SUNOCO PIPELINE
An ENERGY TRANSFER Company

535 Fritztown Road
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Via Electronic and First Class Mail
Dana Drake, P.E.
Environmental Program Manager
Waterway and Wetlands Program
Pennsylvania Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Re: Hydrogeological Reevaluation Report
Hildenbrand Road Crossing (S1B-0190)
Permit No. E65-973
Sewickley Township, Westmoreland County

Dear Ms. Drake:

In compliance with the Corrected Stipulated Order dated August 10, 2017 a Reevaluation Report on the above-referenced horizontal directional drill ("HDD") was submitted to the Department on November 27, 2017. The Department requested more information on the Reevaluation Report by letter dated December 15, 2017. Please accept this letter as a response. Your requests are bolded below followed by the response.

Item 1. Section 3.2.2, Page 11 of the hydrogeology report states that the HDD is not associated with conditions in which IRs generally occur except for potential unidentified open bedrock structural features. In addition, a fracture trace analysis indicated the revised bore profile transects three mapped fracture traces as depicted on Figure 4.

a. Regarding open bedrock structural features, what measures have been taken to identify and avoid these features?

Since the first use of HDD technology for pipeline installation in Pennsylvania, HDDs have been advanced through bedrock structural features. In nearly all geologic settings in Pennsylvania, advancing HDD drills through open pore space associated with structural features is unavoidable because they are widely distributed naturally throughout Pennsylvania. It should also be noted that mapped fracture traces (one mile in length or less) and lineaments (greater than one mile in length) or photo linears by fracture trace analysis, are the surficial expression on natural landscapes of vertical zones of bedrock fracture concentration. Therefore, fracture trace analysis is partly subjective, and every mapped fracture trace, including the three mapped fracture traces depicted on Figure 4, does not necessarily represent a zone of fracture concentration.

b. Please identify and describe any geotechnical survey method that were or could be used to identify these features?

Representative characteristics of local fractured bedrock were obtained by advancing two geotechnical borings in August 2017. One boring (B1-6E) collected 103 ft of bedrock core and the other (B1-6W) collected 115 ft of core representative of local bedrock. The fracture trace analysis described above was performed, as well.

Other methods could be used to verify whether a particular photo linear actually represents a zone of fracturing; however, once verified the information is not determinative as to whether or not the HDD should be rerouted. As described above, HDD drills are regularly installed in fractured bedrock.

While geotechnical information has been used to redesign the profile of HDD drills, it is rarely used to reroute the alignment of the drill. Photo linear mapping is useful for controlling IR risk, managing LORs, and in some cases addressing water supply complaints.

c. Did SPLP consider whether a slight re-route could avoid these features and eliminate or decrease the potential for an IR?

As described above, photo linears do not necessarily represent an actual zone of fracture concentration. Thus, it is not clear that the photo linears indicate that a slight reroute is necessary to avoid those features. More importantly, even if a photo linear did represent a zone of fracture concentration, avoiding this feature would not measurably decrease the potential for an IR; HDD drills are regularly installed in fractured bedrock without resulting in IRs.

d. Describe what measures will be implemented to mitigate the risks associated with these features?

An approach that has been taken on other Mariner East II HDDs to reduce potential IR risk associated with fracture traces and can be applied at HDD S1B-0190. The approach is to transfer photo linears onto the final plan and profile and provide the driller/site foreman with a copy. The professional geologist (PG) then discusses potential fractured bedrock conditions that may be encountered during drilling at the positions of the linear features. The PG explains the difference between a fracture trace and a lineament and discusses the limitations of the mapping in terms of accuracy and how they may represent zones of fracture concentration. The PG and driller monitor the drill advance at it nears the mapped features and look for the changes in pressure readings, drilling fluid returns, fluid pumping rates and rate of advancement that can indicate a loss of fluids and potential for an IR. When monitoring of these factors indicates a loss of returns (LOR) the drill is suspended, PADEP is notified, and project personnel work together to locate any IRs and the reason for the LOR. If an IR does not occur, the drill is re-

started upon PADEP approval. Upon re-start of the drill, the following actions are implemented to reduce the risk of IRs:

- Begin reinitiation of drilling by adding loss control material (LCM) to the drilling fluid mix and circulate this mixture until field observations indicate to stop the addition.
- Constantly perform focused monitoring of drilling fluid returns for indications of slow returns or loss of returns and suspend drilling activities again in the event such an event is observed and determine the cause.
- If bridging of drilling fluid returns is suspected, which would cause a loss of returns and an increase in pressure in the annulus, trip the drill string out and in for a few joints until returns indicate the bridge has dissipated. Conduct this procedure at a higher frequency when bridging is occurring.
- Implement constant IR monitoring of water ways and land during drilling shifts and expand monitoring areas.
- If an IR were to occur, the following procedure from Section 5.1.5 "Monitoring Protocol for Condition 3 – Inadvertent Returns" in the "HDD Inadvertent Return Assessment, Preparedness, Prevention and Contingency Plan", prepared by TetraTech, Inc. and revised August 8, 2017, will be implemented – "If the inadvertent return is 50 gallons or greater, or of unknown quantity, or is a second or subsequent inadvertent return at an HDD location; drilling operation will be suspended until PADEP inspects the site, concludes that further drilling will not result in additional returns of 50 gallons or greater, and approves a restart of drilling operations".

2. Section 4.0, Page 12 of the hydrogeology report states that the revised bore could intersect the reported water bearing zones of the identified potable well located 50 feet south of the alignment, thereby increasing the chances of hydraulic communication of the well with drilling fluids.

a. SPLP should evaluate alternatives that will avoid impacts to private water supplies.

The well reported at a 50 ft offset (PaGWIS data) to the bore alignment is not accurate. SPLP has received a response from this well owner; assessed the actual well location, and performed background water quality sampling. This well is offset 90 ft perpendicular to the entry radius of the HDD at approximately Station 4+50 on the revised HDD profile. At this station the 20-inch HDD profile is approximately 60 ft below the ground surface.

This well location is in immediate proximity to the ME 1 pipeline and two existing Dominion pipelines. The primary means of avoiding any feature or resource, including the periphery of this well, would be a re-route of the pipeline project. An analysis of alternatives, including a re-route analysis was included in the re-evaluation report for HDD S1B-0190 submitted on

November 27, 2017. This analysis concluded that the existing route with a revised HDD profile was the best alternative.

The risk to the well is use during the HDD, and drawing upon the groundwater while the HDD is ongoing. The HDD is an active "pressure event" in the aquifer that pushes upon the static ground water and at minimum would agitate settled sediments within the water bearing zones, or could result in transport of diluted drilling fluids towards the withdrawn zone for individual wells. As a result, active well use potentially could result in the uptake of turbid water. While this does not present a health hazard, it can be unsightly to users and could affect taste.

Although SPLP cannot force a well owner to accept water replacement, it is SPLP's intent to offer this well owner alternative water supply during the HDD. Non-use of this well during the HDD is the best method to prevent impact. If alternative water supplies are rejected by the landowner, SPLP will request permission to monitor the well during the HDD process. At 90 ft of distance from the HDD profile, if some turbidity is detected during the HDD, it is SPLP's experience at other HDDs that water quality is restored shortly after completion of the HDD.

b. Has SPLP notified all landowners within 450 feet of the ROW of the potential water impacts to private water supplies and of the offer to provided alternative water supplies during the HDD?

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

These letters were the third effort by SPLP for to gain information on which properties have private wells as the source of water supply; the location of the well and any general information on size and depth. With this information; SPLP can then analyze risk to the individual wells and take proactive steps towards protection and the provision of alternate water supply during the HDD.

To date, SPLP's outreach has resulted in the verification of two private wells. The well discussed above, and a second located 223 ft southwest of the HDD entry point. Based upon a review of aerial photography, two or three additional wells may fall within the 450 foot adjacency zone, but these are yet to be verified.

Based upon the understanding of the groundwater levels and movement through the overburden and subsurface bedrock fractures and fissures as described in the hydrogeology report, SPLP believes that individual well use during active drilling for wells located within 150 linear ft on either side of the profile may be affected.

SPLP will engage in a last effort to encourage landowners to make advance arrangements for the supply of alternative water sources as necessary during the HDDs. Agents for SPLP will initiate direct contact by phone or in person, and SPLP will prepare a second communication specifically directed to all landowners with known wells, or suspected unidentified water supplies within 150 ft of the HDD profiles. The letter will communicate our analysis regarding their water supply. It will clearly state the preference to establishing communications in advance of the work; permission to perform monitoring during the HDDs, and landowners preference to installing alternative water supply in advance of the HDDs.

During the active HDD process, any landowner contacting SPLP with concerns about their water supply will be responded to and PADEP will be notified in accordance with the water supply plan and existing permit conditions. If an impact from the HDD is verified, then SPLP will encourage the affected landowner to allow the installation of alternative water supply.

c. SPLP should evaluate and discuss the likelihood of permanent impacts to water supplies resulting from the revised bore.

The potential for a permanent impact to water supplies at this HDD is low to none. For a water well supply to be permanently impacted, the HDD would have to result in the sealing by bentonite drilling fluid and cuttings of a number of water bearing fractures within the bedrock aquifer to the extent that the yield of the well is affected. For this to occur, the well would have to be within the primary pressure zone of the annulus of the HDD, *i.e.*, within 2-3 ft of the completed drill hole. So long as the easiest pathway, lowest pressure point for return of fluids and cuttings is maintained (back to the drill rig within the borehole annulus), then the outward migration of fluids and cuttings into the adjacent formation during the HDD process is minimized.

3. HDD S1B-0190 is located proximal to both conventional and unconventional gas wells. Given the fractured nature of the area, SPLP should evaluate the potential for gas communication between the existing gas wells and the HDD. As part of the evaluation, SPLP should consider the potential risk of gas communication with the identified private water well via the HDD line.

At maximum depth, the S1B-0190 HDD is 64 ft below the ground surface. Based upon data from eMapPA, cross checked to current aerial photography for verification of location; there are six (6) conventional or unconventional wells in proximity to this HDD, offset at distances

varying from 732 ft to 1,470 ft. All of these wells were installed between 2002 and 2008 and are therefore modern well installations. Considering that Pennsylvania Code, Chapter 78; Subchapter D § 78.83 (c) requires well operators to set cemented casing "50 foot below the deepest fresh groundwater level, or 50 foot into consolidate rock", and that these procedures were adhered to by these well operators, then the potential for gas communication between the existing gas wells and the HDD should be none.

4. There have been issues associated with HDDs at other nearby locations, specifically the MEII Sewickley Creek HDD site and as well as an IR in June 2017 caused by Tenaska, Inc's HDD that occurred in Sewickley Creek. Please discuss the geology of these sites as compared to the Hildenbrand HDD site and whether any information is available on the other sites that SPLP could consider that would avoid similar issues at this HDD site.

The reported "issue" at the MEII Sewickley Creek HDD is groundwater discharge around the HDD point of entry at the west terminus of the installation. Accordingly, the site-specific geology did not contribute to the root cause of the issue at the MEII Sewickley Creek HDD, and therefore any geologic comparison between the MEII Sewickley Creek HDD site and the Hildenbrand HDD site would not provide information relevant to the risk of IRs at the Hildenbrand HDD site.

The difference in elevation between the entry point and exit point of the HDD at Sewickley Creek is 274 ft and the majority of the profile is elevated above the point of entry. The HDD profile intersected water bearing fractures and bedding plane partings in the bedrock. This water, because of the elevation difference and effect of gravity, slowly percolates downward through the HDD profile to the point of entry and discharges to the land surface. SPLP has already reported to the Department our intent to install grout seals into the annulus of this HDD, which will resolve any water discharge issue. SPLP has successfully addressed groundwater discharge issues at other locations on the MEII project, with DEP approval, using similar methods.

At the Hildenbrand Road HDD location, the difference in elevation between the HDD points of entry and exit is 28 ft and the majority of the profile is set below the entry and exit points. The groundwater discharge issue, at either the point of entry or exit, will not occur at this HDD since there is no possible way for groundwater to develop a sufficient head pressure within the profile to overcome gravity.

SPLP has no knowledge of an IR occurring in June 2017 during an HDD for Tenaska, Inc. and cannot opine on the cause of the event.

SPLP appreciates the effort required to review and consider these responses to your request for information for the Reanalysis of the Hildenbrand Road HDD (S1B-0190).

Sincerely,

Matthew Gordon
Project Director