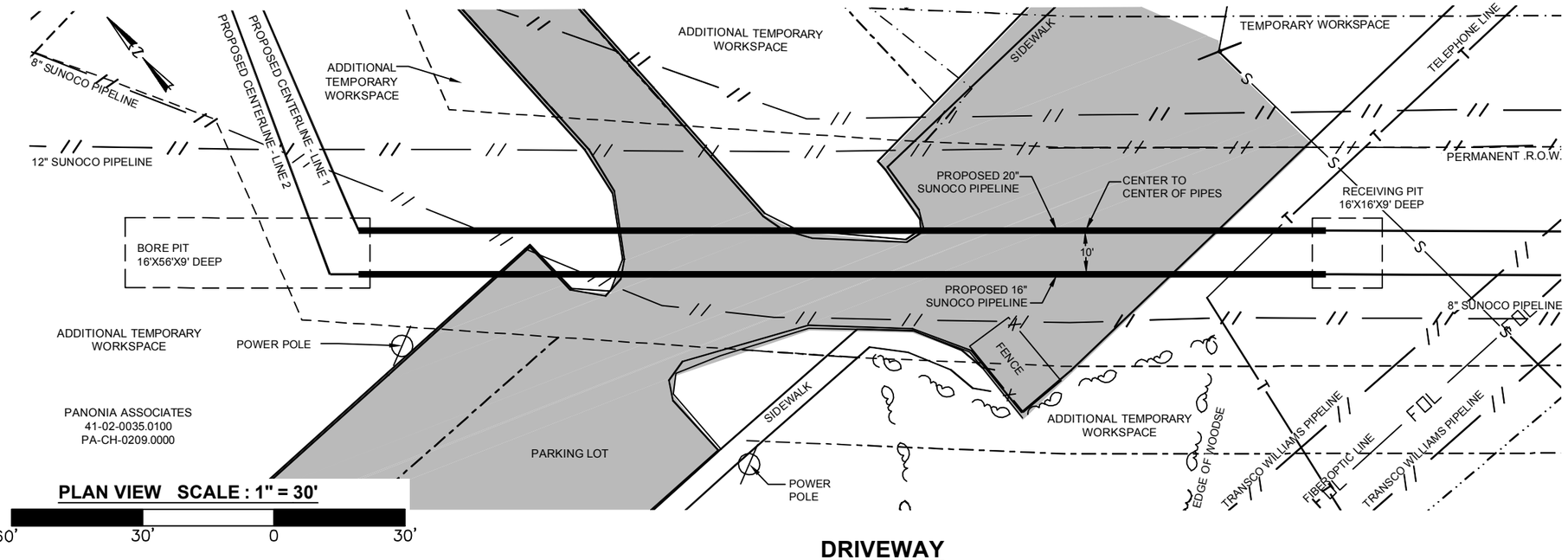
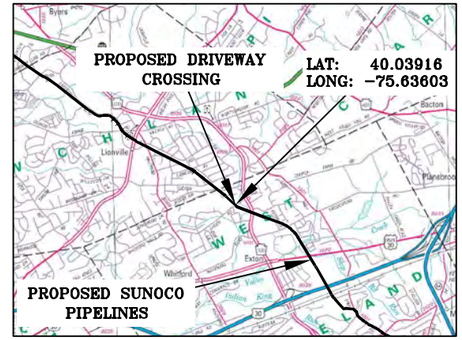
ATTACHMENT 3

HDD PLANS AND PROFILES

WEST WHITELAND TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA



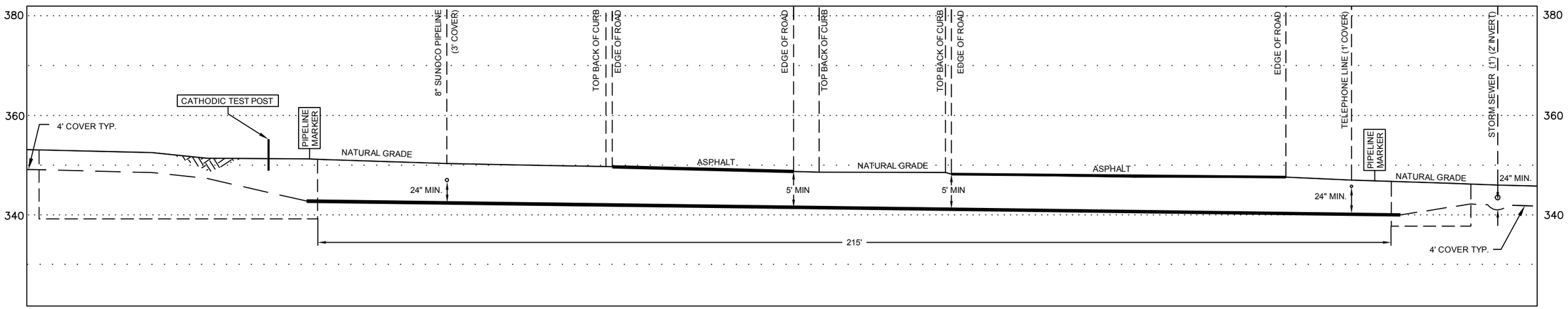


AERIAL VIEW SCALE: 1" = 2MI

DRAWING LEGEND

- PROPERTY LINE
- PERMANENT R.O.W.
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE
- ROAD R.O.W.
- OVERHEAD POWER LINE
- WATER LINE
- UNDERGROUND ELECTRIC
- FIBER OPTIC LINE
- TELEPHONE LINE
- EXISTING PIPELINE
- TREE LINE
- VALVE
- POWER POLE
- TREE

DRIVEWAY



ROAD NOTES
(APPLIES TO BOTH 16" & 20" PIPELINES)

1. 20" WELDED STEEL PIPE 20" OD x .456 WT., X-65, API 5L, PSL2, ERW, DRL
2. 16" WELDED STEEL PIPE 16" OD x .438 WT., X-70, API 5L, PSL2, ERW, BFW
3. COATING: 14-16 MILS OF 3M SCOTCHKOTE TM 6233 FBE WITH 40 MILS MIN. DFT POWERCRETE R95
4. DESIGN FACTOR: 0.50 (HOOP STRESS)
5. DESIGN PSI: 1480 PSIG TEST PSI: 1850
6. WELDING PROCESS(ES): ALL WELDING IS DONE IN ACCORDANCE TO PENNDOT AND APPROVED SUNOCO PROCEDURES.
7. THE COATING ON THE CARRIER PIPE SHALL BE INSPECTED IMMEDIATELY PRIOR TO ITS INSTALLATION AND ALL DAMAGED COATING SHALL BE REPAIRED IN ACCORDANCE WITH SUNOCO PIPELINE SPECIFICATIONS
8. PIPELINE CROSSING SHALL BE AS NEAR TO PERPENDICULAR TO THE ROADWAY CENTERLINE AS PRACTICAL
9. INSTALL CATHODIC PROTECTION TEST LEADS AS SPECIFIED ON THE ALIGNMENT SHEETS OR SUNOCO CORROSION TECHNICIAN
10. WELDED JOINTS INSIDE R.O.W. SHALL BE 100% X-RAYED

CONSTRUCTION NOTES

1. CONTRACTOR WILL MAINTAIN 4' OF COVER TO THE TOP OF PIPE OUTSIDE OF ROAD R.O.W. USING FIELD BENDS
2. CONTRACTOR SHALL USE THE "ONE CALL" SYSTEM PRIOR TO BEGINNING WORK. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE AND VERIFY ALL PARALLEL AND CROSSED UTILITIES PRIOR TO EXCAVATION OR CONSTRUCTION (AND MONITOR DURING EXCAVATION OR CONSTRUCTION). THIS DRAWING SHALL NOT CONSTITUTE VERIFICATION OF LOCATION, QUANTITY, SIZE, DEPTH, OR TYPES OF EXISTING UTILITIES.
3. EMERGENCY CONTACT INFORMATION: SEE INCLUDED COMPANY INFORMATION
4. UPON COMPLETION, UTILITY WILL BE REGISTERED WITH PENNSYLVANIA ONE-CALL SYSTEM
5. ALL WORK AND MATERIALS SHALL CONFORM WITH PENNDOT AND ALL FEDERAL REGULATIONS AND STANDARDS
6. PUBLICATION 213 PATA 5 & PATA 10A APPLIES
7. SUNOCO PIPELINE, L.P. WILL BE AVAILABLE 24/7 FOR EMERGENCY AT 800-786-7440 IF SUCH A PROBLEM SHOULD ARISE.
8. THIS PLAN IS FOR PERMITTING PURPOSES ONLY

PER PUBLICATION 16M; DESIGN MANUAL PART 5, CHAPTER 1.3.D FOR UNCASED PIPELINE:

1. CATHODIC PROTECTION TEST LEADS ARE INSTALLED AS SPECIFIED ON THE ALIGNMENT SHEETS PER SUNOCO'S CORROSION PROGRAM.
2. PLASTIC PIPE WILL NOT BE USED; ONLY WELDED STEEL.
3. DUCTILE IRON OR REINFORCED CONCRETE WILL NOT BE USED; ONLY WELDED STEEL.
4. THE WALL THICKNESS SHOWN ON THE DRAWINGS MEET OR EXCEED ALL APPLICABLE FEDERAL AND INDUSTRY STANDARDS.
5. THE OPERATING STRESS LEVELS INDICATED ON THE DRAWINGS ARE IN ACCORDANCE WITH THE FEDERAL PIPELINE SAFETY REGULATIONS.
6. IT IS ACKNOWLEDGED THAT IF IN THE FUTURE THE CROSSING NEEDS REPLACEMENT, THE REPLACEMENT LINE WILL BE BORED AT A NEW LOCATION.

PROFILE

HORIZ. SCALE : 1" = 20'
VERT. SCALE : 1" = 20'

40' 20' 0' 20'

COORDINATE SYSTEM

PENNSYLVANIA STATE PLANE SOUTH
NAD 83 US FEET

R.O.W. INGRESS
X=2560327.34
Y=264229.96

R.O.W. EGRESS
X=2560374.59
Y=264186.07

24/7 CONTACT INFO & PIPE MARKER INFO:

SUNOCO PIPELINE L.P.
525 FRITZTOWN ROAD
SINKING SPRING, PA 19608
PHONE NUMBER: 800-786-7440
NATURAL GAS PIPELINE

CENTERLINE REV DATE: 7-12-2017

* REVISED FOR HDD-0370 CONVERSION

SUNOCO
DRIVEWAY

WEST WHITELAND TOWNSHIP, CHESTER CO., PA

08/08/17	SCALE	
REVISED XX/XX/XX	AS NOTED	DWG #: PPP-PA-CH-0209.0000-BORE

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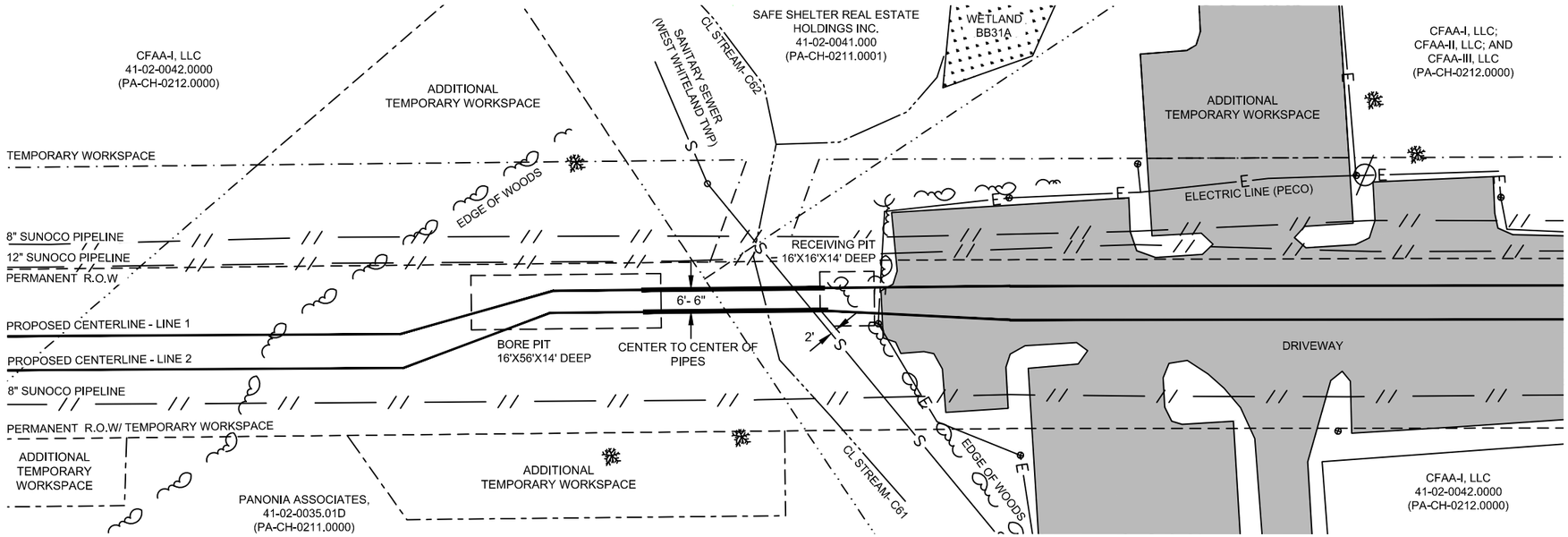
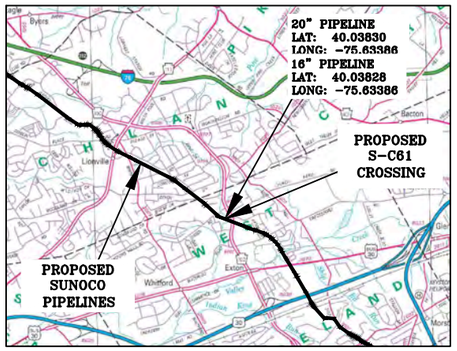
WEST WHITELAND TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA



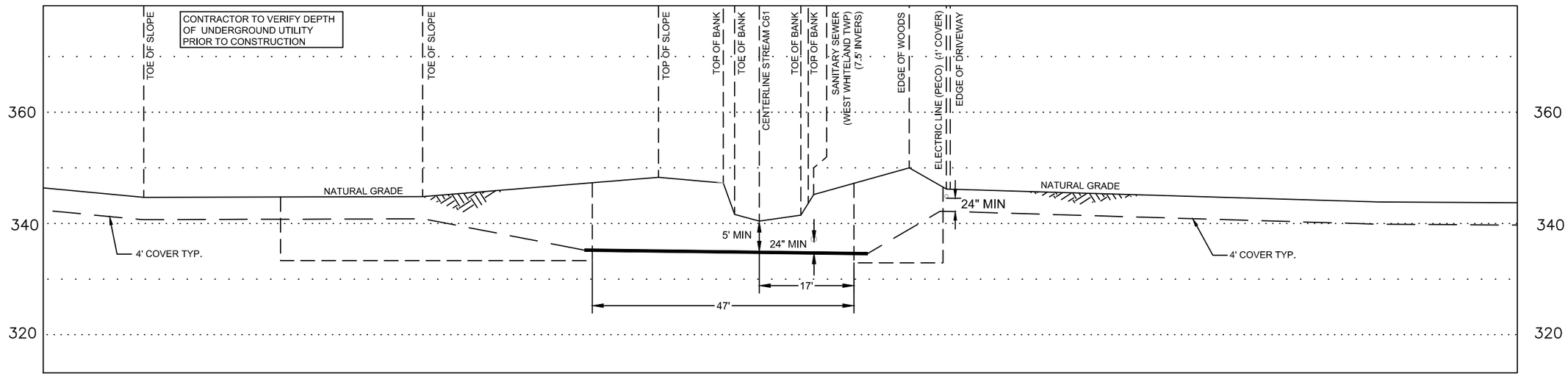


AERIAL VIEW
SCALE: 1" = 2MI

DRAWING LEGEND

- PROPERTY LINE
- PERMANENT R.O.W.
- TEMPORARY WORKSPACE
- OVERHEAD POWER LINE
- SEWER LINE
- PIPELINE
- ELECTRIC LINE
- ROAD R.O.W.
- ADDITIONAL TEMPORARY WORKSPACE
- POWER POLE
- LIGHT POLE

S-C61



ROAD NOTES

(APPLIES TO BOTH 16" & 20" PIPELINES)

1. 20" WELDED STEEL PIPE 20" OD x .456 WT., X-65, API 5L, PSL2, ERW, DRL
2. 16" WELDED STEEL PIPE 16" OD x .438 WT., X-70, API 5L, PSL2, ERW, BFW
3. COATING: 14-16 MILS OF 3M SCOTCHKOTE TM 6233 FBE WITH 40 MILS MIN. DFT POWERCRETE R95
4. DESIGN FACTOR: 0.50 (HOOP STRESS)
5. DESIGN PSI: 1480 PSIG TEST PSI: 1850
6. WELDING PROCESS(ES): ALL WELDING IS DONE IN ACCORDANCE TO PENNDOT AND APPROVED SUNOCO PROCEDURES.
7. THE COATING ON THE CARRIER PIPE SHALL BE INSPECTED IMMEDIATELY PRIOR TO ITS INSTALLATION AND ALL DAMAGED COATING SHALL BE REPAIRED IN ACCORDANCE WITH SUNOCO PIPELINE SPECIFICATIONS
8. PIPELINE CROSSING SHALL BE AS NEAR TO PERPENDICULAR TO THE ROADWAY CENTERLINE AS PRACTICAL
9. INSTALL CATHODIC PROTECTION TEST LEADS AS SPECIFIED ON THE ALIGNMENT SHEETS OR SUNOCO CORROSION TECHNICIAN
10. WELDED JOINTS INSIDE R.O.W. SHALL BE 100% X-RAYED

CONSTRUCTION NOTES

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PROFILE

HORIZ. SCALE : 1" = 20'
VERT. SCALE : 1" = 20'

40' 20' 0' 20'

COORDINATE SYSTEM

PENNSYLVANIA STATE
PLANE SOUTH
NAD 83 US FEET

R.O.W. INGRESS
X=2561423.57
Y=263728.48

R.O.W. EGRESS
X=2561572.16
Y=263671.56

24/7 CONTACT INFO & PIPE MARKER INFO:

SUNOCO PIPELINE L.P.
525 FRITZTOWN ROAD
SINKING SPRING, PA 19608
PHONE NUMBER: 800-786-7440
NATURAL GAS PIPELINE

CENTERLINE REV DATE: 07-12-2017

SUNOCO

S-C61

WEST WHITELAND TOWNSHIP, CHESTER CO., PA

06/11/15	SCALE	
REVISED 08/09/17	AS NOTED	DWG #: PPP-PA-CH-0212.0000-AR1

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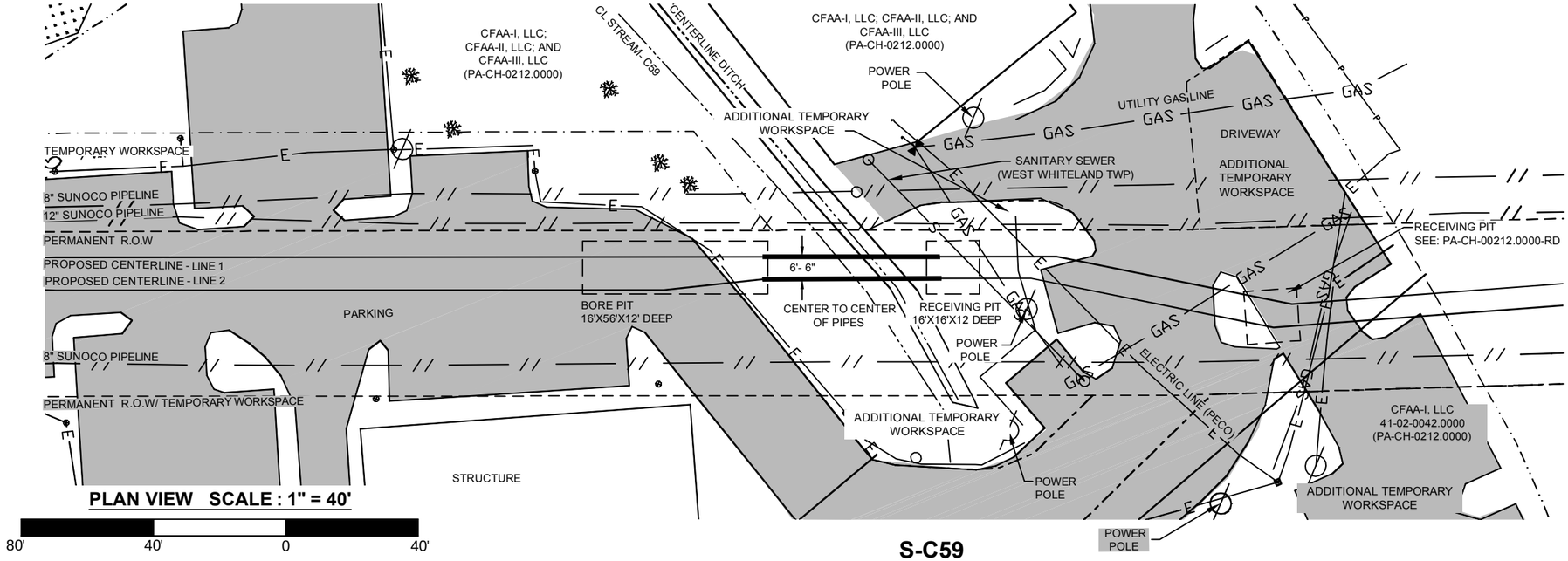
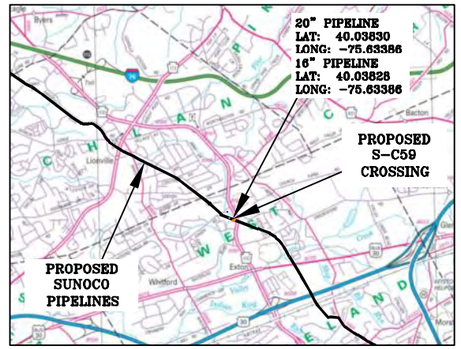
WEST WHITELAND TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA



PLAN VIEW SCALE : 1" = 40'

80' 40' 0 40'

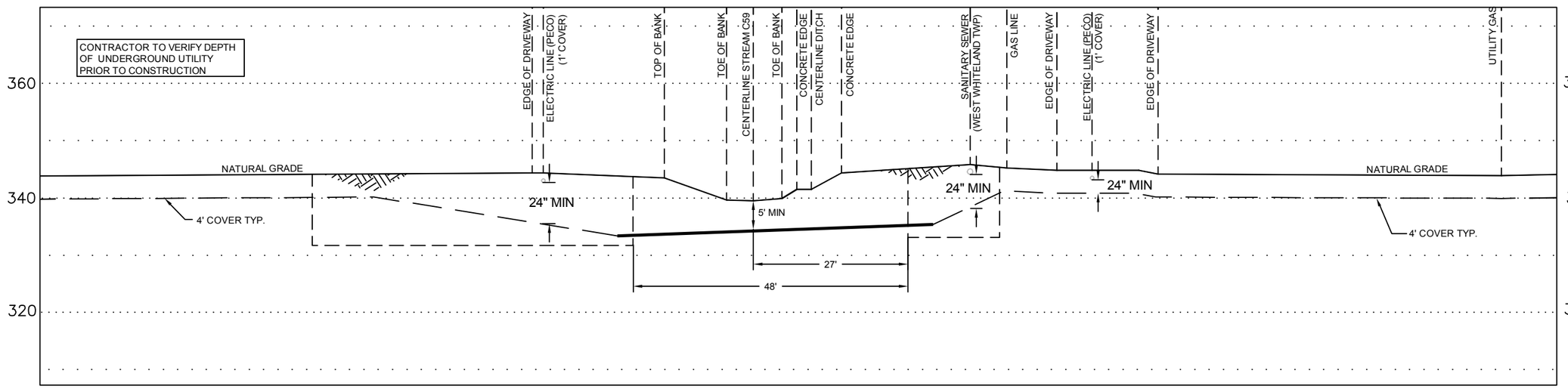


AERIAL VIEW
SCALE: 1" = 2MI

DRAWING LEGEND

- PROPERTY LINE
- PERMANENT R.O.W.
- TEMPORARY WORKSPACE
- GAS — GAS LINE
- S — SEWER LINE
- // — PIPELINE
- E — ELECTRIC LINE
- ROAD R.O.W.
- ADDITIONAL TEMPORARY WORKSPACE
- POWER POLE
- LIGHT POLE

S-C59



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(APPLIES TO BOTH 16" & 20" PIPELINES)

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PROFILE

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40' 20' 0' 20'

COORDINATE SYSTEM

PENNSYLVANIA STATE PLANE SOUTH NAD 83 US FEET

R.O.W. INGRESS
X=2561423.57
Y=263728.48

R.O.W. EGRESS
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SINKING SPRING, PA 19608
PHONE NUMBER: 800-786-7440
NATURAL GAS PIPELINE

CENTERLINE REV DATE: 08-04-2017

SUNOCO

S-C59

WEST WHITELAND TOWNSHIP, CHESTER CO., PA

06/11/15 REVISED 08/09/17	SCALE	
	AS NOTED	DWG #: PPP-PA-CH-0212.0000-AR2

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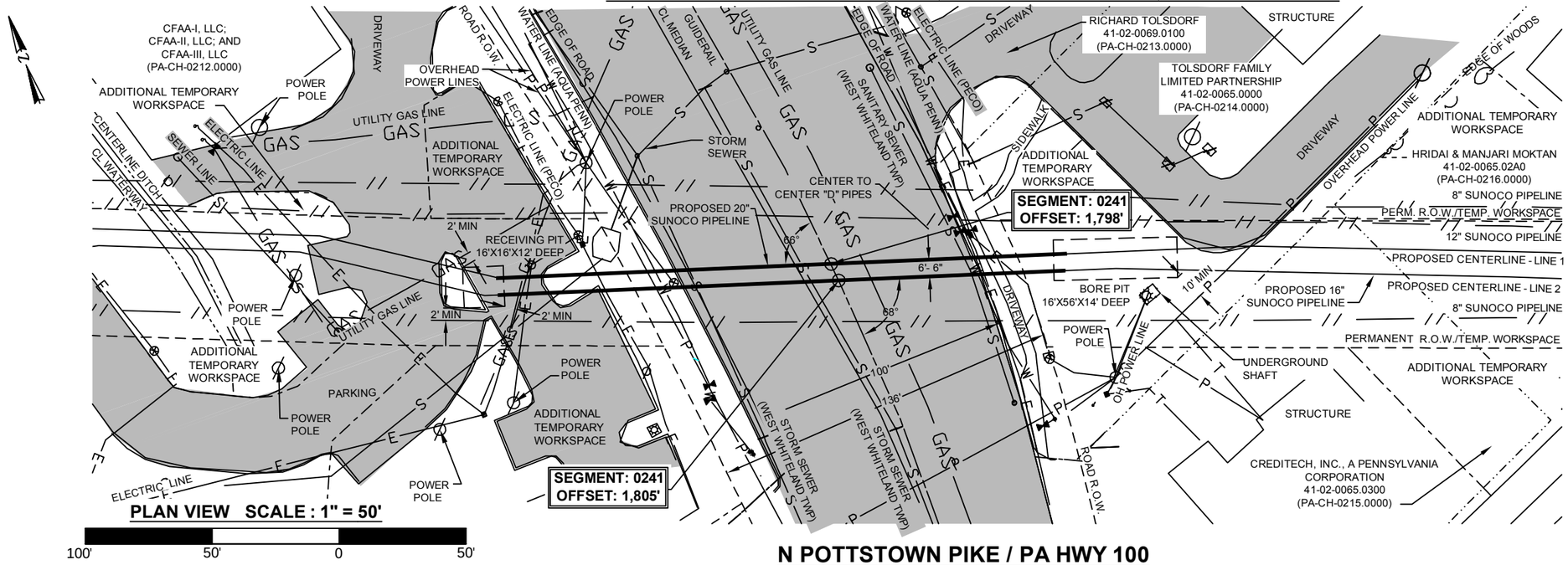
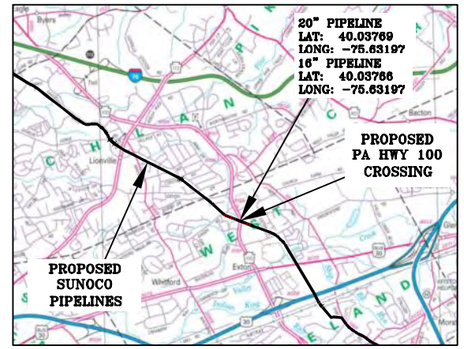
WEST WHITELAND TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA



PLAN VIEW SCALE : 1" = 50'

100' 50' 0 50'



AERIAL VIEW
SCALE: 1" = 2MI

DRAWING LEGEND

- PROPERTY LINE
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- P — OVERHEAD POWER LINE
- S — SEWER LINE
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- // — PIPELINE
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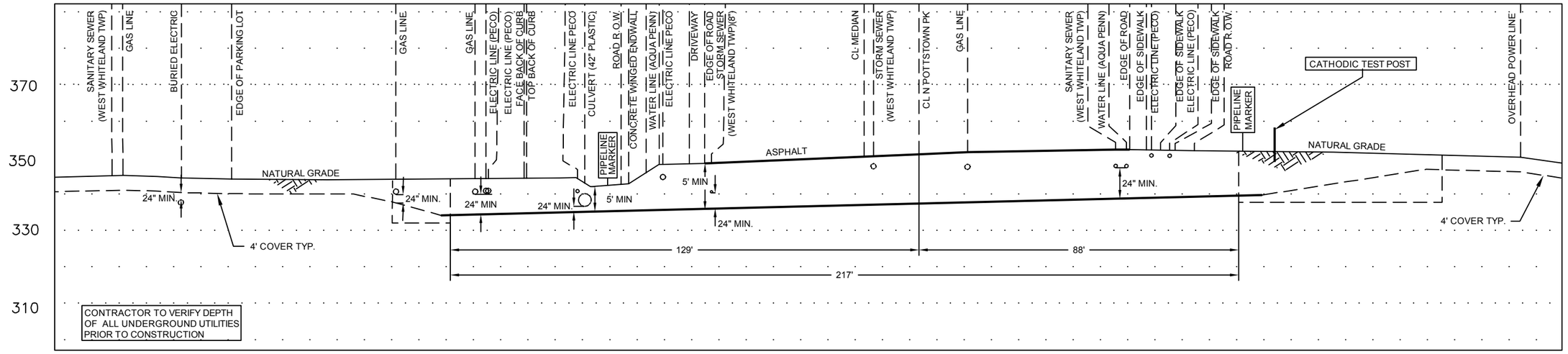
- ROAD R.O.W.
- POWER POLE / PEDESTAL / LIGHT POLE
- WATER WELL
- VALVE
- INLET
- FIRE HYDRANT

N POTTSTOWN PIKE / PA HWY 100



CONTRACTOR TO VERIFY DEPTH OF ALL UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION

ROAD NOTES

(APPLIES TO BOTH 16" & 20" PIPELINES)

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40' 20' 0' 20'

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NAD 83 US FEET

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* REVISED FOR HDD-0370 CONVERSION

SUNOCO

N POTTSTOWN PIKE / PA HWY 100

WEST WHITELAND TOWNSHIP, CHESTER CO., PA

06/11/15	SCALE	
REVISED 08/09/17	AS NOTED	DWG #: PPP-PA-CH-0212.0000-RD

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ATTACHMENT 4

DESIGN CALCULATIONS AND CONSTRUCTION DETAILS

Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	14334+50	14338+50	0.02	723	24
	14338+50	14345+50	0.04	101	12
	14346+60	14346+70	0.09	43	12
	14347+90	14348+10	0.12	67	12
	14348+10	14348+10	0.08	256	18
	14349+00	14349+10	0.05	159	12
	14350+65	14351+50	0.08	129	12
	14352+30	14352+90	0.05	244	12
	14352+90	14354+25	0.03	649	24
	14354+25	14356+50	0.04	474	18
	14357+30	14358+00	0.16	6	12
	14357+90	14360+70	0.18	219	12
	14358+40	14359+00	0.04	110	12
	14360+90	14361+25	0.06	165	12
*	14361+25	14363+50	0.08	145	12
*	14363+80	14369+26	0.12	87	12
	14369+26	14369+89	0.12	96	18
	14370+07	14371+75	0.17	108	18
	14372+40L	14373+85L	0.17	233	32
*	14372+43R	14374+00R	0.13	173	18
	14374+32	14375+48	0.09	101	12
*	14375+90	14377+35	0.06	128	12
	14378+00	14378+06	0.07	42	12
	14380+72	14380+82	0.05	141	12
	14381+15	14382+20	0.04	124	12
	ACCESS 1	14382+60	0.09	33	12
	ACCESS 2	14382+60	0.07	259	18
	ACCESS 3	14382+60	0.07	183	12
	14383+48	14383+56	0.06	82	12
	14384+71	14384+78	0.10	50	12
	14385+87	14386+60	0.07	100	12
	14387+33	14388+43	0.07	121	12
	14388+43	14390+78	0.08	107	12
	14390+78	14391+06	0.19	243	32
	14391+06	14391+70	0.05	126	12
*	14391+70	14392+60	0.04	71	12
	14392+79	14393+80	0.16	152	18
*	14396+65	14396+78	0.10	250	18

Notes:

1. Slopes >50% must have 32" DURASOXX independent of upslope length.
2. CFS installed with jayhook to be upsized one CFS size than slope/length requires.
   (Denoted with *)

Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
*	14397+04	14398+22	0.05	124	12
	14398+63	14399+80	0.08	191	18
*	14400+00	14401+65	0.05	132	12
	14401+65	14402+62	0.10	279	24
	14402+62	14406+37	0.08	326	24
	14406+64	14408+47	0.16	108	18
*	14408+69	14409+51	0.13	68	12
	ACCESS 1	14410+95	0.05	596	32
	ACCESS 2	14410+95	0.07	465	32
	14409+78	14411+64	0.08	109	12
*	14411+87	14413+12	0.05	111	12
	14413+47	14413+47	0.06	17	12
	14414+95	14414+95	0.06	67	12
	14415+69	14415+69	0.06	68	12
	14415+49	14416+30	0.05	244	12
*	14416+54	14420+38	0.08	93	12
	14420+59	14421+14	0.14	283	32
*	14421+14	14422+79	0.10	97	12
*	14423+06	14424+82	0.11	96	12
	14425+33	14425+60	0.17	103	18
	14425+88	14427+85	0.11	350	32
	14427+85	14429+32	0.14	93	12
	14429+55	14432+00	0.09	166	12
	14432+00L	14433+95L	0.03	61	12
	14432+00R	14434+00R	0.07	90	12
	14434+37	14436+17	0.06	209	12
*	14435+83	14438+70	0.06	392	24
	14439+05	14439+20	0.23	26	12
	14439+67	14439+80	0.24	26	12
	14440+55	14440+72	0.06	32	12
*	14445+75	14446+82	0.06	99	12
	14447+06	14448+69	0.08	268	18
	14449+32	14452+15	0.08	111	12
	14453+35	14454+00	0.05	93	12
	14454+86	14455+40	0.07	46	12
	14455+88	14456+05	0.09	106	12
	14457+11	14457+70	0.08	64	12
	14458+25	14458+30	0.09	34	12

Notes:

1. Slopes >50% must have 32" DURASOXX independent of upslope length.
2. CFS installed with jayhook to be upsized one CFS size than slope/length requires. (Denoted with *)

Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	14458+80R	14458+80R	0.06	160	12
	14458+90L	14460+35L	0.04	91	12
	14460+40	14461+80	0.06	109	12
*	14461+95	14463+73	0.07	139	12
*	14463+90	14465+48	0.07	172	12
*	14465+58	14467+72	0.04	623	24
	14467+72	14468+63	0.05	104	12
*	14469+81	14473+50	0.02	674	12
*	14473+75	14477+25	0.02	880	24
	14477+25	14478+97	0.03	150	12
	14479+00	14479+50	0.05	62	12
*	14479+75	14481+25	0.03	153	12
*	14481+25	14482+41	0.04	227	12
*	14482+67	14484+20	0.07	115	12
*	14484+20	14484+77	0.05	330	18
*	14484+90	14486+10	0.05	112	12
	14486+10	14486+39	0.05	409	24
	14486+39	14489+80	0.04	641	24
*	14491+08	14491+85	0.05	86	12
*	14492+00	14492+77	0.06	143	12
*	14493+77	14496+62	0.03	442	18
*	14496+72	14498+03	0.04	135	12
	14498+03	14498+70	0.03	609	24
	14498+70	14501+20	0.03	100	12
	14501+35	14502+15	0.04	130	12
	14503+60	14504+80	0.08	159	12
	14505+47	14506+35	0.10	114	12
	14506+75	14507+85	0.08	104	12
	14508+12	14509+83	0.05	411	24
	14509+83	14515+02	0.04	590	24
	14516+06	14516+55	0.09	130	12
	14516+85	14519+23	0.13	104	12
	14519+55	14519+95	0.21	55	12
	14520+35	14521+00	0.18	76	12
	14521+78L	14521+90L	0.10	80	12
	14521+73R	14521+95R	.13/.25	115/76	24
	14523+83	14523+83	0.08	283	24
	14524+17	14524+17	0.13	114	18

Notes:

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Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	14526+00	14526+00	0.11	64	12
	14526+17	14526+17	0.09	41	12
	14528+80	14528+80	0.16	80	12
	14530+00	14530+41	0.11	110	12
	14533+00	14533+97	0.07	119	12
	14534+43	14535+66	0.07	123	12
	14536+00	14536+65	0.06	256	18
	14536+69	14537+36	0.08	86	12
	14537+69	14538+30	0.09	105	12
	14540+25	14540+63	0.04	112	12
	14542+04	14542+69	0.06	127	12
	14543+00	14544+00	0.05	77	12
	14544+00	14544+72	0.08	66	12
	14544+72	14545+23	0.06	225	18
	14545+97	14546+71	0.08	64	12
	14546+71	14548+81	0.06	172	12
	14547+70	14547+70	0.05	19	12
	14548+81	14549+75	0.04	94	12
	14549+75	14554+00	0.04	396	24
	14554+80	14555+72	0.05	449	24
	14556+55	14556+83	0.06	403	24
	14557+24	14557+90	0.09	65	12
	14559+07	14559+85	0.10	93	12
	14559+94	14560+19	0.08	204	18
	14560+19	14561+07	0.08	164	12
	14561+07	14567+00	0.02	249	12
	14562+78	14564+25	0.04	117	12
	14567+07	14568+59	0.03	475	18
	14568+49	14568+73	0.07	84	12
	14568+60	14569+01	0.10	62	12
	14568+73	14570+11	0.05	428	24
	14569+03	14569+03	0.07	119	12
	14570+11	14570+67	0.07	132	12
	14571+19	14571+60	0.07	234	18
	14571+60	14575+26	0.06	268	18
	14575+26	14575+26	0.08	68	12
	14575+29	14575+29	0.05	56	12
	14575+69	14575+95	0.07	41	12

Notes:

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Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	14576+52	14576+98	0.03	94	12
	14577+39	14577+93	0.05	78	12
	14578+00	14583+19	0.01	158	12
	14583+50	14586+80	0.03	189	12
	14587+70	14588+25	0.06	85	12
	14588+80	14589+75	0.07	76	12
	14590+10	14591+52	0.08	106	12
	14592+60	14593+10	0.14	103	12
	14593+65	14594+35	0.18	78	12
	14595+15	14596+00	0.09	93	12
	14597+00	14597+54	0.04	50	12
	14597+85	14599+44	0.1	262	24
	14599+60	14600+20	0.04	99	12
	14600+60	14601+50	0.1	63	12
	14601+60	14602+00	0.08	52	12
	14602+85	14640+00	0.16	87	12
	14604+90	14605+85	0.06	484	32
	14605+90	14606+85	0.05	214	12
	14607+70	14608+00	0.04	522	24
	14608+00	14612+90	0.08	463	32
	14613+10	14614+70	0.08	99	12
	14615+10	14615+50	0.07	488	32
	14624+75	14624+75	0.2	30	12
	14627+41	14627+85	0.07	73	12
	14628+10	14628+42	0.07	89	12
	14628+60	14631+26	0.08	86	12
	14631+30	14631+85	0.07	95	12
	14632+25	14632+25	0.09	66	12
	14633+75	14634+17	0.12	50	12
	14635+45	14636+90	0.1	145	12
	14637+00	14638+50	0.1	235	18
	14639+23	14639+75	0.12	122	12
	14640+35	14640+70	0.13	90	12
	14641+60	14642+95	0.1	102	12
	14643+15	14644+16	0.07	92	12
	14644+20	14648+10	0.07	83	12
	14652+80	14653+40	0.2	81	18
	14654+75	14655+00	0.07	82	12

Notes:

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   (Denoted with *)

Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	14665+73	14665+73	0.07	57	12
	14660+20	14661+25	0.10	135	12
	14663+00	14664+11	0.25	112	24
	14664+30	14665+00	0.18	73	12
	14665+90	14666+20	0.13	32	12
	14677+00	14668+00	0.03	130	12
	14670+00	14670+70	0.07	171	12
	14670+75	14671+80	0.17	60	12
	14671+60	14672+75	0.12	69	12
	14672+90	14673+35	0.22	65	18
	14739+40 L	14739+40 L	0.11	55	12
	14739+40 R	14739+40 R	0.10	62	12
	14676+00	14677+15	0.02	88	12
	14678+18	14679+14	0.08	82	12
	14679+62	14681+24	0.04	107	12
	14682+50	14685+18	0.16	64	12
	14685+18	14686+27	0.16	90	12
	14686+44	14689+30	0.19	90	18
	14689+20	14691+27	0.28	99	24
	14690+44	14691+33	0.28	135	32
	14693+00	14694+81	0.32	87	24
	14964+83	1469555	0.29	83	18
	1495+60	14679+45	0.19	244	32
	14696+95	14697+42	0.11	73	12
	14697+46	14699+45	0.05	217	12
	14700+20	14700+20	0.09	47	12
	14703+55	14703+55	0.04	93	12
	14704+51	14705+95	0.10	82	12
	14706+00	14707+00	0.10	60	12
	14707+35	14707+35	0.11	38	12
	14709+60	14709+60	0.08	102	12
	14719+20	14719+60	0.07	55	12
	14720+07	14721+00	0.07	111	12
	14721+00	14723+09	0.08	334	24
	14723+09	14723+50	0.07	86	12
	14723+07	14725+38	0.17	119	18
	14725+59	14726+00	0.14	70	12
	14727+53	14728+80	0.07	61	12

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   (Denoted with *)

Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	14728+56	14729+31	0.20	80	18
	14729+53	14730+20	0.28	71	18
	14732+13	14732+38	0.11	55	12
	14733+31	14733+64	0.14	72	12
	14735+42	14734+42	0.12	33	12
	14734+15	14735+00	0.11	65	12
	14735+43	14736+23	0.12	118	12
	14737+08	14737+70	0.16	77	12
	14737+08	14737+08	0.24	42	12
	14743+16	14743+16	0.10	100	12
	14743+28	14743+28	0.12	96	12
	14743+91	14745+00	0.08	116	12
	14745+00	14745+48	0.11	53	12
	14745+76	14746+12	0.26	47	18
	14746+54	14749+22	0.12	155	18
	14749+55	14750+07	0.18	68	12
	14750+53	14750+83	0.20	51	12
	14751+24	14752+28	0.12	82	12
	14753+78	14753+78	0.17	109	18
	14777+50	14777+50	0.17	225	24
	14781+75	14781+95	0.33	49	12
	14783+65	14783+65	0.05	37	12
	14783+90	14783+90	0.06	49	12
	14784+05	14784+05	0.22	9	12
	14784+31	14784+92	0.08	63	12
	14785+00	14785+40	0.03	63	12
	14786+00	14787+00	0.18	228	32
	14787+10	14789+20	0.15	268	32
	14792+06	14793+00	0.09	127	12
	14793+86	14794+67	0.10	103	12
	14795+48	14796+37	0.13	95	12
	14796+80	14797+87	0.15	105	18
	14798+23	14798+48	0.15	66	12
	14799+23	14800+49	0.10	119	12
	14800+41	14801+28	0.05	264	18
	14801+16	14802+46	0.06	248	18
	14825+50	14826+82	0.07	188	12
	14830+13	14832+15	0.03	134	12

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Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	14839+70	14840+85	0.04	93	12
	14840+95	14840+95	0.04	106	12
	14842+54	14842+54	0.05	65	12
	14845+00	14848+33	0.11	223	18
	14848+48	14850+74	0.1	67	12
	14851+90	14851+90	0.24	86	18
	14853+00	14853+00	0.12	50	12
	14856+80	14855+30	0.08	169	12
	14856+00	14856+58	0.09	88	12
	14857+06	14858+00	0.09	137	12
	14877+20	14877+33	0.04	198	12
	14877+33	14877+70	0.06	64	12
	14878+75	14880+70	0.03	209	12
	14885+00	14886+24	0.05	420	24
	14928+59	14929+93	0.14	70	12
	14929+93	14929+63	0.08	163	12
	14930+00	14930+59	0.11	109	12
	14932+38	14933+51	0.05	96	12
	14953+52	14955+74	0.05	124	12
	14956+30 L	14959+00 L	0.07	59	12
	14956+30 R	14959+00 R	0.13	42	12
	14959+60 L	14964+00 L	0.05	19	12
	14959+75 R	14964+25 R	0.04	48	12
	14964+90	14968+25	0.09	84	12
	14968+90	14975+25	0.13	124	18
	15008+00	15012+50	0.03	230	12
	15012+85 R	15013+60 R	0.06	79	12
	15013+30 L	15013+30 L	0.07	78	12
	15014+25	15015+50	0.05	250	18
	15015+75	15020+85	0.05	201	12
	15021+00	15025+80	0.02	335	12
	15044+25	15045+30	0.05	105	12
	15046+75	151047+80	0.08	85	12
	15048+00	15051+00	0.04	428	18
	15051+00	15055+20	0.05	196	12
	15055+20	15058+00	0.03	235	12
	15058+00	15058+00	0.02	100	12
	15062+25	15062+80	0.12	68	12

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Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	15065+00	15065+80	0.09	181	18
	15083+00	15083+90	0.11	123	12
	15084+00	15087+24	0.06	154	12
*	15088+00 R	15089+00 R	0.04	244	12
	15089+00 L	15089+00 L	0.20	16	24
	15089+20	15089+75	0.13	22	24
	15091+70	15092+70	0.03	147	18
	15094+00	15094+50	0.05	150	12
	15095+65	15097+50	0.01	420	12
*	15098+20	15101+60	0.02	173	12
	15102+00	15104+50	0.27	32	12
	15103+90	15104+00	0.07	152	24
	15104+25	15104+35	0.07	160	24
	15104+50	15112+00	0.05	484	24
	15109+40 R	15110+70 R	0.02	59	12
*	15109+85	15110+70	0.02	281	12
*	15110+80 R	15111+90 R	0.02	164	12
*	15112+20 R	15116+30 R	0.02	324	12
*	15116+30 L	15117+50 L	0.02	128	12
	15118+00	15121+50	0.06	200	12
	15121+50	15121+70	0.10	40	12
	15121+70	15125+00	0.03	470	18
	15125+10	15126+40	0.02	150	12
*	15128+00	15129+50	0.03	200	12
*	15129+60	15132+60	0.04	317	12
	15131+00	15131+00	0.03	268	12
*	15132+75	15134+00	0.14	100	12
*	15134+20	15137+00	0.03	243	12
	15139+60	15143+80	0.02	730	24
	15147+35	15147+60	0.08	60	12
*	15148+20	15154+70	0.04	45	12
	15149+30	15149+50	0.03	550	18
	15118+85	15121+00	0.15	66	12
	15121+00	15121+15	0.05	57	12
	15155+00	15159+80	0.06	493	24
	15159+80	15163+00	0.07	330	24
	15163+00	15165+20	0.03	503	18
	Workspace L	Workspace L	0.15	59	12

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Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	Workspace R	Workspace R	0.10	109	12
	15194+00	15197+00	0.09	393	32
	15197+00	15199+10	0.12	361	32
	15199+50	105202+50	0.16	182	18
	15203+00 R	15203+00 R	0.06	33	12
	15203+00	15207+00	0.03	437	18
	15241+00	15242+80	0.09	367	32
	15242+80	15245+00	0.08	159	12
	15245+00	15245+50	0.05	81	12
	15245+70	15246+00	0.08	40	12
	15289+10 LLL	15290+60 LLL	0.07	408	24
	15288+00 LL	15292+25 LL	0.07	391	24
	15288+00 L	15292+25 L	0.05	553	32
	15292+50	15295+00	0.11	76	12
	15319+50 L	15326+50 L	0.19	37	12
	15319+50 R	15326+50 R	0.10	31	12
	15326+50 L	15337+00 L	0.20	31	12
	15326+50 R	15337+00 R	0.27	45	18
	15340+90	15346+10	0.05	607	32
	15377+00	15378+75	0.05	137	12
	15378+75	15380+70	0.07	218	18
	15380+00	15381+20	0.06	80	12
	15380+90	15388+10	0.10	59	12
	15381+20	15383+25	0.10	72	12
	15383+45	15383+95	0.09	260	18
	15383+85	15385+00	0.11	208	18
	15383+95	15385+25	0.24	60	18
	15385+20	15388+95	0.22	44	12
	Workspace	Workspace	0.05	420	24
	15415+20	15416+70	0.11	103	12
	15417+00	15417+00	0.08	170	12
	15424+00	15430+90	0.17	40	12
	15430+90 SW	15432+80 SW	0.10	51	12
	15430+90NE	15433+45 NE	0.14	29	12
	15433+50	15438+15	.09/0.03	145/99	18
	15438+00	15439+10	0.11	19	12
	15438+15	15440+90	0.08	94	12
	15440+45	15440+55	0.06	112	12

Notes:

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Worksheet #1
Compost Filter Sock Table
Chester County

	Compost Filter Sock Table				
	Begin Sta.	**End Sta.**	**Upstream Slope, (ft/ft)**	**Slope Length Above Measure, ft**	**Compost Filter Sock Size, in**
	15441+15	15442+00	0.08	106	12
	15443+00NE	15446+00NE	0.11	53	12
	15443+00SW	15447+00SW	0.12	57	12
	15446+20	15449+90	0.04	150	12
	15487+00	15487+75	0.04	576	24
	15515+25	15520+00	0.14	64	12
	15521+85	15521+95	0.07	30	12
	15521+86	15521+97	0.30	121	32
	15521+97	15522+50	0.22	105	12

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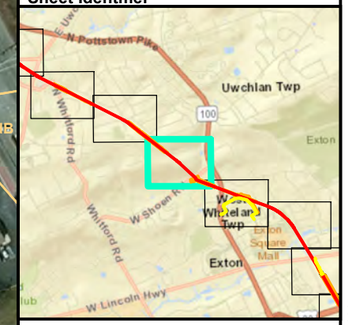
ATTACHMENT 5

LIMITING SOIL CHARACTERISTICS TABLE, SOIL AND GEOLOGICAL MAPS

Legend

- Stationing
- Access Road
- Alignment Centerline
- Major Modification
- Limit of Disturbance
- Block Valve/Station
- NRCS Soils and Codes

Sheet Identifier



N

0 100 200 Feet

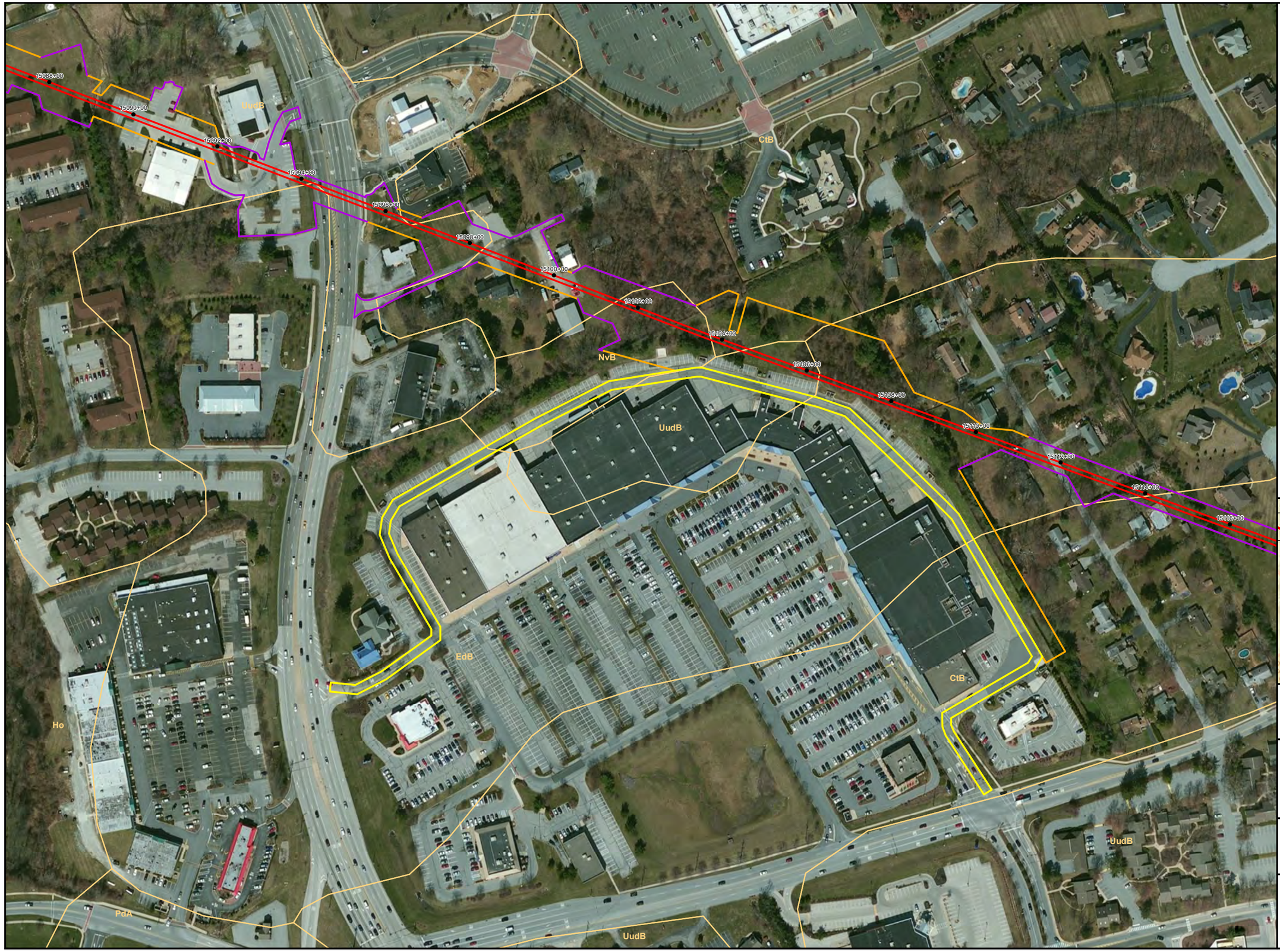
0 30.48 60.96 Meters

NRCS SOILS MAP
ATTATCHMENT 5-25
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12. 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2011 ESRI and its data suppliers).

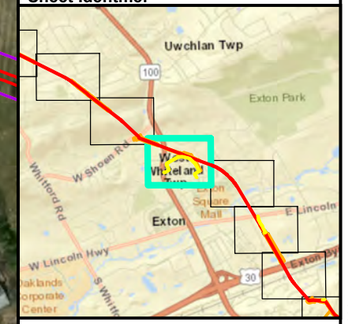
P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ESC\GPP\PENNPIPELINE_SOUTHEAST_SOILS_ESCGP.MXD 10/06/17 JN



Legend

- Stationing
- Access Road
- Alignment Centerline
- Major Modification
- Limit of Disturbance
- Block Valve/Station
- NRCS Soils and Codes

Sheet Identifier



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0 100 200 Feet

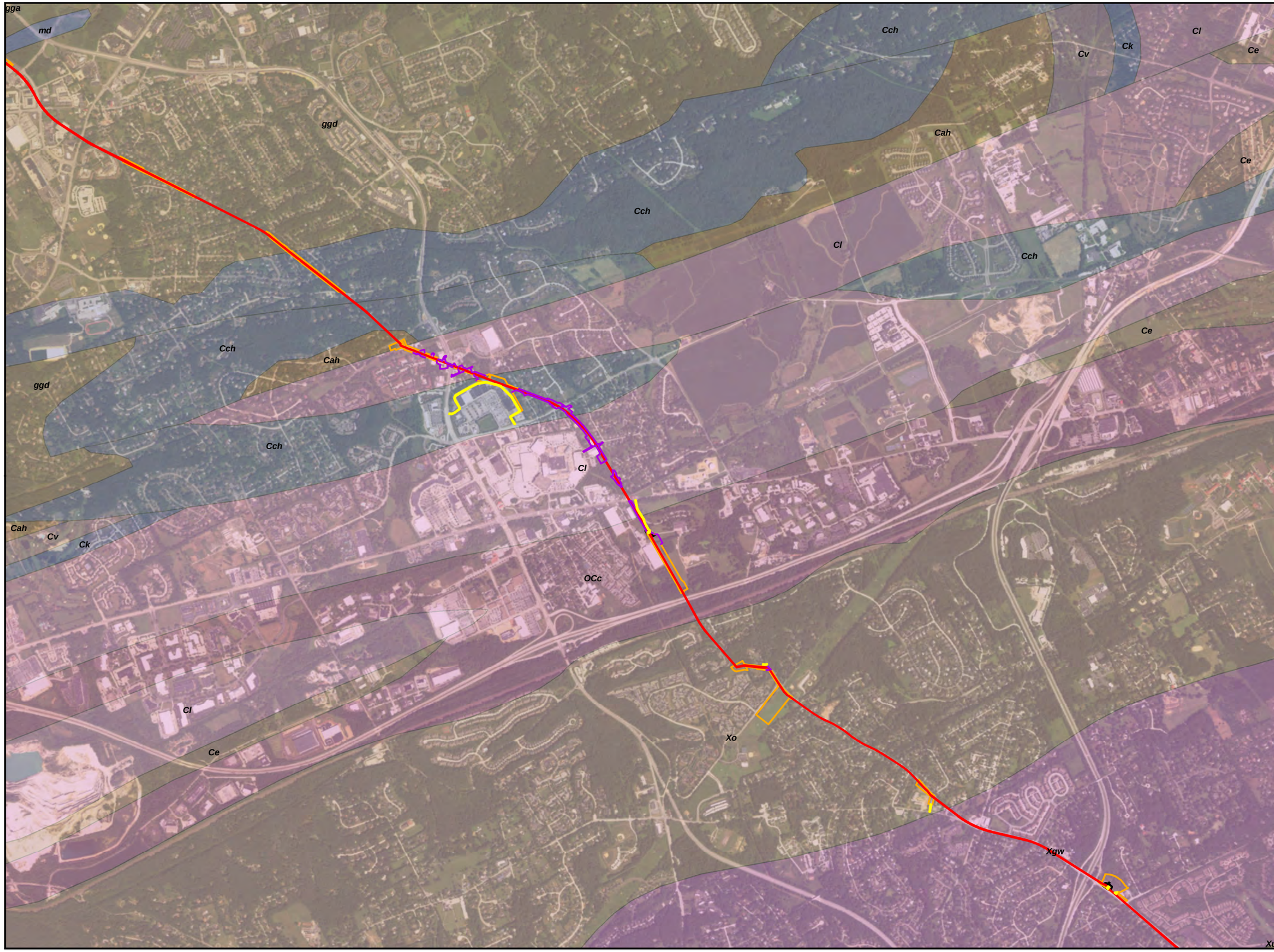
0 30.48 60.96 Meters

NRCS SOILS MAP
ATTATCHMENT 5-26
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12. 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2011 ESRI and its data suppliers).

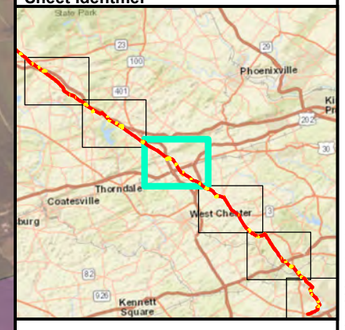
PGH P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ESC\GPP\PENNPIPELINE_SOUTHEAST_SOILS_ESCGP.MXD 10/09/17 JN



Legend

- Access Road
- Major Modification
- Alignment Centerline
- Limit of Disturbance
- Block Valve/Station
- Antietam and Harpers Formations undivided (Cah)
- Chickies Formation (Cch)
- Elbrook Formation (Ce)
- Kinzers Formation (Ck)
- Ledger Formation (Cl)
- Vintage Formation (Cv)
- Conestoga Formation (OCc)
- Glenarm Wissahickon Formation (Xgw)
- Octoraro Formation (Xo)
- Ultramafic rocks (Xu)
- Banded mafic gneiss (gga)
- Felsic and intermediate gneiss (ggd)
- Metadiabase (md)

Sheet Identifier



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Feet
0 1,000 2,000

Meters
0 300 600

GEOLOGIC UNIT MAP
ATTACHMENT 5-3
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12, 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY,
PENNSYLVANIA

TETRA TECH

Notes:
Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2013 ESRI and its data suppliers).

PGH P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ESC\PPPENNPIPELINE_SOUTHEAST_GEOLOGY_ESCGP.MXD 10/06/17 JN

4.

ACT 14 NOTIFICATIONS AND RECEIPTS

TETRA TECH

PITT-10-17-009

October 12, 2017

Project Number 112IC05958

Chester County Commissioners
313 West Market Street, Suite 6202
West Chester, Pennsylvania 19380

Reference: Sunoco Pipeline L.P. (SPLP)
Pennsylvania Pipeline Project –Major Permit Modification 2
E&S Permit No. ESG 01 000 15 001
HDD-370 Installation Method Modification

Dear Commissioners:

This municipal notice, submitted pursuant to the requirements of Acts 14, 67, 68, and 127, is to inform you that our client, Sunoco Pipeline, L.P. (SPLP), is applying to modify their above-referenced Erosion and Sediment Control General Permit (ESCGP-2) for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing or Treatment Operations or Transmission Facilities. Notification of this project was previously sent to you on August 26, 2015. This letter notifies you that SPLP is requesting that its ESCGP-2 Permit be modified. The modification requested is a change in the methodology to install the pipeline at this location from a single horizontal directional drill (HDD) to a combination of open trenching and conventional auger bores. The change in methodology will address the concerns of a local public water supplier, who maintains a groundwater production well along Shoen Road.

Project Name: Pennsylvania Pipeline Project

Applicant Name: Sunoco Pipeline L.P.
525 Fritztown Road
Sinking Spring, PA 19608

Description of Modification:

This permit modification is a change in installation methodology for the portion of the project in Chester County from a single long horizontal directional drill (HDD) to open trenching with some shorter auger bores. The approximate construction stations which are affected by this modification are STA 15084+00 to STA 15102+00. The proposed changes include an open trench pipeline installation with four conventional auger bore sections. Conventional auger bores will be added at: Stations 15083+50 to15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Pottstown Pike/PA HWY 100). Through the utilization of these two installation methods, SPLP is able to avoid impacts to the Shoen Road well and maintain its avoidance of impacts to resources and sensitive areas.

Site Location: The portion of this project being modified is located in West Whiteland Township in Chester County.

Tetra Tech, Inc.
661 Andersen Drive, Pittsburgh, PA 15220
Tel 412-921-7090 Fax 412-921-4040 tetratech.com

Enclosed is a copy of the Notice of Intent (NOI) for the proposed modification to the ESCGP-2 permit and figures of the revised pipeline route and impacted areas. Please submit any comments concerning this proposed permit modification within 30 days from date of receipt of this letter to:

Pennsylvania Department of Environmental Protection (PA DEP)
c/o Mr. Domenic Rocco
2 East Main Street
Norristown, PA 19401
Phone: (484) 250-5900

Should you have questions regarding this correspondence, please do not hesitate to contact me at 412.921.8163 or via e-mail at Robert.Simcik@tetratech.com.

Sincerely,

Robert F. Simcik, P.E.
E&S Task Manager

RFS/clm

Enclosure: Site Location Maps; Notice of Intent; E&S/SR Plan Sheets

cc: File 112IC05958

TETRA TECH

PITT-10-17-008

October 12, 2017

Project Number 112IC05958

Ms. Mimi Gleason
Township Manager
West Whiteland Township
101 Commerce Drive
Exton, Pennsylvania 19341

Reference: Sunoco Pipeline, L.P. (SPLP)
Pennsylvania Pipeline Project – Major Permit Modification 2
E&S Permit No. ESG 01 000 15 001
HDD-370 Installation Method Modification

Dear Ms. Gleason:

This municipal notice, submitted pursuant to the requirements of Acts 14, 67, 68, and 127, is to inform you that our client, Sunoco Pipeline, L.P. (SPLP), is applying to modify their above-referenced Erosion and Sediment Control General Permit (ESCGP-2) for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing or Treatment Operations or Transmission Facilities. Notification of this project was previously sent to you on August 26, 2015. This letter notifies you that SPLP is requesting that its ESCGP-2 Permit be modified. The modification requested is a change in the methodology to install the pipeline at this location from a single horizontal directional drill (HDD) to a combination of open trenching and conventional auger bores. The change in methodology will address the concerns of a local public water supplier, who maintains a groundwater production well along Shoen Road.

Project Name: Pennsylvania Pipeline Project

Applicant Name: Sunoco Pipeline L.P.
525 Fritztown Road
Sinking Spring, PA 19608

Description of Modification:
This permit modification is a change in installation methodology for the portion of the project in Chester County from a single long horizontal directional drill (HDD) to open trenching with some shorter auger bores. The approximate construction stations which are affected by this modification are STA 15084+00 to STA 15102+00. The proposed changes include an open trench pipeline installation with four conventional auger bore sections. Conventional auger bores will be added at: Stations 15083+50 to15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Pottstown Pike/PA HWY 100). Through the utilization of these two installation methods, SPLP is able to avoid impacts to the Shoen Road well and maintain its avoidance of impacts to resources and sensitive areas.

Site Location: The portion of this project being modified is located in West Whiteland Township in Chester County.

Tetra Tech, Inc.
661 Andersen Drive, Pittsburgh, PA 15220
Tel 412-921-7090 Fax 412-921-4040 tetratech.com

Enclosed is a copy of the Notice of Intent (NOI) for the proposed modification to the ESCGP-2 permit and figures of the revised pipeline route and impacted areas. Please submit any comments concerning this proposed permit modification within 30 days from date of receipt of this letter to:

Pennsylvania Department of Environmental Protection (PA DEP)
c/o Mr. Domenic Rocco
2 East Main Street
Norristown, PA 19401
Phone: (484) 250-5900

Should you have questions regarding this correspondence, please do not hesitate to contact me at 412.921.8163 or via e-mail at Robert.Simcik@tetratech.com.

Sincerely,

Robert F. Simcik, P.E.
E&S Task Manager

RFS/clm

Enclosure: Site Location Maps; Notice of Intent; E&S/SR Plan Sheets

cc: File 112IC05958
Ted Otteni- West Whiteland Public Works Director

October 13,2017

Dear Customer:

The following is the proof-of-delivery for tracking number **770486862642**.

Delivery Information:

Status:	Delivered	**Delivered to:**	Receptionist/Front Desk
Signed for by:	K.REICHMAN	**Delivery location:**	313 WEST MARKET STREET WEST CHESTER, PA 19380
Service type:	FedEx Priority Overnight	**Delivery date:**	Oct 13, 2017 10:19
Special Handling:	Deliver Weekday Adult Signature Required		

Shipping Information:

Tracking number:	770486862642	**Ship date:**	Oct 12, 2017
		Weight:	0.5 lbs/0.2 kg

Recipient:
Commissioners
Chester County
313 West Market Street
Suite 6202
WEST CHESTER, PA 19380 US

Shipper:
ADMIN OFFICE
Tetra Tech, Inc.
Foster Plaza Building 7
661 Andersen Drive
Pittsburgh, PA 15220 US

Reference
212IC-BF-00037.500

Purchase order number:
Simcik/Morris

Thank you for choosing FedEx.

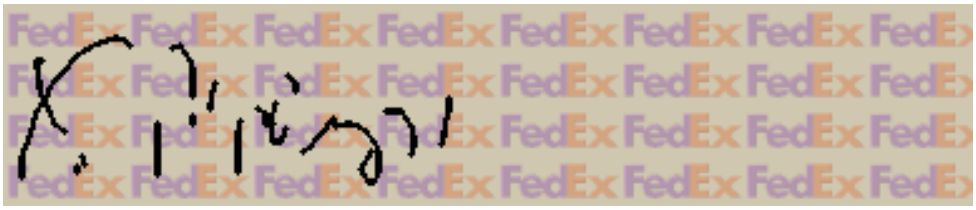
October 13,2017

Dear Customer:

The following is the proof-of-delivery for tracking number **770486876914**.

Delivery Information:

Status:	Delivered	**Delivered to:**	Receptionist/Front Desk
Signed for by:	P.POPOLUSIO	**Delivery location:**	101 COMMERCE DR EXTON, PA 19341
Service type:	FedEx Priority Overnight	**Delivery date:**	Oct 13, 2017 09:06
Special Handling:	Deliver Weekday Adult Signature Required		



Shipping Information:

Tracking number:	770486876914	**Ship date:**	Oct 12, 2017
		Weight:	0.5 lbs/0.2 kg

Recipient:
Ms. Mimi Gleason
West Whiteland Township
101 Commerce Drive
EXTON, PA 19341 US

Shipper:
ADMIN OFFICE
Tetra Tech, Inc.
Foster Plaza Building 7
661 Andersen Drive
Pittsburgh, PA 15220 US

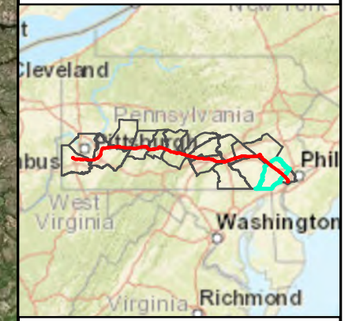
Reference
212IC-BF-00037.500
Purchase order number:
Simcik/Morris

Thank you for choosing FedEx.

Legend

- Limit of Disturbance (Major Modification)
- Limit of Disturbance (Previously Permitted)
- Alignment Centerline (Previously Permitted)
- County Boundary
- Township Boundary

Sheet Identifier



N

0 2.5 5 Miles

0 4.025 8.05 Kilometers

PROJECT LOCATION MAP
FIGURE 2-16
PENNSYLVANIA PIPELINE PROJECT
MAY 26, 2017 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2015 ESRI and its data suppliers).

PGH P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ACT14\PENNPIPELINE_MAJORMOD_ACT14_COUNTIES.MXD 10/06/17 SP

Legend

- Limit of Disturbance (Major Modification)
- Limit of Disturbance (Previously Permitted)
- Alignment Centerline (Previously Permitted)
- County Boundary
- Township Boundary

Sheet Identifier

N

Feet
0 3,500 7,000

Meters
0 1,066.8 2,133.6

PROJECT LOCATION MAP
WEST WHITELAND TOWNSHIP
FIGURE 3 -74
PENNSYLVANIA PIPELINE PROJECT
MAY 26, 2017 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2015 ESRI and its data suppliers).

PGH P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ACT14\PENNPIPELINE_MAJORMOD_ACT14_MUNICIPALITIES.MXD 10/06/17 SP

5.

ACT 167 VERIFICATION REPORT

ACT 167 STORMWATER CONSISTENCY VERIFICATION REPORT FOR CHESTER COUNTY

1.0 INTRODUCTION

Tetra Tech, Inc. (Tt) has prepared this Act 167 Stormwater Consistency Verification Report. The report verifies consistency between the provisions of the Chester Countywide Act 167 Stormwater Management Plan and the Pennsylvania Pipeline Project. The pipeline will traverse through ten townships in Chester County: East Goshen, East Nantmeal, East Whiteland, Elverson, Upper Uwchlan, Uwchlan, Wallace, West Goshen, West Nantmeal, West Whiteland, and Westtown Townships. The County of Chester developed the Countywide Act 167 Stormwater Management Plan, which was adopted in July 2013. Elverson, West Nantmeal, Wallace, East Nantmeal, Upper Uwchlan, Uwchlan, West Whiteland, East Whiteland, East Goshen, West Goshen, and Westtown Townships have all adopted the Chester Countywide Act 167 Stormwater Management Plan. Parts of Elverson and West Nantmeal Townships lie within the Conestoga Creek Watershed Act 167 Plan area, and parts of West Whiteland, West Goshen, East Goshen, and Westtown Townships lie within the Chester Creek Watershed Act 167 Plan area. The Chester Countywide Act 167 Stormwater Management Plan supersedes and replaces the individual Watershed Act 167 Plans; however, certain provisions of those watershed plans still apply.

2.0 PROJECT DESCRIPTION

Sunoco Pipeline, L.P. (SPLP) proposes to construct and operate the Pennsylvania Pipeline Project that would expand existing pipeline systems to provide natural gas liquid (NGL). The project involves the installation of approximately two parallel pipelines within a 306.8-mile, 50-foot-wide right-of-way (ROW) from Houston, Washington County, Pennsylvania (PA) to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306.8 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255.8 miles. The majority of the new ROW will be co-located adjacent to existing utility corridors, including approximately 230 miles of pipeline that will be co-located in the existing SPLP Mariner East pipeline system. The 20-inch pipeline will be installed first, followed by the 16-inch line. Any temporary stabilization required will be implemented in accordance with this Erosion and Sediment (E&S) Plan. Both pipelines will be installed within the same limit of disturbance (LOD) and in the same construction period. Construction activities will involve the installation of vegetated block valve facilities and associated access roads tree removal, clearing and grubbing within the right of way, trenching, pipe installation, and site restoration. The total LOD will be 181 acres in Chester County.

The SERO Major Modification I is a change in installation methodology for a portion of the project located in West Whiteland Township, Chester County. The change in installation method will be from a long horizontal directional drill (HDD) to an open cut with three short conventional auger bores and one shorter HDD. This modification will result in the addition of 7.5 acres of limit of disturbance (LOD) within Sunoco's existing ROW. The modification will occur from construction stations STA 15105+00 to STA 15159+00. A shorter HDD will be installed under stream S-B79 and Lincoln Highway from construction stations STA 15144+00 to 15153+00. Conventional bores will be installed from Stations: 15111+00 to15112+50 (Exton Lane), 15114+00 to 15116+00 (utilities avoidance), 15221+00 to 15122+50 (Swedesford Road), and 15135+00 to 15141+00 (CR sensitive area by stream S-B81 and wetland WL-B71).

The SERO Major Modification II was a change in installation methodology for the portion of the project in Chester County from a single long horizontal directional drill (HDD) to an open cut with some shorter auger bores. 1.8 acres of additional limit of disturbance (LOD). The approximate construction stations which are affected by this modification are STA 15084+00 to STA 15102+00. The proposed changes include an open trench pipeline installation with four conventional bore sections. Conventional bores will be added at:

Stations 15083+50 to15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Pottstown Pike/PA HWY 100). Through the utilization of these two installation methods, SPLP is able to avoid impacts to the Shoen Drive well and maintain its avoidance of impacts to resources and sensitive areas.

Fifty feet will be maintained as permanent ROW. In addition, temporary use areas or extra workspaces will be required at some stream and road/railroad crossings; these will typically expand the construction ROW by 25 feet where needed. Construction activities will involve the installation of permanent vegetated block valve pads and vegetated access roads, temporary access roads, 2 co-located block valves, tree removal, clearing and grubbing within the ROW, trenching, pipe installation, and site restoration.

In Chester County, Pennsylvania, the Pennsylvania Pipeline Project traverses 23.6 linear miles through the municipalities of East Goshen, East Nantmeal, East Whiteland, Elverson, Upper Uwchlan, Uwchlan, Wallace, West Goshen, West Nantmeal, West Whiteland, and Westtown and spans the Downingtown, Elverson, Pottstown, Wagontown, Malvern, West Chester, and Media USGS Quadrangles. A USG location map showing the proposed alignment can be found in Attachment 1 of the E&S report. Past and present land use of the project area and surrounding area is agricultural and forested land. Future land use will be a maintained vegetated natural gas pipeline ROW and agricultural land.

The project area surface water runoff drains to surface waters and unnamed tributaries (UNTs) designated as high quality (HQ), trout stock fisheries (TSF), warm water fisheries (WWF), and cold water fisheries (CWF) under PA Code 25 Chapter 93 including UNT to Conestoga River (WWF), South Branch French Creek (HQ-TSF), UNT to South Branch French Creek (HQ-TSF), UNT to Marsh Creek (HQ-TSF), Marsh Creek (HQ-TSF), Black Horse Creek (HQ-TSF), UNT to Black Horse Creek (HQ-TSF), Shamona Creek (HQ-TSF), UNT to Shamona Creek (HQ-TSF), UNT to Upper East Branch Brandywine Creek (HQ-TSF), UNT to Valley Creek (CWF), Valley Creek (CWF), East Branch Chester Creek (TSF), UNT to Ridley Creek (HQ-TSF), and UNT to Chester Creek (TSF).

The E&S plan contains Antidegradation Best Available Combination of Technologies (ABACT) best management practices (BMPs) to maintain the designated use of the receiving waters. The basic BMPs that are anticipated to be employed during the construction activities include:

- Minimizing disturbances to site areas, especially those currently covered with pavement or vegetation.
- Minimizing the time that soil is exposed.
- Preventing the runoff from flowing across disturbed areas (divert the flow to vegetated areas).
- Stabilizing disturbed soils as soon as possible.
- Slowing down the runoff flowing across the site.
- Removing sediment from surface water runoff before it leaves the site.

3.0 SITE RESTORATION

Following completion of pipeline installation and trench backfilling, the pipeline right of way, associated workspaces, and temporary access roads shall be returned to the general grade present prior to pipeline installation in order to maintain preconstruction drainage patterns. After completion of major construction work, topsoil that was stockpiled during construction will be placed along the ROW. Grounds disturbed by any of the operations necessary to complete the work for this project are to be permanently seeded, or if specified, sodded, unless occupied by structures, paved or designated as a permanent access road. Disturbed areas, which are at final grade, shall be seeded and mulched as soon as practical. The permanent seed mixture will restore disturbed areas to a meadow in good condition or better. As a result of restoring the right of way, workspaces, and temporary access roads to a meadow condition, there will be no increase in stormwater runoff rates or volume attributed to those areas.

Within Chester County, all disturbed areas within the pipeline right of way, additional temporary workspaces, and temporary access roads will be restored to a meadow in good condition or better. The pre-construction drainage patterns surrounding the project will be maintained for the areas of the project within the township. As a result of restoring the pipeline right of way, additional temporary workspaces, and temporary access roads to a meadow condition and maintaining pre-construction drainage patterns in accordance with 25 Pa Code § 102.8(n), there will be no increase in stormwater runoff rate or volume attributed to these locations, and a quantitative stormwater analysis is not required for the pipeline ROW. Where an existing lawn condition exists and the property owner specifies, the area will be restored to a lawn condition instead of meadow.

7.

SITE RESTORATION AND POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN (NARRATIVE)

Site Restoration and Post-Construction Stormwater Management Plan

Pennsylvania Pipeline Project - South East Region: Spread 6

Major Modification II

October 2017

Prepared for:
Sunoco Logistics, L.P.
525 Fritztown Road
Sinking Spring, PA 19608

Prepared by:
Tetra Tech, Inc.
661 Andersen Drive
Pittsburgh, PA 15220

TABLE OF CONTENTS

Section **Page**

TABLES

LIST OF ATTACHMENTS

LIST OF ACRONYMS

ACRONYM	MEANING
% CCE	Calcium carbonate equivalent
% ENV	Effective neutralizing value
ABACT	Antidegradation Best Available Combination of Technologies
BMP	Best Management Practice
E&SC	Erosion and Sediment Control
EV	Exceptional value
HDD	Horizontal directional drilling
HDPE	High-density polyethylene
HQ	High quality

NGL	Natural gas liquids
PA	Pennsylvania
PADEP	Pennsylvania Department of Environmental Protection
PASDA	Pennsylvania Spatial Data Access
PCSM	Post-Construction Stormwater Management
Pls	Pure live seed
ROW	Right of way
SPPP	Sunoco Pennsylvanian Pipeline Project
SR	Site Restoration
TSF	Trout stock fisheries
Tt	Tetra Tech, Inc.
UNT	Unnamed tributary
WWF	Warm water fisheries

1.0 INTRODUCTION

Tetra Tech, Inc. (Tt) has prepared this Site Restoration and Post-Construction Stormwater Management (PCSM) Plan (Plan) for Sunoco Pipeline, L.P. (SPLP) – Pennsylvania Pipeline Project, South East Region: Spread 6. The Plan addresses activities associated with the Sunoco Pennsylvania Pipeline Project (SPPP) installation. Spread 6 (South East Region) of this project is located in Chester and Delaware Counties, Pennsylvania (PA). A site location map is provided in Attachment 1. The site restoration portion of the Plan will ensure prompt and effective stabilization of the pipeline right of way, associated workspaces, temporary access roads, and the vegetated block valve sites following pipeline construction.

2.0 SITE DESCRIPTION

Sunoco Pipeline, L.P. (SPLP) proposes to construct and operate the Pennsylvania Pipeline Project that would expand existing pipeline systems to provide natural gas liquid (NGL). The project involves the installation of approximately two parallel pipelines within a 306.8-mile, 50-foot-wide right-of-way (ROW) from Houston, Washington County, Pennsylvania (PA) to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306.8 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255.8 miles. The majority of the new ROW will be co-located adjacent to existing utility corridors, including approximately 230 miles of pipeline that will be co-located in the existing SPLP Mariner East pipeline system. The 20-inch pipeline will be installed first, followed by the 16-inch line. Any temporary stabilization required will be implemented in accordance with this Erosion and Sediment (E&S) Plan. Both pipelines will be installed within the same limit of disturbance (LOD) and in the same construction period. This SR and Post Construction Stormwater Management Plan specifically relates to impacts associated with the South East Region, Construction Spread 6.

Fifty feet will be maintained as permanent ROW. In addition, temporary use areas or extra workspaces will be required at some stream and road/railroad crossings; these will typically expand the construction ROW by 25 feet where needed. Construction activities will involve tree removal, clearing and grubbing within the ROW, trenching, pipe installation, and SR. The total LOD in the South East Region will be approximately 278 acres. Acres disturbed by county will be as follows: Chester County with 181 acres disturbed, and Delaware County with 97 acres disturbed.

Major Modification I was a change in installation methodology for a portion of the project located in West Whiteland Township, Chester County. The change in installation method will be from a long horizontal directional drill (HDD) to an open cut with three short conventional auger bores and one shorter HDD. This modification will result in the addition of 7.5 acres of limit of disturbance (LOD) within Sunoco's existing ROW. The modification will occur from construction stations STA 15105+00 to STA 15159+00. A shorter HDD will be

installed under stream S-B79 and Lincoln Highway from construction stations STA 15144+00 to 15153+00. Conventional bores will be installed from Stations: 15111+00 to15112+50 (Exton Lane), 15114+00 to 15116+00 (utilities avoidance), 15221+00 to 15122+50 (Swedesford Road), and 15135+00 to 15141+00 (CR sensitive area by stream S-B81 and wetland WL-B71).

Major Modification II was a change in installation methodology for the portion of the project in Chester County from a single long horizontal directional drill (HDD) to an open cut with some shorter auger bores. 1.8 acres of additional limit of disturbance (LOD). The approximate construction stations which are affected by this modification are STA 15084+00 to STA 15102+00. The proposed changes include an open trench pipeline installation with four conventional bore sections. Conventional bores will be added at: Stations 15083+50 to15085+50 (CH-0209 Parking Lot), Stations 15088+50 to 15089+50 (Stream S-C61), Stations 15092+00 to 15093+00 (Stream S-C59), and Stations 15093+50 to 15096+00 (Pottstown Pike/PA HWY 100). Through the utilization of these two installation methods, SPLP is able to avoid impacts to the Shoen Drive well and maintain its avoidance of impacts to resources and sensitive areas.

Past and present land use of the project area and surrounding area is agricultural and forested land. Future land use will be a maintained vegetated natural gas pipeline ROW and agricultural land and forested land. Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items along the gas line alignment are indicated on the plans, where applicable.

Five new block valve locations are proposed for the PADEP Southeast Region portion of the PPP project. Two additional block valves are proposed at existing sites, Elverson Interchange and Eagle Station, and do not expand the current impervious footprint or require grading. Below is a summary table of the seven block valves that will be constructed or co-located at an existing block valve with a proposed expansion.

Table 1
Block Valve and Station Summary Table

Block valve/Station	Co-located or New	County	Township	Receiving water	Designated Use	Existing use	Impairments	PCSM Required?
Elverson Interchange	Existing no change in footprint	Chester	Elverson	UNT to Conestoga River	WWF	-	Agriculture-Nutrients; Other Nutrients; Other- Organic Enrichment/Low D.O.	No
Fairview Road	New – no new impervious	Chester	Wallace	Marsh Creek	HQ-TSF	-	TMDL- Cause Unknown ; Pesticides ; Nutrients ; Siltation ; Organic Enrichment/Low D.O. ; Suspended Solids	No

Table 1
Block Valve and Station Summary Table

Block valve/Station	Co-located or New	County	Township	Receiving water	Designated Use	Existing use	Impairments	PCSM Required?
Eagle	Existing no change in footprint	Chester	Upper Uwchlan	UNT to Black Horse Creek	HQ-TSF	-	TMDL- Cause Unknown ; Pesticides ; Nutrients ; Siltation ; Organic Enrichment/Low D.O. ; Suspended Solids	No
East Lincoln Highway	New – no new impervious	Chester	West Whiteland	Trib 00276 to Valley Creek	CWF	-	Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers- Siltation	No
Boot Road	New – no new impervious	Chester	West Goshen	Trib 00682 to Ridley Creek	HQ-TSF	-	Urban Runoff/Storm Sewers- Siltation; Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers- Cause Unknown	No
Middletown Road	New – no new impervious	Delaware	Thornbury	Trib 00599Chester Creek	TSF	-	Urban Runoff/Storm Sewers- Cause Unknown; Urban Runoff/Storm Sewers- Water/Flow Variability; Urban Runoff/Storm Sewers- Siltation	No
S. Pennell Road	New – no new impervious	Delaware	Middletown	Trib 00576 to Chester Creek	TSF	-	Urban Runoff/Storm Sewers- Cause Unknown; Urban Runoff/Storm	No

Table 1 Block Valve and Station Summary Table								
Block valve/Station	**Co-located or New**	**County**	**Township**	**Receiving water**	**Designated Use**	**Existing use**	**Impairments**	**PCSM Required?**
							Sewers-Water/Flow Variability; Urban Runoff/Storm Sewers-Siltation	

2.1 TOPOGRAPHY

The work zone is located on ground of varying elevations. Site elevations vary from 23 feet (Chester Creek in Delaware County) to 741 feet (western border of Chester County) above mean sea level based on the Pennsylvania Spatial Data Access (PASDA). The construction plans show the topography of the site and the surrounding area.

2.2 GEOLOGY AND SOILS

The soils and geologic formations surrounding the site are shown on the figures provided in Attachment 2. Attachment 2 also provides soil descriptions and properties of the soils found at the site. In general, the following actions will be taken to counteract soil limitations:

1. Erodible Soils - Prompt stabilization practices will be implemented to minimize the risk of erosion. PCSM facilities have been designed to minimize point-source discharges which increase the likelihood of downstream erosion.

2. Cut Banks Caves - Almost all Pennsylvania soils are susceptible to caving of cut banks. Cut slopes will be stabilized as soon as possible with seed and mulch to prevent sliding. Slopes are designed to not exceed 2H:1V.

3. Corrosive to Concrete or Steel Pipe - Pipes to be used on site shall be either HDPE or coated steel.

4. High Water Table - A seasonal high groundwater determination was conducted at the proposed block valve sites. PCSM facilities that infiltrate have been designed to maintain a 20" separation from the seasonal high groundwater table.

5. Low Strength - Most of Pennsylvania soils (73%) have relatively low strength. Precautions will be taken to prevent slope failures due to improper construction practices. Soils will be evaluated during construction of block valve sites and PCSM facilities to determine whether additional measures will need to be taken.

6. Piping Tendencies -Piping is the erosion by percolating waters or seepage in layer of subsoil resulting in caving and the formation of tunnels or pipes thorough which the soluble or granular material is removed. Where necessary, anti-seep collars will be used to prevent piping.

7. Poor Topsoil -Soil amendments will be added to site soils to promote vegetative growth.

8. Potentially Hydric -A wetland delineation has been performed to determine the presence of wetlands.

9. Potential Sinkhole - Should a sinkhole be encountered during construction, repair should be done under the direct observation and supervision of a professional geologist or licensed geotechnical engineer. Site specific sinkhole repairs should be developed on a case by case basis. Block valves located within karst topography have been identified, and infiltration practices have been designed to minimize the risk of sinkholes.

To prevent sediment from leaving the site, stabilization practices will be implemented in disturbed areas as soon as practical. Geologic formations or soil conditions that may have the potential to cause pollution after earth disturbance were not observed during field activities. Infiltration tests are being performed and results are being evaluated for the design of the proposed post construction stormwater BMPs.

2.3 SURFACE WATER HYDROLOGY

The SPPP area surface water runoff drains to surface waters and unnamed tributaries (UNTs) designated as high quality (HQ), warm water fisheries (WWF), exceptional value (EV), cold water fisheries (CWF), and trout stock fisheries (TSF) under Pa. Code 25 Chapter 93. Descriptions of the Primary Receiving Waters can be found in Table 1.

The plan contains Antidegradation Best Available Combination of Technologies (ABACT) BMPs to maintain the designated use of the receiving waters and prevent additional siltation from polluting the streams. The locations of the receiving waters relative to the project area can be seen on the USGS location map in Attachment 1.

3.0 SITE RESTORATION PRACTICES

Section 3.0 addresses restoration of the mainline pipeline, temporary workspaces, temporary access roads, and the block valve sites which will be vegetated. Following completion of pipeline installation and trench backfilling, the pipeline ROW, associated workspaces, and temporary access roads shall be returned to the general grade present prior to pipeline installation in order to maintain preconstruction drainage patterns. After completion of major construction work, topsoil that was stockpiled during construction will be placed along the ROW. Grounds disturbed by any of the operations necessary to complete the work for this project within the ROW are to be permanently seeded, or if specified, sodded, unless occupied by structures, paved, or designated as a permanent access road. Disturbed areas, which are at final grade, shall be seeded and mulched once final grades are achieved. The permanent seed mixture will restore disturbed areas to a meadow in good condition or better. If seeding cannot be completed within a 4 day period due to weather conditions, the disturbed area will be mulched with straw at the rate of 3 tons per acre. This straw will be anchored using a method described in Section 3.4.

Site restoration will be accomplished in several ways, depending on the site conditions:

Co-located valve sites at existing valve or station locations or those with no new impervious area – 2 (Elverson Interchange and Eagle) will be restored to the existing gravel condition, in accordance with 102.8g(2)(ii) and 102.8g(3)(iii).

Valve sites with no impervious area (vegetated cover) – 5

Fairview Road	East Lincoln Highway	Boot Road	Middletown Road
South Pennell Road			

Block valves are typically surfaced with compacted gravel to provide a clean and a mud-free work area to facilitate inspection and access while minimizing maintenance costs. However, at the 5 vegetated block valve locations listed above, right-of-way constraints preclude installation of stormwater BMPs which are needed if a compacted gravel work surface is installed. At these locations, in lieu of a compacted gravel surface, a vegetated surface will be established to return the site to meadow condition or better. At the remaining block valves (except the co-located valves), traditional gravel areas and PCSM BMPs will be installed because there is space available to install and they are preferred for site maintenance.

In order to prevent compaction of the ground surface and provide structural support for vehicles at the vegetated valve sites, Geoweb cellular confinement will be used to reinforce the topsoil layer and minimize rutting due to the occasional maintenance truck. Geoweb is manufactured by Presto Geosystems and is a 3-Dimensional

structure made up of interconnected cells that confines the cellular fill and controls shearing, lateral and vertical movement.

If the subgrade is compacted from pipeline construction, it will be scarified prior to Geoweb installation per the procedures outlined below. Geoweb will be installed over a stabilization geotextile on the subgrade. The Geoweb cells will be filled with a mix of topsoil and aggregate to ensure the soil media can support a vegetative ground cover. The use of this topsoil/aggregate mix in a ratio of two-thirds aggregate (AASTHO #57) and one-third screened topsoil was selected based on the manufacturer's recommendation for load support combined with infiltration (see Attachment 7). AASHTO #57 is an open graded permeable aggregate with a void ratio of approximately 35-40 percent. At one-third of the mixture, the percentage of topsoil in the infill mix closely approximates the void ratio of the aggregate so that the aggregate supports the vehicular loads when confined in the Geoweb cells while the topsoil supports vegetation growth and permits infiltration.

The seeding will establish ground cover of a meadow condition or better, in accordance with Section 3.1. As a result of establishing ground cover of a meadow condition or better and because the aggregate, topsoil, Geoweb, and stabilization geotextile are all permeable, they will promote infiltration.

Once installed, Geoweb will help in preserving the subsoils in their decompacted state because the Geoweb will distribute vehicular loads and prevent rutting.

Access roads where Geoweb will be used have slopes up to approximately 20 percent. Manufacturer's recommendations as outlined in the attached letter from the manufacturer will be followed for anchoring the Geoweb (Attachment 7).

3.1 BMP DESCRIPTION AND CONSTRUCTION SEQUENCE

A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action to conform to the applicable regulatory agency requirements for restoration and post-construction stormwater management of the site. Necessary steps for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on the effectiveness of controls or differing conditions encountered in the field. The appropriate county conservation district and DEP shall be contacted and must approve any deviation to the authorized plans.

A pre-construction meeting is required prior to the start of any construction activity. The Pennsylvania Department of Environmental Protection (PADEP) or applicable county conservation district, contractors, the landowner, appropriate municipal officials, and the plan preparer must be invited to this meeting at least 7 days in advance.

General Construction Sequence

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.

2. Surface roughening will be utilized to rough the soil surface with horizontal depressions for the purpose of reducing runoff velocity, increasing infiltration, aiding the establishment of vegetation, and reducing erosion. Surface roughening should be applied to slopes 3H:1V or steeper unless a stable rock face is provided or it can be shown that there is not a potential for sediment pollution to surface waters. For roughened surfaces within 50 feet of a surface water, and where blanketing of seeded areas is proposed as the means to achieving permanent stabilization, spray-on type blankets are recommended. Surface roughening shall be accomplished using dozers affixed with grouser tracked equipment. Dozers shall run up and down the slopes leaving horizontal grooves perpendicular to the slope. Dozer blades shall be raised and not used during surface roughening. Where compaction does occur, contractor shall scarifiy the soil or provide additional roughening such as deep ripping or chisel ripping to restore the area to a minimal compacted state. In areas of proposed infiltration, soils shall be amended to 2' below grade. See Soil Amendment and Restoration construction sequence below.

3. Place topsoil from topsoil stockpiles as the upper layer of backfill. Topsoil shall not be placed when the subgrade is frozen or when it is excessively wet or dry and shall not be handled when in a frozen or muddy condition.

4. Remove gravel and geotextile from the temporary access roads and scarify the soil. Refer to step 2 of this sequence to address compaction at access roads. After addressing compaction concerns, place topsoil that was stripped prior to installation of the access roads.

5. Immediately seed and mulch disturbed areas in accordance with the permanent seeding schedule once final grade is established and topsoil is placed.

6. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70-percent perennial vegetative cover is established. Regrade and revegetate areas disturbed during the removal of the erosion and sediment controls.

Soil Amendment and Restoration Construction Sequence

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.

2. In the designated soil amendment area, till the ground and mix in the compost at a ratio of 2:1 (soil:compost) to a depth of 24 inches.

3. Immediately seed and mulch disturbed areas once final grade is established in accordance with the permanent seeding schedule.

4. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established.

Geoweb Construction Sequence

1. Grade surface to subgrade elevations as soon as practicable following completion of pipe installation. Do not compact.
2. If needed, scarify the soil or provide additional roughening such as deep ripping or chisel ripping to restore the area to a minimal compacted state.
3. Install geotextile separation layer in accordance with manufacturer's recommendations.
4. Expand Geoweb to required dimensions and anchor edges with ATRA Anchors, if needed. Join adjacent sections with ATRA Keys.
5. Anchor Geoweb on slopes greater that 5% with 24" ATRA Anchors placed on a 3x8 cell pattern.
6. Mix and place engineered infill material (2/3 AASHTO #57 stone and 1/3 screened topsoil) into the Geoweb cells. Infill material shall be free-flowing and not frozen when placed in the Geoweb sections. Limit drop height to 3 feet to avoid damaging or displacement of the cell wall. Slightly overfill the cells and level off material once settlement is negligible. Do not compact.
7. Seed and mulch filled sections in accordance with the permanent seeding schedule once infill is placed.
8. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70-percent perennial vegetative cover is established.

Permanent Seeding

Site preparation and establishment of permanent cover in areas other than lawns will be conducted according to the following guidelines:

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
SLOPES AND BANKS (NOT MOWED) WELL-DRAINED VARIABLE DRAINAGE	 1 PLUS 1 PLUS	 3, 5, 8, OR 12 (1) 3 OR 7
SLOPES AND BANKS (MOWED) WELL-DRAINED **SLOPES AND BANKS (GRAZED/HAY)** WELL-DRAINED	1 PLUS 1 PLUS	2 OR 10 2,3, OR 13
GULLIES AND ERODED AREAS	1 PLUS	3, 5, 7, OR 12 (1)
EROSION CONTROL FACILITIES (BMPS) SOD WATERWAYS, SPILLWAYS, FREQUENT WATER FLOW AREAS DRAINAGE DITCHES	1 PLUS	2, 3, OR 4

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
SHALLOW, LESS THAN THREE FEET DEEP	1 PLUS	2, 3, OR 4
DEEP, NOT MOWED	1 PLUS	5 OR 7
POND BANKS, DIKES, LEVEES, DAMS, DIVERSION CHANNELS, AND OCCASIONAL WATER FLOW AREAS		
MOWED AREAS	1 PLUS	2 OR 3
NON-MOWED AREAS	1 PLUS	5 OR 7
FOR HAY OR SILAGE ON DIVERSION CHANNELS AND OCCASIONAL WATER FLOW AREAS	1 PLUS	3 OR 13
HIGHWAYS		
NON-MOWED AREAS		
WELL-DRAINED	1 PLUS	5, 7, 8, OR 10
VARIABLE DRAINED	1 PLUS	3 OR 7
POORLY DRAINED	1 PLUS	3
AREAS MOWED SEVERAL TIMES PER YEAR	1 PLUS	2, 3, OR 10
UTILITY ROW		
WELL-DRAINED	1 PLUS	5, 8, OR 12 (1)
VARIABLE DRAINED	1 PLUS	3 OR 7
WELL-DRAINED AREAS FOR GRAZING/HAY	1 PLUS	2, 3, OR 13
EFFLUENT DISPOSAL AREAS	1 PLUS	3 OR 4
SANITARY LANDFILLS	1 PLUS	3, 5, 7, 11 (1), OR 12 (1)
SURFACE MINES		
SPOILS, MINE WASTES, FLY ASH, SLAG, SETTLING BASIN RESIDUES AND OTHER SEVERELY DISTURBED AREAS (LIME TO SOIL TEST)	1 PLUS	3, 4, 5, 7, 8, 11 (1) OR 12(1)
SEVERELY DISTURBED AREAS FOR GRAZING/HAY	1 PLUS	3 OR 13
LAWN	1 PLUS	PENNDOT Formula B

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES (8)
1 (2)	spring oats (spring), or 64 96	64	96
	annual ryegrass (spring or fall), or	10	15
	winter wheat (fall), or	90	120
	winter rye (fall)	56	112
2 (3)	tall fescue, or 75	60	75
	fine fescue, or 40	35	40
	kentucky bluegrass, plus 25 30	25	30
	redtop(4), or	3	3
	perennial ryegrass	15	20
3	birdsfoot trefoil, plus 6 10	6	10
	tall fescue	30	35
4	birdsfoot trefoil, plus	6	10
	reed canarygrass	10	15
5 (5)	Big Bluestem, plus	10	15
	tall fescue, or	20	25
	perennial ryegrass	20	25
6 (5,6)	Big Bluestem, plus	10	15

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES (8)
7 (5)	annual ryegrass	20	25
	birdsfoot trefoil, plus	20	30
	Big Bluestem, plus	20	30
	tall fescue	20	25
8	flatpea, plus	20	30
	tall fescue, or	20	30
	perennial ryegrass	20	25
9	Not applicable to project	N/A	N/A
10	tall fescue, plus	40	60
	fine fescue	10	15
11	deertongue, plus	15	20
	birdsfoot trefoil	6	10
12(7)	switchgrass, or	15	20
	big bluestem, plus	15	20
	birdsfoot trefoil	6	10
13	orchardgrass, or	20	30
	smooth bromegrass, plus	25	35
	birdsfoot trefoil	6	10

1. Pure live seed (pls) is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds pls shown on the seed tag. Thus, if the pls content of a given seed lot is 35 percent, divide 12 pls by 0.35 to obtain 34.3 pounds of seed required to plant one-acre. All mixtures in this table are shown in terms of pls.

2. If high-quality seed is used, for most sites seed spring oats at a rate of two bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at one bushel per acre. If germination is below 90 percent, increase these suggested seeding rates by 0.5 bushel per acre.

3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.

4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.

5. Use for highway slopes and similar sites where the desired species after establishment is Big Bluestem.

6. Use only in extreme southeastern or extreme southwestern PA. Serecia lespedeza is not well adapted to most of PA.

7. Do not mow shorter than 9 to 10 inches.

8. If liming, fertilization, and preparation of seedbed are properly done and if care is taken to drill and cover the seed (or mulch applied), the rate for "most sites" should suffice. However, on eroded or coarse and poorly prepared seedbeds, particularly if the soil is very acidic or infertile, the rate for "adverse sites" should be used.

9. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.

In lawn areas, permanent cover will be established using the following PENNDOT seed mixture:

PENNDOT FORMULA B				
Seeding Rate	3 lbs. per 1,000 square feet			
Species	**% by Weight**	**Purity %**	**Minimum % Germination**	**Maximum % Weed Seed**
Kentucky Bluegrass	50	98	80	0.20
Perennial Rye	20	98	90	0.15
Red Fescue	30	98	85	0.15

Liming Rates

Minimum 6 tons per acre at 100% effective neutralizing value (% ENV), unless the soil test determines that a lesser amount is needed. To determine the actual amount of regular lime to apply, divide the amount called for by the soil test by the % ENV for the product used. For example, if 6 tons per acre is needed and the %ENV for the lime used is 88%, divide 6 by 0.88 resulting in 6.8 tons needing to be applied. For dolomitic lime, which has a significant amount of magnesium in it, divide the amount called for by the soil test by the % calcium carbonate equivalent (% CCE) listed for the product instead of the % ENV. The % CCE may be above 100% which accounts for the fact that magnesium has a greater effect per pound than the calcium in regular lime. Note: When a soil test requires more than 8,000 pounds of lime per acre, the lime must be mixed into the top 6 inches of soil.

Fertilization Rates

Apply 10-20-20 at 600 pounds/acre, if top dressed or 1,000 pounds/ac, if incorporated, unless the soil test determines that the rate can be less than these minimums.

SOIL AMENDMENT APPLICATION RATE EQUIVALENTS				
Soil Amendment	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yds.	
AGRICULTURAL LIME	6 TONS	240 LBS.	240 LBS.	or as per soil test; may not be required in agricultural fields
10-20-20 FERTILIZER	1,000 LBS.	25 LBS.	25 LBS.	or as per soil test; may not be required in agricultural fields

Temporary Seeding

Temporary grass cover will be established in the following areas where soil stockpiles are exposed for a period greater than 4 days. The seed mixture for temporary cover will consist of 100% annual ryegrass. Seed will be applied at the rate of 40 pounds per acre or as recommended by a local recognized seed supplier approved by the Owner's representative. Prior to seeding, apply 1 ton of agricultural grade limestone per acre plus 10-10-10 fertilizer at the rate of 500 pounds per acre and work into the soil.

Mulching

The purpose of mulch is to reduce runoff and erosion, prevent surface compaction or crusting, conserve moisture, aid in establishing plant cover, and control weeds. Mulch will be applied on any area subject to erosion or that has unfavorable conditions for plant establishment and growth. The practice may be used alone or in conjunction with other structural and vegetative conservation practices such as waterways, ponds, sedimentation traps, or critical area planting. On sediment-producing areas where the period of exposure is less than 2 months, mulch materials will be applied according to the following guidelines:

1. Straw mulch will be applied at the rate of 3 tons per acre. Chemically treated or salted straw is not acceptable as mulch.

2. Straw mulch will be anchored immediately after application by at least one of the following methods:

   A. "Crimped" into the soil using tractor-drawn equipment (straight-bladed coulter or similar).

      This method is limited to slopes no steeper than 3:1. Machinery should be operated on the contour. (Crimping of hay or straw by running it over with tracked machinery is not recommended.)

   B. Asphalt, either emulsified or cut-back, containing no solvents or other diluting agents toxic to plant or animal life, uniformly applied at the rate of 31 gallons per 1,000 square feet.

C. Synthetic binders (chemical binders) may be used as recommended by the manufacturer to anchor mulch provided that sufficient documentation is provided to show that it is non-toxic to native plant and animal species.

D. Lightweight plastic, fiber, or paper nets may be stapled over the mulch according to the manufacturer's recommendations.

Mulched areas will be checked periodically and after each runoff event (e.g., rain, snowmelt, etc.) for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

3.2 MATERIAL RECYCLING AND DISPOSAL

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with PADEP's solid waste management regulations at 25 Pennsylvania Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Excess material brought into the site areas to facilitate construction access will be completely removed prior to rough grading and final surface stabilization. Expected construction wastes during site restoration will consist of packaging material and sediment cleaned from E&SC BMPs. Packaging from materials brought on site will be disposed of by a licensed hauler. Sediment removed from BMPs will either be spread in a protected area to dry and then recycled as fill material prior to permanent seeding or disposed of off-site. In cases where disposal is necessary, waste materials will be disposed of at an approved PADEP waste site.

3.3 THERMAL IMPACTS

Thermal impacts are most commonly associated with urbanization (i.e., increased impervious surfaces) that results in heated stormwater runoff flowing into receiving waters where it mixes, and potentially increases the base temperature of the surface water in streams. However, another contributing factor for stream temperature is solar exposure (radiant energy input) to the surface water, typically ponded, standing waters. The amount of heat transferred, and the degree of thermal pollution is of importance for fisheries management and the ecological integrity of receiving waters. Among the attributes that determine the contribution of solar energy to thermal impacts are the presence of riparian vegetation, as well as stream width, depth, flow regime (perennial, intermittent, ephemeral), and orientation.

Thermal impacts have been minimized by limiting the disturbed area to the maximum extent practicable. By minimizing the extent of the disturbed area, vegetative clearing, including forested areas, has been minimized. Vegetated block valve sites will be restored to a meadow in good condition or better, and no impervious surface will be created at those sites. Following installation of the pipelines, existing grades along the pipeline right of way, additional temporary workspaces, and temporary access roads will be restored, permanent seeding will occur as soon as practicable to facilitate vegetative growth during germinating months, and the addition/creation

of impervious surfaces in riparian areas has been avoided. By returning these areas to their existing grades, stormwater is unlikely to pond in these locations therefore minimizing the potential for ponded water to result in significant contributions to thermal impacts in receiving waters. In addition, thermal impacts will be minimized during site restoration by facilitating permanent seeding as soon as practicable to encourage vegetative growth. Although shade cover will be reduced in areas that were previously forested, there is no anticipated adverse effect to the receiving watersheds because the project will only clear a narrow corridor of vegetation within each respective watershed. The Project does not have thermal impacts. Specifically, thermal impacts will be avoided by implementing the following:

- Siting parallel to and overlapping with existing ROWs to minimize vegetation clearing at stream crossings;
- Reducing the construction ROW width and additional temporary workspaces at stream crossings;
- No grubbing, grading, or clearing of trees will occur within 50 feet of the top of stream bank until pipeline construction/installation is ready to proceed through that area.
- Restoring (seeding) disturbed areas/ROW as soon as practicable and /or directing runoff to vegetated areas to reduce the temperature of runoff prior to discharge into the streams; and,
- Restoring the stream banks and seeding/planting as soon as practicable to facilitate vegetative growth along the stream channel.

3.4 RIPARIAN FOREST BUFFERS

Pennsylvania Pipeline Project - Riparian Forest Buffer Waiver Request

The Pennsylvania Pipeline Project qualifies for an exception of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix) for areas within the Chapter 105 permit area. Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan.

In addition to the exception, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area. A detailed riparian buffer waiver request has been prepared as an attachment to the ESCGP-2 Notice of Intent.

Demonstration of Waiver Necessity

A riparian forest buffer waiver is necessary to complete the intended scope of the pipeline project. The project involves the installation of approximately two parallel pipelines within a 306-mile, 50-foot-wide ROW from Houston, Washington County, PA to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station,

Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255 miles. Spread 6 (South East Region) of this project crosses through Chester and Delaware Counties, PA. Due to the linear nature of the project and the surrounding topography, riparian forest buffers could not be avoided altogether.

Alternatives Analysis

Impacts to environmental resources, including riparian forest buffers, were evaluated during the pipeline routing phase of the project. Field teams were deployed to evaluate alternate routes based on environmental and constructability constraints. The final route that was selected minimizes environmental impacts to the maximum extent practicable while still maintaining the project's overall constructability and ensuring a safe working environment while also taking landowner constraints into consideration. Additionally, several variations of horizontal direction drill profiles were evaluated to minimize pullback areas, additional workspaces, and overall disturbance within riparian forest buffers. Permanent features, such as access roads and block valves, were evaluated to locate the features outside of the riparian forest buffer, where possible.

Demonstration of Minimizing Impacts

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the maximum extent practicable. The LOD has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible adjacent to the stream area required for crossing and construction. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide within 10 feet of the stream banks to limit the proximity of the work areas as per the stream crossing detail from the 2012 PADEP Erosion and Sediment Control Program Manual. The operations within the LOD near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing the LOD to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible.

Meeting Requirements of Chapter 102

All other aspects of Chapter 102 are being met. The project's E&SC Plan and SR/Post-Construction Stormwater Management Plan have been designed in accordance with Chapter 102. In accordance with Chapter 102, and E&S plan has been developed to minimize the sediment entering the buffer areas. A SR plan is proposed to revegetate the areas adjacent to the buffers within the ROW.

3.5 INSPECTION AND MAINTENANCE PROCEDURES

Seeded areas will be inspected weekly and after each runoff event for bare spots, washouts, and healthy growth. Necessary repairs will be made immediately. Mulched areas will be checked periodically and after severe storms for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

All sedimentation control measures will remain in place until the disturbed areas are stabilized and a uniform 70-percent perennial vegetative cover is established. Any area not achieving a 70-percent vegetative cover will be reseeded and mulched within 24 hours of detection. If BMPs are found to be inoperative or ineffective during an inspection, PADEP should be contacted within 24 hours, followed by submission of a written noncompliance report to PADEP within 5 days of the initial contact.

Long-Term Maintenance

Long-term maintenance of the pipeline ROW will include periodic visual inspections for sufficient vegetative growth and cover. Insufficient vegetative cover is defined as any area not achieving a uniform 70-percent perennial vegetative cover. Bare spots and areas with insufficient vegetative cover will be reseeded and mulched within 24 hours of discovery. The ROW will be inspected for signs of erosion, especially on steep slopes. Corrective measures will be taken, as needed. If there is evidence of trench settling, the area will be regraded to maintain pre-construction drainage patterns, mulched, and seeded. A written report is required for each inspection and for each repair or maintenance activity, and the report should specify how to access the site. SPLP is responsible for maintaining the ROW under the provisions of this permit.

3.6 ANTIDEGRADATION REQUIREMENTS

Earth- disturbance activities associated with the Pennsylvania Pipeline project will be located within siltation-impaired watersheds and HQ/EV special protection watersheds. A combination of non-discharge alternatives and the use of ABACT BMPs on site will protect the water quality of the receiving waters, in accordance with 25 Code §102.8(h).

Non-discharge alternatives were evaluated to minimize accelerated erosion and sedimentation and achieve zero net change in runoff between the pre- and post-construction conditions. The non-discharge alternatives evaluated were the use of infiltration and maintaining pre-construction drainage patterns within the right of way, temporary additional workspaces, and temporary access roads. The permanent waterbars will not divert or diminish the amount of water within the watershed but are intended to manage runoff velocity and potential degradation related to sediment laden runoff into receiving waters. As such, the will be no change to pre-existing drainage patterns as the permanent water bars will continue to direct water to the same receiving waters while providing the protection required in the PADEP Manual regarding slopes. The non-discharge alternatives were incorporated wherever feasible by minimizing soil compaction, restoring the infiltration capacity of the soil prior to permanent seeding, and restoring the disturbed area back to its original grade and

cover condition for the mainline pipeline. To alleviate compaction, surface roughening techniques such as deep ripping or chisel ripping will restore compacted areas to a minimal compacted state prior to permanent stabilization. The extent of the disturbed area will be minimized, and the duration of disturbance will be minimized by stabilizing disturbed areas as soon as practicable. ABACT BMPs will be used on site to protect and maintain the existing water quality of receiving waters.

Due to the linear nature of this project, all of the siltation impaired and HQ/EV special protection watersheds received the same non discharge alternative evaluation and incorporation of ABACT site restoration BMPs throughout the pipeline.

Five block valve facilities in the South East Region that are proposed to be vegetated sites. All five of these sites are located in a special protection watershed. By proposing vegetation instead of gravel, there will be no increase in impervious area. In addition, the existing Eagle block valve is located within a special protection watershed. No expansion of the existing impervious area is proposed at that location.

There will not be an increase in stormwater runoff rate or volume to prevent the physical degradation of the receiving water, such as scour, and stream bank destabilization. Stormwater runoff volume is not increasing throughout post-construction, and any post-construction stormwater discharge is managed so that it will not degrade the physical, chemical or biological characteristics of the receiving stream.

Filtration through the existing vegetation and soil is an efficient way to remove suspended stormwater pollutants such as sediment, as the suspended particles are physically filtered from the stormwater as it flows through the vegetation and percolates into the soil.

The extent of the disturbed area at each of the block valve sites will be minimized, and the duration of disturbance will be minimized by stabilizing disturbed areas as soon as practicable. Cut and fill for the project sites have been minimized. Where possible based on the criteria listed above, sites were located in areas with shallow slopes to minimize the amount of cut and fill required. The sites will be restored promptly with proper vegetative cover techniques.

At sites where vegetated geoweb is proposed, antidegradation requirements for the special protection watersheds are met because no impervious area is proposed. The runoff will be managed so that it will not degrade the physical, chemical, or biological characteristics of the receiving streams.

ABACT site restoration BMPs will include the following:

- Pre-construction drainage pattern intact
- Minimizing the disturbed area
- No direct discharge to surface waters

- Prompt site restoration
- Proper vegetative cover techniques

3.7 STORMWATER RUNOFF ANALYSIS

This section applies to all areas of the project, excluding permanent access roads and block valve sites. All disturbed areas within the pipeline right of way, additional temporary workspaces, and temporary access roads will be restored to a meadow in good condition or better or a lawn condition. The pre-construction drainage patterns surrounding the project will be maintained for the areas of the project covered under this section. As a result of restoring the pipeline right of way, additional temporary workspaces, and temporary access roads to a meadow condition and maintaining pre-construction drainage patterns in accordance with 25 Pa Code § 102.8(n), there will be no increase in stormwater runoff rate or volume attributed to these locations, and a quantitative stormwater analysis is not required.

The proposed mainline pipeline will be restored in accordance with 102.8(n) and meet the requirements outlined in §§ 102.8(b), (c), (e), (f), (h), (i), (l), and (m).

In accordance with § 102.8(b), the following principles have been incorporated into the project design in accordance with the numbering in § 102.8(b): (1) The integrity of stream channels and the physical, biological, and chemical qualities of the receiving waters will remain unchanged. The site restoration principles will protect the existing and designated uses of the receiving waters. BMPs will be maintained until the site achieves stabilization during site restoration to ensure that runoff which leaves the project site will have no short-term adverse effects on the physical, biological, or chemical qualities of downstream receiving waters. The permanent seed mixture will restore the majority of the right of way to a meadow condition. Those areas which are not restored to a meadow condition will be restored to a lawn condition or forest. As a result of restoring the pipeline right of way as specified in the restoration plan, there will be no long-term effects to the physical, biological, or chemical qualities of downstream receiving waters. (2) The mainline pipeline will be restored to original grade so flow paths will not be altered. The right of way will be restored to achieve a meadow in good condition or better, with the exception of areas that will be returned to lawn or forest. In addition, the pipeline right of way accounts for only a narrow corridor of development within each drainage area to the nearest receiving water. As a result, post-development runoff rates to the nearest receiving water will not increase. (3) The right of way will be restored to a meadow in good condition or better in most areas, with the exception of specified locations where the right of way will be restored to the equivalent of its predevelopment land cover (lawn or forest). As a result, any potential increase in stormwater runoff volume has been minimized to the maximum extent practicable. (4) There are no proposed, permanent impervious features associated with the mainline pipeline. Temporary access roads will be restored to a vegetated condition following installation of the pipeline. (5) Existing drainage features and vegetation will be protected by restoring the project area back to its original grade. As a result, drainage features and existing vegetation surrounding the project area will be preserved. (6) Land clearing and grading will be minimized because the project area has been limited to the

area required to safely install the natural gas pipelines. The pipeline right of way will be returned to original grade following installation of the pipelines. (7) Soil compaction will be minimized by utilizing travel lanes within the pipeline right of way. Following construction, areas that have been compacted will be scarified or ripped, or soil amendments will be incorporated prior to backfilling topsoil and seeding. After initiating restoration, vehicular traffic will be restricted to prevent soil compaction. (8) As demonstrated in 102.8(2) and 102.8(3), potential increases in post development stormwater runoff has been minimized to the maximum extent practicable utilizing nonstructural restoration BMPs.

In accordance with § 102.8(c), the mainline Site Restoration and Post Construction Stormwater Management Plan has been planned and designed and will be implemented in consistency with the E&S Plan.

In accordance with § 102.8(e), the Site Restoration and Post Construction Stormwater Management Plan has been prepared by Robert F. Simcik, P.E. who is trained and experienced in PCSM design methods and techniques applicable to the size and scope of the proposed pipeline project.

In accordance with § 102.8(f), the Site Restoration and Post Construction Stormwater Management Plan contains drawings and a narrative consistent with the requirements of Chapter 102. The Plan has been designed to minimize the threat to human health, safety, and the environment to the greatest extent practicable. The Plan includes the required information as outlined in § 102.8(f)(1) through § 102.8(f)(15).

In accordance with § 102.8(h), nondischarge alternatives for Special Protection waters are evaluated in the Antidegradation section of the Site Restoration and Post Construction Stormwater Management Plan. The Plan includes ABACT BMPs where nondischarge alternatives do not exist for the project.

In accordance with § 102.8(i), the applicant has submitted the Site Restoration and Post Construction Stormwater Management Plan to the applicable county conservation districts and Department of Environmental Protection for review and approval. Upon complaint or site inspection, the Plan will be available for subsequent review and inspection by the reviewing agencies.

In accordance with § 102.8(l), the permittee will include with the notice of termination “Record Drawings” with a final certification statement from a licensed professional, which reads as follows:

“I (name) do hereby certify pursuant to the penalties of 18 Pa.C.S.A. § 4904 to the best of my knowledge, information and belief, that the accompanying record drawings accurately reflect the as-built conditions, are true and correct, and are in conformance with Chapter 102 of the rules and regulations of the Department of Environmental Protection and that the project site was constructed in accordance with the approved PCSM Plan, all approved plan changes and accepted construction practices.”

In accordance with § 102.8(m), the Site Restoration and Post Construction Stormwater Management Plan identifies that the permittee shall be responsible for long-term operation and maintenance of PCSM BMPs

associated with permanent surface sites. However, there are no PCSM BMPs proposed as part of the mainline pipeline.

There are no proposed permanent gravel access roads and block valve pads in the South East Region.

4.0 POST-CONSTRUCTION STORMWATER MANAGEMENT ANALYSIS

No permanent gravel access roads and gravel block valve sites will be constructed as part of this project in the South East region. Five new block valves will be constructed as part of this project but will be vegetated sites. Two existing block valve sites will also be utilized, but no expansion of the existing impervious area is proposed.

The proposed, vegetated block valve sites will be restored in accordance with 102.8(n) and meet the requirements outlined in §§ 102.8(b), (c), (e), (f), (h), (i), (l), and (m).

In accordance with § 102.8(b), the following principles have been incorporated into the project design in accordance with the numbering in § 102.8(b): (1) The integrity of stream channels and the physical, biological, and chemical qualities of the receiving waters will remain unchanged. The site restoration principles will protect the existing and designated uses of the receiving waters. BMPs will be maintained until the site achieves stabilization during site restoration to ensure that runoff which leaves the project site will have no short-term adverse effects on the physical, biological, or chemical qualities of downstream receiving waters. The permanent seed mixture will restore the block valve site to a meadow condition. Geoweb will be utilized to mitigate the potential risk for compaction of topsoil on the block valve site. As a result, there will be no long-term effects to the physical, biological, or chemical qualities of downstream receiving waters. (2) Block valve sites will be graded, where necessary, to achieve usable slopes for equipment layout and vehicle access. The grading has been designed to utilize existing slopes in an effort to minimize grading. By minimizing grading, flow paths will only be minimally altered. The post development flow paths will slow the flow of runoff across the valve sites since grading will flatten existing slopes. The block valve will be seeded to achieve a meadow in good condition or better. As a result, post-development runoff rates to the nearest receiving water will not increase. (3) The block valves will be seeded to achieve a ground cover of a meadow in good condition or better. In addition, geoweb will ensure that void space and the infiltration capacity of the soil is maintained in the long term. As a result, any potential increase in stormwater runoff volume has been minimized to the maximum extent practicable. (4) This discussion relates to block valves which will be vegetated. The vegetated block valve sites do not have any proposed, impervious features associated with them. (5) Existing drainage features and vegetation will be protected by minimizing proposed grading. As a result, drainage features and existing vegetation surrounding the project area will be preserved to the maximum extent practicable. (6) Land clearing and grading will be minimized because the project area has been limited to the area required to safely install the natural gas pipelines. Grading at block valve sites has been minimized to the maximum extent practicable and has been designed to utilize existing slopes. (7) Soil compaction will be minimized by installing geoweb cellular confinement which will be filled with a mix of aggregate and topsoil. The geoweb will ensure that the void ratio and infiltration capacity of the soil is maintained, and the risk of compaction from vehicular traffic will be eliminated. The construction sequence and installation detail for geoweb specifies that care shall be taken so as not to compact the subgrade. (8) As demonstrated in 102.8(2) and 102.8(3), potential increases in post development stormwater runoff has been minimized to the maximum extent practicable utilizing nonstructural restoration BMPs.

In accordance with § 102.8(c), the mainline Site Restoration and Post Construction Stormwater Management Plan has been planned and designed and will be implemented in consistency with the E&S Plan.

In accordance with § 102.8(e), the Site Restoration and Post Construction Stormwater Management Plan has been prepared by Robert F. Simcik, P.E. who is trained and experienced in PCSM design methods and techniques applicable to the size and scope of the proposed project.

In accordance with § 102.8(f), the Site Restoration and Post Construction Stormwater Management Plan contains drawings and a narrative consistent with the requirements of Chapter 102. The Plan has been designed to minimize the threat to human health, safety, and the environment to the greatest extent practicable. The Plan includes the required information as outlined in § 102.8(f)(1) through § 102.8(f)(15).

In accordance with § 102.8(h), nondischarge alternatives for Special Protection waters are evaluated in the Antidegradation section of the Site Restoration and Post Construction Stormwater Management Plan. The Plan includes ABACT BMPs where nondischarge alternatives do not exist for the project.

In accordance with § 102.8(i), the applicant has submitted the Site Restoration and Post Construction Stormwater Management Plan to the applicable county conservation districts and Department of Environmental Protection for review and approval. Upon complaint or site inspection, the Plan will be available for subsequent review and inspection by the reviewing agencies.

In accordance with § 102.8(l), the permittee will include with the notice of termination “Record Drawings” with a final certification statement from a licensed professional, which reads as follows:

“I (name) do hereby certify pursuant to the penalties of 18 Pa.C.S.A. § 4904 to the best of my knowledge, information and belief, that the accompanying record drawings accurately reflect the as-built conditions, are true and correct, and are in conformance with Chapter 102 of the rules and regulations of the Department of Environmental Protection and that the project site was constructed in accordance with the approved PCSM Plan, all approved plan changes and accepted construction practices.”

In accordance with § 102.8(m), the Site Restoration and Post Construction Stormwater Management Plan identifies that the permittee shall be responsible for long-term operation and maintenance of PCSM BMPs associated with permanent surface sites. However, there are no PCSM BMPs associated with vegetated block valve sites.

4.1 BMP DESCRIPTION NARRATIVE AND CONSTRUCTION SEQUENCE

All five proposed block valve facilities are proposed to be vegetated to meadow condition or better. Therefore, no post construction BMPs are required. Two additional existing sites will be utilized, but no expansion of the impervious area is proposed. Soil amendment and restoration may be required in areas where soil is compacted following construction activities.

Soil Amendment and Restoration

Soil amendment and restoration is the process of improving disturbed soils and low organic soils by restoring soil porosity and adding a soil amendment, such as compost, for the purpose of reestablishing the soil's long-term capacity for infiltration and pollution removal.

Construction Sequence

Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.

Soil Amendment and Restoration

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.
2. In the designated soil amendment area, till the ground and mix in the compost at a ratio of 2:1 (soil:compost) to a depth of 24 inches. This is a critical step of the sequence which requires oversight by a licensed professional.
3. Immediately seed and mulch disturbed areas once final grade is established in accordance with the permanent seeding schedule.
4. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established.

Permanent Seeding

Site preparation and establishment of permanent cover in areas other than lawns will be conducted according to the following guidelines:

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
SLOPES AND BANKS (NOT MOWED)		
WELL-DRAINED	1 PLUS	3, 5, 8, OR 12 (1)
VARIABLE DRAINAGE	1 PLUS	3 OR 7
SLOPES AND BANKS (MOWED)	1 PLUS	2 OR 10
WELL-DRAINED		
SLOPES AND BANKS (GRAZED/HAY)	1 PLUS	2,3, OR 13
WELL-DRAINED		
GULLIES AND ERODED AREAS	1 PLUS	3, 5, 7, OR 12 (1)
EROSION CONTROL FACILITIES (BMPS)		
SOD WATERWAYS, SPILLWAYS, FREQUENT WATER FLOW AREAS	1 PLUS	2, 3, OR 4
DRAINAGE DITCHES		
SHALLOW, LESS THAN THREE FEET DEEP	1 PLUS	2, 3, OR 4
DEEP, NOT MOWED	1 PLUS	5 OR 7
POND BANKS, DIKES, LEVEES, DAMS, DIVERSION CHANNELS, AND OCCASIONAL WATER FLOW AREAS		

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
MOWED AREAS	1 PLUS	2 OR 3
NON-MOWED AREAS	1 PLUS	5 OR 7
FOR HAY OR SILAGE ON DIVERSION CHANNELS AND OCCASIONAL WATER FLOW AREAS	1 PLUS	3 OR 13
HIGHWAYS		
NON-MOWED AREAS		
WELL-DRAINED	1 PLUS	5, 7, 8, OR 10
VARIABLE DRAINED	1 PLUS	3 OR 7
POORLY DRAINED	1 PLUS	3
AREAS MOWED SEVERAL TIMES PER YEAR	1 PLUS	2, 3, OR 10
UTILITY ROW		
WELL-DRAINED	1 PLUS	5, 8, OR 12 (1)
VARIABLE DRAINED	1 PLUS	3 OR 7
WELL-DRAINED AREAS FOR GRAZING/HAY	1 PLUS	2, 3, OR 13
EFFLUENT DISPOSAL AREAS	1 PLUS	3 OR 4
SANITARY LANDFILLS	1 PLUS	3, 5, 7, 11 (1), OR 12 (1)
SURFACE MINES		
SPOILS, MINE WASTES, FLY ASH, SLAG, SETTLING BASIN RESIDUES AND OTHER SEVERELY DISTURBED AREAS (LIME TO SOIL TEST)	1 PLUS	3, 4, 5, 7, 8, 11 (1) OR 12(1)
SEVERELY DISTURBED AREAS FOR GRAZING/HAY	1 PLUS	3 OR 13
LAWN	1 PLUS	PENNDOT Formula B

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES (8)
1 (2)	spring oats (spring), or 64 96	64	96
	annual ryegrass (spring or fall), or	10	15
	winter wheat (fall), or	90	120
	winter rye (fall)	56	112
2 (3)	tall fescue, or 75	60	75
	fine fescue, or 40	35	40
	kentucky bluegrass, plus 25 30	25	30
	redtop(4), or	3	3
	perennial ryegrass	15	20
3	birdsfoot trefoil, plus 6 10	6	10
	tall fescue	30	35
4	birdsfoot trefoil, plus	6	10
	reed canarygrass	10	15
5 (5)	Big Bluestem, plus	10	15
	tall fescue, or	20	25
	perennial ryegrass	20	25
6 (5,6)	Big Bluestem, plus	10	15
	annual ryegrass	20	25
7 (5)	birdsfoot trefoil, plus	20	30
	Big Bluestem, plus	20	30
	tall fescue	20	25
8	flatpea, plus	20	30
	tall fescue, or	20	30

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	SPECIES	SEEDING RATES – PLS (1)	
		MOST SITES	ADVERSE SITES (8)
	perennial ryegrass	20	25
9	Not applicable to project	N/A	N/A
10	tall fescue, plus	40	60
	fine fescue	10	15
11	deertongue, plus	15	20
	birdsfoot trefoil	6	10
12(7)	switchgrass, or	15	20
	big bluestem, plus	15	20
	birdsfoot trefoil	6	10
13	orchardgrass, or	20	30
	smooth bromegrass, plus	25	35
	birdsfoot trefoil	6	10

1. Pure live seed (pls) is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds pls shown on the seed tag. Thus, if the pls content of a given seed lot is 35 percent, divide 12 pls by 0.35 to obtain 34.3 pounds of seed required to plant one-acre. All mixtures in this table are shown in terms of pls.

2. If high-quality seed is used, for most sites seed spring oats at a rate of two bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at one bushel per acre. If germination is below 90 percent, increase these suggested seeding rates by 0.5 bushel per acre.

3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.

4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.

5. Note not applicable because the project does not propose the use of Crownvetch.

6. Use for highway slopes and similar sites where the desired species after establishment is Big Bluestem.

7. Do not mow shorter than 9 to 10 inches.

8. If liming, fertilization, and preparation of seedbed are properly done and if care is taken to drill and cover the seed (or mulch applied), the rate for “most sites” should suffice. However, on eroded or coarse and poorly prepared seedbeds, particularly if the soil is very acidic or infertile, the rate for “adverse sites” should be used.

9. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.

In lawn areas, permanent cover will be established using the following PENNDOT seed mixture:

PENNDOT FORMULA B				
Seeding Rate	3 lbs. per 1,000 square feet			
Species	**% by Weight**	**Purity %**	**Minimum % Germination**	**Maximum % Weed Seed**
Kentucky Bluegrass	50	98	80	0.20
Perennial Rye	20	98	90	0.15
Red Fescue	30	98	85	0.15

Liming Rates

Minimum 6 tons per acre at 100% effective neutralizing value (% ENV), unless the soil test determines that a lesser amount is needed. To determine the actual amount of regular lime to apply, divide the amount called for by the soil test by the % ENV for the product used. For example, if 6 tons per acre is needed and the %ENV for the lime used is 88%, divide 6 by 0.88 resulting in 6.8 tons needing to be applied. For dolomitic lime, which has a significant amount of magnesium in it, divide the amount called for by the soil test by the % calcium carbonate equivalent (% CCE) listed for the product instead of the % ENV. The % CCE may be above 100% which accounts for the fact that magnesium has a greater effect per pound than the calcium in regular lime. Note: When a soil test requires more than 8,000 pounds of lime per acre, the lime must be mixed into the top 6 inches of soil.

Fertilization Rates

Apply 10-20-20 at 600 pounds/acre, if top dressed or 1,000 pounds/ac, if incorporated, unless the soil test determines that the rate can be less than these minimums.

SOIL AMENDMENT APPLICATION RATE EQUIVALENTS				
Soil Amendment	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yds.	
AGRICULTURAL LIME	6 TONS	240 LBS.	240 LBS.	or as per soil test; may not be required in agricultural fields
10-20-20 FERTILIZER	1,000 LBS.	25 LBS.	25 LBS.	or as per soil test; may not be required in agricultural fields

Temporary Seeding

Temporary grass cover will be established where soil stockpiles are exposed for a period greater than 4 days. The seed mixture for temporary cover will consist of 100% annual ryegrass. Seed will be applied at the rate of 40 pounds per acre or as recommended by a local recognized seed supplier approved by the Owner's representative. Prior to seeding, apply 1 ton of agricultural grade limestone per acre plus 10-10-10 fertilizer at the rate of 500 pounds per acre and work into the soil.

Mulching

The purpose of mulch is to reduce runoff and erosion, prevent surface compaction or crusting, conserve moisture, aid in establishing plant cover, and control weeds. Mulch will be applied on any area subject to erosion or that has unfavorable conditions for plant establishment and growth. The practice may be used alone or in conjunction with other structural and vegetative conservation practices such as waterways, ponds, sedimentation traps, or critical area planting. On sediment-producing areas where the period of exposure is less than two (2) months, mulch materials will be applied according to the following guidelines:

1. Straw mulch will be applied at the rate of 3 tons per acre. Chemically treated or salted straw is not acceptable as mulch.

2. Straw mulch will be anchored immediately after application by at least one of the following methods:

    a. "Crimped" into the soil using tractor-drawn equipment (straight-bladed coulter or similar).

    This method is limited to slopes no steeper than 3:1. Machinery should be operated on the contour. (Crimping of hay or straw by running it over with tracked machinery is not recommended.)

    b. Asphalt, either emulsified or cut-back, containing no solvents or other diluting agents toxic to plant or animal life, uniformly applied at the rate of 31 gallons per 1,000 square feet.

    c. Synthetic binders (chemical binders) may be used as recommended by the manufacturer to anchor mulch provided that sufficient documentation is provided to show that it is non-toxic to native plant and animal species.

    d. Lightweight plastic, fiber, or paper nets may be stapled over the mulch according to the manufacturer's recommendations.

Mulched areas will be checked periodically and after each runoff event (e.g., rain, snowmelt, etc.) for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

4.2 MATERIAL RECYCLING AND DISPOSAL

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with PADEP's solid waste management regulations at 25 Pennsylvania Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Excess material brought into the site areas to facilitate construction access will be completely removed prior to rough grading and final surface stabilization. In cases where disposal is necessary, waste materials will be disposed of at an approved PADEP waste site.

4.3 THERMAL IMPACTS

Thermal impacts are most commonly associated with urbanization (i.e., increased impervious surfaces) that results in heated stormwater runoff flowing into receiving waters where it mixes, and potentially increases the base temperature of the surface water in streams. However, another contributing factor for stream temperature is solar exposure (radiant energy input) to the surface water, typically ponded, standing waters. The amount of heat transferred, and the degree of thermal pollution is of importance for fisheries management and the ecological integrity of receiving waters. Among the attributes that determine the contribution of solar energy to thermal impacts are the presence of riparian vegetation, as well as stream width, depth, flow regime (perennial, intermittent, ephemeral), and orientation.

No permanent gravel block valve facilities are proposed in the South East region. All proposed block valve sites will be vegetated and reinforced with Geoweb to promote infiltration or utilize existing impervious areas. Vegetated block valve sites will be returned to meadow condition or better following construction. There are no thermal impacts for any of these block valve facilities.

4.4 RIPARIAN FOREST BUFFERS

Pennsylvania Pipeline Project - Riparian Forest Buffer Waiver Request

The Pennsylvania Pipeline Project qualifies for an exception of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix) for areas within the Chapter 105 permit area. Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan.

In addition to the exception, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area. A detailed riparian buffer waiver request has also been prepared and is included as an attachment to the ESCGP-2 Notice of Intent.

Demonstration of Waiver Necessity

A riparian forest buffer waiver is necessary to complete the intended scope of the pipeline project. The project involves the installation of approximately two parallel pipelines within a 306-mile, 50-foot-wide ROW from Houston, Washington County, PA to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of

interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255 miles. Spreads 3, 4, and 5 (South Central Region) of this project are cross through Blair, Huntingdon, Juniata, Perry, Cumberland, York, Dauphin, Lebanon, Lancaster, and Berks Counties, PA. Due to the linear nature of the project and the surrounding topography, riparian forest buffers could not be avoided altogether.

Alternatives Analysis

Impacts to environmental resources, including riparian forest buffers, were evaluated during the pipeline routing phase of the project. Field teams were deployed to evaluate alternate routes based on environmental and constructability constraints. The final route that was selected minimizes environmental impacts to the maximum extent practicable while still maintaining the project's overall constructability and ensuring a safe working environment while also taking landowner constraints into consideration. Additionally, several variations of horizontal direction drill profiles were evaluated to minimize pullback areas, additional workspaces, and overall disturbance within riparian forest buffers. Permanent features, such as access roads and block valves, were evaluated to locate the features outside of the riparian forest buffer, where possible.

Demonstration of Minimizing Impacts

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the maximum extent practicable. The LOD has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible adjacent to the stream area required for crossing and construction. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide within 10 feet of the stream banks to limit the proximity of the work areas as per the stream crossing detail from the 2012 PADEP Erosion and Sediment Pollution Control Program Manual. The operations within the LOD near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing the LOD to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible. The post construction stormwater management infiltration berms and trenches are not located within riparian forested buffers.

Meeting Requirements of Chapter 102

All other aspects of Chapter 102 are being met. The project's E&SC Plan and SR/Post-Construction Stormwater Management Plan have been designed in accordance with Chapter 102. In accordance with Chapter 102, and E&S plan has been developed to minimize the sediment entering the buffer areas. The post construction stormwater management plan has been design to control runoff rate and volume which may be discharge through riparian buffer areas.

4.5 INSPECTION AND MAINTENANCE PROCEDURES

Long-term maintenance of the pipeline ROW will include periodic visual inspections for sufficient vegetative growth and cover. Insufficient vegetative cover is defined as any area not achieving a uniform 70-percent perennial vegetative cover. Bare spots and areas with insufficient vegetative cover will be reseeded and mulched within 24 hours of discovery. The ROW will be inspected for signs of erosion, especially on steep slopes. Corrective measures will be taken, as needed. If there is evidence of trench settling, the area will be regraded to maintain pre-construction drainage patterns, mulched, and seeded. A written report is required for each inspection and for each repair or maintenance activity, and the report should specify how to access the site. SPLP is responsible for maintaining the ROW under the provisions of this permit.

Permanent proposed access roads and valve pads will be constructed as part of the project. These access roads and block valve pads will be vegetated after construction to promote infiltration and reduce runoff. The sites will be inspected periodically.

In areas where vegetated Geoweb is installed, in addition to inspecting the vegetation coverage, the Geoweb will be inspected for signs of damage affecting Geoweb performance, e.g., displaced cells or significantly torn cells. If the infill topsoil/aggregate mix settles over time and exposes the Geoweb, it will be filled with the same infill mixture and re-seeded. Note that with age, it is not unusual that the top of the Geoweb sections may become exposed and trampled with use. This does not affect the performance of the cellular confinement. If Geoweb becomes torn, it will be repaired. If the Geoweb becomes exposed it will be filled with the same infill mixture and re-seeded.

Inspection and maintenance procedures for permanent post-construction stormwater management facilities and stormwater conveyance BMPs are summarized below. If any post-construction stormwater management facilities are constructed prior to stabilization of upslope contributory drainage areas, inspections shall occur weekly and after runoff events until the surrounding area achieves stabilization. Sites located within karst terrain require more frequent long-term inspections, as specified in the Sinkhole Repair Plan in Attachment 2.

After stabilization has occurred the PCSM BMPs will continue to be inspected by Sunoco Operations in accordance with 25 Pa. Code 10-2.8(m) related to PCSM long-term operation and maintenance requirements and recorded in the Post Construction Stormwater Management Instrument Filling completed for each valve site that has a PCSM BMP.

Soil Amendment and Restoration

- The soil restoration process may need to be repeated over time, due to compaction by use and/or settling.
- Soil amendment areas shall be inspected at least 4 times per year for signs of compaction. To remedy compaction, till the soil to a depth of 24 inches and mix in compost at a ratio of 2:1 (soil:compost).

4.6 ANTIDEGRADATION REQUIREMENTS

Portions of the earth disturbance activities associated with the SPPP will be located within a HQ/EV watershed. A combination of non-discharge alternatives and the use of ABACT BMPs will be implemented to protect and maintain the existing water quality of the receiving waters.

Non-discharge alternatives were evaluated to minimize accelerated E&S and achieve zero net change in runoff between the pre and post-construction conditions. Non–discharge alternatives exist when the existing land use is revegetated and grade is restored therefore no increase in runoff rate or volume from pre to post construction results. Other non-discharge alternatives implemented are limiting and minimizing the extent of disturbed areas and limiting the extent and duration of disturbance (phasing and sequencing) then stabilizing disturbed areas as soon as practicable. ABACT BMPs will be used onsite to protect and maintain the existing water quality of receiving waters also in areas where non-discharge alternatives exist.

There are no sites that require post-construction stormwater management within special protection watersheds in the South East region. See section 3.6 for additional discussion related to Antidegradation Requirements during Site Restoration.

4.7 STORMWATER RUNOFF ANALYSIS

Five new block valve locations are proposed for the PADEP Southeast Region portion of the PPP project. Two additional block valves are proposed at existing sites, Elverson Interchange and Eagle Station, and do not expand the current impervious footprint or require grading. All five of the new block valve sites will be vegetated, so they will not require PCSM.

The access roads and gravel pads will remain as a permanent facility after pipeline construction is complete. No PCSM design is required because no permanent impervious facilities are proposed. There is no increase in the stormwater runoff rate for the 24-hour duration, 2-, 10-, 50-, and 100-year storm events as a result of the access road and valve site construction.

Karst Topography

The East Lincoln Highway block valve site is believed to be within a 1.5-mile radius of documented sinkholes or depressions (source: http://www.gis.dcnr.state.pa.us/maps/)

Due to the risks associated with constructing stormwater facilities within karst terrain, several principles were employed to reduce the risk of sinkholes while still making every attempt to infiltrate stormwater runoff. The following principles were considered in the design:

- Minimizing proposed impervious surfaces
- Avoiding concentrating stormwater runoff.

In addition, a Sinkhole Repair Plan is included in Attachment 2 in the event that a sinkhole develops onsite.

Loading Ratios

No permanent impervious area is proposed for any facility in the South East region. Therefore, no PCSM BMPs are proposed, and loading ratios do not apply.

Stormwater Rates and Volumes

No permanent impervious area is proposed for any facility in the South East region. Therefore, no PCSM BMPs are proposed, and stormwater rates and volumes do not apply.

5.0 REFERENCES

Erosion and Sediment Pollution Control Program Manual, Commonwealth of Pennsylvania, Department of Environmental Protection, Office of Water Management, March 2012.

Stormwater Management for Construction Activities - Developing Pollution Prevention Plans and Best Management Practices, United States Environmental Protection Agency, Office of Water, 1993.

Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection, Bureau of Watershed Management, December 2006.

Downingtown, Elverson, Pottstown, Washington, Malvern, West Chester, and Media Quadrangles, Pennsylvania – Chester County, Geological Survey, United States Department of Interior.

Soil Survey of Chester County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Media, West Chester, Marcus Hook, and Bridgeport Quadrangles, Pennsylvania – Delaware County, Geological Survey, United States Department of Interior.

Soil Survey of Delaware County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

County-wide Act 167 Stormwater Management Plan for Chester County, PA. Chester Creek Act 167 Plan – Volume I and Volume II. Conestoga River Act 167 Plan. Ridley Creek Act 167 Plan.

DCNR, 2016. *Invasive Plants in Pennsylvania, Crown Vetch,* Coronilla varia. Accessed October 25, 2016. http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_010284.pdf.

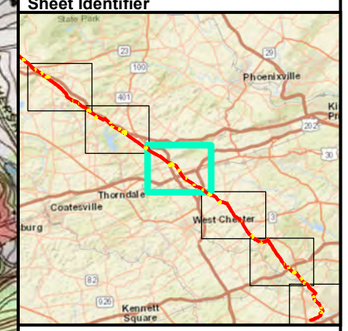
ATTACHMENT 1

USGS LOCATION MAP

Legend

- Access Road
- Major Modification
- Limit of Disturbance
- Alignment Centerline
- Block Valve/Station

Sheet Identifier



N

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0 300 600 Meters

PROJECT LOCATION MAP
ATTACHMENT 1-3
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12, 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY,
PENNSYLVANIA

TETRA TECH

Notes:
1) Topographic map provided by ESRI's ArcGIS Online USA Topo Maps map service (© 2013 National Geographic Society, i-cubed).
2) Quadrangles being displayed are Downingtown, Malvern

PGH P:\GIS\SUNOCO\MARINER EAST 2\MXD\PPP ESC\GPP\PENNPIPELINE_SOUTHEAST_USGS_ESCGP MXD 10/09/17 JN

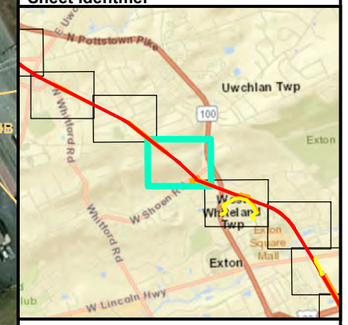
ATTACHMENT 2

SOILS MAP, GEOLOGIC FORMATIONS MAP

Legend

- Stationing
- Access Road
- Alignment Centerline
- Major Modification
- Limit of Disturbance
- Block Valve/Station
- NRCS Soils and Codes

Sheet Identifier



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NRCS SOILS MAP
ATTATCHMENT 5-25
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12. 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
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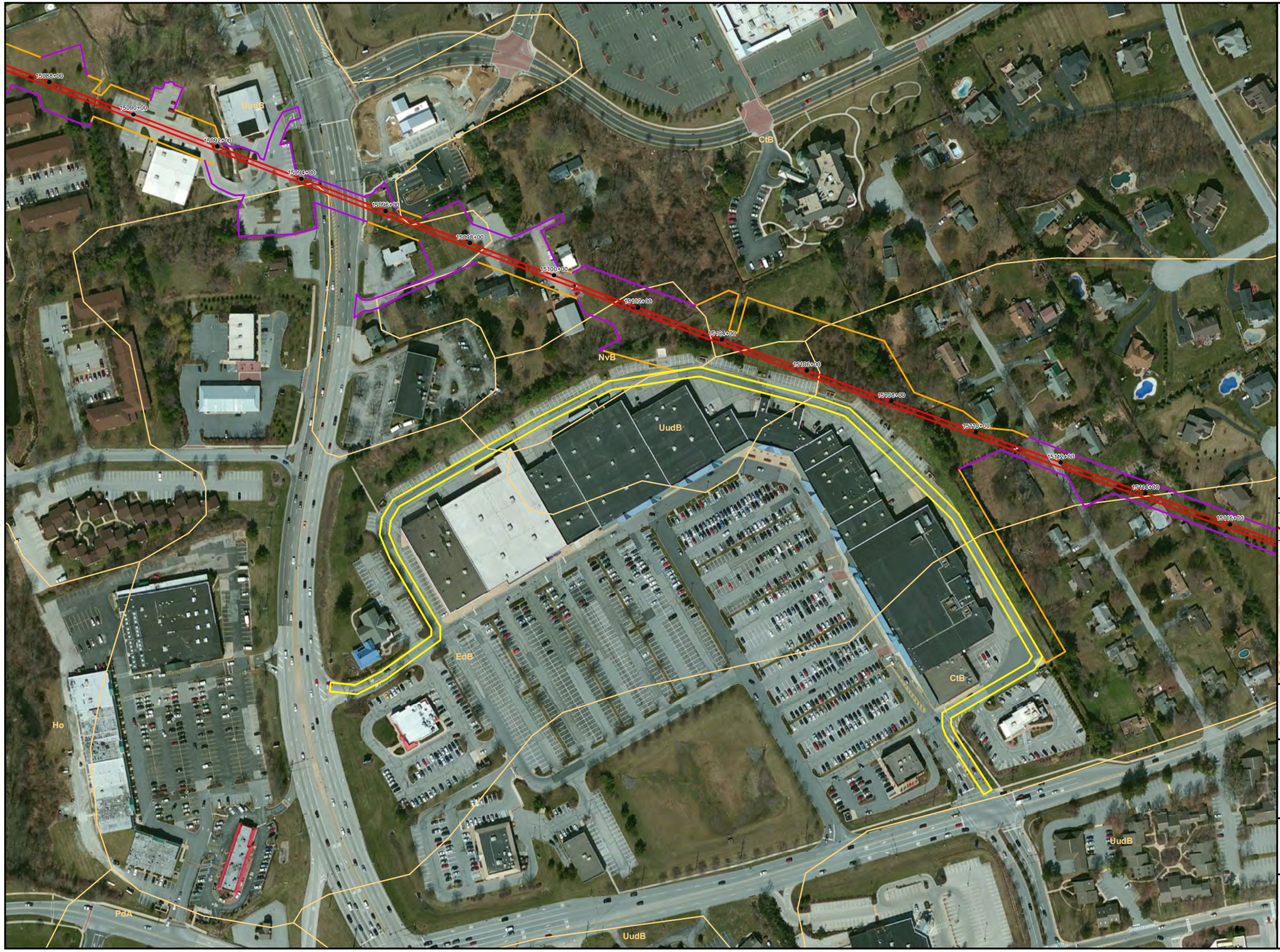
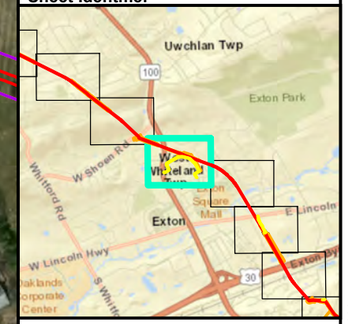


Legend

- Stationing
- Access Road
- Alignment Centerline
- Major Modification
- Limit of Disturbance
- Block Valve/Station
- NRCS Soils and Codes

Sheet Identifier



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NRCS SOILS MAP
ATTATCHMENT 5-26
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12. 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY, PA

TETRA TECH

Notes:
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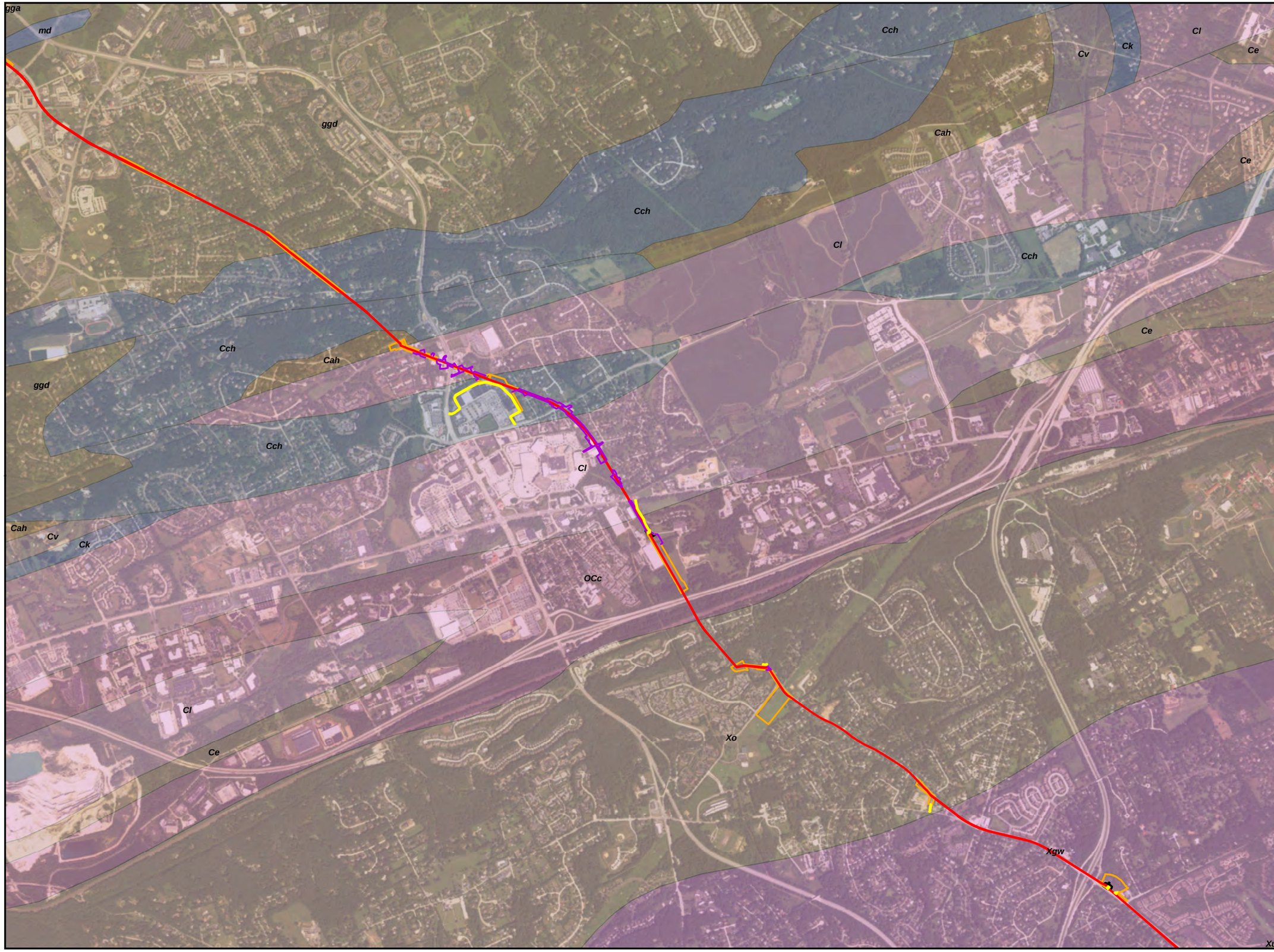
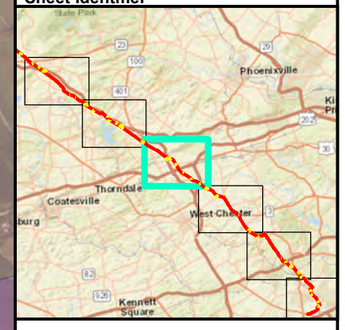


Legend

- Access Road
- Major Modification
- Alignment Centerline
- Limit of Disturbance
- Block Valve/Station
- Antietam and Harpers Formations undivided (Cah)
- Chickies Formation (Cch)
- Elbrook Formation (Ce)
- Kinzers Formation (Ck)
- Ledger Formation (Cl)
- Vintage Formation (Cv)
- Conestoga Formation (OCc)
- Glenarm Wissahickon Formation (Xgw)
- Octoraro Formation (Xo)
- Ultramafic rocks (Xu)
- Banded mafic gneiss (gga)
- Felsic and intermediate gneiss (ggd)
- Metadiabase (md)

Sheet Identifier



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Meters
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GEOLOGIC UNIT MAP
ATTACHMENT 5-3
PENNSYLVANIA PIPELINE PROJECT
NOVEMBER 12, 2016 ALIGNMENT
SUNOCO LOGISTICS, L.P.
CHESTER COUNTY,
PENNSYLVANIA

TETRA TECH

Notes:
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9.

NOV’S

Sunoco Pipeline, L.P. Environmental Compliance History in Pennsylvania for the Past 5 Years

Year	NOV Issued Date	Permit Number or Facility Name	County	Description of Violation	Compliance Schedule	Compliance Status
2017	9/26/2017	E-65-973 and ESG0500015001	Westmoreland	IR- Old William Penn; HDD 0270	All returns have been addressed and reports submitted. Waiting on DEP approval to restart.	Closed
2017	9/18/2017	E22-619 and ESG0300015002	Dauphin	IR- Susquehanna River; HDD 0280	DEP permission to continue drilling. HDD resumed drilling as of 10/6/17. All returns have been addressed and reports submitted.	Closed
2017	9/12/2017	E23-524 and ESG0100015001	Delaware	IR- HDD 0620. First release and NOV was received 7/20/17.	DEP permission to continue drilling obtained. HDD resumed drilling as of 10/6/17. All returns have been addressed and reports submitted.	Closed
2017	9/8/2017	E15-862 and ESG 0100015001	Chester	IR- HDD 290; Green Valley Road	All returns have been address. Required reporting submitted. Drill resumed as of 10/6/17.	Closed
2017	8/16/2017	E38-194 and ESG 0300015002	Lebanon	E&S Control Violation; Bchman Run	All required reports have been submitted and no further action required.	Closed
2017	7/28/2017	E65-973 and ESG0500015001	Westmoreland	IR- HDD 0015; Squibbs Road	HDD completed. All returns have been addressed and all required reports have been submitted.	Closed
2017	7/28/2017	E65-973 and ESG0500015001	Westmoreland	IR- Ten School Rd. HDD 0016	HDD completed. All returns have been addressed and required reports submitted.	Closed
2017	7/28/2017	E65-973 and ESG0500015001	Westmoreland	IR- Arona Road; HDD 0230	HDD completed. All returns have been addressed and required reports submitted.	Closed
2017	7/28/2017	E65-973 and ESG0500015001	Westmoreland	IR- Loyalhanna; HDD 0010	HDD completed. All returns have been addressed and required reports submitted.	Closed
2017	7/28/2017	E32-508 and ESG0500015001	Indiana	IR- Kendall Rd; HDD 0040	HDD completed. All returns have been addressed and required reports submitted.	Closed
2017	7/28/2017	E63-674 and ESG0500015001	Washington	IR- Ross Road; HDD 0100	HDD completed. All returns have been addressed and required reports submitted.	Closed
2017	7/28/2017	E63-674 and ESG0500015001	Washington	IR- Mingo Church Rd; HDD 0110	HDD on hold as of October 6, 2017. All returns have been addressed and required reports submitted. Request for restart submitted pending DEP authorization.	Closed
2017	7/28/2017	E02-1718 and ESG0500015001	Allegheny	IR-Forward Twp. HDD 0150	Guided Bore has been completed. All returns have been addressed and required reports submitted.	Closed
2017	7/24/2017	E15-862 and ESG 0100015001	Chester	IR - Shoen Road; HDD 0360	HDD currently on hold as of October 6, 2017. All returns have been addressed and required reports submitted. Request for restart submitted. Restart pending DEP authorization.	Subject to a Consent Order and Agreement
2017	5/17/2017	E21-449 and ESG 0300015002	Cumberland	IR - I 81 and LeTort WL-13 (second IR NOV 6/5/17).	DEP permission to resume drilling at I-81 and on going as of 10/6/17. LeTort drill in re-evaluation. All returns have been addressed and reports submitted.	Subject to a Consent Order and Agreement
2017	5/9/2017	E23-524and ESG 0100015001	Delaware	IR - Chester Creek; HDD 0631	DEP permission to continue drilling obtained. HDD resumed as of 10/6/17. All returns have been addressed and reports submitted.	Closed
2016	2/3/2016	Pipeline (Region 2)	PA	Water - odor and sheen complaint during 3rd party foreign line installation	All reports have been submitted and no further action required.	Closed
2015	6/1/2015	ESCGP-2 6513806 Mariner East (ME1)	PA	IR - ME1 HDD	All reports have been submitted and no further action required.	Closed

Sunoco Pipeline, L.P. Environmental Compliance History in Pennsylvania for the Past 5 Years

Year	NOV Issued Date	Permit Number or Facility Name	County	Description of Violation	Compliance Schedule	Compliance Status
2015	5/27/2015	ESCGP-2 6513806 Mariner East (ME1)	PA	IR - ME1 HDD	All reports have been submitted and no further action required.	Closed
2015	5/16/2015	ESCGP-2 6513806 Mariner East (ME1)	PA	IR - ME1 HDD	All reports have been submitted and no further action required.	Closed
2015	11/14/2015	Fort Mifflin Station	Delaware	Tanks - tank needed repair prior to return to service.	All reports have been submitted and no further action required.	Closed
2014	7/18/2014	ESCGP-2 6513806 Mairner East Pipeline (Region 2)	PA	Wetland - Improper wetland delineation	All reports have been submitted and no further action required.	Closed
2014	7/16/2014	ESCGP-2 6513806 Mairner East Pipeline (Region 2)	PA	Wetland - Improper wetland delineation	All reports have been submitted and no further action required.	Closed
2014	7/2/2014	ESCGP-2 6513806 Mairner East Pipeline (Region 2)	PA	Wetland - Improper wetland delineation	All reports have been submitted and no further action required.	Closed
2014	1/24/2014	Fort Mifflin Station	Delaware	Spill - Pipeline release	All reports have been submitted and no further action required.	Closed
2013	12/20/1013	Mariner East Pipeline	PA	Spill - Pipeline release	All reports have been submitted and no further action required.	Closed
2012	12/20/2012	Icedale Pump Station	Chester	Air - Late submittal of SMOP Air Permit Renewal	All reports have been submitted and no further action required.	Closed