

June 8, 2019

Via Electronic Mail

Mr. Scott R. Williamson  
Program Manager, Waterways & Wetlands Program  
Pennsylvania Department of Environmental Protection  
Southcentral Regional Office  
909 Elmerton Avenue  
Harrisburg, PA 17110-8200

**Re: DEP HDD Re-Evaluation Report – Request for Additional Information  
Middle Creek & T307 16" Horizontal Directional Drill (S3-0110-16)  
Permit No. E38-194  
Heidelberg Township, Lebanon County**

Dear Mr. Williamson:

In compliance with the Corrected Stipulated Order dated August 10, 2017 a Re-Evaluation Report for the above-referenced horizontal directional drill (HDD) was submitted to the Pennsylvania Department of Environmental Protection (Department) on February 25, 2019. In an email dated May 21, 2019, the Department requested further information, please accept this letter as a response. Your requests are bolded below followed by Sunoco Pipeline, LP (SPLP) responses.

**1. Related to Pipe Stress Radius: Provide further explanation of how the following statement applies to this HDD re-evaluation, “Pipe stress allowances are an integral part of the design calculations performed for each HDD.”**

For steel pipe the “pipe stress allowance” is the amount of curvature that a piece or length of pipeline can bend without resulting in damages such as a “kink” or “crimp” in the wall of the pipe. The innate curvature ability of pipe is termed the “free stress radius”. The stress allowance of the pipe is determined by the ductility of the steel, wall thickness, and the diameter of the pipe. An HDD design is limited by the horizontal distance between the points of entry and exit and the free stress radius of the pipe.

Ductility of the steel used for pipelines is determined by the percentage of carbon within the steel. Generally, steel pipe is categorized as either “low carbon” having less than 0.3% carbon content within the steel, or “high carbon” having greater than 3% carbon within the steel. As the carbon content within the steel used to make the pipe increases, the flexibility (ductility) of the pipe is decreased. The X70 16-inch pipe utilized on the Mariner project is a low carbon (high ductility) steel pipe.

The design of an HDD profile accounts for the free stress radius of the pipeline segment to be pulled into the drilled entry, through the entry radius of curvature at maximum horizontal depth, out the exit radius leaving maximum depth, and out the drilled exit; therefore, each HDD has a minimum of four (4) points

of pipeline curvature to assess for pipeline stress. Additionally, a horizontally drilled profile is not a “perfect” pathway, especially when drilled through rock formations. The pilot tool cutting into the rock face has a larger cutting face than the drill stem pushing the tool forward, which results in flexibility of the tooling within the pilot hole, and as a result the pilot tool will drift in orientation as proceeding forward because the cutting tool will proceed easier into softer material while cutting due to natural variances in hardness of the materials being cut, whether they are soils or rock. Steering of the pilot tool is used to correct drifting as it occurs. As a result of this natural drifting during completion of the pilot hole, the entire length of the drilled pilot hole is assessed for stress allowances at three (3) joint intervals before reaming of the annulus is permitted. If errors during pilot drilling or reaming occur and a mid-point is identified that would breach the pipe stress allowance, then the use of an over-reamed annulus is assessed for breach of the stress allowance. In cases where an over-reamed annulus will not correct the stress problem, the HDD has to be re-drilled.

All the information and stress assessment procedures discussed above are incorporated into the profile design and implemented in analysis of the drilling profile to ensure the integrity of the pipeline as installed.

Specifically to this redesigned HDD profile, the entry angle at the west end of the profile at 16 degrees is at the “break over” tolerance for tying in the HDD pipe segment to the conventionally laid pipe. The exit angle at 12 degrees is below the pull through stress allowance, and will allow for the pipeline pullback without using cranes to support the pipe. The 2,000 ft radius into and out of the horizontal run is below the pipe’s stress allowance and provides a buffer in case drift and corrections are required during drilling of the pilot hole.

SPLP submits that we have been, and are, in complete compliance with the agreed terms and analysis requirements of the Order, as agreed to by the Department, and that no further analysis is required for the Department to consent to the start of this HDD. SPLP requests that the Department approve the Re-evaluation Report for the Middle Creek & T307 Crossing Horizontal Directional Drill (S3-0110-16) as soon as possible.

Sincerely,



Larry J. Gremminger, CWB  
Vice-President – Environmental, Health & Safety  
Energy Transfer Partners  
Mariner East 2 Pipeline Project