**Transcontinental Gas Pipe Line Company, LLC**

***PA DEP Section 401 Water Quality Certification Application***

**Environmental Assessment**

**Appendix S3-6 – Alternatives Analysis**

**Leidy South Project**

**August 2019**

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# ALTERNATIVE ANALYSIS

## 1.0 Introduction

Transco is proposing the Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland. The Project consists of the following components:

- 6.3 miles of 36-inch pipeline loop along Transco's Leidy Line in Clinton County, Pennsylvania (Hensel Replacement) and the related abandonment of 5.8 miles of existing 23.375-inch pipeline on Leidy Line A;
- 2.4 miles of 36-inch pipeline loop along Transco's Leidy Line in Clinton County, Pennsylvania (Hilltop Loop);
- 3.5 miles of 42-inch pipeline loop along Transco's Leidy Line in Lycoming County, Pennsylvania (Benton Loop);
- Existing Compressor Station 605 (Wyoming County, Pennsylvania);
    - Increase the total certificated horsepower of the two electric motor-driven units from 30,000 horsepower (HP) to 42,000 HP and modifications to existing coolers;
- New Compressor Station 607 (Luzerne County, Pennsylvania);
    - Install two gas turbine-driven compressor units (23,465 nominal HP at International Organization for Standardization [ISO] conditions each, 46,930 HP total) and gas coolers;
- Existing Compressor Station 610 (Columbia County, Pennsylvania);
    - Add one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions) and gas cooling;

  - Increase the total certificated horsepower of the two electric motor-driven units from 40,000 HP to 42,000 HP and re-wheel the existing compressors;

- New Compressor Station 620 (Schuylkill County, Pennsylvania);
  - Install one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions);
- Ancillary facilities, such as mainline valves (MLVs), communication facilities, cathodic protection and pig launchers and receivers in Pennsylvania.

Subject to FERC approval of the Project and receipt of the necessary permits and authorizations, Transco anticipates that construction of the Project will commence in winter 2020/2021 to meet a target in-service date of December 1, 2021.

This alternatives analysis is consistent with the Federal Energy Regulatory Commission's (FERC) regulatory requirements as set forth in 18 Code of Federal Regulations 380.15 and 25 PA. Code § 105.13(e)(viii). Thus, it contains a detailed analysis of alternatives to the proposed action, including alternative locations, routings or designs to avoid or minimize environmental impacts.

## 2.0 No-Action Alternative

Under the No-Action Alternative, the Project would not be constructed or operated. The potential environmental impacts of construction and operation of the Project would not occur; however, this alternative would not meet the purpose and need for the Project.

The No-Action Alternative would prevent Transco from providing 582,400 Dth/d of incremental firm transportation capacity to Transco's River Road Regulator Station in Lancaster County, Pennsylvania. In addition, this alternative would prevent Transco from providing additional takeaway capacity from the Marcellus and Utica Shale production areas to support future gas production, and from supporting the overall reliability and diversification of energy infrastructure along the Atlantic seaboard.

The No-Action Alternative would not meet the purpose of the Project, which is to alleviate the constrained takeaway capacity from the Marcellus and Utica Shale production areas and support the overall reliability and diversification of energy infrastructure along the Atlantic seaboard. This assessment is based, in part, on an analysis of existing Transco facilities in or

near the Project area, which do not provide adequate pipeline takeaway capacity for transportation of natural gas to meet current transportation demand (see Section 10.4).

If the No-Action Alternative is selected, Transco's customers will need to:

- Seek other transportation services;
- Forgo meeting their natural gas demand until energy conservation measures stabilize or decrease demand, possibly limiting their growth and the growth of the local economies they serve; and
- Depend on other future development projects with unpredictable schedules and undetermined environmental impacts.

Because existing alternative sources of energy, conservation, and other projects are currently impractical, not available, and/or insufficient to meet the transportation demand addressed by the Project, the No-Action Alternative cannot be the proposed alternative. The No-Action Alternative does not meet the Project objectives of providing the additional transportation capacity of natural gas requested by its customers within the required time frame.

## 3.0 Design Alternatives

Transco's Precedent Agreements with Seneca Resources Corporation, Cabot Oil & Gas Corporation and UGI Utilities require Transco to provide the requested incremental capacity from the existing Leidy Hub and Zick Receipt Point to Transco's River Road Regulator Station in Lancaster County, Pennsylvania. Transco completed hydraulic modeling to identify the scope of facilities and facility modifications required to meet the Project's purpose and need. Then, as outlined in the following sections, evaluated these alternatives to determine which set of facilities provided the best opportunity to avoid and minimize environmental impacts while still meeting the contractual obligations of the project.

## 3.1 System Alternatives

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the purpose and need of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Project, although some modifications or additions to another existing pipeline system may be required to increase its capacity, or another entirely new system may need to be constructed. Such modifications or additions would result in environmental impacts that could be less than, similar to, or potentially greater than those associated with the proposed Project.

In order to be a viable system alternative to the proposed Project, potential system alternatives must meet three criteria:

- The system must be capable of transporting up to 582,400 Dth/d of natural gas to growing markets in Transco's Zone 6;
- The system alternative must be capable of transporting the required volumes within the same schedule as the proposed Project;
- Use of an alternative system must be able to meet the criteria above and at the same time result in reduced environmental impacts when compared to the proposed Project.

### *3.1.1 Existing Pipeline Systems*

Transco operates the Transco Leidy Line system, Central Penn Line (CPL) system, and the Mainline system within the Project area. Transco's existing systems do not have any available unsubscribed capacity to service the volume under contract for the Project. Therefore, Transco's systems currently are not capable of providing an incremental 582,400 Dth/d of year-round firm transportation capacity from the Marcellus and Utica Shale production areas in northern and western Pennsylvania to Transco's Mainline at the River Road Regulator Station in Lancaster County, Pennsylvania.

Transco has identified four other existing interstate natural gas transmission pipeline systems in the Project area: Columbia Gas Transmission, LLC; Dominion Energy Transmission, Inc.; Tennessee Gas Pipeline; and Texas Eastern Transmission, LP (see Figure 10A-1 in Appendix 10A). Based on review of unsubscribed capacity, none of these existing pipeline systems are presently capable of transporting the 582,400 Dth/d without expansion of their existing systems or construction of new systems (Columbia Gas Transmission, LLC 2019; Dominion Energy, Inc. 2019; Tennessee Gas Pipeline Company L.L.C. 2019; Texas Eastern Transmission, LP 2019).

Transco does not have access to the proprietary design criteria and operational data of other pipeline operators' respective systems; however, enough public information is available to estimate the systems capabilities. Using this information, Transco concludes that these existing pipeline systems are not presently capable of transporting the required volumes without expansion of their existing system or construction of a new system to meet the Project objective of providing an incremental 582,400 Dth/d of year-round firm transportation capacity from the

Marcellus and Utica Shale production areas in northern and western Pennsylvania to Transco's Mainline at the River Road Regulator Station in Lancaster County, Pennsylvania. Furthermore, modifications to any other company's pipeline system would likely require an interconnect with, and expansion of, Transco's Mainline system to transport incremental volumes to Transco's existing market areas. Such modifications or additions would result in environmental impacts that could be equal to or greater than those associated with the proposed Project.

### *3.1.2 Compressor Station Loop Intensive Alternatives*

Transco identified four loop-intensive system alternatives in lieu of installing additional HP at existing compressor stations, and/or in lieu of new compressor stations. The loop-intensive alternatives would emphasize the use of pipeline looping along the existing CPL assets to meet the Project capacity demand. The loop-intensive system alternatives are listed below. For the purposes of this comparison, Transco assumed each alternative would be fully co-located with the existing CPL rights-of-ways (ROWs). Note that the distance between beginning and ending mileposts (MPs) may not reflect the actual length of each potential loop; the length of each loop is based on the distance between MPs along existing pipelines. Thus, crossover or variations of the pipeline loops would lengthen the mileage when compared to the existing pipelines and MPs. The loop intensive alternatives were considered to replace the additional compression (i.e., new compressor stations and modifications to existing compressor stations) proposed by the Project. Under each loop intensive alternative, the Hensel Replacement, Hilltop Loop, and Benton Loop would still be required to meet the Project's purpose and need.

#### 3.1.2.1 Loop-Intensive Alternative to Compressor Station 607

Transco considered a loop-intensive alternative that would eliminate the need to install new Compressor Station 607. The Loop-Intensive Alternative to Compressor Station 607 would require 16.9 miles of 36-inch loop from the Zick Interconnect to CPL North MP 43.8 in Susquehanna and Wyoming Counties, Pennsylvania (see Figure 10A-2). Table 2-1 provides a comparison of the environmental impacts of the Project (Compressor Station 607) and this loop-intensive alternative.

**Table 2-1**
**Comparison of the Environmental Impacts of Compressor Station 607 and the Loop-Intensive Alternative**

| Factor | Unit | Compressor Station 607 | Loop-Intensive Alternative |
|---|---|---|---|
| Length of pipeline | Miles | N/A | 16.9 |
| Construction ROW[a] | Acres | 18.0 | 204.5 |

**Table 2-1**
**Comparison of the Environmental Impacts of Compressor Station 607 and the Loop-Intensive Alternative**

| Factor | Unit | Compressor Station 607 | Loop-Intensive Alternative |
|---|---|---|---|
| Operation ROW[a] | Acres | 12.3 | 51.1 |
| Construction impacts on forested land | Acres | 3.2 | 109.8 |
| Operation impacts on forested land | Acres | 2.5 | 27.3 |
| Construction impacts on wetlands (NWI) | Acres | 0.0 | 2.3 |
| Operation impacts on wetlands (NWI) | Acres | 0.0 | 0.6 |
| Number of waterbody crossings (NHD) | Count | 0 | 0 |
| Number of stream crossings (NHD) | Count | 0 | 29 |
| Number of residences within 50 feet of the construction ROW | Count | 0 | 0 |
| Number of landowners crossed by the construction ROW | Count | 0 | 105 |

Sources: USFWS 2016; USGS 2016

[a] Assumes a construction ROW width of 100 feet and an operational ROW of 25 feet on the outermost existing CPL. The additional 25 feet of permanent ROW overlaps with existing, maintained Transco ROW and was therefore not included in this impact analysis.

Key:
N/A = not applicable
NHD = National Hydrographic Database
NWI = National Wetlands Inventory
ROW = Right-of-way

Construction of the additional 16.9 miles of pipeline loop would impact approximately 204.5 acres during construction and 51.1 acres during operation, and would directly impact approximately 105 new landowners, requiring a new permanent easement for its entire length. In contrast, approximately 18.0 acres would be used for construction of Compressor Station 607 and 12.3 acres would be required for its operation. Construction and operation of the new compressor station would not affect any streams, where the Loop-Intensive Alternative would cross approximately 29 streams. In addition, more impacts on wetlands, sensitive species, and cultural resources would occur with construction of pipeline looping. Based on significantly greater land requirements and corresponding environmental impacts, and affecting many more landowners, this alternative was eliminated from further consideration.

#### 3.1.2.2 Loop-Intensive Alternative to Compressor Station 620

Transco considered a loop-intensive alternative that would eliminate the need to install the new Compressor Station 620. The Loop-Intensive Alternative to Compressor Station 620 would

require 37.0 miles of 42-inch loop from Compressor Station 610 discharge to CPL North MP 78.0 in Columbia, Northumberland, and Schuylkill Counties, Pennsylvania (see Figure 10A-3). Table 2-2 provides a comparison of the environmental impacts of the Project (Compressor Station 620) and this loop-intensive alternative.

**Table 2-2**
**Comparison of the Environmental Impacts of Compressor Station 620 and the Loop-Intensive Alternative**

| Factor | Unit | Compressor Station 620 | Loop-Intensive Alternative |
|---|---|---|---|
| Length of pipeline | Miles | N/A | 37.0 |
| Construction ROW[a] | Acres | 45.3 | 448.5 |
| Operation ROW[a] | Acres | 24.2 | 112.1 |
| Construction impacts on forested land | Acres | 0.8 | 83.7 |
| Operation impacts on forested land | Acres | 0.0 | 19.7 |
| Construction impacts on wetlands (NWI) | Acres | 0.0 | 4.0 |
| Operation impacts on wetlands (NWI) | Acres | 0.0 | 1.0 |
| Number of waterbody crossings (NHD) | Count | 0 | 1 |
| Number of stream crossings (NHD) | Count | 0 | 128 |
| Number of residences within 50 feet of the construction ROW | Count | 0 | 0 |
| Number of landowners crossed by the construction ROW | Count | 0 | 245 |

Sources: USFWS 2016; USGS 2016

[a] Assumes a construction ROW width of 100 feet and an operational ROW of 25 feet on the outermost existing CPL. The additional 25 feet of permanent ROW overlaps with existing, maintained Transco ROW and was therefore not included in this impact analysis.

Key:
N/A = not applicable
NHD = National Hydrographic Database
NWI = National Wetlands Inventory
ROW = Right-of-way

Construction of the additional 37.0 miles of pipeline loop would impact approximately 448.5 acres during construction and 112.1 acres during operation of this alternative, and would directly impact approximately 245 new landowners, requiring a new permanent easement for its entire length. In contrast, the approximately 45.3 acres would be used for construction of Compressor Station 620 and 24.2 acres would be required for its operation. Construction and operation of the new compressor station would not affect any streams, where the new pipeline loop would cross approximately 128 streams. In addition, more impacts on wetlands, sensitive

species, and cultural resources would occur with construction of the pipeline loop. Based on significantly greater land requirements and corresponding environmental impacts, and affecting many more landowners, this alternative was eliminated from further consideration.

#### 3.1.2.3 Loop-Intensive Alternative to Modifications at Existing Compressor Station 610

Transco considered a loop-intensive alternative that would eliminate the need to modify (i.e., install additional horsepower) at existing Compressor Station 610. The Loop-Intensive Alternative to Modifications at Existing Compressor Station 610 would require 42.4 miles of 42-inch loop from West Diamond to CPL South MP 85.5 in Columbia and Northumberland Counties, Pennsylvania (see Figure 10A-4). Table 2-3 provides a comparison of the environmental impacts of the Project (Modifications to Compressor Station 610) and this loop-intensive alternative.

**Table 2-3**
**Comparison of the Environmental Impacts of Modifications to Compressor Station 610 and the Loop-Intensive Alternative**

| Factor | Unit | Modifications to Compressor Station 610 | Loop-Intensive Alternative |
|---|---|---|---|
| Length of pipeline | Miles | N/A | 42.4 |
| Construction ROW[a] | Acres | 33.7 | 513.8 |
| Operation ROW[a] | Acres | 0.0 | 128.6 |
| Construction impacts on forested land | Acres | 0.3 | 115.8 |
| Operation impacts on forested land | Acres | 0.0 | 27.9 |
| Construction impacts on wetlands (NWI) | Acres | 0.0 | 4.1 |
| Operation impacts on wetlands (NWI) | Acres | 0.0 | 1.0 |
| Number of waterbody crossings (NHD) | Count | 0 | 0 |
| Number of stream crossings (NHD) | Count | 0 | 148 |
| Number of residences within 50 feet of the construction ROW | Count | 0 | 0 |
| Number of landowners crossed by the construction ROW | Count | 0 | 280 |

Sources: USFWS 2016; USGS 2016

[a] Assumes a construction ROW width of 100 feet and an operational ROW of 25 feet on the outermost existing CPL. The additional 25 feet of permanent ROW overlaps with existing, maintained Transco ROW and was therefore not included in this impact analysis.

Key:
N/A = not applicable
NHD = National Hydrographic Database
NWI = National Wetlands Inventory
ROW = Right-of-way

Construction of the additional 42.4.0 miles of pipeline loop would impact approximately 513.8.5 acres during construction and 128.6 acres during operation of this alternative, and would directly impact approximately 280 new landowners, requiring a new permanent easement for its entire length. In contrast, the approximately 33.7 acres would be used for construction of Compressor Station 610 and the operational footprint would be within the existing facility. Construction and operation of the new compressor station would not affect any streams, where the new pipeline loop would cross approximately 148 streams. In addition, more impacts on wetlands, sensitive species, and cultural resources would occur with construction of the pipeline loop. Based on significantly greater land requirements and corresponding environmental impacts, and affecting many more landowners, this alternative was eliminated from further consideration.

#### 3.1.2.4 Loop-Intensive Alternative to Compressor Station 607, Compressor Station 620, Modifications at Existing Compressor Station 610 and Compressor Station 605

Transco considered a loop-intensive alternative that would eliminate the need for the new Compressor Station 607, new Compressor Station 620, and modifications to existing Compressor Station 610 and Compressor Station 605. The Loop-Intensive Alternative to Compressor Station 607, Compressor Station 620, Modifications at Existing Compressor Station 610 and Compressor Station 605 would require 16.9 miles of 36-inch loop from the Zick Interconnect to CPL North MP 43.79 and 78.8 miles of 42-inch loop from West Diamond to CPL South MP 48.70 in Susquehanna, Wyoming, Columbia, Northumberland and Lebanon Counties, Pennsylvania (see Figure 10A-5). Table 2-4 provides a comparison of the environmental impacts of the Project (Compressor Station 607, Compressor Station 620, Modifications at Existing Compressor Station 610 and Compressor Station 605) and this loop-intensive alternative.

Construction of the additional 95.7 miles of pipeline loop would result in substantively greater environmental disturbance over the short- and long-term than the proposed Compressor Station 607, Compressor Station 620, and modifications at the existing Compressor Station 610 and Compressor Station 605, impacting approximately 1,160.1 acres during construction and 290.1 acres during operation. The pipeline loop would directly impact approximately 431 new landowners, requiring a new permanent easement for its entire length. In comparison, the impacts of constructing the cumulative compression/HP proposed for the Project is 97.1 acres. In addition, the modifications at Compressor Station 605 would occur within the existing compressor station fence line, and modifications at Compressor Station 610 would occur within the area previously disturbed during construction of the existing compressor station.

In addition, more impacts on wetlands, sensitive species, and cultural resources are anticipated with construction of pipeline looping. Based on significantly greater land requirements and corresponding environmental impacts, and affecting many more landowners, this alternative was eliminated from further consideration.

**Table 2-4**
**Comparison of the Environmental Impacts of Compressor Station 607, Compressor Station 620, Modifications at Existing Compressor Station 610 and Compressor Station 605 and the Loop-Intensive Alternative**

| Factor | Unit | Compressor Station Impacts | Loop-Intensive Alternative |
|---|---|---|---|
| Length of pipeline | Miles | N/A | 95.7 |
| Construction ROW[a] | Acres | 97.1 | 1,160.1 |

**Table 2-4**
**Comparison of the Environmental Impacts of Compressor Station 607, Compressor Station 620, Modifications at Existing Compressor Station 610 and Compressor Station 605 and the Loop-Intensive Alternative**

| Factor | Unit | Compressor Station Impacts | Loop-Intensive Alternative |
|---|---|---|---|
| Operation ROW[a] | Acres | 36.5 | 290.1 |
| Construction impacts on forested land | Acres | 4.3 | 293.0 |
| Operation impacts on forested land | Acres | 2.5 | 69.8 |
| Construction impacts on wetlands (NWI) | Acres | 0.0 | 9.9 |
| Operation impacts on wetlands (NWI) | Acres | 0.0 | 2.5 |
| Number of waterbody crossings (NHD) | Count | 0 | 2 |
| Number of stream crossings (NHD) | Count | 0 | 269 |
| Number of residences within 50 feet of the construction ROW | Count | 0 | 0 |
| Number of landowners crossed by the construction ROW | Count | 0 | 431 |

Sources: USFWS 2016; USGS 2016

[a] Assumes a construction ROW width of 100 feet and an operational ROW of 25 feet on the outermost existing CPL. The additional 25 feet of permanent ROW overlaps with existing, maintained Transco ROW and was therefore not included in this impact analysis.

Key:
N/A = not applicable
NHD = National Hydrographic Database
NWI = National Wetlands Inventory
ROW = Right-of-way

### *3.1.3 System Alternatives Analysis Conclusion*

Without the expansion and modifications proposed for the Project, Transco's existing facilities lack the capacity to transport additional volumes needed while maintaining the delivery volume commitments to its existing customers. Transco's proposed Project can achieve its objectives and maintain the overall system integrity, safety, and reliability for both new and existing customers. Transco believes that its design is as efficient as, or more efficient than, system alternatives that could be proposed to provide the same service. Since Transco can construct its facilities with construction and mitigation measures that would minimize environmental impacts, likely comparable to or less than system alternatives, system alternatives were not considered to be preferable to this Project.

## 3.2 Route Alternatives

Transco's Precedent Agreements with Seneca Resources Corporation, Cabot Oil & Gas Corporation, and UGI Utilities require Transco to provide the requested incremental capacity from the existing Leidy Hub and Zick Receipt Point to Transco's River Road Regulator Station. Transco completed hydraulic modeling to identify the segments on its existing Leidy Line system that will require upgrades to achieve the Project's purpose and need:

- MP 183.55 to MP 186.01 (Proposed Hilltop Loop);
- MP 188.51 to Leidy Hub at MP 194.00 (Proposed Hensel Replacement); and
- MP 116.95 to MP 120.44 (Proposed Benton Loop).

The locations of the pipeline loops and replacements were selected in areas that will allow Transco to install the proposed Leidy Line D from the Leidy Hub to MP 116.95 while co-locating with Transco's existing right-of-way (ROW). Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. Based on the results, the proposed 36-inch and 42-inch diameter pipelines are required to meet the necessary Project demand. Further, the diameters of the proposed pipeline loops and replacement match the diameters of the existing Leidy Line, thereby reducing the need for additional MLV facilities containing pig launchers/receivers and minimizing the need for further aboveground facilities.

### *3.2.1 Hilltop Loop*

The Hilltop Loop is co-located with the existing Leidy Line ROW. Once constructed and in operation, Transco will refer to the Hilltop Loop as Leidy Line D. Typically, deviations from existing ROW result in additional construction impacts, additional installation costs, and additional operating procedures (e.g., two separate ROWs to maintain instead of one). Pipeline loops are usually shorter and more hydraulically efficient than deviations because of their placement adjacent to the existing pipeline. For these reasons, Transco has not developed any route alternatives for the Hilltop Loop.

### *3.2.2 Hensel Replacement*

The Hensel Replacement involves replacement of the capacity of the existing 23.375-inch Leidy Line A with 6.3 miles of 36-inch pipe (5.5 miles of which are within Sproul State Forest), and related abandonment of 5.8 miles of the existing 23.375-inch Leidy Line A (5.3 miles of which are within Sproul State Forest). Transco proposes to abandon and remove a portion of the

existing Leidy Line A except for the section within the Tamarack Swamp Natural Area and adjacent wetlands (approximately 0.8 mile), which will be abandoned in place and grouted to limit impacts to the Tamarack Swamp Natural Area and adjacent wetlands.

The Hensel Replacement crosses Sproul State Forest for 5.5 miles. Transco developed the proposed alignment of the Hensel Replacement to minimize overall impacts within the Sproul State Forest and based on input received from the DCNR during the pre-survey meeting held April 19, 2019. Beginning at MP 188.51, the proposed Hensel Replacement follows Transco's ROW for Leidy Lines A, B, and C to MP 190.59, where Leidy Line C crosses over Leidy Lines A and B and runs along its own ROW to the southwest. From here, the Hensel Replacement continues along the A and B Lines' ROW to MP 192.93. The Hensel Replacement exits the Leidy Lines A and B ROW at this location and follows an electric transmission line ROW to the south for approximately 0.3 mile, where it joins the Leidy Line C ROW at MP 193.10. The purpose of this deviation from the Leidy Lines A and B ROW is to avoid disturbance of the Tamarack Swamp Natural Area. Per the Clinton County Natural Heritage Inventory, maintenance or removal of the existing pipelines through this natural area is unadvised as doing so could lead to disruption of the biological community (Western Pennsylvania Conservancy 2019). The Hensel Replacement then follows the Leidy Line C ROW to its terminus at MP 194.00.

As part of the proposed Hensel Replacement, and as requested by the DCNR, Transco also plans to regrade, where necessary, the portion of the Leidy Line A and Leidy Line B ROW from MPs 190.60 to 192.93. The ROW in this area is "two-toned," with the grade over Leidy Line A ranging approximately 20 to 40 feet higher in elevation than the grade over the Leidy Line B. Transco will regrade the ROW in this area to restore approximate original contours. Transco considered five alternative routes to the proposed Hensel Replacement to further minimize impacts on environmental resources within Sproul State Forest (see Figure 10A-6).

#### 3.2.2.1 Hensel Replacement Alternative 1

Hensel Replacement Alternative 1 is a lift and lay alternative that would remove 5.8 miles of the existing Leidy Line A and replace it with 5.8 miles of a new 36-inch pipe within the existing Leidy Line A trench. This was Transco's initial planned alignment as it is the straightest and shortest route between the Hensel Replacement start and end points. Table 2-5 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 1. This alternative would require construction of 0.5 mile less pipeline than the proposed Hensel Replacement. In addition, the alternative would cross approximately 2.8 miles less forested land

than the proposed route. However, Hensel Replacement Alternative 1 would involve surface disturbance (i.e., open cut) along 0.8 mile of the Tamarack Swamp Natural Area and adjacent wetlands. The surface disturbance associated with crossing the Tamarack Swamp Natural Area and adjacent wetlands would also require ATWS south of the existing Leidy Line B, resulting in additional tree clearing.

**Table 2-5**
**Hensel Replacement Alternative 1 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 1 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Length of Corresponding Segment (miles) | 6.3 | 5.8 | +0.5 |
| **Co-location** | | | |
| Length Adjacent to Interstate Pipeline ROW (miles) | 6.0 | 5.8 | +0.2 |
| Length Adjacent to Midstream Pipeline ROW (miles) | 0.0 | 0.0 | 0.0 |
| Length Adjacent to Electric Transmission Line ROW (miles) | 0.3 | 0.0 | +0.3 |
| Length Adjacent to Roadway (miles) | 0.0 | 0.0 | 0.0 |
| Total Length Co-located (miles) | 6.3 | 5.8 | +0.5 |
| **ROW Requirements** | | | |
| Pipeline Construction Requirements (acres)[a] | 71.7 | 55.9 | +15.8 |
| Pipeline Operation Requirements (acres)[b] | 6.0 | 0.0 | +6.0 |
| **Federal and State Land** | | | |
| Federal Lands Crossed (number/miles) | 0 / 0.0 | 0 / 0.0 | 0 / 0.0 |
| State Lands Crossed (number/miles) | 1 / 5.5 | 1 / 5.3 | 0 / +0.2 |
| Tamarack Swamp Natural Area Crossed (miles) | 0 | 0.5 | -0.5 |
| Tamarack Swamp Natural Area Construction Impacts (acres) | 0.0 | 3.3 | -3.3 |
| Tamarack Swamp Natural Area Operation Impacts (acres) | 0.0 | 2.9 | -2.9 |
| **Land Use** | | | |
| Forested Land Crossed (miles)[c] | 4.6 | 1.8 | +2.8 |
| Forested Land Construction Impacts (acres)[c] | 52.3 | 20.9 | +31.4 |
| Forested Land Operation Impacts (acres)[c] | 3.6 | 0.0 | +3.6 |
| Agricultural Land Crossed (miles)[d] | 0.2 | 0.0 | +0.2 |
| Agricultural Land Construction Impacts (acres)[d] | 1.9 | 0.0 | +1.9 |
| Agricultural Land Operation Impacts (acres)[d] | 0.4 | 0.0 | +0.4 |
| Residences within 50 feet of the construction workspace[e] | 0 | 0 | 0 |

**Table 2-5**
**Hensel Replacement Alternative 1 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 1 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Landfills, quarries, and other mining operations within 0.25 mile (number) | 0 | 0 | 0 |
| **Waterbodies** | | | |
| Waterbodies Crossed (number)[f] | 5 | 4 | +1 |
| Major Waterbody Crossings (number >100 feet)[g] | 0 | 0 | 0 |
| Sensitive Waterbodies Crossed (number) [f, l] | 5 | 4 | +1 |
| **Wetlands** | | | |
| Total Wetland Complexes Crossed (number)[h] | 3 | 1 | +2 |
| Total Wetland Crossed (miles)[h] | <0.1 | 0.6 | -0.5 |
| Palustrine Forested Wetland Complex Construction Impacts (acres)[h] | 0.1 | 0.7 | -0.6 |
| Palustrine Forested Wetland Complex Operation Impacts (acres)[h] | 0.0 | 0.2 | -0.2 |
| Sensitive Wetlands Crossed (number) [l] | 3 | 1 | +2 |
| **Cultural Resources** | | | |
| National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i] | 0 | 0 | 0 |
| **Other Physical Features** | | | |
| Road Crossings (number) | 11 | 8 | +3 |
| Railroad Crossings (number) | 0 | 0 | 0 |
| **Other Environmental Features** | | | |
| Steep Slopes Crossed (30 degrees or greater) (miles)[j] | 0.9 | 2.3 | -1.4 |
| Side Slope Construction (miles)[k] | 0.0 | 0.2 | 0.0 |

**Table 2-5**
**Hensel Replacement Alternative 1 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 1 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on a preliminary permanent ROW developed for comparison of alternatives.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

### 3.2.2.2 Hensel Replacement Alternative 2

Hensel Replacement Alternative 2 makes use of a horizontal directional drill (HDD) to avoid trenching through the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 2 includes replacement of approximately 4.7 miles of the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximate MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 2, Transco would complete a 0.8-mile HDD installation of 36-inch pipe from MP 192.93 to MP 193.74 near the current alignment of Leidy Line A across the Tamarack Swamp Natural Area. From MP 193.74 to the Leidy Hub, Transco would replace the remaining 0.3 mile within the existing Leidy Line A ROW. Table 2-6 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 2.

**Table 2-6**
**Hensel Replacement Alternative 2 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 2 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Length of Corresponding Segment (miles) | 6.3 | 5.9 | +0.4 |
| **Co-location** | | | |
| Length Adjacent to Interstate Pipeline ROW (miles) | 6.0 | 5.4 | +0.6 |
| Length Adjacent to Midstream Pipeline ROW (miles) | 0.0 | 0.0 | 0.0 |
| Length Adjacent to Electric Transmission Line ROW (miles) | 0.3 | 0.0 | +0.3 |
| Length Adjacent to Roadway (miles) | 0.0 | 0.0 | 0.0 |
| Total Length Co-located (miles) | 6.3 | 5.4 | +0.7 |
| **ROW Requirements** | | | |
| Pipeline Construction Requirements (acres)[a] | 71.7 | 63.3 | +8.4 |
| Pipeline Operation Requirements (acres)[b] | 6.0 | 35.6 | -29.6 |
| **Federal and State Land** | | | |
| Federal Lands Crossed (number/miles) | 0 / 0.0 | 0 / 0.0 | 0 / 0.0 |
| State Lands Crossed (number/miles) | 1 / 5.5 | 1 / 5.3 | 0 / +0.2 |
| Tamarack Swamp Natural Area Crossed (miles) | 0.0 | 0.5 | -0.5 |
| Tamarack Swamp Natural Area Construction Impacts (acres) | 0.0 | 0.0 | 0.0 |
| Tamarack Swamp Natural Area Operation Impacts (acres) | 0.0 | 0.0 | 0.0 |
| **Land Use** | | | |
| Forested Land Crossed (miles)[c] | 4.6 | 2.2 | +2.4 |
| Forested Land Construction Impacts (acres)[c] | 52.3 | 30.2 | +22.1 |
| Forested Land Operation Impacts (acres)[c] | 3.6 | 13.8 | -10.2 |
| Agricultural Land Crossed (miles)[d] | 0.2 | 0.0 | +0.2 |
| Agricultural Land Construction Impacts (acres)[d] | 1.9 | 0.0 | +1.9 |
| Agricultural Land Operation Impacts (acres)[d] | 0.4 | 0.0 | +0.4 |
| Residences within 50 feet of the construction workspace[e] | 0 | 0 | 0 |
| Landfills, quarries, and other mining operations within 0.25 mile (number) | 0 | 0 | 0 |
| **Waterbodies** | | | |
| Waterbodies Crossed (number)[f] | 5 | 4 | +1 |
| Major Waterbody Crossings (number >100 feet)[g] | 0 | 0 | 0 |
| Sensitive Waterbodies Crossed (number) [f, l] | 5 | 4 | +1 |

**Table 2-6**
**Hensel Replacement Alternative 2 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 2 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| **Wetlands** | | | |
| Total Wetland Complexes Crossed (number)[h] | 3 | 1 | +2 |
| Total Wetland Crossed (miles)[h] | <0.1 | 0.3 | -0.2 |
| Palustrine Forested Wetland Complex Construction Impacts (acres)[h] | 0.1 | 0.7 | -0.6 |
| Palustrine Forested Wetland Complex Operation Impacts (acres)[h] | 0.0 | 0.5 | -0.5 |
| Sensitive Wetlands Crossed (number)[l] | 5 | 4 | +1 |
| **Cultural Resources** | | | |
| National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i] | 0 | 0 | 0 |
| **Other Physical Features** | | | |
| Road Crossings (number) | 11 | 7 | +4 |
| Railroad Crossings (number) | 0 | 0 | 0 |
| **Other Environmental Features** | | | |
| Steep Slopes Crossed (30 degrees or greater) (miles)[j] | 0.9 | 2.3 | -1.4 |
| Side Slope Construction (miles)[k] | 0.0 | 0.2 | -0.2 |

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 2 would require construction of 0.4 mile less pipeline than the proposed Hensel Replacement. Additionally, Hensel Replacement Alternative 2 would avoid surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands. No tree clearing within the Tamarack Swamp Natural Area would be required for construction of Hensel Replacement Alternative 2. However, tree clearing and wetland impacts would be unavoidable to complete the geotechnical studies necessary to determine the feasibility of an HDD associated with this alternative. PADCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for this alternative; as such, Transco did not pursue additional analysis related to the impacts associated with the geotechnical studies.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 2 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the Tamarack Swamp Natural Area. In order to complete the HDD, ATWS would be required for staging of the HDD equipment and a pullback area for the pipe. The workspaces would require tree clearing outside of Transco's existing ROW.

Transco performed a preliminary HDD feasibility analysis for the Hensel Replacement Alternative 2 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells., and a gas storage well facility operated by Dominion Energy, Inc. Transco typically avoids siting HDD alignments near existing water and gas storage wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered noise-sensitive areas (NSAs). Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The HDD feasibility analysis used desktop information from the Natural Resource Conservation Service (NRCS) and USGS to evaluate geologic conditions (NRCS 2018). The

desktop analysis indicated that the likelihood of encountering challenging soils, such as glacial till, in the Project area is very high. Glacial till consists of variable soil types—specifically, interbedded gravel, cobbles, and boulders. The presence of glacial till deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns, ultimately putting the HDD at risk for failure.

#### 3.2.2.3 Hensel Replacement Alternative 3

Hensel Replacement Alternative 3 makes use of an HDD to avoid trenching through the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 3 includes replacement of approximately 4.7 miles of the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximate MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 3, Transco would complete an HDD across the Tamarack Swamp Natural Area westward for approximately 0.7 mile from MP 192.93 to MP 193.55. From the end of the HDD, Alternative 3 would follow the alignment of the proposed Hensel Replacement for 0.7 mile to its terminus at the Leidy Hub. Table 2-7 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 3.

**Table 2-7**
**Hensel Replacement Alternative 3 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 3 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Length of Corresponding Segment (miles) | 6.3 | 6.1 | +0.2 |
| **Co-location** | | | |
| Length Adjacent to Interstate Pipeline ROW (miles) | 6.0 | 5.5 | +0.5 |
| Length Adjacent to Midstream Pipeline ROW (miles) | 0.0 | 0.0 | 0.0 |
| Length Adjacent to Electric Transmission Line ROW (miles) | 0.3 | 0.0 | +0.3 |
| Length Adjacent to Roadway (miles) | 0.0 | 0.0 | 0.0 |
| Total Length Co-located (miles) | 6.3 | 5.5 | +0.8 |
| **ROW Requirements** | | | |
| Pipeline Construction Requirements (acres)[a] | 71.7 | 60.1 | +11.6 |
| Pipeline Operation Requirements (acres)[b] | 6.0 | 37.1 | -31.1 |
| **Federal and State Land** | | | |
| Federal Lands Crossed (number/miles) | 0 / 0.0 | 0 / 0.0 | 0 / 0.0 |
| State Lands Crossed (number/miles) | 1 / 5.5 | 1 / 4.8 | 0 / +0.7 |

**Table 2-7**
**Hensel Replacement Alternative 3 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 3 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Tamarack Swamp Natural Area Crossed (miles) | 0.0 | 0.3 | -0.3 |
| Tamarack Swamp Natural Area Construction Impacts (acres) | 0.0 | 0.0 | 0.0 |
| Tamarack Swamp Natural Area Operation Impacts (acres) | 0.0 | 0.0 | 0.0 |
| **Land Use** | | | |
| Forested Land Crossed (miles)[c] | 4.6 | 2.2 | +2.4 |
| Forested Land Construction Impacts (acres)[c] | 52.3 | 26.6 | +25.7 |
| Forested Land Operation Impacts (acres)[c] | 3.6 | 14.8 | -11.2 |
| Agricultural Land Crossed (miles)[d] | 0.2 | 0.0 | +0.2 |
| Agricultural Land Construction Impacts (acres)[d] | 1.9 | 0.0 | +1.9 |
| Agricultural Land Operation Impacts (acres)[d] | 0.4 | 0.0 | +0.4 |
| Residences within 50 feet of the construction workspace[e] | 0 | 0 | 0 |
| Landfills, quarries, and other mining operations within 0.25 mile (number) | 0 | 0 | 0 |
| **Waterbodies** | | | |
| Waterbodies Crossed (number)[f] | 5 | 4 | +1 |
| Major Waterbody Crossings (number >100 feet)[g] | 0 | 0 | 0 |
| Sensitive Waterbodies Crossed (number) [f, l] | 5 | 4 | +1 |
| **Wetlands** | | | |
| Total Wetland Complexes Crossed (number)[h] | 3 | 1 | +2 |
| Total Wetland Crossed (miles)[h] | <0.1 | <0.1 | 0.0 |
| Palustrine Forested Wetland Complex Construction Impacts (acres)[h] | 0.1 | 1.9 | -1.8 |
| Palustrine Forested Wetland Complex Operation Impacts (acres)[h] | 0.0 | 1.8 | -1.8 |
| Sensitive Wetlands Crossed (number) [l] | 3 | 1 | +2 |
| **Cultural Resources** | | | |
| National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i] | 0 | 0 | 0 |
| **Other Physical Features** | | | |
| Road Crossings (number) | 11 | 9 | +2 |
| Railroad Crossings (number) | 0 | 0 | 0 |
| **Other Environmental Features** | | | |
| Steep Slopes Crossed (30 degrees or greater) (miles)[j] | 0.9 | 2.3 | -1.4 |
| Side Slope Construction (miles)[k] | 0.0 | 0.2 | -0.2 |

**Table 2-7**
**Hensel Replacement Alternative 3 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 3 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| [a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys. | | | |
| [b] Pipeline operation requirements based on an assumed 50-foot-wide corridor. | | | |
| [c] Forested land crossed and impacted based on USGS NLCD. | | | |
| [d] Agricultural land crossed and impacted based on USGS NLCD. | | | |
| [e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence. | | | |
| [f] Waterbodies identified based on NHD. | | | |
| [g] Major waterbodies identified based on review of aerial photographs. | | | |
| [h] Wetlands identified using the NWI. | | | |
| [i] National Registered sites were identified using desktop data. | | | |
| [j] Length determined perpendicular to slope contour. | | | |
| [k] Length determined parallel with slope contour. Developed using USGS 10-foot contours. | | | |
| [l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources. | | | |
| Key: | | | |
| NHD = National Hydrography Dataset | | | |
| NLCD = National Land Cover Data | | | |
| NWI = National Wetland Inventory | | | |
| ROW = right of way | | | |
| SSURGO = Soil Survey Geographic Database | | | |
| USGS = U.S. Geological Survey | | | |

Hensel Replacement Alternative 3 would require construction of 0.2 mile less pipeline than the proposed Hensel Replacement. Hensel Replacement Alternative 3 avoids pipeline trenching within the Tamarack Swamp Natural Area by utilizing an HDD through this area. However, Transco would need to collect geotechnical bores within the natural area and adjacent wetlands to further investigate the feasibility of an HDD crossing. The HDD alignment through the natural area is a mixture of Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS) and Palustrine Forested (PFO) wetlands. Consequently, in order to gain access to geotechnical bore locations, approximately 1.1 acres of wetlands within Tamarack Swamp Natural Area would be impacted. In comparison, the proposed Hensel Replacement would not require any geotechnical studies or tree clearing within the Tamarack Swamp Natural Area.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 3 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the swamp. In order to

complete the HDD, ATWS would be required for staging of the HDD equipment and a pullback area for the pipe. Similar to Hensel Replacement Alternative 2 above, the workspace needed would require tree clearing outside of Transco's existing ROW. While no permanently cleared ROW would be needed through the Tamarack Swamp Natural Area, Transco would need to obtain a License for Right-of-Way on State Forest Land for the pipeline.

Due to the alignment of the HDD of Hensel Replacement Alternative 3, Transco could use the existing Leidy Lines A and B ROW for the HDD pullback area. The workspaces would require tree clearing outside of Transco's existing ROW. Hensel Replacement Alternative 3 would require new permanent ROW across the Tamarack Swamp Natural Area and adjacent wetlands, and within the natural area portion of the Foley Tract[1], a USFWS migratory bird habitat area.

Transco performed a preliminary HDD feasibility analysis for Alternative 3 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells. Transco typically avoids siting HDD alignments near existing water wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered NSAs. Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The desktop analysis of the HDD alternatives used information from NRCS and USGS to evaluate geologic conditions (NRCS 2018). Based on the information from NRCS and USGS, the likelihood of challenging soils, such as glacial till, is very high. Glacial till consists of variable soil types, specifically interbedded gravel, cobbles, and boulders. The presence of glacial till

[1] The Foley Tract was acquired by the DCNR in 2003, and portions of the tract are proposed for inclusion in the Tamarack Swamp Natural Area. Transco's existing easement across the Foley Tract is 75 feetwide, with rights for an additional 25 feet of temporary workspace for the construction of an additional line. Transco is not seeking modifications to its existing easement.

deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns; ultimately putting the HDD at risk for failure.

#### 3.2.2.4 Hensel Replacement Alternative 4

Hensel Replacement Alternative 4 makes use of an HDD to avoid trenching through to the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 4 includes replacement of approximately 4.7 miles of the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximately MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 4, Transco would complete an HDD across the Tamarack Swamp Natural Area northwestward for approximately 0.7 mile from MP 192.93 to MP 193.78. From the end of the HDD, Alternative 4 would parallel Leidy Line A and Leidy Line B for 0.3 mile its terminus at the Leidy Hub. Table 2-8 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 4.

**Table 2-8**
**Hensel Replacement Alternative 4 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 4 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Length of Corresponding Segment (miles) | 6.3 | 5.8 | +0.5 |
| **Co-location** | | | |
| Length Adjacent to Interstate Pipeline ROW (miles) | 6.0 | 5.2 | +0.8 |
| Length Adjacent to Midstream Pipeline ROW (miles) | 0.0 | 0.0 | 0.0 |
| Length Adjacent to Electric Transmission Line ROW (miles) | 0.3 | 0.0 | +0.3 |
| Length Adjacent to Roadway (miles) | 0.0 | 0.0 | 0.0 |
| Total Length Co-located (miles) | 6.3 | 5.2 | +1.1 |
| **ROW Requirements** | | | |
| Pipeline Construction Requirements (acres)[a] | 71.7 | 62.8 | +8.9 |
| Pipeline Operation Requirements (acres)[b] | 6.0 | 35.0 | -29.0 |
| **Federal and State Land** | | | |
| Federal Lands Crossed (number/miles) | 0 / 0.0 | 0 / 0.0 | 0 / 0.0 |
| State Lands Crossed (number/miles) | 1 / 5.5 | 1 / 5.3 | 0 / +0.2 |
| Tamarack Swamp Natural Area Crossed (miles) | 0.0 | 0.5 | -0.5 |
| Tamarack Swamp Natural Area Construction Impacts (acres) | 0.0 | 0.0 | 0.0 |
| Tamarack Swamp Natural Area Operation Impacts (acres) | 0.0 | 0.0 | 0.0 |
| **Land Use** | | | |

**Table 2-8**
**Hensel Replacement Alternative 4 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 4 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Forested Land Crossed (miles)[c] | 4.6 | 1.8 | +2.8 |
| Forested Land Construction Impacts (acres)[c] | 52.3 | 23.7 | +28.6 |
| Forested Land Operation Impacts (acres)[c] | 3.6 | 11.7 | -8.1 |
| Agricultural Land Crossed (miles)[d] | 0.2 | 0.0 | +0.2 |
| Agricultural Land Construction Impacts (acres)[d] | 1.9 | 0.0 | +1.9 |
| Agricultural Land Operation Impacts (acres)[d] | 0.4 | 0.0 | +0.4 |
| Residences within 50 feet of the construction workspace[e] | 0 | 0 | 0 |
| Landfills, quarries, and other mining operations within 0.25 mile (number) | 0 | 0 | 0 |
| **Waterbodies** | | | |
| Waterbodies Crossed (number)[f] | 5 | 4 | +1 |
| Major Waterbody Crossings (number >100 feet)[g] | 0 | 0 | 0 |
| Sensitive Waterbodies Crossed (number) [f, l] | 5 | 4 | +1 |
| **Wetlands** | | | |
| Total Wetland Complexes Crossed (number)[h] | 3 | 1 | +2 |
| Total Wetland Crossed (miles)[h] | <0.1 | 0.6 | -0.5 |
| Palustrine Forested Wetland Complex Construction Impacts (acres)[h] | 0.1 | 3.5 | -3.4 |
| Palustrine Forested Wetland Complex Operation Impacts (acres)[h] | 0.0 | 3.3 | -3.3 |
| Sensitive Wetlands Crossed (number) [l] | 3 | 1 | +2 |
| **Cultural Resources** | | | |
| National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i] | 0 | 0 | 0 |
| **Other Physical Features** | | | |
| Road Crossings (number) | 11 | 8 | +3 |
| Railroad Crossings (number) | 0 | 0 | 0 |
| **Other Environmental Features** | | | |
| Steep Slopes Crossed (30 degrees or greater) (miles)[j] | 0.9 | 2.3 | -1.4 |
| Side Slope Construction (miles)[k] | 0.0 | 0.2 | -0.2 |

**Table 2-8**
**Hensel Replacement Alternative 4 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 4 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 4 would require construction of 0.5 mile less pipeline than the proposed Hensel Replacement. Additionally, Alternative 4 would avoid surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands. No tree clearing within the Tamarack Swamp Natural Area would be required for construction of Hensel Replacement Alternative 4. However, tree clearing and wetland impacts would be unavoidable to complete the geotechnical studies necessary to determine the feasibility of an HDD associated with this alternative. PADCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for this alternative. As such, Transco did not pursue additional analysis related to the impacts associated with the geotechnical studies.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 4 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the Tamarack Swamp Natural Area. Similar to Hensel Replacement Alternative 2 and 3 above, in order to complete the

HDD, ATWS would be required for staging of the HDD equipment and a pullback area for the pipe. The workspaces would require tree clearing outside of Transco's existing ROW. Hensel Replacement Alternative 4 would create a new ROW across the Tamarack Swamp Natural Area and adjacent wetlands. While no permanently cleared ROW would be needed through the Tamarack Swamp Natural Area, Transco would need to obtain a License for Right-of-Way on State Forest Land for the pipeline.

Transco performed a preliminary HDD feasibility analysis for the Alternative 4 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells, and a gas storage well facility operated by Dominion Energy, Inc. Transco typically avoids siting HDD alignments near existing water wells and gas storage wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered NSAs. Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The HDD feasibility analysis used desktop information from the NRCS and USGS to evaluate geologic conditions (NRCS 2018). The desktop analysis indicated that the likelihood of encountering challenging soils, such as glacial till, in the Project area is very high. Glacial till consists of variable soil types, specifically interbedded gravel, cobbles, and boulders. The presence of glacial till deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns, ultimately putting the HDD at risk for failure.

#### 3.2.2.5 Hensel Replacement Alternative 5

Hensel Replacement Alternative 5 is partly located on the Sproul State Forest (see Table S3.F-9 and Figure 10A-6). Hensel Replacement Alternative 5 would follow Transco's Leidy Line A, Leidy Line B, and Leidy Line C ROW for approximately 3.1 miles, from MP 188.51 to 190.58. From here, Hensel Replacement Alternative 5 would deviate from the Leidy Line A and Leidy Line

B ROW and follow Transco's Leidy Line C ROW for approximately 3.0 miles before terminating at the Leidy Hub

Transco considered this alternative to avoid the Tamarack Swamp Natural Area, which crosses the Leidy Line A and Leidy Line B ROW from MP 192.93 to 193.74. This alternative would require construction of 0.2 mile less pipeline than the proposed Hensel Replacement. Both routes would have similar impacts to forested areas, wetlands and waterbodies.

**Table 2-9**
**Hensel Replacement Alternative 5 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 5 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Length of Corresponding Segment (miles) | 6.3 | 6.1 | +0.2 |
| **Co-location** | | | |
| Length Adjacent to Interstate Pipeline ROW (miles) | 6.0 | 6.1 | -0.1 |
| Length Adjacent to Midstream Pipeline ROW (miles) | 0.0 | 0.0 | 0.0 |
| Length Adjacent to Electric Transmission Line ROW (miles) | 0.3 | 0.0 | +0.3 |
| Length Adjacent to Roadway (miles) | 0.0 | 0.6 | -0.6 |
| Total Length Co-located (miles) | 6.3 | 6.1 | +0.2 |
| **ROW Requirements** | | | |
| Pipeline Construction Requirements (acres)[a] | 71.7 | 93.1 | 21.4 |
| Pipeline Operation Requirements (acres)[b] | 6.0 | 37.0 | -31.0 |
| **Federal and State Land** | | | |
| Federal Lands Crossed (number/miles) | 0 / 0.0 | 0 / 0.0 | 0 / 0.0 |
| State Lands Crossed (number/miles) | 1 / 5.5 | 1 / 5.3 | 0 / +0.2 |
| Tamarack Swamp Natural Area Crossed (miles) | 0.0 | 0.0 | 0.0 |
| Tamarack Swamp Natural Area Construction Impacts (acres) | 0.0 | 0.0 | 0.0 |
| Tamarack Swamp Natural Area Operation Impacts (acres) | 0.0 | 0.0 | 0.0 |
| **Land Use** | | | |
| Forested Land Crossed (miles)[c] | 4.6 | 2.8 | +1.8 |
| Forested Land Construction Impacts (acres)[c] | 52.3 | 51.5 | +0.8 |
| Forested Land Operation Impacts (acres)[c] | 3.6 | 17.5 | -13.9 |
| Agricultural Land Crossed (miles)[d] | 0.2 | 0.0 | +0.2 |
| Agricultural Land Construction Impacts (acres)[d] | 1.9 | 2.2 | -0.3 |
| Agricultural Land Operation Impacts (acres)[d] | 0.4 | 0.0 | +0.4 |
| Residences within 50 feet of the construction workspace[e] | 0 | 1 | -1 |

**Table 2-9**
**Hensel Replacement Alternative 5 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 5 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Landfills, quarries, and other mining operations within 0.25 mile (number) | 0 | 0 | 0 |
| **Waterbodies** | | | |
| Waterbodies Crossed (number)[f] | 5 | 3 | +2 |
| Major Waterbody Crossings (number >100 feet)[g] | 0 | 0 | 0 |
| Sensitive Waterbodies Crossed (number) [f, l] | 5 | 3 | +2 |
| **Wetlands** | | | |
| Total Wetland Complexes Crossed (number)[h] | 3 | 1 | +2 |
| Total Wetland Crossed (miles)[h] | <0.1 | 0.1 | -0.1 |
| Palustrine Forested Wetland Complex Construction Impacts (acres)[h] | 0.1 | 0.2 | -0.1 |
| Palustrine Forested Wetland Complex Operation Impacts (acres)[h] | 0.0 | 0.1 | -0.1 |
| Sensitive Wetlands Crossed (number) [l] | 3 | 1 | +2 |
| **Cultural Resources** | | | |
| National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i] | 0 | 0 | 0 |
| **Other Physical Features** | | | |
| Road Crossings (number) | 11 | 8 | +3 |
| Railroad Crossings (number) | 0 | 0 | 0 |

**Table 2-9**
**Hensel Replacement Alternative 5 Comparison**

| Factor | Proposed Hensel Replacement | Hensel Replacement Alternative 5 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| **Other Environmental Features** | | | |
| Steep Slopes Crossed (30 degrees or greater) (miles)[j] | 0.9 | 0.9 | 0.0 |
| Side Slope Construction (miles)[k] | 0.0 | 0.2 | -0.2 |

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement Alternative 5 includes potential workspace needed for abandonment of Leidy Line A.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

### 3.2.2.6 Hensel Replacement Conclusion

Transco used desktop analysis and identified the need to avoid disturbance to the Tamarack Swamp Natural Area, adjacent wetlands, and other resources including Sproul State Forest. Transco subsequently considered a number of route alternatives which avoided and/or minimized impacts to these resources, both through the use of HDD technology (Alternatives 2, 3, and 4), and by deviating from the Leidy Line A ROW (Alternative 5). Transco coordinated with DCNR throughout the final route selection process and ultimately identified a proposed alignment that avoids the Tamarack Swamp Natural Area while also minimizing overall impacts to the Sproul State Forest. Additional discussion regarding Transco's final evaluation of each Hensel Replacement alternative is provided below

Hensel Replacement Alternative 1 was eliminated due to the required surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands.

Hensel Replacement Alternatives 2, 3, and 4, each of which include an HDD crossing of the Tamarack Swamp Natural Area and adjacent wetlands, were eliminated for a number of reasons. As previously discussed, desktop data indicate a risk of encountering problematic soils and bedrock along the HDD alignment of each alternative, which increases the risk of drill failure and/or inadvertent returns. Further investigation to determine drill feasibility would include geotechnical studies within the Tamarack Swamp Natural Area. These geotechnical studies would require surface disturbance and tree removal within the Tamarack Swamp Natural Area and adjacent wetlands. As such, Transco does not propose geotechnical studies to further investigate the HDD alternatives.

An HDD crossing of the Tamarack Swamp Natural Area would also result in greater impacts to residential areas compared to the proposed Hensel Replacement due to the HDD workspace requirements, while the HDD alignment itself would pose a risk to residential private water wells. Furthermore, the HDD alignments for Hensel Replacement Alternatives 2 and 4 would be in proximity to a gas storage well facility operated by Dominion Energy, Inc. Finally, the DCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for Alternatives 2 and 4. While the DCNR did not express concerns related to the length of the Alternative 3 HDD, Transco eliminated this alternative from further consideration based on the additional impacts associated with the required geotechnical studies.

In conclusion, based on the above analysis, Transco believes that the proposed Hensel Replacement provides the greatest opportunity to avoid and minimize environmental impacts to Sproul State Forest in comparison to any of the HDD alternatives.

The proposed Hensel Replacement was selected over Hensel Replacement Alternative 5 because it provides the opportunity to install the proposed Leidy Line D and remove a portion of the existing Leidy Line A within the same proposed workspaces, reducing overall impacts within Sproul State Forest. Transco is also able to meet DCNR's request to regrade a portion of the Leidy Line A and Leidy Line B ROW to approximate original contours within the workspace of the proposed alignment, which would not be possible under Hensel Replacement Alternative 5.

### *3.2.3 Leidy A Line Abandonment Alternatives*

Transco considered three methodologies for abandonment of the existing Leidy Line A associated with the Hensel Replacement. All options would be designed in accordance with USDOT regulations in 49 CFR Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards.* The three alternative methodologies are:

- **Removal** – physical removal of the abandoned portion of the pipeline;
- **Nitrogen Purge** – leave the pipeline in place, and purge the abandoned portion of pipeline of gas using nitrogen; and
- **Grouting** – filling the abandoned portion of the pipeline with grout.

Removal of the pipeline would require excavation along the entire abandonment. All environmental resources within the section of abandonment would be temporarily impacted, including the Tamarack Swamp Natural Area. If the pipeline was removed, a portion of the existing ROW could be reforested.

Nitrogen purging would require the least amount of disturbance initially during abandonment; however, purging would require Transco to continue maintaining the existing pipeline and associated cathodic protection system. In addition, the nitrogen purging reduces the ability for the existing ROW to be reforested.

Grouting the pipeline would require temporary excavation in various locations along the abandonment for installation of grout. The proposed locations for excavation would be selected following a field survey and would be sited to minimize impacts on environmentally sensitive resources to the extent practical. Once the pipeline is grouted, the pipeline would no longer require maintenance or cathodic protection. This alternative also provides the ability for a portion of the existing ROW to be reforested since the pipeline would no longer be maintained and would require less disturbance than a full pipeline removal.

#### *3.2.3.1 Leidy Line A Abandonment Conclusion*

In order to minimize impacts to the extent practicable and through coordination with PADCNR during the License for ROW on State Forest Land permitting process, Transco selected a combination of removal and grouting as the proposed methodology for the Leidy Line A abandonment. Prior to the abandonment, Leidy line A will be cleaned internally with cleaning pigs outfitted with magnets & brushes designed to scrub the inside of the pipe and collect lose ferrous

material. The cleaning process with be documented. Once the pipe has been cleaned, the line will be purged of natural gas and either removed in sections or abandoned in place. The sections of Leidy line A abandoned in place will be sealed on each end and purged with grout.

As requested by the DCNR, Transco plans to regrade the portion of the Leidy Lines A and B ROW from MP 191.10 to 192.55. The ROW in this area is "two-toned," with the grade over Leidy Line A ranging approximately 20 to 40 feet higher in elevation than the grade over Leidy Line B. Transco will regrade the ROW in this area to restore approximate original contours along this portion of the ROW. Because Transco will already be conducting ground-disturbing activities in this area to meet the DCNR's request, Transco is proposing to remove the existing Leidy Line A, with the exception of the portion of the Leidy Line A within the Tamarack Swamp Natural Area and adjacent wetlands (approximately 0.8 mile), which will be abandoned in place and grouted. In addition, the DCNR expressed a preference for pipeline removal or grouting during a pre-survey meeting and site visit with the DCNR on April 19, 2019.

### *3.2.4 Benton Loop*

The Benton Loop is co-located within the existing Leidy Line ROWs. Transco evaluated minor route alternatives that co-locate segments of the proposed Benton Loop on the south side of the existing ROW rather than the north side as proposed (Benton Loop Alternative Option 1 and Benton Loop Alternative Option 2; see Figure 10A-7). Transco has developed these alternatives to evaluate the impact of the ROW crossover on tree clearing. Table S3.F-10 provides a comparison between the proposed Benton Loop and the alternative route.

**Table 2-10**
**Benton Loop Option 2 Comparison**

| Factor | Proposed Benton Loop Analogous Segment | Benton Loop Alternative Option 2 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Length of Corresponding Segment (miles) | 0.8 | 0.8 | 0.0 |
| **Co-location** | | | |
| Length Adjacent to Interstate Pipeline ROW (miles) | 0.9 | 0.9 | 0.0 |
| Length Adjacent to Midstream Pipeline ROW (miles) | 0.0 | 0.0 | 0.0 |
| Length Adjacent to Electric Transmission Line ROW (miles) | 0.0 | 0.0 | 0.0 |
| Length Adjacent to Roadway (miles) | 0.0 | 0.0 | 0.0 |
| Total Length Co-located (miles) | 0.9 | 0.9 | 0.0 |

**Table 2-10**
**Benton Loop Option 2 Comparison**

| Factor | Proposed Benton Loop Analogous Segment | Benton Loop Alternative Option 2 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| **ROW Requirements** | | | |
| Pipeline Construction Requirements (acres)[a] | 15.7 | 9.1 | +6.6 |
| Pipeline Operation Requirements (acres)[b] | 4.3 | 3.9 | +0.4 |
| **Federal and State Land** | | | |
| Federal Lands Crossed (number/miles) | 0/0 | 0/0 | 0/0 |
| State Lands Crossed (number/miles) | 0/0 | 0/0 | 0/0 |
| **Land Use** | | | |
| Forested Land Crossed (miles)[c] | 0.3 | <0.1 | +0.3 |
| Forested Land Construction Impacts (acres)[c] | 3.5 | 0.3 | +3.2 |
| Forested Land Operation Impacts (acres)[c] | 1.9 | 0.3 | +1.6 |
| Agricultural Land Crossed (miles)[d] | 0.4 | 0.2 | +0.2 |
| Agricultural Land Construction Impacts (acres)[d] | 5.6 | 3.8 | +1.8 |
| Agricultural Land Operation Impacts (acres)[d] | 1.5 | 1.0 | +0.5 |
| Residences within 50 feet of the construction workspace[e] | 1 | 0 | +1 |
| Landfills, quarries, and other mining operations within 0.25 mile (number) | 0 | 0 | 0 |
| **Waterbodies** | | | |
| Waterbodies Crossed (number)[f] | 0 | 0 | 0 |
| Major Waterbody Crossings (number >100 feet)[g] | 0 | 0 | 0 |
| Sensitive Waterbodies Crossed (number) [f, l] | 0 | 0 | 0 |
| **Wetlands** | | | |
| Total Wetland Complexes Crossed (number)[h] | 4 | 1 | +3 |
| Total Wetland Crossed (miles)[h] | <0.1 | <0.1 | 0.0 |
| Palustrine Forested Wetland Complex Construction Impacts (acres)[h] | 0.0 | 0.0 | 0.0 |
| Palustrine Forested Wetland Complex Operation Impacts (acres)[h] | 0.0 | 0.0 | 0.0 |
| Sensitive Wetlands Crossed (number) [l] | 0 | 0 | 0 |
| **Cultural Resources** | | | |
| National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i] | 0 | 0 | 0 |
| **Other Physical Features** | | | |
| Road Crossings (number) | 3 | 3 | 0 |

**Table 2-10**
**Benton Loop Option 2 Comparison**

| Factor | Proposed Benton Loop Analogous Segment | Benton Loop Alternative Option 2 | Difference between Proposed Route and Alternative Route |
|---|---|---|---|
| Railroad Crossings (number) | 0 | 0 | 0 |
| **Other Environmental Features** | | | |
| Steep Slopes Crossed (30 degrees or greater) (miles)[j] | 0.0 | 0.0 | 0.0 |
| Side Slope Construction (miles)[k] | 0.0 | 0.0 | 0.0 |

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photography; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photography.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

### 2.3.4.1 Benton Loop Conclusion

Transco incorporated Benton Loop Alternative Option 1 into the proposed route. Benton Loop Alternative Option 1 was incorporated because it minimizes tree clearing, avoids a known northern long-eared bat (*Myotis septentrionalis*) roost tree, and reduces wetland impacts. Transco did not incorporate Benton Loop Alternative Option 2 into the proposed Benton Loop due to challenging topography where the Benton Loop would connect into the MLV facility at MP 116.95. In addition, the workspace needed to complete the conventional bore crossing of State Highway 118 would be constrained due to the presence of a wetland limiting where the ATWS necessary for road crossing could be placed.

## 3.3 Compressor Station Alternatives

Transco conducted a hydraulic analysis to determine the need for additional compression to meet the Project's purpose of supplying 582,400 Dth/d of capacity to the River Road Regulator Station. Based on the results of the hydraulic analysis, Transco identified the need for additional compression at two existing compressor stations in Pennsylvania (Compressor Station 605 and Compressor Station 610) and for two new compressor stations in Pennsylvania (Compressor Station 607 and Compressor Station 620). Transco is not proposing any alternative locations for the modifications at Compressor Station 605 and Compressor Station 610 because these are existing facilities without wetland, stream, or floodway impacts. The following sections include a description of the various alternative sites Transco has evaluated with respect to Compressor Station 607 and Compressor Station 620.

### *3.3.1 Compressor Station Siting Methodology*

Transco considered multiple factors during the compressor station site selection process. Sites were identified through a hydraulic analysis to determine the MP range on CPL North and CPL South where compression is required that would allow for optimum efficiency, and to meet the required volume at the aggregated receipt points, as defined in Transco's purpose and need.

The hydraulic analysis concluded that locating Compressor Station 607 downstream of MP 7.0 would result in material pressure degradation at existing downstream delivery points. Further, any compressor station location upstream of MP 21.0 would be too close to existing Compressor Station 605, making it difficult to coordinate the operation of two compressor stations. Consequently, Transco determined that the hydraulic range for siting Compressor Station 607 is between MP 7.0 and MP 21.0 on the CPL North system.

The hydraulic analysis concluded that locating Compressor Station 620 downstream of MP 70.0 would result in material pressure degradation at existing downstream delivery points. Further, any compressor station location upstream of MP 80.0 would be too close to existing Compressor Station 610, making it difficult to coordinate the operation of two compressor stations rendering it incapable of delivering the contractual volume to the River Road Regulator Station at the requisite pressure. Consequently, Transco determined that the hydraulic range for siting Compressor Station 620 is between MP 70.0 and MP 80.0 on the CPL South system.

Transco reviewed aerial imagery within the defined hydraulic range for Compressor Station 607 and Compressor Station 620 and screened individual parcels based on the following criteria:

- Tie-in piping: Transco evaluated parcels on or adjacent to the existing CPL North and CPL South pipelines to minimize the length of suction/discharge piping connecting the compressor station to Transco's system, and the additional environmental impact associated with pipeline construction.
- Land/workspace requirements: Transco evaluated parcels larger than 40 acres to support construction and operation of the compressor station as well as maintain a buffer around the compressor station.
- Topography: Transco sought out land parcels featuring topography that minimize the extent of fill or excavation of soil required during construction of the new compressor station, including workspace needs.
- Accessibility: Transco sought to identify parcels with reliable access to existing public roads without crossing additional landowners, to minimize the length of an access road, and the additional environmental impact associated with access road construction.
- Noise sensitive areas: Transco sought parcels that allowed for an average day-night sound level not to exceed 55 decibels at NSAs, per FERC's requirements.
- Environmental considerations: Transco sought parcels that could avoid or minimize impacts to streams, floodplains, wetlands, threatened and endangered species habitat, and other sensitive natural resources. Transco also sought to avoid parcels encumbered by geologic hazards, such as abandoned mine land, to minimize the risk of landslides.
- Reasonable availability: Transco only considered parcels that could be reasonably obtained from the current landowner.

Following this process, Transco identified two potential sites for Compressor Station 607 (Options A and B) and two potential sites for Compressor Station 620 (Options A and B). These sites were presented at the Transco Open House in February 2019. During the FERC pre-filing process, Transco engaged with FERC staff, state agencies, landowners, and other stakeholders regarding the compressor station site selection process. As a result of this stakeholder engagement process, Transco introduced an additional alternative for Compressor Station 620

(Option C) at the FERC scoping meeting in March 2019. In response to FERC's comments and public scoping comments, Transco completed additional screening of several parcels against the criteria listed above. However, no new parcels were identified as potentially viable alternatives.

Compressor Station 620 Option A is at the northernmost end of the defined hydraulic range; therefore, no other sites to the north are considered viable alternatives. Transco also determined that Compressor Station 620 Option B is no longer a viable alternative due to reasonable availability. A specific comment was received during scoping to consider an alternative site in the Donaldson Stretch area. Transco understands this area is the section of State Route 125 between Hegins and Joliett. Compressor Station 620 Option C is in this area; no other viable sites were identified nearby.

In summary, Transco has identified two sites that meet the defined criteria for Compressor Station 607 and two sites that meet defined criteria for Compressor Station 620 (see Table S3.F-11 and Table S3.F-12). Transco evaluated potential impact parameters for the alternative compressor stations sites based on field surveys and publicly available data, including 7.5-minute USGS topographic maps, aerial photography, and available literature on environmental resources. Transco also completed Phase 1 Environmental Site Assessments.

### *3.3.2 Compressor Station 607*

Transco identified two alternative sites, Compressor Station 607 Option A and Compressor Station 607 Option B, that met the criteria as defined above (see Figures 10A-8 and 10A-9).

#### 3.3.2.1 Compressor Station 607 Option A

Compressor Station 607 Option A is a 93-acre parcel located in Fairmount Township, Luzerne County, Pennsylvania, and is crossed by the existing CPL North pipeline. Option A is located on a relatively flat agricultural parcel abutting Maransky Road and is surrounded by forest.

Transco identified 46 residences within 0.5-mile of the site. The closest residence is located approximately 364 feet west of the workspace for the compressor station.

Temporary construction workspace would impact 18.0 acres, and the permanent compressor station footprint would impact 12.3 acres. An existing access road totaling 765 feet would be improved on the parcel to meet the operational needs of the compressor station.

Two streams are present to the south and northeast of the parcel boundary; both are classified as or within the watershed of streams classified as High-Quality Coldwater Fishes with Migratory Fishes (HQ-CWF, MF) and Class A Wild Trout Waters. No National Hydrographic Database (NHD) mapped streams or NWI mapped wetlands are located on the site. Compressor Station 607 Option A is located within the watershed of Lick Branch. Lick Branch is located 705 feet east of the site. The nearby reach of Lick Branch is classified as High-Quality Coldwater Fisheries with Migratory Fishes (HQ-CWF, MF) and Class A Wild Trout Waters. No Federal Emergency Management Agency (FEMA) mapped floodplains are present within the site.

Field surveys identified small tributaries to Lick Branch in the southern end of the site with an abutting emergent and forested wetland complex. Several emergent wetlands and one small scrub-shrub wetland were delineated in depressions and on concaved slopes in the western and northern portions of the site. Following completion of field surveys, a site layout was designed to avoid and minimize impacts to streams, wetlands and floodplains. Water resource impacts at this site include 0.3 acre of wetland fill and no stream or floodplain impacts.

The results of the Phase 1 site assessment did not indicate any environmental liabilities or recognized environmental conditions (RECs; BAI Group 2019a).

#### 3.3.2.2 Compressor Station 607 Option B

Compressor Station 607 Option B is a 210.8-acre parcel located in Fairmount and Ross Townships, Luzerne County, Pennsylvania, and is crossed by the existing CPL North pipeline. Compressor Station 607 Option B is located on a forested parcel.

Transco identified 33 residences within 0.5-mile of the site. The closest residence is located approximately 116 feet southeast of the workspace for the compressor station.

Temporary construction workspace would impact 77.4 acres, and the permanent compressor station footprint would impact 31.8 acres. A new access road totaling 1,127 feet would need to be constructed on the parcel.

The site is within the watershed of Lick Branch, a High Quality, Class A Wild Trout Stream. No NHD mapped streams or NWI mapped wetlands are located on the site. Compressor Station 607 Option B is also located within the watershed of Lick Branch. Lick Branch is located 270 feet west of the site. This reach of Lick Branch is classified as High-Quality Coldwater Fisheries with Migratory Fishes (HQ-CWF, MF) and Class A Wild Trout Waters. No FEMA mapped floodplains are present within the site.

Field surveys conducted identified two tributaries to Lick Branch on the site. These streams range from 2 to 4 feet wide and bisect the eastern and central portions of the site. Sixteen wetlands were also delineated during field surveys throughout the site, including PEM, PSS, and PFO wetlands. Based on land requirements and the location of both streams and wetlands on the site, Transco anticipates that approximately 164 linear feet of streams would be directly impacted, and 5.6 acres of wetlands would need to be filled to construct a compressor station on this site.

Due to the acreage of wetland impacts associated with Compressor Station 607 Option B relative to Compressor Station 607 Option A, Transco eliminated Option B from further consideration, and as such did not conduct a Phase I site assessment on Option B.

#### 3.3.2.3 Compressor Station 607 Conclusion

Compressor Station 607 Option B featured topography that would require additional fill and/or excavation, which in turn would require additional land disturbance and result in greater impacts. Overall, Compressor Station 607 Option A would disturb fewer acres during construction and operation relative to Compressor Station 607 Option B.

Compressor Station 607 Option A impacts less wetland and avoids stream impacts, while Option B would result in up to approximately 5.6 acres of permanent wetland fill and 164 linear feet of stream impacts. Further, Compressor Station 607 Option B would result in greater forested impacts relative to Compressor Station 607 Option A. Table 2-11 provides a comparison of Compressor Station 607 Option A and Compressor Station 607 Option B. Transco selected Compressor Station 607 Option A as the proposed site. Transco has come to an agreement with the landowner to purchase the Compressor Station 607 Option A property.

**Table 2-11**
**Comparison of Compressor Station 607 Alternative Sites**

| Factor | Compressor Station 607 Option A (Proposed) | Compressor Station 607 Option B |
|---|---|---|
| Parcel area (acres) | 93.0 | 210.8 |
| Temporary construction workspace (acres)[a] | 18.0 | 77.4 |
| Permanent footprint (acres)[a] | 12.3 | 31.8 |
| Length of temporary access roads (feet) | 0.0 | 0.0 |
| Length of permanent access roads (feet)[a, b] | 765 | 1,127 |
| Length of suction and discharge piping[c] | 297 | 268 |
| Current Zoning Classification[d] | Agriculture/Conservation | Agriculture/Conservation |
| Current Land Use[e] | Hay/Agriculture | Shrub/Scrub |
| Land Ownership | Private | Private |
| Land Availability[f] | Available | Available |
| Permanent impacts on forested lands (acres)[e] | 2.5 | 30.4 |
| Temporary impacts on prime farmland[g] (acres) | 17.7 | 0.0 |
| Permanent impacts on prime farmland (acres)[g] | 12.1 | 0.0 |
| NHD waterbodies impacted (stream length, in feet)[h] | 0.0 | 0.0 |
| Field delineated streams (stream length, in feet)[i] | 0.0 | 164 |
| NWI wetlands impacted (acres)[j] | 0.0 | 0.0 |
| Field delineated wetlands (acres) [i] | 0.3 | 5.6 |
| Number of residences within 0.5 mile[k] | 46 | 33 |
| Distance to nearest residence (feet)[k] | 364 | 116 |
| Highly erodible soils (acres)[l] | <0.1 | 35.7 |
| Hydric soils (acres)[l] | 0.0 | 0.0 |
| Shallow depth to bedrock (acres)[l] | ND | 3.2 |

**Table 2-11**
**Comparison of Compressor Station 607 Alternative Sites**

| Factor | Compressor Station 607 Option A (Proposed) | Compressor Station 607 Option B |
|---|---|---|

[a] Temporary construction workspace and permanent footprint are based on conceptual layout plans and are subject to change.
[b] Length of the access road is located within temporary construction workspace.
[c] Suction and discharge piping is required to connect a new compressor station to the existing pipeline system
[d] Current zoning designation received from Luzerne County (Weber 2019).
[e] Land use calculations based on USGS NLCD 2011 database and adjusted based on field findings.
[f] Land availability is defined as parcels that were available for purchase.
[g] Prime farmland based on SSUGRO data set
[h] Waterbodies identified based on National Hydrography Dataset (NHD).
[i] Wetlands and streams were delineated between October 2018 through June 2019 by WHM
[j] Wetlands identified using the National Wetland Inventory (NWI).
[k] Residence and distances based on aerial photography. Residence counts are measured from the edge of the workspace. This distance may differ from what is included the Noise Study Reports in Appendix 9D of RR 9 as this table presents distance from the edge of the workspace, whereas the Noise Study Reports present distance from the center of the site.
[l] Soil characteristics and shallow depth to bedrock based on SSURGO data set

Key:
ND = No data within SSURGO data set

### *3.3.3 Compressor Station 620*

Transco identified two alternative sites, Compressor Station 620 Option A and Compressor Station 620 Option C, that met the criteria as defined above (see Figures 10A-10 and 10A-11).

#### 3.3.3.1 Compressor Station 620 Option A

Compressor Station 620 Option A is a 105.5-acre parcel located in Hegins Township, Schuylkill County, Pennsylvania, and is crossed by the existing CPL South pipeline (see Figure 10A-10). The parcel is in an agricultural field immediately adjacent to an agricultural operation and associated structures.

Transco identified 23 residences within 0.5-mile of the site. The closest residence is located approximately 75 feet west of the workspace for the compressor station.

Temporary construction workspace would impact 45.3 acres, and the permanent facility footprint would occupy 24.2 acres. A new access road totaling 764 feet would need to be constructed on the parcel.

No mapped NHD streams or NWI wetlands were depicted on the site. Compressor Station 620 Option A is within the watershed of Deep Creek. Deep Creek is located 266 feet south of the site. The nearby reach of Deep Creek is classified as Coldwater Fisheries with Migratory Fishes (CWF, MF) and Trout Stocked Stream. Deep Creek is also classified as impaired due to the presence of pathogens from an unknown source (PADEP 2019a). No TMDL exists for Deep Creek. No FEMA mapped floodplains are present within the site.

Field surveys identified two small tributaries to Deep Creek in the western end of the site, and PEM and PFO wetlands in the southern portion of the site. Following completion of field surveys, a site layout was designed to avoid impacts to streams and wetlands.

One active bald eagle (*Haliaeetus leucocephalus*) nest is located approximately 2,651 feet southwest of the site.

The results of the Phase 1 site assessment did not indicate any environmental liabilities or RECs (BAI Group 2019b).

#### 3.3.3.2 Compressor Station 620 Option C

Compressor Station 620 Option C is a 63.9-acre parcel located in Porter and Frailey Townships, Schuylkill County, Pennsylvania, and is crossed by the existing CPL South pipeline. Option C is located on an industrial property and surrounded by other industrial and forested land. Interstate 81 is located 180 feet east of the site.

Transco identified no residences within 0.5-mile of the site. The closest residence is located approximately 1,400 feet southwest of the workspace for the compressor station.

Temporary construction workspace would impact 29.1 acres, and the permanent facility footprint would occupy 26.1 acres (3.9 acres of which are associated with a permanent access road). An existing access road, crossing six separate parcels, and totaling 9,388 feet would need to be improved to meet the operational needs of the facility.

No mapped NHD streams and 0.3 acre of NWI mapped wetlands are present on the site. Compressor Station 620 Option C is located within the Good Spring Creek watershed. Good Spring Creek is located 378 feet north of the site. The nearby reach of Good Spring Creek is classified as Coldwater Fisheries with Migratory Fishes (CWF, MF) and Naturally Reproducing Trout. Good Spring Creek is classified as impaired due to metals and siltation (PADEP 2019a). No FEMA mapped floodplains are present within the site.

Field surveys identified three tributaries to Good Spring Creek within the site, ranging from 2 to 4 feet wide. Eleven wetlands were also delineated throughout the site, including PEM and PFO wetlands. Based on land requirements and the location of both streams and wetlands on the site, Transco anticipates that approximately 1.3 acres of wetlands would be impacted to develop this site.

The site is partially underlain by an abandoned mine land area (PADEP 2019b). Abandoned mine lands have the potential to cause constructability issues related to subsidence and underground voids. In addition, abandoned mine lands can pose threats to human health and the environment. Geotechnical investigations would be required to fully investigate the extent of the mining activity underneath the site, and related risks to constructability and contamination (BAI Group 2019c).

The results of the Phase 1 site assessment confirmed that surface mining occurred at the site for approximately 20 years. The mining operation on site was not reclaimed and was abandoned when mining activities ended. As such, acid mine drainage discharge has occurred on the site, impacting surface water discharges. These discharges have been mapped by PADEP's eMapPA and appear in the environmental records as the Good Spring at I-81 Abandoned Mine Land Inventory Area. The acid mine drainage discharges present an environmental liability and therefore represent an REC.

The abandoned mine operations also resulted in a series of open mine cuts throughout the site. The mine cuts were reported as filled with fly ash and municipal sludge from an adjacent coal-fired power plant. No erosion and sediment controls were observed to prevent the migration of fly ash across the site. Further, a coal-fired power plant and associated residual/municipal waste landfill are located immediately north and upgradient of the site. For these reasons, the fly ash and municipal sludge are solid waste, which can be potentially hazardous materials, representing an environmental liability and REC for the site (BAI Group 2019c).

#### 3.3.3.3 Compressor Station 620 Conclusion

Based on the evaluation above and Table 2-12. Compressor Station 620 Option C would result in impacts to wetlands and streams and poses constructability constraints and risks due to historic mining activity and the presence of contamination on the site. Compressor Station Option A avoids impacts to wetlands and streams, and does not pose constructability constraints.

Transco selected Compressor Station 620 Option A as the proposed site. Transco has come to an agreement with the landowner to purchase the Compressor Station 620 Option A property.

**Table 2-12**
**Comparison of Compressor Station 620 Alternative Sites**

| Factor | Compressor Station 620 Alternative Sites | |
|---|---|---|
| | **Option A (Proposed)** | **Option C** |
| Parcel area (acres) | 105.5 | 63.9 |
| Temporary construction workspace (acres)[a] | 45.4 | 29.1[m] |
| Permanent footprint (acres)[a] | 24.3 | 26.1[m] |
| Length of temporary access roads (feet)[b] | 0.0 | 0.0 |
| Length of permanent access roads (feet)[a] | 764 [b] | 9,388 |
| Length of suction and discharge piping[c] | 278 | 575 |
| Current Zoning Classification[d] | Agriculture | Industrial-Commercial and Conservation Mining[d] |
| Current Land Use[e] | Cultivated Cropland | Mixed Forest, Industrial/Commercial Land |
| Land Ownership | Private | Private |
| Land Availability[f] | Available | Available |
| Permanent impact on forested land (acres)[g] | 0.0 | 7.9 |
| Temporary impact on prime farmland (acres)[g] | 41.3 | <0.1 |
| Permanent impact on prime farmland (acres)[f] | 24.2 | 2.0 |
| NHD waterbodies impacted (stream length, in feet)[h] | 0.0 | 0.0 |
| Field delineated streams (stream length, in feet)[i] | 0 | 0 |
| NWI wetlands impacted (acres)[j] | 0.0 | 0.3 |
| Field delineated wetlands (acres) [i] | 0.0 | 1.3 |
| Number of residences within 0.5 mile[k] | 23 | 0 |
| Distance to nearest residence (feet)[k] | 75 | 1,400 |
| Highly erodible soils (acres)[l] | 4.5 | 20.4 |
| Hydric soils (acres)[l] | 0.5 | 1.1 |
| Shallow depth to bedrock (acres)[l] | 16.4 | 0.0 |

**Table 2-12**
**Comparison of Compressor Station 620 Alternative Sites**

| Factor | Compressor Station 620 Alternative Sites | |
|---|---|---|
| | Option A (Proposed) | Option C |
| [a] Temporary construction workspace and permanent footprint are based on conceptual layout plans and are subject to change. | | |
| [b] Length of the access road is located within temporary construction workspace. | | |
| [c] Suction and discharge piping is required to connect a new compressor station to the existing pipeline system. | | |
| [d] County of Schuylkill 2010a and 2010b. | | |
| [e] Land use calculations based on USGS NLCD 2011 database and adjusted based on field findings. | | |
| [f] Land availability is defined as parcels that were available for purchase. | | |
| [g] Prime farmland based on SSUGRO data set | | |
| [h] Waterbodies identified based on National Hydrography Dataset (NHD). | | |
| [i] Wetlands and streams were delineated between October 2018 and June 2019 by WHM (see Appendix 2F of RR 2) | | |
| [j] Wetlands identified using the National Wetland Inventory (NWI). | | |
| [k] Residence and distances based on aerial photography. Residence counts are measured from the edge of the workspace. This distance may differ from what is included the Noise Study Reports in Appendix 9D of RR 9 as this table presents distance from the edge of the workspace, whereas the Noise Study Reports present distance from the center of the site. | | |
| [l] Soil characteristics and shallow depth to bedrock based on SSURGO data set. | | |
| [m] Includes the permanent access road. | | |
| Key: | | |
| N/A = not available | | |

## 4.0 Impact Minimization of the Proposed Alternative

### 4.1 Pipeline Workspace

Construction of the pipeline facilities will require the acquisition of temporary construction ROWs, additional temporary workspace (ATWS), and permanent (operational) easements along the entire length of each pipeline route. Transco proposes to utilize the following nominal ROWs during construction of the pipeline facilities:

- A 90-foot-wide construction ROW for installation of the 36-inch-diameter Hensel Replacement, including removal of a portion of Leidy Line A;
- A 90-foot-wide construction ROW for installation of the 36-inch-diameter Hilltop Loop; and
- A 100-foot-wide construction ROW for installation of the 42-inch-diameter Benton Loop.

The Hilltop Loop and Benton Loop are entirely co-located with the existing Transco Leidy Line System. The Hensel Replacement is co-located for 95 percent of its length. Transco proposes the construction ROWs to provide for safe and efficient construction of large diameter pipeline facilities in accordance with OSHA regulations (29 CFR 1926.650-1926.652, Subpart P)

and Interstate Natural Gas Association of America's (INGAA's) workspace guidelines (INGAA 1999). Reductions or "neck-downs" of the construction ROW at resource crossings were employed to avoid and minimize resource impacts.

In wetlands, a 75-foot-wide construction ROW will be used, except where Transco has requested provided site-specific justification, as outlined in Table 3-1. During pipeline construction, machinery operates on one side of the trench (working side), and excavated materials is stockpiled on the other side (non-working side). At most wetland crossings, this workspace has been necked down to 75 feet. In a reduced 75-foot-wide ROW, the proposed working side of the ROW is typically 45 feet wide.

**Table 3-1**
**Site-Specific Justification for Exceeding 75-foot Nominal Workspace in Wetlands**

| Facility | Wetland Feature ID | Approximate Milepost | Feature Type | ROW Width | Justification |
|---|---|---|---|---|---|
| **Hensel Replacement** | | | | | |
| | W3-T1-HR | 193.64 | Wetland | 90 | This particular wetland crossing is at a location along the Hensel Replacement alignment where the proposed route is between two active pipelines, one being a foreign pipeline. Due to length of wetland crossing and being between the two active pipelines the full 90' nominal workspace is necessary to facilitate a safe and efficient wetland crossing. |
| **Hilltop Loop** | | | | | |
| | W3-T7a-HL | 183.55 | Wetland | 315 | This wetland crossing abuts an existing valve site which is proposed for removal located at the eastern terminus of Hilltop Loop. Due to limited access, the proximity of the wetland to the eastern terminus of the project, and the proposed removal of the location existing valve site, the wetland impact is unavoidable. |
| | W1-T4-HL | 184.93 | Wetland | 175 | Due to being located at toe of steep slope and adjacent to large stream crossings (Young Womans Creek) and associated foreign lines, additional workspace is required due to limited space between these restricting features. |

**Table 3-1**
**Site-Specific Justification for Exceeding 75-foot Nominal Workspace in Wetlands**

| Facility | Wetland Feature ID | Approximate Milepost | Feature Type | ROW Width | Justification |
|---|---|---|---|---|---|
| | W3-T2-HL | 185.05 | Wetland | 145 | Due to the location of the roadside wetland swale feature associated with Little Italy Road, additional workspace is required due to limited usable workspace between steep slopes, including two road crossings, additional workspace is needed for stockpiling of excavated materials and installing BMPs to facilitate safe and efficient crossings at this location. |
| **Benton Loop** | | | | | |
| All wetland crossing on Benton Loop met Nominal Workspace of 75 feet | | | | | |

Within the top of bank (TOB) of streams, a 50-foot-wide construction ROW will be used, and a 75-foot-wide construction ROW will be used in floodways, except where Transco has provided site-specific justification, as outlined in Table 3-2. During pipeline construction, machinery operates on one side of the trench (working side), and excavated materials is stockpiled on the other side (non-working side). At most stream crossings, this workspace has been necked down to 50 feet within the TOB and 75 feet in the floodway. Within TOB, in a reduced 50-foot-wide ROW, the proposed working side of the ROW is typically 32 feet wide. Within floodways, in a reduced 75-foot-wide ROW, the proposed working side of the ROW is typically 45 feet wide.

**Table 3-2**
**Site-Specific Justification for Exceeding 50-foot Nominal Workspace in the Top of Bank of Streams and 75-foot in Floodways**

| Facility | Watercourse Feature ID | Approximate Milepost | Feature Type | ROW Width | Justification |
|---|---|---|---|---|---|
| **Hensel Replacement** | | | | | |
| | S12-T6-HR | 189.05 | Stream | 75 | Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing. |
| | S9-T6-HR | 190.36 | Stream | 75 | Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing. |
| | S7-T7-HR | 190.47 | Stream | 75 | Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing. |
| | S1-T7-HR | 190.69 | Stream & Floodway | 90 | Due to steep terrain including side slope construction, associated wetlands crossing and associated BMPs, installation of Hensel Replacement, and removal of Leidy Line A, additional workspace is needed to facilitate a safe and efficient watercourse crossing. |
| | S1-T7-HR | 190.99 | Stream & Floodway | 75 (Stream) 115 (Floodway) | Due to steep terrain including side slope construction, associated wetlands crossing and associated BMPs, installation of Hensel Replacement, and removal of Leidy Line A, additional workspace is needed to facilitate a safe and efficient watercourse and floodway crossing. |
| | S1-T1-HR | 193.88 | Stream | 75 | This particular stream crossing is at a location along the Hensel Replacement alignment where the proposed route is adjacent to other active pipelines, and the crossing of associated large wetland complex (W1-T1-HR) to the south, additional workspace is needed to facilitate a safe and efficient watercourse crossing. |

**Table 3-2**
**Site-Specific Justification for Exceeding 50-foot Nominal Workspace in the Top of Bank of Streams and 75-foot in Floodways**

| Facility | Watercourse Feature ID | Approximate Milepost | Feature Type | ROW Width | Justification |
|---|---|---|---|---|---|
| **Hilltop Loop** | | | | | |
| | S1-T4-HL | 184.97 | Stream & Floodway | 90 (Stream) 300 (Floodway) | Due to steep terrain on either side of crossing location, existing infrastructure, foreign lines, two road crossings, size of Young Womans Creek, associated wetland crossings, and lack of available usable workspace, additional workspace is needed to facilitate a safe and efficient watercourse crossing. |
| **Benton Loop** | | | | | |
| | S5-T6 | 118.07 | Stream & Floodway | 100 | Due to the location of two road crossings in proximity to the watercourse, additional workspace is needed to facilitate a safe and efficient watercourse crossing. |

These wetland, stream, and floodway workspace neck downs are the most reasonable neck downs for pipeline installation within these resources, as it will still allow for required workspace to complete the construction activities while minimizing environmental impacts. These reductions to the workspace are considered the maximum reductions for the safe operation and passage of equipment and personnel while minimizing the length of time required to cross the features.

### 4.1.1 Construction Technique Alternatives

Transco evaluated the feasibility of implementing trenchless construction techniques to cross sensitive areas. These techniques may be used in an attempt to reduce impacts associated with construction in comparison with using conventional (trenching) construction techniques. While use of trenchless methods can reduce impacts on or avoid sensitive areas, these methods have limitations that must be considered before a method is selected as the proposed construction method for a given crossing. The following sections outline the factors that will be evaluated when selecting the proposed construction method for a given crossing.

#### *4.1.1.1 Trenchless Analysis*

A trenchless analysis was conducted for each wetland and watercourse crossing to determine if conventional bore (bore) or horizontal directional drill (HDD) would be feasible

construction method. Each crossing was first assessed to determine if conventional bore would be the suitable construction method. The conventional bore is first reviewed since it is a lower cost and lower risk trenchless method than the HDD. If a conventional bore is feasible, a review for HDD suitability was not completed. If it was determined that conventional boring was not feasible, an assessment was then completed to determine if an HDD would be a feasible construction method. Should neither trenchless method has been found suitable, it was then determined that a dry-open cut methodology would be completed. Below is a summary of the trenchless analysis for both the conventional bore and HDD. Appendix S1 – 1 includes a flow chart that is utilized during the trenchless analysis.

Conventional Bore Analysis

Conventional bores are not practical for avoiding wetland resources. To complete a conventional bore, a significant amount of workspace required for the activity. Clearing within the permanent ROW is required during pipeline operation to ensure that root systems of trees do not compromise the pipe coating, and to allow for aerial inspection of the alignment, whether an open cut or conventional bore is used. Additionally, wetlands would need to be cleared during construction for a travel lane to facilitate movement of construction equipment along the ROW. Therefore, even if a conventional bore were completed, there would be minimal impact reductions to the resource by utilizing the conventional bore installation method versus an open-cut and there would be significant increases in impacts to resources outside of the wetlands to accommodate the workspace required for a conventional bore. Therefore, conventional bores are not practical for avoiding wetland resources and Transco did not select the conventional bore crossing technique for wetland crossings associated with this Project.

For streams, the conventional bore assessment occurred in phases, as shown in Appendix S1-1. Phase I of the stream assessment included a topography evaluation that considered the bore length and depth of each crossing, in addition to proximity to adjacent infrastructure, such as roads. If the bore was less than 300 feet in length, it was considered potentially feasible. The typical maximum length that a conventional bore can be successfully completed is 300 feet. Should the length be longer than 300 feet, the crossing moved on to the HDD assessment. The 300 feet includes the stream, wetland, and floodway widths, with 20 feet offset, in addition to the bore pit dimensions, which are generally 40 feet by 60 feet in size.

The bore pit depth was evaluated, as special considerations must occur if a bore pit exceeds 20 feet. At depths greater than 20 feet, standard trench boxes are not tall enough to

protect the integrity of the pit walls, and significant benching and spoil storage will be required, thereby necessitating a significantly larger footprint for workspace. Therefore, conventional bores were not considered for crossings where the depth of the bore pit would be greater than 20 feet.

If a feature is in the immediate vicinity of existing infrastructure, such as roadways that are proposed for boring, a conventional bore is considered appropriate. The construction method can be completed for both crossings (stream and/or wetland and infrastructure) as the boring can capture both features within the same bore, given their close proximity and that the adjacent roadway must be bored.

For the Benton Loop, only one crossing (Crossing 8 – W2-T4 & S3-T3) was considered feasible for a conventional bore. This crossing is less than 300 feet in length and is in close proximity to the State Route 2079 / Mordan Hollow Road.

The remaining streams and wetlands on the Project that were not deemed feasible for the conventional bore, moved on to the HDD assessment.

Horizontal Directional Drilling Analysis

Phase I of the wetland assessment involved feature characteristic review of the wetlands as well as the total acreage of PFO wetland impacted at the crossing. There were two qualifiers for HDD workspace to be developed related to wetland impacts: the wetlands are either to be located within a special protection watershed or classified as Exceptional Value (EV) in 25 PA Code Chapter 105.17. Due to the temporary nature of impacts, wetlands located outside of special protection watersheds or not classified as EV were not considered in Phase I of the wetland assessment. The qualifying wetlands were then reviewed for their acreage of PFO wetland impact. Crossings with PFO wetland impacts exceeding one acre, along with location in a special protection watershed or an EV wetland status move on to the Phase III of the assessment (there is no Phase II of the wetland assessment) and potential HDD workspace would be developed. Wetlands designated either PEM or PSS were not identified for potential HDD workspace development as no vegetative cover type change occurs in PEM wetlands and only minimal changes occur PSS wetlands due to the 10-foot corridor over the pipe being maintained as emergent cover to allow for pipeline inspection. PFO wetland impacts of less than one acre were not considered. Transco considered one acre based on the potential impacts (i.e. workspace requirements, noise) and risks (i.e. inadvertent return) of an HDD. Additionally, the ROW is allowed to revert to pre-existing condition within 15 feet of the pipeline and impacts to PFO

wetlands have been minimized to the extent practicable with the workspace, as designed. No wetlands continued past Phase I of the HDD assessment as no wetlands had PFO impacts greater than one acre.

Phase I of the stream assessment involved a feature characteristic review of the streams. Streams located within special protection watersheds were identified for Phase II consideration. All streams crossed by the Project are located within special protection watersheds and were therefore included in the Phase II assessment.

Phase II of the stream assessment considered the width of the streams that passed the Phase I review. Streams greater than 30 feet in width were considered feasible for workspace development to complete an HDD and identified for Phase III and Phase IV consideration. Smaller streams were not identified for Phase III or Phase IV consideration because the risks and impacts (i.e. workspace requirements, noise) associated with an HDD crossing categorically outweigh the benefits in these smaller streams. The dry-open cut methodology is an effective construction methodology that minimizes crossing time and avoids the risk of an inadvertent return. Based on the Phase II review, Young Womans Creek (S1-T4-HL), Drury Run (S2 T7a-HR), Paddy Run (S1-T7-HR), and Hensel Fork (S1-T7-HR at MP.190.69) were identified for Phase III and Phase IV consideration.

Phase III-A of the analysis included a desktop analysis of the following items related to workspace required for the HDD:

- Impacted Wetland Acreage
  - PFO
  - PEM
  - PSS
- Impacted Upland Acreage
- Land Use
- Water Consumption
- Noise generated by construction equipment
- Air emissions generated by construction equipment
- Anticipated construction durations

Phase III-B included a risk assessment for the completion of the HDD. The assessment provides an analysis of the following risk factors:

- Site Constraints and Topographic Considerations
- Elevation Differential and Dry Hole
- Hole Stability
- Obstructions
- Pilot Hole Steering
- Drilling Fluid Loss, Hydraulic Fracture and Inadvertent Returns
- Poor Cuttings Removal
- Hole Obstructions and Flushing
- Downhole Tooling Failure/Loss
- Time of Installation

Based on the Phase III assessment, crossings were not considered infeasible and were not identified for Phase IV consideration, as outlined in Appendix 2 – Trenchless Analysis Feasibility Study. As a result of the HDD component of the Trenchless Analysis, all crossings qualified for the dry-open cut construction.

### 4.2 Compressor Station Workspace

Construction of the pipeline compressor station facilities will require temporary and permanent workspace for construction and operation of the facilities. Transco avoided and minimized impacts to the extent practical for the siting and workspace development of Compressor Station 605, 607, 610, and 620. Compressor Station 605 will not have earth disturbance associated with the Project. Compressor Station 610 and 620 have avoided all impacts to wetland, streams, and floodways. Compressor Station 607 will have minor temporary and permanent impacts associated with construction and operation of the facility. However, the proposed Compressor Station 607 has been designed and sited on the property to avoid and minimize resource impacts to the extent possible. Due to the location of existing resources onsite and the required area for construction and operation impacts are considered unavoidable.

## 5.0 Summary

An alternatives analysis has been prepared for the proposed Project, consistent with the requirements of PA Code 105.13(e)(vii). The alternatives analysis has taken a multi-tier approach, first looking at the system alternatives for Project design options, and then taking the selected system design and evaluating the alternatives, avoidance and minimization measures, and construction techniques associated with the proposed alternative design. The Project as proposed

has minimized impacts to environmental resources, while meeting the Project goals. Construction measures and methods were thoroughly evaluated to minimize effects to environmental resources, including streams and wetlands. The Project is considered water dependent, as it requires siting within water to fulfill the basic purposes of the Project, as defined by PA Code 105.13(e)(x)(C). Based upon the results of the analysis, the proposed Project meets the Project goals and is consistent with state antidegradation requirements.

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