ITEM 5

PROPOSED PROJECT ANTIDEGRADATION ANALYSIS

5.0 PROPOSED PROJECT ANTIDEGRADATION ANALYSIS

An antidegradation analysis is required to be performed as part of a Section 401 Water Quality Certification and pursuant to Ohio Administrative Code 3745-1-05. As such this report follows the format of the Ohio EPA Section 401 Water Quality Certification Application Completion and Submittal Instructions (rev. 6/2015). Three alternatives were evaluated for the Access South Project, Adair Southwest Project, and Lebanon Extension Project (collectively, the Projects) and are presented in this application, including the Non-Degradation Alternative (NDA), the Minimal Degradation Alternative (MDA), and the Preferred Design Alternative (PDA) (see Attachment 6 Figures 2.1 and 2.2).

Spectra will accept the MDA for implementation of the Projects presented in this application. Although the MDA does not provide all the benefits that Spectra would gain from the PDA, Spectra's desire to avoid and minimize impacts on streams and wetlands has led to the acceptance of the MDA.

5.1 Project Description

Texas Eastern Transmission, LP (Texas Eastern), an indirect wholly owned subsidiary of Spectra Energy Partners, LP, is seeking certificates of public convenience and necessity from the Federal Energy Regulatory Commission (FERC or Commission) pursuant to Section 7(c) of the Natural Gas Act, a Section 404 Nationwide Permit (NWP) 12 from the United States Army Corps of Engineers (USACE), and a Section 401 Water Quality Certification from the Ohio Environmental Protection Agency (OEPA), in connection with the construction and operation of the Access South Project, Adair Southwest Project, and Lebanon Extension Project (each individually a Project, and collectively, the Projects). The Projects' purpose is to provide incremental pipeline transportation service from the Appalachia area natural gas supply basins to different markets in the Midwest and Southeast by creating additional firm pipeline capacity necessary to deliver natural gas on a long-term basis. Proposed Projects facilities are described in Section 1: Introduction.

Texas Eastern proposes to modify existing facilities along its pipeline system in Pennsylvania (PA), Ohio (OH), Kentucky (KY), Tennessee (TN), Alabama (AL) and Mississippi (MS). The facilities required for the Projects are expected to be located primarily within Texas Eastern's current footprint. The proposed facilities for the Projects include 15.8 miles of 36-inch diameter pipeline looping segments, most of which will be either within or adjacent to Texas Eastern's current right-of-way (ROW). Proposed modifications to existing aboveground facilities will encompass twelve compressor stations and include the installation of additional electric horsepower, additional modifications necessary to allow for bidirectional flow, and meter reversals.

The following new facilities are proposed to be constructed in OH:

New 36-inch Diameter Looping Pipeline

- <u>Wheelersburg to Athens Loop</u> – construct approximately 9.1 miles of pipeline from approximate milepost (MP) 611.6 in Columbia Township, Meigs County, to approximate MP 620.7 in Alexander Township, Athens County.

- Athens to Berne Loop – construct approximately 4.6 miles of pipeline from approximate MP 677.3 in Stock Township, Noble County, to approximate MP 681.9 in Franklin Township, Monroe County.
- Berne to Holbrook Loop – construct approximately 2.1 miles of pipeline from approximate MP 698.2 in Sunsbury Township, Monroe County to MP 700.3 in Sunsbury Township, Monroe County.

Mileage and MPs are rounded to the nearest tenth, which may result in small rounding differences when adding or subtracting various pipeline segments.

Other New Aboveground Facilities

- Athens Launcher/Receiver – install a launcher/receiver, and a 36-inch valve at approximately MP 620.7 in Alexander Township, Athens County. The launcher/receiver will be removed from the Wheelersburg Removal Site and it will be reinstalled at this location. These facilities will be installed within the fenced boundary of the Athens Compressor Station.
- Berne Launcher/Receiver – install a launcher/receiver, and a 30-inch valve at approximate MP 681.9 in Franklin Township, Monroe County. The launcher/receiver will be removed from the Athens Removal Site, and it will be reinstalled at this location. These facilities will be installed within the fenced boundary of the Berne Compressor Station.
- Line 15 Tie-In West – install a new launcher/receiver, a 36-inch valve, and a 30-inch valve at approximate MP 698.2 in Sunsbury Township, Monroe County. The launcher/receiver will be installed partially within the existing Line 15 permanent easement and partially within the new pipeline loop permanent easement. The 36-inch and 30-inch valves will be installed within the existing Line 15 permanent easement.
- Line 15 Tie-In East – install a new launcher/receiver facility that can accept a portable launcher/receiver barrel, a 36-inch valve, and two 30-inch valves at approximate MP 700.3 in Sunsbury Township, Monroe County. The launcher/receiver will be installed partially within the existing Line 15 permanent easement and partially within the new pipeline loop permanent easement. The 36-inch and 30-inch valves will be installed within the existing Line 15 permanent easement.

Modifications at Existing Compressor Stations

Within Ohio, modifications at four existing compressor station sites will include piping modifications to accommodate bi-directional flow capability, installation of new impellers, and installation of increased capacity gas cooling systems along Texas Eastern's existing mainline. These modifications are proposed at the following compressor stations:

- Lebanon Compressor Station in Warren County
- Somerset Compressor Station in Perry County
- Berne Compressor Station in Monroe County
- Athens Compressor Station in Athens County

Receiver Removal Sites

- Wheelersburg Receiver Removal – An existing receiver will be removed at approximate MP 611.6 in Columbia Township, Meigs County. This receiver will be reinstalled at the Athens Compressor Station.
- Athens Receiver Removal – An existing receiver will be removed at approximate MP 677.4 in Stock Township, Noble County. This receiver will be reinstalled at the Berne Compressor Station.

Texas Eastern is not proposing to change the system rating for a maximum allowable operating pressure (MAOP) of 1000 pounds per square inch gauge (psig); the pipeline will operate below 936 psig when flowing in a southerly direction.

The projected in-service date of the Projects is November 1, 2017. Construction of all proposed Projects facilities, including the Wheelersburg to Athens Loop, the Athens to Berne Loop, the Berne to Holbrook Loop, the other new aboveground facilities, and the modifications at existing compressor station sites is currently scheduled to occur from March 2017 to November 2017. Pipeline, compressor station and other aboveground facility construction work is typically restricted to daylight hours, usually starting at 7:00 a.m. and completing at 5:00 or 6:00 p.m. (6 days a week). Some discrete activities (e.g., hydrostatic testing, tie-ins, purge and packing the pipeline, etc.) may require 24 hours of activity for a very limited number of personnel for limited periods of time (e.g., from one to three days).

One construction spread that moves sequentially from one loop to the next is currently anticipated for the pipeline loops and associated facilities. The modifications at existing compressor stations will each require a combination of Texas Eastern employees and third-party contractors.

An analysis was performed to determine whether there are any reasonable alternatives to the proposed Project. The following criteria were utilized in the alternatives analysis:

- Does the alternative meet the purpose and need of the Projects?
- Is the alternative technically and/or economically feasible and practicable?
- Does the alternative offer significant environmental advantages?

Purpose and Need

The Projects will create additional firm pipeline capacity necessary to deliver, in aggregate, 622,000 dekatherms per day (Dth/d) of natural gas on a long-term basis, for new incremental production from the Appalachia area natural gas supply basins to different markets in the Midwest and Southeast along the Texas Eastern system. Specifically, the Access South Project would provide up to 320,000 Dth/d of capacity to transport supply from a receipt point in Uniontown, PA, to delivery points in Texas Eastern's Access Area Zone ELA and Market Zone M1 in Attala County, MS (interconnections with Gulf South Pipeline Company, LP and Southern Natural Gas Company, L.L.C.) to serve Southeast U.S. markets. The Adair Southwest Project would provide up to 200,000 Dth/d of capacity to transport supply from a receipt point in Uniontown West, PA, to delivery points in Texas Eastern's Market Zone M2 in Adair County, KY (interconnection with Columbia Gulf Transmission, LLC) to serve lower U.S. Midwest markets. The Lebanon Extension Project would provide up to 102,000 Dth/d of capacity to

transport supply from receipt point(s) in PA and/or OH to delivery points in Market Zone M2 in or near Lebanon, OH.

Texas Eastern is proposing facilities that will provide the total capacity necessary for the fully subscribed Access South Project and Adair Southwest Project, and for the anticipated design of the Lebanon Extension Project, all with the same proposed in-service date. Each of these Projects will be subscribed by different customers and will serve different market needs, and Texas Eastern will make standalone contractual commitments with the customers of each Project to construct the facilities necessary to provide service under each of the Projects, as necessary.

The need for additional supplies of competitively priced, environmentally friendly natural gas to serve the growing demand throughout the U.S. is well established. Demand is growing not only in the traditional residential, commercial and industrial markets, but also as the electric generation sector has become increasingly dependent on reliable, cost-competitive sources of natural gas that promote a cleaner environment. The Projects present access to multiple markets for the Projects' shippers. The Projects' infrastructure enables gas to move from the developing supply region in Northeast OH and Marcellus gas in PA and West Virginia to markets in OH, the Midwest, Gulf Coast and Southeast. Within the Projects' path, the Projects' shippers will have numerous market options for their gas production, including large electric generation facilities connected directly to the Texas Eastern system or indirectly through downstream facilities, as well as other direct end-users and local distribution company systems.

The Projects also provide for bi-directional flow capability at twelve existing compressor stations to provide firm transportation to Gulf Coast markets. The industrial resurgence along the Louisiana coast has led to a need for diverse supply sources for natural gas, and the Projects connect the Utica and Marcellus shale gas supplies to these growing markets. According to projections by the consulting firm ICF International, the south-central U.S. will see an almost 50 percent growth in demand for natural gas in the next 15 years, driven by power generation, petrochemical, and gas-to-liquid markets.

In addition to providing access to major natural gas markets for the Project Shippers, the Projects will provide Texas Eastern's system and its customers with additional service enhancements such as transportation security, reliability and flexibility by connecting the new Appalachia shale gas supplies to the Texas Eastern mainline system. The Projects will also promote increased commodity price competition and reduce price volatility by introducing new supply sources from the Utica and Marcellus shale production regions to Midwest and Southeast U.S. markets. To that end, the Projects will serve to increase price and supply competition in both the gas and electricity markets in the Midwest, Gulf Coast, and southern U.S. Further, the Projects will provide other Texas Eastern customers with an additional source of supply resulting in increased competition in the regions' energy markets.

5.1.1 Preferred Design Alternative

The locations of the proposed Projects' facilities were determined primarily by the contractual requirements of the service to be rendered by the Projects, such as receipt and delivery points and contract pressures and flows, and by the requirements of Texas Eastern's existing customers. Determinations of facilities and their locations were further refined by considerations which include, but were not limited to: access, suction pressure, discharge pressure, available horsepower, site availability and suitability, and minimization of disturbance to local residents, businesses and the environment.

The proposed pipeline loops' routing and selection processes incorporate information gathered during document reviews, fieldwork, and consultation and feedback from impacted landowners, agencies, government officials, and other interested stakeholders. The proposed pipeline loops parallel the existing Texas Eastern System, and only deviate from the existing ROW in four locations, none of which is more than 0.2 mile from the existing ROW. This proposed co-located alignment does not allow for major route alternatives, as any major route alternative would result in an increase of the area of potential disturbance and impact. As a result, no major route alternatives have been identified that have the potential to meet the Projects' needs and requirements.

Avoidance measures were taken during the Projects' design to reduce impacts to wetlands and waterbodies, including trimming of the workspace and limit of disturbance (LOD) to avoid water resources, minimizing workspace at wetland and waterbody crossings, and siting additional temporary workspaces, pipeyards, and contractor wareyards to maintain a 50' setback from water resources. These construction constraints are oftentimes costly and increase construction time. The PDA would not include any such avoidance measures and would result in 127 streams crossings and 76 wetlands crossings.

Impacts to 12,595 linear feet of streams include 6,324 linear feet of perennial streams, 2,670 linear feet of intermittent streams, and 3,601 linear feet of ephemeral streams. As directed by the OEPA, streams that exhibited the physical characteristics consistent with coldwater habitats were sampled for both macroinvertebrates and fish. According to OEPA, streams must support coldwater macroinvertebrate and fish species to be classified as coldwater habitats. In streams where both macroinvertebrates and fish were collected, vouchers were submitted to OEPA for processing. None of the streams impacted by the PDA were determined coldwater habitat (CWH) or coldwater habitat equivalent. Wetland impacts for the PDA include 4.79 acres of wetlands, including 0.43 acres of forested and 4.36 acres of non-forested wetlands. Of the wetland impacts 1.85 acres are Category 1, and 2.94 acres are Category 2 wetlands; there would be no impacts to Category 3 wetlands. All impacts calculated for the PDA include the pipeline LOD, pipeyards, contractor wareyards, and access roads. No wetlands would be impacted by pipeyards, contractor wareyards or access roads in the PDA. Figure 2.1 – Alternatives Analysis Mapping illustrates the PDA route in comparison to the MDA route.

5.1.2 Minimal Degradation Alternative

Installation or extension of new looping pipelines is one of the most effective ways to achieve an incremental increase in pipeline capacity while limiting impacts to area landowners and environmental resources. The new looping pipelines are located within existing ROWs or on new ROWs adjacent to Texas Eastern's existing pipeline system. The majority of the new ROWs overlap the existing pipeline ROWs, reducing the amount of new permanent ROW needed. By locating new pipeline sections adjacent to maintained existing ROWs, the amount of new clearing and other environmental impacts are reduced and concentrated in a smaller, previously disturbed area. With new looping pipelines adjacent to existing lines, the length of new pipeline sections can be more precisely adjusted to install only the amount of new pipeline required for the specific incremental increase in pipeline capacity, thereby limiting overall disturbance associated with the new facilities.

For the MDA, Texas Eastern has worked with engineering and design to avoid and/or minimize potential direct impacts to environmental resources. The proposed construction work area has

been reduced at wetland crossings to minimize impacts wherever feasible. In addition, ROW agents have worked with and will continue to work with individual landowners to avoid sensitive features on properties and address their concerns.

The proposed pipeline routes are adjacent to, abutting, or co-located with existing utilities where possible for approximately 13.6 miles (approximately 86 percent) of the proposed Projects. Some portions of the pipeline, where co-location was not geographically feasible, deviate from existing ROWs generally to avoid specific construction constraints such as steep side slopes, address feedback from landowners, or avoid or reduce impacts to waterbodies and wetlands. There are four (4) locations where the proposed looping pipeline would deviate from Texas Eastern's existing ROW designated as Deviations 1 through 4.

Deviation 1

Deviation 1 is an approximately 0.8-mile segment of the Wheelersburg to Athens Loop that deviates from Texas Eastern's existing ROW from approximate milepost (MP) 613.2 to 614.0 (Attachment 6 Figure 2.2-1). The initial route paralleled the southern side of the existing ROW, boring under the Norfolk Southern Railroad at approximate MP 613.4. The railroad is located at the bottom of a ravine, and a steep slope abuts it on its eastern side. Environmental surveys identified a perennial stream, Leading Creek (S-BJT-415), and a palustrine forested (PFO) wetland (W-JLK-266) adjacent to the railroad. Two ephemeral streams (S-BJT-414 and S-JLK-101) were also delineated near the railroad crossing, one of which would have paralleled the new loop within its workspace. Based on the construction constraints posed by the bore, steep slopes, streams, and wetlands, Texas Eastern proposes to deviate from the existing ROW, crossing the railroad at a flatter location approximately 500 feet to the south of the initially proposed crossing. This route does not eliminate the perennial stream crossing; however, it will allow sufficient workspace to complete the bore under the railroad without impacting the stream. In addition to crossing Leading Creek (S-BJT-415), the MDA route crosses a 0.06-acre palustrine emergent (PEM) wetland (W-JLK-360) impacting 0.02 acre on non-forested wetland, and a 0.09-acre PFO wetland (W-JLK-359) impacting 0.04 acre of forested wetland. However, this route avoids an approximately 2.19-acre PEM/PFO wetland complex (W-JLK-265), a 0.27-acre PEM wetland (W-JLK-264), and a 0.13-acre PFO wetland (W-JLK-266), avoiding impacts to 0.34 acre of forested wetland and 0.70 acre of non-forested wetland, two ephemeral streams (S-BJT-414 and S-JLK-101), and additional tree clearing northeast of the railroad crossing. Therefore, the MDA route will result in fewer environmental impacts than the PDA route due to Deviation 1.

Deviation 2

Deviation 2 is an approximately 0.2-mile segment of the Wheelersburg to Athens Loop that deviates from Texas Eastern's existing ROW from approximate MP 620.0 to 620.2 (Attachment 6 Figure 2.2-2). The initial route paralleled the northern side of the existing ROW, crossing a parallel perennial tributary to Biddle Creek (S-JLK-124) three times for approximately 155 feet and a 0.07-acre PEM (W-JLK-283) wetland for approximately 73 feet. Texas Eastern proposes to deviate from the existing ROW, shifting to the south at two locations for a total of approximately 200 feet. Deviation 2 does not eliminate wetland and stream crossings, but minimizes overall impacts. An alternate PSS wetland (W-JLK-284) will be impacted resulting in conversion impacts to 0.13 acre of non-forested wetland, and

the tributary to Biddle Creek (S-JLK-124) will be crossed at a perpendicular angle as opposed to the PDA route which paralleled the stream channel, thus minimizing total impacts to the stream. Therefore, the MDA route will result in fewer environmental impacts than the PDA route due to Deviation 2.

Deviation 3

Deviation 3 is an approximately 0.4-mile segment of the Athens to Berne Loop that deviates from Texas Eastern's existing ROW from approximate MP 681.5 to 681.9 (Attachment Figure 2.2-3). The initial route paralleled the southern side of the existing ROW, crossing Swazey Road at an angle before entering the Berne Compressor Station. The initial route crossed five PEM wetlands (W-PJR-013, W-PJR-012, W-PJR-011, W-PJR-009, and W-PJR-010), paralleled a perennial stream (S-RW-019) for approximately 400 feet, and crossed three additional ephemeral streams (S-RW-021, S-RW-020, and S-RW-018), as well as the Clear Fork Little Muskingum River (S-RW-017). It was sited along a steep side slope and would have resulted in crossing Swazey Road at an angle. Texas Eastern proposes to deviate from the existing ROW, shifting upslope approximately 300 feet. The MDA route is sited to minimize impact to wetlands and seeps in side slope areas which appear to contain erodible soils susceptible to slips. This shift would eliminate the crossings of five PEM wetlands (W-PJR-013, W-PJR-012, W-PJR-011, W-PJR-009, and W-PJR-010), eliminating 0.25 acre of impact, two ephemeral streams (S-RW-21 and S-RW-18), and one perennial stream (S-RW-019). Deviation 3 would cross one PEM wetland (W-JLK-387) impacting 0.1 acre of non-forested wetland, one ephemeral stream (S-RW-020), and Clear Fork Little Muskingum River (S-RW-017). The MDA route will result in fewer environmental impacts than the PDA route due to Deviation 3.

Deviation 4

Deviation 4 is an approximately 0.8-mile segment of the Berne to Holbrook Loop that deviates from Texas Eastern's existing ROW from approximate MP 698.2 to 698.9 (Attachment 6 Figure 2.2-4). The initial route co-located the Berne to Holbrook Loop with Texas Eastern's existing Lines 10, 15 and 25 ROW. Environmental surveys identified eight PEM wetlands (W-JLK-310, W-JLK-312, W-JLK-311, W-JLK-314, W-JLK-315, W-JLK-317, W-JLK-320, W-JLK-320, and W-JLK-319), one PSS wetland (W-JLK-318), one PEM/PSS wetland (W-JLK-324) resulting in impacts to 0.48 acre of non-forested wetlands, two perennial streams (S-JLK-190 and S-JLK-199), five intermittent streams (S-JLK-189, S-JLK-191, S-JLK-202, S-JLK-195, and S-JLK-194), and five ephemeral streams (S-JLK-204, S-JLK-200, S-JLK-201, S-JLK-197, and S-JLK-196) that would be impacted by this route. Additionally, due to construction of other planned pipeline projects adjacent to the Lines 10, 15 and 25 ROW, constructability and landowner issues were concerns. As an alternative, Texas Eastern proposes to deviate from the existing Lines 10, 15 and 25 ROW and shift the Berne to Holbrook Loop north to co-locate within Texas Eastern's existing Lines 1, 2 and 3 ROW. This route minimizes wetland and stream crossings; however, does not eliminate impacts. Deviation 4 will impact eight PEM wetlands (W-JLK-350, W-JLK-331, W-JLK-336, W-JLK-335, W-JLK-334, W-JLK-322, W-JLK-321, and W-JLK-333), one PSS wetland (W-JLK-337) resulting in impacts to 0.47 acre of non-forested wetland, one perennial stream (S-JLK-232), two intermittent streams (S-JLK-222 and S-JLK-235), and three

ephemeral streams (S-JLK-233, S-JLK-229, and S-JLK-228). The MDA route will result in fewer environmental impacts than the PDA route due to Deviation 4.

The MDA design approach taken during the Projects planning stages includes minimizing workspace within wetlands to a 75-foot-wide ROW, compared to the typical 100-foot-wide workspace used throughout non-wetland areas. Although this is not preferred due to construction constraints, it is the most effective way to minimize wetland impacts within the Projects' LOD. Operation and maintenance of the pipeline facilities would be limited to a 50-foot-wide permanent ROW. However within wetlands, a 30-foot-wide corridor centered on the pipeline would routinely be cleared of woody vegetation greater than 15 feet in height, with a 10-foot-wide strip centered over the pipeline being maintained in an herbaceous state.

Modifications made to existing aboveground facilities to accommodate bi-directional flow capacity, install impellers, and increase capacity of the gas cooling systems will occur within the current footprint of Texas Eastern's existing compressor stations. These modifications will reduce or eliminate the need for additional new facilities as alternate aboveground sites would require construction of new pipeline and aboveground facilities resulting in greater overall project impacts.

Construction of the proposed Projects implementing the MDA route will result in impacts to streams and wetlands as a result of trenching for the installation of the pipeline looping segments. Impacts have been minimized via deviations from the preferred route and construction practices. The MDA route will result in 82 stream crossings, and 69 wetland crossings.

Impacts to 8,002 linear feet of streams include 3,087 linear feet of perennial streams, 1,996 linear feet of intermittent streams, and 2,919 linear feet of ephemeral streams. As directed by the OEPA, streams that exhibited the physical characteristics consistent with coldwater habitats were sampled for both macroinvertebrates and fish. According to OEPA, streams must support coldwater macroinvertebrate and fish species to be classified as coldwater habitats. In streams where both macroinvertebrates and fish were collected, vouchers were submitted to OEPA for processing. None of the streams impacted by the MDA were determined coldwater habitat (CWH) or coldwater habitat equivalent.

Wetland impacts for the MDA include 3.32 acres of wetlands, including 0.12 acre of forested and 3.20 acres of non-forested wetlands. Of the wetland impacts 1.95 acres are Category 1, and 1.37 acres are Category 2 wetlands; there would be no impacts to Category 3 wetlands. All impacts calculated for the MDA include the pipeline LOD, pipeyards, contractor wareyards, and access roads. No wetlands would be impacted by pipeyards, contractor wareyards or access roads in the PDA. Figure 2.1 – Alternatives Analysis Mapping illustrates the PDA route in comparison to the MDA route.

5.1.3 Non-Degradation Alternative

The NDA includes Horizontal Directional Drilling (HDD) of all stream and wetland crossings and would result in no impacts to existing surface water resources. The non-degradation route would result in greater impacts to landowners as a result of the additional workspace required for HDD operation. Additional workspace would be required outside of the workspace proposed in the MDA in order to operate equipment and have adequate space for pipe-stringing, and would result in additional tree clearing. Additional access would be required to mobilize equipment to

the bore locations, and streams would either be avoided or if feasible, a bridge may be constructed with abutments outside of the ordinary high watermark to eliminate stream impacts.

The HDD method involves boring a pilot hole deep beneath the waterbody to the opposite bank and then enlarging the hole with one or more passes of a reamer until the hole is the necessary diameter. A prefabricated pipe segment is then pulled through the hole to complete the crossing. A successful drill generally results in no impact on the stream bed or banks of the waterbody being crossed. Certain impacts that could occur as a result of the drilling include an inadvertent release of drilling mud (frac-out). This could occur in the area of the mud pits, or along the path of the drill due to unfavorable ground conditions. Drilling mud is comprised of naturally occurring materials, such as bentonite, which in small quantities would not be detrimental to vegetation, fish, or wildlife. In larger quantities, the release of drilling mud into a waterbody could affect fisheries, vegetation, and water quality. The NDA would be significantly more costly than the PDA and the MDA. This alternative was not chosen as result of these potential landowner impacts and cost effectiveness.

5.2 Avoidance

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the proposed project. System options would involve the transportation of the equivalent amount of Utica and Marcellus Shale gas. System alternatives may make it unnecessary to construct some of the proposed Projects, although comparable or more extensive modifications or additions to the other existing pipeline system(s) may be required to increase capacity or provide for bi-directional flow, or another entirely new system may be required. Although these modifications or additions could result in environmental impacts, the impacts may be less, similar to, or greater than that associated with construction of the proposed Projects.

Texas Eastern considered the use of other existing natural gas systems in the region. Since the below ground facilities portion of the Projects are all looping segments located mostly within current Texas Eastern ROW, Texas Eastern has already minimized potential impacts. The least environmentally obtrusive and most cost effective route was to utilize the existing pipeline/compression facilities and modify them to allow bi-directional flow capability.

The No-Action Alternative would entail not constructing the Texas Eastern Projects and would therefore not meet the need requirements for the Projects. This option would have adverse consequences for the Projects' Shippers because it would not meet their needs for firm transportation service commencing on November 1, 2017. Texas Eastern's existing pipeline system is located such that relatively limited modifications to existing facilities would provide the transportation services required by the Projects' Shippers. The No-Action Alternative would avoid the minimal, temporary environmental impacts associated with the Projects. However, this alternative would likely result in a need for new additional gas pipeline projects that would most likely result in significantly greater environmental impacts, both temporary and permanent. Because of the need of the Projects' Shippers to transport gas along the Texas Eastern system in westward and southward directions, and the benefits of meeting the natural gas demands of the Midwest and Southern regions with supply from the Marcellus Shale and Utica Shale transported on the proposed Projects' facilities, no further analysis of this alternative was conducted. The No-Action Alternative is not considered acceptable because it would not accomplish the stated Projects' purpose and need, which is to provide the incremental volumes of natural gas

transportation service for new incremental production in the Utica Shale and Marcellus Shale plays and the larger Appalachian region to markets in an efficient, safe, reliable, and environmentally sound manner.

Installation or extension of new looping pipelines is one of the most effective ways to achieve an incremental increase in pipeline capacity while limiting impacts to area landowners and environmental resources. To meet the Projects' needs, the new looping pipelines are located within existing ROWs or on new ROWs adjacent to Texas Eastern's existing pipeline system. By locating new pipeline sections adjacent to maintained existing ROWs, the amount of new clearing and other environmental impacts are reduced and concentrated in a smaller, previously disturbed area.

5.3 Minimization

The MDA, as described above, is the result of engineering and design processes intended to achieve the desired Projects' purpose and avoid and/or minimize potential direct impacts to environmental resources. During the design phase of the Projects the Berne to Holbrook Loop was shortened from an originally proposed length of approximately 6.2 miles to 2.1 miles, resulting in a reduction of approximately 4.1 miles at the western end of the proposed route. This reduction in length on the Holbrook to Berne Loop resulted in the elimination of approximately 22 stream crossings, and 12 wetland crossings. The stream crossing at Piney Fork, designated by the OEPA as a superior high quality stream, and two PFO wetland crossings will be eliminated as a result of the redesign of the Berne to Holbrook Loop.

For waterbody crossings, adherence to the approved construction procedures will ensure stream flow will be maintained throughout construction. The open-cut crossing method will be utilized for streams that are dry or display no perceptible flow at the time of crossing. Texas Eastern is proposing that all streams will be crossed using a dry crossing method where feasible. Dry crossing methods will involve installation of a flume pipe(s) and/or dam and pump prior to trenching to divert the stream flow over the construction area and allow trenching of the stream crossing in drier conditions isolated from the stream flow. Texas Eastern proposes to cross waterbodies which have flow at the time of construction using a combination of open-cut and dry-ditch crossing methods; the specific method would depend upon site conditions at the time of crossing.

The open-cut method would involve the excavation of the pipeline trench across the waterbody, installation of the pipeline, and backfilling of the trench. The trench width for the installation of a 36-inch pipe typically varies in width between 5 and 8 feet, depending on the soil substrate. Trench spoil would be stored at least 10 feet from the banks of the waterbody (topographic conditions permitting). Sediment barriers, such as silt fencing, staked straw bales, or trench plugs would be installed to prevent spoil and sediment-laden water from entering the waterbody from adjacent upland areas.

Generally during crossings, the full width of the construction ROW would be utilized on either side of the waterbody for construction staging and pipeline fabrication. Extra temporary construction workspace may be required in some situations and would be located in upland areas a minimum of 50 feet from the waterbody, whenever possible, except where adjacent upland consists of cultivated or rotated agricultural lands and other disturbed areas. Certain crossings may require extra workspace in closer proximity to the waterbody. Under no circumstances

would vegetation be cleared between the additional temporary workspace (ATWS) area and the waterbody. The work area would be limited in size to the minimum area necessary to safely construct the waterbody crossing.

For crossings where the dam and pump method is warranted (i.e. perennial stream crossings), temporary dams would be installed upstream and downstream of the crossing location; pumps with screened intakes would be used to transport the stream flow around the construction work area (CWA) and trench. For crossings where the flume crossing method is warranted (i.e. intermittent and ephemeral streams), stream flow would be directed around the CWA and trench through one or more flume pipes placed over the area to be excavated. After trenching across the streambed is completed, a prefabricated segment of pipe would be installed in the trench. Once the trench is backfilled and streambed restoration is complete, the dams and/or flumes would be removed to allow normal flow to reestablish in the stream. If trench dewatering is necessary near waterbodies, the trench water would be discharged into an energy dissipation/sediment filtration device away from the waterbody to prevent silt-lade water from flowing into the waterbody.

Except where reasonable alternative access is available, temporary construction equipment crossings would be installed across all waterbodies to gain access along the ROW for construction operations. Equipment crossings would be installed after clearing to minimize streambed disturbance and downstream siltation. Where culverts are used, devices would also be placed at the outlet to prevent scouring of the stream bottom. After such equipment crossings are established, construction equipment would not be permitted to drive through the waterbody for access, and the equipment crossings would be removed once access in the area is no longer needed. Only the equipment necessary to construct the crossing and install the pipe would be allowed to work in the waterbody.

For wetland crossings, most of the wetlands that would be crossed by the pipeline loops are less than an acre in size and have only seasonally-saturated soils. As a result, the open-trench method will typically be used in these wetlands. When wetland soils are inundated or saturated to the surface, the pipeline trench will be excavated across the wetland by equipment supported on wooden swamp mats to minimize the disturbance to wetland soils.

Texas Eastern does not anticipate the use of the HDD method will be necessary. However, if necessary, Texas Eastern will prepare a site-specific crossing plan for any streams or wetlands that would be crossed using the HDD method. The plans would include the results of geotechnical feasibility studies, temporary and permanent workspace, the HDD crossing locations, entry and exit points, and standard equipment and crossing procedures to be used. An Inadvertent Release and HDD Contingency Plan outlining the procedures to be implemented in the case of drill failure at any phase of the HDD operation, or the inadvertent release of drilling fluid, would be provided.

Texas Eastern determined that open-cut crossings would result in less overall encroachment and less potential for secondary impacts to water resources than HDD crossings. HDD crossings require a substantial footprint on either side of the water resource crossing location for a drill pad and pullback workspace. Drill pads must be excavated to a depth to allow the pipeline to cross at a correct angle beneath the wetland or stream. The pullback area must be cleared to allow for pre-fabrication of the pipeline segment, which is then threaded through the reamed borehole. The extra workspace often results in an increase in forested land clearing and an increase in earth

disturbance directly adjacent to wetlands or streams. In addition, the spoil excavated for the drill pad must be stockpiled and stabilized during construction. The time required to establish drill pads, bore the hole, and install the pipe greatly exceeds the time it would take to cross the wetlands or streams with a conventional open-cut or dry-ditch crossing method.

Texas Eastern will minimize impacts to wetlands and waterbodies through the implementation of Best Management Practices (BMPs) during and after construction. Through BMP implementation, Texas Eastern will minimize the extent of impacts during construction, will restore hydrology to temporarily impacted wetlands and streams, and will enhance restoration of temporarily impacted wetlands. No net loss of wetlands or other waters will be associated with the Projects.

5.4 Magnitude of the Proposed Lowering of Water Quality

Surface water resources were initially identified using the US Geological Survey (USGS) National Hydrography Dataset (NHD) and subsequently verified and surveyed in the field. Surface water resources documented along the Projects' areas include streams, ponds, and associated tributaries. Texas Eastern conducted field surveys during the winter of 2014 and the spring and summer of 2015.

5.4.1 Preferred Design Alternative

Under the PDA the Projects' pipeline facilities would cross 127 waterbodies. Of the 127 crossed waterbodies, 121 streams are considered headwater streams and 6 streams are considered below headwater streams. These include 48 perennial streams, 31 intermittent streams, and 48 ephemeral streams that will be temporarily impacted by the proposed Projects. The Projects' pipeline facilities would cross 76 wetlands. No avoidance measures would be taken to reduce or minimize impacts to wetland and waterbodies.

Impacts to water quality, including the aquatic community, would be similar in nature but in greater quantity than the impacts resulting from the MDA. The MDA magnitude of impacts to water quality is described below.

5.4.2 Minimal Degradation Alternative

The MDA Projects' pipeline facilities will cross 82 waterbodies. Of the 82 crossed waterbodies, 27 perennial streams, 21 intermittent streams, and 34 ephemeral streams will be temporarily impacted by the proposed Projects.

A complete list of waterbodies identified and delineated within the Projects' area, including waterbody identification, stream name, flow type, state water quality classifications, and delineated stream width and length are provided in Item 3: Wetland and Waterbody Delineation Report. Linear feet of impact to streams, and impact type are provided in Item 2: Stream Impact Tables.

Pipeline construction across rivers and streams or adjacent to surface waters can result in temporary and long-term adverse environmental impacts if not properly completed. However, proper construction techniques and timing can ensure that any such impacts are both temporary and minor. The primary impact associated with in-stream trenching is a temporary increase in turbidity and the resulting sedimentation that may occur downstream. Stream crossings will be stabilized within 24-hours of backfilling, so in-stream construction impacts will be short in duration. Surface runoff and erosion from the cleared ROW can also increase in-stream sedimentation during construction. Other potentially deleterious impacts include accidental hazardous material spills resulting from

refueling/maintaining construction equipment, fuel storage, or equipment failure in or near a waterbody, and could have immediate effects on aquatic resources and contaminate the waterbody downstream of the release point.

Long-term impacts on water quality can result from alteration of stream banks and removal of riparian vegetation. If not stabilized and revegetated properly, soil erosion associated with surface runoff and stream bank sloughing can result in the deposition of large quantities of sediment into the waterbody. Prolonged periods of exposure to high levels of suspended solids have been linked to fish egg and fry mortality and degradation of spawning habitat from the infiltration of sediments within the interstitial spaces of streambed gravel. The removal of riparian vegetation tends to increase light penetration into the waterbody, possibly increasing water temperature.

Minor waterbody crossings include all streams less than or equal to 10-feet-wide at the water's edge at the time of construction. Intermediate waterbody crossings include streams greater than 10-feet-wide, but less than 100-feet-wide at the water's edge at the time of construction. Major waterbody crossings include streams greater than 100-feet-wide at the water's edge at the time of construction

All streams crossed by the Projects are considered minor or intermediate streams. It is likely that many of the minor waterbodies will be dry (depending on season) and will not be supporting aquatic habitats at the time of construction. For sites with flowing water, temporary construction-related impacts include increased levels of turbidity and sedimentation associated with installation and removal of the flume or the dam and pump structures as well as the initial flush of stream water across the restored stream bed.

Minor long-term impacts associated with pipeline operations and maintenance will largely be restricted to periodic clearing of vegetation within the permanent ROW at waterbody crossings. These maintenance activities will be consistent with the FERC Procedures, which have been fully integrated into the Projects' Erosion and Sedimentation Control Plan (E&SCP).

Construction impacts on fishery resources may include direct contact by construction equipment with food resources in the form of relatively immobile prey, increased sedimentation and water turbidity immediately downstream of the construction work area, alteration or removal of aquatic habitat cover, introduction of pollutants, impingement or entrainment of fish and other biota associated with the use of water pumps at dam and pump crossings, and downstream scour associated with use of those same pumps. Fish passage during dam and pump crossings will be temporarily restricted during the installation of the new pipeline which typically takes 24 to 48 hours to complete. Fish passage will only be temporarily interrupted during the dam and pump process, and will be restored immediately after the restoration of the stream bed and banks. The short term and localized interruption of fish passage is not anticipated to dramatically affect the migration of fish within the stream systems.

Removal of trees from the edges of waterbodies at the crossing may reduce shading of the waterbody, diminish escape cover, and potentially result in locally elevated water temperatures. Elevated water temperatures can, in turn, lead to reductions in levels of dissolved oxygen, which can negatively influence habitat quality and the fish populations that occupy these habitats. Impacts resulting from tree clearing will be minimized to the extent practicable for the Projects routes by crossing streams and waterbodies perpendicular to the water resource boundaries and clearing only the area that is necessary to construct and operate the pipeline.

There are waterbodies located within areas mapped as having shallow bedrock and may require limited blasting during construction. In such cases, judicious use of blasting will help the contractor comply with restrictions on the duration of in-stream disturbance. Potential adverse effects of blasting may include direct mortality of organisms in the immediate vicinity of the blast. Blasting can also have the same short-term adverse impacts as trenching, including reduced macroinvertebrate prey base, alteration of substrate characteristics, and loss of large woody debris and structure.

To identify the need for drilling or blasting, the trench crew will drill the stream banks to determine if rock will be encountered during construction. Should these test holes identify the need for blasting, the ditch crew will prepare the trench line. When blasting is complete, the ditch crew will remove debris so there is no interference with downstream flow. The mainline tie-in crews will then excavate the trench, install the pipeline, and restore the area in accordance with the Projects E&SCP.

Hydrostatic test water appropriations and discharges will not result in a significant entrainment of fish, loss of habitat, or an adverse effect to water quality. Withdrawal intake hoses will be fitted with intake screen devices that will eliminate the entrainment of fingerling and small fish during water withdrawal. Discharge will comply with regulatory permit conditions and will be controlled to prevent scour and sedimentation, flooding, or the introduction of foreign or toxic substances into the aquatic system.

Accidental spills of construction-related fluids (e.g., oil, gasoline, or hydraulic fluids) on the landscape or directly into waterbodies into the resource could be debilitating to biota, depending on the type and quantity of the spill, and the dispersal and attenuation characteristics of the waterbody. Potential impacts to fish are largely attributable to impacts to water quality and other habitat factors that influence the health of the food base. To reduce the potential for surface water contamination, Texas Eastern will have a Spill Prevention, Control, and Countermeasure Plan (SPCC Plan) in place prior to construction that the Contractor(s) will be required to implement. Refueling or other handling of hazardous materials within 100 feet of wetland and waterbody resources will not be allowed. If the 100-foot setback cannot be met, these activities will be performed under the supervision of an Environmental Inspector in accordance with Texas Eastern's SPCC Plan. The SPCC Plan also specifies that Texas Eastern will conduct routine inspections of tank and storage areas to help reduce the potential for spills or leaks of hazardous materials.

Waterbodies supporting commercial fisheries may be of particular concern because of the need to avoid, minimize and mitigate for any economic impacts that may be caused by construction within the waterbody. There are no waterbodies that have been identified as supporting commercial fisheries within the Projects' area.

Texas Eastern initiated consultation with the USFWS and the ODNR in order to identify waterbodies that may contain federally- or state-listed threatened, endangered, or candidate species and their habitat, coldwater fisheries, and other fisheries resources that could be considered fisheries of special concern. While the consultation with USFWS and ODNR did not indicate there are any fisheries of special concern crossed by the Projects, the agencies did note there were streams that potentially harbor federally- or state-listed threatened, endangered, or candidate species and their habitat. Consultation with ODNR and USFWS to determine ways to reduce and minimize impacts to threatened and endangered species is ongoing.

The pipeline facilities will cross a total of 69 wetlands. A complete list of wetlands identified and delineated within the Projects' area, including wetland identification, classification, and delineated acreage are provided in Item 3: Wetland and Waterbody Delineation Report. Total acres of impact to wetlands, and impact type are provided in Item 2: Wetland Impact Tables.

Some temporary wetland impacts associated with construction of the Projects will involve the temporary removal of wetland vegetation, disturbance of wetland soils and bottoms, and, in some cases, changes in wetland hydrology. There will be some changes in current wetland functions and values; however, it is important to note that following construction and restoration the affected wetlands will continue to provide numerous ecological functions such as: sediment/toxicant retention; nutrient removal/transformation; flood attenuation; groundwater recharge/discharge; and wildlife habitat. These changes may require additional mitigation to ensure reestablishment and growth of the wetland plant communities. Construction impacts to wetlands will be minimized by employing the wetland construction procedures and BMPs in the Projects' E&SCP. In addition, the proposed Projects' facilities are co-located with existing pipeline ROWs for approximately 13.6 miles, or 87 percent of the Projects' length. Therefore, large-scale clearing of forested cover types will be limited as the forested wetland impact will involve a minimal expansion of the existing ROW.

Mitigation for impacts to wetlands and waterbodies is discussed in greater detail in Item 7: Mitigation Plan.

5.4.3 Non-Degradation Alternative

The NDA would not require filling of any jurisdictional waters, since all wetlands and waterbodies would be crossed via HDD. Since no work would be performed in jurisdictional waters under the NDA, water quality functions and ecosystem benefits by the existing water resources would remain essentially the same. However, inadvertent returns are a risk associated with HDD construction procedures and impacts to water resources could occur as a result of drill mud entering the waterbody.

5.5 Technical Feasibility and Cost Effectiveness

5.5.1 Preferred Design Alternative

The PDA is the most technically feasible and cost-effective design for optimizing land use along the pipeline route. The PDA would not require any reduction of workspace or LOD through wetlands or across waterbodies and would be more cost effective for construction than the MDA. However, the PDA would result in the greatest impact to water resources, and therefore would result in a greater cost for the purchase of mitigation credits.

5.5.2 Minimal Degradation Alternative

The MDA is feasible to construct, but less cost-effective to construct than the PDA.

Installation or extension of new looping pipelines is one of the most effective ways to achieve an incremental increase in pipeline capacity while limiting impacts to area landowners and environmental resources. The new looping pipelines are located within existing ROWs or on new ROWs adjacent to Texas Eastern's existing pipeline system. The MDA design includes minimizing workspace through wetlands to a 75-foot-wide ROW, compared to the typical 100-foot-wide workspace used throughout upland areas. Although this is not preferred due to

construction constraints and costs, it is the most effective way to minimize wetland impacts within the Projects' LOD. By locating new pipeline sections adjacent to maintained existing ROWs and reducing workspace through wetlands, the amount of new clearing and other environmental impacts are reduced and concentrated in a smaller, previously disturbed area.

5.5.3 Non-Degradation Alternative

The NDA may be technically feasible to construct, but is not a cost-effective alternative. In order to eliminate all impacts to all onsite jurisdictional waters, the NDA would result in HDD or boring of all wetland and waterbody crossings. Because of the stream and wetland locations and the scope of the planned Projects, all streams and wetlands crossings could not be avoided as part of the Projects.

The NDA using the MDA route would include boring 82 stream crossings with a total of 660 feet of crossing width, and 69 wetland crossings with a total of 4,390 feet of crossing width. The bore equipment would require a minimum of 50 additional feet on either side of each crossing in order to allow for equipment set-up and pipe-stringing. This would result in approximately 20,150 feet of bore length. The average cost of installing pipe via conventional bore is $500 per foot for a 36-inch-diameter pipe. Therefore, the approximate cost to cross all streams and wetlands via conventional bore for the Projects would be greater than $10 million. Additionally, some crossings may require an HDD. The average cost of installing pipe via HDD bore is $2,000 per foot which may result in an additional construction cost of over $40 million.

The cost to bore all wetland and stream crossings would be significantly higher than the PDA or MDA, and is not a feasible option and outweighs the benefits of the construction of the Projects.

5.6 Economic Considerations

The socioeconomic data used in this evaluation was obtained from the most recent U.S. Bureau of the Census and Bureau of Labor Statistics online databases and the Ohio Office of Policy, Research and Strategic Planning. The Projects' socioeconomic impact areas include Monroe, Noble, Athens, and Meigs Counties in Ohio. The townships crossed by the proposed Projects include:

- Sunsbury and Franklin Townships in Monroe County;
- Stock Township in Noble County;
- Alexander Township in Athens County; and
- Scipio and Columbia Townships in Meigs County.

According to the Ohio Office of Policy, Research and Strategic Planning, which is based on U.S. Census Bureau data, the population of Monroe County in 2010 was 14,642. The population density in Monroe County was 32.1 people per square mile in 2010. The estimated 2014 population was 14,465, resulting in a 0.3 percent population decrease.

The population of Noble County in 2010 was 14,645. The population density in Noble County was 36.7 people per square mile in 2010. The estimated 2014 population was 14,363, resulting in a 0.5 percent population decrease.

The population of Athens County in 2010 was 64,757. The population density in Athens County was 127.8 people per square mile in 2010. The estimated 2014 population was 64,713, resulting in a <0.1 percent population decrease.

The population of Meigs County in 2010 was 23,770. The population density in Meigs County was 55.3 people per square mile in 2010. The estimated 2014 population was 23,331, resulting in a 0.4 percent population decrease (Development.ohio.gov website. 2013 and 2014).

All four counties in Ohio that would be affected by the Projects' construction have a weak economic base when compared to the rest of Ohio. In 2010, Monroe County had a lower per capita income, $18,738, and a higher percent of persons below the poverty line, 17.3 percent, compared to the state as a whole, $25,113 and 14.2 percent, respectively. The latest unemployment data shows a relatively high unemployment rate in Monroe County. In March 2015, the unemployment rate was 9.9 percent, which represents a higher rate than Ohio, 5.4 percent, and the U.S., 5.4 percent (U.S. Department of Labor, Bureau of Labor Statistics. 2015b).

In 2010, Noble County had a lower per capita income, $20,029, and a higher percent of persons below the poverty line, 14.9 percent, compared to the state as a whole, $25,113 and 14.2 percent, respectively. The latest unemployment data shows a relatively high unemployment rate in Noble County. In March 2015, the unemployment rate was 7.5 percent in Noble County, which represents a higher rate than Ohio, 5.4 percent, and the U.S., 5.4 percent (U.S. Department of Labor, Bureau of Labor Statistics. 2015b).

In 2010, Athens County had a lower per capita income, $16,642, and a significantly higher percent of persons below the poverty line, 30.3 percent, compared to the state as a whole, $25,113 and 14.2 percent, respectively. The latest unemployment data shows a high unemployment rate in Athens County. In March 2015, the unemployment rate was 6.3 percent which represents a slightly higher rate than Ohio, 5.4 percent, and the U.S., 5.4 percent (U.S. Department of Labor, Bureau of Labor Statistics. 2015b).

In 2010, Meigs County had a lower per capita income, $18,003, and a higher percent of persons below the poverty line, 20.8 percent, compared to the state as a whole, $25,113 and 14.2 percent, respectively. The latest unemployment data shows a relatively high unemployment rate in Meigs County. In March 2015, the unemployment rate was 9.5 percent in Meigs County, which represents a higher rate than Ohio, 5.4 percent, and the U.S., 5.4 percent (U.S. Department of Labor, Bureau of Labor Statistics. 2015b).

In 2010, Monroe County had 1,502 vacant housing units with a rental vacancy rate of 9.2 percent, and Noble County had 1,201 vacant housing units with a rental vacancy rate of 6.9 percent. Athens County had 2,807 vacant housing units with a rental vacancy rate of 7.4 percent, while Meigs County had 1,634 vacant housing units with a rental vacancy rate of 10.5 percent. In addition, there are a number of hotels, campgrounds and RV parks, and apartments in the socioeconomic impact area. At the time of report preparation, no motels were found within the socioeconomic impact area (Ohio Visitors Network. 2015).

According to the U.S. Census Bureau Selected Economic Characteristics, in 2010 the civilian labor force in Monroe County was 6,135 individuals, and in Noble County 5,239 individuals. The same year, the civilian labor force in Athens County was 29,543 individuals, and in Meigs County 10,313 individuals.

The three major occupations in Monroe County within the townships which comprise the Projects' area from the standpoint of employment are: 1) educational, health and social services, 2) manufacturing, and 3) retail trade. The major occupations in Noble County are: 1) educational, health and social services, 2) manufacturing, and 3) retail trade. The major occupations in Athens County

are: 1) educational, health and social services, 2) arts, entertainment, recreation, accommodation and food services, and 3) retail trade. The major occupations in Meigs County from the standpoint of employment are: 1) educational, health and social services, 2) retail trade, and 3) construction.

Socioeconomic impacts during construction are generally related to the size and composition of the labor force and its potential need for public services (including transportation) and temporary housing. Other impacts are directly related to the construction and operation activities themselves, including the need to transport materials to and from the Projects' areas, commerce generated by local materials purchases, and tax revenues generated by the Projects' activities.

Most socioeconomic impacts will be short-term and localized, due primarily to the relatively short construction period when substantial numbers of workers will be active and the limited geographic scope of the Projects. Potential impacts associated with construction may include minor, short-term traffic disruption and congestion in the general vicinity of the Projects. Pipeline construction will also result in minor short-term disturbance of agricultural activities. Since the modifications at proposed aboveground facilities are limited to previously disturbed areas at existing compressor stations, no long-term disturbance to site-specific agricultural areas is anticipated. Two launcher/receivers will be installed within the proposed permanent pipeline easement in agricultural fields. The installation of these two facilities will result in a permanent loss of agricultural land; however, the footprints of these facilities are small and will have a negligible impact on the agricultural productivity of the property. The Projects will not involve the displacement of any residences or businesses, and any disruptions of local residential use will be of short duration and fully mitigated.

Revenues from construction employment, as well as local expenditures by both the construction companies (for construction materials) and non-local construction workers (for temporary housing, food, and entertainment) will benefit the local economy. The increased property tax base and (minimally) enhanced employment opportunities during Projects operation will be beneficial in the long-term.

Construction will temporarily increase the population in the general vicinity of the Projects. The work force requirements for the Projects will fluctuate depending on the construction activity. The highest concentration of workers for the Projects will occur from March 2017 through October 2017. Work force numbers during this period will range from a low of approximately 350 workers to a high of approximately 955 workers. The peak work force coincides with the modifications at existing aboveground facilities. For the construction of the Projects, Texas Eastern anticipates 1 construction spread that moves sequentially from one pipeline loop to the next. The modifications at existing compressor stations will each require a combination of Texas Eastern employees and third-party contractors.

Texas Eastern anticipates hiring a substantial number of local construction workers with the requisite experience for the installation of natural gas facilities. These local hires will include surveyors, welders, equipment operators, and general laborers. Approximately 15 to 35 percent of the construction workers (about 160 to 350 workers at peak) are expected to be local hires. The local supply of construction workers needed for the Projects is expected to be derived from workers employed in the construction industry in Ohio, including those employed in Monroe, Noble, Athens, and Meigs Counties. Construction personnel that may be hired from outside these areas include supervisory personnel and inspectors. These individuals will temporarily relocate to the Projects' vicinity.

If a larger than anticipated percentage of non-local workers is required to meet peak workforce requirements, sufficient workers should be available in the labor pool in the surrounding counties and states. Impacts to the local population in the vicinity of the Projects' areas from non-local worker activities would be temporary and minimal, as these individuals would not relocate their families to the Projects' areas due to the relatively short duration of the work.

It is currently estimated that 1-2 new permanent employees will be required for operation and maintenance (O&M) of the Projects.

The Projects' construction will result in short-term, beneficial impacts in terms of increased payroll and local material purchases. Since about 15 to 35 percent of the workers are expected to be local, and non-local workers will temporarily relocate to the Project vicinity, a substantial portion of the payroll will be spent with local vendors and businesses. Texas Eastern estimates that some additional money will be spent locally on the purchase of equipment and materials. While most of the major materials for the Projects' construction will be purchased from national vendors, common supplies (e.g., stone, concrete, hay bales, grass seed, *etc.*) will be purchased, as available, from vendors within the Projects' socioeconomic impact area. Construction of the Projects will also result in increased state and local sales tax revenues associated with the purchase of some construction materials as well as goods and services by the construction workforce.

The Projects' O&M activities will result in long-term employment benefits for an estimated 1-2 employees as well as substantial long-term benefits in annual property taxes and other revenues including ad valorem taxes, paid annually by Texas Eastern over the life of the Projects' facilities. Communities along the Projects' pipelines will experience ad valorem taxes on an annual basis.

5.7 Cumulative Impacts

Cumulative impacts may result when the environmental effects associated with a proposed project are superimposed on, or added to, either temporary (construction-related) or permanent (operation-related) impacts associated with past, present, or reasonably foreseeable future projects. Although the individual impact of each separate project may be minor, the additive or synergistic effects of multiple projects could be significant.

Texas Eastern has conducted federal and state permitting agency and county planning or development organization website searches and contacted county officials concerning recent or planned new residential developments or large commercial/industrial developments occurring within the counties in OH that are affected by the Projects. No regulation of development occurs at the local level in the Project areas. Recently completed, current, and proposed projects identified within the Projects' counties were evaluated for potential cumulative or additive impacts to resources that would be affected by the construction and operation of the Projects.

Soils and Sediments – Clearing and grading associated with construction of any of the Projects' alternatives and the other projects could accelerate the soil erosion process and, without adequate protection, could result in discharge of sediment to adjacent waterbodies and wetlands. Texas Eastern will implement the FERC Plan and Procedures, as incorporated in the Projects' E&SCP, to establish a baseline for minimizing the potential for erosion as a result of water or wind action and to aid in reestablishing vegetation after construction. In addition, disturbance associated with construction activities will be minimized and mitigated further through the application of Best Management Practices that are incorporated in the Projects' E&SCP.

Wetlands and Waterbodies – Each proponent for past, present, or reasonably foreseeable future projects considered during the cumulative impacts analysis will be required by the terms and conditions of their respective Clean Water Act Section 401 and 404 permits, as applicable, to provide compensatory mitigation for unavoidable wetland and waterbody impacts. The construction and operation of any of the Projects' alternatives, along with the other potential projects, could result in a cumulative reduction in the amount and/or type of wetland within the respective counties. Impacts from the Projects' PDA and MDA on wetlands will be temporary or permanent conversion of forested to emergent or scrub/shrub wetlands only. There will be no loss of wetlands as a result of the pipeline facility installation or aboveground facility installations or modifications for any of the Projects' alternatives.

Vegetation and Wildlife – When projects are constructed at or near the same time, the combination of construction activities could have a cumulative impact on vegetation and wildlife in the immediate area. Clearing and grading and other construction activities associated with each of the Projects' alternatives will result in the removal of vegetation, alteration of wildlife habitat, displacement of wildlife, and other secondary effects such as forest fragmentation and establishment of invasive plant species.

The total amount of vegetation that may be affected by each of the Projects' alternatives could appear large but are still relatively minor compared to the abundance of similar vegetation cover types and wildlife habitats in the Project areas. As part of each Project's permit conditions, mitigation measures should be implemented to minimize the potential for erosion, revegetate disturbed area or otherwise increase the stability of site conditions, and control the spread of noxious weeds. Therefore, the degree and duration of the cumulative impact on vegetation and terrestrial wildlife from these projects will be minimized.

Conclusion – For each of the Projects' alternatives, the majority of cumulative impacts would be temporary and minor when considered in combination with past, present, and reasonably foreseeable activities. However, some long-term cumulative impacts would occur on wetland and upland vegetation and associated wildlife habitats. Some long-term cumulative benefits to the community would be realized from the increased tax revenues. Short-term cumulative benefits would also be realized through jobs and wages and purchases of goods and materials. There is also the potential that the Projects would contribute to a cumulative improvement in regional air quality if a portion of the natural gas associated with the Access South, Adair Southwest, and Lebanon Extension Projects displaces the use of other more polluting fossil fuels.

5.8 Indirect Impacts

The MDA would result in 82 stream crossings, and 69 wetland crossings, resulting in direct temporary impacts to 8,002 linear feet of stream, including 2,919 linear feet of ephemeral, 1,996 linear feet of intermittent, and 3,087 linear feet of perennial, and 3.32 acres of wetlands. No impacts to streams or wetlands will occur as a result of the proposed modifications at the existing compressor stations. There would be no net loss of wetlands as a result of the Projects.

The ecological and hydrological functions of the impacted streams would be reduced by the MDA as compared to the Preferred Design. In regard to off-site impacts, downstream streams would be potentially indirectly impacted by changes to the surface contours and drainage on the site, and reduction of riparian buffers. Sediment and erosion controls during project construction

would protect downstream populations from project-related impacts stemming from in-stream activities.

5.9 Construction Storm Water Management Plans

Best Management Practices (BMPs) for sediment and erosion control would be implemented at all times during the construction of the proposed Projects.

To minimize the potential for sedimentation of waterbodies caused by erosion from the adjacent landscape, trench spoil that is excavated from streambeds and banks will be placed at least 10 feet from the top of the waterbody bank. Erosion control devices, such as silt fences and straw/hay bales, will be placed at the downslope edges of the spoil piles to prevent sediment from entering the waterbody. Once the pipeline is placed in the trench, the temporarily-stored spoil material will be placed back in the trench and the stream banks and streambed will be restored as close to their pre-construction contours as feasible. Stream banks and riparian areas will then be revegetated in accordance with the Projects' E&SCP and any applicable agency requirements.

In accordance with the NWP 12 conditions, materials from trench excavation will not be sidecast into any wetlands or waterbodies for more than 180 days. The material must be stored in a manner that it will not be dispersed by currents or other forces.

Appropriate, site-specific Best Management Practices (BMPs) will be included in construction plans to decrease erosion and sedimentation during and after construction of the Projects site, including the placement of sediment fence inside impact areas. All sediment controls that are utilized will be kept in place during construction activities and will remain until the site has been stabilized. All areas disturbed during construction will be seeded to encourage the establishment of a vegetative cover and decrease erosion potential.

In general, ATWS is typically required on both sides of a waterbody (or wetland) crossing to stage construction equipment, fabricate the pipe, and store materials and trench spoil. Texas Eastern has located most of its proposed ATWS areas in uplands a minimum of 50 feet from waterbody or wetland edge.

Completed stream crossings will be stabilized within 24 hours of backfilling. Original stream bed and bank contours will be re-established, and mulch, jute thatching, or bonded fiber blankets will be installed on the stream banks to prevent erosion and encourage reestablishment of vegetation cover. Where the flume technique is used, stream banks will be stabilized before removing the flume pipes and returning flow to the temporarily isolated channel segment.

Seeding of disturbed ROW approaches to stream crossings will be completed immediately after final ROW grading, in accordance with the Projects' E&SCP, weather and soil conditions permitting. Where necessary, slope breakers (i.e., interceptor dikes) will be installed adjacent to stream banks to minimize the potential for erosion. Temporary sediment barriers, such as silt fence or straw bales, will be maintained across the ROW until a permanent vegetation cover is established. For certain waterbodies, site-specific restoration and habitat enhancement measures will be implemented.

5.10 Post-Construction Storm Water Management Plans

Post-construction storm water control will rely upon structural controls such as slope breakers. In accordance with the Projects' E&SCP, Texas Eastern will conduct post-construction maintenance

and monitoring of the ROW in affected wetlands to assess the success of restoration and revegetation. Monitoring efforts will include documenting occurrences of exotic invasive species to compare to pre-construction conditions.

5.11 References

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