

June 12, 2018

Mr. Matthew Gordon
Sunoco Logistics, L.P.
535 Fritztown Road
Sinking Spring, PA 19608

Re: Hydrogeological Reevaluation Report
Gradyville Road Crossing, Horizontal Directional Drill (HDD) Location (S3-0580)
PA DEP Permit No. E23-524
Edgmont Township
Delaware County

Dear Mr. Gordon:

The Department of Environmental Protection (DEP) has reviewed the HDD reevaluation analysis (Report) submitted on March 1, 2018, for the Gradyville Road Crossing Horizontal Directional Drill Location (S3-0580), DEP Permit No. E23-524. The Report is composed of the report titled "Horizontal Directional Drill Analysis Gradyville Road Crossing," prepared by Sunoco Pipeline, L.P. (SPLP or Sunoco), and the "HDD Hydrogeological Reevaluation Report," prepared by Groundwater and Environmental Services, Inc. (GES Report), on Sunoco's behalf. Collectively, these reports are referred to as the Reevaluation Report, for the purposes of this letter. The initial submission was posted on the DEP Mariner East II pipeline portal webpage on March 2, 2018, and public comments were received.

This reanalysis of the HDD installation of a 16-inch and 20-inch diameter pipeline paralleling Valley Road between Gradyville Road and Sycamore Mills has been completed in accordance with paragraphs 4 and 5 of the Corrected Stipulated Order (Order) issued under Environmental Hearing Board Docket No. 2017-009-L on August 10, 2017. This HDD is No. 20 on the list of HDDs included on Exhibit 2 of the Order. This HDD was not initiated before the issuance of the Order.

Pursuant to paragraphs 2, 4, and 5 of the Order, Sunoco proposed to reevaluate the original design profiles for the 16- and 20-inch HDDs to determine if the design could be improved to eliminate, reduce, or control the release or inadvertent return (IR) of drilling fluids to the surface of the ground or waters of the Commonwealth, and prevent impacts to water supplies during HDD operations. HDD specialists and geologists employed by SPLP have investigated the HDD design and subsurface geologic conditions for HDD S3-0580, and have made minor adjustments to the profile design, which included a minor extension in length of the proposed 20-inch pipeline. SPLP proposes to employ many of the HDD best management practices which are listed in the Reevaluation Report. Other than the implementation of these

drilling practices and procedures, no significant changes to the HDD plans for the pipelines at this location are recommended or planned.

The nearest surface water body to the HDD is a small tributary to Chester Creek, 500 feet west of the site. Chester Creek is located 1 mile west of the HDD. A pond is located 3,400 feet southwest of HDD S3-0580 near the Glen Mills Quarry. Other small private ponds exist in the area.

The Reevaluation Report provided an analysis of the following alternatives:

- **Open Trench:** Based on the potential land disturbance area to private and public properties, it is believed that open trenching this area would cause more burden than HDD to the citizens.
- **Rerouting:** This is not a viable option as the pipeline would have to cross similar infrastructure and some natural areas of concern (e.g., stream crossings).
- **HDD Alternative Boring Depths:** The original proposed HDD depth is unaltered.

Based on the technical review of the information submitted in the subject HDD Analysis and the related comments listed above, the following concerns and questions must be addressed:

1. Provide the following:
 - a. The location on the plan/profile drawings of the repaired leak on the Point Breeze to Montello pipeline as well as the type and location of facilities associated with monitoring and remediation of the spill. This will be useful in predicting when potentially contaminated cuttings and/or contaminated groundwater may be encountered in the HDD.
 - b. A more detailed plan which addresses not only procedures to be employed during drilling to properly handle potentially spill contaminated drill cuttings and groundwater but also adequately addresses and prevents migration of contaminated groundwater from the spill area post construction.
 - c. An adequate grouting plan. The currently proposed tremie grouting plan to be employed near the entry and exit points is inadequate. Please provide additional detail related to the proposed grouting plan.
 - d. An overall discussion of the Point Breeze pipeline spill that identifies all the regulatory agencies involved with overseeing the cleanup effort, the mitigation and monitoring requirements, and the time table for site remediation.

- e. Documentation that all appropriate agencies have been notified of the current HDD construction plans and concur that the proposed HDD will not result in adverse impacts.
2. With reference to Section 2.2.8 of the GES Report, explain the likely cause(s) for the loss of mud return encountered in drill hole B6-3W and evaluate this in conjunction with the decrease in RQD values at depth in this drill hole. Also, clarify and correct the statements on page 4 (Inadvertent Returns Discussion) to acknowledge conditions encountered in this drill hole.
3. The top line of Design and Construction Note No. 9 on the plan/profile drawings appears to have been erroneously removed. Provide a correction.
4. Revise the Report to acknowledge that SPLP will provide the drilling crew and company inspectors the location(s) data of potential zones of higher risk for fluid loss and IRs, including the area related to the previous spill area, and potential zones of fracture concentration identified by the fracture trace analysis along the drill path so that monitoring can be enhanced when drilling through these locations.
5. Surface geophysics need to be employed to provide evidence of the top of bedrock along the whole run of the pipeline. The five geotechnical borings installed, while very useful in determining fracture density and lithology, are insufficient to determine the top of bedrock outside of their sample locations.
6. A borehole geophysical suite needs to be performed in geotechnical borings to determine any local fracture sets that exist which may help determine preferential pathways of groundwater and potential drilling fluids.
7. A complaint and response plan needs to be created which is specific and prescriptive. Potential impacts and remedies need to be discussed and presented in table format.
8. The GES Report was signed and sealed by a P.G. It made the following two recommendations that were not incorporated into the first Report, which was not sealed by a professional of any kind. Explain why these two recommendations were not adopted by Sunoco:
 - a. The drill crew should be oriented, prior to initiation of drilling, to the locations of zones of higher risk for fluid loss and IRs, including fracture zones identified by the fracture trace analysis along the drill path at approximately 275 feet, 1,520 feet, and 2,740 feet from the northwest entry/exit point. Other zones of elevated risk include the borehole entry/exit points where drilling fluids may migrate through shallow low cohesive soils and saprolite as the drill descends from the entry and shallows toward the drill exit.

- b. Given the risk for fluid losses and IRs, a fluid loss mitigation plan (i.e., grouting or sealing) should be developed and implemented during and after construction. The annulus between the installed pipe and borehole wall should be properly sealed upon completion to prevent possible long-term migration of groundwater through the borehole annulus.
9. DEP agrees that leaving the annular space open carries the possibility of dewatering ponds and wetlands. As a remedy, the annular space around the pipe needs to be filled with a bentonite grout slurry or some other impervious medium.
10. Downhole geophysics were not performed. Geophysical techniques, including, but not limited to, caliper tests and ATV, need to be employed to determine fracture dips and strikes to determine a predominant fracture trace. This would provide data that will assist in understanding the direction of groundwater flow and likely paths of drilling fluids in the subsurface.
11. Given the geologic conditions present at this site, and in particular given the prediction that both Sunoco and DEP's reviewing geologists have reached, that this HDD has the potential to produce significant quantities of groundwater that would flow back to the entry point, during critical drilling phases Sunoco management/technical representatives need to be present on-site, and appropriate DEP regional staff need to be notified in advance of commencement of the phase.

Pending resolution of the above-listed comments and deficiencies, the following best management practices need to be adopted and implemented by SPLP as part of the reevaluation:

- a. SPLP will require and enforce the use of annular pressure monitoring during the drilling of the pilot hole, which assists in immediate identification of pressure changes indicative of loss of return flows or over pressurization of the annulus, managing development pressures that can induce an IR.
- b. SPLP inspectors will ensure that an appropriate diameter pilot tool, relative to the diameter of the drilling pipe, is used to ensure adequate "annulus spacing" around the drilling pipe exits to allow good return flows during the pilot drilling.
- c. Produced water management system will be implemented before drilling begins to handle water in excess of that required for the HDD. If excessive water is generated during the HDD, all wells within a 450-ft radius of the HDD need to be monitored periodically to evaluate changes in the water table.

- d. Soil cuttings will be carefully monitored for presence of volatile organics. If olfactory evidence, elevated photoionization detector (PID) readings, or a sheen suggests significant petroleum concentrations, drilling must be suspended until samples can be analyzed. Cuttings would be screened before disposal, as required by law.
- e. SPLP will mandate short-tripping of the reaming tools to ensure an open annulus is maintained to manage the potential inducement of IRs.
- f. SPLP must monitor drilling fluid viscosity, such that fissures and fractures in the subsurface are sealed during the drilling process.
- g. Based upon the behavior of the soil overburden and near subsurface geology during the entry and exit of the pilot phase, casing of the pilot hole can be implemented to control IRs where the profile depth is shallow and oversight of the pilot indicates a long-term risk of IRs that should be controlled.
- h. During the reaming phase, the use of Loss Control Materials can be implemented if indications of a potential IR are noted or an IR is observed.
- i. If LCMs prove ineffective to mitigate loss of returns or IRs, then grouting of the pilot hole may be implemented.

Public comments on the Reevaluation Report were reviewed and considered. Many of the comments received expressed concern regarding safety and long-term operations of the facility. A certain amount of uncertainty and unpredictability is inherent to HDD activities. In the event that unpredicted, unplanned, and unanticipated drilling returns, consequences, or impacts to the waters of the Commonwealth occur, Sunoco Pipeline, LP, and/or its contractors shall immediately abide by the project's HDD Inadvertent Return Assessment, Preparedness, Prevention and Contingency Plan as revised April 16, 2018.

In summary, the review of the submitted information demonstrates that IRs are highly possible during this boring activity and that the vertical structures in the bedrock may be a contributing factor. DEP concurs that the borehole depths are sufficiently deep to reduce the risk of IRs. However, to make this reevaluation viable, SPLP needs to adhere to the recommendations in the GES Report, and adequately address each of the comments, concerns and questions raised by DEP in this review letter.

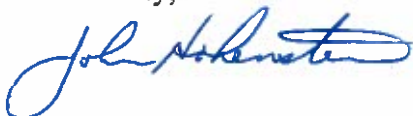
Mr. Matthew Gordon

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June 12, 2018

If you have additional questions, please contact me at 484.250.5171.

Sincerely,



John Hohenstein, P.E.
Chief, Dams and Waterways Section
Waterways and Wetlands

cc: Mr. Mulray, P.G., GES
Mr. Wardrop, P.G., GES
Ms. Wheeler, Delaware County Conservation District
Re 30 (GJS18WAW)163-1