Northeast Supply Enhancement

SAFETY & RELIABILITY

- RESOURCE REPORT 11 -

Williams has collaborated with the public to develop the safest, most efficient project route.

MARCH 2017

This page intentionally left blank.

RESOURCE REPORT 11 – RELIABILITY AND SAFETY

INFORMATION	Data Sources[a]	Found in Section
Full FERC Filing Requirements		
1. Identify by milepost and in table form, all U.S. Department of Transportation Class Locations, High Consequence Areas, or areas of concern (as defined in Title 49 Code of Federal Regulations Part 192.903) for the proposed route, alternate routes, and compressor stations and explain the basis for high consequence area identification.	D	See Sections 11.3.1 and 11.3.2
2. Provide a list of mainline valves and for each one indicate whether the applicant proposes to use automatic, remote, or manually operated valves. Provide a justification for the use of each type.	D	See Section 11.3.4
3. Discuss the outcome of the applicant's consultations with local fire departments and emergency response agencies relative to whether additional equipment, training, and support are needed in the project area.	D	See Section 11.6.2
4. Provide an analysis or identify/justify mitigation measures the applicant would implement to address electrical arcing or alternating current/direct current interference anywhere a pipeline or compressor station is located adjacent to a high voltage electric transmission line.	D	This does not apply for the compressor stations. Transco is currently evaluating areas where the pipeline is located adjacent to a high voltage electric transmission lines and will apply special coating as necessary.

[a] Data Source Definitions:

D = Applicant

RESPONSES TO FERC COMMENTS DATED 1/17/2017

REGARDING DRAFT RESOURCE REPORT 11

Comment:	Response/Information Location:
139. Provide the potential impact radius along the planned pipeline facilities and at Compressor Stations 200 and 206.	See Section 11.7

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ACRONYMS

API	American Petroleum Institute
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CP	cathodic protection
FERC (or Commission)	Federal Energy Regulatory Commission
HCA	high consequence area
IRP	industry recommended practices
ISO	International Organization for Standardizations
MAOP	maximum allowable operating pressure
MLV	mainline valve
MP	milepost
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIR	Potential Impact Radius
Project	Northeast Supply Enhancement Project
ROW	right-of-way
IRP	Industry-Recommended Practice
RR	resource report
SCADA	supervisory control and data acquisition
Transco	Transcontinental Gas Pipe Line Company, LLC.
TSA	Transportation Security Administration
USDHS	U.S. Department of Homeland Security
USDOT	U.S. Department of Transportation
Williams	Williams Partners L.P.

This page intentionally left blank.

11 RELIABILITY AND SAFETY

11.1 Introduction

Resource Report (RR) 11 describes the reliability and safety aspects of the Transcontinental Gas Pipe Line Company, LLC (Transco) proposed Northeast Supply Enhancement Project (Project). More information about pipeline safety and Transco's safety, design, operations, maintenance, and integrity management programs and procedures can be found at http://co.williams.com/williams/safety/keeping-our-systems-safe/. Information pending in this RR will be submitted in a supplemental filing as noted *in grey italics with the anticipated filing date*.

Transco, a subsidiary of Williams Partners L.P. (Williams), prepared this RR to support its application to the Federal Energy Regulatory Commission (FERC *or* Commission) for a Certificate of Public Convenience and Necessity (Certificate) for the Project. The Project supports National Grid's long-term growth, reliability, and flexibility beginning in the 2019/2020 heating season. Transco is proposing to expand its existing interstate natural gas pipeline system in Pennsylvania and New Jersey and its existing offshore natural gas pipeline system in New Jersey and New York waters. The Project capacity is fully subscribed by two entities of National Grid: Brooklyn Union Gas Company (d/b/a [doing business as] National Grid NY) and KeySpan Gas East Corporation (d/b/a National Grid), collectively referred to herein as "National Grid."

To provide the incremental 400,000 dekatherms per day (Dth/d) of capacity, Transco plans to expand portions of its system from the existing Compressor Station 195 in York County, Pennsylvania, to the Rockaway Transfer Point in New York State waters. As defined in executed precedent agreements with National Grid, the Rockaway Transfer Point is the interconnection point between Transco's existing Lower New York Bay Lateral (LNYBL) and existing offshore Rockaway Delivery Lateral (RDL). Table 11.1-1 lists the pipeline facilities associated with the Project. Figure 1A-1 in Appendix 1A shows the overall Project location and facilities.

Table 11.1-1
Summary of Pipeline Facilities

Facility	Size	Onshore/ Offshore	State	County	Length (miles)
Quarryville Loop	42-inch-diameter pipeline	Onshore	Pennsylvania	Lancaster County	10.17
Madison Loop	26-inch-diameter pipeline	Onshore	New Jersey	Middlesex County	3.43
Raritan Bay Loop	26-inch-diameter pipeline	Onshore	New Jersey	Middlesex County	0.16
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New Jersey	Middlesex County	1.86
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New Jersey	Monmouth County	4.09
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New York	Queens County	6.44
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New York	Richmond County	10.94

A description of the Project facilities is provided below. Note that the mileposts (MPs) provided below for the onshore pipeline facilities correspond to the existing Transco Mainline and Lower New York Bay Lateral[1]. The offshore pipeline facility MPs are unique to the Raritan Bay Loop. The starting MP for the Raritan Bay Loop corresponds to MP12.00 of the Lower New York Bay Lateral, and the end MP corresponds to the Rockaway Transfer Point.

Onshore Pipeline Facilities

Quarryville Loop

- 10.17 miles of 42-inch-diameter pipeline from MP1681.00 near Compressor Station 195 to MP1691.17 co-located with the Transco Mainline in Drumore, East Drumore, and Eden Townships, Lancaster County, Pennsylvania. Once in service, the Quarryville Loop will be referred to as Mainline D.

Madison Loop

- 3.43 miles of 26-inch-diameter pipeline from Compressor Station 207 at MP8.57 to MP12.00 southwest of the Morgan meter and regulating (M&R) Station on the Lower New York Bay Lateral in Old Bridge Township and the Borough of Sayreville, Middlesex County, New Jersey. Once in service, the Madison Loop will be referred to as Lower New York Bay Lateral Loop F.

Raritan Bay Loop

- 0.16 mile of 26-inch-diameter pipeline from MP12.00 west-southwest of the Morgan M&R Station to the Sayreville shoreline at MP12.16. Additionally, a

[1] Also referred to as Lower Bay Loop C.

cathodic protection (CP) power cable will be installed from a rectifier located at the existing Transco Morgan M&R Station near MP12.10 and extending to a connecting point on the proposed 26-inch-diameter pipeline at MP12.00. The approximately 545-foot-long power cable will be installed by horizontal directional drill (HDD).

Offshore Pipeline Facilities

Raritan Bay Loop

- 23.33 miles of 26-inch-diameter pipeline from MP12.16 at the Sayreville shoreline in Middlesex County, New Jersey, to MP35.49 at the Rockaway Transfer Point in the Lower New York Bay, New York, south of the Rockaway Peninsula in Queens County, New York. Additionally, a 1,831-foot-long CP power cable will be installed via HDD from a rectifier at the existing Transco Morgan M&R Station near MP12.10 to an offshore anode sled located approximately 1,200 feet north of MP12.32. Once in service, the Raritan Bay Loop will be referred to as Lower New York Bay Lateral Loop F.

Aboveground Facilities

New Compressor Station 206

- Construction of a new 32,000 ISO (International Organization for Standardizations) horsepower (hp) compressor station and related ancillary equipment in Franklin Township, Somerset County, New Jersey, with two Solar Mars® 100 (or equivalent) natural gas-fired, turbine-driven compressors.

Modifications to Existing Compressor Station 200

- Addition of one electric motor-driven compressor (21,902 hp) and related ancillary equipment to Transco's existing Compressor Station 200 in East Whiteland Township, Chester County, Pennsylvania.

Modifications to Existing Mainline Valve Facilities

- **Existing Valve Site 195-5** – Installation of a new mainline valve, launcher/receiver and tie-in facilities at the start of the Quarryville Loop (MP1681.00).
- **Existing Valve Site 195-10** – Installation of a new mainline valve, launcher/receiver, and tie-in facilities at the end of the Quarryville Loop (MP1691.17).

- **Existing Valve Site 200-55** – Installation of a new mainline valve, launcher/receiver, and tie-in facilities at the start of the Madison Loop (MP8.57).

New Mainline Valve Facilities

- **Proposed Valve Site 195-8** – Installation of a new intermediate mainline valve for the Quarryville Loop (MP1687.86).
- **Proposed Valve Site 200-59** – Installation of a new mainline (isolation) valve for the Madison Loop (MP11.90).

If the Commission issues a Certificate for the Project and Transco obtains the applicable permits and authorizations, Transco anticipates that construction of the Project will begin in the 3rd quarter of 2018 to meet an in-service date in the 3rd quarter of 2019.

11.2 Hazards

The transportation of natural gas by pipeline may involve some risk to the public in the event of an incident and subsequent release of natural gas. Potential impacts on public safety from pipeline transportation of natural gas have been directly related to leaks or line breaks due to corrosion or equipment malfunctions, or indirectly related to leaks or line breaks resulting from external forces not associated with pipeline operations (e.g., damage from third-party digging near buried pipeline sections). Natural forces also have the potential to damage the pipeline, valves, and meter stations. Damage from natural forces could result in an unintentional release, leak, or fire.

To minimize incidents, interstate natural gas pipeline facilities are designed, constructed, operated, and maintained in accordance with the U.S. Department of Transportation's (USDOT's) Pipeline and Hazardous Materials Safety Administration (PHMSA) Standard 49, Code of Federal Regulations (CFR) Part 192 (49 CFR Part 192). These federal safety standards, together with pipeline-integrity management programs and recent advances in pipeline manufacture, construction, and inspection techniques, minimize the potential for pipeline failure. These measures include improved public awareness initiatives, such as the "811" call system, "Call Before You Dig," and other One Call programs intended to reduce third-party damage to underground utilities, including buried high-pressure natural gas pipelines.

The primary component of natural gas in interstate transmission pipelines is methane, a colorless, tasteless, and odorless gas. It is non-toxic, but is classified as an asphyxiant, possessing only a slight inhalation hazard. However, if inhaled in high concentration, oxygen

deficiency can result in serious injury or death. Methane has an ignition temperature of 1,000 degrees Fahrenheit (°F) and is flammable at concentrations between 5.0 and 15.0 percent in air. A flammable concentration within an enclosed space in the presence of an ignition source can explode. The specific gravity of methane is 0.55 and therefore it is buoyant at atmospheric temperatures. Consequently, at normal atmospheric temperature and pressure, methane tends to rise, dispersing rapidly in the atmosphere.

Infrequently, gas is released intentionally during the routine operation and maintenance of pipeline facilities. Transco will follow safety procedures during intentional gas releases to prevent ignition and to safely vent gases to the atmosphere. Facilities are designed to meet hazardous area classification requirements to prevent ignition, as per National Electric Code (National Fire Protection Association [NFPA 70: NEC]) and Transco design standards. Transco will design, construct, operate, and maintain the Project to meet or exceed the requirements of the PHMSA regulation noted above.

11.3 Safety Standards for Pipelines

Transco will follow standard operating procedures and regulations during installation of the Project. Safety is a common concern with respect to natural gas pipeline projects and associated compressor facilities. While the Commission has oversight in ensuring that aboveground facilities are safely constructed and installed, once the natural gas is flowing in the new facilities, the USDOT assumes oversight responsibility during the operational life of the pipeline and supporting appurtenances. The USDOT is also responsible for setting the federal safety standards for natural gas.

Transco will comply with, and in most cases exceed, the requirements of the USDOT, the Occupational Safety and Health Administration (OSHA), and other applicable regulations, standards, and guidelines for safety. This will include compliance with applicable design standards and codes, construction provisions as mandated, and operation procedures and standards, such as the Pennsylvania, New Jersey and New York One Call systems.

49 CFR Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Section 192.615, each pipeline operator must also establish an emergency plan that provides written procedures to minimize the hazards from a gas pipeline emergency. Key elements of the plan include procedures for:

- Receiving, identifying, and classifying emergency events (gas leakage, fires, explosions, and natural disasters);
- Establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- Making personnel, equipment, tools, and materials available at the scene of an emergency;
- Protecting people first and then property, and ensuring that they are safe from actual or potential hazards; and
- Emergency shutdown of systems and safely restoring service.

Under Section 192.615, each operator must also establish and maintain liaison with appropriate fire, police, and other public officials to learn the resources and responsibilities of each organization that may respond to a gas pipeline emergency and coordinate mutual assistance in responding to emergencies. Each operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to the appropriate public officials.

Transco is in full compliance with all applicable regulations and guidelines from the Transportation Security Administration (TSA). The TSA Pipeline Security Branch regularly audits the Williams corporate security program to ensure that Transco's and other Williams' assets comply with regulations. Transco is currently in compliance with TSA Pipeline Security Guidelines managed by the TSA Office of Transportation Security Network Management. These guidelines are considered sensitive security information and are available only to persons with a "need to know" (TSA 2011).

Transco maintains a corporate security plan that addresses recommended TSA guidelines. This security plan identifies Transco's critical facilities and associated security vulnerability assessments for these facilities. Transco maintains baseline and enhanced security measures for standard and critical facilities as well as security measures that should be taken at the elevated and imminent threat levels. Transco has an advanced cyber-security program that it implements in collaboration with the U.S. Department of Homeland Security (USDHS) and employs regional investigators trained to lead security-related investigations and collaborate with local law enforcement.

Many of the characteristics of the natural gas pipeline system that contribute to public safety in the vicinity of a pipeline also minimize the impact on energy delivery in the event terrorist third-party activities target a pipeline. The natural gas pipeline industry, in conjunction with the USDHS, has been diligent in taking steps to safeguard critical facilities against terrorist threats and to ensure the ability to recover from any such incident on an expedited basis. The pipeline facilities will be buried and pipeline pressures will be monitored 24 hours per day by Transco's Gas Control facility in Houston, Texas. Operations personnel will patrol the pipeline and appurtenant facilities on a routine basis (see Section 11.6).

11.3.1 USDOT Class Locations

The proposed Project will be designed, constructed, operated, and maintained in accordance with the USDOT Minimum Federal Safety Standards stated in 49 CFR Part 192. The regulations are intended to provide adequate protection for the public from natural gas pipeline incidents and failures. 49 Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

To establish more rigorous safety requirements for populated areas, 49 CFR Part 192.5 defines pipeline class locations based on the density of buildings intended for human occupancy in the vicinity of the pipeline. Pipeline design pressures, hydrostatic test pressures and maximum allowable operating pressure (MAOP), inspection and testing of welds, and frequency of pipeline patrols and leak surveys must conform to higher standards in more populated areas.

49 Part 192 also defines area classifications, based on population density in the vicinity of a pipeline, which determine more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous one-mile length of pipeline. The four primary classifications are defined below.

- Class 1: Offshore areas and areas within 220 yards of a pipeline with ≤ 10 buildings intended for human occupancy;
- Class 2: Areas within 220 yards of a pipeline with >10 but <46 buildings intended for human occupancy;
- Class 3: Areas within 220 yards of a pipeline with ≥ 46 buildings intended for human occupancy and areas within 100 yards of either a building or a small, well-defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least five days per week for 10 weeks in any 12-month period; and

- Class 4: Areas within 220 yards of a pipeline where buildings with four or more stories are prevalent.

The minimum pipeline burial depth and maximum distance to a sectionalizing block valve are specified by class location. Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipeline design pressures, hydrostatic test pressures, MAOP, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. The minimum depth of cover for pipelines located within each class location, as defined by the USDOT, are summarized below in Table 11.3-1.

Table 11.3-1
U.S. Department of Transportation Minimum Depth of Cover Standards

Location	Depth of Cover (inches)	
	Normal Soil	Consolidated Rock
Class 1	30	18
Class 2, 3, and 4	36	24
Drainage ditches of public roads and railroad crossings	36	24
Source: 49 CFR Part 192.327		

Class locations also specify the maximum distance from any point on the pipeline to a mainline valve (MLV) (i.e., 10 miles in Class 1 locations, 7.5 miles in Class 2 locations, 4 miles in Class 3 locations, and 2.5 miles in Class 4 locations). Pipe design regulations for steel pipe are contained in 49 CFR Part 192, Subpart C, 49 CFR 192.105 contains a formula for the pipeline's design pressure, and 49 CFR 192.107 through 192.115 contain the components of the design formula, including yield strength, wall thickness, design factor, longitudinal joint factor, and temperature derating factor. These components are adjusted according to project design conditions.

As previously stated, Transco will design, construct, operate, and maintain the proposed pipeline and associated facilities to meet or exceed the requirements of PHMSA Safety Standards in 49 CFR Part 192. Transco will exceed the minimum federal safety standards for this Project by implementing the following reliability and safety measures:

- The pipe material will meet and generally exceed the American Petroleum Institute (API) 5L requirements.
- Class 2 spacing will be used for new MLV assemblies in onshore Class 1 locations.

- Class 2 (0.6 design factor) pipe will be installed in all Class 1 (0.72 design factor) locations in order to increase the safety factor.
- Nondestructive inspection of 100% of welds will be conducted (49 CFR Part 192 requires testing 10% of welds in Class 1 locations; see Section 11.3.1 for a description of class locations).
- Piping will be hydrostatically tested above the minimum federal regulations in 49 CFR Part 192, Subpart J. A minimum of Class 3 hydrostatic test requirements (1.5 times MAOP test pressures) will be applied to all pipeline segments.
- Additional cover depth will be provided at certain onshore locations, including:
    - 36 inches of cover in non-rock areas (49 CFR 192.327 requires 30 inches in Class 1 areas and 36 inches for all other locations);
    - 36 inches of cover in active agricultural land (e.g., corn, soybeans) (49 CFR 192.327 requires 30 inches in Class 1 areas and 36 inches for all other locations); and
    - 60 inches of cover under drainage ditches of public roads and railroad crossings (49 CFR 192.327 requires 36 inches).
    - At a minimum, the Raritan Bay Loop will be installed with a minimum depth of cover of 4 feet over the pipeline.

The Project pipeline components are located in the classification areas in Table 11.3-2, below. Transco has designed all pipeline facilities to meet or exceed the class designation.

Table 11.3-2
Class Locations of Pipeline Facilities

Facility	Begin MP	End MP	Class Designation	Design Class
Quarryville Loop	1681.00	1682.42	1	2
	1682.42	1682.76	2	2
	1682.76	1685.18	1	2
	1685.18	1685.26	2	2
	1685.26	1685.60	3	3
	1685.60	1685.95	1	2
	1685.95	1686.77	3	3
	1686.77	1688.55	1	2
	1688.55	1688.98	2	2
	1688.98	1689.19	1	2
	1689.19	1689.47	2	2
	1689.47	1691.17	1	2

Table 11.3-2
Class Locations of Pipeline Facilities

Facility	Begin MP	End MP	Class Designation	Design Class
Madison Loop	8.57	9.11	1	3
	9.11	9.22	3	3
	9.22	9.40	1	3
	9.40	10.17	3	3
	10.17	10.23	1	3
	10.23	12.00	3	3
Raritan Bay Loop	12.00	12.22	3	3
	12.22	35.49	1	1
Compressor Station 200 Piping	N/A	N/A	N/A	3
Compressor Station 206 Piping	N/A	N/A	N/A	3
Key: N/A = Not applicable				

Transco will monitor changes in population density around the onshore pipelines with a yearly survey that will facilitate a comparison between the previous and current residence count. Heavily populated areas are subject to more frequent monitoring. When changes in population density occur, the pipeline operator is required to ensure that the installed pipeline meets the criteria for pipe design that applies in the higher class location. If the pipe does not meet this requirement, the operator may replace the pipe, reduce the operating pressure in the line, or take other safety measures to achieve the required factor of safety.

11.3.2 High Consequence Areas

On November 15, 2002, Congress passed the Pipeline Safety Improvement Act (H.R. 3609), which was signed into law on December 17, 2002. The act required the USDOT to issue regulations establishing standards for risk analysis and to develop an integrity management program to strengthen overall pipeline safety. The act also established minimum requirements for integrity management programs for gas pipelines located in high consequence areas (HCAs). (The term HCA is used to identify an area where pipeline releases could have greater consequences to health and safety or the environment.) As required by the Pipeline Safety Improvement Act, the PHMSA issued its final rule on December 15, 2003, requiring operators to develop integrity-management programs for gas transmission pipelines located in HCAs.

Section 11.8 summarizes the Transco Integrity Management Program. HCAs are defined in 49 CFR 192.903 as follows:

High consequence area means an area established by one of the methods described in paragraphs (1) or (2) as follows:

(1) An area defined as-

(i) A Class 3 location under §192.5; or

(ii) A Class 4 location under §192.5; or

(iii) Any area in a Class 1 or Class 2 location where the potential impact radius is greater than 660 feet (200 meters), and the area within a potential impact circle contains 20 or more buildings intended for human occupancy; or

(iv) Any area in a Class 1 or Class 2 location where the potential impact circle contains an identified site.

(2) The area within a potential impact circle containing-

(i) 20 or more buildings intended for human occupancy, unless the exception in paragraph (4) applies; or

(ii) An identified site.

(3) Where a potential impact circle is calculated under either method (1) or (2) to establish a high consequence area, the length of the high consequence area extends axially along the length of the pipeline from the outermost edge of the first potential impact circle that contains either an identified site or 20 or more buildings intended for human occupancy to the outermost edge of the last contiguous potential impact circle that contains either an identified site or 20 or more buildings intended for human occupancy.

(4) If in identifying a high consequence area under paragraph (1)(iii) of this definition or paragraph (2)(i) of this definition, the radius of the potential impact circle is greater than 660 feet (200 meters), the operator may identify a high consequence area based on a prorated number of buildings intended for human occupancy with a distance of 660 feet (200 meters) from the centerline of the pipeline until December 17, 2006. If an operator chooses this approach, the operator must prorate the number of buildings intended for human occupancy based on the ratio of an area with a radius of 660 feet (200 meters) to the area of the potential impact circle (i.e., the prorated number of buildings intended for human occupancy is equal to 20 x (660 feet) [or 200 meters]/potential impact radius in feet [or meters]).

Identified site means each of the following areas:

(a) An outside area or open structure that is occupied by twenty (20) or more persons on at least 50 days in any twelve (12)-month period. (The days need not be consecutive.) Examples include but are not limited to, beaches, playgrounds, recreational facilities, camping grounds, outdoor theaters, stadiums, recreational areas near a body of water, or areas outside a rural building such as a religious facility; or

(b) A building that is occupied by twenty (20) or more persons on at least five (5) days a week for ten (10) weeks in any twelve (12)-month period. (The days and weeks need not be consecutive.) Examples include, but are not limited to, religious facilities, office buildings, community centers, general stores, 4-H facilities, or roller skating rinks; or

(c) A facility occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate. Examples include but are not limited to hospitals, prisons, schools, day-care facilities, retirement facilities or assisted-living facilities.

HCAs located along the Project are presented in Table 11.3-3 below.

Table 11.3-3
High Consequence Areas Located along the Project

County	Begin Milepost	End Milepost	HCA Area
Pennsylvania			
Quarryville Loop			
Lancaster	1685.90	1686.06	Identified Site & Cluster of 20+ Structures
New Jersey			
Madison Loop			
Middlesex	9.40	12.00	Mixed Use (Residential and Commercial)
Raritan Bay Loop			
Middlesex	12.00	12.29[a]	Mixed Use (Residential and Commercial)

Key:
HCA = High consequence area.
[a] – The HCA for Raritan Bay Loop extends 660 feet beyond the shoreline into the water.

11.3.3 Pipeline Markers

The PHMSA requires pipeline operators to place pipeline markers at frequent intervals along the pipeline right-of-way (ROW), such as where a pipeline intersects a street, highway,

railway, or waterway, and at other prominent points along the route. Pipeline ROW markers can help prevent encroachment and excavation-related damage to pipelines. The pipeline ROW is much wider than the pipeline itself and, as a result, the pipeline can be located anywhere within the ROW. State laws require excavators to call the "811" call system, "Call Before You Dig," or other One Call programs well in advance of digging to locate underground utilities and ensure it is safe for the contractor to dig in that location.

11.3.4 Mainline Valves

In addition to meeting or exceeding the minimum requirements of MLV spacing specified by the PHMSA (see Section 11.3.1), Transco will install remotely operated valves at each new MLV site; the MLV sites will be monitored and controlled by Transco Gas Control through Transco's Supervisory Control and Data Acquisition (SCADA) system. Pipeline pressure and valve status will be transmitted from each MLV site to Transco Gas Control in regular intervals to monitor the overall condition of the pipelines. In the event of an upset condition, Transco Gas Control will have the ability to isolate a segment by sending commands to close the remotely operated MLVs. Section 11.1 lists the new mainline valve facilities.

11.3.5 Pipeline Hydrostatic Testing

To provide an added level of safety, PHMSA regulations require that pipelines operate at a lower pressure than the pressure used during hydrostatic testing of the pipeline. This high margin of safety is intended to protect the public above and beyond the pipe's tested strength and all of the other safety and maintenance programs undertaken by Transco. Transco will hydrostatically test the pipelines to a minimum of 1.5 times the required MAOP (see Section 11.3.1). RR 1, Sections 1.4.2.17 and 1.4.3.7, provides construction methods for hydrostatically testing the new pipeline, and RR 2, Sections 2.3.6.3.2 and 2.3.6.5.5, provides the location and details regarding hydrostatic testing for pipeline segments and aboveground facilities.

11.4 Safety Standards for Compressor Stations

In addition to pipeline safety standards for any pipelines within compressor stations, 49 CFR 192.731 through 192.736 establish guidelines for inspections, hazardous materials storage, and monitoring at compressor stations. Transco's planned modifications at Compressor Station 200 and new Compressor Station 206 will be designed, constructed, and operated to meet or exceed applicable specifications. The piping at the stations will be manufactured in accordance with Transco specifications, and wall thickness will conform to the PHMSA safety regulations contained in 49 CFR Part 192.

The compressor stations, at a minimum, will be manned during normal business hours on weekdays and designed for unattended operation 24 hours a day, 7 days a week via remote control from Transco's Gas Control facility. Each compressor station will be surrounded by a perimeter fence to restrict access to authorized personnel only. Compressor Station 206 will also have a security system consisting of video cameras, intrusion alarms, and coded and keyed access to the facility and its building doors. The security system will be monitored both by personnel at the station and remotely by Transco's pipeline control center.

Outdoor lighting for the Compressor Station 206 will be limited to the minimum amount required for security during unmanned nighttime operation. The security system will incorporate outdoor video cameras designed with intrinsic lighting sufficient to record clear images at night. The main gates, yards, and all building entry and exit doors will be equipped with security lighting, and Transco will ensure these lights will have directional control or that they are positioned in a downward position to minimize their visibility from local residences and their effect on migratory birds, while maintaining Occupational Safety and Health Administration (OSHA) standards for lighting.

The compressor buildings are built with noncombustible material and will be sufficiently ventilated to minimize the potential for gas to accumulate within enclosed areas. The existing and new compressor stations are, and will be, equipped with automatic emergency detection and shutdown systems. Transco tests these safety and emergency systems routinely to ensure they are operating properly. The emergency shutdown system design forces a shutdown. The emergency shutdown system isolates areas of the compressor station in the event of a fire before a flammable mixture of gas can develop. The systems also includes sensors for detecting natural gas concentrations and ultraviolet sensors for detecting potential ignition sources. The most effective and immediate way to begin to address a gas pipeline fire is to shut off the gas source. Thus, no special fire-fighting apparatus is required to fight a high-pressure natural gas fire. However, Transco will maintain hand-held dry chemical fire extinguishers at the stations.

In addition, the compressor station equipment will shut down automatically if a mechanical failure poses risks to the equipment or otherwise constitutes a hazard. Transco equips its compressor stations with multiple pressure transmitters and pressure switches with alarms and shutdowns to protect the piping from over-pressurization.

Further, Transco completed a comprehensive engineering analysis at the Compressor Station 206 location to measure any potential impacts from blasting at the nearby quarry. The results of that analysis will be used to effectively mitigate any potential issues in the station's final

engineering design. The Geotechnical and Vibration Analysis Report for Compressor Station 206 is provided as Appendix 6D in RR 6.

Transco maintains first aid and safety equipment at the compressor station at all times. Transco's operations personnel receive training in proper equipment use and first aid.

11.5 Safety Standards for Construction

11.5.1 Traffic Control

Transco's construction contractors will provide traffic warning signs and flagmen as required by local and/or state road encroachment specifications. For those roads where Transco will install the proposed pipeline using an open-cut construction method, one lane of traffic will remain open to traffic at all times or an alternate route will be provided to maintain traffic flows. Further, Transco will coordinate with towns, townships, and counties prior to construction to ensure both Transco and local representatives have appropriate contact information.

11.5.2 Public Access

Transco proposes to keep construction in proximity to residences limited to the shortest timeframe required to safely construct the pipeline. At a minimum, Transco will place safety fences along the construction corridor at warranted locations to keep non-workers out of the workspace. In addition, Transco may hire a security guard to patrol the work sites after work hours and on weekends, as necessary.

11.5.3 Working over Existing In-Service Pipelines

Generally, conducting construction operations over existing pipelines is not a preferred construction method but, if subsurface conditions allow, such operations may occur over short distances in certain areas to minimize impacts on surrounding areas. The Transco pipeline construction specifications indicate that "the minimum cover required to operate heavy equipment over existing pipelines is 5 feet. Operation of heavy equipment over existing pipelines with less than 5 feet of cover shall not be permitted without Company approval. Company may require additional cover, mats, or other protection if soil appears muddy, rocky, or otherwise unsafe. Tracked equipment shall not spin or turn sharply while working over the existing line."

When working over existing in-service pipelines, approximately 5 feet of cover or timber mats (8 inches thick or greater) will be used to distribute the weight of the equipment over a wider ground surface area to reduce the transference of pressure from the ground surface to the

pipeline. Prior to and during construction, the results of pipe stress calculations will determine the number of mats and/or additional spoil coverage required.

11.5.4 Minimum Horizontal Offset between Pipelines

The preferred separation for safely constructing and maintaining large-diameter, high-pressure pipelines is 25 feet. Transco has occasionally allowed reductions in separation below 25 feet for short distances to minimize effects on sensitive resources or residences that cannot reasonably be relocated or removed from the ROW. Consideration of such a reduction in separation distance occurs on a case-by-case basis for each location and varies according to site conditions, type of obstacle, and availability of alternate routing.

11.5.5 Utility Crossings

Crossing over/under existing pipelines or other utility infrastructure is very common for all types of utilities and can be done safely. Transco and its contractors avoid unnecessarily crossing over/under its lines when possible but rely on written safety procedures where crossovers are unavoidable.

A crossover requires deeper excavation, a greater volume of spoil, additional workspace, and exposing the crossed pipelines. All of these factors increase impacts on the surrounding land and require extra care during installation of the new pipeline. Consequently, the crossover method of avoiding obstacles is reserved for locations of particular concern.

Transco will review the material specifications of any utilities to be exposed during installation of a crossover, including cables. Before a crossover is allowed, Transco engineers will work with the utility owner to agree upon a crossing method that satisfies both companies' policies and public safety codes.

Transco's construction inspectors and pipeline construction contractors have extensive experience and knowledge of the proper means and methods for safely installing pipeline crossovers.

RR 8, Sections 8.2.1.1.1 and 8.2.1.1.2, describe the location, utility name/type, and crossing method for each of the utility crossovers.

11.5.6 Welding

It is Transco's policy that only company-approved and company-tested welders are permitted to work on Transco pipeline facilities. Additionally, qualified welders must meet the following standards: American Society of Mechanical Engineers Section IX or API 1104, in

accordance with Subpart E of 49 CFR Part 192. A Transco welding inspector supervises the welding activities and ensures the completion of non-destructive examinations on the girth welds.

11.5.7 Blasting

If necessary, Transco's construction contractor will conduct blasting in accordance with applicable regulatory requirements to ensure that it is done in a safe manner, avoids potential damage to structures, and minimizes potential effects on drinking water supplies, drinking water wells, and agricultural water supplies. Additional geotechnical investigations are being conducted along Madison Loop to inform HDD design and to determine the need for blasting. Additional information regarding blasting is provided in RR 6. No blasting is planned as part of the Quarryville Loop and Raritan Bay Loop. (*If required, a Blasting Plan will be provided for FERC's review*).

11.6 Pipeline Safety Monitoring Program

The first step in Transco's pipeline safety monitoring program for all projects is to make sure that each pipeline is constructed properly. Safety begins at the pipe mill with the manufacturing of the steel pipe. Transco representatives inspect the pipe and coating at the mill to ensure that it meets quality control standards and specifications. During construction, Transco inspects the integrity of pipeline coatings, which protects the pipeline against corrosion. Transco corrects or repairs the coatings, as necessary, and experienced inspectors verify that the corrections and repairs are performed to specifications. Transco requires that 100% of the pipe girth-welds be nondestructively tested and verified in the field before backfilling the pipeline trench. Before a newly installed pipeline is placed into service, Transco pressure-tests each pipeline by filling it with water and increasing the pressure in the line up to a level that exceeds the maximum pressure at which the pipeline will operate, per 49 CFR Part 192. The test pressure is held to demonstrate the pipeline meets the design strength requirements and to determine if any leaks are present.

Once a pipeline installation is complete, Transco implements a number of routine monitoring measures along the permanent ROW, including:

- Physically walking and inspecting the onshore ROW annually;
- Inspecting onshore pipeline ROWs at public road crossings by vehicle, as needed;
- Inspecting and maintaining onshore MLVs once a year;

- Conducting leak surveys as required by PHMSA regulations: once per year for Class 1 and 2 locations, twice per year for Class 3 locations, and four times per year for Class 4 locations;
- Conducting tests with analyzers to verify the effectiveness of CP systems at least once every calendar year, with the time between tests not to exceed 15 months (see Section 11.6.1);
- Rectifiers are monitored remotely 24 hours per days, 7 days per week and at least six times every calendar year, with the time between inspections not to exceed 2.5 months; and
- Within ten years of being placed into service, and every seven years thereafter, Transco will inspect the Raritan Bay Loop with a smart pig.

During inspections, Transco employees will look for signs of unusual activity on the ROWs (i.e., any deviation from the normal conditions). Examples of such deviations include:

- Grading, excavating equipment, or heavy machinery adjacent to or near the ROWs without receiving prior notification;
- Evidence of recent excavation work adjacent to or over the ROWs;
- Any recent landowner plantings over the ROWs or placement of new structures over or adjacent to the ROWs;
- Any evidence of valve, flange, or other gas leaks such as dead or discolored vegetation near the valve, flange, or pipeline; and
- Any abnormal pipeline integrity readings (e.g. varying rectifier readings).

Upon discovery of any such unusual activity, Transco personnel will assess the nature of the activity and remedy any problems with the prescribed corrective action.

In addition to the PHMSA-required surveys listed above, Transco monitors portions of its pipeline systems using SCADA systems. SCADA systems monitor and control facilities or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining, and transportation. SCADA systems gather information, transfer the information back to a control center, carry out necessary analysis and control, and display the information in a logical and organized fashion. SCADA systems include pressure monitoring and provide alerts to the Gas Control facility personnel, who in turn activate the controls, as necessary, and provide the information needed for an appropriate response. The Gas Control facility for the Project facilities is located in Houston, Texas.

11.6.1 Cathodic Protection

Transco has installed CP systems (i.e., low-voltage electrical systems) on its pipeline facilities to prevent corrosion. Transco's pipeline system has an impressed current CP system whereby a direct current is applied, or impressed, on the pipeline to protect against external corrosion. Transco personnel check the voltage and amperage every two months, with many of the facilities being remotely monitored, and notify local operations personnel if readings fall below acceptable levels. In addition, at varying intervals, Transco performs multiple integrity surveys that measure CP effectiveness.

11.6.2 Emergency Response Capabilities

Operation of the pipeline is regulated by the USDOT's PHMSA, and emergency planning requirements are outlined in 49 CFR 192.615. Transco will comply with 49 CFR 192.615 by establishing written procedures to minimize the hazards resulting from a gas pipeline emergency. Transco's emergency procedures will include but not be limited to the following:

- Prompt and effective response to facility emergencies;
- Readily accessible site-specific information that may be needed to effectively respond;
- Receiving, identifying, and classifying notices of events that require immediate response;
- Training appropriate operating personnel to effectively respond to an emergency; and
- Establishing and maintaining adequate means of communication with fire, police, and other public officials.

Transco has a Public Awareness and Damage Prevention Program that calls for communication with emergency responders on an annual basis. The message communicated revolves around pipeline safety, including:

- How to identify a pipeline marker;
- What a pipeline ROW is and looks like;
- Who to call in case of an emergency;
- Physical properties of natural gas; and
- What is expected of first responders during an emergency.

Transco maintains 24-hour emergency response capabilities, including an emergency-only toll-free phone number. The number will be included in informational mailings, posted on

pipeline markers, and provided to local emergency agencies in the vicinity of the Project pipelines and facilities.

In addition, Transco has developed site-specific emergency response plans for its entire system, and Transco's operations personnel attend annual training for emergency response procedures and plans. Transco will establish its emergency response plans for the Project before placing the new facilities in operation. Before the Project is in service, Transco operations personnel will meet with local emergency planning committees, including fire departments, police departments, and public officials, to review the emergency response plans and provide mapping for the Project, aboveground facilities, and permanent access roads in the area. Transco will work with the local emergency officials to determine response procedures for remote residential areas with limited entrance and exit routes for emergency responders and residents. Transco will conduct facility-specific training to inform local emergency personnel of response procedures and meet periodically with the groups to review and revise the plans, if necessary, as discussed in Section 11.7 below.

Local emergency planning committee personnel will be involved in any operator-simulated emergency exercises and post-exercise critiques, as necessary. In response to a pipeline incident, local emergency personnel will set up a perimeter, evacuate residents, contain fires, allow pipeline personnel access, and establish a command center. Transco will use all available, reasonable, and relevant means to support the local emergency personnel in the event of a pipeline incident.

The most effective and immediate way to begin to address a high-pressure natural gas pipeline rupture is to shut off the fuel source. Transco will install MLVs with remote control functionality along the pipeline so that pipeline segments can be isolated, as necessary. The required spacing of these MLVs is based on the applicable class location, as summarized in Section 11.3.1.

11.7 Public Awareness Program

The API Pipeline Standards Committee has developed a set of industry recommended practices (IRPs) for pipeline operators to use in developing public awareness programs. Referred to as IRP 1162, it mandates the distribution of pertinent information to landowners, excavators, and emergency responders. The Transco Public Awareness Program exceeds the requirements of IRP 1162 and has three main objectives:

- Awareness – The public awareness program should raise the awareness of the affected public and key stakeholders of the presence of the pipeline in their community and help them better understand the role Transco plays in transporting energy. A more informed public will supplement pipeline safety measures and contribute to reducing the likelihood of emergencies and/or releases.
- Prevention and Response – The public awareness program should help the public and key stakeholders understand the steps that should be taken to prevent or respond to pipeline emergencies. "Prevention" refers to the objective of reducing the occurrences of pipeline emergencies caused by third-party damage through awareness of safe excavation practices and use of the One Call system. The "response" steps are to protect life, property, and the environment, and to promptly notify pipeline operators and emergency response officials in the event of a release or emergency.
- Continuous Improvement – Transco will periodically evaluate its public awareness program to assess whether it is effective and determine where improvements can be made. The company will complete an annual self-assessment or review of whether the program has been developed and implemented according to the guidelines of API's IRP 1162, 1st Edition, Public Awareness Programs for Pipeline Operators. The results of the review will help to further refine the public awareness program to ensure that it is effective in achieving its stated goals.

Transco will provide the following audiences with information about the pipeline on a regular basis with messages tailored for each targeted stakeholder audience.

- Affected Public – Includes residences, businesses, or places of congregation along the Project. Transco distributes public awareness materials to residents located within the PHMSA defined Potential Impact Radius (PIR). PHMSA defines PIR as the radius of a circle within which the potential failure of a pipeline could have significant impact on people or property (Section 192.903). The PIR is calculated from a mathematical formula (PIR = 0.69 x (sqrt(MAOP)) x pipe diameter), and is considered an area of interest by the USDOT. The public awareness materials provide basic information related to pipeline damage prevention, hazard awareness, emergency response guidelines and pipe location information.

- Emergency and First Responders – Local, state, or regional officials, agencies and organizations with emergency response and/or public safety jurisdiction along the Project.
- Local Public Officials – Local, county, or state officials and/or their staffs having land use and street/road jurisdiction along the Project.
- Excavators – Companies and local government agencies that are involved in earth excavation activities, land developers, and One Call Centers.

Public awareness messages will provide an overview of how pipelines operate, the hazards that may result from activity close to these assets, and the hazards possible due to operations. In addition, messages will include measures undertaken to prevent impacts on public safety, property, and the environment. For residents who live along its pipeline ROWs, Transco provides its 24-hour emergency-only number and information about the pipeline, including what activities to look for and what to do in an emergency. This program operates under requirements identified in API IRP 1162, 1st Edition, and 49 CFR Part 192. As part of this program, Transco mails pipeline educational materials to residences, businesses, and places where people gather that are along the pipeline. Transco formally evaluates its public education program on a regular basis to ensure consistent baseline evaluations by all pipeline operators. Some of the evaluation techniques include formal self-assessment, surveys, and other feedback instruments.

In an emergency, Transco relies on the local emergency services (e.g., fire and police) to communicate with the public. Transco follows local Incident Command System protocols, developed by the local fire marshal and implemented by local fire departments, and maintains contact with the emergency responders. As such, local emergency officials will notify the general public during a pipeline incident. Transco personnel will notify any landowners directly of an incident that affects their property.

Transco works with local emergency response officials to educate them about the nature of pipeline operations and the appropriate actions to take in the unlikely event of an emergency. This includes personal contact with appropriate emergency response organizations and may include joint training, mock drills, and other emergency preparedness exercises. Because pipeline incidents require a high degree of coordination between pipeline operators and emergency officials, select Transco operations personnel receive training in the Incident Command System management process implemented by the USDHS to support the management of expanding incidents.

The Incident Command System provides common terminology, organizational structure, duties, and operational procedures among various federal, state, and local regulatory and response agencies that may be involved in response operations. In the event of a pipeline emergency, a Transco representative will coordinate with emergency responders using the Unified Command organizational structure.

11.8 Integrity Management Program

Transco has developed an enhanced pipeline Integrity Management Program to improve pipeline safety along its entire pipeline system and implements to comply with the prescriptive-based requirements of 49 CFR Part 192, Subpart O. The PHMSA audits this program every year and Transco monitors the program's effectiveness and strives for continuous improvement. Transco implements the program through:

- Installing passive and active CP systems;
- Taking monthly, bi-annual, and annual readings;
- Assessing the integrity of pipelines in HCAs and other areas;
- Improving integrity management data systems within the company;
- Increasing the integrity and reliability of the pipeline system;
- Improving the government's role in reviewing the adequacy of integrity programs and plans; and
- Providing increased public assurance of pipeline safety.

Transco will incorporate the new pipeline segments into the Integrity Management Program. The design of the facilities will allow for internal pipeline inspections and assessment of these new pipeline segments.

11.8.1 Hydrostatic Testing

Transco hydrostatically tests both new and existing pipelines and aboveground facilities as part of its integrity management programs.

New Pipelines

Pipelines are designed to operate at certain pressures based on the pipe material's yield strength, diameter, and wall thickness. Before placing newly installed pipeline segments into service, Transco pressure tests the line by filling it with water and pressuring the line up to a level that exceeds the maximum pressure at which the pipeline will operate. The test pressure is held

to demonstrate whether the pipeline meets the design strength requirements and whether any leaks are present.

New and Modifications to Existing Aboveground Facilities

Transco uses the same testing procedure described above for new compressor stations and new piping associated with new modifications to existing compressor stations.

11.8.2 Smart Pigs

An important part of the Integrity Management Program is the use of an internal pipeline inspection gauge known as a "smart pig." A smart pig is a mechanical device that travels inside the pipe and checks for anomalies, such as pipe wall metal loss caused by corrosion. These devices inspect the pipeline with various sensors and record the data for later analysis, using technologies such as magnetic flux leakage and ultrasonics to detect anomalies in the pipeline. Transco pioneered the use of smart pigs in the pipeline industry, utilizing the technology almost 25 years ago. Federal law now mandates this practice, pursuant to the Pipeline Safety Act, and requires that the internal inspection occur once within ten years of installation and every seven years thereafter. The locations of pig launchers and receivers are identified in Section 11.1.

11.8.3 Caliper Pigs

A caliper, or geometry, pig is an inline inspection tool designed to record pipe features such as dents, ovality, bend radius, and angle. In addition to hydrostatically testing pipelines before they go into service, Transco runs caliper pigs prior to the pipeline being put into-service to ensure the integrity of the pipeline.

11.9 References

Transportation Security Administration (TSA). 2011. Pipeline Security Guidelines. https://www.tsa.gov/sites/default/files/tsapipelinesecurityguidelines-2011.pdf. Accessed October 28, 2016.